UTAH BIG GAME RANGE TREND STUDIES
2019
WILDLIFE MANAGEMENT UNITS
13A, 14, 15, 16B & 16C



PUBLICATION NUMBER 20-02
REPORT FOR FEDERAL AID PROJECT W-82-R-64

STATE OF UTAH
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WILDLIFE RESOURCES

Utah Big Game Range Trend Studies
2019
Wildlife Management Units
13A, 14, 15, 16B & 16C

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Reports for study sites, with accompanying photographs, are available online at http://wildlife.utah.gov/range-trend.html.

PROGRAM NARRATIVE

State: UTAH

Project Number: W-82-R-64

Grant Title: Wildlife Habitat Research and Monitoring

Project Title: Wildlife Habitat Monitoring/Range Trend Studies

Need: The ability to detect changes in vegetation composition (range trend) on big game winter ranges is an important part of the Utah Division of Wildlife Resources (UDWR) big game management program. The health and vigor of big game populations are closely correlated to the quality and quantity of forage in key areas. The majority of the permanent range trend studies are located on deer and elk winter ranges, however on certain management units, studies are located on spring and/or summer ranges, if vegetation composition on these ranges is the limiting factor for big game populations. Range trend data are used by wildlife biologists for habitat improvement planning purposes, reviewing Bureau of Land Management (BLM) and United States Forest Service (USFS) allotment management plans, and as one of several sources of information for revising deer and elk herd unit management plans. Range trend data may also be gathered where habitat information is necessary for other wildlife species such as greater sage-grouse.

Objective: Monitor, evaluate, and report range trend within designated key areas throughout the state, and inform DWR biologists, public land managers and private landowners of significant changes in plant community composition in these areas.

Expected Results or Benefits: Range trend studies in each region will be reread every five years, and vegetation condition and trend assessments will be made for key areas. UDWR biologists, land management personnel from the USFS and BLM, and private landowners will use the range trend database to evaluate the impact of land management programs on big game habitat. Annual reports are readily available on the Division's website, on USBs, and in hard copies located in UDWR regional offices, BLM and USFS offices. Special studies (habitat project monitoring and big game/livestock forage utilization studies) will give UDWR biologists and public land managers' additional information to address local resource management problems.

REMARKS

The work completed during the 2019 field season and reported in this publication involves the reading of interagency range trend studies in the DWR Southern Region. Most trend studies surveyed in these management units were established in the 1980s and reread at 5-year intervals.

The following Bureau of Land Management and U.S. Forest Service offices provided information and/or assistance in completion of the trend studies, which add to the value of this interagency report:

Bureau of Land Management

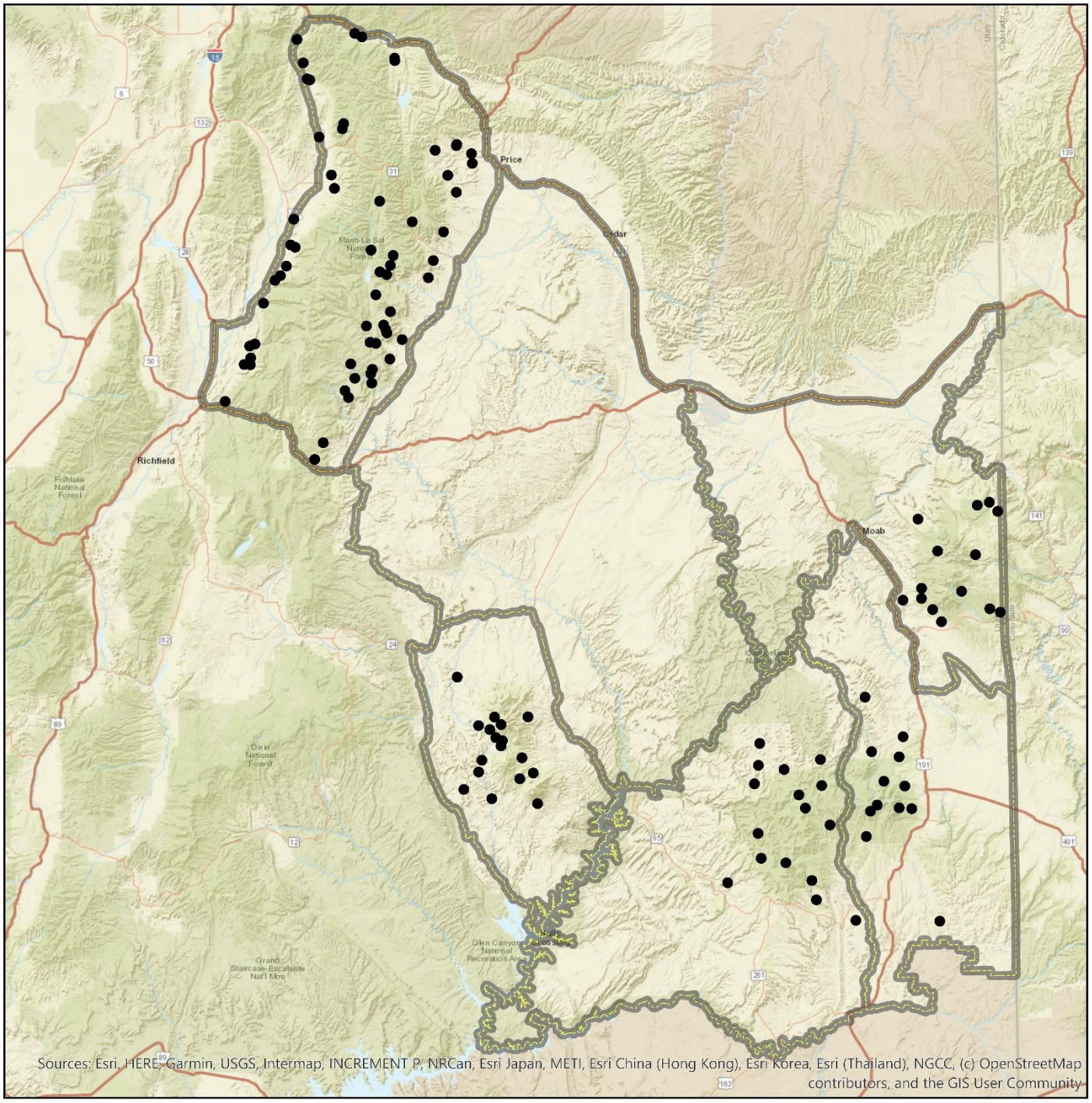
- Monticello Resource Area
- Moab Resource Area

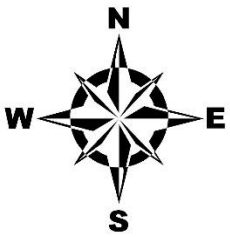
Manti-LaSal National Forest

- Ferron Ranger District
- Moab Ranger District
- Monitcello Ranger District
- Sanpete Ranger District

Private landowners were cooperative in allowing access to study sites located on their land.

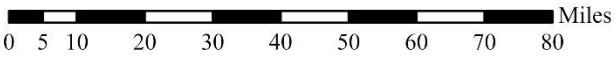
RANGE TREND STUDY SITES SURVEYED IN 2019



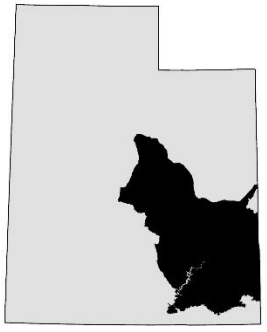


Project, Status

- RT,Active
- Wildlife Management Unit Boundaries



Area of Interest



RANGE TREND STUDY METHODS

Studies monitoring range trend depend greatly on site selection, especially when dealing with large geographic areas such as wildlife management units. Since it is impossible to intensively monitor all vegetation or habitat types within a unit, it is necessary to concentrate on specific sites and/or "key" areas within distinct plant communities on big game ranges. These "key" areas should be places where big game has demonstrated a definite pattern of use during normal climatic conditions over a long period. Trend studies are located within these areas of high use and/or crucial habitat as agreed upon by DWR, BLM, and USFS personnel. Often, range trend studies are established in conjunction with permanently marked pellet group transects. Once a "key" area has been selected, specific placement for sampling is determined. The sampling grid is carefully placed in order to adequately represent the surrounding area. Half-high steel fence posts or similar material permanently marks all sampling baselines. The first, or "0-foot baseline stake", is marked with a metal tag for proper identification of the transect.

Study sites for the Watershed Restoration Imitative (WRI) are placed to monitor vegetation treatment projects. Studies are established to assess conditions prior to treatment. Each study is re-read approximately every 3-5 years following treatment.

Vegetation Composition

Vegetation composition is determined by setting up five consecutive 100 foot transects in the area of interest. This 500-foot line is the baseline and one 100-foot belt is placed perpendicular to each 100-foot section of the baseline at predetermined footmarks and centered on the 50-foot mark of the belt. A rebar stake is placed at the beginning of each belt to ensure that future sampling is in consistent alignment with the originally sampled belt. A 1/4 m^2 quadrat is centered every 5 feet along the same side of the belt, starting at the 5-foot mark. Cover and nested frequency values are determined for vegetation, litter, rock, pavement, cryptogams, and bare ground. Cover and nested frequency values are also estimated for all plant species occurring within a quadrat, including annual species. However, prior to 1992 no data was collected for annual species.

Percent Cover: Cover is determined using an ocular cover estimation procedure using seven cover classes (Bailey and Poulton 1968, Daubenmire 1959). The seven cover classes are: 1) .01-1%, 2) 1.1-5%, 3) 5.1-25%, 4) 25.1-50%, 5) 50.1-75%, 6) 75.1-95%, and 7) 95.1-100% (Figure 1). For example, to estimate vegetation cover with this method, an observer would visualize which cover class all the vegetation would fit into if the plants were moved together until they were touching. To quantify percent cover for bare ground, litter, rock, pavement, and cryptogams, the observer would visually estimate which cover class could accommodate all of the specified cover type within the quadrat. These numbers are then recorded. To determine percent cover for each belt, the midpoint for each cover class value observed is summed and divided by the number of sampling quadrats (20). The mean for the five belts is the percent cover for a given site.

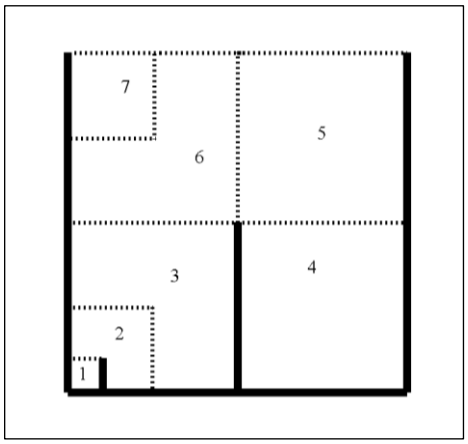


Figure 1 Cover classes of the 1/4 m^2 sampling quadrat

Total canopy cover of shrubs or trees is also estimated using the line-intercept method ([1]U.S. Department of Interior Bureau of Land Management 1999). The total distance intersecting the line by a particular species of tree or shrub along each belt is divided by the total length of the line to give percent canopy cover. A six-inch gap rule is used in measuring intercept; gaps less than six inches between the same tree or shrub species are included in total measurement (Boyd, Bates, & Miller 2007).

Nested Frequency: Nested frequency values for the quadrat range from 1-5 according to which area or sub-quadrat the plant species or cover type is rooted in. The notation for each sub-quadrat is as follows: 5 = 1% of the area, 4 = 5% of the area, 3 = 25% of the area, 2 = 50% of the area, and 1 = the remainder of the quadrat. Each time a particular plant species or cover type occurs within the quadrat, it is scored relative to which of the smallest nested quadrats it is rooted in (in the case of vegetation) or where it first occurs (for all other cover types). The highest possible score is 5 for each quadrat occurrence and 100 per belt, for a possible score of 500 for each species or cover type at a given site (Figure 2).

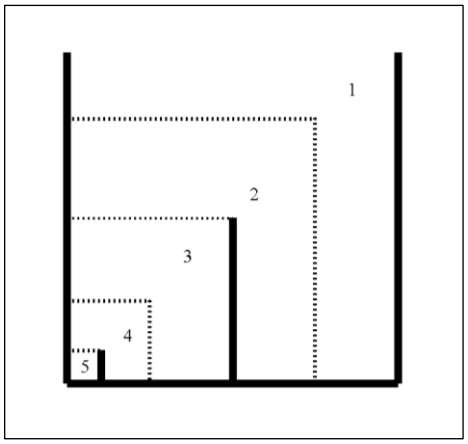


Figure 2 Nested frequency sub-quadrats of the 1/4 m^2 sampling quadrat.

Higher nested frequency scores represent a higher abundance for that plant species or cover type. These summed values are used to help determine changes in trend and composition through time. Nested frequency has been found to be a more sensitive measurement for changes taking place within plant communities than quadrat frequency (Smith et al. 1987, Smith et al. 1986, Mosley et al. 1986). Plant cover and density values are not reliable indicators of trend for herbaceous species and can fluctuate greatly with precipitation and time of season sampled. Therefore, plant cover and density values can be misleading if used independently and do not necessarily indicate changes in composition and/or distribution of key plant species.

Shrub Density & Characterization: Shrub densities are estimated using five, 1/100th acre strips centered over the length of each 100-foot belt. All shrubs rooted within each strip are counted and categorized using a modified Cole Browse Method ([2]U.S. Department of Interior Bureau of Land Management 1999):

Seedling:	Plants up to three years old, which have become firmly established, usually less than 1/8-inch diameter.
Young:	Larger with more complex branching. Does not show signs of maturity. Usually between 1/8 and 1/4-inch diameter.
Mature:	Complex branching, rounded growth form, larger size, seed is produced on healthy plants. Generally larger than 1/4-inch diameter.
Decadent:	Plant, regardless of age, that is in a state of decline, usually evidenced by 25% or more dead branches.
Dead:	A plant that is no longer living.

Data Collection for Aspen Density by Size Class: Starting in 2011, aspen density was estimated using an aspen classification method by Jones, Burton, and Tate (2005). All aspen stems within 67 cm of each side of 100 ft distance tape are counted and recorded in the following size classes:

Size Class I:	less than or equal to 1.5 feet (18 inches). Scan as *Seedling* This class size represents the annual or recent recruitment of suckers due to suckering at root buds.
Size Class II:	greater than 1.5 feet to 5 feet. Scan as *Young* This class size represents the survival of suckers and the progression of recruitment of existing suckers that are vulnerable to browsing of the terminal leader.
Size Class III:	greater than 5 feet and up to 1 inch dbh. Scan as *Mature* This class size represents the aspen regeneration grown above the height range that is vulnerable to browsing; the minimum height for size class III represents the maximum browse line height for herbivores present.
Size Class IV:	greater than 1 inch dbh. Scan as *Decadent* Class IV captures information for all remaining cohorts in the plot.

Shrubs are also rated according to their availability and the amount of use they display, and placed in one of nine form classes:

1. All available, lightly hedged.
2. All available, moderately hedged.
3. All available, heavily hedged.
4. Largely available, lightly hedged.
5. Largely available, moderately hedged.
6. Largely available, heavily hedged.
7. Mostly unavailable.
8. Unavailable due to height.
9. Unavailable due to hedging.

Lightly hedged*: 0 to 40 percent of twigs browsed.
Moderately hedged*: 41 to 60 percent of twigs browsed.
Heavily hedged*: Over 60 percent of twigs browsed.
Largely available: One-third to two-thirds of plant available to animal.
Mostly unavailable: Less than one-third of plant available to animal.
Unavailable: In classifying browse to a form class, unavailability may be the result of height, location, or density.

*Degree of hedging is based on leader use over the past three years: current annual growth is not included.

Shrubs are also rated on their health and placed into one of four vigor classes:

1. Normal and vigorous.
2. Insect infested or diseased.
3. Poor vigor
4. Dying

Poor vigor:	chlorotic or discolored leaves, smaller than normal stems or leaves, flowering restricted, partially trampled, pulled up, or otherwise damaged. Stunted growth, partial crown death.
Dying:	substantial portion of crown dead (more than 50%), more extreme than 3 above. Probably an irreversible condition.

In addition, each mature shrub species closest to every 10-foot mark along a sampling belt is measured to determine average height and crown. This allows a maximum sample of 50 plants per species to be measured at a given site depending on their respective densities.

Point-Center Quadrat Method: Tree density is determined using the point-center quarter method (Mitchell 2007, Dahdouh-Guebas and Koedam 2006, Pollard 1971, Cottam and Curtis 1956) at 100-foot intervals along the baseline measuring to a maximum of 15 meters. The strip method that is used to estimate shrub density can, in most cases, effectively inventory seedling and young tree densities. However, the strip method is less effective at estimating density of mature trees that are often widely distributed.

Animal Occupancy: The pellet group transect utilizes (50) 100ft^2 circular plots that are placed through the study area. These are usually two parallel transects of 25 plots on each side of the vegetation transect which runs 400 feet to 500 feet in length. The number of recent pellet groups for wildlife (usually deer and elk) and pats for cattle are recorded. That number is then converted to days use per acre (hectare) (Neff 1968). Quadrat frequency of wildlife and livestock droppings is also captured within the 1/4 m² quadrat. Rabbit pellet groups are not included in the pellet group transects but are sampled in quadrat frequency.

Other Information: Management background information, photographs, and knowledgeable plant identification add to the dataset for each site. Management and background information for each site is obtained from the administering agency. Repeat photographs are taken including a general view down and back up the baseline. A close-up of each half-high baseline post further characterizes individual sites. Correct plant identification is critical for a complete and accurate site analysis. Starting in 2016, species identification and classification is reported following the USDA Plant Database taxomic nomenclature (USDA, NRCS. 2016). Prior to 2015, species identification mostly followed "A Utah Flora" (Welsh et al. 2003). In some cases, most notably *Agropyron sp*. and *Purshia sp.*, the species names used were those found in the Range Trend Study Plant Species List (Giunta 1983), Intermountain Flora (Cronquist et al. 1977), and the Intermountain Range Plant Names and Symbols (Plummer et al. 1977) and were retained to maintain continuity and alleviate confusion with earlier published reports.

Trend Determination

The methods described above rely on relative and absolute measurements of plant composition as determined from the frequency, cover, and density data. In addition, estimates of plant vigor, average height and crown diameter, form class, and age class are utilized to characterize shrub populations.

In order to assess and interpret the landscape in a more effective way, trend assessments are no longer formally addressed within the report and have been replaced by the Desirable Components Index (DCI), Woodland Succession Phase models, and State-and-Transition Models that are associated with their Ecological Site as described by the National Resources Conservation Service (NRCS). Using these three methods in conjunction will give land managers a more complete assessment of the area of interest, and what measures, if any, need to be taken in order to improve the ecology of a site.

Desirable Components Index: Range Trend Program personnel created the desirable components index (DCI) as a tool to address condition and/or value of winter ranges for mule deer. This index is meant to be a companion to, not a replacement for, the site-specific range trend assessments that are found in the annual Utah Big Game Range Trend Studies report. This index was designed to score mule deer winter range based upon several important vegetation components (i.e. preferred browse cover, shrub decadence, shrub young recruitment, cover of perennial grasses, cover of perennial forbs, cover of annual grasses, and presence of noxious weeds). Although the index may be useful for assessing habitat for other species (i.e. sage-grouse and elk), the rating system was devised to specifically address mule deer winter range requirements.

This index is used primarily to determine if a particular site has the vegetation components necessary to be good winter range for mule deer. It can also be used to identify areas where habitat restoration projects may be needed and assist land managers in determining possible rehabilitation options. Because it does not take into account factors such as soil stability, hydrologic function, and other environmental factors, it should not be used to assess a sites function and/or condition as typically used by the Federal land management agencies.

Desirable mule deer winter range provides 12-20% of preferred browse cover, 20% or less shrub decadency, and 10% or more of the shrub population is young. The herbaceous understory contains 8-15% perennial grass cover, 5% perennial forb cover, and less than 5% annual grass cover. Based on these criteria, communities are scored in a 100-point scale using the following system:

Preferred Browse (60 points)

(Preferred Browse species are favorable or crucial to deer and are broken into three categories; Highly Preferred, Preferred and Key).

Preferred Browse Cover (30 pts. possible)

- Highly Preferred species = 1.5 points for each 1% of cover, Preferred species = 1.25 points for each 1% of cover and Key species = 1 point for each 1% of cover (maximum 30 points)

Percent Decadence (15 points possible)

- 0.3 points for each 1% under 50% decadence and -0.3 points for each 1% over 50% decadence (maximum 15 points or minimum -15 points)

Percent Young (15 points possible)

- 0.5 points for each 1% of young

Herbaceous Understory (40 points)

Perennial Grass Cover (30 points possible)

- 2 points for each 1% cover

Perennial Forb Cover (10 points possible)

- 2 points for each 1% cover

Annual Grass Cover (-20 points possible)

- -0.75 points for each 1%cover

Noxious Weeds (State List)

- -2 points for each species present

The Desirable Components Index ratings are divided into four categories because each community has a different ecological potential. These categories include very low potential (Desert Ecological Site), low potential (Semidesert Ecological Site), mid-level potential (Upland Ecological Site) and high potential (Mountain and High Mountain Ecological Sites) categories. The four categories are scored based on the above criteria as follows:

Very Low potential scale (Desert Ecological Site)

> 50	Excellent
50-40	Good
40-25	Fair
25-10	Poor
< 10	Very Poor

Low potential scale (Semidesert Ecological Site)

> 65	Excellent
45-64	Good
25-44	Fair
10-24	Poor
< 10	Very Poor

Mid-level potential scale (Upland Ecological Site)

> 80	Excellent
79-65	Good
64-50	Fair
49-35	Poor
< 35	Very Poor

High potential scale (Mountain and High Mountain Ecological Site)

> 90	Excellent
89-70	Good
69-55	Fair
54-40	Poor
< 39	Very Poor

Once a DCI score has been determined for a particular site, the score can be compared to previous sample years in order to determine a quality trend and better assess conditions that may need to be addressed within the community for mule deer habitat (i.e. .increasing preferred browse cover, decreasing the decadence to young ratio, increasing perennial herbaceous cover, or control/removal of noxious weeds et cetera).

Woodland Succession: Although pinyon-juniper woodlands are an important community within their own ecotype, sagebrush steppe, mixed shrub, and grassland communities have experienced significant encroachment of pinyon-juniper woodlands. As active encroachment within these communities continues, abiotic and biotic structures and functions are interrupted, which leads to the reduction of wildlife habitat, forage production, and biodiversity. Moreover, encroachment increases fuel load and fire frequency jeopardizing remnant shrub and grass communities to future loss. In an attempt to describe the succession or maturation of pinyon-juniper, phases of succession are presented within the report to aid managers in identifying the progress of infilling on a particular site and what type of input may be necessary for site rehabilitation (Tausch, Miller, Roundy, & Chambers, 2009).

Phase I: is described as having an open canopy where crown lift is absent, there is active recruitment of young pinyon-juniper trees to the community with low seed production, and an intact shrub understory (Tausch, Miller, Roundy, & Chambers, 2009).

Phase II: is described by the expansion of the pinyon-juniper canopy where crown lift is absent, there is active recruitment of young pinyon-juniper trees to the community with moderate to high seed production, and a shrub understory that ranges from nearly intact to one that is significantly thinning (Tausch, Miller, Roundy, & Chambers, 2009).

Phase III: is described by the stabilization of the pinyon-juniper canopy where crown lift is present and lower limbs are dying, recruitment of young trees is limited with low to moderate seed production, and the shrub understory exhibits 75% or greater dead plants throughout the respective population (Tausch, Miller, Roundy, & Chambers, 2009).

State-and-Transition: Ecological sites are individual land types that have the ability to support specific plant species or communities based on the characteristic for their respective land type. Each ecological site therefore has its own potential and responds according to that potential when a site is influenced by natural or anthropomorphic inputs. State-and-Transition modeling attempts to describe an individual ecological site's response to these inputs by dividing the plant communities into states that are comprised of one to multiple community phases and to potentially predict the direction of a community transitioning from one state to another. State-and-Transitions are not trends per se, but rather an illustration of a community's current state in which it has the potential to respond positively or negatively to triggers and thresholds specific to that ecological site. As a tool, State-and-Transition models can provide a way for land managers to interpret a landscape and provide meaningful assessment and monitoring for landscape management. This report identifies each site's potential by supplying the ecological site name and corresponding number, and where available, verifying the provided NRCS state-and-transition models with range trend's quinquennial data, and a description of the transitions between states and phases over the duration of each study. Where not available, state-and-transition models are not referenced, but an attempt is made to describe the transitional processes that have occurred over the duration of a particular study not referenced to a model.

REPORT FORMAT

The first page of the report is the map page, which has a topographic map and a diagrammatic sketch to illustrate the study location. The map page also contains three sections, *Location information*, *Transect Information* and *Directions to Site*, which contain directions, location, and transect setup decriptions. Following the map page, discussions of the study site are addressed by several topics including *Site Information*, *Wildlife Habitat and Vegetation History*, *Site Notes*, *Soils*, *Site Potential*, and "Trend Summary" tables. Site information contains geographic information such as land ownership, allotment, elevation, aspect, slope, and sample dates. *Disturbance History* contains all known disturbances that have occurred on the site. Known seed mixes are listed within the table named "SeedMix." *Habitat and Vegetation Information* contains wildlife habitat that the site falls within for specific big game and other species of interest. *Vegetation History* follows *Wildlife Seasonal Habitat* and evaluates any major compositional transitions within the vegetation community. Site notes discuss any miscellaneous information as it relates to the site and immediate area. Site potential presents a table containing average annual precipitation, NRCS taxonomic soil classification, NRCS ecological site, and NRCS ecological site number. If available, the name of the NRCS ecological site will be hyperlinked to the NRCS' website for additional features concerning ecological site. The table titled "Soil Analysis Data" presents texture and chemical characteristics found on the site. The *States and Transitions* portion states if the site has a defined state and transition model available and is followed by, if available, descriptions of any state or phase transitions that have occurred on the site as it relates to the State-and-Transition diagram modeled by the NRCS. Additional assessment is made by comparing photographs from year to year which can be referred to in the accompanying CD or webpage http://wildlife.utah.gov/range-trend.html.

The "Trend Summary" tables contain compiled vegetation data for each site. A computer-generated data summary presents the pooled data for nested frequency, quadrat frequency, basic ground cover, soil characterization, shrub density, and shrub characterization.

Report Description

The following tables and partial tables are examples from study numbers 09-01 and 11B-06.

Map Page

The name and directions for locating a site are given on the map page. A topographical map and diagrammatic sketch are provided to show spacial reference of site location and arrangement. A 7.5 minute topographical map name and public land survey description are located below the map. In addition, UTM coordinates follow the public land survey location. Compass bearings are in degrees relative to magnetic north, unless specified as true north (T). Directions to a site and baseline are provided starting from a prominent location on a mileage and turn-by-turn basis that is closely referenced to the diagrammatic sketch. Also included on this page are the identification and dimensions of the specified transect, which include the browse tag number by which the transect is identified, transect bearing and length, belt placement as it relates to the baseline, and belt marker placement as it relates to the belt itself.

Site Information

Table 1: The "Disturbance History" table summarizes what type of treatments and/or disturbances have affected the site over it's history. Where available, historic treatments have been listed that have occurred on the site prior to establishment. If applicable, treatment projects that are associated with the Utah Watershed Restoration Initiative (WRI) are referenced by their project number. Finalization dates or the date in which a particular disturbance occurred are listed with reported affected acreage of the respective disturbance.

Table 09-01.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Herbicide - Herbicide	Taylor Mountain Fire Rehabilitation	3182	Fall 2014	2200
Chaining - Two-Way Ely Chain	Taylor Mountain Fire Rehabilitation	3182	Fall 2014	1100
Seeding - Rangeland Drill	Taylor Mountain Fire Rehabilitation	3182	October 2014	2000
Hand Crew - Lop and Scatter	Steinaker Draw PJ (CCI)	28	September 2015	266
Seeding - Aerial After	Taylor Mountain Fire--BLM ESR Supplement	3207	December 2014	2019
Fire - Wildfire	Taylor Mountain Road	-	July 2014	3146.98

Table 2: The "Seed Mix" tables are included when a seed mix is made available and are referenced to a particular WRI project. Additionally, multiple seed mixes are often associated with one particular treatment and are combined to simplify the appearance of the report.

Table 09-01.2 SeedMix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Taylor Mountain fire; drill seed mix			Drill	Oct 2014	200
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS lbs/acr
G	Achnatherum hymenoides	Indian Ricegrass		0.50	0.00
G	Agropyron cristatum	Crested Wheatgrass		1.00	0.00
G	Agropyron fragile	Siberian Wheatgrass		1.00	0.00
F	Medicago sativa	Alfalfa		1.00	0.00
F	Onobrychis viciifolia	Sainfoin		4.00	0.00

Mix Name			Application Type	Application Date	Acres
Taylor Mountain Fire Sage/Kochia			Aerial	Dec 2014	2020
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS lbs/acr
	Bassia prostrata	Forage Kochia	Millard UT	0.99	0.83
S	Artemisia tridentata ssp. wyomingensis	Wyoming Big Sagebrush	Uintah UT	1.22	0.15
S	Artemisia tridentata ssp. wyomingensis	Wyoming Big Sagebrush	Beaver UT	0.26	0.05

Habitat and Vegetation Information

Table 3: The "Wildlife Seasonal Habitat" table is a summarization of habitat for big game and other species of interest, and further categorizes the habitat into seasonal range and a value description of the habitat for the allied species.

Table 09-01.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Deer	crucial	winter
Elk	crucial	winter

Table 4: The "Vegetation History" table summarizes what major vegetation types have occurred on the site over the duration of the study. Ranges of sample years provide the length of time that the dominant vegetation type has persisted on the site with it's corresponding species listed in the adjacent cell. Most vegetation types will have one dominant species listed: this is is usually a shrub species (Appendix A - Vegetation Type). For example, some sites will have a shrub canopy that dominates the site with a perennial herbaceous understory that has similar average cover as the canopy, but occurs infrequently. In this case, precedence is given to the shrub layer. Vegetation type can also be shared in the case of co-dominance. Using the example above, if the herbaceous understory had a higher cover, then the shrub layer would likely share the vegetation type with the perennial understory. The history of pinyon-juniper encroachment is characterized within the table stating the phase(s) of succession and the corresponding years of persistence. Phases of woodland succession may also influence the vegetation type. For example, pinyon-juniper encroachments in phase I are not considered co-dominant and may not be listed within the vegetation type column as they are subordi vegetation type. Trees in phase II are considered co-dominant with the co-dominant understory counterpart, and under these circumstances tree species are then listed with the understory counterpart within the vegetation type column.

The following "Vegetation History" table indicates that Wyoming big sagebrush was the dominant vegetation type on the site from 1982 to 2010, but the site transitioned to an annual grass-forb community in 2015. The table also indicates that woodland succession has remained in Phase I over the sample years until 2015 when the Taylor Mountain Fire removed all of the trees on the site. The transition from Wyoming big sagebrush to an annual grass-forb community that occurred between the 2010 and 2015 sample years indicates that a trigger mechanism has occurred and a threshold has been crossed that lead to the change in community composition, and in this case is related to the Taylor Mountain fire that occurred in 2014.

Table 09-01.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1982	Wyoming Big Sagebrush	Phase I
1988	Wyoming Big Sagebrush	Phase I
1995	Wyoming Big Sagebrush	Phase I
2000	Wyoming Big Sagebrush	Phase I
2005	Wyoming Big Sagebrush/Annual Grass	Phase I
2010	Wyoming Big Sagebrush/Annual Grass	Phase I
2015	Annual Grass-Forb	No Encroachment

Site Notes

This section contains miscellaneous information pertinent to the study site.

Soils

Table 4: Chemical and textural characteristics are listed here and were determined by laboratory analysis from a composite soil sample taken near each of the five baseline starting stakes (Allison and Moode 1965, Day 1965, Kenney and Nelson 1982, Normandin et. al. 1998, Olsen et. al. 1954, Rhodes 1982, Schoenau and Karamonos 1993, Sims and Jackson 1934, Walkley and Black 1971).

The descriptive terms used for ranges in pH are as follows:

Ultra Acidic	< 3.5
Extremely Acidic	3.5-4.4
Very Strong Acidic	4.5-5.0
Strongly Acidic	5.1-5.5
Moderately Acidic	5.6-6.0
Slightly Acidic	6.1-6.5
Neutral	6.6-7.3
Slightly Alkaline	7.4-7.8
Moderately Alkaline	7.9-8.4
Strongly Alkaline	8.5-9.0
Very Strongly Alkaline	> 9.1

Percent organic matter (% OM) refers to the amount of organic matter in the top 12 inches of the soil profile. Parts per million (ppm) of phosphorus (P) and potassium (K) are also included. Values for phosphorus and potassium less than 6

ppm and 60 ppm, respectively, are considered to have low availability for plant growth and development (Tiedemann and Lopez 2004).

The electrical conductivity of the soil is reported in decisiemens per meter (dS/m). Electrical conductivity is related to the amount of salts more soluble than gypsum in the soil. The following classes can be used as a reference.

Non saline	0-2
Very slightly saline	2-4
Slightly saline	4-8
Moderately saline	8-16
Strongly saline	>16

Table 09-01.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Loam	7.9	77.0	12.7	10.3	0.6	6.3	64.0	0.6	08/19/2000

Site Potential

This section is prefaced by the listing of the average annual precipitation, NRCS ecological site name, and NRCS ecological site number. The ecological site name and numbers are determined by range trend personnel by digging a soil pit on site to establish the soil characteristics of the site, which is then dichotomized to establish the name of the ecological site and number.

State-and Transitions: The state-and-transitions section is prefaced by whether or not there is a defined state-and-transitions model proposed for the ecological site. If a model is not proposed, an attempt is made to find a similar ecological site that has a proposed state-and transition model, but is not directly correlated to the site being evaluated. When state-and-transition models are available, an effort is made to summarize the community transitions that have occurred over the duration of the study in conjunction with the referenced state-and-transition diagram provided by the NRCS. This section closely reflects the transitions captured in the "Vegetation History" table, but an emphasis is placed on the states and community phases of a particular vegetation type and what community pathway (mechanism) drove the community phase to its current ecological state. States are identified in the diagram by whole numbers. For example, the reference state is referred to by 1, the current potential state by 2, and subsequent states are labeled 3, 4 and etc. while community phases are nested within a state and are identified by rational numbers. For example, community phases in state 1 would be identified by 1.1, 1.2, 1.3 etc. Transitions are labeled alpha-numerically and are preceded by the letter "T". It is important to note that this section of the report does not stand alone and care must be taken by the reader to reference the provided state-and-transition model in order to understand the driving factors within the community.

Trend Summary Tables

Table 6: The "Shrub/Tree Summary" table summarizes percent average quadrat cover and percent average line intercept cover for all shrub and tree species occurring on the site. Average quadrat cover is determined using cover classes in conjunction with the 1/4m^2 quadrat to estimate percent quadrat cover. To more accurately estimate canopy cover of trees and shrubs, the line-intercept method is used along each 100-foot belt.

Table 09-01.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees.

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1995	21.2	4.1	-	-	-	-
2000	20.0	2.1	-	-	-	-
2005	14.8	0.2	-	20.1	0.8	-
2010	16.3	0.2	-	17.6	0.6	-
2015	-	-	-	-	-	-

Table 7: The "Herbaceous Summary" table summarizes the total average cover for all grass and forb species and summarizes the nested frequency by life form.

Table 09-01.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups.

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1995	408	133	300	69	7.5	1.7	1.7	0.3
2000	356	99	121	8	7.0	1.2	0.4	0.0
2005	485	62	170	13	21.4	0.8	0.8	0.1
2010	405	78	136	9	17.6	1.6	1.6	0.2
2015	192	180	178	114	17.1	4.2	21.8	3.1

Table 8: The “Basic Ground Cover” table summarizes average cover of vegetation, rock, pavement, litter, cryptogams, and bare ground. Vegetation crown cover estimates are projected vertically while the remaining cover types’ cover estimates are a planar projection and when combined will usually exceed 100%. Therefore, comparisons can be made for all cover measurements except for general vegetation cover.

Table 09-01.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

	Cover Type (%)					
Year	Bare Ground	Cryptograms	Litter	Pavement	Rock	Vegetation
1995	21.0	15.9	43.5	0.0	0.0	34.0
2000	25.8	18.3	43.0	0.1	-	30.1
2005	16.3	14.2	44.7	0.1	0.0	37.3
2010	20.7	9.7	56.5	-	0.0	36.5
2015	72.9	0.0	14.4	2.0	0.0	36.2

Table 9: The “Pellet Group Data” table summarizes the frequency of animal pellets sampled within the 100 quadrats placed along the sampling belts as well as data from a pellet group transect read parallel to the study site baseline. Quadrat frequency of rabbit or big game pellets indicates a relative amount of presence by a particular animal. This data can help characterize changes in wildlife occupancy patterns on a site.

The data presented in the “Days Use per Acre” section of the table is reported from the pellet group transect in conjunction with the vegetation transects. The pellet group transect utilizes 50 100ft^2 circular plots that are placed in the study area: these are usually two parallel transects of 25 plots on each side of the vegetation transect which runs 400 feet to 500 feet in length. The number of recent pellet groups for wildlife (usually deer and elk) and pats for cattle are recorded. That number is then converted to days use per acre (hectare) (Neff 1968). Animals that do not have a defined defecation rate are recorded as pellets per acre (ha) and are indicated by (*). Rabbit pellet groups were recorded in a few of the years close to the year 2000, but have not been sample within the transect since that time; these are also recorded as pellets per acre (ha).

Table 09-01.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Coyote	Mule Deer	Elk	Rabbit
	Quadrat Frequency				
1995	-	-	47	2	14
2000	1	-	30	1	65
2005	1	-	29	1	90
2010	-	-	40	2	28
2015	-	-	4	-	15
Year	Days Use Per Acre (ha)				
1995	-	-	-	-	-
2000	0.7 (1.8)	-	45.6 (112.6)	-	400.8 (989.9)*
2005	2.2 (5.4)	8.7 (21.5)*	59.0 (145.7)	-	-
2010	-	-	65.0 (160.6)	6.0 (14.9)	-
2015	-	-	8.7 (21.5)	-	-

*Pellets per acre (ha)

Table 10: The "Grass Species" table summarizes the average cover and nested frequency for grass species. Species may be designated as annual species, noxious weeds, and/or introduced species by the associated symbol below the graph. Only species that are on the Utah Noxious Weed List are designated as a noxious weed.

Table 09-01.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bromus briziformis[ai] (rattlesnake brome)	Bromus tectorum[ai] (cheatgrass)	Elymus elymoides (squirreltail)	Elymus lanceolatus (thickspike wheatgrass)	Hesperostipa comata (needle and thread)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Sporobolus cryptandrus (sand dropseed)	Vulpia octoflora[a] (sixweeks fescue)
year	Nested Frequency										
1995	-	-	-	294	26	61	3	53	18	-	290
2000	-	-	-	345	4	16	2	47	52	-	35
2005	-	-	-	476	10	16	5	25	16	-	292
2010	4	-	-	405	2	4	11	7	56	-	-
2015	85	56	5	160	-	26	5	-	30	4	50
year	Average Cover (%)										
1995	-	-	-	5.6	0.2	0.3	0.1	0.7	0.4	-	1.8
2000	-	-	-	6.9	0.0	0.1	0.0	0.4	0.6	-	0.1
2005	-	-	-	19.1	0.1	0.1	0.0	0.5	0.1	-	2.3
2010	0.0	-	-	17.6	0.0	0.0	0.1	0.2	1.2	-	-
2015	1.8	0.9	0.0	16.6	-	0.5	0.4	-	0.5	0.0	0.5

a - Annual; n - Noxious Weed; i - Introduced Species

Table 11: The "Forb Species" table table summarizes the average cover and nested frequency for forb species. Species may be designated as annual species, noxious weeds, and/or introduced species by the associated symbol below the graph. Only species that are on the Utah Noxious Weed List are designated as a noxious weed.

Table 09-01.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Allium (onion)	Alyssum alyssoides[ai] (pale madwort)	Androsace septentrionalis[a] (pygmyflower rockjasmine)	Astragalus (milkvetch)	Calochortus nuttallii (sego lily)	Chaenactis (pincushion)	Chenopodium leptophyllum[a] (narrowleaf goosefoot)	Cleome serrulata[a] (Rocky Mountain beeplant)	Collinsia parviflora[a] (maiden blue eyed Mary)	Cryptantha[a] (annual cryptantha)	Cryptantha (cryptantha)	Descurainia pinnata[a] (western tansymustard)	Draba[a] (draba)	Erigeron pumilus (shaggy fleabane)	Eriogonum cernuum[a] (nodding buckwheat)	Gilia[a] (gilia)
year	Nested Frequency																
1995	-	11	-	4	-	2	2	17	-	3	-	18	103	-	8	2	16
2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	7
2005	-	-	-	-	2	2	-	-	-	8	-	7	11	-	2	-	-
2010	-	-	-	-	-	-	-	-	-	-	-	1	4	-	-	-	2
2015	1	-	25	-	-	2	-	-	22	-	11	-	60	1	-	-	8
year	Average Cover (%)																
1995	-	0.0	-	0.0	-	0.0	0.0	0.0	-	0.0	-	0.1	0.3	-	0.0	0.0	0.0
2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	0.0
2005	-	-	-	-	0.0	0.0	-	-	-	0.0	-	0.0	0.1	-	0.0	-	-
2010	-	-	-	-	-	-	-	-	-	-	-	0.1	0.0	-	-	-	0.0
2015	0.0	-	2.0	-	-	0.0	-	-	2.2	-	0.2	-	8.2	0.0	-	-	0.7

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 12: The “Shrub and Tree Species” table summarizes the quadrat average and line intercept cover for shrub and tree species. Species may be designated as tree species, preferred browse, and/or introduced species by the associated symbol below the graph. Preferred browse species are determined by Range Trend staff.

Table 09-01.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. wyomingensis[p] (Wyoming big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus (yellow rabbitbrush)	Linanthus pungens (granite prickly phlox)	Opuntia (pricklypear)
year	Line Intercept Cover (%)			
1995	-	-	-	-
2000	-	-	-	-
2005	20.1	0.8	-	-
2010	17.6	0.4	-	0.2
2015	-	-	-	-
year	Quadrat Cover (%)			
1995	21.2	4.0	0.1	-
2000	20.0	2.1	-	-
2005	14.8	0.2	-	0.0
2010	16.3	0.0	-	0.2
2015	-	-	-	-

t - Tree Species; p - Preferred Browse; i - Introduced

Table 13: The “Shrub/Tree Characteristics” table summarizes shrub and tree species by density, age class distribution, utilization, poor vigor, and average height/crown.

Table 09-01.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding	Seedling	Young	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Artemisia tridentata ssp. wyomingensis[p] -- (Wyoming big sagebrush)									
1995	4360	120	8	77	15	39	8	6	83/107
2000	5440	40	1	34	65	28	3	25	74/78
2005	4360	3280	12	26	62	9	30	30	92/94
2010	3080	-	3	65	32	34	1	29	88/106
2015	-	-	-	-	-	-	-	-	-/-
Chrysothamnus viscidiflorus ssp. viscidiflorus -- (yellow rabbitbrush)									
1995	1000	-	6	86	8	0	0	2	60/81
2000	1020	20	8	65	28	0	0	12	46/56
2005	320	40	13	63	25	0	0	6	46/48
2010	120	-	0	50	50	0	0	50	49/65
2015	-	-	-	-	-	-	-	-	-/-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 13a: The “Aspen Characteristics” table summarizes characteristics of the aspen community. Only aspen that was sampled using the size class distribution method is included in this table. Aspen sampled using the modified Cole Browse method is included in the “Browse Characteristics” table. Density is reported for the aspen population and is characterized by age class distribution, which is further subdivided into its corresponding age class demographics; this method was started in 2011. Aspen data prior to 2011 is included in Table 13.

Class I:	Trees are less than or equal to 1.5 ft tall
Class II:	Trees are greater than 1.5 ft to 5 ft
Class III:	Trees are greater than 5ft and up to 1 in. dbh
Class IV:	Trees are greater than 1 in. dbh

The aspen population is then characterized by utilization, which is subcategorized by percentages of moderate and heavily hedged plants, and concluded with the percentage of plants displaying poor vigor.

Table 11B-06.13a - Aspen Characteristics. Characteristics of aspen populations including density, size class distribution, and vigor of plants.

Year	Density	Size Class Distribution				Utilization		Poor Vigor (%)
	Plants per Acre	Class I (%)	Class II (%)	Class III (%)	Class IV (%)	Moderate (%)	Heavy (%)	
Populus tremuloides (quaking aspen)								
2015	1620	10	62	20	9	27	11	1

- Class I - Less than or equal to 1.5 feet
- Class II - Greater than 1.5 feet to 5 feet
- Class III - Greater than 5 feet and up to 1 inch diameter at breast height (dbh)
- Class IV - Greater than 1 in diameter at breast height (dbh)

Table 14: The “Tree Characteristics” table tree density estimates using the point-center quarter method which better estimates density of widely distributed trees than the shrub density strips. Average basal diameter is also listed in centimeters.

Table 11B-06.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12'	
Abies lasiocarpa (subalpine fir)							
2015	74	-	60	13	-	27	6.4
Pinus flexilis (limber pine)							
2015	6	-	-	50	50	-	6.0
Picea pungens (blue spruce)							
2015	1	-	100	-	-	-	3.0
Populus tremuloides (quaking aspen)							
2015	179	15	55	15	15	-	2.5
Pseudotsuga menziesii (Douglas-fir)							
2015	5	-	50	-	-	50	6.0

PRE-1992 DATA

Pre-1992 Data: Data collected before July 19, 1992 has been excluded from the individual site summaries due to differences in sampling techniques and changes in sample size and area. This pre-1992 data can be found in the Utah Big Game Range Trend Studies 1982-1992 report. The following explanations address some of the major changes that occurred with data collection. Nested frequency quadrat divisions and zones were different with four divisions as compared to the five divisions and zones. In addition, nested frequency data for annual species was not collected. Shrub density was collected along a separate transect that was adjacent to the nested frequency transect within three circular plots (radius of 8.3 or 11.7 ft) centered on three permanently marked stakes. Therefore, changes in density (before and after 1992) may not necessarily indicate changes in trend, especially shrub populations that are characteristically clumped and/or have discontinuous distributions. The earlier smaller sample could easily either overestimate or underestimate shrub populations. Other characteristics like percent decadence, percent poor vigor, percent heavy hedging, young recruitment, etc., are given more weight in determining shrub population transitions when comparing survey years where sample sizes were different. For more information on earlier range trend sampling methods, see the Pre-1992 Data report methodologies (Utah Big Game Range Trend Studies 1982-1992).

REFERENCES

Allison L. E. & C. C. Moode. Carbonate. pp. 1387-1388. In C. A. Black (ed.), Methods of Soil Analysis Part 2. 1965. American Society of Agronomy, Inc. Madison, WI.

Bailey, A. W. & C. E. Poulton. 1968. Plant communities and environmental interrelationships in a portion of the Tillamook burn, Northwest Oregon. Ecology. 49(1):1-13.

Boyd, C. S., J. D. Bates, & R. F. Miller. 2007. The influence of gap size on sagebrush cover estimates using line intercept technique. Rangeland Ecology and Management 60:199–202.

Cottam, G. & Curtis, J. T. 1956. The use of distance methods in phytosociological sampling. Ecology 37:451-460.

Conover, W. J. 1980. Practical Nonparametric Statistics (second edition). John Wiley & Sons, New York. 493pp.

Cronquist, A., A. H. Holmgren, N. H. Holmgren, J. Reveal and P. Holmgren. 1977. Intermountain Flora (volume six). Columbia University Press, New York. 584pp.

Dahdouh-Guebas, F. & N. Koedam. 2006. Empirical estimate of the reliability of the use of the point- centred quarter method (PCQM): solutions to ambiguous field situations and description of the PCQM+ protocol. Forest Ecology and Management. 228:1-18

Daubenmire, R. 1959. A canopy coverage method of vegetational analysis. Northwest Science 33:43-66.

Day P. R. Particle fractionation and particle-size analysis. pp. 562-566. In: C. A. Black (ed.), Methods of Soil Analysis Part 1. 1965. American Society of Agronomy, Inc. Madison, WI.

Giunta, B. C. 1983. Utah interagency big game range trend plant species list. Utah Dept. Of Natural Resources, Division of Wildlife Resources. Salt Lake City, Utah. 281pp.

Jones, B.E., Burton, D. & Tate, K.W. 2005. Effectiveness monitoring of aspen regeneration on managed rangelands. R5–EM–TP–004, USDA, Forest Service, Pacific Southwest Region, Vallejo, CA.

Kenney, D. R. & D. W. Nelson. Nitrogen - Inorganic forms. Pp. 643-698. In: A. L. Page (ed.), Methods of Soil Analysis Part 2. 1982. American Society of Agronomy, Inc. Madison, WI.

Mitchell, K. 2007. Quantitive Analysis by the Point-Centered Quarter Method. Department of Mathematics and Computer Science Hobart and William Smith Colleges. Geneva, New York. 33pp. <http://people.hws.edu/mitchell/PCQM.pdf>

Mosley, J. C., S. C. Bunting, & M. Hironaka. 1986. Determining range condition from frequency data in mountain meadows of central Idaho. J. Range Manage. 39:561-565.

Neff, D. J. 1968. The Pellet-Group Count Technique for Big Game Trend, Census, and Distribution: A Review. Journal of Wildlife Management. 32(3):597-614

Normandin, V., J. Kotuby-Amacher, & R. O. Miller. 1998. Modification of the ammonium acetate extractant for the determination of exchangeable cation in calcareous soils. Commun. Soil Sci. Plant Anal. 29(11-14):1785-1791.

Olsen, S. R., C. V. Cole, F. S. Watanabe, & L. A. Dean. 1954. Estimation of Available phosphorous in soil by extraction with sodium bicarbonate. USDA Cir. No. 939.

Plummer, A. P., S. B. Monsen and R. Stevens. 1977. Intermountain Range Plant Names and Symbols. USDA Forest Service, General Technical Report INT-38. Ogden, Utah.

Pollard, J. H. 1971. On distance estimators of density in randomly distributed forests. Biometrics. 27(4):991-1002.

Schoenau, J. J. and R. E. Karamonos. Sodium Bicarbonate Extractable P, K, and N. pp. 51-58. In: M. R. Carter (ed.), Soil Sampling and Methods of Analysis. 1993. Canadian Society of Soil Science. Ottawa, Ontario, Canada.

Sims, J. R. and G. D. Jackson. 1971. Rapid analysis of soil nitrate with chromotropic acid. Soil Sci. Soc. Amer. Proc. 35:603-606.

Smith, S. D., S. C. Bunting, and M. Hironaka. 1987. Evaluation of the improvement in sensitivity of nested frequency plots to vegetational change by summation. Great Basin Naturalist. 47(2): 299- 307.

Smith, S. D., S. C. Bunting, and M. Hironaka. 1986. Sensitivity of frequency plots for detecting vegetation change. Northwest Science. 60: 279-286.

Rhodes, J. D. Soluble Salts. pp. 167-179. In: A. L. Page (ed.), Methods of Soil Analysis Part 2. 1982. American Society of Agronomy, Inc. Madison, WI.

Tausch, R. J., Miller, R. F., Roundy, B. A., & Chambers, J. C. (2009). Piñon and Juniper Field Guide: Asking the Right Questions to Select Appropriate Management Actions. *Circular 1335*, 96. U.S. Geological Survey.

Tiedemann, A. R. and C. F. Lopez. 2004. Assessing Soil Factors in Wildland Improvement Programs. In: S. B. Monsen, R. Stevens, and N. Shaw (compilers) Restoring Western Ranges and Wildlands. Gen. Tech. Rep. RMRS-GTR-136-vol 1. Fort Collins, CO: U.S. Department of Agriculture, Forest

Service, Rocky Mountain Research Station. pp. 39-56. U. S. Dept. of Agriculture - Soil Conservation Service. 1972. Soil survey of Utah County, Utah - central part. U. S. Govt. Printing Office, Wash. D. C. 161 pp.

USDA, NRCS. 2016. The PLANTS Database (http://plants.usda.gov, 3 May 2016). National Plant Data Team, Greensboro, NC 27401-4901 USA.

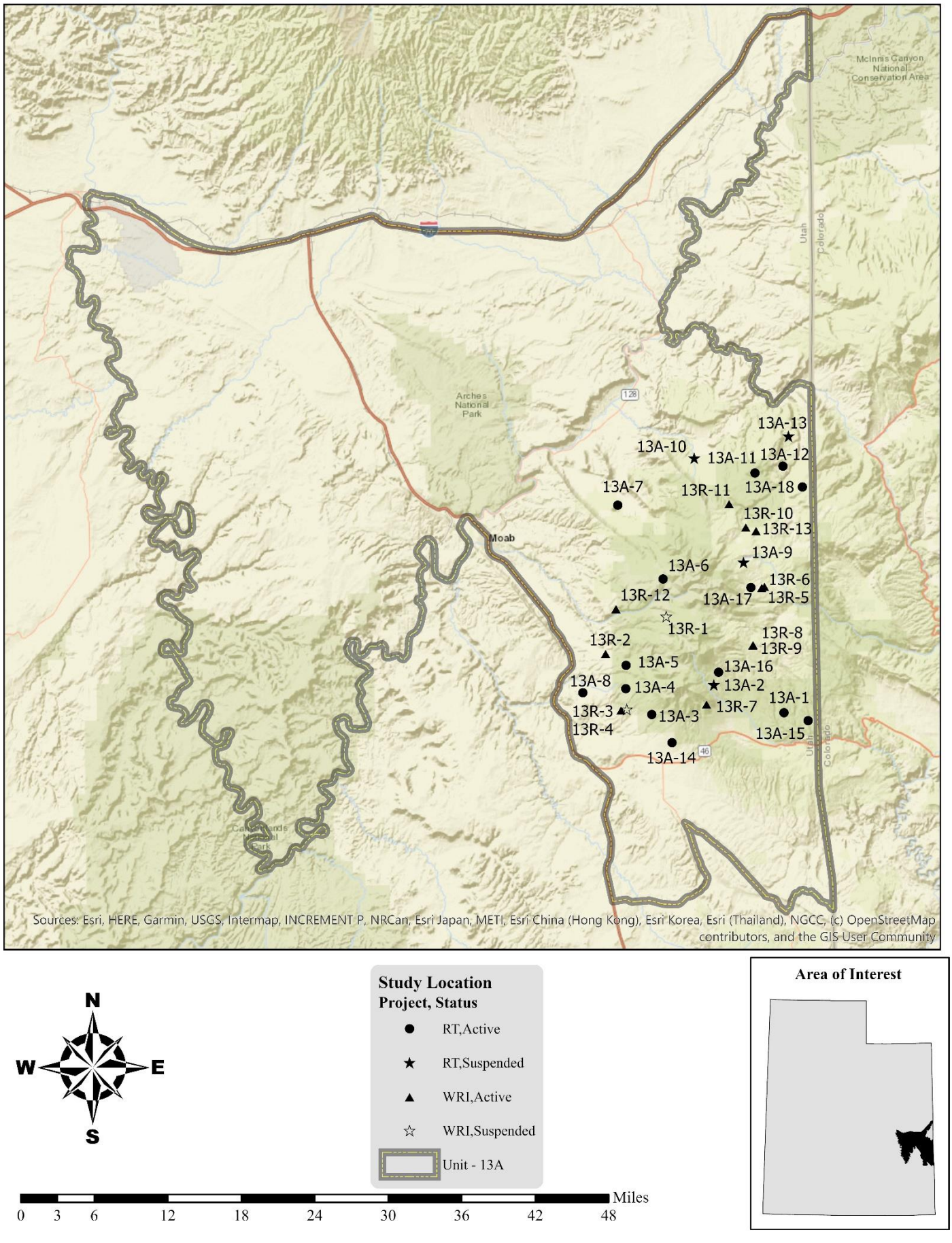
[1]U.S. Department of Interior Bureau of Land Management. 1999. Sampling vegetation attributes, Interagency Technical Reference, BLM/RS/ST-96/002+1730.

[2]U.S. Department of Interior Bureau of Land Management. 1999. Utilization Studies and Residual Measurements, Interagency Technical Reference, BLM/RS/ST-96/004+1730.

Walkley, A. and I. A. Black. 1934. An examination of Degtjareff method for determining soil organic matter and a proposed modification of the chromic acid titration method. Soil Science 37:29-38.

Welsh, S. L., N. D. Atwood, S. Goodrich and L. C. Higgins. 2003. A Utah Flora (Third Edition, revised). Brigham Young University. Provo, Utah. 912 pp.

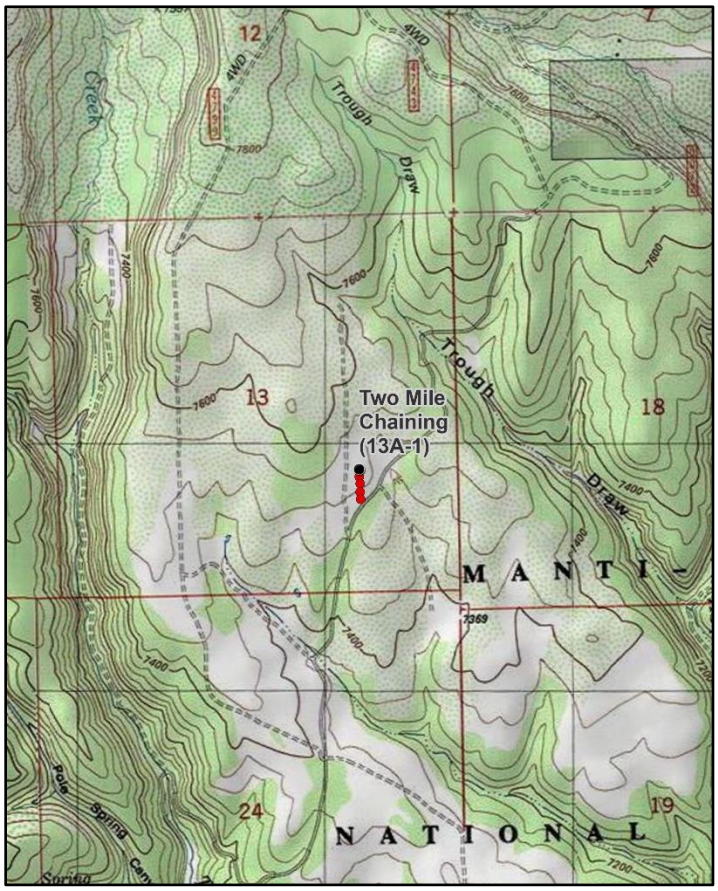
WILDLIFE MANAGEMENT UNIT 13A - LA SAL MOUNTAINS

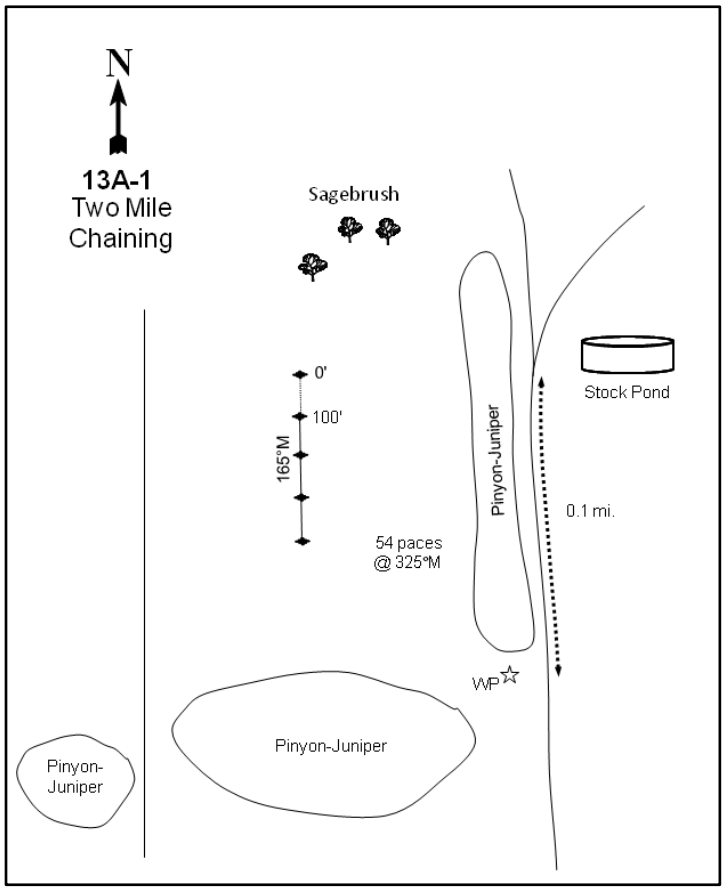


Study Location Project, Status

- RT,Active
- RT,Suspended
- WRI,Active
- WRI,Suspended
- Unit - 13A

TWO MILE CHAINING - STUDY NO. 13A-1





Location Information

USGS 7.5 min Map Info	Ray Mesa NW; Township 28S, Range 25E, Section 13
GPS (0' Stake)	NAD 83 UTM ZONE 12, 665079 East 4248100 North

Transect Information

Browse Tag # (0' Stake)	7813
Transect Bearing	165° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	No Rebar

Directions to Site

Travel east on State Route 46 through the town of La Sal to mile marker 16. Continue 0.1 miles past mile marker 16, then turn left off of the highway. Drive 1.2 miles to a fork. Proceed right at the fork and continue toward Buckeye Reservoir for 0.8 miles to another fork. Stay left and continue 2.95 miles to a witness post (fencepost) on the left (west) side of the road. The transect is located in the chaining opposite a fork further up the road and can be reached from the witness post by walking 54 paces northwest at 325 degrees magnetic. The 0-foot baseline stake is a one-foot tall fencepost and is marked with browse tag #7813.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	SOUTH PARADOX
Elevation	7,600ft (2,316m)
Aspect	Southeast
Slope	4%
Sample Dates	06/30/1994, 07/14/1999, 07/13/2004, 07/14/2009, 07/09/2014, 06/25/2019

Table 13A-01.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Chain Unknown	-	-	1978	900
Seeding - Seed Unknown	-	-	1978	900

Wildlife Habitat and Vegetation History

Table 13A-01.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	summer
Rocky Mountain Elk	crucial	winter

Table 13A-01.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1987	Mountain Big Sagebrush	Phase I
1994	Mountain Big Sagebrush	Phase I
1999	Mountain Big Sagebrush	Phase I
2004	Mountain Big Sagebrush/Pinyon	Phase I transitioning to Phase II
2009	Mountain Big Sagebrush/Pinyon	Phase I transitioning to Phase II
2014	Mountain Big Sagebrush/Pinyon	Phase I transitioning to Phase II
2019	Mountain Big Sagebrush/Pinyon	Phase I transitioning to Phase II

Site Notes

The Hang Dog Fire on Ray Mesa burned 6,000 acres about 300 yards from the edge of this site in 2002.

Soils

Table 13A-01.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	6.5	48.2	30.6	21.3	2.0	8.0	105.6	0.3	07/14/1999

Site Potential

1981 - 2010 Average Annual Precipitation	18 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R048AY405UT
States and Transitions	No state and transition model is available for this ecological site.

Since establishment in 1987, this site has been dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) with an understory composed mostly of perennial grasses (Table 13A-01.6, Table 13A-01.7). However, other shrubs are present and provide a moderate amount of cover (Table 13A-01.12). The introduced perennial grass species crested wheatgrass (*Agropyron cristatum*) and bulbous bluegrass (*Poa bulbosa*) are the primary herbaceous species (Table 13A-01.10). Forbs are moderately diverse but provide low cover overall; looseflower milkvetch (*Astragalus tenellus*) and lesser rushy milkvetch (*Astragalus convallarius*) provide the most of the forb cover (Table 13A-01.11). Over the sample years, twoneedle pinyon (*Pinus edulis*) has increased and is becoming a major component of the site (Table 13A-01.12, Table 13A-01.14). Without a major disturbance, tree cover will likely continue to increase over time.

Trend Summary Tables

Table 13A-01.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	19.8	4.0	2.9	-	-	-
1999	15.0	5.5	3.5	0.1	-	0.3
2004	20.1	6.3	7.2	22.9	5.4	11.9
2009	16.9	7.5	8.6	25.6	8.1	13.4
2014	22.5	7.0	13.8	25.9	6.6	18.3
2019	23.2	8.7	15.6	27.0	8.0	21.9

Table 13A-01.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	-	373	-	163	-	11.5	-	4.1
1999	3	381	-	172	0.0	13.9	-	2.2
2004	-	333	5	122	-	11.3	0.2	2.7
2009	-	302	13	102	-	7.3	0.0	1.2
2014	-	345	3	109	-	8.7	0.0	1.5
2019	-	300	18	178	-	12.3	0.0	4.7

Table 13A-01.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	31.9	1.5	45.7	0.0	0.0	33.1
1999	29.3	8.0	40.1	0.0	0.0	39.3
2004	33.9	2.7	45.0	0.1	0.0	41.8
2009	22.7	2.0	50.4	0.0	0.0	41.9
2014	35.6	1.6	54.4	0.0	0.0	44.0
2019	35.4	1.6	39.8	0.1	0.0	48.4

Table 13A-01.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1994	-	15	28	44
1999	2	28	26	6
2004	-	15	11	6
2009	1	9	3	34
2014	-	-	9	38
2019	1	6	6	5
Year	Days Use Per Acre (ha)			
1994	-	-	-	-
1999	5.8 (14.3)	32.2 (79.5)	69.7 (172.1)	-
2004	4.4 (10.8)	16.1 (39.7)	27.5 (67.9)	-
2009	3.6 (9.0)	24.1 (59.6)	4.0 (9.9)	-
2014	-	1.3 (3.3)	6.7 (16.6)	-
2019	10.2 (25.1)	6.7 (16.6)	10.7 (26.5)	-

Table 13A-01.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bouteloua gracilis (blue grama)	Bromus inermis[i] (smooth brome)	Bromus tectorum[ai] (cheatgrass)	Carex (sedge)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Koeleria macrantha (prairie Junegrass)	Pleuraphis jamesii (James' galleta)	Poa bulbosa[i] (bulbous bluegrass)	Poa fendleriana (muttongrass)	Thinopyrum intermedium[i] (intermediate wheatgrass)
year	Nested Frequency												
1994	4	117	22	74	-	0	1	14	3	-	298	17	-
1999	3	110	19	72	3	-	-	26	20	-	299	59	3
2004	4	127	15	72	-	-	-	31	3	2	153	62	2
2009	9	88	18	101	-	-	-	22	-	-	160	28	3
2014	-	54	22	72	-	1	7	28	3	-	282	35	3
2019	-	48	21	82	-	-	9	24	7	-	230	13	-
year	Average Cover (%)												
1994	0.0	2.5	1.1	0.6	-	0.0	0.0	0.1	0.0	-	7.1	0.1	-
1999	0.0	2.5	0.1	2.4	0.0	-	-	0.2	0.2	-	8.0	0.4	0.0
2004	0.0	4.8	0.5	1.0	-	-	-	1.2	0.0	0.0	2.4	1.2	0.0
2009	0.1	2.0	0.3	1.4	-	-	-	0.4	-	-	2.9	0.3	0.0
2014	-	1.5	0.4	0.7	-	0.0	0.1	0.6	0.1	-	4.6	0.5	0.1
2019	-	2.2	0.6	1.5	-	-	0.1	1.4	0.4	-	5.5	0.6	-

a - Annual; n - Noxious Weed; i - Introduced Species

Table 13A-01.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus tenellus (looseflower milkvetch)	Calochortus nuttallii (sego lily)	Castilleja angustifolia (northwestern Indian paintbrush)	Castilleja linariifolia (Wyoming Indian paintbrush)	Chenopodium fremontii[a] (Fremont's goosefoot)	Chenopodium leptophyllum[a] (narrowleaf goosefoot)	Comandra umbellata (bastard toadflax)	Cordylanthus[a] (bird's-beak)	Crepis acuminata (tapertip hawksbeard)	Cymopterus (springparsley)	Erigeron flagellaris (trailing fleabane)	Erigeron pumilus (shaggy fleabane)	Eriogonum racemosum (redroot buckwheat)	Lappula occidentalis[a] (flatspine stickseed)	Lesquerella (bladderpod)
year	Nested Frequency																
1994	-	18	-	-	4	2	-	-	-	-	6	-	-	21	32	-	-
1999	-	27	-	-	-	1	-	-	-	-	-	-	4	49	36	-	-
2004	0	40	-	1	-	-	-	-	3	5	-	-	-	21	27	-	-
2009	-	9	-	-	-	-	-	-	-	6	-	-	1	13	29	-	-
2014	-	37	-	-	1	-	-	-	-	-	2	-	-	11	7	-	-
2019	1	26	18	21	-	-	4	1	-	4	9	1	-	28	17	5	2
year	Average Cover (%)																
1994	-	0.1	-	-	0.0	0.0	-	-	-	-	0.0	-	-	0.1	0.1	-	-
1999	-	0.4	-	-	-	0.0	-	-	-	-	-	-	0.1	0.5	0.3	-	-
2004	0.0	1.0	-	0.0	-	-	-	-	0.0	0.2	-	-	-	0.5	0.4	-	-
2009	-	0.1	-	-	-	-	-	-	-	0.0	-	-	0.0	0.1	0.2	-	-
2014	-	1.0	-	-	0.0	-	-	-	-	-	0.0	-	-	0.1	0.0	-	-
2019	0.0	0.8	1.4	0.1	-	-	0.0	0.0	-	0.0	0.1	0.0	-	0.6	0.4	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Lomatium triternatum (nineleaf biscuitroot)	Lupinus argenteus (silvery lupine)	Machaeranthera canescens (hoary tansyaster)	Packera multilobata (lobeleaf groundsel)	Penstemon caespitosus (mat penstemon)	Penstemon comarrhenus (dusty beardtongue)	Petradoria pumila (rock goldenrod)	Phlox longifolia (longleaf phlox)	Polygonum douglasii[a] (Douglas' knotweed)	Sphaeralcea coccinea (scarlet globemallow)	Tetraneuris acaulis (stemless four-nerve daisy)	Tragopogon dubius[ai] (yellow salsify)	Trifolium gymnocarpon (hollyleaf clover)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency													
1994	-	58	-	1	2	-	-	56	-	58	-	-	3	-
1999	-	21	2	1	7	-	5	36	-	53	3	-	3	3
2004	-	-	-	-	6	-	-	7	-	51	1	-	2	0
2009	-	-	-	-	5	-	-	18	7	50	-	-	-	1
2014	8	-	-	-	-	-	-	27	-	45	-	3	-	-
2019	32	5	5	-	1	14	-	25	5	31	-	-	3	5
year	Average Cover (%)													
1994	-	2.3	-	0.0	0.0	-	-	0.1	-	1.2	-	-	0.0	-
1999	-	0.1	0.0	0.0	0.0	-	0.1	0.1	-	0.4	0.0	-	0.0	0.0
2004	-	-	-	-	0.1	-	-	0.1	-	0.6	0.0	-	0.0	0.0
2009	-	-	-	-	0.0	-	-	0.1	0.0	0.6	-	-	-	0.0
2014	0.0	-	-	-	-	-	-	0.1	-	0.2	-	0.0	-	-
2019	0.4	0.0	0.0	-	0.0	0.1	-	0.2	0.0	0.3	-	-	0.0	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 13A-01.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis[p] (Utah serviceberry)	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Chrysothamnus depressus[p] (longflower rabbitbrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Eriogonum microthecum[p] (slender buckwheat)	Escobaria vivipara var. arizonica (Arizona spinystar)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma[t] (Utah juniper)	Opuntia fragilis (brittle pricklypear)	Pinus edulis[t] (twoneedle pinyon)	Purshia tridentata[p] (antelope bitterbrush)	Quercus gambelii[p] (Gambel oak)	Symphoricarpos oreophilus[p] (mountain snowberry)
year	Line Intercept Cover (%)												
1994	-	-	-	-	-	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-	-	-	-	-	-
2004	7.3	13.2	1.1	4.7	0.1	-	-	-	0.7	11.9	-	1.2	-
2009	9.5	13.9	0.6	7.3	0.1	-	0.1	-	0.7	13.4	-	1.4	0.1
2014	5.7	13.9	0.7	5.9	0.1	-	0.1	-	0.6	18.3	-	1.2	4.3
2019	10.5	14.1	0.9	6	0.1	0.1	0.5	-	1.4	21.9	0	1	0.4
year	Quadrat Cover (%)												
1994	2.3	16.2	0.7	3.6	0.0	-	0.0	-	0.3	2.9	-	0.8	-
1999	3.7	9.3	0.7	4.9	0.5	-	0.0	-	0.6	3.5	-	0.6	-
2004	6.5	10.6	1.5	5.0	0.1	0.0	0.1	-	1.1	7.2	-	1.5	-
2009	5.3	9.9	0.9	6.1	0.1	-	0.0	0.1	1.3	8.5	-	0.8	0.0
2014	5.1	12.2	0.4	5.3	0.1	-	0.0	-	1.8	13.8	0.0	1.6	3.0
2019	6.9	14.0	0.9	6.5	0.0	0.0	0.2	0.8	1.9	14.7	0.0	1.4	0.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 13A-01.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
1994	480	-	38	58	4	21	4	0	107/111
1999	440	60	23	68	9	36	32	9	131/134
2004	400	60	30	65	5	5	70	0	111/117
2009	680	-	44	53	3	27	12	3	126/129
2014	340	40	18	77	6	35	6	12	122/126
2019	480	-	25	71	4	29	13	4	169/171
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1994	4800	940	4	54	42	13	2	10	46/81
1999	4080	360	13	63	24	41	3	3	52/80
2004	3800	-	5	73	22	33	10	10	38/61
2009	3820	60	6	68	26	34	17	22	43/64
2014	3580	60	3	84	13	16	20	20	48/74
2019	3240	-	1	73	26	37	6	31	51/70
Cercocarpus montanus[p] -- (alderleaf mountain mahogany)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	256/288
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Chrysothamnus depressus[p] -- (longflower rabbitbrush)									
1994	560	80	0	100	0	0	0	0	66/77
1999	1580	40	6	94	0	33	0	0	12/24
2004	1500	20	1	97	1	17	49	1	14/26
2009	1720	-	9	90	1	7	0	0	14/25
2014	960	-	2	98	0	60	13	0	11/25
2019	1200	40	0	100	0	5	0	0	18/25
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1994	7300	2500	3	96	0	0	0	1	23/51
1999	8500	-	6	93	1	2	0	0	13/26
2004	5680	20	2	96	2	4	0	1	14/27
2009	5840	40	5	92	3	3	0	2	13/31
2014	6320	220	5	94	0	38	2	1	13/25
2019	4980	-	2	97	1	1	0	1	21/32
Eriogonum microthecum[p] -- (slender buckwheat)									
1994	280	20	0	100	0	0	0	0	16/19
1999	400	20	5	95	0	15	0	0	15/22
2004	340	-	0	100	0	6	0	0	18/19
2009	400	-	0	100	0	5	0	0	22/19
2014	200	-	0	100	0	70	0	0	26/23
2019	200	-	0	100	0	0	0	0	24/19
Escobaria vivipara var. arizonica -- (Arizona spinystar)									
1994	-	-	-	-	-	-	-	-	-/-
1999	60	-	0	100	0	0	0	0	9/13
2004	100	-	20	80	0	0	0	0	5/11
2009	100	-	0	100	0	0	0	0	8/12
2014	100	-	20	80	0	0	0	0	3/9
2019	200	-	10	90	0	0	0	0	4/7

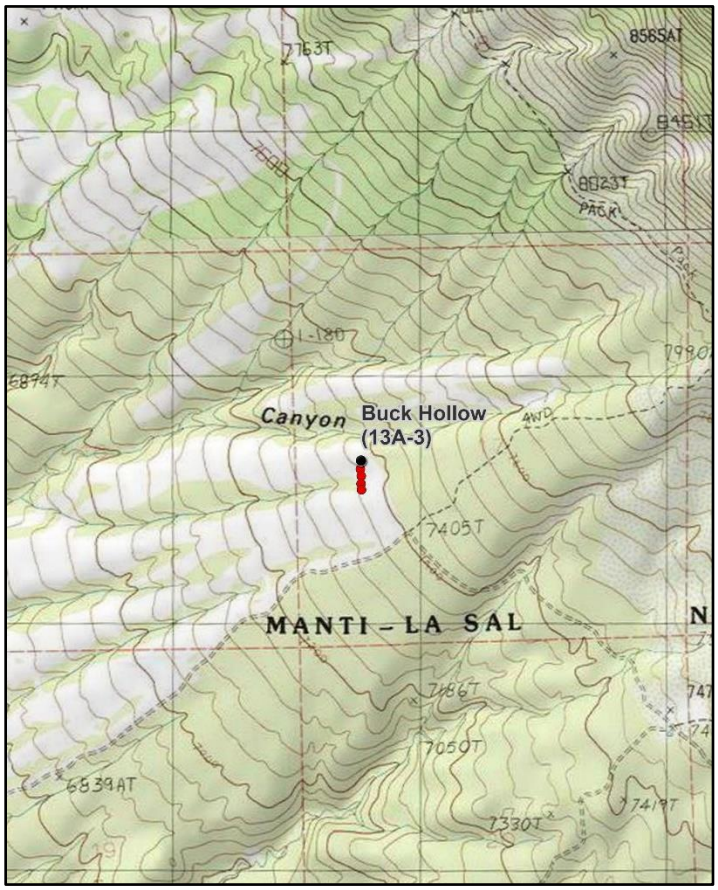
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Gutierrezia sarothrae -- (broom snakeweed)									
1994	-	-	-	-	-	-	-	-	20/24
1999	160	-	13	88	0	0	0	0	27/20
2004	180	-	0	100	0	0	0	0	20/26
2009	140	-	0	100	0	0	0	0	22/26
2014	20	-	0	100	0	0	0	0	- / -
2019	340	-	0	100	0	0	0	0	16/21
Opuntia fragilis -- (brittle pricklypear)									
1994	1480	40	16	69	15	3	0	7	5/16
1999	1320	20	30	65	5	0	0	0	8/23
2004	1800	40	1	90	9	0	0	9	9/21
2009	1880	-	5	92	3	0	0	4	8/20
2014	2040	160	12	88	0	0	0	1	8/19
2019	1680	-	1	96	2	0	0	2	7/20
Pinus edulis[t] -- (twoneedle pinyon)									
1994	-	-	-	-	-	-	-	-	-/-
1999	340	80	53	47	0	0	0	0	- / -
2004	380	40	32	68	0	0	0	0	- / -
2009	280	20	14	86	0	0	0	7	- / -
2014	380	40	26	74	0	0	0	0	- / -
2019	400	60	25	75	0	0	0	0	- / -
Purshia tridentata[p] -- (antelope bitterbrush)									
1994	-	-	-	-	-	-	-	-	32/71
1999	20	-	0	100	0	0	0	0	30/102
2004	20	-	0	100	0	100	0	0	25/59
2009	20	-	0	100	0	0	100	0	39/83
2014	20	-	0	100	0	0	100	0	50/113
2019	20	-	0	100	0	0	0	0	54/109
Quercus gambelii[p] -- (Gambel oak)									
1994	-	-	-	-	-	-	-	-	-/-
1999	220	20	18	82	0	0	0	0	108/46
2004	140	-	14	14	71	0	0	0	108/48
2009	120	-	17	83	0	17	0	0	19/21
2014	200	-	0	100	0	0	0	0	75/60
2019	360	-	61	39	0	0	0	0	75/61
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
1994	80	-	0	100	0	25	0	0	19/48
1999	40	-	50	50	0	0	0	0	57/93
2004	80	-	0	100	0	0	0	0	26/32
2009	80	-	50	50	0	0	25	25	39/76
2014	520	260	15	85	0	62	12	0	91/77
2019	80	-	0	100	0	50	0	0	42/55

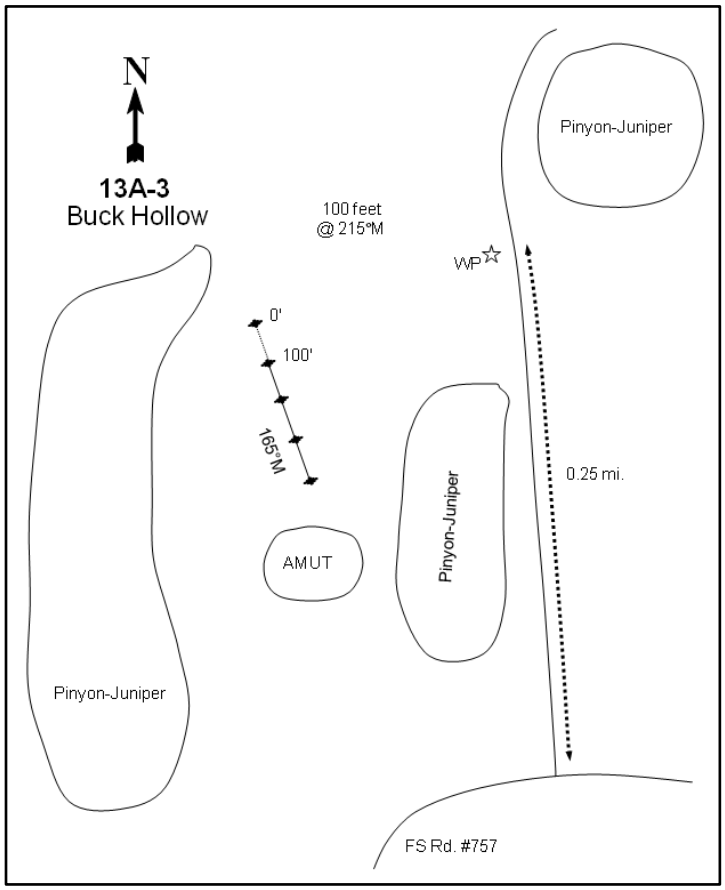
t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 13A-01.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2019	2	-	-	100	-	-	8.0
Pinus edulis (twoneedle pinyon)							
1994	153	-	-	-	-	-	4.0
1999	201	-	-	-	-	-	5.5
2004	175	-	5	80	5	10	7.2
2009	212	-	15	75	5	5	8.3
2014	151	-	15	45	40	-	9.6
2019	157	-	10	20	65	5	13.5
Pinus ponderosa (ponderosa pine)							
2014	1	-	-	-	-	100	54.0

BUCK HOLLOW - STUDY NO. 13A-3





Location Information

USGS 7.5 min Map Info	La Sal West NE; Township 28S, Range 24E, Section 17
GPS (0' Stake)	NAD 83 UTM ZONE 12, 647710 East 4247863 North

Transect Information

Browse Tag # (0' Stake)	7810
Transect Bearing	165° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

From La Sal Junction, proceed east on State Route 46 for 0.3 miles past mile marker 5. Turn left onto County Road 130 and travel 2.95 miles to a fork. Bear right at the fork on Forest Service Road #166 and go 0.8 miles to another fork. Proceed to the right and continue 1.3 miles to a cattle guard marking the Forest Service boundary. Continue 1.55 miles to another fork, proceed to the left, and continue 0.25 miles. A red witness post (one-half foot tall fencepost) is located on the left site of the road. The transect starts 100 feet out in the chaining. The study is marked by high green T-posts, and the 0-foot stake is marked with browse tag #7810.

***Alternate route: Travel on State Route 191 south from Moab. At mile marker 113, continue 0.15 miles south and turn left (east) onto County Road 166. Continue south on main road for 11.4 miles to a fork, and turn left (east). Go 1.3 miles to the cattle guard and Forest Service boundary listed above. Follow remainder of the directions as noted above.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	LASAL
Elevation	7,300ft (2,225m)
Aspect	Southwest
Slope	5-10%
Sample Dates	06/30/1994, 07/13/1999, 07/14/2004, 07/15/2009, 07/09/2014, 06/26/2019

Table 13A-03.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Chain Unknown	Buck Hollow	-	1982	700
Seeding - Seed Unknown	Buck Hollow	-	1982	700

Wildlife Habitat and Vegetation History

Table 13A-03.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter

Table 13A-03.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1987	Perennial Grass	Phase I
1994	Perennial Grass	Phase I
1999	Perennial Grass	Phase I
2004	Perennial Grass	Phase I
2009	Perennial Grass/Pinyon-Juniper	Phase I transitioning to Phase II
2014	Perennial Grass/Pinyon-Juniper	Phase I transitioning to Phase II
2019	Perennial Grass/Pinyon-Juniper	Phase II

Site Notes

Scattered clumps of unchained, mature twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) provide escape cover.

Soils

Table 13A-03.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	7.6	52.9	21.8	25.3	4.5	25.0	144.0	0.7	07/13/1999

Site Potential

1981 - 2010 Average Annual Precipitation	16 inches
NRCS Ecological Site	Upland Stony Loam (Pinyon-Utah Juniper)
NRCS Ecological Site #	R035XY321UT
States and Transitions	A defined state and transition model is available.

Trees were chained and the site was seeded prior to study establishment (Table 13A-03.1). Since establishment in 1987, the understory has been dominated by introduced perennial grasses with smooth brome (*Bromus inermis*) contributing the most cover of any single species. Crested wheatgrass (*Agropyron cristatum*) and intermediate wheatgrass (*Thinopyrum intermedium*) are sub-dominant understory components (Table 13A-03.10). Perennial forb cover has remained average for this ecological type with alfalfa (*Medicago sativa*) and lesser rushy milkvetch (*Astragalus convallarius*) being the most common forbs (Table 13A-03.11). Twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) trees have increased in abundance over the study period, and the site is considered to be within Phase III of woodland succession as of 2019 (Table 13A-03.4, Table 13A-03.12, Table 13A-03.14). Browse species have remained a minor component over the sample years, with alderleaf mountain mahogany (*Cercocarpus montanus*) as the main species present. The state and transition model states that inappropriate management practices can lead to a diminished understory and increased dominance of trees. If a tree-removing disturbance does not occur, it is probable that tree cover and density will continue to increase on this site (Jornada, 2019).

Trend Summary Tables

Table 13A-03.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	-	-	2.6	-	-	-
1999	0.1	-	4.1	-	-	0.5
2004	0.5	-	3.4	0.9	-	9.6
2009	0.1	0.0	3.9	2.4	0.1	13.5
2014	0.1	0.2	6.3	0.8	0.1	14.5
2019	0.2	0.5	17.1	2.6	1.0	22.1

Table 13A-03.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	-	381	22	111	-	15.1	0.1	3.0
1999	-	389	2	107	-	20.1	0.0	7.0
2004	15	340	11	99	0.0	15.1	0.1	4.9
2009	2	329	19	124	0.0	16.2	0.1	4.6
2014	-	301	4	98	-	9.1	0.0	0.8
2019	-	290	79	134	-	14.5	0.5	6.8

Table 13A-03.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	14.2	-	53.1	1.0	4.8	24.6
1999	12.0	0.1	61.1	4.6	5.3	34.0
2004	20.4	0.2	53.9	5.1	6.1	24.2
2009	17.7	0.2	51.9	3.3	4.2	28.1
2014	32.0	0.0	47.1	5.7	5.4	19.6
2019	27.7	0.0	50.2	6.0	7.7	33.4

Table 13A-03.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1994	2	17	14	10
1999	6	29	12	19
2004	1	42	14	15
2009	4	42	5	25
2014	-	21	5	11
2019	1	34	4	13
Year	Days Use Per Acre (ha)			
1994	-	-	-	-
1999	19.6 (48.4)	65.7 (162.2)	14.7 (36.4)	-
2004	3.6 (9.0)	42.2 (104.3)	11.4 (28.1)	-
2009	6.5 (16.1)	47.6 (117.5)	12.1 (29.8)	-
2014	8.7 (21.5)	12.8 (31.5)	7.4 (18.2)	-
2019	0.7 (1.8)	31.5 (77.8)	9.4 (23.2)	-

Table 13A-03.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bromus inermis[i] (smooth brome)	Bromus tectorum[ai] (cheatgrass)	Carex (sedge)	Elymus elymoides (squirreltail)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Sporobolus cryptandrus (sand dropseed)	Thinopyrum intermedium[i] (intermediate wheatgrass)
year	Nested Frequency									
1994	-	62	252	-	25	22	3	-	-	242
1999	0	88	274	-	20	3	9	6	-	235
2004	-	105	262	15	13	0	5	0	0	153
2009	2	88	242	2	5	-	13	1	-	131
2014	-	70	228	-	-	-	14	5	-	65
2019	3	76	199	-	7	1	3	5	8	74
year	Average Cover (%)									
1994	-	0.9	7.4	-	0.5	0.1	0.0	-	-	6.2
1999	0.0	2.5	10.1	-	0.4	0.0	0.1	0.1	-	6.9
2004	-	3.7	8.4	0.0	0.2	0.0	0.0	0.0	0.0	2.8
2009	0.0	2.5	10.1	0.0	0.5	-	0.4	0.0	-	2.7
2014	-	1.8	6.1	-	-	-	0.4	0.1	-	0.7
2019	0.2	3.8	7.5	-	0.6	0.2	0.0	0.0	0.4	1.8

a - Annual; n - Noxious Weed; i - Introduced Species

Table 13A-03.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Alyssum[ai] (madwort)	Arabis hirsuta (hairy rockcress)	Astragalus convallarius (lesser rushy milkvetch)	Ceratocephala testiculata[ai] (curveseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Chamaesyce (sandmat)	Chenopodium fremontii[a] (Fremont's goosefoot)	Collinsia parviflora[a] (maiden blue eyed Mary)	Cryptantha (cryptantha)	Descurainia pinnata[a] (western tansymustard)	Draba[a] (draba)	Gilia inconspicua[a] (shy gilia)	Heterotheca villosa (hairy false goldenaster)	Machaeranthera canescens (hoary tansyaster)	Medicago sativa[i] (alfalfa)	Melilotus officinalis[i] (sweetclover)	Packera multilobata (lobeleaf groundsel)
year	Nested Frequency																
1994	0	-	22	-	3	-	-	3	18	7	-	3	-	1	30	20	-
1999	-	7	24	-	-	-	-	-	4	1	-	-	-	-	31	-	2
2004	-	-	29	-	-	-	-	-	1	-	-	-	-	-	23	-	2
2009	-	-	34	-	-	-	-	5	12	-	-	-	-	3	27	-	-
2014	-	1	17	-	3	1	-	-	4	-	4	-	-	-	21	-	2
2019	5	2	53	2	-	-	5	12	3	18	29	-	8	-	10	-	5
year	Average Cover (%)																
1994	0.0	-	0.4	-	0.0	-	-	0.0	0.1	0.0	-	0.0	-	0.0	1.6	0.2	-
1999	-	0.0	1.4	-	-	-	-	-	0.0	0.0	-	-	-	-	4.8	-	0.0
2004	-	-	1.5	-	-	-	-	-	0.0	-	-	-	-	-	2.4	-	0.1
2009	-	-	1.4	-	-	-	-	0.0	0.0	-	-	-	-	0.0	2.1	-	-
2014	-	0.0	0.1	-	0.0	0.0	-	-	0.0	-	0.0	-	-	-	0.3	-	0.0
2019	0.0	0.0	4.1	0.0	-	-	0.0	0.1	0.0	0.1	0.1	-	0.0	-	0.8	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Penstemon (beardtongue)	Phlox austromontana (mountain phlox)	Phlox longifolia (longleaf phlox)	Physaria (twinpod)	Polygonum douglasii[a] (Douglas' knotweed)	Schoenocrambe linifolia (flaxleaf plainsmustard)	Sphaeralcea coccinea (scarlet globemallow)	Symphyotrichum (aster)	Tetraneuris acaulis (stemless four-nerve daisy)	Tragopogon dubius[ai] (yellow salsify)	Trifolium (clover)
year	Nested Frequency										
1994	24	15	-	14	10	-	13	2	-	2	-
1999	24	11	-	17	1	-	16	-	-	-	2
2004	6	11	-	5	11	-	38	-	-	-	-
2009	13	6	1	11	14	-	42	0	-	-	-
2014	6	8	-	4	-	-	46	-	2	-	-
2019	12	4	-	22	32	2	45	-	-	0	6
year	Average Cover (%)										
1994	0.1	0.3	-	0.0	0.0	-	0.3	0.0	-	0.0	-
1999	0.2	0.1	-	0.2	0.0	-	0.3	-	-	-	0.0
2004	0.0	0.2	-	0.0	0.1	-	0.8	-	-	-	-
2009	0.2	0.0	0.0	0.1	0.1	-	0.6	0.0	-	-	-
2014	0.0	0.0	-	0.0	-	-	0.4	-	0.0	-	-
2019	0.0	0.1	-	0.1	0.2	0.3	1.3	-	-	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 13A-03.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis[p] (Utah serviceberry)	Cercocarpus montanus[p] (alderleaf mountain mahogany)	Juniperus osteosperma[t] (Utah juniper)	Opuntia (pricklypear)	Opuntia fragilis (brittle pricklypear)	Pinus edulis[t] (twoneedle pinyon)
year	Line Intercept Cover (%)					
1994	-	-	-	-	-	-
1999	-	-	-	-	-	-
2004	0.1	0.8	1.8	-	-	7.8
2009	-	2.4	1.4	0.1	-	12.1
2014	-	0.8	2.6	0.1	-	11.9
2019	-	2.6	5.6	-	1	16.5
year	Quadrat Cover (%)					
1994	-	-	-	-	-	2.6
1999	-	0.1	0.1	-	-	4.0
2004	0.0	0.5	0.4	-	-	3.0
2009	-	0.1	0.1	0.0	-	3.8
2014	-	0.1	0.3	0.0	0.2	6.0
2019	0.0	0.2	1.7	-	0.5	15.4

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 13A-03.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
1994	40	-	50	50	0	0	0	0	183/208
1999	-	-	-	-	-	-	-	-	166/205
2004	20	580	100	0	0	0	0	0	213/228
2009	20	-	100	0	0	0	0	0	182/173
2014	40	-	100	0	0	0	0	0	147/146
2019	40	460	50	50	0	0	0	0	163/172
Atriplex canescens[p] -- (fourwing saltbush)									
1994	-	-	-	-	-	-	-	-	45/35
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	65/50
2009	-	-	-	-	-	-	-	-	77/65
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	81/62
Cercocarpus montanus[p] -- (alderleaf mountain mahogany)									
1994	100	-	0	100	0	20	0	0	91/80
1999	100	-	0	100	0	80	0	0	128/98
2004	100	20	20	80	0	0	100	0	129/115
2009	100	-	0	100	0	0	60	0	124/107
2014	100	-	0	100	0	60	20	0	154/136
2019	100	160	0	100	0	20	60	0	149/139
Ephedra viridis[p] -- (mormon tea)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	93/87
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	89/117
Gutierrezia sarothrae -- (broom snakeweed)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	28/31
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Juniperus osteosperma[t] -- (Utah juniper)									
1994	-	-	-	-	-	-	-	-	-/-
1999	100	-	100	0	0	0	0	0	- / -
2004	120	-	100	0	0	0	0	0	- / -
2009	120	-	17	83	0	0	17	0	- / -
2014	120	-	33	67	0	0	0	0	- / -
2019	100	-	20	80	0	0	0	20	- / -
Opuntia fragilis -- (brittle pricklypear)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	180	-	11	89	0	0	0	33	11/27
2019	380	-	0	100	0	0	0	0	10/36

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Opuntia -- (pricklypear)									
1994	-	-	-	-	-	-	-	-	11/50
1999	20	-	0	100	0	0	0	0	20/45
2004	20	-	0	100	0	0	0	0	13/42
2009	220	-	0	100	0	0	0	0	10/30
2014	120	-	0	100	0	0	0	0	10/24
2019	20	-	0	100	0	0	0	0	13/33
Pinus edulis[t] -- (twoneedle pinyon)									
1994	-	-	-	-	-	-	-	-	-/-
1999	100	-	80	20	0	0	0	0	- / -
2004	120	-	33	67	0	0	0	0	- / -
2009	100	-	0	100	0	0	0	0	- / -
2014	100	40	0	100	0	0	0	0	- / -
2019	120	20	17	83	0	0	0	0	- / -
Quercus gambelii[p] -- (Gambel oak)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	69/63
2009	-	-	-	-	-	-	-	-	31/37
2014	-	-	-	-	-	-	-	-	148/189
2019	-	-	-	-	-	-	-	-	55/75
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
1994	20	-	0	100	0	0	0	0	77/148
1999	-	-	-	-	-	-	-	-	66/133
2004	-	-	-	-	-	-	-	-	66/117
2009	-	-	-	-	-	-	-	-	63/130
2014	-	-	-	-	-	-	-	-	84/192
2019	-	-	-	-	-	-	-	-	75/144

t - Tree Species; p - Preferred Browse; i - Introduced Species

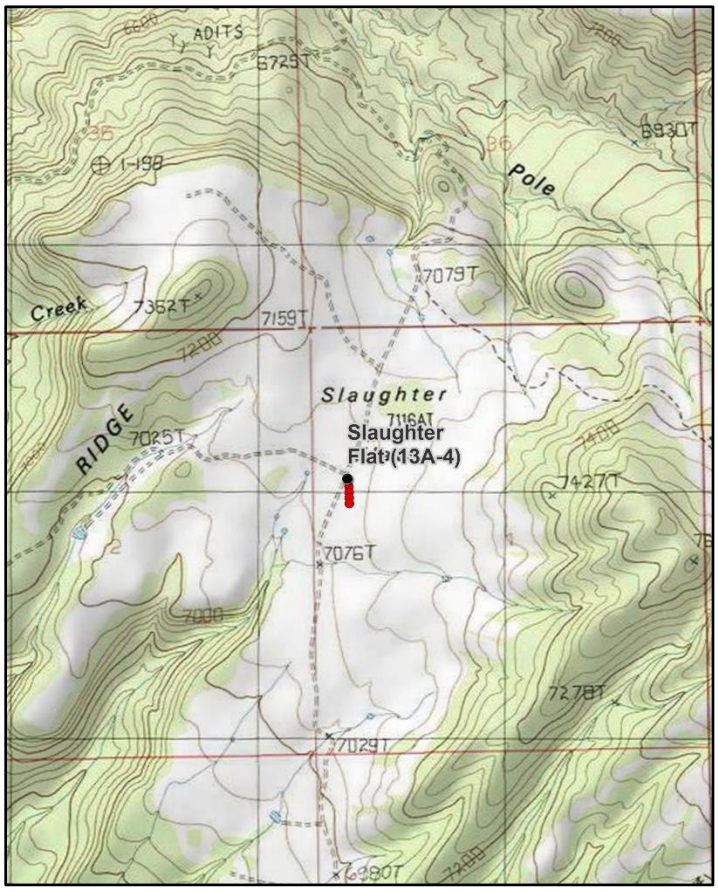
Table 13A-03.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

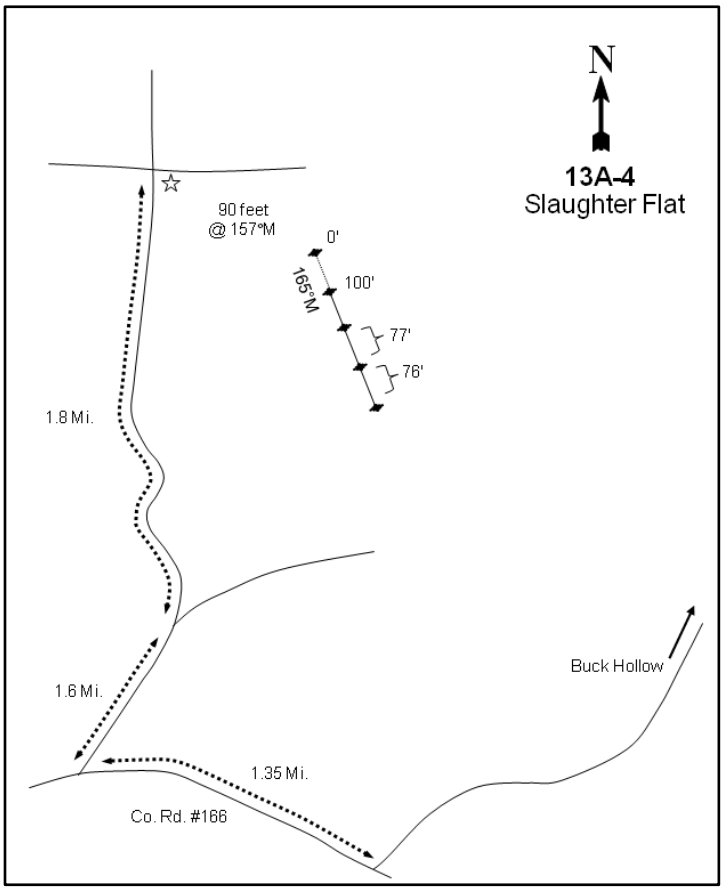
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1994	57	-	-	-	-	-	3.7
1999	62	-	-	-	-	-	8.4
2004	66	17	44	17	17	6	6.4
2009	59	-	53	21	16	11	5.6
2014	63	-	42	47	11	-	9.0
2019	59	6	35	35	12	12	8.5
Pinus edulis (twoneedle pinyon)							
1994	100	-	-	-	-	-	5.1
1999	118	-	-	-	-	-	9.9
2004	108	-	42	26	16	16	9.3
2009	102	-	32	16	32	21	6.9
2014	102	5	32	42	21	-	9.6
2019	118	5	26	11	42	16	8.3

Table 13A-03.15 - Deer Desirable Components Index: Mid Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1994	0.0	0.0	0.0	30.0	0.0	5.9	0.0	35.9	Very Poor-Poor
1999	0.2	0.0	0.0	30.0	0.0	10.0	0.0	40.2	Poor
2004	1.4	0.0	0.0	30.0	0.0	9.9	0.0	41.2	Poor
2009	3.6	0.0	0.0	30.0	0.0	9.2	0.0	42.7	Poor
2014	1.2	0.0	0.0	18.2	0.0	1.6	0.0	21.0	Very Poor
2019	3.9	0.0	0.0	29.1	0.0	10.0	0.0	43.0	Poor

SLAUGHTER FLAT - STUDY NO. 13A-4





Location Information

USGS 7.5 min Map Info	Mount Tukuhnikivatz ; Township 28S, Range 23E, Section 01
GPS (0' Stake)	NAD 83 UTM ZONE 12, 644300 East 4251252 North

Transect Information

Browse Tag # (0' Stake)	7125
Transect Bearing	165° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard; Line 3: 77ft Long, Line 4: 76ft Long

Directions to Site

Take State Route 191 south from Moab. At mile marker 113, continue 0.15 miles south and turn left (east) onto County Road 166. Continue south on the main road for 10.1 miles, turn left (east), and continue for 1.6 miles to a fork. Proceed left at the fork and drive 1.8 miles to a witness post on the right (east) side of the road at a four-way intersection. The transect is located in the southeast quarter, marked by short fenceposts. The transect starts 90 feet away from the intersection at 157 degrees magnetic, and the 0-foot baseline stake is marked with browse tag #7125.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	SQUAW SPRINGS
Elevation	7,100ft (2,164m)
Aspect	West Northwest
Slope	0-2%
Sample Dates	06/28/1994, 07/13/1999, 07/14/2004, 07/15/2009, 07/08/2014, 06/26/2019

Table 13A-04.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Chain Unknown	-	-	1974	940
Seeding - Seed Unknown	-	-	1974	940

Wildlife Habitat and Vegetation History

Table 13A-04.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter

Table 13A-04.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1987	Mountain Big Sagebrush	Phase I
1994	Mountain Big Sagebrush	Phase I
1999	Mountain Big Sagebrush	Phase I
2004	Mountain Big Sagebrush	Phase I
2009	Mountain Big Sagebrush	Phase I
2014	Mountain Big Sagebrush	Phase I
2019	Mountain Big Sagebrush	Phase I

Site Notes

The chaining extends north of the study site.

Soils

Table 13A-04.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	7.2	52.9	19.8	27.3	1.9	5.4	89.6	0.4	07/13/1999

Site Potential

1981 - 2010 Average Annual Precipitation	14 inches
NRCS Ecological Site	Upland Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R035XY308UT
States and Transitions	A defined state and transition model is available.

Since establishment of the study in 1987, the plant community on this site has existed as a stand of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) with a moderately diverse understory of native and introduced grass species. Perennial grass cover has remained stable with crested wheatgrass (*Agropyron cristatum*) and needle and thread (*Hesperostipa comata*) being co-dominant species (Table 13A-04.10). Perennial forbs are moderately diverse, but cover has generally remained low (Table 13A-04.11). Twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) have increased in size over the sample years (Table 13A-04.12, Table 13A-04.14). The state and transition model shows that there is a possibility to transition between a PJ-encroached sagebrush state and a mountain big sagebrush/perennial grass state depending on disturbance and management inputs (Jornada, 2019).

Trend Summary Tables

Table 13A-04.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	10.1	5.5	1.3	-	-	-
1999	10.5	6.9	1.3	-	-	-
2004	9.4	7.0	1.4	9.7	7.8	1.3
2009	11.5	7.5	2.4	11.2	5.9	1.8
2014	8.2	5.9	1.4	12.7	5.3	1.3
2019	9.7	9.2	3.3	13.2	9.4	2.6

Table 13A-04.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	94	371	139	249	0.3	14.7	0.7	2.7
1999	285	350	20	75	7.4	13.4	0.1	0.7
2004	248	304	50	170	5.5	14.2	0.3	3.1
2009	209	309	69	101	4.7	9.9	0.6	0.7
2014	42	330	25	109	0.2	19.8	0.1	0.7
2019	132	318	318	201	2.0	10.0	5.4	4.3

Table 13A-04.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	34.7	0.4	39.3	0.2	0.3	35.6
1999	37.1	0.5	41.5	0.5	0.1	38.4
2004	36.8	0.7	34.0	0.3	0.1	42.3
2009	34.1	0.1	41.8	0.1	0.0	37.2
2014	44.8	0.3	29.5	0.2	0.1	38.5
2019	49.1	0.2	31.7	0.1	0.1	35.1

Table 13A-04.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1994	1	14	41	11
1999	1	36	34	19
2004	1	28	33	11
2009	9	15	16	39
2014	2	13	17	25
2019	4	9	18	9
Year	Days Use Per Acre (ha)			
1994	-	-	-	-
1999	22.5 (55.6)	24.8 (61.2)	53.0 (130.8)	-
2004	0.7 (1.8)	27.5 (67.9)	36.8 (91.0)	-
2009	18.1 (44.8)	6.7 (16.6)	66.4 (163.9)	-
2014	3.6 (9.0)	8.7 (21.5)	22.8 (56.3)	-
2019	21.8 (53.8)	8.7 (21.5)	12.8 (31.5)	-

Table 13A-04.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bromus inermis[i] (smooth brome)	Bromus tectorum[ai] (cheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Pascopyrum smithii (western wheatgrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Vulpia octoflora[a] (sixweeks fescue)
year	Nested Frequency									
1994	74	90	1	93	19	190	46	163	51	1
1999	26	246	1	284	1	27	70	108	15	1
2004	41	104	-	246	5	153	15	84	-	6
2009	7	172	-	202	1	144	6	47	-	25
2014	9	174	-	28	8	150	14	53	14	18
2019	8	188	-	100	16	109	20	21	15	58
year	Average Cover (%)									
1994	1.7	2.2	0.0	0.3	0.1	6.0	0.3	3.8	0.5	0.0
1999	0.8	8.4	0.0	7.3	0.0	0.6	0.5	2.9	0.1	0.0
2004	1.2	6.6	-	5.3	0.0	4.5	0.1	1.8	-	0.2
2009	0.1	4.7	-	4.7	0.0	3.6	0.0	1.4	-	0.1
2014	0.3	8.3	-	0.1	0.1	8.7	0.1	1.8	0.5	0.0
2019	0.2	6.2	-	1.5	0.3	2.9	0.1	0.2	0.2	0.5

a - Annual; n - Noxious Weed; i - Introduced Species

Table 13A-04.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Alyssum alyssoides[ai] (pale madwort)	Alyssum desertorum[ai] (desert madwort)	Antennaria (pussytoes)	Arabis (rockcress)	Astragalus convallarius (lesser rushy milkvetch)	Calochortus nuttallii (sego lily)	Castilleja angustifolia (northwestern Indian paintbrush)	Ceratocephala testiculata[ai] (curveseed butterwort)	Cirsium (thistle)	Cordylanthus wrightii[a] (Wright's bird's beak)	Crepis acuminata (tapertip hawksbeard)	Cryptantha (cryptantha)	Cymopterus (springparsley)	Descurainia pinnata[a] (western tansymustard)	Draba reptans[a] (Carolina draba)	Erigeron pumilus (shaggy fleabane)
year	Nested Frequency																
1994	-	-	-	3	18	38	-	4	14	3	19	6	8	-	-	42	3
1999	-	-	-	-	-	3	-	-	-	-	2	-	-	-	-	5	1
2004	1	-	-	0	-	30	-	-	-	-	24	2	3	-	-	-	4
2009	-	-	-	-	-	1	-	-	61	-	-	-	-	-	-	-	4
2014	-	-	-	-	-	8	-	-	4	-	-	-	5	-	4	18	1
2019	12	7	4	-	9	19	13	2	247	-	20	-	1	16	-	134	11
year	Average Cover (%)																
1994	-	-	-	0.0	0.0	1.4	-	0.0	0.0	0.0	0.0	0.0	0.0	-	-	0.1	0.0
1999	-	-	-	-	-	0.0	-	-	-	-	0.0	-	-	-	-	0.0	0.0
2004	0.0	-	-	0.0	-	1.4	-	-	-	-	0.2	0.0	0.0	-	-	-	0.0
2009	-	-	-	-	-	0.0	-	-	0.6	-	-	-	-	-	-	-	0.0
2014	-	-	-	-	-	0.2	-	-	0.0	-	-	-	0.0	-	0.0	0.0	0.0
2019	0.1	0.0	0.0	-	0.2	0.5	0.0	0.1	3.1	-	0.3	-	0.0	0.0	-	0.5	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Gayophytum ramosissimum[a] (pinyon groundsmoke)	Lappula occidentalis[a] (flatspine stickseed)	Lepidium[a] (pepperweed)	Machaeranthera grindelioides (rayless tansyaster)	Microsteris gracilis[a] (slender phlox)	Petradoria pumila (rock goldenrod)	Phlox longifolia (longleaf phlox)	Polygonum douglasii[a] (Douglas' knotweed)	Sphaeralcea coccinea (scarlet globemallow)	Taraxacum officinale (common dandelion)	Trifolium gymnocarpon (hollyleaf clover)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency											
1994	14	6	-	-	80	4	102	52	82	12	108	-
1999	-	-	-	-	15	-	-	-	68	-	3	-
2004	-	11	-	-	8	-	41	8	83	2	47	-
2009	-	-	-	-	4	-	7	6	60	-	45	-
2014	-	1	-	2	-	-	15	-	50	-	37	3
2019	42	30	1	0	115	-	56	8	48	2	94	4
year	Average Cover (%)											
1994	0.0	0.0	-	-	0.4	0.0	0.3	0.1	0.6	0.0	0.3	-
1999	-	-	-	-	0.0	-	-	-	0.7	-	0.0	-
2004	-	0.1	-	-	0.0	-	0.2	0.0	1.2	0.0	0.2	-
2009	-	-	-	-	0.0	-	0.0	0.0	0.4	-	0.2	-
2014	-	0.0	-	0.0	-	-	0.0	-	0.3	-	0.1	0.0
2019	0.3	0.2	0.0	0.0	0.9	-	1.3	0.0	0.5	0.0	1.4	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 13A-04.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Eriogonum microthecum[p] (slender buckwheat)	Escobaria vivipara var. arizonica (Arizona spinystar)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma[t] (Utah juniper)	Mahonia repens (creeping barberry)	Opuntia polyacantha (plains pricklypear)	Pediocactus simpsonii (mountain ball cactus)	Pinus edulis[t] (twoneedle pinyon)
year	Line Intercept Cover (%)									
1994	-	-	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-	-	-
2004	9.7	5.8	0	-	-	-	-	2	-	1.3
2009	11.2	4.6	-	-	0.1	0.2	-	1.2	-	1.6
2014	12.7	2.9	-	-	1.3	-	-	1.1	-	1.3
2019	13.2	6.1	-	0	-	-	-	3.3	-	2.6
year	Quadrat Cover (%)									
1994	10.1	4.5	-	-	0.0	0.1	-	0.9	-	1.1
1999	10.5	5.6	-	0.0	0.2	0.4	-	1.2	-	0.9
2004	9.4	5.6	0.0	0.0	-	0.4	-	1.4	-	1.0
2009	11.5	5.9	-	0.0	0.1	0.4	-	1.6	-	2.0
2014	8.1	4.2	0.0	-	0.3	0.0	0.0	1.3	0.0	1.4
2019	9.7	6.2	-	0.0	-	0.6	-	3.0	-	2.7

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 13A-04.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
1994	-	-	-	-	-	-	-	-	112/137
1999	-	-	-	-	-	-	-	-	93/130
2004	-	-	-	-	-	-	-	-	146/188
2009	-	-	-	-	-	-	-	-	121/136
2014	-	-	-	-	-	-	-	-	91/120
2019	-	-	-	-	-	-	-	-	125/201
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1994	2940	440	13	77	10	14	2	21	51/74
1999	2560	60	16	64	20	34	20	7	52/72
2004	2340	440	2	74	25	58	29	12	49/73
2009	2480	20	1	76	23	27	44	17	49/72
2014	2120	-	0	78	22	57	30	15	56/85
2019	2080	-	1	68	31	30	34	35	60/93
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1994	6960	1380	8	91	1	0	0	0	13/30
1999	7340	220	15	83	1	10	0	0	14/30
2004	7380	20	10	88	3	0	0	3	18/32
2009	7020	60	1	97	2	5	2	3	14/30
2014	4600	-	0	100	0	24	35	0	12/29
2019	5800	-	2	97	1	10	9	1	19/32
Eriogonum microthecum[p] -- (slender buckwheat)									
1994	-	-	-	-	-	-	-	-	-/-
1999	20	-	0	100	0	0	0	0	16/24
2004	20	-	0	100	0	0	0	0	- / -
2009	-	-	-	-	-	-	-	-	-/-
2014	20	-	0	100	0	0	100	0	5/7
2019	-	-	-	-	-	-	-	-	-/-
Ericameria nauseosa ssp. nauseosa var. speciosa[p] -- (rubber rabbitbrush)									
1994	20	-	0	0	100	0	0	0	81/69
1999	20	-	0	0	100	100	0	0	- / -
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Escobaria vivipara var. arizonica -- (Arizona spinystar)									
1994	-	-	-	-	-	-	-	-	-/-
1999	40	-	0	100	0	0	0	0	8/8
2004	20	-	0	100	0	0	0	0	11/9
2009	-	-	-	-	-	-	-	-	9/9
2014	-	-	-	-	-	-	-	-	-/-
2019	20	-	0	100	0	0	0	0	10/11
Gutierrezia sarothrae -- (broom snakeweed)									
1994	200	120	50	50	0	0	0	0	4/5
1999	40	-	0	100	0	0	0	0	22/26
2004	120	-	0	100	0	0	0	0	13/24
2009	120	-	0	100	0	0	0	0	19/25
2014	1100	60	0	100	0	36	7	0	15/32
2019	40	-	0	100	0	0	0	0	15/21

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Juniperus osteosperma[t] -- (Utah juniper)									
1994	-	-	-	-	-	-	-	-	-/-
1999	20	-	0	100	0	0	0	0	- / -
2004	20	-	0	100	0	0	0	0	- / -
2009	20	-	0	100	0	0	0	0	- / -
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Mahonia repens -- (creeping barberry)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	20	-	0	100	0	0	0	0	- / -
2019	-	-	-	-	-	-	-	-	-/-
Opuntia polyacantha -- (plains pricklypear)									
1994	2200	200	26	67	7	0	2	14	11/41
1999	2420	40	14	74	12	0	2	6	10/26
2004	2300	-	11	81	8	0	0	1	12/29
2009	1600	60	0	90	10	0	0	16	10/29
2014	2280	-	4	87	10	0	0	34	11/30
2019	1980	-	0	100	0	0	0	1	11/47
Pediocactus simpsonii -- (mountain ball cactus)									
1994	-	-	-	-	-	-	-	-	-/-
1999	20	-	100	0	0	0	0	0	- / -
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	5/9
2014	20	-	0	100	0	0	0	0	5/8
2019	-	-	-	-	-	-	-	-	-/-
Pinus edulis[t] -- (twoneedle pinyon)									
1994	-	-	-	-	-	-	-	-	-/-
1999	20	20	100	0	0	0	0	0	- / -
2004	20	-	100	0	0	0	0	0	- / -
2009	20	-	0	100	0	0	0	0	- / -
2014	20	-	0	100	0	0	0	0	- / -
2019	20	-	0	100	0	0	0	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

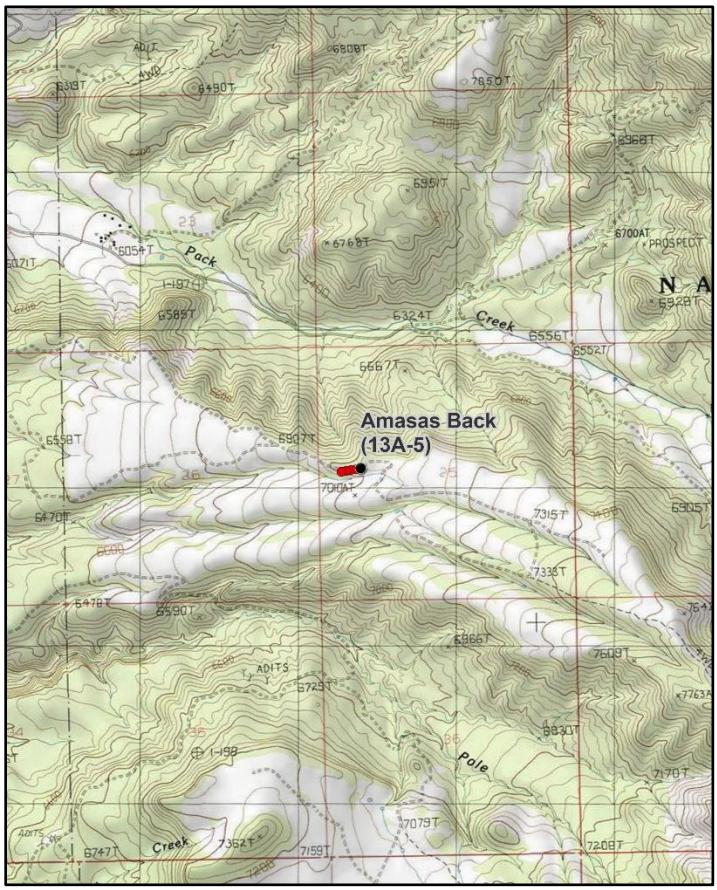
Table 13A-04.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

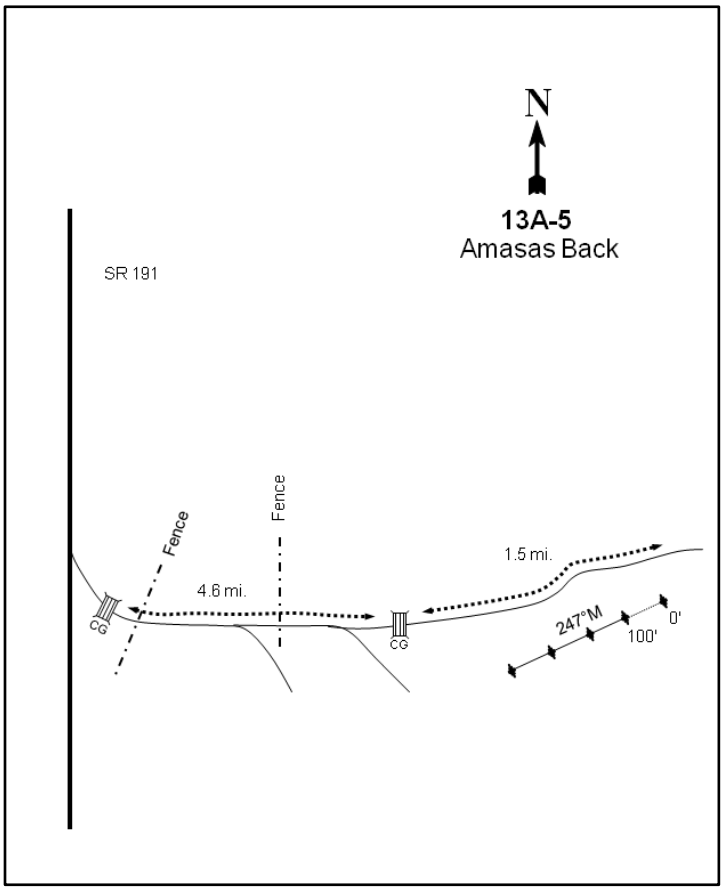
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1994	15	-	-	-	-	-	4.2
1999	16	-	-	-	-	-	5.5
2004	13	-	29	57	14	-	7.7
2009	12	-	29	57	14	-	6.0
2014	14	-	-	86	14	-	10.1
2019	13	-	13	75	13	-	18.9
Pinus edulis (twoneedle pinyon)							
1994	6	-	-	-	-	-	5.0
1999	11	-	-	-	-	-	6.1
2004	7	-	33	50	17	-	9.5
2009	8	-	50	50	-	-	6.6
2014	15	9	36	45	9	-	7.5
2019	13	-	56	33	11	-	7.7

Table 13A-04.15 - Deer Desirable Components Index: Mid Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1994	12.6	11.9	6.4	29.5	-0.2	5.5	0.0	65.7	Fair-Good
1999	13.1	9.2	8.2	26.7	-5.5	1.5	0.0	53.1	Fair
2004	12.1	7.6	0.9	28.5	-4.1	6.1	0.0	51.0	Poor-Fair
2009	14.0	8.0	0.4	19.8	-3.6	1.3	0.0	39.9	Poor
2014	15.9	8.5	0.0	30.0	-0.1	1.4	0.0	55.6	Fair
2019	16.5	5.8	0.5	20.0	-1.5	8.5	0.0	49.8	Poor-Fair

AMASAS BACK - STUDY NO. 13A-5





Location Information

USGS 7.5 min Map Info	Mount Tukuhnikivatz ; Township 27S, Range 23E, Section 25
GPS (0' Stake)	NAD 83 UTM ZONE 12, 644334 East 4254327 North

Transect Information

Browse Tag # (0' Stake)	7859
Transect Bearing	247° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

Traveling south on State Road 191 out of Moab, turn east off of the highway onto a dirt road just past mile marker 114. Cross the cattle guard and stay right, continuing on the main road for 0.7 miles to a fence. Proceed for 1.3 miles to a fork. Stay left at the fork, travel 0.4 miles to another fence, and continue 1.0 miles to a fork. Stay left while traveling 1.2 miles to the Forest Service boundary cattle guard. Cross the cattle guard and continue for 1.5 miles to the witness post. The 0-foot stake is 16 paces from the witness post at a bearing of 165 degrees magnetic and is marked by browse tag #7859.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	SQUAW SPRINGS
Elevation	7,000ft (2,134m)
Aspect	South
Slope	15-18%
Sample Dates	07/06/1994, 07/13/1999, 07/14/2004, 07/16/2009, 07/09/2014, 06/26/2019

Table 13A-05.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Chain Unknown	-	-	1978	750
Seeding - Seed Unknown	-	-	1978	750

Wildlife Habitat and Vegetation History

Table 13A-05.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	summer
Rocky Mountain Elk	crucial	winter

Table 13A-05.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1987	Black Sagebrush	Phase I
1994	Black Sagebrush/Pinyon-Juniper	Phase I transitioning to Phase II
1999	Black Sagebrush/Pinyon-Juniper	Phase I transitioning to Phase II
2004	Black Sagebrush/Pinyon-Juniper	Phase I transitioning to Phase II
2009	Black Sagebrush/Pinyon-Juniper	Phase II
2014	Black Sagebrush/Pinyon-Juniper	Phase II
2019	Black Sagebrush/Pinyon-Juniper	Phase II

Site Notes

No Notes

Soils

Table 13A-05.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	7.5	50.9	19.8	29.3	3.5	7.5	96.0	0.6	07/13/1999

Site Potential

1981 - 2010 Average Annual Precipitation	14 inches
NRCS Ecological Site	Upland Stony Loam (Pinyon-Utah Juniper)
NRCS Ecological Site #	R035XY321UT
States and Transitions	A defined state and transition model is available.

When the study was established in 1987, the plant community on this site existed as a stand of black sagebrush (*Artemisia nova*) with a small component of other shrub species that provided limited cover (Table 13A-05.12). Black sagebrush has displayed a generally decreasing trend in both cover and density over the sample years (Table 13A-05.12, Table 13A-05.13). Introduced perennial grasses have made up the majority of the herbaceous understory with crested wheatgrass (*Agropyron cristatum*) as the dominant species (Table 13A-05.10). Annual grasses have fluctuated throughout the study period, contributing significant amounts of cover in some years (Table 13A-05.7). Young twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) were scattered across the site during the first few sample years (Table 13A-05.12, Table 13A-05.14, Photos). As time has passed, however, trees have increased in abundance and cover and encroachment will likely continue without a major tree-removing disturbance.

Trend Summary Tables

Table 13A-05.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	11.0	0.5	6.1	-	-	-
1999	8.2	0.0	10.8	-	-	0.1
2004	9.6	0.3	15.8	11.8	0.7	18.0
2009	9.7	1.5	15.3	11.5	2.6	20.8
2014	8.0	0.4	11.5	8.9	0.7	16.2
2019	6.4	0.2	21.0	6.2	0.2	24.5

Table 13A-05.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	390	185	113	165	16.5	5.5	0.4	8.6
1999	406	192	15	130	9.1	6.2	0.1	4.3
2004	328	171	45	71	8.3	6.8	0.1	2.6
2009	335	175	2	61	5.5	6.2	0.0	2.6
2014	104	196	67	74	0.7	6.7	0.2	1.0
2019	264	172	318	62	12.7	7.1	13.4	1.8

Table 13A-05.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	12.3	0.6	42.1	1.5	19.6	40.8
1999	12.2	1.3	42.2	5.1	20.4	37.4
2004	11.9	0.6	42.2	4.9	22.0	42.0
2009	9.3	0.6	44.1	1.5	15.7	41.3
2014	17.9	0.2	42.9	5.7	20.0	30.9
2019	15.4	0.7	41.4	4.6	22.1	49.4

Table 13A-05.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Black Bear	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency				
1994	-	-	13	7	9
1999	-	-	23	20	20
2004	-	-	12	22	12
2009	-	1	18	13	29
2014	-	-	5	8	9
2019	-	-	14	10	9
Year	Days Use Per Acre (ha)				
1994	-	-	-	-	-
1999	-	-	34.2 (84.4)	53.6 (132.4)	-
2004	-	-	20.1 (49.7)	18.7 (46.3)	-
2009	-	1.5 (3.6)	15.4 (38.1)	36.8 (91.0)	-
2014	-	-	14.1 (34.8)	11.4 (28.1)	-
2019	8.7 (21.5)*	0.7 (1.8)	8.1 (19.9)	12.1 (29.8)	-

*Pellets per acre (ha)

Table 13A-05.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bouteloua gracilis (blue grama)	Bromus arvensis[ai] (field brome)	Bromus tectorum[ai] (cheatgrass)	Elymus elymoides (squirreltail)	Pleuraphis jamesii (James' galleta)	Poa bulbosa[i] (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Sporobolus cryptandrus (sand dropseed)	Thinopyrum intermedium[i] (intermediate wheatgrass)	Vulpia octoflora[a] (sixweeks fescue)
year	Nested Frequency												
1994	31	73	-	8	388	34	15	-	29	-	-	55	-
1999	24	91	-	2	406	18	27	-	20	-	-	53	-
2004	19	87	-	-	328	6	22	-	6	-	1	42	-
2009	33	89	-	13	325	12	22	-	6	-	1	39	4
2014	18	91	8	-	104	14	25	-	20	1	8	31	-
2019	11	95	6	3	261	20	23	1	2	12	8	15	-
year	Average Cover (%)												
1994	1.1	2.7	-	0.2	16.3	0.1	0.1	-	0.4	-	-	1.0	-
1999	0.8	3.1	-	0.0	9.1	0.2	0.7	-	0.2	-	-	1.2	-
2004	0.9	3.4	-	-	8.3	0.1	1.0	-	0.1	-	0.1	1.2	-
2009	0.9	2.9	-	0.0	5.5	0.1	0.9	-	0.1	-	0.2	1.1	0.0
2014	0.4	3.5	0.1	-	0.7	0.2	1.3	-	0.4	0.0	0.1	0.8	-
2019	0.8	4.5	0.2	0.1	12.5	0.3	0.5	0.0	0.0	0.4	0.2	0.2	-

a - Annual; n - Noxious Weed; i - Introduced Species

Table 13A-05.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Allium (onion)	Annual Forb[a] (null)	Arabis perennans (perennial rockcress)	Astragalus (milkvetch)	Astragalus coltonii (Colton's milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Calochortus nuttallii (sego lily)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata[ai] (curveseed butterwort)	Chamaesyce (sandmat)	Chenopodium fremontii[a] (Fremont's goosefoot)	Cryptantha humilis (roundspike cryptantha)	Cymopterus (springparsley)	Descurainia pinnata[a] (western tansymustard)	Draba reptans[a] (Carolina draba)	Erigeron pumilus (shaggy fleabane)	Gilia inconspicua[a] (shy gilia)
year	Nested Frequency																
1994	-	-	7	-	3	10	-	3	6	-	-	0	-	5	66	-	37
1999	-	-	-	-	2	16	-	-	-	-	-	-	1	2	3	-	5
2004	-	-	2	-	-	2	-	-	-	-	1	-	-	-	-	-	14
2009	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
2014	-	4	-	2	-	2	-	2	-	-	-	-	-	7	35	-	6
2019	0	-	3	-	2	5	4	-	11	2	20	4	-	53	150	1	265
year	Average Cover (%)																
1994	-	-	0.0	-	0.0	1.6	-	0.0	0.0	-	-	0.0	-	0.0	0.1	-	0.1
1999	-	-	-	-	0.0	0.4	-	-	-	-	-	-	0.0	0.0	0.0	-	0.0
2004	-	-	0.0	-	-	0.2	-	-	-	-	0.0	-	-	-	-	-	0.0
2009	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-	-	-	-
2014	-	0.0	-	0.0	-	0.0	-	0.0	-	-	-	-	-	0.0	0.1	-	0.0
2019	0.0	-	0.0	-	0.0	0.3	0.1	-	0.2	0.0	0.1	0.0	-	1.1	1.3	0.0	10.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Lappula occidentalis[a] (flatspine stickseed)	Lathyrus lanszwertii (Nevada pea)	Lesquerella (bladderpod)	Machaeranthera canescens (hoary tansyaster)	Microsteris gracilis[a] (slender phlox)	Packera multilobata (lobeleaf groundsel)	Petradoria pumila (rock goldenrod)	Phlox longifolia (longleaf phlox)	Solanum triflorum[a] (cutleaf nightshade)	Sphaeralcea coccinea (scarlet globemallow)	Tragopogon dubius[ai] (yellow salsify)
year	Nested Frequency										
1994	-	85	1	3	48	-	84	8	-	7	-
1999	-	58	6	-	5	-	68	-	-	8	-
2004	-	8	-	-	34	-	53	3	-	9	-
2009	-	6	-	-	2	-	48	5	-	11	-
2014	6	16	-	4	12	-	47	13	7	6	-
2019	15	10	9	4	33	1	17	5	-	4	0
year	Average Cover (%)										
1994	-	2.6	0.0	0.0	0.1	-	4.0	0.0	-	0.4	-
1999	-	0.7	0.0	-	0.0	-	3.0	-	-	0.1	-
2004	-	0.1	-	-	0.1	-	2.2	0.0	-	0.1	-
2009	-	0.0	-	-	0.0	-	2.5	0.0	-	0.1	-
2014	0.0	0.1	-	0.0	0.0	-	0.8	0.0	0.0	0.0	-
2019	0.4	0.2	0.0	0.0	0.3	0.0	0.8	0.1	-	0.2	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 13A-05.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia nova[p] (black sagebrush)	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Atriplex canescens[p] (fourwing saltbush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ephedra viridis[p] (mormon tea)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma[t] (Utah juniper)	Opuntia polyacantha var. erinacea (grizzlybear pricklypear)	Pediocactus simpsonii (mountain ball cactus)	Pinus edulis[t] (twoneedle pinyon)	Purshia tridentata[p] (antelope bitterbrush)	Yucca baccata (banana yucca)
year	Line Intercept Cover (%)											
1994	-	-	-	-	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-	-	-	-	-
2004	10.1	0.8	0.8	-	-	0.7	12.8	-	-	5.2	0.1	-
2009	10.9	-	0.4	-	0.2	2.6	14.8	-	-	6	-	-
2014	7.6	-	0.8	-	0.5	0.7	12.2	-	-	4	-	-
2019	5.1	-	0.6	-	0.5	-	17.1	-	-	7.4	-	0.2
year	Quadrat Cover (%)											
1994	10.0	-	1.0	-	-	0.5	4.9	0.0	-	1.2	-	-
1999	7.4	-	0.8	-	-	0.0	7.5	-	-	3.3	-	-
2004	7.2	0.4	1.4	-	-	0.3	11.6	-	0.0	4.3	0.6	-
2009	8.9	-	0.8	-	0.0	1.5	10.7	-	0.0	4.7	-	-
2014	7.4	-	0.5	0.0	0.0	0.4	9.4	-	-	2.2	-	-
2019	5.2	0.3	0.5	-	0.4	0.2	15.3	-	-	5.7	0.0	0.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 13A-05.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Artemisia nova[P] -- (black sagebrush)									
1994	2720	160	7	85	8	22	2	23	46/78
1999	2020	-	8	74	18	31	6	6	44/68
2004	2000	60	1	82	17	52	5	7	36/60
2009	2140	60	1	89	10	20	7	9	34/58
2014	2220	20	0	95	5	61	19	7	38/64
2019	1120	-	0	41	59	21	4	57	37/71
Artemisia tridentata ssp. vaseyana[P] -- (mountain big sagebrush)									
1994	-	-	-	-	-	-	-	-	87/142
1999	40	-	0	100	0	100	0	0	77/86
2004	60	-	0	100	0	0	100	0	47/91
2009	-	-	-	-	-	-	-	-	77/168
2014	-	-	-	-	-	-	-	-	69/89
2019	60	-	0	33	67	100	0	67	63/81
Atriplex canescens[P] -- (fourwing saltbush)									
1994	80	-	25	75	0	0	0	0	72/81
1999	100	-	40	40	20	60	40	0	82/104
2004	100	-	0	100	0	40	60	0	94/133
2009	100	-	0	0	100	0	100	80	84/101
2014	140	-	29	57	14	14	14	14	91/132
2019	100	-	0	60	40	0	100	40	84/88
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	60	-	0	100	0	0	0	0	22/25
2019	-	-	-	-	-	-	-	-	-/-
Ephedra viridis[P] -- (mormon tea)									
1994	100	-	20	80	0	0	80	0	28/14
1999	40	-	0	100	0	0	50	0	47/59
2004	40	-	0	100	0	50	0	0	33/64
2009	140	-	0	100	0	0	0	0	31/29
2014	100	-	0	100	0	0	0	0	34/25
2019	80	-	0	100	0	0	0	0	67/67
Escobaria vivipara var. arizonica -- (Arizona spinystar)									
1994	-	-	-	-	-	-	-	-	-/-
1999	40	-	50	50	0	0	0	0	9/20
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	20	-	0	100	0	0	0	0	11/9
Gutierrezia sarothrae -- (broom snakeweed)									
1994	660	40	18	64	18	0	0	3	21/29
1999	420	-	19	81	0	0	0	0	21/28
2004	3340	-	46	54	0	0	0	0	19/29
2009	3180	-	8	77	15	1	0	13	18/28
2014	580	-	0	100	0	0	0	0	21/29
2019	1260	2260	81	18	2	0	0	2	18/20

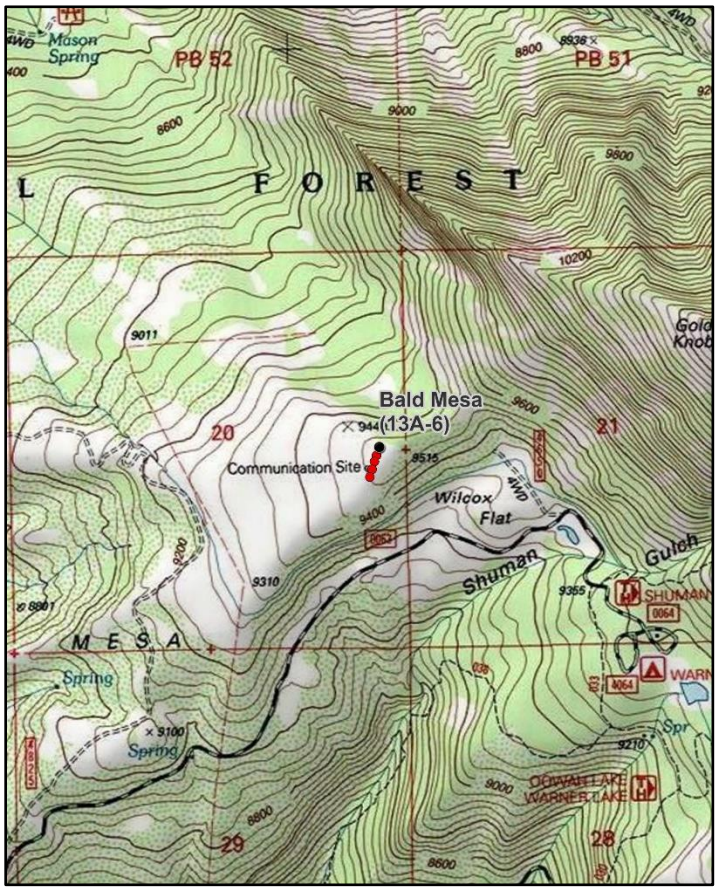
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Juniperus osteosperma[t] -- (Utah juniper)									
1994	-	-	-	-	-	-	-	-	-/-
1999	220	-	27	73	0	0	0	0	- / -
2004	160	-	13	88	0	0	0	0	- / -
2009	180	-	11	89	0	0	0	0	- / -
2014	80	-	0	100	0	0	0	0	- / -
2019	240	-	0	92	8	0	0	8	- / -
Opuntia polyacantha var. erinacea -- (grizzlybear pricklypear)									
1994	20	20	0	100	0	0	0	100	4/10
1999	-	-	-	-	-	-	-	-	13/38
2004	40	-	0	100	0	0	0	0	13/52
2009	-	-	-	-	-	-	-	-	-/-
2014	20	-	0	100	0	0	0	0	14/22
2019	-	-	-	-	-	-	-	-	19/21
Pediocactus simpsonii -- (mountain ball cactus)									
1994	-	-	-	-	-	-	-	-	-/-
1999	40	-	50	50	0	0	0	0	3/8
2004	60	-	0	67	33	0	0	33	10/19
2009	20	-	0	100	0	0	0	0	9/9
2014	-	-	-	-	-	-	-	-	3/7
2019	20	-	0	100	0	0	0	0	8/10
Pinus edulis[t] -- (twoneedle pinyon)									
1994	-	-	-	-	-	-	-	-	-/-
1999	120	-	33	67	0	0	0	0	- / -
2004	120	-	17	67	17	0	0	17	- / -
2009	160	-	25	75	0	0	0	0	- / -
2014	60	-	33	67	0	0	0	0	- / -
2019	100	-	20	80	0	0	0	0	- / -
Purshia tridentata[p] -- (antelope bitterbrush)									
1994	-	-	-	-	-	-	-	-	41/75
1999	-	-	-	-	-	-	-	-	49/110
2004	20	-	0	100	0	0	100	0	37/75
2009	80	-	0	100	0	25	0	25	52/148
2014	-	-	-	-	-	-	-	-	26/88
2019	-	-	-	-	-	-	-	-	30/99
Yucca baccata -- (banana yucca)									
1994	-	-	-	-	-	-	-	-	9/20
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	22/38
2014	-	-	-	-	-	-	-	-	24/52
2019	20	-	0	100	0	0	0	0	21/32

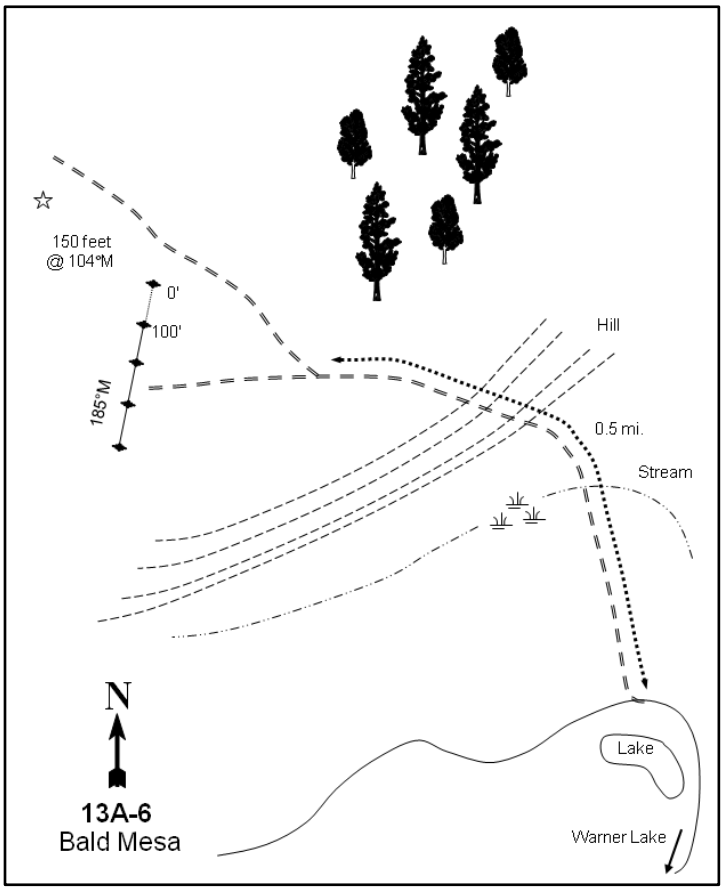
t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 13A-05.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1994	91	-	-	-	-	-	8.0
1999	103	-	-	-	-	-	9.6
2004	99	5	20	45	30	-	12.2
2009	94	-	25	40	30	5	6.7
2014	102	-	20	70	10	-	9.3
2019	103	-	35	40	25	-	11.0
Pinus edulis (twoneedle pinyon)							
1994	78	-	-	-	-	-	2.7
1999	88	-	-	-	-	-	6.8
2004	101	-	30	50	20	-	6.5
2009	95	-	35	35	30	-	5.7
2014	108	-	30	50	20	-	8.6
2019	98	-	21	58	16	5	10.2

BALD MESA - STUDY NO. 13A-6





Location Information

USGS 7.5 min Map Info	Warner Lake SE; Township 26S, Range 24E, Section 20
GPS (0' Stake)	NAD 83 UTM ZONE 12, 649195 East 4265676 North

Transect Information

Browse Tag # (0' Stake)	620
Transect Bearing	185° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

From the La Sal Mountain Loop Road, travel on the Warner Lake Campground road for 4.8 miles. Turn left and park at the trailhead; there is a minor road which crosses Wilcox Flat and leads up the side of the hill to Bald Mesa, but it is no longer drivable. Walk 0.5 miles up this road, continuing past the aspen-conifer edge to a fork in the meadow. Proceed to the right and continue for 200 feet to the first baseline stake, located 10 feet off of the road to the left. 12-inch high posts mark the baseline, and the 0-foot stake is marked by browse tag #620.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	BALD MESA
Elevation	9,500ft (2,896m)
Aspect	Southwest
Slope	5%
Sample Dates	07/05/1994, 07/21/1999, 07/08/2004, 07/13/2009, 07/09/2014, 06/25/2019

Wildlife Habitat and Vegetation History

Table 13A-06.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	summer
Rocky Mountain Elk	crucial	summer

Table 13A-06.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1987	Perennial Grass-Forb/Snowberry	NA
1994	Perennial Grass-Forb/Snowberry	NA
1999	Perennial Grass-Forb/Snowberry	NA
2004	Perennial Grass-Forb/Snowberry	NA
2009	Perennial Grass-Forb/Snowberry	NA
2014	Perennial Grass-Forb/Snowberry	NA
2019	Perennial Grass-Forb/Snowberry	NA

Site Notes

Aspen (*Populus tremuloides*) and conifer forests border the site to the north and east. A mountain bike trail also runs through this site.

Soils

Table 13A-06.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	6.2	40.2	32.5	27.3	5.0	6.1	262.4	0.4	07/21/1999

Site Potential

1981 - 2010 Average Annual Precipitation	31 inches
NRCS Ecological Site	High Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R048AY516UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 1987, this site has remained in a stable state with a diverse understory and robust shrub growth. Mountain snowberry (*Symphoricarpos oreophilus*) has been the dominant browse species and has provided significant cover (Table 13A-06.12). Perennial grasses are comprised of a mix of introduced and native species, with Kentucky bluegrass (*Poa pratensis*) as the dominant grass component. Both annual and perennial forbs are very diverse and abundant with the dominant species varying between years (Table 13A-06.7, Table 13A-06.10, Table 13A-06.11). This site has remained in the current ecological condition throughout the study period and it is likely that this will continue in the future barring a major disturbance.

Trend Summary Tables

Table 13A-06.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	17.8	1.8	-	-	-	-
1999	18.3	2.5	-	-	-	-
2004	20.6	2.7	-	22.5	2.8	-
2009	17.3	2.6	-	25.9	4.6	-
2014	24.7	3.2	-	28.0	3.0	-
2019	30.8	2.2	-	34.5	2.3	-

Table 13A-06.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	-	428	164	386	-	16.4	2.4	31.9
1999	-	452	98	367	-	26.5	2.3	30.7
2004	-	333	47	386	-	10.9	0.5	36.5
2009	-	372	52	355	-	17.1	0.7	29.3
2014	-	386	34	322	-	33.1	0.5	26.6
2019	-	363	262	358	-	14.6	10.7	26.0

Table 13A-06.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	6.1	0.1	39.4	0.2	1.6	65.9
1999	5.0	0.1	54.6	1.1	1.4	70.5
2004	12.7	-	30.7	1.4	1.6	67.1
2009	8.0	-	48.0	0.8	2.9	66.9
2014	8.3	0.0	27.5	0.5	3.0	79.4
2019	11.2	0.3	41.4	1.4	3.2	60.8

Table 13A-06.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Coyote	Mule Deer	Rocky Mountain Elk	Horse
	Quadrat Frequency				
1994	4	-	-	4	-
1999	17	-	1	3	-
2004	22	-	1	1	-
2009	28	-	-	1	-
2014	12	-	-	-	-
2019	27	-	1	1	-
Year	Days Use Per Acre (ha)				
1994	-	-	-	-	-
1999	83.5 (206.2)	-	-	8.7 (21.5)	0.6 (1.4)
2004	111.8 (276.2)	-	1.3 (3.3)	5.3 (13.2)	-
2009	33.4 (82.5)	-	2.7 (6.6)	2.7 (6.6)	3.5 (8.6)
2014	5.1 (12.6)	8.7 (21.5)*	0.7 (1.7)	0.7 (1.7)	-
2019	2.9 (7.2)	-	-	-	-

*Pellets per acre (ha)

Table 13A-06.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Achnatherum nelsonii (Columbia needlegrass)	Agropyron[i] (wheatgrass)	Bromus porteri (Porter brome)	Carex (sedge)	Dactylis glomerata[i] (orchardgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Koeleria macrantha (prairie Junegrass)	Phleum pratense[i] (timothy)	Poa arida (Plains bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis[i] (Kentucky bluegrass)
year	Nested Frequency												
1994	60	-	-	5	-	-	59	50	38	-	31	-	410
1999	51	-	1	-	6	6	51	35	29	6	19	3	422
2004	57	-	-	-	10	5	42	29	25	-	3	-	273
2009	103	-	-	-	-	-	39	44	34	-	-	-	328
2014	121	-	16	-	4	3	45	66	56	-	3	-	331
2019	94	3	38	2	25	5	40	81	4	-	56	5	202
year	Average Cover (%)												
1994	1.1	-	-	0.0	-	-	0.8	1.1	0.4	-	0.5	-	12.4
1999	1.4	-	0.0	-	0.0	0.0	0.7	0.7	0.2	0.2	1.1	0.0	22.2
2004	0.9	-	-	-	0.5	0.0	0.7	0.3	0.3	-	0.0	-	8.1
2009	2.7	-	-	-	-	-	0.4	0.4	0.2	-	-	-	13.3
2014	4.5	-	0.4	-	0.0	0.0	1.1	3.1	2.7	-	0.0	-	21.3
2019	2.5	0.1	0.6	0.0	1.2	0.0	0.5	2.2	0.2	-	1.2	0.2	5.8

a - Annual; n - Noxious Weed; i - Introduced Species

Table 13A-06.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Androsace septentrionalis[a] (pygmyflower rockjasmine)	Arabis drummondii (Drummond's rockcress)	Arenaria congesta (ballhead sandwort)	Argentina anserina (silverweed cinquefoil)	Astragalus (milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus miser (timber milkvetch)	Calochortus nuttallii (sego lily)	Carduus nutans[ani] (nodding plumeless thistle)	Castilleja linariifolia (Wyoming Indian paintbrush)	Chenopodium album[a] (lambsquarters)	Cirsium calcareum[a] (Cainville thistle)	Clematis (leather flower)	Collinsia parviflora[a] (maiden blue eyed Mary)	Collomia linearis[a] (tiny trumpet)
year	Nested Frequency																
1994	142	14	-	-	285	104	-	-	212	3	-	20	-	113	-	-	-
1999	122	19	-	-	222	84	200	-	82	13	-	15	1	58	2	1	-
2004	46	7	-	-	309	90	201	-	-	5	0	3	-	4	-	1	-
2009	47	6	-	-	237	90	-	-	1	5	-	1	-	2	-	-	5
2014	63	-	7	5	158	61	-	33	99	-	2	-	-	-	-	2	-
2019	77	5	-	-	158	62	-	3	159	16	7	-	1	4	-	91	-
year	Average Cover (%)																
1994	2.5	0.1	-	-	8.0	2.2	-	-	7.7	0.0	-	0.3	-	1.2	-	-	-
1999	2.0	0.1	-	-	5.3	1.7	8.0	-	3.4	0.1	-	0.3	0.0	2.0	0.1	0.0	-
2004	0.5	0.1	-	-	13.5	2.7	7.8	-	-	0.0	0.0	0.0	-	0.2	-	0.0	-
2009	0.7	0.2	-	-	7.4	2.5	-	-	0.0	0.0	-	0.0	-	0.0	-	-	0.0
2014	2.0	-	0.1	0.0	3.6	2.3	-	1.4	3.6	-	0.1	-	-	-	-	0.0	-
2019	1.5	0.1	-	-	2.9	1.7	-	0.0	4.5	0.1	0.2	-	0.0	0.1	-	1.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawksbeard)	Delphinium nuttallianum (twolobe larkspur)	Erigeron eatonii (Eaton's fleabane)	Erigeron flagellaris (trailing fleabane)	Erigeron speciosus (aspen fleabane)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Galium boreale (northern bedstraw)	Ipomopsis aggregata (scarlet gilia)	Lathyrus brachycalyx (Bonneville pea)	Lewisia pygmaea (alpine lewisia)	Ligusticum (licorice-root)	Lomatium dissectum (fernleaf biscuitroot)	Lupinus sericeus (silky lupine)	Mertensia brevistyla (shortstyle bluebells)	Orobanche (broomrape)
year	Nested Frequency																
1994	24	19	8	-	57	72	67	6	5	3	-	-	-	4	59	4	-
1999	34	19	-	-	31	18	59	2	4	4	0	-	-	1	43	-	-
2004	15	2	6	-	61	91	57	-	4	-	-	-	-	8	44	-	-
2009	-	7	-	-	25	7	67	-	-	-	186	-	8	2	33	-	-
2014	1	-	5	-	44	11	61	4	-	-	60	-	-	2	20	-	-
2019	13	-	233	5	49	84	39	-	1	-	7	1	4	4	27	31	2
year	Average Cover (%)																
1994	0.3	0.2	0.1	-	0.3	2.0	1.4	0.0	0.5	0.0	-	-	-	0.0	3.2	0.0	-
1999	0.8	0.5	-	-	0.2	0.3	0.8	0.1	0.4	0.0	0.5	-	-	0.4	2.7	-	-
2004	0.1	0.1	0.0	-	1.3	4.0	0.9	-	0.2	-	-	-	-	0.5	2.1	-	-
2009	-	0.2	-	-	0.7	0.1	1.3	-	-	-	7.0	-	0.5	0.0	1.4	-	-
2014	0.0	-	0.0	-	1.4	0.2	1.4	0.3	-	-	2.2	-	-	0.0	1.1	-	-
2019	0.1	-	5.1	0.1	0.4	3.3	0.9	-	0.1	-	0.1	0.0	0.1	0.0	0.9	0.2	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Penstemon crandallii (Crandall's beardtongue)	Penstemon humilis (low beardtongue)	Penstemon palmeri (Palmer's penstemon)	Penstemon strictus (Rocky Mountain penstemon)	Petradoria pumila (rock goldenrod)	Phlox (phlox)	Polygonum douglasii[a] (Douglas' knotweed)	Potentilla gracilis (slender cinquefoil)	Sedum lanceolatum (spearleaf stonecrop)	Senecio integerrimus[a] (lambstongue ragwort)	Silene antirrhina[a] (sleepy silene)	Silene drummondii (Drummond's campion)	Symphyotrichum (aster)	Symphyotrichum ascendens (western aster)	Taraxacum officinale (common dandelion)	Thalictrum fendleri (Fendler's meadow-rue)	Trifolium (clover)
year	Nested Frequency																
1994	2	-	4	33	30	4	1	-	1	87	-	-	-	58	70	-	-
1999	6	-	4	34	32	3	16	-	-	30	5	2	-	-	68	3	3
2004	12	-	-	9	29	-	24	-	2	25	-	-	14	13	21	-	-
2009	19	1	-	2	53	-	4	-	-	45	-	-	32	113	11	-	-
2014	10	-	-	24	28	-	-	-	7	23	2	-	4	137	16	3	-
2019	10	2	-	7	22	-	57	12	7	220	-	4	15	67	42	11	5
year	Average Cover (%)																
1994	0.0	-	0.2	0.5	0.9	0.1	0.0	-	0.0	1.2	-	-	-	0.9	0.4	-	-
1999	0.1	-	0.0	0.6	0.5	0.0	0.0	-	-	0.3	0.0	0.0	-	-	1.4	0.3	0.0
2004	0.5	-	-	0.1	1.5	-	0.1	-	0.0	0.3	-	-	0.1	0.2	0.4	-	-
2009	0.4	0.0	-	0.1	1.4	-	0.0	-	-	0.6	-	-	0.8	4.4	0.1	-	-
2014	0.1	-	-	0.5	1.1	-	-	-	0.0	0.3	0.0	-	0.1	5.2	0.1	0.0	-
2019	0.1	0.1	-	0.1	0.9	-	0.1	0.1	0.0	9.3	-	0.0	0.1	1.4	0.7	0.2	0.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 13A-06.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. lanceolatus (yellow rabbitbrush)	Ribes[p] (currant)	Ribes cereum var. cereum[p] (wax currant)	Ribes montigenum[p] (gooseberry currant)	Rosa woodsii[p] (Woods' rose)	Sambucus racemosa[p] (red elderberry)	Symphoricarpos oreophilus[p] (mountain snowberry)
year	Line Intercept Cover (%)							
1994	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-
2004	0.9	2.8	-	3	0.2	-	-	18.4
2009	1.6	4.6	-	3.1	1	-	0.5	19.7
2014	2.6	3	-	2.2	-	-	0.1	23.1
2019	3	2.3	-	3.8	0.5	-	0.1	27.1
year	Quadrat Cover (%)							
1994	1.9	1.8	2.6	-	-	0.1	0.0	13.1
1999	1.6	2.5	-	1.3	1.3	0.0	-	14.1
2004	1.2	2.7	-	1.5	2.0	-	-	15.8
2009	1.4	2.6	-	2.5	0.8	-	0.0	12.6
2014	2.3	3.2	-	2.3	0.0	0.4	0.0	19.7
2019	2.1	2.2	-	3.5	0.4	0.5	0.0	24.2

t - Tree Species; p - Preferred Browse; i - Introduced Species

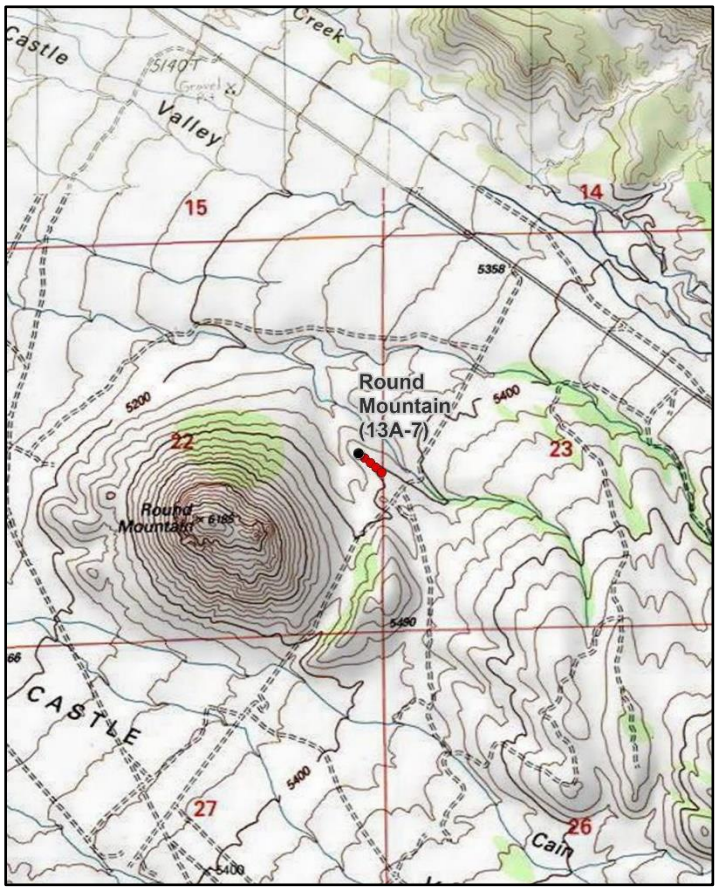
Table 13A-06.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

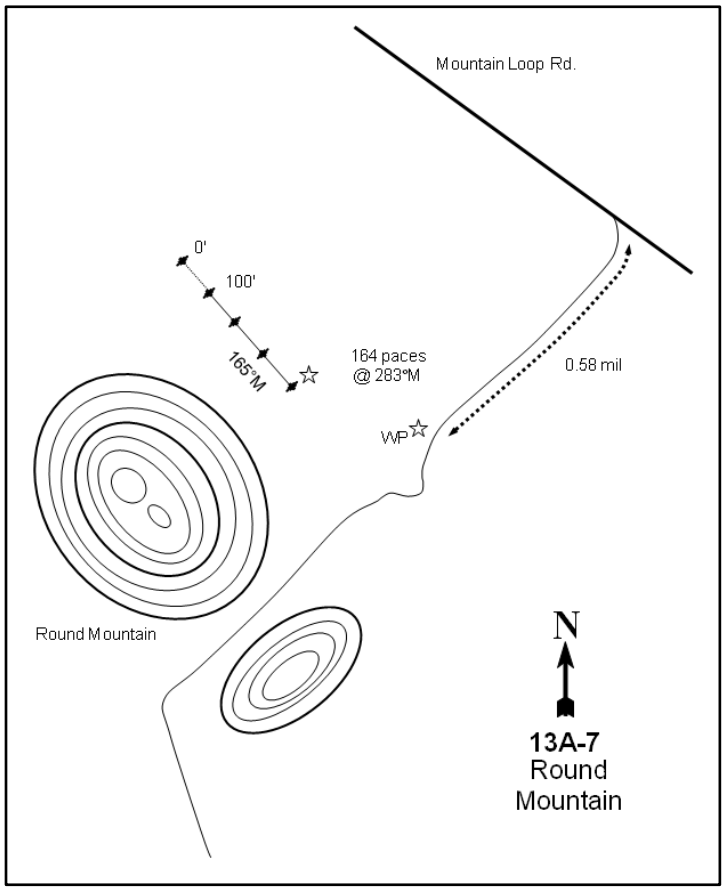
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1994	620	80	10	58	32	10	0	10	40/50
1999	620	180	26	48	26	58	0	0	36/59
2004	1540	-	44	49	7	1	0	4	31/46
2009	1880	160	20	79	1	45	6	2	30/45
2014	1540	320	33	68	0	44	1	0	34/59
2019	2040	20	38	60	2	27	0	4	30/51
Chrysothamnus viscidiflorus ssp. lanceolatus -- (yellow rabbitbrush)									
1994	1340	-	9	91	0	0	0	0	34/44
1999	1060	-	6	94	0	4	0	0	35/46
2004	1320	-	2	99	0	8	0	0	36/49
2009	1300	-	3	97	0	0	0	6	36/49
2014	1080	-	0	100	0	0	0	0	36/47
2019	1080	-	11	87	2	22	0	4	29/46
Clematis -- (leather flower)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	55/40
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Quercus gambelii[p] -- (Gambel oak)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	71/63
Ribes[p] -- (currant)									
1994	180	-	0	100	0	0	0	0	132/231
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Ribes cereum var. cereum[p] -- (wax currant)									
1994	-	-	-	-	-	-	-	-	-/-
1999	60	-	0	100	0	0	0	0	164/228
2004	60	-	0	100	0	0	0	0	142/158
2009	60	-	0	100	0	0	0	0	190/300
2014	80	-	0	100	0	0	0	0	179/248
2019	60	-	0	100	0	0	0	0	209/267
Ribes montigenum[p] -- (gooseberry currant)									
1994	-	-	-	-	-	-	-	-	-/-
1999	60	-	0	100	0	0	0	0	87/94
2004	40	-	0	100	0	0	0	0	67/62
2009	40	-	0	100	0	0	0	0	168/195
2014	20	-	0	100	0	0	0	0	110/73
2019	40	-	0	100	0	0	0	50	99/100
Rosa woodsii[p] -- (Woods' rose)									
1994	20	-	0	100	0	0	0	0	32/49
1999	20	-	100	0	0	0	0	0	- / -
2004	20	-	0	100	0	0	0	0	68/36
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	80	-	0	100	0	0	0	0	62/40
Sambucus racemosa[p] -- (red elderberry)									
1994	60	-	0	100	0	0	0	0	73/102
1999	60	-	33	67	0	0	0	0	88/98
2004	40	-	0	100	0	0	0	0	70/56
2009	100	-	20	80	0	0	0	0	69/78
2014	20	-	0	100	0	0	0	0	35/42
2019	60	-	0	100	0	0	0	0	89/99
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
1994	2100	-	9	91	0	0	0	0	57/127
1999	1400	80	7	81	11	13	1	0	61/107
2004	1360	-	3	94	3	0	0	2	55/122
2009	1680	-	6	91	4	6	18	23	62/114
2014	1480	-	0	100	0	8	1	0	69/122
2019	1880	680	9	90	1	29	20	1	71/143

t - Tree Species; p - Preferred Browse; i - Introduced Species

ROUND MOUNTAIN - STUDY NO. 13A-7





Location Information

USGS 7.5 min Map Info	Warner Lake NW; Township 25S, Range 23E, Section 22
GPS (0' Stake)	NAD 83 UTM ZONE 12, 643242 East 4275370 North

Transect Information

Browse Tag # (0' Stake)	7837
Transect Bearing	165° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Belts 2, 4: No Rebar

Directions to Site

Travel 6.8 miles up the Castle Valley Road (La Sal Mountain Loop Road) from State Road 128 along the Colorado River. Turn right onto a rough road heading south toward Round Mountain and travel 0.55 miles to just before the road drops into a deep draw. There is a witness post (four-foot, green post) on the right (north) side of the road. From here, walk 164 paces west northwest (approximately 238 degrees magnetic) down and across the draw to the top of a sage-blackbrush ridge. The 0-foot baseline stake is a short fencepost marked with a red browse tag #7837.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	No data
Elevation	5,400ft (1,646m)
Aspect	West
Slope	3-7%
Sample Dates	06/29/1994, 07/09/1999, 07/09/2004, 07/09/2009, 07/08/2014, 06/26/2019

Wildlife Habitat and Vegetation History

Table 13A-07.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter

Table 13A-07.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1987	Blackbrush	Phase I
1994	Blackbrush	Phase I
1999	Blackbrush	Phase I
2004	Blackbrush	Phase I
2009	Blackbrush	Phase I
2014	Blackbrush	Phase I
2019	Blackbrush	Phase I

Site Notes

In 2009, it was noted that deer pellet groups were congregated in the blackbrush (*Coleogyne ramosissima*).

Soils

Table 13A-07.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	7.8	58.9	19.8	21.3	1.9	6.4	48.0	0.4	07/09/1999

Site Potential

1981 - 2010 Average Annual Precipitation	12 inches
NRCS Ecological Site	Semidesert Stony Loam (Blackbrush)
NRCS Ecological Site #	R035XY243UT
States and Transitions	A defined state and transition model is available.

Since study establishment in 1987, the plant community on this site has existed as a blackbrush (*Coleogyne ramosissima*) stand with a depleted herbaceous understory. Blackbrush has been the primary browse species in all sample years, and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has decreased significantly since study establishment (Table 13A-07.12, Table 13A-07.13). The herbaceous understory of this site has consistently been in a depleted state throughout the study period: cheatgrass (*Bromus tectorum*) has been the most common grass species (Table 13A-07.7, Table 13A-07.10). Perennial forbs are rare while annual forb cover has shown fluctuations, with smallflowered milkvetch (*Astragalus nuttallianus*) displaying significant cover in 2014 and 2019 (Table 13A-07.7, Table 13A-07.11). Twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) have slowly increased on the site over the sample years (Table 13A-07.6, Table 13A-07.12, Table 13A-07.14). The state and transition model predicts that without inputs the site is likely to remain in the present community type. However, there is a greater potential for catastrophic fires with increased amounts of cheatgrass; wildfire could result in the long-term loss of blackbrush on this site (Jornada, 2019).

Trend Summary Tables

Table 13A-07.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	16.5	1.0	3.1	-	-	-
1999	14.8	1.2	6.5	-	-	0.3
2004	10.7	1.0	7.4	14.7	1.5	5.4
2009	10.7	0.6	5.2	16.3	0.5	7.5
2014	10.4	4.8	6.1	21.4	1.3	8.3
2019	18.0	0.9	7.6	23.4	0.4	5.8

Table 13A-07.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	312	7	259	97	3.3	0.1	0.8	0.7
1999	398	4	45	21	6.6	0.0	0.1	0.1
2004	303	3	40	-	7.6	0.0	0.1	-
2009	356	17	4	14	9.2	0.3	0.2	0.0
2014	393	43	197	4	12.7	0.6	3.5	0.1
2019	259	25	356	44	4.4	0.5	15.5	0.2

Table 13A-07.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	24.1	0.9	19.9	10.0	30.3	22.3
1999	8.0	1.5	23.1	25.7	23.3	29.4
2004	10.7	1.6	20.0	27.4	24.1	27.4
2009	12.8	0.4	30.6	18.4	21.9	26.0
2014	10.3	2.2	34.8	19.8	24.1	35.8
2019	11.3	2.3	30.7	29.4	27.9	38.3

Table 13A-07.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency		
1994	49	-	8
1999	40	3	9
2004	33	-	2
2009	25	-	6
2014	20	1	5
2019	20	1	8
Year	Days Use Per Acre (ha)		
1994	-	-	-
1999	77.7 (192.0)	2.0 (5.0)	-
2004	-	-	-
2009	51.6 (127.5)	1.3 (3.3)	-
2014	23.4 (57.9)	2.0 (5.0)	-
2019	16.1 (39.7)	2.0 (5.0)	-

Table 13A-07.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Bromus tectorum[ai] (cheatgrass)	Elymus elymoides (squirreltail)	Poa secunda (Sandberg bluegrass)	Vulpia octoflora[a] (sixweeks fescue)
year	Nested Frequency			
1994	249	4	3	168
1999	396	-	4	81
2004	285	-	3	57
2009	356	-	17	2
2014	393	-	43	11
2019	233	-	25	68
year	Average Cover (%)			
1994	3.0	0.0	0.0	0.3
1999	6.4	-	0.0	0.2
2004	7.4	-	0.0	0.2
2009	9.1	-	0.3	0.1
2014	12.6	-	0.6	0.0
2019	4.1	-	0.5	0.2

a - Annual; n - Noxious Weed; i - Introduced Species

Table 13A-07.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Alyssum alyssoides[ai] (pale madwort)	Arabis (rockcress)	Astragalus (milkvetch)	Astragalus moencoppensis (Moenkopi milkvetch)	Astragalus nuttallianus[a] (smallflowered milkvetch)	Calochortus nuttallii (sego lily)	Castilleja angustifolia (northwestern Indian paintbrush)	Cymopterus (springparsley)	Descurainia pinnata[a] (western tansymustard)	Draba reptans[a] (Carolina draba)	Eriogonum cemuum[a] (nodding buckwheat)	Erodium cicutarium[ai] (redstem stork's bill)	Gilia inconspicua[a] (shy gilia)	Lappula occidentalis[a] (flatspine stickseed)	Packera multilobata (lobeleaf groundsel)	Phlox longifolia (longleaf phlox)	Physaria (twinpod)
year	Nested Frequency																
1994	-	3	72	1	-	-	2	-	28	202	2	-	117	11	19	-	4
1999	-	1	11	-	-	-	-	-	-	11	-	-	11	-	9	-	-
2004	-	-	-	-	-	-	-	-	3	-	-	-	15	2	-	-	-
2009	-	-	10	-	-	-	-	-	4	-	-	-	-	-	3	-	-
2014	-	-	-	-	150	-	-	-	29	43	-	7	36	-	-	1	-
2019	1	11	-	-	280	2	-	3	39	237	-	2	177	1	17	10	10
year	Average Cover (%)																
1994	-	0.0	0.2	0.0	-	-	0.0	-	0.1	0.4	0.0	-	0.2	0.0	0.1	-	0.0
1999	-	0.0	0.0	-	-	-	-	-	-	0.0	-	-	0.1	-	0.1	-	-
2004	-	-	-	-	-	-	-	-	0.0	-	-	-	0.0	0.0	-	-	-
2009	-	-	0.0	-	-	-	-	-	0.2	-	-	-	-	-	0.0	-	-
2014	-	-	-	-	2.9	-	-	-	0.3	0.1	-	0.1	0.2	-	-	0.0	-
2019	0.0	0.1	-	-	7.8	0.0	-	0.0	0.2	2.4	-	0.0	3.4	0.0	0.0	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Plantago patagonica[a] (woolly plantain)	Polygonum (knotweed)	Silene antirrhina[a] (sleepy silene)	Sisymbrium altissimum[ai] (tall tumblemustard)	Streptanthus cordatus (heartleaf twistflower)
year	Nested Frequency				
1994	22	-	-	10	16
1999	12	-	12	3	-
2004	22	-	-	-	-
2009	-	1	-	-	-
2014	7	-	-	-	3
2019	24	-	-	21	2
year	Average Cover (%)				
1994	0.0	-	-	0.0	0.4
1999	0.0	-	0.0	0.0	-
2004	0.1	-	-	-	-
2009	-	0.0	-	-	-
2014	0.0	-	-	-	0.1
2019	0.1	-	-	1.7	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 13A-07.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Coleogyne ramosissima[p] (blackbrush)	Ephedra viridis[p] (mormon tea)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma[t] (Utah juniper)	Opuntia (pricklypear)	Sclerocactus (fishhook cactus)
year	Line Intercept Cover (%)						
1994	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-
2004	1	13.7	-	1.5	5.4	-	-
2009	1	14.8	0.5	0.5	7.5	0	-
2014	1.2	20.2	0	0.9	8.3	0.4	-
2019	1.3	21.1	1	0.1	5.8	0.3	-
year	Quadrat Cover (%)						
1994	7.0	9.5	0.0	1.0	3.1	-	-
1999	3.0	11.7	0.1	1.2	6.5	-	-
2004	1.0	9.5	0.1	1.0	7.4	-	-
2009	0.8	9.3	0.6	0.6	5.2	0.0	-
2014	0.7	9.1	0.6	1.2	6.1	0.0	3.6
2019	1.3	15.7	1.0	0.6	7.6	0.0	0.3

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 13A-07.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1994	2140	-	3	34	64	28	3	35	47/92
1999	1720	-	1	48	51	38	52	23	50/82
2004	680	-	0	15	85	12	85	77	37/65
2009	480	-	4	33	63	38	13	63	39/62
2014	460	-	0	74	26	39	17	48	38/67
2019	360	-	0	50	50	39	28	50	59/82
Atriplex canescens[p] -- (fourwing saltbush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	68/108
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Cercocarpus montanus[p] -- (alderleaf mountain mahogany)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	51/82
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Coleogyne ramosissima[p] -- (blackbrush)									
1994	4120	-	1	87	12	20	1	10	33/65
1999	3500	40	1	97	2	23	7	1	36/71
2004	3720	-	1	86	14	53	21	4	31/66
2009	3740	40	1	92	8	34	1	4	34/70
2014	3780	-	3	97	0	32	5	7	37/73
2019	3740	620	3	91	6	13	1	5	42/78
Ephedra viridis[p] -- (mormon tea)									
1994	40	-	50	50	0	50	0	0	44/50
1999	80	-	75	25	0	0	25	0	63/84
2004	20	-	0	100	0	0	0	0	52/61
2009	100	-	20	80	0	0	0	0	60/94
2014	100	-	0	100	0	60	0	0	60/95
2019	60	-	0	100	0	0	0	0	70/108
Gutierrezia sarothrae -- (broom snakeweed)									
1994	2220	2880	28	61	11	1	0	2	23/29
1999	3560	160	24	73	3	0	0	2	19/24
2004	1840	-	4	95	1	0	0	1	19/26
2009	1320	80	30	24	46	0	0	44	16/22
2014	1420	100	1	99	0	68	3	0	28/39
2019	1220	7520	23	77	0	0	0	0	24/24
Juniperus osteosperma[t] -- (Utah juniper)									
1994	-	-	-	-	-	-	-	-	-/-
1999	60	20	67	33	0	0	0	0	- / -
2004	60	-	67	33	0	0	0	0	- / -
2009	80	-	100	0	0	0	0	0	- / -
2014	120	-	33	67	0	0	0	0	- / -
2019	60	-	33	67	0	0	0	0	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Opuntia -- (pricklypear)									
1994	-	-	-	-	-	-	-	-	-/-
1999	20	-	0	100	0	0	0	0	30/19
2004	40	-	50	50	0	0	0	0	26/70
2009	40	-	0	100	0	0	0	0	31/66
2014	40	-	0	100	0	0	0	0	29/98
2019	40	-	0	100	0	0	0	0	29/72
Pinus edulis[t] -- (twoneedle pinyon)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	20	-	0	0	100	0	0	100	- / -
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Sclerocactus -- (fishhook cactus)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	40	-	0	100	0	0	0	0	12/9
2019	40	-	0	100	0	0	0	0	21/11

t - Tree Species; p - Preferred Browse; i - Introduced Species

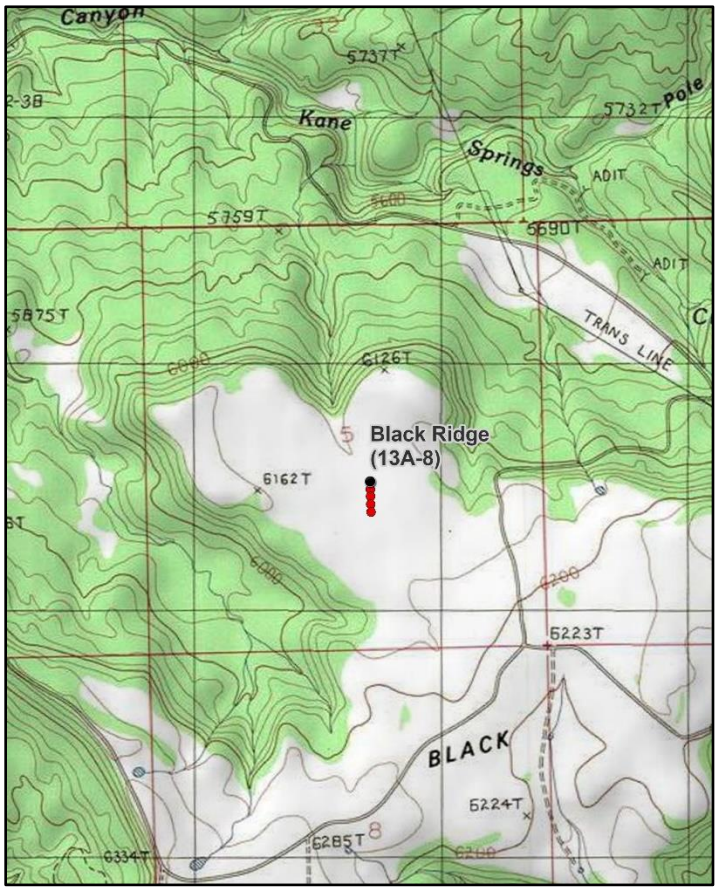
Table 13A-07.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

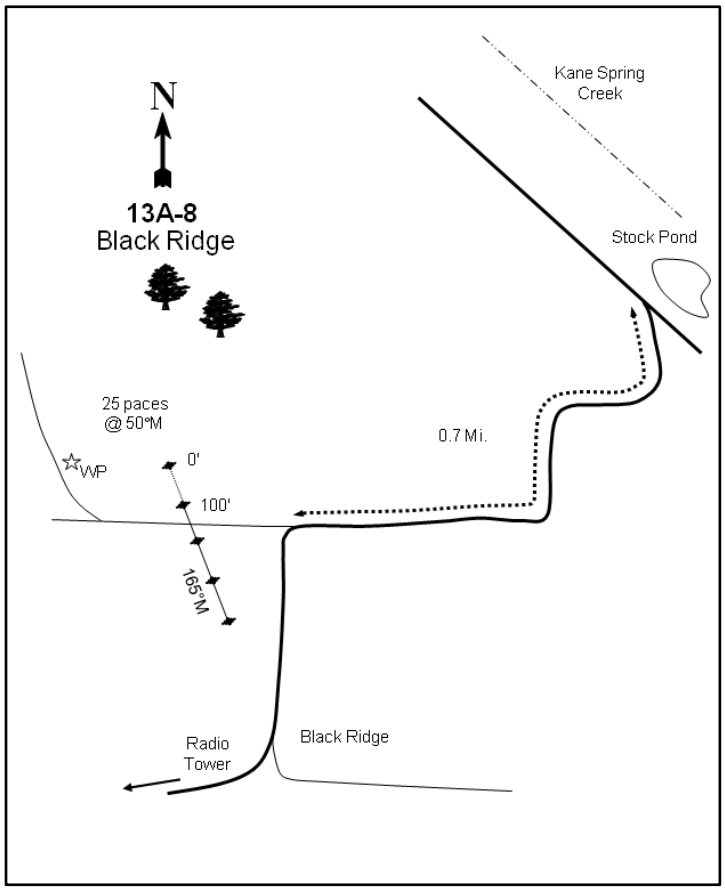
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1994	40	-	-	-	-	-	10.8
1999	41	-	-	-	-	-	7.9
2009	49	15	23	46	8	8	8.5
2014	55	15	46	38	-	-	7.6
2019	39	7	43	36	14	-	14.0
Pinus edulis (twoneedle pinyon)							
1994	5	-	-	-	-	-	5.5
1999	8	-	-	-	-	-	7.2
2009	7	-	40	40	-	20	7.2
2014	11	33	17	50	-	-	7.3
2019	9	-	40	40	20	-	7.6

Table 13A-07.15 - Deer Desirable Components Index: Low Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1994	18.3	4.8	0.8	0.1	-2.5	1.5	0.0	23.0	Poor
1999	15.6	11.5	0.9	0.1	-5.0	0.2	0.0	23.3	Poor-Fair
2004	15.0	9.3	0.2	0.1	-5.7	0.0	0.0	18.9	Poor
2009	16.7	11.8	0.7	0.5	-6.9	0.1	0.0	22.8	Poor
2014	21.7	14.6	1.5	1.1	-9.5	0.1	0.0	29.5	Fair
2019	24.0	12.4	1.2	0.9	-3.3	0.4	0.0	35.7	Fair

BLACK RIDGE - STUDY NO. 13A-8





Location Information

USGS 7.5 min Map Info	Kane Springs SE; Township 28S, Range 23E, Section 05
GPS (0' Stake)	NAD 83 UTM ZONE 12, 638655 East 4250723 North

Transect Information

Browse Tag # (0' Stake)	7173
Transect Bearing	165° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Belts 2, 5: No Rebar

Directions to Site

Travel south from Moab on State Road 191. Turn left just past mile marker 113, where a road turns off to Black Ridge and Yellow Circle Mine. Proceed 4.4 miles on the main road to the top of the ridge, then turn right onto a faint dirt road bearing west towards the relay tower. Travel for 0.15 miles to a faint fork. Proceed to the right at the fork and continue for 0.3 miles to a witness post on the right (east) side of the road. The baseline starts 25 paces away from the witness post at 50 degrees magnetic, and the 0-foot stake is marked with browse tag #7173.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	BLACK RIDGE
Elevation	6,100ft (1,859m)
Aspect	North
Slope	0-2%
Sample Dates	06/28/1994, 07/08/1999, 07/12/2004, 07/16/2009, 07/08/2014, 06/24/2019

Table 13A-08.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Chain Unknown	-	-	Historic	-
Seeding - Seed Unknown	-	-	Historic	-
Hand Crew - Lop and Scatter	Black Ridge Fuels Reduction and Vegetation Restoration - Phase II	1730	2011	1359

Wildlife Habitat and Vegetation History

Table 13A-08.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter

Table 13A-08.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1987	Mountain Big Sagebrush	Phase I
1994	Mountain Big Sagebrush	Phase I
1999	Mountain Big Sagebrush	Phase I
2004	Mountain Big Sagebrush	Phase I
2009	Mountain Big Sagebrush	Phase I
2014	Mountain Big Sagebrush	Phase I
2019	Mountain Big Sagebrush	Phase I

Site Notes

The site is located approximately a half mile south of the mesa's edge, near the middle of the chained area. Deer use appears to be greatest along the north rim above Kane Springs Creek.

Soils

Table 13A-08.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	7.5	56.9	19.8	23.3	1.4	5.8	19.2	0.4	07/02/1999

Site Potential

1981 - 2010 Average Annual Precipitation	13 inches
NRCS Ecological Site	Upland Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R035XY308UT
States and Transitions	A defined state and transition model is available.

Over the time since study establishment, the plant community on this site has been dominated by mountain big sagebrush (*Artemisia tridentata* spp. *vaseyana*). In addition, browse cover is almost exclusively provided by mountain big sagebrush, the cover of which has remained stable (Table 13A-08.12). The herbaceous understory is mostly depleted. The introduced annual grass species cheatgrass (*Bromus tectorum*) and perennial species crested wheatgrass (*Agropyron cristatum*) have comprised a majority of the herbaceous understory over the study period, although cheatgrass has decreased and has become rare. Native grasses and forbs have remained a minor component of the understory (Table 13A-08.10, Table 13A-08.11). Utah juniper (*Juniperus osteosperma*) trees were treated by a lop and scatter treatment in 2011, but have still been sampled in subsequent years (Table 13A-08.14).

Trend Summary Tables

Table 13A-08.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	14.5	0.4	-	-	-	-
1999	11.8	-	-	-	-	-
2004	13.2	0.0	-	18.5	-	-
2009	12.1	-	-	14.0	-	-
2014	10.6	0.0	-	14.0	0.1	-
2019	12.1	0.4	-	16.9	0.2	-

Table 13A-08.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	262	185	59	4	1.7	5.7	0.1	0.0
1999	231	161	-	1	2.1	3.2	-	0.0
2004	219	136	18	3	3.2	5.1	0.1	0.0
2009	88	159	2	-	0.4	5.5	0.0	-
2014	51	163	82	4	0.1	6.2	0.5	0.0
2019	198	189	219	99	2.5	6.0	6.6	1.2

Table 13A-08.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	53.9	0.4	29.0	0.1	0.1	20.6
1999	60.6	1.4	15.9	0.3	-	16.6
2004	61.4	3.1	24.9	0.2	0.0	23.2
2009	61.9	0.9	23.5	0.2	0.0	16.9
2014	65.7	2.3	17.6	0.2	0.0	16.7
2019	65.5	2.0	19.2	0.4	0.0	23.3

Table 13A-08.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1994	-	45	-	59
1999	-	29	-	17
2004	-	24	1	12
2009	8	30	3	50
2014	3	10	-	20
2019	5	40	1	31
Year	Days Use Per Acre (ha)			
1994	-	-	-	-
1999	20.3 (50.2)	93.8 (231.7)	-	-
2004	1.5 (3.6)	63.0 (155.6)	3.4 (8.3)	-
2009	21.1 (52.0)	23.4 (57.9)	4.7 (11.6)	-
2014	4.4 (10.8)	14.1 (34.8)	0.7 (1.7)	-
2019	0.7 (1.8)	30.2 (74.5)	-	-

Table 13A-08.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum[i] (crested wheatgrass)	Aristida purpurea var. longiseta (Fendler threeawn)	Bromus tectorum[ai] (cheatgrass)	Elymus elymoides (squirreltail)	Vulpia octoflora[a] (sixweeks fescue)
year	Nested Frequency					
1994	-	152	9	215	45	99
1999	-	155	5	228	4	10
2004	-	136	-	218	1	2
2009	-	159	-	88	-	-
2014	-	161	-	17	6	34
2019	3	186	-	8	2	195
year	Average Cover (%)					
1994	-	5.5	0.1	1.5	0.1	0.2
1999	-	3.1	0.0	2.0	0.0	0.0
2004	-	5.1	-	3.2	0.0	0.0
2009	-	5.5	-	0.4	-	-
2014	-	6.2	-	0.1	0.0	0.1
2019	0.0	6.0	-	0.2	0.0	2.3

a - Annual; n - Noxious Weed; i - Introduced Species

Table 13A-08.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Ceratocephala testiculata[ai] (curveseed butterwort)	Chenopodium fremontii[a] (Fremont's goosefoot)	Descurainia pinnata[a] (western tansymustard)	Draba[a] (draba)	Eriogonum cemuum[a] (nodding buckwheat)	Eriogonum ovalifolium (cushion buckwheat)	Gilia inconspicua[a] (shy gilia)	Lappula occidentalis[a] (flatspine stickseed)	Machaeranthera canescens (hoary tansyaster)	Machaeranthera grindelioides (rayless tansyaster)	Mentzelia albicaulis[a] (whitestem blazingstar)	Microsteris gracilis[a] (slender phlox)	Navarretia intertexta[a] (needleleaf navarretia)	Oenothera (evening primrose)	Salsola tragus[ai] (prickly Russian thistle)
year	Nested Frequency														
1994	-	-	3	-	53	-	-	5	-	4	-	-	-	-	-
1999	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
2004	-	-	1	-	13	-	-	2	-	3	-	-	-	-	2
2009	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	-	-	26	10	7	2	-	11	2	-	45	-	-	-	3
2019	1	61	98	12	35	2	22	4	-	2	-	1	81	97	-
year	Average Cover (%)														
1994	-	-	0.0	-	0.1	-	-	0.0	-	0.0	-	-	-	-	-
1999	-	-	-	-	-	-	-	-	-	0.0	-	-	-	-	-
2004	-	-	0.0	-	0.1	-	-	0.0	-	0.0	-	-	-	-	0.0
2009	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	-	-	0.1	0.0	0.2	0.0	-	0.0	0.0	-	0.1	-	-	-	0.0
2019	0.0	0.2	2.5	0.3	0.6	0.0	0.6	0.1	-	0.0	-	0.0	2.4	1.1	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 13A-08.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Gutierrezia sarothrae (broom snakeweed)	Opuntia (pricklypear)
year	Line Intercept Cover (%)		
1994	-	-	-
1999	-	-	-
2004	18.5	-	-
2009	14	-	-
2014	14	-	0.1
2019	16.9	0.1	0.1
year	Quadrat Cover (%)		
1994	14.5	-	0.4
1999	11.8	-	-
2004	13.2	0.0	-
2009	12.1	-	-
2014	10.6	0.0	0.0
2019	12.1	0.4	0.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 13A-08.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1994	4180	1060	6	70	24	16	4	19	47/81
1999	3300	-	4	83	13	55	42	4	48/77
2004	2880	-	1	76	22	44	52	9	46/82
2009	3700	-	1	64	35	34	55	9	47/85
2014	3220	-	4	85	12	50	39	12	49/81
2019	2720	-	0	70	30	21	55	35	58/92
Atriplex canescens[p] -- (fourwing saltbush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	40/60
2004	-	-	-	-	-	-	-	-	- / -
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	69/102
Ephedra viridis[p] -- (mormon tea)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	105/98
2009	-	-	-	-	-	-	-	-	95/90
2014	-	-	-	-	-	-	-	-	91/98
2019	-	-	-	-	-	-	-	-	85/84

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Gutierrezia sarothrae -- (broom snakeweed)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	20	-	100	0	0	0	0	0	- / -
2009	60	-	0	100	0	0	0	0	18/24
2014	40	860	50	50	0	0	0	50	16/26
2019	4440	100	87	13	0	0	0	0	14/14
Opuntia -- (pricklypear)									
1994	60	-	0	100	0	0	0	0	13/65
1999	20	-	0	100	0	0	0	0	14/12
2004	20	-	0	100	0	0	0	0	9/17
2009	40	-	0	100	0	0	0	0	14/25
2014	60	-	0	100	0	0	0	0	10/18
2019	60	-	0	100	0	0	0	0	11/43
Sclerocactus -- (fishhook cactus)									
1994	20	-	0	100	0	0	0	0	6/8
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	6/7
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	24/17

t - Tree Species; p - Preferred Browse; i - Introduced Species

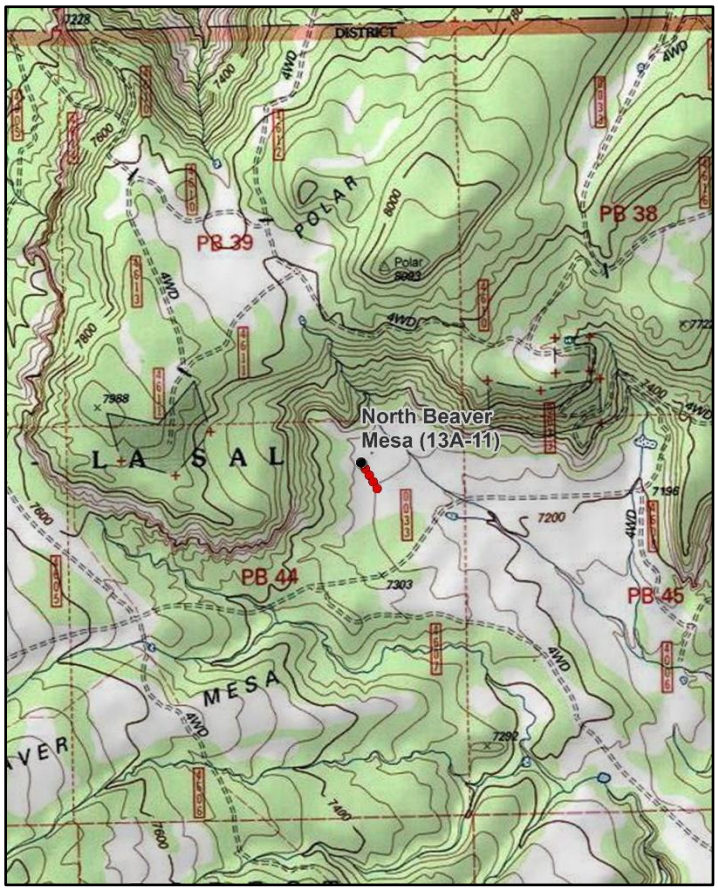
Table 13A-08.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

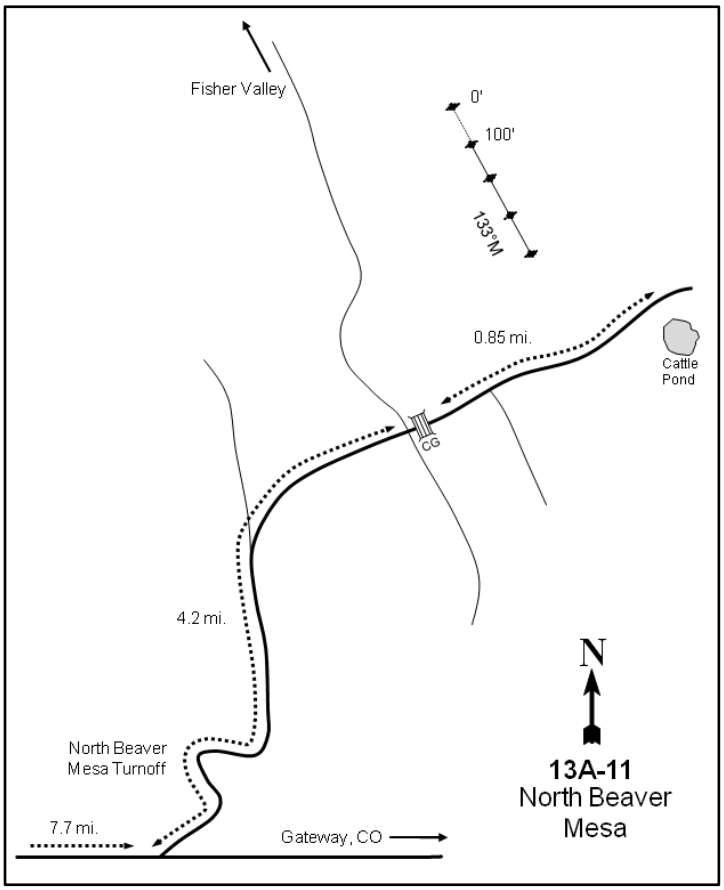
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1999	2	-	-	-	-	-	13.7
2019	8	-	100	-	-	-	4.2

Table 13A-08.15 - Deer Desirable Components Index: Mid Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1994	18.1	7.8	3.1	11.3	-1.3	0.0	0.0	39.1	Poor
1999	14.7	11.0	1.8	6.4	-1.5	0.0	0.0	32.4	Very Poor
2004	23.1	8.3	0.7	10.2	-2.4	0.0	0.0	40.0	Poor
2009	17.5	4.6	0.6	11.1	-0.3	0.0	0.0	33.4	Very Poor-Poor
2014	17.5	11.5	1.9	12.5	-0.1	0.0	0.0	43.2	Poor
2019	21.1	6.0	0.0	12.0	-1.8	2.3	0.0	39.6	Poor

NORTH BEAVER MESA - STUDY NO. 13A-11





Location Information

USGS 7.5 min Map Info	Fisher Valley SE; Township 25S, Range 25E, Section 44
GPS (0' Stake)	NAD 83 UTM ZONE 12, 661264 East 4279597 North

Transect Information

Browse Tag # (0' Stake)	7842
Transect Bearing	133° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

From the intersection of the La Sal Mountain Loop and Gateway roads, travel east towards Gateway, Colorado for 7.7 miles to the North Beaver Mesa turnoff. Turn left and travel 4.2 miles to the Polar Mesa/Fisher Valley Road. Continue straight through this fork, over a cattle guard, and 0.85 miles to a stock pond at the head of a large sagebrush valley. The transect is located to the west (300 yards away at 284 degrees magnetic) towards an alcove. The baseline stakes are one-foot tall fence posts. The 0-foot baseline stake is the furthest away and is marked with browse tag #7842.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	BEAVER
Elevation	7,300ft (2,225m)
Aspect	Southeast
Slope	3-6%
Sample Dates	07/07/1994, 07/20/1999, 07/08/2004, 07/09/2009, 07/08/2014, 06/26/2019

Table 13A-11.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Chain Unknown	-	-	1962	1000
Seeding - Seed Unknown	-	-	1962	1000

Wildlife Habitat and Vegetation History

Table 13A-11.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter

Table 13A-11.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1987	Mountain Big Sagebrush	Phase I
1994	Mountain Big Sagebrush	Phase I
1999	Mountain Big Sagebrush	Phase I
2004	Mountain Big Sagebrush	Phase I
2009	Mountain Big Sagebrush	Phase I
2014	Mountain Big Sagebrush	Phase I
2019	Mountain Big Sagebrush	Phase I

Site Notes

In 1962, 1,000 acres within the allotment were chained or contour trenched and seeded. A roller chopper was used to retreat other parts of the allotment in 1985 and 1987, but did not include the study site. The study is located in the upper part of a large sagebrush valley, where the only evidence of vegetation treatments is the partially filled-in contoured trenches and presence of seeded species.

Soils

Table 13A-11.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Loam	7.4	70.9	11.8	17.3	1.6	8.8	92.8	0.4	07/20/1999

Site Potential

1981 - 2010 Average Annual Precipitation	19 inches
NRCS Ecological Site	Upland Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R035XY308UT
States and Transitions	A defined state and transition model is available.

Since study establishment in 1987, the plant community on this site has remained a stand of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) with a diverse component of other shrub species which provide limited cover (Table 13A-11.12). Introduced perennial grass species, especially crested wheatgrass (*Agropyron cristatum*), have made up the majority of the herbaceous understory; native grass species are present, but provide little cover (Table 13A-11.7, Table 13A-11.10). In addition, native forb species are diverse, but do not provide significant amounts of cover and are not abundant (Table 13A-11.7, Table 13A-11.11). Twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) have increased over time and it is likely that density will continue to increase without a tree-removing disturbance (Table 13A-11.12, Table 13A-11.14). The state and transition model shows that the site resembles the Seeded Range State with remnants of the Mountain Big Sagebrush/Perennial Grass Phase within the Current Potential State (Jornada, 2019).

Trend Summary Tables

Table 13A-11.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	24.6	2.4	0.5	-	-	-
1999	19.6	0.9	2.1	-	-	0.1
2004	15.9	2.5	1.9	21.8	3.2	2.7
2009	16.3	1.8	1.0	25.5	1.9	1.7
2014	16.8	1.5	1.2	21.1	3.2	2.6
2019	15.3	3.3	2.2	22.0	2.0	4.5

Table 13A-11.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	51	319	45	198	1.6	9.4	0.1	4.5
1999	42	383	23	162	0.5	13.9	0.1	4.1
2004	39	319	71	107	0.3	13.0	0.5	2.9
2009	25	344	54	108	0.1	18.1	0.4	2.1
2014	25	378	43	190	0.1	17.7	0.2	4.6
2019	16	362	179	207	0.1	15.4	2.3	6.1

Table 13A-11.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	30.0	1.6	41.2	0.4	0.2	40.3
1999	29.6	3.3	40.0	0.1	0.2	40.6
2004	29.8	2.4	43.5	0.0	0.1	38.6
2009	23.3	2.6	54.4	0.0	0.1	38.7
2014	34.4	4.2	49.0	0.0	0.0	38.0
2019	34.3	3.9	52.1	0.1	0.0	38.3

Table 13A-11.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
1994	-	29	55	-	19
1999	5	20	52	1	5
2004	-	12	51	-	17
2009	6	6	30	-	13
2014	6	-	38	-	14
2019	4	10	40	-	9
Year	Days Use Per Acre (ha)				
1994	-	-	-	-	-
1999	16.7 (41.2)	46.2 (114.2)	164.9 (407.2)	0.6 (1.4)	-
2004	7.2 (17.9)	2.7 (6.6)	101.2 (249.9)	-	-
2009	26.8 (66.3)	1.3 (3.3)	76.4 (188.7)	-	-
2014	8.7 (21.5)	-	30.2 (74.5)	-	-
2019	5.8 (14.3)	-	46.2 (114.2)	-	-

Table 13A-11.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum[i] (crested wheatgrass)	Bouteloua gracilis (blue grama)	Bromus inermis[i] (smooth brome)	Bromus tectorum[ai] (cheatgrass)	Hesperostipa comata (needle and thread)	Sporobolus cryptandrus (sand dropseed)	Thinopyrum intermedium[i] (intermediate wheatgrass)	Vulpia octoflora[a] (sixweeks fescue)
year	Nested Frequency							
1994	262	8	14	49	7	11	81	2
1999	343	5	16	42	4	4	82	-
2004	298	4	17	39	4	-	37	-
2009	333	7	22	25	5	4	33	-
2014	330	17	36	21	12	-	64	4
2019	317	16	22	8	10	24	75	8
year	Average Cover (%)							
1994	7.1	0.3	0.4	1.6	0.0	0.1	1.6	0.0
1999	12.0	0.3	0.2	0.5	0.2	0.0	1.2	-
2004	11.2	0.2	0.3	0.3	0.2	-	1.1	-
2009	16.7	0.1	0.5	0.1	0.1	0.0	0.7	-
2014	13.9	0.5	1.2	0.1	0.4	-	1.7	0.0
2019	11.7	0.5	0.6	0.0	0.6	1.1	1.0	0.0

a - Annual; n - Noxious Weed; i - Introduced Species

Table 13A-11.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Alyssum[ai] (madwort)	Alyssum desertorum[ai] (desert madwort)	Arabis (rockcress)	Artemisia ludoviciana (white sagebrush)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus mollissimus (woolly locoweed)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata[ai] (curveseed butterwort)	Chenopodium album[a] (lambsquarters)	Descurainia pinnata[a] (western tansymustard)	Draba reptans[a] (Carolina draba)	Erigeron pumilus (shaggy fleabane)	Eriogonum cemuum[a] (nodding buckwheat)	Eriogonum racemosum (redroot buckwheat)	Erodium cicutarium[ai] (redstem stork's bill)	Fritillaria atropurpurea (spotted fritillary)	Gayophytum ramosissimum[a] (pinyon groundsmoke)
year	Nested Frequency																
1994	3	-	1	11	16	8	-	-	-	-	4	14	2	49	-	11	3
1999	-	-	-	4	13	6	2	-	-	-	1	18	-	41	-	-	-
2004	-	-	-	-	23	11	-	4	3	-	2	0	-	36	-	-	-
2009	-	-	3	-	26	1	-	14	3	-	-	1	-	29	-	-	-
2014	-	-	1	-	27	9	-	7	-	4	15	52	-	53	-	-	-
2019	3	15	7	-	10	37	-	54	15	24	64	3	9	42	2	-	4
year	Average Cover (%)																
1994	0.0	-	0.0	0.2	0.4	0.0	-	-	-	-	0.0	0.1	0.0	0.3	-	0.0	0.0
1999	-	-	-	0.0	0.1	0.0	0.0	-	-	-	0.0	0.2	-	0.7	-	-	-
2004	-	-	-	-	0.9	0.1	-	0.0	0.0	-	0.0	0.0	-	0.7	-	-	-
2009	-	-	0.0	-	0.3	0.0	-	0.1	0.1	-	-	0.0	-	0.3	-	-	-
2014	-	-	0.0	-	0.7	0.1	-	0.0	-	0.0	0.0	0.6	-	0.8	-	-	-
2019	0.1	0.0	0.0	-	0.1	0.2	-	0.4	0.0	0.3	0.2	0.0	0.0	1.4	0.0	-	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Heliomeris multiflora var. multiflora (showy goldeneye)	Heterotheca villosa (hairy false goldenaster)	Lappula occidentalis[a] (flatspine stickseed)	Lepidium ramosissimum[a] (manybranched pepperweed)	Lesquerella ludoviciana (foothill bladderpod)	Lithospermum ruderale (western stoneseed)	Machaeranthera canescens (hoary tansyaster)	Machaeranthera grindelioides (rayless tansyaster)	Medicago sativa[i] (alfalfa)	Microsteris gracilis[a] (slender phlox)	Mirabilis linearis (narrowleaf four o'clock)	Oenothera coronopifolia (crownleaf evening primrose)	Penstemon (beardtongue)	Petradoria pumila (rock goldenrod)	Phlox longifolia (longleaf phlox)	Polygonum douglasii[a] (Douglas' knotweed)	Pseudostellaria jamesiana (tuber starwort)
year	Nested Frequency																
1994	-	104	-	3	2	14	27	-	11	31	1	13	-	-	5	1	-
1999	-	80	-	-	3	-	17	-	5	18	-	-	-	-	6	8	-
2004	-	28	-	-	1	-	6	-	11	57	-	-	-	-	2	32	-
2009	-	30	-	-	-	-	4	-	9	38	-	-	-	-	8	6	3
2014	1	55	10	4	2	-	8	1	19	2	-	-	-	4	7	6	-
2019	-	99	53	-	-	-	43	1	12	36	-	1	1	-	14	29	-
year	Average Cover (%)																
1994	-	2.8	-	0.0	0.0	0.2	0.1	-	0.4	0.1	0.0	0.0	-	-	0.0	0.0	-
1999	-	2.4	-	-	0.0	-	0.3	-	0.2	0.0	-	-	-	-	0.0	0.0	-
2004	-	0.3	-	-	0.0	-	0.0	-	0.7	0.3	-	-	-	-	0.0	0.1	-
2009	-	0.9	-	-	-	-	0.1	-	0.2	0.1	-	-	-	-	0.0	0.0	0.0
2014	0.0	1.5	0.0	0.1	0.0	-	0.1	0.0	0.6	0.0	-	-	-	0.0	0.0	0.0	-
2019	-	3.5	0.7	-	-	-	0.2	0.0	0.5	0.2	-	0.0	0.0	-	0.0	0.1	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Sphaeralcea coccinea (scarlet globemallow)	Symphyotrichum (aster)	Tetraneuris acaulis (stemless four-nerve daisy)	Tragopogon dubius[ai] (yellow salsify)
year	Nested Frequency			
1994	14	-	-	4
1999	14	5	-	-
2004	5	-	-	-
2009	7	4	-	1
2014	11	9	0	0
2019	13	-	-	-
year	Average Cover (%)			
1994	0.1	-	-	0.0
1999	0.1	0.0	-	-
2004	0.2	-	-	-
2009	0.2	0.0	-	0.0
2014	0.1	0.1	0.0	0.0
2019	0.1	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 13A-11.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis[p] (Utah serviceberry)	Artemisia frigida[p] (prairie sagewort)	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Atriplex canescens[p] (fourwing saltbush)	Ericameria nauseosa (rubber rabbitbrush)	Eriogonum microthecum[p] (slender buckwheat)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma[t] (Utah juniper)	Opuntia (pricklypear)	Pinus edulis[t] (twoneedle pinyon)	Quercus gambelii[p] (Gambel oak)
year	Line Intercept Cover (%)										
1994	-	-	-	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-	-	-	-
2004	-	-	20.9	-	0.6	0.3	2.1	-	0.5	2.7	0.6
2009	0.3	-	24	0.3	0.6	0.3	1.2	0.1	0.1	1.6	0.6
2014	-	-	20	0.2	1.2	0.2	1.6	0.2	0.4	2.4	0.7
2019	-	-	20.8	0.2	0.4	0.3	1.4	-	0.2	4.5	0.7
year	Quadrat Cover (%)										
1994	0.2	0.0	23.4	-	0.5	0.2	1.8	-	0.1	0.5	0.8
1999	0.0	-	19.2	0.1	0.2	0.3	0.6	-	0.1	2.1	0.0
2004	-	-	14.5	0.1	0.2	0.4	2.1	-	0.2	1.9	0.8
2009	0.0	-	15.1	0.0	0.7	0.3	0.6	0.0	0.5	1.0	0.8
2014	-	0.3	14.9	0.0	0.5	0.6	0.9	0.0	0.1	1.2	1.0
2019	-	-	14.3	0.1	2.4	0.3	0.8	0.1	0.2	2.1	0.6

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 13A-11.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
1994	100	-	60	40	0	0	0	0	37/29
1999	60	-	100	0	0	0	0	0	81/73
2004	-	-	-	-	-	-	-	-	40/35
2009	20	-	0	100	0	100	0	0	73/66
2014	20	-	0	100	0	0	0	0	78/63
2019	-	-	-	-	-	-	-	-	87/74
Artemisia frigida[p] -- (prairie sagewort)									
1994	100	-	0	100	0	0	0	0	21/23
1999	100	-	0	100	0	0	0	0	25/17
2004	20	-	0	100	0	0	0	0	40/26
2009	20	-	0	100	0	0	0	0	32/34
2014	1000	20	28	72	0	82	0	0	17/16
2019	40	-	0	100	0	0	0	0	39/33
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1994	6140	2340	18	70	12	31	4	11	40/71
1999	8200	460	22	59	19	52	11	6	62/91
2004	5900	-	1	88	12	45	19	6	45/65
2009	6480	40	12	78	9	30	11	4	50/73
2014	7240	80	19	71	10	37	14	14	46/72
2019	5040	20	11	73	16	39	15	17	52/68

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Atriplex canescens[p] -- (fourwing saltbush)									
1994	60	-	33	67	0	67	0	0	41/49
1999	80	-	75	25	0	25	0	0	51/39
2004	40	-	0	100	0	0	100	0	50/40
2009	60	-	0	100	0	0	0	0	42/42
2014	60	-	0	100	0	0	100	0	55/64
2019	40	-	0	100	0	100	0	0	74/92
Cercocarpus montanus[p] -- (alderleaf mountain mahogany)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	73/63
2019	-	-	-	-	-	-	-	-	-/-
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	21/66
Ephedra nevadensis[p] -- (Nevada jointfir)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	220	-	82	18	0	0	0	0	23/19
2019	-	-	-	-	-	-	-	-	-/-
Eriogonum microthecum[p] -- (slender buckwheat)									
1994	620	60	23	77	0	13	0	0	28/19
1999	540	-	15	78	7	7	19	0	16/17
2004	380	-	0	95	5	11	37	5	25/22
2009	440	20	14	86	0	0	0	0	29/23
2014	680	20	38	62	0	18	15	0	21/21
2019	400	-	0	100	0	60	15	0	18/17
Ericameria nauseosa -- (rubber rabbitbrush)									
1994	240	20	25	67	8	0	0	17	73/65
1999	200	-	40	40	20	0	0	0	60/100
2004	100	-	0	80	20	0	0	0	50/52
2009	100	-	0	80	20	0	0	20	75/85
2014	220	-	36	36	27	0	9	9	51/55
2019	80	-	0	75	25	25	25	25	62/76
Gutierrezia sarothrae -- (broom snakeweed)									
1994	1820	400	8	91	1	0	0	1	24/29
1999	1200	-	13	87	0	50	0	0	18/20
2004	1540	-	0	100	0	0	0	0	24/29
2009	2220	-	4	95	2	0	0	2	18/24
2014	1260	-	10	91	0	0	0	0	24/38
2019	1860	20	1	99	0	0	0	0	22/25

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Juniperus osteosperma[t] -- (Utah juniper)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	20	-	100	0	0	0	0	0	- / -
2019	20	-	100	0	0	0	0	0	- / -
Krascheninnikovia lanata[p] -- (winterfat)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	20	-	0	100	0	0	100	0	35/10
2009	-	-	-	-	-	-	-	-	19/10
2014	-	-	-	-	-	-	-	-	-/-
2019	20	-	0	100	0	0	100	0	16/21
Opuntia -- (pricklypear)									
1994	280	-	0	100	0	0	0	0	11/24
1999	160	-	38	63	0	0	0	0	14/32
2004	460	-	0	100	0	0	0	0	13/37
2009	560	20	7	89	4	0	0	11	10/26
2014	380	-	26	74	0	0	5	0	11/25
2019	560	-	0	96	4	0	0	4	11/27
Pinus edulis[t] -- (twoneedle pinyon)									
1994	-	-	-	-	-	-	-	-	-/-
1999	80	20	75	25	0	0	0	0	- / -
2004	100	-	80	20	0	0	0	0	- / -
2009	80	20	75	25	0	0	0	0	- / -
2014	100	-	100	0	0	0	0	0	- / -
2019	180	80	56	44	0	0	0	0	- / -
Quercus gambelii[p] -- (Gambel oak)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	180	-	56	22	22	22	0	22	73/70
2009	100	-	20	80	0	0	0	0	- / -
2014	60	-	0	100	0	0	0	0	123/80
2019	120	-	0	100	0	0	0	0	87/55
Sclerocactus whipplei -- (Whipple's fishhook cactus)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	9/14
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	40	-	50	50	0	0	0	0	34/44
2009	-	-	-	-	-	-	-	-	-/-
2014	20	-	0	100	0	0	0	0	84/82
2019	20	-	100	0	0	0	0	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

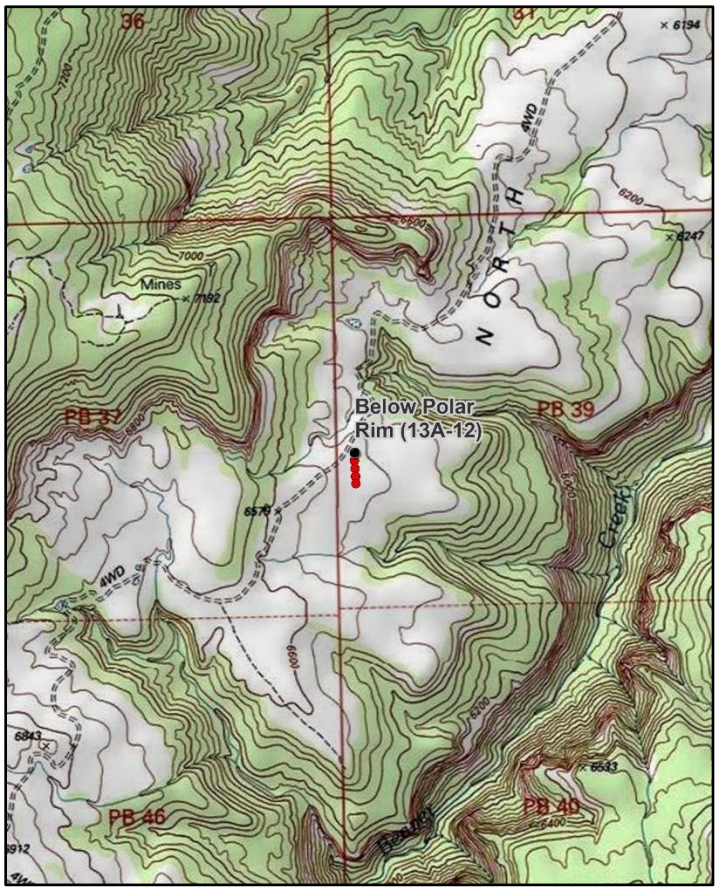
Table 13A-11.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

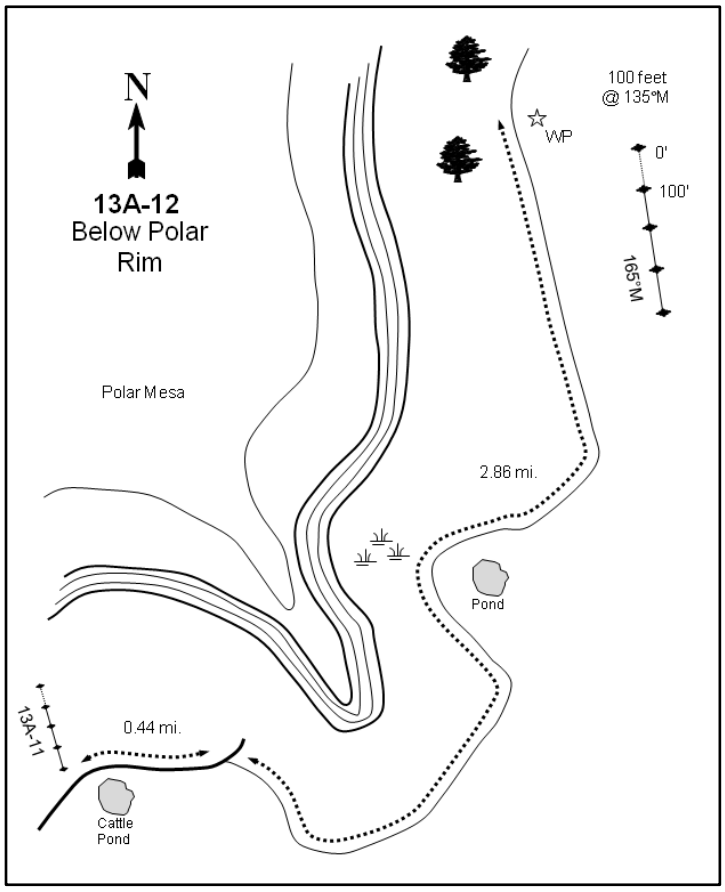
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma & J. scopulorum (Utah and Rocky Mountain juniper)							
2014	25	-	42	42	-	17	11.8
Juniperus osteosperma (Utah juniper)							
1994	7	-	-	-	-	-	15.7
1999	10	-	-	-	-	-	17.2
2004	15	14	29	29	29	-	7.9
2009	11	-	38	38	-	25	10.9
2019	26	-	27	45	9	18	13.7
Juniperus scopulorum (Rocky Mountain juniper)							
1994	3	-	-	-	-	-	11.0
Pinus edulis (twoneedle pinyon)							
1994	11	-	-	-	-	-	5.5
1999	38	-	-	-	-	-	3.2
2004	50	-	72	22	6	-	5.3
2009	72	5	60	15	5	15	5.2
2014	66	-	53	42	5	-	4.4
2019	121	-	60	30	5	5	5.4

Table 13A-11.15 - Deer Desirable Components Index: Mid Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1994	30.0	11.2	8.9	18.9	-1.2	9.0	0.0	76.8	Good
1999	24.5	9.5	11.4	27.9	-0.4	8.3	0.0	81.2	Good-Excellent
2004	27.1	11.4	1.1	25.9	-0.2	5.7	0.0	71.0	Good
2009	30.0	12.4	6.1	30.0	-0.1	4.3	0.0	82.6	Excellent
2014	26.2	12.1	9.2	30.0	-0.1	9.1	0.0	86.6	Excellent
2019	27.3	10.5	5.2	30.0	0.0	10.0	0.0	83.0	Excellent

BELOW POLAR RIM - STUDY NO. 13A-12





Location Information

USGS 7.5 min Map Info	Dolores Point North ; Township 25S, Range 26E, Section 39
GPS (0' Stake)	NAD 83 UTM ZONE 12, 664940 East 4280500 North

Transect Information

Browse Tag # (0' Stake)	7855
Transect Bearing	165° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

From the intersection of the La Sal Mountain Loop and Gateway roads, travel east towards Gateway, Colorado for 7.7 miles to the North Beaver Mesa turnoff. Turn left and travel 4.2 miles to the Polar Mesa/Fisher Valley road. Continue straight through this fork, over a cattle guard, and 0.85 miles to a stock pond and study #13A-11 (North Beaver Mesa). Drive for 0.45 miles to a fork by another stock pond. Proceed to the right at the fork, then continue 0.35 miles to an intersection. Turn left at the intersection and proceed 0.6 miles to a boundary fence. Continue on the road for 1.05 miles, winding through the large chaining, to a stock pond. Cross the pond and proceed for 0.45 miles to a fork. Keep left on the main road and continue 0.55 miles to a fencepost on the right (east) side of the road. The 0-foot baseline stake, tagged #7855, is 100 feet away at 85 degrees magnetic.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	TAYLOR
Elevation	6,500ft (1,981m)
Aspect	Southeast
Slope	5%
Sample Dates	07/07/1994, 07/20/1999, 07/08/2004, 07/09/2009, 07/08/2014, 06/26/2019

Table 13A-12.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Hand Crew - Lop and Scatter	Moab Mule Deer Winter Range Habitat Improvement-Phase 3	4514	November 2018	1470
Chaining - Two-Way Chain Unknown	-	-	1969	1540
Seeding - Seed Unknown	-	-	1969	1540

Wildlife Habitat and Vegetation History

Table 13A-12.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter

Table 13A-12.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1987	Mountain Big Sagebrush	Phase I
1994	Mountain Big Sagebrush	Phase I
1999	Mountain Big Sagebrush	Phase I
2004	Mountain Big Sagebrush	Phase I
2009	Mountain Big Sagebrush	Phase I
2014	Mountain Big Sagebrush	Phase I
2019	Mountain Big Sagebrush	Phase I

Site Notes

No Notes

Soils

Table 13A-12.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	6.7	58.9	19.8	21.3	1.6	6.5	60.8	0.3	07/20/1999

Site Potential

1981 - 2010 Average Annual Precipitation	17 inches
NRCS Ecological Site	Upland Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R035XY308UT
States and Transitions	A defined state and transition model is available.

Since the site was first placed in 1987, the plant community has been a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) type. Native grass and forb species have been a major component of the herbaceous understory; blue grama (*Bouteloua gracilis*) is the dominant grass with Sandberg bluegrass (*Poa secunda*) as a subdominant species (Table 13A-12.7, Table 13A-12.10). Introduced perennial grass species have been a minor understory component (Table 13A-12.10). Forbs do not provide significant amounts of cover and are a mix of introduced and native species (Table 13A-12.11). Twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) have increased over the sample years and have the potential to become a major component of the site without a tree-removing disturbance (Table 13A-12.12, Table 13A-12.14). According to the state and transition model, the site currently fits into the Mountain Big Sagebrush/Warm Season Perennial Grass State: the lop and scatter treatment moved the site from the Mountain Big Sagebrush/P-J Encroachment State into the current state (Jornada, 2019).

Trend Summary Tables

Table 13A-12.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	11.0	0.5	1.3	-	-	-
1999	12.1	0.1	5.0	-	-	0.3
2004	13.3	0.7	3.9	18.9	0.7	5.5
2009	13.4	0.4	3.2	21.3	0.2	5.0
2014	15.3	0.5	4.1	20.4	0.3	7.0
2019	17.5	0.9	0.0	20.6	0.5	-

Table 13A-12.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	207	415	243	230	0.8	15.1	0.8	2.1
1999	126	370	84	182	1.8	16.7	0.5	3.1
2004	31	314	151	111	0.1	9.8	0.6	1.2
2009	29	361	-	107	0.5	16.4	-	0.5
2014	51	379	252	164	0.2	19.5	1.2	1.0
2019	206	348	351	217	2.0	19.0	5.0	2.4

Table 13A-12.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	37.9	1.8	30.7	-	0.0	33.8
1999	38.6	5.0	31.0	0.0	-	36.1
2004	44.6	4.7	34.3	0.0	-	29.6
2009	41.8	4.1	32.1	-	-	34.9
2014	47.4	8.4	24.9	-	0.0	40.5
2019	37.5	9.8	40.5	0.0	-	39.8

Table 13A-12.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
1994	-	8	39	-	30
1999	6	18	37	2	22
2004	7	8	18	-	30
2009	5	5	28	-	25
2014	3	7	23	-	55
2019	1	8	21	-	19
Year	Days Use Per Acre (ha)				
1994	-	-	-	-	-
1999	45.0 (111.2)	12.8 (31.5)	93.2 (230.1)	-	-
2004	29.8 (73.5)	18.7 (46.3)	33.5 (82.8)	0.6 (1.4)	-
2009	17.4 (43.0)	9.4 (23.2)	17.4 (43.0)	-	-
2014	6.5 (16.1)	-	18.7 (46.3)	-	-
2019	6.5 (16.1)	14.1 (34.8)	14.1 (34.8)	-	-

Table 13A-12.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum[i] (crested wheatgrass)	Bouteloua gracilis (blue grama)	Bromus tectorum[ai] (cheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Pleuraphis jamesii (James' galleta)	Poa secunda (Sandberg bluegrass)	Sporobolus cryptandrus (sand dropseed)	Vulpia octoflora[a] (sixweeks fescue)
year	Nested Frequency								
1994	164	250	57	19	224	23	126	7	187
1999	140	232	42	17	108	14	103	5	96
2004	62	225	23	-	40	0	136	4	9
2009	81	246	26	4	43	2	243	5	3
2014	96	281	14	19	59	-	192	-	42
2019	60	286	31	23	29	4	139	4	201
year	Average Cover (%)								
1994	3.2	7.1	0.3	0.1	3.4	0.1	1.0	0.2	0.4
1999	3.1	9.9	0.5	0.1	1.0	0.1	2.3	0.2	1.3
2004	0.7	6.7	0.1	-	0.7	0.0	1.7	0.0	0.0
2009	2.5	8.3	0.3	0.0	0.5	0.0	5.0	0.1	0.1
2014	2.6	13.2	0.1	0.3	1.6	-	1.8	-	0.2
2019	1.7	14.0	0.4	0.3	1.0	0.1	2.0	0.0	1.6

a - Annual; n - Noxious Weed; i - Introduced Species

Table 13A-12.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Astragalus cicer[i] (chickpea milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus mollissimus (woolly locoweed)	Calochortus nuttallii (sego lily)	Castilleja (Indian paintbrush)	Ceratocephala testiculata[ai] (curveseed butterwort)	Cymopterus (springparsley)	Descurainia pinnata[a] (western tansymustard)	Draba reptans[a] (Carolina draba)	Erigeron pumilus (shaggy fleabane)	Gilia inconspicua[a] (shy gilia)	Lappula occidentalis[a] (flatspine stickseed)	Lomatium (desertparsley)	Machaeranthera grindelioides (rayless tansyaster)	Medicago sativa[i] (alfalfa)	Microsteris gracilis[a] (slender phlox)	Oenothera (evening primrose)
year	Nested Frequency																
1994	55	6	-	4	26	-	-	-	149	45	91	-	-	-	4	52	-
1999	45	2	-	-	-	-	-	-	-	61	-	-	-	-	2	5	-
2004	19	4	-	3	-	-	-	-	1	-	19	5	-	-	-	19	-
2009	16	7	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-
2014	-	0	30	15	-	2	-	-	75	16	1	6	16	12	-	3	-
2019	-	2	75	74	7	10	3	4	196	24	101	26	5	6	-	59	15
year	Average Cover (%)																
1994	0.2	0.0	-	0.0	0.1	-	-	-	0.3	0.2	0.2	-	-	-	0.2	0.1	-
1999	0.2	0.0	-	-	-	-	-	-	-	0.9	-	-	-	-	0.2	0.0	-
2004	0.2	0.0	-	0.0	-	-	-	-	0.0	-	0.0	0.0	-	-	-	0.0	-
2009	0.0	0.0	-	-	-	-	-	-	-	0.0	-	-	-	-	-	-	-
2014	-	0.0	0.2	0.0	-	0.0	-	-	0.2	0.1	0.0	0.0	0.1	0.0	-	0.0	-
2019	-	0.0	0.4	0.4	0.0	0.0	0.0	0.0	1.0	0.1	1.1	0.1	0.0	0.0	-	0.3	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Phlox longifolia (longleaf phlox)	Plantago patagonica[a] (woolly plantain)	Sphaeralcea coccinea (scarlet globemallow)	Tragopogon dubius[ai] (yellow salsify)	Trifolium (clover)
year	Nested Frequency				
1994	73	104	137	10	-
1999	24	82	116	-	-
2004	19	136	79	10	-
2009	27	-	63	-	-
2014	62	228	61	8	-
2019	89	259	29	20	2
year	Average Cover (%)				
1994	0.2	0.2	1.1	0.0	-
1999	0.1	0.5	1.6	-	-
2004	0.1	0.4	0.9	0.1	-
2009	0.1	-	0.3	-	-
2014	0.2	0.9	0.4	0.0	-
2019	0.9	2.0	0.5	0.5	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 13A-12.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Atriplex canescens[p] (fourwing saltbush)	Eriogonum microthecum[p] (slender buckwheat)	Gutierrezia sarothrae (broom snakeweed)	Opuntia (pricklypear)	Pediocactus simpsonii (mountain ball cactus)	Pinus edulis[t] (twoneedle pinyon)	Sclerocactus whipplei (Whipple's fishhook cactus)
year	Line Intercept Cover (%)							
1994	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-
2004	18.6	-	0.3	0.4	0.3	-	5.5	-
2009	21.2	-	0.1	-	0.2	0	5	0
2014	20.3	-	0.1	-	0.3	-	7	-
2019	20.3	-	0.3	0.2	0.3	-	-	-
year	Quadrat Cover (%)							
1994	9.9	1.0	0.1	0.1	0.3	-	1.3	0.0
1999	12.0	0.0	0.0	0.0	0.1	-	5.0	0.0
2004	13.2	-	0.0	0.4	0.3	0.1	3.9	-
2009	13.3	0.1	0.0	-	0.4	0.0	3.2	0.0
2014	15.3	-	0.0	0.0	0.5	0.0	4.1	0.0
2019	17.5	-	0.0	0.0	0.8	0.0	0.0	0.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 13A-12.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1994	13800	-	2	95	4	2	0	10	38/55
1999	10900	380	40	51	9	47	14	1	46/79
2004	6580	160	0	88	12	58	10	4	45/69
2009	7640	40	7	81	12	67	16	3	42/70
2014	7160	60	7	88	5	49	21	15	47/77
2019	5680	-	3	80	17	49	8	15	48/73
Atriplex canescens[p] -- (fourwing saltbush)									
1994	40	20	0	100	0	100	0	0	46/53
1999	80	-	0	100	0	0	0	0	50/41
2004	20	-	0	100	0	0	100	0	45/35
2009	20	-	0	100	0	100	0	0	29/41
2014	20	-	0	100	0	0	0	0	59/47
2019	20	-	0	100	0	100	0	0	43/41
Eriogonum microthecum[p] -- (slender buckwheat)									
1994	400	-	0	100	0	0	0	0	18/22
1999	120	-	50	50	0	0	0	0	28/20
2004	200	-	0	100	0	10	70	0	22/18
2009	220	-	0	91	9	0	0	0	15/14
2014	380	-	16	84	0	11	0	0	26/21
2019	320	-	31	69	0	81	6	0	21/27
Gutierrezia sarothrae -- (broom snakeweed)									
1994	100	-	0	80	20	0	0	0	19/25
1999	140	-	43	57	0	0	0	0	23/34
2004	340	-	6	94	0	0	0	0	20/25
2009	40	-	0	0	100	0	0	100	15/24
2014	100	40	0	100	0	0	0	0	19/26
2019	180	20	0	100	0	0	0	0	21/26
Opuntia -- (pricklypear)									
1994	620	20	0	97	3	10	0	7	8/20
1999	560	20	32	57	11	0	0	11	10/21
2004	600	-	10	87	3	0	0	3	12/30
2009	960	-	4	92	4	0	0	8	9/32
2014	740	-	11	89	0	0	0	16	10/31
2019	800	20	13	88	0	0	0	0	10/24
Pediocactus simpsonii -- (mountain ball cactus)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	200	-	10	90	0	0	0	0	3/7
2009	40	40	0	100	0	0	0	0	2/6
2014	60	-	33	67	0	0	0	0	3/7
2019	180	-	44	56	0	0	0	0	4/5
Pinus edulis[t] -- (twoneedle pinyon)									
1994	-	-	-	-	-	-	-	-	-/-
1999	100	-	20	80	0	0	0	0	- / -
2004	120	-	33	67	0	0	0	17	- / -
2009	60	20	0	100	0	0	0	0	- / -
2014	60	20	67	33	0	0	0	0	31/22
2019	-	20	0	0	0	0	0	0	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Sclerocactus whipplei -- (Whipple's fishhook cactus)									
1994	-	-	-	-	-	-	-	-	3/8
1999	200	40	70	30	0	0	0	0	3/6
2004	-	-	-	-	-	-	-	-	-/-
2009	60	-	0	100	0	0	0	0	5/7
2014	120	-	17	83	0	0	0	0	5/7
2019	40	-	0	100	0	0	0	0	4/5

t - Tree Species; p - Preferred Browse; i - Introduced Species

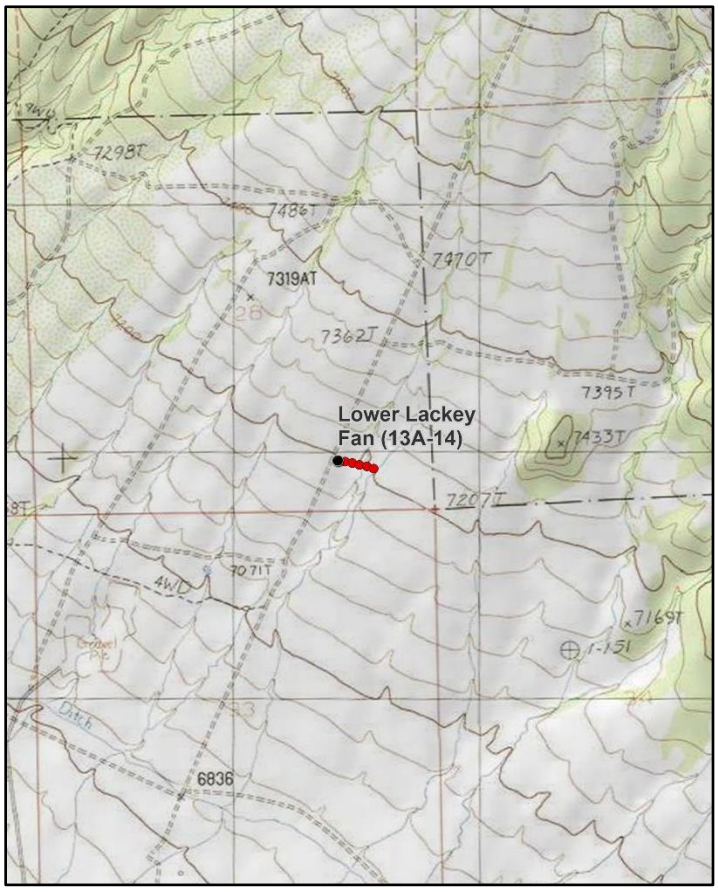
Table 13A-12.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

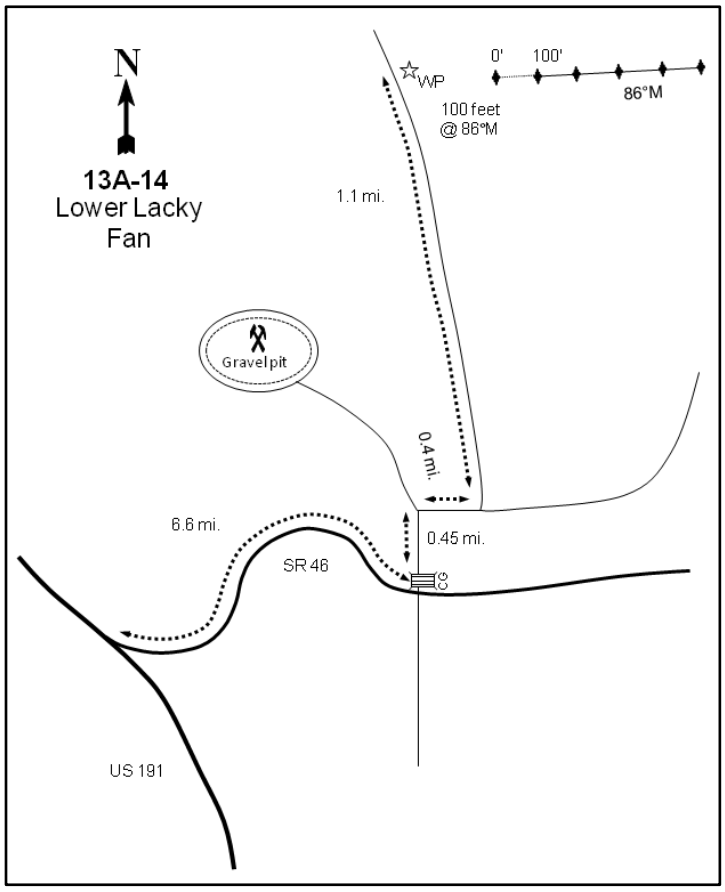
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1999	144	-	-	-	-	-	1.0
2014	96	-	100	-	-	-	3.0
2019	116	100	-	-	-	-	4.0
Pinus edulis (twoneedle pinyon)							
1994	62	-	-	-	-	-	6.4
1999	73	-	-	-	-	-	8.2
2004	50	-	21	71	7	-	10.9
2009	43	13	50	19	19	-	5.8
2014	40	-	65	35	-	-	6.4
2019	6	25	75	-	-	-	1.8

Table 13A-12.15 - Deer Desirable Components Index: Mid Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1994	13.8	14.1	0.7	30.0	-0.6	4.2	0.0	62.2	Fair
1999	15.1	12.3	15.0	30.0	-1.4	6.2	0.0	77.1	Good
2004	23.6	11.4	0.1	19.6	-0.1	2.4	0.0	57.1	Fair
2009	26.6	11.5	3.5	30.0	-0.4	0.9	0.0	72.2	Good
2014	25.5	13.6	3.7	30.0	-0.2	2.0	0.0	74.6	Good
2019	25.8	9.9	1.6	30.0	-1.5	4.8	0.0	70.6	Good

LOWER LACKEY FAN - STUDY NO. 13A-14





Location Information	
USGS 7.5 min Map Info	La Sal West NE; Township 28S, Range 24E, Section 28
GPS (0' Stake)	NAD 83 UTM ZONE 12, 650375 East 4244165 North

Transect Information	
Browse Tag # (0' Stake)	100
Transect Bearing	86° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Belts 3, 5: No Rebar

Directions to Site

From La Sal Junction, travel east on Highway 46 to mile marker 6. Continue 0.60 miles past mile marker 6 and turn left (north) onto a dirt road. Drive 0.45 miles to where the road forks and proceed to the right, then continue for 0.4 miles to another fork. Proceed to the left at the fork and go 1.1 miles to a witness post on the right (east) side of the road. The 0-foot stake is found 100 feet away from the witness post at a bearing of 86 degrees magnetic and is marked by browse tag #100.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	HATCH POINT
Elevation	7,200ft (2,195m)
Aspect	South
Slope	2-4%
Sample Dates	07/11/1994, 07/14/1999, 07/19/2004, 07/15/2009, 07/10/2014, 06/24/2019

Table 13A-14.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Herbicide - Herbicide Unknown	-	-	Historic	-
Seeding - Seed Unknown	-	-	Historic	-

Wildlife Habitat and Vegetation History

Table 13A-14.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter
Gunnison Sage-Grouse	Vacant	

Table 13A-14.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1994	Mountain Big Sagebrush	Phase I
1999	Mountain Big Sagebrush	Phase I
2004	Mountain Big Sagebrush	Phase I
2009	Mountain Big Sagebrush	Phase I
2014	Mountain Big Sagebrush	Phase I
2019	Mountain Big Sagebrush	Phase I

Site Notes

It was noted in 2014 that belt 5 is entirely in an active gully.

Soils

Table 13A-14.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	7.2	52.9	25.8	21.3	2.1	8.1	76.8	0.5	07/14/1999

Site Potential

1981 - 2010 Average Annual Precipitation	15 inches
NRCS Ecological Site	Upland Stony Loam (Wyoming Big Sagebrush)
NRCS Ecological Site #	R035XY318UT
States and Transitions	No state and transition model is available for this ecological site.

Since establishment of the study, the plant community on this site has been a stand of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) with other shrub species present in small amounts. Sagebrush cover has shown an increasing trend through the sample years (Table 13A-14.12). Gambel oak (*Quercus gambelii*) is present in small amounts with slight fluctations in cover being noted (Table 13A-14.12). Introduced perennial grass species have made up the majority of the herbaceous understory in all samplings (Table 13A-14.10). Annual and perennial forbs are moderately diverse, but do not provide a significant amount of cover (Table 13A-14.11). Twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) are sparsely scattered across the site but have displayed a generally increasing trend (Table 13A-14.14). Without a tree-removing disturbance, it is likely that pinyon and juniper will continue to increase.

Trend Summary Tables

Table 13A-14.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	12.1	2.4	-	-	-	-
1999	10.1	9.3	3.7	0.3	-	0.4
2004	10.2	3.8	6.0	14.5	5.2	6.4
2009	9.4	4.3	2.1	19.3	4.3	5.6
2014	13.3	2.8	3.3	17.8	2.8	7.1
2019	17.9	3.7	3.3	24.8	2.9	5.2

Table 13A-14.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	175	225	250	94	3.2	7.5	1.4	0.8
1999	206	309	8	8	3.5	10.1	0.0	0.1
2004	80	285	4	25	1.2	16.1	0.2	0.7
2009	77	302	96	32	0.4	12.5	0.4	0.2
2014	16	296	7	20	0.1	14.2	0.0	0.3
2019	127	221	180	66	2.6	5.5	1.9	1.0

Table 13A-14.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	28.5	0.1	31.0	1.1	12.8	27.5
1999	23.7	1.4	36.5	3.1	15.8	33.9
2004	29.8	0.4	29.9	4.6	16.1	36.2
2009	26.6	0.2	35.5	1.6	12.7	30.5
2014	36.2	0.4	38.3	3.7	15.4	32.6
2019	38.1	0.3	39.2	4.9	13.7	35.0

Table 13A-14.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1994	-	1	30	17
1999	8	16	21	21
2004	1	8	26	7
2009	2	29	3	19
2014	2	18	6	30
2019	2	32	9	12
Year	Days Use Per Acre (ha)			
1994	-	-	-	-
1999	11.6 (28.7)	20.1 (49.7)	46.9 (115.9)	-
2004	6.5 (16.1)	7.4 (18.2)	52.3 (129.1)	-
2009	14.5 (35.9)	36.2 (89.4)	14.1 (34.8)	-
2014	5.8 (14.3)	43.6 (107.6)	15.4 (38.1)	-
2019	4.4 (10.8)	58.3 (144.0)	17.4 (43.0)	-

Table 13A-14.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum[i] (crested wheatgrass)	Bromus tectorum[ai] (cheatgrass)	Hesperostipa comata (needle and thread)	Koeleria macrantha (prairie Junegrass)	Poa bulbosa[i] (bulbous bluegrass)	Vulpia octoflora[a] (sixweeks fescue)
year	Nested Frequency					
1994	225	175	-	-	-	-
1999	309	206	-	-	-	8
2004	285	80	-	-	-	5
2009	302	77	-	-	-	-
2014	296	16	-	3	-	-
2019	217	119	1	11	2	17
year	Average Cover (%)					
1994	7.5	3.2	-	-	-	-
1999	10.1	3.5	-	-	-	0.0
2004	16.1	1.2	-	-	-	0.0
2009	12.5	0.4	-	-	-	-
2014	14.0	0.1	-	0.1	-	-
2019	5.3	2.3	0.0	0.0	0.1	0.3

a - Annual; n - Noxious Weed; i - Introduced Species

Table 13A-14.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Astragalus convallarius (lesser rushy milkvetch)	Astragalus mollissimus (woolly locoweed)	Ceratocephala testiculata[ai] (curveseed butterwort)	Chenopodium[a] (goosefoot)	Collinsia parviflora[a] (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)	Cryptantha (cryptantha)	Cryptantha nevadensis[a] (Nevada cryptantha)	Dalea searlsiae (Searls' prairie clover)	Descurainia pinnata[a] (western tansymustard)	Draba nemorosa[a] (woodland draba)	Erigeron pumilus (shaggy fleabane)	Gayophytum ramosissimum[a] (pinyon groundsmoke)	Gilia inconspicua[a] (shy gilia)	Heterotheca villosa (hairy false goldenaster)	Ipomopsis aggregata (scarlet gilia)	Lappula occidentalis[a] (flatspine stickseed)
year	Nested Frequency																
1994	24	-	158	11	26	24	20	39	2	14	42	-	22	18	-	2	-
1999	3	-	-	-	4	-	-	-	-	-	-	0	-	-	4	1	-
2004	19	-	-	-	-	-	-	-	-	4	-	-	-	-	-	1	-
2009	3	4	45	-	3	-	6	-	-	-	-	-	-	-	7	-	-
2014	3	5	-	-	-	-	-	-	-	-	7	0	-	-	2	-	-
2019	20	4	24	1	6	-	-	8	-	17	109	9	4	37	18	1	3
year	Average Cover (%)																
1994	0.1	-	0.7	0.0	0.1	0.1	0.0	0.1	0.0	0.0	0.1	-	0.0	0.0	-	0.0	-
1999	0.0	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	0.0	0.0	-
2004	0.6	-	-	-	-	-	-	-	-	0.2	-	-	-	-	-	0.0	-
2009	0.0	0.0	0.1	-	0.0	-	0.0	-	-	-	-	-	-	-	0.1	-	-
2014	0.0	0.0	-	-	-	-	-	-	-	-	0.0	0.0	-	-	0.1	-	-
2019	0.3	0.0	0.1	0.0	0.0	-	-	0.0	-	0.1	0.6	0.2	0.0	0.4	0.1	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Lomatium (desertparsley)	Machaeranthera (tansyaster)	Microsteris gracilis[a] (slender phlox)	Mirabilis linearis (narrowleaf four o'clock)	Packera multilobata (lobeleaf groundsel)	Phlox longifolia (longleaf phlox)	Polygonum douglasii[a] (Douglas' knotweed)	Salsola tragus[ai] (prickly Russian thistle)	Schoenocrambe linifolia (flaxleaf plainsmustard)	Sisymbrium altissimum[ai] (tall tumblemustard)	Sphaeralcea coccinea (scarlet globemallow)	Tetraneuris acaulis (stemless four-nerve daisy)	Tragopogon dubius[ai] (yellow salsify)	Trifolium (clover)
year	Nested Frequency													
1994	-	1	60	2	-	3	-	3	27	0	5	-	5	3
1999	-	-	6	-	-	-	-	-	-	-	-	-	-	-
2004	-	-	-	-	-	5	-	-	-	-	-	-	-	2
2009	-	-	80	-	-	4	-	-	-	-	3	-	-	5
2014	-	-	-	-	-	3	-	-	3	-	-	1	-	3
2019	0	1	58	-	3	3	5	-	3	-	3	1	-	8
year	Average Cover (%)													
1994	-	0.0	0.3	0.0	-	0.0	-	0.0	0.1	0.0	0.4	-	0.0	0.0
1999	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-
2004	-	-	-	-	-	0.0	-	-	-	-	-	-	-	0.0
2009	-	-	0.3	-	-	0.0	-	-	-	-	0.0	-	-	0.0
2014	-	-	-	-	-	0.0	-	-	0.0	-	-	0.1	-	0.0
2019	0.0	0.0	0.6	-	0.0	0.0	0.0	-	0.0	-	0.0	0.1	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 13A-14.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Chrysothamnus depressus[p] (longflower rabbitbrush)	Eriogonum microthecum[p] (slender buckwheat)	Escobaria vivipara var. arizonica (Arizona spinystar)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma[t] (Utah juniper)	Pediocactus simpsonii (mountain ball cactus)	Pinus edulis[t] (twoneedle pinyon)	Purshia tridentata[p] (antelope bitterbrush)	Quercus gambelii[p] (Gambel oak)	Yucca (yucca)
year	Line Intercept Cover (%)										
1994	-	-	-	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-	-	-	-
2004	10.7	0	-	-	2.5	0.1	-	6.3	0.2	3.6	2.7
2009	11.2	-	-	-	1.7	0.2	-	5.4	0.1	8	2.6
2014	14.7	-	-	-	0.3	0.5	-	6.6	-	3.1	2.5
2019	20.5	-	0.1	-	0.7	0.8	-	4.4	-	4.2	2.2
year	Quadrat Cover (%)										
1994	12.0	-	-	-	0.8	-	-	-	0.1	-	1.6
1999	9.8	-	-	-	8.0	-	-	3.7	0.1	0.1	1.3
2004	9.6	0.0	-	-	2.0	0.0	-	6.0	0.1	0.4	1.8
2009	9.3	0.0	0.0	-	2.4	0.1	0.0	2.0	0.0	0.0	2.0
2014	12.8	-	0.0	0.0	0.3	0.3	-	3.0	-	0.4	2.5
2019	17.5	-	0.0	-	1.3	1.0	-	2.2	0.0	0.4	2.4

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 13A-14.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1994	4920	4240	36	44	21	9	2	16	65/91
1999	3880	560	19	52	29	52	13	7	52/71
2004	3860	-	6	79	14	54	30	11	46/73
2009	4020	20	4	54	42	24	45	30	46/65
2014	3740	-	3	85	12	26	44	13	46/73
2019	3600	20	6	78	16	34	37	18	56/79
Atriplex canescens[p] -- (fourwing saltbush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	140/97
2019	-	-	-	-	-	-	-	-	-/-
Chrysothamnus depressus[p] -- (longflower rabbitbrush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	20	-	0	100	0	0	0	0	7/14
2004	240	-	17	83	0	50	0	0	16/25
2009	60	-	67	33	0	0	0	33	- / -
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Ephedra viridis[p] -- (mormon tea)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	109/161
2009	-	-	-	-	-	-	-	-	65/56
2014	-	-	-	-	-	-	-	-	124/181
2019	100	640	100	0	0	0	0	0	119/132
Eriogonum microthecum[p] -- (slender buckwheat)									
1994	40	-	0	100	0	0	0	0	23/29
1999	-	-	-	-	-	-	-	-	-/-
2004	20	-	0	100	0	0	0	0	26/34
2009	100	-	0	100	0	0	0	0	15/12
2014	120	40	33	67	0	17	0	0	17/18
2019	100	20	0	100	0	0	0	0	13/13
Gutierrezia sarothrae -- (broom snakeweed)									
1994	1800	1720	29	68	3	0	0	1	24/25
1999	20060	880	28	70	2	1	0	1	25/24
2004	15100	200	16	83	2	0	0	1	19/17
2009	6800	-	4	90	6	0	0	4	21/20
2014	1080	440	15	82	4	0	0	4	18/17
2019	2060	28100	39	61	0	0	0	0	23/23
Juniperus osteosperma[t] -- (Utah juniper)									
1994	-	-	-	-	-	-	-	-	-/-
1999	20	-	100	0	0	0	0	0	- / -
2004	20	-	0	100	0	0	0	0	- / -
2009	20	-	0	100	0	0	0	0	- / -
2014	60	-	67	33	0	0	0	0	- / -
2019	60	-	67	33	0	0	0	0	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Linanthus pungens -- (granite prickly phlox)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	22/18
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Opuntia -- (pricklypear)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	15/34
2009	-	-	-	-	-	-	-	-	-/-
2014	20	-	0	100	0	0	0	0	- / -
2019	-	-	-	-	-	-	-	-	14/64
Pediocactus simpsonii -- (mountain ball cactus)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	20	-	0	100	0	0	0	0	3/8
2009	40	-	50	50	0	0	0	0	6/14
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Pinus edulis[t] -- (twoneedle pinyon)									
1994	-	-	-	-	-	-	-	-	-/-
1999	20	-	0	100	0	0	0	0	- / -
2004	20	-	0	100	0	0	0	0	- / -
2009	40	20	50	50	0	0	0	0	- / -
2014	60	-	100	0	0	0	0	0	- / -
2019	40	20	100	0	0	0	0	0	- / -
Purshia tridentata[p] -- (antelope bitterbrush)									
1994	20	-	0	100	0	0	0	0	29/60
1999	80	-	0	100	0	0	75	0	39/78
2004	80	-	50	50	0	50	50	0	67/156
2009	80	-	25	50	25	0	100	25	53/78
2014	60	-	100	0	0	33	0	0	58/114
2019	60	140	0	100	0	67	0	0	37/87
Quercus gambelii[p] -- (Gambel oak)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	120	-	83	17	0	0	0	0	26/32
2019	40	-	0	100	0	50	0	0	19/31
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	43/47
2019	-	-	-	-	-	-	-	-	-/-

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Yucca -- (yucca)									
1994	360	-	0	100	0	0	0	0	56/93
1999	440	-	9	91	0	0	0	0	50/80
2004	600	-	30	67	3	0	0	3	52/74
2009	500	-	0	92	8	0	8	20	55/68
2014	520	-	0	100	0	0	0	0	54/73
2019	340	-	0	100	0	0	0	0	55/77

t - Tree Species; p - Preferred Browse; i - Introduced Species

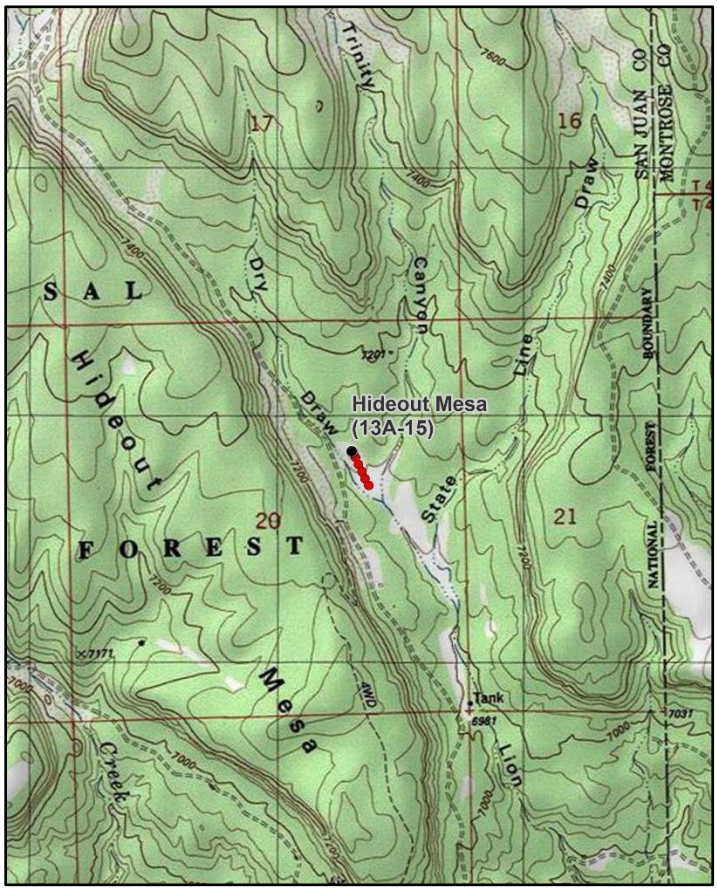
Table 13A-14.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

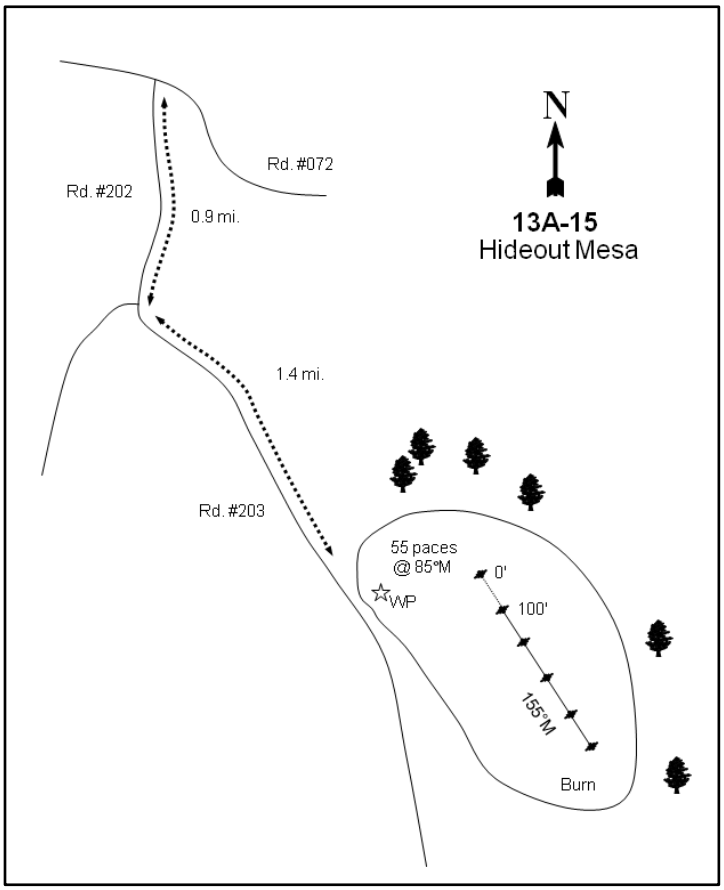
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1994	5	-	-	-	-	-	15.7
1999	5	-	-	-	-	-	8.5
2014	5	-	33	33	33	-	19.0
2019	11	43	43	-	14	-	6.2
Pinus edulis (twoneedle pinyon)							
1994	17	-	-	-	-	-	6.8
1999	4	-	-	-	-	-	1.0
2014	10	-	60	-	40	-	7.0
2019	22	-	67	11	-	22	7.3
Quercus gambelii (Gambel oak)							
1994	11	-	-	-	-	-	6.5

Table 13A-14.15 - Deer Desirable Components Index: Mid Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1994	15.2	8.9	15.0	15.1	-2.4	1.5	0.0	53.3	Fair
1999	12.6	6.2	9.0	20.2	-2.6	0.1	0.0	45.5	Poor
2004	17.3	8.1	2.6	30.0	-0.9	1.3	0.0	58.4	Fair
2009	22.2	1.5	1.2	25.0	-0.3	0.4	0.0	49.9	Poor-Fair
2014	21.5	12.1	8.6	28.4	-0.1	0.5	0.0	71.0	Good
2019	30.0	11.0	2.3	10.6	-2.0	1.9	0.0	53.9	Fair

HIDEOUT MESA - STUDY NO. 13A-15





Location Information

USGS 7.5 min Map Info	Ray Mesa NW; Township 28S, Range 26E, Section 20
GPS (0' Stake)	NAD 83 UTM ZONE 12, 668249 East 4247055 North

Transect Information

Browse Tag # (0' Stake)	25
Transect Bearing	145° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Standard

Directions to Site

From La Sal Junction, travel east on Highway 46 to mile marker 16. From mile marker 16, proceed east for 0.10 miles, then turn left (north). Continue for 1.2 miles to Forest Service Road #072 and turn right (fork heads toward Buckeye Reservoir). Continue 5.2 miles to a cattle guard. Drive for 1.9 miles and turn right (south) on FS Road #202. Continue 0.90 miles, then proceed on FS Road #203. Proceed 1.4 miles to a burn on the left side of the road: the study baseline is several hundred feet to the east in the burn. The 0-foot stake is marked by browse tag #25.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	SOUTH PARADOX
Elevation	7,100ft (2,164m)
Aspect	Southeast
Slope	2-3%
Sample Dates	07/12/1994, 07/14/1999, 07/13/2004, 07/14/2009, 07/09/2014, 08/21/2019

Table 13A-15.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	Hideout Mesa Fire	-	1992	-

Wildlife Habitat and Vegetation History

Table 13A-15.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter

Table 13A-15.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1994	Mountain Big Sagebrush	Phase I
1999	Mountain Big Sagebrush	Phase I
2004	Mountain Big Sagebrush	Phase I
2009	Mountain Big Sagebrush	Phase I
2014	Mountain Big Sagebrush	Phase I
2019	Mountain Big Sagebrush	Phase I

Site Notes

Prior to the establishment of the study site a small localized wildfire burned a portion of the transect (belt 1). In 2002, a large wildfire burned within one-third of a mile of the transect. A doe was seen on the study site in 2014.

Soils

Table 13A-15.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	7.2	50.9	28.5	20.6	2.2	18.6	227.2	0.5	07/14/1999

Site Potential

1981 - 2010 Average Annual Precipitation	19 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R048AY405UT
States and Transitions	No state and transition model is available for this ecological site.

Since the study was established in 1994, mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has been the dominant shrub species on this site. However, a diverse number of other shrub species are also present and have provided additional cover and forage (Table 13A-15.12). The herbaceous understory has been mainly comprised of native grasses and forbs. Cheatgrass (*Bromus tectorum*) has fluctuated in abundance and contributed moderate cover in 2019 (Table 13A-15.10). Forbs have remained moderately abundant and comprised of a diverse mix of species, and scarlet globemallow (*Sphaeralcea coccinea*) has consistently provided the most cover (Table 13A-15.11). The area adjacent to the study site is dominated by pinyon pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) with a small number of trees encroaching on the site itself (Table 13A-15.12, Table 13A-15.14). Over time and without a tree-removing disturbance, the site will likely exhibit further tree encroachment.

Trend Summary Tables

Table 13A-15.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	12.5	1.3	-	-	-	-
1999	11.1	1.4	-	-	-	-
2004	15.2	2.4	0.0	19.1	3.0	0.5
2009	22.3	2.4	0.1	23.9	2.6	0.7
2014	18.3	2.1	0.4	24.8	3.0	1.0
2019	13.5	3.6	0.0	19.0	4.0	1.4

Table 13A-15.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	29	397	253	278	0.0	12.7	1.2	4.9
1999	131	380	166	204	2.8	12.5	0.8	3.8
2004	272	244	126	183	12.2	4.6	0.8	3.8
2009	121	246	53	171	4.2	6.1	0.5	4.9
2014	41	279	149	195	0.6	8.9	2.1	5.0
2019	162	216	349	174	8.6	10.5	19.5	4.4

Table 13A-15.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	32.1	1.3	43.6	0.0	0.1	29.5
1999	32.5	9.9	32.8	0.1	0.9	35.7
2004	33.1	1.8	42.7	0.1	0.0	37.3
2009	25.1	1.7	47.5	-	0.1	40.5
2014	47.1	0.6	41.6	0.0	0.0	33.5
2019	34.7	2.4	47.9	0.1	0.1	46.5

Table 13A-15.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
1994	-	6	17	-	42
1999	5	17	20	-	11
2004	4	2	1	-	2
2009	14	-	5	-	16
2014	2	5	1	-	16
2019	2	6	2	-	1
Year	Days Use Per Acre (ha)				
1994	-	-	-	-	-
1999	50.1 (123.7)	11.4 (28.1)	36.2 (89.4)	0.6 (1.4)	-
2004	21.8 (53.8)	-	11.4 (28.1)	-	-
2009	37.7 (93.2)	3.4 (8.3)	6.0 (14.9)	-	-
2014	7.2 (17.9)	2.7 (6.6)	2.0 (5.0)	-	-
2019	17.4 (43.0)	2.7 (6.6)	6.0 (14.9)	-	-

Table 13A-15.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bouteloua gracilis (blue grama)	Bromus inermis[i] (smooth brome)	Bromus tectorum[ai] (cheatgrass)	Carex obtusata (obtuse sedge)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Koeleria macrantha (prairie Junegrass)	Pascopyrum smithii (western wheatgrass)	Pleuraphis jamesii (James' galleta)	Poa bulbosa[i] (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis[i] (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Sporobolus cryptandrus (sand dropseed)	Thinopyrum intermedium[i] (intermediate wheatgrass)	Vulpia octoflora[a] (sixweeks fescue)
year	Nested Frequency																
1994	3	58	-	26	1	54	51	216	276	6	-	29	5	-	-	-	3
1999	9	50	-	127	5	25	86	169	252	4	-	45	-	56	9	-	4
2004	11	52	-	269	10	16	102	35	75	5	-	3	-	19	1	20	3
2009	-	37	5	121	4	4	142	24	22	-	-	26	-	23	1	9	-
2014	-	36	18	41	21	15	161	41	44	6	-	-	-	10	7	18	-
2019	5	15	10	147	16	14	101	19	74	-	2	3	10	4	3	7	20
year	Average Cover (%)																
1994	0.2	1.2	-	0.0	0.0	1.0	1.2	3.8	5.0	0.2	-	0.1	0.0	-	-	-	0.0
1999	0.1	0.7	-	2.8	0.0	0.2	2.5	4.2	3.7	0.0	-	0.5	-	0.6	0.0	-	0.0
2004	0.0	0.8	-	12.2	0.1	0.3	2.1	0.3	0.5	0.0	-	0.0	-	0.3	0.0	0.1	0.0
2009	-	0.3	0.1	4.2	0.0	0.1	4.0	0.4	0.2	-	-	0.7	-	0.2	0.0	0.0	-
2014	-	1.2	0.2	0.6	0.4	0.6	4.4	1.0	0.7	0.0	-	-	-	0.0	0.3	0.1	-
2019	0.0	0.2	0.8	8.4	0.8	0.4	4.5	0.4	2.2	-	0.0	0.1	0.4	0.1	0.1	0.4	0.2

a - Annual; n - Noxious Weed; i - Introduced Species

Table 13A-15.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Alyssum desertorum[ai] (desert madwort)	Androsace septentrionalis[a] (pygmyflower rockjasmine)	Artemisia carruthii (Carruth's sagewort)	Artemisia ludoviciana (white sagebrush)	Astragalus miser (timber milkvetch)	Calochortus nuttallii (sego lily)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata[ai] (curveseed butterwort)	Chenopodium fremontii[a] (Fremont's goosefoot)	Chenopodium leptophyllum[a] (narrowleaf goosefoot)	Cirsium undulatum[a] (wavyleaf thistle)	Collinsia parviflora[a] (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawksbeard)	Cryptantha (cryptantha)	Cymopterus (springparsley)
year	Nested Frequency																
1994	-	4	-	-	29	9	-	6	2	-	-	4	39	94	-	6	4
1999	2	-	45	-	23	3	-	-	-	-	-	1	1	-	1	-	-
2004	1	1	2	-	13	-	3	-	3	21	3	1	2	-	5	13	0
2009	-	-	-	-	25	-	1	1	15	-	-	-	1	-	1	6	-
2014	-	1	9	32	7	-	1	7	-	1	-	-	14	-	1	8	-
2019	-	20	79	12	-	-	2	2	35	58	105	7	62	-	6	3	-
year	Average Cover (%)																
1994	-	0.0	-	-	0.5	0.4	-	0.1	0.0	-	-	0.0	0.1	0.7	-	0.0	0.0
1999	0.0	-	0.1	-	0.6	0.0	-	-	-	-	-	0.0	0.0	-	0.0	-	-
2004	0.0	0.0	0.0	-	0.4	-	0.0	-	0.0	0.0	0.0	0.0	0.0	-	0.1	0.1	0.0
2009	-	-	-	-	1.1	-	0.0	0.1	0.0	-	-	-	0.0	-	0.0	0.1	-
2014	-	0.0	0.0	0.7	0.1	-	0.0	0.1	-	0.0	-	-	0.0	-	0.0	0.1	-
2019	-	1.0	0.5	0.1	-	-	0.0	0.0	0.1	0.9	0.7	0.2	0.7	-	0.1	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Descurainia pinnata[a] (western tansymustard)	Draba nemorosa[a] (woodland draba)	Erigeron (fleabane)	Erigeron divergens[a] (spreading fleabane)	Erigeron flagellaris (trailing fleabane)	Erigeron pumilus (shaggy fleabane)	Eriogonum racemosum (redroot buckwheat)	Gayophytum ramosissimum[a] (pinyon groundsmoke)	Gilia inconspicua[a] (shy gilia)	Grindelia squarrosa (curlycup gumweed)	Heterotheca villosa (hairy false goldenaster)	Ipomopsis aggregata (scarlet gilia)	Lactuca serriola[ai] (prickly lettuce)	Lappula occidentalis[a] (flatspine stickseed)	Lepidium[a] (pepperweed)	Linum lewisii (Lewis flax)	Lomatium (desertparsley)
year	Nested Frequency																
1994	3	75	8	-	-	42	11	4	148	41	12	10	-	13	-	4	-
1999	-	11	-	-	-	14	6	-	1	-	11	-	-	12	-	7	-
2004	1	7	-	8	1	17	2	5	5	-	5	-	-	61	-	4	-
2009	-	-	-	7	3	-	3	-	-	-	13	-	1	10	-	11	-
2014	2	15	-	107	-	41	3	-	-	4	19	-	-	27	2	13	26
2019	34	90	-	85	-	27	7	-	11	-	13	-	1	166	27	28	-
year	Average Cover (%)																
1994	0.0	0.2	0.0	-	-	0.1	0.2	0.0	0.3	0.2	0.1	0.0	-	0.0	-	0.0	-
1999	-	0.0	-	-	-	0.1	0.1	-	0.0	-	0.4	-	-	0.0	-	0.1	-
2004	0.0	0.0	-	0.1	0.0	0.1	0.0	0.0	0.0	-	0.4	-	-	0.3	-	0.0	-
2009	-	-	-	0.1	0.1	-	0.1	-	-	-	0.1	-	0.0	0.2	-	0.1	-
2014	0.0	0.0	-	1.8	-	0.2	0.0	-	-	0.2	0.3	-	-	0.1	0.0	0.8	0.3
2019	1.2	0.4	-	0.9	-	0.5	0.2	-	0.0	-	0.2	-	0.0	8.4	0.8	0.3	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Lupinus (lupine)	Machaeranthera canescens (hoary tansyaster)	Machaeranthera grindelioides (rayless tansyaster)	Microsteris gracilis[a] (slender phlox)	Oenothera pallida[a] (pale evening primrose)	Orobanche fasciculata (clustered broomrape)	Orthocarpus[a] (owl's-clover)	Penstemon (beardtongue)	Penstemon caespitosus (mat penstemon)	Penstemon comarrhenus (dusty beardtongue)	Phlox longifolia (longleaf phlox)	Plantago patagonica[a] (woolly plantain)	Polygonum douglasii[a] (Douglas' knotweed)	Sphaeralcea coccinea (scarlet globemallow)	Tragopogon dubius[ai] (yellow salsify)	Trifolium (clover)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency																
1994	4	27	-	38	5	-	-	20	14	2	36	77	28	129	-	11	6
1999	1	6	-	114	7	-	4	29	-	5	19	50	38	132	-	2	8
2004	5	2	-	10	1	-	-	-	18	7	10	29	3	125	3	4	12
2009	-	2	-	13	-	-	-	-	5	5	3	4	6	115	8	-	7
2014	3	6	5	3	7	-	-	-	11	1	7	3	-	78	3	-	-
2019	2	0	10	58	29	4	-	-	7	6	26	109	35	74	17	5	3
year	Average Cover (%)																
1994	0.0	0.1	-	0.1	0.0	-	-	0.1	0.7	0.0	0.1	0.3	0.1	1.7	-	0.0	0.0
1999	0.0	0.0	-	0.4	0.0	-	0.0	1.3	-	0.0	0.0	0.1	0.1	1.2	-	0.0	0.0
2004	0.0	0.0	-	0.0	0.0	-	-	-	0.6	0.3	0.0	0.2	0.0	1.7	0.0	0.0	0.0
2009	-	0.0	-	0.0	-	-	-	-	0.0	0.8	0.0	0.0	0.0	2.4	0.1	-	0.1
2014	0.0	0.0	0.0	0.0	0.0	-	-	-	0.6	0.0	0.0	0.0	-	1.6	0.0	-	-
2019	0.0	0.0	0.1	0.9	0.2	0.0	-	-	0.5	0.1	0.1	2.2	0.3	2.0	0.2	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 13A-15.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis[p] (Utah serviceberry)	Artemisia frigida[p] (prairie sagewort)	Artemisia nova[p] (black sagebrush)	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Atriplex canescens[p] (fourwing saltbush)	Chrysothamnus depressus[p] (longflower rabbitbrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa (rubber rabbitbrush)	Eriogonum microthecum[p] (slender buckwheat)	Escobaria vivipara var. arizonica (Arizona spinystar)	Gutierrezia sarothrae (broom snakeweed)	Opuntia (pricklypear)	Opuntia fragilis (brittle pricklypear)	Pinus edulis[t] (twoneedle pinyon)	Symphoricarpos oreophilus[p] (mountain snowberry)
year	Line Intercept Cover (%)														
1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2004	0.2	2.4	-	15.9	0.5	0	2.2	0.1	0.1	-	0.6	0.1	-	0.5	-
2009	0.2	5.1	-	18.1	0.2	0.1	1.7	0.2	0.2	-	0.4	0.1	0.2	0.7	-
2014	-	2.2	-	22.1	0.2	0.1	2.7	0.2	0.1	-	-	-	0.1	1	0.1
2019	-	0.3	-	17.8	0.1	0.2	2.8	-	0.2	-	0.8	-	0.4	1.4	0.4
year	Quadrat Cover (%)														
1994	-	2.5	-	9.8	0.2	-	0.7	-	0.0	-	0.6	-	0.0	-	-
1999	0.0	0.9	-	10.1	0.0	0.0	1.0	-	-	-	0.3	-	0.1	-	-
2004	0.1	1.8	-	13.0	0.2	0.0	1.9	0.1	0.0	-	0.4	0.0	-	0.0	-
2009	0.1	5.3	0.1	16.3	0.2	0.2	1.7	0.0	0.0	0.0	0.5	0.0	0.1	0.1	-
2014	-	2.4	-	15.8	0.0	0.0	2.1	0.0	0.1	0.0	-	-	0.0	0.4	0.0
2019	-	0.4	-	12.5	0.1	0.0	1.9	0.1	0.3	0.0	1.2	-	0.3	0.0	0.1

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 13A-15.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
1994	20	-	0	100	0	0	0	0	51/59
1999	20	-	0	100	0	0	100	0	77/72
2004	20	-	0	100	0	0	100	0	71/66
2009	40	-	0	100	0	0	100	0	87/89
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	85/79
Artemisia frigida[p] -- (prairie sagewort)									
1994	3660	40	13	84	3	0	0	0	21/27
1999	5040	160	24	74	2	8	1	1	17/15
2004	3260	1300	4	96	1	5	14	1	31/24
2009	7000	6240	11	87	1	0	0	3	34/35
2014	9800	6480	57	38	5	4	0	1	18/18
2019	1640	80	50	49	1	0	0	1	22/16
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1994	4600	9000	27	55	17	4	0	19	51/61
1999	6500	200	54	34	13	16	3	2	62/78
2004	5000	13440	9	78	13	17	0	4	49/66
2009	7480	20	33	55	12	15	13	14	50/73
2014	8160	80	23	67	10	20	22	10	47/66
2019	5060	20	12	59	29	12	8	43	56/69

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Atriplex canescens[p] -- (fourwing saltbush)									
1994	80	-	0	100	0	0	0	25	52/43
1999	140	60	29	71	0	29	29	0	62/61
2004	100	-	0	100	0	60	40	0	65/61
2009	40	-	0	100	0	0	0	0	65/55
2014	60	-	0	100	0	33	33	0	69/62
2019	60	-	0	100	0	0	100	0	61/59
Chrysothamnus depressus[p] -- (longflower rabbitbrush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	60	-	0	100	0	0	0	0	10/30
2004	200	-	0	100	0	0	0	0	9/18
2009	60	-	0	100	0	0	0	0	12/24
2014	220	40	55	46	0	64	0	0	13/18
2019	60	-	33	67	0	0	0	0	28/41
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1994	1180	180	12	88	0	0	0	3	18/38
1999	1600	-	14	86	0	4	0	0	15/26
2004	1920	-	1	99	0	1	0	0	20/29
2009	1840	100	0	96	4	0	4	14	19/35
2014	1920	120	6	94	0	38	0	1	20/34
2019	1140	-	5	95	0	0	0	0	28/47
Eriogonum microthecum[p] -- (slender buckwheat)									
1994	120	-	0	100	0	0	0	0	21/25
1999	300	-	33	67	0	27	0	0	19/15
2004	200	-	0	100	0	0	0	0	19/22
2009	100	-	0	100	0	0	0	0	31/17
2014	280	-	14	86	0	36	7	0	40/42
2019	140	-	57	43	0	100	0	0	25/27
Ericameria nauseosa -- (rubber rabbitbrush)									
1994	40	-	0	100	0	0	0	0	74/81
1999	20	-	0	100	0	0	0	0	68/82
2004	60	-	0	100	0	0	0	0	55/62
2009	40	-	0	50	50	0	0	0	87/124
2014	-	-	-	-	-	-	-	-	97/139
2019	40	-	0	50	50	0	0	50	104/122
Escobaria vivipara var. arizonica -- (Arizona spinystar)									
1994	-	-	-	-	-	-	-	-	-/-
1999	60	-	0	100	0	0	0	0	8/10
2004	40	-	0	100	0	0	0	0	8/11
2009	60	20	0	100	0	0	0	0	8/16
2014	20	20	100	0	0	0	0	0	8/14
2019	20	-	0	100	0	0	0	0	7/11
Gutierrezia sarothrae -- (broom snakeweed)									
1994	840	120	5	86	10	0	0	5	17/27
1999	720	-	14	81	6	0	0	0	15/14
2004	580	-	7	93	0	0	0	0	20/25
2009	420	-	5	95	0	0	0	0	24/28
2014	20	-	0	100	0	0	0	0	16/20
2019	440	-	5	96	0	0	0	0	28/37

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Opuntia fragilis -- (brittle pricklypear)									
1994	160	-	38	63	0	13	0	0	8/21
1999	140	20	14	86	0	0	0	0	11/26
2004	-	-	-	-	-	-	-	-	-/-
2009	120	-	0	100	0	0	0	0	63/55
2014	180	-	0	100	0	0	0	0	10/32
2019	320	-	0	100	0	0	0	0	10/33
Opuntia -- (pricklypear)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	160	-	13	88	0	0	0	0	11/18
2009	60	-	0	100	0	0	0	67	11/36
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Pinus edulis[t] -- (twoneedle pinyon)									
1994	-	-	-	-	-	-	-	-	-/-
1999	20	-	0	100	0	0	0	0	- / -
2004	20	-	0	100	0	0	0	0	- / -
2009	20	-	0	100	0	0	0	0	- / -
2014	20	-	0	100	0	0	0	0	- / -
2019	20	-	0	100	0	0	0	0	- / -
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	75/150
2014	60	-	100	0	0	100	0	0	54/68
2019	20	-	0	100	0	0	0	0	64/132

t - Tree Species; p - Preferred Browse; i - Introduced Species

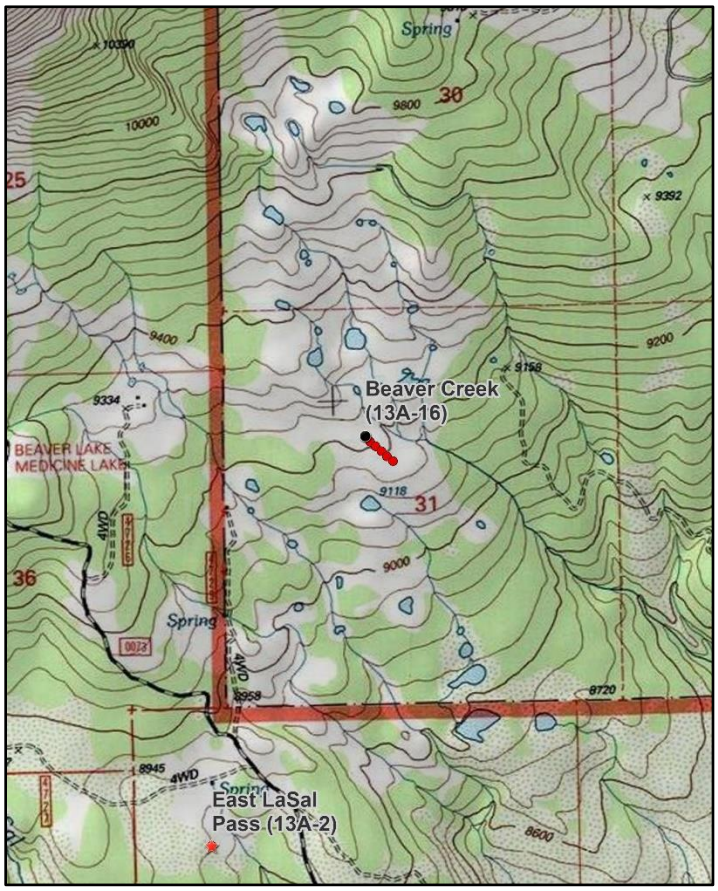
Table 13A-15.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

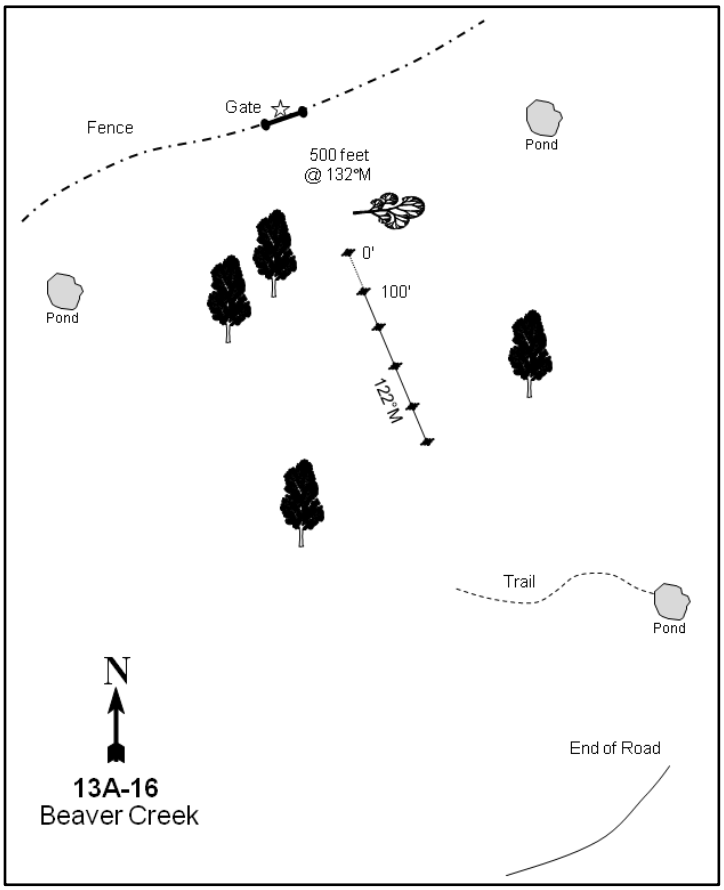
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2014	3	-	-	100	-	-	12.0
2019	1	-	-	100	-	-	24.0
Pinus edulis (twoneedle pinyon)							
2014	7	-	75	-	-	25	7.3
2019	14	-	67	17	17	-	7.7

Table 13A-15.15 - Deer Desirable Components Index: High Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1994	15.0	10.7	12.1	25.4	0.0	9.9	0.0	73.0	Good
1999	13.7	11.5	15.0	25.0	-2.1	7.6	0.0	70.7	Fair-Good
2004	23.3	11.8	3.9	9.2	-9.2	7.6	0.0	46.6	Poor
2009	28.7	12.1	13.5	12.2	-3.1	9.9	0.0	73.2	Good
2014	30.0	12.2	13.3	17.8	-0.4	10.0	0.0	82.8	Good
2019	23.6	6.9	6.4	21.0	-6.5	8.7	0.0	60.1	Fair

BEAVER CREEK - STUDY NO. 13A-16





Location Information

USGS 7.5 min Map Info	Mount Peale SW; Township 27S, Range 25E, Section 31
GPS (0' Stake)	NAD 83 UTM ZONE 12, 656488 East 4253417 North

Transect Information

Browse Tag # (0' Stake)	161
Transect Bearing	122° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	No Rebar

Directions to Site

On State Road 46, travel northeast past La Sal to mile marker 12. Continue 0.75 miles past mile marker 12 to the La Sal Pass Road. Turn left onto La Sal Pass Road and go 1.9 miles to a fork just beyond the Forest Service boundary cattle guard. Follow the road left and drive for 0.05 miles to a canal. Continue 0.7 miles to a fork by the canal. Proceed to the right and travel 0.1 miles to a fork. Stay left and proceed 0.4 miles to another fork. Stay right on the main road and continue 0.8 miles to the La Sal Creek crossing. Continue 1.0 mile to a cattle guard, then drive 0.8 miles to a fork. Stay right at the fork and continue 0.11 more miles to another fork. Proceed to the right and drive to the end of the road: park here. Follow the trail to an open area and walk west up the hill to the site. Use a GPS unit to navigate to the 0-foot stake, which is marked by browse tag #161.

Site Information

Land Ownership	State
Land Administrator	SITLA
Allotment	No data
Elevation	9,200ft (2,804m)
Aspect	South
Slope	10-12%
Sample Dates	07/15/2004, 07/20/2009, 08/07/2014, 06/24/2019

Wildlife Habitat and Vegetation History

Table 13A-16.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	summer
Rocky Mountain Elk	crucial	summer

Table 13A-16.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2004	Quaking Aspen/Snowberry	NA
2009	Quaking Aspen/Snowberry	NA
2014	Quaking Aspen/Snowberry	NA
2019	Quaking Aspen/Snowberry	NA

Site Notes

No Notes

Soils

Table 13A-16.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	5.6	46.3	34.4	19.3	6.3	28.1	515.2	0.6	07/15/2004

Site Potential

1981 - 2010 Average Annual Precipitation	31 inches
NRCS Ecological Site	High Mountain Loam (Aspen)
NRCS Ecological Site #	R048AY506UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 2004, this site has been in stable ecological condition. The herbaceous understory has remained diverse and abundant, with perennial forbs and grasses being observed in high amounts (Table 13A-16.7). Kentucky bluegrass (*Poa pratensis*) has been the dominant grass species sampled on the site, with mountain brome (*Bromus marginatus*) and slender wheatgrass (*Elymus trachycaulus*) providing lesser but still significant cover (Table 13A-16.10). Forbs are diverse with western aster (*Symphyotrichum ascendens*) and common yarrow (*Achillea millefolium*) as the dominant species (Table 13A-16.11). Snowberry (*Symphoricarpos oreophilus*) has been the most abundant shrub species present with cover remaining stable throughout the sample years (Table 13A-16.13). Quaking aspen (*Populus tremuloides*) trees have shown slight decreases in density and abundance (Table 13A-16.13a, Table 13A-16.14). Barring a major disturbance, it is likely that this site will remain in the same or a similar condition in future sample years.

Trend Summary Tables

Table 13A-16.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2004	12.5	-	2.5	27.1	-	24.2
2009	16.9	-	0.4	24.6	-	20.7
2014	17.4	-	0.3	27.2	-	19.8
2019	22.3	0.0	3.3	29.6	-	15.5

Table 13A-16.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2004	-	395	98	333	-	23.2	2.3	22.3
2009	-	462	38	285	-	54.2	0.5	15.4
2014	-	460	100	356	-	44.0	7.2	29.1
2019	-	411	255	381	-	32.6	7.9	41.4

Table 13A-16.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2004	7.8	-	46.3	-	0.3	59.8
2009	4.4	-	47.1	0.0	0.1	79.2
2014	2.4	-	56.2	0.0	0.2	82.6
2019	8.7	-	53.6	0.1	1.0	68.8

Table 13A-16.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
2004	18	-	2	-	-
2009	39	-	1	-	1
2014	8	1	6	-	-
2019	24	4	8	-	-
Year	Days Use Per Acre (ha)				
2004	66.1 (163.2)	6.0 (14.9)	42.2 (104.3)	-	-
2009	101.7 (251.1)	-	8.1 (19.9)	-	-
2014	16.0 (39.5)	2.0 (5.0)	13.4 (33.1)	-	-
2019	10.9 (26.9)	15.4 (38.1)	8.1 (19.9)	4.0 (10.0)	-

Table 13A-16.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Achnatherum nelsonii (Columbia needlegrass)	Bromus marginatus (mountain brome)	Bromus porteri (Porter brome)	Carex (sedge)	Dactylis glomerata[i] (orchardgrass)	Elymus trachycaulus (slender wheatgrass)	Festuca thurberi (Thurber's fescue)	Poa pratensis[i] (Kentucky bluegrass)
year	Nested Frequency								
2004	5	59	64	13	21	6	70	-	320
2009	2	69	128	7	17	4	50	-	388
2014	35	21	35	28	18	-	117	6	441
2019	88	31	134	5	20	22	65	51	344
year	Average Cover (%)								
2004	0.1	2.3	1.2	0.4	0.5	0.0	1.6	-	17.1
2009	0.0	3.1	8.0	0.8	0.8	0.0	1.6	-	39.9
2014	1.1	0.5	1.0	0.8	0.3	-	3.7	0.3	36.4
2019	3.4	0.9	3.8	0.1	0.6	0.2	2.0	3.9	17.8

a - Annual; n - Noxious Weed; i - Introduced Species

Table 13A-16.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Androsace septentrionalis[a] (pygmyflower rockjasmine)	Arabis (rockcress)	Calochortus nuttallii (sego lily)	Capsella bursa-pastoris[ai] (shepherd's purse)	Chenopodium fremontii[a] (Fremont's goosefoot)	Cirsium (thistle)	Collinsia parviflora[a] (maiden blue eyed Mary)	Crepis acuminata (tapertip hawksbeard)	Cryptantha (cryptantha)	Delphinium nuttallianum (twolobe larkspur)	Descurainia californica[a] (Sierra tansymustard)	Draba[a] (draba)	Erigeron flagellaris (trailing fleabane)	Erigeron speciosus (aspen fleabane)	Galium[a] (bedstraw)
year	Nested Frequency																
2004	167	2	3	-	-	-	53	17	-	5	-	-	58	15	1	-	-
2009	147	-	3	1	-	-	12	12	-	1	-	-	-	-	-	-	-
2014	245	4	9	17	-	53	26	30	-	8	0	-	1	-	10	65	-
2019	224	7	-	9	9	28	171	47	51	-	-	37	23	-	5	60	61
year	Average Cover (%)																
2004	4.2	0.0	0.0	-	-	-	0.4	0.6	-	0.0	-	-	1.5	0.1	0.0	-	-
2009	3.3	-	0.0	0.0	-	-	0.1	0.1	-	0.0	-	-	-	-	-	-	-
2014	11.4	0.0	0.1	0.3	-	5.8	0.3	0.9	-	0.1	0.1	-	0.0	-	0.7	2.3	-
2019	9.5	0.2	-	0.1	0.1	1.3	2.7	1.8	0.8	-	-	0.6	0.4	-	0.2	2.3	1.5

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Geranium viscosissimum (sticky purple geranium)	Hymenoxys hoopesii (owl's-claws)	Lamiaceae (mint family)	Lappula occidentalis[a] (flatspine stickseed)	Lathyrus lanszwertii (Nevada pea)	Lepidium[a] (pepperweed)	Lesquerella (bladderpod)	Ligusticum porteri (Porter's licorice-root)	Lupinus argenteus (silvery lupine)	Mertensia (bluebells)	Microsteris gracilis[a] (slender phlox)	Penstemon comarrhenus (dusty beardtongue)	Phacelia heterophylla[a] (varileaf phacelia)	Polygonum ramosissimum[a] (bushy knotweed)	Potentilla gracilis (slender cinquefoil)	Potentilla hippiana (woolly cinquefoil)	Pseudostellaria jamesiana (tuber starwort)
year	Nested Frequency																
2004	12	-	3	7	53	10	-	13	48	-	-	-	-	-	25	-	23
2009	18	15	-	-	48	-	-	21	29	-	-	-	10	13	13	-	10
2014	11	9	-	-	81	-	4	35	46	-	-	2	12	3	14	2	27
2019	5	5	3	16	83	-	3	39	28	12	4	1	5	21	30	-	70
year	Average Cover (%)																
2004	0.1	-	0.0	0.2	1.3	0.1	-	1.5	4.6	-	-	-	-	-	0.7	-	0.3
2009	0.1	0.5	-	-	1.6	-	-	0.4	2.0	-	-	-	0.1	0.3	0.4	-	0.1
2014	0.4	0.2	-	-	2.9	-	0.4	1.6	3.1	-	-	0.0	0.7	0.2	0.3	0.0	0.3
2019	0.2	0.2	0.1	0.2	3.7	-	0.0	2.8	2.0	0.3	0.0	0.0	0.0	0.1	0.5	-	2.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Ranunculus inamoenus (graceful buttercup)	Senecio eremophilus (desert ragwort)	Swertia perennis (felwort)	Symphyotrichum ascendens (western aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius[ai] (yellow salsify)	Vicia americana (American vetch)	Viola (violet)
year	Nested Frequency							
2004	-	-	2	184	143	5	-	-
2009	-	-	2	165	108	4	-	-
2014	11	11	2	97	92	7	10	-
2019	8	23	2	150	169	34	5	1
year	Average Cover (%)							
2004	-	-	0.6	6.2	2.1	0.0	-	-
2009	-	-	0.4	5.2	1.5	0.0	-	-
2014	0.1	0.3	0.4	2.0	1.2	0.1	0.2	-
2019	0.1	0.2	0.6	6.6	7.3	0.9	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 13A-16.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Juniperus osteosperma[t] (Utah juniper)	Mahonia repens (creeping barberry)	Populus tremuloides[t] (quaking aspen)	Quercus gambelii[p] (Gambel oak)	Ribes montigenum[p] (gooseberry currant)	Rosa woodsii[p] (Woods' rose)	Symphoricarpos oreophilus[p] (mountain snowberry)
year	Line Intercept Cover (%)						
2004	-	-	24.2	0.6	1.5	0.6	24.4
2009	-	-	20.7	0.9	1.5	0.1	22.1
2014	-	-	19.8	0.8	0.1	0.4	25.9
2019	-	-	15.5	0.4	2	0.5	26.7
year	Quadrat Cover (%)						
2004	2.0	-	0.5	0.4	0.3	0.4	11.4
2009	-	-	0.4	0.5	0.5	0.6	15.3
2014	-	-	0.3	0.5	0.1	0.2	16.5
2019	-	0.0	3.3	0.3	0.8	1.0	20.2

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 13A-16.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Mahonia repens -- (creeping barberry)									
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	60	-	0	100	0	0	0	0	8/15
2019	20	-	0	100	0	0	0	0	7/22
Populus tremuloides[t] -- (quaking aspen)									
2004	200	-	70	30	0	10	30	0	- / -
2009	200	40	70	30	0	30	20	10	- / -
2014	See table 13a - Aspen Characteristics								
2019	See table 13a - Aspen Characteristics								
Prunus virginiana[p] -- (chokecherry)									
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	129/40
Quercus gambelii[p] -- (Gambel oak)									
2004	480	-	100	0	0	0	0	0	33/18
2009	240	-	0	100	0	0	100	0	- / -
2014	240	-	0	100	0	0	0	0	47/30
2019	340	-	71	29	0	0	0	0	78/53
Ribes montigenum[p] -- (gooseberry currant)									
2004	20	-	0	100	0	0	0	0	87/219
2009	260	-	0	100	0	0	0	0	57/89
2014	60	-	0	100	0	0	0	0	82/137
2019	80	-	25	75	0	25	0	0	74/132

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Rosa woodsii[p] -- (Woods' rose)									
2004	800	-	0	100	0	0	0	0	34/25
2009	880	-	0	100	0	0	0	0	31/23
2014	600	-	0	100	0	3	0	0	51/25
2019	1160	-	0	100	0	85	12	12	50/57
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
2004	2080	40	7	92	1	0	0	0	70/110
2009	3060	20	5	94	1	14	13	0	70/106
2014	4640	-	1	99	0	7	0	0	79/104
2019	3800	1860	15	84	2	0	0	2	74/111

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 13A-16.13a - Aspen Characteristics. Characteristics of aspen populations including density, size class distribution, and vigor of plants.

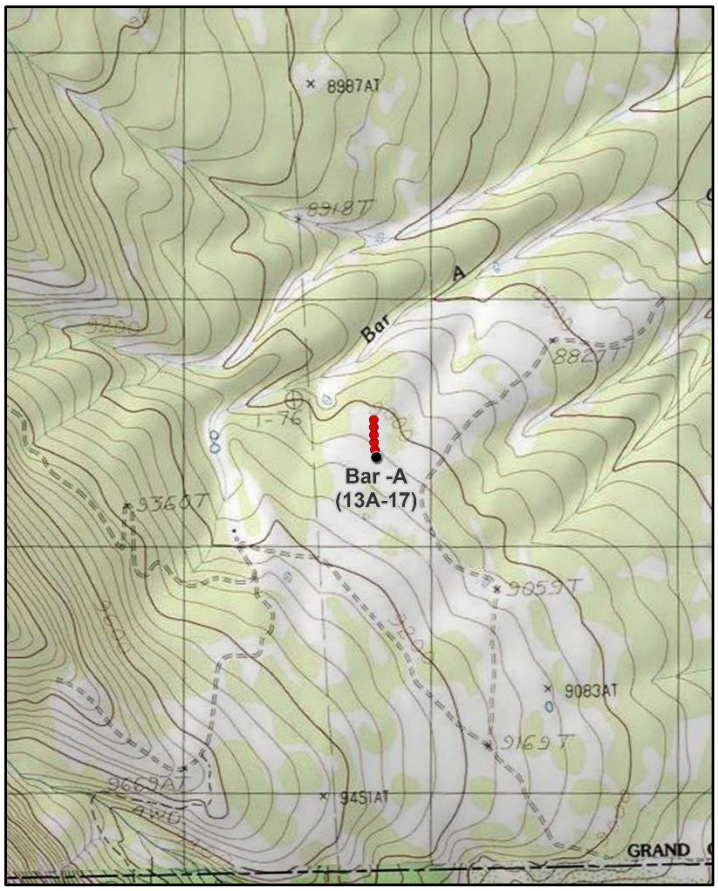
Year	Density	Size Class Distribution				Utilization		Poor Vigor (%)
	Plants per Acre	Class I (%)	Class II (%)	Class III (%)	Class IV (%)	Moderate (%)	Heavy (%)	
Populus tremuloides (quaking aspen)								
2014	620	77	13	-	10	14	14	14
2019	340	35	47	-	18	9	9	0

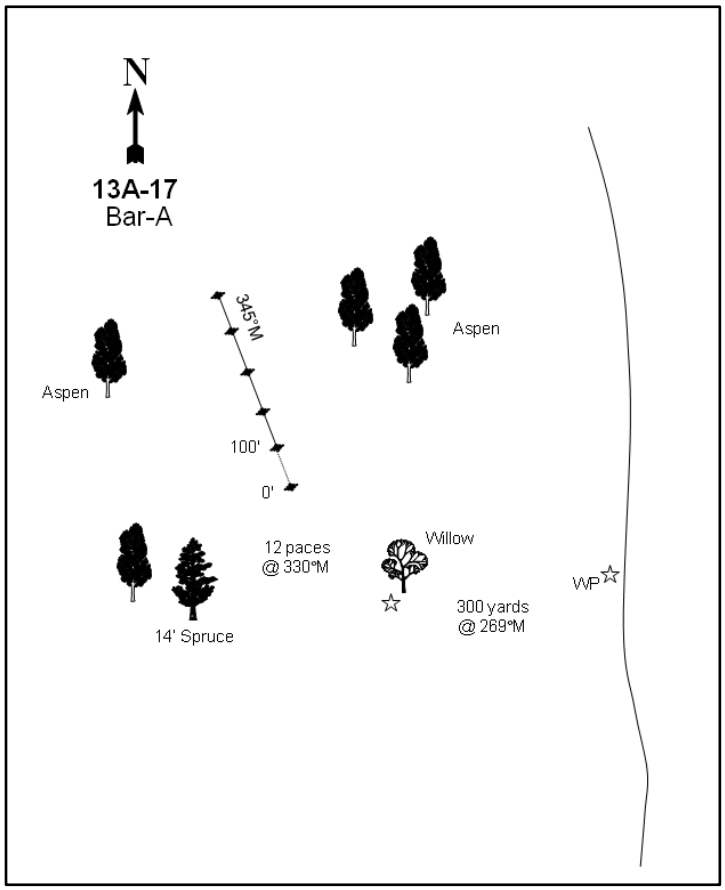
Class I - <= 1.5 feet; Class II - > 1.5 feet to 5 feet; Class III - > 5 feet and up to 1 inch diameter at breast height (dbh); Class IV - > 1 in diameter at breast height (dbh)

Table 13A-16.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Populus tremuloides (quaking aspen)							
2014	52	18	64	-	-	18	7.8
2019	29	14	21	14	-	50	24.5

BAR -A - STUDY NO. 13A-17





Location Information

USGS 7.5 min Map Info	Mount Waas SE; Township 26S, Range 25E, Section 27
GPS (0' Stake)	NAD 83 UTM ZONE 12, 660729 East 4264552 North

Transect Information

Browse Tag # (0' Stake)	144
Transect Bearing	345° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Standard

Directions to Site

From the intersection of State Road 128 and the La Sal Mountain Loop Road, drive 10.9 miles to the Gateway Road. From the intersection of the La Sal Mountain Loop Road and the Gateway Road at the upper end of Castle Valley, travel 12.7 miles towards Gateway, Colorado to the Sally Hollow turnoff. Turn right and stay on the main road for 6.7 miles. Turn right again and drive 0.7 miles to a fork. Bear right at the fork and continue for 0.8 miles to a witness post on the left (west) side of the road. From the witness post, walk 300 yards at 269 degrees magnetic to a small highlined willow tree. From the willow tree, walk 12 paces at 330 degrees magnetic to the beginning of the study baseline. The 0-foot stake is marked with browse tag #144.

Site Information

Land Ownership	State
Land Administrator	SITLA
Allotment	No data
Elevation	9,050ft (2,758m)
Aspect	North
Slope	5-8%
Sample Dates	07/20/2004, 07/21/2009, 08/06/2014, 06/25/2019

Wildlife Habitat and Vegetation History

Table 13A-17.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	summer
Rocky Mountain Elk	crucial	summer

Table 13A-17.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2004	Perennial Grass-Forb	NA
2009	Perennial Grass-Forb	NA
2014	Perennial Grass-Forb	NA
2019	Perennial Grass-Forb	NA

Site Notes

A small fire burned east of the study transect along the edge of the meadow and in the understory of the mixed conifer-aspen forest.

Soils

Table 13A-17.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	6.0	49.0	33.5	17.5	6.0	4.9	192.0	0.6	07/20/2004

Site Potential

1981 - 2010 Average Annual Precipitation	29 inches
NRCS Ecological Site	High Mountain Loam (Thurber Fescue)
NRCS Ecological Site #	R048AY515UT
States and Transitions	No state and transition model is available for this ecological site.

Since the site was established in 2004, the study has remained in a stable mountain meadow ecological state with perennial grasses and native forbs being the dominant components (Table 13A-17.7, Table 13A-17.10, Table 13A-17.11). The introduced grass species Kentucky bluegrass (*Poa pratensis*) is the dominant grass species with sedge (*Carex sp.*) and Thurber's fescue (*Festuca thurberi*) being co-dominant (Table 13A-17.10). The perennial forb rocky mountain iris (*Iris missouriensis*) has been the major forb species sampled on the site with lesser amounts of common yarrow (*Achillea millefolium*) being present alongside a diverse mix of many other native species (Table 13A-17.11). Shrubs are present in small amounts with silver sagebrush (*Artemisia cana*), the most common species, having shown an increasing trend over time (Table 13A-17.12, Table 13A-17.13). The site is at the edge of an aspen (*Populus tremuloides*) stand with a small number of young trees having been sampled in density (Table 13A-17.13a).

Trend Summary Tables

Table 13A-17.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2004	0.2	0.1	-	0.2	0.2	-
2009	0.7	-	-	0.5	-	-
2014	0.9	0.0	0.0	2.2	0.1	-
2019	2.9	0.0	-	2.8	0.1	-

Table 13A-17.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2004	-	434	95	416	-	30.6	1.0	45.2
2009	-	464	16	433	-	41.4	0.2	63.5
2014	-	423	128	447	-	35.2	1.2	55.4
2019	-	419	77	420	-	26.2	0.7	50.4

Table 13A-17.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2004	12.8	-	30.6	1.0	0.9	71.7
2009	2.6	-	55.7	-	0.1	80.9
2014	3.4	-	59.8	0.2	0.0	81.5
2019	8.9	0.1	60.3	0.9	0.2	68.8

Table 13A-17.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
2004	14	-	5	1
2009	2	-	1	-
2014	2	1	11	-
2019	4	4	16	4
Year	Days Use Per Acre (ha)			
2004	44.3 (109.4)	2.0 (5.0)	20.8 (51.3)	-
2009	20.3 (50.2)	0.7 (1.7)	28.1 (69.5)	-
2014	8.7 (21.5)	0.7 (1.7)	14.7 (36.4)	-
2019	11.6 (28.7)	-	6.7 (16.6)	-

Table 13A-17.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Achnatherum nelsonii (Columbia needlegrass)	Agrostis stolonifera[i] (creeping bentgrass)	Bromus marginatus (mountain brome)	Bromus porteri (Porter brome)	Carex (sedge)	Danthonia intermedia (timber oatgrass)	Elymus trachycaulus (slender wheatgrass)	Festuca idahoensis (Idaho fescue)	Festuca thurberi (Thurber's fescue)	Hesperostipa comata (needle and thread)	Juncus (rush)	Koeleria macrantha (prairie Junegrass)	Muhlenbergia (muhly)	Poa fendleriana (muttongrass)	Poa pratensis[i] (Kentucky bluegrass)
year	Nested Frequency															
2004	40	38	-	-	18	21	15	90	1	35	14	-	8	3	-	417
2009	66	2	-	15	26	81	112	11	-	-	30	-	7	-	-	389
2014	88	24	10	20	22	138	90	37	18	68	33	11	-	2	3	323
2019	70	37	-	105	26	134	34	30	4	84	3	-	-	-	2	271
year	Average Cover (%)															
2004	1.1	1.6	-	-	0.2	0.4	0.1	1.2	0.0	2.6	0.2	-	0.1	0.1	-	23.1
2009	4.0	0.0	-	0.9	0.7	2.2	4.9	0.4	-	-	0.9	-	0.1	-	-	27.3
2014	3.2	1.1	0.3	0.2	0.3	5.4	2.1	0.7	0.6	5.8	1.3	0.1	-	0.0	0.0	14.0
2019	2.4	1.4	-	1.8	0.2	3.1	0.4	0.8	0.4	6.7	0.5	-	-	-	0.0	8.4

a - Annual; n - Noxious Weed; i - Introduced Species

Table 13A-17.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris aurantiaca (orange agoseris)	Androsace septentrionalis[a] (pygmyflower rockjasmine)	Antennaria microphylla (littleleaf pussytoes)	Arabis drummondii (Drummond's rockcress)	Arenaria (sandwort)	Artemisia ludoviciana (white sagebrush)	Calochortus gunnisonii (Gunnison's mariposa lily)	Cerastium beeringianum (Bering chickweed)	Cirsium (thistle)	Claytonia (springbeauty)	Collomia linearis[a] (tiny trumpet)	Crepis acuminata (tapertip hawksbeard)	Delphinium nuttallianum (twolobe larkspur)	Dracocephalum parviflorum (American dragonhead)	Erigeron eatonii (Eaton's fleabane)	Erigeron flagellaris (trailing fleabane)
year	Nested Frequency																
2004	284	27	25	25	2	49	-	6	196	30	-	8	-	-	-	-	9
2009	354	36	-	27	1	58	-	17	93	31	-	-	2	-	6	-	42
2014	362	29	60	20	12	61	1	7	210	56	-	2	0	-	14	1	16
2019	276	54	1	16	1	32	-	13	81	54	60	-	-	19	-	29	7
year	Average Cover (%)																
2004	9.5	0.3	0.1	1.0	0.0	0.8	-	0.0	3.3	1.3	-	0.0	-	-	-	-	0.2
2009	17.1	1.0	-	0.5	0.0	1.2	-	0.1	1.6	0.6	-	-	0.0	-	0.1	-	1.0
2014	13.5	0.4	0.3	0.2	0.1	1.3	0.1	0.0	6.0	0.7	-	0.0	0.0	-	0.2	0.0	0.5
2019	6.9	0.9	0.0	0.5	0.0	0.4	-	0.1	4.2	1.3	1.7	-	-	0.2	-	0.8	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Erigeron speciosus (aspen fleabane)	Eriogonum ovalifolium (cushion buckwheat)	Galium[a] (bedstraw)	Geranium richardsonii (Richardson's geranium)	Hymenoxys hoopesii (owl's-claws)	Iris missouriensis (Rocky Mountain iris)	Lathyrus lanszwertii (Nevada pea)	Lewisia pygmaea (alpine lewisia)	Lupinus (lupine)	Lupinus argenteus (silvery lupine)	Noccaea fendleri ssp. glauca (alpine pennycress)	Orthocarpus[a] (owl's-clover)	Polygonum ramosissimum[a] (bushy knotweed)	Potentilla gracilis (slender cinquefoil)	Pseudocymopterus montanus (alpine false springparsley)	Pseudostellaria jamesiana (tuber starwort)	Ranunculus inamoenus (graceful buttercup)
year	Nested Frequency																
2004	-	4	-	5	74	209	144	-	-	15	-	-	35	28	14	11	-
2009	22	12	-	30	21	271	236	-	18	21	5	2	-	26	10	55	-
2014	102	-	49	3	100	267	191	-	-	32	2	-	12	34	19	30	1
2019	25	-	19	15	68	288	79	28	2	26	21	-	27	51	8	175	8
year	Average Cover (%)																
2004	-	0.0	-	0.3	4.2	13.5	2.9	-	-	0.3	-	-	0.2	0.5	0.1	0.1	-
2009	0.5	0.1	-	0.4	0.3	20.8	10.0	-	0.7	0.8	0.0	0.0	-	0.5	0.1	1.6	-
2014	1.8	-	0.5	0.0	2.7	19.5	2.9	-	-	0.4	0.1	-	0.1	0.6	0.1	0.4	0.0
2019	0.1	-	0.1	0.3	2.6	16.2	1.3	0.3	0.0	0.2	0.2	-	0.3	0.9	0.1	6.2	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Senecio integerrimus[ai] (lambstongue ragwort)	Silene drummondii (Drummond's campion)	Symphyotrichum (aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius[ai] (yellow salsify)	Trifolium (clover)	Vicia americana (American vetch)
year	Nested Frequency						
2004	36	-	226	119	5	-	-
2009	2	-	92	118	12	-	-
2014	3	4	65	136	22	2	30
2019	17	10	84	114	21	-	30
year	Average Cover (%)						
2004	0.6	-	4.8	1.9	0.0	-	-
2009	0.0	-	2.4	2.3	0.1	-	-
2014	0.1	0.0	1.7	2.0	0.2	0.0	0.1
2019	0.1	0.0	1.7	2.8	0.2	-	0.4

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 13A-17.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia cana[p] (silver sagebrush)	Dasiphora fruticosa (shrubby cinquefoil)	Populus tremuloides[t] (quaking aspen)
year	Line Intercept Cover (%)		
2004	0.2	0.2	-
2009	0.5	-	-
2014	2.2	0.1	-
2019	2.8	0.1	-
year	Quadrat Cover (%)		
2004	0.2	0.1	-
2009	0.7	-	-
2014	0.9	0.0	0.0
2019	2.9	0.0	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 13A-17.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Artemisia cana[p] -- (silver sagebrush)									
2004	100	-	0	100	0	80	0	0	55/81
2009	320	-	31	69	0	0	0	25	47/55
2014	500	-	24	76	0	0	0	8	56/87
2019	460	780	9	70	22	30	0	22	47/86
Dasiphora fruticosa -- (shrubby cinquefoil)									
2004	20	-	0	100	0	0	0	0	41/88
2009	-	-	-	-	-	-	-	-	35/71
2014	80	-	75	25	0	75	0	0	26/53
2019	20	-	0	100	0	100	0	0	29/63
Rosa woodsii[p] -- (Woods' rose)									
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	45/46
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	79/69
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	52/78

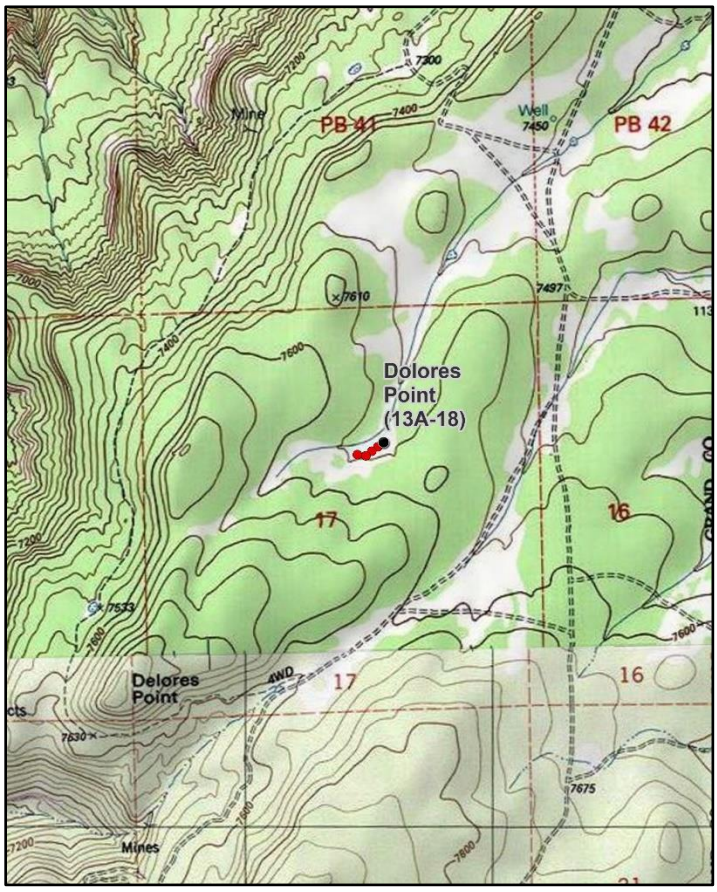
t - Tree Species; p - Preferred Browse; i - Introduced Species

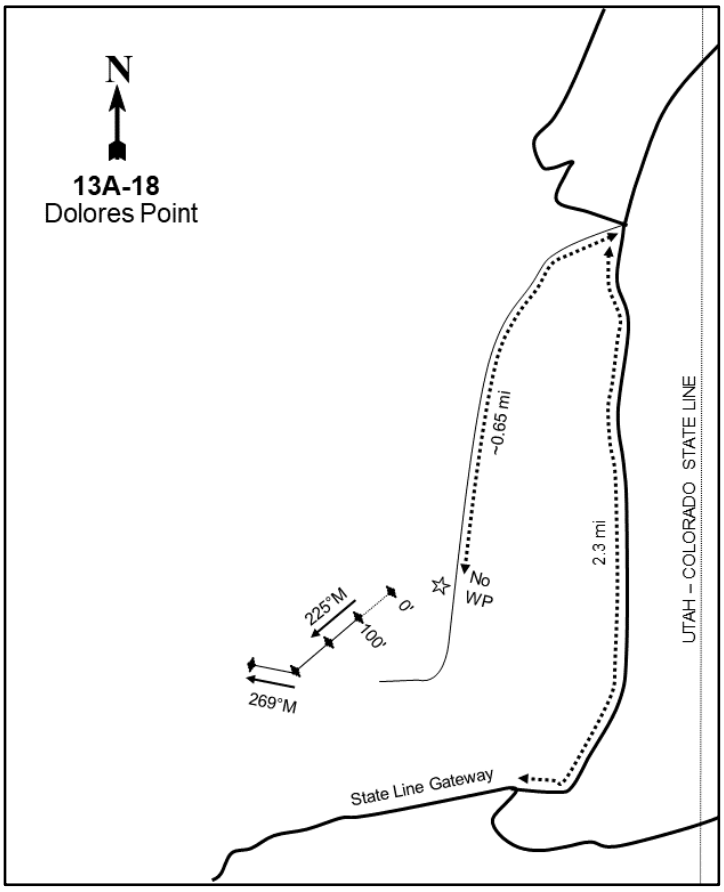
Table 13A-17.13a - Aspen Characteristics. Characteristics of aspen populations including density, size class distribution, and vigor of plants.

Year	Density	Size Class Distribution				Utilization		Poor Vigor (%)
	Plants per Acre	Class I (%)	Class II (%)	Class III (%)	Class IV (%)	Moderate (%)	Heavy (%)	
Populus tremuloides (quaking aspen)								
2014	20	-	100	-	-	0	0	0
2019	40	100	-	-	-	0	0	0

Class I - <= 1.5 feet; Class II - > 1.5 feet to 5 feet; Class III - > 5 feet and up to 1 inch diameter at breast height (dbh); Class IV - > 1 in diameter at breast height (dbh)

DOLORES POINT - STUDY NO. 13A-18





Location Information

USGS 7.5 min Map Info	Dolores Point North ; Township 25S, Range 26E, Section 17
GPS (0' Stake)	NAD 83 UTM ZONE 12, 667498 East 4277763 North

Transect Information

Browse Tag # (0' Stake)	572
Transect Bearing	225° magnetic (Line 4: 269° magnetic)
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

From Moab, follow UT-128 along the Colorado River for 16 miles to the La Sal Loop Road and Castle Valley. Travel on the La Sal Loop Road for 10.7 miles to the junction of La Sal Loop Road and Mountain Loop Road: take a left onto this main road. Proceed for approximately 7.6 miles to a "T" junction. At this "T" turn right onto the Paradox Trail/Gateway Road. From this turn, follow the road through a winding section and pass by the Taylor Flat Road and Pine Ridge Road. Proceed for 10.7 miles, bearing northeast after passing Pine Ridge. After the 10.7 miles, you will come to another "T" junction. Continue straight (to the east): this road is the Dolores Point Road. Proceed for 2.3 miles to a "Y" intersection. Bear left and follow this road for 0.2 miles, at which point you will come to a 4-way turn in a sagebrush flat. Turn left and proceed down this road for 0.65 miles, passing a water pond and coming to an open sagebrush flat. Park before getting to the tree patch and the site is on the right (east) side of the two-track in the clearing.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	No data
Elevation	7,550ft (2,301m)
Aspect	Northwest
Slope	5%
Sample Dates	06/20/2019

Table 13A-18.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Hand Crew - Lop and Scatter	Moab Mule Deer Winter Range Habitat Improvement-Phase 3	4514	November 2018	1470

Wildlife Habitat and Vegetation History

Table 13A-18.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter

Table 13A-18.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2019	Mountain Big Sagebrush	Phase I

Site Notes

No Notes

Soils

Table 13A-18.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	6.7	35.8	45.1	19.1	2.9	11.3	172.0	0.5	06/20/2019

Site Potential

1981 - 2010 Average Annual Precipitation	21 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R048AY405UT
States and Transitions	No state and transition model is available for this ecological site.

At the time of study establishment in 2019, this study is a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) ecological site with a diverse understory dominated by native grasses and forbs (Table 13A-18.7, Table 13A-18.10, Table 13A-18.11). Preferred browse cover is primarily supplied by mountain big sagebrush along with a diverse mixture of other mountain shrub species present such as Gambel oak (*Quercus gambelii*) and Utah serviceberry (*Amelanchier utahensis*) (Table 13A-18.12, Table 13A-18.13). The dominant grass species on the site is the native species needle and thread (*Hesperostipa comata*): co-dominant species include the native graminoids obtuse sedge (*Carex obtusata*), muttongrass (*Poa fendleriana*), and Sandberg bluegrass (*Poa secunda*) (Table 13A-18.10). Forbs are diverse and abundant with maiden blue eyed Mary (*Collinsia parviflora*) and pinyon groundsmoke (*Gayophytum ramosissimum*) as the dominant species (Table 13A-18.11). Both Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) were sampled in point quarter data in low abundance, placing the site within Phase I of woodland succession (Table 13A-18.4, Table 13A-18.14, Photos).

Trend Summary Tables

Table 13A-18.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2019	17.1	8.4	0.0	20.6	10.6	0.1

Table 13A-18.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2019	27	370	367	277	0.2	21.2	12.0	9.7

Table 13A-18.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2019	19.0	4.7	57.4	-	0.4	48.1

Table 13A-18.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
2019	6	26	39	15
Year	Days Use Per Acre (ha)			
2019	18.9 (46.6)	16.1 (39.7)	77.1 (190.4)	-

Table 13A-18.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Bouteloua gracilis (blue grama)	Bromus tectorum[ai] (cheatgrass)	Carex geyeri (Geyer's sedge)	Carex obtusata (obtuse sedge)	Elymus elymoides (squirreltail)	Elymus lanceolatus (thickspike wheatgrass)	Hesperostipa comata (needle and thread)	Koeleria macrantha (prairie Junegrass)	Pascopyrum smithii (western wheatgrass)	Poa fendleriana (muttongrass)	Poa pratensis[i] (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Vulpia octoflora[a] (sixweeks fescue)
year	Nested Frequency												
2019	33	26	25	125	44	21	233	72	3	91	12	87	1
year	Average Cover (%)												
2019	0.4	0.2	0.2	2.9	1.3	0.2	9.0	1.6	0.0	2.8	0.0	2.8	0.0

a - Annual; n - Noxious Weed; i - Introduced Species

Table 13A-18.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Allium (onion)	Antennaria dimorpha (low pussytoes)	Artemisia carruthii (Carruth's sagewort)	Astragalus (milkvetch)	Astragalus tenellus (looseflower milkvetch)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata[ai] (curveseed butterwort)	Chenopodium fremontii[a] (Fremont's goosefoot)	Chenopodium leptophyllum[a] (narrowleaf goosefoot)	Collinsia parviflora[a] (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)	Cordylanthus[a] (bird's-beak)	Delphinium nuttallianum (twolobe larkspur)	Draba[a] (draba)	Erigeron pumilus (shaggy fleabane)	Eriogonum racemosum (redroot buckwheat)
year	Nested Frequency																
2019	1	0	5	4	0	12	38	51	16	42	248	21	11	37	72	30	87
year	Average Cover (%)																
2019	0.0	0.0	0.0	0.0	0.1	0.3	0.4	0.2	0.0	0.2	4.2	0.2	0.0	0.3	0.4	0.3	2.5

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Gayophytum ramosissimum[a] (pinyon groundsmoke)	Hedysarum boreale (Utah sweetvetch)	Lappula occidentalis[a] (flatspine stickseed)	Linanthus (linanthus)	Linum lewisii (Lewis flax)	Lithophragma tenellum (slender woodland-star)	Lomatium (desertparsley)	Lupinus argenteus (silvery lupine)	Machaeranthera canescens (hoary tansyaster)	Medicago sativa[i] (alfalfa)	Microsteris gracilis[a] (slender phlox)	Oenothera pallida[a] (pale evening primrose)	Penstemon strictus (Rocky Mountain penstemon)	Phlox longifolia (longleaf phlox)	Polygonum douglasii[a] (Douglas' knotweed)	Senecio integerrimus[a] (lambstongue ragwort)	Silene antirrhina[a] (sleepy silene)
year	Nested Frequency																
2019	235	2	83	152	1	3	4	15	0	2	7	2	3	15	86	4	3
year	Average Cover (%)																
2019	5.4	0.1	0.8	2.4	0.0	0.0	0.0	0.8	0.0	0.0	0.1	0.0	0.0	0.4	0.6	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Silene drummondii (Drummond's campion)	Sphaeralcea coccinea (scarlet globemallow)	Tragopogon dubius[ai] (yellow salsify)	Trifolium (clover)
year	Nested Frequency			
2019	12	67	8	4
year	Average Cover (%)			
2019	0.0	1.6	0.1	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 13A-18.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis[p] (Utah serviceberry)	Artemisia frigida[p] (prairie sagewort)	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus	Eriogonum microthecum[p] (slender buckwheat)	Juniperus osteosperma[t] (Utah juniper)	Mahonia repens (creeping barberry)	Quercus gambelii[p] (Gambel oak)
year	Line Intercept Cover (%)							
2019	0.3	-	15.6	9.4	0.5	0.1	1.2	4.2
year	Quadrat Cover (%)							
2019	0.3	0.0	12.9	7.2	0.7	0.0	1.2	3.1

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 13A-18.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
2019	60	-	0	100	0	33	33	33	56/72
Artemisia frigida[p] -- (prairie sagewort)									
2019	60	-	0	100	0	0	0	0	16/11
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
2019	7700	660	28	57	14	18	8	18	45/59
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
2019	7180	40	8	91	1	0	0	1	22/34
Eriogonum microthecum[p] -- (slender buckwheat)									
2019	520	-	0	100	0	0	15	0	22/32
Juniperus osteosperma[t] -- (Utah juniper)									
2019	20	-	0	0	100	0	0	100	- / -
Mahonia repens -- (creeping barberry)									
2019	4460	-	0	100	0	0	0	0	7/10
Pediocactus -- (pincushion cactus)									
2019	-	-	-	-	-	-	-	-	5/12
Quercus gambelii[p] -- (Gambel oak)									
2019	1140	-	0	97	4	0	0	4	67/45

t - Tree Species; p - Preferred Browse; i - Introduced Species

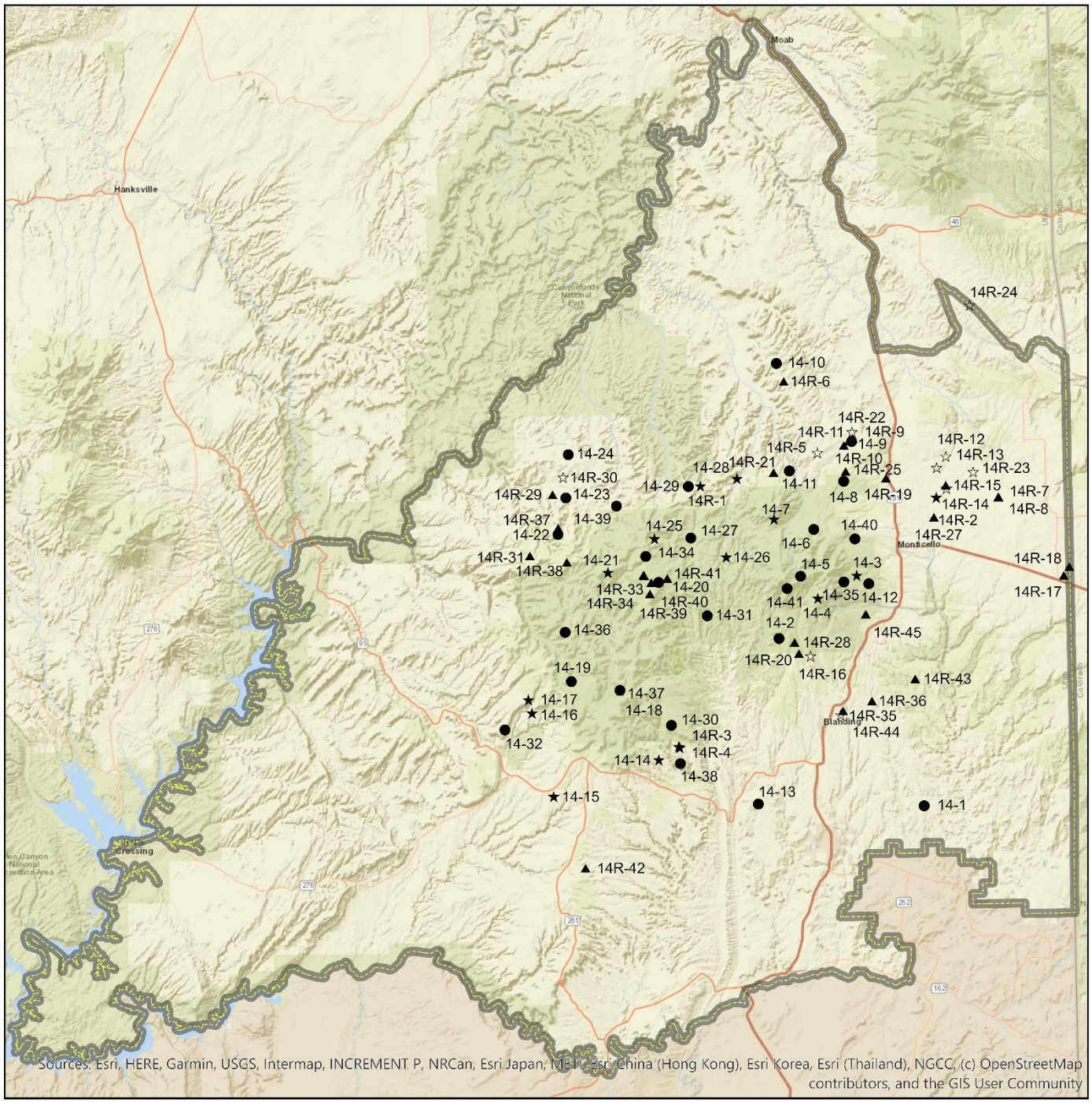
Table 13A-18.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2019	4	50	50	-	-	-	5.0
Pinus edulis (twoneedle pinyon)							
2019	26	50	50	-	-	-	1.5

Table 13A-18.15 – Deer Desirable Components Index: High Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
2019	24.8	11.5	10.6	30.0	-0.2	10.0	0.0	86.7	Good

WILDLIFE MANAGEMENT UNIT 14 - SAN JUAN



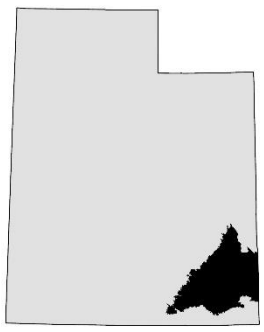
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Study Location
Project, Status

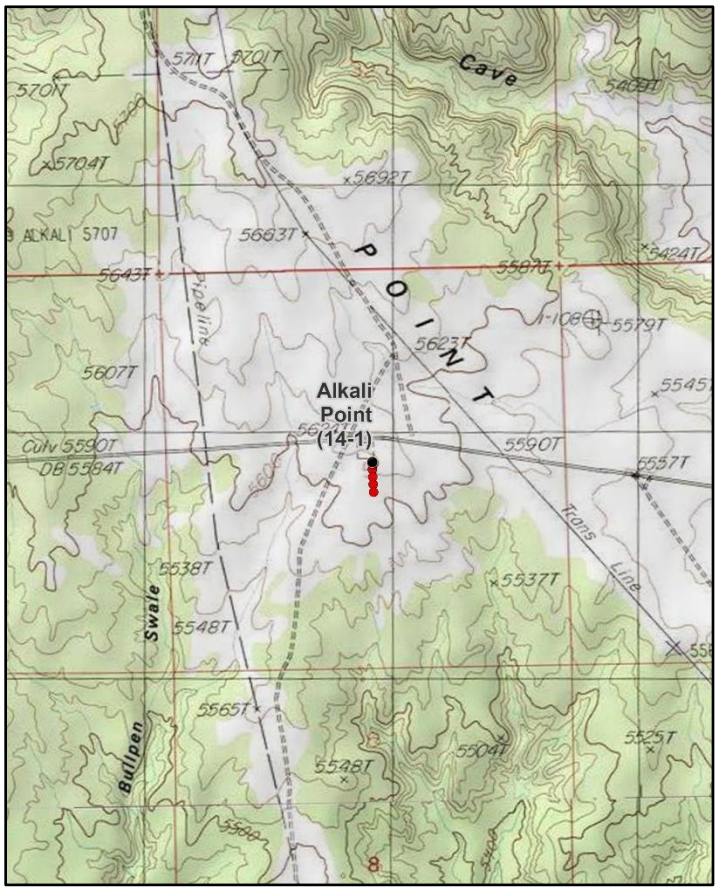
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- RT,Suspended
- WRI,Active
- WRI,Suspended
- Unit - 14

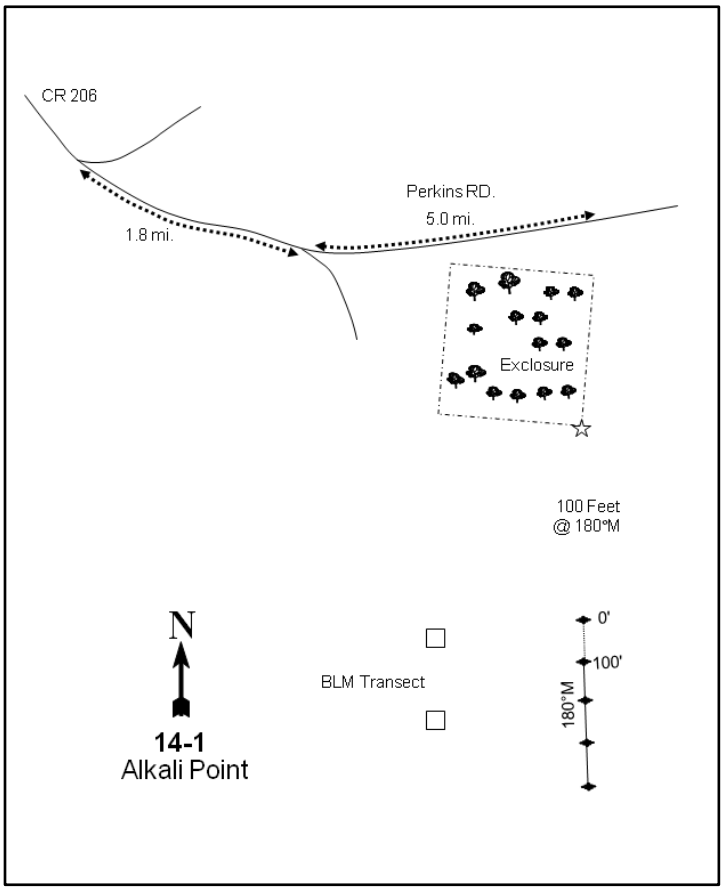
Miles
0 4.25 8.5 17 25.5 34 42.5 51 59.5 68

Area of Interest



ALKALI POINT - STUDY NO. 14-1





Location Information

USGS 7.5 min Map Info	Bradford Canyon SE; Township 38S, Range 24E, Section 05
GPS (0' Stake)	NAD 83 UTM ZONE 12, 649869 East 4153067 North

Transect Information

Browse Tag # (0' Stake)	7549
Transect Bearing	180° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

Turn east by A&M Propane, 0.2 miles south of the UDOT shed on the south end of Blanding on State Road l91, then travel 1.15 miles. Turn right (south) on County Road 206 and travel along the main gravel road for 7.0 miles to a fork. Stay right (passing the turnoff to “mustang," County Road 207) and proceed 1.8 miles to another fork. Stay left at this fork and continue for 5 miles. Stop at the northeast corner of the exclosure on the right (south) side of the road. The transect starts 100 feet off of the southeast corner (in line with the east boundary fence) of the exclosure and runs south from there. The 0-foot baseline stake is a fencepost marked with browse tag #7549.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	CAVE CANYON
Elevation	5,600ft (1,707m)
Aspect	West
Slope	5%
Sample Dates	06/21/1994, 06/30/1999, 06/24/2004, 06/18/2009, 06/19/2012, 06/26/2014, 06/17/2019

Wildlife Habitat and Vegetation History

Table 14-01.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter

Table 14-01.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1986	Wyoming Big Sagebrush	Phase I
1994	Wyoming Big Sagebrush	Phase I
1999	Wyoming Big Sagebrush	Phase I
2004	Wyoming Big Sagebrush	Phase I
2009	Wyoming Big Sagebrush	Phase I
2012	Wyoming Big Sagebrush	Phase I
2014	Wyoming Big Sagebrush	Phase I
2019	Wyoming Big Sagebrush/Annual Forb	Phase I

Site Notes

Water is limited on the flat. A two-track road runs through belt 4. Sagebrush is very decadent on this site.

Soils

Table 14-01.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	7.4	62.9	14.5	22.6	1.6	5.8	54.4	0.4	06/30/1999

Site Potential

1981 - 2010 Average Annual Precipitation	11 inches
NRCS Ecological Site	Semidesert Loam (Wyoming Big Sagebrush)
NRCS Ecological Site #	R035XY209UT
States and Transitions	A defined state and transition model is available.

Since establishment in 1986, this study site has remained dominated by Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), although density and decadence have increased over time (Table 14-01.12, Table 14-01.13). The herbaceous understory has been comprised of the introduced annual species cheatgrass (*Bromus tectorum*) in most sample years. However, annual forbs -- particularly the introduced species redstem stork's bill (*Erodium cicutarium*) -- increased and became a co-dominant vegetation component in 2019 (Table 14-01.7, Table 14-01.10, Table 14-01.11). Continued decadence and death of sagebrush could cause this community to transition to one solely dominated by annual grasses and/or forbs. In addition, Utah juniper (*Juniperus osteosperma*) has been observed in all sample years. Should trees increase in the future, this plant community could transition to one dominated by juniper. However, point-quarter data and site photos indicate that tree density has remained low since 1994, placing this site in Phase I of woodland succession (Table 14-01.14, Photos). Although a state and transition model is available for this site, it does not define the state of the current plant community as of 2019 (Jornada, 2019).

Trend Summary Tables

Table 14-01.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	11.2	2.9	0.6	-	-	-
1999	8.6	1.3	0.0	-	-	0.1
2004	7.4	6.3	0.8	5.5	5.9	1.0
2009	3.8	0.0	0.8	4.7	-	1.6
2012	2.7	0.8	0.6	3.9	0.4	1.8
2014	3.7	1.6	1.8	3.3	2.3	2.4
2019	0.4	0.7	1.0	0.5	0.3	2.3

Table 14-01.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	357	128	118	68	4.0	1.7	0.4	0.3
1999	487	28	61	6	24.0	0.4	0.4	0.0
2004	311	23	246	28	14.3	0.3	3.7	0.2
2009	339	26	75	198	18.7	0.3	1.1	1.4
2012	424	42	162	60	16.4	0.7	1.7	0.4
2014	258	47	251	74	5.0	0.5	3.2	0.9
2019	375	30	436	85	8.2	0.7	33.6	0.9

Table 14-01.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	52.6	1.8	23.9	0.2	0.0	22.4
1999	29.9	2.0	41.7	0.0	0.7	32.4
2004	45.1	0.8	30.6	0.0	0.2	33.5
2009	35.9	1.3	52.2	0.0	0.5	24.2
2012	40.4	2.1	40.2	0.2	0.2	25.2
2014	49.5	1.2	31.5	0.0	0.2	21.2
2019	36.0	1.1	41.0	0.1	0.4	40.7

Table 14-01.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
1994	-	43	6	-	67
1999	5	37	-	-	36
2004	-	53	-	-	4
2009	3	48	1	-	23
2012	1	40	1	-	4
2014	2	55	-	1	14
2019	3	57	8	1	14
Year	Days Use Per Acre (ha)				
1994	-	-	-	-	-
1999	2.2 (5.4)	135.4 (334.4)	-	-	-
2004	5.8 (14.3)	103.2 (254.9)	2.0 (5.0)	-	-
2009	12.3 (30.5)	119.3 (294.6)	-	-	-
2012	3.6 (9.0)	25.5 (62.9)	1.3 (3.3)	-	-
2014	8.0 (19.7)	113.9 (281.4)	-	-	-
2019	11.6 (28.7)	91.8 (226.8)	-	-	-

Table 14-01.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus tectorum[ai] (cheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Pleuraphis jamesii (James' galleta)	Sporobolus cryptandrus (sand dropseed)	Vulpia octoflora[a] (sixweeks fescue)
year	Nested Frequency						
1994	10	329	115	-	12	-	183
1999	6	487	16	-	7	-	180
2004	7	310	9	-	7	-	9
2009	3	337	9	-	14	-	10
2012	7	422	16	4	15	-	40
2014	7	236	7	-	27	6	62
2019	6	343	2	-	19	3	173
year	Average Cover (%)						
1994	0.2	3.6	1.4	-	0.1	-	0.4
1999	0.0	22.4	0.2	-	0.2	-	1.7
2004	0.1	14.3	0.1	-	0.1	-	0.0
2009	0.0	18.7	0.1	-	0.2	-	0.0
2012	0.1	16.3	0.4	0.0	0.2	-	0.1
2014	0.0	4.9	0.2	-	0.3	0.0	0.1
2019	0.0	6.7	0.0	-	0.6	0.0	1.5

a - Annual; n - Noxious Weed; i - Introduced Species

Table 14-01.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Arabis (rockcress)	Astragalus (milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus mollissimus (woolly locoweed)	Astragalus nuttallianus[a] (smallflowered milkvetch)	Calochortus nuttallii (sego lily)	Chamaesyce fendleri (Fendler's sandmat)	Cordylanthus wrightii[a] (Wright's bird's beak)	Cryptantha[a] (annual cryptantha)	Cymopterus acaulis (plains springparsley)	Descurainia pinnata[a] (western tansymustard)	Draba[a] (draba)	Eriogonum cemuum[a] (nodding buckwheat)	Erodium cicutarium[ai] (redstem stork's bill)	Gilia inconspicua[a] (shy gilia)	Lappula occidentalis[a] (flatspine stickseed)	Mentzelia albicaulis[a] (whitestem blazingstar)
year	Nested Frequency																
1994	-	51	9	-	-	-	-	67	14	2	-	-	-	8	4	28	-
1999	-	-	6	-	-	-	-	-	-	-	-	-	-	54	-	-	-
2004	-	-	16	-	203	-	-	-	-	-	6	-	2	37	3	47	-
2009	-	-	6	-	-	-	185	3	-	-	-	-	-	67	-	4	-
2012	-	-	31	-	-	-	-	-	4	-	4	-	-	137	-	16	-
2014	1	-	38	2	162	-	-	-	2	1	3	3	-	106	-	57	-
2019	16	-	41	2	206	6	-	58	72	-	72	-	6	326	8	20	1
year	Average Cover (%)																
1994	-	0.1	0.0	-	-	-	-	0.3	0.1	0.0	-	-	-	0.0	0.0	0.1	-
1999	-	-	0.0	-	-	-	-	-	-	-	-	-	-	0.3	-	-	-
2004	-	-	0.1	-	2.1	-	-	-	-	-	0.0	-	0.0	0.5	0.0	1.0	-
2009	-	-	0.0	-	-	-	1.1	0.2	-	-	-	-	-	0.9	-	0.0	-
2012	-	-	0.1	-	-	-	-	-	0.0	-	0.0	-	-	1.6	-	0.0	-
2014	0.0	-	0.3	0.0	1.9	-	-	-	0.0	0.0	0.0	0.0	-	0.8	-	0.4	-
2019	0.1	-	0.3	0.0	5.3	0.0	-	1.2	1.7	-	0.8	-	0.2	17.7	0.0	0.1	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Navarretia intertexta[a] (needleleaf navarretia)	Oenothera coronopifolia (crownleaf evening primrose)	Phlox longifolia (longleaf phlox)	Plantago patagonica[a] (woolly plantain)	Salsola tragus[ai] (prickly Russian thistle)	Sisymbrium altissimum[ai] (tall tumblemustard)	Sphaeralcea grossulariifolia (gooseberryleaf globemallow)
year	Nested Frequency						
1994	-	-	2	8	-	-	16
1999	7	-	-	2	-	-	-
2004	11	-	3	5	-	-	10
2009	-	-	3	4	-	-	16
2012	4	-	5	28	-	-	25
2014	3	-	-	17	1	3	36
2019	103	5	5	160	-	47	34
year	Average Cover (%)						
1994	-	-	0.0	0.0	-	-	0.2
1999	0.0	-	-	0.0	-	-	-
2004	0.0	-	0.0	0.0	-	-	0.1
2009	-	-	0.0	0.0	-	-	0.3
2012	0.0	-	0.0	0.1	-	-	0.3
2014	0.0	-	-	0.1	0.0	0.0	0.6
2019	0.8	0.0	0.0	2.9	-	2.7	0.5

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 14-01.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. wyomingensis[p] (Wyoming big sagebrush)	Echinocereus (hedgehog cactus)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma[t] (Utah juniper)	Krascheninnikovia lanata[p] (winterfat)	Opuntia polyacantha (plains pricklypear)
year	Line Intercept Cover (%)					
1994	-	-	-	-	-	-
1999	-	-	-	-	-	-
2004	5.5	-	5.9	1	-	-
2009	4.7	-	-	1.6	-	-
2012	3.9	-	0.4	1.8	-	-
2014	3.3	0.1	2.2	2.4	-	-
2019	0.5	-	0.3	2.3	-	-
year	Quadrat Cover (%)					
1994	11.2	-	2.9	0.6	-	0.0
1999	8.6	0.0	1.3	0.0	-	-
2004	7.4	0.1	6.1	0.8	-	-
2009	3.8	0.0	0.0	0.8	-	-
2012	2.7	0.1	0.6	0.6	-	-
2014	3.7	0.0	1.6	1.8	0.0	-
2019	0.4	0.1	0.6	1.0	-	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 14-01.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Artemisia tridentata ssp. wyomingensis[p] -- (Wyoming big sagebrush)									
1994	2680	120	0	37	63	26	13	49	59/88
1999	2160	-	0	20	80	52	46	18	66/84
2004	2100	20	0	10	91	35	64	85	59/82
2009	1660	20	0	18	82	40	52	75	67/98
2012	1280	40	0	33	67	0	97	84	65/76
2014	1720	-	4	35	62	26	69	22	62/74
2019	400	-	0	10	90	5	95	90	57/66
Echinocereus -- (hedgehog cactus)									
1994	-	-	-	-	-	-	-	-	-/-
1999	20	-	0	100	0	0	0	0	20/34
2004	20	-	0	100	0	0	0	0	16/37
2009	20	-	0	100	0	0	0	0	17/52
2012	20	-	0	100	0	0	0	0	17/30
2014	40	-	0	100	0	0	0	0	38/37
2019	20	-	0	0	100	0	0	100	15/26
Ericameria nauseosa -- (rubber rabbitbrush)									
1994	100	40	0	80	20	0	0	0	- / -
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Gutierrezia sarothrae -- (broom snakeweed)									
1994	6840	2380	23	73	3	0	0	2	19/23
1999	4660	80	14	84	2	7	0	1	22/24
2004	31760	-	14	86	1	8	0	31	15/18
2009	-	-	-	-	-	-	-	-	- / -
2012	880	120	32	68	0	0	0	0	16/15
2014	1380	840	16	84	0	0	0	0	25/32
2019	3480	1100	88	12	0	0	0	0	21/15
Juniperus osteosperma[t] -- (Utah juniper)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2014	20	20	0	100	0	0	0	0	- / -
2019	40	-	0	100	0	0	0	0	- / -
Krascheninnikovia lanata[p] -- (winterfat)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2014	20	-	100	0	0	0	0	0	- / -
2019	-	-	-	-	-	-	-	-	-/-

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Lycium pallidum -- (pale desert-thorn)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2012	20	-	0	100	0	0	0	0	36/6
2014	-	-	-	-	-	-	-	-	-/-
2019	20	-	0	100	0	0	0	0	65/59
Opuntia polyacantha -- (plains pricklypear)									
1994	120	20	17	67	17	0	0	0	6/10
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	10/25
2009	-	-	-	-	-	-	-	-	10/36
2012	-	-	-	-	-	-	-	-	17/63
2014	20	-	0	100	0	0	0	0	12/27
2019	20	-	0	0	100	0	0	100	12/21

t - Tree Species; p - Preferred Browse; i - Introduced Species

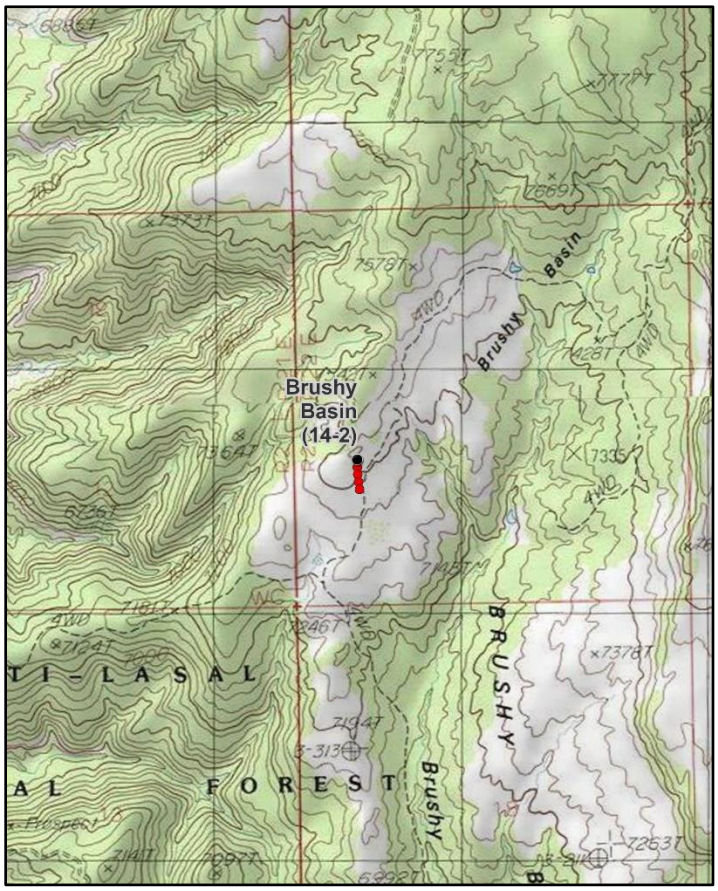
Table 14-01.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

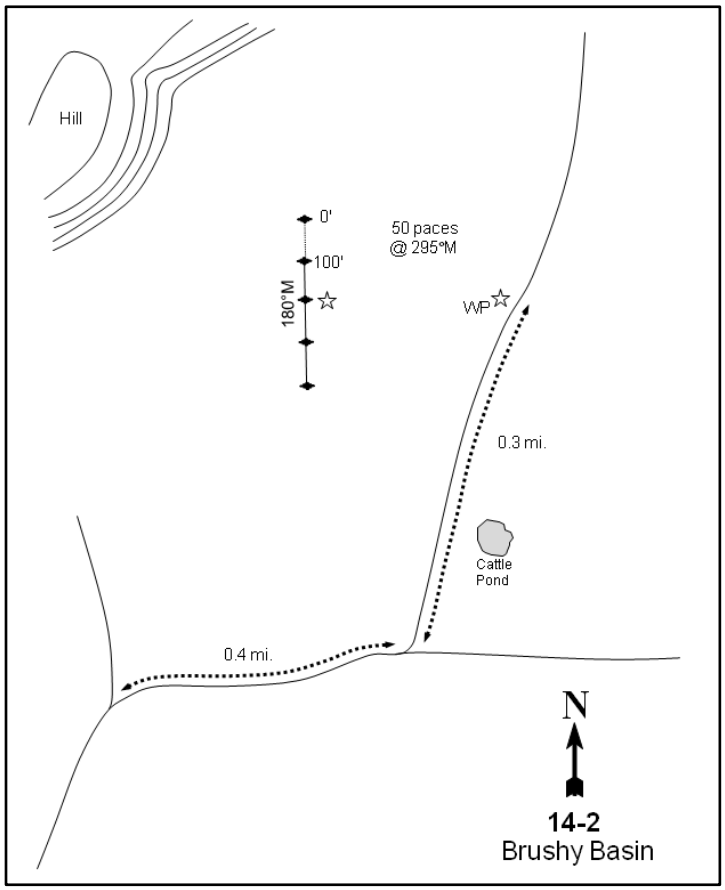
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1994	5	-	-	-	-	-	15.5
2009	4	-	-	-	100	-	28.0
2014	5	-	25	25	50	-	18.3
2019	4	-	-	50	50	-	31.8

Table 14-01.15 - Deer Desirable Components Index: Low Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1994	14.0	-4.0	0.0	3.5	-3.0	0.7	0.0	11.1	Very Poor-Poor
1999	10.8	-8.9	0.0	0.8	-18.0	0.0	0.0	-15.3	Very Poor
2004	6.9	-12.2	0.0	0.5	-10.8	0.3	0.0	-15.2	Very Poor
2009	5.9	0.0	0.0	0.6	-14.0	2.8	0.0	-4.7	Very Poor
2012	4.9	0.0	0.0	1.3	-12.3	0.8	0.0	-5.3	Very Poor
2014	4.1	0.0	0.0	1.0	-3.8	1.8	0.0	3.2	Very Poor
2019	0.6	0.0	0.0	1.4	-6.1	1.9	0.0	-2.3	Very Poor

BRUSHY BASIN - STUDY NO. 14-2





Location Information

USGS 7.5 min Map Info	Mancos Jim Butte NE; Township 35S, Range 22E, Section 07
GPS (0' Stake)	NAD 83 UTM ZONE 12, 627520 East 4178828 North

Transect Information

Browse Tag # (0' Stake)	7869
Transect Bearing	180° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Belt 1: No Rebar

Directions to Site

From Blanding, travel northwest on the mountain road (toward the Causeway, Elk Ridge) to a junction 0.6 miles beyond the Forest Service boundary, then turn left. After 0.05 miles, go straight through an intersection, continue 0.6 miles to a fork, then proceed to the left. Go 0.75 miles to another fork and bear right. Turn right again after 0.7 miles. Proceed for 0.4 miles and stay left at the fork. After 0.3 miles, you will reach the edge of a chaining. Continue 0.1 miles to a fork and bear right. Go 0.1 miles, pass a stock pond, and continue 0.2 miles to a witness post (green fencepost) ten feet off of the west side of the road. From the witness post, walk 50 feet at 295 degrees magnetic to the 200-foot stake. The 0-foot baseline stake is found 200 feet to the north, and has browse tag #7869 attached.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	CAMP JACKSON
Elevation	7,400ft (2,256m)
Aspect	South
Slope	12%
Sample Dates	06/20/1994, 06/25/1999, 07/02/2004, 06/24/2009, 06/25/2014, 06/19/2019

Table 14-02.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Chain Unknown	-	-	1971	1400
Seeding - Seed Unknown	-	-	1971	1400
Mechanical - Bullhog	Brushy Basin Habitat Improvement Project Phase II	2275	Fall 2012-Winter 2014	573

Wildlife Habitat and Vegetation History

Table 14-02.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	summer
Rocky Mountain Elk	crucial	winter

Table 14-02.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1986	Perennial Grass/Mountain Big Sagebrush	Phase I
1994	Mountain Big Sagebrush	Phase I
1999	Mountain Big Sagebrush	Phase I
2004	Mountain Big Sagebrush/Pinyon-Juniper	Phase I transitioning to Phase II
2009	Mountain Big Sagebrush/Pinyon-Juniper	Phase I transitioning to Phase II
2014	Mountain Big Sagebrush	Phase I
2019	Mountain Big Sagebrush	Phase I

Site Notes

Water is available in a stock pond about 0.2 miles down the road.

Soils

Table 14-02.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay	6.6	46.9	10.5	42.6	2.9	6.8	102.4	0.6	06/25/1999

Site Potential

1981 - 2010 Average Annual Precipitation	19 inches
NRCS Ecological Site	Mountain Stony Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R048AY448UT
States and Transitions	No state and transition model is available for this ecological site.

Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has dominated the shrub component of this site since study establishment in 1986. Other shrubs including (but not limited to) Utah Serviceberry (*Amelanchier utahensis*) and antelope bitterbrush (*Purshia tridentata*) have also been present to a lesser extent (Table 14-02.12, Table 14-02.13, Photos). The herbaceous understory has remained moderately abundant throughout the study period (Table 14-02.7). Composition of the understory has fluctuated, but introduced perennial grasses such as intermediate wheatgrass (*Thinopyrum intermedium*), crested wheatgrass (*Agropyron cristatum*), and smooth brome (*Bromus inermis*) have contributed much of the cover in many sample years (Table 14-02.10). Young twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) trees were scattered across the site upon study establishment (Photos). These trees increased over time (Table 14-02.12, Table 14-02.14), and woodland succession shifted from Phase I to Phase I transitioning to Phase II in 2004. A bullhog project removed many of the pinyon and juniper trees between fall 2012 and winter 2014 (Table 14-02.1), and the site has been considered to be within Phase I of succession since 2014 (Table 14-02.4). However, the continued presence of trees within the vegetation community indicates that this site may be at risk for infilling in future sample years.

Trend Summary Tables

Table 14-02.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	12.3	1.3	1.7	-	-	-
1999	14.7	0.6	4.7	0.3	-	0.3
2004	13.4	0.5	4.7	22.2	0.3	11.7
2009	16.2	0.9	5.2	23.6	0.2	8.9
2014	9.7	0.1	2.0	10.4	-	5.4
2019	23.0	0.9	4.0	25.6	0.1	7.4

Table 14-02.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	1	327	22	152	0.0	11.5	0.1	4.2
1999	8	272	24	153	0.0	7.1	0.1	3.8
2004	-	171	7	101	-	3.5	0.0	2.8
2009	-	186	-	122	-	5.5	-	3.9
2014	-	111	3	94	-	2.1	0.0	1.8
2019	-	162	100	134	-	6.8	1.2	5.0

Table 14-02.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	20.0	0.0	43.4	0.3	4.8	31.4
1999	27.2	0.1	53.3	1.2	5.8	29.9
2004	31.8	0.0	49.1	1.2	7.5	24.7
2009	27.1	0.5	52.4	1.8	5.9	30.5
2014	21.3	0.0	60.4	1.1	5.5	15.5
2019	21.1	0.0	56.2	1.9	7.9	37.0

Table 14-02.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1994	-	5	3	6
1999	4	17	6	30
2004	-	2	6	1
2009	2	4	8	4
2014	-	2	-	6
2019	1	11	4	1
Year	Days Use Per Acre (ha)			
1994	-	-	-	-
1999	32.7 (80.7)	14.1 (34.8)	16.8 (41.4)	-
2004	10.2 (25.1)	23.4 (57.9)	18.7 (46.3)	-
2009	6.5 (16.1)	2.7 (6.6)	18.7 (46.3)	-
2014	-	8.1 (19.9)	6.0 (14.9)	-
2019	3.6 (9.0)	12.8 (31.5)	8.7 (21.5)	-

Table 14-02.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bromus arvensis[ai] (field brome)	Bromus inermis[i] (smooth brome)	Bromus tectorum[ai] (cheatgrass)	Carex (sedge)	Elymus elymoides (squirreltail)	Koeleria macrantha (prairie Junegrass)	Poa fendleriana (muttongrass)	Thinopyrum intermedium[i] (intermediate wheatgrass)
year	Nested Frequency									
1994	1	86	1	-	-	46	29	3	94	252
1999	3	122	6	-	2	23	6	1	94	172
2004	8	70	-	0	-	1	-	-	34	84
2009	1	100	-	2	-	-	11	-	54	78
2014	6	51	-	-	-	-	3	-	32	35
2019	3	64	-	13	-	7	4	8	51	53
year	Average Cover (%)									
1994	0.0	1.6	0.0	-	-	0.8	0.2	0.0	1.2	7.7
1999	0.0	2.7	0.0	-	0.0	0.4	0.0	0.0	0.9	3.1
2004	0.0	1.7	-	0.0	-	0.0	-	-	0.5	1.3
2009	0.0	2.9	-	0.0	-	-	0.2	-	1.3	1.1
2014	0.2	1.0	-	-	-	-	0.0	-	0.7	0.2
2019	0.5	1.5	-	1.2	-	0.0	0.2	0.2	1.8	1.4

a - Annual; n - Noxious Weed; i - Introduced Species

Table 14-02.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium (onion)	Arabis (rockcress)	Astragalus miser (timber milkvetch)	Camelina microcarpa[ai] (littlepod false flax)	Chenopodium album[a] (lambsquarters)	Cirsium (thistle)	Crepis acuminata (tapertip hawksbeard)	Cymopterus (springparsley)	Descurainia pinnata[a] (western tansymustard)	Eriogonum elatum (tall woolly buckwheat)	Eriogonum racemosum (redroot buckwheat)	Helianthella uniflora (oneflower helianthella)	Lactuca serriola[ai] (prickly lettuce)	Lappula occidentalis[a] (flatspine stickseed)	Lesquerella fendleri (Fendler's bladderpod)
year	Nested Frequency																
1994	-	-	2	1	4	-	-	6	2	46	-	3	4	6	9	3	27
1999	-	-	3	7	4	-	-	11	10	45	-	-	10	15	-	-	20
2004	-	-	-	-	12	-	-	-	-	11	-	-	5	-	-	-	7
2009	1	-	0	-	13	-	-	-	4	18	-	2	5	-	-	-	13
2014	-	-	1	-	14	-	-	-	-	13	1	-	3	15	-	2	3
2019	2	4	12	12	20	5	9	6	1	23	48	-	9	-	6	35	-
year	Average Cover (%)																
1994	-	-	0.0	0.0	0.2	-	-	0.0	0.0	0.3	-	0.0	0.0	0.1	0.0	0.0	0.1
1999	-	-	0.0	0.0	0.2	-	-	0.1	0.0	0.5	-	-	0.1	0.4	-	-	0.1
2004	-	-	-	-	0.4	-	-	-	-	0.0	-	-	0.0	-	-	-	0.0
2009	0.0	-	0.0	-	0.3	-	-	-	0.0	0.1	-	0.0	0.0	-	-	-	0.1
2014	-	-	0.0	-	0.2	-	-	-	-	0.2	0.0	-	0.1	0.3	-	0.0	0.0
2019	0.0	0.0	0.1	0.1	0.7	0.2	0.0	0.2	0.0	0.9	0.6	-	0.1	-	0.0	0.2	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Lupinus (lupine)	Machaeranthera canescens (hoary tansyaster)	Machaeranthera grindelioides (rayless tansyaster)	Medicago sativa[i] (alfalfa)	Melilotus officinalis[i] (sweetclover)	Packera multilobata (lobeleaf groundsel)	Pedicularis centranthera (dwarf lousewort)	Penstemon caespitosus (mat penstemon)	Penstemon comarrhenus (dusty beardtongue)	Penstemon pachyphyllus (thickleaf beardtongue)	Penstemon thompsoniae (Thompson's beardtongue)	Phlox longifolia (longleaf phlox)	Polygonum douglasii[a] (Douglas' knotweed)	Symphyotrichum (aster)	Tetraneuris acaulis (stemless four-nerve daisy)	Tragopogon dubius[ai] (yellow salsify)	Trifolium gymnocarpon (hollyleaf clover)
year	Nested Frequency																
1994	1	-	-	0	20	-	9	52	-	3	-	8	6	-	9	8	4
1999	7	-	5	3	5	-	-	0	-	7	62	-	23	-	6	1	3
2004	3	1	6	2	3	-	0	40	7	2	-	0	7	-	4	-	2
2009	2	-	3	-	2	-	9	58	3	22	-	4	-	-	4	-	4
2014	6	-	-	0	-	-	5	-	-	-	46	6	-	-	6	-	6
2019	1	-	5	3	-	2	12	50	3	5	-	2	29	10	5	-	5
year	Average Cover (%)																
1994	0.1	-	-	0.2	1.0	-	0.3	1.4	-	0.0	-	0.0	0.0	-	0.2	0.1	0.1
1999	0.2	-	0.1	0.0	0.0	-	-	0.1	-	0.1	1.8	-	0.1	-	0.1	0.0	0.0
2004	0.2	0.0	0.1	0.0	0.0	-	0.0	1.5	0.0	0.0	-	0.0	0.0	-	0.0	-	0.0
2009	0.2	-	0.2	-	0.0	-	0.3	1.7	0.1	0.7	-	0.0	-	-	0.0	-	0.0
2014	0.2	-	-	0.0	-	-	0.3	-	-	-	0.3	0.0	-	-	0.0	-	0.2
2019	0.2	-	0.0	0.2	-	0.0	0.9	1.1	0.0	0.0	-	0.0	0.2	0.2	0.2	-	0.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	unknown perennial forb (unknown forb)
year	Nested Frequency
1994	-
1999	-
2004	21
2009	-
2014	-
2019	-
year	Average Cover (%)
1994	-
1999	-
2004	0.4
2009	-
2014	-
2019	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 14-02.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis[p] (Utah serviceberry)	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Cercocarpus montanus[p] (alderleaf mountain mahogany)	Chrysothamnus depressus[p] (longflower rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. hololeuca[p] (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma[t] (Utah juniper)	Opuntia (pricklypear)	Pinus edulis[t] (twoneedle pinyon)	Purshia tridentata[p] (antelope bitterbrush)	Quercus gambelii[p] (Gambel oak)	Yucca (yucca)
year	Line Intercept Cover (%)											
1994	-	-	-	-	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-	-	-	-	-
2004	6.9	11	0.6	-	-	0.3	2.2	-	9.5	2.1	1.6	-
2009	5.2	13.7	0.7	-	-	0.2	1.6	-	7.3	2.8	1.2	-
2014	0	9.2	0.7	0	-	-	0.6	-	4.8	0.5	-	-
2019	2.9	17.5	1	-	0.1	0.1	1.2	-	6.2	2.6	1.5	-
year	Quadrat Cover (%)											
1994	3.0	5.2	-	0.2	-	0.5	0.8	0.1	0.9	2.9	1.0	0.6
1999	3.3	6.9	-	0.4	-	0.2	1.2	0.4	3.5	3.4	0.8	0.0
2004	2.9	6.9	0.0	0.3	0.0	0.3	0.9	0.2	3.8	2.4	0.8	-
2009	2.9	9.3	0.2	0.7	-	0.9	0.1	-	5.1	2.2	1.0	-
2014	0.0	7.2	0.8	0.0	-	0.1	0.0	-	2.0	1.6	0.0	-
2019	1.0	15.9	0.8	0.2	0.0	0.9	0.4	-	3.6	3.3	1.7	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 14-02.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
1994	140	40	0	100	0	0	0	0	208/232
1999	100	40	0	100	0	60	0	0	203/205
2004	200	20	20	80	0	30	0	0	194/172
2009	240	20	58	42	0	8	8	0	226/209
2014	40	80	0	100	0	0	0	0	114/95
2019	360	60	28	72	0	39	11	0	97/106
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1994	2320	3120	6	86	8	0	1	10	62/78
1999	2920	3780	45	49	6	10	1	0	59/94
2004	2980	1420	29	65	6	41	9	3	44/77
2009	3920	360	11	76	13	15	35	30	37/61
2014	2540	100	18	78	4	58	29	1	42/67
2019	2840	-	4	85	11	30	25	11	56/89
Cercocarpus montanus[p] -- (alderleaf mountain mahogany)									
1994	20	-	0	100	0	0	0	100	125/116
1999	40	-	0	100	0	0	100	0	110/109
2004	40	-	0	100	0	50	50	0	138/129
2009	60	-	33	67	0	0	0	0	130/116
2014	80	-	25	75	0	25	25	0	104/110
2019	100	-	0	100	0	0	20	0	71/80

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Chrysothamnus depressus[p] -- (longflower rabbitbrush)									
1994	120	80	17	83	0	0	0	0	17/39
1999	800	340	80	15	5	8	0	5	17/42
2004	160	-	0	100	0	25	50	0	15/35
2009	220	80	0	100	0	0	0	0	14/31
2014	140	80	71	14	14	43	0	0	12/18
2019	120	-	17	67	17	0	0	17	25/35
Echinocereus engelmannii -- (Engelmann's hedgehog cactus)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	11/20
2004	-	-	-	-	-	-	-	-	9/22
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Ericameria nauseosa ssp. nauseosa var. hololeuca[p] -- (rubber rabbitbrush)									
1994	20	-	100	0	0	0	0	0	24/7
1999	-	-	-	-	-	-	-	-	-/-
2004	20	-	0	100	0	0	100	0	22/23
2009	20	-	0	0	100	0	0	0	21/19
2014	-	-	-	-	-	-	-	-	-/-
2019	20	-	0	100	0	100	0	0	47/13
Gutierrezia sarothrae -- (broom snakeweed)									
1994	540	20	15	85	0	0	0	0	18/23
1999	580	20	14	79	7	0	0	7	19/24
2004	600	-	3	97	0	0	0	0	21/26
2009	720	20	3	92	6	0	0	0	19/21
2014	140	-	43	57	0	0	0	14	14/16
2019	160	20	13	88	0	0	0	0	21/25
Juniperus osteosperma[t] -- (Utah juniper)									
1994	-	-	-	-	-	-	-	-	-/-
1999	40	-	100	0	0	0	0	0	- / -
2004	40	-	50	50	0	0	0	0	- / -
2009	80	-	50	50	0	0	0	0	- / -
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Opuntia fragilis -- (brittle pricklypear)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	6/23
Opuntia -- (pricklypear)									
1994	80	-	0	75	25	0	0	25	9/22
1999	80	-	0	75	25	0	0	25	10/36
2004	120	-	0	83	17	0	0	17	10/32
2009	80	-	0	100	0	0	0	0	4/12
2014	20	-	100	0	0	0	0	0	- / -
2019	20	-	0	100	0	0	0	0	3/15

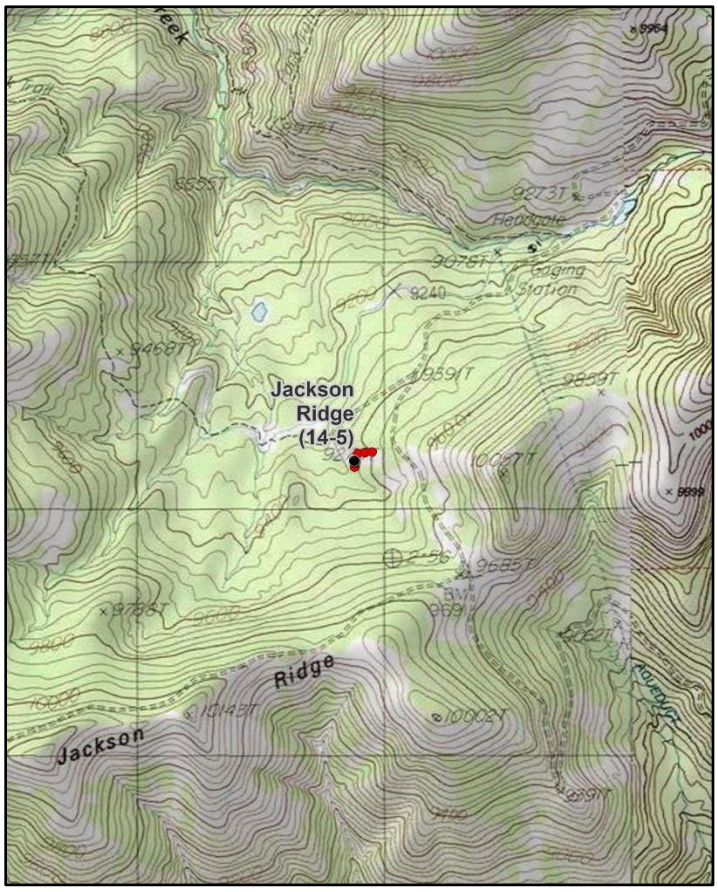
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Pinus edulis[t] -- (twoneedle pinyon)									
1994	-	-	-	-	-	-	-	-	-/-
1999	20	20	0	100	0	0	0	0	- / -
2004	20	-	0	100	0	0	0	0	- / -
2009	40	-	50	50	0	0	0	0	- / -
2014	40	-	50	50	0	0	0	0	- / -
2019	60	-	67	33	0	0	0	0	- / -
Purshia tridentata[p] -- (antelope bitterbrush)									
1994	640	-	3	88	9	3	0	0	30/88
1999	460	80	17	83	0	30	48	0	35/103
2004	800	-	8	80	13	13	65	13	24/66
2009	880	-	0	91	9	23	34	7	25/64
2014	620	-	10	87	3	36	39	0	24/46
2019	800	-	0	98	3	20	78	3	29/69
Quercus gambelii[p] -- (Gambel oak)									
1994	-	-	-	-	-	-	-	-	-/-
1999	160	20	38	63	0	0	0	0	126/90
2004	260	20	85	15	0	0	0	0	143/85
2009	320	-	50	50	0	0	0	0	33/38
2014	140	80	71	29	0	0	0	0	18/22
2019	180	40	22	78	0	33	33	0	68/65
Sclerocactus -- (fishhook cactus)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	9/10
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	160/142
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Yucca -- (yucca)									
1994	40	-	0	100	0	0	0	100	36/73
1999	20	-	0	0	100	0	0	100	- / -
2004	-	-	-	-	-	-	-	-	13/25
2009	60	-	0	100	0	0	0	0	15/28
2014	-	-	-	-	-	-	-	-	-/-
2019	20	-	0	100	0	0	0	0	33/54

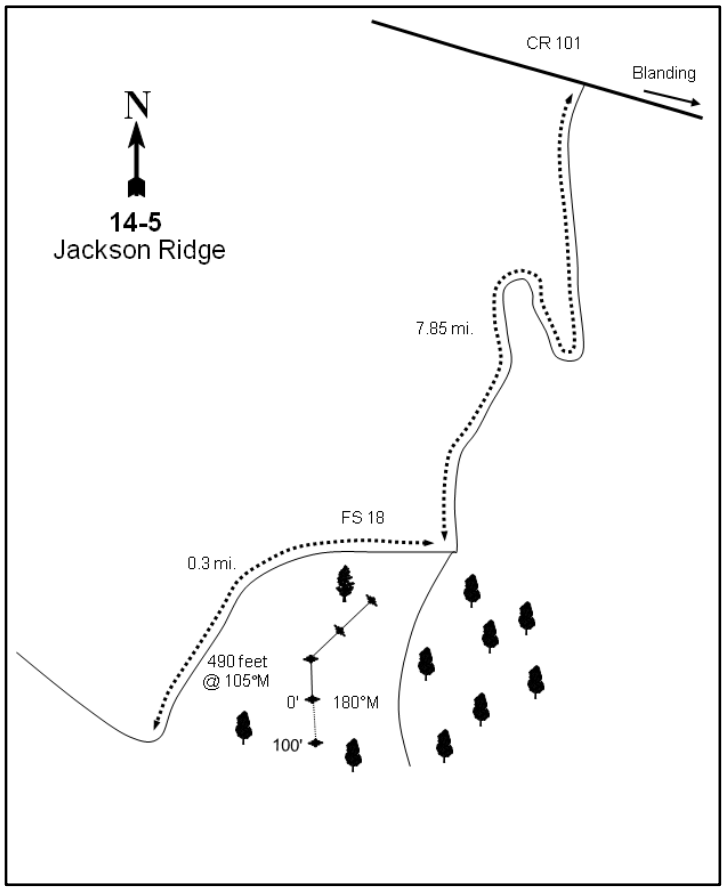
t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 14-02.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1994	42	-	-	-	-	-	10.3
1999	43	-	-	-	-	-	11.2
2004	59	-	15	62	23	-	14.8
2009	47	-	19	50	13	19	8.0
2014	23	-	13	75	-	13	9.3
2019	36	-	47	33	13	7	9.2
Pinus edulis (twoneedle pinyon)							
1994	87	-	-	-	-	-	7.0
1999	95	-	-	-	-	-	9.6
2004	103	-	11	22	33	33	10.3
2009	88	11	11	11	11	56	9.3
2014	46	-	21	36	36	7	11.5
2019	49	6	29	24	35	6	10.8
Quercus gambelii (Gambel oak)							
1994	22	-	-	-	-	-	1.4

JACKSON RIDGE - STUDY NO. 14-5





Location Information

USGS 7.5 min Map Info	Mount Linnaeus NE; Township 34S, Range 22E, Section 09
GPS (0' Stake)	NAD 83 UTM ZONE 12, 630829 East 4188397 North

Transect Information

Browse Tag # (0' Stake)	Not Available
Transect Bearing	180° magnetic (Line 2: 10° magnetic, Lines 3-4: 80° magnetic)
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

From the junction of the Blue Mountain Road and the North Creek-Indian Creek Road (just west of Dalton Springs campground), travel 7.25 miles to Indian Creek. From the crossing, continue 0.55 miles to a fork, then stay left on the main road. Continue 0.05 miles to another small fork to the right. Proceed down the jeep trail (FS Road #18) 0.3 miles to a sharp right bend in the road near a small stream. Stop here and walk southeast (105 degrees magnetic) up the clearing for 490 feet. The 0-foot baseline stake is a four-foot tall green fencepost; there is no browse tag.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	
Elevation	9,400ft (2,865m)
Aspect	Southwest
Slope	20-35%
Sample Dates	06/23/1994, 06/15/1999, 07/06/2004, 07/06/2009, 06/26/2014, 07/31/2019

Wildlife Habitat and Vegetation History

Table 14-05.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	summer
Rocky Mountain Elk	crucial	summer

Table 14-05.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1986	Quaking Aspen/Perennial Grass-Forb	NA
1994	Quaking Aspen/Perennial Grass-Forb	NA
1999	Quaking Aspen/Perennial Grass-Forb	NA
2004	Quaking Aspen/Perennial Grass-Forb	NA
2009	Quaking Aspen/Perennial Grass-Forb	NA
2014	Quaking Aspen/Perennial Grass-Forb	NA
2019	Quaking Aspen/Perennial Grass-Forb	NA

Site Notes

Water is not a limiting factor on this study site and the small perennial stream flowing northwest down the slope towards Indian Creek contains water late in the year. Because of an underground aqueduct moving water from this drainage, this area is considered to be part of the Blanding municipal watershed. Consequently, grazing cattle are not permitted on this part of the Manti-La Sal National Forest. However, cattle do sometimes break fences and trespass from the Camp Jackson allotment.

Soils

Table 14-05.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	6.0	36.9	34.5	28.6	5.3	15.6	390.4	0.3	06/15/1999

Site Potential

1981 - 2010 Average Annual Precipitation	30 inches
NRCS Ecological Site	High Mountain Stony Loam (Aspen)
NRCS Ecological Site #	R048AY521UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 2004, this site has remained in a stable state with an open overstory dominated by quaking aspen (*Populus tremuloides*); shrubs have been observed, but in limited amounts (Table 14-05.12, Table 14-05.13, Table 14-05.13a). The herbaceous understory has been abundant and has been a co-dominant part of the plant community in all sample years. A diverse number of perennial grasses and forbs have been the dominant component of the understory, with Kentucky bluegrass (*Poa pratensis*), common yarrow (*Achillea millefolium*), common dandelion (*Taraxacum officinale*), and Nevada pea (*Lathyrus lanszwertii*) contributing a majority of the cover in 2019 (Table 14-05.7, Table 14-05.10, Table 14-05.11). Conifer trees have been observed in all sample years, there is the potential for them to become the dominant tree species in the future barring a major disturbance (Table 14-05.12, Table 14-05.14, Photos).

Trend Summary Tables

Table 14-05.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	0.5	0.3	0.8	-	-	-
1999	0.4	-	1.5	-	-	1.8
2004	0.3	-	3.1	0.1	-	34.2
2009	0.7	-	5.6	-	-	40.7
2014	1.6	-	7.0	-	-	44.7
2019	0.4	-	6.8	-	-	45.5

Table 14-05.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	-	434	115	446	-	10.6	0.9	21.4
1999	-	461	98	422	-	17.1	0.6	27.7
2004	-	377	59	396	-	15.0	1.2	28.2
2009	-	416	92	410	-	23.2	1.1	43.5
2014	-	425	69	391	-	27.3	1.8	42.3
2019	-	352	77	408	-	16.5	0.7	42.1

Table 14-05.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	4.0	0.1	44.4	0.0	8.0	37.7
1999	4.8	0.6	66.9	0.4	7.1	48.9
2004	18.0	0.2	38.5	1.0	6.3	44.9
2009	10.6	0.2	41.2	0.2	5.0	58.0
2014	7.3	0.0	65.9	0.1	3.6	71.7
2019	11.9	0.2	55.0	0.4	2.8	59.3

Table 14-05.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk
	Quadrat Frequency		
1994	-	1	-
1999	-	1	7
2004	-	1	6
2009	-	4	5
2014	-	-	5
2019	1	8	11
Year	Days Use Per Acre (ha)		
1994	-	-	-
1999	-	1.3 (3.3)	11.4 (28.1)
2004	0.7 (1.8)	6.0 (14.9)	13.4 (33.1)
2009	0.7 (1.8)	1.3 (3.3)	14.7 (36.4)
2014	-	3.4 (8.3)	5.3 (13.2)
2019	4.4 (10.8)	9.4 (23.2)	8.1 (19.9)

Table 14-05.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Achnatherum nelsonii (Columbia needlegrass)	Bromus marginatus (mountain brome)	Carex (sedge)	Dactylis glomerata[i] (orchardgrass)	Elymus trachycaulus (slender wheatgrass)	Hesperostipa comata (needle and thread)	Phleum pratense[i] (timothy)	Poa pratensis[i] (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Trisetum spicatum (spike trisetum)
year	Nested Frequency										
1994	47	-	21	23	9	72	-	-	423	-	6
1999	82	-	8	7	30	56	-	5	447	-	-
2004	64	-	33	33	29	91	-	-	291	-	-
2009	21	2	80	34	71	13	-	-	370	10	-
2014	28	39	55	56	49	55	-	-	368	-	-
2019	48	25	57	54	55	63	24	-	270	3	-
year	Average Cover (%)										
1994	0.2	-	0.3	0.4	0.2	0.9	-	-	8.4	-	0.1
1999	1.3	-	0.2	0.1	1.1	0.6	-	0.0	13.8	-	-
2004	2.0	-	0.5	1.1	0.7	2.0	-	-	8.7	-	-
2009	1.1	0.1	2.6	2.5	1.8	0.6	-	-	14.2	0.3	-
2014	0.8	2.3	3.6	1.5	2.2	1.8	-	-	15.2	-	-
2019	1.1	1.1	1.6	2.3	2.0	3.0	1.0	-	4.3	0.0	-

a - Annual; n - Noxious Weed; i - Introduced Species

Table 14-05.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris aurantiaca (orange agoseris)	Androsace septentrionalis[a] (pygmyflower rockjasmine)	Arabis (rockcress)	Castilleja (Indian paintbrush)	Cerastium arvense (field chickweed)	Chenopodium album[a] (lambsquarters)	Cirsium (thistle)	Cirsium wheeleri (Wheeler's thistle)	Collomia linearis[a] (tiny trumpet)	Conioselinum scopulorum (Rocky Mountain hemlockparsley)	Delphinium nuttallianum (twolobe larkspur)	Descurainia pinnata[a] (western tansymustard)	Draba[a] (draba)	Erigeron (fleabane)	Erigeron engelmannii (Engelmann's fleabane)	Erigeron flagellaris (trailing fleabane)
year	Nested Frequency																
1994	353	23	37	1	-	10	2	-	11	-	5	81	-	-	-	12	95
1999	345	14	57	10	-	-	-	-	26	-	-	212	-	-	-	-	59
2004	295	24	24	5	1	-	2	-	18	-	-	5	-	-	-	-	56
2009	302	2	32	-	1	-	12	7	6	24	8	4	0	-	19	-	52
2014	272	47	53	13	20	26	2	24	-	9	-	11	-	-	-	-	55
2019	276	87	1	5	16	35	9	51	15	18	-	24	-	1	-	-	59
year	Average Cover (%)																
1994	6.5	0.1	0.1	0.0	-	0.0	0.0	-	0.0	-	0.1	0.2	-	-	-	0.1	0.5
1999	9.2	0.1	0.2	0.1	-	-	-	-	0.5	-	-	2.1	-	-	-	-	0.3
2004	7.0	0.1	0.7	0.0	0.0	-	0.0	-	0.5	-	-	0.0	-	-	-	-	0.4
2009	12.0	0.0	0.1	-	0.0	-	0.1	0.2	0.6	0.3	0.6	0.0	0.0	-	0.1	-	1.3
2014	9.1	1.0	1.4	0.1	0.1	1.5	0.0	1.9	-	0.0	-	0.0	-	-	-	-	0.8
2019	7.3	1.3	0.0	0.0	0.7	1.1	0.1	1.2	0.7	0.1	-	0.2	-	0.0	-	-	1.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Erigeron speciosus (aspen fleabane)	Fragaria vesca (woodland strawberry)	Galium bifolium[a] (twinleaf bedstraw)	Gentianella amarella ssp. heterosepala[a] (autumn dwarf gentian)	Geranium[a] (geranium)	Lathyrus lanszwertii (Nevada pea)	Lupinus (lupine)	Lupinus argenteus (silvery lupine)	Machaeranthera canescens (hoary tansyaster)	Mertensia brevistyla (shortstyle bluebells)	Microsteris gracilis[a] (slender phlox)	Noccaea fendleri ssp. glauca (alpine pennycress)	Orthocarpus[a] (owl's-clover)	Osmorhiza occidentalis (western sweetroot)	Packera neomexicana (New Mexico groundsel)	Penstemon (beardtongue)	Phacelia hastata (silverleaf phacelia)
year	Nested Frequency																
1994	24	19	11	9	-	45	-	96	-	3	1	70	-	29	78	-	5
1999	2	18	17	-	-	104	-	129	-	-	-	77	7	32	97	-	-
2004	-	26	-	-	-	104	2	58	-	-	-	22	-	21	38	-	-
2009	-	29	-	-	-	105	-	140	3	-	-	13	-	39	89	-	-
2014	-	22	-	-	3	123	-	98	-	2	-	26	-	14	61	-	-
2019	10	25	-	-	5	185	-	73	-	4	-	7	-	18	40	9	-
year	Average Cover (%)																
1994	0.5	0.2	0.0	0.0	-	1.6	-	1.6	-	0.0	0.0	0.2	-	0.5	0.6	-	0.0
1999	0.1	0.6	0.2	-	-	2.4	-	2.4	-	-	-	0.3	0.0	0.3	0.6	-	-
2004	-	0.4	-	-	-	5.9	0.0	4.0	-	-	-	0.1	-	0.5	0.3	-	-
2009	-	1.0	-	-	-	6.0	-	6.5	0.0	-	-	0.0	-	1.0	1.2	-	-
2014	-	0.4	-	-	0.2	8.2	-	7.0	-	0.0	-	0.1	-	0.8	1.8	-	-
2019	0.2	0.5	-	-	0.1	6.7	-	5.4	-	0.1	-	0.1	-	0.4	0.4	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Phlox longifolia (longleaf phlox)	Polygonum douglasii[a] (Douglas' knotweed)	Potentilla gracilis (slender cinquefoil)	Pseudostellaria jamesiana (tuber starwort)	Ranunculus (buttercup)	Silene drummondii (Drummond's campion)	Symphyotrichum (aster)	Taraxacum officinale (common dandelion)	Thalictrum fendleri (Fendler's meadow-rue)	Thermopsis montana (mountain goldenbanner)	Tragopogon dubius[ai] (yellow salsify)	unknown annual forb[a] (unknown forb)	unknown perennial forb (unknown forb)	Vicia americana (American vetch)	Viola canadensis (Canadian white violet)
year	Nested Frequency														
1994	-	54	12	258	55	-	-	237	-	75	17	-	-	176	4
1999	-	16	-	235	51	-	-	227	-	-	8	-	-	101	6
2004	-	27	3	160	25	-	-	161	-	3	9	-	-	101	8
2009	-	3	4	143	30	-	5	181	-	3	30	2	11	133	5
2014	7	7	2	168	-	-	5	158	12	2	7	-	-	127	4
2019	2	60	-	201	50	6	6	259	8	21	8	-	-	43	20
year	Average Cover (%)														
1994	-	0.1	0.2	2.6	0.2	-	-	3.1	-	0.5	0.7	-	-	1.8	0.0
1999	-	0.1	-	2.8	0.3	-	-	5.1	-	-	0.0	-	-	0.6	0.0
2004	-	0.0	0.0	2.6	0.2	-	-	3.7	-	0.0	0.5	-	-	2.3	0.1
2009	-	0.0	0.0	1.7	0.1	-	0.1	5.2	-	0.4	0.5	0.0	0.1	5.2	0.2
2014	0.0	0.0	0.0	2.9	-	-	0.0	2.8	0.1	0.0	0.2	-	-	3.4	0.1
2019	0.0	0.3	-	5.3	0.3	0.1	0.1	7.3	0.1	0.5	0.2	-	-	0.6	0.6

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 14-05.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Abies concolor[t] (white fir)	Picea engelmannii[t] (Engelmann spruce)	Populus tremuloides[t] (quaking aspen)	Pseudotsuga menziesii[t] (Douglas-fir)	Ribes montigenum[p] (gooseberry currant)	Symphoricarpos oreophilus[p] (mountain snowberry)	Vaccinium uliginosum (bog blueberry)
year	Line Intercept Cover (%)						
1994	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-
2004	-	3.5	30.7	-	-	0.1	-
2009	0.5	6.3	33.3	0.6	-	-	-
2014	0.1	7.9	36.7	-	-	-	-
2019	3.9	4.9	36.7	-	-	0	-
year	Quadrat Cover (%)						
1994	-	0.0	0.8	-	-	0.5	0.3
1999	-	0.1	1.4	0.0	-	0.4	-
2004	-	2.3	0.8	0.0	-	0.3	-
2009	0.4	2.2	2.3	0.6	0.4	0.4	-
2014	1.3	4.0	1.7	-	0.6	1.0	-
2019	3.5	1.3	2.1	-	-	0.4	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 14-05.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Abies concolor[t] -- (white fir)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	40	-	100	0	0	0	0	0	- / -
2009	40	-	100	0	0	0	0	0	- / -
2014	140	40	71	29	0	0	0	0	- / -
2019	360	20	83	17	0	0	0	0	- / -
Picea engelmannii[t] -- (Engelmann spruce)									
1994	-	-	-	-	-	-	-	-	-/-
1999	40	80	100	0	0	0	0	0	- / -
2004	100	20	80	20	0	0	0	0	- / -
2009	60	20	33	33	33	0	0	33	- / -
2014	60	-	67	33	0	0	0	0	- / -
2019	120	-	67	33	0	0	0	17	- / -
Populus tremuloides[t] -- (quaking aspen)									
1994	-	-	-	-	-	-	-	-	-/-
1999	620	-	23	77	0	0	0	0	- / -
2004	600	-	57	43	0	0	3	3	- / -
2009	360	160	11	89	0	0	0	0	- / -
2014	See table 13a - Aspen Characteristics								
2019	See table 13a - Aspen Characteristics								

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Pseudotsuga menziesii[t] -- (Douglas-fir)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	180	0	0	0	0	0	0	- / -
2004	-	180	0	0	0	0	0	0	- / -
2009	120	180	100	0	0	0	0	0	- / -
2014	20	-	0	100	0	0	0	0	- / -
2019	-	-	-	-	-	-	-	-	-/-
Ribes montigenum[p] -- (gooseberry currant)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	20	-	0	100	0	0	0	0	66/27
2009	20	120	0	100	0	0	0	0	94/72
2014	20	-	0	100	0	0	0	0	36/48
2019	-	-	-	-	-	-	-	-	-/-
Sambucus racemosa[p] -- (red elderberry)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	33/32
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	73/133
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
1994	60	-	0	100	0	0	0	0	57/131
1999	240	-	17	50	33	17	0	17	45/81
2004	360	-	50	44	6	56	0	0	37/84
2009	180	60	78	22	0	11	0	0	35/67
2014	20	-	100	0	0	0	0	0	40/82
2019	180	-	11	89	0	0	22	0	40/80

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 14-05.13a - Aspen Characteristics. Characteristics of aspen populations including density, size class distribution, and vigor of plants.

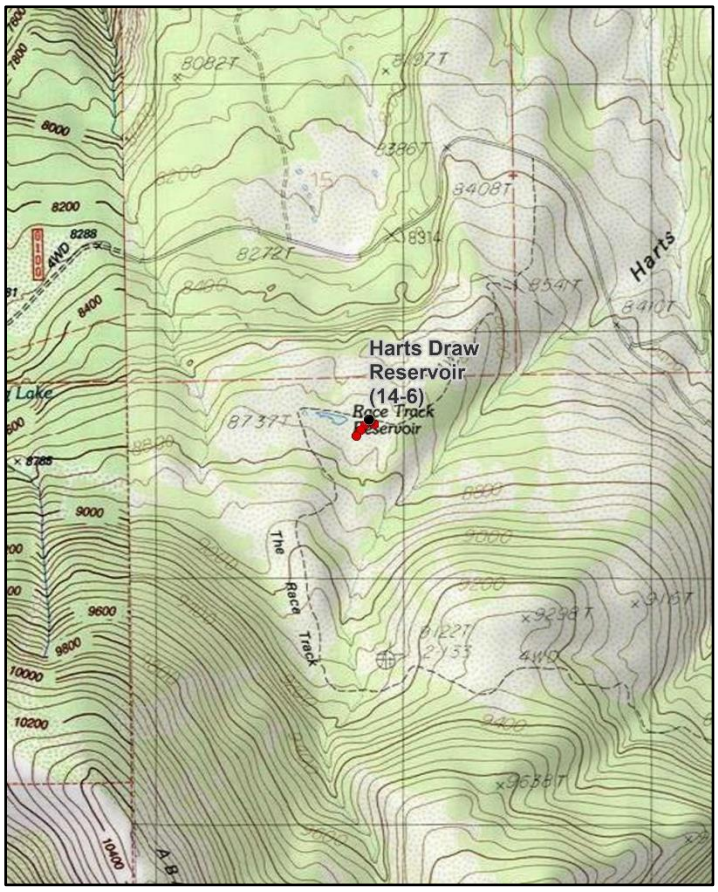
Year	Density	Size Class Distribution				Utilization		Poor Vigor (%)
	Plants per Acre	Class I (%)	Class II (%)	Class III (%)	Class IV (%)	Moderate (%)	Heavy (%)	
Populus tremuloides (quaking aspen)								
2014	660	52	12	-	36	19	0	0
2019	640	16	19	6	59	0	0	0

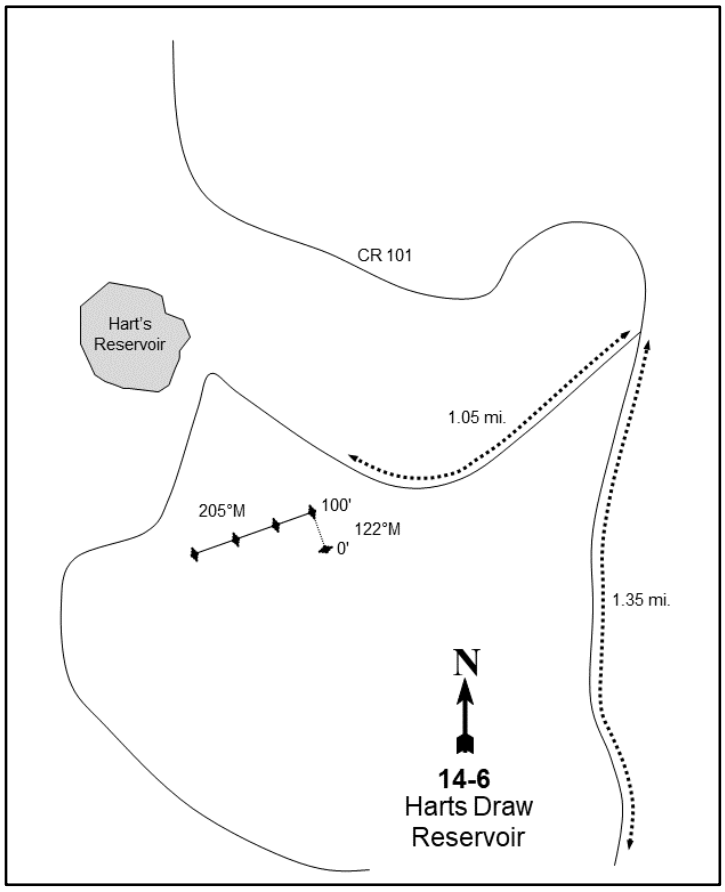
Class I - <= 1.5 feet; Class II - > 1.5 feet to 5 feet; Class III - > 5 feet and up to 1 inch diameter at breast height (dbh); Class IV - > 1 in diameter at breast height (dbh)

Table 14-05.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Abies (fir)							
2014	15	-	60	10	20	10	4.9
2019	19	9	36	36	9	9	5.7
Abies lasiocarpa (subalpine fir)							
1994	16	-	-	-	-	-	7.5
Picea (spruce)							
1999	7	-	-	-	-	-	15.0
2014	16	-	63	25	13	-	4.0
2019	11	20	20	60	-	-	4.6
Populus tremuloides (quaking aspen)							
1994	133	-	-	-	-	-	9.2
1999	53	-	-	-	-	-	29.7
2014	103	28	22	-	-	50	17.6
2019	86	19	6	-	-	75	20.6
Pseudotsuga menziesii (Douglas-fir)							
2019	3	-	-	-	-	100	13.0

HARTS DRAW RESERVOIR - STUDY NO. 14-6





Location Information

USGS 7.5 min Map Info	Monticello Lake SW; Township 33S, Range 22E, Section 47
GPS (0' Stake)	NAD 83 UTM ZONE 12, 632865 East 4195632 North

Transect Information

Browse Tag # (0' Stake)	715
Transect Bearing	122° magnetic (Lines 2-4: 205° magnetic)
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (59ft), Line 3 (34ft), Line 4 (71ft)
Belt Marker Placement	Belt 1: No Rebar

Directions to Site

From the turnoff on Blue Mountain Road to Spring Creek Road by Monticello Lake (Spring Creek), proceed west on the paved road towards Foy Lake for 1.35 miles. Turn left (south) on a very rough dirt road (FS Road #113) and travel 1.05 miles to a point 200 feet east of Harts Draw Reservoir (Race Track Reservoir). From here, walk south for 5 paces to the transect starting point, a 12-inch high red fencepost. The frequency baseline runs southeast through the sagebrush and small oaks to another red fencepost. The first hundred feet run at 122 degrees magnetic. The rest of the baseline is doglegged off of the 0-foot stake and runs at 205 degrees magnetic.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	HARTS DRAW
Elevation	8,900ft (2,713m)
Aspect	North
Slope	2-4%
Sample Dates	06/15/1994, 06/15/1999, 06/15/2004, 06/18/2009, 06/25/2014, 06/18/2019

Table 14-06.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Seeding - Seed Unknown	-	-	Historic	-

Wildlife Habitat and Vegetation History

Table 14-06.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	summer
Rocky Mountain Elk	crucial	spring/fall

Table 14-06.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1986	Mixed Mountain Brush	No Encroachment
1994	Mixed Mountain Brush	No Encroachment
1999	Mixed Mountain Brush	No Encroachment
2004	Mixed Mountain Brush	No Encroachment
2009	Mixed Mountain Brush	No Encroachment
2014	Mixed Mountain Brush	No Encroachment
2019	Mixed Mountain Brush	No Encroachment

Site Notes

The area was seeded over twenty years ago with no land treatments planned at the present time. Water is plentiful at the nearby reservoir. Escape cover is provided by thick clumps of Gambel oak (*Quercus gambelii*) and nearby groves of quaking aspen (*Populus tremuloides*).

Soils

Table 14-06.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	6.4	44.0	35.4	20.6	3.1	23.2	272.0	0.5	06/15/1999

Site Potential

1981 - 2010 Average Annual Precipitation	27 inches
NRCS Ecological Site	Mountain Loam (Oak)
NRCS Ecological Site #	R048AY415UT
States and Transitions	No state and transition model is available for this ecological site.

This site has remained in a stable state as a mixed mountain brush-dominated plant community since study establishment in 1986. Gambel oak (*Quercus gambelii*) has been the most abundant shrub in most sample years, although other species such as mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), Utah serviceberry (*Amelanchier utahensis*), and mountain snowberry (*Symphoricarpos oreophilus*) have also been present in lesser amounts with an overall increasing trend noted for the browse species (Table 14-06.12, Table 14-06.13, Photos). The abundant herbaceous understory has been primarily comprised of the introduced perennial grass species Kentucky bluegrass (*Poa pratensis*) and smooth brome (*Bromus inermis*), and the perennial forb tailcup lupine (*Lupinus caudatus* ssp. *caudatus*) in most sample years (Table 14-06.7, Table 14-06.10, Table 14-06.11). Barring a major disturbance, this study site is likely to remain in this or a similar state in future sample years.

Trend Summary Tables

Table 14-06.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	16.4	-	-	-	-	-
1999	16.5	-	-	-	-	-
2004	15.1	-	-	24.8	-	-
2009	22.3	-	-	26.7	-	-
2014	29.0	-	-	31.0	-	-
2019	22.4	-	-	44.9	-	-

Table 14-06.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	-	457	72	323	-	20.0	0.8	10.9
1999	-	483	64	307	-	40.2	0.6	19.6
2004	-	459	78	298	-	26.7	0.3	18.8
2009	-	475	74	304	-	54.1	0.5	20.1
2014	5	462	74	237	0.1	56.1	2.0	11.1
2019	-	448	146	277	-	41.4	3.2	14.0

Table 14-06.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	2.8	0.1	57.7	0.2	1.1	58.5
1999	4.3	0.1	67.0	0.1	0.0	63.6
2004	5.8	0.2	62.9	1.1	0.1	58.7
2009	5.0	0.2	61.7	0.2	0.0	72.8
2014	6.2	0.0	60.9	-	0.0	77.0
2019	7.2	-	76.5	0.1	0.0	62.9

Table 14-06.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1994	2	8	1	3
1999	11	2	-	12
2004	13	5	4	5
2009	18	4	-	2
2014	-	1	1	5
2019	11	6	6	-
Year	Days Use Per Acre (ha)			
1994	-	-	-	-
1999	74.0 (182.9)	18.1 (44.7)	0.7 (1.7)	-
2004	41.4 (102.2)	6.7 (16.6)	2.7 (6.6)	-
2009	51.5 (127.3)	4.7 (11.6)	6.0 (14.9)	-
2014	-	13.4 (33.1)	6.0 (14.9)	-
2019	71.1 (175.7)	10.7 (26.5)	6.0 (14.9)	-

Table 14-06.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum[i] (crested wheatgrass)	Bromus inermis[i] (smooth brome)	Bromus tectorum[ai] (cheatgrass)	Carex (sedge)	Dactylis glomerata[i] (orchardgrass)	Elymus elymoides (squirreltail)	Koeleria macrantha (prairie Junegrass)	Poa bulbosa[i] (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis[i] (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Thinopyrum intermedium[i] (intermediate wheatgrass)
year	Nested Frequency											
1994	2	391	-	22	-	4	-	-	79	321	-	-
1999	3	409	-	-	2	-	-	-	-	398	-	-
2004	-	406	-	59	-	-	3	-	51	328	-	-
2009	-	420	-	48	-	-	3	-	9	390	4	-
2014	3	430	5	37	-	-	-	-	27	288	2	4
2019	4	427	-	66	5	3	4	1	22	169	29	2
year	Average Cover (%)											
1994	0.0	8.0	-	0.4	-	0.0	-	-	2.0	9.5	-	-
1999	0.0	20.0	-	-	0.1	-	-	-	-	20.0	-	-
2004	-	17.1	-	1.2	-	-	0.0	-	0.6	7.8	-	-
2009	-	27.5	-	1.0	-	-	0.0	-	0.1	25.3	0.1	-
2014	0.0	37.8	0.1	0.7	-	-	-	-	0.7	16.7	0.1	0.1
2019	0.0	31.9	-	1.7	0.0	0.0	0.0	0.0	0.5	6.6	0.6	0.0

a - Annual; n - Noxious Weed; i - Introduced Species

Table 14-06.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Androsace septentrionalis[a] (pygmyflower rockjasmine)	Antennaria (pussytoes)	Arabis (rockcress)	Arenaria (sandwort)	Astragalus lentiginosus (freckled milkvetch)	Calochortus nuttallii (sego lily)	Castilleja linariifolia (Wyoming Indian paintbrush)	Collinsia parviflora[a] (maiden blue eyed Mary)	Crepis acuminata (tapertip hawksbeard)	Erigeron flagellaris (trailing fleabane)	Eriogonum racemosum (redroot buckwheat)	Gayophytum ramosissimum[a] (pinyon groundsmoke)	Ipomopsis aggregata (scarlet gilia)	Lathyrus pauciflorus (fewflower pea)	Lomatium parryi (Utah desertparsley)
year	Nested Frequency																
1994	-	-	9	5	6	-	-	-	8	21	1	28	58	29	1	48	28
1999	3	-	7	1	-	9	-	2	13	6	-	12	29	-	-	33	-
2004	-	3	29	1	-	11	-	-	20	39	2	19	40	-	1	61	-
2009	4	1	33	2	-	-	-	-	12	9	4	54	56	-	-	70	-
2014	-	2	72	7	6	4	3	1	-	2	1	48	35	-	-	44	-
2019	3	1	5	2	12	1	-	9	8	91	1	24	58	20	2	36	-
year	Average Cover (%)																
1994	-	-	0.6	0.2	0.0	-	-	-	0.1	0.1	0.0	0.1	0.5	0.0	0.0	0.8	0.9
1999	0.0	-	0.0	0.1	-	0.3	-	0.0	0.3	0.0	-	0.0	0.5	-	-	0.4	-
2004	-	0.0	0.1	0.0	-	0.3	-	-	0.1	0.1	0.0	0.2	0.7	-	0.0	1.3	-
2009	0.0	0.0	0.2	0.0	-	-	-	-	0.1	0.0	0.1	1.0	1.0	-	-	1.9	-
2014	-	0.0	2.0	0.0	0.0	0.2	0.0	0.0	-	0.0	0.0	1.6	0.4	-	-	1.6	-
2019	0.0	0.0	0.0	0.1	0.0	0.0	-	0.0	0.1	2.5	0.1	0.2	1.2	0.2	0.0	1.8	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Lupinus caudatus ssp. caudatus (tailcup lupine)	Microsteris gracilis[a] (slender phlox)	Packera neomexicana (New Mexico groundsel)	Penstemon (beardtongue)	Penstemon comarrhenus (dusty beardtongue)	Phlox longifolia (longleaf phlox)	Polygonum douglasii[a] (Douglas' knotweed)	Schoenocrambe linifolia (flaxleaf plainsmustard)	Silene antirrhina[a] (sleepy silene)	Symphyotrichum (aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius[ai] (yellow salsify)	Trifolium (clover)	unknown perennial forb (unknown forb)	Vicia americana (American vetch)
year	Nested Frequency														
1994	262	-	7	-	68	77	33	-	-	1	7	-	-	-	-
1999	265	55	1	-	7	33	7	-	-	-	9	-	-	-	49
2004	213	11	5	-	33	101	21	-	-	-	9	-	-	-	6
2009	188	-	1	-	45	104	50	-	-	-	44	-	-	8	-
2014	128	-	2	25	4	69	-	1	-	-	2	-	-	-	-
2019	152	-	1	19	53	120	64	-	7	8	27	1	3	-	5
year	Average Cover (%)														
1994	7.8	-	0.0	-	0.3	0.2	0.1	-	-	0.0	0.0	-	-	-	-
1999	17.0	0.5	0.0	-	0.1	0.1	0.0	-	-	-	0.1	-	-	-	0.7
2004	14.9	0.1	0.0	-	0.3	0.6	0.0	-	-	-	0.0	-	-	-	0.1
2009	14.1	-	0.0	-	0.4	0.9	0.2	-	-	-	0.4	-	-	0.0	-
2014	6.1	-	0.0	0.3	0.1	0.7	-	0.0	-	-	0.0	-	-	-	-
2019	8.4	-	0.0	0.1	0.4	0.9	0.4	-	0.0	0.0	0.3	0.0	0.0	-	0.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 14-06.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis[p] (Utah serviceberry)	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Quercus gambelii[p] (Gambel oak)	Symphoricarpos oreophilus[p] (mountain snowberry)
year	Line Intercept Cover (%)			
1994	-	-	-	-
1999	-	-	-	-
2004	2.7	8.1	13.5	0.5
2009	2.6	3.4	18.6	2.1
2014	3	6.2	19.9	1.9
2019	5.6	9.4	26	3.9
year	Quadrat Cover (%)			
1994	0.6	6.0	8.8	1.0
1999	1.4	8.4	5.9	0.9
2004	1.9	5.2	6.7	1.2
2009	2.0	2.8	14.8	2.6
2014	0.6	4.7	18.5	5.3
2019	2.8	5.0	11.2	3.3

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 14-06.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

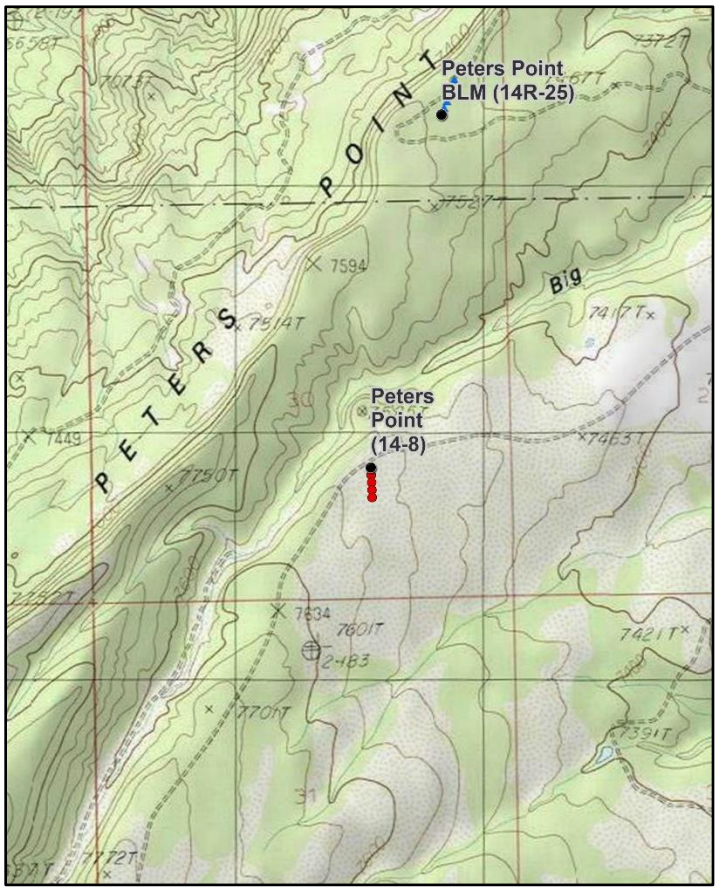
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
1994	360	60	28	44	28	11	0	33	122/183
1999	380	-	37	63	0	47	0	0	98/74
2004	320	-	6	94	0	56	38	0	115/102
2009	440	-	36	64	0	9	5	0	116/97
2014	480	20	17	83	0	50	4	0	94/78
2019	580	200	17	83	0	28	0	0	141/112
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1994	3100	2160	7	15	78	2	1	43	47/64
1999	2580	140	5	54	42	12	4	13	50/57
2004	2320	5460	10	60	30	32	10	18	56/74
2009	1460	440	19	53	27	14	0	11	57/75
2014	1020	180	18	73	10	47	18	10	56/75
2019	1900	9500	30	56	15	32	17	17	57/79
Cercocarpus montanus[p] -- (alderleaf mountain mahogany)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	42/57
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Quercus gambelii[p] -- (Gambel oak)									
1994	-	-	-	-	-	-	-	-	-/-
1999	3740	160	29	64	7	17	0	1	118/82
2004	4040	-	20	79	1	6	0	1	102/63
2009	5380	180	19	81	0	0	0	0	149/115
2014	2400	-	11	86	3	44	0	3	112/101
2019	2640	20	16	84	0	39	7	0	152/92
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
1994	600	-	7	93	0	17	0	17	39/56
1999	460	-	13	87	0	13	0	0	45/47
2004	500	20	28	72	0	4	0	0	43/49
2009	800	140	10	90	0	0	0	0	49/58
2014	760	-	29	71	0	47	0	0	64/75
2019	580	-	10	90	0	24	3	0	62/77

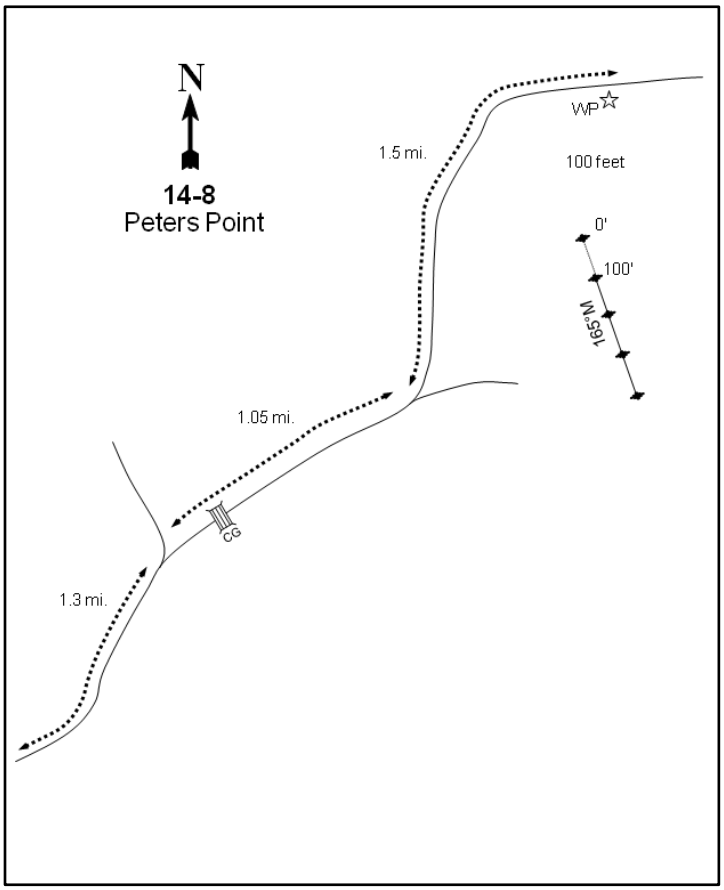
t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 14-06.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Populus tremuloides (quaking aspen)							
2019	1	-	50	50	-	-	8.0
Quercus gambelii (Gambel oak)							
1994	436	-	-	-	-	-	2.6

PETERS POINT - STUDY NO. 14-8





Location Information	
USGS 7.5 min Map Info	Monticello Lake NE; Township 32S, Range 23E, Section 30
GPS (0' Stake)	NAD 83 UTM ZONE 12, 637489 East 4203056 North

Transect Information	
Browse Tag # (0' Stake)	1888
Transect Bearing	165° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

From Monticello Lake, travel on the dirt road (Spring Creek Road) for 0.7 miles to a fork. Proceed to the right and continue 2.2 miles to a fork. Turn left (FS Road #119) and go north for 1.3 miles to another fork. Stay right, traveling towards an exclosure, and proceed for 0.25 miles to a cattle guard. Continue 0.8 miles to a fork. Stay left and continue 1.5 miles to a witness post on the right (south) side of the road. The 0-foot stake is 100 feet south of the witness post, and has browse tag #1888 attached.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	HARTS DRAW
Elevation	7,500ft (2,286m)
Aspect	Southeast
Slope	3-9%
Sample Dates	06/14/1994, 06/17/1999, 06/17/2004, 06/18/2009, 06/24/2014, 06/18/2019

Table 14-08.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Chain Unknown	-	-	1962	-
Seeding - Seed Unknown	-	-	1962	-

Wildlife Habitat and Vegetation History

Table 14-08.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	spring/fall
Rocky Mountain Elk	crucial	year-long

Table 14-08.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1986	Perennial Grass	Phase I
1994	Perennial Grass/Mountain Big Sagebrush	Phase I
1999	Perennial Grass/Mountain Big Sagebrush	Phase I
2004	Mountain Big Sagebrush	Phase I
2009	Mountain Big Sagebrush	Phase I
2014	Mountain Big Sagebrush	Phase I
2019	Mountain Big Sagebrush	Phase I

Site Notes

The Forest Service conducted follow up treatments in 1985, which included burning the perimeter of the old chaining and a Tordon treatment of approximately 200 acres, but is unclear if the study site was treated. The availability of water is limited, although there are some seasonal sources and small stock ponds.

Soils

Table 14-08.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Loam	7.2	62.9	18.5	18.6	2.3	8.5	86.4	0.6	06/17/1999

Site Potential

1981 - 2010 Average Annual Precipitation	18 inches
NRCS Ecological Site	Upland Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R035XY308UT
States and Transitions	A defined state and transition model is available.

When established in 1985, this study site was mostly dominated by seeded introduced perennial grass species (Table 14-08.7, Table 14-08.10) with mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) scattered across the area that is near the site. Crested wheatgrass (*Agropyron cristatum*) has been the dominant perennial grass species with a stable trend being noted (Table 14-08.7, Table 14-08.10). Mountain big sagebrush increased in abundance over time and became the dominant vegetation component in 2004 (Table 14-08.12, Table 14-08.13). Twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) have been observed since study establishment and have exhibited an overall increase in size and abundance over the study period (Table 14-08.12, Table 14-08.14, Photos); the study has been considered to be within Phase I of woodland succession in all sample years (Table 14-08.4). According to the available state and transition model, pinyon and juniper may have the potential to further increase and become the dominant vegetation component depending on disturbance and management practices (Jornada, 2019).

Trend Summary Tables

Table 14-08.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	7.8	0.0	2.5	-	-	-
1999	11.3	0.1	4.3	-	-	0.2
2004	12.8	0.3	4.8	13.8	1.2	4.8
2009	14.3	0.5	3.3	15.9	0.4	7.3
2014	12.3	0.3	5.5	12.8	-	9.1
2019	9.7	0.3	5.9	11.7	0.2	6.4

Table 14-08.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	4	296	4	103	0.0	13.4	0.0	5.0
1999	24	337	9	91	0.1	15.3	0.0	3.7
2004	14	264	34	57	0.1	9.6	0.1	1.7
2009	15	286	110	73	0.1	9.3	0.4	2.6
2014	1	233	10	58	0.0	10.4	0.1	2.3
2019	3	230	135	63	0.0	11.3	2.8	2.6

Table 14-08.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	31.9	0.2	34.9	1.0	0.5	28.8
1999	34.3	2.4	42.4	1.9	0.4	35.2
2004	45.4	1.2	36.6	1.9	0.4	30.9
2009	43.4	0.8	40.5	1.4	0.9	28.3
2014	47.4	2.2	34.8	2.4	0.7	30.3
2019	41.0	2.1	42.3	3.1	1.3	29.1

Table 14-08.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1994	-	6	-	23
1999	2	13	-	39
2004	4	12	4	9
2009	9	5	4	46
2014	-	12	-	15
2019	1	6	1	15
Year	Days Use Per Acre (ha)			
1994	-	-	-	-
1999	7.2 (17.9)	13.4 (33.1)	0.7 (1.7)	-
2004	11.6 (28.7)	14.7 (36.4)	10.7 (26.5)	-
2009	20.3 (50.2)	4.7 (11.6)	8.1 (19.9)	-
2014	-	3.4 (8.3)	14.7 (36.4)	-
2019	5.1 (12.6)	14.7 (36.4)	0.7 (1.7)	-

Table 14-08.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bromus tectorum[ai] (cheatgrass)	Elymus elymoides (squirreltail)	Koeleria macrantha (prairie Junegrass)	Poa fendleriana (muttongrass)	Poa pratensis[i] (Kentucky bluegrass)
year	Nested Frequency						
1994	4	273	4	0	8	29	7
1999	5	329	24	3	4	21	-
2004	6	240	14	11	15	23	-
2009	-	258	15	-	1	43	-
2014	5	210	1	11	16	5	-
2019	4	217	3	0	-	21	1
year	Average Cover (%)						
1994	0.0	12.7	0.0	0.0	0.1	0.5	0.2
1999	0.2	14.6	0.1	0.0	0.0	0.6	-
2004	0.0	9.1	0.1	0.1	0.1	0.3	-
2009	-	8.3	0.1	-	0.0	1.0	-
2014	0.1	9.8	0.0	0.2	0.2	0.0	-
2019	0.2	10.5	0.0	0.1	-	0.4	0.0

a - Annual; n - Noxious Weed; i - Introduced Species

Table 14-08.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Arabis (rockcress)	Artemisia ludoviciana (white sagebrush)	Ceratocephala testiculata[ai] (curveseed butterwort)	Chenopodium album[a] (lambsquarters)	Cryptantha humilis (roundspike cryptantha)	Descurainia pinnata[a] (western tansymustard)	Draba[a] (draba)	Erigeron pumilus (shaggy fleabane)	Eriogonum alatum (winged buckwheat)	Gayophytum ramosissimum[a] (pinyon groundsmoke)	Heterotheca villosa (hairy false goldenaster)	Lactuca serriola[ai] (prickly lettuce)	Lappula occidentalis[a] (flatspine stickseed)	Machaeranthera grindelioides (rayless tansyaster)	Microsteris gracilis[a] (slender phlox)	Oenothera (evening primrose)	Pedicularis centranthera (dwarf lousewort)
year	Nested Frequency																
1994	5	-	-	-	1	-	-	-	3	-	-	-	-	-	4	6	-
1999	1	-	-	-	-	-	2	13	-	-	1	-	3	-	4	-	4
2004	-	-	-	-	5	7	8	0	3	-	-	-	17	-	4	-	-
2009	-	1	66	-	3	1	-	14	-	-	-	-	5	3	90	-	4
2014	-	-	-	-	-	2	-	9	1	-	-	-	8	-	-	-	3
2019	3	2	15	14	-	31	46	7	2	16	5	1	29	-	45	3	-
year	Average Cover (%)																
1994	0.0	-	-	-	0.0	-	-	-	0.0	-	-	-	-	-	0.0	0.0	-
1999	0.0	-	-	-	-	-	0.0	0.1	-	-	0.0	-	0.0	-	0.0	-	0.1
2004	-	-	-	-	0.0	0.0	0.0	0.0	0.0	-	-	-	0.1	-	0.0	-	-
2009	-	0.0	0.1	-	0.0	0.0	-	0.1	-	-	-	-	0.0	0.0	0.2	-	0.1
2014	-	-	-	-	-	0.0	-	0.1	0.0	-	-	-	0.0	-	-	-	0.0
2019	0.0	0.0	0.1	0.2	-	0.6	0.5	0.0	0.0	0.2	0.0	0.0	0.4	-	0.8	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Penstemon pachyphyllus (thickleaf beardtongue)	Petradoria pumila (rock goldenrod)	Phlox longifolia (longleaf phlox)	Physaria rectipes (straight bladderpod)	Polygonum douglasii[a] (Douglas' knotweed)	Sphaeralcea coccinea (scarlet globemallow)
year	Nested Frequency					
1994	22	76	-	-	-	2
1999	7	80	2	-	-	2
2004	-	50	-	-	-	-
2009	5	47	-	2	8	-
2014	5	42	3	3	-	-
2019	10	38	5	-	18	-
year	Average Cover (%)					
1994	1.5	3.4	-	-	-	0.0
1999	0.0	3.5	0.0	-	-	0.0
2004	-	1.7	-	-	-	-
2009	0.0	2.4	-	0.0	0.0	-
2014	0.0	2.2	0.0	0.0	-	-
2019	0.1	2.4	0.0	-	0.1	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 14-08.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Ericameria nauseosa (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma[t] (Utah juniper)	Opuntia fragilis (brittle pricklypear)	Purshia tridentata[p] (antelope bitterbrush)
year	Line Intercept Cover (%)					
1994	-	-	-	-	-	-
1999	-	-	-	-	-	-
2004	13.8	0.1	1.1	4.8	-	-
2009	15.9	-	0.4	7.3	-	-
2014	12.8	-	-	9.1	-	-
2019	11.6	-	-	6.4	0.2	0.1
year	Quadrat Cover (%)					
1994	7.8	0.0	0.0	2.5	0.0	-
1999	11.3	-	0.0	4.3	0.0	-
2004	12.8	0.0	0.3	4.8	0.0	-
2009	14.3	-	0.3	3.3	0.1	-
2014	12.3	-	0.3	5.5	0.0	-
2019	9.7	0.0	0.1	5.9	0.2	0.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 14-08.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	137/239
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	188/213
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1994	2780	460	23	56	21	17	5	68	47/82
1999	2300	60	13	79	8	4	6	6	48/76
2004	2720	2200	14	68	18	35	7	10	47/79
2009	3580	13160	16	67	17	30	1	8	46/84
2014	3140	340	27	67	6	41	29	13	42/72
2019	2720	80	8	66	26	29	36	25	43/70
Cercocarpus montanus[p] -- (alderleaf mountain mahogany)									
1994	-	-	-	-	-	-	-	-	84/79
1999	-	-	-	-	-	-	-	-	163/139
2004	-	-	-	-	-	-	-	-	139/112
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	84/89
2019	-	-	-	-	-	-	-	-	74/74
Chrysothamnus viscidiflorus -- (yellow rabbitbrush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	40	-	0	50	50	0	0	50	- / -
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	20	-	100	0	0	0	0	0	14/10
2019	-	-	-	-	-	-	-	-	-/-
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	120	-	0	100	0	0	0	0	14/20
2019	-	-	-	-	-	-	-	-	-/-
Ericameria nauseosa -- (rubber rabbitbrush)									
1994	160	-	0	0	100	50	0	88	38/36
1999	20	-	0	100	0	100	0	0	- / -
2004	60	-	0	0	100	0	0	100	- / -
2009	20	-	0	100	0	100	0	0	30/32
2014	20	-	0	100	0	100	0	0	70/76
2019	-	-	-	-	-	-	-	-	-/-
Gutierrezia sarothrae -- (broom snakeweed)									
1994	200	-	0	90	10	0	0	20	15/20
1999	1580	260	33	67	0	0	0	0	11/11
2004	1160	-	0	72	28	19	0	10	18/27
2009	2420	60	19	81	0	0	0	0	15/17
2014	360	1080	50	50	0	0	0	0	14/17
2019	240	2540	0	83	17	0	0	17	13/15

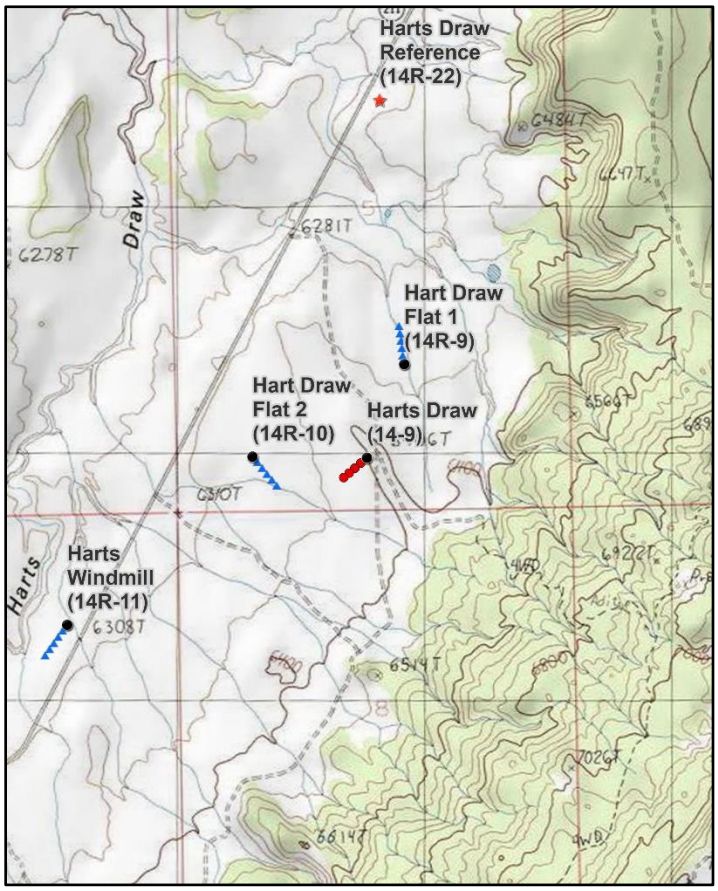
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Juniperus osteosperma[t] -- (Utah juniper)									
1994	-	-	-	-	-	-	-	-	-/-
1999	140	-	29	71	0	0	0	0	- / -
2004	120	-	17	83	0	0	0	0	- / -
2009	120	-	0	100	0	0	0	0	- / -
2014	20	-	0	100	0	0	0	0	- / -
2019	100	-	0	100	0	0	0	0	- / -
Opuntia fragilis -- (brittle pricklypear)									
1994	80	-	50	50	0	0	0	0	7/31
1999	120	-	0	100	0	0	0	0	8/26
2004	100	-	20	80	0	0	0	0	9/27
2009	120	-	17	83	0	0	0	17	9/25
2014	120	-	0	100	0	0	0	0	12/30
2019	120	-	0	83	17	0	0	17	10/36
Pediocactus simpsonii -- (mountain ball cactus)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	3/5
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Pinus edulis[t] -- (twoneedle pinyon)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	- / -
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Purshia tridentata[p] -- (antelope bitterbrush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	27/55
2009	-	-	-	-	-	-	-	-	23/69
2014	-	-	-	-	-	-	-	-	28/90
2019	20	-	0	100	0	0	0	0	26/78
Quercus gambelii[p] -- (Gambel oak)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	127/74

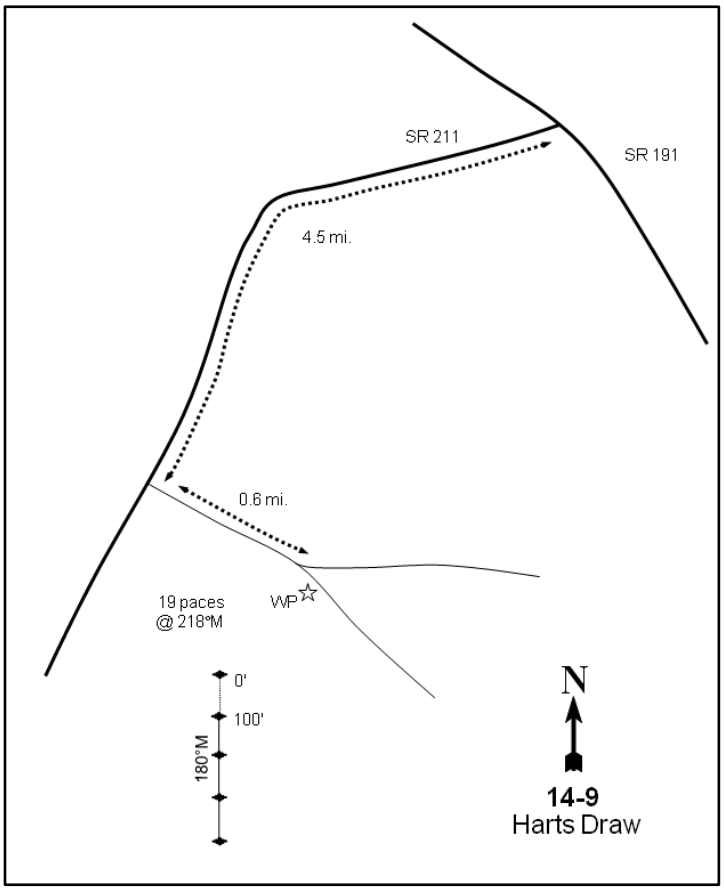
t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 14-08.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1994	70	-	-	-	-	-	6.7
1999	66	-	-	-	-	-	10.7
2004	87	-	33	33	33	-	11.6
2009	73	-	11	33	56	-	14.6
2014	81	-	11	50	39	-	12.8
2019	79	-	5	42	37	16	19.4
Pinus edulis (twoneedle pinyon)							
1994	1	-	-	-	-	-	4.0
1999	6	-	-	-	-	-	5.0
2004	8	-	60	20	-	20	6.2
2009	11	-	43	29	29	-	8.4
2014	10	17	33	17	17	17	8.5
2019	11	-	43	29	14	14	11.6
Quercus gambelii (Gambel oak)							
1994	1	-	-	-	-	-	4.0

HARTS DRAW - STUDY NO. 14-9





Location Information

USGS 7.5 min Map Info	Photograph Gap SE; Township 32S, Range 23E, Section 05
GPS (0' Stake)	NAD 83 UTM ZONE 12, 638712 East 4209177 North

Transect Information

Browse Tag # (0' Stake)	4
Transect Bearing	221° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

Travel north from Monticello on State Road 191 to the turnoff to Canyonlands National Park (0.3 miles north of mile marker 86). Turn left (west) onto State Road 211 and proceed approximately 4.0 miles to mile marker 14. Continue 0.5 miles past the mile marker, then turn left onto a dirt road that goes up and along a small ridge. Drive for 0.6 miles, bearing right at a faint fork, and look for two green fenceposts on the left between the roads. There is a witness post on the right-hand (south) side of the road. The 0-foot stake is 19 paces away from the witness post at 218 degrees magnetic. The 0-foot stake is also near a small juniper and is marked with browse tag #4.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	HART DRAW
Elevation	6,400ft (1,951m)
Aspect	Southwest
Slope	4-6%
Sample Dates	06/24/1994, 06/18/1999, 06/25/2004, 06/16/2009, 06/24/2014, 06/17/2019

Table 14-09.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Aerator - Single Drum/Seed	Hart Draw Sagebrush Restoration (year 1)	246	December 2005	629

Table 14-09.2 SeedMix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Hart Draw			Broadcast	Dec 2005	517
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Achnatherum hymenoides	Indian Ricegrass	Rimrock	0.97	0.00
G	Agropyron fragile	Siberian Wheatgrass	Vavilov	1.06	0.00
G	Dactylis glomerata	Orchardgrass	Paiute	0.48	0.00
G	Hesperostipa comata	Needle and Threadgrass	Beaver UT	0.29	0.00
G	Hesperostipa comata	Needle and Threadgrass	Beaver UT	0.19	0.00
G	Pascopyrum smithii	Western Wheatgrass		0.95	0.00
G	Sporobolus cryptandrus	Sand Dropseed		0.29	0.00
F	Linum perenne	Blue Flax		0.19	0.00
F	Medicago sativa	Alfalfa	Nomad	0.48	0.00
F	Medicago sativa	Alfalfa	Spreador 4	0.48	0.00
F	Onobrychis viciifolia	Sainfoin	Eski	2.03	0.00
F	Sanguisorba minor	Small Burnet	Delar	2.03	0.00
S	Atriplex canescens	Fourwing Saltbush	San Juan UT	0.20	0.00
S	Atriplex canescens	Fourwing Saltbush	Juab/Tooele UT	0.77	0.00
S	Atriplex canescens	Fourwing Saltbush	Wayne UT	0.06	0.00

Mix Name			Application Type	Application Date	Acres
Hart Draw Shrubs			Aerial	Dec 2005	517
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
S	Artemisia tridentata ssp. wyomingensis	Wyoming Big Sagebrush	Utah UT	0.40	0.00
S	Artemisia tridentata ssp. wyomingensis	Wyoming Big Sagebrush	Utah UT	0.58	0.00
S	Bassia prostrata	Forage Kochia	Millard UT	0.39	0.00

Wildlife Habitat and Vegetation History

Table 14-09.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter

Table 14-09.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1986	Mountain Big Sagebrush	No Encroachment
1994	Mountain Big Sagebrush	No Encroachment
1999	Mountain Big Sagebrush	No Encroachment
2004	Mountain Big Sagebrush	No Encroachment
2009	Mountain Big Sagebrush	No Encroachment
2014	Mountain Big Sagebrush	No Encroachment
2019	Mountain Big Sagebrush	Phase I

Site Notes

In the valley below the ridge, sagebrush has been removed and the flat has been planted with crested wheatgrass (*Agropyron cristatum*). A pellet group transect located nearby at an elevation of 6,600 feet from 1987-1997 showed the highest use of any transect in the herd unit during this time period with a ten year average of 91 deer days use/acre. There are two extra stakes in the vicinity of the transect -- one near the 0-foot stake and one near the 400-foot stake. Use GPS and browse tag to locate correct stakes.

Soils

Table 14-09.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Loam	7.6	72.9	12.6	14.5	1.3	8.8	51.2	0.4	06/18/1999

Site Potential

1981 - 2010 Average Annual Precipitation	14 inches
NRCS Ecological Site	Upland Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R035XY308UT
States and Transitions	A defined state and transition model is available.

This site has been dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) since study establishment in 1986, although cover and density have exhibited a general decrease over the study period (Table 14-09.12, Table 14-09.13). The herbaceous understory has remained diverse and abundant. Perennial grasses -- particularly Indian ricegrass (*Achnatherum hymenoides*) and blue grama (*Bouteloua gracilis*) -- have contributed a majority of the herbaceous cover in most sample years. However, the annual forb species desert pale gilia (*Aliciella hutchinsifolia*) provided the most cover of any single herbaceous species in 2019 (Table 14-09.7, Table 14-09.10, Table 14-09.11). Utah juniper (*Juniperus osteosperma*) was observed for the first time in 2019 and the site was considered to be within Phase I of woodland succession. Continued tree encroachment is not an immediate concern, however: point-quarter data indicates that juniper density is very low as of 2019 (Table 14-09.4, Table 14-09.14). Should sagebrush continue to decrease, this study site could transition into one dominated by perennial grasses, a state which is defined by the available state and transition model (Jornada, 2019).

Trend Summary Tables

Table 14-09.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	11.7	1.3	-	-	-	-
1999	9.4	4.6	-	-	-	-
2004	7.0	4.3	-	8.2	3.5	-
2009	5.7	3.1	-	8.2	3.4	-
2014	7.8	3.2	-	7.7	2.3	-
2019	4.6	1.2	-	7.1	0.9	-

Table 14-09.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	275	272	81	42	0.6	10.6	0.6	0.4
1999	423	249	16	54	13.2	7.5	0.3	0.7
2004	30	241	64	23	0.6	14.6	0.9	0.2
2009	185	335	31	25	3.3	19.9	0.7	0.4
2014	33	327	199	108	0.4	22.8	5.7	2.8
2019	84	305	379	212	0.4	13.4	22.2	4.8

Table 14-09.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	51.5	1.5	18.9	1.0	0.5	20.9
1999	41.1	2.0	30.4	2.0	0.1	34.6
2004	48.5	1.3	27.3	2.6	0.0	28.4
2009	41.6	0.6	35.1	3.8	0.1	33.9
2014	37.5	0.5	29.6	1.0	0.1	42.7
2019	38.6	0.6	37.4	1.6	0.2	42.8

Table 14-09.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1994	-	37	8	14
1999	1	40	1	53
2004	5	41	-	9
2009	4	30	-	36
2014	4	34	-	23
2019	6	35	3	29
Year	Days Use Per Acre (ha)			
1994	-	-	-	-
1999	6.5 (16.1)	85.1 (210.2)	-	-
2004	15.3 (37.7)	103.9 (256.6)	-	-
2009	29.8 (73.5)	67.7 (167.2)	-	-
2014	-	7.4 (18.2)	-	-
2019	24.7 (61.0)	55.6 (137.4)	4.7 (11.6)	-

Table 14-09.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bouteloua gracilis (blue grama)	Bromus tectorum[ai] (cheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Pleuraphis jamesii (James' galleta)	Sporobolus cryptandrus (sand dropseed)	Vulpia octoflora[a] (sixweeks fescue)
year	Nested Frequency								
1994	15	7	152	18	140	-	5	-	273
1999	20	4	89	420	165	4	45	-	105
2004	9	-	196	20	51	4	-	2	12
2009	31	17	251	185	84	10	16	-	-
2014	70	11	258	16	41	12	8	1	23
2019	61	12	233	22	29	33	26	7	70
year	Average Cover (%)								
1994	0.4	0.0	5.4	0.1	4.7	-	0.0	-	0.6
1999	0.3	0.1	3.0	12.8	2.6	0.0	1.5	-	0.3
2004	1.0	-	12.6	0.5	0.9	0.0	-	0.0	0.0
2009	0.7	0.3	17.3	3.3	1.1	0.1	0.3	-	-
2014	3.3	0.7	17.6	0.3	0.7	0.3	0.3	0.0	0.1
2019	4.8	1.2	5.2	0.1	0.7	1.1	0.5	0.0	0.3

a - Annual; n - Noxious Weed; i - Introduced Species

Table 14-09.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Aliciella hutchinsifolia[a] (desert pale gilia)	Astragalus mollissimus (woolly locoweed)	Ceratocephala testiculata[ai] (curveseed butterwort)	Chaetopappa ericoides (rose heath)	Chenopodium[a] (goosefoot)	Chenopodium album[a] (lambsquarters)	Cryptantha (cryptantha)	Cryptantha[a] (annual cryptantha)	Descurainia pinnata[a] (western tansymustard)	Erigeron (fleabane)	Erigeron pumilus (shaggy fleabane)	Eriogonum cernuum[a] (nodding buckwheat)	Ipomopsis congesta (ballhead ipomopsis)	Lappula occidentalis[a] (flatspine stickseed)	Lepidium[a] (pepperweed)	Navarretia intertexta[a] (needleleaf navarretia)	Oenothera (evening primrose)
year	Nested Frequency																
1994	20	-	-	11	2	-	14	-	39	-	1	1	-	-	21	-	-
1999	9	5	-	-	-	-	20	-	1	-	18	-	-	1	7	-	-
2004	35	-	1	7	-	3	-	-	11	-	1	-	-	18	4	-	-
2009	-	-	-	-	-	-	-	-	8	3	4	-	-	7	18	-	-
2014	110	2	-	-	-	-	16	-	76	3	8	-	13	101	18	-	45
2019	350	1	-	-	-	-	97	74	39	-	3	-	-	92	1	4	150
year	Average Cover (%)																
1994	0.1	-	-	0.3	0.0	-	0.0	-	0.1	-	0.0	0.0	-	-	0.4	-	-
1999	0.0	0.1	-	-	-	-	0.2	-	0.0	-	0.3	-	-	0.0	0.2	-	-
2004	0.3	-	0.0	0.1	-	0.0	-	-	0.2	-	0.0	-	-	0.3	0.1	-	-
2009	-	-	-	-	-	-	-	-	0.4	0.0	0.0	-	-	0.0	0.3	-	-
2014	1.6	0.0	-	-	-	-	0.4	-	1.0	0.0	0.2	-	0.1	2.6	0.5	-	1.5
2019	19.3	0.0	-	-	-	-	1.7	1.4	0.2	-	0.0	-	-	1.0	0.2	0.0	2.9

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Orobanche fasciculata (clustered broomrape)	Packera multilobata (lobeleaf groundsel)	Phlox longifolia (longleaf phlox)	Plantago patagonica[a] (woolly plantain)	Schoenocrambe linifolia (flaxleaf plainsmustard)	Sphaeralcea coccinea (scarlet globemallow)	Streptanthus cordatus (heartleaf twistflower)	Tragopogon dubius[ai] (yellow salsify)	unknown perennial forb (unknown forb)
year	Nested Frequency								
1994	-	-	-	-	-	16	-	-	-
1999	4	-	-	-	-	14	-	-	-
2004	-	5	3	-	-	6	-	-	1
2009	-	-	-	-	0	19	-	-	-
2014	-	-	2	-	8	15	11	2	-
2019	-	7	10	6	-	3	0	-	-
year	Average Cover (%)								
1994	-	-	-	-	-	0.0	-	-	-
1999	0.0	-	-	-	-	0.1	-	-	-
2004	-	0.0	0.0	-	-	0.1	-	-	0.0
2009	-	-	-	-	0.0	0.3	-	-	-
2014	-	-	0.0	-	0.0	0.4	0.3	0.0	-
2019	-	0.0	0.0	0.0	-	0.0	0.0	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 14-09.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Opuntia (pricklypear)	Sclerocactus (fishhook cactus)
year	Line Intercept Cover (%)				
1994	-	-	-	-	-
1999	-	-	-	-	-
2004	8.2	1	2.5	-	-
2009	8.2	1.9	1.5	-	-
2014	7.7	1.4	0.9	-	-
2019	7.1	0.9	0	0	-
year	Quadrat Cover (%)				
1994	11.7	0.2	1.0	0.0	0.0
1999	9.4	0.5	4.0	0.2	-
2004	7.0	1.8	2.4	0.2	-
2009	5.7	1.2	1.5	0.3	0.2
2014	7.8	1.7	1.3	0.2	-
2019	4.6	0.7	0.5	0.0	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 14-09.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1994	3580	40	2	51	46	60	10	32	51/85
1999	3340	-	1	67	33	53	23	14	57/77
2004	2120	40	2	7	92	32	63	82	55/85
2009	2000	-	5	58	37	29	17	34	50/84
2014	1820	-	2	84	14	30	14	0	51/69
2019	1440	-	1	49	50	19	78	49	55/81
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
1994	480	-	8	92	0	0	0	0	26/46
1999	300	20	20	53	27	0	0	0	43/62
2004	400	-	0	85	15	0	0	10	32/53
2009	460	-	9	65	26	17	4	9	38/63
2014	1180	80	39	61	0	2	0	0	60/68
2019	440	-	0	91	9	23	0	9	41/63
Ephedra nevadensis[p] -- (Nevada jointfir)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	33/46
2019	-	-	-	-	-	-	-	-	-/-

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Gutierrezia sarothrae -- (broom snakeweed)									
1994	5480	260	11	88	2	1	0	2	12/14
1999	19600	80	17	82	2	0	0	2	19/20
2004	2580	-	2	97	2	0	0	2	21/27
2009	3020	40	16	83	1	0	0	1	17/21
2014	10160	2040	60	40	0	0	0	0	20/19
2019	180	24500	44	56	0	0	0	0	18/16
Opuntia -- (pricklypear)									
1994	340	20	35	65	0	0	0	0	5/23
1999	120	-	17	83	0	0	0	17	8/18
2004	60	-	0	67	33	0	0	33	5/11
2009	80	-	0	100	0	0	0	0	7/16
2014	120	-	33	67	0	0	0	0	10/19
2019	140	-	14	86	0	0	0	0	7/19
Sclerocactus -- (fishhook cactus)									
1994	-	-	-	-	-	-	-	-	6/19
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	80	-	25	75	0	0	0	25	3/3
2014	80	-	0	100	0	0	0	0	5/12
2019	20	-	0	100	0	0	0	0	10/15

t - Tree Species; p - Preferred Browse; i - Introduced Species

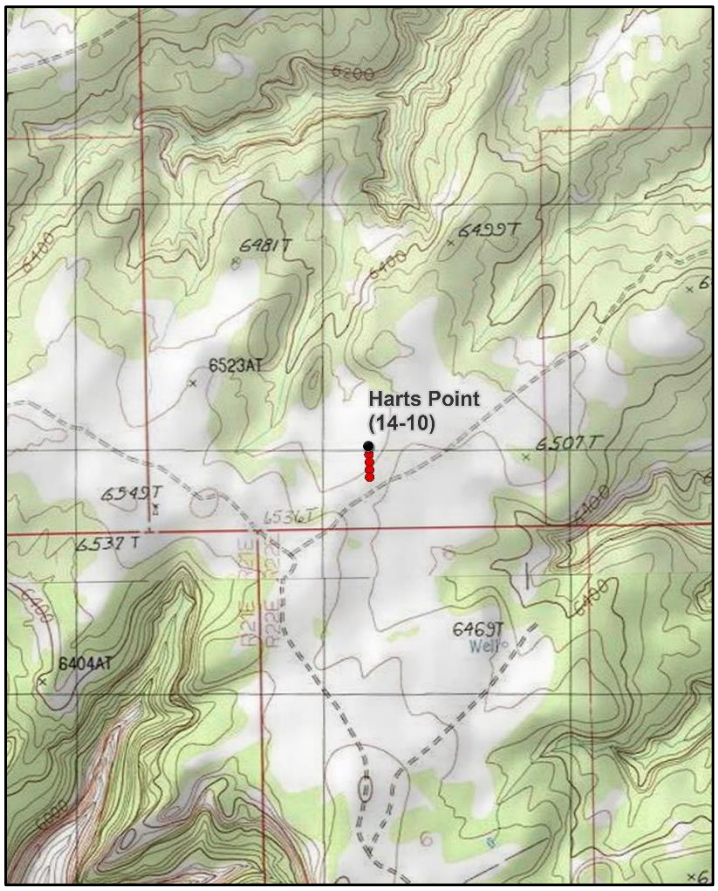
Table 14-09.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

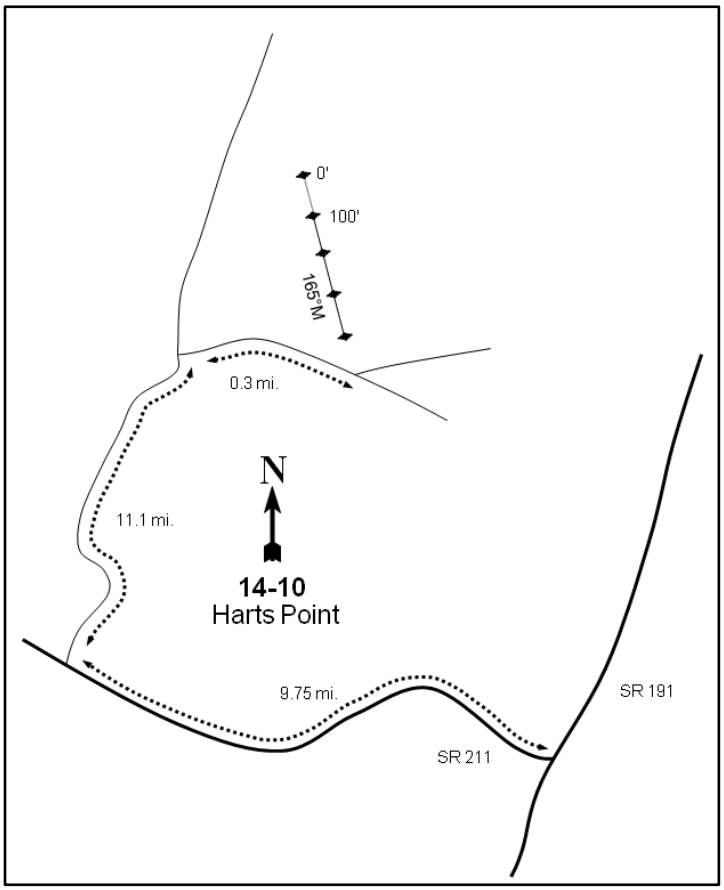
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2019	1	-	100	-	-	-	3.0

Table 14-09.15 - Deer Desirable Components Index: Mid Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1994	14.6	1.1	1.1	21.1	-0.5	0.9	0.0	38.3	Poor
1999	11.8	5.2	0.3	15.0	-9.9	1.4	0.0	23.7	Very Poor
2004	10.3	-12.5	1.0	29.3	-0.4	0.4	0.0	28.0	Very Poor
2009	10.3	3.9	2.5	30.0	-2.4	0.7	0.0	44.9	Poor
2014	9.6	10.7	1.1	30.0	-0.3	5.7	0.0	56.9	Fair
2019	8.9	0.0	0.7	26.9	-0.3	9.5	0.0	45.7	Poor

HARTS POINT - STUDY NO. 14-10





Location Information

USGS 7.5 min Map Info	Harts Point North SE; Township 30S, Range 22E, Section 31
GPS (0' Stake)	NAD 83 UTM ZONE 12, 627129 East 4221208 North

Transect Information

Browse Tag # (0' Stake)	7820
Transect Bearing	165° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Belt 4: 5ft, 20ft

Directions to Site

From the turnoff to the Needles District of Canyonlands National Park (onto State Road 211 from State Road 191), travel west and south on the main paved road for 9.75 miles. At this point, just before the road drops down into Indian Creek Canyon, turn right onto the Harts Point Road. Proceed north on this road for 11.1 miles. Turn right onto a small dirt road and travel 0.3 miles to a faint fork: the transect is north and west of these two roads. The last baseline stake is located approximately 30 feet from the fork. The start of the baseline is located 400 feet north and is marked by a fencepost with browse tag #7820 attached.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	HART POINT
Elevation	6,400ft (1,951m)
Aspect	West
Slope	5%
Sample Dates	06/16/1994, 06/16/1999, 11/08/2004, 06/16/2009, 06/24/2014, 06/17/2019

Wildlife Habitat and Vegetation History

Table 14-10.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter

Table 14-10.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1986	Mountain Big Sagebrush	No Encroachment
1994	Mountain Big Sagebrush	No Encroachment
1999	Mountain Big Sagebrush	Phase I
2004	Mountain Big Sagebrush	Phase I
2009	Mountain Big Sagebrush	Phase I
2014	Mountain Big Sagebrush	Phase I
2019	Mountain Big Sagebrush	Phase I

Site Notes

The area in which the study site is located is arid, with a stock pond constructed in the area where a small drainage flows between two sandstone bluffs: this pond collects seasonal water in the springtime. Another principal use for this area is oil and gas exploration and extraction. A pipeline was constructed across Harts Point in 1986.

Soils

Table 14-10.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Loam	7.5	64.9	18.6	16.6	1.0	4.9	38.4	0.4	06/07/1999

Site Potential

1981 - 2010 Average Annual Precipitation	13 inches
NRCS Ecological Site	Upland Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R035XY308UT
States and Transitions	A defined state and transition model is available.

Since establishment in 1986, the vegetation community of this site has remained in a stable state with mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) as the dominant species (Table 14-10.12, Table 14-10.13). The herbaceous understory has been diverse and abundant, although composition has fluctuated. Native perennial grasses, particularly blue grama (*Bouteloua gracilis*), have provided a majority of the herbaceous cover in most sample years. However, it can be noted that annual grasses dominated the understory in 2014 and 2019. Annual forbs were a co-dominant herbaceous component in 2019; forbs have remained rare otherwise (Table 14-10.7, Table 14-10.10, Table 14-10.11). Utah juniper (*Juniperus osteosperma*) has been observed in low abundance on the site since 1999 (Photos), placing the study within Phase I of woodland succession (Table 14-10.4). Time without disturbance and continued encroachment could cause the site to transition to a tree-dominated state (Jornada, 2019). Point-quarter density shows that trees have remained rare which indicates that tree encroachment may not be an immediate concern as of the 2019 sample year (Table 14-10.14, Photos).

Trend Summary Tables

Table 14-10.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	12.1	0.0	-	-	-	-
1999	11.6	-	-	-	-	-
2004	14.2	-	-	21.9	-	-
2009	14.7	0.0	-	20.7	-	-
2014	11.3	0.0	-	15.4	-	-
2019	12.9	0.2	-	18.6	-	-

Table 14-10.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	374	349	183	47	1.0	11.1	0.4	0.3
1999	418	284	227	73	7.4	6.0	2.0	2.5
2004	158	273	61	161	1.2	8.0	0.3	5.8
2009	166	264	3	9	1.7	11.7	0.0	0.1
2014	377	282	227	100	12.9	10.5	3.4	1.0
2019	431	267	353	269	10.8	7.0	14.0	1.5

Table 14-10.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	49.0	3.0	19.7	-	0.0	27.4
1999	42.8	6.2	18.2	0.0	-	27.6
2004	54.0	7.6	19.7	0.0	0.0	29.2
2009	47.9	6.7	28.9	-	-	27.4
2014	50.8	3.7	23.8	-	-	38.9
2019	50.0	4.9	27.8	0.0	0.0	37.6

Table 14-10.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1994	7	30	-	36
1999	7	21	-	47
2004	6	18	-	15
2009	4	35	-	58
2014	1	21	-	14
2019	4	49	-	20
Year	Days Use Per Acre (ha)			
1994	-	-	-	-
1999	21.8 (53.8)	47.6 (117.5)	0.7 (1.7)	-
2004	6.5 (16.1)	32.2 (79.5)	-	-
2009	15.3 (37.7)	53.0 (130.8)	-	-
2014	7.2 (17.9)	39.6 (97.7)	8.1 (19.9)	-
2019	7.2 (17.9)	85.1 (210.2)	-	-

Table 14-10.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bouteloua gracilis (blue grama)	Bromus tectorum[ai] (cheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Pleuraphis jamesii (James' galleta)	Poa secunda (Sandberg bluegrass)	Sporobolus cryptandrus (sand dropseed)	Vulpia octoflora[a] (sixweeks fescue)
year	Nested Frequency								
1994	31	201	63	32	94	49	-	50	370
1999	69	186	312	22	19	47	1	20	368
2004	10	149	36	7	61	18	1	104	151
2009	15	156	76	14	56	14	2	76	108
2014	11	208	109	35	56	3	8	10	368
2019	8	190	191	18	34	3	-	50	420
year	Average Cover (%)								
1994	0.1	8.3	0.2	0.2	1.0	0.7	-	0.8	0.9
1999	0.5	4.5	4.4	0.1	0.2	0.4	0.0	0.1	3.1
2004	0.2	5.0	0.1	0.0	0.8	0.3	0.0	1.7	1.1
2009	0.3	7.8	1.0	0.3	1.1	0.1	0.1	2.0	0.7
2014	0.1	8.9	0.8	0.5	0.8	0.0	0.0	0.1	12.1
2019	0.2	5.0	3.4	0.2	1.1	0.0	-	0.6	7.4

a - Annual; n - Noxious Weed; i - Introduced Species

Table 14-10.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Calochortus nuttallii (sego lily)	Ceratocephala testiculata[ai] (curveseed butterwort)	Cryptantha[a] (annual cryptantha)	Cymopterus (springparsley)	Delphinium nuttallianum (twolobe larkspur)	Descurainia pinnata[a] (western tansymustard)	Draba reptans[a] (Carolina draba)	Erigeron flagellaris (trailing fleabane)	Erigeron pumilus (shaggy fleabane)	Erodium cicutarium[ai] (redstem stork's bill)	Gilia inconspicua[a] (shy gilia)	Lappula occidentalis[a] (flatspine stickseed)	Machaeranthera canescens (hoary tansyaster)	Machaeranthera grindelioides (rayless tansyaster)	Oenothera coronopifolia (crownleaf evening primrose)	Packera multilobata (lobeleaf groundsel)	Plantago patagonica[a] (woolly plantain)
year	Nested Frequency																
1994	-	-	6	3	-	-	7	1	1	-	47	1	-	-	-	43	154
1999	3	4	-	-	1	-	3	3	3	-	76	2	-	-	-	67	177
2004	2	-	-	-	7	-	-	-	-	-	17	-	-	-	2	152	51
2009	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	9	-
2014	1	1	-	-	-	1	1	-	4	1	112	6	2	-	2	91	146
2019	7	4	27	-	4	5	20	-	1	22	277	7	9	1	48	261	271
year	Average Cover (%)																
1994	-	-	0.0	0.1	-	-	0.0	0.0	0.0	-	0.1	0.0	-	-	-	0.2	0.3
1999	0.0	0.0	-	-	0.0	-	0.0	0.0	0.2	-	0.9	0.0	-	-	-	2.3	1.1
2004	0.0	-	-	-	0.0	-	-	-	-	-	0.1	-	-	-	0.0	5.8	0.2
2009	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-	-	0.1	-
2014	0.0	0.0	-	-	-	0.1	0.0	-	0.0	0.0	2.2	0.1	0.0	-	0.0	1.0	0.9
2019	0.1	0.0	0.5	-	0.0	0.2	0.0	-	0.0	1.2	9.8	0.3	0.0	0.0	0.5	0.9	1.9

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 14-10.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Gutierrezia sarothrae (broom snakeweed)	Krascheninnikovia lanata[p] (winterfat)	Opuntia polyacantha (plains pricklypear)
year	Line Intercept Cover (%)			
1994	-	-	-	-
1999	-	-	-	-
2004	21.7	-	0.2	-
2009	20.6	-	0.1	-
2014	15.2	-	0.2	-
2019	18.3	-	0.3	-
year	Quadrat Cover (%)			
1994	12.0	0.0	0.0	0.0
1999	11.5	-	0.1	-
2004	14.1	-	0.1	-
2009	14.7	-	0.0	0.0
2014	11.2	-	0.1	0.0
2019	12.6	-	0.3	0.2

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 14-10.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1994	3560	20	6	67	26	13	9	62	60/93
1999	3580	-	12	77	11	30	11	5	64/92
2004	3420	40	3	56	42	43	0	18	65/100
2009	3800	-	0	69	31	39	20	10	55/88
2014	2880	20	5	85	10	50	38	8	55/82
2019	2860	-	1	64	35	22	78	37	63/98
Gutierrezia sarothrae -- (broom snakeweed)									
1994	40	-	0	100	0	0	0	0	19/24
1999	20	-	0	100	0	0	0	0	22/21
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	26/28
2014	-	-	-	-	-	-	-	-	26/34
2019	-	-	-	-	-	-	-	-	18/17
Krascheninnikovia lanata[p] -- (winterfat)									
1994	220	-	0	73	27	0	0	18	15/14
1999	180	-	0	100	0	0	11	0	18/22
2004	100	-	0	100	0	0	100	0	22/26
2009	260	-	0	100	0	8	69	0	24/18
2014	100	-	60	40	0	20	0	0	39/30
2019	100	-	0	100	0	0	100	0	33/28

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Opuntia polyacantha -- (plains pricklypear)									
1994	80	20	0	75	25	0	0	25	14/23
1999	60	-	0	100	0	0	0	0	9/22
2004	20	-	0	100	0	0	0	0	22/27
2009	-	20	0	0	0	0	0	0	11/36
2014	40	-	0	100	0	0	0	0	12/41
2019	120	-	33	50	17	0	0	17	8/27

t - Tree Species; p - Preferred Browse; i - Introduced Species

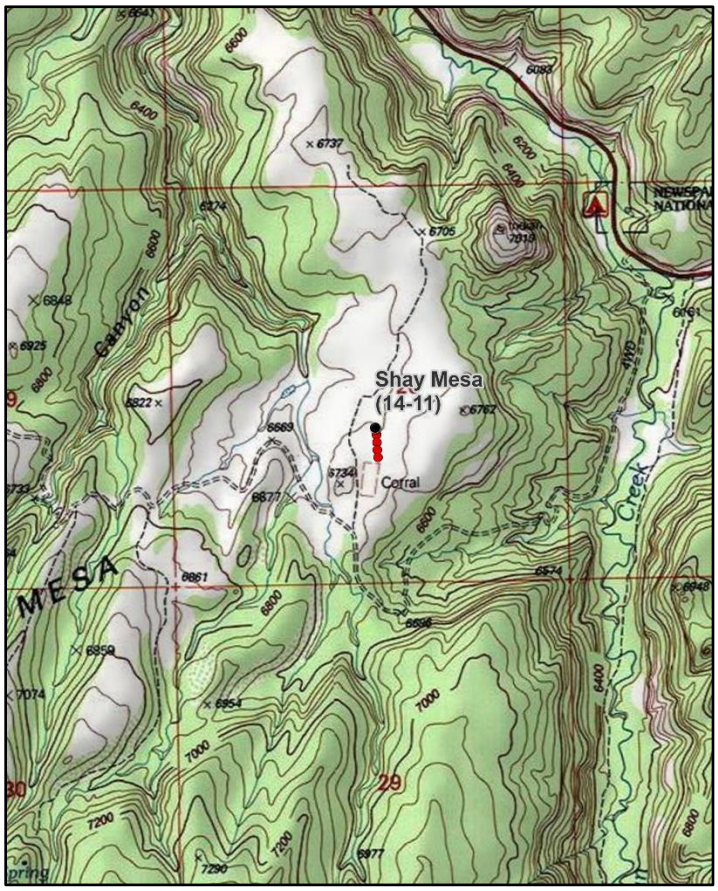
Table 14-10.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

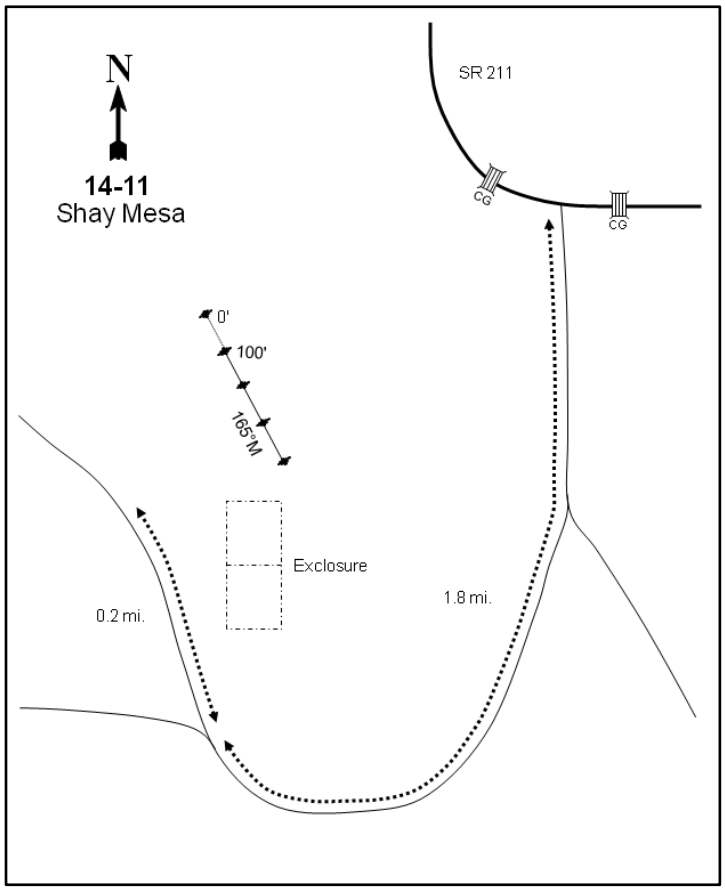
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2014	2	-	100	-	-	-	5.0
2019	2	-	50	50	-	-	6.5

Table 14-10.15 - Deer Desirable Components Index: Mid Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1994	15.1	7.1	3.1	22.2	-0.8	0.7	0.0	47.2	Poor
1999	14.5	11.7	5.8	12.1	-5.6	4.9	0.0	43.4	Poor
2004	27.4	2.7	1.4	16.0	-0.9	10.0	0.0	56.6	Fair
2009	25.9	5.7	0.0	23.4	-1.3	0.1	0.0	53.8	Fair
2014	19.3	12.1	2.8	20.9	-9.6	2.0	0.0	47.5	Poor
2019	23.3	4.7	0.7	14.1	-8.1	3.0	0.0	37.6	Poor

SHAY MESA - STUDY NO. 14-11





Location Information

USGS 7.5 min Map Info	Shay Mountain NE; Township 32S, Range 22E, Section 20
GPS (0' Stake)	NAD 83 UTM ZONE 12, 629121 East 4204634 North

Transect Information

Browse Tag # (0' Stake)	7877
Transect Bearing	165° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

From the junction of State Roads 191 and 211 (about 14 miles north of Monticello), turn west on the road towards Canyonlands National Park and Newspaper Rock. Travel approximately 13 miles on this paved road, the last two miles of which drop into the canyon of a tributary to Indian Creek. Cross a cattle guard and turn left just before another cattle guard and 0.1 miles east of Newspaper Rock. After turning left onto this road, cross Indian Creek and go 1.8 miles up onto the mesa. Look for a faint road going up to the right through an old pinyon-juniper chaining to an exclosure. Follow this road 0.2 miles to the north end of the exclosure. The end of the baseline is located 100 feet north of the northeast corner of the exclosure. The 0-foot end of the baseline is 400 feet north and the stake is tagged with browse tag #7877.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	HART DRAW
Elevation	6,665ft (2,031m)
Aspect	North
Slope	5%
Sample Dates	06/14/1994, 06/16/1999, 06/15/2004, 06/16/2009, 07/20/2011, 06/24/2014, 06/18/2019

Table 14-11.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Chain Unknown	-	-	Mid-1960s	-
Seeding - Seed Unknown	-	-	Mid-1960s	-
Mechanical - Bullhog	Shay Mesa Phase II	1091	May-June 2009	545

Wildlife Habitat and Vegetation History

Table 14-11.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter

Table 14-11.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1986	Mountain Big Sagebrush/Pinyon-Juniper	Phase I transitioning to Phase II
1994	Mountain Big Sagebrush/Pinyon-Juniper	Phase I transitioning to Phase II
1999	Mountain Big Sagebrush/Pinyon-Juniper	Phase I transitioning to Phase II
2004	Mountain Big Sagebrush/Pinyon-Juniper	Phase I transitioning to Phase II
2009	Mountain Big Sagebrush	Phase I
2011	Mountain Big Sagebrush	Phase I
2014	Mountain Big Sagebrush	Phase I
2019	Mountain Big Sagebrush	Phase I

Site Notes

The study transect was placed just outside of a 1958 BLM two-way exclosure and is 700 feet above a perennial stream, Indian Creek.

Soils

Table 14-11.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	7.3	58.9	18.6	22.5	1.5	7.9	83.2	0.6	06/16/1999

Site Potential

1981 - 2010 Average Annual Precipitation	15 inches
NRCS Ecological Site	Upland Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R035XY308UT
States and Transitions	A defined state and transition model is available.

Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has been the dominant vegetation component on this site since study establishment in 1986. Other shrubs have been present, but have generally contributed much less cover (Table 14-11.12, Table 14-11.13). The herbaceous understory has been diverse and dominated by native perennial grass species with the exception of the 2019 sample year, when annual forbs -- particularly shy gilia (*Gilia inconspicua*) and woolly plantain (*Plantago patagonica*) -- contributed the most herbaceous cover (Table 14-11.7, Table 14-11.10, Table 14-11.11). Twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) were a co-dominant vegetation component through the 2004 sample year and woodland succession was classified as being within Phase I transitioning to Phase II. A bullhog treatment in 2009 removed most of the trees, and the study has been considered to be in Phase I since that time (14-11.1, Table 14-11.4, Table 14-11.14). According to the state and transition model, continued tree presence indicates that there may be potential for infilling in the future as time without disturbance passes (Jornada, 2019).

Trend Summary Tables

Table 14-11.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	3.6	0.3	10.2	-	-	-
1999	5.7	1.7	11.2	-	-	1.4
2004	10.4	0.4	9.4	13.9	3.7	12.9
2009	6.2	1.0	0.1	5.8	2.6	-
2011	7.3	1.6	-	8.0	2.0	-
2014	5.9	0.4	0.0	7.1	1.1	-
2019	10.5	0.3	0.3	10.0	-	0.1

Table 14-11.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	171	324	175	155	0.6	7.2	0.6	1.0
1999	281	287	108	159	5.6	8.2	0.5	1.6
2004	16	258	122	121	0.1	7.3	0.5	0.7
2009	124	224	73	97	1.9	6.8	0.3	0.8
2011	208	300	102	138	3.5	16.3	0.9	3.4
2014	127	322	185	154	1.7	19.1	1.5	1.8
2019	196	329	323	223	4.7	7.6	10.3	4.6

Table 14-11.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	39.4	1.7	35.9	0.0	0.0	23.2
1999	40.9	5.4	39.8	0.0	-	33.7
2004	59.2	3.5	29.0	0.0	-	27.6
2009	30.1	0.8	58.0	-	-	15.9
2011	29.1	1.0	45.3	-	-	33.1
2014	26.6	0.1	45.9	0.0	-	35.9
2019	35.9	1.1	50.0	0.0	-	33.0

Table 14-11.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Coyote	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency					
1994	3	-	9	-	-	62
1999	11	-	3	-	-	60
2004	3	-	1	20	-	56
2009	-	-	12	4	-	43
2011	1	-	13	4	-	5
2014	7	-	5	3	-	9
2019	6	-	17	11	-	33
Year	Days Use Per Acre (ha)					
1994	-	-	-	-	-	-
1999	25.4 (62.8)	8.7 (21.5)*	1.3 (3.3)	-	-	-
2004	8.0 (19.7)	-	2.0 (5.0)	12.8 (31.5)	-	-
2009	6.5 (16.1)	-	25.5 (62.9)	11.4 (28.1)	1.2 (2.9)	-
2011	16.0 (39.5)	-	14.1 (34.8)	10.7 (26.5)	-	-
2014	2.2 (5.4)	-	0.7 (1.7)	1.3 (3.3)	-	-
2019	15.3 (37.7)	-	8.1 (19.9)	26.2 (64.6)	-	-

*Pellets per acre (ha)

Table 14-11.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bouteloua gracilis (blue grama)	Bromus tectorum[ai] (cheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Pascopyrum smithii (western wheatgrass)	Pleuraphis jamesii (James' galleta)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Sporobolus cryptandrus (sand dropseed)	Vulpia octoflora[a] (sixweeks fescue)
year	Nested Frequency											
1994	5	180	58	13	203	75	-	1	-	-	4	137
1999	10	188	270	19	131	77	-	-	-	-	7	42
2004	3	178	2	13	66	38	-	-	-	-	9	14
2009	9	171	119	18	48	27	3	1	-	-	8	20
2011	7	184	202	51	120	67	-	3	3	1	3	30
2014	6	193	107	83	75	97	-	-	-	-	-	52
2019	17	170	100	85	36	203	8	-	1	-	6	138
year	Average Cover (%)											
1994	0.0	3.1	0.2	0.0	3.6	0.4	-	0.0	-	-	0.0	0.4
1999	0.0	5.1	5.4	0.1	2.5	0.5	-	-	-	-	0.0	0.2
2004	0.0	5.7	0.0	0.2	1.2	0.2	-	-	-	-	0.1	0.0
2009	0.1	5.4	1.8	0.2	1.0	0.1	0.0	0.0	-	-	0.0	0.1
2011	0.3	9.6	3.4	1.5	2.8	1.7	-	0.1	0.0	0.0	0.2	0.1
2014	0.8	12.1	1.4	1.7	3.3	1.1	-	-	-	-	-	0.3
2019	0.4	2.8	3.4	0.5	0.4	3.4	0.1	-	0.0	-	0.0	1.3

a - Annual; n - Noxious Weed; i - Introduced Species

Table 14-11.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Artemisia dracunculus (tarragon)	Astragalus amphioxys (Crescent milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus mollissimus (woolly locoweed)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata[ai] (curveseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Chenopodium[a] (goosefoot)	Chenopodium fremontii[a] (Fremont's goosefoot)	Conyza[a] (horseweed)	Cymopterus (springparsley)	Descurainia pinnata[a] (western tansymustard)	Draba[a] (draba)	Erigeron pumilus (shaggy fleabane)	Eriogonum cernuum[a] (nodding buckwheat)	Erodium cicutarium[ai] (redstem stork's bill)	Gilia inconspicua[a] (shy gilia)
year	Nested Frequency																
1994	-	-	-	15	-	17	3	-	-	-	-	16	73	-	5	-	4
1999	-	-	-	1	4	40	-	-	-	-	-	17	-	9	4	-	-
2004	-	-	-	-	-	-	-	-	-	-	-	6	-	-	-	-	4
2009	-	-	-	12	2	24	-	-	-	-	-	-	1	2	3	-	1
2011	1	-	-	16	-	2	-	-	-	-	-	1	3	5	-	-	3
2014	-	-	-	19	-	-	-	-	-	-	-	43	7	5	1	-	7
2019	-	40	6	6	10	13	-	6	2	4	6	57	74	-	-	2	122
year	Average Cover (%)																
1994	-	-	-	0.1	-	0.0	0.0	-	-	-	-	0.0	0.1	-	0.0	-	0.0
1999	-	-	-	0.0	0.0	0.1	-	-	-	-	-	0.0	-	0.0	0.0	-	-
2004	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-	-	-	0.0
2009	-	-	-	0.1	0.0	0.1	-	-	-	-	-	-	0.0	0.0	0.0	-	0.0
2011	0.1	-	-	0.1	-	0.0	-	-	-	-	-	0.0	0.0	0.2	-	-	0.0
2014	-	-	-	0.1	-	-	-	-	-	-	-	0.1	0.0	0.0	0.0	-	0.0
2019	-	0.2	0.0	0.0	0.2	0.1	-	0.0	0.0	0.2	0.0	0.3	0.3	-	-	0.0	3.5

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Lactuca serriola[ai] (prickly lettuce)	Lappula occidentalis[a] (flatspine stickseed)	Lepidium montanum[a] (mountain pepperweed)	Machaeranthera canescens (hoary tansyaster)	Microsteris gracilis[a] (slender phlox)	Mirabilis oxybaphoides (smooth spreading four o'clock)	Oenothera albicaulis[a] (whitest evening primrose)	Oenothera coronopifolia (crownleaf evening primrose)	Packera multilobata (lobeleaf groundsel)	Penstemon comarrhenus (dusty beardtongue)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Physalis hederifolia (ivyleaf groundcherry)	Plantago patagonica[a] (woolly plantain)	Silene antirrhina[a] (sleepy silene)	Sisymbrium[ai] (hedgemustard)	Sphaeralcea coccinea (scarlet globemallow)
year	Nested Frequency																
1994	-	20	-	-	-	-	-	-	-	3	22	8	-	107	3	-	134
1999	-	4	-	-	-	-	-	-	1	4	23	16	-	80	1	-	147
2004	-	4	-	-	-	-	-	-	-	-	17	10	-	119	-	-	103
2009	-	2	-	-	-	-	-	-	-	4	13	3	-	62	-	-	76
2011	-	3	4	3	-	4	-	-	1	-	19	19	-	95	-	-	100
2014	-	26	-	-	-	-	14	-	8	1	8	18	4	165	-	0	115
2019	5	48	1	47	11	-	15	43	4	3	33	40	4	227	-	0	118
year	Average Cover (%)																
1994	-	0.1	-	-	-	-	-	-	-	0.0	0.3	0.0	-	0.3	0.0	-	0.6
1999	-	0.0	-	-	-	-	-	-	0.0	0.0	0.3	0.1	-	0.2	0.0	-	1.2
2004	-	0.2	-	-	-	-	-	-	-	-	0.1	0.1	-	0.3	-	-	0.6
2009	-	0.0	-	-	-	-	-	-	-	0.0	0.2	0.0	-	0.2	-	-	0.4
2011	-	0.0	0.2	0.1	-	0.4	-	-	0.0	-	0.3	0.1	-	0.7	-	-	2.0
2014	-	0.1	-	-	-	-	0.2	-	0.0	0.0	0.1	0.2	0.0	1.0	-	0.0	1.3
2019	0.3	0.5	0.0	0.3	0.1	-	0.0	0.3	0.0	0.0	0.3	0.2	0.6	4.9	-	0.0	2.5

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Taraxacum officinale (common dandelion)	Tragopogon dubius[ai] (yellow salsify)
year	Nested Frequency	
1994	-	1
1999	-	-
2004	-	-
2009	-	-
2011	-	-
2014	-	-
2019	1	7
year	Average Cover (%)	
1994	-	0.0
1999	-	-
2004	-	-
2009	-	-
2011	-	-
2014	-	-
2019	0.0	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 14-11.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Atriplex canescens[p] (fourwing saltbush)	Echinocereus (hedgehog cactus)	Ericameria nauseosa (rubber rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. hololeuca[p] (rubber rabbitbrush)	Eriogonum microthecum[p] (slender buckwheat)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma[t] (Utah juniper)	Linanthus pungens (granite prickly phlox)	Opuntia (pricklypear)	Pediocactus simpsonii (mountain ball cactus)	Pinus edulis[t] (twoneedle pinyon)	Yucca baccata (banana yucca)
year	Line Intercept Cover (%)												
1994	-	-	-	-	-	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-	-	-	-	-	-
2004	13.8	-	-	-	-	0.1	0.1	-	-	3.6	-	12.9	-
2009	5.7	-	-	-	-	0.1	0.3	-	-	2.3	-	-	-
2011	7.5	-	-	-	-	0.5	0.5	-	0.1	1.4	-	-	-
2014	7	-	-	-	-	0.1	0.7	-	-	0.4	-	0	-
2019	9.5	-	-	-	-	0.5	-	0.1	-	-	-	-	-
year	Quadrat Cover (%)												
1994	3.5	0.0	0.0	-	-	0.1	0.1	0.8	-	0.2	-	9.5	-
1999	5.5	0.0	0.0	-	-	0.2	1.1	1.9	-	0.6	-	9.4	0.0
2004	10.0	0.3	0.0	-	-	0.1	0.0	-	-	0.4	-	9.4	-
2009	5.7	0.0	-	-	-	0.4	0.1	-	-	0.8	-	0.1	0.0
2011	6.5	0.1	0.0	-	-	0.6	0.6	-	0.1	1.0	-	-	-
2014	5.8	0.0	-	-	0.0	0.1	0.3	0.0	-	0.1	0.0	0.0	-
2019	9.7	0.2	-	0.0	-	0.6	0.3	0.3	-	0.1	0.0	-	0.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 14-11.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Artemisia frigida[p] -- (prairie sagewort)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	7/28
2011	20	-	0	100	0	0	0	0	65/87
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1994	2100	20	20	76	4	0	0	22	45/57
1999	2060	20	8	86	6	49	17	1	55/74
2004	2960	-	4	69	27	52	16	18	47/73
2009	1440	-	1	67	32	35	21	28	46/71
2011	1320	40	17	74	9	32	3	9	53/72
2014	1680	-	17	81	2	62	20	7	59/80
2019	1620	-	4	82	15	24	53	16	62/93

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Atriplex canescens[p] -- (fourwing saltbush)									
1994	120	20	50	17	33	0	0	33	52/84
1999	40	-	0	50	50	0	50	50	48/48
2004	40	-	0	100	0	0	0	0	37/44
2009	60	-	67	33	0	0	0	0	52/48
2011	60	-	67	33	0	33	0	0	52/76
2014	60	-	100	0	0	0	0	0	48/62
2019	60	-	33	67	0	33	33	0	53/73
Echinocereus -- (hedgehog cactus)									
1994	-	-	-	-	-	-	-	-	-/-
1999	100	-	60	40	0	0	0	0	7/14
2004	80	-	100	0	0	0	0	0	- / -
2009	-	-	-	-	-	-	-	-	6/42
2011	40	-	50	50	0	0	0	0	6/18
2014	-	-	-	-	-	-	-	-	10/23
2019	-	-	-	-	-	-	-	-	10/9
Ephedra viridis[p] -- (mormon tea)									
1994	-	-	-	-	-	-	-	-	65/70
1999	-	-	-	-	-	-	-	-	51/77
2004	-	-	-	-	-	-	-	-	38/61
2009	-	-	-	-	-	-	-	-	63/99
2011	-	-	-	-	-	-	-	-	23/42
2014	-	-	-	-	-	-	-	-	32/58
2019	-	-	-	-	-	-	-	-	40/86
Eriogonum microthecum[p] -- (slender buckwheat)									
1994	560	60	46	43	11	0	0	0	10/11
1999	1020	40	24	73	4	18	51	0	15/13
2004	620	-	3	97	0	0	0	0	11/10
2009	620	40	13	77	10	7	0	0	21/20
2011	540	-	15	85	0	26	0	4	30/30
2014	740	20	24	76	0	14	3	0	21/25
2019	760	-	13	87	0	11	11	0	25/20
Ericameria nauseosa -- (rubber rabbitbrush)									
1994	-	-	-	-	-	-	-	-	24/162
1999	-	-	-	-	-	-	-	-	-/-
2004	80	-	0	100	0	0	0	0	- / -
2009	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2014	-	60	0	0	0	0	0	0	37/31
2019	20	-	100	0	0	0	0	0	90/131
Gutierrezia sarothrae -- (broom snakeweed)									
1994	640	-	19	72	9	0	0	0	15/14
1999	4120	60	15	84	2	0	0	1	17/18
2004	700	40	3	97	0	0	0	0	14/17
2009	1100	-	11	78	11	0	7	4	15/19
2011	1060	20	13	87	0	2	0	4	17/25
2014	1480	200	15	85	0	0	0	0	15/19
2019	200	760	20	80	0	0	0	0	23/23

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Juniperus osteosperma[t] -- (Utah juniper)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2014	20	-	100	0	0	0	0	0	- / -
2019	60	-	100	0	0	0	0	0	- / -
Krascheninnikovia lanata[p] -- (winterfat)									
1994	-	-	-	-	-	-	-	-	29/29
1999	20	-	0	100	0	0	100	0	29/30
2004	20	-	0	100	0	0	100	0	30/36
2009	20	-	0	0	100	0	0	100	19/20
2011	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Linanthus pungens -- (granite prickly phlox)									
1994	-	-	-	-	-	-	-	-	-/-
1999	20	-	0	100	0	0	0	0	- / -
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2011	220	20	9	91	0	0	0	0	5/9
2014	-	-	-	-	-	-	-	-	48/52
2019	-	-	-	-	-	-	-	-	26/34
Opuntia -- (pricklypear)									
1994	580	-	10	66	24	0	0	3	9/28
1999	760	60	18	79	3	0	0	0	14/33
2004	1240	-	2	95	3	0	0	3	12/36
2009	960	-	6	88	6	0	4	19	8/33
2011	1120	-	13	71	16	2	0	13	9/35
2014	620	-	0	74	26	0	0	10	8/18
2019	160	-	38	63	0	0	0	0	6/12
Pediocactus simpsonii -- (mountain ball cactus)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	40	-	0	100	0	0	0	0	4/6
2009	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2014	20	-	0	100	0	0	0	0	- / -
2019	40	-	100	0	0	0	0	0	6/6
Pinus edulis[t] -- (twoneedle pinyon)									
1994	-	-	-	-	-	-	-	-	-/-
1999	160	20	25	75	0	0	0	0	- / -
2004	60	-	0	100	0	0	0	0	- / -
2009	-	-	-	-	-	-	-	-	-/-
2011	20	-	100	0	0	100	0	0	- / -
2014	40	-	100	0	0	0	0	0	- / -
2019	-	-	-	-	-	-	-	-	-/-

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Yucca baccata -- (banana yucca)									
1994	-	-	-	-	-	-	-	-	85/97
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	18/48
2011	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	40	-	0	100	0	0	0	0	23/33

t - Tree Species; p - Preferred Browse; i - Introduced Species

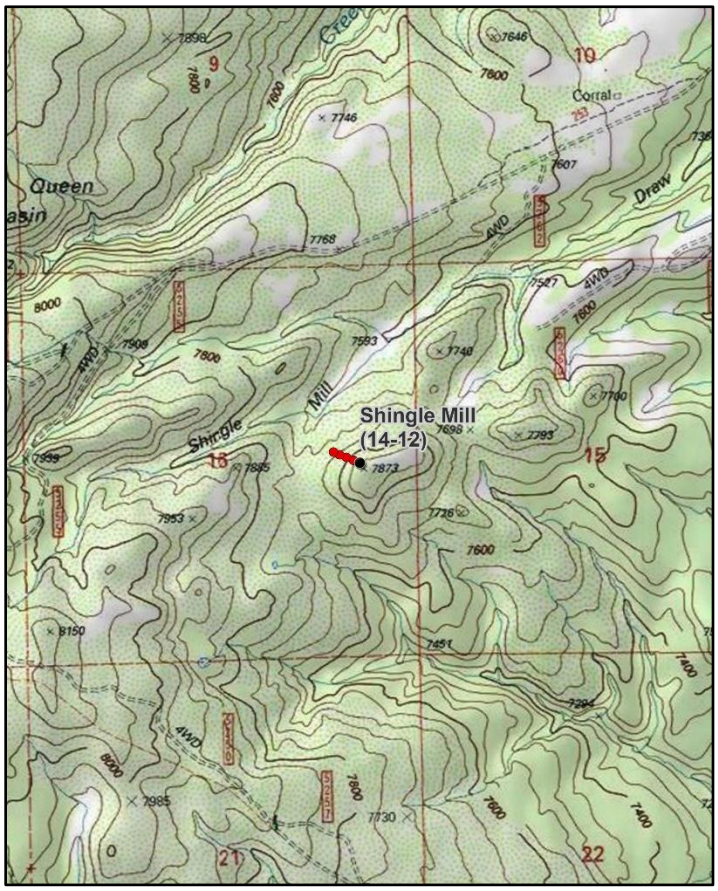
Table 14-11.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

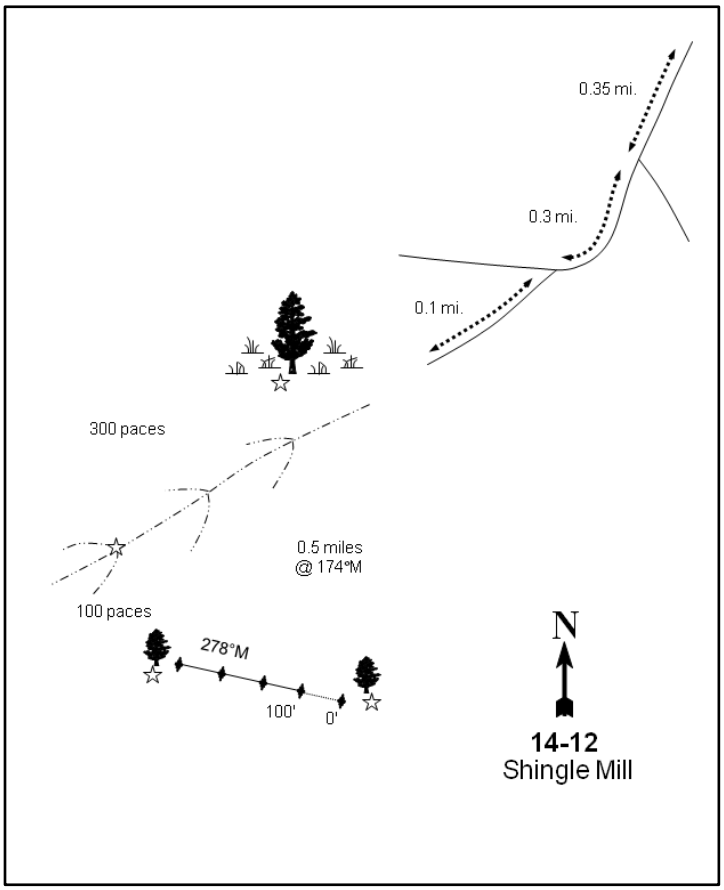
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1994	16	-	-	-	-	-	9.7
1999	20	-	-	-	-	-	13.2
2004	20	-	20	-	30	50	21.5
2009	4	50	50	-	-	-	1.5
2011	9	50	25	25	-	-	1.5
2014	7	-	100	-	-	-	2.8
2019	15	-	100	-	-	-	3.3
Pinus edulis (twoneedle pinyon)							
1994	86	-	-	-	-	-	9.2
1999	93	-	-	-	-	-	11.6
2004	80	-	6	6	28	61	13.0
2009	7	17	83	-	-	-	2.2
2011	7	50	33	17	-	-	1.3
2014	7	-	100	-	-	-	2.8
2019	7	-	100	-	-	-	2.7

Table 14-11.15 – Deer Desirable Components Index: Mid Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1994	4.5	0.0	0.0	14.4	-0.4	2.1	0.0	20.5	Very Poor
1999	7.1	13.2	4.1	16.5	-4.2	3.3	0.0	39.9	Poor
2004	17.4	7.0	2.0	14.7	0.0	1.4	0.0	42.4	Poor
2009	7.3	5.5	0.8	13.6	-1.4	1.5	0.0	27.3	Very Poor
2011	10.0	12.4	8.3	30.0	-2.6	6.7	0.0	64.8	Fair-Good
2014	8.9	14.3	8.4	30.0	-1.3	3.6	0.0	63.9	Fair-Good
2019	12.5	10.8	2.1	15.2	-3.5	9.3	0.0	46.3	Poor

SHINGLE MILL - STUDY NO. 14-12





Location Information

USGS 7.5 min Map Info	Abajo Peak NE; Township 34S, Range 23E, Section 16
GPS (0' Stake)	NAD 83 UTM ZONE 12, 641327 East 4187273 North

Transect Information

Browse Tag # (0' Stake)	DWR 5
Transect Bearing	278° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

On South Creek Road (the road to Loyd's Lake), travel 3.5 miles from the junction of the North Creek (200 South heading west out of Monticello) and South Creek Roads. Turn left onto FS Road #261 and continue 0.35 miles to a fork. Turn right onto a faint road and proceed for 0.3 miles to another fork. Bear left and continue for 0.1 miles to a large ponderosa pine growing in a flat: park here. The site is on a hillside about 0.5 miles away at a bearing of approximately 174 degrees magnetic. The 0-foot stake is uphill, with the baseline running down at 278 degrees magnetic.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	LAKES/SOUTH PEAK
Elevation	7,800ft (2,377m)
Aspect	Northwest
Slope	30%
Sample Dates	06/23/1994, 06/17/1999, 06/16/2004, 06/17/2009, 08/04/2014, 06/18/2019

Wildlife Habitat and Vegetation History

Table 14-12.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	summer
Rocky Mountain Elk	crucial	winter

Table 14-12.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1994	Mixed Mountain Brush	Phase I
1999	Mixed Mountain Brush	Phase I
2004	Mixed Mountain Brush	Phase I
2009	Mixed Mountain Brush	Phase I
2014	Mixed Mountain Brush	Phase I
2019	Mixed Mountain Brush	Phase I

Site Notes

A stream runs in the bottom of Shingle Mill Draw about one-third of a mile to the west and downhill from the site.

Soils

Table 14-12.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay	7.3	26.9	20.5	52.6	3.4	5.6	86.4	0.4	06/07/1999

Site Potential

1981 - 2010 Average Annual Precipitation	20 inches
NRCS Ecological Site	Mountain Stony Loam (Browse)
NRCS Ecological Site #	R048AY451UT
States and Transitions	No state and transition model is available for this ecological site.

Since establishment in 1994, this site has remained in a stable state and dominated by mixed mountain brush species such as mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), mountain snowberry (*Symphoricarpos oreophilus*), and Gambel oak (*Quercus gambelii*) with lesser amounts of other shrub species (Table 14-12.12, Table 14-12.13). The herbaceous understory has been abundant and diverse throughout the study period, with perennial grasses and forbs contributing a majority of the herbaceous cover (Table 14-12.7, Table 14-12.10, Table 14-12.11). Twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) have been observed since study establishment (Table 14-12.12, Table 14-12.14, Photos). Although the study site has remained in Phase I of woodland succession (Table 14-12.4), there is potential for tree cover and density to increase over time.

Trend Summary Tables

Table 14-12.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	28.7	0.0	0.4	-	-	-
1999	33.8	0.0	0.7	-	-	0.2
2004	32.2	0.2	0.8	39.0	0.2	3.6
2009	34.5	0.3	1.2	49.6	0.2	3.6
2014	26.5	0.2	1.3	38.8	-	4.0
2019	40.8	0.1	1.1	50.0	-	5.7

Table 14-12.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	-	333	3	283	-	8.6	0.0	10.8
1999	-	336	1	289	-	11.9	0.0	17.9
2004	-	283	26	254	-	8.9	1.0	6.8
2009	-	345	5	257	-	14.5	0.0	11.1
2014	-	319	-	197	-	10.1	-	4.6
2019	1	331	53	288	0.0	13.7	0.5	12.4

Table 14-12.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	17.2	0.3	25.1	2.5	17.0	47.6
1999	17.9	0.8	32.7	5.2	15.9	53.1
2004	13.7	0.1	30.0	6.0	18.0	49.7
2009	8.9	0.4	31.1	6.2	16.1	54.0
2014	19.4	0.7	31.9	8.9	14.7	37.1
2019	20.7	1.9	31.7	9.3	16.9	50.4

Table 14-12.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1994	-	17	5	-
1999	-	19	-	4
2004	1	21	10	11
2009	2	16	5	5
2014	2	19	1	8
2019	-	26	7	6
Year	Days Use Per Acre (ha)			
1994	-	-	-	-
1999	9.4 (23.3)	38.9 (96.0)	7.4 (18.2)	-
2004	0.7 (1.8)	54.3 (134.1)	18.7 (46.3)	-
2009	3.6 (9.0)	49.6 (122.5)	11.4 (28.1)	-
2014	-	36.8 (91.0)	2.7 (6.6)	-
2019	1.5 (3.6)	73.0 (180.4)	2.0 (5.0)	-

Table 14-12.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Achnatherum lettermanii (Letterman's needlegrass)	Achnatherum nelsonii (Columbia needlegrass)	Bromus tectorum[ai] (cheatgrass)	Carex (sedge)	Carex geyeri (Geyer's sedge)	Elymus elymoides (squirreltail)	Elymus trachycaulus (slender wheatgrass)	Hesperostipa comata (needle and thread)	Koeleria macrantha (prairie Junegrass)	Pascopyrum smithii (western wheatgrass)	Poa fendleriana (muttongrass)	Poa pratensis[i] (Kentucky bluegrass)
year	Nested Frequency												
1994	13	35	17	-	23	-	91	40	-	33	5	241	7
1999	9	-	54	-	30	-	23	57	3	68	15	201	37
2004	14	3	25	-	3	-	41	16	3	56	3	204	-
2009	27	3	52	-	3	-	42	40	-	55	13	222	14
2014	6	5	25	-	1	-	71	14	3	33	22	219	-
2019	24	12	22	1	4	4	120	13	-	77	14	219	4
year	Average Cover (%)												
1994	0.1	0.7	0.5	-	1.2	-	0.7	0.8	-	0.5	0.0	3.9	0.2
1999	0.0	-	1.6	-	0.9	-	0.4	0.8	0.0	2.6	0.1	4.7	0.9
2004	0.1	0.0	0.4	-	0.0	-	0.7	0.4	0.0	0.9	0.0	6.4	-
2009	0.2	0.2	2.1	-	0.1	-	1.1	1.6	-	1.3	0.2	7.1	0.7
2014	0.1	0.1	0.3	-	0.0	-	1.2	1.1	0.0	0.9	0.4	6.1	-
2019	0.4	0.4	0.9	0.0	0.0	0.3	2.6	0.1	-	2.3	0.3	6.1	0.2

a - Annual; n - Noxious Weed; i - Introduced Species

Table 14-12.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium (onion)	Arabis (rockcress)	Arenaria fendleri (Fendler's sandwort)	Artemisia ludoviciana (white sagebrush)	Astragalus bisulcatus (twogrooved milkvetch)	Calochortus nuttallii (sego lily)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata[ai] (curveseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Chenopodium leptophyllum[a] (narrowleaf goosefoot)	Cirsium (thistle)	Crepis acuminata (tapertip hawksbeard)	Cymopterus (springparsley)	Descurainia pinnata[a] (western tansymustard)	Dracocephalum parviflorum (American dragonhead)
year	Nested Frequency																
1994	24	4	7	4	-	10	154	2	5	-	-	-	4	2	1	-	-
1999	18	-	-	-	-	3	162	8	4	-	-	-	1	13	3	-	-
2004	-	1	10	8	1	-	97	3	-	-	-	-	-	7	-	-	7
2009	-	0	-	-	-	4	147	1	-	-	-	-	-	8	-	3	-
2014	1	-	2	13	7	-	92	-	-	-	3	-	-	-	4	-	-
2019	3	4	12	6	-	-	114	32	-	4	-	2	3	6	18	9	11
year	Average Cover (%)																
1994	0.2	0.0	0.0	0.0	-	0.0	5.6	0.0	0.0	-	-	-	0.0	0.0	0.0	-	-
1999	0.4	-	-	-	-	0.0	9.5	0.2	0.0	-	-	-	0.0	0.1	0.0	-	-
2004	-	0.0	0.0	0.0	0.0	-	3.0	0.0	-	-	-	-	-	0.1	-	-	0.0
2009	-	0.0	-	-	-	0.1	5.1	0.0	-	-	-	-	-	0.1	-	0.0	-
2014	0.0	-	0.0	0.0	0.0	-	1.5	-	-	-	0.0	-	-	-	0.0	-	-
2019	0.0	0.0	0.1	0.4	-	-	4.2	0.3	-	0.0	-	0.0	0.0	0.1	0.5	0.0	0.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Erigeron eatonii (Eaton's fleabane)	Erigeron flagellaris (trailing fleabane)	Eriogonum elatum (tall woolly buckwheat)	Lactuca serriola[ai] (prickly lettuce)	Lappula occidentalis[a] (flatspine stickseed)	Lathyrus lanszwertii (Nevada pea)	Lomatium dissectum (fernleaf biscuitroot)	Lupinus argenteus (silvery lupine)	Packera neomexicana (New Mexico groundsel)	Penstemon caespitosus (mat penstemon)	Penstemon pachyphyllus (thickleaf beardtongue)	Petradoria pumila (rock goldenrod)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii[a] (Douglas' knotweed)	Taraxacum officinale (common dandelion)	Tetraneuris acaulis (stemless four-nerve daisy)
year	Nested Frequency																
1994	-	4	2	-	-	4	14	39	3	144	3	-	-	72	-	-	9
1999	-	4	-	-	-	-	21	46	1	132	-	5	-	45	-	14	13
2004	1	3	-	3	22	-	18	42	-	106	2	2	3	95	1	1	4
2009	2	7	3	-	-	-	20	32	1	160	5	2	-	72	-	9	8
2014	1	2	1	-	-	-	-	14	-	105	2	1	-	40	-	-	-
2019	-	7	-	-	34	-	7	8	-	145	4	-	-	104	14	6	10
year	Average Cover (%)																
1994	-	0.0	0.0	-	-	0.0	0.2	2.0	0.0	2.3	0.0	-	-	0.2	-	-	0.1
1999	-	0.0	-	-	-	-	0.2	3.6	0.0	3.5	-	0.1	-	0.1	-	0.1	0.1
2004	0.0	0.0	-	0.0	0.9	-	0.1	1.0	-	1.8	0.0	0.0	0.0	0.5	0.0	0.0	0.0
2009	0.1	0.1	0.0	-	-	-	0.1	2.0	0.0	2.8	0.1	0.0	-	0.3	-	0.1	0.2
2014	0.0	0.0	0.0	-	-	-	-	0.5	-	2.4	0.0	0.0	-	0.1	-	-	-
2019	-	0.2	-	-	0.3	-	0.1	0.6	-	4.1	0.1	-	-	1.3	0.1	0.0	0.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Tragopogon dubius[ai] (yellow salsify)	Trifolium gymnocarpon (hollyleaf clover)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency		
1994	3	1	-
1999	1	3	7
2004	1	4	3
2009	2	4	10
2014	-	-	-
2019	-	3	3
year	Average Cover (%)		
1994	0.0	0.0	-
1999	0.0	0.0	0.0
2004	0.0	0.0	0.0
2009	0.0	0.0	0.1
2014	-	-	-
2019	-	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 14-12.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis[p] (Utah serviceberry)	Artemisia nova[p] (black sagebrush)	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Cercocarpus montanus[p] (alderleaf mountain mahogany)	Chrysothamnus depressus[p] (longflower rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma[t] (Utah juniper)	Opuntia fragilis (brittle pricklypear)	Peraphyllum ramosissimum[p] (wild crab apple)	Pinus edulis[t] (twoneedle pinyon)	Quercus gambelii[p] (Gambel oak)	Symphoricarpos oreophilus[p] (mountain snowberry)
year	Line Intercept Cover (%)											
1994	-	-	-	-	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-	-	-	-	-
2004	1.3	-	12.6	1.9	3.7	0.2	-	-	4.2	3.6	3.1	12.2
2009	1.1	-	14.6	1.6	3.8	0.2	-	-	4.4	3.6	6.8	17.3
2014	0.7	-	10.5	1.9	3.8	0	0.1	-	3.2	3.9	5.9	12.8
2019	1.3	-	15.8	3.3	3.4	-	0.5	-	3.5	5.2	6.2	16.5
year	Quadrat Cover (%)											
1994	0.7	-	10.0	2.8	1.7	0.0	-	-	3.9	0.4	4.1	5.6
1999	0.9	-	11.3	2.9	1.7	0.0	-	-	3.4	0.7	6.1	7.4
2004	0.4	-	9.0	2.7	3.7	0.2	-	0.0	3.8	0.8	4.7	7.9
2009	0.7	-	9.4	2.4	3.2	0.2	-	0.1	3.4	1.2	7.4	8.1
2014	0.5	-	7.9	1.3	4.4	0.1	0.0	0.1	2.2	1.3	3.7	6.4
2019	0.7	0.1	11.4	3.2	4.3	0.0	0.0	0.1	4.5	1.1	7.0	9.5

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 14-12.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
1994	860	-	28	61	12	2	5	2	31/38
1999	660	40	55	39	6	18	15	18	40/61
2004	400	-	15	80	5	10	70	5	38/53
2009	760	20	8	92	0	32	13	0	35/43
2014	340	-	29	65	6	41	29	6	34/40
2019	640	-	31	66	3	13	31	3	36/46
Artemisia nova[p] -- (black sagebrush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	37/90
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1994	2400	740	5	71	24	3	3	7	49/74
1999	2560	20	13	77	9	16	0	2	48/84
2004	2500	4260	2	62	36	44	9	20	42/71
2009	2980	200	10	70	20	24	3	7	40/71
2014	2600	20	6	76	18	47	32	6	38/69
2019	3020	20	14	66	21	22	19	21	44/80

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Cercocarpus montanus[p] -- (alderleaf mountain mahogany)									
1994	1020	40	12	82	6	41	16	0	49/57
1999	860	-	23	65	12	16	54	9	65/78
2004	940	-	21	68	11	6	92	11	50/66
2009	800	20	13	83	5	30	60	3	56/66
2014	860	-	9	84	7	26	51	7	34/45
2019	780	-	3	97	0	41	49	3	43/59
Chrysothamnus depressus[p] -- (longflower rabbitbrush)									
1994	3600	20	0	100	0	0	0	0	12/24
1999	2600	-	0	100	0	2	0	0	10/19
2004	6000	-	1	99	0	24	4	0	16/26
2009	4940	20	1	98	1	7	0	0	11/24
2014	4960	7560	4	96	1	38	17	2	10/20
2019	5520	-	0	97	3	34	39	2	15/25
Gutierrezia sarothrae -- (broom snakeweed)									
1994	120	-	0	100	0	0	0	0	20/20
1999	80	-	0	100	0	0	0	0	16/17
2004	180	-	0	100	0	0	0	0	19/25
2009	180	-	11	89	0	0	0	0	19/22
2014	300	-	7	93	0	0	0	0	18/26
2019	120	40	0	100	0	0	0	0	15/16
Juniperus osteosperma[t] -- (Utah juniper)									
1994	-	-	-	-	-	-	-	-	-/-
1999	20	-	0	0	100	0	0	100	- / -
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	20	-	100	0	0	0	0	0	- / -
2019	20	-	100	0	0	0	0	0	- / -
Opuntia fragilis -- (brittle pricklypear)									
1994	-	20	0	0	0	0	0	0	- / -
1999	-	-	-	-	-	-	-	-	-/-
2004	100	-	60	40	0	0	0	0	6/7
2009	100	-	40	60	0	0	0	0	4/10
2014	240	20	17	83	0	0	0	0	8/13
2019	280	-	14	86	0	0	0	14	14/12
Peraphyllum ramosissimum[p] -- (wild crab apple)									
1994	1520	-	8	87	5	36	3	3	45/66
1999	800	-	8	90	3	43	15	0	41/59
2004	1060	-	2	64	34	8	43	13	54/75
2009	1400	80	7	91	1	36	0	1	58/76
2014	860	-	0	98	2	70	7	2	48/68
2019	1260	80	0	100	0	16	33	0	54/80
Pinus edulis[t] -- (twoneedle pinyon)									
1994	-	-	-	-	-	-	-	-	-/-
1999	60	-	100	0	0	0	0	33	- / -
2004	100	20	100	0	0	0	0	0	- / -
2009	20	20	0	100	0	0	0	0	- / -
2014	120	20	100	0	0	0	0	0	- / -
2019	160	-	88	13	0	0	0	0	- / -

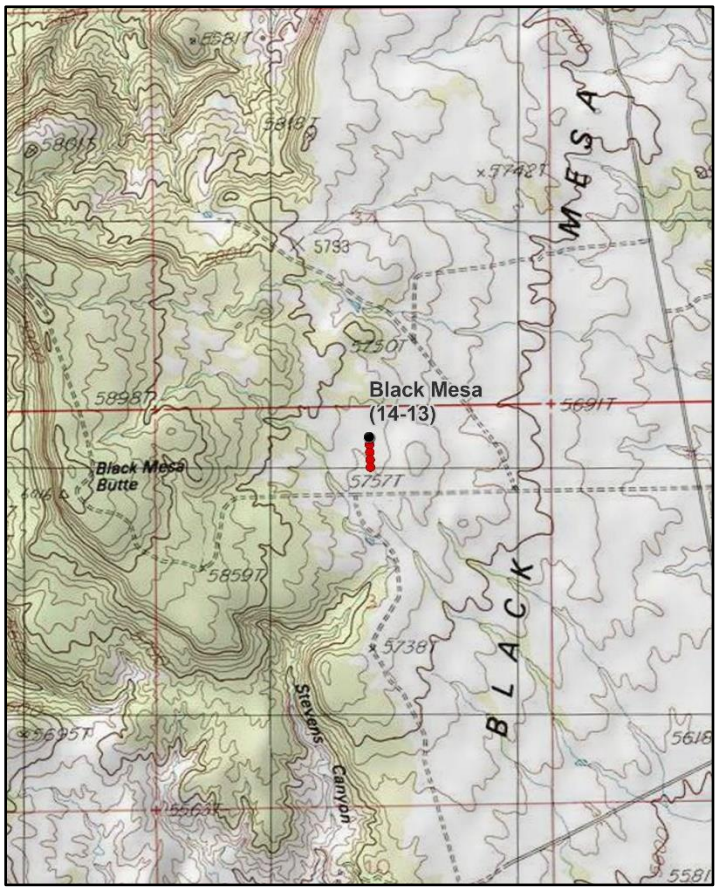
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Quercus gambelii[p] -- (Gambel oak)									
1994	-	-	-	-	-	-	-	-	-/-
1999	2700	-	31	66	3	17	11	3	67/55
2004	2440	-	20	66	15	43	7	9	49/40
2009	2280	340	47	53	1	10	0	4	55/113
2014	2020	20	11	86	3	64	3	3	45/58
2019	3580	-	10	89	1	10	7	1	41/47
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
1994	6820	100	13	86	1	1	0	0	32/53
1999	4580	40	7	92	1	4	0	0	34/55
2004	6500	-	8	91	2	11	12	0	30/50
2009	8680	140	5	95	1	7	1	0	36/57
2014	6440	-	1	98	1	10	2	3	29/42
2019	6400	20	2	98	1	5	7	1	32/54
Tetradymia canescens -- (spineless horsebrush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	40/48

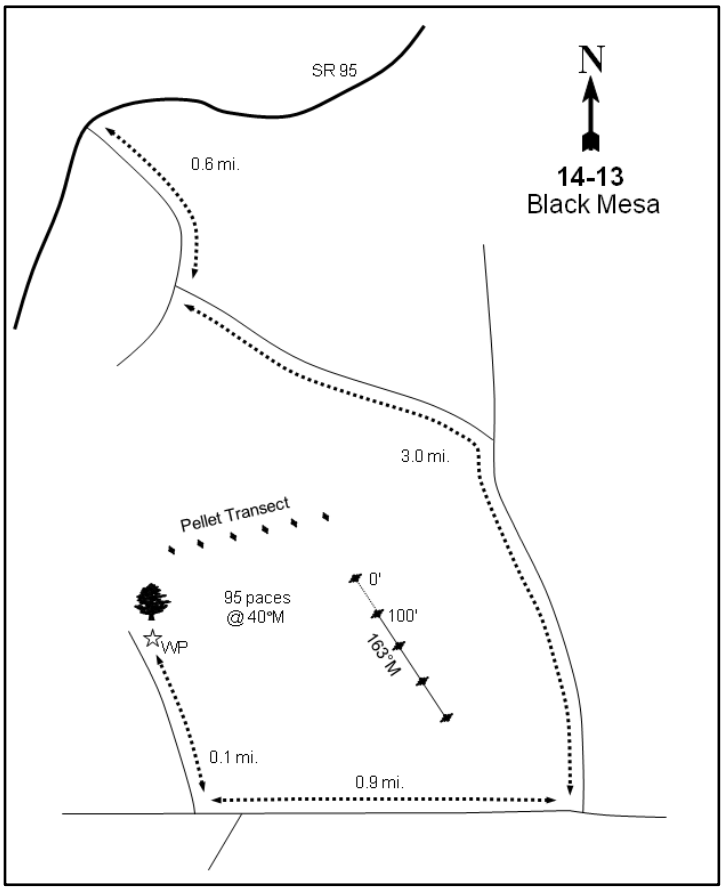
t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 14-12.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2014	14	-	17	83	-	-	11.5
2019	15	-	25	75	-	-	11.4
Pinus edulis (twoneedle pinyon)							
2014	39	-	69	8	15	8	8.6
2019	49	8	38	31	8	15	9.7

BLACK MESA - STUDY NO. 14-13





Location Information	
USGS 7.5 min Map Info	Black Mesa Butte SW; Township 38S, Range 21E, Section 03
GPS (0' Stake)	NAD 83 UTM ZONE 12, 624339 East 4153317 North

Transect Information	
Browse Tag # (0' Stake)	7822
Transect Bearing	163° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95t), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

From mile marker 114 on State Road 95 near Cottonwood Canyon east of Comb Ridge, go 0.5 miles east to County Road 233. Proceed south on County Road 233 for 0.6 miles to a fork. Stay left and drive 3.0 miles to an intersection (County Road 280). Turn right and go 0.9 miles beyond a fork to the left, to a very faint road to the right. Turn right onto this faint road before two gullies and go 0.1 miles to a fencepost which is six feet from the right side of the road: there is a lone juniper just behind the stake. From this witness post, go about 600 feet (95 paces) at 40 degrees magnetic (following the deer pellet group transect) to the first baseline stake which is located 25 feet south of pellet transect stake #8718 (a 6-inch tall yellow rebar). The baseline stake is a three-foot tall green fencepost tagged #7822. The transect runs south from the 0-foot baseline stake, with 100 feet between all posts.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	COTTONWOOD
Elevation	5,700ft (1,737m)
Aspect	Southwest
Slope	3-4%
Sample Dates	08/25/1992, 06/22/1994, 06/30/1999, 06/22/2004, 07/07/2009, 06/26/2014, 06/10/2019

Table 14-13.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	-	-	Before 1986	-

Wildlife Habitat and Vegetation History

Table 14-13.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter

Table 14-13.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1986	Wyoming Big Sagebrush	Phase I
1992	Wyoming Big Sagebrush	Phase I
1994	Wyoming Big Sagebrush	Phase I
1999	Wyoming Big Sagebrush	Phase I
2004	Wyoming Big Sagebrush	Phase I
2009	Wyoming Big Sagebrush	Phase I
2014	Wyoming Big Sagebrush	Phase I
2019	Annual Grass/Wyoming Big Sagebrush	Phase I

Site Notes

There are several mining claims stakes near the study site. A fire burned through the site prior to study establishment in 1986.

Soils

Table 14-13.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	7.3	60.9	16.5	22.6	1.3	7.5	70.4	0.5	06/30/1999

Site Potential

1981 - 2010 Average Annual Precipitation	12 inches
NRCS Ecological Site	Semidesert Sandy Loam (Wyoming Big Sagebrush)
NRCS Ecological Site #	R035XY216UT
States and Transitions	A defined state and transition model is available.

Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) has been a dominant vegetation component on this site since study establishment in 1986, although cover and density decreased significantly between 2014 and 2019 (Table 14-13.12, Table 14-13.13). Native perennial grasses were the dominant herbaceous species in most sample years, but the introduced annual grass cheatgrass (*Bromus tectorum*) contributed the most herbaceous cover in 1999, 2004, and 2019. In addition, cheatgrass was considered to be a co-dominant site component in 2019 (Table 14-13.7, Table 14-13.10, Table 14-13.11). Continued decreases in sagebrush could cause this site to transition to a solely annual grass-dominated state, which is not currently described by the available state and transition model (Jornada, 2019). Utah juniper (*Juniperus osteosperma*) has been observed in all sample years. Point-quarter data indicates that tree density has exhibited a slight increase overall. Although the study has been considered to be within Phase I of woodland succession in all sample years, juniper may have the potential to increase over time and become a major component of the site (Table 14-13.4, Table 14-13.12, Table 14-13.14, Photos).

Trend Summary Tables

Table 14-13.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1992	7.8	7.5	-	-	-	-
1994	12.2	0.6	0.9	-	-	-
1999	4.7	2.9	-	-	-	-
2004	6.6	6.1	-	5.0	7.3	-
2009	5.3	0.0	-	6.5	0.2	-
2014	3.9	8.2	-	5.6	9.0	-
2019	1.3	0.1	-	1.9	0.1	-

Table 14-13.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1992	40	190	200	163	0.2	9.4	4.0	1.6
1994	137	276	46	84	0.6	8.9	0.2	0.3
1999	447	137	19	23	12.3	3.8	0.2	0.1
2004	300	160	50	85	10.0	12.0	0.7	0.8
2009	201	223	34	71	3.2	10.9	0.2	0.5
2014	84	207	122	65	0.9	8.1	1.4	0.4
2019	332	138	270	80	18.7	1.2	12.7	0.9

Table 14-13.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1992	39.6	0.9	27.1	0.0	0.5	23.2
1994	46.0	0.3	29.5	0.1	0.1	23.2
1999	38.1	0.1	38.0	0.1	0.1	25.4
2004	45.4	0.2	25.3	0.3	0.0	36.7
2009	53.6	0.3	35.3	0.1	-	19.0
2014	58.5	0.3	22.3	0.2	0.0	25.0
2019	45.9	0.0	41.4	0.3	0.1	34.2

Table 14-13.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1992	-	22	-	52
1994	4	17	1	39
1999	10	34	1	75
2004	3	33	-	39
2009	-	30	3	61
2014	1	18	-	39
2019	1	23	3	24
Year	Days Use Per Acre (ha)			
1992	-	-	-	-
1994	-	-	-	-
1999	36.3 (89.7)	57.7 (142.4)	1.3 (3.3)	-
2004	10.2 (25.1)	37.5 (92.7)	0.7 (1.7)	-
2009	4.4 (10.8)	77.1 (190.4)	10.7 (26.5)	-
2014	-	8.7 (21.5)	-	-
2019	3.6 (9.0)	48.9 (120.8)	-	-

Table 14-13.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus tectorum[ai] (cheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Pleuraphis jamesii (James' galleta)	Sporobolus cryptandrus (sand dropseed)	Vulpia octoflora[a] (sixweeks fescue)
year	Nested Frequency						
1992	15	27	58	56	77	28	17
1994	13	106	143	101	87	11	54
1999	2	445	15	44	83	5	61
2004	4	293	21	38	93	10	24
2009	9	201	26	30	99	97	4
2014	18	65	30	40	116	28	36
2019	22	215	53	45	42	4	252
year	Average Cover (%)						
1992	0.1	0.1	1.3	2.0	4.2	1.7	0.0
1994	0.1	0.5	2.2	1.8	4.4	0.4	0.1
1999	0.0	12.1	0.2	0.3	3.2	0.0	0.2
2004	0.2	9.9	1.4	1.9	8.2	0.4	0.1
2009	0.2	3.2	0.5	1.4	5.8	3.0	0.0
2014	0.3	0.8	0.3	0.6	6.4	0.6	0.1
2019	0.1	13.1	0.4	0.3	0.4	0.0	5.6

a - Annual; n - Noxious Weed; i - Introduced Species

Table 14-13.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Aliciella hutchinsifolia[a] (desert pale gilia)	Astragalus convallarius (lesser rushy milkvetch)	Chaenactis stevioides[a] (Esteve's pincushion)	Chaetopappa ericoides (rose heath)	Chamaesyce fendleri (Fendler's sandmat)	Chenopodium album[a] (lambsquarters)	Comandra umbellata (bastard toadflax)	Cordylanthus wrightii[a] (Wright's bird's beak)	Cryptantha (cryptantha)	Cryptantha[a] (annual cryptantha)	Delphinium (larkspur)	Descurainia pinnata[a] (western tansymustard)	Draba rectifructa[a] (mountain draba)	Eriogonum cemuum[a] (nodding buckwheat)	Erodium cicutarium[ai] (redstem stork's bill)	Lactuca serriola[ai] (prickly lettuce)	Lappula occidentalis[a] (flatspine stickseed)
year	Nested Frequency																
1992	117	7	5	-	-	27	13	59	-	-	-	19	-	22	-	-	29
1994	5	5	-	-	1	-	10	-	9	-	-	14	10	2	-	7	12
1999	16	4	-	-	-	-	12	-	-	-	-	3	-	-	2	-	-
2004	13	0	-	0	1	-	7	3	-	-	-	15	-	-	4	-	17
2009	4	-	-	-	24	-	8	2	-	-	-	8	-	-	-	-	22
2014	20	-	-	-	-	-	5	-	10	-	-	35	2	-	3	-	88
2019	156	1	-	-	2	-	0	41	42	87	6	5	-	-	-	-	51
year	Average Cover (%)																
1992	0.4	0.1	0.0	-	-	0.4	0.3	2.4	-	-	-	0.1	-	0.1	-	-	0.3
1994	0.0	0.0	-	-	0.0	-	0.0	-	0.1	-	-	0.1	0.1	0.0	-	0.0	0.0
1999	0.2	0.0	-	-	-	-	0.1	-	-	-	-	0.0	-	-	0.0	-	-
2004	0.1	0.0	-	0.0	0.0	-	0.2	0.0	-	-	-	0.2	-	-	0.2	-	0.2
2009	0.1	-	-	-	0.3	-	0.0	0.0	-	-	-	0.0	-	-	-	-	0.1
2014	0.1	-	-	-	-	-	0.0	-	0.2	-	-	0.1	0.0	-	0.0	-	1.1
2019	6.5	0.1	-	-	0.0	-	0.0	0.4	0.5	2.9	0.1	0.0	-	-	-	-	0.3

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Lupinus (lupine)	Lygodesmia (skeletonplant)	Melilotus officinalis[i] (sweetclover)	Mentzelia albicaulis[a] (whitestem blazingstar)	Navarretia intertexta[a] (needleleaf navarretia)	Oenothera (evening primrose)	Packera multilobata (lobeleaf groundsel)	Phlox longifolia (longleaf phlox)	Sphaeralcea coccinea (scarlet globemallow)	Tragopogon dubius[ai] (yellow salsify)	unknown annual forb[a] (unknown forb)	unknown perennial forb (unknown forb)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency												
1992	96	-	41	-	-	-	-	42	0	-	36	-	-
1994	-	1	-	-	3	-	-	57	1	-	-	2	-
1999	-	-	-	-	1	-	-	7	3	-	-	-	-
2004	29	-	-	1	1	-	-	45	16	3	-	-	-
2009	-	-	-	-	-	-	-	41	-	-	-	-	-
2014	-	-	-	-	-	-	-	49	2	-	-	-	-
2019	-	-	-	-	71	2	6	15	4	-	-	-	2
year	Average Cover (%)												
1992	0.7	-	0.5	-	-	-	-	0.1	0.0	-	0.3	-	-
1994	-	0.0	-	-	0.0	-	-	0.1	0.0	-	-	0.0	-
1999	-	-	-	-	0.0	-	-	0.0	0.0	-	-	-	-
2004	0.1	-	-	0.0	0.0	-	-	0.2	0.3	0.0	-	-	-
2009	-	-	-	-	-	-	-	0.1	-	-	-	-	-
2014	-	-	-	-	-	-	-	0.2	0.0	-	-	-	-
2019	-	-	-	-	2.7	0.0	0.1	0.1	0.0	-	-	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 14-13.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. wyomingensis[p] (Wyoming big sagebrush)	Ephedra viridis[p] (mormon tea)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma[t] (Utah juniper)	Yucca (yucca)
year	Line Intercept Cover (%)				
1992	-	-	-	-	-
1994	-	-	-	-	-
1999	-	-	-	-	-
2004	5	-	7.3	-	-
2009	6.5	-	0	-	0.2
2014	5.6	-	8.6	-	0.4
2019	1.8	0.1	0.1	-	-
year	Quadrat Cover (%)				
1992	7.8	-	6.9	-	0.6
1994	12.2	-	0.6	0.9	-
1999	4.7	-	2.9	-	-
2004	6.6	-	6.1	-	0.0
2009	5.3	-	0.0	-	0.0
2014	3.9	-	7.8	-	0.4
2019	1.3	0.0	0.1	-	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 14-13.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Artemisia tridentata ssp. wyomingensis[p] -- (Wyoming big sagebrush)									
1992	2880	-	19	24	57	50	26	7	- / -
1994	3660	5660	26	35	39	0	0	25	64/92
1999	2140	120	9	31	60	36	53	22	63/88
2004	1680	80	1	30	69	61	14	77	46/65
2009	1600	40	1	48	51	31	10	31	50/66
2014	1060	-	8	68	25	45	43	17	59/79
2019	420	-	0	5	95	43	24	100	52/81
Ephedra viridis[p] -- (mormon tea)									
1992	20	-	0	100	0	0	0	0	- / -
1994	20	-	0	100	0	0	0	0	43/49
1999	20	-	0	100	0	0	0	0	49/37
2004	20	-	0	100	0	0	0	0	42/44
2009	20	-	0	100	0	0	0	0	55/16
2014	20	-	0	100	0	0	0	0	50/35
2019	20	-	0	0	100	0	100	100	41/39
Gutierrezia sarothrae -- (broom snakeweed)									
1992	8720	80	2	89	10	0	0	0	- / -
1994	2940	3920	27	59	14	0	0	25	29/31
1999	8900	40	18	80	2	0	0	2	22/24
2004	24460	-	10	89	1	0	0	18	18/23
2009	580	-	7	38	55	0	0	52	13/9
2014	8060	1380	6	92	3	0	0	3	23/30
2019	220	100	27	73	0	0	0	0	21/22
Opuntia -- (pricklypear)									
1992	-	-	-	-	-	-	-	-	-/-
1994	20	-	100	0	0	0	0	0	10/7
1999	-	-	-	-	-	-	-	-	-/-
2004	20	-	0	100	0	0	0	0	20/61
2009	20	-	0	100	0	0	0	0	17/82
2014	-	-	-	-	-	-	-	-	16/56
2019	20	-	0	100	0	0	0	0	20/43
Yucca -- (yucca)									
1992	20	-	0	100	0	100	0	0	- / -
1994	-	-	-	-	-	-	-	-	-/-
1999	40	-	0	100	0	0	0	0	35/48
2004	40	-	0	100	0	0	0	0	50/67
2009	40	-	0	100	0	0	0	0	55/71
2014	40	-	0	100	0	0	0	0	68/94
2019	-	-	-	-	-	-	-	-	64/134

t - Tree Species; p - Preferred Browse; i - Introduced Species

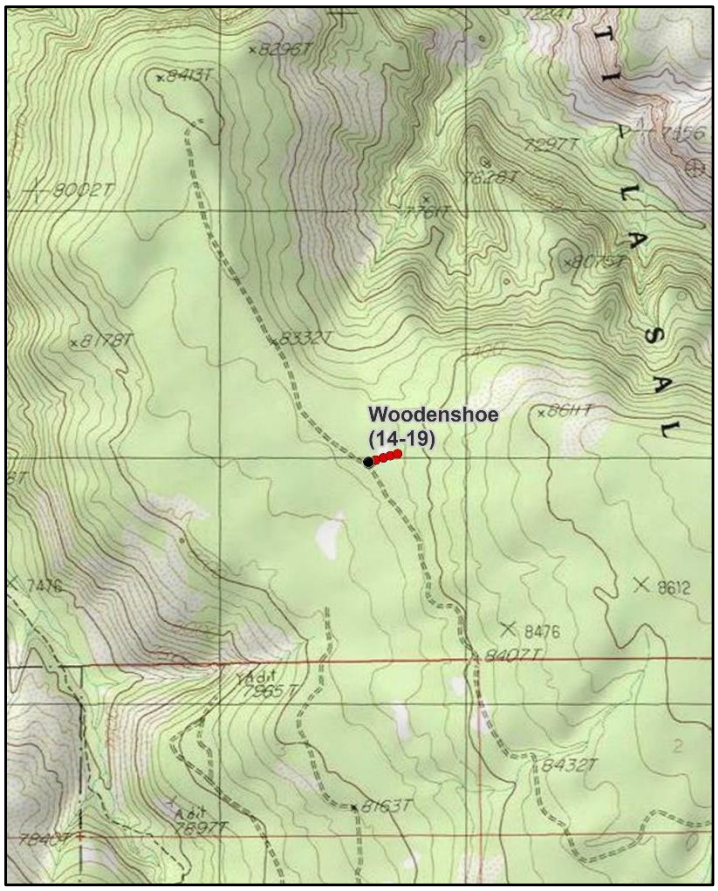
Table 14-13.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

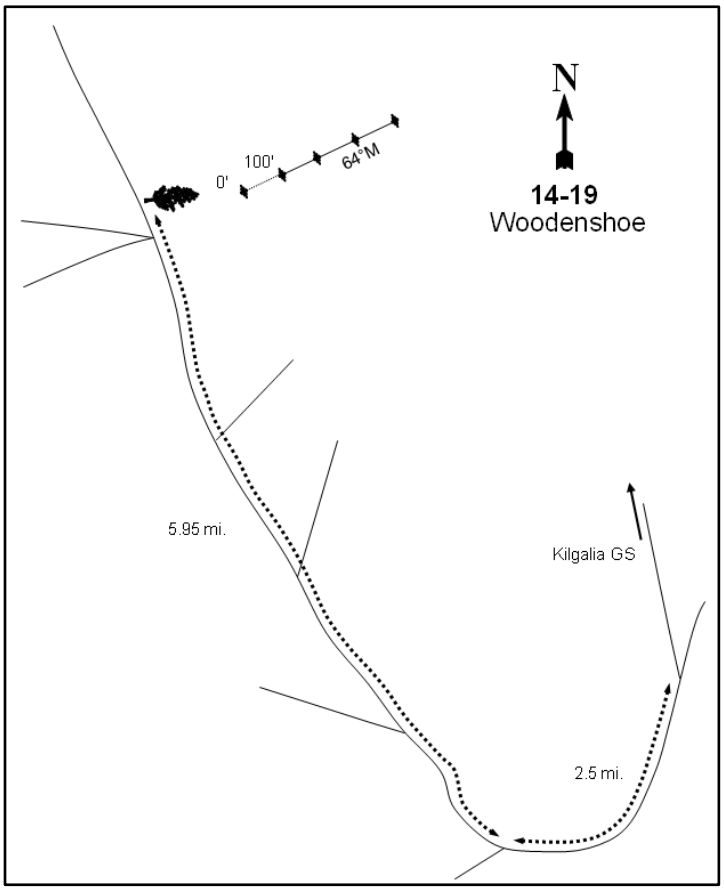
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1994	7	-	-	-	-	-	106.0
1999	12	-	-	-	-	-	15.0
2009	11	-	14	43	29	14	18.3
2014	11	-	14	43	14	29	18.7
2019	8	-	50	33	17	-	24.3

Table 14-13.15 - Deer Desirable Components Index: Low Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1992	9.8	-2.1	9.7	18.8	-0.1	3.3	0.0	39.4	Fair
1994	15.2	3.3	13.1	17.7	-0.5	0.6	0.0	49.4	Good
1999	5.9	0.0	0.0	7.6	-9.2	0.3	0.0	4.5	Very Poor
2004	6.3	0.0	0.0	24.1	-7.5	1.5	0.0	24.4	Poor-Fair
2009	8.1	-0.4	0.7	21.8	-2.4	1.0	0.0	28.7	Fair
2014	7.0	7.7	3.8	16.2	-0.7	0.8	0.0	34.7	Fair
2019	2.4	0.0	0.0	2.3	-14.0	1.7	0.0	-7.6	Very Poor

WOODENSHOE - STUDY NO. 14-19





Location Information

USGS 7.5 min Map Info	Woodenshoe Buttes NE; Township 35S, Range 18E, Section 47
GPS (0' Stake)	NAD 83 UTM ZONE 12, 595546 East 4172181 North

Transect Information

Browse Tag # (0' Stake)	482
Transect Bearing	64° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 71ft), Line 2 (34ft), Line 3 (59ft), Line 4 (95ft)
Belt Marker Placement	Standard

Directions to Site

From the Kigalia Guard Station turnoff, travel 2.5 miles southwest towards the Bears Ears. Turn right at the fork and proceed 2.05 miles to a fork located just west of a cattle guard and opposite a corral. Turn right, then go north 1.05 mile to another fork (County Road 271a). Turn left toward Woodenshoe Point Road and drive 1.35 miles to a fork. Stay left and continue for 1.45 miles. At this point, there are two overgrown, impassable logging roads taking off to the left. Go 0.05 miles (about 210 feet) past the logging roads to a moderately large, cut-down ponderosa on the right and a small clump of tall oak on the left. The transect starting point is about 10 feet east of the pine. The baseline is marked by red and green steel fence posts that are 16 inches tall, and the 0-foot stake has browse tag #482 attached.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	TWIN SPRINGS
Elevation	8,400ft (2,560m)
Aspect	Southwest
Slope	2%
Sample Dates	08/18/1992, 07/06/1999, 06/23/2004, 06/23/2009, 06/25/2014, 06/11/2019

Table 14-19.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	Woodenshoe	-	2003	2710

Wildlife Habitat and Vegetation History

Table 14-19.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	summer
Rocky Mountain Elk	crucial	summer

Table 14-19.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1986	Ponderosa Pine/Mixed Mountain Brush	NA
1992	Ponderosa Pine/Mixed Mountain Brush	NA
1999	Ponderosa Pine/Mixed Mountain Brush	NA
2004	Ponderosa Pine/Mixed Mountain Brush	NA
2009	Ponderosa Pine/Mixed Mountain Brush	NA
2014	Ponderosa Pine/Mixed Mountain Brush	NA
2019	Ponderosa Pine/Mixed Mountain Brush	NA

Site Notes

No Notes

Soils

Table 14-19.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	6.5	48.4	31.1	20.5	3.8	7.6	204.8	0.4	07/02/1999

Site Potential

1981 - 2010 Average Annual Precipitation	23 inches
NRCS Ecological Site	Mountain Loam (Ponderosa Pine)
NRCS Ecological Site #	R048AY417UT
States and Transitions	No state and transition model is available for this ecological site.

Ponderosa pine (*Pinus ponderosa*) and mountain brush species -- particularly mountain snowberry (*Symphoricarpos oreophilus*), mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), and Gambel oak (*Quercus gambelii*) -- have dominated this site since study establishment in 1986, even though a low severity fire burned the site in 2003 (Table 14-19.1, Table 14-19.12, Table 14-19.13). The herbaceous understory has remained abundant and diverse with perennial grasses and forbs contributing a majority of the cover throughout the sample period. The introduced annual grass cheatgrass (*Bromus tectorum*) has been observed since 2009, but in very low amounts (Table 14-19.7, Table 14-19.10, Table 14-19.11). This study site will likely remain in this or a similar state in future sample years unless a major disturbance occurs.

Trend Summary Tables

Table 14-19.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1992	22.1	0.7	19.4	-	-	-
1999	20.6	1.0	1.3	0.3	-	1.8
2004	6.8	1.2	1.5	8.2	0.6	5.9
2009	17.4	1.4	0.3	22.2	0.9	21.8
2014	16.0	1.2	1.0	25.0	0.5	15.2
2019	22.6	1.1	1.9	28.1	1.3	25.7

Table 14-19.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1992	-	276	107	234	-	13.5	1.1	6.7
1999	-	249	56	228	-	10.1	0.3	6.9
2004	-	150	173	174	-	6.1	3.4	6.8
2009	13	268	105	301	0.3	11.9	0.7	15.8
2014	7	265	58	243	0.0	7.8	0.5	8.4
2019	9	227	316	258	0.0	9.1	5.9	8.2

Table 14-19.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1992	14.3	0.9	61.5	0.0	2.1	54.6
1999	11.5	0.1	62.1	0.2	1.3	39.9
2004	23.2	1.5	54.0	0.2	2.6	27.0
2009	13.8	0.4	54.6	0.3	2.7	44.4
2014	20.7	-	58.5	0.1	2.4	37.5
2019	15.0	2.5	63.7	0.7	2.9	40.3

Table 14-19.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Dusky Grouse	Rocky Mountain Elk	Rabbit
	Quadrat Frequency				
1992	4	11	4	4	11
1999	8	8	-	1	3
2004	3	4	-	-	2
2009	15	3	-	2	4
2014	9	3	-	5	-
2019	5	3	-	2	1
Year	Days Use Per Acre (ha)				
1992	-	-	-	-	-
1999	26.8 (66.3)	7.4 (18.2)	-	2.7 (6.6)	-
2004	26.2 (64.6)	12.8 (31.5)	8.7 (21.5)*	6.7 (16.6)	-
2009	21.8 (53.8)	4.7 (11.6)	-	1.3 (3.3)	-
2014	37.0 (91.5)	10.7 (26.5)	-	3.4 (8.3)	-
2019	13.1 (32.3)	15.4 (38.1)	17.4 (43.0)*	21.5 (53.0)	-

*Pellets per acre (ha)

Table 14-19.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Achnatherum nelsonii (Columbia needlegrass)	Bouteloua gracilis (blue grama)	Bromus porteri (Porter brome)	Bromus tectorum[ai] (cheatgrass)	Carex (sedge)	Carex obtusata (obtuse sedge)	Elymus elymoides (squirreltail)	Elymus trachycaulus (slender wheatgrass)	Hesperostipa comata (needle and thread)	Koeleria macrantha (prairie Junegrass)	Muhlenbergia montana (mountain muhly)	Phleum pratense[i] (timothy)	Poa bulbosa[i] (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis[i] (Kentucky bluegrass)
year	Nested Frequency															
1992	43	24	8	12	-	35	-	94	29	12	2	8	-	-	114	95
1999	8	10	-	17	-	24	-	11	45	8	-	8	-	-	41	146
2004	36	6	-	12	-	42	-	30	-	1	-	7	-	-	7	64
2009	29	16	-	6	13	41	-	46	35	1	-	9	-	-	48	121
2014	12	22	-	-	7	27	-	69	59	11	-	-	3	-	25	126
2019	19	2	-	14	9	46	12	125	2	8	-	4	-	0	26	49
year	Average Cover (%)															
1992	1.2	0.7	0.1	0.3	-	2.2	-	2.1	0.4	0.4	0.0	0.5	-	-	1.8	3.9
1999	0.3	0.1	-	0.1	-	0.9	-	0.2	0.6	0.1	-	0.1	-	-	0.7	7.0
2004	1.0	0.1	-	0.3	-	2.1	-	1.2	-	0.0	-	0.0	-	-	0.1	1.3
2009	1.2	0.4	-	0.1	0.3	2.1	-	0.8	0.5	0.0	-	0.8	-	-	1.1	4.9
2014	0.3	0.3	-	-	0.0	1.2	-	1.0	0.7	0.2	-	-	0.0	-	0.8	3.3
2019	0.7	0.4	-	0.3	0.0	1.7	0.4	2.8	0.0	0.4	-	0.0	-	0.0	0.6	1.8

a - Annual; n - Noxious Weed; i - Introduced Species

Table 14-19.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Androsace septentrionalis[a] (pygmyflower rockjasmine)	Antennaria (pussytoes)	Arabis (rockcress)	Arenaria congesta (ballhead sandwort)	Artemisia ludoviciana (white sagebrush)	Astragalus (milkvetch)	Balsamorhiza sagittata (arrowleaf balsamroot)	Calochortus gunnisonii (Gunnison's mariposa lily)	Castilleja linariifolia (Wyoming Indian paintbrush)	Chenopodium[a] (goosefoot)	Chenopodium album[a] (lambsquarters)	Collinsia parviflora[a] (maiden blue eyed Mary)	Collomia linearis[a] (tiny trumpet)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawksbeard)
year	Nested Frequency																
1992	37	-	-	-	-	3	-	-	-	-	2	5	-	-	-	-	-
1999	43	7	-	-	-	6	-	-	-	3	-	-	-	3	-	1	-
2004	25	12	-	-	-	3	-	5	-	-	-	2	-	148	2	-	4
2009	43	20	2	-	3	39	-	1	-	3	-	-	5	17	14	-	8
2014	33	6	3	-	-	11	1	-	1	-	-	-	-	20	-	3	9
2019	19	28	-	3	3	7	1	-	-	-	-	-	-	257	12	-	5
year	Average Cover (%)																
1992	0.9	-	-	-	-	0.0	-	-	-	-	0.0	0.0	-	-	-	-	-
1999	1.4	0.0	-	-	-	0.1	-	-	-	0.0	-	-	-	0.0	-	0.0	-
2004	0.8	0.1	-	-	-	0.1	-	0.0	-	-	-	0.0	-	2.1	0.0	-	0.0
2009	1.9	0.1	0.0	-	0.0	0.6	-	0.0	-	0.0	-	-	0.0	0.1	0.4	-	0.0
2014	0.9	0.1	0.0	-	-	0.0	0.0	-	0.1	-	-	-	-	0.0	-	0.1	0.0
2019	0.3	0.3	-	0.2	0.0	0.2	0.0	-	-	-	-	-	-	4.0	0.1	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Cryptantha (cryptantha)	Delphinium nuttallianum (twolobe larkspur)	Epilobium brachycarpum[a] (tall annual willowherb)	Erigeron divergens[a] (spreading fleabane)	Erigeron eatonii (Eaton's fleabane)	Erigeron flagellaris (trailing fleabane)	Eriogonum racemosum (redroot buckwheat)	Gayophytum ramosissimum[a] (pinyon groundsmoke)	Heterotheca villosa (hairy false goldenaster)	Ipomopsis aggregata (scarlet gilia)	Lappula occidentalis[a] (flatspine stickseed)	Lathyrus lanszwertii (Nevada pea)	Lewisia pygmaea (alpine lewisia)	Lithophragma tenellum (slender woodland-star)	Lupinus sericeus (silky lupine)	Mertensia (bluebells)	Microsteris gracilis[a] (slender phlox)
year	Nested Frequency																
1992	-	-	8	26	3	107	5	-	3	4	-	52	-	-	13	-	3
1999	-	-	-	1	-	98	15	-	-	4	-	63	-	-	33	-	37
2004	-	3	-	-	4	60	6	13	-	3	2	18	-	-	17	-	32
2009	-	1	-	-	44	166	12	8	-	4	6	20	-	-	49	-	28
2014	1	-	-	4	51	123	15	-	6	5	11	16	-	-	31	-	38
2019	-	35	-	38	7	27	5	26	8	4	4	16	4	1	32	3	49
year	Average Cover (%)																
1992	-	-	0.0	0.3	0.0	2.7	0.1	-	0.6	0.0	-	0.9	-	-	0.1	-	0.0
1999	-	-	-	0.0	-	2.1	0.1	-	-	0.0	-	1.6	-	-	0.9	-	0.2
2004	-	0.0	-	-	0.0	1.8	0.1	0.5	-	0.0	0.0	0.4	-	-	2.1	-	0.4
2009	-	0.0	-	-	1.2	6.6	0.1	0.0	-	0.0	0.0	0.4	-	-	3.0	-	0.1
2014	0.0	-	-	0.0	0.6	3.1	0.1	-	0.0	0.0	0.1	0.6	-	-	1.5	-	0.4
2019	-	0.2	-	0.7	0.1	0.3	0.0	0.1	0.1	0.0	0.0	0.3	0.1	0.0	1.1	0.0	0.3

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Mimulus suksdorfii[a] (Suksdorf's monkeyflower)	Navarretia breweri[a] (Brewer's navarretia)	Oenothera (evening primrose)	Orogenia linearifolia (Great Basin Indian potato)	Packera cana (woolly groundsel)	Packera multilobata (lobeleaf groundsel)	Penstemon strictus (Rocky Mountain penstemon)	Phacelia[a] (phacelia)	Phlox longifolia (longleaf phlox)	Polygonum douglasii[a] (Douglas' knotweed)	Potentilla (cinquefoil)	Pseudostellaria jamesiana (tuber starwort)	Senecio spartioides var. multicapitatus (broom-like ragwort)	Silene drummondii (Drummond's campion)	Symphyotrichum (aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius[ai] (yellow salsify)
year	Nested Frequency																
1992	-	-	2	-	4	-	17	5	64	80	-	1	0	-	5	28	8
1999	-	-	-	-	7	2	5	0	50	18	-	5	-	-	15	27	3
2004	-	14	-	-	10	3	6	-	64	43	-	1	-	0	3	-	4
2009	-	13	-	-	3	1	11	-	8	13	-	4	-	-	15	48	13
2014	-	-	-	-	8	-	21	3	36	-	3	13	-	-	25	10	-
2019	1	17	-	57	64	20	-	11	105	90	-	9	-	12	8	21	3
year	Average Cover (%)																
1992	-	-	0.0	-	0.0	-	0.1	0.0	0.4	0.4	-	0.0	0.0	-	0.1	0.5	0.2
1999	-	-	-	-	0.0	0.0	0.1	0.0	0.1	0.0	-	0.0	-	-	0.1	0.3	0.0
2004	-	0.1	-	-	0.1	0.0	0.1	-	1.0	0.3	-	0.0	-	0.0	0.0	-	0.0
2009	-	0.0	-	-	0.2	0.0	0.1	-	0.1	0.0	-	0.0	-	-	0.4	0.9	0.1
2014	-	-	-	-	0.1	-	0.2	0.0	0.1	-	0.0	0.1	-	-	0.4	0.1	-
2019	0.0	0.1	-	0.6	1.7	0.5	-	0.2	1.1	0.4	-	0.3	-	0.1	0.2	0.2	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Trifolium (clover)	unknown annual forb[a] (unknown forb)	unknown perennial forb (unknown forb)
year	Nested Frequency		
1992	-	9	13
1999	-	-	-
2004	-	-	-
2009	6	-	-
2014	8	-	-
2019	14	-	-
year	Average Cover (%)		
1992	-	0.1	0.0
1999	-	-	-
2004	-	-	-
2009	0.1	-	-
2014	0.2	-	-
2019	0.2	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 14-19.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Mahonia repens (creeping barberry)	Pinus ponderosa[t] (ponderosa pine)	Prunus virginiana[p] (chokecherry)	Purshia tridentata[p] (antelope bitterbrush)	Quercus gambelii[p] (Gambel oak)	Rosa woodsii[p] (Woods' rose)	Symphoricarpos oreophilus[p] (mountain snowberry)
year	Line Intercept Cover (%)							
1992	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-
2004	1.5	0.6	5.9	-	0.1	1.1	-	5.5
2009	2.2	0.9	21.8	-	0.1	9.1	-	10.8
2014	4.1	0.5	15.2	-	0.1	11.5	0.1	9.2
2019	7.9	1.3	25.7	0.2	1.2	7	-	11.8
year	Quadrat Cover (%)							
1992	3.4	0.7	19.4	-	1.0	5.8	0.0	12.0
1999	2.6	1.0	1.3	-	0.2	6.1	-	11.8
2004	0.7	1.2	1.5	-	0.1	1.9	-	4.1
2009	2.8	1.4	0.3	1.1	0.2	6.5	-	6.9
2014	2.6	1.2	1.0	-	0.0	7.3	0.2	5.9
2019	8.4	1.1	1.9	0.0	0.5	5.5	0.0	8.1

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 14-19.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1992	1660	460	39	31	30	17	2	7	- / -
1999	1500	80	31	61	8	15	3	1	65/86
2004	800	60	65	33	3	60	0	3	40/58
2009	1280	400	28	72	0	0	0	0	45/55
2014	800	460	10	88	3	68	0	0	56/69
2019	2800	-	42	57	1	8	3	1	50/89
Ceanothus fendleri -- (Fendler's ceanothus)									
1992	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	20	-	0	100	0	0	0	0	- / -
2019	-	-	-	-	-	-	-	-	37/150
Chrysothamnus depressus[p] -- (longflower rabbitbrush)									
1992	20	-	0	100	0	0	0	0	- / -
1999	20	-	0	100	0	0	100	0	- / -
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	22/36
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Mahonia repens -- (creeping barberry)									
1992	4600	120	56	44	0	2	0	0	- / -
1999	3640	80	31	69	0	0	0	0	12/21
2004	3660	-	19	81	0	1	0	0	10/15
2009	6680	120	56	44	0	0	0	0	10/15
2014	3340	-	26	74	0	0	0	0	9/14
2019	5440	-	8	92	0	0	0	0	7/10
Pinus edulis[t] -- (twoneedle pinyon)									
1992	-	-	-	-	-	-	-	-	-/-
1999	-	20	0	0	0	0	0	0	- / -
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Pinus ponderosa[t] -- (ponderosa pine)									
1992	180	60	22	78	0	0	0	0	- / -
1999	160	-	13	88	0	0	0	0	- / -
2004	160	-	0	75	25	0	0	13	- / -
2009	160	40	0	88	13	0	0	0	- / -
2014	160	-	13	88	0	0	0	0	- / -
2019	200	40	20	80	0	0	0	0	- / -
Populus tremuloides[t] -- (quaking aspen)									
1992	-	20	0	0	0	0	0	0	- / -
1999	See table 13a - Aspen Characteristics								
2004	See table 13a - Aspen Characteristics								
2009	See table 13a - Aspen Characteristics								
2014	See table 13a - Aspen Characteristics								
2019	See table 13a - Aspen Characteristics								

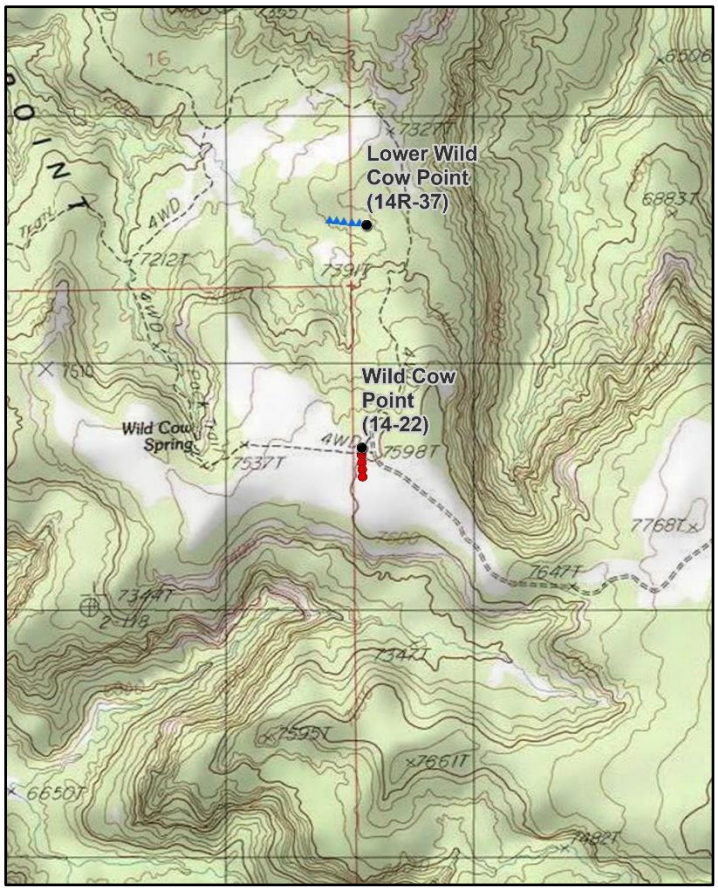
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Prunus virginiana[p] -- (chokecherry)									
1992	40	-	0	100	0	0	0	0	- / -
1999	-	-	-	-	-	-	-	-	-/-
2004	40	-	50	50	0	0	0	0	65/32
2009	300	-	67	33	0	0	0	0	48/25
2014	-	-	-	-	-	-	-	-	-/-
2019	60	-	0	100	0	0	0	0	41/30
Purshia tridentata[p] -- (antelope bitterbrush)									
1992	200	-	60	30	10	50	30	0	- / -
1999	200	-	10	70	20	70	20	10	25/58
2004	40	-	50	50	0	0	50	0	16/33
2009	40	-	50	50	0	50	50	0	15/49
2014	20	-	0	100	0	0	0	0	16/55
2019	80	-	25	75	0	75	25	0	28/56
Quercus gambelii[p] -- (Gambel oak)									
1992	4000	9420	77	21	3	22	1	2	- / -
1999	3580	1220	73	25	2	1	0	1	118/98
2004	2300	20	87	13	0	2	0	0	51/37
2009	3120	2920	29	71	0	0	0	0	59/63
2014	1760	260	34	66	0	9	0	0	67/66
2019	1800	-	10	90	0	1	0	0	79/70
Rosa woodsii[p] -- (Woods' rose)									
1992	80	-	100	0	0	0	0	0	- / -
1999	40	-	0	100	0	0	0	0	29/37
2004	-	-	-	-	-	-	-	-	33/19
2009	-	20	0	0	0	0	0	0	25/22
2014	180	-	0	100	0	0	0	0	25/33
2019	220	-	46	46	9	0	0	9	23/28
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
1992	4320	460	32	66	2	13	2	3	- / -
1999	3280	240	36	64	0	0	0	0	72/106
2004	2400	-	35	65	0	3	7	0	38/75
2009	3160	180	23	77	0	0	16	0	44/67
2014	2800	-	29	71	0	16	0	2	49/71
2019	2320	300	3	96	2	1	0	2	47/78

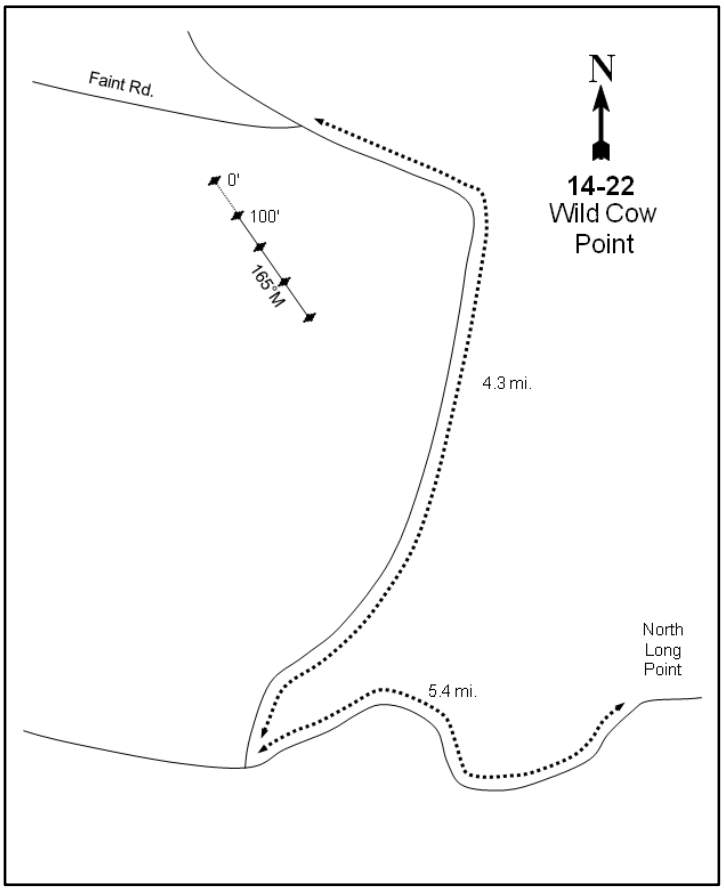
t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 14-19.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Pinus ponderosa (ponderosa pine)							
1999	81	-	-	-	-	-	31.6
2009	27	-	-	10	-	90	31.4
2014	33	-	20	-	-	80	27.0
2019	41	-	36	-	-	64	22.5
Quercus gambelii (Gambel oak)							
1999	146	-	-	-	-	-	6.9
2009	71	-	83	-	-	17	4.8

WILD COW POINT - STUDY NO. 14-22





Location Information

USGS 7.5 min Map Info	Fable Valley SE; Township 33S, Range 18E, Section 56
GPS (0' Stake)	NAD 83 UTM ZONE 12, 593494 East 4194850 North

Transect Information

Browse Tag # (0' Stake)	481
Transect Bearing	165° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 71ft), Line 2 (34ft), Line 3 (59ft), Line 4 (95ft)
Belt Marker Placement	Belt 1: No Rebar

Directions to Site

Drive to North Long Point. From the west rim of North Long Point, proceed west down the dugway on the Dark Canyon Plateau Road for 5.4 miles. Turn north on the Wild Cow Point Road and drive 4.3 miles to a chaining and a faint road to the left (west). The 0-foot stake is 10 feet south of the faint road on the west side of the Wild Cow Point Road about 100 hundred feet into the chaining, with the 0-foot stake having browse tag #481 attached. All stakes are 3 1/2-foot tall, green fenceposts.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	INDIAN CREEK
Elevation	7,600ft (2,316m)
Aspect	West
Slope	0-2%
Sample Dates	09/14/1992, 06/24/1999, 06/30/2004, 07/01/2009, 08/27/2014, 06/13/2019

Table 14-22.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Chain Unknown	-	-	Early 1960s	-
Seeding - Seed Unknown	-	-	Early 1960s	-

Wildlife Habitat and Vegetation History

Table 14-22.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter

Table 14-22.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1986	Black Sagebrush/Mountain Big Sagebrush/ Pinyon-Juniper	Phase I transitioning to Phase II
1992	Black Sagebrush/Mountain Big Sagebrush/ Pinyon-Juniper	Phase I transitioning to Phase II
1999	Black Sagebrush/Mountain Big Sagebrush/ Pinyon-Juniper	Phase I transitioning to Phase II
2004	Black Sagebrush/Mountain Big Sagebrush/ Pinyon-Juniper	Phase I transitioning to Phase II
2009	Black Sagebrush/Mountain Big Sagebrush/ Pinyon-Juniper	Phase I transitioning to Phase II
2014	Black Sagebrush/Mountain Big Sagebrush/ Pinyon-Juniper	Phase I transitioning to Phase II
2019	Black Sagebrush/Mountain Big Sagebrush/Pinyon-Juniper	Phase I transitioning to Phase II

Site Notes

No Notes

Soils

Table 14-22.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Loam	7.4	72.3	15.1	12.6	1.6	4.8	60.8	0.5	06/24/1999

Site Potential

1981 - 2010 Average Annual Precipitation	15 inches
NRCS Ecological Site	Upland Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R035XY308UT
States and Transitions	A defined state and transition model is available.

Since establishment in 1986, this site has remained dominated by a mixture of mountain big sagebrush (*Artemisia tridentata* spp. *vaseyana*), black sagebrush (*A. nova*), twoneedle pinyon (*Pinus edulis*), and Utah juniper (*Juniperus osteosperma*) (Table 14-22.12, Table 14-22.13, Photos). The herbaceous understory has remained diverse, but the introduced perennial grass species crested wheatgrass (*Agropyron cristatum*) has provided a majority of the herbaceous cover throughout the sample period (Table 14-22.7, Table 14-22.10, Table 14-22.11). Pinyon and juniper trees have increased in abundance over time, and the site has been considered to be within Phase I transitioning to Phase II of woodland succession since establishment (Table 14-22.4, Table 14-22.14). Pinyon and juniper may have the potential to become the dominant species in the community without a tree-removing disturbance (Jornada, 2019).

Trend Summary Tables

Table 14-22.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1992	18.9	0.0	8.3	-	-	-
1999	14.3	0.1	8.9	-	-	1.0
2004	12.1	0.0	10.4	13.1	-	19.7
2009	12.2	0.0	8.8	15.2	-	15.0
2014	8.9	0.0	9.8	11.9	-	19.3
2019	9.8	0.1	10.7	10.4	-	19.3

Table 14-22.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1992	-	307	36	107	-	17.3	0.9	2.9
1999	8	311	10	89	0.0	16.8	0.1	1.9
2004	21	243	103	88	0.1	9.8	1.4	1.2
2009	-	315	19	45	-	17.5	0.1	0.6
2014	-	309	34	41	-	12.8	0.3	0.3
2019	25	269	231	183	0.1	14.4	5.0	1.8

Table 14-22.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1992	15.9	5.1	46.1	-	1.2	43.3
1999	24.6	2.2	49.8	0.1	1.2	38.4
2004	34.7	2.1	48.7	0.0	0.7	35.4
2009	31.1	0.6	51.5	0.2	1.2	38.7
2014	32.9	0.7	51.7	0.1	1.0	31.6
2019	28.6	1.9	60.1	0.1	1.2	40.0

Table 14-22.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1992	1	29	1	49
1999	-	18	2	39
2004	2	19	2	38
2009	1	19	1	31
2014	-	12	2	36
2019	-	11	1	16
Year	Days Use Per Acre (ha)			
1992	-	-	-	-
1999	2.9 (7.2)	37.5 (92.7)	1.3 (3.3)	-
2004	-	27.5 (67.9)	10.7 (26.5)	-
2009	2.9 (7.2)	24.8 (61.2)	2.0 (5.0)	-
2014	4.4 (10.8)	12.8 (31.5)	1.3 (3.3)	-
2019	4.4 (10.8)	16.1 (39.7)	3.4 (8.3)	-

Table 14-22.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum[i] (crested wheatgrass)	Bouteloua gracilis (blue grama)	Bromus tectorum[ai] (cheatgrass)	Elymus elymoides (squirreltail)	Poa fendleriana (muttongrass)	Vulpia octoflora[a] (sixweeks fescue)
year	Nested Frequency					
1992	205	56	-	45	140	-
1999	223	19	8	4	131	-
2004	177	18	21	2	94	-
2009	272	17	-	11	103	-
2014	249	26	-	7	98	-
2019	228	26	3	9	53	23
year	Average Cover (%)					
1992	8.4	2.0	-	0.3	6.6	-
1999	10.2	0.1	0.0	0.0	6.4	-
2004	7.2	0.1	0.1	0.0	2.4	-
2009	14.3	0.4	-	0.3	2.5	-
2014	10.5	1.2	-	0.1	1.0	-
2019	12.4	1.0	0.0	0.1	1.0	0.1

a - Annual; n - Noxious Weed; i - Introduced Species

Table 14-22.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Aliciella hutchinsifolia[a] (desert pale gilia)	Allium (onion)	Antennaria neglecta (field pussytoes)	Arabis (rockcress)	Astragalus (milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Calochortus nuttallii (sego lily)	Camelina microcarpa[ai] (littlepod false flax)	Camissonia[a] (suncup)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata[ai] (curveseed butterwort)	Chenopodium leptophyllum[a] (narrowleaf goosefoot)	Cordylanthus kingii[a] (King's bird's-beak)	Delphinium nuttallianum (twolobe larkspur)	Descurainia pinnata[a] (western tansymustard)	Erigeron flagellaris (trailing fleabane)	Erigeron pumilus (shaggy fleabane)
year	Nested Frequency																
1992	-	6	7	-	-	8	-	-	-	3	-	-	27	-	-	1	3
1999	-	12	1	3	-	2	-	-	-	2	-	-	9	-	-	2	1
2004	-	11	-	0	-	-	-	-	-	-	-	-	102	-	-	-	3
2009	-	2	-	1	2	-	-	-	-	-	-	-	16	-	-	-	6
2014	-	3	-	7	0	-	-	6	-	-	-	-	4	-	22	4	4
2019	33	44	-	14	-	-	7	17	6	1	14	21	109	7	72	-	8
year	Average Cover (%)																
1992	-	0.0	0.5	-	-	0.2	-	-	-	0.0	-	-	0.9	-	-	0.0	0.0
1999	-	0.1	0.0	0.2	-	0.0	-	-	-	0.0	-	-	0.1	-	-	0.0	0.0
2004	-	0.0	-	0.0	-	-	-	-	-	-	-	-	1.4	-	-	-	0.0
2009	-	0.0	-	0.0	0.1	-	-	-	-	-	-	-	0.1	-	-	-	0.2
2014	-	0.0	-	0.0	0.0	-	-	0.0	-	-	-	-	0.2	-	0.1	0.0	0.0
2019	0.1	0.3	-	0.1	-	-	0.0	0.1	0.0	0.0	0.0	0.1	0.8	0.0	2.5	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Fritillaria atropurpurea (spotted fritillary)	Gayophytum ramosissimum[a] (pinyon groundsmoke)	Gilia inconspicua[a] (shy gilia)	Heterotheca villosa (hairy false goldenaster)	Lappula occidentalis[a] (flatspine stickseed)	Machaeranthera canescens (hoary tansyaster)	Machaeranthera grindelioides (rayless tansyaster)	Oenothera caespitosa (tufted evening primrose)	Packera multilobata (lobeleaf groundsel)	Penstemon lentus (handsome beardtongue)	Phlox austromontana (mountain phlox)	Phlox longifolia (longleaf phlox)	Physaria rectipes (straight bladderpod)	Polygonum douglasii[a] (Douglas' knotweed)	Senecio spartioides var. multicapitatus (broom-like ragwort)
year	Nested Frequency																
1992	23	8	-	-	-	2	-	6	-	-	-	3	42	-	9	12	4
1999	8	11	-	-	-	-	-	13	-	-	3	4	25	-	17	1	-
2004	15	4	-	-	-	-	-	36	-	2	5	1	19	-	8	2	-
2009	2	3	-	-	-	-	-	4	-	4	9	-	7	3	3	5	-
2014	1	1	-	-	-	-	2	2	10	-	10	-	6	-	4	-	-
2019	-	4	3	63	9	3	38	99	-	-	90	-	1	3	4	21	-
year	Average Cover (%)																
1992	0.2	0.1	-	-	-	0.0	-	0.0	-	-	-	0.0	1.5	-	0.2	0.0	0.0
1999	0.1	0.1	-	-	-	-	-	0.1	-	-	0.0	0.0	0.6	-	0.6	0.0	-
2004	0.1	0.0	-	-	-	-	-	0.6	-	0.0	0.1	0.0	0.2	-	0.1	0.0	-
2009	0.0	0.0	-	-	-	-	-	0.0	-	0.0	0.1	-	0.1	0.0	0.0	0.0	-
2014	0.0	0.0	-	-	-	-	0.0	0.0	0.0	-	0.0	-	0.1	-	0.0	-	-
2019	-	0.2	0.0	0.5	0.0	0.0	0.7	0.6	-	-	0.5	-	0.0	0.0	0.0	0.1	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Townsendia incana (hoary Townsend daisy)
year	Nested Frequency
1992	8
1999	5
2004	1
2009	-
2014	2
2019	4
year	Average Cover (%)
1992	0.1
1999	0.0
2004	0.0
2009	-
2014	0.0
2019	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 14-22.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis[p] (Utah serviceberry)	Artemisia nova[p] (black sagebrush)	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Chrysothamnus depressus[p] (longflower rabbitbrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Echinocereus mojavensis (Mojave kingcup cactus)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma[t] (Utah juniper)	Opuntia (pricklypear)	Pinus edulis[t] (twoneedle pinyon)	Sclerocactus parviflorus (smallflower fishhook cactus)
year	Line Intercept Cover (%)										
1992	-	-	-	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-	-	-	-
2004	-	5.6	7.2	0.3	-	-	-	6.7	-	13	-
2009	-	9.4	5.6	0.2	-	-	-	6.9	-	8.1	-
2014	-	5.3	6.6	0	-	-	-	7.3	-	12	-
2019	-	4.7	5.3	0.4	-	-	-	7.8	-	11.5	-
year	Quadrat Cover (%)										
1992	-	9.6	7.3	2.0	-	0.0	-	3.3	0.0	5.0	-
1999	-	6.7	6.6	1.0	-	-	0.0	2.8	0.0	6.1	-
2004	-	4.6	6.9	0.6	0.0	-	0.0	4.5	0.0	5.9	-
2009	-	7.2	4.7	0.2	-	-	-	5.0	0.0	3.7	-
2014	-	4.6	4.2	0.0	0.0	-	-	3.5	-	6.3	0.0
2019	0.0	4.8	4.9	0.2	-	-	-	4.4	0.1	6.3	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 14-22.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
1992	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	100	0	0	0	0	0	0	- / -
Artemisia nova[p] -- (black sagebrush)									
1992	5160	240	17	71	11	45	13	11	- / -
1999	3260	120	9	74	18	15	4	4	28/46
2004	2260	1540	1	57	43	21	3	29	26/54
2009	2700	100	5	74	21	4	0	14	30/72
2014	2000	-	2	69	29	49	28	21	32/64
2019	1480	-	4	65	31	4	16	39	36/61
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1992	2560	40	38	43	20	30	56	6	- / -
1999	1840	-	9	79	12	26	27	2	57/91
2004	1660	12860	4	63	34	18	70	12	51/80
2009	1400	-	1	86	13	56	30	1	50/82
2014	1080	-	0	59	41	39	56	37	51/91
2019	1200	-	3	72	25	22	5	23	54/82

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Chrysothamnus depressus[p] -- (longflower rabbitbrush)									
1992	2320	60	14	56	30	34	31	16	- / -
1999	880	-	5	80	16	14	30	7	14/27
2004	680	20	3	71	27	41	21	9	16/29
2009	240	-	0	75	25	0	0	0	12/22
2014	380	-	5	68	26	26	68	11	10/20
2019	280	260	7	93	0	21	7	7	14/26
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1992	-	-	-	-	-	-	-	-	-/-
1999	20	-	0	100	0	0	0	0	90/135
2004	-	-	-	-	-	-	-	-	24/25
2009	40	-	0	100	0	0	0	0	30/63
2014	20	-	0	100	0	0	0	0	39/49
2019	20	-	0	100	0	0	0	0	43/59
Echinocereus mojavensis -- (Mojave kingcup cactus)									
1992	20	20	0	100	0	0	0	0	- / -
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	5/13
2019	-	-	-	-	-	-	-	-	-/-
Ephedra viridis[p] -- (mormon tea)									
1992	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	108/127
Ericameria nauseosa ssp. nauseosa var. glabrata -- (rubber rabbitbrush)									
1992	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	73/93
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	85/41
Gutierrezia sarothrae -- (broom snakeweed)									
1992	60	-	67	33	0	0	0	0	- / -
1999	100	40	40	40	20	0	20	0	21/36
2004	20	-	0	100	0	0	0	0	17/24
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	14/18
2019	20	-	100	0	0	0	0	0	- / -
Juniperus osteosperma[t] -- (Utah juniper)									
1992	140	20	57	43	0	0	0	0	- / -
1999	80	20	0	100	0	0	0	0	- / -
2004	60	-	0	100	0	0	0	0	- / -
2009	40	-	0	100	0	0	0	0	- / -
2014	40	-	0	100	0	0	0	0	- / -
2019	100	-	0	100	0	0	0	0	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Opuntia -- (pricklypear)									
1992	80	20	0	100	0	0	0	50	- / -
1999	60	-	0	100	0	0	0	0	9/21
2004	40	-	0	100	0	0	0	0	7/18
2009	20	-	0	100	0	0	0	0	6/10
2014	-	-	-	-	-	-	-	-	12/32
2019	-	-	-	-	-	-	-	-	10/30
Pinus edulis[t] -- (twoneedle pinyon)									
1992	180	-	56	44	0	0	0	0	- / -
1999	160	-	38	63	0	0	0	0	- / -
2004	200	-	10	90	0	0	0	0	- / -
2009	100	-	0	100	0	0	0	0	- / -
2014	140	-	14	86	0	0	0	0	- / -
2019	160	-	25	75	0	0	0	0	- / -
Sclerocactus -- (fishhook cactus)									
1992	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	9/11
2019	-	-	-	-	-	-	-	-	13/10
Sclerocactus parviflorus -- (smallflower fishhook cactus)									
1992	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	20	-	0	100	0	0	0	0	12/11
2009	-	-	-	-	-	-	-	-	13/12
2014	-	-	-	-	-	-	-	-	12/13
2019	-	-	-	-	-	-	-	-	9/8

t - Tree Species; p - Preferred Browse; i - Introduced Species

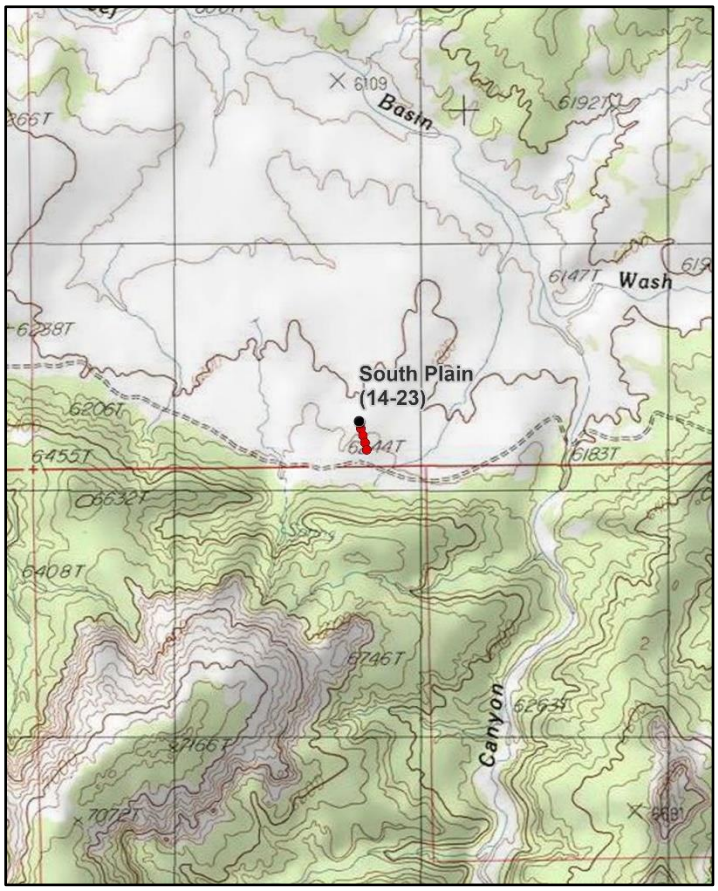
Table 14-22.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

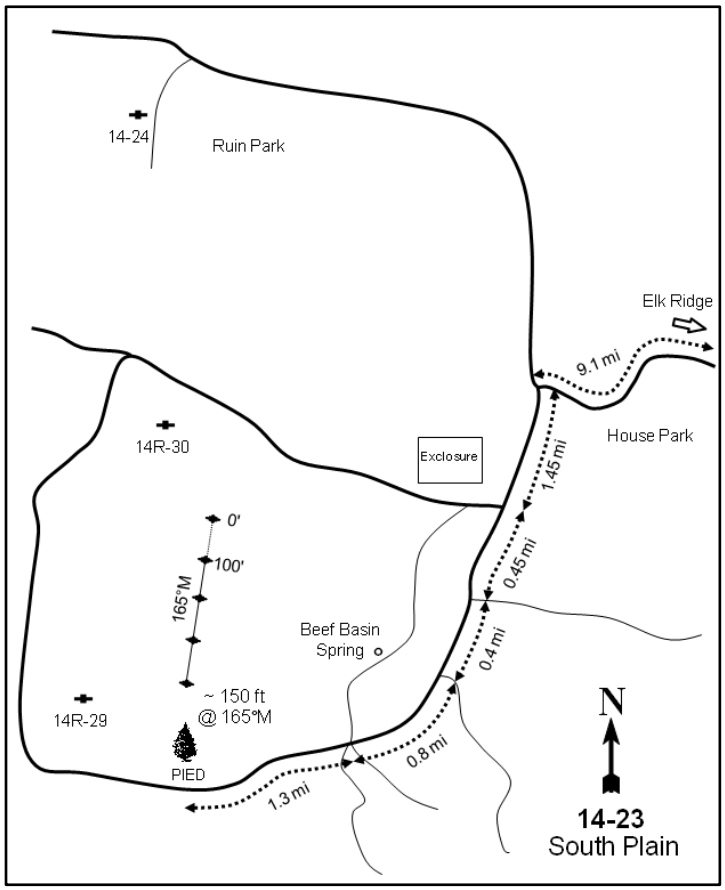
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1992	38	7	7	21	64	-	-
1999	33	-	-	-	-	-	31.1
2004	37	-	7	40	27	27	26.3
2009	40	-	14	29	29	29	22.3
2014	41	-	7	50	36	7	9.9
2019	39	-	7	27	47	20	29.1
Pinus edulis (twoneedle pinyon)							
1992	63	-	22	67	11	-	-
1999	56	-	-	-	-	-	10.4
2004	59	-	6	35	47	12	14.0
2009	37	-	18	24	59	-	11.2
2014	40	-	13	25	63	-	10.7
2019	53	6	11	22	50	11	14.6

Table 14-22.15 – Deer Desirable Components Index: Mid Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1992	23.6	10.1	12.4	30.0	0.0	5.9	0.0	82.0	Excellent
1999	17.8	10.5	4.2	30.0	0.0	3.8	0.0	66.3	Fair-Good
2004	16.4	3.8	1.2	19.6	0.0	2.3	0.0	43.3	Poor
2009	19.0	9.6	1.9	30.0	0.0	1.3	0.0	61.8	Fair
2014	14.9	4.4	0.4	25.5	0.0	0.6	0.0	45.7	Poor
2019	13.0	7.0	1.9	28.9	-0.1	3.7	0.0	54.3	Fair

SOUTH PLAIN - STUDY NO. 14-23





Location Information

USGS 7.5 min Map Info	Fable Valley NE; Township 32S, Range 18E, Section 64
GPS (0' Stake)	NAD 83 UTM ZONE 12, 594696 East 4200480 North

Transect Information

Browse Tag # (0' Stake)	Not Available
Transect Bearing	165° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 71ft), Line 2 (34ft), Line 3 (59ft), Line 4 (95ft)
Belt Marker Placement	Standard

Directions to Site

At the junction of the Rocky Mountain Elk Ridge, Salt Creek Mesa, and Beef Basin Roads, travel north down into the Beef Basin area. Follow the main road for 9.1 miles, passing the FS/BLM boundary to an intersection where there is a BLM register box. Stay left on County Road #104 and proceed 1.45 miles to the turnoff to an exclosure. Stay left and continue for 0.45 miles to a fork. Stay right and go 0.4 miles to another fork. Go right at the intersection with the Beef Basin Canyon Road and drive for 0.8 miles to a five-way intersection. Take the west fork straight through the intersection (left fork goes to Ancestral Puebloan ruins) and continue for 1.3 miles to a large pinyon pine on the right (north) side of the road: stop here. The 400-foot stake of the transect is 150 feet north of the pinyon.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	INDIAN CREEK
Elevation	6,300ft (1,920m)
Aspect	North
Slope	5-10%
Sample Dates	09/11/1992, 07/01/1999, 11/08/2004, 06/25/2009, 08/28/2012, 07/02/2014, 06/12/2019

Table 14-23.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Seeding - Transplant	Beef Basin Phase II	3307	May 2016	10
Seeding - Aerial After	Beef Basin Phase I	2939	January 2015	272
Herbicide - Plateau	Beef Basin Phase I	2939	Late November 2014	272

Table 14-23.2 SeedMix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Beef Basin Sagebrush			Aerial	Jan 2015	875
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
		Rice Hulls		0.57	0.00
S	Artemisia tridentata ssp. wyomingensis	Wyoming Big Sagebrush	Piute UT	1.06	0.20

Wildlife Habitat and Vegetation History

Table 14-23.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter

Table 14-23.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1986	Mountain Big Sagebrush	Phase I
1992	Mountain Big Sagebrush	Phase I
1999	Perennial Grass	Phase I
2004	Perennial Grass	Phase I
2009	Perennial Grass	Phase I
2012	Perennial Grass	Phase I
2014	Perennial Grass	Phase I
2019	Annual Grass	Phase I

Site Notes

Sagebrush in this area has been decreasing since the establishment of the study.

Soils

Table 14-23.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Loam	7.6	60.0	23.4	16.6	0.8	5.3	67.2	0.4	07/01/1999

Site Potential

1981 - 2010 Average Annual Precipitation	12 inches
NRCS Ecological Site	Upland Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R035XY308UT
States and Transitions	A defined state and transition model is available.

When the study was established in 1986, the plant community on this site was a stand of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) with an abundant herbaceous understory consisting primarily of grasses. Sagebrush has substantially decreased over the study period, becoming a minor component (Table 14-23.12, Table 14-23.13); the site transitioned to a perennial grass-dominated state in 1999. The herbaceous understory has remained abundant, cover of the introduced annual grass species cheatgrass (*Bromus tectorum*) fluctuated over the sample period and became the dominant site component in 2019 (Table 14-23.7, Table 14-23.10, Table 14-23.11). Cover and density of twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) have remained low (Table 14-23.12, Table 14-23.14), but these trees may have the potential to become the dominant species in the plant community without a tree-removing disturbance (Jornada, 2019).

Trend Summary Tables

Table 14-23.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1992	5.5	4.0	0.8	-	-	-
1999	2.7	4.9	0.7	-	-	-
2004	1.5	4.9	0.8	2.3	5.5	1.1
2009	1.6	6.1	0.4	1.8	7.6	1.9
2012	1.7	7.0	1.6	3.1	8.5	2.7
2014	1.8	4.7	0.2	1.7	5.4	1.2
2019	2.9	3.3	0.1	3.1	6.0	-

Table 14-23.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1992	35	352	30	32	0.2	25.7	0.1	0.2
1999	420	172	35	23	26.2	3.6	0.2	0.2
2004	326	240	49	12	9.6	10.8	0.5	0.2
2009	159	322	2	17	1.2	18.4	0.0	0.3
2012	168	339	24	9	1.2	24.3	0.1	0.3
2014	180	333	222	140	2.7	16.1	6.4	1.4
2019	367	304	317	110	20.9	11.6	9.8	0.9

Table 14-23.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1992	33.3	0.7	30.8	0.0	1.8	38.8
1999	33.2	0.3	34.0	0.7	0.1	37.6
2004	51.7	0.4	24.0	0.3	0.0	31.8
2009	51.2	0.1	40.8	0.8	-	28.9
2012	42.3	0.9	37.6	0.8	0.0	35.3
2014	41.7	2.1	36.9	0.8	0.0	37.3
2019	39.8	1.1	37.5	0.8	0.1	41.6

Table 14-23.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1992	1	47	-	25
1999	6	47	-	28
2004	17	32	2	9
2009	11	17	-	21
2012	10	15	2	5
2014	6	10	2	10
2019	5	8	4	7
Year	Days Use Per Acre (ha)			
1992	-	-	-	-
1999	13.1 (32.3)	77.1 (190.4)	-	-
2004	-	-	-	-
2009	45.0 (111.2)	32.2 (79.5)	3.4 (8.3)	-
2012	4.4 (10.8)	16.1 (39.7)	7.4 (18.2)	-
2014	3.6 (9.0)	-	-	-
2019	22.5 (55.6)	16.8 (41.4)	5.3 (13.2)	-

Table 14-23.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bouteloua gracilis (blue grama)	Bromus tectorum[ai] (cheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Sporobolus cryptandrus (sand dropseed)	Vulpia octoflora[a] (sixweeks fescue)
year	Nested Frequency						
1992	7	225	19	103	57	105	21
1999	2	64	420	53	82	21	5
2004	13	113	326	37	105	45	1
2009	12	145	159	13	171	71	-
2012	9	149	165	3	94	199	5
2014	12	229	131	15	188	29	62
2019	9	125	322	18	156	84	126
year	Average Cover (%)						
1992	0.2	18.6	0.1	1.1	1.5	4.3	0.1
1999	0.0	1.2	26.2	0.5	1.6	0.3	0.0
2004	0.2	5.4	9.6	0.4	2.7	2.1	0.0
2009	0.3	7.8	1.2	0.2	7.1	3.0	-
2012	0.2	9.4	1.2	0.1	3.3	11.3	0.0
2014	0.3	9.1	2.4	0.1	6.1	0.6	0.4
2019	0.8	2.9	19.2	0.2	6.5	1.2	1.7

a - Annual; n - Noxious Weed; i - Introduced Species

Table 14-23.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Antennaria (pussytoes)	Arabis (rockcress)	Astragalus amphioxys (Crescent milkvetch)	Calochortus nuttallii (sego lily)	Chamaesyce (sandmat)	Chenopodium album[a] (lambsquarters)	Chenopodium leptophyllum[a] (narrowleaf goosefoot)	Collinsia parviflora[a] (maiden blue eyed Mary)	Cryptantha (cryptantha)	Delphinium nuttallianum (twolobe larkspur)	Descurainia pinnata[a] (western tansymustard)	Erigeron pumilus (shaggy fleabane)	Eriogonum cemuum[a] (nodding buckwheat)	Erodium cicutarium[ai] (redstem stork's bill)	Gayophytum ramosissimum[a] (pinyon groundsmoke)	Gilia inconspicua[a] (shy gilia)	Lappula occidentalis[a] (flatspine stickseed)
year	Nested Frequency																
1992	-	-	18	1	-	-	11	-	-	-	-	8	5	-	-	-	-
1999	-	-	13	-	-	-	-	-	-	-	1	2	-	-	5	-	-
2004	1	-	-	-	-	-	1	10	-	-	5	2	-	-	-	-	4
2009	-	-	10	-	-	-	1	-	-	-	-	4	-	-	-	-	-
2012	-	-	-	-	1	-	-	-	-	-	1	1	-	-	-	-	2
2014	-	-	22	-	2	1	4	-	2	-	53	3	7	-	-	35	133
2019	-	5	17	-	-	-	5	-	8	1	79	3	-	36	-	129	109
year	Average Cover (%)																
1992	-	-	0.1	0.0	-	-	0.0	-	-	-	-	0.1	0.0	-	-	-	-
1999	-	-	0.1	-	-	-	-	-	-	-	0.0	0.1	-	-	0.0	-	-
2004	0.0	-	-	-	-	-	0.0	0.0	-	-	0.0	0.0	-	-	-	-	0.0
2009	-	-	0.0	-	-	-	0.0	-	-	-	-	0.0	-	-	-	-	-
2012	-	-	-	-	0.0	-	-	-	-	-	0.0	0.0	-	-	-	-	0.0
2014	-	-	0.1	-	0.0	0.0	0.0	-	0.0	-	0.8	0.0	0.1	-	-	0.3	4.2
2019	-	0.0	0.1	-	-	-	0.0	-	0.0	0.0	0.8	0.0	-	2.0	-	3.1	1.4

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Machaeranthera canescens (hoary tansyaster)	Medicago sativa[i] (alfalfa)	Oenothera coronopifolia (crownleaf evening primrose)	Phlox austromontana (mountain phlox)	Phlox longifolia (longleaf phlox)	Plantago patagonica[a] (woolly plantain)	Portulaca oleracea[ai] (little hogweed)
year	Nested Frequency						
1992	8	-	-	3	-	18	-
1999	7	-	-	-	2	29	-
2004	1	-	-	3	5	37	-
2009	-	-	-	6	-	1	-
2012	-	-	-	7	-	3	18
2014	81	2	42	6	-	101	-
2019	43	-	40	10	-	188	-
year	Average Cover (%)						
1992	0.1	-	-	0.0	-	0.0	-
1999	0.1	-	-	-	0.0	0.2	-
2004	0.0	-	-	0.1	0.0	0.5	-
2009	-	-	-	0.3	-	0.0	-
2012	-	-	-	0.3	-	0.0	0.0
2014	0.3	0.0	0.8	0.2	-	1.0	-
2019	0.1	-	0.4	0.2	-	2.4	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 14-23.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Atriplex canescens[p] (fourwing saltbush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma[t] (Utah juniper)	Krascheninnikovia lanata[p] (winterfat)	Opuntia (pricklypear)	Pinus edulis[t] (twoneedle pinyon)	Sclerocactus whipplei (Whipple's fishhook cactus)
year	Line Intercept Cover (%)									
1992	-	-	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-	-	-
2004	0.7	0.9	5.3	-	-	-	0.7	0.1	1.1	0.1
2009	0.5	0.9	7.5	-	-	-	0.4	-	1.9	0.1
2012	0.9	1.7	8.4	-	0.1	-	0.5	-	2.7	-
2014	0.5	0.8	5.3	-	-	-	0.4	0.1	1.2	-
2019	0.7	1.7	5.5	0.1	-	-	0.7	0.4	-	-
year	Quadrat Cover (%)									
1992	5.1	0.0	3.8	-	-	-	0.3	0.2	0.8	0.0
1999	2.0	0.1	4.6	-	-	0.0	0.5	0.2	0.6	0.1
2004	1.0	0.2	4.7	-	-	-	0.3	0.1	0.8	0.1
2009	0.9	0.3	6.0	-	-	-	0.3	0.0	0.4	0.1
2012	0.8	0.7	6.6	-	0.1	-	0.1	0.0	1.6	0.2
2014	1.1	0.2	4.2	0.4	0.0	-	0.5	0.0	0.2	0.1
2019	1.1	0.9	3.1	0.0	0.0	0.1	0.9	0.2	-	0.1

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 14-23.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1992	3520	20	18	2	81	19	77	61	- / -
1999	1160	140	2	7	91	22	66	52	48/60
2004	600	-	7	17	77	0	93	60	46/64
2009	540	-	0	33	67	15	52	67	33/51
2012	440	-	5	41	55	5	50	46	33/48
2014	420	-	0	38	62	29	62	57	35/49
2019	280	-	7	50	43	36	57	36	43/57
Atriplex canescens[p] -- (fourwing saltbush)									
1992	60	-	0	100	0	67	0	0	- / -
1999	40	-	0	100	0	0	0	0	96/137
2004	60	20	0	100	0	67	33	0	103/146
2009	100	-	0	80	20	20	40	0	86/114
2012	220	40	73	27	0	0	0	9	94/147
2014	120	20	17	67	17	0	0	0	85/120
2019	260	40	39	54	8	8	8	8	76/108
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
1992	2320	-	31	52	17	10	0	22	- / -
1999	1920	-	4	77	19	13	2	3	46/71
2004	1500	-	0	80	20	0	0	16	39/68
2009	1600	-	1	78	21	0	0	18	38/70
2012	1460	80	1	80	19	7	1	80	43/78
2014	1500	20	1	59	40	3	0	15	44/72
2019	1080	40	0	37	63	0	0	57	43/75
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1992	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	80	-	0	50	50	0	0	0	35/59
Gutierrezia sarothrae -- (broom snakeweed)									
1992	-	-	-	-	-	-	-	-	-/-
1999	20	-	0	100	0	100	0	0	24/26
2004	-	-	-	-	-	-	-	-	18/18
2009	-	-	-	-	-	-	-	-	18/22
2012	80	-	25	75	0	0	0	0	17/25
2014	-	20	0	0	0	0	0	0	16/18
2019	40	20	0	100	0	0	0	0	20/28
Juniperus osteosperma[t] -- (Utah juniper)									
1992	-	-	-	-	-	-	-	-	-/-
1999	20	-	100	0	0	0	0	0	- / -
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Krascheninnikovia lanata[p] -- (winterfat)									
1992	640	20	66	6	28	25	53	13	- / -
1999	400	-	0	95	5	0	100	5	38/29
2004	440	20	18	82	0	18	64	0	29/28
2009	540	20	19	74	7	11	22	7	22/26
2012	160	-	13	88	0	0	25	0	31/38
2014	280	-	0	100	0	0	0	0	40/31
2019	320	-	25	75	0	0	94	0	48/60
Opuntia -- (pricklypear)									
1992	200	60	100	0	0	0	0	30	- / -
1999	80	20	25	75	0	0	0	0	13/32
2004	220	-	0	91	9	0	0	9	10/28
2009	260	-	23	69	8	0	0	8	10/33
2012	220	20	82	18	0	0	0	0	11/37
2014	280	-	64	29	7	0	0	7	11/24
2019	100	-	40	60	0	0	0	0	16/56
Pediocactus simpsonii -- (mountain ball cactus)									
1992	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	7/18
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Pinus edulis[t] -- (twoneedle pinyon)									
1992	-	-	-	-	-	-	-	-	-/-
1999	40	-	0	100	0	0	0	0	- / -
2004	20	-	0	100	0	0	0	0	- / -
2009	20	-	0	100	0	0	0	0	- / -
2012	20	-	0	100	0	0	0	0	- / -
2014	-	-	-	-	-	-	-	-	- / -
2019	-	-	-	-	-	-	-	-	- / -
Sclerocactus whipplei -- (Whipple's fishhook cactus)									
1992	100	20	60	40	0	0	0	0	- / -
1999	160	-	0	100	0	0	0	0	14/16
2004	120	-	0	100	0	0	0	0	14/15
2009	100	-	0	100	0	0	0	0	13/14
2012	80	-	0	50	50	0	0	50	11/13
2014	80	-	0	100	0	0	0	0	11/13
2019	60	40	0	100	0	0	0	0	12/14

t - Tree Species; p - Preferred Browse; i - Introduced Species

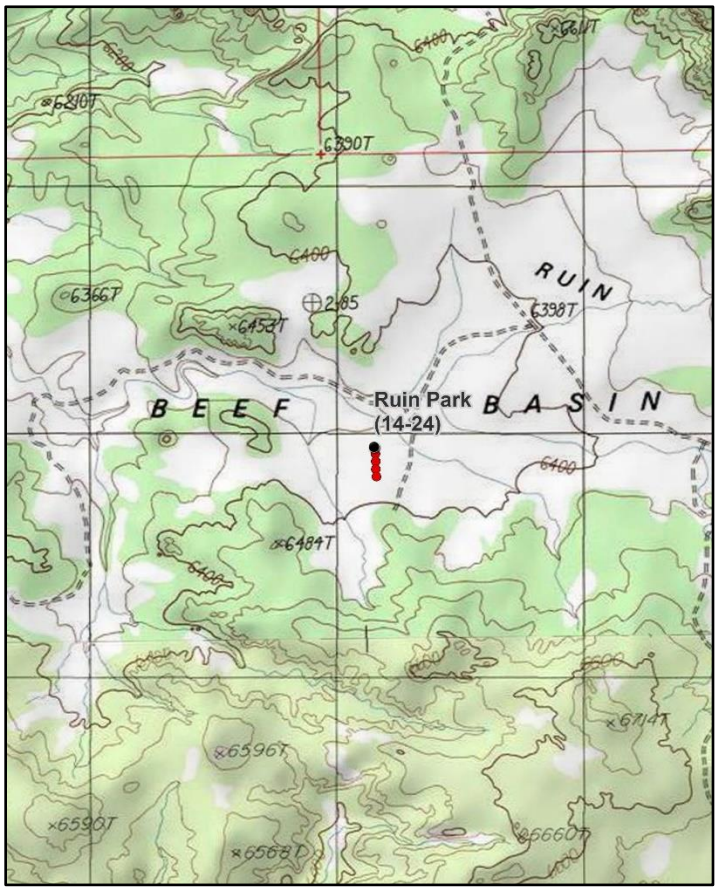
Table 14-23.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

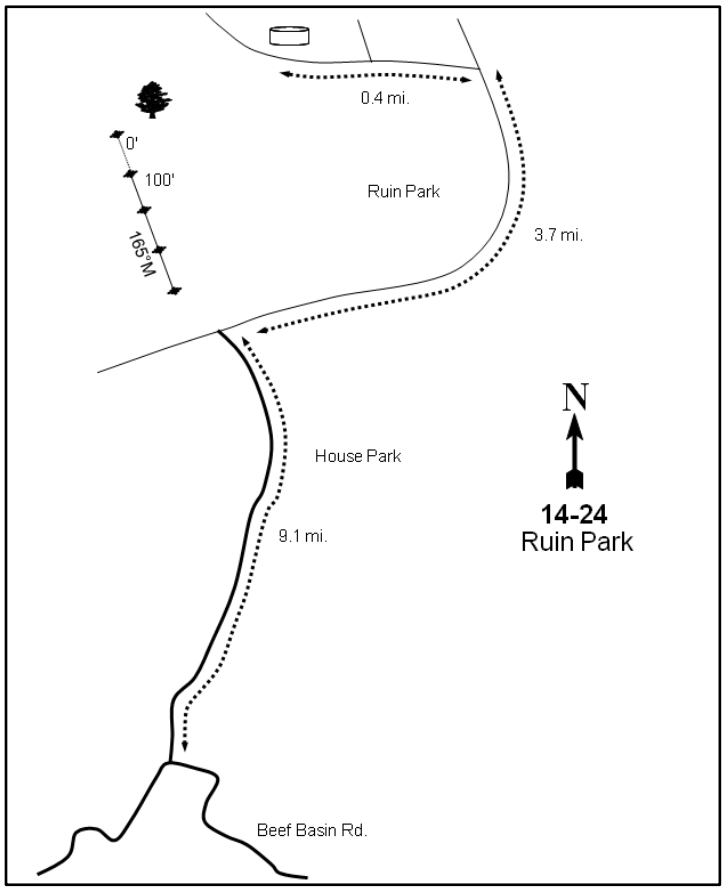
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1999	13	-	-	-	-	-	19.6
2009	10	20	40	20	-	20	5.2
2012	11	-	60	20	-	20	6.0
2014	11	-	60	20	20	-	5.4
2019	8	-	40	40	-	20	11.6
Pinus edulis (twoneedle pinyon)							
1999	17	-	-	-	-	-	19.6
2009	24	-	25	25	25	25	12.0
2012	39	13	38	25	13	13	8.5
2014	19	-	17	33	17	33	12.8
2019	21	-	25	25	25	25	18.3

Table 14-23.15 - Deer Desirable Components Index: Mid Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1992	6.8	-8.3	10.1	30.0	-0.1	0.5	0.0	39.0	Poor
1999	3.4	0.0	0.0	7.2	-19.7	0.4	0.0	-8.7	Very Poor
2004	2.9	0.0	0.0	21.6	-7.2	0.4	0.0	17.7	Very Poor
2009	2.3	0.0	0.0	30.0	-0.9	0.7	0.0	32.0	Very Poor
2012	3.9	0.0	0.0	30.0	-0.9	0.6	0.0	33.6	Very Poor-Poor
2014	2.1	0.0	0.0	30.0	-2.1	2.8	0.0	32.9	Very Poor
2019	3.9	0.0	0.0	23.3	-15.7	1.7	0.0	13.1	Very Poor

RUIN PARK - STUDY NO. 14-24





Location Information

USGS 7.5 min Map Info	Cross Canyon SE; Township 32S, Range 18E, Section 45
GPS (0' Stake)	NAD 83 UTM ZONE 12, 595094 East 4207141 North

Transect Information

Browse Tag # (0' Stake)	Not Available
Transect Bearing	165° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 71ft), Line 2 (34ft), Line 3 (59ft), Line 4 (95ft)
Belt Marker Placement	Standard

Directions to Site

At the junction of the Rocky Mountain Elk Ridge, Salt Creek Mesa, and Beef Basin Roads, travel north down into the Beef Basin area. Follow the main road for 9.1 miles, passing the FS/BLM boundary, down to an intersection where there is a BLM register box. Bear right and proceed for 3.7 miles on the main road disregarding all forks until you come to a fork at this mileage. Stay left and continue for 0.3 miles to a right turn off to a ruin. Continue left and drive 0.1 miles to a water trough by a fork. Turn right and continue for approximately 0.05 miles before turning south and driving southwest across the cheatgrass flat (no road). Stop at the sagebrush border and look out in the sagebrush flat for a small lone juniper near a shallow gully. The frequency baseline starts by this juniper and runs south towards the pinyon and juniper-covered hills. All stakes are 3 1/2-foot tall, green steel fenceposts.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	INDIAN CREEK
Elevation	6,400ft (1,951m)
Aspect	North
Slope	0-5%
Sample Dates	09/10/1992, 07/01/1999, 11/08/2004, 06/25/2009, 07/02/2014, 06/11/2019

Wildlife Habitat and Vegetation History

Table 14-24.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter

Table 14-24.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1986	Mountain Big Sagebrush	No Encroachment
1992	Mountain Big Sagebrush	Phase I
1999	Perennial Grass	Phase I
2004	Perennial Grass	Phase I
2009	Perennial Grass	Phase I
2014	Perennial Grass	Phase I
2019	Perennial Grass	Phase I

Site Notes

Numerous Ancestral Puebloan ruins are found in the hills near the study, thus the name Ruin Park for the large open flat. A water development for cattle is located just northeast of the study transect. Cattle are distributed across the landscape by proximity to water and there are few fences in the area.

Soils

Table 14-24.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Loam	7.9	61.6	21.8	16.6	0.6	5.9	80.0	0.4	07/01/1999

Site Potential

1981 - 2010 Average Annual Precipitation	13 inches
NRCS Ecological Site	Semidesert Sandy Loam (Wyoming Big Sagebrush)
NRCS Ecological Site #	R035XY216UT
States and Transitions	A defined state and transition model is available.

When the study was established in 1986, this site existed as a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) dominated plant community. However, sagebrush decreased substantially over the sample years and has only been sampled in height crown measurements since 1999 (Table 14-24.12, Table 14-24.13, Photos); the site transitioned to a perennial grass state in 1999 (Table 14-24.4). The herbaceous understory has remained abundant and moderately diverse throughout the study period with the native perennial grass species needle and thread (*Hesperostipa comata*) contributing the most cover of any single species. The introduced annual grass species cheatgrass (*Bromus tectorum*) has been observed in most sample years since 1992 and was present in low amounts in 2019 (Table 14-24.7, Table 14-24.10, Table 14-24.11). However, the site could transition into one dominated by annual grasses should cheatgrass increase in the future. Utah juniper (*Juniperus osteosperma*) is visible in photos from previous years and was recorded in point-quarter measurements in 2019, placing the site in Phase I of woodland succession (Table 14-24.4, Table 14-24.14, Photos). Although density was low, further encroachment over time could transition the site to one dominated by trees (Jornada, 2019).

Trend Summary Tables

Table 14-24.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1992	4.7	1.2	-	-	-	-
1999	1.9	1.4	-	-	-	-
2004	0.2	0.3	-	0.3	1.8	-
2009	0.2	0.7	-	0.2	0.9	-
2014	0.4	0.7	-	0.4	1.2	-
2019	0.5	1.4	-	0.7	1.3	-

Table 14-24.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1992	14	377	75	90	0.1	28.1	1.6	1.6
1999	416	253	34	34	21.1	9.7	0.1	0.6
2004	1	320	69	15	0.0	22.8	1.5	0.2
2009	103	314	7	8	0.6	21.9	0.1	0.1
2014	-	333	102	67	-	26.6	1.0	1.3
2019	111	329	349	73	0.8	26.4	15.0	1.4

Table 14-24.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1992	33.7	0.6	22.6	0.0	0.8	36.0
1999	33.9	0.2	34.1	0.3	-	36.3
2004	55.2	0.2	24.5	0.3	0.0	27.4
2009	53.9	0.1	40.0	0.2	0.0	22.6
2014	44.4	0.1	36.4	0.2	0.0	31.1
2019	42.3	0.1	33.1	0.2	0.1	40.4

Table 14-24.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1992	10	57	1	17
1999	12	40	-	16
2004	2	16	-	10
2009	6	11	2	39
2014	4	-	1	20
2019	6	6	2	17
Year	Days Use Per Acre (ha)			
1992	-	-	-	-
1999	26.2 (64.6)	69.0 (170.5)	-	-
2004	-	-	-	-
2009	16.7 (41.2)	24.1 (59.6)	-	-
2014	2.2 (5.4)	2.7 (6.6)	-	-
2019	15.3 (37.7)	1.3 (3.3)	6.7 (16.6)	-

Table 14-24.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bouteloua gracilis (blue grama)	Bromus tectorum[ai] (cheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Sporobolus cryptandrus (sand dropseed)	Vulpia octoflora[a] (sixweeks fescue)
year	Nested Frequency						
1992	65	168	5	12	313	12	9
1999	104	65	416	3	193	1	6
2004	50	70	1	10	277	-	-
2009	56	93	102	3	241	9	1
2014	28	143	-	-	288	0	-
2019	77	119	14	18	207	96	106
year	Average Cover (%)						
1992	1.4	9.2	0.0	0.1	17.2	0.2	0.0
1999	2.2	0.8	21.1	0.0	6.7	0.0	0.0
2004	1.8	3.4	0.0	0.3	17.3	-	-
2009	3.4	4.9	0.6	0.0	13.2	0.4	0.0
2014	0.8	6.4	-	-	19.5	0.0	-
2019	2.4	5.8	0.0	0.3	15.0	3.0	0.7

a - Annual; n - Noxious Weed; i - Introduced Species

Table 14-24.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Astragalus chamaeleuce (cicada milkvetch)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata[ai] (curveseed butterwort)	Chamaesyce fendleri (Fendler's sandmat)	Chenopodium leptophyllum[a] (narrowleaf goosefoot)	Cryptantha[a] (annual cryptantha)	Cymopterus (springparsley)	Descurainia pinnata[a] (western tansymustard)	Erigeron pumilus (shaggy fleabane)	Eriogonum (buckwheat)	Gilia inconspicua[a] (shy gilia)	Helianthus annuus[a] (common sunflower)	Lappula occidentalis[a] (flatspine stickseed)	Machaeranthera canescens (hoary tansyaster)	Mentzelia albicaulis[a] (whitestem blazingstar)	Microsteris gracilis[a] (slender phlox)	Navarretia intertexta[a] (needleleaf navarretia)
year	Nested Frequency																
1992	8	-	-	3	70	-	-	-	8	2	-	2	-	36	-	-	-
1999	6	-	3	10	-	-	-	-	2	-	-	-	6	7	-	1	-
2004	-	0	-	9	59	-	-	7	-	-	-	-	11	-	-	-	1
2009	-	-	-	3	-	-	-	1	-	-	-	-	-	-	-	-	6
2014	4	-	-	2	1	-	-	1	-	-	1	-	54	32	-	-	20
2019	1	-	-	5	149	25	2	182	-	-	40	-	106	19	9	-	61
year	Average Cover (%)																
1992	0.0	-	-	0.1	1.4	-	-	-	0.1	0.0	-	0.0	-	0.9	-	-	-
1999	0.0	-	0.0	0.2	-	-	-	-	0.0	-	-	-	0.1	0.0	-	0.0	-
2004	-	0.0	-	0.1	1.4	-	-	0.0	-	-	-	-	0.1	-	-	-	0.0
2009	-	-	-	0.0	-	-	-	0.0	-	-	-	-	-	-	-	-	0.1
2014	0.0	-	-	0.1	0.0	-	-	0.0	-	-	0.0	-	0.3	0.1	-	-	0.1
2019	0.0	-	-	0.0	1.1	0.6	0.0	3.0	-	-	1.0	-	4.1	0.1	0.1	-	1.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Oenothera coronopifolia (crownleaf evening primrose)	Penstemon (beardtongue)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Plantago patagonica[a] (woolly plantain)	Salsola tragus[ai] (prickly Russian thistle)	Sphaeralcea coccinea (scarlet globemallow)	Tragopogon dubius[ai] (yellow salsify)	unknown annual forb[a] (unknown forb)
year	Nested Frequency								
1992	-	1	22	24	-	3	2	-	2
1999	-	-	16	2	31	-	-	2	-
2004	-	-	-	6	7	6	1	-	-
2009	-	-	5	-	-	-	-	-	-
2014	10	-	9	3	32	37	10	-	-
2019	26	-	20	4	114	97	6	1	-
year	Average Cover (%)								
1992	-	0.0	0.2	0.1	-	0.2	0.2	-	0.0
1999	-	-	0.3	0.0	0.1	-	-	0.0	-
2004	-	-	-	0.1	0.0	0.0	0.0	-	-
2009	-	-	0.1	-	-	-	-	-	-
2014	0.2	-	0.3	0.0	0.2	0.3	0.4	-	-
2019	0.5	-	0.5	0.0	3.5	0.7	0.2	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 14-24.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia frigida[p] (prairie sagewort)	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Krascheninnikovia lanata[p] (winterfat)
year	Line Intercept Cover (%)				
1992	-	-	-	-	-
1999	-	-	-	-	-
2004	-	-	1.8	-	0.3
2009	-	-	0.9	-	0.2
2014	-	-	1.2	-	0.4
2019	-	-	1.3	-	0.7
year	Quadrat Cover (%)				
1992	0.0	4.1	1.2	-	0.5
1999	-	1.8	1.4	-	0.2
2004	0.1	-	0.3	-	0.1
2009	-	-	0.7	-	0.2
2014	0.0	-	0.7	-	0.4
2019	-	-	1.4	0.0	0.5

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 14-24.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Artemisia frigida[P] -- (prairie sagewort)									
1992	140	-	0	100	0	0	0	0	- / -
1999	60	-	33	67	0	67	0	0	18/19
2004	40	-	0	100	0	0	0	0	5/11
2009	-	-	-	-	-	-	-	-	8/31
2014	-	20	0	0	0	0	0	0	- / -
2019	-	-	-	-	-	-	-	-	-/-
Artemisia tridentata ssp. vaseyana[P] -- (mountain big sagebrush)									
1992	1520	-	5	18	76	43	38	24	- / -
1999	640	-	0	9	91	9	88	50	55/80
2004	-	-	-	-	-	-	-	-	- / -
2009	-	-	-	-	-	-	-	-	12/17
2014	-	-	-	-	-	-	-	-	- / -
2019	-	-	-	-	-	-	-	-	56/67
Atriplex canescens[P] -- (fourwing saltbush)									
1992	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	107/126
2014	-	-	-	-	-	-	-	-	96/127
2019	-	-	-	-	-	-	-	-	78/104
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
1992	900	40	24	76	0	0	0	0	- / -
1999	1000	-	6	68	26	4	0	8	31/53
2004	460	-	0	83	17	0	0	13	24/43
2009	440	-	0	86	14	0	5	5	24/54
2014	300	120	0	100	0	0	0	0	34/62
2019	320	140	0	94	6	0	0	6	40/74
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1992	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	20	-	0	100	0	0	0	0	37/39
Ericameria nauseosa ssp. nauseosa var. speciosa[P] -- (rubber rabbitbrush)									
1992	20	-	0	100	0	0	0	0	- / -
1999	20	-	0	100	0	0	100	0	36/47
2004	-	-	-	-	-	-	-	-	-/-
2009	60	-	0	100	0	0	0	0	40/66
2014	20	-	0	100	0	0	0	0	75/132
2019	20	-	0	100	0	0	0	100	95/199
Gutierrezia sarothrae -- (broom snakeweed)									
1992	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	10/23
2014	-	-	-	-	-	-	-	-	11/19
2019	-	40	0	0	0	0	0	0	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Krascheninnikovia lanata[p] -- (winterfat)									
1992	640	-	34	59	6	13	6	0	- / -
1999	300	-	47	27	27	13	40	7	32/33
2004	160	-	0	100	0	13	0	0	37/41
2009	240	120	42	58	0	0	0	0	29/33
2014	220	-	9	91	0	9	0	0	44/43
2019	400	20	25	75	0	30	65	0	43/55
Opuntia -- (pricklypear)									
1992	40	-	100	0	0	0	0	0	- / -
1999	-	-	-	-	-	-	-	-	14/62
2004	-	-	-	-	-	-	-	-	17/45
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	11/36
2019	-	-	-	-	-	-	-	-	18/53
Sclerocactus -- (fishhook cactus)									
1992	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	11/17
2004	-	-	-	-	-	-	-	-	-/-
2009	20	-	100	0	0	0	0	0	- / -
2014	20	-	0	100	0	0	0	0	4/6

t - Tree Species; p - Preferred Browse; i - Introduced Species

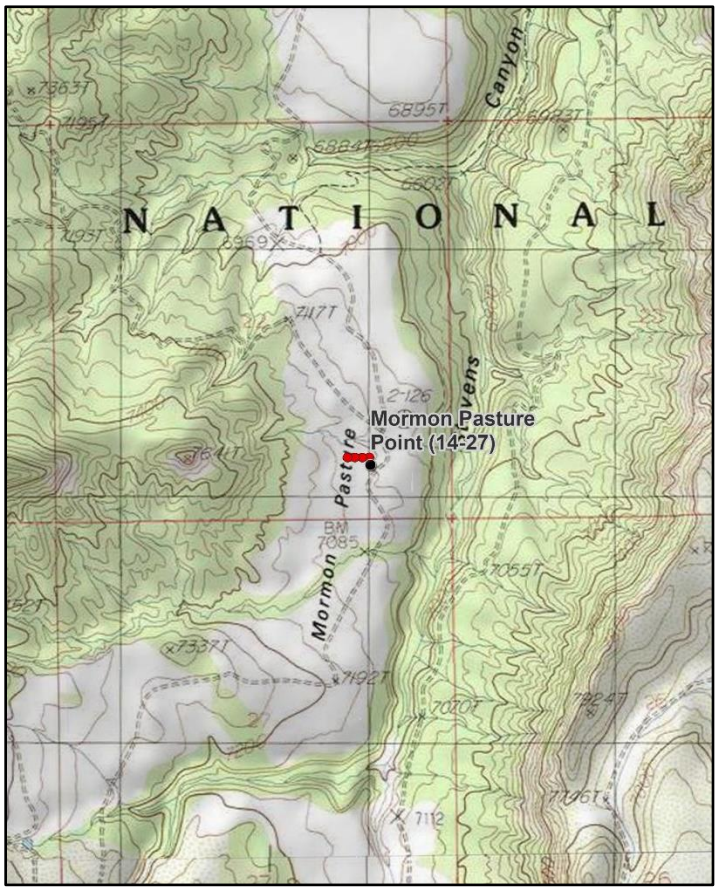
Table 14-24.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

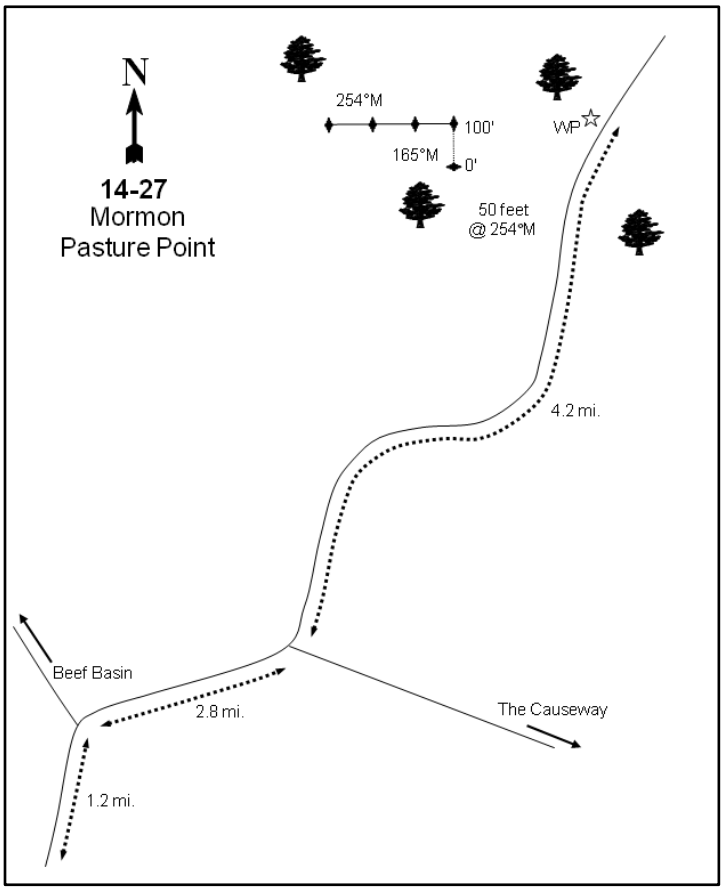
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2019	2	-	-	100	-	-	34.0

Table 14-24.15 - Deer Desirable Components Index: Low Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1992	5.8	0.0	0.0	30.0	0.0	3.2	0.0	39.0	Fair
1999	2.4	0.0	0.0	19.5	-15.8	1.1	0.0	7.2	Very Poor
2004	0.4	0.0	0.0	30.0	0.0	0.4	0.0	30.7	Fair
2009	0.3	0.0	0.0	30.0	-0.5	0.2	0.0	30.0	Fair
2014	0.5	0.0	0.0	30.0	0.0	2.5	0.0	33.0	Fair
2019	0.9	0.0	0.0	30.0	-0.6	2.7	0.0	33.0	Fair

MORMON PASTURE POINT - STUDY NO. 14-27





Location Information

USGS 7.5 min Map Info	Cathedral Butte SW; Township 33S, Range 20E, Section 22
GPS (0' Stake)	NAD 83 UTM ZONE 12, 613952 East 4194321 North

Transect Information

Browse Tag # (0' Stake)	7883
Transect Bearing	165° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 71ft), Line 2 (95ft), Line 3 (59ft), Line 4 (34ft)
Belt Marker Placement	Standard

Directions to Site

From the Gooseberry Guard Station, travel 1.2 miles toward the Causeway to a fork. Turn right and continue for 2.8 miles to another fork. Turn left towards Mormon Pasture and drive 1.2 miles to two mining cabins. Stay right, pass the uranium quarry, and continue for 0.9 miles to a fork. Stay left and proceed for 2.1 miles to the transect. There is a witness post (3-foot tall, green fencepost) on the left (west) side of the road. The 0-foot end of the baseline is 50 feet west of the witness post (254 degrees magnetic) and is marked with browse tag #7883.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	COTTONWOOD
Elevation	7,100ft (2,164m)
Aspect	East
Slope	8-10%
Sample Dates	09/01/1992, 06/22/1999, 07/01/2004, 06/24/2009, 07/02/2014, 06/11/2019

Table 14-27.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Mechanical - Bullhog	Mormon Pasture Mountain Wildlife Habitat Improvement Phase I	3774	November 2016	463
Chaining - Chain Unknown	-	-	Early 1970s	900
Seeding - Seed Unknown	-	-	Early 1970s	900
Herbicide - Tordon	-	-	1985	200

Wildlife Habitat and Vegetation History

Table 14-27.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	spring/fall
Rocky Mountain Elk	crucial	winter

Table 14-27.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1986	Mixed Mountain Brush	Phase I
1992	Mixed Mountain Brush	Phase I
1999	Mixed Mountain Brush	Phase I
2004	Mixed Mountain Brush	Phase I
2009	Mixed Mountain Brush	Phase I
2014	Mixed Mountain Brush/Pinyon-Juniper	Phase I transitioning to Phase II
2019	Mixed Mountain Brush	Phase I

Site Notes

No Notes

Soils

Table 14-27.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	7.5	53.6	17.8	28.6	1.4	3.9	118.4	0.6	06/22/1999

Site Potential

1981 - 2010 Average Annual Precipitation	15 inches
NRCS Ecological Site	Mountain Loam (Oak)
NRCS Ecological Site #	R048AY415UT
States and Transitions	No state and transition model is available for this ecological site.

Since establishment in 1986, the site has been in a stable mixed mountain brush state. Introduced grass species dominating the understory are intermediate wheatgrass (*Thinopyrum intermedium*) and crested wheatgrass (*Agropyron cristatum*) while native species are present but provide little cover (Table 14-27.10). Forbs have typically been diverse though an individual species has not been abundant on the site (Table 14-27.11). Preferred browse cover decreased following the treatment though it is probable that there will be a return of these desirable shrubs considering the high precipitation and re-growth of browse plants (Table 14-27.12). Pinyon pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) were significantly decreased following the bullhog treatment on the site, though not totally removed (Table 14-27.12, Table 14-27.14). In the future, it is possible that pinyon and juniper trees will infill on the site.

Trend Summary Tables

Table 14-27.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1992	4.3	0.0	4.8	-	-	-
1999	5.6	0.2	2.3	0.4	-	0.3
2004	7.1	0.5	3.7	16.6	0.3	5.0
2009	9.8	0.6	5.1	15.2	0.3	6.3
2014	10.5	0.8	5.1	12.8	0.2	10.5
2019	3.3	0.9	-	5.2	0.6	-

Table 14-27.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1992	-	399	-	141	-	25.0	-	3.5
1999	-	360	2	148	-	16.9	0.0	2.2
2004	-	314	8	107	-	16.2	0.0	3.8
2009	-	317	3	132	-	17.9	0.0	5.2
2014	-	303	5	139	-	8.0	0.0	3.6
2019	-	332	30	112	-	21.4	0.3	5.2

Table 14-27.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1992	18.5	0.2	50.7	0.1	2.7	39.5
1999	31.5	0.1	48.4	1.2	0.5	29.3
2004	36.5	0.7	44.8	1.0	0.5	30.3
2009	31.0	0.1	51.9	2.0	0.3	36.1
2014	41.0	-	45.9	0.8	0.1	29.4
2019	25.3	0.6	60.0	0.4	0.5	29.4

Table 14-27.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
1992	7	15	8	-	51
1999	5	1	8	-	20
2004	4	-	4	-	19
2009	4	3	6	-	2
2014	1	1	2	-	23
2019	3	4	5	-	2
Year	Days Use Per Acre (ha)				
1992	-	-	-	-	-
1999	35.6 (87.9)	4.7 (11.6)	22.1 (54.6)	-	-
2004	13.1 (32.3)	4.0 (9.9)	6.0 (14.9)	-	-
2009	25.4 (62.8)	8.1 (19.9)	12.1 (29.8)	-	-
2014	16.0 (39.5)	2.0 (5.0)	4.7 (11.6)	-	-
2019	4.4 (10.8)	8.1 (19.9)	8.1 (19.9)	0.6 (1.4)	-

Table 14-27.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bromus inermis[i] (smooth brome)	Carex rossii (Ross' sedge)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Poa fendleriana (muttongrass)	Thinopyrum intermedium[i] (intermediate wheatgrass)
year	Nested Frequency							
1992	17	93	-	9	-	-	29	372
1999	23	93	-	16	-	3	25	321
2004	16	66	-	18	-	3	19	259
2009	16	78	-	7	-	3	21	275
2014	10	68	-	16	3	9	2	262
2019	19	86	8	11	-	13	8	286
year	Average Cover (%)							
1992	0.3	4.6	-	0.5	-	-	0.2	19.3
1999	0.3	2.9	-	0.2	-	0.0	0.3	13.3
2004	0.2	4.5	-	0.3	-	0.0	0.4	10.8
2009	0.3	3.8	-	0.2	-	0.4	0.4	12.9
2014	0.2	2.1	-	0.3	0.0	0.1	0.0	5.3
2019	0.2	3.6	0.3	0.4	-	0.6	0.2	16.1

a - Annual; n - Noxious Weed; i - Introduced Species

Table 14-27.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Antennaria parvifolia (small-leaf pussytoes)	Arabis (rockcress)	Astragalus 2 (Milkvetch)	Astragalus tenellus (looseflower milkvetch)	Calochortus nuttallii (sego lily)	Chenopodium leptophyllum[a] (narrowleaf goosefoot)	Cirsium (thistle)	Crepis acuminata (tapertip hawksbeard)	Cymopterus (springparsley)	Descurainia pinnata[a] (western tansymustard)	Draba[a] (draba)	Eriogonum racemosum (redroot buckwheat)	Hedysarum boreale (Utah sweetvetch)	Heterotheca villosa (hairy false goldenaster)	Ipomopsis aggregata (scarlet gilia)	Lappula occidentalis[a] (flatspine stickseed)	Lomatium (desertparsley)
year	Nested Frequency																
1992	-	-	-	32	-	-	6	-	-	-	-	-	-	3	3	-	-
1999	-	6	-	9	7	-	5	-	7	1	-	-	-	0	0	-	6
2004	-	-	-	13	-	-	3	-	8	-	-	3	8	0	-	8	-
2009	5	-	0	24	6	-	-	-	20	-	-	1	-	-	-	3	-
2014	7	-	-	30	4	-	3	-	13	3	-	-	2	-	-	2	-
2019	8	-	21	0	10	4	3	4	25	12	1	-	3	-	-	3	-
year	Average Cover (%)																
1992	-	-	-	0.8	-	-	0.2	-	-	-	-	-	-	0.0	0.0	-	-
1999	-	0.0	-	0.5	0.0	-	0.0	-	0.0	0.0	-	-	-	0.0	0.0	-	0.0
2004	-	-	-	1.0	-	-	0.0	-	0.0	-	-	0.0	0.6	0.0	-	0.0	-
2009	0.0	-	0.0	1.4	0.0	-	-	-	0.3	-	-	0.0	-	-	-	0.0	-
2014	0.0	-	-	0.9	0.0	-	0.0	-	0.1	0.0	-	-	0.2	-	-	0.0	-
2019	0.0	-	1.3	0.0	0.1	0.0	0.0	0.0	0.8	0.1	0.0	-	0.2	-	-	0.2	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Machaeranthera canescens (hoary tansyaster)	Packera multilobata (lobeleaf groundsel)	Pedicularis centranthera (dwarf lousewort)	Penstemon lentus (handsome beardtongue)	Petradoria pumila (rock goldenrod)	Phlox longifolia (longleaf phlox)	Physaria rectipes (straight bladderpod)	Polygonum douglasii[a] (Douglas' knotweed)	Sphaeralcea coccinea (scarlet globemallow)	Symphyotrichum (aster)	Taraxacum officinale (common dandelion)	Tetraneuris acaulis (stemless four-nerve daisy)	Tragopogon dubius[ai] (yellow salsify)	Trifolium (clover)
year	Nested Frequency													
1992	3	-	-	22	8	12	44	-	50	-	1	-	-	8
1999	1	3	5	20	16	27	31	1	39	-	-	14	-	13
2004	-	4	-	4	18	7	25	-	42	-	-	6	0	7
2009	2	-	-	31	23	4	7	-	37	0	-	16	-	8
2014	-	-	5	21	27	-	22	-	23	-	2	19	-	4
2019	-	-	1	15	25	12	14	10	8	-	-	8	1	4
year	Average Cover (%)													
1992	0.0	-	-	0.6	0.7	0.0	0.3	-	0.8	-	0.0	-	-	0.0
1999	0.0	0.0	0.0	0.2	0.7	0.1	0.2	0.0	0.3	-	-	0.1	-	0.1
2004	-	0.0	-	0.1	0.9	0.0	0.1	-	0.7	-	-	0.2	0.0	0.0
2009	0.0	-	-	0.7	2.0	0.0	0.0	-	0.4	0.0	-	0.3	-	0.0
2014	-	-	0.1	0.1	1.5	-	0.1	-	0.1	-	0.0	0.5	-	0.0
2019	-	-	0.0	0.5	2.0	0.1	0.1	0.0	0.0	-	-	0.1	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 14-27.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis[p] (Utah serviceberry)	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Cercocarpus montanus[p] (alderleaf mountain mahogany)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma[t] (Utah juniper)	Opuntia fragilis (brittle pricklypear)	Pinus edulis[t] (twoneedle pinyon)	Purshia tridentata[p] (antelope bitterbrush)	Quercus gambelii[p] (Gambel oak)	Symphoricarpos oreophilus[p] (mountain snowberry)
year	Line Intercept Cover (%)										
1992	-	-	-	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-	-	-	-
2004	6.9	0.2	-	-	0.3	1.8	-	3.2	0.6	8.9	-
2009	4.3	0.6	0.8	-	0.2	2.2	0.1	4.1	0.5	9	-
2014	4.8	1	-	-	-	6.5	0.2	4	0.1	6.8	0.1
2019	0.3	0.5	-	-	0.6	-	-	-	-	4.3	0.1
year	Quadrat Cover (%)										
1992	1.3	-	-	-	0.0	1.7	0.0	3.1	1.0	2.0	-
1999	2.0	0.0	0.1	-	0.1	1.4	0.0	0.9	0.9	2.6	-
2004	2.1	0.1	0.4	-	0.4	0.7	0.2	3.1	0.3	4.1	-
2009	3.5	0.9	0.6	-	0.3	2.2	0.3	2.9	0.7	4.1	-
2014	3.8	0.9	0.0	0.1	0.1	3.0	0.6	2.2	0.4	5.2	0.2
2019	0.2	0.2	0.0	-	0.8	-	0.2	-	0.2	2.8	0.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 14-27.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
1992	100	-	60	40	0	60	0	0	- / -
1999	80	-	0	100	0	25	25	0	198/197
2004	220	-	9	91	0	9	0	0	168/179
2009	240	20	8	83	8	25	8	0	194/190
2014	80	80	0	100	0	0	0	0	211/224
2019	60	-	0	100	0	33	0	0	76/125
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1992	-	-	-	-	-	-	-	-	-/-
1999	200	20	40	60	0	40	10	0	42/62
2004	140	-	14	86	0	86	0	0	48/70
2009	380	-	26	74	0	26	11	11	43/56
2014	520	-	27	65	8	42	39	12	48/66
2019	200	-	50	40	10	20	0	10	42/73
Cercocarpus montanus[p] -- (alderleaf mountain mahogany)									
1992	20	40	0	100	0	100	0	0	- / -
1999	-	-	-	-	-	-	-	-	121/104
2004	-	-	-	-	-	-	-	-	154/160
2009	-	-	-	-	-	-	-	-	118/128
2014	-	-	-	-	-	-	-	-	160/154
2019	20	-	100	0	0	0	0	0	79/76
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
1992	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	12/11
2019	20	-	0	100	0	0	0	0	19/31
Ericameria nauseosa -- (rubber rabbitbrush)									
1992	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	54/82
2004	-	-	-	-	-	-	-	-	84/95
2009	-	-	-	-	-	-	-	-	69/86
2014	-	-	-	-	-	-	-	-	21/18
2019	-	-	-	-	-	-	-	-	68/72
Gutierrezia sarothrae -- (broom snakeweed)									
1992	380	120	37	63	0	0	0	0	- / -
1999	40	-	50	50	0	0	0	0	- / -
2004	240	-	0	83	17	0	0	0	22/28
2009	440	-	27	73	0	0	0	0	18/23
2014	260	100	62	39	0	0	0	0	19/15
2019	860	-	5	95	0	0	0	0	22/27
Juniperus osteosperma[t] -- (Utah juniper)									
1992	100	-	80	20	0	0	0	0	- / -
1999	40	-	0	100	0	0	0	0	- / -
2004	20	-	0	100	0	0	0	0	- / -
2009	40	-	0	100	0	0	0	0	- / -
2014	40	-	0	100	0	0	0	0	- / -
2019	-	-	-	-	-	-	-	-	-/-

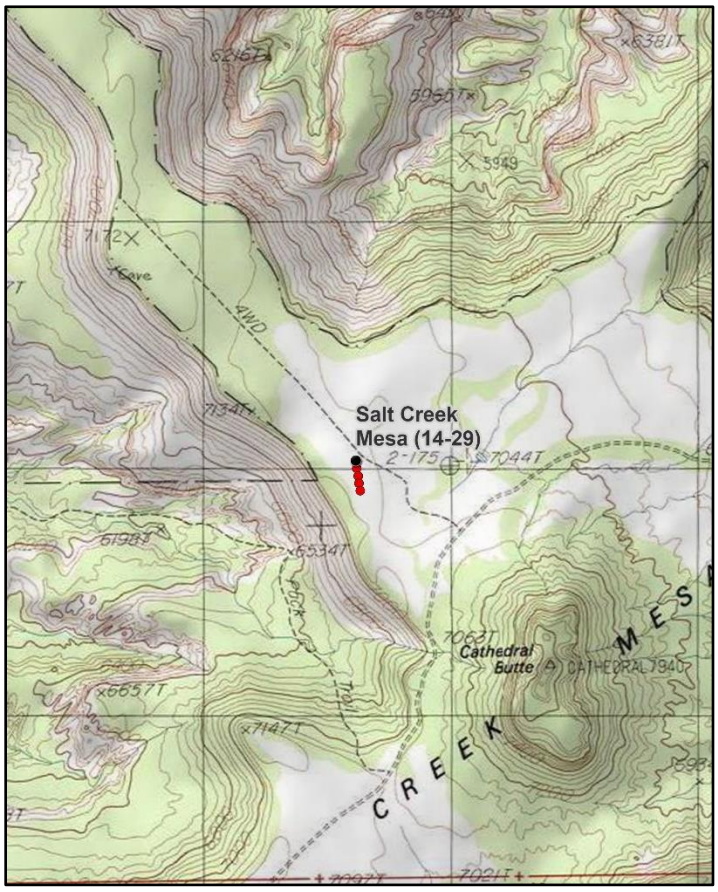
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Juniperus scopulorum[t] -- (Rocky Mountain juniper)									
1992	20	-	0	100	0	0	0	0	- / -
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Opuntia fragilis -- (brittle pricklypear)									
1992	200	-	60	40	0	0	0	0	- / -
1999	200	20	60	40	0	0	0	0	10/29
2004	240	-	8	92	0	0	0	0	26/33
2009	520	-	35	62	4	0	0	4	9/29
2014	640	-	0	100	0	0	0	0	6/22
2019	120	-	33	67	0	0	0	0	8/26
Pinus edulis[t] -- (twoneedle pinyon)									
1992	-	-	-	-	-	-	-	-	-/-
1999	40	-	50	50	0	0	0	0	- / -
2004	60	-	0	100	0	0	0	0	- / -
2009	80	-	0	100	0	0	0	0	- / -
2014	20	20	0	100	0	0	0	0	- / -
2019	-	-	-	-	-	-	-	-	-/-
Purshia tridentata[p] -- (antelope bitterbrush)									
1992	80	-	0	100	0	0	100	0	- / -
1999	160	-	0	63	38	50	50	38	52/132
2004	200	-	0	70	30	30	70	30	46/115
2009	160	-	0	75	25	75	25	13	58/107
2014	140	-	14	57	29	29	0	29	50/112
2019	120	-	17	83	0	0	67	0	58/104
Quercus gambelii[p] -- (Gambel oak)									
1992	500	40	68	16	16	4	0	0	- / -
1999	1380	20	45	54	1	0	0	0	139/76
2004	1820	-	37	58	4	0	0	17	105/81
2009	2540	-	34	65	2	0	0	1	89/82
2014	1540	20	70	30	0	25	0	0	77/76
2019	2320	-	25	75	0	37	0	5	81/49
Ribes[p] -- (currant)									
1992	20	-	100	0	0	0	0	0	- / -
1999	-	-	-	-	-	-	-	-	151/79
2004	-	-	-	-	-	-	-	-	153/84
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	74/50
2019	-	-	-	-	-	-	-	-	-/-
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
1992	20	40	100	0	0	0	0	0	- / -
1999	-	-	-	-	-	-	-	-	71/184
2004	-	-	-	-	-	-	-	-	79/135
2009	-	-	-	-	-	-	-	-	-/-
2014	40	-	0	50	50	50	0	50	150/194
2019	20	-	100	0	0	0	0	0	84/100

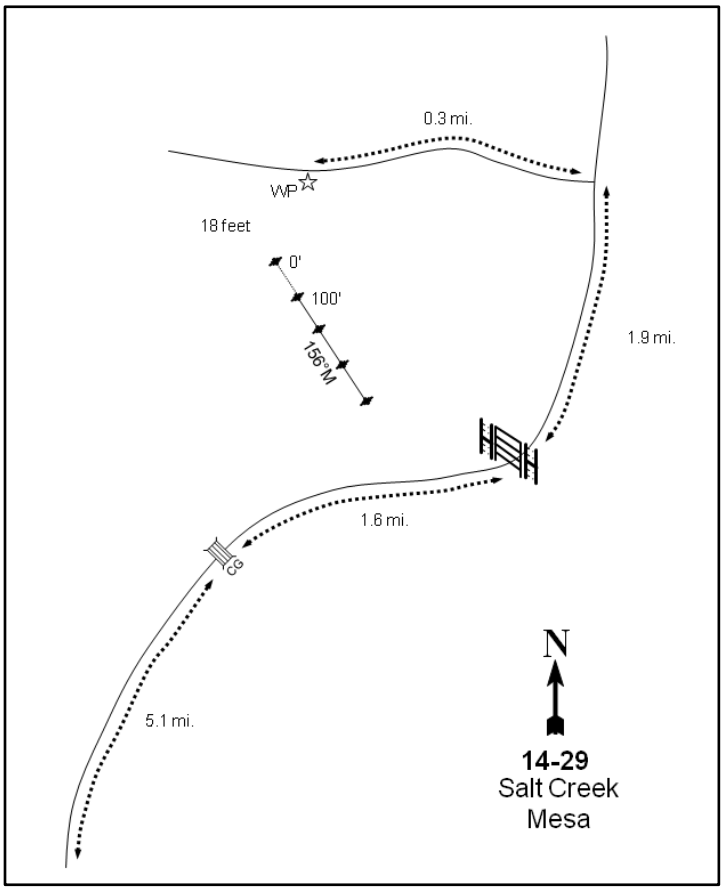
t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 14-27.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1992	53	-	25	31	44	-	-
1999	54	-	-	-	-	-	9.0
2004	64	-	7	36	57	-	18.2
2009	59	-	-	21	43	36	10.1
2014	54	-	8	23	54	15	18.8
2019	13	-	40	40	20	-	14.6
Juniperus scopulorum (Rocky Mountain juniper)							
2019	1	-	100	-	-	-	20.0
Pinus edulis (twoneedle pinyon)							
1992	38	13	56	25	6	-	-
1999	39	-	-	-	-	-	8.1
2004	40	-	33	50	17	-	8.5
2009	32	-	7	27	40	27	8.1
2014	46	-	8	23	38	31	13.2
2019	23	17	33	-	33	17	10.5
Quercus gambelii (Gambel oak)							
1999	21	-	-	-	-	-	2.7

SALT CREEK MESA - STUDY NO. 14-29





Location Information

USGS 7.5 min Map Info	Cathedral Butte NW; Township 32S, Range 20E, Section 27
GPS (0' Stake)	NAD 83 UTM ZONE 12, 613558 East 4202235 North

Transect Information

Browse Tag # (0' Stake)	599
Transect Bearing	156° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 71ft), Line 2 (34ft), Line 3 (59ft), Line 4 (95ft)
Belt Marker Placement	Standard

Directions to Site

From the intersection in Sego Flat, proceed to the left towards Dugout Ranch for 5.9 miles to the Beef Basin turnoff. Continue down Salt Creek Mesa Road for 5.1 miles to a cattle guard at the BLM/USFS boundary. Continue 1.6 miles on the main road to a fence/gate. Drive for 1.9 miles to a fork on the west side of Cathedral Butte. Proceed to the left and go 0.3 miles through juniper trees into a chaining and to a witness post (full-high fencepost) 18 feet south of the road. The 0-foot baseline stake is 15 paces at a bearing of 220 degrees magnetic from the witness post and is marked with browse tag #599.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	INDIAN CREEK
Elevation	7,100ft (2,164m)
Aspect	Northeast
Slope	2%
Sample Dates	09/14/1992, 06/24/1999, 07/01/2004, 06/25/2009, 07/02/2014, 06/11/2019

Table 14-29.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Unknown	Salt Creek Mesa Chain and Seed Treatment	LTDL	1968	1600
Seeding - Aerial Before	Salt Creek Mesa Chain and Seed Treatment	LTDL	1968	1600
Fire - Prescribed Fire	Salt Creek	LTDL	Fall 2002- Fall 2003	1621

Wildlife Habitat and Vegetation History

Table 14-29.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter

Table 14-29.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1992	Perennial Grass	Phase I
1999	Perennial Grass	Phase I
2004	Perennial Grass/Pinyon-Juniper	Phase I transitioning to Phase II
2009	Perennial Grass/Pinyon-Juniper	Phase I transitioning to Phase II
2014	Perennial Grass/Pinyon-Juniper	Phase I transitioning to Phase II
2019	Perennial Grass/Pinyon-Juniper	Phase I transitioning to Phase II

Site Notes

This area was targeted to be part of the Salt Creek prescribed fire that burned 130 acres in 2002, but the fire did not carry across the site and only a few trees were burned.

Soils

Table 14-29.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	7.5	56.0	21.4	22.6	2.7	5.3	92.8	0.6	06/24/1999

Site Potential

1981 - 2010 Average Annual Precipitation	13 inches
NRCS Ecological Site	Upland Shallow Loam (Pinyon-Utah Juniper)
NRCS Ecological Site #	R035XY315UT
States and Transitions	A defined state and transition model is available.

At the time of establishment in 1992, introduced perennial grass species such as crested wheatgrass (*Agropyron cristatum*) and intermediate wheatgrass (*Thinopyrum intermedium*) dominated the herbaceous understory and have been the major vegetation component on this study site over the sample years, although it is noted that the herbaceous understory has been on a decreasing trend (Table 14-29.7, Table 14-29.10). Twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) have increased in abundance and became a co-dominant site component in 2004, and the site has been considered to be within Phase I transitioning to Phase II of woodland succession since that time (Table 14-29.4, Table 14-29.14). Browse species such as Utah serviceberry (*Amelanchier utahensis*) and alderleaf mountain mahogany (*Cercocarpus montanus*) are also present, with an increasing trend being noted for shrubs (Table 14-29.12, Table 14-29.13). Barring a major disturbance, pinyon and juniper will likely continue to increase and may become the dominant vegetation component in the future.

Trend Summary Tables

Table 14-29.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1992	1.5	3.4	3.8	-	-	-
1999	3.1	6.4	5.0	0.2	-	0.4
2004	3.5	1.8	5.3	5.3	3.8	8.7
2009	3.0	8.4	9.6	5.8	7.8	13.1
2014	4.4	5.0	10.1	4.9	7.3	14.7
2019	6.3	4.8	11.8	12.7	4.9	19.2

Table 14-29.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1992	-	331	22	85	-	23.4	0.1	1.3
1999	-	255	2	109	-	10.1	0.0	2.2
2004	-	131	49	155	-	4.3	1.2	3.4
2009	-	149	6	173	-	5.7	0.1	5.4
2014	-	145	61	154	-	7.3	0.9	2.4
2019	-	141	190	217	-	5.2	2.5	2.0

Table 14-29.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1992	22.1	-	49.9	0.3	8.8	31.9
1999	39.0	-	32.3	4.4	2.8	25.2
2004	53.0	0.0	32.0	6.0	3.1	19.6
2009	41.6	-	45.8	3.1	3.1	31.6
2014	47.3	0.4	35.4	2.1	1.6	33.4
2019	47.7	-	40.6	5.4	3.4	31.2

Table 14-29.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1992	8	17	4	39
1999	10	16	21	37
2004	1	3	11	27
2009	2	2	15	11
2014	3	1	2	29
2019	-	4	2	6
Year	Days Use Per Acre (ha)			
1992	-	-	-	-
1999	22.5 (55.6)	19.4 (48.0)	18.1 (44.7)	-
2004	2.9 (7.2)	7.4 (18.2)	2.7 (6.6)	-
2009	33.4 (82.5)	2.0 (5.0)	37.5 (92.7)	-
2014	0.7 (1.8)	-	-	-
2019	5.1 (12.6)	5.3 (13.2)	12.8 (31.5)	-

Table 14-29.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum[i] (crested wheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Thinopyrum intermedium[i] (intermediate wheatgrass)
year	Nested Frequency				
1992	96	112	-	-	230
1999	80	106	0	0	169
2004	42	47	-	6	55
2009	22	104	1	0	63
2014	48	81	-	4	47
2019	58	63	3	27	14
year	Average Cover (%)				
1992	5.1	5.3	-	-	13.0
1999	1.7	5.9	0.0	0.0	2.5
2004	0.8	2.2	-	0.2	1.1
2009	0.6	3.9	0.0	0.0	1.2
2014	1.4	3.9	-	0.2	1.8
2019	2.0	2.3	0.0	0.3	0.7

a - Annual; n - Noxious Weed; i - Introduced Species

Table 14-29.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Abronia fragrans (snowball sand verbena)	Astragalus mollissimus (woolly locoweed)	Chaenactis douglasii (Douglas' dustymaiden)	Chamaesyce fendleri (Fendler's sandmat)	Chenopodium album[a] (lambsquarters)	Chenopodium fremontii[a] (Fremont's goosefoot)	Chenopodium leptophyllum[a] (narrowleaf goosefoot)	Cordylanthus[a] (bird's-beak)	Cryptantha (cryptantha)	Cymopterus (springparsley)	Descurainia pinnata[a] (western tansymustard)	Draba[a] (draba)	Erigeron (fleabane)	Gilia inconspicua[a] (shy gilia)	Heterotheca villosa (hairy false goldenaster)	Hymenopappus filifolius (fineleaf hymenopappus)	Lappula occidentalis[a] (flatspine stickseed)
year	Nested Frequency																
1992	-	-	-	30	4	-	-	-	-	-	5	-	-	-	-	-	-
1999	-	-	1	25	-	-	-	-	3	-	2	-	-	-	-	-	-
2004	-	2	3	52	0	7	-	17	6	-	10	-	0	-	5	-	9
2009	-	2	-	84	1	-	-	2	6	-	-	-	2	-	-	-	-
2014	-	1	-	90	8	2	-	38	5	3	9	1	-	-	-	1	-
2019	17	-	9	58	18	57	3	90	6	4	58	38	-	7	-	16	8
year	Average Cover (%)																
1992	-	-	-	0.2	0.0	-	-	-	-	-	0.0	-	-	-	-	-	-
1999	-	-	0.0	0.5	-	-	-	-	0.0	-	0.0	-	-	-	-	-	-
2004	-	0.0	0.0	1.4	0.0	0.2	-	0.5	0.0	-	0.2	-	0.0	-	0.2	-	0.2
2009	-	0.0	-	2.7	0.0	-	-	0.0	0.0	-	-	-	0.0	-	-	-	-
2014	-	0.0	-	1.0	0.0	0.0	-	0.8	0.0	0.0	0.0	0.0	-	-	-	0.1	-
2019	0.1	-	0.2	0.4	0.1	0.2	0.0	1.1	0.0	0.0	0.9	0.1	-	0.0	-	0.1	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Lepidium[a] (pepperweed)	Lesquerella (bladderpod)	Machaeranthera canescens (hoary tansyaster)	Medicago sativa[i] (alfalfa)	Nicotiana attenuata[a] (coyote tobacco)	Orobanche (broomrape)	Packera multilobata (lobeleaf groundsel)	Pediomelum megalanthum (Intermountain Indian breadroot)	Penstemon (beardtongue)	Penstemon comarrhenus (dusty beardtongue)	Petradoria pumila (rock goldenrod)	Phlox hoodii (spiny phlox)	Salsola tragus[ai] (prickly Russian thistle)	Sphaeralcea coccinea (scarlet globemallow)	Streptanthus cordatus (heartleaf twistflower)	Tetraneuris acaulis (stemless four-nerve daisy)	Townsendia incana (hoary Townsend daisy)
year	Nested Frequency																
1992	-	14	2	7	-	2	-	-	-	43	-	-	10	-	1	-	-
1999	-	25	1	-	-	-	14	4	-	55	-	-	-	1	-	-	3
2004	1	48	3	-	1	-	4	5	-	53	0	-	5	3	-	1	2
2009	-	34	7	-	-	-	21	7	-	63	1	1	3	1	-	-	7
2014	-	18	-	-	-	-	8	4	22	32	2	-	10	2	4	5	9
2019	-	35	-	-	-	-	40	11	5	102	8	-	12	-	5	5	6
year	Average Cover (%)																
1992	-	0.0	0.0	0.2	-	0.0	-	-	-	0.8	-	-	0.0	-	0.0	-	-
1999	-	0.1	0.0	-	-	-	0.3	0.0	-	1.1	-	-	-	0.0	-	-	0.0
2004	0.0	0.7	0.0	-	0.0	-	0.0	0.2	-	0.8	0.0	-	0.0	0.0	-	0.0	0.0
2009	-	0.1	0.0	-	-	-	0.3	0.2	-	1.8	0.1	0.0	0.0	0.0	-	-	0.0
2014	-	0.1	-	-	-	-	0.1	0.0	0.2	0.5	0.0	-	0.0	0.0	0.0	0.2	0.0
2019	-	0.1	-	-	-	-	0.1	0.4	0.0	0.3	0.2	-	0.0	-	0.0	0.0	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Tragopogon dubius[ai] (yellow salsify)
year	Nested Frequency
1992	3
1999	-
2004	-
2009	-
2014	-
2019	-
year	Average Cover (%)
1992	0.0
1999	-
2004	-
2009	-
2014	-
2019	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 14-29.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis[p] (Utah serviceberry)	Atriplex canescens[p] (fourwing saltbush)	Cercocarpus montanus[p] (alderleaf mountain mahogany)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma[t] (Utah juniper)	Mahonia fremontii (Fremont's mahonia)	Mahonia repens (creeping barberry)	Opuntia fragilis (brittle pricklypear)	Pinus edulis[t] (twoneedle pinyon)	Pseudotsuga menziesii[t] (Douglas-fir)	Symphoricarpos oreophilus[p] (mountain snowberry)
year	Line Intercept Cover (%)										
1992	-	-	-	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-	-	-	-
2004	4.1	-	-	1	2.9	2.7	-	0.1	5.8	-	1.2
2009	3.5	-	0.7	3.1	5.2	4.7	-	-	7.9	-	1.6
2014	3.4	-	1.5	2.9	4.8	4.4	-	-	9.9	-	-
2019	10	-	2	0.2	6.1	4.6	-	0.1	13.1	-	0.7
year	Quadrat Cover (%)										
1992	1.4	0.0	0.0	3.3	0.2	0.0	0.1	-	3.6	0.0	0.1
1999	1.8	-	1.0	6.4	0.6	-	-	-	4.4	-	0.4
2004	3.1	-	-	0.7	0.8	1.0	-	0.0	4.5	-	0.4
2009	1.9	-	0.8	5.0	2.6	3.4	-	-	7.0	-	0.2
2014	3.5	-	1.0	2.4	2.3	2.5	-	-	7.8	-	-
2019	5.4	-	0.9	0.3	3.8	4.3	-	0.1	8.1	-	0.1

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 14-29.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
1992	40	-	50	50	0	0	50	0	- / -
1999	40	-	0	100	0	0	0	0	244/301
2004	120	280	83	17	0	17	0	17	235/270
2009	20	-	0	100	0	0	0	0	264/290
2014	40	40	0	100	0	0	0	0	252/263
2019	60	520	0	100	0	0	0	0	256/304
Atriplex canescens[p] -- (fourwing saltbush)									
1992	60	-	0	67	33	0	100	0	- / -
1999	20	-	0	0	100	0	100	100	61/67
2004	-	-	-	-	-	-	-	-	66/87
2009	-	-	-	-	-	-	-	-	72/69
2014	-	-	-	-	-	-	-	-	74/80
2019	-	-	-	-	-	-	-	-	61/83
Cercocarpus intricatus[p] -- (littleleaf mountain mahogany)									
1992	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	32/37
2019	-	-	-	-	-	-	-	-	-/-

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Cercocarpus montanus[p] -- (alderleaf mountain mahogany)									
1992	100	-	60	40	0	20	80	0	- / -
1999	60	-	0	100	0	33	33	0	126/142
2004	40	-	0	100	0	0	100	0	116/142
2009	20	-	0	100	0	0	100	0	185/177
2014	40	-	50	50	0	50	0	0	176/219
2019	20	-	0	100	0	0	0	0	139/176
Ephedra viridis[p] -- (mormon tea)									
1992	-	-	-	-	-	-	-	-	-/-
1999	20	-	100	0	0	0	0	0	- / -
2004	20	-	0	100	0	0	0	0	40/54
2009	20	-	0	100	0	0	0	0	- / -
2014	-	-	-	-	-	-	-	-	25/27
2019	-	-	-	-	-	-	-	-	50/63
Ericameria nauseosa -- (rubber rabbitbrush)									
1992	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	92/61
2014	-	-	-	-	-	-	-	-	48/76
2019	-	-	-	-	-	-	-	-	85/76
Gutierrezia sarothrae -- (broom snakeweed)									
1992	9960	360	20	79	1	0	0	0	- / -
1999	23760	80	13	87	1	0	0	0	16/23
2004	1400	360	53	44	3	1	0	3	17/28
2009	11180	340	21	73	6	0	0	2	14/23
2014	7100	5340	32	68	1	0	0	1	16/24
2019	560	1960	11	89	0	0	0	0	11/16
Juniperus osteosperma[t] -- (Utah juniper)									
1992	100	-	80	20	0	20	0	0	- / -
1999	120	-	100	0	0	0	0	0	- / -
2004	120	-	17	50	33	0	0	17	- / -
2009	100	-	20	80	0	0	0	0	- / -
2014	120	-	0	100	0	0	0	0	- / -
2019	100	-	60	40	0	0	0	0	- / -
Mahonia fremontii -- (Fremont's mahonia)									
1992	40	-	0	100	0	50	50	50	- / -
1999	-	-	-	-	-	-	-	-	-/-
2004	40	-	0	100	0	0	0	0	162/201
2009	60	-	33	67	0	0	0	0	167/210
2014	60	-	33	33	33	0	0	0	217/280
2019	40	200	0	100	0	0	0	0	159/211
Opuntia fragilis -- (brittle pricklypear)									
1992	20	-	100	0	0	0	0	0	- / -
1999	-	-	-	-	-	-	-	-	-/-
2004	20	-	0	100	0	0	0	0	11/27
2009	40	-	0	100	0	0	0	0	9/41
2014	20	-	0	100	0	0	0	0	10/22
2019	20	-	0	100	0	0	0	0	10/74

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Pinus edulis[t] -- (twoneedle pinyon)									
1992	140	-	57	43	0	29	0	0	- / -
1999	140	20	29	71	0	0	0	0	- / -
2004	80	-	25	50	25	0	0	0	- / -
2009	40	20	0	100	0	0	0	0	- / -
2014	80	20	25	75	0	0	0	0	- / -
2019	60	60	33	67	0	0	0	0	- / -
Purshia tridentata[p] -- (antelope bitterbrush)									
1992	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	15/37
2004	-	-	-	-	-	-	-	-	19/42
2009	-	-	-	-	-	-	-	-	15/25
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
1992	40	-	0	100	0	0	100	0	- / -
1999	20	-	0	100	0	0	0	0	98/184
2004	60	-	0	100	0	0	0	67	101/172
2009	60	-	0	100	0	0	0	0	122/159
2014	-	-	-	-	-	-	-	-	43/141
2019	80	-	0	75	25	0	0	25	80/157
Yucca -- (yucca)									
1992	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	19/42
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	34/53

t - Tree Species; p - Preferred Browse; i - Introduced Species

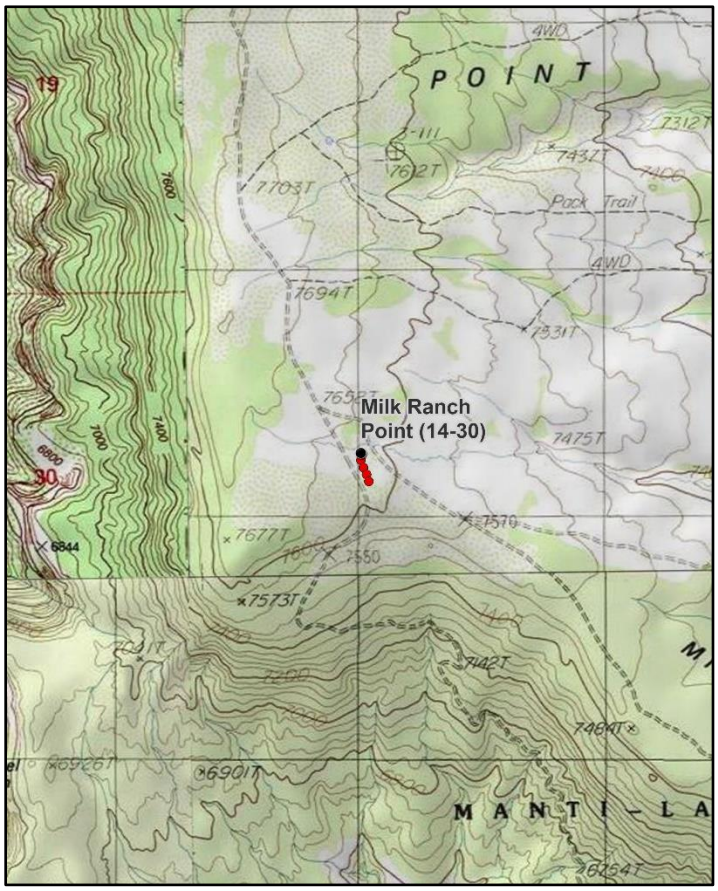
Table 14-29.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

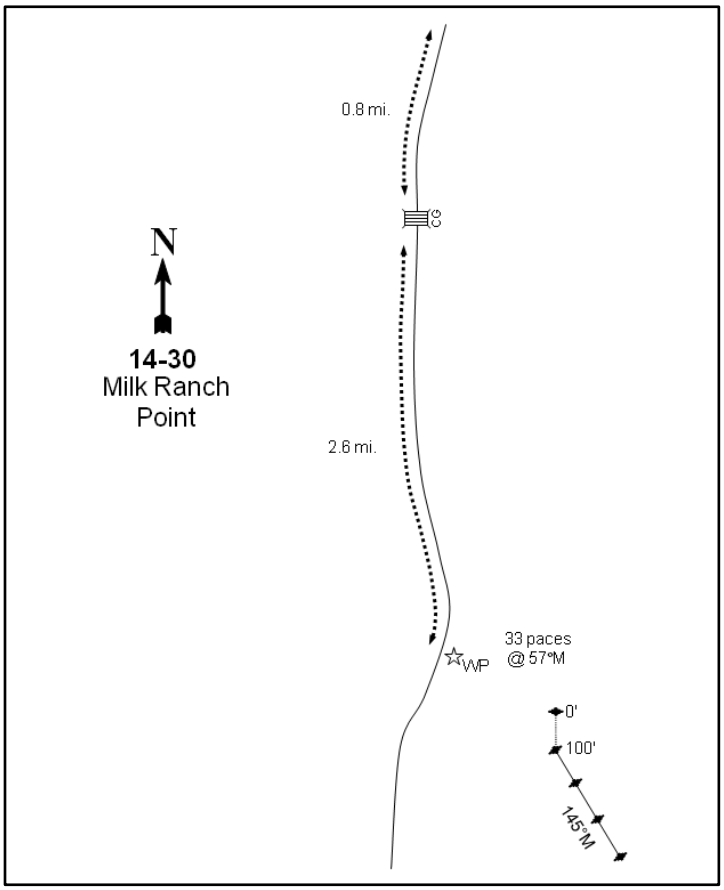
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1992	47	-	71	29	-	-	-
1999	61	-	-	-	-	-	6.8
2004	68	-	40	60	-	-	12.6
2009	31	-	17	75	8	-	11.7
2014	41	-	10	60	30	-	9.7
2019	46	-	20	80	-	-	12.8
Pinus edulis (twoneedle pinyon)							
1992	57	-	47	47	5	-	-
1999	56	-	-	-	-	-	8.8
2004	45	-	18	41	41	-	13.1
2009	54	-	12	29	24	35	12.3
2014	42	-	-	35	29	35	15.0
2019	44	6	-	19	44	31	15.8

Table 14-29.15 - Deer Desirable Components Index: Mid Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1992	2.2	0.0	0.0	30.0	0.0	2.6	0.0	34.8	Very Poor-Poor
1999	4.5	0.0	0.0	20.2	0.0	4.3	0.0	29.0	Very Poor
2004	7.4	15.0	15.0	8.7	0.0	6.7	0.0	52.8	Fair
2009	7.9	15.0	0.0	11.4	0.0	10.0	0.0	44.3	Poor
2014	7.4	0.0	0.0	14.6	0.0	4.8	0.0	26.7	Very Poor
2019	18.7	14.6	0.0	10.4	0.0	4.1	0.0	47.8	Poor

MILK RANCH POINT - STUDY NO. 14-30





Location Information

USGS 7.5 min Map Info	Cream Pots SW; Township 36S, Range 20E, Section 29
GPS (0' Stake)	NAD 83 UTM ZONE 12, 610949 East 4165444 North

Transect Information

Browse Tag # (0' Stake)	Not Available
Transect Bearing	165° magnetic (Lines 2-4: 145° magnetic)
Length	400ft
Belt Placement	Line 1 (11ft & 71ft), Line 2 (34ft), Line 3 (59ft), Line 4 (95ft)
Belt Marker Placement	Standard

Directions to Site

Driving from FS Road #92, turn south onto Milk Ranch Point Road and travel 0.8 miles to a cattle guard. Continue 2.6 miles past the cattle guard to a witness post. From the witness post, walk 33 paces at 57 degrees magnetic to the 0-foot stake, which is not marked by a browse tag.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	BABYLON
Elevation	7,600ft (2,316m)
Aspect	East
Slope	2%
Sample Dates	08/26/1992, 06/23/1999, 06/29/2004, 06/23/2009, 07/01/2014, 06/12/2019

Table 14-30.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Mechanical - Plow	-	-	1953	-
Seeding - Seed Unknown	-	-	1953	-

Wildlife Habitat and Vegetation History

Table 14-30.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	spring/fall
Rocky Mountain Elk	crucial	winter

Table 14-30.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1992	Mixed Mountain Brush	Phase I
1999	Mixed Mountain Brush	Phase I
2004	Mixed Mountain Brush	Phase I
2009	Mixed Mountain Brush	Phase I
2014	Mixed Mountain Brush	Phase I
2019	Mixed Mountain Brush	Phase I

Site Notes

The site was originally plowed and seeded in 1953. Part of the bench burned sometime prior to 2004 in a prescribed burn, but the sampling area was not affected. There are many stock ponds along the bench.

Soils

Table 14-30.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Loam	6.7	58.0	23.4	18.6	1.5	3.4	108.8	0.6	06/23/1999

Site Potential

1981 - 2010 Average Annual Precipitation	18 inches
NRCS Ecological Site	Mountain Loam (Oak)
NRCS Ecological Site #	R048AY415UT
States and Transitions	No state and transition model is available for this ecological site.

Since establishment in 1992, this site has remained dominated by mixed mountain brush species such as Utah serviceberry (*Amelanchier utahensis*), mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), and Gambel oak (*Quercus gambelii*), among others (Table 14-30.12, Table 14-30.13). The herbaceous understory has remained diverse and abundant throughout the study period; perennial forbs, particularly arrowleaf balsamroot (*Balsamorhiza saggitata*), have contributed a majority of the herbaceous cover (Table 14-30.7, Table 14-30.10, Table 14-30.11). Twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) have been a minor site component and the study has been classified as being within Phase I of woodland succession in all years (Table 14-30.4, Table 14-30.12, Table 14-30.14, Photos). Without a tree-removing disturbance, pinyon and juniper may have the potential to increase and become the dominant vegetation component on the site.

Trend Summary Tables

Table 14-30.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1992	27.9	1.2	3.2	-	-	-
1999	22.3	0.1	2.2	0.6	-	0.3
2004	21.8	0.7	2.5	28.3	0.6	5.0
2009	22.3	0.9	3.2	34.5	0.9	8.8
2014	26.8	0.4	1.9	31.6	0.4	6.0
2019	24.3	0.0	8.7	32.9	-	19.0

Table 14-30.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1992	-	256	60	304	-	9.9	0.2	15.6
1999	-	277	7	293	-	7.4	0.0	14.7
2004	-	228	31	240	-	7.8	0.1	10.7
2009	-	233	27	274	-	7.8	0.1	12.3
2014	-	200	6	220	-	4.3	0.0	9.4
2019	-	209	122	261	-	8.3	0.6	15.9

Table 14-30.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1992	18.4	6.7	52.7	0.0	2.7	47.2
1999	25.9	3.3	50.6	1.3	1.0	44.2
2004	34.9	1.9	42.5	0.8	1.2	41.5
2009	27.3	2.8	48.8	1.5	1.5	41.9
2014	29.4	1.1	50.5	0.5	2.2	41.3
2019	33.4	2.3	51.2	1.3	1.2	45.1

Table 14-30.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1992	-	5	2	29
1999	1	12	-	44
2004	1	1	3	21
2009	-	4	5	18
2014	-	3	1	11
2019	-	6	-	9
Year	Days Use Per Acre (ha)			
1992	-	-	-	-
1999	5.8 (14.3)	11.4 (28.1)	0.7 (1.7)	-
2004	-	3.4 (8.3)	2.7 (6.6)	-
2009	-	6.0 (14.9)	7.4 (18.2)	-
2014	-	1.3 (3.3)	0.7 (1.7)	-
2019	1.5 (3.6)	3.4 (8.3)	2.7 (6.6)	-

Table 14-30.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Achnatherum nelsonii (Columbia needlegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bouteloua gracilis (blue grama)	Bromus inermis[i] (smooth brome)	Carex (sedge)	Elymus elymoides (squirreltail)	Koeleria macrantha (prairie Junegrass)	Poa bulbosa[i] (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis[i] (Kentucky bluegrass)	Thinopyrum intermedium[i] (intermediate wheatgrass)
year	Nested Frequency											
1992	4	3	59	4	-	17	9	7	-	71	2	173
1999	19	4	95	4	-	10	-	5	6	99	-	127
2004	4	-	83	4	-	1	3	-	-	86	-	96
2009	-	1	21	1	2	2	3	-	6	145	-	115
2014	0	5	37	9	-	5	4	-	-	121	1	39
2019	5	1	15	-	36	17	4	31	17	98	4	44
year	Average Cover (%)											
1992	0.0	0.0	0.4	0.2	-	0.4	0.0	0.3	-	2.9	0.0	5.6
1999	0.3	0.1	1.5	0.0	-	0.2	-	0.0	0.0	2.2	-	3.0
2004	0.0	-	1.6	0.1	-	0.2	0.0	-	-	2.8	-	3.1
2009	-	0.0	0.3	0.0	0.0	0.0	0.2	-	0.0	4.1	-	3.2
2014	0.0	0.1	0.4	0.0	-	0.2	0.0	-	-	2.1	0.0	1.4
2019	0.0	0.0	0.2	-	2.7	0.2	0.0	0.5	0.2	3.8	0.0	0.6

a - Annual; n - Noxious Weed; i - Introduced Species

Table 14-30.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Androsace septentrionalis[a] (pygmyflower rockjasmine)	Arabis (rockcress)	Balsamorhiza sagittata (arrowleaf balsamroot)	Camelina microcarpa[ai] (littlepod false flax)	Castilleja angustifolia (northwestern Indian paintbrush)	Castilleja linariifolia (Wyoming Indian paintbrush)	Chamaesyce (sandmat)	Collinsia parviflora[a] (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawksbeard)	Cryptantha (cryptantha)	Cymopterus (springparsley)	Delphinium nuttallianum (twolobe larkspur)	Erigeron eatonii (Eaton's fleabane)	Erigeron pumilus (shaggy fleabane)	Eriogonum alatum (winged buckwheat)
year	Nested Frequency																
1992	-	-	-	46	-	-	59	-	-	-	10	28	-	-	18	16	102
1999	7	3	2	89	-	-	38	2	2	-	22	-	6	-	9	14	51
2004	-	-	2	57	-	-	-	-	10	5	6	2	4	-	13	10	43
2009	-	-	-	99	-	-	3	-	7	2	29	11	27	-	7	20	24
2014	-	-	-	74	6	2	10	-	-	7	3	6	-	-	9	8	20
2019	2	-	-	106	60	-	5	-	17	6	16	1	22	6	11	6	11
year	Average Cover (%)																
1992	-	-	-	2.5	-	-	0.9	-	-	-	0.1	0.1	-	-	0.4	0.1	2.2
1999	0.1	0.0	0.0	4.5	-	-	0.5	0.0	0.0	-	0.3	-	0.1	-	0.1	0.1	0.5
2004	-	-	0.0	3.4	-	-	-	-	0.0	0.0	0.1	0.0	0.0	-	0.0	0.1	0.3
2009	-	-	-	3.6	-	-	0.0	-	0.0	0.0	0.5	0.1	0.1	-	0.1	0.1	0.2
2014	-	-	-	3.7	0.0	0.0	0.1	-	-	0.1	0.0	0.0	-	-	0.0	0.0	0.2
2019	0.0	-	-	7.4	0.3	-	0.2	-	0.1	0.0	0.1	0.0	0.3	0.0	0.2	0.0	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Gayophytum ramosissimum[a] (pinyon groundsmoke)	Ipomopsis aggregata (scarlet gilia)	Lathyrus lanszwertii (Nevada pea)	Lesquerella (bladderpod)	Lupinus argenteus (silvery lupine)	Lupinus wyethii ssp. wyethii (Wyeth's lupine)	Mertensia (bluebells)	Microsteris gracilis[a] (slender phlox)	Mimulus suksdorfii[a] (Suksdorf's monkeyflower)	Packera multilobata (lobeleaf groundsel)	Packera neomexicana (New Mexico groundsel)	Penstemon comarrhenus (dusty beardtongue)	Penstemon lentus (handsome beardtongue)	Penstemon strictus (Rocky Mountain penstemon)	Petradoria pumila (rock goldenrod)
year	Nested Frequency																
1992	43	-	-	5	7	98	79	6	-	-	-	-	25	-	68	6	58
1999	30	-	-	6	1	63	96	41	-	1	-	3	16	-	50	14	35
2004	23	3	-	1	8	58	2	41	-	25	-	-	10	-	37	1	54
2009	13	1	-	-	-	49	-	30	-	24	-	14	3	-	31	7	85
2014	11	5	-	4	-	37	-	15	-	-	-	1	-	2	38	-	81
2019	14	-	23	8	3	59	4	22	12	19	5	31	-	26	43	-	43
year	Average Cover (%)																
1992	0.6	-	-	0.0	1.0	0.5	2.9	0.0	-	-	-	-	0.1	-	0.4	0.0	2.4
1999	0.2	-	-	0.2	0.0	0.3	2.4	1.7	-	0.0	-	0.0	0.1	-	1.3	0.1	1.7
2004	0.2	0.0	-	0.0	0.0	0.4	0.1	1.8	-	0.0	-	-	0.1	-	0.2	0.0	3.3
2009	0.1	0.0	-	-	-	0.3	-	1.5	-	0.0	-	0.2	0.1	-	0.5	0.0	4.3
2014	0.1	0.0	-	0.0	-	0.2	-	0.6	-	-	-	0.0	-	0.0	0.3	-	3.6
2019	0.1	-	0.1	0.0	0.1	0.4	0.0	2.6	0.1	0.1	0.0	0.1	-	0.8	1.2	-	1.6

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Phlox longifolia (longleaf phlox)	Polygonum douglasii[a] (Douglas' knotweed)	Stenotus acaulis (stemless mock goldenweed)	Taraxacum officinale (common dandelion)	Tetraneuris acaulis (stemless four-nerve daisy)	unknown perennial forb (unknown forb)	Vicia americana (American vetch)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency							
1992	77	60	-	-	95	3	-	-
1999	72	1	1	4	37	-	2	2
2004	30	-	-	1	68	-	-	-
2009	31	1	-	-	51	-	-	-
2014	10	-	-	-	43	-	5	-
2019	24	32	-	-	43	-	-	1
year	Average Cover (%)							
1992	0.4	0.2	-	-	0.9	0.0	-	-
1999	0.2	0.0	0.0	0.0	0.5	-	0.0	0.0
2004	0.1	-	-	0.0	0.5	-	-	-
2009	0.1	0.0	-	-	0.5	-	-	-
2014	0.2	-	-	-	0.3	-	0.0	-
2019	0.1	0.1	-	-	0.3	-	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 14-30.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis[p] (Utah serviceberry)	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Chrysothamnus depressus[p] (longflower rabbitbrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma[t] (Utah juniper)	Pinus edulis[t] (twoneedle pinyon)	Purshia tridentata[p] (antelope bitterbrush)	Quercus gambelii[p] (Gambel oak)
year	Line Intercept Cover (%)								
1992	-	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-	-
2004	15.4	5.1	0.7	-	0.6	0.5	4.5	-	7.1
2009	13.8	8.1	1.9	-	0.9	1	7.8	-	10.7
2014	12	10.1	0.2	0.1	0.3	0.7	5.3	-	9.3
2019	12.8	10.6	0.5	-	-	1	18	0.1	8.9
year	Quadrat Cover (%)								
1992	16.1	4.7	0.3	-	1.2	0.6	2.5	0.4	6.5
1999	11.0	4.6	0.3	-	0.1	0.1	2.1	0.0	6.4
2004	11.7	5.1	0.3	-	0.7	0.1	2.4	-	4.7
2009	11.3	4.5	0.4	-	0.9	0.4	2.8	-	6.1
2014	11.1	6.9	0.2	0.1	0.4	0.4	1.5	-	8.6
2019	9.5	8.4	0.6	-	0.0	0.4	8.3	0.4	5.5

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 14-30.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
1992	3800	3220	68	31	1	28	5	21	- / -
1999	980	20	16	82	2	31	31	4	133/174
2004	1120	-	23	73	4	39	4	0	124/152
2009	1280	240	50	48	2	8	16	0	132/158
2014	2380	-	3	97	0	66	20	2	112/133
2019	1820	1040	18	82	0	19	8	0	136/164
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1992	1520	100	38	42	20	32	5	7	- / -
1999	1500	20	11	69	20	21	4	13	46/75
2004	1580	27460	3	72	25	6	0	9	49/72
2009	1960	240	11	79	10	4	3	7	48/78
2014	1720	140	16	81	2	59	17	12	53/85
2019	2020	20	7	76	17	23	12	17	54/90
Chrysothamnus depressus[p] -- (longflower rabbitbrush)									
1992	1600	60	53	44	4	21	4	4	- / -
1999	920	-	0	96	4	7	9	4	8/19
2004	1020	-	2	92	6	20	12	2	12/25
2009	1020	20	4	94	2	4	12	0	9/19
2014	860	20	5	95	0	28	7	0	8/22
2019	540	-	7	78	15	22	0	15	12/29

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
1992	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	140	-	0	100	0	0	0	0	16/17
2019	-	-	-	-	-	-	-	-	15/34
Gutierrezia sarothrae -- (broom snakeweed)									
1992	2160	20	2	98	0	0	0	1	- / -
1999	740	60	8	92	0	0	0	0	16/17
2004	2300	240	46	54	0	0	0	0	19/24
2009	3200	-	10	89	1	0	0	0	16/15
2014	600	-	37	63	0	0	0	0	16/18
2019	260	400	0	100	0	0	0	0	26/28
Juniperus osteosperma[t] -- (Utah juniper)									
1992	20	-	100	0	0	0	0	0	- / -
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Pinus edulis[t] -- (twoneedle pinyon)									
1992	120	140	67	33	0	0	0	0	- / -
1999	100	20	60	40	0	0	0	0	- / -
2004	80	60	50	50	0	0	0	0	- / -
2009	140	20	57	43	0	0	0	0	- / -
2014	80	-	100	0	0	0	0	0	- / -
2019	140	-	14	86	0	0	0	0	- / -
Purshia tridentata[p] -- (antelope bitterbrush)									
1992	100	-	20	60	20	40	60	0	- / -
1999	80	-	25	75	0	25	25	0	31/80
2004	60	-	0	100	0	33	33	0	31/70
2009	60	-	0	100	0	67	0	0	36/66
2014	60	-	0	100	0	33	0	0	39/101
2019	80	-	0	75	25	25	25	25	61/93
Quercus gambelii[p] -- (Gambel oak)									
1992	1620	380	42	58	0	26	0	12	- / -
1999	1280	80	47	53	0	0	0	0	128/105
2004	1240	-	63	32	5	0	0	0	123/112
2009	1220	100	39	54	7	0	0	0	74/123
2014	1660	660	48	51	1	16	0	0	80/68
2019	1360	-	43	53	4	0	0	4	94/79
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
1992	160	-	88	0	13	0	0	13	- / -
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	51/44
2009	20	-	0	0	100	0	0	0	- / -
2014	20	-	100	0	0	0	0	0	27/23
2019	-	-	-	-	-	-	-	-	45/30

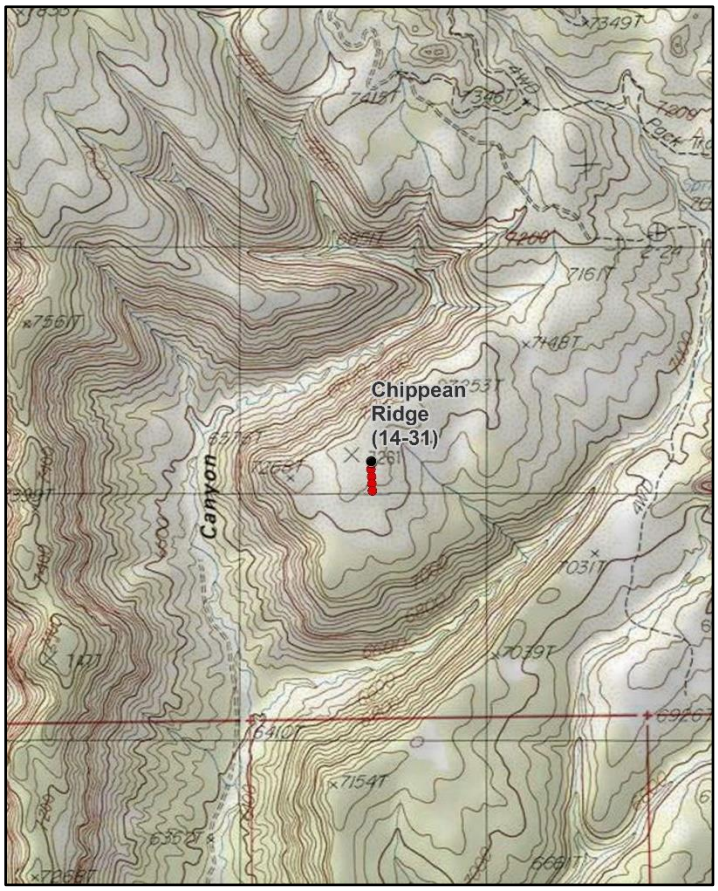
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Tetradymia canescens -- (spineless horsebrush)									
1992	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	17/27

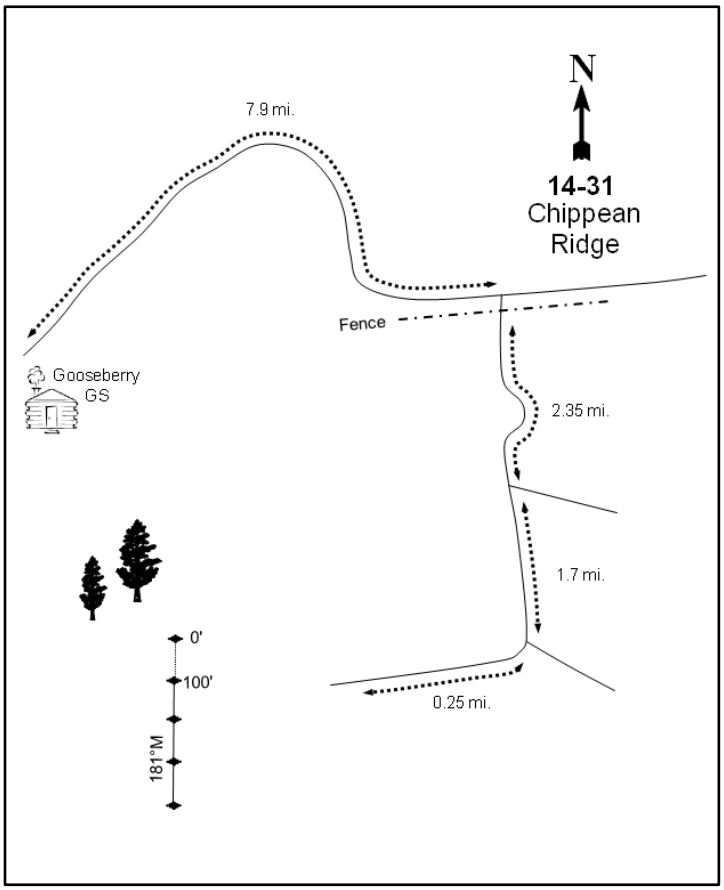
t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 14-30.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1992	4	-	-	67	33	-	-
1999	4	-	-	-	-	-	11.3
2009	4	-	-	-	67	33	12.7
2014	4	-	-	-	100	-	17.0
2019	6	-	-	25	25	50	20.3
Pinus edulis (twoneedle pinyon)							
1992	84	5	30	30	35	-	-
1999	84	-	-	-	-	-	9.1
2004	95	-	25	20	25	30	11.4
2009	118	5	10	30	5	50	11.2
2014	92	5	5	40	50	-	13.3
2019	109	-	20	40	15	25	12.0
Quercus gambelii (Gambel oak)							
1999	49	-	-	-	-	-	3.4
2009	58	-	43	50	7	-	3.5

CHIPPEAN RIDGE - STUDY NO. 14-31





Location Information

USGS 7.5 min Map Info	Chippean Rocks SE; Township 34S, Range 20E, Section 52
GPS (0' Stake)	NAD 83 UTM ZONE 12, 616475 East 4182324 North

Transect Information

Browse Tag # (0' Stake)	268
Transect Bearing	181° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 71ft), Line 2 (34ft), Line 3 (59ft), Line 4 (95ft)
Belt Marker Placement	Standard

Directions to Site

From the Gooseberry Guard Station, travel northeast towards "The Causeway" for 7.9 miles, at which point there will be a fork. Turn right off of the main road and pass through a gate/fence shortly after the turn. Continue 2.35 miles to a fork and bear right. Drive 1.7 miles to another fork and proceed to the right on a very faint overgrown road (left road ends about 100 feet or so near a spring). Continue on another 0.25 miles to the end of the road. Continue to follow the old road or trail west at a slight rise in elevation for about 0.66 of a mile to the third ridge. There are two ponderosa pines 30 feet apart from each other which are near the ridge's northern apex. The 0-foot baseline stake is 50 feet away from the lowermost, larger ponderosa pine at a bearing of 60 degrees magnetic. The baseline is marked with half-high steel fenceposts and the 0-foot stake is marked with browse tag #268.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	GOOSEBERRY
Elevation	7,200ft (2,195m)
Aspect	South
Slope	8-10%
Sample Dates	09/13/1992, 06/24/1999, 07/07/2004, 07/08/2009, 07/02/2014, 06/19/2019

Wildlife Habitat and Vegetation History

Table 14-31.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	summer
Rocky Mountain Elk	crucial	winter

Table 14-31.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1992	Mixed Mountain Brush	Phase I
1999	Mixed Mountain Brush	Phase I
2004	Mixed Mountain Brush	Phase I
2009	Mixed Mountain Brush	Phase I
2014	Mixed Mountain Brush	Phase I
2019	Mixed Mountain Brush	Phase I

Site Notes

Several elk antler drops were found on the site in 1992, but all appeared to be from the previous winter (1991). One elk shed was found near the site in 2014. There were signs of ATV use on the hillsides surrounding the site in 2009.

Soils

Table 14-31.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	7.2	57.6	17.8	24.6	1.2	4.0	102.4	0.7	06/22/1999

Site Potential

1981 - 2010 Average Annual Precipitation	16 inches
NRCS Ecological Site	Mountain Loam (Oak)
NRCS Ecological Site #	R048AY415UT
States and Transitions	No state and transition model is available for this ecological site.

Since establishment in 1992, this site has remained dominated by mixed mountain brush species such as Utah serviceberry (*Amelanchier utahensis*), alderleaf mountain mahogany (*Cercocarpus montanus*), and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), among others (Table 14-31.12, Table 14-31.13). The herbaceous understory has remained diverse and abundant. Perennial grasses have provided a majority of the herbaceous cover, but much of this cover is contributed by introduced species such as smooth brome (*Bromus inermis*), crested wheatgrass (*Agropyron cristatum*), and bulbous bluegrass (*Poa bulbosa*) (Table 14-31.7, Table 14-31.10, Table 14-31.11). Twoneedle pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) have been minor site components and the study has been considered to be within Phase I of woodland succession throughout the sample period (Table 14-31.4, Table 14-31.12, Table 14-31.14, Photos). Without a tree-removing disturbance, however, pinyon and juniper may have the potential to increase and become dominant vegetation components in future sample years.

Trend Summary Tables

Table 14-31.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1992	22.4	4.0	3.4	-	-	-
1999	17.7	5.1	3.1	0.6	-	0.5
2004	19.0	6.6	3.9	32.1	7.0	5.6
2009	21.3	6.3	5.2	28.5	6.4	7.2
2014	16.0	6.8	4.0	29.0	8.1	7.1
2019	21.1	7.4	5.8	24.3	7.9	6.1

Table 14-31.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1992	2	324	38	186	0.0	16.2	0.1	3.2
1999	6	310	12	215	0.0	13.0	0.2	4.7
2004	-	253	23	179	-	7.9	0.3	4.0
2009	-	303	15	152	-	12.1	0.2	3.4
2014	5	288	2	123	0.0	9.9	0.0	2.0
2019	25	314	160	211	0.5	16.9	1.6	4.1

Table 14-31.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1992	22.1	6.7	43.1	-	0.5	41.0
1999	29.0	8.5	40.8	0.1	0.3	40.4
2004	40.0	3.0	39.4	0.1	1.2	43.1
2009	31.4	5.1	46.4	0.0	0.6	42.8
2014	31.8	1.0	53.5	0.1	0.8	40.9
2019	26.5	4.8	59.2	0.1	0.7	51.1

Table 14-31.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1992	-	10	1	15
1999	2	6	3	34
2004	-	4	7	15
2009	-	2	11	5
2014	-	3	3	22
2019	-	-	11	3
Year	Days Use Per Acre (ha)			
1992	-	-	-	-
1999	3.6 (9.0)	7.4 (18.2)	24.1 (59.6)	-
2004	1.5 (3.6)	4.7 (11.6)	23.4 (57.9)	-
2009	-	0.7 (1.7)	28.1 (69.5)	-
2014	-	2.0 (5.0)	16.8 (41.4)	-
2019	-	4.0 (9.9)	21.5 (53.0)	-

Table 14-31.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bouteloua gracilis (blue grama)	Bromus inermis[i] (smooth brome)	Bromus tectorum[ai] (cheatgrass)	Carex (sedge)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Koeleria macrantha (prairie Junegrass)	Poa bulbosa[i] (bulbous bluegrass)	Poa fendleriana (muttongrass)	Vulpia octoflora[a] (sixweeks fescue)
year	Nested Frequency											
1992	-	72	7	143	2	4	3	74	-	165	13	-
1999	8	64	13	132	-	1	-	61	-	175	8	6
2004	29	76	12	113	-	-	2	31	4	29	16	-
2009	11	70	14	142	-	1	-	16	-	122	40	-
2014	-	60	3	138	-	2	4	58	-	90	51	5
2019	-	61	6	133	-	-	-	21	-	183	21	25
year	Average Cover (%)											
1992	-	4.7	0.3	2.8	0.0	0.3	0.0	1.3	-	6.5	0.3	-
1999	0.2	2.7	0.5	3.4	-	0.0	-	1.2	-	5.0	0.1	0.0
2004	0.3	3.5	0.3	2.1	-	-	0.0	0.6	0.0	0.5	0.5	-
2009	0.4	3.3	0.6	3.5	-	0.0	-	0.7	-	2.6	1.0	-
2014	-	3.3	0.0	2.8	-	0.0	0.0	1.6	-	0.6	1.5	0.0
2019	-	3.9	0.3	4.5	-	-	-	1.0	-	6.7	0.5	0.5

a - Annual; n - Noxious Weed; i - Introduced Species

Table 14-31.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Arabis (rockcress)	Artemisia ludoviciana (white sagebrush)	Calochortus nuttallii (sego lily)	Camelina microcarpa[ai] (littlepod false flax)	Castilleja linariifolia (Wyoming Indian paintbrush)	Chaenactis douglasii (Douglas' dustymaiden)	Cirsium (thistle)	Collinsia parviflora[a] (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)	Cordylanthus[a] (bird's-beak)	Crepis acuminata (tapertip hawksbeard)	Cryptantha (cryptantha)	Cymopterus (springparsley)	Draba[a] (draba)	Epilobium brachycarpum[a] (tall annual willowherb)	Erigeron pumilus (shaggy fleabane)	Eriogonum alatum (winged buckwheat)
year	Nested Frequency																
1992	-	-	-	-	6	67	-	-	35	-	3	-	-	-	-	-	-
1999	-	-	3	-	4	28	1	4	64	-	6	-	-	-	3	-	-
2004	-	-	-	-	-	21	2	-	56	23	-	-	-	-	-	-	2
2009	-	-	-	-	7	9	-	-	42	14	4	-	-	-	-	-	9
2014	-	4	4	-	1	8	-	-	32	2	1	3	-	-	-	-	-
2019	4	-	8	117	-	-	-	-	30	39	6	3	34	6	9	3	6
year	Average Cover (%)																
1992	-	-	-	-	0.0	1.3	-	-	0.1	-	0.0	-	-	-	-	-	-
1999	-	-	0.0	-	0.0	0.3	0.0	0.0	1.1	-	0.0	-	-	-	0.2	-	-
2004	-	-	-	-	-	0.4	0.0	-	0.6	0.3	-	-	-	-	-	-	0.0
2009	-	-	-	-	0.6	0.3	-	-	0.6	0.2	0.0	-	-	-	-	-	0.0
2014	-	0.0	0.0	-	0.0	0.1	-	-	0.3	0.0	0.0	0.0	-	-	-	-	-
2019	0.0	-	0.1	0.7	-	-	-	-	0.2	0.4	0.1	0.0	0.5	0.0	0.0	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Heterotheca villosa (hairy false goldenaster)	Lomatium (desertparsley)	Lupinus sericeus (silky lupine)	Machaeranthera canescens (hoary tansyaster)	Machaeranthera grindelioides (rayless tansyaster)	Packera multilobata (lobeleaf groundsel)	Penstemon comarrhenus (dusty beardtongue)	Phlox longifolia (longleaf phlox)	Physaria rectipes (straight bladderpod)	Polygonum douglasii[a] (Douglas' knotweed)	Senecio spartioides var. multicapitatus (broom-like ragwort)	Sphaeralcea coccinea (scarlet globemallow)	Tetraneuris acaulis (stemless four-nerve daisy)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency															
1992	52	5	-	3	3	7	-	-	17	26	67	38	14	17	9	0
1999	57	16	1	34	12	21	-	60	8	53	80	5	-	1	26	3
2004	41	5	-	2	9	9	-	63	3	6	92	-	-	2	22	-
2009	30	15	-	6	1	-	-	22	-	17	45	4	-	3	35	3
2014	14	9	-	-	1	-	-	7	7	2	41	-	-	2	46	3
2019	30	4	8	-	14	7	5	75	21	22	-	49	6	3	37	12
year	Average Cover (%)															
1992	0.8	0.0	-	0.1	0.0	0.0	-	-	0.1	0.1	0.3	0.1	0.1	0.1	0.1	0.0
1999	0.6	0.2	0.0	0.6	0.3	0.0	-	0.8	0.0	0.1	0.3	0.0	-	0.0	0.2	0.0
2004	0.3	0.1	-	0.0	0.1	0.1	-	0.8	0.0	0.1	1.4	-	-	0.0	0.1	-
2009	0.3	0.1	-	0.0	0.0	-	-	0.1	-	0.0	0.2	0.0	-	0.0	1.0	0.0
2014	0.1	0.1	-	-	0.0	-	-	0.1	0.0	0.0	0.4	-	-	0.0	0.7	0.0
2019	0.9	0.1	0.0	-	0.6	0.0	0.0	0.5	0.1	0.1	-	0.4	0.0	0.0	0.7	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 14-31.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis[p] (Utah serviceberry)	Arctostaphylos patula (greenleaf manzanita)	Artemisia nova[p] (black sagebrush)	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Cercocarpus montanus[p] (alderleaf mountain mahogany)	Chrysothamnus depressus[p] (longflower rabbitbrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	Escobaria vivipara var. arizonica (Arizona spinystar)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma[t] (Utah juniper)	Opuntia fragilis (brittle pricklypear)	Pediocactus simpsonii (mountain ball cactus)	Pinus edulis[t] (twoneedle pinyon)	Pinus ponderosa[t] (ponderosa pine)	Purshia tridentata[p] (antelope bitterbrush)	Quercus gambelii[p] (Gambel oak)	Symphoricarpos oreophilus[p] (mountain snowberry)
year	Line Intercept Cover (%)																
1992	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2004	13.2	5.9	-	6.8	8.3	0.2	-	-	0.9	-	0.2	-	5.6	0	0.8	1	1.8
2009	14.3	5.8	-	5.2	8.1	0.1	-	-	0.6	0.3	0	-	6.9	-	-	0.8	-
2014	8.2	7.9	-	4.8	10.2	-	-	-	-	1.1	0.2	-	6	-	-	0.5	5.3
2019	11.1	7.8	-	4.5	7.4	0.2	-	-	-	0.3	0.1	-	5.8	-	-	0.7	0.4
year	Quadrat Cover (%)																
1992	11.5	3.0	-	5.1	4.8	0.7	-	0.0	1.0	0.0	0.1	-	3.4	-	0.1	-	0.1
1999	8.1	4.9	-	4.5	4.7	0.2	-	0.0	0.2	0.1	0.0	-	3.0	-	0.0	0.0	0.1
2004	7.3	5.7	0.0	4.5	5.2	0.7	-	-	0.9	0.2	0.0	-	3.7	0.0	0.0	0.0	1.3
2009	9.7	4.5	-	4.5	6.5	0.3	-	-	1.3	1.4	0.1	0.4	3.8	-	0.1	0.1	-
2014	4.5	6.7	-	3.3	5.6	0.2	0.0	-	0.1	1.5	0.1	0.0	2.5	-	-	0.0	2.4
2019	8.0	6.9	-	5.2	7.1	0.1	0.0	0.1	0.3	0.8	0.0	-	4.4	0.6	-	0.0	0.8

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 14-31.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
1992	1280	340	55	45	0	41	5	0	- / -
1999	680	180	27	74	0	6	56	0	162/221
2004	880	-	30	66	5	32	9	2	148/179
2009	1040	320	33	65	2	6	8	4	149/198
2014	540	-	37	59	4	26	0	4	155/164
2019	780	-	15	80	5	46	5	5	146/178
Artemisia nova[p] -- (black sagebrush)									
1992	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	200	-	0	20	80	70	20	40	27/54
2009	-	-	-	-	-	-	-	-	-/-
2014	220	-	9	91	0	18	73	18	26/53
2019	-	-	-	-	-	-	-	-	-/-
Arctostaphylos patula -- (greenleaf manzanita)									
1992	40	-	0	100	0	0	0	0	- / -
1999	80	-	25	75	0	0	0	0	104/344
2004	60	-	0	100	0	0	0	0	77/229
2009	20	-	0	100	0	0	0	0	72/244
2014	1160	-	0	98	2	79	0	0	63/153
2019	380	-	5	90	5	0	0	5	83/129
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1992	3300	20	55	40	6	55	19	6	- / -
1999	2240	40	10	73	17	21	13	5	49/73
2004	1780	-	6	60	35	81	3	23	43/69
2009	2100	40	2	73	25	34	18	19	52/73
2014	1420	20	7	82	11	35	37	11	41/66
2019	1120	-	5	48	46	39	30	38	46/73
Cercocarpus montanus[p] -- (alderleaf mountain mahogany)									
1992	240	180	33	67	0	58	8	0	- / -
1999	320	60	25	75	0	44	6	0	161/174
2004	240	-	0	100	0	50	0	0	155/140
2009	380	60	42	53	5	21	0	5	120/119
2014	380	20	11	90	0	42	0	0	120/136
2019	340	-	18	82	0	47	24	0	132/143
Chrysothamnus depressus[p] -- (longflower rabbitbrush)									
1992	680	20	35	65	0	21	0	0	- / -
1999	420	-	5	81	14	0	10	14	19/41
2004	620	-	0	87	13	7	0	7	19/35
2009	380	-	5	95	0	0	0	0	15/28
2014	420	60	24	76	0	24	57	0	13/27
2019	280	-	0	93	7	7	0	7	20/28
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
1992	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	60	-	0	100	0	0	0	0	15/16
2019	40	-	0	100	0	0	0	0	22/28

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Escobaria vivipara var. arizonica -- (Arizona spinystar)									
1992	-	-	-	-	-	-	-	-	-/-
1999	20	-	0	100	0	0	0	0	5/7
2004	-	-	-	-	-	-	-	-	7/10
2009	-	-	-	-	-	-	-	-	-/-
2014	100	-	0	100	0	0	0	0	8/13
2019	-	-	-	-	-	-	-	-	-/-
Gutierrezia sarothrae -- (broom snakeweed)									
1992	3120	-	5	95	1	0	0	1	- / -
1999	1000	240	62	38	0	4	0	0	12/12
2004	2540	-	1	98	1	0	0	0	18/25
2009	2360	140	0	100	0	0	0	0	20/22
2014	300	460	40	60	0	13	0	0	18/17
2019	340	4760	47	53	0	0	0	0	17/18
Juniperus osteosperma[t] -- (Utah juniper)									
1992	20	-	100	0	0	0	0	0	- / -
1999	20	40	100	0	0	0	0	0	- / -
2004	20	-	100	0	0	0	0	0	- / -
2009	-	-	-	-	-	-	-	-	-/-
2014	40	-	50	50	0	0	0	50	- / -
2019	20	-	100	0	0	0	0	0	- / -
Opuntia fragilis -- (brittle pricklypear)									
1992	400	-	55	40	5	0	0	5	- / -
1999	140	-	29	57	14	0	0	29	7/17
2004	80	-	25	50	25	0	0	25	9/25
2009	280	20	14	86	0	0	0	0	7/18
2014	380	-	37	53	11	0	0	21	7/21
2019	360	-	0	94	6	0	0	6	8/20
Pediocactus simpsonii -- (mountain ball cactus)									
1992	-	-	-	-	-	-	-	-	-/-
1999	20	-	0	100	0	0	0	0	7/13
2004	-	-	-	-	-	-	-	-	-/-
2009	20	-	0	100	0	0	0	0	56/151
2014	40	-	100	0	0	0	0	0	4/2
2019	-	-	-	-	-	-	-	-	-/-
Pinus edulis[t] -- (twoneedle pinyon)									
1992	80	-	25	75	0	0	0	0	- / -
1999	60	40	33	67	0	0	0	0	- / -
2004	180	40	78	22	0	0	0	0	- / -
2009	60	60	33	67	0	0	0	0	- / -
2014	80	20	25	75	0	0	0	0	- / -
2019	60	-	33	67	0	0	0	0	- / -
Purshia stansburiana[p] -- (Stansbury cliffrose)									
1992	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	110/106
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-

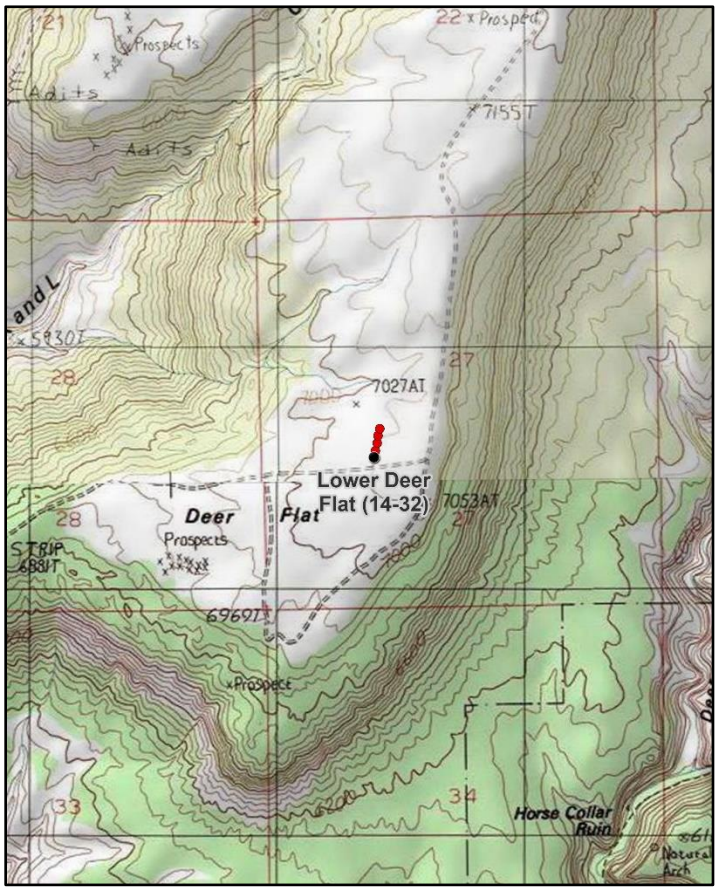
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Purshia tridentata[p] -- (antelope bitterbrush)									
1992	20	-	100	0	0	100	0	0	- / -
1999	-	-	-	-	-	-	-	-	-/-
2004	40	-	0	100	0	0	100	0	47/125
2009	20	-	0	100	0	100	0	0	50/118
2014	-	-	-	-	-	-	-	-	42/126
2019	20	-	0	100	0	100	0	0	33/99
Quercus gambelii[p] -- (Gambel oak)									
1992	-	-	-	-	-	-	-	-	-/-
1999	-	20	0	0	0	0	0	0	71/63
2004	-	-	-	-	-	-	-	-	86/56
2009	-	-	-	-	-	-	-	-	232/289
2014	-	-	-	-	-	-	-	-	123/146
2019	-	-	-	-	-	-	-	-	89/88
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
1992	160	40	63	38	0	13	0	0	- / -
1999	40	-	100	0	0	0	0	0	74/123
2004	480	-	17	83	0	4	0	0	33/50
2009	60	20	33	67	0	0	0	0	44/109
2014	320	120	6	94	0	13	0	0	86/142
2019	40	-	0	100	0	100	0	0	36/67

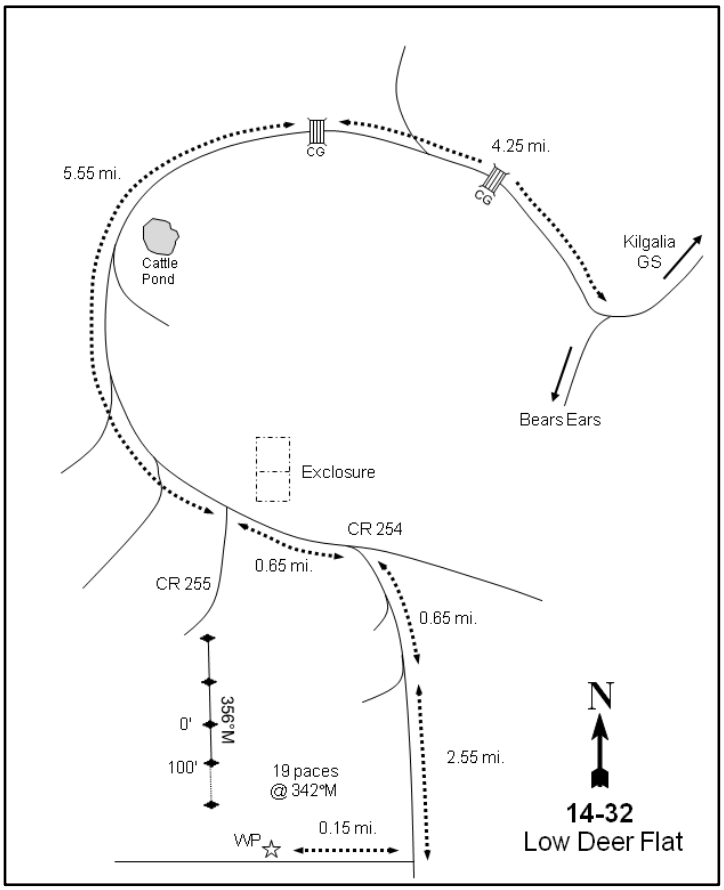
t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 14-31.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1999	34	-	-	-	-	-	21.5
2009	18	13	-	25	63	-	15.0
2014	17	-	13	13	75	-	16.4
2019	22	-	36	9	27	27	15.5
Pinus edulis (twoneedle pinyon)							
1999	25	-	-	-	-	-	13.3
2009	31	21	14	36	14	14	8.3
2014	30	7	21	29	36	7	14.4
2019	80	5	68	16	5	5	5.3
Pinus ponderosa (ponderosa pine)							
1999	1	-	-	-	-	-	25.0
2014	1	-	-	-	-	100	32.0
2019	1	-	-	-	-	100	36.0
Quercus gambelii (Gambel oak)							
1999	3	-	-	-	-	-	5.0

LOWER DEER FLAT - STUDY NO. 14-32





Location Information

USGS 7.5 min Map Info	The Cheesebox SE; Township 36S, Range 17E, Section 27
GPS (0' Stake)	NAD 83 UTM ZONE 12, 585339 East 4164745 North

Transect Information

Browse Tag # (0' Stake)	173
Transect Bearing	356° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 71ft), Line 2 (34ft), Line 3 (59ft), Line 4 (95ft)
Belt Marker Placement	Standard

Directions to Site

At the intersection 2.45 miles southwest of the turnoff to Kigalia Guard Station and almost 2 miles northeast of the Bears Ears, turn west and proceed 2.0 miles to a cattle guard near a corral. Continue straight on this road, ignoring the turnoffs near the corral, for 1.75 miles to a fork. Stay left and continue 1.5 miles to a cattle guard at the FS/BLM boundary. After 2.4 miles, stay to the right at a fork near a stock pond. Continue 0.65 miles to another fork: stay left. Proceed 0.6 more miles and stay left at the fork. Go 1.90 miles to an exclosure on the east side of the road. From the fork where County Roads 254 and 255 split, go left on County Road 254 and continue for 0.65 miles to a fork. Proceed to the right and go 0.35 miles to another fork. Stay left for 0.3 miles to another fork. Stay left and drive for 2.55 miles to another fork. Turn right onto a two-track and continue for 0.15 miles to a witness post on the right (north) side of the road. The 0-foot stake is 19 paces at 342 degrees magnetic from the witness post and is marked by browse tag #173.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	WHITE CANYON
Elevation	7,000ft (2,134m)
Aspect	Southwest
Slope	3%
Sample Dates	06/22/1994, 06/29/1999, 06/23/2004, 06/30/2009, 07/01/2014, 06/12/2019

Table 14-32.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Herbicide - Graslan	Deer Flat Revegetation	LTDL	1984	2600
Chaining - Chain Unknown	Deer Flat Revegetation	LTDL	1950	1900
Seeding - Aerial Unknown	Deer Flat Revegetation	LTDL	1950	1900

Table 14-32.2 SeedMix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Deer Flat Revegetation			Aerial	Oct 1950	1980
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Agropyron cristatum	Crested Wheatgrass		3.79	0.00

Wildlife Habitat and Vegetation History

Table 14-32.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Desert Bighorn	substantial	year-long
Rocky Mountain Elk	substantial	winter

Table 14-32.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1994	Mountain Big Sagebrush	Phase I
1999	Mountain Big Sagebrush	Phase I
2004	Mountain Big Sagebrush	Phase I
2009	Mountain Big Sagebrush	Phase I
2014	Mountain Big Sagebrush	Phase I
2019	Mountain Big Sagebrush	Phase I

Site Notes

No Notes

Soils

Table 14-32.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	7.1	46.0	29.4	24.6	1.4	4.5	51.2	0.6	06/29/1999

Site Potential

1981 - 2010 Average Annual Precipitation	12 inches
NRCS Ecological Site	Upland Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R035XY308UT
States and Transitions	No state and transition model is available for the above ecological site.

Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has contributed the most shrub cover on this site since study establishment in 1994 (Table 14-32.12). The seeded introduced perennial grass species crested wheatgrass (*Agropyron cristatum*) has dominated the herbaceous understory throughout the study period, with few other forbs or grasses providing significant cover (Table 14-32.7, Table 14-32.10). Twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) have been sampled on site each year since study establishment. The study has been classified as being within Phase I of woodland succession over the duration of the study period (Table 14-32.4, Table 14-32.12, Table 14-32.14, Photos). Without a tree-removing disturbance, however, encroachment could continue and trees may become the dominant vegetation component of the site (Jornada, 2019).

Trend Summary Tables

Table 14-32.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	12.7	0.0	1.2	-	-	-
1999	12.1	0.2	1.2	-	-	-
2004	13.0	0.1	0.5	13.6	0.1	1.7
2009	12.0	0.1	1.5	18.6	0.2	2.0
2014	10.9	0.2	1.7	13.9	0.2	3.0
2019	14.4	0.3	2.4	15.2	0.8	3.0

Table 14-32.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	35	309	19	136	0.2	12.7	0.1	1.0
1999	103	320	9	129	0.8	13.5	0.0	0.9
2004	61	262	1	100	0.3	15.8	0.0	0.6
2009	4	292	11	98	0.0	16.4	0.0	1.3
2014	-	277	17	22	-	9.9	0.0	0.3
2019	9	339	174	79	0.0	19.9	2.3	2.8

Table 14-32.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	30.4	0.2	41.4	-	0.2	28.0
1999	36.3	0.5	43.1	-	-	27.7
2004	48.4	0.7	32.2	0.0	-	29.6
2009	40.8	0.7	37.9	0.0	-	30.7
2014	53.3	0.8	32.6	-	0.0	24.5
2019	44.2	1.7	40.7	0.0	-	35.7

Table 14-32.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1994	1	59	1	30
1999	4	61	1	50
2004	14	45	5	24
2009	7	41	8	43
2014	5	30	1	32
2019	4	33	4	7
Year	Days Use Per Acre (ha)			
1994	-	-	-	-
1999	39.9 (98.6)	120.6 (298.0)	0.7 (1.7)	-
2004	29.8 (73.5)	56.3 (139.0)	9.4 (23.2)	-
2009	21.1 (52.0)	126.0 (311.2)	21.5 (53.0)	-
2014	1.5 (3.6)	5.3 (13.2)	-	-
2019	11.6 (28.7)	53.0 (130.8)	10.7 (26.5)	-

Table 14-32.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bouteloua gracilis (blue grama)	Bromus tectorum[ai] (cheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Poa fendleriana (muttongrass)	Sporobolus cryptandrus (sand dropseed)	Thinopyrum intermedium[i] (intermediate wheatgrass)	Vulpia octoflora[a] (sixweeks fescue)
year	Nested Frequency									
1994	58	198	-	35	39	94	12	3	2	-
1999	23	291	2	103	17	41	-	-	-	-
2004	1	247	-	61	1	16	-	11	-	-
2009	-	289	-	4	2	3	-	8	-	-
2014	0	274	-	-	3	-	3	-	-	-
2019	-	336	-	1	6	1	2	-	-	8
year	Average Cover (%)									
1994	0.8	9.4	-	0.2	0.7	1.4	0.3	0.0	0.0	-
1999	0.2	12.6	0.0	0.8	0.3	0.4	-	-	-	-
2004	0.0	15.6	-	0.3	0.0	0.1	-	0.1	-	-
2009	-	16.2	-	0.0	0.0	0.2	-	0.1	-	-
2014	0.0	9.9	-	-	0.0	-	0.0	-	-	-
2019	-	19.6	-	0.0	0.2	0.0	0.0	-	-	0.0

a - Annual; n - Noxious Weed; i - Introduced Species

Table 14-32.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Astragalus coltonii (Colton's milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Calochortus (mariposa lily)	Chenopodium album[a] (lambsquarters)	Chenopodium leptophyllum[a] (narrowleaf goosefoot)	Cordylanthus wrightii[a] (Wright's bird's beak)	Crepis acuminata (tapertip hawksbeard)	Cryptantha[a] (annual cryptantha)	Descurainia pinnata[a] (western tansymustard)	Descurainia pinnata ssp. paysonii[a] (Payson's tansymustard)	Erigeron (fleabane)	Gayophytum ramosissimum[a] (pinyon groundsmoke)	Lappula occidentalis[a] (flatspine stickseed)	Machaeranthera canescens (hoary tansyaster)	Microsteris gracilis[a] (slender phlox)	Orthocarpus[a] (owl's-clover)	Penstemon (beardtongue)
year	Nested Frequency																
1994	-	18	-	-	-	-	3	-	-	-	9	-	4	2	-	15	-
1999	-	15	-	-	-	-	6	-	5	-	-	-	3	-	1	-	-
2004	-	4	-	-	-	-	11	-	-	-	-	-	1	1	-	-	-
2009	-	16	-	-	-	11	2	-	-	-	-	-	-	-	-	-	3
2014	-	7	-	-	-	-	11	-	9	-	-	-	9	-	-	-	-
2019	22	0	9	2	3	83	9	3	106	3	-	1	22	-	2	-	-
year	Average Cover (%)																
1994	-	0.7	-	-	-	-	0.0	-	-	-	0.0	-	0.0	0.0	-	0.0	-
1999	-	0.4	-	-	-	-	0.0	-	0.0	-	-	-	0.0	-	0.0	-	-
2004	-	0.2	-	-	-	-	0.1	-	-	-	-	-	0.0	0.0	-	-	-
2009	-	0.7	-	-	-	0.0	0.0	-	-	-	-	-	-	-	-	-	0.0
2014	-	0.2	-	-	-	-	0.1	-	0.0	-	-	-	0.0	-	-	-	-
2019	2.0	0.0	0.1	0.0	0.0	0.8	0.2	0.0	1.2	0.0	-	0.0	0.1	-	0.0	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Phlox longifolia (longleaf phlox)	Sphaeralcea coccinea (scarlet globemallow)	Townsendia (Townsend daisy)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency			
1994	91	29	-	-
1999	105	18	-	-
2004	75	20	-	-
2009	71	18	-	-
2014	-	5	-	-
2019	37	9	2	1
year	Average Cover (%)			
1994	0.2	0.1	-	-
1999	0.3	0.1	-	-
2004	0.3	0.1	-	-
2009	0.5	0.1	-	-
2014	-	0.1	-	-
2019	0.2	0.3	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 14-32.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Atriplex canescens[p] (fourwing saltbush)	Chrysothamnus viscidiflorus (yellow rabbitbrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Juniperus osteosperma[t] (Utah juniper)	Opuntia (pricklypear)	Pinus edulis[t] (twoneedle pinyon)
year	Line Intercept Cover (%)							
1994	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-
2004	13.6	-	0.1	-	-	1.7	-	-
2009	18.6	-	0.2	-	-	2	-	-
2014	13.9	-	0.2	-	-	3	-	-
2019	15.2	-	-	0.4	0.2	3	0.2	-
year	Quadrat Cover (%)							
1994	12.7	-	-	-	-	1.0	0.0	0.1
1999	11.7	0.4	0.2	-	-	1.2	-	-
2004	13.0	-	0.1	-	-	0.5	-	-
2009	12.0	-	0.1	-	-	1.5	-	-
2014	10.9	-	0.1	-	-	1.7	0.0	-
2019	14.4	-	-	0.0	0.1	2.4	0.2	0.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 14-32.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1994	6740	1060	8	73	18	4	1	48	54/83
1999	5160	-	22	59	19	42	42	11	50/72
2004	4920	2520	7	54	39	65	20	24	47/76
2009	4260	-	5	83	12	36	52	9	45/76
2014	4120	40	3	82	15	58	39	17	47/79
2019	3320	-	0	84	16	17	81	15	49/81
Atriplex canescens[p] -- (fourwing saltbush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	20	-	0	0	100	0	100	100	- / -
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Chrysothamnus viscidiflorus -- (yellow rabbitbrush)									
1994	40	-	0	50	50	0	0	100	21/34
1999	60	-	0	33	67	0	0	33	31/46
2004	40	-	0	50	50	0	0	50	23/33
2009	40	-	0	100	0	0	0	0	29/42
2014	20	-	0	100	0	0	0	100	20/26
2019	-	-	-	-	-	-	-	-	-/-
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	20	-	0	100	0	0	0	0	- / -
2019	40	-	0	100	0	50	0	0	30/54
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	20	-	0	100	0	0	0	0	28/31
2019	20	-	0	100	0	0	0	0	41/48
Ericameria nauseosa -- (rubber rabbitbrush)									
1994	-	-	-	-	-	-	-	-	36/22
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Juniperus osteosperma[t] -- (Utah juniper)									
1994	-	-	-	-	-	-	-	-	-/-
1999	60	-	67	33	0	0	0	0	- / -
2004	60	-	0	100	0	0	0	0	- / -
2009	40	-	0	100	0	0	0	0	- / -
2014	80	-	25	75	0	0	0	0	- / -
2019	40	-	0	100	0	0	0	0	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Opuntia -- (pricklypear)									
1994	20	-	0	100	0	0	0	0	10/43
1999	-	-	-	-	-	-	-	-	12/32
2004	-	-	-	-	-	-	-	-	11/61
2009	40	-	0	100	0	0	0	0	9/39
2014	80	-	0	100	0	0	0	0	11/36
2019	80	-	0	100	0	0	0	0	8/34
Sclerocactus -- (fishhook cactus)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	13/12

t - Tree Species; p - Preferred Browse; i - Introduced Species

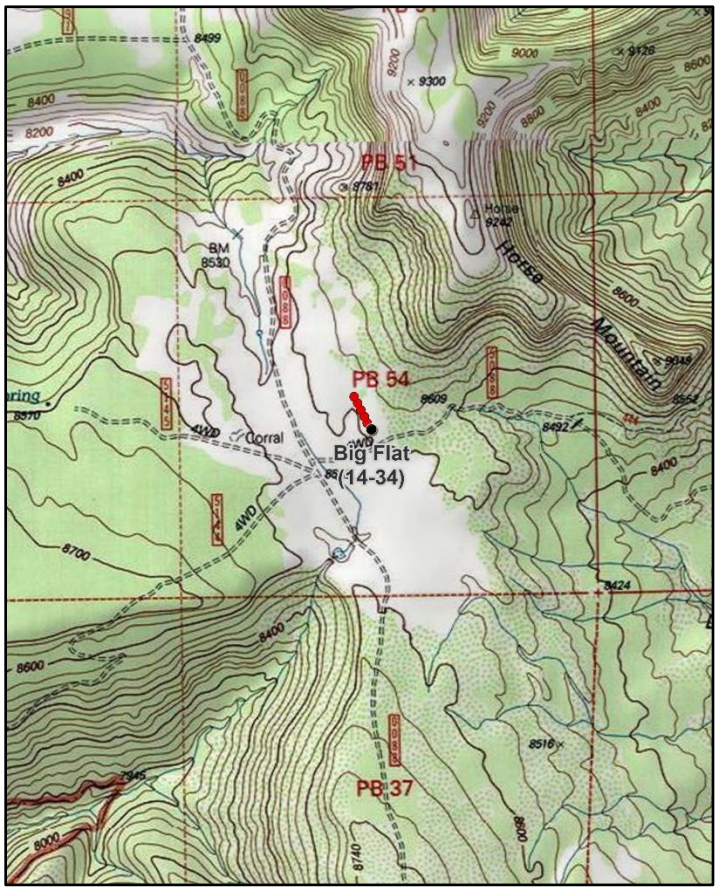
Table 14-32.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

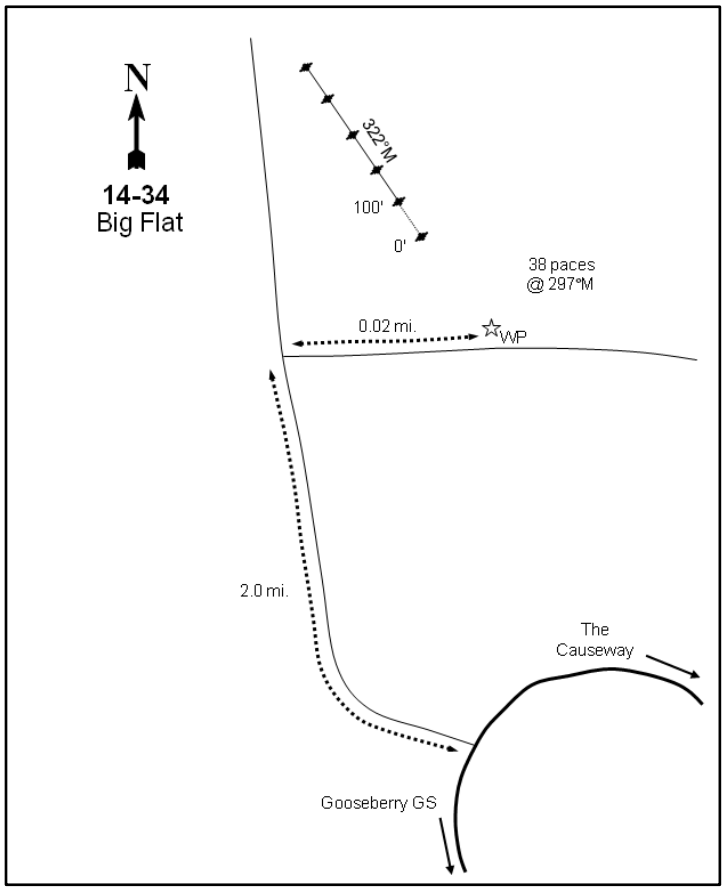
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1994	40	-	-	-	-	-	7.1
1999	40	-	-	-	-	-	11.5
2004	43	-	63	19	19	-	8.1
2009	42	-	25	56	19	-	9.9
2014	39	-	31	50	19	-	14.5
2019	38	-	13	63	19	6	15.7
Pinus edulis (twoneedle pinyon)							
1994	25	-	-	-	-	-	5.6
1999	24	-	-	-	-	-	8.5
2004	24	-	20	60	20	-	8.7
2009	21	10	-	60	30	-	8.1
2014	18	-	-	33	67	-	12.0
2019	20	-	-	57	43	-	13.4

Table 14-32.15 - Deer Desirable Components Index: Mid Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1994	15.9	9.5	4.1	25.4	-0.2	2.0	0.0	56.7	Fair
1999	15.1	8.7	10.7	26.9	-0.6	1.7	0.0	62.5	Fair
2004	17.0	3.2	3.5	30.0	-0.2	1.3	0.0	54.7	Fair
2009	23.3	11.3	2.6	30.0	0.0	2.6	0.0	69.7	Good
2014	17.4	10.6	1.7	19.9	0.0	0.7	0.0	50.3	Poor-Fair
2019	19.0	10.3	0.0	30.0	0.0	5.6	0.0	64.9	Fair-Good

BIG FLAT - STUDY NO. 14-34





Location Information

USGS 7.5 min Map Info	Poison Canyon NE; Township 33S, Range 19E, Section 54
GPS (0' Stake)	NAD 83 UTM ZONE 12, 607009 East 4191476 North

Transect Information

Browse Tag # (0' Stake)	152
Transect Bearing	322° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Standard

Directions to Site

From the Kigalia Guard Station, travel north for about 1.2 miles to Sego Flat. From Sego Flat, travel 2.0 miles north. At this point, turn right onto a faint road and drive 0.2 miles to a witness post on the left (north) side of the road. The beginning of the frequency baseline is 38 paces away at 297 degrees magnetic. The 0-foot stake is marked with browse tag #152.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	COTTONWOOD
Elevation	8,600ft (2,621m)
Aspect	West
Slope	2%
Sample Dates	06/30/2004, 06/24/2009, 06/30/2014, 06/11/2019

Wildlife Habitat and Vegetation History

Table 14-34.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	summer
Rocky Mountain Elk	crucial	summer

Table 14-34.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2004	Mountain Big Sagebrush	No Encroachment
2009	Mountain Big Sagebrush	No Encroachment
2014	Mountain Big Sagebrush	No Encroachment
2019	Mountain Big Sagebrush	Phase I

Site Notes

The study was located near a clipping study that the Range Trend Project monitored in the past to determine use of elk and cattle. Between 1999 and 2002, pellet group transects found an average of 29 elk days use/acre, 15 cow days use/acre, and 9 deer days/use acre. Production of available forage varied between 1,550 lbs/acre in 1999 and 251 lbs/acre in 2002.

Soils

Table 14-34.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	6.8	23.9	44.2	31.9	3.6	18.5	249.6	0.8	06/30/2004

Site Potential

1981 - 2010 Average Annual Precipitation	26 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R048AY405UT
States and Transitions	No state and transition model is available for this ecological site.

Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has dominated the vegetation community of this site since study establishment in 2004; other browse species such as Gambel oak (*Quercus gambelii*) and mountain snowberry (*Symphoricarpos oreophilus*) are also present, but provide much less cover (Table 14-34.12, Table 14-34.13). The herbaceous understory has remained diverse and abundant with the introduced perennial grass species smooth brome (*Bromus inermis*) and Kentucky bluegrass (*Poa pratensis*) as the dominant species. Perennial forbs have also been abundant throughout the study period, with a variety of native forbs providing moderate cover (Table 14-34.7, Table 14-34.10, Table 14-34.11).

Trend Summary Tables

Table 14-34.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2004	20.1	-	-	28.8	-	-
2009	24.4	-	-	26.8	-	-
2014	20.5	-	-	24.6	-	-
2019	25.9	-	-	34.1	-	-

Table 14-34.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2004	-	344	14	281	-	12.2	0.0	10.2
2009	-	382	43	329	-	24.7	0.2	20.2
2014	-	390	41	303	-	20.0	0.2	13.6
2019	-	361	175	300	-	15.3	2.1	9.9

Table 14-34.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2004	33.4	0.1	33.1	0.1	0.4	44.7
2009	24.9	0.2	35.6	0.1	0.0	58.6
2014	29.2	0.0	46.1	0.1	0.0	52.1
2019	25.2	0.8	55.1	0.2	0.7	43.0

Table 14-34.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
2004	10	12	15	-
2009	11	4	5	3
2014	2	7	3	1
2019	5	25	6	3
Year	Days Use Per Acre (ha)			
2004	26.2 (64.6)	16.1 (39.7)	32.2 (79.5)	-
2009	34.1 (84.3)	12.8 (31.5)	17.4 (43.0)	-
2014	4.4 (10.8)	6.7 (16.6)	1.3 (3.3)	-
2019	18.9 (46.6)	24.1 (59.6)	7.4 (18.2)	-

Table 14-34.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum nelsonii (Columbia needlegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bromus inermis[i] (smooth brome)	Carex rossii (Ross' sedge)	Dactylis glomerata[i] (orchardgrass)	Elymus elymoides (squirreltail)	Koeleria macrantha (prairie Junegrass)	Muhlenbergia (muhly)	Pascopyrum smithii (western wheatgrass)	Poa bulbosa[i] (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis[i] (Kentucky bluegrass)	Psathyrostachys juncea[i] (Russian wildrye)	Thinopyrum intermedium[i] (intermediate wheatgrass)
year	Nested Frequency													
2004	-	-	246	4	-	1	-	-	-	-	-	254	-	13
2009	1	-	273	3	4	-	-	-	-	-	6	301	3	5
2014	8	-	268	1	-	7	7	1	-	-	17	299	-	15
2019	16	15	228	0	11	18	6	-	3	1	20	186	2	69
year	Average Cover (%)													
2004	-	-	6.1	0.1	-	0.0	-	-	-	-	-	6.0	-	0.0
2009	0.0	-	9.5	0.0	0.1	-	-	-	-	-	0.1	14.9	0.0	0.0
2014	0.4	-	7.5	0.0	-	0.1	0.2	0.0	-	-	0.2	11.4	-	0.1
2019	0.3	0.4	7.5	0.0	0.1	0.3	0.2	-	0.0	0.0	0.2	4.8	0.0	1.5

a - Annual; n - Noxious Weed; i - Introduced Species

Table 14-34.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Androsace septentrionalis[a] (pygmyflower rockjasmine)	Antennaria (pussytoes)	Arenaria congesta (ballhead sandwort)	Artemisia ludoviciana (white sagebrush)	Calochortus nuttallii (sego lily)	Castilleja linariifolia (Wyoming Indian paintbrush)	Chenopodium leptophyllum[a] (narrowleaf goosefoot)	Cirsium (thistle)	Collinsia parviflora[a] (maiden blue eyed Mary)	Cordylanthus[a] (bird's-beak)	Crepis acuminata (tapertip hawksbeard)	Cymopterus (springparsley)	Delphinium nuttallianum (twolobe larkspur)	Dracocephalum parviflorum (American dragonhead)	Erigeron flagellaris (trailing fleabane)
year	Nested Frequency																
2004	86	2	-	6	81	3	-	-	-	-	9	-	3	17	-	-	97
2009	111	3	2	7	108	4	-	-	-	-	1	4	-	12	4	-	63
2014	74	-	8	5	133	4	-	0	6	4	23	-	3	14	8	1	94
2019	81	3	-	5	160	10	3	3	14	-	170	-	3	17	47	-	29
year	Average Cover (%)																
2004	2.1	0.0	-	0.1	1.4	0.0	-	-	-	-	0.0	-	0.0	0.1	-	-	1.9
2009	5.1	0.2	0.0	0.2	2.5	0.0	-	-	-	-	0.0	0.0	-	0.6	0.0	-	0.5
2014	1.2	-	0.1	0.2	2.1	0.0	-	0.0	0.0	0.0	0.1	-	0.0	0.4	0.0	0.0	1.7
2019	1.1	0.0	-	0.1	3.7	0.0	0.0	0.1	0.0	-	2.0	-	0.0	0.3	0.6	-	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Eriogonum racemosum (redroot buckwheat)	Heterotheca villosa (hairy false goldenaster)	Ipomopsis aggregata (scarlet gilia)	Lathyrus brachycalyx (Bonneville pea)	Linum lewisii (Lewis flax)	Lupinus argenteus (silvery lupine)	Lupinus wyethii ssp. wyethii (Wyeth's lupine)	Microsteris gracilis[a] (slender phlox)	Navarretia breweri[a] (Brewer's navarretia)	Penstemon humilis (low beardtongue)	Penstemon strictus (Rocky Mountain penstemon)	Petradoria pumila (rock goldenrod)	Phlox longifolia (longleaf phlox)	Polygonum douglasii[a] (Douglas' knotweed)	Potentilla hippiana (woolly cinquefoil)	Senecio integerrimus[a] (lambstongue ragwort)	Silene drummondii (Drummond's campion)
year	Nested Frequency																
2004	26	9	-	6	-	26	8	-	-	2	2	-	43	4	7	-	-
2009	24	6	-	29	-	84	13	19	3	19	6	-	8	17	3	-	-
2014	22	21	1	5	1	78	-	4	-	2	19	0	17	1	6	1	-
2019	40	28	2	13	1	33	-	-	-	5	4	4	43	12	8	-	4
year	Average Cover (%)																
2004	0.3	0.5	-	0.0	-	1.7	0.2	-	-	0.0	0.0	-	0.3	0.0	0.2	-	-
2009	0.7	0.5	-	0.9	-	3.8	0.3	0.1	0.0	0.4	0.2	-	0.0	0.0	0.2	-	-
2014	0.6	1.4	0.0	0.2	0.0	3.9	-	0.0	-	0.0	0.2	0.0	0.1	0.0	0.4	0.0	-
2019	0.6	0.4	0.0	0.3	0.0	0.4	-	-	-	0.0	0.2	0.0	0.5	0.1	0.2	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Symphyotrichum (aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius[ai] (yellow salsify)	Trifolium (clover)	Vicia americana (American vetch)
year	Nested Frequency				
2004	67	2	1	-	11
2009	132	14	5	-	5
2014	67	7	3	1	14
2019	112	8	0	0	6
year	Average Cover (%)				
2004	1.2	0.0	0.0	-	0.0
2009	3.2	0.5	0.1	-	0.2
2014	0.7	0.0	0.0	0.0	0.3
2019	1.2	0.0	0.0	0.0	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 14-34.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Quercus gambelii[p] (Gambel oak)	Rosa woodsii[p] (Woods' rose)	Symphoricarpos oreophilus[p] (mountain snowberry)
year	Line Intercept Cover (%)			
2004	25	1.4	0.1	2.3
2009	24.3	0.4	-	2.1
2014	21.4	0.1	-	3.1
2019	30.9	0.3	-	2.9
year	Quadrat Cover (%)			
2004	19.2	0.0	0.0	0.8
2009	22.9	0.0	-	1.4
2014	18.3	0.1	0.4	1.7
2019	24.5	0.0	-	1.4

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 14-34.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
2004	12380	11940	60	37	3	22	2	1	53/80
2009	8800	2780	22	67	11	33	14	8	46/80
2014	6980	300	31	65	4	46	28	3	59/81
2019	6880	8900	18	66	16	29	11	18	56/83
Ceanothus fendleri -- (Fendler's ceanothus)									
2004	-	-	-	-	-	-	-	-	32/153
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Mahonia repens -- (creeping barberry)									
2004	-	-	-	-	-	-	-	-	9/20
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	9/17
Quercus gambelii[p] -- (Gambel oak)									
2004	80	-	50	50	0	50	0	0	38/46
2009	260	-	46	46	8	8	8	0	28/41
2014	240	-	83	17	0	50	0	0	53/44
2019	140	-	29	71	0	43	57	0	52/32
Rosa woodsii[p] -- (Woods' rose)									
2004	120	-	0	100	0	0	0	0	36/29
2009	40	-	100	0	0	0	0	0	- / -
2014	20	-	0	100	0	0	0	0	108/101
2019	20	-	0	100	0	0	0	0	- / -

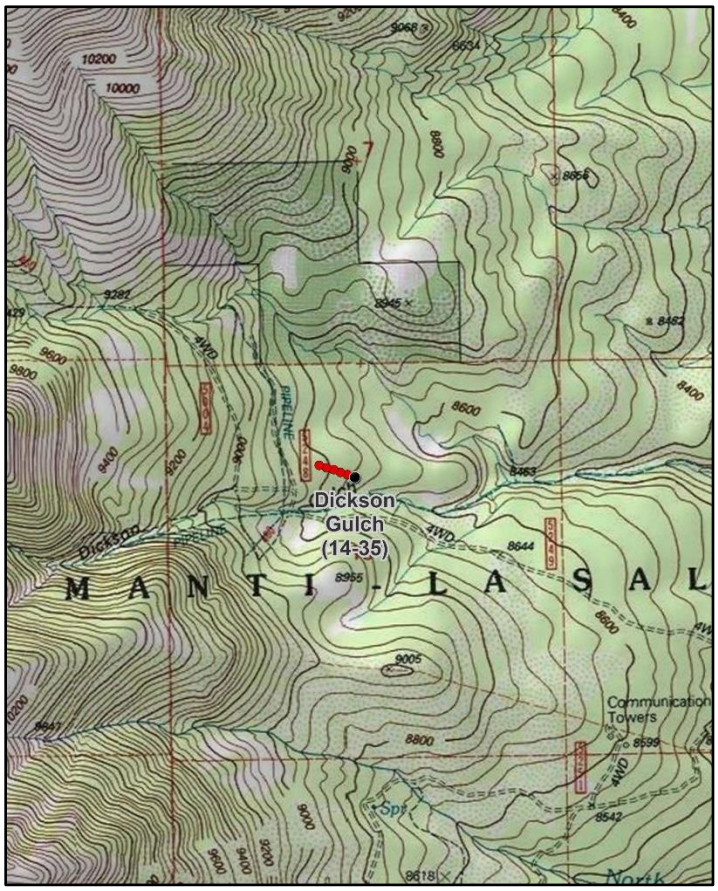
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
2004	600	-	17	83	0	17	0	0	38/56
2009	840	-	17	81	2	2	2	0	41/49
2014	840	-	7	93	0	12	0	0	53/58
2019	740	-	11	78	11	41	5	8	52/64

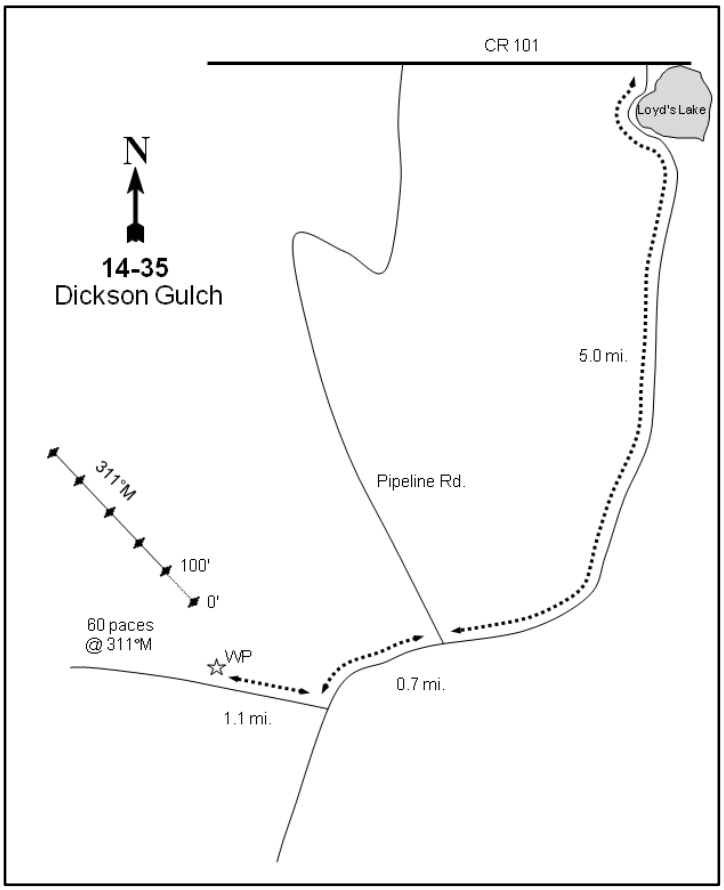
t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 14-34.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus scopulorum (Rocky Mountain juniper)							
2019	3	-	100	-	-	-	4.0

DICKSON GULCH - STUDY NO. 14-35





Location Information

USGS 7.5 min Map Info	Abajo Peak NW; Township 34S, Range 23E, Section 18
GPS (0' Stake)	NAD 83 UTM ZONE 12, 637504 East 4187545 North

Transect Information

Browse Tag # (0' Stake)	Not Available
Transect Bearing	278° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Belt 1: Rebar 1ft behind 0ft end of belt

Directions to Site

From the junction of South Creek Road (the road to Loyd's Lake) and North Creek Road (200 South going west out of Monticello), travel south on South Creek Road for 5 miles to a fork with the Pipeline Road. Proceed left at the fork and continue 0.7 miles to another fork. Proceed to the right and continue 1.1 miles to the witness post on the right (north) side of the road. The 0-foot stake is 60 paces up the hill from the witness post at a bearing of three degrees magnetic.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	LAKES/SOUTH PEAK
Elevation	8,740ft (2,664m)
Aspect	East
Slope	5-10%
Sample Dates	06/17/2009, 06/25/2014, 06/19/2019

Wildlife Habitat and Vegetation History

Table 14-35.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	summer
Rocky Mountain Elk	crucial	summer

Table 14-35.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2009	Quaking Aspen	NA
2014	Quaking Aspen	NA
2019	Quaking Aspen	NA

Site Notes

The last belt of the study transect falls in a clearing with fewer forbs and a few Gambel oak (*Quercus gambelii*). The understory is very thick, making it difficult to see pellets, but deer were observed on site in 2009; there were also bedding areas and bear scat found in the area in 2009. In 2014, recent bear claw marks were seen scratched into an aspen tree attempting to get to a bird's nest. A new full-high 100-foot stake was placed in 2019.

Soils

Table 14-35.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	5.8	37.1	42.7	20.2	4.7	6.1	256.0	0.5	06/17/2009

Site Potential

1981 - 2010 Average Annual Precipitation	28 inches
NRCS Ecological Site	High Mountain Loam (Aspen)
NRCS Ecological Site #	R048AY506UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 2009, quaking aspen (*Populus tremuloides*) has been the dominant vegetation component on this site; the shrub layer has also been robust, consisting of mountain snowberry (*Symphoricarpos oreophilus*) and Gambel oak (*Quercus gambelii*) (Table 14-35.12, Table 14-35.13). The herbaceous understory has remained abundant and diverse and has mainly been comprised of perennial grasses and forbs. Poa pratensis (*Poa pratensis*) is the perennial grass exhibiting the most cover and Nevada pea (*Lathyrus lanszwertii*) is the most common perennial forb species (Table 14-35.7, Table 14-35.10, Table 14-35.11). Cover of aspen decreased by more than half between 2014 and 2019, and density also exhibited a marked decrease (Table 14-35.12, Table 14-35.13a). This site has the potential to transition to one dominated by snowberry and oak should aspen continue to decrease over time.

Trend Summary Tables

Table 14-35.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2009	6.3	-	1.4	17.8	-	53.8
2014	5.9	-	2.0	21.0	-	64.4
2019	14.1	-	2.1	25.0	-	29.6

Table 14-35.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2009	-	427	56	407	-	34.1	0.6	57.5
2014	-	435	116	382	-	42.5	5.8	55.5
2019	-	407	186	415	-	23.2	5.2	56.7

Table 14-35.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2009	0.9	-	60.4	-	-	79.3
2014	5.1	0.0	56.9	-	0.1	84.0
2019	5.7	0.0	67.3	0.2	0.7	64.6

Table 14-35.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Coyote	Mule Deer	Rocky Mountain Elk
	Quadrat Frequency			
2009	4	-	9	-
2014	-	-	-	-
2019	8	-	2	-
Year	Days Use Per Acre (ha)			
2009	11.6 (28.7)	8.7 (21.5)*	4.7 (11.6)	-
2014	7.2 (17.9)	-	-	-
2019	25.4 (62.8)	-	4.7 (11.6)	3.4 (8.3)

*Pellets per acre (ha)

Table 14-35.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Achnatherum nelsonii (Columbia needlegrass)	Bromus inermis[i] (smooth brome)	Bromus marginatus (mountain brome)	Carex (sedge)	Dactylis glomerata[i] (orchardgrass)	Elymus lanceolatus (thickspike wheatgrass)	Poa fendleriana (muttongrass)	Poa pratensis[i] (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)
year	Nested Frequency									
2009	69	-	72	0	65	7	-	5	381	5
2014	18	48	-	63	-	1	14	4	423	-
2019	3	35	2	135	39	22	1	-	359	1
year	Average Cover (%)									
2009	3.1	-	1.6	0.3	1.5	0.5	-	0.1	26.7	0.1
2014	0.2	2.4	-	3.9	-	0.0	0.7	0.6	34.6	-
2019	0.1	1.3	0.0	4.5	1.0	0.9	0.0	-	15.2	0.1

a - Annual; n - Noxious Weed; i - Introduced Species

Table 14-35.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Androsace septentrionalis[a] (pygmyflower rockjasmine)	Capsella bursa-pastoris[ai] (shepherd's purse)	Chenopodium fremontii[a] (Fremont's goosefoot)	Chenopodium leptophyllum[a] (narrowleaf goosefoot)	Claytonia rosea (western springbeauty)	Clematis orientalis[i] (Oriental virginsbower)	Collinsia parviflora[a] (maiden blue eyed Mary)	Collomia linearis[a] (tiny trumpet)	Cymopterus (springparsley)	Descurainia californica[a] (Sierra tansymustard)	Dracocephalum parviflorum (American dragonhead)	Erigeron flagellaris (trailing fleabane)	Galium[a] (bedstraw)	Gilia inconspicua[a] (shy gilia)	Hackelia (stickseed)
year	Nested Frequency																
2009	257	-	31	0	21	-	46	-	-	-	5	-	15	7	-	-	102
2014	208	-	7	19	24	3	-	-	4	-	-	-	-	11	78	3	-
2019	241	9	5	7	60	9	168	43	54	6	3	8	-	-	114	3	-
year	Average Cover (%)																
2009	9.4	-	0.2	0.0	0.2	-	0.9	-	-	-	0.0	-	1.1	0.2	-	-	2.2
2014	9.7	-	0.1	1.7	0.6	0.0	-	-	0.0	-	-	-	-	0.1	3.0	0.0	-
2019	8.8	0.0	0.0	0.1	0.6	0.0	4.4	1.9	1.6	0.3	0.0	0.1	-	-	2.1	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Hydrophyllum capitatum (ballhead waterleaf)	Lathyrus lanszwertii (Nevada pea)	Ligusticum porteri (Porter's licorice-root)	Maianthemum stellatum (starry false lily of the valley)	Osmorhiza depauperata (bluntseed sweetroot)	Packera neomexicana (New Mexico groundsel)	Phacelia heterophylla[a] (varileaf phacelia)	Polygonum douglasii[a] (Douglas' knotweed)	Potentilla (cinquefoil)	Pseudostellaria jamesiana (tuber starwort)	Ranunculus inamoenus (graceful buttercup)	Sedum lanceolatum (spearleaf stonecrop)	Taraxacum officinale (common dandelion)	Thalictrum fendleri (Fendler's meadow-rue)	Thermopsis montana (mountain goldenbanner)	Tragopogon dubius[ai] (yellow salsify)	unknown perennial forb (unknown forb)
year	Nested Frequency																
2009	-	274	4	-	208	1	-	5	13	118	-	-	98	-	7	-	3
2014	-	274	14	-	101	0	6	5	1	142	-	4	96	20	6	-	-
2019	6	236	5	12	122	-	18	8	-	175	7	-	239	11	5	0	-
year	Average Cover (%)																
2009	-	25.0	0.4	-	9.1	0.0	-	0.2	0.2	3.0	-	-	3.1	-	0.5	-	0.0
2014	-	28.9	0.5	-	3.4	0.0	0.3	0.0	0.0	6.9	-	0.1	2.6	0.4	0.4	-	-
2019	0.0	15.4	0.4	0.0	2.4	-	0.3	0.1	-	8.8	0.0	-	13.2	0.1	0.0	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Urtica dioica (stinging nettle)	Vicia americana (American vetch)	Viola (violet)
year	Nested Frequency		
2009	-	68	30
2014	1	29	12
2019	1	28	42
year	Average Cover (%)		
2009	-	1.1	1.2
2014	0.0	1.7	0.9
2019	0.1	0.3	0.7

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 14-35.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Populus tremuloides[t] (quaking aspen)	Quercus gambelii[p] (Gambel oak)	Symphoricarpos oreophilus[p] (mountain snowberry)
year	Line Intercept Cover (%)		
2009	53.8	13.1	4.7
2014	64.4	12.5	8.5
2019	29.6	12.4	12.6
year	Quadrat Cover (%)		
2009	1.4	0.0	6.3
2014	2.0	0.4	5.5
2019	2.1	0.6	13.5

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 14-35.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Populus tremuloides[t] -- (quaking aspen)									
2009	1040	320	73	27	0	0	2	0	- / -
2014	See table 13a - Aspen Characteristics								
2019	See table 13a - Aspen Characteristics								
Quercus gambelii[p] -- (Gambel oak)									
2009	160	-	50	50	0	0	0	0	- / -
2014	360	100	56	44	0	0	6	0	45/18
2019	480	-	67	33	0	0	0	0	68/48
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
2009	4760	-	35	65	0	0	0	0	39/36
2014	2580	220	47	54	0	25	0	0	47/47
2019	7420	-	5	95	0	5	5	0	42/44

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 14-35.13a - Aspen Characteristics. Characteristics of aspen populations including density, size class distribution, and vigor of plants.

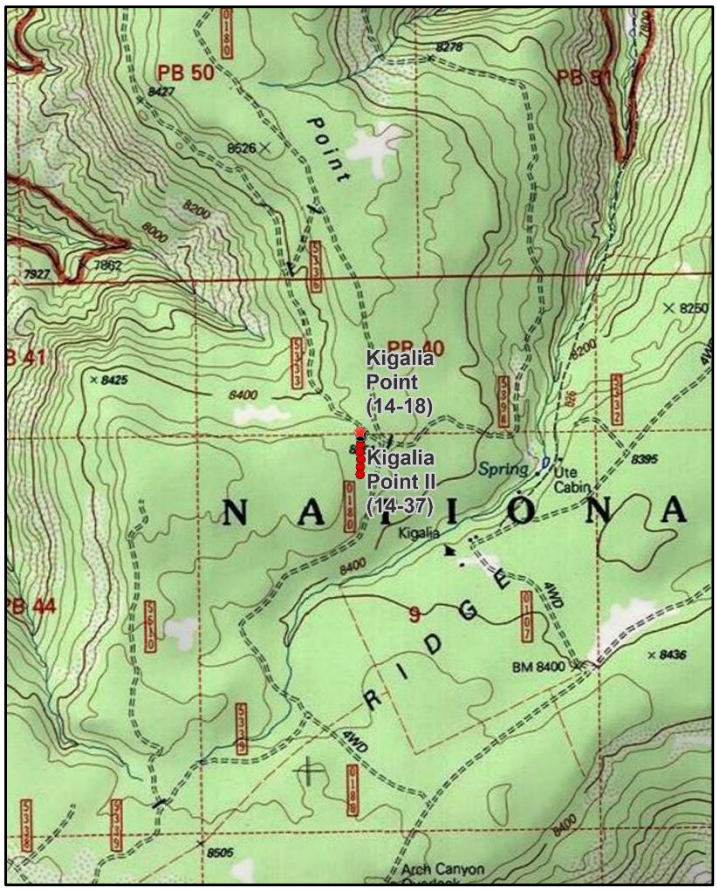
Year	Density	Size Class Distribution				Utilization		Poor Vigor (%)
	Plants per Acre	Class I (%)	Class II (%)	Class III (%)	Class IV (%)	Moderate (%)	Heavy (%)	
Populus tremuloides (quaking aspen)								
2014	1820	25	58	4	12	10	4	2
2019	1200	22	67	-	12	30	32	6

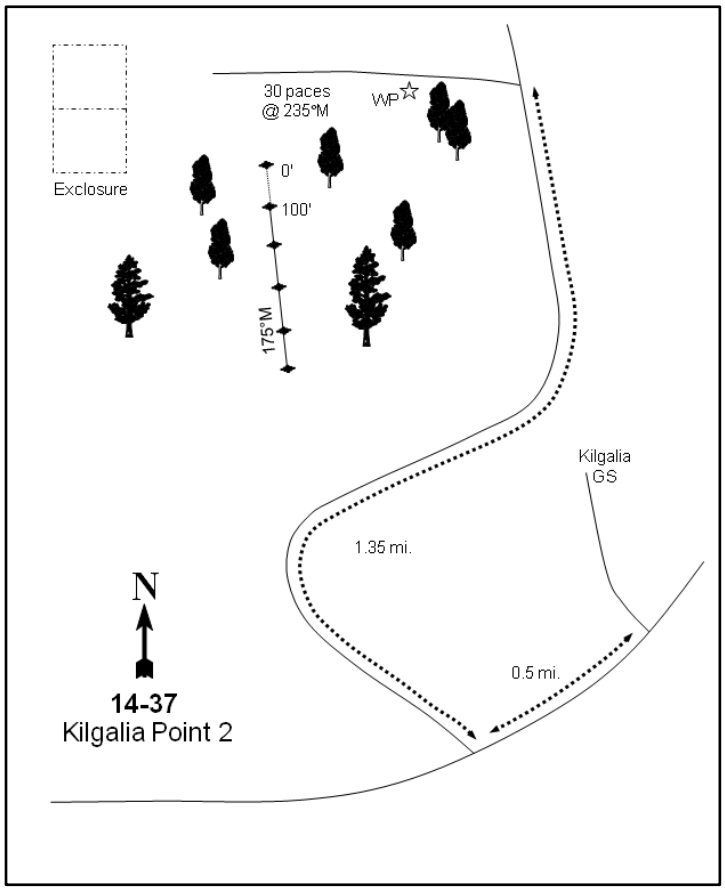
Class I - <= 1.5 feet; Class II - > 1.5 feet to 5 feet; Class III - > 5 feet and up to 1 inch diameter at breast height (dbh); Class IV - > 1 in diameter at breast height (dbh)

Table 14-35.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Populus tremuloides (quaking aspen)							
2009	375	25	5	-	-	70	22.7
2014	982	40	15	-	-	45	18.8
2019	318	15	15	35	-	35	15.7

KIGALIA POINT II - STUDY NO. 14-37





Location Information

USGS 7.5 min Map Info	Kigalia Point SW; Township 36S, Range 19E, Section 09
GPS (0' Stake)	NAD 83 UTM ZONE 12, 603043 East 4170826 North

Transect Information

Browse Tag # (0' Stake)	9178
Transect Bearing	175° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Standard

Directions to Site

From the turnoff to the Kigalia Guard Station on the main Elk Ridge-Bears Ears Road, proceed southwest for 0.50 miles to the Kigalia Point Road. Turn right onto this road and travel north for 1.35 miles to a small clearing in the ponderosa pine-aspen forest with a faint road turning off to the left. Park here and walk 0.05 miles down the faint road (just past the west end of the clearing) to where four clustered ponderosa with a large aspen growing in the middle of them are located on the left side of the road. The witness post is located near these trees on the left (south) side of the road. The 0-foot stake is about 30 paces away at a bearing of 235 degrees magnetic and is marked by browse tag #9178.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	TWIN SPRINGS
Elevation	8,400ft (2,560m)
Aspect	Northeast
Slope	3%
Sample Dates	07/07/2009, 07/01/2014, 06/11/2019

Table 14-37.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Logging - Selective	-	-	1960s	-
Fire - Prescribed Fire	-	-	1998	-
Seeding - Seed Unknown	-	-	Historic	-

Wildlife Habitat and Vegetation History

Table 14-37.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	summer
Rocky Mountain Elk	crucial	summer

Table 14-37.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2009	Ponderosa Pine	NA
2014	Ponderosa Pine	NA
2019	Ponderosa Pine	NA

Site Notes

The study is located on Kigalia Point on the same site as the original Kigalia Point (14-18) study. The original study was suspended because a wildlife exclosure was constructed between the 2004 and 2009 sample years around the quaking aspen (*Populus tremuloides*) stand that the study transect sampled. The exclosure fence divided the study transect surrounding several of the sample belts but leaving several outside of the exclosure. The new study samples a ponderosa pine (*Pinus ponderosa*) flat that is representative of the area.

Soils

Table 14-37.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	6.1	43.1	38.7	18.2	3.7	8.3	227.2	0.7	07/07/2009

Site Potential

1981 - 2010 Average Annual Precipitation	23 inches
NRCS Ecological Site	Mountain Loam (Ponderosa Pine)
NRCS Ecological Site #	R048AY417UT
States and Transitions	No state and transition model is available for the above ecological site.

Since study establishment in 2009, the vegetation community on this site has remained in a stable state with an overstory of ponderosa pine (*Pinus ponderosa*) and a shrub understory primarily comprised of mountain snowberry (*Symphoricarpos oreophilus*) (Table 14-37.12, Table 14-37.13, Table 14-37.14). The herbaceous component has been dominated by the introduced perennial grass species smooth brome (*Bromus inermis*) and Kentucky bluegrass (*Poa pratensis*). Other herbaceous species have remained diverse, but overall abundance of these herbaceous species has remained low (Table 14-37.7, Table 14-37.10, Table 14-37.11). This site will likely continue to remain in this or a similar state in the future in the absence of a major disturbance or change in management practices.

Trend Summary Tables

Table 14-37.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2009	2.9	0.5	1.8	4.0	0.4	44.3
2014	2.6	0.7	0.6	4.4	0.7	45.6
2019	3.1	0.6	1.2	4.9	0.5	44.6

Table 14-37.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2009	-	426	6	285	-	33.5	0.0	8.1
2014	-	411	27	293	-	37.7	0.1	6.4
2019	-	407	97	320	-	21.0	0.7	8.2

Table 14-37.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2009	1.1	-	85.2	-	1.9	45.1
2014	3.2	-	79.9	-	1.7	49.1
2019	6.3	0.9	80.4	0.0	1.4	31.7

Table 14-37.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
2009	2	1	-	-
2014	4	-	-	-
2019	7	3	1	1
Year	Days Use Per Acre (ha)			
2009	14.5 (35.9)	8.1 (19.9)	12.1 (29.8)	-
2014	-	3.4 (8.3)	1.3 (3.3)	-
2019	29.8 (73.5)	2.7 (6.6)	-	-

Table 14-37.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Achnatherum nelsonii (Columbia needlegrass)	Bromus inermis[i] (smooth brome)	Carex (sedge)	Dactylis glomerata[i] (orchardgrass)	Phleum pratense[i] (timothy)	Poa bulbosa[i] (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis[i] (Kentucky bluegrass)	Thinopyrum intermedium[i] (intermediate wheatgrass)
year	Nested Frequency									
2009	7	10	276	7	8	27	3	-	326	107
2014	4	20	280	4	21	16	3	10	269	115
2019	22	22	292	14	17	-	11	27	98	87
year	Average Cover (%)									
2009	0.2	0.4	18.5	0.2	0.2	0.3	0.4	-	11.5	1.8
2014	0.2	0.5	20.2	0.0	0.5	0.4	0.0	0.2	11.4	4.3
2019	0.2	0.4	15.2	0.1	0.3	-	0.0	0.5	1.8	2.5

a - Annual; n - Noxious Weed; i - Introduced Species

Table 14-37.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Antennaria (pussytoes)	Arabis (rockcress)	Arenaria (sandwort)	Claytonia lanceolata (lanceleaf springbeauty)	Clematis columbiana (rock clematis)	Collinsia parviflora[a] (maiden blue eyed Mary)	Collomia linearis[a] (tiny trumpet)	Delphinium nuttallianum (twolobe larkspur)	Descurainia[a] (tansymustard)	Erigeron flagellaris (trailing fleabane)	Lathyrus brachycalyx (Bonneville pea)	Lewisia pygmaea (alpine lewisia)	Orogenia linearifolia (Great Basin Indian potato)	Packera multilobata (lobeleaf groundsel)	Packera neomexicana (New Mexico groundsel)
year	Nested Frequency																
2009	31	13	-	-	8	-	-	6	-	-	-	11	9	-	-	5	-
2014	29	3	-	2	7	-	3	23	4	-	-	16	22	-	-	1	15
2019	28	2	1	-	5	37	3	94	-	20	3	16	37	4	4	12	14
year	Average Cover (%)																
2009	0.5	0.2	-	-	0.1	-	-	0.0	-	-	-	0.2	0.4	-	-	0.0	-
2014	0.7	0.0	-	0.0	0.0	-	0.0	0.1	0.0	-	-	0.3	0.7	-	-	0.0	0.1
2019	0.3	0.0	0.0	-	0.0	0.1	0.0	0.7	-	0.1	0.0	0.5	0.7	0.0	0.1	0.0	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Polygonum douglasii[a] (Douglas' knotweed)	Pseudostellaria jamesiana (tuber starwort)	Symphyotrichum ascendens (western aster)	Taraxacum officinale (common dandelion)	Thermopsis montana (mountain goldenbanner)	Trifolium (clover)	Vicia americana (American vetch)
year	Nested Frequency						
2009	-	121	-	31	8	148	13
2014	-	154	2	22	6	128	-
2019	6	132	1	26	1	139	-
year	Average Cover (%)						
2009	-	1.6	-	0.5	0.6	3.5	0.5
2014	-	1.7	0.0	0.3	0.7	1.9	-
2019	0.0	2.2	0.0	0.5	0.0	3.4	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 14-37.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Mahonia repens (creeping barberry)	Pinus ponderosa[t] (ponderosa pine)	Populus tremuloides[t] (quaking aspen)	Quercus gambelii[p] (Gambel oak)	Symphoricarpos oreophilus[p] (mountain snowberry)
year	Line Intercept Cover (%)				
2009	0.4	40.1	4.2	1	3
2014	0.7	39	6.6	1.1	3.3
2019	0.5	39.8	4.8	1.8	3.1
year	Quadrat Cover (%)				
2009	0.5	1.8	0.0	0.0	2.9
2014	0.7	0.6	0.0	0.0	2.6
2019	0.6	1.2	0.0	0.0	3.1

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 14-37.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Mahonia repens -- (creeping barberry)									
2009	1720	-	12	88	0	0	0	0	10/17
2014	1760	-	0	100	0	0	0	8	11/15
2019	1940	-	0	99	1	0	0	1	10/12
Pinus ponderosa[t] -- (ponderosa pine)									
2009	160	-	0	100	0	0	0	0	- / -
2014	120	1660	17	83	0	0	0	0	- / -
2019	240	20	42	50	8	0	0	8	- / -
Populus tremuloides[t] -- (quaking aspen)									
2009	-	-	-	-	-	-	-	-	- / -
2014	See table 13a - Aspen Characteristics								
2019	See table 13a - Aspen Characteristics								
Quercus gambelii[p] -- (Gambel oak)									
2009	-	20	0	0	0	0	0	0	- / -
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	552/362
Rosa woodsii[p] -- (Woods' rose)									
2009	-	-	-	-	-	-	-	-	30/26
2014	20	-	100	0	0	0	0	0	- / -
2019	-	-	-	-	-	-	-	-	-/-
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
2009	5660	40	45	56	0	0	1	1	32/43
2014	4080	360	36	64	0	0	0	0	30/40
2019	4700	-	23	76	1	3	1	1	28/36

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 14-37.13a - Aspen Characteristics. Characteristics of aspen populations including density, size class distribution, and vigor of plants.

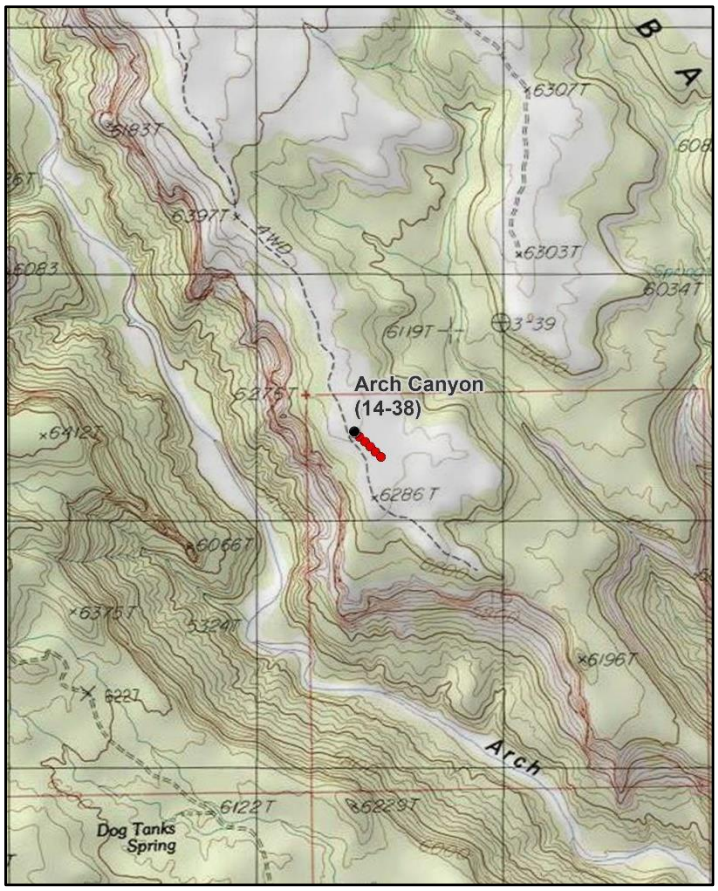
Year	Density	Size Class Distribution				Utilization		Poor Vigor (%)
	Plants per Acre	Class I (%)	Class II (%)	Class III (%)	Class IV (%)	Moderate (%)	Heavy (%)	
Populus tremuloides (quaking aspen)								
2014	60	100	-	-	-	0	0	0

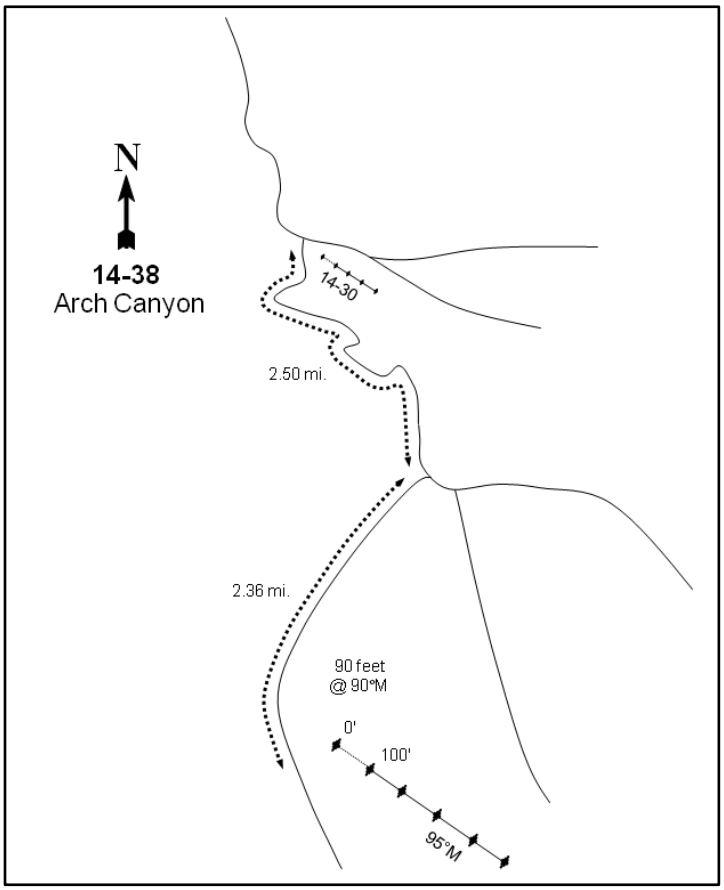
Class I - <= 1.5 feet; Class II - > 1.5 feet to 5 feet; Class III - > 5 feet and up to 1 inch diameter at breast height (dbh); Class IV - > 1 in diameter at breast height (dbh)

Table 14-37.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Pinus ponderosa (ponderosa pine)							
2009	86	-	-	5	-	95	37.9
2014	85	-	-	6	6	89	42.9
2019	108	-	5	5	-	90	43.0
Populus tremuloides (quaking aspen)							
2009	20	78	-	-	-	22	16.9
2014	4	-	-	-	20	80	45.8
2019	4	-	-	-	-	100	59.0

ARCH CANYON - STUDY NO. 14-38





Location Information	
USGS 7.5 min Map Info	Hotel Rock NW; Township 37S, Range 20E, Section 16
GPS (0' Stake)	NAD 83 UTM ZONE 12, 612338 East 4159557 North

Transect Information	
Browse Tag # (0' Stake)	274
Transect Bearing	95° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Standard

Directions to Site

Driving from FS Road #92, turn south onto Milk Ranch Point Road and drive 0.8 miles to a cattle guard. Continue 2.6 miles to a fork and proceed to the right. Follow this road for 2.4 miles to another fork and stay right again. Follow this road for 2.5 miles to the site; the road is sandy and rough. The 0-foot stake is approximately 90 feet away from the left (east) side of the road and is marked with browse tag #274. The site is marked with green, half-high stakes.

Site Information

Land Ownership	State
Land Administrator	SITLA
Allotment	COMB WASH
Elevation	6,325ft (1,928m)
Aspect	Northeast
Slope	10-12%
Sample Dates	07/01/2014, 06/12/2019

Table 14-38.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Chain Unknown	Little Baullies Reseeding	LTDL	September 1960	1600
Seeding - Aerial Unknown	Little Baullies Reseeding	LTDL	September 1960	1600

Table 14-38.2 SeedMix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Little Baullies Reseeding			Aerial	Sep 1960	1600
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Agropyron cristatum	Crested Wheatgrass		6.00	0.00

Wildlife Habitat and Vegetation History

Table 14-38.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter

Table 14-38.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2014	Wyoming Big Sagebrush/Basin Big Sagebrush	Phase I
2019	Wyoming Big Sagebrush/Basin Big Sagebrush	Phase I

Site Notes

No Notes

Site Potential

1981 - 2010 Average Annual Precipitation	13 inches
NRCS Ecological Site	Upland Loam (Big Sagebrush)
NRCS Ecological Site #	R036XY306UT
States and Transitions	A defined state and transition model is available.

Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) and basin big sagebrush (*A. tridentata* ssp. *tridentata*) have been the dominant shrub species on this site since study establishment in 2014. A number of other shrub species have also been present, but have provided limited cover (Table 14-38.12, Table 14-38.13). The introduced perennial grass species crested wheatgrass (*Agropyron cristatum*) and the native species blue grama (*Bouteloua gracilis*) made up the majority of the herbaceous understory in 2014, but the annual forbs western tansymustard (*Descurainia pinnata*) and shy gilia (*Gilia inconspicua*) contributed the most herbaceous cover in 2019 (Table 14-38.7, Table 14-38.10, Table 14-38.11). Twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) have been observed in cover and point-quarter density measurements; the site has been considered to be within Phase I of woodland succession in both sample years (Table 14-38.4, Table 14-38.12, Table 14-38.14). The available state and transition model indicates that this site may have the potential to transition into a pinyon-juniper dominated state without a major tree-removing disturbance (Jornada, 2019).

Trend Summary Tables

Table 14-38.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2014	16.5	3.1	4.9	21.2	2.9	6.0
2019	11.8	2.5	6.5	14.4	1.5	5.4

Table 14-38.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2014	14	126	78	43	0.0	6.5	0.4	0.3
2019	55	114	269	153	0.4	1.9	16.0	2.7

Table 14-38.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2014	39.4	2.7	47.4	0.0	-	31.6
2019	25.5	5.8	55.1	0.1	-	35.1

Table 14-38.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency		
2014	6	4	26
2019	11	6	22
Year	Days Use Per Acre (ha)		
2014	5.3 (13.2)	1.3 (3.3)	-
2019	6.7 (16.6)	3.4 (8.3)	-

Table 14-38.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bouteloua gracilis (blue grama)	Bromus tectorum[ai] (cheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Pleuraphis jamesii (James' galleta)	Poa fendleriana (muttongrass)	Vulpia octoflora[a] (sixweeks fescue)
year	Nested Frequency								
2014	8	39	76	-	7	1	-	4	14
2019	24	17	46	3	13	4	4	22	53
year	Average Cover (%)								
2014	0.2	2.3	3.8	-	0.1	0.1	-	0.0	0.0
2019	0.1	0.1	1.1	0.0	0.3	0.2	0.0	0.1	0.4

a - Annual; n - Noxious Weed; i - Introduced Species

Table 14-38.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Aliciella hutchinsifolia[a] (desert pale gilia)	Arabis (rockcress)	Artemisia dracunculus (tarragon)	Calochortus (mariposa lily)	Camelina microcarpa[ai] (littlepod false flax)	Chenopodium album[a] (lambsquarters)	Chenopodium leptophyllum[a] (narrowleaf goosefoot)	Collinsia parviflora[a] (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)	Cryptantha[a] (annual cryptantha)	Cryptantha pterocarya[a] (wingnut cryptantha)	Descurainia pinnata[a] (western tansymustard)	Gilia inconspicua[a] (shy gilia)	Hymenopappus filifolius (fineleaf hymenopappus)	Ipomopsis longiflora[a] (flaxflowered ipomopsis)	Lappula occidentalis[a] (flatspine stickseed)	Lygodesmia (skeletonplant)
year	Nested Frequency																
2014	-	-	2	-	3	-	-	-	26	-	-	50	2	5	-	5	3
2019	16	4	12	8	21	5	2	1	10	14	5	170	82	11	35	40	1
year	Average Cover (%)																
2014	-	-	0.0	-	0.0	-	-	-	0.3	-	-	0.3	0.0	0.0	-	0.0	0.0
2019	0.4	0.2	0.0	0.1	0.2	0.2	0.0	0.0	0.1	0.1	0.1	8.7	3.4	0.1	0.9	0.9	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Machaeranthera grindelioides (rayless tansyaster)	Packera multilobata (lobeleaf groundsel)	Phlox longifolia (longleaf phlox)	Plantago patagonica[a] (woolly plantain)	Tradescantia occidentalis (prairie spiderwort)	Tragopogon dubius[ai] (yellow salsify)
year	Nested Frequency					
2014	5	-	3	20	4	4
2019	87	46	16	58	0	-
year	Average Cover (%)					
2014	0.0	-	0.0	0.1	0.0	0.0
2019	1.9	0.3	0.0	1.1	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 14-38.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. tridentata[p] (basin big sagebrush)	Artemisia tridentata ssp. wyomingensis[p] (Wyoming big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ephedra nevadensis[p] (Nevada jointfir)	Ephedra viridis[p] (mormon tea)	Eriogonum microthecum[p] (slender buckwheat)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma[t] (Utah juniper)	Opuntia fragilis (brittle pricklypear)	Pinus edulis[t] (twoneedle pinyon)
year	Line Intercept Cover (%)										
2014	9.2	10	2.1	0.5	-	1.8	0.2	0.3	0.6	-	5.4
2019	1.5	9.7	0.7	0.5	1	2.2	-	0.2	-	0.1	5.4
year	Quadrat Cover (%)										
2014	7.0	8.5	2.3	0.6	-	1.0	0.0	0.2	0.1	-	4.7
2019	1.5	8.8	1.0	1.2	0.3	1.3	-	0.3	1.0	0.0	5.5

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 14-38.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Artemisia tridentata ssp. tridentata[p] -- (basin big sagebrush)									
2014	620	20	3	87	10	48	26	0	119/166
2019	80	-	0	25	75	0	0	75	155/210
Artemisia tridentata ssp. wyomingensis[p] -- (Wyoming big sagebrush)									
2014	1100	-	0	82	18	42	27	20	68/116
2019	1140	180	0	54	46	33	49	46	83/100
Bassia prostrata[pi] -- (forage kochia)									
2014	-	-	-	-	-	-	-	-	27/11
2019	-	-	-	-	-	-	-	-	-/-
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
2014	840	100	7	86	7	36	2	5	40/52
2019	220	-	9	91	0	0	0	0	53/66
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
2014	220	100	18	82	0	9	0	0	41/48
2019	120	-	0	100	0	0	0	0	48/52
Ephedra nevadensis[p] -- (Nevada jointfir)									
2014	40	-	0	100	0	0	0	0	- / -
2019	400	-	0	100	0	0	0	0	54/71
Ephedra viridis[p] -- (mormon tea)									
2014	640	-	13	88	0	0	47	0	53/84
2019	200	-	0	100	0	0	0	0	76/106
Eriogonum heracleoides -- (parsnipflower buckwheat)									
2014	-	-	-	-	-	-	-	-	84/132
2019	-	-	-	-	-	-	-	-	-/-
Eriogonum microthecum[p] -- (slender buckwheat)									
2014	240	40	17	83	0	42	17	0	41/40
2019	-	-	-	-	-	-	-	-	-/-

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Gutierrezia sarothrae -- (broom snakeweed)									
2014	380	640	11	79	11	0	0	11	19/27
2019	3380	3780	99	1	0	0	0	0	27/24
Opuntia fragilis -- (brittle pricklypear)									
2014	-	20	0	0	0	0	0	0	5/9
2019	100	-	0	100	0	0	0	0	9/13
Pinus edulis[t] -- (twoneedle pinyon)									
2014	20	-	0	100	0	0	0	0	- / -
2019	80	-	0	100	0	0	0	0	- / -
Purshia tridentata[p] -- (antelope bitterbrush)									
2014	-	-	-	-	-	-	-	-	43/86
2019	-	-	-	-	-	-	-	-	96/140
Sclerocactus -- (fishhook cactus)									
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	7/12
Tetradymia canescens -- (spineless horsebrush)									
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	73/184

t - Tree Species; p - Preferred Browse; i - Introduced Species

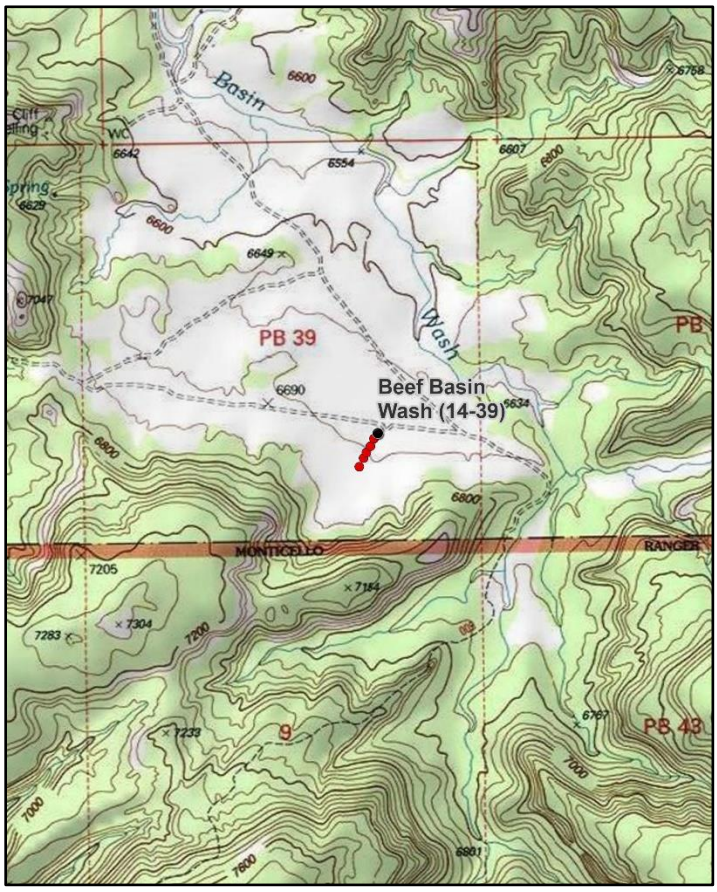
Table 14-38.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

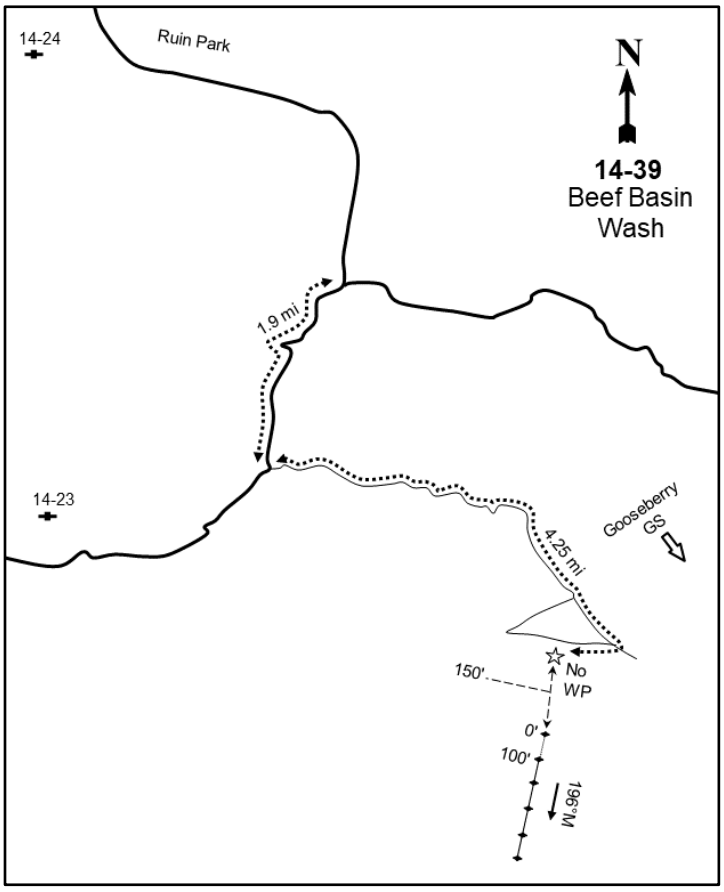
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2014	18	9	9	18	64	-	20.5
2019	28	-	17	25	50	8	19.0
Pinus edulis (twoneedle pinyon)							
2014	31	-	7	27	67	-	19.7
2019	42	-	-	24	65	12	17.7

Table 14-38.15 - Deer Desirable Components Index: Mid Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
2014	26.5	11.2	1.3	12.9	0.0	0.7	0.0	52.5	Fair
2019	18.0	3.4	0.0	3.9	-0.3	5.3	0.0	30.3	Very Poor

BEEF BASIN WASH - STUDY NO. 14-39





Location Information	
USGS 7.5 min Map Info	House Park Butte SW; Township 33S, Range 19E, Section 39
GPS (0' Stake)	NAD 83 UTM ZONE 12, 602501 East 4199209 North

Transect Information	
Browse Tag # (0' Stake)	113
Transect Bearing	196° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Standard

Directions to Site

From the intersection of Beef Basin Road and Ruin Park Road, turn left onto Beef Basin Road and travel for approximately 1.9 miles, staying left at any forks. Turn left onto the Beef Basin Wash road and continue on this road for 2.9 miles, staying right at the first fork and then left at the fork immediately after that. Drive for 0.6 miles to another fork and proceed to the right. Continue for 0.55 miles to another fork, then proceed left by making a sharp left-hand turn. Drive on this road for 0.2 miles and stop: there is no witness post. The 0-foot stake is approximately 150 feet south of the road and is marked by browse tag #113.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	INDIAN CREEK
Elevation	6,700ft (2,042m)
Aspect	North
Slope	3-4%
Sample Dates	06/12/2019

Wildlife Habitat and Vegetation History

Table 14-39.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter

Table 14-39.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2019	Basin Big Sagebrush	Phase I

Site Notes

No Notes

Soils

Table 14-39.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Loam	7.7	75.4	15.4	9.1	1.0	4.3	34.0	0.3	06/12/2019

Site Potential

1981 - 2010 Average Annual Precipitation	14 inches
NRCS Ecological Site	Upland Loam (Basin Big Sagebrush)
NRCS Ecological Site #	R035XY306UT
States and Transitions	A defined state and transition model is available.

This study site is dominated by basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*) as of study establishment in 2019, although yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus* var. *viscidiflorus*) also contributes significant cover (Table 14-39.12, Table 14-39.13). The herbaceous understory is abundant and moderately diverse, with the native perennial grass species blue grama (*Bouteloua gracilis*) providing the most cover of any single species (Table 14-39.7, Table 14-39.10, Table 14-39.11). Twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) were observed in photos and point-quarter density measurements, placing the study site within Phase I of woodland succession (Table 14-39.4, Table 14-39.14, Photos). Although trees are not abundant as of 2019, the state and transition model indicates that further encroachment in the absence of a major tree-removing disturbance could cause the study site to transition to a pinyon-juniper dominated state in the future (Jornada, 2019).

Trend Summary Tables

Table 14-39.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2019	9.4	8.3	-	11.1	9.9	-

Table 14-39.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2019	205	361	383	213	3.0	21.9	15.2	3.0

Table 14-39.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2019	34.2	1.7	39.4	0.4	0.0	49.5

Table 14-39.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Coyote	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency				
2019	6	-	26	19	19
Year	Days Use Per Acre (ha)				
2019	19.6 (48.4)	8.7 (21.5)*	26.2 (64.6)	16.1 (39.7)	-

*Pellets per acre (ha)

Table 14-39.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bouteloua gracilis (blue grama)	Bromus tectorum[ai] (cheatgrass)	Elymus elymoides (squirreltail)	Sporobolus cryptandrus (sand dropseed)	Vulpia octoflora[a] (sixweeks fescue)
year	Nested Frequency					
2019	1	320	100	8	91	148
year	Average Cover (%)					
2019	0.1	17.9	2.0	0.4	3.5	0.9

a - Annual; n - Noxious Weed; i - Introduced Species

Table 14-39.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Arabis (rockcress)	Astragalus amphioxys (Crescent milkvetch)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata[ai] (curveseed butterwort)	Chenopodium leptophyllum[a] (narrowleaf goosefoot)	Cryptantha[a] (annual cryptantha)	Delphinium nuttallianum (twolobe larkspur)	Descurainia pinnata[a] (western tansymustard)	Draba[a] (draba)	Erodium cicutarium[ai] (redstem stork's bill)	Gilia inconspicua[a] (shy gilia)	Lappula occidentalis[a] (flatspine stickseed)	Lapsana communis[ai] (common nipplewort)	Lesquerella (bladderpod)	Machaeranthera canescens (hoary tansyaster)	Oenothera coronopifolia (crownleaf evening primrose)	Packera multilobata (lobeleaf groundsel)
year	Nested Frequency																
2019	2	14	83	10	32	86	52	83	9	5	308	65	12	7	53	105	31
year	Average Cover (%)																
2019	0.0	0.0	0.5	0.2	0.3	0.5	0.9	1.4	0.1	0.0	9.6	0.5	0.3	0.0	0.2	1.1	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Plantago patagonica[a] (woolly plantain)	Salsola tragus[ai] (prickly Russian thistle)	Streptanthus cordatus (heartleaf twistflower)
year	Nested Frequency		
2019	195	2	2
year	Average Cover (%)		
2019	2.3	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 14-39.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis[p] (Utah serviceberry)	Artemisia tridentata ssp. tridentata[p] (basin big sagebrush)	Atriplex canescens[p] (fourwing saltbush)	Atriplex confertifolia[p] (shadscale saltbush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus	Opuntia fragilis (brittle pricklypear)	Opuntia polyacantha (plains pricklypear)
year	Line Intercept Cover (%)							
2019	-	9	2	0.1	-	9.8	-	0.1
year	Quadrat Cover (%)							
2019	0.0	6.3	2.9	0.2	0.1	8.2	0.0	0.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 14-39.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
2019	-	20	0	0	0	0	0	0	- / -
Artemisia tridentata ssp. tridentata[p] -- (basin big sagebrush)									
2019	1320	-	0	64	36	23	59	35	71/98
Atriplex canescens[p] -- (fourwing saltbush)									
2019	520	-	15	85	0	0	8	0	74/98
Atriplex confertifolia[p] -- (shadscale saltbush)									
2019	60	-	67	33	0	0	0	0	83/108
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
2019	60	-	33	33	33	0	0	33	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
2019	2520	-	1	90	10	0	0	10	41/62
Krascheninnikovia lanata[p] -- (winterfat)									
2019	20	-	0	100	0	100	0	0	40/58
Opuntia fragilis -- (brittle pricklypear)									
2019	100	-	20	80	0	0	0	0	7/24
Opuntia polyacantha -- (plains pricklypear)									
2019	140	-	14	86	0	0	0	0	11/27
Opuntia -- (pricklypear)									
2019	-	-	-	-	-	-	-	-	8/22
Sclerocactus -- (fishhook cactus)									
2019	20	-	0	100	0	0	0	0	13/11

t - Tree Species; p - Preferred Browse; i - Introduced Species

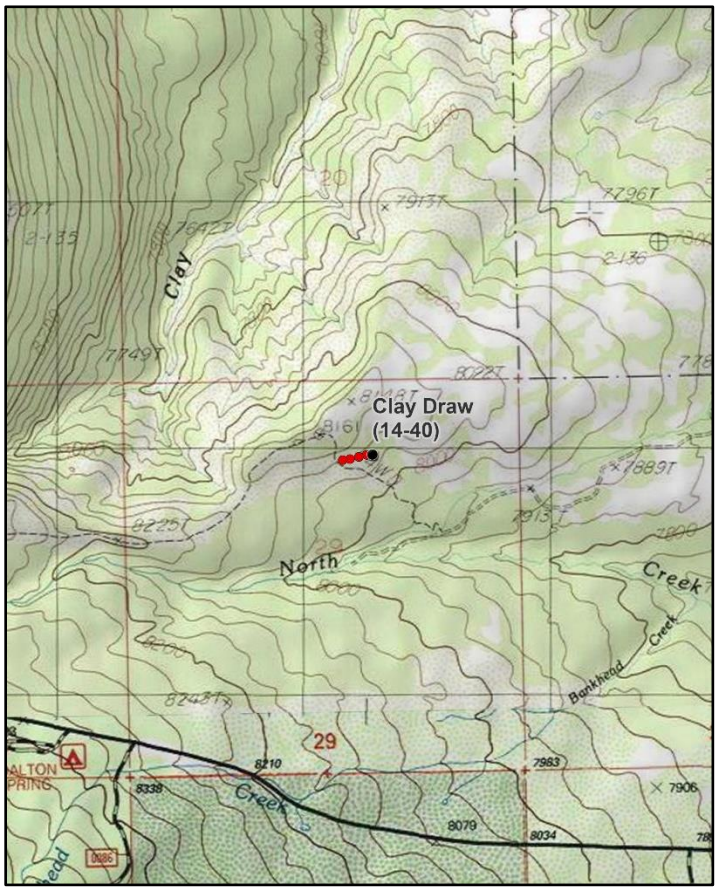
Table 14-39.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

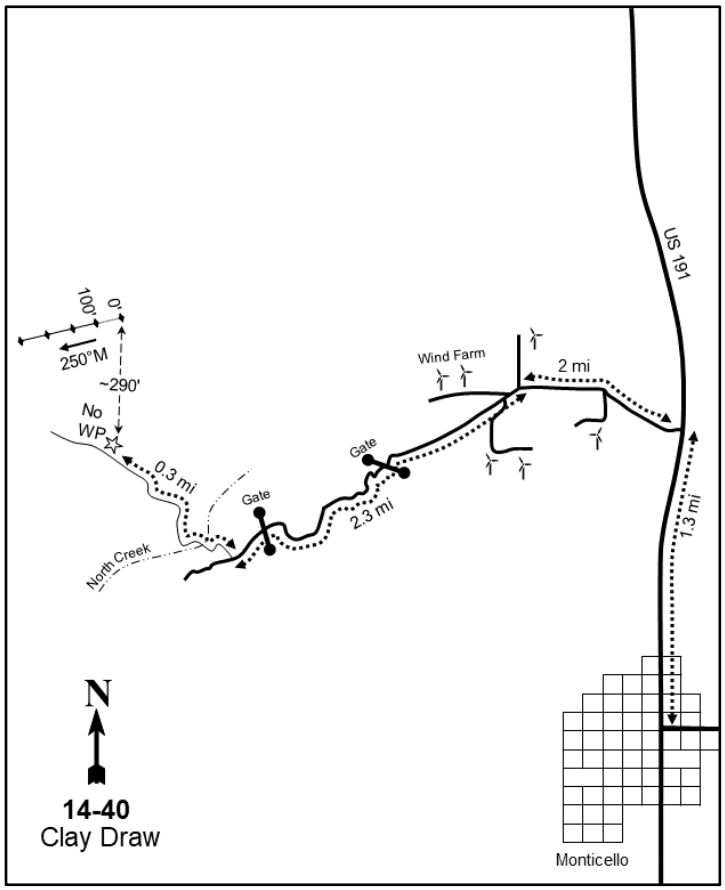
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2019	1	-	-	100	-	-	22.0
Pinus edulis (twoneedle pinyon)							
2019	4	-	-	100	-	-	15.3

Table 14-39.15 – Deer Desirable Components Index: Mid Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
2019	13.9	6.1	1.7	30.0	-2.2	5.9	0.0	55.4	Fair

CLAY DRAW - STUDY NO. 14-40





Location Information

USGS 7.5 min Map Info	Monticello Lake SE; Township 33S, Range 23E, Section 29
GPS (0' Stake)	NAD 83 UTM ZONE 12, 639224 East 4194166 North

Transect Information

Browse Tag # (0' Stake)	711
Transect Bearing	250° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (95ft)
Belt Marker Placement	Belt 1: 4ft

Directions to Site

Drive north for 1.3 miles on US-191 from Monticello. Turn left onto a road that leads towards the wind farm and stay on this road for 2 miles to a fork. Proceed to the left, staying left and then right at two forks immediately afterwards: the road becomes fainter and rougher at this point. Continue for 2.3 miles, passing through two gates, to another fork. Proceed to the right -- North Creek will be crossed immediately after the fork. Drive for 0.3 miles, then park; there is no witness post. The 0-foot baseline stake is roughly 290 feet north of the road and is marked with browse tag #711.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	NORTH CREEK
Elevation	No data
Aspect	Southeast
Slope	10-15%
Sample Dates	07/31/2019

Wildlife Habitat and Vegetation History

Table 14-40.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	summer
Rocky Mountain Elk	crucial	spring/fall

Table 14-40.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2019	Mixed Mountain Brush	Phase I

Site Notes

No Notes

Soils

Table 14-40.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.0	38.2	45.1	27.1	3.9	24.4	267.0	0.5	07/31/2019

Site Potential

1981 - 2010 Average Annual Precipitation	22 inches
NRCS Ecological Site	Mountain Stony Loam (Browse)
NRCS Ecological Site #	R048AY451UT
States and Transitions	No state and transition model is available for this ecological site.

As of study establishment in 2019, this site is dominated by mixed mountain brush species such as wild crabapple (*Peraphyllum ramosissimum*), mountain snowberry (*Symphoricarpos oreophilus*), and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), among others (Table 14-40.12, Table 14-40.13). The herbaceous understory is abundant and diverse with mainly native perennial grasses as the major component. However, perennial forbs also contribute significant cover; annual forbs are rare. The introduced annual grasses field brome (*Bromus arvensis*) and cheatgrass (*B. tectorum*) are also present, but in low amounts (Table 14-40.7, Table 14-40.10, Table 14-40.11). Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) are scattered throughout the area, and the study site is considered to be within Phase I of woodland succession (Table 14-40.4, Table 14-40.12, Table 14-40.14, Photos). Presence of trees indicates the potential for further encroachment, and this site could possibly transition into a pinyon and juniper-dominated state in the future without a tree-removing disturbance.

Trend Summary Tables

Table 14-40.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2019	38.6	6.1	1.4	55.7	5.3	4.2

Table 14-40.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2019	29	367	41	261	0.2	14.5	0.4	8.9

Table 14-40.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2019	25.0	-	39.1	3.0	7.4	56.1

Table 14-40.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
2019	2	39	1	1
Year	Days Use Per Acre (ha)			
2019	4.4 (10.8)	65.7 (162.2)	-	-

Table 14-40.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Achnatherum nelsonii (Columbia needlegrass)	Bromus arvensis[ai] (field brome)	Bromus tectorum[ai] (cheatgrass)	Carex geyeri (Geyer's sedge)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Koeleria macrantha (prairie Junegrass)	Pascopyrum smithii (western wheatgrass)	Poa fendleriana (muttongrass)	Poa pratensis[i] (Kentucky bluegrass)
year	Nested Frequency										
2019	23	10	13	16	66	93	3	15	216	99	125
year	Average Cover (%)										
2019	0.4	0.2	0.2	0.1	1.5	3.0	0.0	0.2	4.5	2.3	2.3

a - Annual; n - Noxious Weed; i - Introduced Species

Table 14-40.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Allium (onion)	Antennaria (pussytoes)	Artemisia ludoviciana (white sagebrush)	Astragalus (milkvetch)	Calochortus nuttallii (sego lily)	Camelina microcarpa[ai] (littlepod false flax)	Chenopodium fremontii[a] (Fremont's goosefoot)	Cirsium (thistle)	Collinsia parviflora[a] (maiden blue eyed Mary)	Crepis acuminata (tapertip hawksbeard)	Descurainia pinnata[a] (western tansymustard)	Dracocephalum parviflorum (American dragonhead)	Erigeron flagellaris (trailing fleabane)	Eriogonum racemosum (redroot buckwheat)	Lappula occidentalis[a] (flatspine stickseed)	Lupinus argenteus (silvery lupine)
year	Nested Frequency																
2019	1	8	4	7	57	10	7	3	5	8	2	7	3	76	15	14	1
year	Average Cover (%)																
2019	0.0	0.0	0.2	0.1	3.2	0.2	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.9	0.2	0.1	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Mertensia (bluebells)	Packera multilobata (lobeleaf groundsel)	Penstemon caespitosus (mat penstemon)	Petradoria pumila (rock goldenrod)	Phlox longifolia (longleaf phlox)	Polygonum douglasii[a] (Douglas' knotweed)	Taraxacum officinale (common dandelion)	Tragopogon dubius[ai] (yellow salsify)	Vicia americana (American vetch)
year	Nested Frequency								
2019	3	12	157	4	46	8	5	3	3
year	Average Cover (%)								
2019	0.0	0.0	3.3	0.3	0.2	0.0	0.2	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 14-40.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis[p] (Utah serviceberry)	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Chrysothamnus depressus[p] (longflower rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Mahonia repens (creeping barberry)	Peraphyllum ramosissimum[p] (wild crab apple)	Pinus edulis[t] (twoneedle pinyon)	Quercus gambelii[p] (Gambel oak)	Symphoricarpos oreophilus[p] (mountain snowberry)
year	Line Intercept Cover (%)								
2019	0.2	9.7	0.3	4.7	0.6	24.7	4.2	7.3	13.5
year	Quadrat Cover (%)								
2019	0.0	8.8	0.6	5.5	0.6	18.6	1.4	1.9	8.7

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 14-40.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

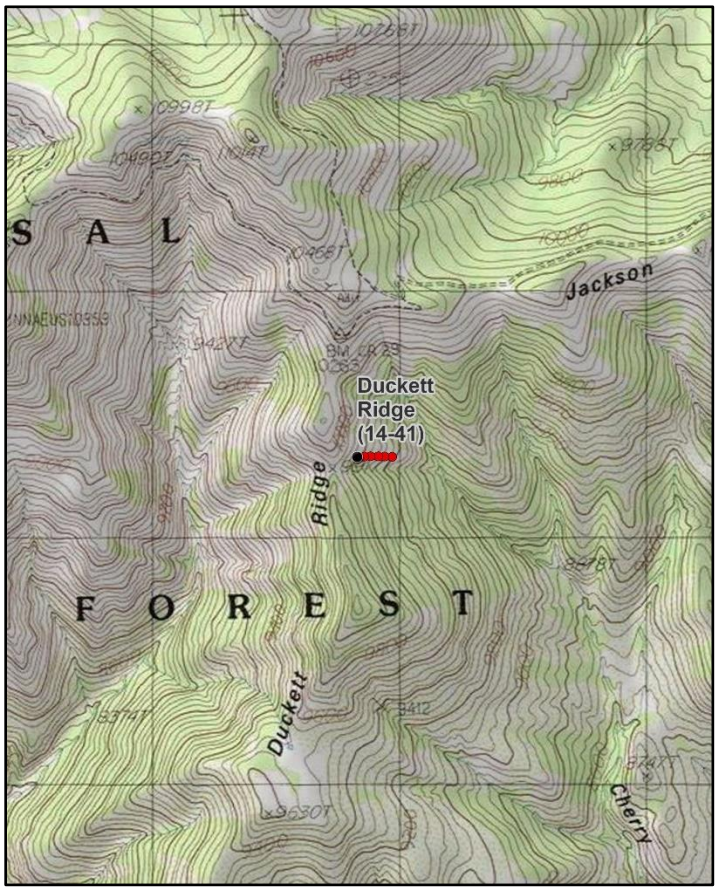
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
2019	20	-	0	100	0	0	100	0	40/65
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
2019	2740	20	3	80	17	38	18	17	46/75
Chrysothamnus depressus[p] -- (longflower rabbitbrush)									
2019	620	-	0	97	3	10	32	3	19/31
Gutierrezia sarothrae -- (broom snakeweed)									
2019	5040	-	0	100	0	0	0	0	27/29
Mahonia repens -- (creeping barberry)									
2019	1860	-	0	100	0	0	0	0	8/12
Opuntia fragilis -- (brittle pricklypear)									
2019	140	-	0	86	14	0	0	29	8/22
Opuntia polyacantha -- (plains pricklypear)									
2019	-	-	-	-	-	-	-	-	18/40
Peraphyllum ramosissimum[p] -- (wild crab apple)									
2019	1820	-	1	98	1	43	51	1	79/110
Pinus edulis[t] -- (twoneedle pinyon)									
2019	40	20	50	50	0	0	0	0	- / -
Quercus gambelii[p] -- (Gambel oak)									
2019	1440	-	61	38	1	3	10	1	62/64
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
2019	3440	20	16	83	2	26	1	2	41/56

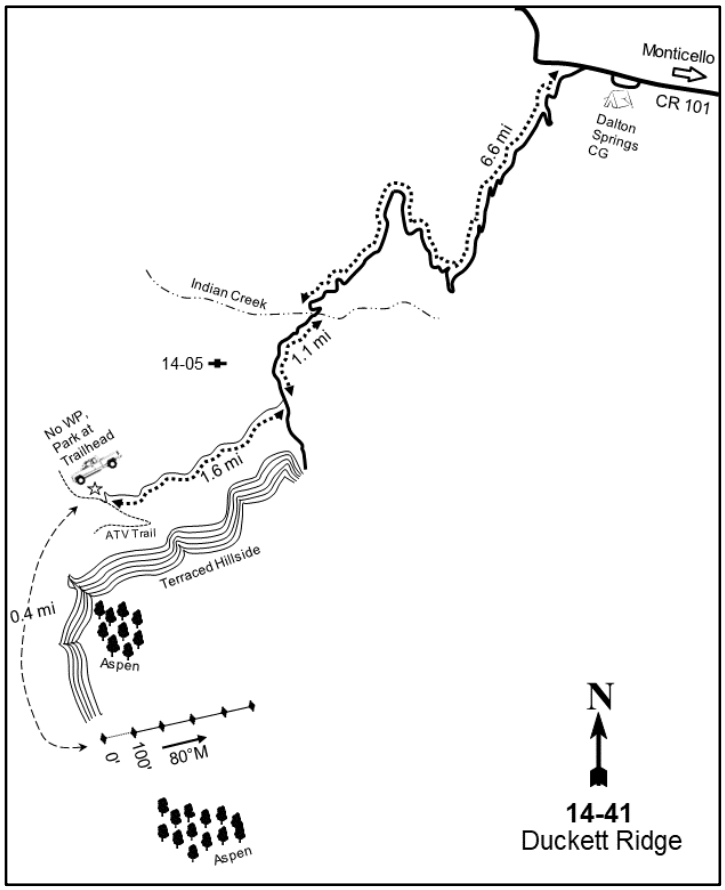
t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 14-40.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2019	1	-	-	-	-	100	38.0
Pinus edulis (twoneedle pinyon)							
2019	80	5	37	32	26	-	7.4

DUCKETT RIDGE - STUDY NO. 14-41





Location Information	
USGS 7.5 min Map Info	Mount Linnaeus NE; Township 34S, Range 22E, Section 17
GPS (0' Stake)	NAD 83 UTM ZONE 12, 628779 East 4186527 North

Transect Information	
Browse Tag # (0' Stake)	Not Available
Transect Bearing	80° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Standard

Directions to Site

From the junction of Blue Mountain Road and North Creek-Indian Creek Road (just west of Dalton Springs campground), travel 6.6 miles to Indian Creek. From the crossing, continue for 1.1 miles, passing the Jackson Ridge study (study #14-05), to a road on the right. Proceed right onto this road and travel approximately 1.6 miles to a trailhead: park here. From the trailhead, hike south along the terraced hillside for roughly 0.4 miles. The 0-foot baseline stake is on the hillside below the terracing and is not marked with a browse tag.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	
Elevation	9,900ft (3,018m)
Aspect	Southeast
Slope	40-45%
Sample Dates	07/31/2019

Wildlife Habitat and Vegetation History

Table 14-41.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	summer
Rocky Mountain Elk	crucial	summer

Table 14-41.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2019	Snowberry/Perennial Grass	NA

Site Notes

No Notes

Soils

Table 14-41.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Loam	5.7	57.4	29.4	13.1	3.0	34.1	221.0	0.4	07/31/2019

Site Potential

1981 - 2010 Average Annual Precipitation	30 inches
NRCS Ecological Site	High Mountain Loam (Thurber Fescue)
NRCS Ecological Site #	R048AY515UT
States and Transitions	No state and transition model is available for this ecological site.

Mountain snowberry (*Symphoricarpos oreophilus*) dominates this site as of study establishment in 2019; Gambel oak (*Quercus gambelii*) contributes a lesser, but still significant amount of cover (Table 14-41.12, Table 14-41.13). The herbaceous understory is abundant and moderately diverse. Perennial grasses, particularly the native species Thurber's fescue (*Festuca thurberi*), provide most of the herbaceous cover and are considered to be a co-dominant site component. Perennial forbs are moderately abundant while annual forbs are rare (Table 14-41.7, Table 14-41.10, Table 14-41.11). Quaking aspen (*Populus tremuloides*) and conifer species such as Douglas fir (*Pseudotsuga menziesii*) and Engelmann spruce (*Picea engelmannii*) were sampled in point-quarter density in low amounts, but are present in higher amounts in the areas directly adjacent to the transect (Table 14-41.14, Photos).

Trend Summary Tables

Table 14-41.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2019	34.5	0.1	-	56.8	0.1	-

Table 14-41.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2019	-	391	46	262	-	34.6	0.4	5.9

Table 14-41.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2019	15.1	-	49.2	3.2	7.1	56.4

Table 14-41.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
2019	1	28	5	1
Year	Days Use Per Acre (ha)			
2019	1.5 (3.6)	49.6 (122.5)	10.7 (26.5)	-

Table 14-41.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum nelsonii (Columbia needlegrass)	Bromus inermis[i] (smooth brome)	Bromus marginatus (mountain brome)	Carex geyeri (Geyer's sedge)	Elymus elymoides (squirreltail)	Elymus trachycaulus (slender wheatgrass)	Festuca thurberi (Thurber's fescue)	Muhlenbergia montana (mountain muhly)	Poa fendleriana (muttongrass)	Poa pratensis[i] (Kentucky bluegrass)
year	Nested Frequency									
2019	9	8	16	203	26	13	259	10	29	35
year	Average Cover (%)									
2019	0.3	0.2	0.6	8.2	0.8	0.6	22.1	0.5	0.7	0.7

a - Annual; n - Noxious Weed; i - Introduced Species

Table 14-41.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris aurantiaca (orange agoseris)	Chenopodium atrovirens[a] (pinyon goosefoot)	Collinsia parviflora[a] (maiden blue eyed Mary)	Erigeron flagellaris (trailing fleabane)	Erigeron speciosus (aspen fleabane)	Lathyrus lanszwertii (Nevada pea)	Packera neomexicana (New Mexico groundsel)	Penstemon (beardtongue)	Phacelia hastata (silverleaf phacelia)	Polygonum douglasii[a] (Douglas' knotweed)	Pseudostellaria jamesiana (tuber starwort)	Tragopogon dubius[ai] (yellow salsify)	Vicia americana (American vetch)
year	Nested Frequency													
2019	29	4	8	23	46	26	24	2	7	11	17	184	1	43
year	Average Cover (%)													
2019	0.3	0.0	0.0	0.1	0.8	0.4	0.5	0.0	0.1	0.1	0.2	3.0	0.0	0.6

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 14-41.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis[p] (Utah serviceberry)	Mahonia repens (creeping barberry)	Quercus gambelii[p] (Gambel oak)	Rosa woodsii[p] (Woods' rose)	Symphoricarpos oreophilus[p] (mountain snowberry)
year	Line Intercept Cover (%)				
2019	0.2	0.1	22.3	0.1	34.2
year	Quadrat Cover (%)				
2019	0.2	0.1	11.8	0.2	22.2

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 14-41.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

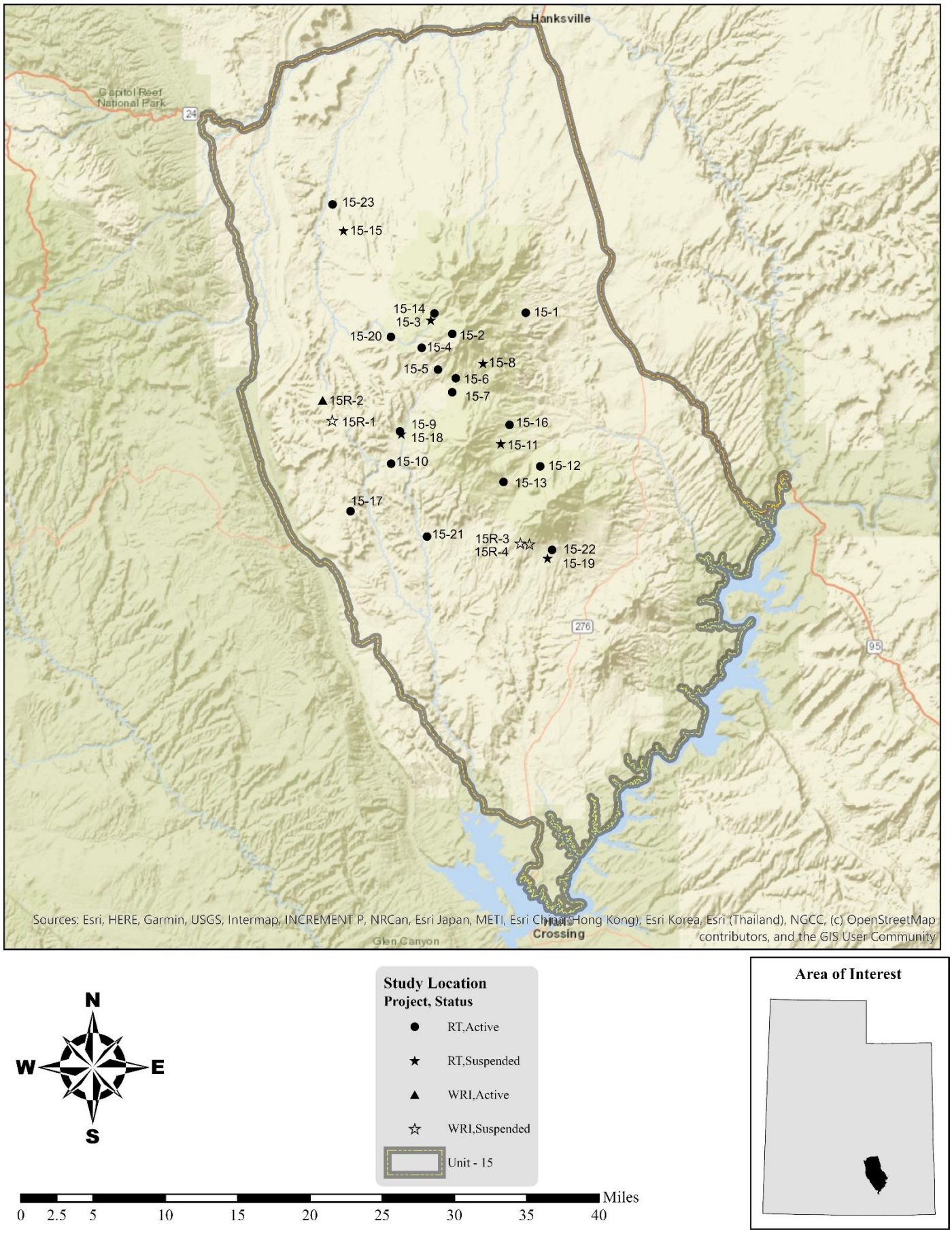
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
2019	280	-	57	43	0	0	100	0	27/31
Mahonia repens -- (creeping barberry)									
2019	300	-	0	100	0	0	0	0	9/14
Quercus gambelii[p] -- (Gambel oak)									
2019	6280	-	12	84	5	2	94	5	51/48
Ribes[p] -- (currant)									
2019	-	-	-	-	-	-	-	-	156/195
Rosa woodsii[p] -- (Woods' rose)									
2019	440	-	9	91	0	41	0	0	23/17
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
2019	9900	20	4	96	0	47	49	0	35/55

t - Tree Species; p - Preferred Browse; i - Introduced Species

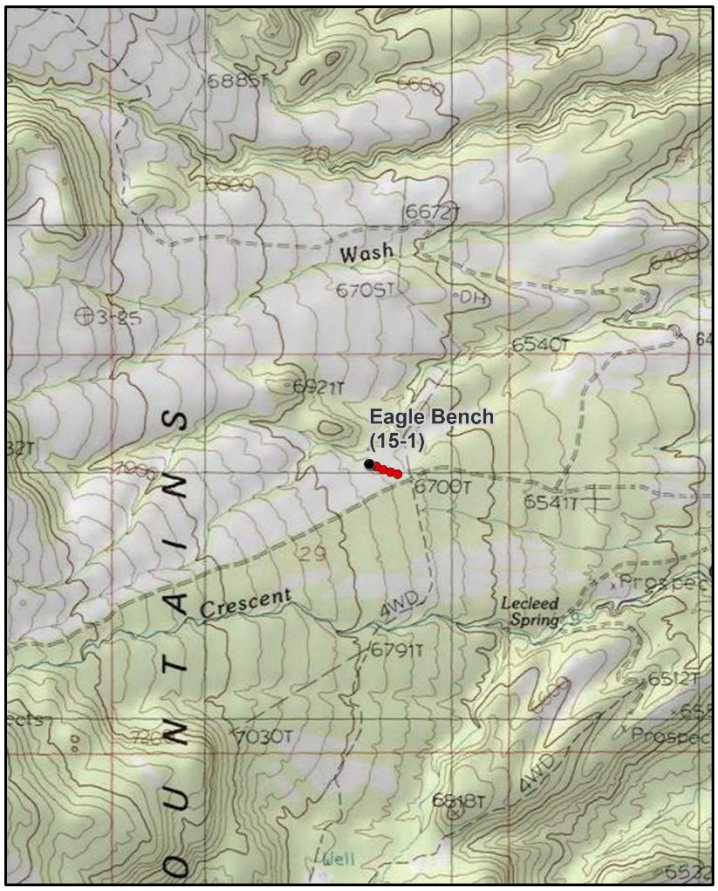
Table 14-41.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

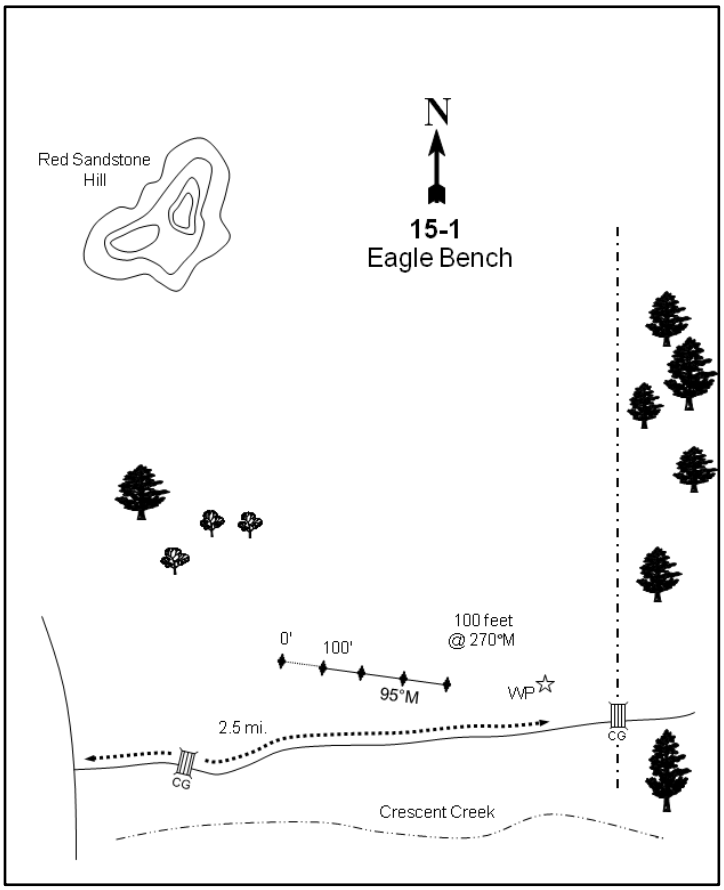
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Picea engelmannii (Engelmann spruce)							
2019	1	-	-	-	-	100	24.0
Populus tremuloides (quaking aspen)							
2019	2	-	-	-	-	100	17.0
Pseudotsuga menziesii (Douglas-fir)							
2019	2	-	-	67	33	-	13.7

WILDLIFE MANAGEMENT UNIT 15 - HENRY MOUNTAINS



EAGLE BENCH - STUDY NO. 15-1





Location Information

USGS 7.5 min Map Info	Raggy Canyon NW; Township 31S, Range 11E, Section 29
GPS (0' Stake)	NAD 83 UTM ZONE 12, 524611 East 4215234 North

Transect Information

Browse Tag # (0' Stake)	7138
Transect Bearing	95° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Belt 1: No Rebar

Directions to Site

This transect is located in the Crescent Creek chaining on the east side of the Henry Mountains. It can be reached from State Road 95 (approximately 11 miles through Little Egypt then west up Crescent Creek), or from the west via Copper Ridge of Granite Ridges and down Crescent Creek. From the intersection in the north part of Section 36 (T 31S, R 10E), go 0.6 miles down Crescent Creek to a cattle guard. Continue 1.95 miles to another cattle guard on the east edge of a large chaining (near section marker T 31S, R 11E, Section 29). On the north side of the road (northwest of the cattle guard), there is a witness post out in the chaining. The transect starts with the 0-foot end of the baseline stake 500 feet to the west-northwest (275 degrees magnetic) at a short fence post tagged #7138.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	CRESCENT CREEK
Elevation	6,640ft (2,024m)
Aspect	Northeast
Slope	5-10%
Sample Dates	06/02/1994, 06/04/1999, 06/07/2004, 06/04/2009, 06/04/2014, 06/05/2019

Table 15-01.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Two-Way Unknown	Eagle Bench Seeding	LTDL	August 1966- October 1966	1500
Seeding - Aerial After	Eagle Bench Seeding	LTDL	August 1966-October 1966	1500
Hand Crew - Lop and Scatter	Henry Mountain Fuel Reduction	LTDL	April-May 2002	1011

Table 15-01.2 SeedMix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Eagle Bench Seeding			Aerial	Oct 1966	1500
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Agropyron cristatum	Crested Wheatgrass		7.07	5.34
S	Atriplex canescens	Fourwing Saltbush		0.50	0.00

Wildlife Habitat and Vegetation History

Table 15-01.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
American Bison	crucial	year-long
Mule Deer	substantial	winter
Rocky Mountain Elk	substantial	year-long

Table 15-01.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1987	Wyoming Big Sagebrush	Phase I
1994	Wyoming Big Sagebrush	Phase I
1999	Wyoming Big Sagebrush	Phase I
2004	Wyoming Big Sagebrush	Phase I
2009	Wyoming Big Sagebrush	Phase I
2014	Wyoming Big Sagebrush	Phase I
2019	Wyoming Big Sagebrush	Phase I

Site Notes

Water for livestock and wildlife is available in Crescent Creek, which is about one mile south of the study area.

Soils

Table 15-01.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	6.6	51.3	28.2	20.5	2.4	14.5	96.0	0.6	06/04/1999

Site Potential

1981 - 2010 Average Annual Precipitation	10 inches
NRCS Ecological Site	Semidesert Gravelly Loam (Wyoming Big Sagebrush)
NRCS Ecological Site #	R035XY204UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 1987, the plant community on this site has remained in a stable Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) state. Wyoming big sagebrush is the primary browse species with Utah serviceberry (*Amelanchier utahensis*) and slender buckwheat (*Eriogonum microthecum*) also present in very low numbers (Table 15-01.12, Table 15-01.13). The herbaceous understory is mostly composed of native species with perennial grasses providing good amounts of cover; blue grama (*Bouteloua gracilis*) is the dominant grass species. Forbs are diverse, but relatively sparse (Table 15-01.10, Table 15-01.11). Twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) exhibited an increasing trend before the lop and scatter treatment in 2002 (Table 15-01.1) which removed a majority of the trees that were present prior to the 2004 sample year (Table 15-

01.14). It is likely that without disturbance this site will remain intact ecologically, although further infill of trees is possible given the continuous presence of conifer trees in the area.

Trend Summary Tables

Table 15-01.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	16.0	1.1	3.1	-	-	-
1999	21.3	0.3	2.9	-	-	0.1
2004	18.5	1.2	-	25.4	1.0	-
2009	19.7	0.7	-	20.6	0.8	-
2014	17.1	1.2	-	22.5	1.3	-
2019	18.6	2.0	-	22.0	1.4	-

Table 15-01.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	3	206	35	105	0.0	3.5	0.1	1.6
1999	16	217	74	106	0.1	4.2	0.3	0.7
2004	1	176	33	105	0.0	3.8	0.1	0.4
2009	-	203	2	132	-	3.3	0.0	1.1
2014	47	252	88	213	0.1	9.4	0.3	0.6
2019	88	226	259	212	0.3	10.8	4.0	0.9

Table 15-01.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	19.9	0.0	22.8	4.6	22.4	23.5
1999	21.8	0.1	24.7	13.6	23.6	29.5
2004	15.0	0.1	25.1	16.7	26.6	24.4
2009	15.6	0.1	28.8	14.4	26.4	26.5
2014	24.3	0.1	28.1	12.8	23.1	29.8
2019	21.1	0.2	28.5	17.6	30.2	34.8

Table 15-01.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle/Bison	Mule Deer	Rabbit
	Quadrat Frequency		
1994	-	-	10
1999	2	1	12
2004	-	3	8
2009	1	28	30
2014	-	19	7
2019	3	17	7
Year	Days Use Per Acre (ha)		
1994	-	-	-
1999	9.4 (23.3)	0.7 (1.7)	-
2004	2.2 (5.4)	8.1 (19.9)	-
2009	1.5 (3.6)	40.9 (101.0)	-
2014	0.7 (1.8)	42.9 (105.9)	-
2019	1.5 (3.6)	10.7 (26.5)	-

Table 15-01.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Achnatherum lettermanii (Letterman's needlegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bouteloua gracilis (blue grama)	Bromus tectorum[ai] (cheatgrass)	Elymus elymoides (squirreltail)	Pleuraphis jamesii (James' galleta)	Vulpia octoflora[a] (sixweeks fescue)
year	Nested Frequency							
1994	30	3	36	140	3	40	5	-
1999	24	-	35	127	16	92	-	-
2004	5	-	4	126	1	53	4	-
2009	3	-	7	121	-	96	-	-
2014	21	-	17	141	2	130	-	45
2019	4	-	1	161	7	92	9	83
year	Average Cover (%)							
1994	0.1	0.0	1.4	1.5	0.0	0.3	0.0	-
1999	0.3	-	0.7	1.9	0.1	1.3	-	-
2004	0.0	-	0.0	3.1	0.0	0.6	0.1	-
2009	0.0	-	0.0	2.7	-	0.6	-	-
2014	0.1	-	0.2	6.8	0.0	2.2	-	0.1
2019	0.2	-	0.0	7.3	0.0	3.1	0.1	0.3

a - Annual; n - Noxious Weed; i - Introduced Species

Table 15-01.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Arabis (rockcress)	Astragalus (milkvetch)	Astragalus amphioxys (Crescent milkvetch)	Astragalus lentiginosus (freckled milkvetch)	Calochortus nuttallii (sego lily)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata[ai] (curveseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Chenopodium fremontii[a] (Fremont's goosefoot)	Chenopodium leptophyllum[a] (narrowleaf goosefoot)	Collinsia parviflora[a] (maiden blue eyed Mary)	Cryptantha (cryptantha)	Cymopterus (springparsley)	Descurainia pinnata[a] (western tansymustard)	Draba[a] (draba)	Erigeron (fleabane)	Erigeron pumilus (shaggy fleabane)
year	Nested Frequency																
1994	1	-	-	-	6	-	-	3	-	-	-	-	-	-	-	7	-
1999	9	15	-	-	-	-	1	-	-	-	-	-	-	7	-	-	-
2004	-	14	-	-	-	1	-	-	2	1	15	-	-	4	-	-	-
2009	-	12	-	-	-	-	-	-	-	-	-	7	-	-	-	-	-
2014	3	-	4	22	2	-	-	-	-	-	12	5	5	13	-	-	3
2019	5	-	31	12	17	-	-	-	-	-	4	10	26	37	10	-	-
year	Average Cover (%)																
1994	0.0	-	-	-	0.0	-	-	0.0	-	-	-	-	-	-	-	0.0	-
1999	0.1	0.1	-	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-
2004	-	0.0	-	-	-	0.0	-	-	0.0	0.0	0.0	-	-	0.0	-	-	-
2009	-	0.0	-	-	-	-	-	-	-	-	-	0.0	-	-	-	-	-
2014	0.0	-	0.0	0.1	0.0	-	-	-	-	-	0.0	0.0	0.0	0.0	-	-	0.0
2019	0.1	-	0.1	0.0	0.0	-	-	-	-	-	0.0	0.0	0.1	0.3	0.1	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Eriogonum (buckwheat)	Gayophytum ramosissimum[a] (pinyon groundsmoke)	Gilia inconspicua[a] (shy gilia)	Lappula occidentalis[a] (flatspine stickseed)	Lesquerella kingii[a] (King bladderpod)	Lupinus (lupine)	Lupinus brevicaulis[a] (shortstem lupine)	Packera multilobata (lobeleaf groundsel)	Phlox austromontana (mountain phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii[a] (Douglas' knotweed)	Schoenocrambe linifolia (flaxleaf plainsmustard)	Streptanthus cordatus (heartleaf twistflower)	Symphyotrichum (aster)	Tetraneuris acaulis (stemless four-nerve daisy)	Townsendia incana (hoary Townsend daisy)
year	Nested Frequency															
1994	-	-	24	-	8	-	-	8	-	59	5	-	-	29	-	7
1999	1	-	17	-	45	-	-	34	3	63	12	-	-	-	-	14
2004	2	2	6	1	5	9	-	36	-	51	-	-	-	-	-	4
2009	-	-	-	-	2	-	-	114	-	25	-	-	-	-	2	14
2014	-	-	50	9	-	-	20	188	-	32	-	0	-	-	-	-
2019	-	-	211	7	-	-	74	123	1	40	-	-	6	-	-	-
year	Average Cover (%)															
1994	-	-	0.1	-	0.0	-	-	0.0	-	1.3	0.0	-	-	0.1	-	0.2
1999	0.0	-	0.0	-	0.2	-	-	0.2	0.2	0.2	0.0	-	-	-	-	0.0
2004	0.0	0.0	0.0	0.0	0.0	0.0	-	0.2	-	0.1	-	-	-	-	-	0.0
2009	-	-	-	-	0.0	-	-	0.9	-	0.1	-	-	-	-	0.0	0.0
2014	-	-	0.1	0.0	-	-	0.2	0.4	-	0.1	-	0.0	-	-	-	-
2019	-	-	2.7	0.0	-	-	0.9	0.3	0.0	0.2	-	-	0.0	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 15-01.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis[p] (Utah serviceberry)	Artemisia tridentata ssp. wyomingensis[p] (Wyoming big sagebrush)	Eriogonum microthecum[p] (slender buckwheat)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma[t] (Utah juniper)	Opuntia (pricklypear)	Pinus edulis[t] (twoneedle pinyon)
year	Line Intercept Cover (%)						
1994	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-
2004	0	25.4	-	1	-	-	-
2009	0.1	20.5	-	0.8	-	-	-
2014	0.1	22.4	-	1.3	-	-	-
2019	0.5	21.4	0.1	1.4	-	-	-
year	Quadrat Cover (%)						
1994	-	15.9	0.1	1.1	1.3	0.0	1.9
1999	-	21.3	0.0	0.3	0.6	-	2.2
2004	0.0	18.4	0.0	1.2	-	-	-
2009	0.0	19.7	-	0.7	-	-	-
2014	0.0	17.1	0.0	1.2	-	-	-
2019	0.0	18.5	0.1	2.0	-	-	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 15-01.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
1994	-	-	-	-	-	-	-	-	-/-
1999	20	-	0	100	0	100	0	0	117/154
2004	-	-	-	-	-	-	-	-	127/145
2009	-	-	-	-	-	-	-	-	118/133
2014	20	-	0	100	0	0	100	0	116/142
2019	20	-	0	100	0	100	0	0	121/171
Artemisia tridentata ssp. wyomingensis[p] -- (Wyoming big sagebrush)									
1994	6400	240	7	90	3	0	0	31	43/66
1999	6340	220	8	84	9	39	5	4	42/78
2004	5280	400	0	73	27	4	0	14	42/74
2009	5540	300	1	83	16	25	67	6	40/76
2014	4420	80	6	81	14	22	62	16	49/74
2019	4320	-	4	65	32	30	32	32	44/78
Chrysothamnus depressus[p] -- (longflower rabbitbrush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	27/54
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Echinocereus mojavensis -- (Mojave kingcup cactus)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	20	-	0	100	0	0	0	0	4/6
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Ephedra viridis[p] -- (mormon tea)									
1994	-	-	-	-	-	-	-	-	26/21
1999	20	-	0	100	0	0	0	0	16/26
2004	20	-	0	0	100	0	0	100	26/21
2009	20	-	100	0	0	0	0	0	13/29
2014	-	-	-	-	-	-	-	-	10/9
2019	-	-	-	-	-	-	-	-	25/22
Eriogonum microthecum[p] -- (slender buckwheat)									
1994	360	-	50	50	0	11	17	0	7/9
1999	320	80	13	88	0	31	13	0	8/12
2004	20	-	0	100	0	100	0	0	8/11
2009	140	-	0	100	0	0	0	0	4/8
2014	140	20	43	57	0	0	0	0	7/11
2019	60	-	0	100	0	33	33	0	13/17
Gutierrezia sarothrae -- (broom snakeweed)									
1994	1960	80	8	89	3	0	0	0	13/15
1999	2080	380	36	64	1	0	0	1	9/9
2004	2620	-	36	59	5	0	0	5	18/26
2009	9100	3560	44	55	1	0	0	1	9/10
2014	3380	4500	24	75	1	0	0	1	17/19
2019	7940	960	3	97	1	2	0	1	14/16

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Juniperus osteosperma[t] -- (Utah juniper)									
1994	-	-	-	-	-	-	-	-	-/-
1999	60	20	100	0	0	0	0	0	- / -
2004	-	-	-	-	-	-	-	-	- / -
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	20	-	100	0	0	0	0	0	- / -
Opuntia -- (pricklypear)									
1994	20	-	0	100	0	0	0	0	- / -
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	9/25
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	9/11
Pinus edulis[t] -- (twoneedle pinyon)									
1994	-	-	-	-	-	-	-	-	-/-
1999	100	60	40	60	0	0	0	0	- / -
2004	-	-	-	-	-	-	-	-	- / -
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Sclerocactus -- (fishhook cactus)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	17/29

t - Tree Species; p - Preferred Browse; i - Introduced Species

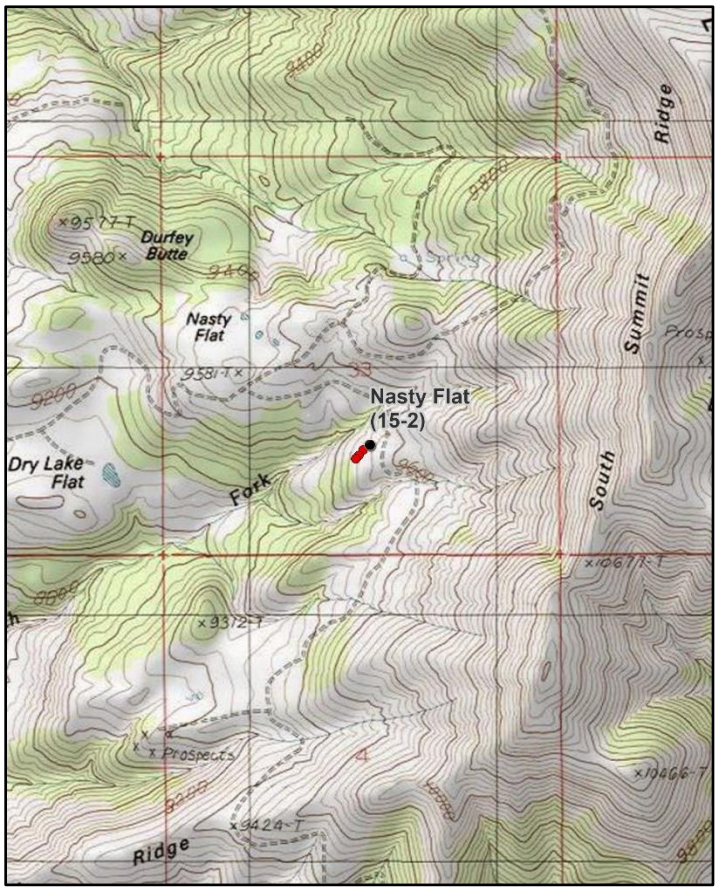
Table 15-01.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

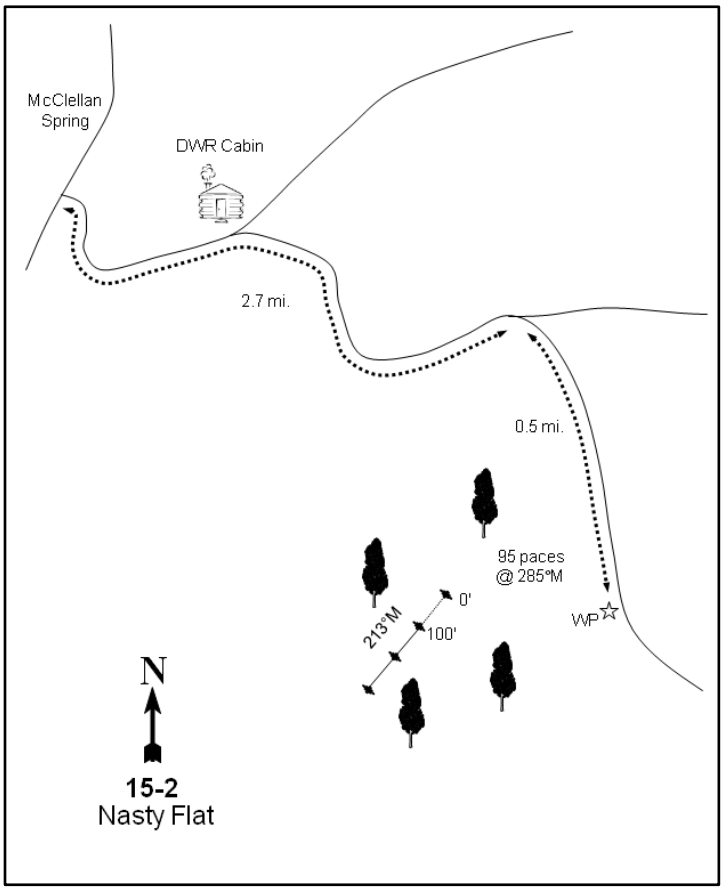
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1994	57	-	-	-	-	-	9.0
1999	61	-	-	-	-	-	7.4
2014	30	-	100	-	-	-	4.3
2019	21	18	82	-	-	-	4.7
Pinus edulis (twoneedle pinyon)							
1994	54	-	-	-	-	-	4.1
1999	65	-	-	-	-	-	7.6
2014	13	17	67	17	-	-	4.8
2019	14	-	57	43	-	-	5.9

Table 15-01.15 – Deer Desirable Components Index: Low Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1994	20.0	14.0	3.5	6.9	0.0	3.2	0.0	47.5	Good
1999	26.7	12.4	3.8	8.4	0.0	1.5	0.0	52.7	Good
2004	30.0	7.1	0.2	7.7	0.0	0.8	0.0	45.7	Fair-Good
2009	25.8	10.2	0.5	6.6	0.0	2.1	0.0	45.2	Fair-Good
2014	28.2	10.9	2.9	18.7	-0.1	1.3	0.0	61.9	Good
2019	27.6	5.8	1.8	21.5	-0.3	1.8	0.0	58.3	Good

NASTY FLAT - STUDY NO. 15-2





Location Information

USGS 7.5 min Map Info	Mount Ellen NW; Township 31S, Range 10E, Section 33
GPS (0' Stake)	NAD 83 UTM ZONE 12, 516430 East 4212885 North

Transect Information

Browse Tag # (0' Stake)	7852
Transect Bearing	213° magnetic
Length	300ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft & 71ft), Line 3 (59ft)
Belt Marker Placement	Standard

Directions to Site

From the McMillan (McClellan) Spring Campground (BLM), proceed east on the road past Willow Spring and the DWR cabin for 2.7 miles to a fork. Stay right and continue for 0.5 miles; the transect is located in the patch of aspens below the road. A witness post is located on the right (west) side of the road. From this fence post, walk 95 feet at a bearing of 285 degrees magnetic to the start of the baseline. The first stake is under the aspens and is tagged with a red browse tag #7852.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	NASTY FLAT
Elevation	9,500ft (2,896m)
Aspect	West
Slope	12-30%
Sample Dates	06/10/1994, 06/09/1999, 06/09/2004, 06/10/2009, 06/04/2014, 09/10/2019

Wildlife Habitat and Vegetation History

Table 15-02.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
American Bison	crucial	year-long
Mule Deer	crucial	summer
Rocky Mountain Elk	substantial	year-long

Table 15-02.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1987	Quaking Aspen	NA
1994	Quaking Aspen	NA
1999	Quaking Aspen	NA
2004	Quaking Aspen	NA
2009	Quaking Aspen	NA
2014	Quaking Aspen	NA
2019	Quaking Aspen	NA

Site Notes

This site is in a mature aspen stand with a considerable number of young aspen in the understory as well as a few conifers. In 1999, the baseline was realigned to better sample aspen regeneration and animal use near the edge of the aspen clone.

Soils

Table 15-02.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	5.8	49.3	30.2	20.5	5.4	31.3	204.8	0.5	06/08/1999

Site Potential

1981 - 2010 Average Annual Precipitation	30 inches
NRCS Ecological Site	High Mountain Stony Loam (Aspen)
NRCS Ecological Site #	R047XB531UT
States and Transitions	No state and transition model is available for this ecological site.

This site has been in a stable quaking aspen (*Populus tremuloides*) ecological state since the time of study establishment in 1987. The herbaceous understory has been abundant over the years and is moderately diverse. Perennial grasses have displayed an increasing trend while perennial forb cover has remained stable overall (Table 15-02.7). Perennial grasses are common and are primarily native species, with the dominant species being muttongrass (*Poa fendleriana*) (Table 15-02.10). Forbs are also common on this site and are all native species, with tuber starwort (*Pseudostellaria jamesiana*) and common dandelion (*Taraxacum officinale*) contributing the most cover (Table 15-02.11). Conifer trees have increased over time with significant cover provided by Douglas fir (*Pseudotsuga menziesii*) and limber pine (*Pinus flexilis*). In future sample years, it is likely that conifers will encroach upon the aspen further and become a major component of the site if a tree-removing disturbance does not occur (Table 15-02.12, Table 15-02.13, Table 15-02.14).

Trend Summary Tables

Table 15-02.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	0.7	1.0	3.5	-	-	-
1999	1.2	-	5.2	-	-	6.1
2004	1.6	-	8.3	2.6	0.2	78.7
2009	1.9	0.0	8.4	1.3	0.3	61.2
2014	1.9	-	10.3	2.3	-	74.6
2019	1.8	-	12.5	3.3	0.3	97.2

Table 15-02.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	-	319	6	367	-	6.7	0.0	8.3
1999	-	275	8	292	-	4.1	0.0	4.8
2004	-	265	66	301	-	7.4	0.1	6.8
2009	-	319	38	295	-	10.2	0.1	5.4
2014	-	312	4	293	-	13.2	0.0	5.5
2019	-	309	26	252	-	16.9	0.1	8.7

Table 15-02.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	1.3	-	77.2	0.0	0.7	24.4
1999	1.2	0.0	82.6	0.0	6.2	15.7
2004	4.6	-	75.3	0.5	5.7	24.5
2009	5.5	-	71.7	0.1	7.5	28.4
2014	1.2	0.0	78.3	0.0	7.0	29.6
2019	4.3	0.1	79.5	0.1	5.6	36.9

Table 15-02.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle/Bison	Mule Deer	Dusky Grouse	Rocky Mountain Elk	Rabbit
	Quadrat Frequency				
1994	-	3	-	2	-
1999	1	5	-	-	-
2004	4	11	1	-	-
2009	-	16	-	-	1
2014	-	1	-	-	-
2019	1	14	-	-	-
Year	Days Use Per Acre (ha)				
1994	-	-	-	-	-
1999	15.3 (37.7)	12.8 (31.5)	-	-	-
2004	18.1 (44.8)	22.1 (54.6)	-	-	-
2009	-	38.9 (96.0)	-	2.0 (5.0)	-
2014	-	5.3 (13.2)	-	-	-
2019	10.9 (26.9)	10.7 (26.5)	-	-	-

Table 15-02.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Bromus inermis[i] (smooth brome)	Bromus marginatus (mountain brome)	Bromus porteri (Porter brome)	Carex geyeri (Geyer's sedge)	Elymus elymoides (squirreltail)	Elymus trachycaulus (slender wheatgrass)	Festuca idahoensis (Idaho fescue)	Festuca thurberi (Thurber's fescue)	Hesperostipa comata (needle and thread)	Poa fendleriana (muttongrass)
year	Nested Frequency										
1994	72	4	-	-	15	-	94	-	-	-	266
1999	53	4	-	-	73	11	121	2	-	-	134
2004	5	-	2	-	26	44	81	-	-	-	208
2009	15	-	-	-	32	4	154	-	-	-	239
2014	50	5	13	9	25	4	163	1	20	-	203
2019	81	6	28	25	52	92	52	-	30	3	114
year	Average Cover (%)										
1994	1.9	0.0	-	-	0.3	-	0.4	-	-	-	4.1
1999	0.4	0.0	-	-	1.0	0.0	1.1	0.0	-	-	1.5
2004	0.1	-	0.0	-	0.3	0.6	1.0	-	-	-	5.6
2009	0.2	-	-	-	0.6	0.1	3.1	-	-	-	6.3
2014	0.7	0.3	0.1	0.3	0.5	0.0	4.0	0.0	1.6	-	5.7
2019	3.2	0.6	0.5	0.8	0.8	2.7	1.7	-	2.2	0.0	4.4

a - Annual; n - Noxious Weed; i - Introduced Species

Table 15-02.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium (onion)	Androsace septentrionalis[a] (pygmyflower rockjasmine)	Antennaria (pussytoes)	Arabis drummondii (Drummond's rockcress)	Astragalus miser (timber milkvetch)	Calochortus nuttallii (sego lily)	Castilleja linariifolia (Wyoming Indian paintbrush)	Chenopodium fremontii[a] (Fremont's goosefoot)	Erigeron eatonii (Eaton's fleabane)	Fritillaria atropurpurea (spotted fritillary)	Packera multilobata (lobeleaf groundsel)	Penstemon watsonii (Watson's penstemon)	Phlox longifolia (longleaf phlox)	Physalis (groundcherry)	Polygonum douglasii[a] (Douglas' knotweed)
year	Nested Frequency																
1994	-	6	-	4	-	18	78	-	-	5	28	-	-	22	17	3	-
1999	3	3	4	8	-	20	-	4	-	-	70	4	-	42	25	-	-
2004	2	12	2	4	-	4	-	-	-	8	65	-	-	21	23	-	57
2009	-	-	12	2	-	-	-	-	1	2	65	-	3	12	25	-	34
2014	1	-	6	4	-	8	2	3	-	-	70	-	-	21	15	-	-
2019	1	-	3	6	1	3	4	-	-	1	47	-	2	19	1	-	22
year	Average Cover (%)																
1994	-	0.0	-	0.0	-	0.1	1.5	-	-	0.0	0.1	-	-	0.2	0.1	0.0	-
1999	0.0	0.0	0.1	0.0	-	0.1	-	0.0	-	-	0.5	0.0	-	0.3	0.1	-	-
2004	0.0	0.1	0.0	0.0	-	0.0	-	-	-	0.0	0.5	-	-	0.5	0.1	-	0.1
2009	-	-	0.1	0.0	-	-	-	-	0.0	0.0	0.6	-	0.0	0.3	0.1	-	0.1
2014	0.6	-	0.0	0.0	-	0.1	0.0	0.0	-	-	0.5	-	-	0.1	0.1	-	-
2019	0.0	-	0.0	0.0	0.0	0.0	0.0	-	-	0.0	0.6	-	0.0	0.5	0.0	-	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Pseudocymopterus montanus (alpine false springparsley)	Pseudostellaria jamesiana (tuber starwort)	Sedum lanceolatum (spearleaf stonecrop)	Silene drummondii (Drummond's campion)	Symphyotrichum (aster)	Taraxacum officinale (common dandelion)	unknown perennial forb (unknown forb)	unknown perennial forb 2 (unknown forb)	Viola (violet)
year	Nested Frequency								
1994	-	316	-	-	-	183	-	-	57
1999	4	185	6	-	-	153	-	-	-
2004	4	201	3	14	-	120	3	-	-
2009	4	219	3	-	-	120	4	6	-
2014	4	194	-	-	0	135	-	-	-
2019	-	198	-	-	-	59	-	-	-
year	Average Cover (%)								
1994	-	3.0	-	-	-	2.3	-	-	1.1
1999	0.0	1.1	0.1	-	-	2.4	-	-	-
2004	0.0	3.0	0.0	0.0	-	2.5	0.0	-	-
2009	0.0	2.1	0.0	-	-	2.2	0.0	0.0	-
2014	0.0	2.2	-	-	0.0	1.8	-	-	-
2019	-	6.8	-	-	-	0.6	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 15-02.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Juniperus communis (common juniper)	Mahonia repens (creeping barberry)	Pinus flexilis[t] (limber pine)	Populus tremuloides[t] (quaking aspen)	Pseudotsuga menziesii[t] (Douglas-fir)	Ribes velutinum var. velutinum[p] (desert gooseberry)	Symphoricarpos oreophilus[p] (mountain snowberry)
year	Line Intercept Cover (%)							
1994	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-
2004	1.7	0.2	-	0.5	67.9	10.3	-	0.9
2009	1.1	0.3	-	3.5	47.8	9.9	-	0.2
2014	1.3	-	-	5.9	51.6	17.1	-	1
2019	1.4	0.1	0.2	6.7	65.9	24.6	-	1.9
year	Quadrat Cover (%)							
1994	0.2	1.0	-	0.5	2.2	0.8	0.2	0.3
1999	1.0	-	-	0.6	1.6	3.0	-	0.2
2004	1.3	0.0	-	0.4	1.4	6.5	-	0.3
2009	1.6	0.0	-	1.1	1.7	5.5	-	0.3
2014	1.3	-	-	1.4	0.7	8.2	-	0.6
2019	1.4	0.0	0.0	2.4	0.9	9.1	-	0.4

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 15-02.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1994	300	-	47	47	7	0	0	7	24/34
1999	1460	60	25	70	6	0	0	6	31/51
2004	1080	-	4	78	19	17	4	9	29/50
2009	1100	120	38	33	29	24	7	7	31/46
2014	720	-	19	75	6	22	0	0	28/38
2019	360	-	6	89	6	0	0	61	31/51
Juniperus communis -- (common juniper)									
1994	20	-	0	100	0	0	0	0	35/158
1999	-	-	-	-	-	-	-	-	-/-
2004	60	-	0	67	33	0	0	0	- / -
2009	20	-	0	100	0	0	0	0	- / -
2014	-	-	-	-	-	-	-	-	-/-
2019	140	-	43	57	0	0	0	0	35/125
Juniperus osteosperma[t] -- (Utah juniper)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	20	-	100	0	0	0	0	0	50/62
2019	-	-	-	-	-	-	-	-	-/-
Mahonia repens -- (creeping barberry)									
1994	-	-	-	-	-	-	-	-	-/-
1999	100	-	0	100	0	0	0	0	8/43
2004	-	-	-	-	-	-	-	-	17/20
2009	-	-	-	-	-	-	-	-	-/-
2014	20	-	0	100	0	0	0	0	9/14
2019	40	-	0	100	0	0	0	0	15/23
Pinus flexilis[t] -- (limber pine)									
1994	-	-	-	-	-	-	-	-	-/-
1999	60	20	67	33	0	0	0	0	- / -
2004	60	-	67	33	0	0	0	0	- / -
2009	200	-	60	40	0	0	0	10	- / -
2014	160	60	63	25	13	0	0	0	31/62
2019	180	20	78	22	0	0	0	0	- / -
Populus tremuloides[t] -- (quaking aspen)									
1994	-	-	-	-	-	-	-	-	-/-
1999	2840	-	75	22	3	0	0	3	- / -
2004	2540	-	36	42	22	24	6	19	- / -
2009	2520	120	52	40	8	18	10	3	- / -
2014	See table 13a - Aspen Characteristics								
2019	See table 13a - Aspen Characteristics								
Pseudotsuga menziesii[t] -- (Douglas-fir)									
1994	-	-	-	-	-	-	-	-	-/-
1999	500	60	88	12	0	0	0	0	- / -
2004	460	60	61	39	0	0	0	0	- / -
2009	500	120	48	52	0	0	0	0	- / -
2014	340	300	41	29	29	0	0	0	- / -
2019	600	60	57	43	0	3	0	3	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Ribes velutinum var. velutinum[p] -- (desert gooseberry)									
1994	20	-	0	100	0	0	0	0	40/128
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	20	0	0	0	0	0	0	- / -
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
1994	80	-	25	75	0	0	0	0	52/81
1999	220	-	82	18	0	0	0	0	51/71
2004	220	-	9	91	0	0	0	0	44/52
2009	320	-	63	38	0	0	0	0	50/86
2014	420	100	19	81	0	0	0	0	32/44
2019	360	20	0	100	0	6	0	0	33/53

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 15-02.13a - Aspen Characteristics. Characteristics of aspen populations including density, size class distribution, and vigor of plants.

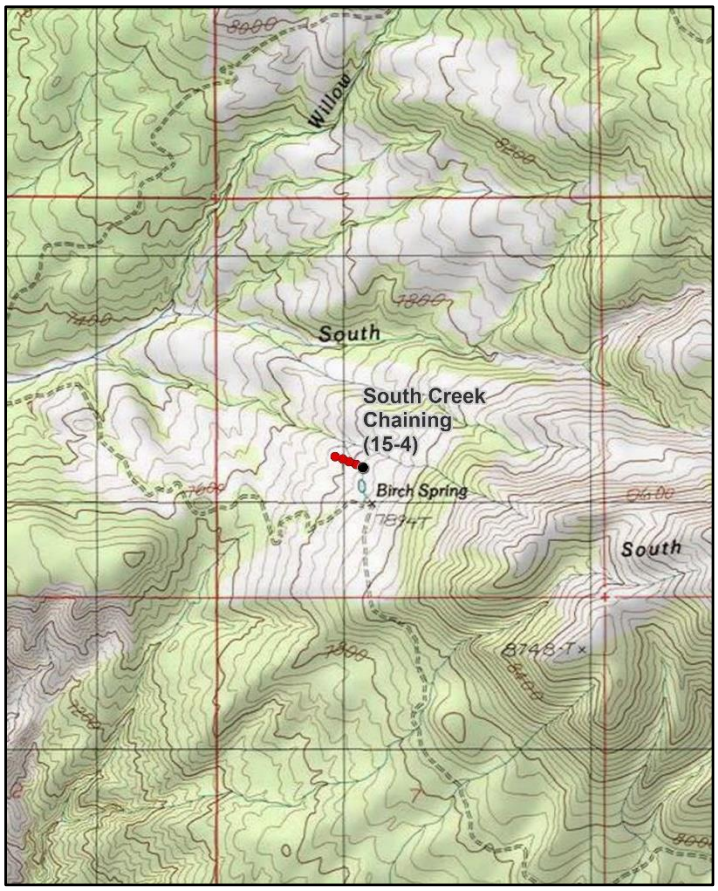
Year	Density	Size Class Distribution				Utilization		Poor Vigor (%)
	Plants per Acre	Class I (%)	Class II (%)	Class III (%)	Class IV (%)	Moderate (%)	Heavy (%)	
Populus tremuloides (quaking aspen)								
2014	2340	39	17	6	38	9	7	6
2019	2120	23	30	2	45	18	12	7

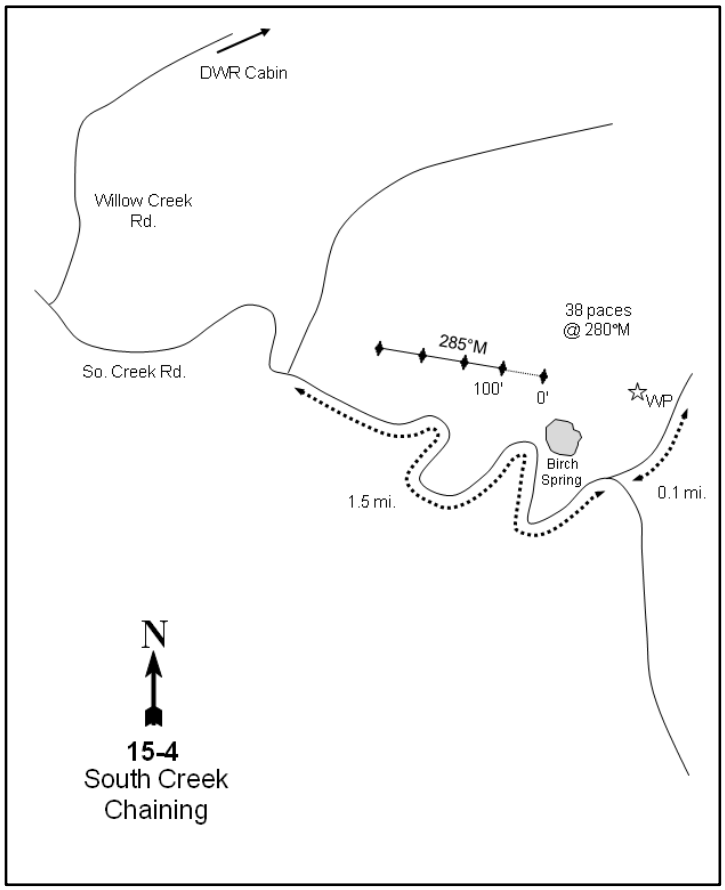
Class I - <= 1.5 feet; Class II - > 1.5 feet to 5 feet; Class III - > 5 feet and up to 1 inch diameter at breast height (dbh); Class IV - > 1 in diameter at breast height (dbh)

Table 15-02.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Pinus flexilis (limber pine)							
1994	126	-	-	-	-	-	3.9
1999	77	-	-	-	-	-	5.2
2004	83	-	57	29	7	7	5.3
2009	78	-	56	31	6	6	5.9
2014	108	5	55	25	5	10	6.3
2019	78	7	43	21	21	7	5.7
Populus tremuloides (quaking aspen)							
1994	2296	-	-	-	-	-	8.3
1999	4794	-	-	-	-	-	3.4
2004	1509	-	38	-	6	56	9.7
2009	1023	25	6	-	19	50	11.8
2014	1740	60	5	5	10	20	4.1
2019	1099	31	-	-	13	56	14.1
Pseudotsuga menziesii (Douglas-fir)							
1994	65	-	-	-	-	-	5.8
1999	121	-	-	-	-	-	7.2
2004	150	-	53	20	-	27	10.2
2009	110	7	47	13	7	27	7.5
2014	153	15	25	10	-	50	13.4
2019	121	19	19	19	-	44	15.3

SOUTH CREEK CHAINING - STUDY NO. 15-4





Location Information

USGS 7.5 min Map Info	Mount Ellen SW; Township 32S, Range 10E, Section 06
GPS (0' Stake)	NAD 83 UTM ZONE 12, 513018 East 4211338 North

Transect Information

Browse Tag # (0' Stake)	7127
Transect Bearing	285° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

From the intersection of the Willow Creek and South Creek Roads, travel 1.5 miles west-southwest to a fork by Birch Spring. Turn left, go 0.1 miles past the fenced spring, and down a faint road. A witness post (tall, green fence post) is located in the pinyon and juniper just west of the road. The transect starts 38 paces away from the witness post at a bearing of 280 degrees magnetic. The 0-foot baseline stake is marked with browse tag #7127.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	NASTY FLAT
Elevation	7,900ft (2,408m)
Aspect	North
Slope	5%
Sample Dates	05/31/1994, 06/03/1999, 06/09/2004, 06/04/2009, 06/02/2014, 06/04/2019

Table 15-04.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Seeding - Dribbler	South Creek Pinyon-Juniper Project	LTDL	Fall 1968-Spring 1969	500
Chaining - Chain Unknown	South Creek Pinyon-Juniper Project	LTDL	Fall 1968- Spring 1969	500
Seeding - Aerial After	South Creek Pinyon-Juniper Project	LTDL	May 1969	500
Hand Crew - Lop and Scatter	Henry Mountains PJ Thinning	LTDL	Fall 2000-Fall 2002	500
Hand Crew - Lop and Scatter	Dugout Flat Lop and Scatter Phase II	1335	Fall 2009	1396

Table 15-04.2 SeedMix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
South Creek Seeding			Aerial	May 1969	500
Type	**Species**	**Common Name**	**Cultivar/Source ID**	**Bulk lbs/acre**	**PLS**
G	Agropyron cristatum	Crested Wheatgrass		9.00	0.00
F	Medicago sativa	Alfalfa		0.60	0.00
F	Sanguisorba minor	Small Burnet		0.60	0.00
S	Atriplex canescens	Fourwing Saltbush		0.30	0.00

Mix Name			Application Type	Application Date	Acres
South Creek Seeding			Dribbler	May 1969	500
Type	**Species**	**Common Name**	**Cultivar/Source ID**	**Bulk lbs/acre**	**PLS**
S	Purshia tridentata	Bitterbrush		0.30	0.00

Wildlife Habitat and Vegetation History

Table 15-04.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
American Bison	crucial	year-long
Mule Deer	crucial	summer
Rocky Mountain Elk	substantial	year-long

Table 15-04.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1987	Perennial Grass	Phase I
1994	Perennial Grass	Phase I
1999	Perennial Grass/Rubber Rabbitbrush	Phase I
2004	Mountain Big Sagebrush	Phase I
2009	Mountain Big Sagebrush	Phase I
2014	Mountain Big Sagebrush	Phase I
2019	Mountain Big Sagebrush	Phase I

Site Notes

Water is available for livestock and wildlife a few hundred yards to the south at Birch Spring. The 300-foot stake is a piece of rebar.

Soils

Table 15-04.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	6.9	45.6	27.8	26.6	3.6	19.7	156.8	0.7	06/03/1999

Site Potential

1981 - 2010 Average Annual Precipitation	20 inches
NRCS Ecological Site	Mountain Stony Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XB462UT
States and Transitions	No state and transition model is available for this ecological site.

Upon study establishment in 1987, the main components of the site were seeded perennial grasses. Browse species increased and the site transitioned into a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*)/perennial grass ecological type in 2004 (Photos). The herbaceous understory is dominated by introduced perennial grasses, namely crested wheatgrass (*Agropyron cristatum*) (Table 15-04.10). Perennial forbs provide a moderate amount of cover with the consistently dominant species being alfalfa (*Medicago sativa*) (Table 15-04.11). Shrubs provide good amounts of cover with mountain big sagebrush being dominant; lesser amounts of other browse such as mountain snowberry (*Symphoricarpos oreophilus*), Utah serviceberry (*Amelanchier utahensis*) and alderleaf mountain mahogany (*Cercocarpus montanus*) are also present (Table 15-04.12, Table 15-04.13). Conifer trees have decreased in both cover and density following lop and scatter treatments in 2002 and 2009 (Table 15-04.1) -- both Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) have been observed on this site (Table 15-04.12, Table 15-04.14).

Trend Summary Tables

Table 15-04.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	1.3	1.5	2.6	-	-	-
1999	4.0	5.5	1.0	-	-	0.2
2004	8.1	4.9	0.4	9.8	6.9	0.7
2009	14.2	4.9	0.4	17.9	6.3	0.2
2014	16.2	1.2	0.0	14.1	0.4	-
2019	13.9	0.6	-	18.0	0.5	-

Table 15-04.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	27	344	118	129	0.3	21.9	1.0	7.1
1999	63	354	129	116	0.6	21.7	1.2	5.2
2004	64	287	318	93	0.4	11.3	3.4	2.6
2009	27	310	81	102	0.2	16.1	0.3	4.5
2014	24	293	50	88	0.2	14.0	0.2	2.0
2019	44	338	278	118	0.8	20.3	3.3	4.4

Table 15-04.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	10.6	0.0	21.9	3.2	13.0	38.9
1999	18.0	0.0	28.6	6.5	18.2	38.1
2004	28.2	-	33.0	6.5	14.2	32.5
2009	14.6	0.1	48.6	7.6	14.7	38.9
2014	21.2	0.2	45.8	6.5	15.7	32.0
2019	18.0	0.1	43.9	7.9	16.3	38.5

Table 15-04.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle/Bison	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1994	12	6	-	31
1999	22	4	-	39
2004	11	2	-	15
2009	8	22	4	19
2014	-	12	1	3
2019	8	27	1	12
Year	Days Use Per Acre (ha)			
1994	-	-	-	-
1999	43.6 (107.6)	13.4 (33.1)	-	-
2004	50.1 (123.7)	5.3 (13.2)	-	-
2009	18.1 (44.8)	52.3 (129.1)	4.0 (9.9)	-
2014	26.8 (66.3)	23.4 (57.9)	1.3 (3.3)	-
2019	18.1 (44.8)	40.9 (101.0)	-	-

Table 15-04.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum[i] (crested wheatgrass)	Bromus tectorum[ai] (cheatgrass)	Elymus elymoides (squirreltail)	Pascopyrum smithii (western wheatgrass)	Poa fendleriana (muttongrass)
year	Nested Frequency				
1994	343	27	4	-	1
1999	350	63	-	14	2
2004	285	64	3	8	-
2009	308	27	-	13	4
2014	293	24	3	4	4
2019	331	44	11	10	5
year	Average Cover (%)				
1994	21.9	0.3	0.0	-	0.0
1999	20.8	0.6	-	0.8	0.1
2004	11.2	0.4	0.1	0.1	-
2009	15.7	0.2	-	0.3	0.0
2014	13.9	0.2	0.0	0.0	0.0
2019	19.9	0.8	0.3	0.0	0.1

a - Annual; n - Noxious Weed; i - Introduced Species

Table 15-04.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Alyssum desertorum[ai] (desert madwort)	Arabis (rockcress)	Artemisia ludoviciana (white sagebrush)	Astragalus argophyllus var. stocksii (silverleaf milkvetch)	Astragalus miser (timber milkvetch)	Capsella bursa-pastoris[ai] (shepherd's purse)	Ceratocephala testiculata[ai] (curveseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Chenopodium album[a] (lambsquarters)	Cryptantha (cryptantha)	Descurainia pinnata[a] (western tansymustard)	Erigeron (fleabane)	Erigeron eatonii (Eaton's fleabane)	Eriogonum racemosum (redroot buckwheat)	Gayophytum ramosissimum[a] (pinyon groundsmoke)	Lactuca serriola[ai] (prickly lettuce)	Lappula occidentalis[a] (flatspine stickseed)
year	Nested Frequency																
1994	-	-	1	5	-	-	-	-	3	2	35	-	-	-	-	-	-
1999	-	2	7	6	-	3	-	2	-	-	11	1	-	-	-	-	70
2004	-	-	5	3	-	-	5	3	-	-	19	-	-	2	10	-	173
2009	-	4	7	5	-	-	1	6	-	-	-	-	0	-	1	-	20
2014	-	-	3	6	-	-	2	1	-	-	12	-	-	1	-	-	41
2019	5	2	4	28	0	-	20	3	25	3	22	-	-	3	54	3	73
year	Average Cover (%)																
1994	-	-	0.0	0.0	-	-	-	-	0.0	0.0	0.1	-	-	-	-	-	-
1999	-	0.0	0.1	0.0	-	0.0	-	0.0	-	-	0.0	0.0	-	-	-	-	0.4
2004	-	-	0.0	0.1	-	-	0.0	0.0	-	-	0.0	-	-	0.0	0.1	-	1.6
2009	-	0.0	0.0	0.0	-	-	0.0	0.0	-	-	-	-	0.0	-	0.0	-	0.1
2014	-	-	0.0	0.0	-	-	0.0	0.0	-	-	0.0	-	-	0.0	-	-	0.1
2019	0.0	0.0	0.0	0.0	0.0	-	0.3	0.0	0.1	0.0	0.1	-	-	0.0	0.6	0.1	0.5

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Lesquerella kingii[a] (King bladderpod)	Lomatium (desertparsley)	Machaeranthera canescens (hoary tansyaster)	Malcolmia africana[ai] (African mustard)	Medicago sativa[i] (alfalfa)	Microsteris gracilis[a] (slender phlox)	Pedicularis centranthera (dwarf lousewort)	Penstemon (beardtongue)	Phlox longifolia (longleaf phlox)	Polygonum douglasii[a] (Douglas' knotweed)	Sisymbrium altissimum[ai] (tall tumblemustard)	Sphaeralcea coccinea (scarlet globemallow)	Taraxacum officinale (common dandelion)	Tetraneuris acaulis (stemless four-nerve daisy)
year	Nested Frequency													
1994	55	19	-	-	80	-	-	-	13	60	-	20	3	3
1999	45	-	6	4	77	-	-	-	-	44	2	19	23	2
2004	-	3	10	10	55	2	-	-	10	280	-	13	-	-
2009	7	5	3	-	59	-	-	-	5	62	-	21	1	-
2014	-	10	-	-	56	-	2	-	17	-	-	11	-	-
2019	6	32	-	1	48	4	4	1	8	235	-	15	3	-
year	Average Cover (%)													
1994	0.4	0.4	-	-	6.5	-	-	-	0.0	0.5	-	0.1	0.0	0.0
1999	0.3	-	0.2	0.4	4.4	-	-	-	-	0.1	0.0	0.1	0.4	0.0
2004	-	0.0	0.2	0.3	1.9	0.0	-	-	0.1	1.4	-	0.3	-	-
2009	0.0	0.0	0.0	-	3.9	-	-	-	0.0	0.2	-	0.4	0.0	-
2014	-	0.1	-	-	1.8	-	0.0	-	0.0	-	-	0.1	-	-
2019	0.0	0.4	-	0.0	3.4	0.0	0.2	0.0	0.0	1.5	-	0.2	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 15-04.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis[p] (Utah serviceberry)	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Cercocarpus montanus[p] (alderleaf mountain mahogany)	Ericameria nauseosa ssp. nauseosa var. glabrata (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma[t] (Utah juniper)	Pinus edulis[t] (twoneedle pinyon)	Ribes cereum var. cereum[p] (wax currant)	Rosa woodsii[p] (Woods' rose)	Symphoricarpos oreophilus[p] (mountain snowberry)
year	Line Intercept Cover (%)									
1994	-	-	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-	-	-
2004	-	9.6	0.2	6.9	-	0.1	0.6	-	-	-
2009	-	17.9	-	6.3	-	-	0.2	-	-	0
2014	0.3	13.5	-	0.4	-	-	-	-	-	0.3
2019	-	15.5	0.3	0.4	0.1	-	-	-	-	2.2
year	Quadrat Cover (%)									
1994	-	1.3	-	1.5	-	0.8	1.7	0.0	-	-
1999	-	3.9	-	5.5	-	0.1	0.8	-	-	0.2
2004	-	7.9	0.0	4.9	-	0.4	0.0	-	-	0.1
2009	-	13.3	-	4.9	-	-	0.4	-	-	0.8
2014	0.0	16.1	-	1.2	-	0.0	-	-	-	0.2
2019	-	12.8	0.0	0.6	0.0	-	-	-	0.0	1.1

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 15-04.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
1994	40	100	0	100	0	0	100	0	87/140
1999	20	-	0	100	0	0	100	0	54/90
2004	40	-	0	100	0	0	100	0	100/146
2009	60	-	0	67	33	0	100	33	106/139
2014	60	-	0	100	0	0	100	0	100/146
2019	20	180	100	0	0	0	0	0	111/150
Artemisia nova[p] -- (black sagebrush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	35/60
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1994	160	6120	38	63	0	0	0	0	45/71
1999	2740	4560	39	61	0	9	0	7	35/55
2004	5400	30460	19	81	0	27	31	0	34/58
2009	18720	12880	70	30	0	23	1	0	30/53
2014	10040	120	37	63	1	47	43	0	31/58
2019	7060	260	29	66	5	22	48	9	35/61

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Cercocarpus montanus[p] -- (alderleaf mountain mahogany)									
1994	-	-	-	-	-	-	-	-	24/55
1999	20	-	0	100	0	0	100	0	24/69
2004	20	-	0	100	0	0	100	0	56/83
2009	-	-	-	-	-	-	-	-	74/76
2014	-	-	-	-	-	-	-	-	34/63
2019	20	-	0	100	0	0	100	100	37/64
Chrysothamnus depressus[p] -- (longflower rabbitbrush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	20	-	0	100	0	0	0	0	- / -
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Ericameria nauseosa ssp. nauseosa var. glabrata -- (rubber rabbitbrush)									
1994	1340	3880	57	40	3	22	5	6	60/65
1999	3220	1000	58	40	2	26	4	4	63/70
2004	1940	6120	12	78	9	0	1	0	65/70
2009	1480	20	20	53	27	1	19	18	68/66
2014	700	-	20	54	26	23	34	60	60/66
2019	500	-	12	76	12	20	4	12	59/71
Gutierrezia sarothrae -- (broom snakeweed)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	300	20	40	60	0	0	0	0	14/24
Juniperus osteosperma[t] -- (Utah juniper)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	- / -
2004	20	20	0	0	100	0	0	100	- / -
2009	-	-	-	-	-	-	-	-	-/-
2014	20	20	100	0	0	0	0	0	- / -
2019	20	-	100	0	0	0	0	0	- / -
Opuntia -- (pricklypear)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	13/34
2014	-	-	-	-	-	-	-	-	15/25
2019	-	-	-	-	-	-	-	-	-/-
Pediocactus simpsonii -- (mountain ball cactus)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	2/15
2019	80	-	0	100	0	0	0	0	4/5

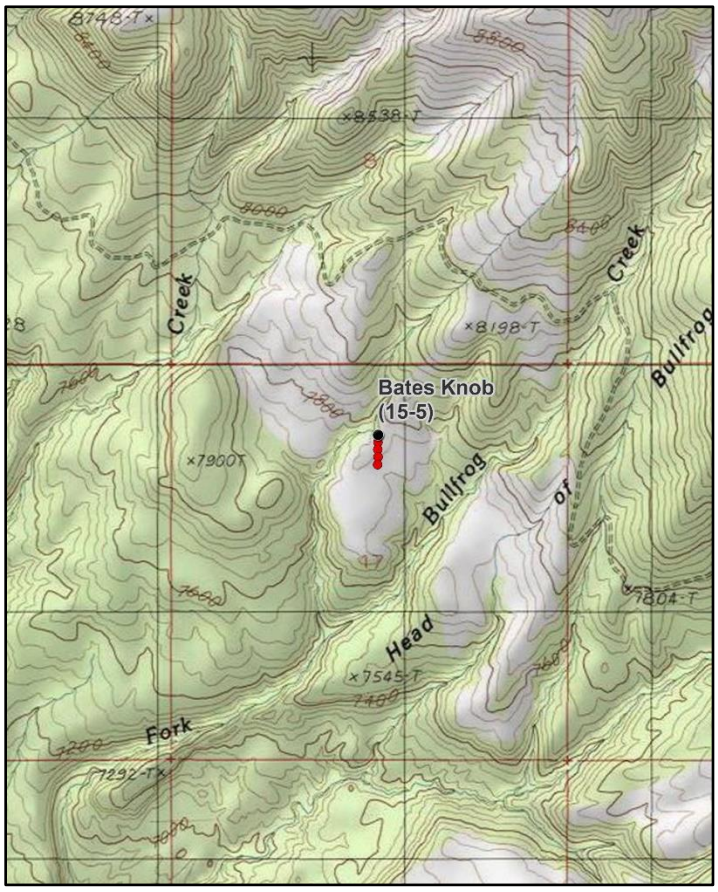
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Pinus edulis[t] -- (twoneedle pinyon)									
1994	-	-	-	-	-	-	-	-	-/-
1999	60	-	33	67	0	0	0	0	- / -
2004	20	20	0	100	0	0	0	0	- / -
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Ribes[p] -- (currant)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	99/104
2019	-	-	-	-	-	-	-	-	144/194
Ribes cereum var. cereum[p] -- (wax currant)									
1994	-	20	0	0	0	0	0	0	- / -
1999	-	-	-	-	-	-	-	-	172/173
2004	-	-	-	-	-	-	-	-	158/187
2009	20	-	100	0	0	0	0	0	64/60
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Rosa woodsii[p] -- (Woods' rose)									
1994	-	-	-	-	-	-	-	-	34/22
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	93/47
2009	-	-	-	-	-	-	-	-	74/57
2014	-	-	-	-	-	-	-	-	-/-
2019	60	-	67	33	0	0	0	0	66/81
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
1994	40	-	100	0	0	0	0	0	36/65
1999	40	-	50	50	0	0	0	0	33/54
2004	100	-	60	40	0	0	0	0	41/67
2009	160	-	0	100	0	0	0	0	49/68
2014	140	-	0	100	0	29	0	0	53/100
2019	80	-	0	100	0	0	0	0	68/141

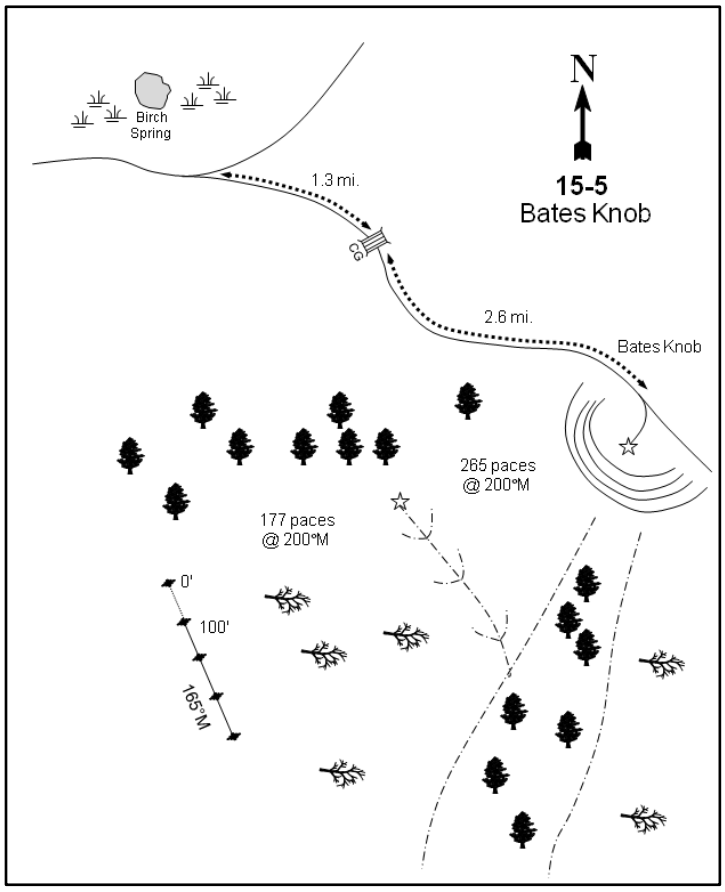
t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 15-04.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1999	15	-	-	-	-	-	15.6
2014	5	-	100	-	-	-	3.0
2019	24	22	78	-	-	-	3.3
Pinus edulis (twoneedle pinyon)							
1999	42	-	-	-	-	-	12.7
2014	14	-	75	13	-	13	4.0
2019	12	13	50	25	-	13	5.5

BATES KNOB - STUDY NO. 15-5





Location Information	
USGS 7.5 min Map Info	Mount Ellen SW; Township 32S, Range 10E, Section 17
GPS (0' Stake)	NAD 83 UTM ZONE 12, 514835 East 4208910 North

Transect Information	
Browse Tag # (0' Stake)	7124
Transect Bearing	175° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

From Birch Spring (see transect #15-04), continue southwest on the main road for 1.3 miles to a cattle guard. From the cattle guard, go 2.6 miles to a minor road which forks off to the right and goes up on top of a small hill (Bates Knob) overlooking a chaining. From the hilltop, walk down through a chained strip, over a small wash, and through the chaining to the baseline stake about 600 (265 paces) yards at a bearing of 220 degrees magnetic. The transect is marked by 1 1/2-foot tall fence posts. The first baseline stake has a red browse tag, #7124, attached.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	PENNELL
Elevation	7,700ft (2,347m)
Aspect	South
Slope	7%
Sample Dates	06/02/1994, 06/07/1999, 06/08/2004, 06/03/2009, 06/02/2014, 06/04/2019

Table 15-05.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Seeding - Dribbler	South Creek Seeding	LTDL	Fall 1968-Spring 1969	500
Chaining - Chain Unknown	South Creek Seeding	LTDL	Fall 1968-Spring 1969	500
Seeding - Aerial After	South Creek Seeding	LTDL	May 1969	500
Hand Crew - Lop and Scatter	Airplane Springs Fuels Project	1123	June-July 2008	1464

Table 15-05.2 SeedMix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
South Creek Seeding-Dribbler			Dribbler	May 1969	500
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
S	Atriplex canescens	Fourwing Saltbush		0.60	0.00
S	Purshia tridentata	Bitterbrush		0.30	0.00

Wildlife Habitat and Vegetation History

Table 15-05.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
American Bison	crucial	year-long
Mule Deer	substantial	winter
Rocky Mountain Elk	substantial	year-long

Table 15-05.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1987	Perennial Grass	Phase I
1994	Perennial Grass/Rubber Rabbitbrush	Phase I
1999	Perennial Grass/Rubber Rabbitbrush	Phase I
2003	Mountain Big Sagebrush/Rubber Rabbitbrush	Phase I
2009	Mountain Big Sagebrush/Rubber Rabbitbrush	Phase I
2014	Mountain Big Sagebrush/Rubber Rabbitbrush	Phase I
2019	Mountain Big Sagebrush/Rubber Rabbitbrush	Phase I

Site Notes

Bison were observed near or on the site during the 1987, 1999, and 2009 samplings. Pellet group data for bison and cattle were combined due to the difficulty in differentiating between the species. Water is available seasonally in Buck Canyon.

Soils

Table 15-05.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	7.0	46.0	25.4	28.6	2.8	16.9	121.6	0.7	06/07/1999

Site Potential

1981 - 2010 Average Annual Precipitation	20 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XB430UT
States and Transitions	No state and transition model is available for this ecological site.

At the time of establishment in 1987, this site was in an introduced perennial grass-dominated ecological state. The site then transitioned into a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and rubber rabbitbrush (*Ericameria nauseosa* ssp. *nauseosa* var. *glabrata*) site. Most recently, the site has transitioned into primarily a mountain big sagebrush site with rubber rabbitbrush decreasing in cover and density (Table 15-05.12). The herbaceous understory has been composed of perennial grasses that have provided good cover through the years. In addition, a sparse but moderately diverse component of forbs has also

been present (Table 15-05.7, Table 15-05.10, Table 15-05.11). Trees have been observed on the site in all years, with a lop and scatter treatment occurring in 2008 (Table 15-05.1, Table 15-05.6, Table 15-05.14). Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) are the tree species present and it is likely that there will be infill occurring as time since treatment passes (Table 15-05.12, Table 15-05.13, Table 15-05.14).

Trend Summary Tables

Table 15-05.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	1.8	5.8	1.8	-	-	-
1999	3.6	8.3	2.1	-	-	0.1
2004	5.5	12.2	3.9	8.0	15.1	3.6
2009	7.9	9.1	-	12.5	10.0	-
2014	15.3	2.6	0.0	13.6	1.5	-
2019	21.8	0.9	0.0	24.2	0.8	-

Table 15-05.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	45	296	186	61	0.7	10.4	1.7	2.3
1999	126	318	84	80	2.2	11.9	0.5	1.7
2004	17	217	97	56	0.1	5.9	0.6	2.5
2009	-	251	33	40	-	8.1	0.1	1.1
2014	5	235	30	35	0.0	11.1	0.1	0.4
2019	4	259	85	53	0.0	9.1	0.4	0.8

Table 15-05.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	18.5	-	39.2	0.7	5.7	25.2
1999	19.0	0.2	47.5	1.6	7.4	27.8
2004	29.6	0.0	41.7	3.0	8.5	30.4
2009	22.4	0.0	53.4	3.0	9.0	25.2
2014	23.3	0.0	51.9	4.4	8.4	29.4
2019	25.0	0.0	51.0	6.6	11.1	30.6

Table 15-05.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle/Bison	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1994	14	3	-	14
1999	10	8	-	20
2004	8	4	-	11
2009	4	10	-	36
2014	1	9	-	8
2019	2	12	-	7
Year	Days Use Per Acre (ha)			
1994	-	-	-	-
1999	64.6 (159.6)	2.7 (6.6)	-	-
2004	25.4 (62.8)	7.4 (18.2)	-	-
2009	8.0 (19.7)	14.7 (36.4)	-	-
2014	2.2 (5.4)	9.4 (23.2)	6.7 (16.6)	-
2019	17.4 (43.0)	26.8 (66.2)	-	-

Table 15-05.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum[i] (crested wheatgrass)	Bouteloua gracilis (blue grama)	Bromus tectorum[ai] (cheatgrass)	Elymus elymoides (squirreltail)	Sporobolus cryptandrus (sand dropseed)
year	Nested Frequency				
1994	289	1	45	8	1
1999	314	2	126	6	2
2004	214	-	17	5	-
2009	250	5	-	-	1
2014	228	6	5	8	-
2019	251	3	4	23	-
year	Average Cover (%)				
1994	10.3	0.0	0.7	0.0	0.0
1999	11.9	0.0	2.2	0.0	0.0
2004	5.9	-	0.1	0.0	-
2009	8.0	0.0	-	-	0.0
2014	10.5	0.0	0.0	0.5	-
2019	9.0	0.0	0.0	0.1	-

a - Annual; n - Noxious Weed; i - Introduced Species

Table 15-05.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Arabis (rockcress)	Artemisia carruthii (Carruth's sagewort)	Artemisia ludoviciana (white sagebrush)	Astragalus (milkvetch)	Astragalus amphioxys (Crescent milkvetch)	Astragalus lentiginosus (freckled milkvetch)	Astragalus utahensis (Utah milkvetch)	Chaenactis douglasii (Douglas' dustymaiden)	Chenopodium album[a] (lambsquarters)	Chenopodium fremontii[a] (Fremont's goosefoot)	Collinsia parviflora[a] (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)	Cymopterus purpureus (purple springparsley)	Descurainia pinnata[a] (western tansymustard)	Eriogonum alatum (winged buckwheat)	Gayophytum ramosissimum[a] (pinyon groundsmoke)	Lappula occidentalis[a] (flatspine stickseed)
year	Nested Frequency																
1994	3	-	2	5	-	-	5	1	11	-	-	-	2	50	-	20	98
1999	4	8	-	2	-	-	1	3	-	-	-	-	-	25	-	1	17
2004	-	3	0	5	-	-	7	-	-	17	-	-	-	8	-	54	40
2009	-	5	-	6	-	-	2	-	3	-	-	-	-	1	3	-	1
2014	-	-	-	-	7	2	-	1	-	-	-	6	-	5	2	-	21
2019	4	-	3	-	14	4	-	7	12	7	1	-	-	26	-	6	36
year	Average Cover (%)																
1994	0.0	-	0.0	0.0	-	-	0.0	0.0	0.0	-	-	-	0.0	0.3	-	0.0	0.8
1999	0.0	0.1	-	0.0	-	-	0.0	0.0	-	-	-	-	-	0.1	-	0.0	0.0
2004	-	0.2	0.0	0.0	-	-	0.0	-	-	0.1	-	-	-	0.0	-	0.2	0.2
2009	-	0.4	-	0.0	-	-	0.0	-	0.0	-	-	-	-	0.0	0.0	-	0.0
2014	-	-	-	-	0.0	0.0	-	0.0	-	-	-	0.0	-	0.0	0.0	-	0.1
2019	0.0	-	0.0	-	0.2	0.0	-	0.0	0.1	0.0	0.0	-	-	0.1	-	0.0	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Lesquerella kingii[a] (King bladderpod)	Machaeranthera canescens (hoary tansyaster)	Medicago sativa[i] (alfalfa)	Packera multilobata (lobeleaf groundsel)	Pedicularis centranthera (dwarf lousewort)	Penstemon (beardtongue)	Petradoria pumila (rock goldenrod)	Phlox longifolia (longleaf phlox)	Polygonum douglasii[a] (Douglas' knotweed)	Sisymbrium altissimum[ai] (tall tumblemustard)	Symphyotrichum (aster)	Tetraneuris acaulis (stemless four-nerve daisy)	Tragopogon dubius[ai] (yellow salsify)
year	Nested Frequency												
1994	28	8	31	3	-	-	-	2	53	23	1	-	1
1999	46	2	54	-	-	3	6	5	1	7	-	-	-
2004	-	0	31	2	-	3	-	7	15	3	-	2	3
2009	12	4	26	1	-	-	-	-	19	-	-	-	-
2014	5	3	12	-	2	-	-	-	-	-	-	-	-
2019	4	-	2	5	1	-	4	14	17	-	-	-	2
year	Average Cover (%)												
1994	0.1	0.0	2.1	0.0	-	-	-	0.0	0.3	0.2	0.0	-	0.0
1999	0.3	0.0	1.5	-	-	0.0	0.1	0.0	0.0	0.0	-	-	-
2004	-	0.0	2.1	0.0	-	0.1	-	0.1	0.0	0.0	-	0.0	0.0
2009	0.1	0.0	0.6	0.0	-	-	-	-	0.0	-	-	-	-
2014	0.0	0.0	0.2	-	0.1	-	-	-	-	-	-	-	-
2019	0.0	-	0.4	0.0	0.0	-	0.1	0.1	0.0	-	-	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 15-05.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia carruthii (Carruth's sagewort)	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Atriplex canescens[p] (fourwing saltbush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. glabrata (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma[t] (Utah juniper)	Pinus edulis[t] (twoneedle pinyon)
year	Line Intercept Cover (%)							
1994	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-
2004	0.2	8	-	-	14.7	0.2	-	3.6
2009	0	12.5	-	-	8	2	-	-
2014	-	13.6	-	-	1.2	0.3	-	-
2019	-	24.2	-	-	0.7	0.1	-	-
year	Quadrat Cover (%)							
1994	-	1.8	-	0.2	5.6	0.0	-	1.8
1999	-	3.6	-	-	7.6	0.6	0.4	1.8
2004	0.0	5.5	-	-	11.5	0.7	0.4	3.5
2009	0.0	7.8	0.1	-	8.2	1.0	-	-
2014	-	15.3	-	-	2.3	0.4	0.0	-
2019	-	21.8	-	0.3	0.5	0.1	0.0	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 15-05.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	119/59
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	122/124
2019	-	-	-	-	-	-	-	-	142/190
Artemisia carruthii -- (Carruth's sagewort)									
1994	740	20	11	89	0	0	0	0	13/23
1999	860	260	77	21	2	0	0	2	6/7
2004	240	-	17	83	0	0	0	0	17/20
2009	440	-	14	86	0	0	0	0	4/4
2014	20	-	0	100	0	0	0	0	10/8
2019	-	-	-	-	-	-	-	-	-/-
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1994	1780	4480	66	34	0	0	0	0	32/48
1999	4740	220	48	50	2	42	2	0	23/47
2004	3360	3580	11	85	4	30	6	1	45/71
2009	5860	140	16	83	1	0	3	0	35/58
2014	4520	60	22	76	3	34	40	4	43/68
2019	4180	200	4	87	9	28	50	10	44/75
Atriplex canescens[p] -- (fourwing saltbush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	40	-	50	50	0	0	0	0	25/30
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1994	80	440	0	100	0	0	0	0	12/15
1999	20	-	0	100	0	0	0	0	14/25
2004	-	-	-	-	-	-	-	-	34/47
2009	-	-	-	-	-	-	-	-	-/-
2014	40	-	0	100	0	0	0	0	25/31
2019	40	20	0	100	0	0	0	0	19/37
Ericameria nauseosa ssp. nauseosa var. glabrata -- (rubber rabbitbrush)									
1994	6060	20320	53	40	7	15	0	9	56/71
1999	5820	80	22	74	5	47	13	1	61/67
2004	3460	14940	13	81	6	3	0	2	70/89
2009	2680	-	3	63	34	15	5	27	65/73
2014	940	-	15	43	43	6	4	30	58/68
2019	280	-	0	57	43	21	14	43	62/68
Escobaria vivipara var. arizonica -- (Arizona spinystar)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	10/17
2019	-	-	-	-	-	-	-	-	8/11

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Gutierrezia sarothrae -- (broom snakeweed)									
1994	400	20	45	55	0	10	0	0	84/130
1999	1620	80	11	85	4	0	0	3	17/22
2004	960	60	4	88	8	10	0	8	22/26
2009	1900	120	7	93	0	0	0	0	22/23
2014	900	140	31	67	2	7	0	9	14/16
2019	720	60	8	78	14	6	0	14	13/16
Juniperus osteosperma[t] -- (Utah juniper)									
1994	-	-	-	-	-	-	-	-	-/-
1999	20	-	100	0	0	0	0	0	- / -
2004	-	-	-	-	-	-	-	-	-/-
2009	20	-	100	0	0	0	0	0	- / -
2014	40	20	100	0	0	0	0	0	- / -
2019	60	-	33	67	0	0	0	67	- / -
Opuntia -- (pricklypear)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	22/83
2009	-	-	-	-	-	-	-	-	19/23
2014	20	-	0	100	0	0	0	0	13/43
2019	20	-	0	100	0	0	0	0	16/54
Pinus edulis[t] -- (twoneedle pinyon)									
1994	-	-	-	-	-	-	-	-	-/-
1999	80	-	0	100	0	0	0	0	- / -
2004	140	-	29	71	0	0	0	0	- / -
2009	20	-	0	100	0	0	0	0	- / -
2014	20	-	100	0	0	0	0	0	- / -
2019	-	-	-	-	-	-	-	-	-/-
Sambucus nigra ssp. cerulea[p] -- (blue elderberry)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	134/202
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	145/207
2019	-	-	-	-	-	-	-	-	83/82
Shepherdia -- (buffaloberry)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	263/275
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	154/241
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	38/64

t - Tree Species; p - Preferred Browse; i - Introduced Species

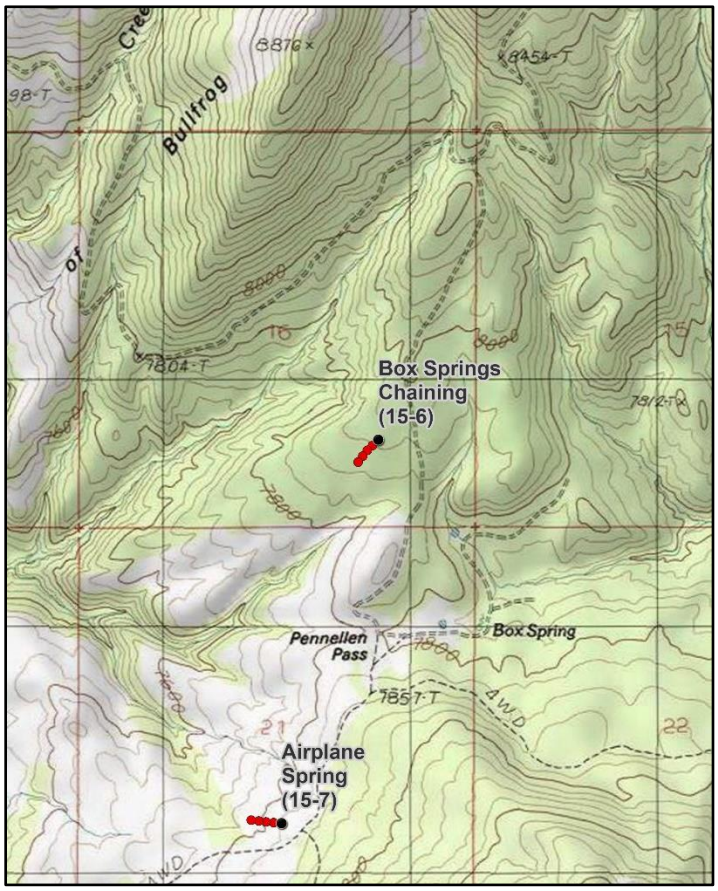
Table 15-05.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

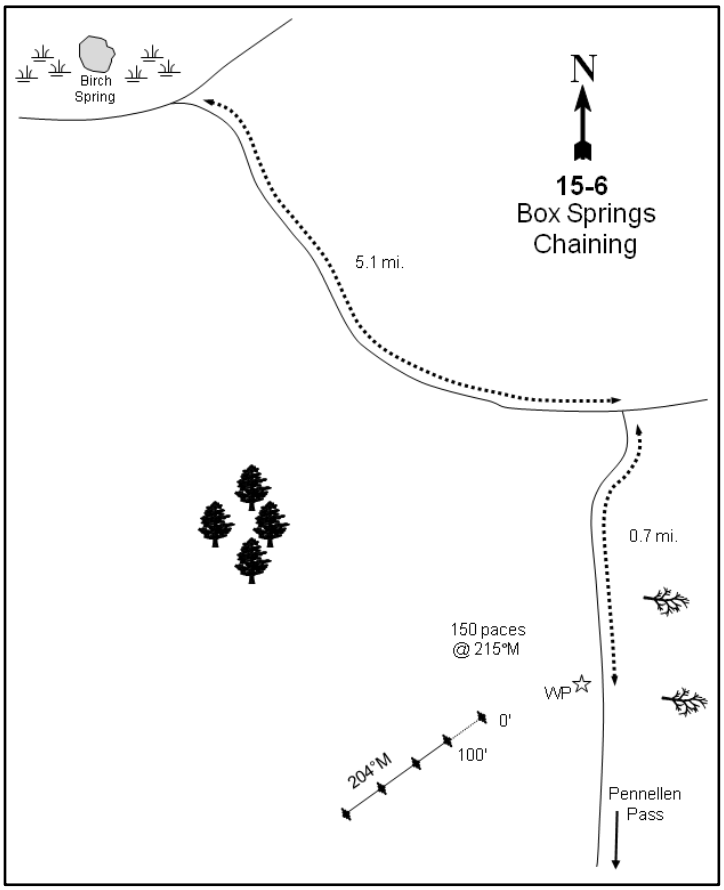
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1994	2	-	-	-	-	-	11.5
1999	22	-	-	-	-	-	11.2
2004	23	-	42	42	17	-	14.2
2009	8	17	50	33	-	-	9.8
2014	8	-	-	100	-	-	9.5
2019	15	13	50	38	-	-	6.1
Pinus edulis (twoneedle pinyon)							
1994	12	-	-	-	-	-	6.3
1999	30	-	-	-	-	-	7.9
2004	28	-	36	55	9	-	10.7
2009	4	-	100	-	-	-	7.0
2014	3	-	100	-	-	-	4.5
2019	11	14	86	-	-	-	2.3

Table 15-05.15 - Deer Desirable Components Index: High Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1994	2.2	0.0	0.0	20.8	-0.5	4.6	0.0	27.1	Very Poor
1999	4.5	0.0	0.0	23.9	-1.7	3.4	0.0	30.1	Very Poor
2004	10.0	13.7	5.4	11.8	0.0	5.0	0.0	45.9	Poor
2009	15.6	14.6	8.0	16.2	0.0	2.2	0.0	56.5	Poor-Fair
2014	17.0	14.2	10.9	22.2	0.0	0.7	0.0	64.9	Fair
2019	30.0	12.3	1.9	18.2	0.0	1.7	0.0	64.0	Fair

BOX SPRINGS CHAINING - STUDY NO. 15-6





Location Information

USGS 7.5 min Map Info	Mount Ellen SE; Township 32S, Range 10E, Section 16
GPS (0' Stake)	NAD 83 UTM ZONE 12, 516816 East 4207948 North

Transect Information

Browse Tag # (0' Stake)	7134
Transect Bearing	204° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

From Birch Spring, proceed southeast for 5.1 miles to a major intersection. Turn right (south) towards Pennellen Pass, then go 0.7 miles. A witness post on the right (west) side of the road marks the transect location in the chaining. The 0-foot baseline stake, a 2-foot tall fence post, is approximately 150 yards from the road and is marked by a red browse tag, #7134. This study runs approximately southwest.

Site Information

Land Ownership	State
Land Administrator	SITLA
Allotment	PENNELL
Elevation	7,900ft (2,408m)
Aspect	Southwest
Slope	5-9%
Sample Dates	06/03/1994, 05/20/1999, 06/08/2004, 06/02/2009, 06/04/2014, 09/12/2019

Table 15-06.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Seeding - Dribbler	Box Springs Chain and Seed	LTDL	August 1984-March 1985	2200
Chaining - Chain Unknown	Box Springs Chain and Seed	LTDL	August 1984-March 1985	2200
Seeding - Seed Unknown	Box Springs Chain and Seed	LTDL	August 1984-March 1985	2200
Hand Crew - Lop and Scatter	Bullfrog Creek Chaining Maint. Phase I	339	June-November 2008	164

Table 15-06.2 SeedMix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Box Spring Seeding			Aerial	Mar 1985	400
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Agropyron cristatum	Crested Wheatgrass		2.00	0.00
G	Thinopyrum intermedium	Intermediate Wheatgrass		3.00	0.00
F	Astragalus cicer	Cicer Milkvetch		0.10	0.00
F	Medicago sativa	Alfalfa		0.30	0.00
F	Melilotus officinalis	Yellow Sweetclover		0.50	0.00
F	Onobrychis viciifolia	Sainfoin		0.50	0.00

Mix Name			Application Type	Application Date	Acres
Box Spring Seeding-Dribbler			Dribbler	Mar 1985	400
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
S	Purshia tridentata	Bitterbrush		0.30	0.00

Wildlife Habitat and Vegetation History

Table 15-06.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
American Bison	crucial	year-long
Mule Deer	substantial	winter
Rocky Mountain Elk	substantial	year-long

Table 15-06.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1987	Perennial Grass	Phase I
1994	Perennial Grass	Phase I
1999	Perennial Grass/Pinyon-Juniper	Phase I transitioning to Phase II
2004	Perennial Grass/Pinyon-Juniper	Phase I transitioning to Phase II
2009	Perennial Grass	Phase I
2014	Perennial Grass	Phase I
2019	Mountain Big Sagebrush/Perennial Grass	Phase I

Site Notes

This site was chained in 1984 prior to study establishment. It was noted that prior to the chaining, the area supported a dense stand of tall, mature twoneedle pinyon (*Pinus edulis*) with a small number of Utah juniper (*Juniperus osteosperma*) trees present. Water is available for livestock and wildlife at Box Springs, which is located about a quarter of a mile southeast of the study. Pellet data for bison and cattle were combined due to difficulties in distinguishing between species.

Soils

Table 15-06.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	7.3	48.0	23.4	28.6	3.7	13.1	137.6	1.0	05/20/1999

Site Potential

1981 - 2010 Average Annual Precipitation	21 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	047XB430UT
States and Transitions	No state and transition model is available for this ecological site.

At the time of study establishment in 1987, the plant community on this site was mostly composed of introduced perennial grasses. By 1999, young twoneedle pinyon (*Pinus edulis*) and juniper (*Juniperus osteosperma*) trees had infilled the site and became a much more significant part of the community. However, a lop and scatter treatment in 2008 removed many of these trees (Table 15-06.1, Table 15-06.6, Table 15-06.12, Table 15-06.14). The herbaceous understory has been primarily composed of introduced and native perennial grasses, with crested wheatgrass (*Agropyron cristatum*), Idaho fescue (*Festuca idahoensis*), and intermediate wheatgrass (*Thinopyrum intermedium*) as the dominant grass species (Table 15-06.7, Table 15-06.10). Forbs have remained rare and have provided little cover (Table 15-06.11) Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has exhibited steady increases over time and became a significant component of the plant community in 2019 (Table 15-06.6, Table 15-06.12, Table 15-06.13). This site will likely continue in the current state barring a major disturbance. However, treatments would be advisable if tree infill occurs in future years.

Trend Summary Tables

Table 15-06.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	0.3	0.2	3.2	-	-	-
1999	1.8	0.1	3.6	-	-	-
2004	2.9	0.3	6.9	3.0	0.4	10.0
2009	3.0	0.0	-	3.6	-	-
2014	6.0	1.0	0.2	6.7	0.6	0.4
2019	6.8	3.0	1.2	10.7	2.6	5.3

Table 15-06.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	-	381	12	34	-	20.0	0.0	0.5
1999	-	389	40	19	-	23.3	0.2	0.2
2004	-	349	4	2	-	20.6	0.0	0.0
2009	-	333	15	6	-	18.8	0.0	0.0
2014	-	383	-	4	-	31.3	-	0.1
2019	-	384	8	7	-	26.5	0.0	0.2

Table 15-06.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	11.3	-	50.0	1.0	5.5	26.1
1999	10.2	0.0	59.4	6.6	5.5	32.0
2004	19.3	-	48.2	5.8	5.8	31.9
2009	16.1	0.0	60.6	6.6	4.6	25.1
2014	10.5	0.0	52.6	4.2	4.8	37.5
2019	18.4	0.1	55.6	7.5	7.3	33.6

Table 15-06.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle/Bison	Mule Deer	Rabbit
	Quadrat Frequency		
1994	7	1	6
1999	10	12	34
2004	4	3	15
2009	8	20	32
2014	3	3	4
2019	11	11	9
Year	Days Use Per Acre (ha)		
1994	-	-	-
1999	53.7 (132.7)	5.3 (13.2)	-
2004	23.2 (57.4)	6.7 (16.6)	-
2009	35.6 (87.9)	16.1 (39.7)	-
2014	5.1 (12.6)	8.1 (19.9)	-
2019	14.5 (35.9)	22.8 (56.3)	-

Table 15-06.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bromus inermis[i] (smooth brome)	Dactylis glomerata[i] (orchardgrass)	Elymus elymoides (squirreltail)	Festuca idahoensis (Idaho fescue)	Leymus cinereus (basin wildrye)	Thinopyrum intermedium[i] (intermediate wheatgrass)
year	Nested Frequency							
1994	-	205	102	20	-	101	6	249
1999	-	203	111	11	2	156	7	231
2004	-	226	38	3	-	135	8	183
2009	-	203	17	9	1	140	18	133
2014	-	205	44	1	-	168	5	206
2019	3	237	34	2	2	177	5	126
year	Average Cover (%)							
1994	-	6.3	2.3	0.8	-	2.9	0.2	7.6
1999	-	6.6	3.0	0.1	0.0	6.5	0.3	6.8
2004	-	10.5	0.7	0.2	-	4.2	0.2	4.8
2009	-	9.0	0.4	0.5	0.0	6.1	0.4	2.5
2014	-	12.2	0.9	0.0	-	11.4	0.5	6.2
2019	0.2	12.2	0.7	0.1	0.0	9.6	0.4	3.3

a - Annual; n - Noxious Weed; i - Introduced Species

Table 15-06.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Arabis (rockcress)	Astragalus (milkvetch)	Astragalus cicer[i] (chickpea milkvetch)	Chaenactis douglasii (Douglas' dustymaiden)	Descurainia pinnata[a] (western tansymustard)	Ipomopsis aggregata (scarlet gilia)	Lappula occidentalis[a] (flatspine stickseed)	Lesquerella (bladderpod)	Lesquerella kingii[a] (King bladderpod)	Machaeranthera canescens (hoary tansyaster)	Medicago sativa[i] (alfalfa)	Onobrychis viciifolia[i] (sainfoin)	Packera multilobata (lobeleaf groundsel)	Polygonum douglasii[a] (Douglas' knotweed)	Sanguisorba minor[i] (small burnet)	Symphyotrichum (aster)	Tetraneuris acaulis (stemless four-nerve daisy)
year	Nested Frequency																
1994	8	-	7	6	-	-	2	-	8	3	1	5	-	2	3	3	1
1999	4	-	6	3	3	3	-	-	37	3	1	-	-	-	1	-	1
2004	1	-	1	-	-	-	-	-	-	-	-	-	-	4	-	-	-
2009	-	-	-	-	-	0	-	-	14	-	-	-	3	-	-	3	-
2014	-	2	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-
2019	-	1	-	1	-	3	-	-	4	-	-	-	5	4	-	-	-
year	Average Cover (%)																
1994	0.0	-	0.0	0.0	-	-	0.0	-	0.0	0.0	0.0	0.1	-	0.0	0.2	0.0	0.0
1999	0.0	-	0.1	0.1	0.0	0.0	-	-	0.2	0.0	0.0	-	-	-	0.0	-	0.0
2004	0.0	-	0.0	-	-	-	-	-	-	-	-	-	-	0.0	-	-	-
2009	-	-	-	-	-	0.0	-	-	0.0	-	-	-	0.0	-	-	0.0	-
2014	-	0.0	-	-	-	-	-	0.0	-	-	-	-	-	-	-	-	-
2019	-	0.1	-	0.0	-	0.0	-	-	0.0	-	-	-	0.0	0.0	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Tragopogon dubius[ai] (yellow salsify)
year	Nested Frequency
1994	-
1999	-
2004	-
2009	1
2014	-
2019	-
year	Average Cover (%)
1994	-
1999	-
2004	-
2009	0.0
2014	-
2019	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 15-06.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Echinocereus (hedgehog cactus)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma[t] (Utah juniper)	Opuntia (pricklypear)	Pinus edulis[t] (twoneedle pinyon)	Purshia stansburiana[p] (Stansbury cliffrose)	Purshia tridentata[p] (antelope bitterbrush)
year	Line Intercept Cover (%)							
1994	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-
2004	2	-	0.4	3.2	-	6.8	-	1
2009	2.7	-	-	-	0	-	-	0.9
2014	5	-	0.6	0.4	0	-	0.4	1.3
2019	8.8	-	2.5	1.8	0.1	3.5	-	1.9
year	Quadrat Cover (%)							
1994	0.2	-	0.2	3.1	-	0.1	-	0.2
1999	1.3	0.0	0.1	2.3	-	1.3	-	0.6
2004	2.0	-	0.3	4.3	-	2.6	-	0.9
2009	2.6	-	0.0	-	0.0	-	-	0.4
2014	5.0	-	1.0	0.1	0.0	0.0	0.0	0.9
2019	6.0	-	3.0	1.1	0.0	0.0	-	0.8

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 15-06.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	30/47
2014	-	-	-	-	-	-	-	-	48/56
2019	-	-	-	-	-	-	-	-	56/92
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1994	80	-	0	100	0	0	0	0	48/55
1999	40	-	0	100	0	50	0	0	64/89
2004	80	20	25	75	0	25	0	0	91/138
2009	320	-	50	50	0	6	0	0	61/100
2014	320	-	0	100	0	6	6	0	63/95
2019	400	20	0	100	0	10	0	0	89/146
Echinocereus -- (hedgehog cactus)									
1994	-	-	-	-	-	-	-	-	-/-
1999	20	-	100	0	0	0	0	0	- / -
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Ericameria nauseosa ssp. nauseosa var. glabrata -- (rubber rabbitbrush)									
1994	-	-	-	-	-	-	-	-	101/46
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	156/147
2009	-	-	-	-	-	-	-	-	168/120
2014	-	-	-	-	-	-	-	-	102/107
2019	20	-	0	100	0	0	0	0	96/107
Gutierrezia sarothrae -- (broom snakeweed)									
1994	800	20	40	60	0	0	0	0	19/21
1999	620	120	29	52	19	0	0	19	8/10
2004	640	-	0	97	3	0	0	0	19/25
2009	700	60	49	51	0	0	0	0	11/13
2014	1300	600	15	83	2	0	0	3	20/30
2019	2280	-	11	90	0	0	0	0	23/31
Juniperus osteosperma[t] -- (Utah juniper)									
1994	-	-	-	-	-	-	-	-	-/-
1999	80	-	75	25	0	0	0	0	- / -
2004	120	-	17	83	0	0	0	0	- / -
2009	40	-	0	100	0	0	0	50	- / -
2014	20	20	0	100	0	0	0	0	- / -
2019	40	-	50	50	0	0	0	0	- / -
Opuntia -- (pricklypear)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	40	-	0	100	0	0	0	0	8/21
2009	60	-	0	100	0	0	0	0	10/41
2014	40	20	0	100	0	0	0	0	12/58
2019	60	-	0	100	0	0	0	0	16/55
Pinus edulis[t] -- (twoneedle pinyon)									
1994	-	-	-	-	-	-	-	-	-/-
1999	80	20	50	50	0	0	0	0	- / -
2004	100	-	20	80	0	0	0	0	- / -
2009	-	-	-	-	-	-	-	-	-/-
2014	40	20	100	0	0	0	0	0	- / -
2019	20	40	100	0	0	0	0	0	- / -
Purshia stansburiana[p] -- (Stansbury cliffrose)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	20	-	0	100	0	0	100	0	50/94
2019	-	-	-	-	-	-	-	-	-/-
Purshia tridentata[p] -- (antelope bitterbrush)									
1994	120	-	33	67	0	67	0	0	11/24
1999	100	-	0	100	0	0	40	0	12/45
2004	120	-	0	50	50	0	33	0	17/58
2009	80	-	0	100	0	0	75	0	25/75
2014	180	-	0	100	0	11	89	0	33/92
2019	200	-	0	100	0	0	100	0	33/104
Sclerocactus -- (fishhook cactus)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	20	-	0	100	0	0	0	0	2/6
2009	-	-	-	-	-	-	-	-	3/5

t - Tree Species; p - Preferred Browse; i - Introduced Species

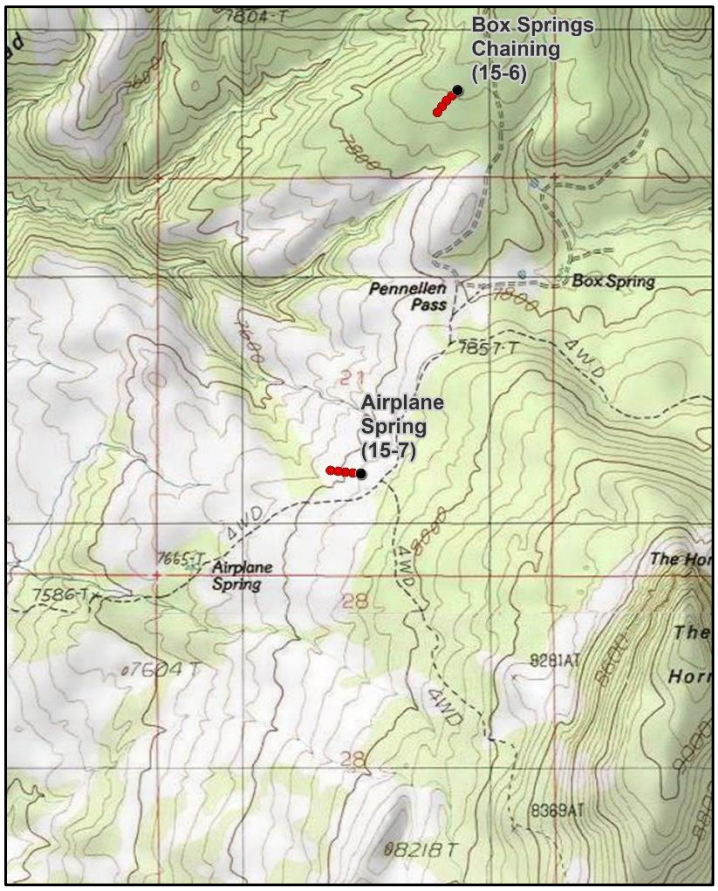
Table 15-06.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

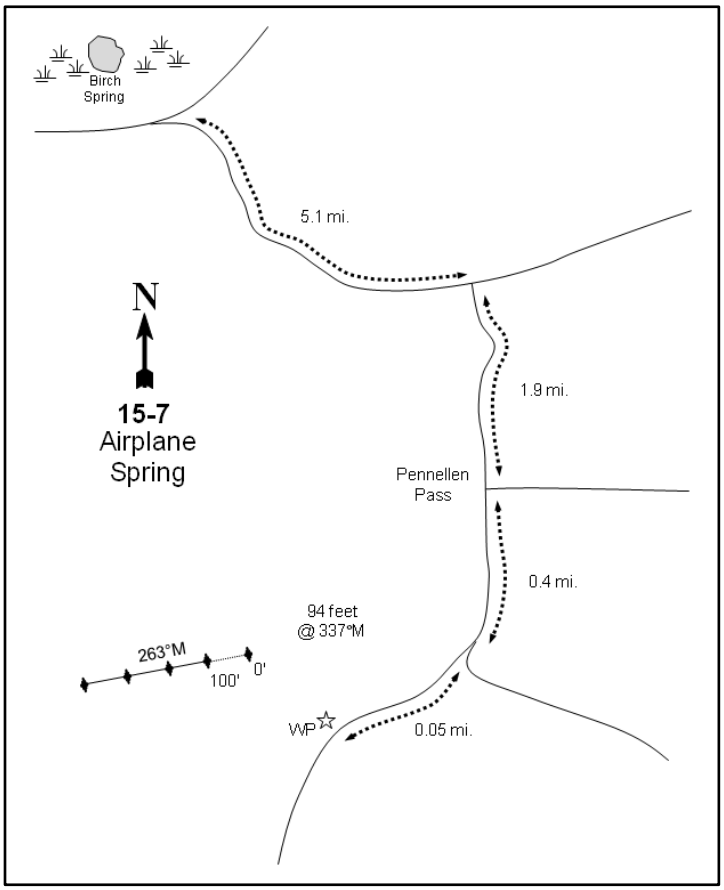
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1994	43	-	-	-	-	-	16.2
1999	46	-	-	-	-	-	6.9
2004	48	-	47	53	-	-	10.3
2009	24	-	92	8	-	-	2.1
2014	32	-	40	50	10	-	8.3
2019	39	8	54	38	-	-	9.8
Pinus edulis (twoneedle pinyon)							
1994	99	-	-	-	-	-	4.7
1999	85	-	-	-	-	-	9.2
2004	94	-	40	60	-	-	8.6
2009	16	-	91	-	-	9	4.2
2014	24	-	75	17	8	-	4.2
2019	37	38	38	15	-	8	6.7

Table 15-06.15 – Deer Desirable Components Index: High Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1994	0.5	0.0	0.0	30.0	0.0	0.9	0.0	31.4	Very Poor
1999	2.4	0.0	0.0	30.0	0.0	0.5	0.0	32.9	Very Poor
2004	4.0	0.0	0.0	30.0	0.0	0.0	0.0	34.0	Very Poor
2009	4.7	0.0	0.0	30.0	0.0	0.1	0.0	34.8	Very Poor
2014	8.8	15.0	0.0	30.0	0.0	0.1	0.0	53.9	Poor-Fair
2019	13.9	15.0	0.0	30.0	0.0	0.4	0.0	59.2	Fair

AIRPLANE SPRING - STUDY NO. 15-7





Location Information

USGS 7.5 min Map Info	Mount Ellen SW; Township 32S, Range 10E, Section 21
GPS (0' Stake)	NAD 83 UTM ZONE 12, 516424 East 4206393 North

Transect Information

Browse Tag # (0' Stake)	7174
Transect Bearing	263° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

From Birch Spring, travel southeast for 5.1 miles. Turn right, then continue 1.9 miles past Box Springs to a major intersection at Pennellen Pass. Bear right and go 0.4 miles to another intersection. Proceed right towards Airplane Spring, but only drive about 0.05 miles (200 feet) to a pullout on the right: park here. A witness post is located northwest and 117 feet off of the main road. The first baseline stake is 94 feet northwest of the witness post at 337 degrees magnetic. The transect stakes are 2-foot tall fence posts, and the first one is marked with browse tag #7174.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	PENNELL
Elevation	7,800ft (2,377m)
Aspect	Southwest
Slope	18-20%
Sample Dates	06/08/1994, 06/09/1999, 06/08/2004, 06/02/2009, 06/04/2014, 06/05/2019

Table 15-07.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Chain Unknown	Horn Chaining	LTDL	October 1968-June 1969	3100
Seeding - Aerial Before	West Horn Seeding	LTDL	October 1968-June 1969	700
Hand Crew - Lop and Scatter	Airplane Springs Fuels Project	1123	June-July 2008	1464

Table 15-07.2 SeedMix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
West Horn Seeding			Aerial	May 1969	700
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Agropyron cristatum	Crested Wheatgrass		6.00	0.00
G	Thinopyrum intermedium	Intermediate Wheatgrass		3.00	0.00
F	Medicago sativa	Alfalfa	Nomad	0.86	0.00
F	Sanguisorba minor	Small Burnet		1.93	0.00

Mix Name			Application Type	Application Date	Acres
West Horn Seeding-Dribbler			Dribbler	May 1969	700
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
S	Atriplex canescens	Fourwing Saltbush		0.86	0.00
S	Purshia tridentata	Bitterbrush		0.43	0.00

Wildlife Habitat and Vegetation History

Table 15-07.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
American Bison	crucial	year-long
Mule Deer	substantial	winter
Rocky Mountain Elk	substantial	year-long

Table 15-07.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1987	Mixed Mountain Brush	Phase I
1994	Mixed Mountain Brush	Phase I
1999	Mixed Mountain Brush/Pinyon-Juniper	Phase I transitioning to Phase II
2004	Mixed Mountain Brush/Pinyon-Juniper	Phase I transitioning to Phase II
2009	Mixed Mountain Brush	Phase I
2014	Mixed Mountain Brush	Phase I
2019	Mixed Mountain Brush	Phase I

Site Notes

The 2003 Bulldog fire burned the area just west of this site, but did not directly affect the study area. The nearest water source is Airplane Spring, which is one-half mile down slope from the site. Pellet group data for bison and cattle were combined due to difficulties in differentiating between these species.

Soils

Table 15-07.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.0	44.0	27.4	28.6	5.2	17.7	156.8	0.7	06/09/1999

Site Potential

1981 - 2010 Average Annual Precipitation	20 inches
NRCS Ecological Site	Upland Stony Loam (Black Sagebrush)
NRCS Ecological Site #	R047XB332UT
States and Transitions	A defined state and transition model is available.

At the time that the study was instituted in 1987, this site was a twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*)-encroached mountain brush ecological site. However, a lop and scatter treatment in 2008 (Table 15-07.1) removed many of the trees, and the site has been within Phase I of woodland succession since 2009 (Table 15-07.4, Table 15-07.12, Table 15-07.14). The browse species Utah serviceberry (*Amelanchier utahensis*), black sagebrush (*Artemisia nova*), and alderleaf mountain mahogany (*Cercocarpus montanus*) have provided a moderate amount of cover and have remained stable; black sagebrush has been the dominant species. The herbaceous understory has been comprised of a mixture of native and introduced species with a moderately diverse but sparse forb component. Grasses are dominated by the introduced perennial species crested wheatgrass (*Agropyron cristatum*) with native species as a minor component (Table 15-07.7, Table 15-07.10, Table 15-07.11). Although tree density is low to moderate as of 2019, future infill is likely to occur without a further tree-removing disturbance (Table 15-07.14). The state and transition model indicates that there is a potential for the ratio of grasses and forbs to browse to change depending on the type and amount of grazing that occurs on the site (Jornada, 2019).

Trend Summary Tables

Table 15-07.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	7.1	0.4	5.4	-	-	-
1999	9.0	0.3	8.5	-	-	0.7
2004	9.4	0.4	11.0	13.4	0.9	15.6
2009	10.2	0.1	0.0	15.6	0.1	0.3
2014	13.7	0.8	0.0	17.8	0.9	0.1
2019	17.4	2.4	1.4	17.2	1.7	0.4

Table 15-07.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	6	318	41	76	0.0	13.0	0.1	1.7
1999	-	328	29	81	-	20.0	0.1	1.4
2004	3	277	40	46	0.0	15.0	0.2	0.8
2009	6	307	25	68	0.0	11.4	0.1	0.6
2014	34	330	57	67	0.9	20.3	0.3	0.7
2019	68	312	67	46	1.6	15.8	0.4	0.6

Table 15-07.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	11.2	0.2	33.1	2.9	22.4	27.9
1999	12.9	0.3	28.9	9.4	27.8	37.4
2004	14.6	0.1	32.3	7.8	25.4	36.5
2009	11.2	0.1	46.5	7.4	22.0	24.0
2014	10.4	0.0	38.5	6.9	26.1	34.6
2019	9.5	0.1	46.9	8.9	27.3	37.5

Table 15-07.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle/Bison	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1994	-	8	-	18
1999	6	12	-	61
2004	1	19	-	14
2009	3	25	-	43
2014	-	23	-	5
2019	2	34	1	6
Year	Days Use Per Acre (ha)			
1994	-	-	-	-
1999	20.3 (50.2)	4.7 (11.6)	-	-
2004	25.4 (62.8)	13.4 (33.1)	-	-
2009	13.8 (34.1)	40.2 (99.3)	-	-
2014	3.6 (9.0)	18.7 (46.3)	-	-
2019	2.2 (5.4)	63.7 (157.3)	-	-

Table 15-07.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bouteloua gracilis (blue grama)	Bromus tectorum[ai] (cheatgrass)	Elymus elymoides (squirreltail)	Festuca idahoensis (Idaho fescue)	Poa fendleriana (muttongrass)	Thinopyrum intermedium[i] (intermediate wheatgrass)
year	Nested Frequency							
1994	-	272	6	6	30	-	19	64
1999	2	315	-	-	1	8	10	32
2004	-	270	1	3	7	4	3	7
2009	-	283	-	6	13	-	28	-
2014	8	281	14	34	42	4	25	19
2019	23	266	10	68	29	10	12	12
year	Average Cover (%)							
1994	-	11.6	0.0	0.0	0.2	-	0.1	1.1
1999	0.0	18.9	-	-	0.0	0.2	0.1	0.6
2004	-	14.7	0.0	0.0	0.1	0.0	0.0	0.0
2009	-	10.7	-	0.0	0.3	-	0.4	-
2014	0.2	17.6	0.4	0.9	0.9	0.0	0.8	0.4
2019	0.1	14.0	0.5	1.6	0.8	0.0	0.1	0.3

a - Annual; n - Noxious Weed; i - Introduced Species

Table 15-07.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Allium (onion)	Arabis (rockcress)	Astragalus (milkvetch)	Astragalus argophyllus var. stocksii (silverleaf milkvetch)	Astragalus utahensis (Utah milkvetch)	Castilleja (Indian paintbrush)	Castilleja angustifolia (northwestern Indian paintbrush)	Ceratocephala testiculata[ai] (curveseed butterwort)	Chenopodium fremontii[a] (Fremont's goosefoot)	Cymopterus (springparsley)	Descurainia pinnata[a] (western tansymustard)	Erigeron eatonii (Eaton's fleabane)	Eriogonum alatum (winged buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Gayophytum ramosissimum[a] (pinyon groundsmoke)	Hedysarum boreale (Utah sweetvetch)
year	Nested Frequency																
1994	-	-	-	-	-	-	-	-	-	-	3	-	30	-	4	13	2
1999	-	-	12	2	-	-	5	-	-	-	-	-	16	-	2	-	-
2004	-	-	-	3	-	1	0	-	-	5	-	-	7	-	9	20	-
2009	-	-	-	11	-	-	5	-	-	1	1	-	5	-	10	5	-
2014	0	-	6	-	0	-	-	4	-	-	3	-	9	-	3	10	3
2019	-	1	4	-	0	4	-	0	2	11	-	5	4	5	1	24	1
year	Average Cover (%)																
1994	-	-	-	-	-	-	-	-	-	-	0.0	-	0.3	-	0.0	0.0	0.0
1999	-	-	0.0	0.0	-	-	0.0	-	-	-	-	-	0.1	-	0.0	-	-
2004	-	-	-	0.0	-	0.0	0.0	-	-	0.0	-	-	0.0	-	0.1	0.0	-
2009	-	-	-	0.1	-	-	0.0	-	-	0.0	0.0	-	0.0	-	0.1	0.0	-
2014	0.0	-	0.0	-	0.0	-	-	0.0	-	-	0.0	-	0.0	-	0.0	0.0	0.2
2019	-	0.0	0.0	-	0.0	0.0	-	0.0	0.0	0.1	-	0.2	0.0	0.1	0.0	0.1	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Hymenoxys richardsonii (pingue rubberweed)	Lappula occidentalis[a] (flatspine stickseed)	Lesquerella (bladderpod)	Lesquerella kingii[a] (King bladderpod)	Lomatium (desertparsley)	Machaeranthera canescens (hoary tansyaster)	Machaeranthera grindelioides (rayless tansyaster)	Medicago sativa[i] (alfalfa)	Penstemon (beardtongue)	Phlox longifolia (longleaf phlox)	Polygonum douglasii[a] (Douglas' knotweed)	Schoenocrambe linifolia (flaxleaf plainsmustard)	Sphaeralcea coccinea (scarlet globemallow)	Symphyotrichum (aster)	Tetraneuris acaulis (stemless four-nerve daisy)	Tragopogon dubius[ai] (yellow salsify)
year	Nested Frequency															
1994	-	19	-	4	-	-	-	9	11	11	8	3	7	4	8	-
1999	7	5	-	23	-	-	-	22	1	9	1	-	7	-	10	-
2004	2	19	-	-	-	-	-	6	9	3	12	-	4	-	5	-
2009	0	3	-	13	13	2	1	2	3	5	5	2	-	5	8	-
2014	4	44	5	-	13	-	-	0	9	9	8	-	-	-	17	1
2019	-	18	-	-	12	-	-	2	3	10	14	-	-	-	4	4
year	Average Cover (%)															
1994	-	0.1	-	0.0	-	-	-	0.9	0.0	0.0	0.0	0.0	0.3	0.0	0.0	-
1999	0.0	0.0	-	0.1	-	-	-	1.0	0.0	0.1	0.0	-	0.1	-	0.1	-
2004	0.0	0.1	-	-	-	-	-	0.5	0.1	0.0	0.0	-	0.1	-	0.0	-
2009	0.0	0.0	-	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.1	0.0	-
2014	0.0	0.3	0.0	-	0.1	-	-	0.0	0.1	0.0	0.0	-	-	-	0.1	0.0
2019	-	0.0	-	-	0.1	-	-	0.0	0.0	0.1	0.0	-	-	-	0.2	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 15-07.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis[p] (Utah serviceberry)	Artemisia nova[p] (black sagebrush)	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Cercocarpus montanus[p] (alderleaf mountain mahogany)	Chrysothamnus depressus[p] (longflower rabbitbrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. glabrata (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma[t] (Utah juniper)	Opuntia (pricklypear)	Pinus edulis[t] (twoneedle pinyon)	Purshia tridentata[p] (antelope bitterbrush)	Ribes leptanthum[p] (trumpet gooseberry)	Sclerocactus (fishhook cactus)	Symphoricarpos oreophilus[p] (mountain snowberry)
year	Line Intercept Cover (%)														
1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2004	1.2	7.1	0.2	2.6	-	0.2	-	0.7	2.3	-	13.3	-	1.4	-	0.9
2009	1.7	8.3	-	2.8	-	-	-	-	-	0.1	0.3	0.8	1.6	-	0.4
2014	1.6	12.4	0.3	3.2	-	-	0.7	0.2	0.1	-	-	-	0.1	-	0.2
2019	1.7	10	1.8	2.6	-	-	1.4	0.2	0.3	-	0.1	0.5	-	0.1	0.6
year	Quadrat Cover (%)														
1994	1.1	3.5	0.4	1.6	0.1	0.0	0.0	0.4	1.3	0.0	4.1	0.1	-	-	0.2
1999	1.0	6.6	-	1.3	0.0	0.0	0.0	0.2	2.0	-	6.5	0.0	0.0	0.0	0.0
2004	0.1	6.8	0.1	2.0	0.0	0.0	-	0.4	2.4	-	8.6	-	0.3	-	0.0
2009	0.7	7.1	-	1.5	-	-	-	0.1	0.0	0.0	0.0	0.0	1.0	-	0.0
2014	0.8	11.1	0.1	1.8	-	-	0.5	0.3	0.0	-	-	-	0.0	-	0.0
2019	0.8	14.3	0.6	1.6	0.0	-	1.9	0.5	0.8	-	0.7	0.0	-	0.0	0.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 15-07.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
1994	220	-	9	82	9	27	9	9	123/177
1999	220	20	9	91	0	36	9	0	143/151
2004	100	-	0	100	0	0	100	0	151/151
2009	200	-	10	80	10	30	0	0	162/149
2014	140	-	0	100	0	29	71	0	174/178
2019	160	-	50	25	25	38	25	13	164/158
Artemisia nova[p] -- (black sagebrush)									
1994	3520	3400	20	68	13	0	0	18	24/45
1999	5100	5440	35	55	10	14	9	0	29/54
2004	5940	100	13	78	9	0	0	3	27/45
2009	5220	380	13	77	10	12	0	7	22/46
2014	5120	420	14	85	1	48	12	1	27/50
2019	4140	-	8	78	14	25	34	14	27/49
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1994	60	300	33	67	0	0	0	0	52/84
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	52/85
2009	60	40	100	0	0	0	0	0	43/94
2014	140	-	0	100	0	100	0	0	24/64
2019	400	20	0	100	0	0	60	0	36/54

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Cercocarpus montanus[p] -- (alderleaf mountain mahogany)									
1994	180	-	0	100	0	22	44	0	80/72
1999	340	-	24	71	6	6	47	0	107/107
2004	240	100	0	100	0	17	83	0	100/105
2009	260	-	8	92	0	31	54	0	121/132
2014	260	-	0	100	0	15	85	0	76/146
2019	220	60	0	82	18	9	91	18	86/106
Chrysothamnus depressus[p] -- (longflower rabbitbrush)									
1994	100	-	0	100	0	0	0	0	17/36
1999	280	-	0	71	29	36	50	7	8/16
2004	140	-	0	100	0	57	29	0	15/22
2009	140	-	14	86	0	29	0	0	6/10
2014	60	-	0	100	0	33	0	0	13/24
2019	140	-	14	86	0	29	29	0	13/26
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1994	180	-	0	78	22	0	0	0	8/15
1999	140	-	29	57	14	0	0	0	24/31
2004	40	-	0	100	0	0	0	0	28/40
2009	-	-	-	-	-	-	-	-	-/-
2014	40	-	0	100	0	0	0	0	22/40
2019	-	-	-	-	-	-	-	-	33/42
Eriogonum microthecum[p] -- (slender buckwheat)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	12/33
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Ericameria nauseosa ssp. nauseosa var. glabrata -- (rubber rabbitbrush)									
1994	40	40	0	100	0	50	50	50	55/75
1999	60	-	0	100	0	0	0	0	61/61
2004	40	-	50	50	0	0	0	0	90/109
2009	40	-	0	100	0	0	0	0	81/102
2014	140	-	0	100	0	29	0	0	78/111
2019	260	-	15	54	31	62	0	31	80/91
Escobaria vivipara var. vivipara -- (spinystar)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	10/14
2019	20	-	0	100	0	0	0	0	8/10
Gutierrezia sarothrae -- (broom snakeweed)									
1994	660	100	30	61	9	0	0	9	18/19
1999	1000	260	48	48	4	0	0	2	15/21
2004	780	-	5	95	0	0	0	0	18/21
2009	660	-	12	82	6	0	0	6	12/13
2014	520	220	4	96	0	15	0	0	17/21
2019	800	-	5	95	0	3	0	0	11/14

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Juniperus osteosperma[t] -- (Utah juniper)									
1994	-	-	-	-	-	-	-	-	-/-
1999	100	-	80	20	0	0	0	0	- / -
2004	80	-	25	75	0	0	0	0	- / -
2009	-	-	-	-	-	-	-	-	- / -
2014	40	-	100	0	0	0	0	0	- / -
2019	40	-	50	50	0	0	0	0	- / -
Opuntia -- (pricklypear)									
1994	40	-	50	50	0	0	0	0	1/3
1999	20	-	0	100	0	0	0	0	10/11
2004	20	-	0	100	0	0	0	0	- / -
2009	60	-	0	100	0	0	0	0	12/15
2014	20	-	100	0	0	0	0	0	17/33
2019	20	-	0	100	0	0	0	0	8/25
Pediocactus simpsonii -- (mountain ball cactus)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	4/6
2019	-	-	-	-	-	-	-	-	3/4
Pinus edulis[t] -- (twoneedle pinyon)									
1994	-	-	-	-	-	-	-	-	-/-
1999	160	-	13	88	0	0	0	0	- / -
2004	160	-	25	75	0	0	0	0	- / -
2009	20	-	100	0	0	0	0	0	- / -
2014	40	20	100	0	0	0	0	0	- / -
2019	100	-	60	40	0	0	0	0	- / -
Purshia tridentata[p] -- (antelope bitterbrush)									
1994	20	-	0	0	100	0	100	0	16/61
1999	20	-	0	100	0	0	100	0	189/193
2004	-	-	-	-	-	-	-	-	30/71
2009	60	-	0	100	0	0	100	0	42/209
2014	-	-	-	-	-	-	-	-	39/61
2019	20	-	0	100	0	0	100	0	54/135
Quercus gambelii[p] -- (Gambel oak)									
1994	-	-	-	-	-	-	-	-	-/-
1999	160	120	50	38	13	0	0	0	45/56
2004	-	-	-	-	-	-	-	-	30/62
2009	40	-	0	100	0	0	0	0	25/30
2014	-	-	-	-	-	-	-	-	36/58
2019	40	-	100	0	0	100	0	0	32/45
Ribes leptanthum[p] -- (trumpet gooseberry)									
1994	-	-	-	-	-	-	-	-	152/244
1999	20	-	0	100	0	0	0	0	162/170
2004	20	-	0	100	0	0	0	0	158/195
2009	-	-	-	-	-	-	-	-	130/95
2014	20	-	0	0	100	0	100	0	72/75
2019	-	-	-	-	-	-	-	-	27/32

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Sambucus[p] -- (elderberry)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	173/182
2019	-	-	-	-	-	-	-	-	-/-
Sclerocactus -- (fishhook cactus)									
1994	-	-	-	-	-	-	-	-	-/-
1999	20	-	0	100	0	0	0	0	7/8
2004	20	-	0	100	0	0	0	0	- / -
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	60	-	0	100	0	0	0	0	10/9
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
1994	40	40	50	50	0	50	0	0	28/61
1999	40	-	50	50	0	0	0	0	70/183
2004	40	-	0	100	0	50	0	0	55/136
2009	80	-	75	0	25	0	0	25	64/160
2014	60	-	33	67	0	0	0	0	64/138
2019	100	-	0	100	0	0	60	0	41/86

t - Tree Species; p - Preferred Browse; i - Introduced Species

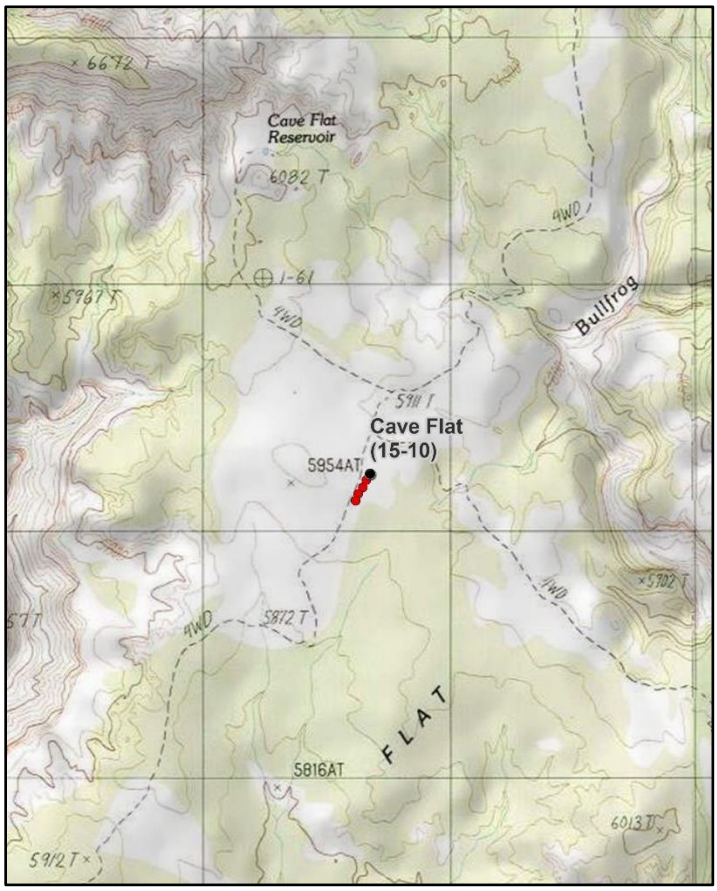
Table 15-07.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

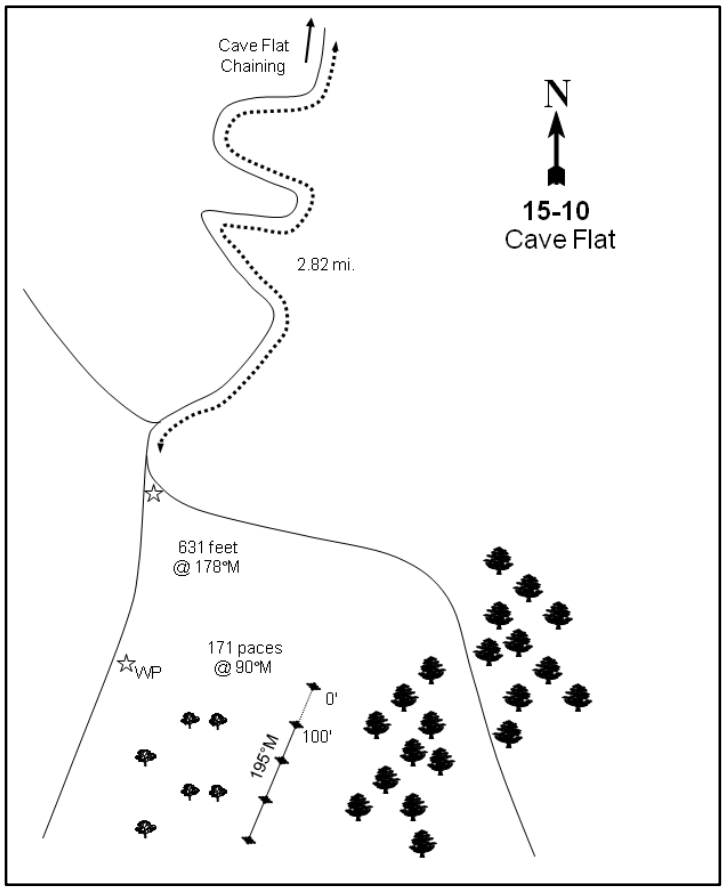
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1994	58	-	-	-	-	-	6.5
1999	60	-	-	-	-	-	9.8
2004	57	-	6	69	19	6	11.3
2009	22	-	80	-	10	10	4.7
2014	43	8	54	8	23	8	7.3
2019	35	-	79	7	7	7	9.1
Pinus edulis (twoneedle pinyon)							
1994	104	-	-	-	-	-	4.9
1999	96	-	-	-	-	-	9.5
2004	78	-	6	67	22	6	10.6
2009	8	20	20	20	40	-	6.8
2014	8	17	-	33	50	-	9.3
2019	17	36	27	18	-	18	7.8

Table 15-07.15 – Deer Desirable Components Index: Mid Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1994	9.5	12.0	7.1	26.0	0.0	3.4	0.0	57.9	Fair
1999	11.8	12.4	15.0	30.0	0.0	2.8	0.0	72.0	Good
2004	17.5	13.3	3.5	29.9	0.0	1.6	0.0	65.8	Fair-Good
2009	20.7	11.3	5.5	22.7	0.0	1.2	0.0	61.4	Fair
2014	23.4	14.6	5.1	30.0	-0.6	1.3	0.0	73.8	Good
2019	22.6	11.1	4.9	30.0	-1.2	1.2	0.0	68.5	Good

CAVE FLAT - STUDY NO. 15-10





Location Information

USGS 7.5 min Map Info	Cave Flat SE; Township 33S, Range 9E, Section 14
GPS (0' Stake)	NAD 83 UTM ZONE 12, 509625 East 4198430 North

Transect Information

Browse Tag # (0' Stake)	7126
Transect Bearing	195° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Belt 4: No Rebar

Directions to Site

From Cave Flat Chaining (transect #15-09), continue south along Bullfrog Creek for 2.15 miles to a faint fork, then stay right. Continue 0.7 miles to another faint intersection and stay right again. Continue 0.15 miles into the large sage flat to the witness post on the left side of the road (a 2-foot tall piece of angle iron). The 0-foot baseline stake, a 2-foot tall fencepost tagged #7126, is 171 feet away from the witness post at a bearing of 90 degrees magnetic. The transect runs southwest from there.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	STEELE BUTTE
Elevation	5,800ft (1,768m)
Aspect	southwest
Slope	0-3%
Sample Dates	06/07/1994, 06/02/1999, 08/09/2011, 05/03/2014, 08/06/2019

Wildlife Habitat and Vegetation History

Table 15-10.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
American Bison	crucial	year-long
Mule Deer	substantial	winter
Rocky Mountain Elk	substantial	year-long

Table 15-10.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1987	Wyoming Big Sagebrush	Phase I
1994	Wyoming Big Sagebrush	Phase I
1999	Wyoming Big Sagebrush	Phase I
2011	Wyoming Big Sagebrush	Phase I
2014	Wyoming Big Sagebrush	Phase I
2019	Wyoming Big Sagebrush	Phase I

Site Notes

A road runs through the middle of the flat, but is rarely traveled. The area is inaccessible by vehicle when Bullfrog Creek washes out the road at the turn to Bullfrog. Pellet group data for bison and cattle were combined due to the difficulty in differentiating between the species.

Soils

Table 15-10.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Loam	7.2	63.3	18.2	18.6	0.8	9.2	105.6	0.4	06/02/1999

Site Potential

1981 - 2010 Average Annual Precipitation	9 inches
NRCS Ecological Site	Semidesert Sandy Loam (Wyoming Big Sagebrush)
NRCS Ecological Site #	R035XY216UT
States and Transitions	A defined state and transition model is available.

Following establishment of the study in 1987, this site has remained in a stable Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) ecological state. The herbaceous understory is depleted with perennial grasses being the most common herbaceous vegetation group. These perennial grasses are a mixture of native and introduced species with James' galleta (*Pleuraphis jamesii*) and blue grama (*Bouteloua gracilis*) as the dominant species. Annual grasses are present, but rare overall (Table 15-10.7, Table 15-10.10). The forb component is a mix of annual and perennial species that provide very little cover (Table 15-07.11). Shrub cover is almost exclusively provided by Wyoming big sagebrush, and data has shown that cover of sagebrush has remained stable over the sample years (Table 15-10.12). Utah juniper (*Juniperus osteosperma*) has been observed in all years (Table 15-10.12, Table 15-10.13, Table 15-10.14). The state and transition model indicates that this site is in the Wyoming Big Sagebrush/Perennial Grass Phase within the Current Potential State. There may be the potential for the site to transition into a Depleted Understory State or Juniper State depending on disturbance regimes and/or management practices (Jornada, 2019).

Trend Summary Tables

Table 15-10.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	12.6	4.3	0.0	-	-	-
1999	12.8	2.8	0.2	-	-	-
2011	19.2	3.3	1.4	22.4	2.9	1.8
2014	17.9	3.4	1.5	27.9	1.6	1.6
2019	15.6	5.9	0.8	23.4	5.0	1.7

Table 15-10.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	278	235	178	25	0.8	7.6	0.8	0.1
1999	361	235	251	3	5.8	6.1	2.0	0.0
2011	104	198	102	35	0.4	4.5	0.2	0.9
2014	31	207	101	41	0.1	5.8	0.2	0.1
2019	252	211	260	176	2.8	6.2	3.2	2.2

Table 15-10.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	51.1	0.4	15.6	0.1	0.1	24.2
1999	48.3	0.0	23.2	0.3	0.0	24.6
2011	61.8	0.4	20.0	0.3	-	28.9
2014	66.2	0.3	17.4	0.3	0.0	27.4
2019	60.1	3.5	27.1	1.2	0.0	30.3

Table 15-10.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle/Bison	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1994	3	6	-	24
1999	9	18	-	36
2011	-	52	-	7
2014	-	35	-	9
2019	1	52	-	8
Year	Days Use Per Acre (ha)			
1994	-	-	-	-
1999	37.7 (93.2)	4.0 (9.9)	0.7 (1.7)	-
2011	-	93.2 (230.1)	-	-
2014	0.7 (1.8)	59.0 (145.7)	-	-
2019	2.2 (5.4)	34.9 (86.1)	-	-

Table 15-10.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum[i] (crested wheatgrass)	Aristida purpurea (purple threeawn)	Bouteloua gracilis (blue grama)	Bromus tectorum[ai] (cheatgrass)	Elymus elymoides (squirreltail)	Pleuraphis jamesii (James' galleta)	Sporobolus cryptandrus (sand dropseed)	Vulpia octoflora[a] (sixweeks fescue)
year	Nested Frequency								
1994	13	2	6	100	171	22	113	29	230
1999	15	-	-	133	315	38	97	3	181
2011	7	-	-	66	44	18	123	13	81
2014	7	-	-	73	1	22	111	19	31
2019	5	-	-	89	26	23	121	8	250
year	Average Cover (%)								
1994	0.2	0.0	0.0	4.4	0.4	0.1	2.5	0.3	0.4
1999	0.1	-	-	3.6	4.6	0.3	2.2	0.0	1.3
2011	0.1	-	-	1.0	0.2	0.1	3.2	0.0	0.2
2014	0.1	-	-	2.0	0.0	0.2	3.6	0.0	0.1
2019	0.1	-	-	2.6	0.2	0.3	3.0	0.2	2.6

a - Annual; n - Noxious Weed; i - Introduced Species

Table 15-10.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Astragalus (milkvetch)	Chenopodium fremontii[a] (Fremont's goosefoot)	Chenopodium leptophyllum[a] (narrowleaf goosefoot)	Cordylanthus[a] (bird's-beak)	Cryptantha[a] (annual cryptantha)	Descurainia pinnata[a] (western tansymustard)	Eriogonum cernuum[a] (nodding buckwheat)	Erodium cicutarium[ai] (redstem stork's bill)	Fritillaria atropurpurea (spotted fritillary)	Gilia inconspicua[a] (shy gilia)	Lesquerella (bladderpod)	Lygodesmia (skeletonplant)	Machaeranthera canescens (hoary tansyaster)	Oenothera (evening primrose)	Phlox longifolia (longleaf phlox)	Plantago patagonica[a] (woolly plantain)	Sphaeralcea coccinea (scarlet globemallow)
year	Nested Frequency																
1994	6	-	-	-	-	-	-	6	3	-	-	8	-	-	-	173	11
1999	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	251	1
2011	26	-	-	3	-	-	-	-	-	14	-	-	-	-	4	88	6
2014	20	-	-	-	4	-	-	-	-	4	-	-	-	19	-	94	3
2019	150	14	4	2	7	14	3	-	-	50	9	1	2	38	3	224	2
year	Average Cover (%)																
1994	0.0	-	-	-	-	-	-	0.0	0.0	-	-	0.0	-	-	-	0.8	0.0
1999	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.0	0.0
2011	0.9	-	-	0.0	-	-	-	-	-	0.0	-	-	-	-	0.0	0.2	0.0
2014	0.1	-	-	-	0.0	-	-	-	-	0.0	-	-	-	0.0	-	0.2	0.0
2019	2.0	0.1	0.0	0.0	0.1	0.1	0.0	-	-	0.9	0.0	0.0	0.0	0.2	0.0	2.1	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 15-10.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. wyomingensis[p] (Wyoming big sagebrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma[t] (Utah juniper)	Opuntia (pricklypear)
year	Line Intercept Cover (%)			
1994	-	-	-	-
1999	-	-	-	-
2011	22.4	0.4	1.8	2.5
2014	27.9	0.8	1.6	0.8
2019	23.4	3.2	1.7	1.8
year	Quadrat Cover (%)			
1994	12.6	3.2	0.0	1.1
1999	12.8	1.6	0.2	1.1
2011	19.2	0.4	1.4	2.9
2014	17.9	1.3	1.5	2.0
2019	15.6	3.6	0.8	2.3

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 15-10.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Artemisia tridentata ssp. wyomingensis[p] -- (Wyoming big sagebrush)									
1994	3940	1320	17	53	31	3	0	80	43/75
1999	4680	80	19	71	9	29	10	5	50/83
2011	3300	60	2	82	16	39	54	10	46/76
2014	3140	60	2	88	10	37	52	6	48/73
2019	3560	-	12	70	17	43	30	20	56/84
Atriplex canescens[p] -- (fourwing saltbush)									
1994	-	-	-	-	-	-	-	-	43/52
1999	20	-	0	0	100	0	100	0	60/61
2011	-	-	-	-	-	-	-	-	98/126
2014	-	-	-	-	-	-	-	-	-/-
2019	20	-	0	0	100	0	0	0	94/84
Atriplex confertifolia[p] -- (shadscale saltbush)									
1994	40	-	0	100	0	0	50	0	28/37
1999	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Chrysothamnus viscidiflorus -- (yellow rabbitbrush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	20	-	0	0	100	0	0	100	18/19
2011	-	-	-	-	-	-	-	-	17/18
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Coleogyne ramosissima[p] -- (blackbrush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	80	-	100	0	0	0	25	0	49/73
2011	-	-	-	-	-	-	-	-	-/-
2014	40	-	50	50	0	0	100	0	7/7
2019	20	-	100	0	0	100	0	0	43/68
Eriogonum microthecum[p] -- (slender buckwheat)									
1994	60	20	67	33	0	0	0	0	- / -
1999	-	-	-	-	-	-	-	-	-/-
2011	20	-	0	100	0	0	100	0	5/7
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Ericameria nauseosa -- (rubber rabbitbrush)									
1994	-	20	0	0	0	0	0	0	- / -
1999	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Gutierrezia sarothrae -- (broom snakeweed)									
1994	6740	2160	13	84	2	0	0	2	22/29
1999	10000	120	16	83	1	0	0	1	12/17
2011	1500	80	4	96	0	0	0	0	21/22
2014	1580	80	19	80	1	0	0	1	21/22
2019	76540	2360	98	3	0	0	0	0	24/25
Juniperus osteosperma[t] -- (Utah juniper)									
1994	-	-	-	-	-	-	-	-	-/-
1999	20	-	100	0	0	0	0	0	- / -
2011	60	-	67	33	0	0	0	0	- / -
2014	20	-	100	0	0	0	0	0	- / -
2019	20	-	100	0	0	0	0	0	- / -
Opuntia -- (pricklypear)									
1994	260	20	15	69	15	0	0	31	16/88
1999	760	20	21	55	24	3	0	26	13/68
2011	1080	-	0	100	0	0	0	35	15/70
2014	1180	-	0	90	10	0	0	9	15/58
2019	1760	-	0	85	15	0	0	18	16/54

t - Tree Species; p - Preferred Browse; i - Introduced Species

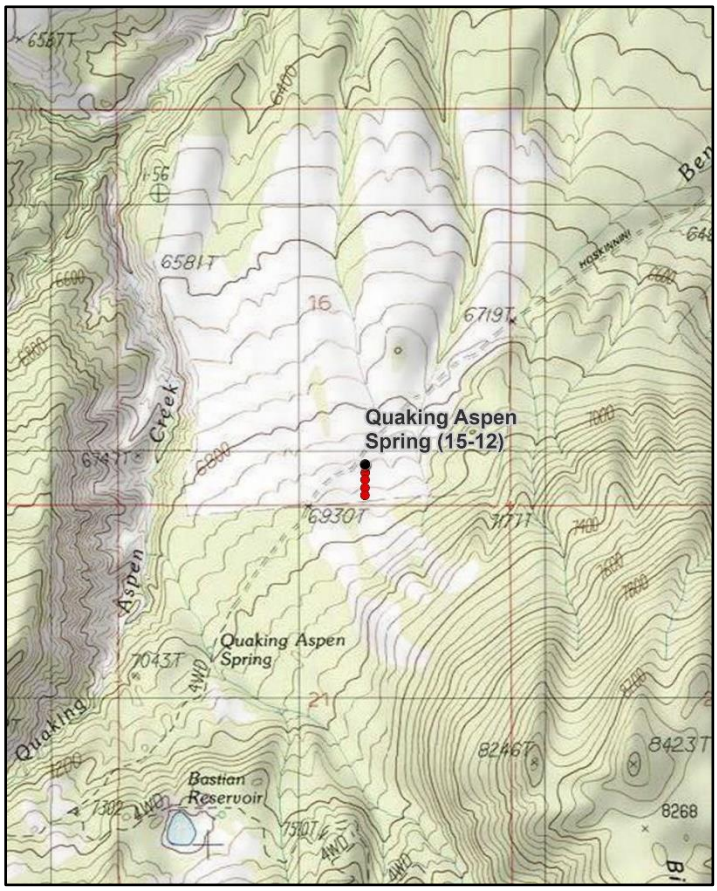
Table 15-10.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

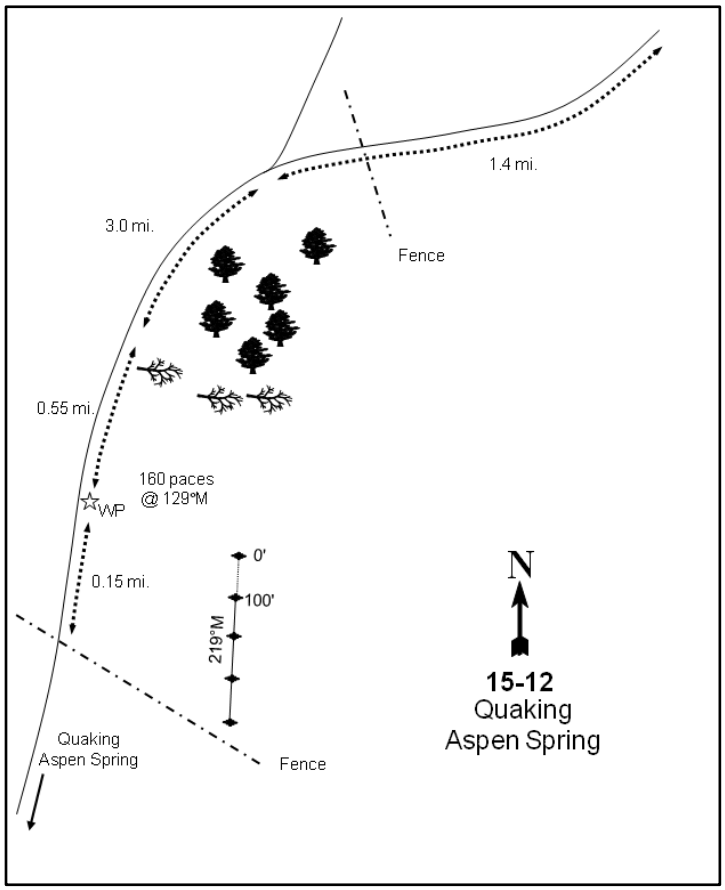
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2019	19	-	75	-	25	-	5.0

Table 15-10.15 – Deer Desirable Components Index: Low Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1994	15.8	5.9	8.4	15.2	-0.6	0.1	0.0	44.8	Fair-Good
1999	16.0	12.1	9.6	12.3	-4.4	0.0	0.0	45.6	Fair-Good
2011	28.0	10.3	1.2	8.9	-0.3	1.8	0.0	49.8	Good
2014	30.0	11.9	1.0	11.6	-0.1	0.3	0.0	54.7	Good
2019	29.3	9.8	6.2	12.4	-2.1	4.5	0.0	60.0	Good

QUAKING ASPEN SPRING - STUDY NO. 15-12





Location Information

USGS 7.5 min Map Info	Cass Creek Peak SW; Township 33S, Range 11E, Section 16
GPS (0' Stake)	NAD 83 UTM ZONE 12, 526219 East 4198142 North

Transect Information

Browse Tag # (0' Stake)	553
Transect Bearing	170° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

From the intersection of highways 95 and 276, go 4.7 miles south down State Road 276 to a gravel road. Turn right and travel 3.1 miles to an abandoned cabin near the creek, then continue 0.6 miles to a fork. Stay right, cross the creek, and drive 0.8 miles to some mining cabins. Keep left on the main road, then continue 1.2 miles to a fence. Continue 0.2 miles to a fork. Take the left fork towards Quaking Aspen Spring and travel 3 miles to the edge of a chaining. Continue 0.55 miles to a witness post on the left (east) side of the road. The 0-foot baseline stake, a one and half foot tall fence post, is 160 feet southeast of witness post and is marked by a red browse tag #553. ***Alternate route: From study #15-13, go 2.2 miles to a fork. Stay left and continue 1.6 miles to another fork. Stay left again and go 1.2 miles (you will go through Stanton Pass and pass Quaking Aspen Spring) passing through a fence to a witness post on the right (east) side of the road.***

Site Information

Land Ownership	State
Land Administrator	SITLA
Allotment	PENNELL
Elevation	6,800ft (2,073m)
Aspect	Northeast
Slope	8-12%
Sample Dates	06/09/1994, 06/08/1999, 08/17/2004, 06/09/2009, 06/03/2014, 06/05/2019

Table 15-12.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Chain Unknown	-	-	Historic	-
Seeding - Seed Unknown	-	-	Historic	-
Fire - Wildfire	Bulldog	-	2003	31754
Chaining - Chain Unknown	Bulldog Fire Rehabilitation-Non WSA	-	2003	4600
Seeding - Aerial	Henry Mountains Low Elevation Seeding	-	2003	7676
Seeding - Dribbler	Henry Mountains Dribbler	-	2003	900

Table 15-12.2 SeedMix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Henry Mountain Low Elevation			Aerial	Nov 2003	2200
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Agropyron cristatum	Crested Wheatgrass	Hycrest	1.00	0.00
G	Dactylis glomerata	Orchardgrass	Paiute	0.50	0.00
G	Elymus lanceolatus	Thickspike Wheatgrass	Critana	1.00	0.00
G	Festuca arizonica	Arizona Fescue	Redondo	0.57	0.00
G	Koeleria macrantha	Prairie Junegrass		0.16	0.00
G	Psathyrostachys juncea	Russian Wildrye	Bozoisky	0.88	0.00
G	Psathyrostachys juncea	Russian Wildrye	Bozoisky	0.12	0.00
G	Thinopyrum intermedium	Pubescent Wheatgrass		1.00	0.00
G	Thinopyrum intermedium	Intermediate Wheatgrass		1.00	0.00
F	Cleome serrulata	Rocky Mountain Beeplant		0.27	0.00
F	Cleome serrulata	Rocky Mountain Beeplant		0.23	0.00
F	Linum perenne	Blue Flax	Appar	0.23	0.00
F	Medicago sativa	Alfalfa	Ranger	0.11	0.00
F	Medicago sativa	Alfalfa	Ladak +	0.93	0.00
F	Onobrychis viciifolia	Sainfoin		1.05	0.00
F	Sanguisorba minor	Small Burnet	Delar	1.20	0.00
S	Artemisia tridentata ssp. vaseyana	Mountain Big Sagebrush		0.27	0.00
S	Artemisia tridentata ssp. wyomingensis	Wyoming Big Sagebrush		0.51	0.00

Mix Name			Application Type	Application Date	Acres
Henry Mtn. Dribbler			Dribbler	Nov 2003	1500
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
S	Amelanchier utahensis	Utah Serviceberry		0.07	0.00
S	Atriplex canescens	Fourwing Saltbush		0.13	0.00
S	Cercocarpus montanus	True Mountain Mahogany		0.07	0.00
S	Purshia tridentata	Bitterbrush	Ada/Boise	0.07	0.00

Wildlife Habitat and Vegetation History

Table 15-12.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
American Bison	crucial	year-long
Mule Deer	substantial	winter
Desert Bighorn	crucial	year-long
Rocky Mountain Elk	substantial	year-long

Table 15-12.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1987	Black Sagebrush/Pinyon-Juniper	Phase I transitioning to Phase II
1994	Black Sagebrush/Pinyon-Juniper	Phase I transitioning to Phase II
1999	Black Sagebrush/Pinyon-Juniper	Phase I transitioning to Phase II
2004	Perennial Grass	No Encroachment
2009	Perennial Grass	No Encroachment
2014	Perennial Grass	Phase I
2019	Mountain Big Sagebrush/Perennial Grass	Phase I

Site Notes

Water is available for wildlife and livestock at Quaking Aspen Creek.

Soils

Table 15-12.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	7.5	51.3	22.2	26.6	2.0	6.6	44.8	0.6	06/08/1999

Site Potential

1981 - 2010 Average Annual Precipitation	14 inches
NRCS Ecological Site	Upland Stony Loam (Black Sagebrush)
NRCS Ecological Site #	R047XB332UT
States and Transitions	A defined state and transition model is available.

At the time that the study site was established in 1987, it was in a black sagebrush (*Artemisia nova*) community state that was being encroached by twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) trees. The herbaceous understory was diverse and moderately abundant (Table 15-12.10, Table 15-12.11). Following the fire in 2003 that removed most of the trees (Table 15-12.1, Table 15-12.12, Table 15-12.14), the site transitioned to a seeded perennial grass state. The seeded and introduced grass species crested wheatgrass (*Agropyron cristatum*) and intermediate wheatgrass (*Agropyron intermedium*) became the dominant species in the understory (Table 15-12.10). In addition, the seeded shrub species Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) and mountain big sagebrush (*A. tridentata* ssp. *vaseyana*) have increased and will likely become a major site component (Table 15-12.2, Table 15-12.6, Table 15-12.12). For the purposes of this study, however, all big sagebrush plants have been classified as mountain big sagebrush. It is difficult to use the state and transition model (Jornada, 2019) to place this site into a community phase; the seeding has altered the understory and has caused a shift in sagebrush dominance from black sagebrush to mountain big sagebrush.

Trend Summary Tables

Table 15-12.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	20.4	0.2	5.9	-	-	-
1999	19.7	0.1	14.0	-	-	1.1
2004	0.2	0.1	-	-	-	-
2009	1.0	2.4	-	1.4	1.8	-
2014	3.3	1.5	-	4.6	1.2	-
2019	4.9	6.5	-	7.9	5.1	-

Table 15-12.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	25	268	92	204	0.1	3.5	0.3	1.5
1999	207	243	98	232	3.4	3.1	0.6	2.7
2004	57	222	115	282	1.3	5.1	7.5	6.3
2009	12	306	22	216	0.0	16.8	0.2	6.5
2014	94	374	55	262	1.8	21.2	0.3	5.5
2019	88	355	102	210	0.6	24.4	0.4	3.8

Table 15-12.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	12.1	0.0	29.9	2.5	22.0	33.2
1999	12.5	1.3	35.4	6.6	24.0	39.8
2004	31.2	-	25.6	7.2	28.9	18.5
2009	19.0	-	35.3	6.7	27.2	29.0
2014	21.4	0.0	24.9	4.9	31.5	36.4
2019	24.8	0.0	30.3	6.8	30.4	33.3

Table 15-12.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle/Bison	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1994	1	9	-	17
1999	3	16	-	28
2004	-	2	2	16
2009	6	10	1	34
2014	1	15	-	7
2019	5	36	-	18
Year	Days Use Per Acre (ha)			
1994	-	-	-	-
1999	2.9 (7.2)	12.1 (29.8)	-	-
2004	-	1.3 (3.3)	-	-
2009	24.0 (59.2)	18.7 (46.3)	1.3 (3.3)	-
2014	21.1 (52.0)	46.9 (115.9)	0.7 (1.7)	-
2019	6.5 (16.1)	42.2 (104.3)	-	-

Table 15-12.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bouteloua gracilis (blue grama)	Bromus marginatus (mountain brome)	Bromus tectorum[ai] (cheatgrass)	Dactylis glomerata[i] (orchardgrass)	Elymus elymoides (squirreltail)	Elymus trachycaulus (slender wheatgrass)	Hesperostipa comata (needle and thread)	Koeleria macrantha (prairie Junegrass)	Poa fendleriana (muttongrass)	Psathyrostachys juncea[i] (Russian wildrye)	Pseudoroegneria spicata (bluebunch wheatgrass)	Sporobolus cryptandrus (sand dropseed)	Thinopyrum intermedium[i] (intermediate wheatgrass)
year	Nested Frequency														
1994	1	9	132	-	25	-	118	-	-	-	104	-	-	-	-
1999	64	49	104	-	207	-	15	-	3	1	66	-	-	-	-
2004	8	104	-	37	57	9	12	7	-	-	8	7	-	-	95
2009	1	217	2	7	12	1	13	7	3	-	6	20	-	7	171
2014	9	247	2	1	94	-	66	63	7	21	35	10	-	2	164
2019	-	224	2	2	88	1	110	37	5	12	41	6	5	-	109
year	Average Cover (%)														
1994	0.0	0.2	1.6	-	0.1	-	0.4	-	-	-	1.3	-	-	-	-
1999	0.5	0.7	0.9	-	3.4	-	0.2	-	0.0	0.0	0.9	-	-	-	-
2004	0.0	2.4	-	0.7	1.3	0.0	0.1	0.0	-	-	0.1	0.2	-	-	1.4
2009	0.0	8.9	0.0	0.1	0.0	0.0	0.1	0.3	0.0	-	0.1	0.4	-	0.1	6.8
2014	0.1	12.8	0.1	0.0	1.8	-	1.2	2.0	0.2	0.2	0.6	0.4	-	0.0	3.6
2019	-	14.4	0.2	0.0	0.6	0.0	2.5	1.0	0.2	0.1	1.6	0.5	0.0	-	4.0

a - Annual; n - Noxious Weed; i - Introduced Species

Table 15-12.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Arabis demissa (nodding rockcress)	Astragalus (milkvetch)	Astragalus moencoppensis (Moenkopi milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Castilleja angustifolia (northwestern Indian paintbrush)	Chenopodium fremontii[a] (Fremont's goosefoot)	Chenopodium leptophyllum[a] (narrowleaf goosefoot)	Cleome[a] (spiderflower)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawksbeard)	Cryptantha (cryptantha)	Descurainia pinnata[a] (western tansymustard)	Erigeron eatonii (Eaton's fleabane)	Erigeron pumilus (shaggy fleabane)
year	Nested Frequency																
1994	-	3	8	6	14	-	6	10	-	-	-	14	2	-	2	-	20
1999	-	15	32	6	-	-	10	23	-	-	-	-	1	3	-	-	22
2004	25	-	3	-	-	49	3	-	3	25	4	6	-	-	2	4	15
2009	43	-	-	-	35	35	-	2	-	-	-	24	2	1	-	2	33
2014	7	1	-	91	-	17	27	-	-	-	3	30	2	10	10	-	5
2019	2	-	3	-	79	19	39	-	1	31	-	23	1	-	12	2	27
year	Average Cover (%)																
1994	-	0.0	0.0	0.0	0.0	-	0.0	0.1	-	-	-	0.1	0.0	-	0.0	-	0.2
1999	-	0.1	0.1	0.1	-	-	0.0	0.7	-	-	-	-	0.0	0.0	-	-	0.1
2004	0.1	-	0.0	-	-	0.4	0.0	-	0.6	3.6	0.1	0.1	-	-	0.0	0.0	0.1
2009	0.9	-	-	-	0.4	0.3	-	0.0	-	-	-	0.5	0.0	0.0	-	0.1	0.4
2014	0.0	0.0	-	0.8	-	0.2	0.1	-	-	-	0.2	0.5	0.0	0.0	0.0	-	0.2
2019	0.0	-	0.0	-	0.7	0.1	0.3	-	0.0	0.1	-	0.1	0.0	-	0.1	0.0	0.4

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Eriogonum (buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Gayophytum ramosissimum[a] (pinyon groundsmoke)	Gilia inconspicua[a] (shy gilia)	Halogeton glomeratus[ai] (saltlover)	Lappula occidentalis[a] (flatspine stickseed)	Lesquerella (bladderpod)	Lesquerella kingii[a] (King bladderpod)	Linum lewisii (Lewis flax)	Lomatium (desertparsley)	Machaeranthera canescens (hoary tansyaster)	Medicago sativa[i] (alfalfa)	Nicotiana attenuata[a] (coyote tobacco)	Onobrychis viciifolia[i] (sainfoin)	Packera multilobata (lobeleaf groundsel)	Penstemon comarrhenus (dusty beardtongue)	Penstemon humilis (low beardtongue)
year	Nested Frequency																
1994	-	-	29	-	-	20	-	16	44	-	-	-	-	-	1	6	-
1999	3	2	-	-	-	-	-	91	22	1	-	-	-	-	25	3	-
2004	-	-	28	3	-	16	-	-	76	-	0	115	6	27	7	-	-
2009	-	-	1	-	3	-	-	15	9	-	3	47	-	-	28	-	-
2014	-	4	-	-	-	43	2	-	16	-	-	29	-	2	44	-	5
2019	-	-	3	-	-	42	-	-	3	6	-	3	-	-	54	-	-
year	Average Cover (%)																
1994	-	-	0.1	-	-	0.1	-	0.0	0.1	-	-	-	-	-	0.0	0.2	-
1999	0.0	0.0	-	-	-	-	-	0.5	0.3	0.0	-	-	-	-	0.3	0.0	-
2004	-	-	0.7	0.0	-	0.3	-	-	0.6	-	0.0	1.4	0.1	0.4	0.0	-	-
2009	-	-	0.0	-	0.0	-	-	0.2	0.1	-	0.0	1.2	-	-	0.6	-	-
2014	-	0.0	-	-	-	0.1	0.0	-	0.0	-	-	0.8	-	0.2	0.1	-	0.2
2019	-	-	0.0	-	-	0.1	-	-	0.0	0.1	-	0.1	-	-	0.1	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Phlox longifolia (longleaf phlox)	Physaria (twinpod)	Pleiacanthus spinosus (thorn skeletonweed)	Polygonum douglasii[a] (Douglas' knotweed)	Sanguisorba minor[i] (small burnet)	Sphaeralcea coccinea (scarlet globemallow)	Symphyotrichum (aster)	Tetraneuris acaulis (stemless four-nerve daisy)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency								
1994	122	-	16	50	-	2	4	31	1
1999	131	-	3	8	-	-	-	32	2
2004	90	21	7	61	70	10	-	2	-
2009	-	-	14	3	47	12	-	-	3
2014	86	1	18	-	18	10	-	47	7
2019	23	-	9	32	-	12	-	41	5
year	Average Cover (%)								
1994	0.3	-	0.2	0.1	-	0.0	0.0	0.1	0.0
1999	0.7	-	0.0	0.0	-	-	-	0.2	0.0
2004	1.5	0.2	0.3	2.1	1.1	0.1	-	0.0	-
2009	-	-	1.1	0.0	0.8	0.1	-	-	0.0
2014	0.4	0.0	1.0	-	0.1	0.2	-	0.6	0.0
2019	0.1	-	0.4	0.1	-	0.6	-	0.7	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 15-12.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis[p] (Utah serviceberry)	Artemisia nova[p] (black sagebrush)	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Atriplex canescens[p] (fourwing saltbush)	Cercocarpus montanus[p] (alderleaf mountain mahogany)	Chrysothamnus depressus[p] (longflower rabbitbrush)	Ericameria nauseosa (rubber rabbitbrush)	Eriogonum microthecum[p] (slender buckwheat)	Escobaria vivipara var. arizonica (Arizona spinystar)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma[t] (Utah juniper)	Pinus edulis[t] (twoneedle pinyon)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)												
1994	-	-	-	-	-	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-	-	-	-	-	-
2004	-	-	-	-	-	-	-	0	-	0	-	-	-
2009	-	-	1.2	-	0.2	-	-	0	-	1.8	-	-	-
2014	-	-	4.3	-	0.3	-	-	-	-	1.2	-	-	-
2019	-	0.9	6	-	0.6	-	-	0.4	-	5.1	-	-	-
year	Quadrat Cover (%)												
1994	0.0	18.2	-	-	1.2	0.4	0.2	0.6	-	0.0	2.7	3.2	-
1999	0.0	16.8	-	-	2.0	0.3	-	0.6	0.0	0.0	6.5	7.6	-
2004	-	-	0.1	0.0	0.0	-	-	0.0	-	0.1	-	-	-
2009	-	-	0.8	-	0.2	-	0.0	0.0	-	2.3	-	-	0.0
2014	0.1	-	3.0	-	0.1	-	-	0.1	0.0	1.5	-	-	-
2019	-	1.0	3.4	-	0.3	-	-	0.2	0.0	6.5	-	-	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 15-12.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
1994	80	-	25	75	0	0	0	0	77/117
1999	60	-	0	100	0	0	100	0	102/134
2004	-	-	-	-	-	-	-	-	70/86
2009	-	-	-	-	-	-	-	-	68/118
2014	-	-	-	-	-	-	-	-	83/154
2019	-	-	-	-	-	-	-	-	74/139
Artemisia nova[p] -- (black sagebrush)									
1994	14160	360	5	74	22	0	0	17	28/47
1999	12600	60	6	72	22	18	1	1	30/49
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	80	20	0	100	0	75	25	0	32/54
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	60	840	100	0	0	0	0	0	16/10
2009	960	120	8	92	0	6	15	0	26/29
2014	780	-	8	92	0	62	10	0	36/56
2019	860	60	14	77	9	35	30	9	39/67

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Atriplex canescens[p] -- (fourwing saltbush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	20	-	0	100	0	0	0	0	12/17
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Bassia prostrata[pi] -- (forage kochia)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	80	520	0	100	0	0	0	0	- / -
2019	-	-	-	-	-	-	-	-	-/-
Cercocarpus montanus[p] -- (alderleaf mountain mahogany)									
1994	440	20	23	77	0	46	18	0	95/73
1999	400	-	15	85	0	25	55	0	95/109
2004	160	140	0	100	0	0	0	0	42/31
2009	160	-	0	100	0	13	38	0	52/75
2014	100	20	0	100	0	40	60	0	67/97
2019	140	-	0	100	0	14	71	0	56/98
Chrysothamnus depressus[p] -- (longflower rabbitbrush)									
1994	580	120	14	83	3	0	0	0	11/19
1999	660	40	12	79	9	9	0	6	11/22
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	20	-	0	100	0	0	0	0	18/32
2019	-	-	-	-	-	-	-	-	-/-
Chrysothamnus viscidiflorus -- (yellow rabbitbrush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	18/20
2019	-	-	-	-	-	-	-	-	-/-
Eriogonum microthecum[p] -- (slender buckwheat)									
1994	3380	80	11	88	1	0	0	2	11/14
1999	1640	-	11	60	29	38	2	2	11/15
2004	120	-	0	100	0	0	0	0	11/22
2009	200	220	70	30	0	0	0	0	5/7
2014	340	-	6	94	0	0	0	0	10/14
2019	840	-	2	98	0	10	2	0	10/16
Ericameria nauseosa -- (rubber rabbitbrush)									
1994	120	-	0	100	0	0	0	0	10/19
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	20	-	0	100	0	0	0	0	- / -
2014	-	-	-	-	-	-	-	-	60/49
2019	-	-	-	-	-	-	-	-	48/73

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Escobaria vivipara var. arizonica -- (Arizona spinystar)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	40	0	0	0	0	0	0	7/10
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	20	-	0	100	0	0	100	0	6/13
2019	-	-	-	-	-	-	-	-	12/24
Gutierrezia sarothrae -- (broom snakeweed)									
1994	320	-	6	63	31	0	0	6	19/16
1999	120	60	50	33	17	0	0	0	12/13
2004	360	20	39	61	0	0	0	0	16/15
2009	3300	220	33	64	3	1	0	2	20/24
2014	3180	15600	13	84	4	0	0	5	17/17
2019	20960	340	1	97	2	0	0	3	13/18
Juniperus osteosperma[t] -- (Utah juniper)									
1994	-	-	-	-	-	-	-	-	-/-
1999	400	40	60	40	0	0	0	0	- / -
2004	-	-	-	-	-	-	-	-	- / -
2009	-	-	-	-	-	-	-	-	-/-
2014	-	60	0	0	0	0	0	0	- / -
2019	20	-	100	0	0	0	0	0	- / -
Opuntia -- (pricklypear)									
1994	80	-	25	75	0	0	0	0	- / -
1999	20	-	0	100	0	0	0	0	14/39
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	6/13
2014	-	-	-	-	-	-	-	-	19/56
2019	20	-	100	0	0	0	0	0	17/66
Pinus edulis[t] -- (twoneedle pinyon)									
1994	-	-	-	-	-	-	-	-	-/-
1999	280	20	21	79	0	0	0	0	- / -
2004	-	-	-	-	-	-	-	-	- / -
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Purshia tridentata[p] -- (antelope bitterbrush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	17/32
2019	-	-	-	-	-	-	-	-	12/52
Tetradymia canescens -- (spineless horsebrush)									
1994	20	-	0	100	0	0	0	0	15/12
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	40	20	0	50	50	0	50	50	11/17
2014	-	-	-	-	-	-	-	-	11/20

t - Tree Species; p - Preferred Browse; i - Introduced Species

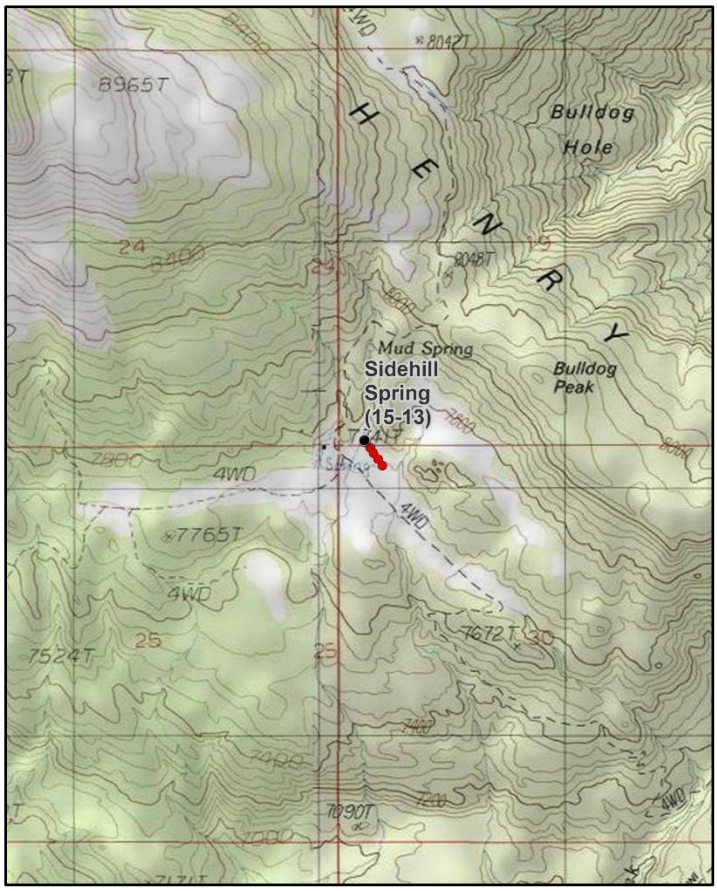
Table 15-12.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

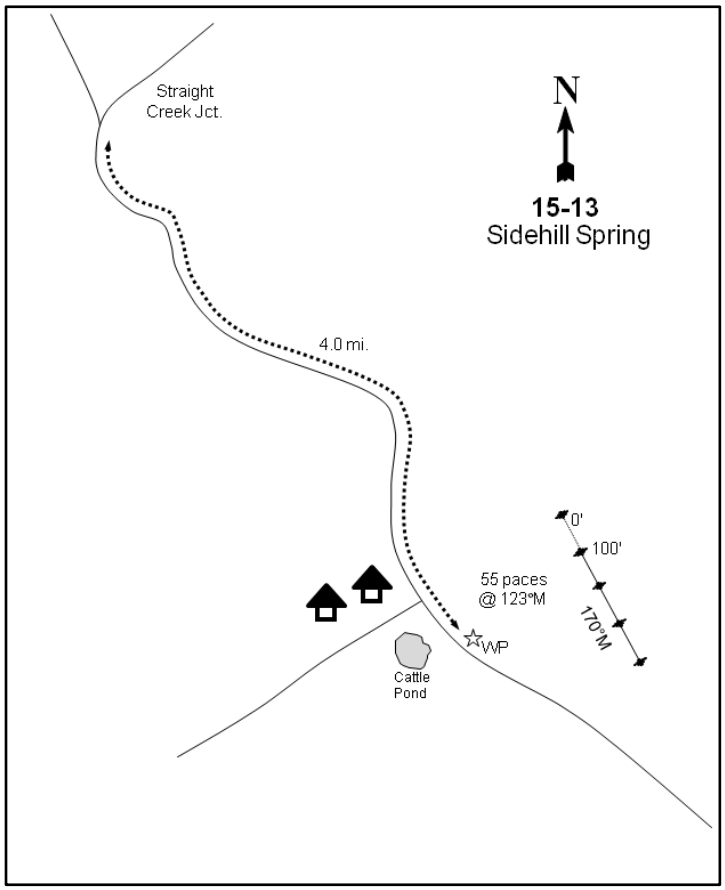
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1994	116	-	-	-	-	-	4.1
1999	127	-	-	-	-	-	5.4
2009	1	-	100	-	-	-	4.0
2014	1	-	100	-	-	-	6.0
2019	6	33	33	33	-	-	4.3
Pinus edulis (twoneedle pinyon)							
1994	257	-	-	-	-	-	5.4
1999	251	-	-	-	-	-	8.2
2019	1	100	-	-	-	-	1.0

Table 15-12.15 – Deer Desirable Components Index: Mid Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1994	25.8	9.2	3.1	7.1	-0.1	3.0	0.0	48.2	Poor-Fair
1999	25.2	9.1	3.7	6.3	-2.6	5.3	0.0	47.0	Poor
2004	0.0	0.0	0.0	10.2	-1.0	10.0	0.0	19.2	Very Poor
2009	1.8	0.0	0.0	30.0	0.0	10.0	0.0	41.8	Poor
2014	5.8	0.0	0.0	30.0	-1.3	10.0	0.0	44.5	Poor
2019	10.0	12.9	5.4	30.0	-0.4	7.6	0.0	65.5	Fair-Good

SIDEHILL SPRING - STUDY NO. 15-13





Location Information

USGS 7.5 min Map Info	Cass Creek Peak SW; Township 33S, Range 11E, Section 19
GPS (0' Stake)	NAD 83 UTM ZONE 12, 522131 East 4196390 North

Transect Information

Browse Tag # (0' Stake)	271
Transect Bearing	170° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Belt 1: No Rebar

Directions to Site

From Straight Creek Junction, proceed south on the main road for 0.3 miles to Straight Creek. Continue 3.6 miles to a minor fork by a spring, stock pond, and some abandoned cabins. Bear left on the main road, cross a small wash, and continue less than 0.1 miles into the sage flat where a witness post for the transect is found on the left (east) side of the road. The study area is northeast of the witness post. The 0-foot stake has browse tag #271 attached, and is 40 paces away from the witness post at a bearing of 21 degrees magnetic.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	PENNELL
Elevation	7,700ft (2,347m)
Aspect	Southeast
Slope	5%
Sample Dates	06/09/1994, 06/08/1999, 08/17/2004, 06/09/2009, 06/03/2014, 06/05/2019

Table 15-13.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	Bulldog	-	2003	31754
Chaining - Chain Unknown	-	LTDL	November 2003	4600
Seeding - Seed Unknown	BLM Bulldog Fire (Non-WSA)	LTDL	November 2003	7676

Table 15-13.2 SeedMix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Bulldog Fire Rehabilitation-Non WSA			Aerial	Nov 2003	7676
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Achnatherum hymenoides	Indian Ricegrass	Rimrock	0.56	0.00
G	Agropyron cristatum	Crested Wheatgrass	Hycrest	3.33	0.00
G	Psathyrostachys juncea	Russian Wildrye	Bozoisky	2.78	0.00
G	Thinopyrum intermedium	Pubescent Wheatgrass	Luna	2.78	0.00
G	Thinopyrum ponticum	Tall Wheatgrass	Alkar	2.22	0.00
F	Linum perenne	Blue Flax	Appar	0.22	0.00
F	Medicago sativa	Alfalfa	Ladak	0.56	0.00

Mix Name			Application Type	Application Date	Acres
Bulldog Fire Rehabilitation-Non WSA-Dribbler			Aerial	Nov 2003	7676
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
S	Atriplex canescens	Fourwing Saltbush		0.56	0.00

Wildlife Habitat and Vegetation History

Table 15-13.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
American Bison	crucial	year-long
Mule Deer	crucial	year-long
Rocky Mountain Elk	substantial	year-long

Table 15-13.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1987	Mountain Big Sagebrush	Phase I
1994	Mountain Big Sagebrush	Phase I
1999	Mountain Big Sagebrush	Phase I
2004	Perennial Grass	Phase I
2009	Perennial Grass/Mountain Big Sagebrush	Phase I
2014	Perennial Grass/Mountain Big Sagebrush	Phase I
2019	Perennial Grass/Mountain Big Sagebrush	Phase I

Site Notes

The study is located in the foothills on the north slope of Mt. Hillars and about two-thirds of a mile from Quaking Aspen Spring.

Soils

Table 15-13.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	7.5	37.3	36.2	26.5	2.1	5.8	83.2	0.5	06/08/1999
Loam	7.3	37.6	37.8	24.6	2.1	13.5	252.8	0.5	08/17/2004

Site Potential

1981 - 2010 Average Annual Precipitation	19 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XB430UT
States and Transitions	No state and transition model is available for this ecological site.

At the time of establishment in 1987, the site was in a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*)-dominated ecological state with a mostly depleted understory primarily comprised of annual grasses (Table 15-13.6, Table 15-13.7, Table 15-13.12). After the fire, chaining, and seeding occurred in 2003 (Table 15-13.1), native and introduced grass species, particularly crested wheatgrass (*Agropyron cristatum*) and intermediate wheatgrass (*Thinopyrum intermedium*), established and became the dominant understory components (Table 15-13.10). Before the fire, silky lupine (*Lupinus sericeus*) provided good cover and was the dominant forb. However, cover of forbs has remained relatively low after the fire with no particular species being dominant (Table 15-13.11). Shrub cover is mainly provided by mountain big sagebrush with a lesser component of black sagebrush (*Artemisia nova*). Other species such as Gambel oak (*Quercus gambelii*) and mountain snowberry (*Symphoricarpos oreophilus*) are present, but with low cover and density (Table 15-13.12, Table 15-13.13). Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) were present on the site in moderate amounts through the 1999 sample year, but the fire removed a majority of the trees (Photos). A small number of young juniper trees have been observed following the fire, and it is likely that infilling will continue in future sample years (Table 15-13.14).

Trend Summary Tables

Table 15-13.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	19.5	6.1	6.2	-	-	-
1999	19.2	7.1	10.1	-	-	0.6
2004	0.3	0.3	-	0.5	0.1	-
2009	6.4	0.2	-	5.9	-	-
2014	8.8	0.3	-	11.6	0.4	-
2019	16.3	0.8	-	21.1	0.5	-

Table 15-13.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	178	176	10	194	0.8	1.5	0.0	5.1
1999	401	113	-	120	16.7	2.2	-	3.6
2004	59	234	76	134	2.2	8.6	5.8	4.8
2009	61	324	19	86	2.1	12.6	0.2	3.4
2014	59	348	9	97	1.6	16.4	0.1	0.9
2019	51	343	137	163	0.5	17.2	1.3	2.3

Table 15-13.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	25.1	0.2	32.4	0.5	2.1	40.7
1999	24.1	0.4	38.9	1.0	2.0	53.5
2004	68.0	-	10.5	3.3	4.4	20.7
2009	55.2	-	19.0	6.2	2.7	27.7
2014	57.8	-	16.7	1.2	2.2	28.3
2019	57.1	0.0	17.3	2.4	3.5	34.5

Table 15-13.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle/Bison	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1994	-	12	1	19
1999	2	5	-	24
2004	-	3	1	19
2009	42	3	-	29
2014	2	-	-	6
2019	12	3	-	2
Year	Days Use Per Acre (ha)			
1994	-	-	-	-
1999	25.4 (62.8)	18.1 (44.7)	-	-
2004	-	1.3 (3.3)	-	-
2009	87.9 (217.0)	1.3 (3.3)	-	-
2014	25.4 (62.8)	2.7 (6.6)	-	-
2019	29.8 (73.5)	2.7 (6.6)	-	-

Table 15-13.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Achnatherum lettermanii (Letterman's needlegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bouteloua gracilis (blue grama)	Bromus marginatus (mountain brome)	Bromus tectorum[ai] (cheatgrass)	Dactylis glomerata[i] (orchardgrass)	Elymus elymoides (squirreltail)	Elymus trachycaulus (slender wheatgrass)	Pascopyrum smithii (western wheatgrass)	Poa nemoralis ssp. interior (inland bluegrass)	Poa secunda (Sandberg bluegrass)	Psathyrostachys juncea[i] (Russian wildrye)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium[i] (intermediate wheatgrass)
year	Nested Frequency														
1994	13	6	-	5	-	178	-	154	-	-	5	-	-	-	-
1999	16	1	-	4	-	401	-	94	-	-	2	-	-	0	-
2004	11	-	81	4	43	59	5	15	75	-	-	-	20	4	97
2009	6	-	222	7	12	61	-	6	16	-	-	5	44	19	164
2014	13	-	173	5	-	59	-	6	-	101	-	6	57	5	194
2019	8	-	105	6	-	51	-	-	-	36	-	12	116	-	194
year	Average Cover (%)														
1994	0.1	0.0	-	0.0	-	0.8	-	1.4	-	-	0.0	-	-	-	-
1999	0.2	0.0	-	0.0	-	16.7	-	1.9	-	-	0.0	-	-	0.0	-
2004	0.1	-	1.8	0.1	1.0	2.2	0.2	0.7	1.8	-	-	-	0.5	0.0	2.3
2009	0.1	-	7.4	0.2	0.1	2.1	-	0.0	0.1	-	-	0.0	0.5	0.6	3.6
2014	0.1	-	5.3	0.4	-	1.6	-	0.4	-	3.2	-	0.0	2.1	0.2	4.8
2019	0.0	-	3.4	0.3	-	0.5	-	-	-	0.9	-	0.1	6.8	-	5.7

a - Annual; n - Noxious Weed; i - Introduced Species

Table 15-13.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agastache (giant hyssop)	Agoseris glauca (pale agoseris)	Astragalus (milkvetch)	Calochortus nuttallii (sego lily)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata[ai] (curveseed butterwort)	Chenopodium album[a] (lambsquarters)	Chenopodium leptophyllum[a] (narrowleaf goosefoot)	Collinsia parviflora[a] (maiden blue eyed Mary)	Cymopterus purpureus (purple springparsley)	Eriogonum racemosum (redroot buckwheat)	Gayophytum ramosissimum[a] (pinyon groundsmoke)	Lappula occidentalis[a] (flatspine stickseed)	Linum lewisii (Lewis flax)	Lupinus sericeus (silky lupine)	Machaeranthera canescens (hoary tansyaster)
year	Nested Frequency																
1994	-	-	-	-	55	-	-	-	-	-	3	-	9	5	3	174	-
1999	-	-	-	0	45	3	-	-	-	-	8	-	-	-	-	77	-
2004	24	-	-	3	12	-	7	2	17	-	-	-	18	4	17	15	-
2009	39	0	-	1	-	4	6	-	3	-	3	-	-	8	-	7	-
2014	2	-	1	-	19	-	-	-	-	-	-	-	-	9	-	7	-
2019	1	-	-	-	87	-	75	4	17	1	3	1	5	14	5	5	0
year	Average Cover (%)																
1994	-	-	-	-	0.1	-	-	-	-	-	0.0	-	0.0	0.0	0.0	4.9	-
1999	-	-	-	0.0	0.3	0.4	-	-	-	-	0.1	-	-	-	-	2.7	-
2004	0.8	-	-	0.0	0.0	-	0.0	0.2	1.9	-	-	-	0.5	0.2	0.3	0.8	-
2009	1.9	0.1	-	0.0	-	0.0	0.2	-	0.0	-	0.0	-	-	0.0	-	0.6	-
2014	0.0	-	0.0	-	0.1	-	-	-	-	-	-	-	-	0.1	-	0.0	-
2019	0.1	-	-	-	0.7	-	0.9	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.0	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Medicago sativa[i] (alfalfa)	Nicotiana attenuata[a] (coyote tobacco)	Penstemon (beardtongue)	Penstemon comarrhenus (dusty beardtongue)	Phlox longifolia (longleaf phlox)	Pleiacanthus spinosus (thorn skeletonweed)	Polygonum douglasii[a] (Douglas' knotweed)	Solanum triflorum[a] (cutleaf nightshade)	Sphaeralcea coccinea (scarlet globemallow)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency									
1994	-	-	-	2	-	-	-	-	-	6
1999	-	-	-	4	5	-	-	-	1	0
2004	8	10	0	2	78	9	34	2	2	-
2009	3	-	-	2	-	30	7	-	12	-
2014	-	-	-	8	38	28	-	-	8	6
2019	-	-	-	-	64	27	49	-	18	5
year	Average Cover (%)									
1994	-	-	-	0.0	-	-	-	-	-	0.0
1999	-	-	-	0.0	0.0	-	-	-	0.1	0.0
2004	0.5	0.5	0.0	0.1	0.8	1.2	1.6	0.9	0.2	-
2009	0.0	-	-	0.0	-	0.6	0.0	-	0.1	-
2014	-	-	-	0.1	0.1	0.5	-	-	0.0	0.0
2019	-	-	-	-	0.7	0.3	0.2	-	0.1	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 15-13.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis[p] (Utah serviceberry)	Artemisia nova[p] (black sagebrush)	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Atriplex canescens[p] (fourwing saltbush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma[t] (Utah juniper)	Opuntia (pricklypear)	Pinus edulis[t] (twoneedle pinyon)	Quercus gambelii[p] (Gambel oak)	Symphoricarpos oreophilus[p] (mountain snowberry)
year	Line Intercept Cover (%)												
1994	-	-	-	-	-	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-	-	-	-	-	-
2004	-	-	0.1	0.2	-	0.1	-	-	-	-	-	-	0.2
2009	-	0	5.4	-	-	0	-	-	-	-	-	0.5	0
2014	-	0.5	10.3	-	-	0.3	-	0.1	-	-	-	0.5	0.3
2019	-	4.5	16.1	-	0.3	0.2	-	0	-	-	-	0.5	-
year	Quadrat Cover (%)												
1994	0.0	-	19.2	-	-	6.1	-	-	4.6	0.0	1.6	-	0.3
1999	-	0.4	18.6	-	-	7.0	-	-	7.5	0.0	2.6	-	0.2
2004	-	-	0.3	0.0	-	0.3	-	-	-	-	-	-	0.0
2009	-	0.0	6.2	-	0.0	0.2	-	-	-	-	-	0.0	0.2
2014	-	0.1	8.2	-	-	0.3	0.0	0.0	-	-	-	0.0	0.5
2019	-	4.1	12.1	-	0.0	0.5	-	0.2	-	-	-	0.0	0.1

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 15-13.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
1994	60	-	0	100	0	33	0	0	142/116
1999	40	-	0	100	0	0	0	0	111/102
2004	-	-	-	-	-	-	-	-	57/88
2009	20	-	0	100	0	0	0	0	67/93
2014	-	-	-	-	-	-	-	-	85/85
2019	-	-	-	-	-	-	-	-	58/93
Artemisia nova[p] -- (black sagebrush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	60	-	0	100	0	0	0	0	44/70
2004	-	-	-	-	-	-	-	-	-/-
2009	20	-	0	100	0	100	0	0	28/55
2014	20	-	0	100	0	100	0	0	26/62
2019	1460	5800	34	66	0	53	1	0	36/69
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1994	5600	3020	15	56	29	2	1	9	61/73
1999	5920	240	14	74	12	2	0	7	61/91
2004	520	1560	100	0	0	0	0	0	36/66
2009	2240	-	11	89	0	12	0	3	40/53
2014	5100	140	56	44	1	32	5	2	38/66
2019	4160	4340	35	63	2	23	6	5	42/79

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Atriplex canescens[p] -- (fourwing saltbush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	60	60	100	0	0	0	0	0	32/20
2009	20	-	100	0	0	0	100	0	6/3
2014	40	-	100	0	0	0	50	0	4/13
2019	-	-	-	-	-	-	-	-	-/-
Cercocarpus montanus[p] -- (alderleaf mountain mahogany)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	31/24
2009	-	-	-	-	-	-	-	-	12/37
2014	-	-	-	-	-	-	-	-	20/36
2019	-	-	-	-	-	-	-	-	-/-
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	20	-	0	100	0	0	0	0	14/34
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1994	8340	3960	9	90	1	1	0	0	17/33
1999	11000	200	13	87	1	0	0	0	15/26
2004	340	-	0	100	0	0	0	0	17/26
2009	440	20	36	64	0	5	14	0	14/25
2014	480	40	38	63	0	13	8	0	14/25
2019	280	-	0	100	0	21	50	0	11/23
Eriogonum corymbosum -- (crispleaf buckwheat)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	20	-	100	0	0	0	0	0	- / -
2019	-	-	-	-	-	-	-	-	-/-
Ericameria nauseosa -- (rubber rabbitbrush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	53/85
2019	-	-	-	-	-	-	-	-	53/113
Gutierrezia sarothrae -- (broom snakeweed)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	17/33
2019	420	-	0	100	0	0	0	0	14/24

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Juniperus osteosperma[t] -- (Utah juniper)									
1994	-	-	-	-	-	-	-	-	-/-
1999	100	-	0	100	0	0	0	0	- / -
2004	-	-	-	-	-	-	-	-	- / -
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Opuntia -- (pricklypear)									
1994	200	-	40	60	0	0	0	0	13/40
1999	100	-	0	100	0	0	0	0	10/17
2004	-	-	-	-	-	-	-	-	17/19
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	10/38
Pediocactus simpsonii -- (mountain ball cactus)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	4/8
Pinus edulis[t] -- (twoneedle pinyon)									
1994	-	-	-	-	-	-	-	-	-/-
1999	60	-	33	67	0	0	0	0	- / -
2004	-	-	-	-	-	-	-	-	- / -
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Quercus gambelii[p] -- (Gambel oak)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	40	-	0	100	0	0	0	0	61/49
2009	20	-	0	100	0	0	0	0	231/133
2014	40	-	0	100	0	0	100	0	149/88
2019	60	-	0	100	0	0	100	0	161/78
Rosa woodsii[p] -- (Woods' rose)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	20	-	0	100	0	0	0	0	26/33
2009	-	-	-	-	-	-	-	-	53/58
2014	-	-	-	-	-	-	-	-	46/46
2019	-	-	-	-	-	-	-	-	40/57
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
1994	260	20	15	69	15	15	0	0	31/59
1999	280	-	57	43	0	0	0	0	44/62
2004	40	-	0	100	0	0	0	100	41/85
2009	80	20	0	100	0	100	0	0	25/47
2014	60	-	0	100	0	0	33	0	33/85
2019	20	-	0	100	0	0	100	0	19/86

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Tetradymia canescens -- (spineless horsebrush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	23/69
2019	-	-	-	-	-	-	-	-	15/36

t - Tree Species; p - Preferred Browse; i - Introduced Species

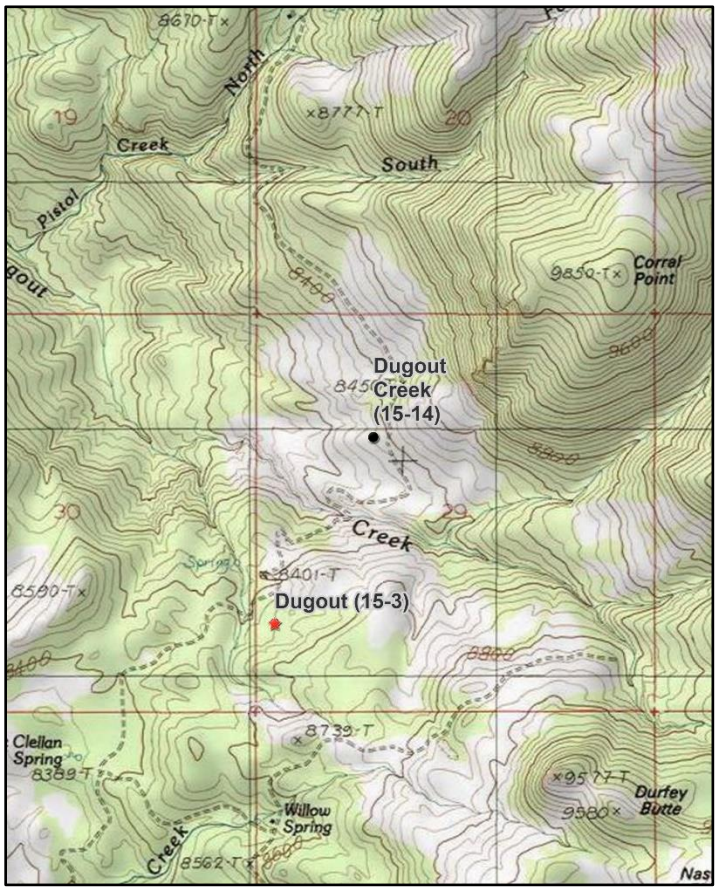
Table 15-13.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

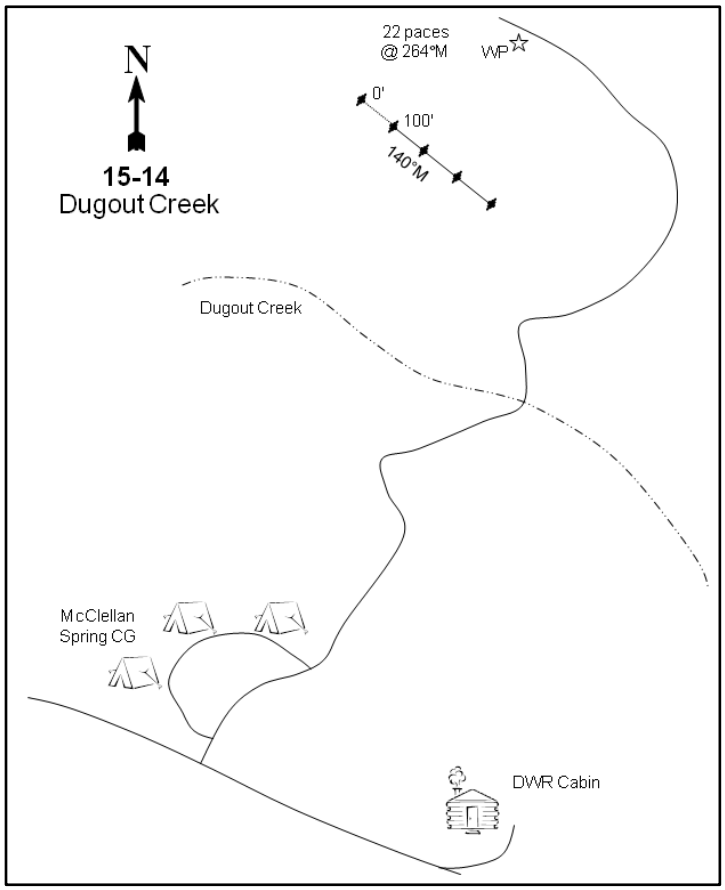
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1994	35	-	-	-	-	-	11.7
1999	46	-	-	-	-	-	12.6
2009	2	-	100	-	-	-	7.0
2014	1	-	100	-	-	-	8.0
2019	3	-	100	-	-	-	7.0
Pinus edulis (twoneedle pinyon)							
1994	20	-	-	-	-	-	9.7
1999	22	-	-	-	-	-	11.3
Quercus gambelii (Gambel oak)							
2009	1	-	100	-	-	-	3.0

Table 15-13.15 – Deer Desirable Components Index: High Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1994	24.3	6.3	7.5	3.1	-0.6	10.0	0.0	50.7	Poor
1999	24.0	11.5	6.8	4.3	-12.6	7.3	0.0	41.3	Very Poor-Poor
2004	0.6	0.0	0.0	17.3	-1.6	9.6	0.0	25.8	Very Poor
2009	7.3	15.0	4.9	25.2	-1.6	6.8	0.0	57.5	Fair
2014	14.3	14.8	15.0	30.0	-1.2	1.7	0.0	74.6	Good
2019	26.3	14.6	15.0	30.0	-0.4	4.5	0.0	89.9	Good-Excellent

DUGOUT CREEK - STUDY NO. 15-14





Location Information

USGS 7.5 min Map Info	Mount Ellen NW; Township 31S, Range 10E, Section 29
GPS (0' Stake)	NAD 83 UTM ZONE 12, 514442 East 4215166 North

Transect Information

Browse Tag # (0' Stake)	153
Transect Bearing	140° magnetic (Line 3: 145° magnetic)
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

From the DWR State Cabin, travel northwest toward McClellan Spring for 0.5 miles. Turn right onto the road passing McClellan Spring Campground, then travel 0.1 miles to a cattle guard. Cross the cattle guard and continue 1.1 miles to Dugout Creek. Drive 0.5 miles past the creek to a witness post on the left-hand (south) side of the road. The beginning of the baseline is 22 paces from the witness post at 264 degrees magnetic. The 0-foot stake is marked with browse tag #153.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	NASTY FLAT
Elevation	8,300ft (2,530m)
Aspect	Southeast
Slope	5-12%
Sample Dates	06/10/2004, 06/01/2009, 06/05/2014, 06/05/2019

Wildlife Habitat and Vegetation History

Table 15-14.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
American Bison	crucial	year-long
Mule Deer	crucial	summer
Rocky Mountain Elk	substantial	year-long

Table 15-14.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2004	Mountain Big Sagebrush	Phase I
2009	Mountain Big Sagebrush	Phase I
2014	Mountain Big Sagebrush	Phase I
2019	Mountain Big Sagebrush	Phase I

Site Notes

Water is available for livestock and wildlife within one-quarter of a mile of the study site. Pellet group data for bison and cattle were combined due to difficulties in differentiating between these species.

Soils

Table 15-14.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.2	28.3	32.2	39.5	2.1	14.0	361.6	0.5	06/09/2004

Site Potential

1981 - 2010 Average Annual Precipitation	25 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XB430UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 2004, this site has remained in a stable mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) state with a lesser amount of black sagebrush (*A. nova*). Other browse species such as Gambel oak (*Quercus gambelii*) and Utah serviceberry (*Amelanchier utahensis*) are also present, but in lesser amounts. Cover of browse species has remained stable or has increased slightly (Table 15-14.12, Table 15-14.13). The understory has been composed of a mixture of perennial grasses and forbs, the cover of which has been stable over time. Slender wheatgrass (*Elymus trachycaulus*) is the most common perennial grass with other native species also present. Perennial forbs provide moderate cover with pale agoseris (*Agoseris glauca*) and Eaton's fleabane (*Erigeron eatonii*) as the dominant species (Table 15-14.10, Table 15-14.11). A mixture of conifer species have been observed on site, including Utah juniper (*Juniperus osteosperma*), Rocky Mountain juniper (*J. scopulorum*), twoneedle pinyon (*Pinus edulis*), limber pine (*P. flexilis*) and Douglas fir (*Pseudotsuga menziesii*). Pinyon and juniper have increased in abundance over the sample period (Table 15-14.14), a trend which is likely to continue without a major tree-removing disturbance.

Trend Summary Tables

Table 15-14.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2004	22.7	2.2	6.5	22.6	1.6	8.6
2009	22.2	2.6	6.8	23.0	2.0	9.8
2014	22.4	4.2	6.2	24.7	1.5	9.4
2019	26.6	2.1	8.4	32.9	1.8	7.4

Table 15-14.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2004	271	152	92	128	9.8	3.9	0.6	2.3
2009	108	179	45	179	1.4	9.2	0.4	4.5
2014	105	175	49	146	1.4	9.0	0.2	2.9
2019	137	152	51	155	1.4	4.8	0.3	2.5

Table 15-14.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2004	12.0	0.0	46.2	3.3	11.4	48.2
2009	14.4	0.6	42.5	2.2	13.1	46.3
2014	17.9	0.2	51.6	2.6	13.5	46.7
2019	15.2	0.2	57.0	5.8	12.0	44.4

Table 15-14.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle/Bison	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
2004	7	8	-	11
2009	2	34	-	17
2014	1	10	1	4
2019	1	25	5	6
Year	Days Use Per Acre (ha)			
2004	11.6 (28.7)	41.5 (102.6)	-	-
2009	2.2 (5.4)	97.9 (241.7)	0.7 (1.7)	-
2014	-	7.4 (18.2)	-	-
2019	0.7 (1.8)	20.8 (51.3)	-	-

Table 15-14.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Achnatherum lettermanii (Letterman's needlegrass)	Bouteloua gracilis (blue grama)	Bromus tectorum[ai] (cheatgrass)	Elymus elymoides (squirreltail)	Elymus trachycaulus (slender wheatgrass)	Poa fendleriana (muttongrass)	Poa pratensis[i] (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)
year	Nested Frequency								
2004	1	19	-	271	53	48	45	2	3
2009	9	10	5	108	29	95	41	-	8
2014	2	21	-	105	15	108	43	5	1
2019	12	3	-	137	14	83	44	7	6
year	Average Cover (%)								
2004	0.0	0.3	-	9.8	0.9	1.4	1.3	0.0	0.0
2009	0.1	0.9	0.2	1.4	0.5	6.2	1.0	-	0.2
2014	0.1	1.1	-	1.4	0.8	4.9	1.7	0.4	0.0
2019	0.5	0.0	-	1.4	0.3	2.1	1.5	0.3	0.0

a - Annual; n - Noxious Weed; i - Introduced Species

Table 15-14.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Antennaria (pussytoes)	Arabis (rockcress)	Calochortus nuttallii (sego lily)	Castilleja linariifolia (Wyoming Indian paintbrush)	Cirsium (thistle)	Crepis acuminata (tapertip hawksbeard)	Cryptantha (cryptantha)	Cymopterus (springparsley)	Erigeron eatonii (Eaton's fleabane)	Gayophytum ramosissimum[a] (pinyon groundsmoke)	Ipomopsis aggregata (scarlet gilia)	Lappula occidentalis[a] (flatspine stickseed)	Lomatium (desertparsley)	Machaeranthera canescens (hoary tansyaster)	Machaeranthera grindelioides (rayless tansyaster)	Packera multilobata (lobeleaf groundsel)
year	Nested Frequency																
2004	12	4	1	10	7	1	48	-	12	38	8	4	39	5	4	-	1
2009	30	12	2	41	13	1	21	-	11	50	-	7	3	7	21	-	1
2014	18	8	6	15	-	1	27	-	12	62	-	3	33	4	-	7	4
2019	27	4	2	55	2	2	15	5	3	28	22	-	12	16	1	9	1
year	Average Cover (%)																
2004	0.0	0.2	0.0	0.0	0.1	0.0	0.6	-	0.0	0.7	0.1	0.0	0.2	0.0	0.0	-	0.0
2009	0.6	0.3	0.0	0.1	0.1	0.2	0.3	-	0.2	1.0	-	0.1	0.0	0.0	0.1	-	0.0
2014	0.2	0.2	0.0	0.1	-	0.0	0.2	-	0.1	1.8	-	0.0	0.2	0.0	-	0.1	0.0
2019	0.6	0.2	0.0	0.3	0.2	0.0	0.1	0.0	0.0	0.4	0.1	-	0.1	0.1	0.0	0.1	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Penstemon (beardtongue)	Phlox longifolia (longleaf phlox)	Polygonum douglasii[a] (Douglas' knotweed)	Sanguisorba minor[i] (small burnet)	Symphyotrichum (aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius[ai] (yellow salsify)
year	Nested Frequency						
2004	-	21	66	-	6	8	5
2009	3	12	30	1	5	35	18
2014	-	15	2	-	5	5	16
2019	3	46	27	-	2	6	2
year	Average Cover (%)						
2004	-	0.1	0.2	-	0.0	0.3	0.1
2009	0.0	0.0	0.1	0.0	0.2	1.2	0.3
2014	-	0.1	0.0	-	0.2	0.0	0.1
2019	0.0	0.3	0.1	-	0.1	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 15-14.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis[p] (Utah serviceberry)	Artemisia nova[p] (black sagebrush)	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Chrysothamnus depressus[p] (longflower rabbitbrush)	Ephedra viridis[p] (mormon tea)	Ericameria nauseosa ssp. nauseosa var. glabrata (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma[t] (Utah juniper)	Juniperus scopulorum[t] (Rocky Mountain juniper)	Opuntia (pricklypear)	Pinus edulis[t] (twoneedle pinyon)	Pinus flexilis[t] (limber pine)	Quercus gambelii[p] (Gambel oak)
year	Line Intercept Cover (%)												
2004	0.4	6	15.3	-	-	1.1	0.5	1.1	4.6	-	1.6	1.3	0.9
2009	0.6	6.8	15	-	0.1	1.3	0.7	4.4	1.8	-	2.1	1.5	0.5
2014	1.1	2.8	18.5	-	-	0.9	0.6	3.1	3	-	3.3	-	2.3
2019	0.8	4.5	26.2	-	-	1.8	-	1.6	2.5	-	2.2	1.1	1.4
year	Quadrat Cover (%)												
2004	0.0	7.1	14.8	-	-	1.0	1.1	0.8	3.8	-	1.0	0.8	0.8
2009	0.0	6.0	15.4	-	0.0	1.9	0.7	3.4	1.8	0.0	0.7	0.9	0.8
2014	0.1	2.7	19.0	-	-	3.3	0.9	2.9	1.4	0.0	1.3	0.6	0.5
2019	0.0	4.4	21.4	0.0	-	1.9	0.2	0.4	4.8	-	0.8	2.4	0.8

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 15-14.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
2004	60	-	0	100	0	67	0	0	74/89
2009	200	40	60	40	0	20	0	0	111/108
2014	60	-	0	100	0	0	33	0	95/108
2019	60	-	33	67	0	33	0	0	127/124
Artemisia nova[p] -- (black sagebrush)									
2004	2880	460	8	56	36	8	0	9	30/60
2009	3540	180	30	48	23	9	1	6	26/62
2014	1100	40	11	75	14	24	64	6	26/67
2019	2200	-	5	58	37	14	78	36	23/46
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
2004	3340	10080	0	69	31	44	0	13	67/89
2009	13260	2620	63	27	10	4	0	7	45/66
2014	6320	20	5	85	10	57	5	6	44/78
2019	4180	60	2	76	22	47	24	22	52/86
Cercocarpus montanus[p] -- (alderleaf mountain mahogany)									
2004	-	-	-	-	-	-	-	-	92/114
2009	-	-	-	-	-	-	-	-	147/136
2014	-	-	-	-	-	-	-	-	98/136
2019	-	-	-	-	-	-	-	-	89/110
Chrysothamnus depressus[p] -- (longflower rabbitbrush)									
2004	20	-	0	100	0	0	0	0	15/26
2009	20	-	0	100	0	100	0	0	11/23
2014	20	-	0	100	0	100	0	100	12/23
2019	20	-	0	100	0	0	0	0	15/23

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Ephedra viridis[p] -- (mormon tea)									
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	43/30
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Ericameria nauseosa ssp. nauseosa var. glabrata -- (rubber rabbitbrush)									
2004	260	20	0	54	46	0	0	15	87/100
2009	220	20	0	73	27	9	0	27	73/87
2014	200	-	0	90	10	20	20	10	89/120
2019	200	100	0	40	60	70	0	60	84/101
Gutierrezia sarothrae -- (broom snakeweed)									
2004	1180	60	15	83	2	9	0	0	18/24
2009	2260	80	25	74	2	0	0	2	13/20
2014	860	520	5	95	0	5	0	0	15/43
2019	480	60	8	92	0	0	0	0	11/14
Juniperus osteosperma[t] -- (Utah juniper)									
2004	20	-	0	100	0	0	0	0	- / -
2009	20	-	0	100	0	0	0	0	- / -
2014	-	-	-	-	-	-	-	-	-/-
2019	20	-	0	100	0	0	0	0	- / -
Juniperus scopulorum[t] -- (Rocky Mountain juniper)									
2004	-	-	-	-	-	-	-	-	-/-
2009	20	60	0	100	0	0	0	0	- / -
2014	40	-	0	100	0	0	0	0	- / -
2019	20	-	0	100	0	0	0	0	- / -
Opuntia -- (pricklypear)									
2004	20	-	100	0	0	0	0	0	10/37
2009	40	-	0	100	0	0	0	0	12/33
2014	40	-	100	0	0	0	0	0	9/30
2019	20	-	0	100	0	0	0	0	9/13
Pinus edulis[t] -- (twoneedle pinyon)									
2004	20	60	100	0	0	0	0	0	- / -
2009	20	40	0	100	0	0	0	0	- / -
2014	60	-	33	67	0	0	0	33	- / -
2019	40	20	100	0	0	0	0	0	- / -
Pinus flexilis[t] -- (limber pine)									
2004	20	-	0	100	0	0	0	0	- / -
2009	20	-	0	100	0	0	0	0	- / -
2014	20	-	100	0	0	0	0	0	- / -
2019	20	-	0	100	0	0	0	100	- / -
Quercus gambelii[p] -- (Gambel oak)									
2004	420	-	19	81	0	0	0	0	115/55
2009	740	-	19	81	0	60	30	0	128/73
2014	400	-	0	100	0	0	0	0	94/77
2019	340	-	18	82	0	0	0	0	89/62
Ribes[p] -- (currant)									
2004	-	-	-	-	-	-	-	-	155/143
2009	-	-	-	-	-	-	-	-	148/244
2014	-	-	-	-	-	-	-	-	135/188
2019	-	-	-	-	-	-	-	-	156/183

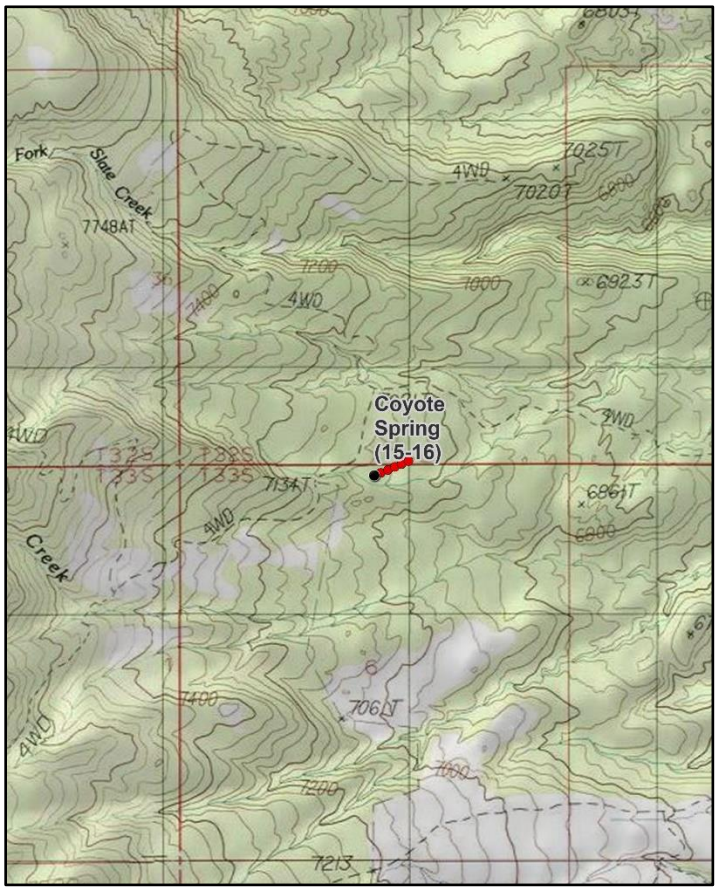
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Symphoricarpos oreophilus^{p} -- (mountain snowberry)									
2004	-	-	-	-	-	-	-	-	49/104
2009	-	-	-	-	-	-	-	-	48/102
2014	-	-	-	-	-	-	-	-	62/102
2019	-	-	-	-	-	-	-	-	36/72

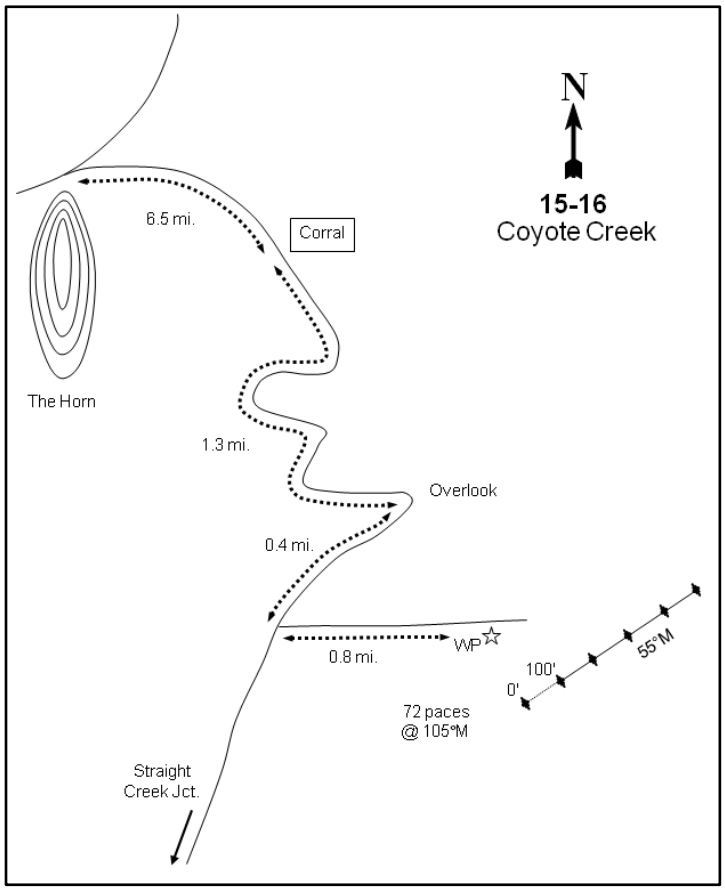
t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 15-14.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2009	5	-	50	25	25	-	6.3
2014	11	25	50	-	25	-	6.5
2019	14	-	57	29	14	-	5.1
Juniperus scopulorum (Rocky Mountain juniper)							
2009	5	-	60	-	20	20	8.8
2014	8	-	80	-	-	20	11.0
2019	9	-	43	29	14	14	13.1
Pinus edulis (twoneedle pinyon)							
2009	23	20	30	10	10	30	8.9
2014	41	-	50	29	7	14	8.1
2019	71	-	71	-	14	14	6.1
Pinus flexilis (limber pine)							
2019	1	-	-	-	-	100	15.0
Pseudotsuga menziesii (Douglas-fir)							
2014	3	100	-	-	-	-	2.0
2019	3	-	100	-	-	-	3.0
Quercus gambelii (Gambel oak)							
2009	6	20	60	-	-	20	2.4

COYOTE SPRING - STUDY NO. 15-16





Location Information

USGS 7.5 min Map Info	Cass Creek Peak NW; Township 33S, Range 11E, Section 06
GPS (0' Stake)	NAD 83 UTM ZONE 12, 522802 East 4202759 North

Transect Information

Browse Tag # (0' Stake)	265
Transect Bearing	60° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Standard

Directions to Site

From Pennellen Pass, travel east on the Coyote Spring road around The Horn towards Mud Spring and the Straight Creek Junction for 6.5 miles to a corral on the left (east) side of the road. Continue on the road for 1.3 miles to a fork with a faint road that leads towards the cliff overlook. Stay right on the main road and proceed 0.4 miles to another fork with a faint road. Go left on this road and continue for 0.8 miles to a witness post on the right (south) side of the road. The 0-foot stake is about 70 paces from the witness post at a bearing of 105 degrees magnetic and is marked by browse tag #265.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	PENNELL
Elevation	7,058ft (2,151m)
Aspect	Northeast
Slope	9-13%
Sample Dates	06/10/2009, 06/03/2014, 06/04/2019

Table 15-16.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	Bulldog	-	2003	31754
Chaining - Chain Unknown	-	LTDL	November 2003	4600
Seeding - Seed Unknown	BLM Bulldog Fire (Non-WSA)	LTDL	November 2003	7676

Wildlife Habitat and Vegetation History

Table 15-16.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
American Bison	crucial	year-long
Mule Deer	crucial	year-long
Rocky Mountain Elk	substantial	year-long

Table 15-16.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2009	Perennial Grass	No Encroachment
2014	Perennial Grass	No Encroachment
2019	Perennial Grass	No Encroachment

Site Notes

Pellet group data for bison and cattle were combined due to difficulties in distinguishing between these species.

Soils

Table 15-16.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	6.8	47.4	26.7	25.9	2.6	22.2	172.8	0.9	06/10/2009

Site Potential

1981 - 2010 Average Annual Precipitation	15 inches
NRCS Ecological Site	Mountain Stony Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XB462UT
States and Transitions	No state and transition model is available for this ecological site.

Since the study was established in 2009, this has been a perennial grass-dominated site primarily comprised of introduced species. Cover of perennial grasses has increased slightly with crested wheatgrass (*Agropyron cristatum*) and intermediate wheatgrass (*Thinopyrum intermedium*) as co-dominant species. In addition, Russian wildrye (*Psathyrostachys juncea*) is a sub-dominant species that provides moderate amounts of cover (Table 15-16.7, Table 15-16.10). Perennial forbs have remained sparse with little fluctuations in cover, and alfalfa (*Medicago sativa*) is the dominant forb present in the understory (Table 15-16.7, Table 15-16.11). Browse species have provided little cover overall with Utah serviceberry (*Amelanchier utahensis*), fourwing saltbush (*Atriplex canescens*), and rubber rabbitbrush (*Ericameria nauseosa*) as the most common shrubs (Table 15-16.12). Furthermore, density data indicates that shrubs are not a significant part of the vegetation community for this site (Table 15-16.13). No trees have been sampled, although photos show young conifer trees growing near the site, suggesting that there may be the possibility of encroachment in future sample years (Photos).

Trend Summary Tables

Table 15-16.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2009	0.4	0.0	-	0.2	0.3	-
2014	0.2	0.2	-	0.3	0.6	-
2019	0.2	0.8	-	0.9	1.1	-

Table 15-16.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2009	9	332	8	31	0.0	24.6	0.0	1.4
2014	14	355	24	53	0.3	25.4	0.2	1.8
2019	10	359	128	45	0.2	29.5	1.3	1.2

Table 15-16.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2009	22.2	-	35.1	2.8	21.5	29.6
2014	22.1	0.0	35.9	3.0	20.3	31.3
2019	23.5	0.1	43.6	4.3	24.0	36.4

Table 15-16.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle/Bison	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
2009	13	6	-	15
2014	-	6	-	2
2019	4	12	-	9
Year	Days Use Per Acre (ha)			
2009	46.5 (114.8)	4.0 (9.9)	1.3 (3.3)	-
2014	22.5 (55.6)	18.7 (46.3)	-	-
2019	21.1 (52.0)	23.4 (57.9)	-	-

Table 15-16.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bromus tectorum[ai] (cheatgrass)	Elymus elymoides (squirreltail)	Elymus trachycaulus (slender wheatgrass)	Psathyrostachys juncea[i] (Russian wildrye)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium[i] (intermediate wheatgrass)
year	Nested Frequency							
2009	5	200	9	-	63	96	52	119
2014	1	258	14	3	5	53	25	184
2019	6	261	10	4	4	61	14	187
year	Average Cover (%)							
2009	0.4	9.2	0.0	-	3.3	3.9	3.0	4.7
2014	0.0	13.4	0.3	0.0	0.0	3.0	1.9	7.0
2019	0.2	14.9	0.2	0.0	0.0	4.0	0.7	9.7

a - Annual; n - Noxious Weed; i - Introduced Species

Table 15-16.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Arabis (rockcress)	Artemisia ludoviciana (white sagebrush)	Astragalus (milkvetch)	Astragalus amphioxys (Crescent milkvetch)	Astragalus lentiginosus (freckled milkvetch)	Calochortus nuttallii (sego lily)	Chenopodium album[a] (lambsquarters)	Chenopodium leptophyllum[a] (narrowleaf goosefoot)	Crepis acuminata (tapertip hawksbeard)	Cryptantha (cryptantha)	Descurainia pinnata[a] (western tansymustard)	Draba[a] (draba)	Dracocephalum parviflorum (American dragonhead)	Gilia[a] (gilia)	Gilia inconspicua[a] (shy gilia)	Lappula occidentalis[a] (flatspine stickseed)
year	Nested Frequency																
2009	0	-	-	5	-	-	-	-	8	-	-	-	-	-	-	-	-
2014	4	-	5	-	3	7	-	-	-	2	1	24	-	4	-	-	2
2019	-	2	4	-	5	5	2	5	7	-	2	66	40	-	7	19	13
year	Average Cover (%)																
2009	0.0	-	-	0.2	-	-	-	-	0.0	-	-	-	-	-	-	-	-
2014	0.0	-	0.0	-	0.0	0.4	-	-	-	0.0	0.0	0.1	-	0.0	-	-	0.2
2019	-	0.0	0.1	-	0.2	0.0	0.0	0.0	0.0	-	0.0	0.8	0.3	-	0.0	0.1	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Linum lewisii (Lewis flax)	Lomatium (desertparsley)	Medicago sativa[i] (alfalfa)	Phlox longifolia (longleaf phlox)	Polygonum douglasii[a] (Douglas' knotweed)	Sphaeralcea coccinea (scarlet globemallow)
year	Nested Frequency					
2009	1	-	15	2	-	8
2014	-	-	14	7	-	8
2019	-	2	14	5	2	8
year	Average Cover (%)					
2009	0.0	-	1.1	0.0	-	0.1
2014	-	-	1.1	0.0	-	0.2
2019	-	0.0	0.4	0.0	0.0	0.3

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 15-16.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis[p] (Utah serviceberry)	Atriplex canescens[p] (fourwing saltbush)	Ephedra viridis[p] (mormon tea)	Ericameria nauseosa (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)
year	Line Intercept Cover (%)				
2009	-	0.2	-	0.3	-
2014	0.1	0.2	-	0.6	-
2019	0.3	0.5	0.1	0.9	0.2
year	Quadrat Cover (%)				
2009	0.1	0.2	-	0.0	-
2014	0.1	0.0	-	0.2	-
2019	0.1	0.0	0.0	0.6	0.2

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 15-16.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
2009	40	-	0	100	0	0	100	0	76/107
2014	20	-	0	100	0	0	100	0	95/139
2019	40	-	0	100	0	0	100	0	119/151
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
2009	-	-	-	-	-	-	-	-	29/34
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Atriplex canescens[p] -- (fourwing saltbush)									
2009	260	-	15	39	46	8	69	15	35/46
2014	60	-	0	100	0	67	33	0	43/60
2019	100	-	20	60	20	0	100	20	50/62
Cercocarpus montanus[p] -- (alderleaf mountain mahogany)									
2009	20	-	0	100	0	0	100	0	57/65
2014	20	-	0	100	0	100	0	0	23/46
2019	20	-	0	100	0	0	100	0	42/68
Chrysothamnus viscidiflorus -- (yellow rabbitbrush)									
2009	-	-	-	-	-	-	-	-	47/79
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Ephedra viridis[p] -- (mormon tea)									
2009	-	-	-	-	-	-	-	-	-/-
2014	20	-	100	0	0	0	0	0	39/73
2019	20	-	0	100	0	0	0	0	49/66
Ericameria nauseosa -- (rubber rabbitbrush)									
2009	20	-	0	100	0	0	0	0	59/70
2014	100	-	0	20	80	20	20	80	67/105
2019	20	-	0	100	0	100	0	0	99/133

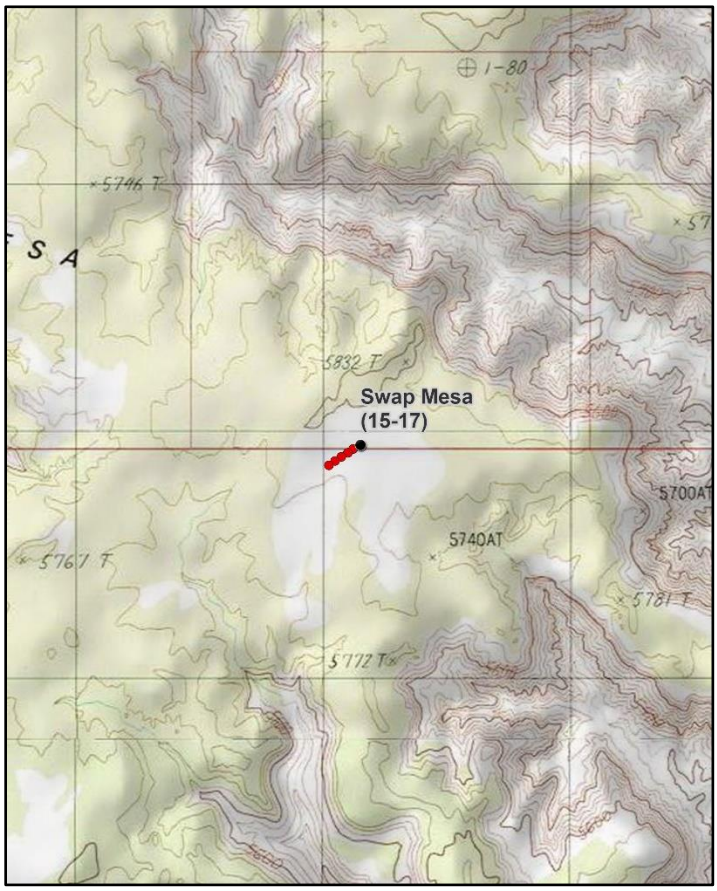
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Fallugia paradoxa -- (Apache plume)									
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	86/130
Gutierrezia sarothrae -- (broom snakeweed)									
2009	-	-	-	-	-	-	-	-	20/41
2014	-	-	-	-	-	-	-	-	26/47
2019	400	100	10	90	0	0	0	0	15/20
Opuntia -- (pricklypear)									
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	22/38

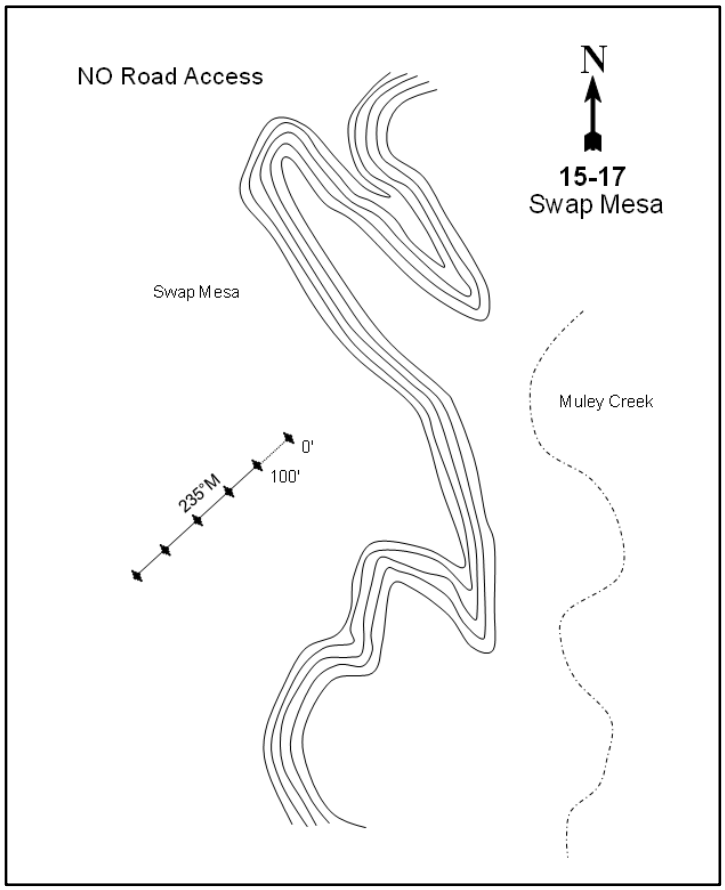
t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 15-16.15 – Deer Desirable Components Index: High Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
2009	0.3	0.0	0.0	30.0	0.0	2.8	0.0	33.0	Very Poor
2014	0.4	0.0	0.0	30.0	-0.2	3.6	0.0	33.8	Very Poor
2019	1.2	0.0	0.0	30.0	-0.1	2.3	0.0	33.4	Very Poor

SWAP MESA - STUDY NO. 15-17





Location Information

USGS 7.5 min Map Info	Cave Flat SW; Township 33S, Range 9E, Section 32
GPS (0' Stake)	NAD 83 UTM ZONE 12, 505099 East 4193136 North

Transect Information

Browse Tag # (0' Stake)	Not Available
Transect Bearing	235° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	No Rebar

Directions to Site

There is no road access to this site.

Site Information

Land Ownership	State
Land Administrator	SITLA
Allotment	SANDY #2
Elevation	5,760ft (1,756m)
Aspect	South
Slope	2-5%
Sample Dates	07/28/2009, 07/29/2014, 08/06/2019

Table 15-17.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	-	-	Historic	-

Wildlife Habitat and Vegetation History

Table 15-17.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
American Bison	crucial	year-long
Rocky Mountain Elk	substantial	year-long

Table 15-17.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2009	Perennial Grass/Broom Snakeweed	Phase I
2014	Perennial Grass	Phase I
2019	Perennial Grass/Annual-Perennial Forb	Phase I

Site Notes

The study is located in a remote area to the west of Mt. Pennell on Swap Mesa. It appears that the area burned sometime in the distant past. The study was established to monitor bison use.

Soils

Table 15-17.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Loam	7.3	68.3	17.1	14.6	1.3	7.2	160.0	0.6	07/28/2009

Site Potential

1981 - 2010 Average Annual Precipitation	8 inches
NRCS Ecological Site	Semidesert Sandy Loam (Fourwing Saltbush)
NRCS Ecological Site #	R035XY215UT
States and Transitions	A defined state and transition model is available.

Since the time of study establishment in 2009, this site has been considered to be in a perennial grass/shrub state. The grass component is dominated by the perennial native species James' galleta (*Pleuraphis jamesii*), sand dropseed (*Sporobolus cryptandrus*), and Indian ricegrass (*Achnatherum hymenoides*): cover of these perennial grasses displayed an overall decrease in the 2019 sample year (Table 15-17.7, Table 15-17.10). Forbs have been relatively rare, although in 2019 several new species were sampled and there was a significant increase in overall forb cover (Table 15-17.7, Table 15-17.11). Shrub cover on the site has remained relatively stable with fourwing saltbush (*Atriplex canescens*) as the dominant species. In addition, broom snakeweed (*Gutierrezia sarothrae*) has been on the site in all years -- cover was high in 2009, but cover and density have decreased since then (Table 15-17.12, Table 15-17.13). Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) trees are near and have been sampled on the site, suggesting that further encroachment may be a possibility in future years (Photos, Table 15-17.14). The state and transition model indicates that there is potential for the site to move to a shrub-dominated state if grazing pressure is increased. Conversely, this site could shift to a grass-dominated state if a disturbance such as fire takes place (Jornada, 2019). Given current management regimes, however, it is probable that the site will continue in the current community.

Trend Summary Tables

Table 15-17.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2009	1.0	6.1	-	1.3	5.3	-
2014	0.6	0.9	-	0.5	0.2	-
2019	0.7	1.1	-	1.4	0.9	-

Table 15-17.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2009	77	236	150	101	0.3	10.7	0.8	1.8
2014	46	353	91	274	0.1	12.5	0.5	5.1
2019	314	197	306	233	7.9	6.0	13.0	10.2

Table 15-17.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2009	73.0	0.1	15.1	0.2	0.0	20.1
2014	64.3	0.1	27.5	0.1	0.0	17.4
2019	53.1	0.1	33.5	0.5	0.0	32.3

Table 15-17.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	American Bison	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
2009	14	1	-	64
2014	20	-	2	57
2019	10	-	-	46
Year	Days Use Per Acre (ha)			
2009	34.1 (84.3)	-	-	-
2014	34.1 (84.3)	-	-	-
2019	29.0 (71.7)	4.0 (9.9)	-	-

Table 15-17.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Aristida purpurea (purple threeawn)	Bouteloua gracilis (blue grama)	Bromus tectorum[ai] (cheatgrass)	Pleuraphis jamesii (James' galleta)	Sporobolus cryptandrus (sand dropseed)	Sporobolus giganteus (giant dropseed)	Vulpia octoflora[a] (sixweeks fescue)
year	Nested Frequency							
2009	27	10	7	76	153	69	1	4
2014	52	26	1	31	213	106	-	19
2019	22	7	5	170	145	21	2	275
year	Average Cover (%)							
2009	0.4	0.1	0.2	0.2	8.7	1.4	0.0	0.0
2014	1.8	0.6	0.0	0.1	7.6	2.5	-	0.0
2019	0.8	0.0	0.2	2.5	4.4	0.5	0.1	5.4

a - Annual; n - Noxious Weed; i - Introduced Species

Table 15-17.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Astragalus (milkvetch)	Astragalus 2 (Milkvetch)	Chaenactis douglasii (Douglas' dustymaiden)	Chamaesyce (sandmat)	Chenopodium fremontii[a] (Fremont's goosefoot)	Cryptantha (cryptantha)	Cryptantha[a] (annual cryptantha)	Descurainia pinnata[a] (western tansymustard)	Eriogonum cernuum[a] (nodding buckwheat)	Gilia inconspicua[a] (shy gilia)	Helianthus (sunflower)	Lappula occidentalis[a] (flatspine stickseed)	Lepidium[a] (pepperweed)	Lygodesmia juncea (rush skeletonplant)	Machaeranthera canescens (hoary tansyaster)	Navarretia intertexta[a] (needleleaf navarretia)	Oenothera (evening primrose)
year	Nested Frequency																
2009	5	4	-	-	30	-	-	-	3	-	-	-	2	-	-	68	-
2014	1	-	3	-	5	206	-	-	-	-	-	-	-	-	-	37	53
2019	22	2	-	3	4	82	136	9	4	23	2	13	3	78	87	250	76
year	Average Cover (%)																
2009	0.0	0.0	-	-	0.1	-	-	-	0.0	-	-	-	0.0	-	-	0.3	-
2014	0.0	-	0.0	-	0.0	3.5	-	-	-	-	-	-	-	-	-	0.1	0.6
2019	0.3	0.1	-	0.0	0.0	1.6	2.5	0.0	0.0	0.2	0.0	0.2	0.0	4.5	2.0	9.0	1.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Plantago patagonica[a] (woolly plantain)	Salsola tragus[ai] (prickly Russian thistle)	Sphaeralcea coccinea (scarlet globemallow)	Sphaeralcea grossulariifolia (gooseberryleaf globemallow)
year	Nested Frequency			
2009	-	89	1	91
2014	29	35	21	145
2019	82	11	5	25
year	Average Cover (%)			
2009	-	0.4	0.0	1.8
2014	0.3	0.1	0.1	0.9
2019	0.6	0.4	0.1	0.4

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 15-17.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Atriplex canescens[p] (fourwing saltbush)	Ephedra viridis[p] (mormon tea)	Gutierrezia sarothrae (broom snakeweed)	Opuntia polyacantha (plains pricklypear)
year	Line Intercept Cover (%)			
2009	1.3	-	5	0.3
2014	0.5	-	0.2	-
2019	1.4	-	0.8	0.1
year	Quadrat Cover (%)			
2009	1.0	-	6.0	0.1
2014	0.6	0.0	0.3	0.5
2019	0.7	-	1.0	0.2

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 15-17.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

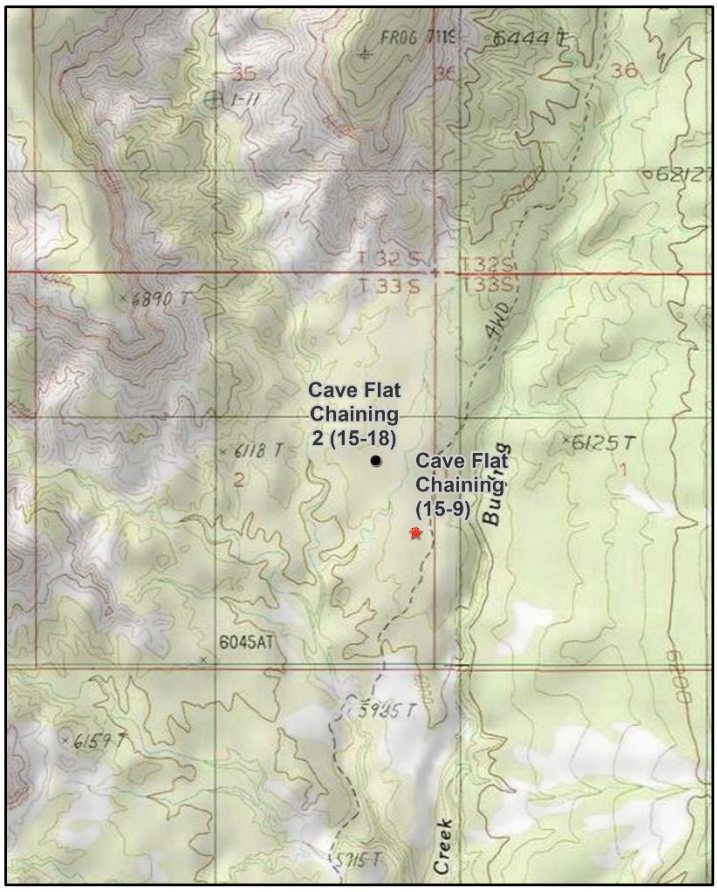
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Atriplex canescens[p] -- (fourwing saltbush)									
2009	140	-	14	86	0	43	57	0	101/152
2014	240	40	75	8	17	17	0	17	77/109
2019	160	-	38	38	25	13	13	13	71/98
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	83/141
Ephedra viridis[p] -- (mormon tea)									
2009	-	-	-	-	-	-	-	-	53/127
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	49/58
Gutierrezia sarothrae -- (broom snakeweed)									
2009	4720	-	3	91	7	0	0	4	23/29
2014	4140	1400	86	14	0	0	0	11	24/26
2019	7240	40	96	3	1	0	0	0	19/19
Krascheninnikovia lanata[p] -- (winterfat)									
2009	20	-	0	100	0	0	100	0	19/23
2014	40	-	0	50	50	100	0	50	15/12
2019	60	-	33	67	0	0	0	0	34/32
Opuntia polyacantha -- (plains pricklypear)									
2009	260	-	15	85	0	0	0	0	15/39
2014	160	-	0	38	63	0	0	63	8/35
2019	100	-	40	60	0	0	0	0	13/41

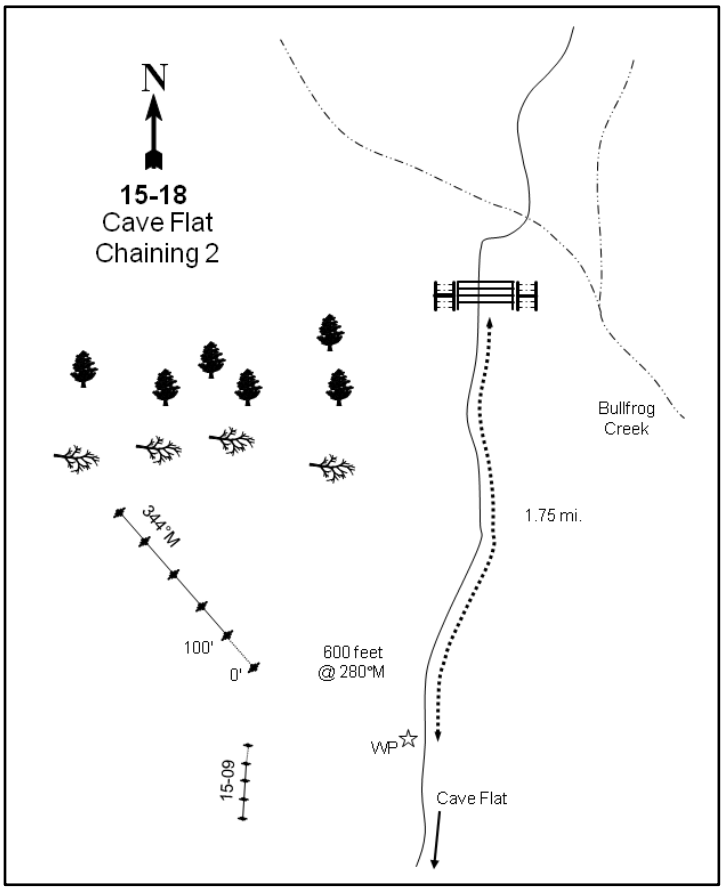
t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 15-17.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2014	16	-	-	100	-	-	11.7
Pinus edulis (twoneedle pinyon)							
2014	6	-	100	-	-	-	9.0

CAVE FLAT CHAINING 2 - STUDY NO. 15-18





Location Information

USGS 7.5 min Map Info	Cave Flat NE; Township 33S, Range 9E, Section 02
GPS (0' Stake)	NAD 83 UTM ZONE 12, 510601 East 4202027 North

Transect Information

Browse Tag # (0' Stake)	Not Available
Transect Bearing	344° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Belt 2: 10ft

Directions to Site

From Pennellen Pass, drive south for 0.4 miles to an intersection. Stay right towards Airplane Spring and drive 3.5 miles to another intersection. Turn left and travel along Bullfrog Creek for 1.35 miles to a gate. Continue past the gate and up out of the creek, going 1.75 miles to a witness post on the right (west) side of the road in the chaining. The transect starts 600 feet west of the witness post at a bearing of 280 degrees magnetic. This site is northwest of the original Cave Flat Chaining study (#15-09).

Site Information

Land Ownership	State
Land Administrator	SITLA
Allotment	STEELE BUTTE
Elevation	6,100ft (1,859m)
Aspect	South
Slope	2-8%
Sample Dates	06/03/2014, 08/07/2019

Table 15-18.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Chaining Unknown	-	-	Fall 1983	-
Seeding - Seeding Unknown	-	-	Fall 1983	-

Wildlife Habitat and Vegetation History

Table 15-18.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
American Bison	crucial	year-long
Mule Deer	substantial	winter
Rocky Mountain Elk	substantial	year-long

Table 15-18.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2014	Stansbury Cliffrose	Phase I
2019	Stansbury Cliffrose	Phase I

Site Notes

This site replaces the original Cave Flat Chaining (#15-09) site. Pellet group data for bison and cattle were combined due to the difficulties in distinguishing between these two species.

Site Potential

1981 - 2010 Average Annual Precipitation	10 inches
NRCS Ecological Site	Semidesert Shallow Loam (Utah Juniper-Pinyon)
NRCS Ecological Site #	R035XY221UT
States and Transitions	A defined state and transition model is available.

Since the study was established in 2014, this has been a stansbury cliffrose (*Purshia stansburiana*) site with lesser amounts of shrubs such as rubber rabbitbrush (*Ericameria nauseosa* ssp. *nauseosa* var. *glabrata*) and Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*). Stansbury cliffrose cover increased between 2014 and 2019, but other shrubs present do not provide a significant amount of intercept cover (Table 15-18.12). The understory has been dominated by annual grasses, primarily cheatgrass (*Bromus tectorum*). However, smaller amounts of perennial grasses have also been present throughout the study period (Table 15-18.7, Table 15-18.10). Forbs have provided a small amount of cover in both sample years with no single species showing dominance (Table 15-18.11). Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) trees have been observed on site in low abundance (Photos, Table 15-18.14).

Trend Summary Tables

Table 15-18.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2014	4.4	5.5	0.6	5.1	5.6	-
2019	4.9	2.2	0.4	7.6	1.7	0.6

Table 15-18.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2014	252	140	189	44	4.3	2.5	1.4	0.6
2019	368	28	314	76	10.4	0.3	8.4	0.8

Table 15-18.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2014	60.5	-	27.6	0.3	0.8	18.9
2019	50.5	0.1	40.1	2.6	2.3	24.9

Table 15-18.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle/Bison	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
2014	6	9	1	19
2019	6	6	-	24
Year	Days Use Per Acre (ha)			
2014	6.5 (16.1)	32.2 (79.5)	-	-
2019	24.7 (61.0)	1.3 (3.3)	-	-

Table 15-18.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bromus tectorum[ai] (cheatgrass)	Elymus elymoides (squirreltail)	Festuca idahoensis (Idaho fescue)	Pleuraphis jamesii (James' galleta)	Psathyrostachys juncea[i] (Russian wildrye)	Sporobolus cryptandrus (sand dropseed)	Thinopyrum intermedium[i] (intermediate wheatgrass)	Vulpia octoflora[a] (sixweeks fescue)
year	Nested Frequency									
2014	9	4	252	5	2	-	21	81	41	-
2019	4	-	368	-	-	3	-	17	4	8
year	Average Cover (%)									
2014	0.1	0.2	4.3	0.0	0.0	-	1.2	0.7	0.4	-
2019	0.0	-	10.3	-	-	0.0	-	0.1	0.1	0.0

a - Annual; n - Noxious Weed; i - Introduced Species

Table 15-18.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Arabis (rockcress)	Astragalus mollissimus (woolly locoweed)	Chamaesyce (sandmat)	Chenopodium album[a] (lambsquarters)	Chenopodium fremontii[a] (Fremont's goosefoot)	Cryptantha[a] (annual cryptantha)	Cryptantha humilis (roundspike cryptantha)	Descurainia pinnata[a] (western tansymustard)	Eriogonum cemuum[a] (nodding buckwheat)	Gilia inconspicua[a] (shy gilia)	Lappula occidentalis[a] (flatspine stickseed)	Lygodesmia (skeletonplant)	Mirabilis multiflora (Colorado four o'clock)	Phacelia[a] (phacelia)	Plantago patagonica[a] (woolly plantain)	Portulaca oleracea[ai] (little hogweed)	Salsola tragus[ai] (prickly Russian thistle)
year	Nested Frequency																
2014	-	23	-	-	-	43	20	34	-	13	9	1	0	-	3	-	147
2019	8	48	23	10	6	102	2	126	36	198	20	1	0	7	4	44	17
year	Average Cover (%)																
2014	-	0.2	-	-	-	0.5	0.3	0.2	-	0.2	0.1	0.0	0.1	-	0.0	-	0.5
2019	0.0	0.6	0.1	0.0	0.0	2.4	0.1	2.0	0.1	3.2	0.1	0.0	0.0	0.1	0.0	0.1	0.3

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Tragopogon dubius[ai] (yellow salsify)
year	Nested Frequency
2014	3
2019	-
year	Average Cover (%)
2014	0.0
2019	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 15-18.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis[p] (Utah serviceberry)	Artemisia tridentata ssp. wyomingensis[p] (Wyoming big sagebrush)	Chrysothamnus viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. glabrata (rubber rabbitbrush)	Eriogonum corymbosum (crispleaf buckwheat)	Eriogonum microthecum[p] (slender buckwheat)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma[t] (Utah juniper)	Purshia stansburiana[p] (Stansbury cliffrose)
year	Line Intercept Cover (%)								
2014	0.5	0.1	-	0.8	0	-	4.8	-	4.5
2019	-	0.6	-	0.5	0.4	0.1	0.8	0.6	6.9
year	Quadrat Cover (%)								
2014	0.6	0.0	-	1.3	0.0	-	4.3	0.6	3.7
2019	0.0	0.4	0.1	1.1	0.4	0.0	0.6	0.4	4.6

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 15-18.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
2014	-	-	-	-	-	-	-	-	252/309
2019	-	60	0	0	0	0	0	0	292/421
Artemisia tridentata ssp. wyomingensis[p] -- (Wyoming big sagebrush)									
2014	20	-	100	0	0	0	0	0	62/62
2019	20	-	0	100	0	0	0	0	69/79
Atriplex canescens[p] -- (fourwing saltbush)									
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	108/93
Chrysothamnus viscidiflorus -- (yellow rabbitbrush)									
2014	-	-	-	-	-	-	-	-	52/74
2019	-	-	-	-	-	-	-	-	52/114

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Ephedra viridis[p] -- (mormon tea)									
2014	-	-	-	-	-	-	-	-	182/272
2019	-	-	-	-	-	-	-	-	97/139
Eriogonum corymbosum -- (crispleaf buckwheat)									
2014	40	-	100	0	0	0	0	0	104/189
2019	20	-	0	100	0	0	0	0	32/45
Eriogonum microthecum[p] -- (slender buckwheat)									
2014	-	-	-	-	-	-	-	-	-/-
2019	20	-	0	100	0	0	0	0	19/43
Ericameria nauseosa ssp. nauseosa var. glabrata -- (rubber rabbitbrush)									
2014	80	-	25	75	0	0	0	0	93/181
2019	80	-	50	50	0	25	25	0	88/105
Grayia spinosa -- (spiny hopsage)									
2014	-	-	-	-	-	-	-	-	31/38
2019	-	-	-	-	-	-	-	-	-/-
Gutierrezia sarothrae -- (broom snakeweed)									
2014	3880	620	17	82	1	0	0	1	24/32
2019	6040	2000	90	10	0	0	0	0	21/30
Juniperus osteosperma[t] -- (Utah juniper)									
2014	-	-	-	-	-	-	-	-	-/-
2019	-	20	0	0	0	0	0	0	- / -
Opuntia -- (pricklypear)									
2014	20	-	0	100	0	0	0	0	8/28
2019	20	-	0	100	0	0	0	0	10/32
Purshia stansburiana[p] -- (Stansbury cliffrose)									
2014	220	20	36	64	0	55	18	0	178/241
2019	200	80	20	80	0	20	0	0	137/179
Sclerocactus -- (fishhook cactus)									
2014	-	-	-	-	-	-	-	-	-/-
2019	20	-	0	100	0	0	0	0	12/14
Shepherdia rotundifolia -- (roundleaf buffaloberry)									
2014	-	-	-	-	-	-	-	-	203/252
2019	-	-	-	-	-	-	-	-	166/249

t - Tree Species; p - Preferred Browse; i - Introduced Species

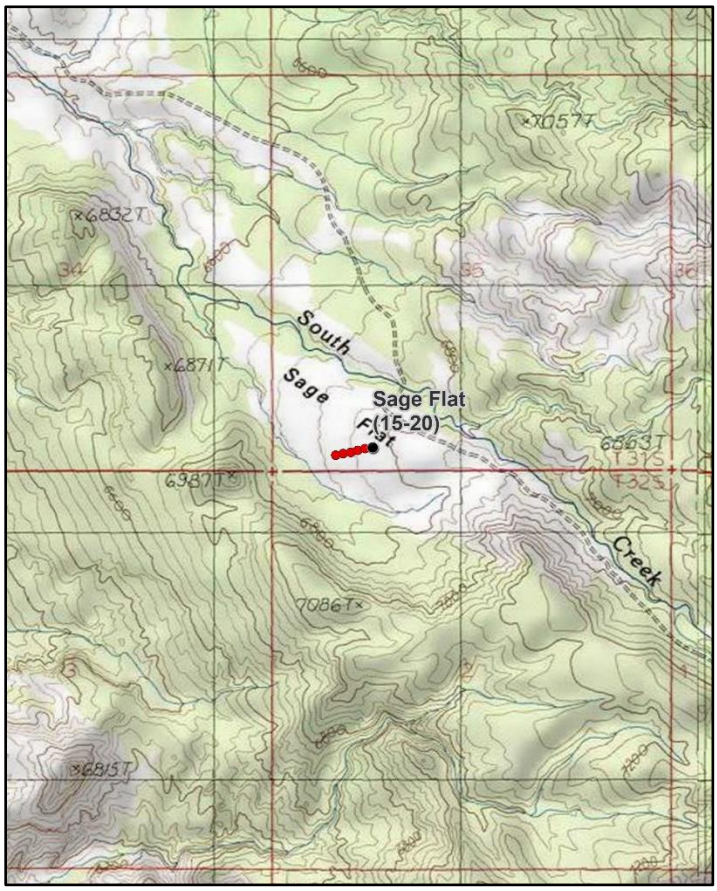
Table 15-18.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

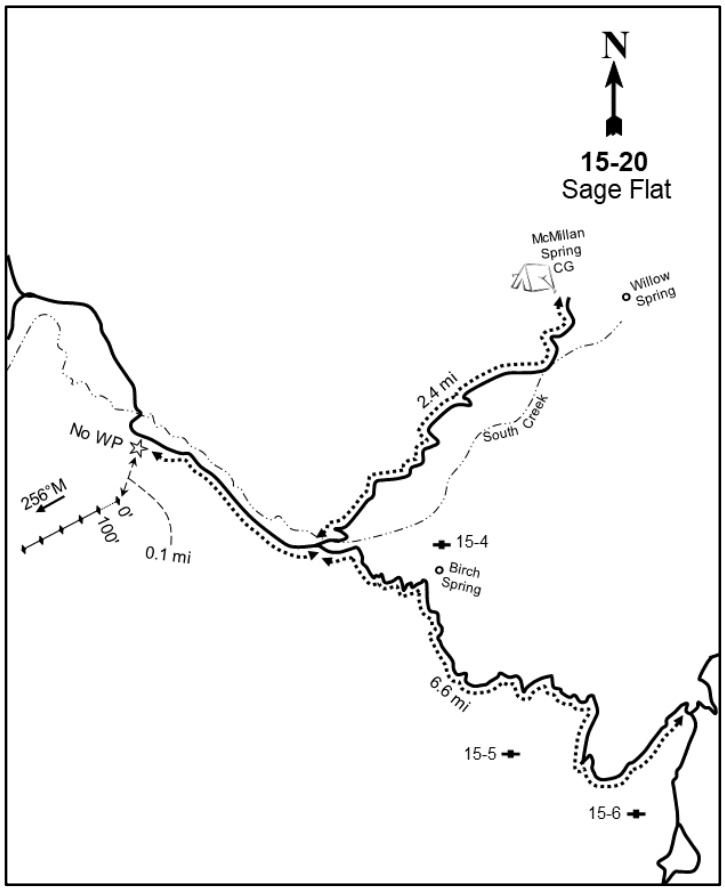
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2019	16	-	10	20	50	20	9.0
Pinus edulis (twoneedle pinyon)							
2019	4	-	-	50	50	-	9.5

Table 15-18.15 – Deer Desirable Components Index: Low Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
2014	7.6	13.5	15.0	5.1	-3.2	1.2	0.0	39.2	Fair
2019	11.2	15.0	9.1	0.5	-7.8	1.5	0.0	29.6	Fair

SAGE FLAT - STUDY NO. 15-20





Location Information	
USGS 7.5 min Map Info	Steele Butte SE; Township 31S, Range 9E, Section 35
GPS (0' Stake)	NAD 83 UTM ZONE 12, 509596 East 4212546 North

Transect Information	
Browse Tag # (0' Stake)	142
Transect Bearing	252° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Standard

Directions to Site

From McMillian Spring Campground, drive southwest on the McMillian Springs Road for 2.4 miles until you reach a "Y" junction. Turn right and travel west on the Henry Mountains Road for approximately 1 mile. There is an old chaining on the left (south); park in the pullout before turning north and crossing through the draw. The site is in the middle of the clearing.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	NASTY FLAT
Elevation	6,800ft (2,073m)
Aspect	Southwest
Slope	5%
Sample Dates	06/04/2019

Table 15-20.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Two-Way Ely	Nasty Flat Chaining	-	August 1984-March 1985	685
Seeding - Aerial Before	Nasty Flat Chaining	-	March 1985	685

Table 15-20.2 SeedMix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Nasty Flat			Aerial	Mar 1984	685
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Agropyron cristatum	Crested Wheatgrass	Nordan	7.30	0.00
G	Psathyrostachys juncea	Russian Wildrye		1.46	0.00
G	Thinopyrum intermedium	Pubescent Wheatgrass		2.92	0.00
F	Medicago sativa	Alfalfa		0.44	0.00
F	Melilotus officinalis	Yellow Sweet Clover		0.73	0.00
S	Atriplex canescens	Four-wing Saltbush		0.73	0.00

Wildlife Habitat and Vegetation History

Table 15-20.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
American Bison	crucial	year-long
Mule Deer	substantial	winter
Rocky Mountain Elk	substantial	year-long

Table 15-20.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2019	Wyoming Big Sagebrush/Annual Grass	Phase I

Site Notes

No Notes

Soils

Table 15-20.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Loam	6.4	53.4	29.4	17.1	1.5	6.9	123.0	0.4	06/04/2019

Site Potential

1981 - 2010 Average Annual Precipitation	12 inches
NRCS Ecological Site	Upland Stony Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XB336UT
States and Transitions	A defined state and transition model is available.

As of study establishment in 2019, this site is dominated by Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) and is established in a historic chaining (Table 15-20.1); sagebrush contributes a significant amount of cover (Table 15-20.12, Table 15-20.13). The understory is a mixture of perennial grasses with high amounts of the introduced annual grass species cheatgrass (*Bromus tectorum*). The dominant grass species are native and introduced with crested wheatgrass (*Agropyron cristatum*), sand dropseed (*Sporobolus cryptandrus*), and blue grama (*Bouteloua gracilis*) providing the most cover (Table 15-20.10). Forbs are also a mix of perennial and annual species: the dominant species are shy gilia (*Gilia inconspicua*) and wooly plantain (*Plantago patagonica*) (Table 15-20.7, Table 15-20.11). Utah juniper (*Juniperus osteosperma*) has been observed on site in low density, but this tree presence indicates that there may be the potential for infilling in future years (Table 15-20.14, Photos). This site does not yet exhibit any trends as 2019 is the only sample year. However, without a major disturbance, the site will likely remain in this or a similar community state in future years.

Trend Summary Tables

Table 15-20.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2019	11.8	1.8	-	17.0	1.8	-

Table 15-20.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2019	371	293	345	233	14.5	13.0	6.7	2.0

Table 15-20.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2019	33.5	0.4	29.6	5.8	20.4	38.5

Table 15-20.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle/Bison	Mule Deer	Rabbit
	Quadrat Frequency		
2019	4	23	34
Year	Days Use Per Acre (ha)		
2019	9.4 (23.3)	32.8 (81.1)	-

Table 15-20.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bouteloua gracilis (blue grama)	Bromus tectorum[ai] (cheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Spartina gracilis (alkali cordgrass)	Sporobolus cryptandrus (sand dropseed)	Vulpia octoflora[a] (sixweeks fescue)
year	Nested Frequency								
2019	31	121	87	362	15	27	20	90	104
year	Average Cover (%)								
2019	1.2	3.5	3.0	13.4	0.3	0.8	0.7	3.5	1.1

a - Annual; n - Noxious Weed; i - Introduced Species

Table 15-20.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Allium (onion)	Arabis (rockcress)	Astragalus chamaeleuce (cicada milkvetch)	Calochortus nuttallii (sego lily)	Castilleja angustifolia (northwestern Indian paintbrush)	Chenopodium leptophyllum[a] (narrowleaf goosefoot)	Cymopterus (springparsley)	Delphinium nuttallianum (twolobe larkspur)	Descurainia incana[a] (mountain tansymustard)	Descurainia pinnata[a] (western tansymustard)	Gilia inconspicua[a] (shy gilia)	Lappula occidentalis[a] (flatspine stickseed)	Phlox longifolia (longleaf phlox)	Plantago patagonica[a] (woolly plantain)	Sphaeralcea grossulariifolia (gooseberryleaf globemallow)	Townsendia annua[a] (annual Townsend daisy)
year	Nested Frequency															
2019	12	8	99	46	4	13	6	40	7	9	262	22	130	192	8	5
year	Average Cover (%)															
2019	0.0	0.0	0.3	0.3	0.0	0.0	0.0	0.3	0.1	0.0	3.7	0.1	0.7	2.8	0.3	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 15-20.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. wyomingensis[p] (Wyoming big sagebrush)	Echinocereus (hedgehog cactus)	Gutierrezia sarothrae (broom snakeweed)
year	Line Intercept Cover (%)		
2019	17	-	1.8
year	Quadrat Cover (%)		
2019	11.8	0.0	1.8

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 15-20.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Artemisia tridentata ssp. wyomingensis[p] -- (Wyoming big sagebrush)									
2019	3700	100	4	61	35	22	71	34	44/78
Echinocereus -- (hedgehog cactus)									
2019	-	-	-	-	-	-	-	-	20/25
Gutierrezia sarothrae -- (broom snakeweed)									
2019	3120	1920	6	94	0	0	0	3	14/17
Opuntia polyacantha -- (plains pricklypear)									
2019	40	-	0	100	0	0	0	0	13/38
Sclerocactus -- (fishhook cactus)									
2019	-	-	-	-	-	-	-	-	11/10

t - Tree Species; p - Preferred Browse; i - Introduced Species

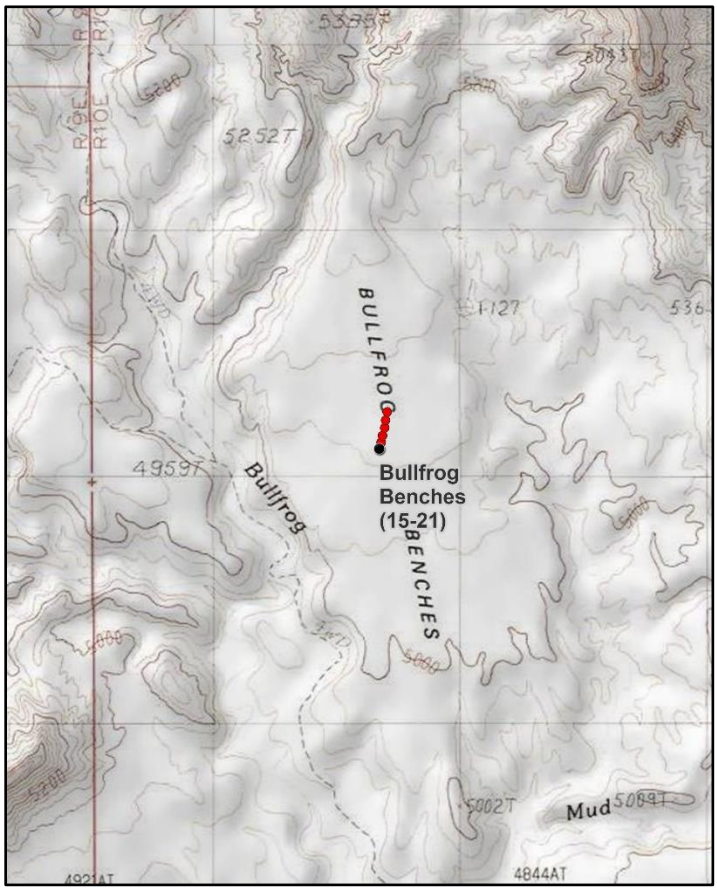
Table 15-20.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

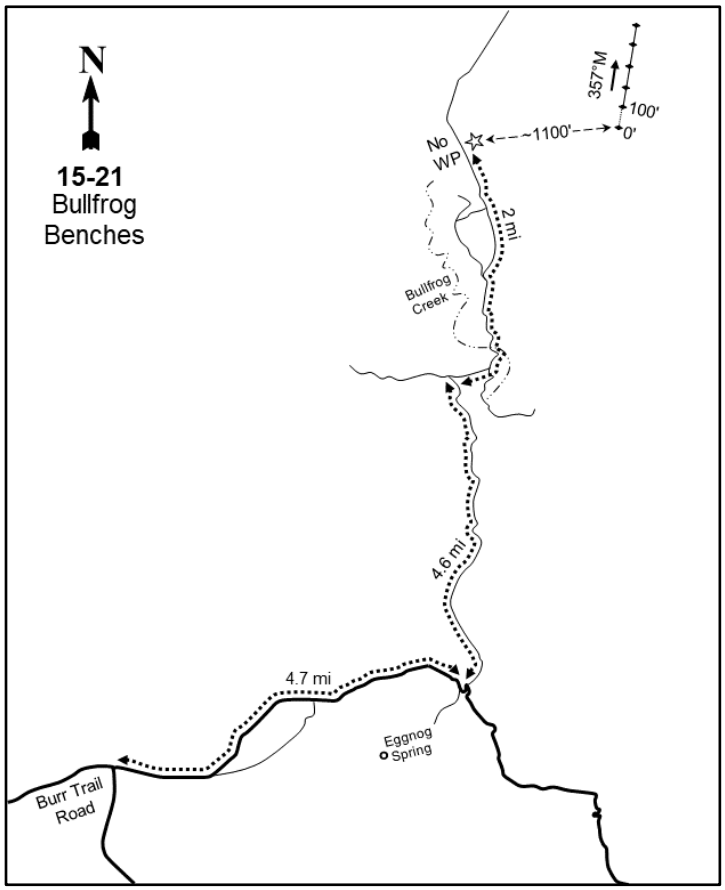
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2019	3	-	100	-	-	-	6.0

Table 15-20.15 – Deer Desirable Components Index: Mid Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
2019	21.3	4.5	1.9	26.0	-10.9	4.0	0.0	46.7	Poor

BULLFROG BENCHES - STUDY NO. 15-21





Location Information

USGS 7.5 min Map Info	Ant Knoll NW; Township 34S, Range 10E, Section 07
GPS (0' Stake)	NAD 83 UTM ZONE 12, 513615 East 4190315 North

Transect Information

Browse Tag # (0' Stake)	Not Available
Transect Bearing	357° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Standard

Directions to Site

From the intersection of the Burr Trail Road and Eggnog-Star Springs Road, park in the lot and leave the trailer/get on ATVs here. Travel east on the Burr Trail for approximately 4.7 miles. At Bullfrog Creek, you will have a multi-turn intersection. Go across the creek and turn north, crossing the creek again. You will be on a two-track which you will follow for 4.6 miles, crossing the creek several times. There are a few faint two-tracks, but keep on the main road traveling up the creek. At the 4.6 mile mark you will arrive at a "T" junction; turn right and follow the trail up the creek until you get to an opening. At this point there is a "Y" junction that you can turn right on and follow up the hill -- you can also proceed another 1/2 mile or so to another "Y" in which you would also go right and travel up the hill. The site is on the bench on the right (east) side of the road: there is no witness post.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	BULLFROG
Elevation	5,080ft (1,548m)
Aspect	Southeast
Slope	2-5%
Sample Dates	10/03/2019

Wildlife Habitat and Vegetation History

Table 15-21.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Bison	crucial	year-long
American Bison	crucial	year-long
Pronghorn		

Table 15-21.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2019	Annual Forb/Shadscale Saltbush	NA

Site Notes

Note: ATVs are recommended for site access.

Soils

Table 15-21.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Loam	8.0	65.4	21.4	13.2	0.6	6.5	263.0	0.5	10/03/2019

Site Potential

1981 - 2010 Average Annual Precipitation	7 inches
NRCS Ecological Site	Desert Loam (Shadscale)
NRCS Ecological Site #	R035XY109UT
States and Transitions	A defined state and transition model is available.

As of establishment in 2019, this study is a shadscale saltbush (*Atriplex confertifolia*) ecological site in a decadent and depleted state. The understory is in poor condition and primarily composed of annual forbs, particularly redstem stork's bill (*Erodium cicutarium*). Grasses are rare with cheatgrass (*Bromus tectorum*) and James' galleta (*Pleuraphis jamesii*) being the only species sampled with little cover (Table 15-21.7, Table 15-21.10). Shrubs are present on the site with cover being being low, and the primary browse species is shadscale saltbush (Table 15-21.12). Browse decadence is high with nearly fifty percent of plants being considered decadent (Table 15-21.13); this site appears to have been severely affected by recent droughts. The state and transition model does not discuss the current community type, but it is possible that with a favorable precipitation regime and appropriate herbivory levels that this site will improve in species composition and forage production (Jornada, 2019).

Trend Summary Tables

Table 15-21.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2019	1.0	2.3	-	1.1	1.3	-

Table 15-21.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2019	22	10	462	113	0.1	0.0	36.6	0.7

Table 15-21.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2019	35.2	0.3	18.1	13.3	5.1	42.0

Table 15-21.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle/Bison	Rabbit
	Quadrat Frequency	
2019	16	7
Year	Days Use Per Acre (ha)	
2019	43.6 (107.6)	-

Table 15-21.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Bromus tectorum[ai] (cheatgrass)	Pleuraphis jamesii (James' galleta)
year	Nested Frequency	
2019	22	10
year	Average Cover (%)	
2019	0.1	0.0

a - Annual; n - Noxious Weed; i - Introduced Species

Table 15-21.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Astragalus nuttallianus[a] (smallflowered milkvetch)	Calochortus nuttallii (sego lily)	Cryptantha[a] (annual cryptantha)	Descurainia pinnata[a] (western tansymustard)	Erodium cicutarium[ai] (redstem stork's bill)	Lappula occidentalis[a] (flatspine stickseed)	Lygodesmia juncea (rush skeletonplant)	Navarretia intertexta[a] (needleleaf navarretia)	Oenothera coronopifolia (crownleaf evening primrose)	Plantago patagonica[a] (woolly plantain)	Townsendia incana (hoary Townsend daisy)
year	Nested Frequency										
2019	258	56	66	87	438	32	7	229	6	234	52
year	Average Cover (%)										
2019	2.6	0.3	0.3	0.5	30.4	0.1	0.1	1.3	0.1	1.4	0.3

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 15-21.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Atriplex confertifolia[p] (shadscale saltbush)	Echinocereus engelmannii (Engelmann's hedgehog cactus)	Opuntia polyacantha (plains pricklypear)
year	Line Intercept Cover (%)		
2019	1.1	0.2	1.1
year	Quadrat Cover (%)		
2019	1.0	0.2	2.2

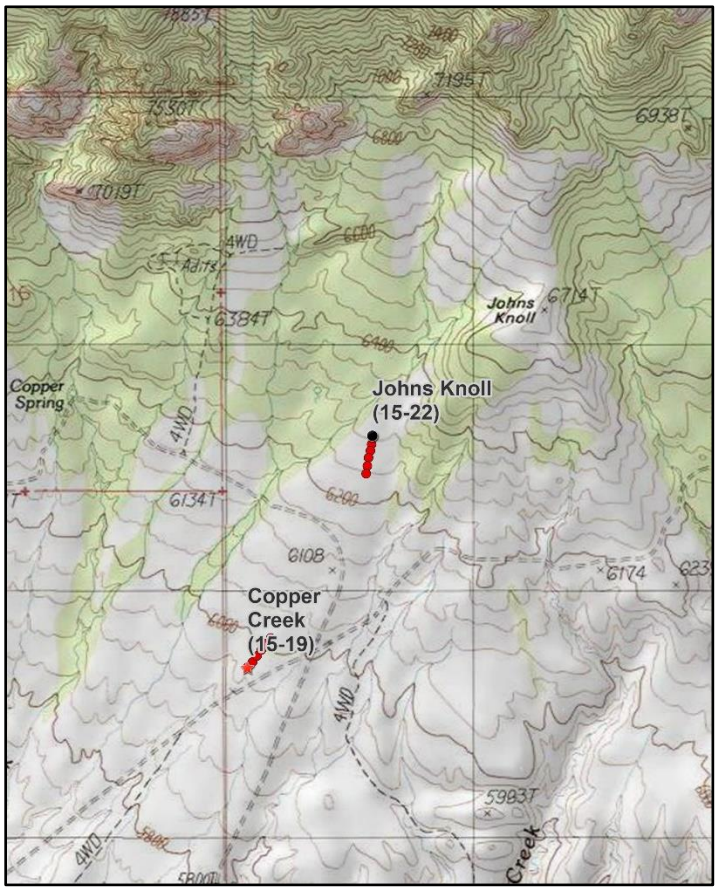
t - Tree Species; p - Preferred Browse; i - Introduced Species

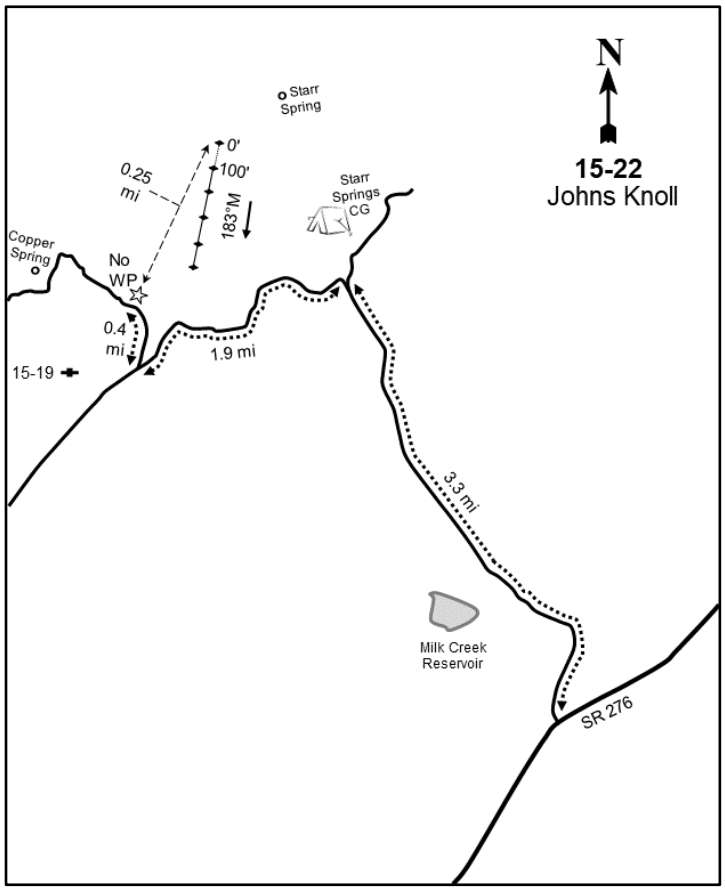
Table 15-21.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Atriplex confertifolia[p] -- (shadscale saltbush)									
2019	1060	-	21	26	53	4	0	59	26/45
Echinocereus engelmannii -- (Engelmann's hedgehog cactus)									
2019	240	-	0	100	0	0	0	8	11/25
Gutierrezia sarothrae -- (broom snakeweed)									
2019	-	-	-	-	-	-	-	-	18/9
Opuntia polyacantha -- (plains pricklypear)									
2019	1100	-	0	42	58	0	0	42	12/41

t - Tree Species; p - Preferred Browse; i - Introduced Species

JOHNS KNOLL - STUDY NO. 15-22





Location Information

USGS 7.5 min Map Info	Copper Creek Benches; Township 34S, Range 11E, Section 15
GPS (0' Stake)	NAD 83 UTM ZONE 12, 527538 East 4188829 North

Transect Information

Browse Tag # (0' Stake)	123
Transect Bearing	183° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Standard

Directions to Site

From Hanksville, travel south on State Route 95 past Little Egypt to the junction of SR-276 and SR-95. Turn right onto SR-276 and proceed for approximately 17.5 miles. Turn right onto the Eggnog-Star Springs Road and proceed for 3.3 miles. Turn left onto the Eggnog road, proceed for 1.9 miles to a "Y" junction, and turn right onto Hoskinnini Road. Proceed up the road for 0.4 miles to a sagebrush flat. Park here on the side of the road: the site is to north of the road.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	ROCKIES
Elevation	6,280ft (1,914m)
Aspect	Southwest
Slope	10%
Sample Dates	06/04/2019

Wildlife Habitat and Vegetation History

Table 15-22.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	substantial	winter
Rocky Mountain Elk	substantial	year-long

Table 15-22.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2019	Wyoming Big Sagebrush/Perennial Grass	Phase I

Site Notes

No Notes

Soils

Table 15-22.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Loam	6.9	67.4	15.5	17.1	1.2	10.1	113.0	0.3	06/05/2019

Site Potential

1981 - 2010 Average Annual Precipitation	12 inches
NRCS Ecological Site	Upland Stony Loam (Wyoming Big Sagebrush)
NRCS Ecological Site #	R035XY318UT
States and Transitions	No state and transition model is available for this ecological site.

As of site establishment in 2019, this study is considered to be a Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) ecological site. The herbaceous understory is a mixture of annual and perennial grasses as well as annual forbs (Table 15-22.7). Blue grama (*Bouteloua gracilis*) and sand dropseed (*Sporobolus cryptandrus*) are the dominant perennial grass species while cheatgrass (*Bromus tectorum*) and sixweeks fescue (*Vulpia octoflora*) are the dominant annual species (Table 15-22.10). Shy gilia (*Gilia inconspicua*) is the most abundant forb species, but it may not maintain dominance in future years as this sample year seemed to show a flush of this particular species (Table 15-22.11). Shrub species are dominated by Wyoming big sagebrush, but there is a lesser component of blackbrush (*Coleogyne ramosissima*) present as well (Table 15-22.12, Table 15-22.13). There are a small number of Utah juniper (*Juniperus osteosperma*) trees present on site, and it is possible that there will be further encroachment in the future given the proximity of the site to other trees (Table 15-22.14, Photos). Without the occurrence of a major disturbance, it is likely that the site will remain in the present state in future sample years.

Trend Summary Tables

Table 15-22.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2019	17.1	1.8	-	22.6	0.8	-

Table 15-22.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2019	223	278	344	114	5.9	11.4	10.4	0.9

Table 15-22.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2019	27.5	1.3	25.6	14.3	24.1	35.3

Table 15-22.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle/Bison	Mule Deer	Rabbit
	Quadrat Frequency		
2019	-	37	5
Year	Days Use Per Acre (ha)		
2019	1.5 (3.6)	32.8 (81.1)	-

Table 15-22.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Bouteloua gracilis (blue grama)	Bromus tectorum[ai] (cheatgrass)	Elymus elymoides (squirreltail)	Spartina gracilis (alkali cordgrass)	Sporobolus cryptandrus (sand dropseed)	Vulpia octoflora[a] (sixweeks fescue)
year	Nested Frequency					
2019	153	106	61	30	94	153
year	Average Cover (%)					
2019	6.0	2.2	1.5	0.7	3.3	3.7

a - Annual; n - Noxious Weed; i - Introduced Species

Table 15-22.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Allium (onion)	Astragalus lentiginosus (freckled milkvetch)	Astragalus mollissimus (woolly locoweed)	Calochortus aureus (golden mariposa lily)	Cirsium (thistle)	Cryptantha[a] (annual cryptantha)	Cymopterus (springparsley)	Delphinium nuttallianum (twolobe larkspur)	Gilia inconspicua[a] (shy gilia)	Lepidium montanum[a] (mountain pepperweed)	Lupinus brevicaulis[a] (shortstem lupine)	Navarretia intertexta[a] (needleleaf navarretia)	Oenothera pallida[a] (pale evening primrose)	Packera multilobata (lobeleaf groundsel)	Plantago patagonica[a] (woolly plantain)	Sphaeralcea grossulariifolia (gooseberryleaf globemallow)
year	Nested Frequency															
2019	1	6	6	93	3	3	5	2	303	32	14	82	7	1	201	2
year	Average Cover (%)															
2019	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	7.5	0.1	0.1	0.6	0.0	0.0	2.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 15-22.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. wyomingensis[p] (Wyoming big sagebrush)	Coleogyne ramosissima[p] (blackbrush)	Echinocereus (hedgehog cactus)	Ephedra viridis[p] (mormon tea)	Gutierrezia sarothrae (broom snakeweed)	Opuntia polyacantha (plains pricklypear)
year	Line Intercept Cover (%)					
2019	21.7	0.9	-	-	0.7	0.1
year	Quadrat Cover (%)					
2019	15.8	1.2	0.0	0.0	1.7	0.1

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 15-22.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Artemisia tridentata ssp. wyomingensis[p] -- (Wyoming big sagebrush)									
2019	5560	60	4	45	51	38	39	46	37/72
Coleogyne ramosissima[p] -- (blackbrush)									
2019	680	-	15	77	9	3	21	9	29/53
Echinocereus -- (hedgehog cactus)									
2019	20	-	0	100	0	0	0	0	11/17
Ephedra viridis[p] -- (mormon tea)									
2019	-	-	-	-	-	-	-	-	57/78
Ericameria nauseosa -- (rubber rabbitbrush)									
2019	-	-	-	-	-	-	-	-	55/96
Gutierrezia sarothrae -- (broom snakeweed)									
2019	2860	72560	74	23	3	0	0	4	19/21
Opuntia polyacantha -- (plains pricklypear)									
2019	240	-	8	75	17	0	0	25	12/38

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Pediocactus simpsonii -- (mountain ball cactus)									
2019	-	-	-	-	-	-	-	-	6/7
Sclerocactus -- (fishhook cactus)									
2019	20	-	0	100	0	0	0	0	12/17

t - Tree Species; p - Preferred Browse; i - Introduced Species

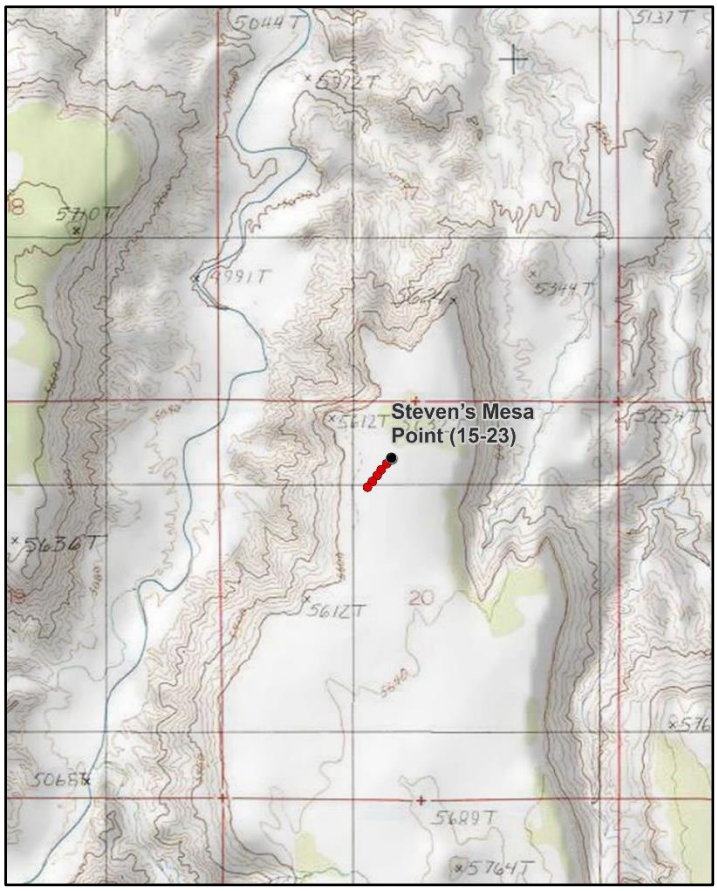
Table 15-22.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

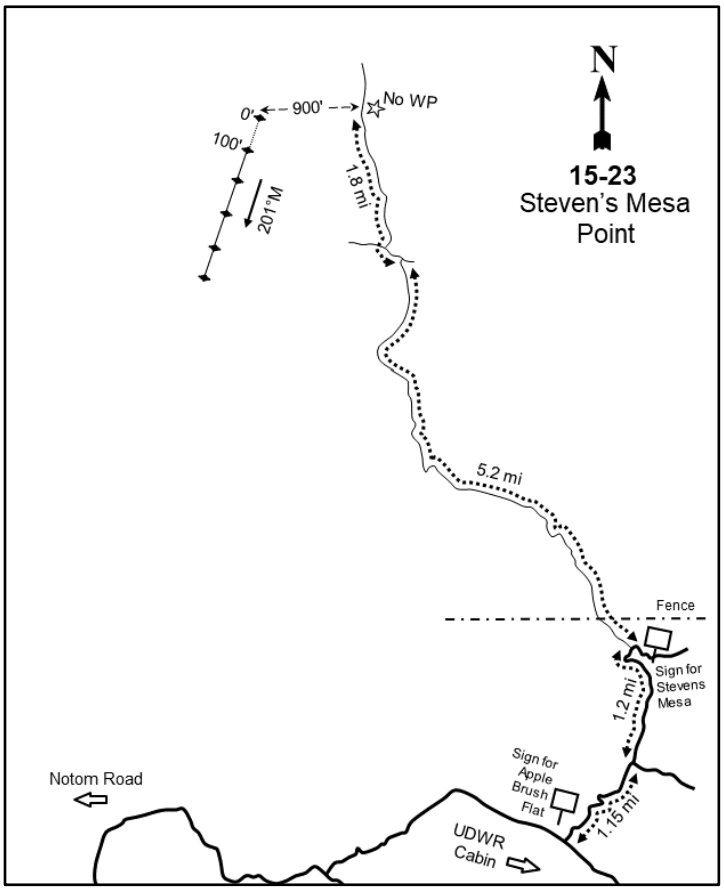
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2019	3	-	-	-	100	-	34.5

Table 15-22.15 – Deer Desirable Components Index: Mid Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
2019	28.0	0.3	2.4	22.9	-4.4	1.7	0.0	50.9	Poor-Fair

STEVEN'S MESA POINT - STUDY NO. 15-23





Location Information

USGS 7.5 min Map Info	Stevens Mesa NW; Township 30S, Range 9E, Section 20
GPS (0' Stake)	NAD 83 UTM ZONE 12, 503094 East 4227305 North

Transect Information

Browse Tag # (0' Stake)	178
Transect Bearing	201° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Standard

Directions to Site

From Mcmillian Springs Campground, drive 7.2 miles down the Henry Mountain Road to the turn for Apple Brush Flat (alternatively, drive 11.7 miles up the Henry Mountains Road from Notom Road). Turn onto the road for Stevens Mesa (toward Apple Brush Flat): take this road for 1.15 miles to a "Y" junction. Continue straight for 1.2 miles, passing a corral on the right. You will come to another "Y" junction with a sign for Steven's Mesa. Turn left onto the Stevens Mesa Road and drive for 5.2 miles. The road will come to a "T" junction: turn left, then take the next right which cuts to the north. Continue for 1.8 miles near the end of the point where the site will be on the left (west) side of the road.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	STEELE BUTTE
Elevation	5,600ft (1,707m)
Aspect	Southwest
Slope	1%
Sample Dates	06/03/2019

Wildlife Habitat and Vegetation History

Table 15-23.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
American Bison	crucial	year-long

Table 15-23.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2019	Annual Forb/Perennial Grass	NA

Site Notes

No Notes

Soils

Table 15-23.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Loam	7.7	69.5	13.4	17.1	0.6	12.7	155.0	0.4	06/04/2019

Site Potential

1981 - 2010 Average Annual Precipitation	7 inches
NRCS Ecological Site	Desert Loam (Shadscale)
NRCS Ecological Site #	R035XY109UT
States and Transitions	A defined state and transition model is available.

As of study establishment in 2019, this site is a shadscale saltbush (*Atriplex confertifolia*) ecological site dominated by annual forbs (Table 15-23.7). Perennial grasses make up a moderate portion of the understory with sand dropseed (*Sporobolus cryptandrus*) providing a majority of the cover (Table 15-23.10). The forb component is dominated by annual species, but perennial species provide a moderate amount of cover as well. The most abundant annual species is phacelia (*Phacelia sp.*) while the most common perennial forb is pincushion (*Chaenactis sp.*) (Table 15-23.11). Shrub species are present on the site in moderate numbers, with shadscale saltbush and Parry's rabbitbrush (*Ericameria parryi*) as the dominant species (Table 15-23.12, Table 15-23.13). The state and transition model indicates that there is a potential for the site to move either towards more perennial grass cover or more shrub cover depending on factors such as precipitation and/or grazing (Jornada, 2019). However, it is likely that the site will remain in it's current condition in the future if major disturbances do not occur.

Trend Summary Tables

Table 15-23.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2019	3.4	1.1	-	1.3	2.6	-

Table 15-23.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2019	29	235	303	128	0.1	5.8	17.8	3.8

Table 15-23.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2019	49.4	0.1	29.7	11.7	0.5	27.4

Table 15-23.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle/Bison	Rabbit
	Quadrat Frequency	
2019	3	48
Year	Days Use Per Acre (ha)	
2019	19.6 (48.4)	-

Table 15-23.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Hesperostipa comata (needle and thread)	Sporobolus cryptandrus (sand dropseed)	Vulpia octoflora[a] (sixweeks fescue)
year	Nested Frequency		
2019	13	227	29
year	Average Cover (%)		
2019	0.0	5.7	0.1

a - Annual; n - Noxious Weed; i - Introduced Species

Table 15-23.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Astragalus mollissimus (woolly locoweed)	Chaenactis (pincushion)	Cryptantha[a] (annual cryptantha)	Cymopterus (springparsley)	Descurainia incana[a] (mountain tansymustard)	Lappula occidentalis[a] (flatspine stickseed)	Lapsana communis[ai] (common nipplewort)	Lygodesmia grandiflora (largeflower skeletonplant)	Mentzelia[a] (blazingstar)	Phacelia[a] (phacelia)	Stephanomeria (wirelettuce)	Townsendia annua[a] (annual Townsend daisy)
year	Nested Frequency											
2019	1	127	159	2	51	9	3	2	23	223	2	7
year	Average Cover (%)											
2019	0.0	3.8	3.1	0.0	0.8	0.0	0.0	0.0	0.5	13.2	0.0	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 15-23.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Atriplex confertifolia[p] (shadscale saltbush)	Ephedra viridis[p] (mormon tea)	Ericameria parryi (Parry's rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)
year	Line Intercept Cover (%)			
2019	1.3	0	2.5	0.1
year	Quadrat Cover (%)			
2019	2.3	1.1	0.6	0.4

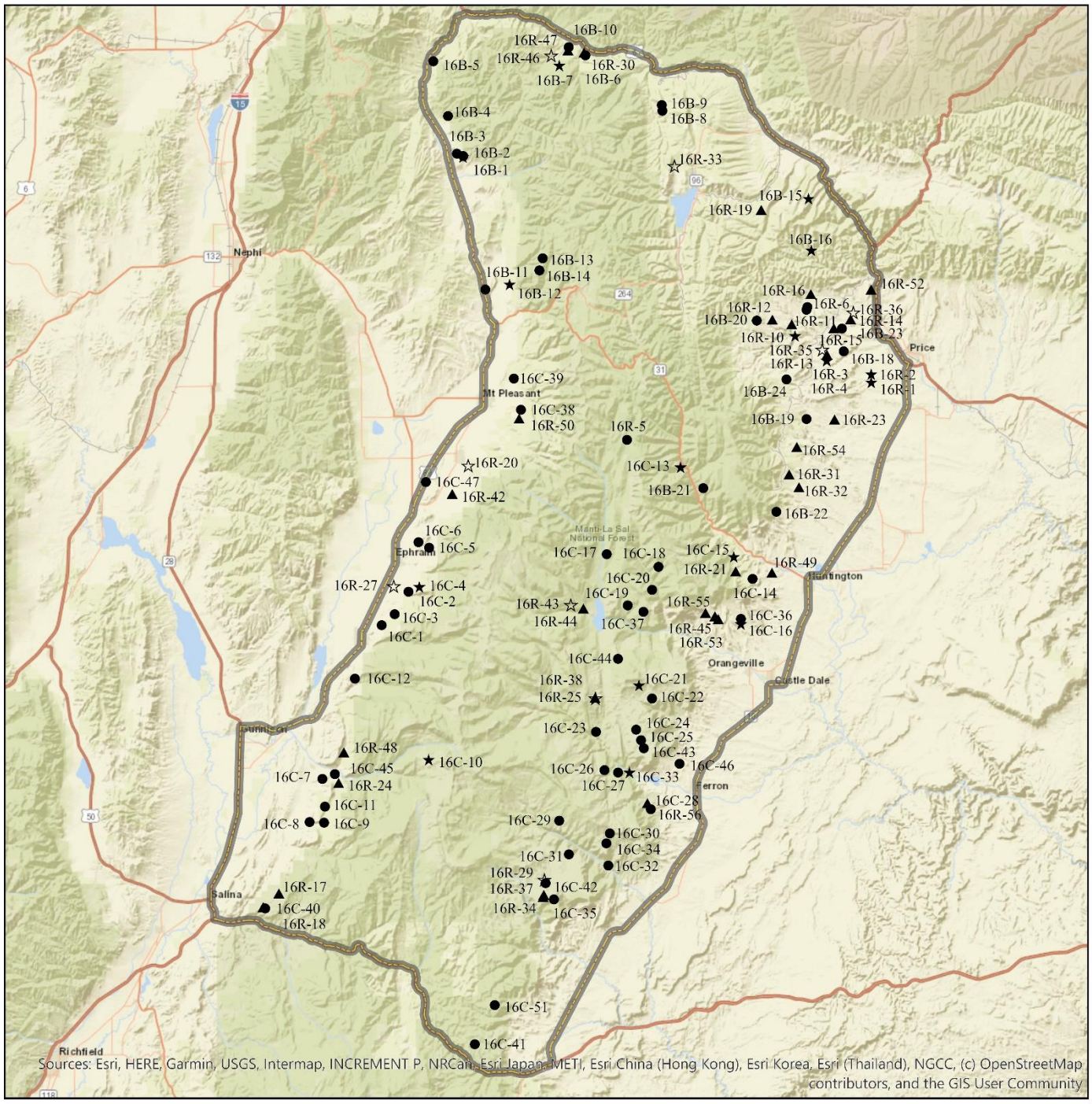
t - Tree Species; p - Preferred Browse; i - Introduced Species

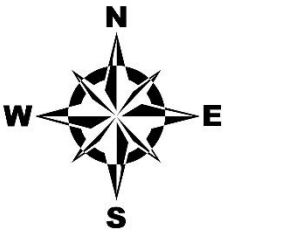
Table 15-23.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Artemisia bigelovii[p] -- (Bigelow sage)									
2019	20	-	0	0	100	100	0	100	22/37
Atriplex confertifolia[p] -- (shadscale saltbush)									
2019	940	-	17	55	28	30	13	28	20/42
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
2019	20	-	0	100	0	0	0	0	40/72
Ephedra viridis[p] -- (mormon tea)									
2019	500	-	0	96	4	4	0	4	38/88
Ericameria parryi -- (Parry's rabbitbrush)									
2019	240	-	0	8	92	58	8	100	49/85
Gutierrezia sarothrae -- (broom snakeweed)									
2019	6240	1680	93	7	0	0	0	0	11/15
Opuntia polyacantha -- (plains pricklypear)									
2019	-	-	-	-	-	-	-	-	14/29

t - Tree Species; p - Preferred Browse; i - Introduced Species

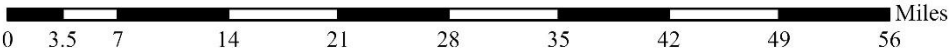
WILDLIFE MANAGEMENT UNIT 16B, 16C - MANTI CENTRAL MOUNTAINS



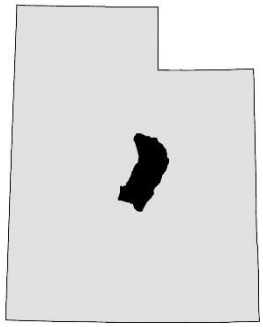


Study Location
Project, Status

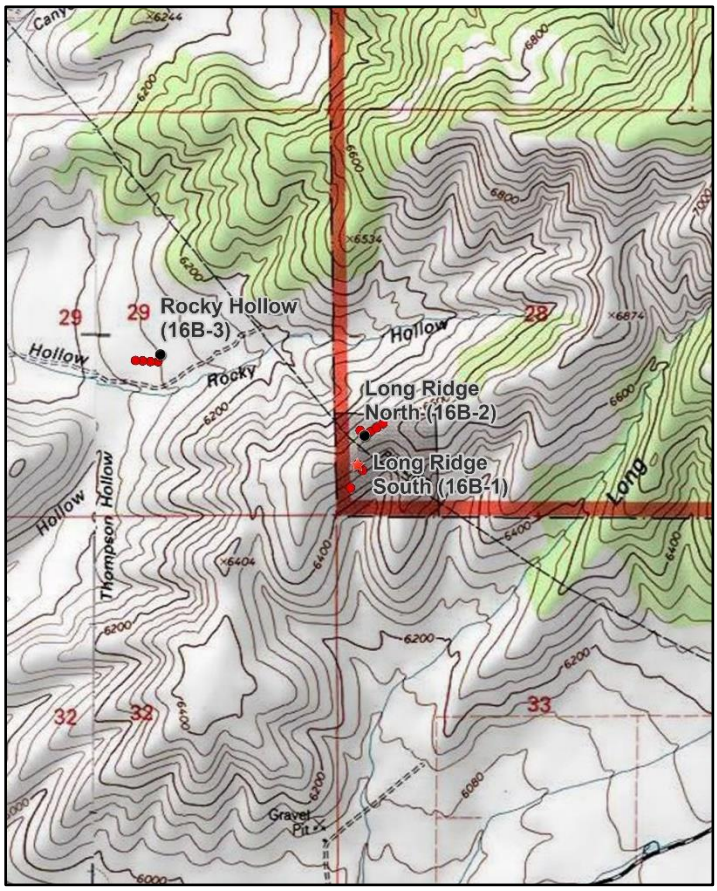
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- RT,Suspended
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- Unit - 16

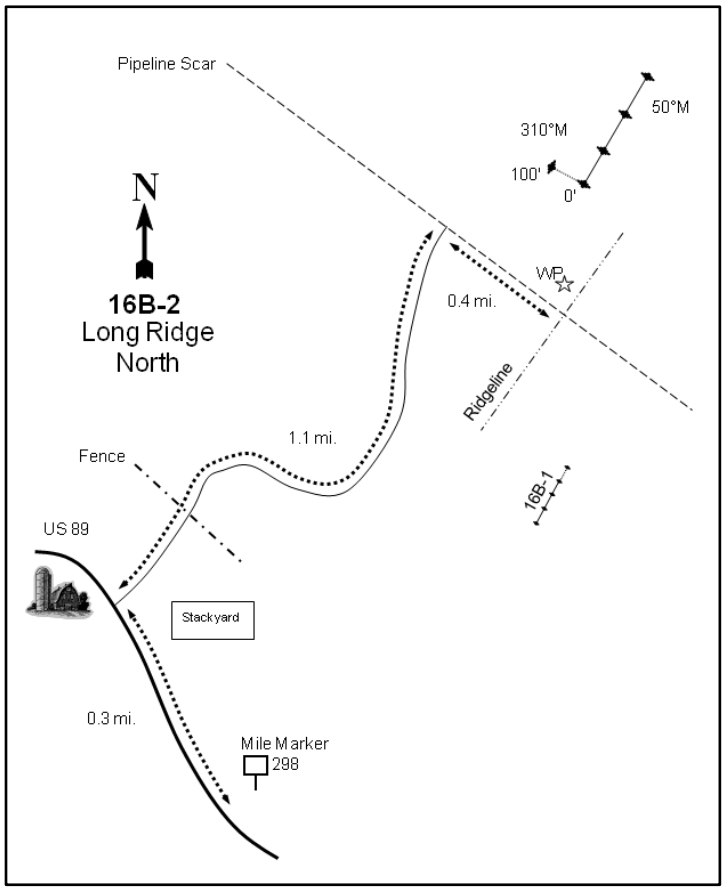


Area of Interest



LONG RIDGE NORTH - STUDY NO. 16B-2





Location Information

USGS 7.5 min Map Info	Indianola NW; Township 11S, Range 4E, Section 28
GPS (0' Stake)	NAD 83 UTM ZONE 12, 458241 East 4408964 North

Transect Information

Browse Tag # (0' Stake)	173
Transect Bearing	310° magnetic (Lines 2-4: 50° magnetic)
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (59ft), Line 3 (34ft), Line 4 (71ft)
Belt Marker Placement	Belt 3: 1ft, Belt 5: 10ft

Directions to Site

Travel north from Fairview on US-89 for approximately 15 miles to a ranch house and stockyard (0.3 miles north of mile marker 298). Turn right and pass through a UDWR gate onto Lassen Draw property, then drive 0.2 miles to another gate/fence. Continue up the road past transect #16B-3 for about 0.9 miles to a pipeline intersection at the upper end of the valley: park here. Walk 0.4 miles up the steep hill following the pipeline to the top of the first ridge. Stop here at an intersection and witness post. From the witness post, walk 21 paces at 5 degrees magnetic to the 0-foot baseline stake, marked by browse tag #173.

Site Information

Land Ownership	State
Land Administrator	UDWR
Allotment	LASSON C & H
Elevation	6,530ft (1,990m)
Aspect	North
Slope	25-35%
Sample Dates	06/03/1997, 06/04/2002, 06/19/2007, 05/21/2014, 07/17/2019

Wildlife Habitat and Vegetation History

Table 16B-02.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter
Greater Sage-Grouse	occupied	year-long

Table 16B-02.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1989	Mountain Big Sagebrush/Perennial Grass	No Encroachment
1997	Mountain Big Sagebrush/Perennial Grass	No Encroachment
2002	Mountain Big Sagebrush/Perennial Grass	Phase I
2007	Mountain Big Sagebrush/Perennial Grass	Phase I
2014	Mountain Big Sagebrush/Perennial Grass	Phase I
2019	Mountain Big Sagebrush/Perennial Grass	Phase I

Site Notes

Thistle Creek is located about 1.5 miles to the west. An underground natural gas pipeline is located to the southwest of the site.

Soils

Table 16B-02.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	6.9	54.7	19.7	25.6	2.8	13.6	294.4	0.6	06/03/1997

Site Potential

1981 - 2010 Average Annual Precipitation	17 inches
NRCS Ecological Site	Mountain Stony Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA461UT
States and Transitions	A defined state and transition model is available.

Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has been the dominant shrub on this site since study establishment in 1989, although cover and density have decreased since that time. Other preferred browse species such as Utah serviceberry (*Amelanchier utahensis*) and mountain snowberry (*Symphoricarpos oreophilus*) have also been present, but have contributed limited cover (Table 16B-02.12, Table 16B-02.13, Photos). The herbaceous understory has been diverse and abundant throughout the study period. Perennial grasses, particularly bluebunch wheatgrass (*Pseudoroegneria spicata*), have provided most of the herbaceous cover and have been a co-dominant site component in all sample years; there may be potential for this site to transition to a perennial grass state should sagebrush continue to decrease. The introduced annual grasses field brome (*Bromus arvensis*) and cheatgrass (*B. tectorum*) have been observed in most sample years, and cover increased by nearly eight percent between 2014 and 2019. Increased amounts of annual grasses may impact the resiliency of the plant community (Table 16B-02.7, Table 16B-02.10, Table 16B-02.11). Twoneedle pinyon (*Pinus edulis*) and/or Utah juniper (*Juniperus osteosperma*) have been present in all sample years since 2002 (Table 16B-02.14, Photos), placing the site in Phase I of woodland succession (Table 16B-02.4). The state and transition model states that continued tree encroachment in the absence of a major disturbance could transition the site to a tree-dominated state (Jornada, 2019). As trees are rare on site, however, this ecological shift is likely not an immediate threat to this community.

Trend Summary Tables

Table 16B-02.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	10.3	3.6	-	-	-	-
2002	10.0	2.8	-	-	-	-
2007	6.4	4.5	-	12.9	5.0	-
2014	6.3	4.4	-	8.1	3.1	-
2019	5.7	5.2	-	7.4	6.1	-

Table 16B-02.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	65	415	125	294	0.5	14.5	0.5	8.3
2002	67	371	119	170	0.2	20.6	0.6	3.9
2007	164	387	345	215	1.1	21.6	2.9	5.9
2014	74	396	283	249	0.6	31.0	2.0	4.5
2019	283	347	417	207	8.4	22.5	8.5	5.3

Table 16B-02.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	17.7	0.4	33.0	10.8	9.8	35.6
2002	10.2	0.1	26.5	17.1	12.9	40.2
2007	13.2	0.1	27.6	15.5	10.9	43.5
2014	16.1	0.2	45.1	10.5	9.2	51.1
2019	13.6	0.0	36.7	16.5	12.4	45.9

Table 16B-02.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1997	-	41	29	3
2002	-	30	2	1
2007	-	46	21	10
2014	-	30	2	14
2019	-	20	2	1
Year	Days Use Per Acre (ha)			
1997	-	-	-	-
2002	1.5 (3.6)	79.8 (197.0)	9.4 (23.2)	-
2007	-	36.2 (89.4)	18.7 (46.3)	-
2014	-	40.2 (99.3)	-	-
2019	-	18.1 (44.7)	3.4 (8.3)	-

Table 16B-02.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus arvensis[ai] (field brome)	Bromus briziformis[ai] (rattlesnake brome)	Bromus tectorum[ai] (cheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Poa bulbosa[i] (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency									
1997	-	-	-	65	4	30	-	197	216	310
2002	-	-	-	67	-	6	-	74	114	333
2007	-	21	10	157	-	41	-	150	215	299
2014	-	2	-	72	-	1	-	244	234	250
2019	4	88	-	223	4	65	2	94	208	272
year	Average Cover (%)									
1997	-	-	-	0.5	0.0	0.2	-	3.4	3.8	7.2
2002	-	-	-	0.2	-	0.1	-	1.7	1.1	17.7
2007	-	0.2	0.0	0.9	-	1.0	-	4.9	4.2	11.5
2014	-	0.0	-	0.6	-	0.0	-	13.4	5.3	12.3
2019	0.1	2.7	-	5.7	0.1	1.8	0.0	2.3	4.0	14.3

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16B-02.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum alyssoides[ai] (pale madwort)	Antennaria dimorpha (low pussytoes)	Arabis (rockcress)	Artemisia ludoviciana (white sagebrush)	Astragalus beckwithii (Beckwith's milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus utahensis (Utah milkvetch)	Balsamorhiza sagittata (arrowleaf balsamroot)	Calochortus nuttallii (sego lily)	Castilleja angustifolia (northwestern Indian paintbrush)	Ceratocephala testiculata[ai] (curveseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Cirsium (thistle)	Collinsia parviflora[a] (maiden blue eyed Mary)	Collomia linearis[a] (tiny trumpet)
year	Nested Frequency																
1997	51	3	32	59	6	3	60	-	21	11	108	8	9	-	5	38	49
2002	34	-	77	23	1	14	4	-	12	1	5	5	38	-	-	14	26
2007	14	-	239	23	28	12	10	9	10	6	11	5	196	3	-	69	39
2014	40	4	203	34	21	6	46	-	10	8	99	3	187	3	0	65	-
2019	28	-	393	-	2	3	19	-	6	5	107	1	134	-	3	76	71
year	Average Cover (%)																
1997	0.2	0.0	0.1	0.7	0.0	0.1	1.5	-	0.5	0.4	0.2	0.0	0.0	-	0.3	0.3	0.1
2002	0.2	-	0.4	0.6	0.0	0.3	0.0	-	0.2	0.1	0.0	0.0	0.1	-	-	0.0	0.1
2007	0.1	-	1.4	0.3	0.1	0.2	0.1	0.2	0.1	0.4	0.0	0.2	0.9	0.1	-	0.4	0.1
2014	0.3	0.0	1.2	0.3	0.1	0.3	0.6	-	0.1	0.2	0.3	0.1	0.5	0.0	0.0	0.2	-
2019	0.1	-	7.1	-	0.0	0.1	0.1	-	0.0	0.3	0.5	0.0	0.4	-	0.0	0.6	0.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawksbeard)	Cryptantha humilis (roundspike cryptantha)	Cymopterus longipes (longstalk springparsley)	Descurainia pinnata[a] (western tansymustard)	Epilobium brachycarpum[a] (tall annual willowherb)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Erodium cicutarium[ai] (redstem stork's bill)	Lactuca serriola[ai] (prickly lettuce)	Lappula occidentalis[a] (flatspine stickseed)	Linum lewisii (Lewis flax)	Lithospermum ruderale (western stoneseed)	Lupinus argenteus (silvery lupine)	Machaeranthera canescens (hoary tansyaster)	Microsteris gracilis[a] (slender phlox)	Phlox longifolia (longleaf phlox)
year	Nested Frequency																
1997	-	26	23	121	-	1	32	19	-	-	6	3	18	48	-	14	13
2002	-	11	7	59	-	-	37	30	-	-	-	4	9	13	-	8	10
2007	10	21	26	95	6	1	44	32	-	-	6	6	13	70	-	23	16
2014	12	28	13	98	-	-	37	19	-	-	23	-	19	15	3	3	1
2019	21	12	5	40	9	-	31	14	9	2	10	3	12	16	1	6	1
year	Average Cover (%)																
1997	-	0.1	0.2	0.8	-	0.0	0.2	0.1	-	-	0.0	0.0	0.4	2.4	-	0.0	0.0
2002	-	0.3	0.2	0.1	-	-	0.7	0.3	-	-	-	0.0	0.3	0.2	-	0.0	0.0
2007	0.1	0.4	0.3	0.4	0.0	0.0	0.3	0.5	-	-	0.0	0.0	0.4	1.5	-	0.1	0.1
2014	0.3	0.2	0.0	0.7	-	-	0.3	0.1	-	-	0.1	-	0.3	0.4	0.0	0.0	0.0
2019	0.2	0.1	0.1	0.2	0.0	-	0.4	0.2	0.1	0.0	0.0	0.0	0.2	2.3	0.0	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Sphaeralcea coccinea (scarlet globemallow)	Tragopogon dubius[ai] (yellow salsify)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency		
1997	9	21	-
2002	7	-	-
2007	8	5	-
2014	6	4	2
2019	9	5	-
year	Average Cover (%)		
1997	0.0	0.0	-
2002	0.0	-	-
2007	0.0	0.0	-
2014	0.0	0.0	0.0
2019	0.1	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16B-02.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis[p] (Utah serviceberry)	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Chrysothamnus depressus[p] (longflower rabbitbrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Mahonia repens (creeping barberry)	Opuntia (pricklypear)	Purshia tridentata[p] (antelope bitterbrush)	Symphoricarpos oreophilus[p] (mountain snowberry)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)									
1997	-	-	-	-	-	-	-	-	-	-
2002	-	-	-	-	-	-	-	-	-	-
2007	0.2	12.7	-	3.1	0.7	0.1	0.1	-	-	1
2014	0.4	7.7	-	2.4	0.1	0	0.1	-	-	0.5
2019	0.4	6.9	0	4.5	0.3	0.1	0.2	-	0.1	1
year	Quadrat Cover (%)									
1997	0.6	9.7	-	2.7	0.1	0.1	0.3	0.0	-	0.5
2002	0.6	9.5	-	1.5	0.0	0.1	0.4	-	-	0.7
2007	0.5	5.9	-	2.3	0.7	0.2	0.7	0.0	-	0.6
2014	0.6	5.7	-	3.0	0.1	0.0	0.7	-	-	0.6
2019	1.4	4.3	0.0	3.3	0.3	0.0	0.4	-	0.0	1.2

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16B-02.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
1997	520	-	31	58	12	8	31	4	36/53
2002	400	-	40	50	10	20	20	5	40/48
2007	420	-	24	76	0	19	48	0	45/57
2014	600	-	13	87	0	23	17	3	42/49
2019	280	-	43	57	0	36	50	0	47/63
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1997	2220	20	4	59	38	53	14	8	65/85
2002	2480	60	11	58	31	27	54	15	60/76
2007	2100	120	9	48	44	31	42	19	56/82
2014	2600	300	18	68	15	22	46	8	49/62
2019	2080	20	28	49	23	24	38	20	48/64
Chrysothamnus depressus[p] -- (longflower rabbitbrush)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	20	-	0	100	0	0	0	0	16/23
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1997	1420	-	3	96	1	0	0	0	24/33
2002	1560	-	8	85	8	0	0	3	24/35
2007	1860	-	5	87	8	0	0	1	26/36
2014	1540	220	17	77	7	10	1	0	27/41
2019	1540	-	10	90	0	0	0	0	33/48

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Echinocereus -- (hedgehog cactus)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	6/10
2014	-	-	-	-	-	-	-	-	13/19
2019	60	-	0	100	0	0	0	0	7/16
Ericameria nauseosa -- (rubber rabbitbrush)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	99/183
Gutierrezia sarothrae -- (broom snakeweed)									
1997	500	-	0	100	0	0	0	0	16/15
2002	120	-	17	33	50	0	0	17	16/10
2007	1280	20	14	73	13	0	0	5	25/28
2014	280	160	21	79	0	0	0	0	16/18
2019	1000	40	8	92	0	0	0	0	23/20
Mahonia repens -- (creeping barberry)									
1997	520	-	4	96	0	0	0	0	9/10
2002	320	-	0	100	0	0	0	0	4/5
2007	580	-	3	97	0	0	0	0	8/15
2014	280	-	0	100	0	0	0	0	6/11
2019	980	-	4	96	0	0	0	0	9/15
Opuntia -- (pricklypear)									
1997	380	-	5	90	5	0	0	0	12/22
2002	400	20	5	85	10	0	0	10	12/20
2007	540	-	4	85	11	0	0	7	12/25
2014	380	-	11	90	0	0	0	0	13/30
2019	400	-	0	95	5	0	0	10	16/31
Purshia tridentata[p] -- (antelope bitterbrush)									
1997	-	20	0	0	0	0	0	0	- / -
2002	-	-	-	-	-	-	-	-	-/-
2007	-	60	0	0	0	0	0	0	- / -
2014	-	-	-	-	-	-	-	-	-/-
2019	-	300	0	0	0	0	0	0	- / -
Rosa woodsii[p] -- (Woods' rose)									
1997	20	-	0	100	0	0	0	0	20/18
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
1997	80	-	25	75	0	25	0	0	7/21
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2014	40	-	0	100	0	50	0	0	17/28
2019	40	-	0	100	0	0	0	0	28/28
Tetradymia canescens -- (spineless horsebrush)									
1997	740	-	11	78	11	0	0	0	21/33
2002	640	-	13	81	6	0	0	0	19/32
2007	700	-	17	66	17	0	0	11	24/38
2014	560	-	7	75	18	14	0	4	23/33
2019	760	-	11	90	0	0	0	0	29/45

t - Tree Species; p - Preferred Browse; i - Introduced Species

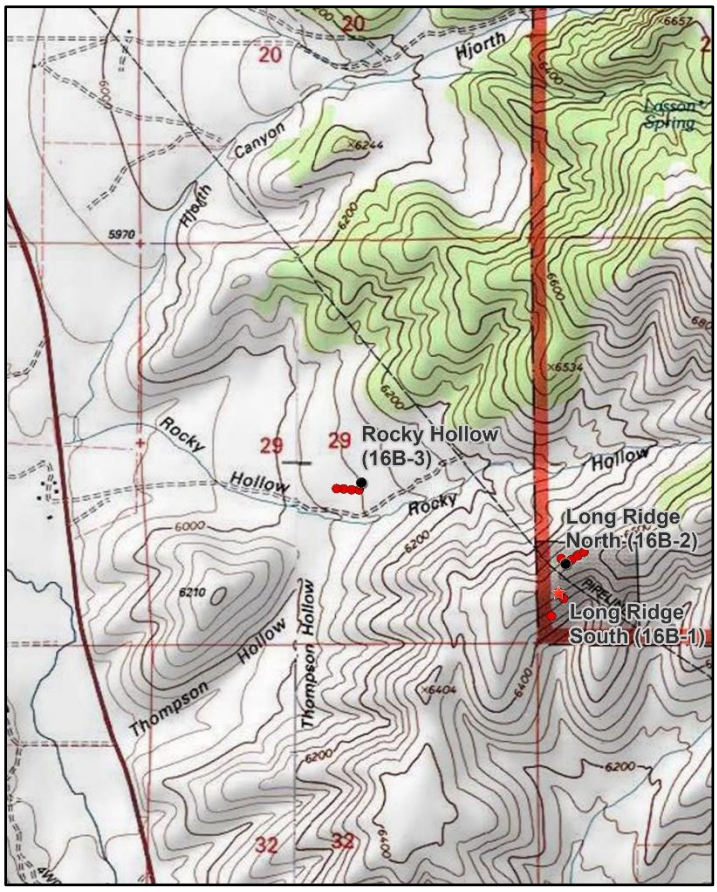
Table 16B-02.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

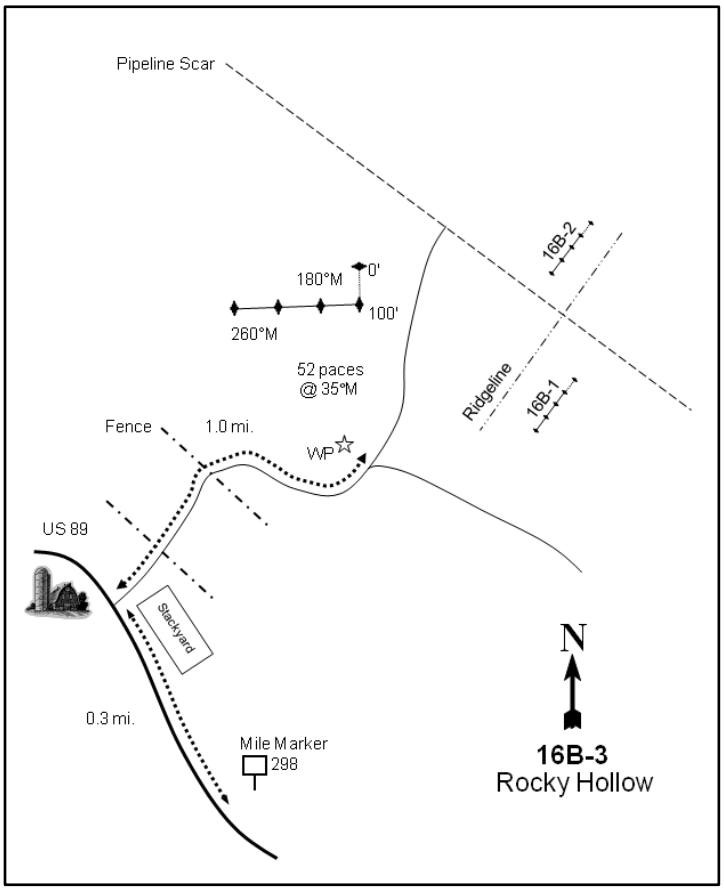
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Pinus edulis (twoneedle pinyon)							
2019	1	-	-	100	-	-	12.0

Table 16B-02.15 – Deer Desirable Components Index: High Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1997	13.1	4.2	2.6	28.9	-0.4	10.0	0.0	58.5	Fair
2002	12.7	6.2	6.5	30.0	-0.1	7.7	0.0	63.0	Fair
2007	16.2	2.1	4.4	30.0	-0.8	10.0	0.0	61.8	Fair
2014	10.2	10.8	8.7	30.0	-0.5	9.0	0.0	68.3	Fair-Good
2019	9.3	8.5	14.2	30.0	-6.3	10.0	0.0	65.8	Fair

ROCKY HOLLOW - STUDY NO. 16B-3





Location Information

USGS 7.5 min Map Info	Indianola NW; Township 11S, Range 4E, Section 29
GPS (0' Stake)	NAD 83 UTM ZONE 12, 457413 East 4409294 North

Transect Information

Browse Tag # (0' Stake)	Not Available
Transect Bearing	191° magnetic (Line 1: 191° magnetic; Lines 2-4: 260° magnetic)
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (59ft), Line 3 (34ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

Travel north from Fairview on US-89 for approximately 15 miles to a ranch house and stockyard (0.3 miles north of mile marker 298). Turn right, then pass through a UDWR gate into Lassen Draw property. Travel 0.2 miles to another gate/fence. Continue up the road for another 0.6 miles to a green and white witness post that is three paces from the road on the left-hand (north) side. From the witness post, walk 52 paces at 350 degrees magnetic to the 100-foot baseline stake. The 0-foot stake has no browse tag.

Site Information

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	6,050ft (1,844m)
Aspect	West
Slope	5%
Sample Dates	06/03/1997, 06/04/2002, 06/19/2007, 05/21/2014, 05/22/2019

Wildlife Habitat and Vegetation History

Table 16B-03.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter
Greater Sage-Grouse	occupied	year-long

Table 16B-03.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1989	Mountain Big Sagebrush	Phase I
1997	Mountain Big Sagebrush	Phase I
2002	Mountain Big Sagebrush	Phase I
2007	Mountain Big Sagebrush	Phase I
2014	Mountain Big Sagebrush	Phase I
2019	Mountain Big Sagebrush	Phase I

Site Notes

Thistle Creek is located about 1.0 mile to the west.

Soils

Table 16B-03.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	6.1	54.7	24.7	20.6	1.5	22.8	316.8	0.4	06/03/1997

Site Potential

1981 - 2010 Average Annual Precipitation	16 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA430UT
States and Transitions	A defined state and transition model is available.

Since establishment in 1989, this study site has remained dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*). Other shrub species have not been diverse, but have provided additional cover (Table 16B-03.12, Table 16B-03.13). The herbaceous understory has been diverse and abundant. However, the introduced annual grass species cheatgrass (*Bromus tectorum*) has been a major understory component and provided 32 percent cover in 2019. Increased amounts of annual grasses may pose a risk to the resilience of the plant community and increase fuel loads. Weedy annual forbs such as desert madwort (*Alyssum desertorum*) and curveseed butterwort (*Ceratocephala testiculata*) have also contributed significant amounts of cover in many sample years (Table 16B-03.7, Table 16B-03.10, Table 16B-03.11). Utah juniper (*Juniperus osteosperma*) have been observed and the site has been classified as being in Phase I of woodland succession throughout the study period (Table 16B-03.4, Table 16B-03.14, Photos). Although not described by the state and transition model (Jornada, 2019), continued tree encroachment could transition the site to a tree-dominated state in future sample years.

Trend Summary Tables

Table 16B-03.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	11.5	5.6	-	-	-	-
2002	14.9	4.9	-	-	-	-
2007	10.0	4.4	-	15.7	6.9	-
2014	7.8	6.0	-	6.9	3.2	-
2019	9.3	6.0	-	11.2	4.5	-

Table 16B-03.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	399	212	405	274	13.1	8.8	5.4	7.5
2002	394	209	458	192	7.3	6.8	19.3	2.9
2007	398	247	417	153	10.1	8.8	11.3	2.4
2014	387	234	395	198	13.0	10.8	6.7	5.0
2019	451	236	442	257	32.5	9.1	15.7	5.5

Table 16B-03.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	16.4	3.3	37.0	1.0	7.5	45.9
2002	15.2	4.3	32.3	2.8	7.4	57.6
2007	15.8	1.9	41.8	0.9	6.4	48.2
2014	25.9	3.2	43.6	1.1	6.9	48.7
2019	12.2	2.2	50.2	1.3	6.7	63.6

Table 16B-03.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
1997	2	38	19	-	5
2002	1	48	1	-	24
2007	1	51	22	-	28
2014	-	35	-	-	11
2019	1	44	15	1	11
Year	Days Use Per Acre (ha)				
1997	-	-	-	-	-
2002	0.7 (1.8)	136.0 (336.0)	-	-	-
2007	-	102.6 (253.3)	33.5 (82.8)	-	-
2014	-	69.7 (172.1)	-	-	-
2019	8.0 (19.7)	77.7 (192.0)	8.1 (19.9)	-	-

Table 16B-03.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus arvensis[ai] (field brome)	Bromus tectorum[ai] (cheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Pascopyrum smithii (western wheatgrass)	Poa bulbosa[i] (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency								
1997	3	-	399	43	9	2	-	117	70
2002	4	92	388	13	3	-	-	122	111
2007	2	-	398	28	10	-	-	183	76
2014	-	-	387	0	44	10	-	158	78
2019	5	14	446	2	17	38	5	165	64
year	Average Cover (%)								
1997	0.4	-	13.1	0.9	0.5	0.0	-	3.2	3.8
2002	0.0	0.5	6.8	0.4	0.2	-	-	2.2	4.0
2007	0.0	-	10.1	0.4	0.5	-	-	3.3	4.6
2014	-	-	13.0	0.0	2.6	0.2	-	2.0	5.9
2019	0.2	0.2	32.3	0.0	1.1	0.8	0.1	3.9	3.0

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16B-03.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum desertorum[ai] (desert madwort)	Antennaria (pussytoes)	Astragalus beckwithii (Beckwith's milkvetch)	Astragalus utahensis (Utah milkvetch)	Camelina microcarpa[ai] (littlepod false flax)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata[ai] (curveseed butterwort)	Cirsium (thistle)	Collinsia parviflora[a] (maiden blue eyed Mary)	Collomia linearis[a] (tiny trumpet)	Crepis acuminata (tapertip hawksbeard)	Cryptantha (cryptantha)	Cymopterus longipes (longstalk springparsley)	Descurainia pinnata[a] (western tansymustard)	Draba[a] (draba)
year	Nested Frequency																
1997	16	67	197	3	22	23	2	20	80	4	377	46	1	-	41	-	-
2002	9	85	379	-	27	-	3	5	261	-	413	16	3	-	-	-	-
2007	4	9	329	-	-	-	0	-	309	-	290	8	-	3	14	1	171
2014	6	-	368	-	9	-	-	5	217	-	95	2	-	-	23	2	85
2019	15	137	398	-	14	-	-	0	213	-	251	-	-	1	41	-	217
year	Average Cover (%)																
1997	0.3	0.2	0.7	0.0	0.6	0.8	0.0	0.2	0.5	0.0	3.8	0.1	0.0	-	0.1	-	-
2002	0.2	0.3	6.8	-	0.1	-	0.0	0.0	4.2	-	8.2	0.0	0.0	-	-	-	-
2007	0.0	0.0	3.0	-	-	-	0.0	-	5.9	-	1.4	0.0	-	0.0	0.1	0.0	0.9
2014	0.0	-	4.9	-	0.1	-	-	0.0	0.9	-	0.4	0.0	-	-	0.2	0.0	0.3
2019	0.5	0.9	7.3	-	0.1	-	-	0.0	1.1	-	1.8	-	-	0.0	0.8	-	4.3

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Erigeron pumilus (shaggy fleabane)	Gayophytum ramosissimum[a] (pinyon groundsmoke)	Lappula occidentalis[a] (flatspine stickseed)	Lathyrus brachycalyx (Bonneville pea)	Lithophragma tenellum (slender woodland-star)	Lithospermum ruderale (western stoneseed)	Lomatium triternatum (nineleaf biscuitroot)	Lupinus argenteus (silvery lupine)	Microsteris gracilis[a] (slender phlox)	Orogenia linearifolia (Great Basin Indian potato)	Phlox longifolia (longleaf phlox)	Polygonum douglasii[a] (Douglas' knotweed)	Silene antirrhina[a] (sleepy silene)	Sphaeralcea coccinea (scarlet globemallow)	Tragopogon dubius[ai] (yellow salsify)	Vicia americana (American vetch)
year	Nested Frequency															
1997	-	-	-	-	-	16	4	6	6	-	9	15	-	72	5	148
2002	-	-	-	-	-	11	-	-	28	-	2	1	-	67	-	54
2007	5	-	1	-	-	4	-	14	2	-	3	-	-	55	2	66
2014	-	4	8	19	-	0	-	12	8	-	3	-	41	98	-	66
2019	3	3	4	-	2	4	-	4	2	0	3	-	86	97	0	54
year	Average Cover (%)															
1997	-	-	-	-	-	0.5	0.0	0.4	0.0	-	0.0	0.2	-	1.2	0.0	3.2
2002	-	-	-	-	-	0.2	-	-	0.1	-	0.0	0.0	-	1.0	-	1.1
2007	0.0	-	0.0	-	-	0.2	-	0.2	0.0	-	0.0	-	-	1.1	0.0	0.8
2014	-	0.0	0.0	1.0	-	0.0	-	0.2	0.0	-	0.0	-	0.1	2.5	-	0.9
2019	0.0	0.2	0.0	-	0.0	0.0	-	0.3	0.0	0.0	0.0	-	1.0	1.8	0.0	1.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16B-03.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis[p] (Utah serviceberry)	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Opuntia (pricklypear)
year	Line Intercept Cover (%)				
1997	-	-	-	-	-
2002	-	-	-	-	-
2007	0.4	15.3	3.8	-	3.1
2014	0.6	6.3	0.7	-	2.5
2019	0.5	10.7	1.2	0.6	2.7
year	Quadrat Cover (%)				
1997	0.0	11.5	3.9	-	1.7
2002	0.0	14.8	2.8	-	2.1
2007	0.1	9.8	2.4	-	2.1
2014	0.1	7.6	1.3	-	4.8
2019	0.1	9.1	1.7	0.7	3.6

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16B-03.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[P] -- (Utah serviceberry)									
1997	40	-	0	100	0	0	100	0	84/112
2002	40	-	0	50	50	100	0	0	95/113
2007	40	-	0	50	50	0	100	50	106/119
2014	20	-	0	100	0	0	100	0	109/114
2019	20	-	0	100	0	0	100	0	111/125
Artemisia tridentata ssp. vaseyana[P] -- (mountain big sagebrush)									
1997	1700	40	8	62	29	44	0	11	77/116
2002	1600	400	5	65	30	41	16	14	78/99
2007	1440	40	3	60	38	35	18	54	98/113
2014	1340	-	8	52	40	18	51	19	79/107
2019	1140	20	7	56	37	18	56	37	72/109
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1997	2040	-	2	96	2	0	0	2	30/43
2002	2960	20	4	78	18	1	0	3	26/40
2007	2240	-	2	90	8	3	0	3	28/42
2014	2020	-	7	66	27	9	29	7	23/34
2019	1360	-	4	96	0	4	4	0	26/38
Echinocereus -- (hedgehog cactus)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	20	-	0	100	0	0	0	0	- / -
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Eriogonum microthecum[P] -- (slender buckwheat)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	23/25
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Gutierrezia sarothrae -- (broom snakeweed)									
1997	-	-	-	-	-	-	-	-	-/-
2002	60	-	0	100	0	0	0	0	- / -
2007	20	-	0	100	0	0	0	0	19/27
2014	-	-	-	-	-	-	-	-	14/19
2019	520	-	4	89	8	0	0	4	25/33
Mahonia repens -- (creeping barberry)									
1997	-	-	-	-	-	-	-	-	-/-
2002	20	-	0	100	0	0	0	0	- / -
2007	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Opuntia -- (pricklypear)									
1997	2400	-	1	96	3	0	0	1	16/29
2002	1620	-	1	88	11	0	0	4	16/51
2007	3160	20	1	94	6	0	0	4	19/49
2014	2920	-	0	99	1	0	0	1	17/47
2019	2760	20	0	97	3	0	0	14	16/51

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Purshia tridentata[p] -- (antelope bitterbrush)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	149/178
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	114/163

t - Tree Species; p - Preferred Browse; i - Introduced Species

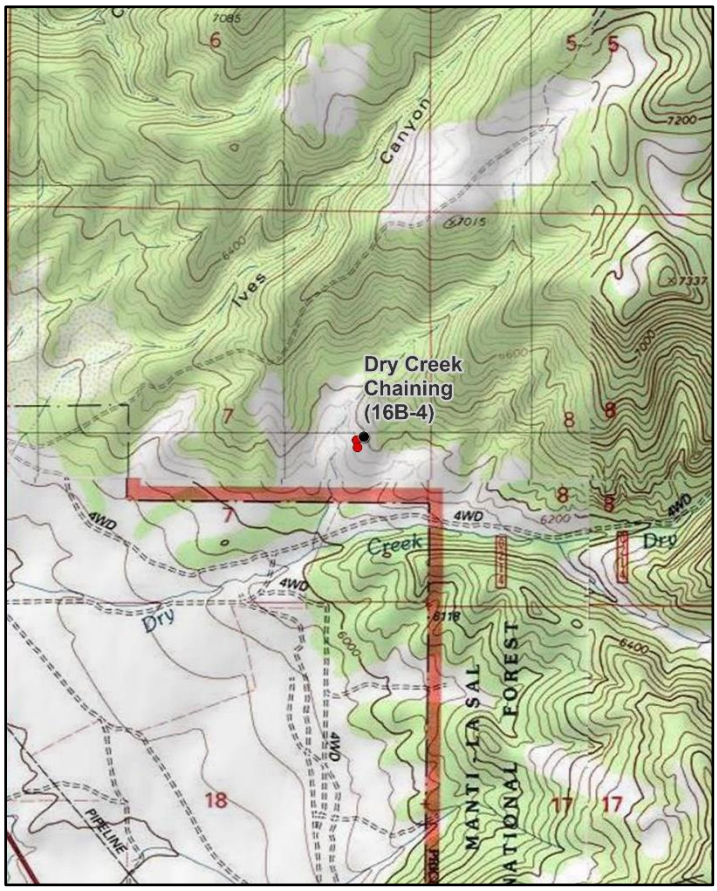
Table 16B-03.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

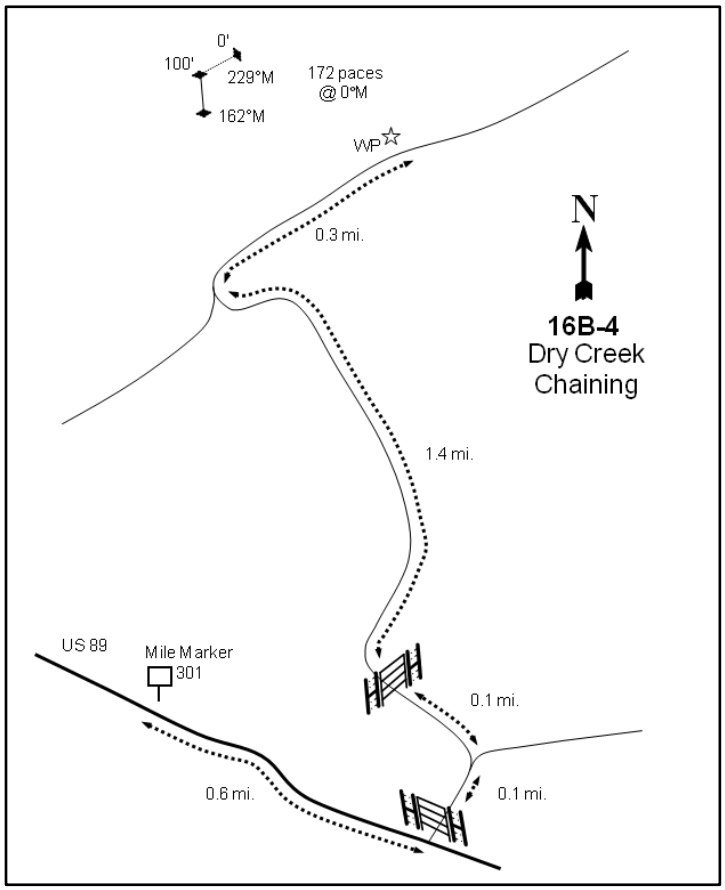
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2014	4	-	33	-	67	-	11.7
2019	3	-	33	33	-	33	12.0

Table 16B-03.15 – Deer Desirable Components Index: High Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1997	14.4	6.2	4.1	17.5	-9.8	10.0	0.0	42.4	Poor
2002	18.6	6.0	2.5	13.6	-5.5	5.7	0.0	40.9	Very Poor-Poor
2007	19.7	3.7	1.4	17.5	-7.6	4.7	0.0	39.4	Very Poor-Poor
2014	8.8	4.0	3.4	21.5	-9.7	10.0	0.0	37.9	Very Poor
2019	14.1	4.5	3.3	18.0	-20.0	10.0	0.0	29.9	Very Poor

DRY CREEK CHAINING - STUDY NO. 16B-4





Location Information

USGS 7.5 min Map Info	Birdseye SE; Township 11S, Range 4E, Section 07
GPS (0' Stake)	NAD 83 UTM ZONE 12, 456267 East 4414176 North

Transect Information

Browse Tag # (0' Stake)	188
Transect Bearing	229° magnetic (Line 1: 229° magnetic; Line 2: 162° magnetic)
Length	200ft
Belt Placement	Line 1 (11ft, 34ft & 71ft), Line 2 (59ft & 95ft)
Belt Marker Placement	Belt 1: No Rebar, Belt 2: 11ft, Belt 3: 1.3ft

Directions to Site

From mile marker 301 on US-89, travel south for 0.6 miles to a gate on the left. Go through this gate (traveling east) and continue for 0.1 miles to a fork. Stay left, continue for 0.1 miles through another gate, and proceed to the right. Go 1.4 miles to a fork and turn right, then drive for 0.3 miles to a witness post near a gully on the left (north) side of the road. From this post, walk 172 paces north (crossing over a fence) to the 0-foot baseline stake marked by browse tag #188.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	CEDAR KNOLLS S & G
Elevation	6,200ft (1,890m)
Aspect	Southwest
Slope	20%
Sample Dates	06/19/1997, 06/13/2002, 06/18/2007, 05/21/2014, 07/17/2019

Table 16B-04.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Chain Unknown	-	-	Historic	-
Seeding - Seed Unknown	-	-	Historic	-
Mechanical - Bullhog	Dry Canyon Wildlife Improvement and Fuels Reduction Project Phase I	1701	Between July 2010 and June 2012	496

Wildlife Habitat and Vegetation History

Table 16B-04.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter/spring
Rocky Mountain Elk	crucial	winter
Shiras Moose	substantial	year-long

Table 16B-04.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1989	Pinyon-Juniper/Mixed Mountain Brush	Phase II
1997	Pinyon-Juniper/Mixed Mountain Brush	Phase II
2002	Pinyon-Juniper/Mixed Mountain Brush	Phase II
2007	Pinyon-Juniper/Mixed Mountain Brush	Phase II
2014	Pinyon-Juniper/Mixed Mountain Brush	Phase II
2019	Pinyon-Juniper/Mixed Mountain Brush	Phase II

Site Notes

Part of the transect was bullhogged between 2010 and 2012. Thistle Creek and a large pond are located about 1.5 miles to the west, although water may potentially be found closer in one of two nearby ephemeral streams.

Soils

Table 16B-04.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.3	34.7	30.7	34.6	3.2	9.2	80.0	0.6	06/19/1997

Site Potential

1981 - 2010 Average Annual Precipitation	18 inches
NRCS Ecological Site	Mountain Stony Loam (Browse)
NRCS Ecological Site #	R047XA460UT
States and Transitions	No state and transition model is available for this ecological site.

Since establishment in 1989, this study site has remained in a stable state with twoneedle pinyon (*Pinus edulis*), Utah juniper (*Juniperus osteosperma*), and a mixture of mountain brush species as the dominant vegetation components (Table 16B-04.12, Table 16B-04.13, Table 16B-04.14, Photos). The herbaceous understory has remained diverse and moderately abundant with introduced perennial grasses such as intermediate wheatgrass (*Thinopyrum intermedium*) and smooth brome (*Bromus inermis*) providing much of the cover. The introduced annual grass cheatgrass (*Bromus tectorum*) has been present with generally low cover since 1997. In 2019, however, cheatgrass cover was nearly 11 percent; increased amounts of annual grasses have the potential to negatively impact the ecological resilience of the community (Table 16B-04.7, Table 16B-04.10). Some of the pinyon and juniper trees were treated between 2010 and 2012 (Table 16B-04.1), but they have remained a major component. The study site has been considered to be within Phase II of woodland succession throughout the study period (Table 16B-04.4). Tree encroachment will likely continue in the absence of a further tree-removing disturbance, and this site may have the potential to transition to one dominated by pinyon and juniper in the future.

Trend Summary Tables

Table 16B-04.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	10.0	1.2	6.8	-	-	-
2002	9.8	0.3	10.8	13.9	0.1	19.1
2007	8.5	0.8	13.6	13.7	0.8	20.5
2014	9.4	1.4	1.4	12.5	1.0	7.2
2019	17.0	1.4	2.5	21.7	0.9	9.8

Table 16B-04.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	142	217	122	98	1.6	5.3	0.4	3.9
2002	135	176	171	64	1.8	3.4	1.8	2.6
2007	154	161	298	81	1.9	4.0	3.0	3.0
2014	128	164	168	95	1.1	4.9	0.9	2.4
2019	186	148	273	99	10.6	10.0	7.9	5.2

Table 16B-04.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	14.5	4.4	40.9	7.5	14.2	28.5
2002	25.6	3.6	45.1	7.7	14.4	28.2
2007	22.0	3.4	35.7	13.6	13.4	33.2
2014	17.5	1.5	50.9	8.1	12.9	24.0
2019	14.8	0.9	50.4	12.7	14.5	41.7

Table 16B-04.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency		
1997	9	13	20
2002	5	13	21
2007	2	12	31
2014	-	3	23
2019	5	8	7
Year	Days Use Per Acre (ha)		
1997	-	-	-
2002	11.4 (28.1)	34.2 (84.4)	-
2007	5.3 (13.2)	24.8 (61.2)	-
2014	2.0 (5.0)	1.3 (3.3)	-
2019	6.0 (14.9)	20.8 (51.3)	-

Table 16B-04.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bromus arvensis[ai] (field brome)	Bromus inermis[i] (smooth brome)	Bromus tectorum[ai] (cheatgrass)	Carex (sedge)	Elymus elymoides (squirreltail)	Pascopyrum smithii (western wheatgrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium[i] (intermediate wheatgrass)
year	Nested Frequency											
1997	17	52	-	22	142	3	5	-	-	49	22	130
2002	4	64	2	20	135	-	-	-	8	25	35	72
2007	6	25	7	27	149	-	-	8	2	42	18	67
2014	0	14	-	32	128	3	4	22	-	38	37	58
2019	14	16	-	36	186	-	7	13	-	22	21	50
year	Average Cover (%)											
1997	0.2	0.4	-	0.5	1.6	0.1	0.0	-	-	0.3	0.4	3.2
2002	0.0	0.9	0.0	0.2	1.8	-	-	-	0.1	0.2	0.5	1.5
2007	0.2	0.2	0.0	0.5	1.9	-	-	0.2	0.0	0.3	0.6	2.1
2014	0.0	0.2	-	1.0	1.1	0.0	0.0	0.5	-	0.4	1.4	1.4
2019	0.5	0.7	-	1.9	10.6	-	0.4	1.5	-	0.5	0.8	3.7

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16B-04.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum alyssoides[ai] (pale madwort)	Alyssum desertorum[ai] (desert madwort)	Alyssum szovitsianum[ai] (Szowits' madwort)	Balsamorhiza sagittata (arrowleaf balsamroot)	Calochortus nuttallii (sego lily)	Camelina microcarpa[ai] (littlepod false flax)	Ceratocephala testiculata[ai] (curveseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Cirsium (thistle)	Collinsia parviflora[a] (maiden blue eyed Mary)	Crepis acuminata (tapertip hawksbeard)	Cryptantha (cryptantha)	Cymopterus (springparsley)	Cymopterus longipes (longstalk springparsley)	Descurainia pinnata[a] (western tansymustard)
year	Nested Frequency																
1997	-	-	-	26	-	3	7	6	21	3	13	-	-	17	-	0	14
2002	-	-	-	161	-	4	-	4	59	-	-	-	-	-	-	-	8
2007	-	-	-	277	-	2	-	-	130	-	-	-	-	11	-	6	11
2014	8	1	-	94	-	8	4	38	67	1	3	4	4	14	11	-	6
2019	-	3	64	28	192	2	-	-	27	-	0	5	-	20	9	-	26
year	Average Cover (%)																
1997	-	-	-	0.1	-	0.2	0.0	0.0	0.0	0.0	0.2	-	-	0.1	-	0.0	0.0
2002	-	-	-	1.6	-	0.6	-	0.0	0.2	-	-	-	-	-	-	-	0.0
2007	-	-	-	1.7	-	0.3	-	-	0.9	-	-	-	-	0.1	-	0.0	0.0
2014	0.0	0.0	-	0.2	-	0.2	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.0	-	0.2
2019	-	0.0	3.9	0.9	2.7	1.2	-	-	0.1	-	0.0	0.1	-	0.3	0.0	-	0.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Draba[a] (draba)	Epilobium brachycarpum[a] (tall annual willowherb)	Eriogonum brevicaule (shortstem buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Erodium cicutarium[ai] (redstem stork's bill)	Gayophytum ramosissimum[a] (pinyon groundsmoke)	Gilia inconspicua[a] (shy gilia)	Hackelia patens (spotted stickseed)	Lactuca serriola[ai] (prickly lettuce)	Lappula occidentalis[a] (flatspine stickseed)	Lesquerella (bladderpod)	Medicago sativa[i] (alfalfa)	Microsteris gracilis[a] (slender phlox)	Penstemon humilis (low beardtongue)	Petradoria pumila (rock goldenrod)	Phlox longifolia (longleaf phlox)	Polygonum douglasii[a] (Douglas' knotweed)
year	Nested Frequency																
1997	48	1	-	-	2	18	-	-	-	10	-	-	6	6	59	17	3
2002	-	-	-	5	1	-	-	-	2	-	-	1	3	2	51	8	1
2007	39	-	10	6	10	-	4	-	-	15	6	-	6	-	65	-	1
2014	10	-	1	5	49	-	-	4	2	1	3	-	-	6	47	2	-
2019	8	-	0	2	11	-	3	3	2	-	1	-	6	0	65	-	-
year	Average Cover (%)																
1997	0.1	0.0	-	-	0.0	0.0	-	-	-	0.0	-	-	0.0	0.2	2.9	0.2	0.0
2002	-	-	-	0.0	0.0	-	-	-	0.0	-	-	0.0	0.0	0.0	1.9	0.0	0.0
2007	0.1	-	0.0	0.2	0.1	-	0.0	-	-	0.2	0.0	-	0.0	-	2.3	-	0.0
2014	0.0	-	0.0	0.0	0.2	-	-	0.2	0.0	0.0	0.0	-	-	0.2	1.5	0.0	-
2019	0.0	-	0.0	0.0	0.0	-	0.0	0.1	0.0	-	0.0	-	0.0	0.0	3.4	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Silene antirrhina[a] (sleepy silene)	Streptanthus cordatus (heartleaf twistflower)	Symphyotrichum (aster)	unknown annual forb[a] (unknown forb)	Verbascum thapsus[ai] (common mullein)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency					
1997	2	-	-	48	-	-
2002	-	4	1	-	-	-
2007	-	-	-	-	-	-
2014	-	-	-	-	9	2
2019	-	5	-	-	-	3
year	Average Cover (%)					
1997	0.0	-	-	0.1	-	-
2002	-	0.0	0.0	-	-	-
2007	-	-	-	-	-	-
2014	-	-	-	-	0.0	0.0
2019	-	0.0	-	-	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16B-04.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Cercocarpus montanus[p] (alderleaf mountain mahogany)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma[t] (Utah juniper)	Opuntia (pricklypear)	Pinus edulis[t] (twoneedle pinyon)	Purshia tridentata[p] (antelope bitterbrush)	Quercus gambelii[p] (Gambel oak)	Symphoricarpos oreophilus[p] (mountain snowberry)
year	Line Intercept Cover (%)								
1997	-	-	-	-	-	-	-	-	-
2002	0.1	6.2	-	12.5	0.1	6.6	1.2	3.6	2.8
2007	0.1	6.1	0.7	11.1	0.1	9.4	2.7	2.1	2.7
2014	0.4	5.2	0.9	4.7	0.1	2.5	2.6	1.7	2.6
2019	0.2	8.9	0.6	6.5	0.3	3.3	4.9	3.8	3.9
year	Quadrat Cover (%)								
1997	-	5.5	1.0	3.2	0.2	3.6	1.8	2.1	0.6
2002	0.0	4.0	0.0	5.6	0.3	5.2	1.7	2.8	1.3
2007	0.1	3.0	0.5	7.9	0.2	5.7	1.8	2.2	1.4
2014	0.1	3.1	1.4	0.8	0.0	0.5	2.1	1.9	2.0
2019	0.0	5.3	0.9	0.3	0.5	2.2	5.1	2.7	3.8

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16B-04.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	183/295
2019	-	-	-	-	-	-	-	-	-/-
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1997	20	-	0	100	0	0	0	0	21/23
2002	20	-	0	0	100	0	100	100	18/30
2007	20	-	0	0	100	0	0	100	34/62
2014	20	-	0	100	0	0	0	0	48/96
2019	20	-	0	0	100	0	0	100	38/97
Cercocarpus montanus[p] -- (alderleaf mountain mahogany)									
1997	360	-	11	89	0	17	0	0	130/125
2002	400	-	5	45	50	20	60	20	140/148
2007	400	540	10	65	25	30	0	15	135/153
2014	380	20	21	79	0	58	21	0	120/142
2019	440	-	14	86	0	23	50	0	138/167
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	40/50
2014	-	-	-	-	-	-	-	-	26/26
2019	-	-	-	-	-	-	-	-	61/82

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Ericameria nauseosa ssp. nauseosa var. speciosa[p] -- (rubber rabbitbrush)									
1997	-	-	-	-	-	-	-	-	33/40
2002	40	-	50	0	50	0	0	0	- / -
2007	40	-	0	100	0	0	100	0	61/60
2014	20	-	0	0	100	100	0	100	30/35
2019	-	-	-	-	-	-	-	-	64/91
Gutierrezia sarothrae -- (broom snakeweed)									
1997	2060	60	9	89	2	0	0	2	23/24
2002	120	-	0	50	50	0	0	50	13/10
2007	1280	-	2	92	6	0	2	3	21/24
2014	2740	200	23	77	0	6	0	0	16/21
2019	1060	220	4	87	9	0	0	9	26/30
Juniperus osteosperma[t] -- (Utah juniper)									
1997	120	-	0	100	0	0	0	0	- / -
2002	200	-	0	100	0	0	0	10	- / -
2007	260	-	8	85	8	0	0	0	- / -
2014	-	20	0	0	0	0	0	0	- / -
2019	60	-	0	67	33	0	0	67	- / -
Opuntia -- (pricklypear)									
1997	180	-	0	78	22	0	0	22	13/29
2002	500	-	4	92	4	0	0	4	13/24
2007	380	-	0	90	11	0	5	5	15/32
2014	200	-	10	90	0	0	0	0	16/38
2019	300	-	0	100	0	0	0	7	16/42
Pinus edulis[t] -- (twoneedle pinyon)									
1997	60	-	33	67	0	0	0	0	- / -
2002	140	20	29	71	0	0	0	0	- / -
2007	120	40	0	83	17	0	0	17	- / -
2014	60	40	67	33	0	0	0	0	- / -
2019	60	20	67	33	0	0	0	0	- / -
Purshia tridentata[p] -- (antelope bitterbrush)									
1997	360	-	22	78	0	33	28	0	51/101
2002	240	-	0	92	8	42	58	8	42/116
2007	240	-	8	83	8	42	25	8	57/130
2014	280	-	0	100	0	50	36	0	56/111
2019	360	280	0	100	0	56	6	0	65/121
Quercus gambelii[p] -- (Gambel oak)									
1997	600	20	0	93	7	0	0	3	98/75
2002	920	-	0	94	7	0	0	4	101/63
2007	860	20	40	40	21	5	28	19	101/69
2014	520	-	15	77	8	23	0	4	91/73
2019	760	-	26	74	0	3	0	0	96/78
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
1997	220	-	9	91	0	0	0	0	58/76
2002	260	-	15	85	0	0	0	0	31/54
2007	720	-	44	53	3	3	3	3	55/104
2014	360	-	28	72	0	50	0	0	47/94
2019	380	-	0	100	0	0	0	0	59/83

t - Tree Species; p - Preferred Browse; i - Introduced Species

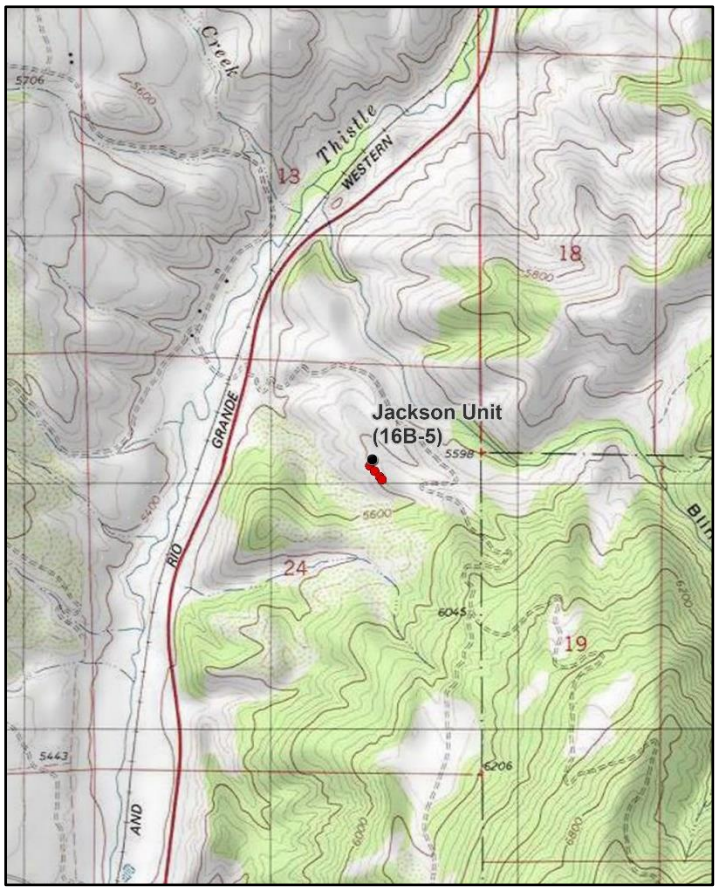
Table 16B-04.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

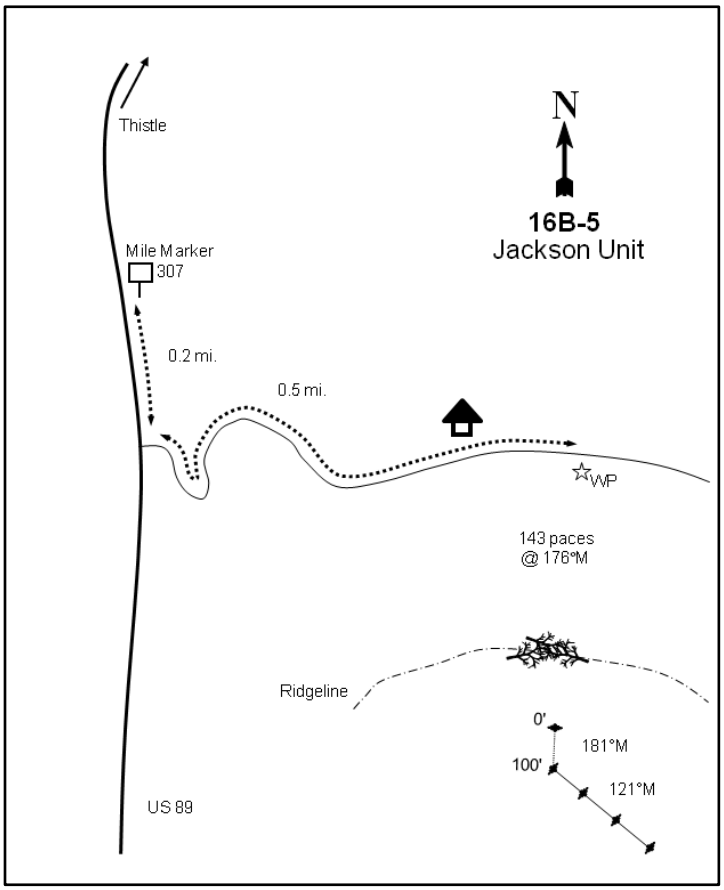
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2002	99	-	-	-	-	-	12.1
2007	87	5	-	40	40	15	18.6
2014	40	36	29	-	7	29	15.7
2019	27	-	71	14	14	-	8.3
Pinus edulis (twoneedle pinyon)							
2002	120	-	-	-	-	-	8.2
2007	67	6	17	17	33	28	10.3
2014	43	33	20	20	-	27	7.4
2019	43	75	-	13	-	13	4.8

Table 16B-04.15 – Deer Desirable Components Index: High Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1997	13.7	14.6	5.4	10.7	-1.2	7.8	0.0	50.9	Poor
2002	12.6	7.8	2.0	6.9	-1.4	5.2	0.0	33.1	Very Poor
2007	18.1	9.8	10.4	8.0	-1.4	5.9	0.0	50.8	Poor
2014	16.5	14.7	8.3	9.7	-0.8	4.7	0.0	53.1	Poor-Fair
2019	28.7	14.7	5.1	19.9	-8.0	10.0	0.0	70.4	Fair-Good

JACKSON UNIT - STUDY NO. 16B-5





Location Information

USGS 7.5 min Map Info	Birdseye NE; Township 10S, Range 3E, Section 24
GPS (0' Stake)	NAD 83 UTM ZONE 12, 454355 East 4421291 North

Transect Information

Browse Tag # (0' Stake)	417
Transect Bearing	181° magnetic (Line 1: 181° magnetic; Lines 2-4: 121° magnetic)
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (59ft), Line 3 (79ft), Line 4 (34ft)
Belt Marker Placement	Belt 3: 1ft

Directions to Site

From Thistle bridge, proceed south on US-89 0.2 miles south of mile marker 307. From here, take a side road east onto a UDWR reseeding and travel for 0.5 miles; stop at a full-high witness post. From this witness post, walk 143 paces at 176 degrees magnetic to the 0-foot baseline stake marked by browse tag #417.

Site Information

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	5,600ft (1,707m)
Aspect	Southwest
Slope	28%
Sample Dates	06/19/1997, 06/14/2002, 06/18/2007, 05/28/2014, 05/22/2019

Table 16B-05.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Mechanical - Bullhog	Birdseye WMA Bullhog Project	3605	September 2016-December 2017	229
Chaining - Chain Unknown	-	-	1972	-
Seeding - Seed Unknown	-	-	1972	-

Wildlife Habitat and Vegetation History

Table 16B-05.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter/spring
Rocky Mountain Elk	crucial	winter
Shiras Moose	substantial	year-long

Table 16B-05.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1989	Perennial Grass/Juniper	Phase I transitioning to Phase II
1997	Perennial Grass/Juniper	Phase I transitioning to Phase II
2002	Juniper/Perennial Grass	Phase II
2007	Juniper/Perennial Grass	Phase II
2014	Juniper/Perennial Grass	Phase II
2019	Juniper/Perennial Grass	Phase II

Site Notes

An older line-intercept transect is located approximately 360 feet to the east. The nearest perennial water sources are Blind Canyon Creek, which is located 1,000 feet to the northwest, and Thistle Creek, which is located 0.4 miles to the west. The lack of palatable winter browse makes this area less important to deer.

Soils

Table 16B-05.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	7.2	56.7	19.7	23.6	2.5	6.8	128.0	0.6	06/19/1997

Site Potential

1981 - 2010 Average Annual Precipitation	19 inches
NRCS Ecological Site	Mountain Gravelly Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XB406UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 1989, this site has remained co-dominated by Utah juniper (*Juniper osteosperma*) and a mixture of perennial grass species such as crested wheatgrass (*Agropyron cristatum*), needle and thread (*Hesperostipa comata*), and bluebunch wheatgrass (*Pseudoroegneria spicata*), among others. Forbs have been limited in comparison with the introduced and annual species desert madwort (*Alyssum desertorum*) providing a majority of the cover (Table 16B-05.7, Table 16B-05.10, Table 16B-05.11). Browse species such as mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) have been observed, but have remained rare (Table 16B-05.12, Table 16B-05.13). Juniper increased in both cover and density through the 2014 sample year. Some of the trees were removed by a 2016 bullhog project (Table 16B-05.1), but the study has remained in Phase II of woodland succession throughout the study period (Table 16B-05.4, Table 16B-05.12, Table 16B-05.14, Photos). This continued tree presence indicates that this site may have the potential to transition to one dominated by juniper in the future.

Trend Summary Tables

Table 16B-05.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	0.1	1.2	6.1	-	-	-
2002	0.2	0.8	8.6	0.2	0.5	10.7
2007	0.6	1.0	11.4	0.4	0.4	17.5
2014	0.4	1.3	11.3	0.1	0.7	20.8
2019	-	1.0	7.8	-	0.2	15.1

Table 16B-05.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	119	355	406	37	0.8	14.5	4.4	1.6
2002	126	320	270	9	0.4	14.1	0.8	0.1
2007	109	311	360	14	0.3	17.4	5.7	0.3
2014	27	314	287	12	0.1	16.3	1.5	0.1
2019	18	261	397	30	0.1	16.3	6.9	0.3

Table 16B-05.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	16.0	4.1	29.8	8.2	8.6	30.9
2002	24.5	9.3	36.9	9.6	12.5	26.9
2007	17.0	8.1	32.1	12.8	8.2	35.6
2014	25.1	6.4	38.2	18.4	11.1	27.9
2019	25.7	3.8	45.2	11.8	12.1	28.3

Table 16B-05.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Coyote	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency					
1997	-	-	14	36	-	20
2002	1	-	11	7	1	3
2007	-	-	8	8	-	24
2014	-	-	2	1	-	14
2019	-	-	3	2	1	19
Year	Days Use Per Acre (ha)					
1997	-	-	-	-	-	-
2002	1.5 (3.6)	-	10.0 (24.8)	44.9 (110.9)	4.0 (10.0)	-
2007	-	-	8.1 (19.9)	28.8 (71.2)	4.0 (10.0)	-
2014	-	17.4 (43.0)*	-	3.4 (8.3)	-	-
2019	-	8.7 (21.5)*	3.4 (8.3)	-	-	-

*Pellets per acre (ha)

Table 16B-05.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bromus tectorum[ai] (cheatgrass)	Elymus elymoides (squirreltail)	Festuca idahoensis (Idaho fescue)	Hesperostipa comata (needle and thread)	Poa bulbosa[i] (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Psathyrostachys juncea[i] (Russian wildrye)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium[i] (intermediate wheatgrass)
year	Nested Frequency										
1997	45	148	119	2	41	110	-	13	1	66	110
2002	33	141	126	-	19	79	-	6	-	73	69
2007	26	163	109	-	33	66	-	18	-	72	29
2014	15	164	27	3	38	85	-	13	-	63	51
2019	5	151	18	4	40	67	6	3	-	42	20
year	Average Cover (%)										
1997	1.0	4.0	0.8	0.1	1.4	3.7	-	0.1	0.0	2.8	1.5
2002	1.4	4.2	0.4	-	0.9	4.0	-	0.0	-	2.6	0.9
2007	0.8	7.0	0.3	-	1.5	3.2	-	0.5	-	3.6	0.8
2014	0.5	6.7	0.1	0.0	2.7	3.6	-	0.0	-	1.8	0.9
2019	0.2	6.9	0.1	0.0	2.3	3.8	0.3	0.0	-	2.1	0.6

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16B-05.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum desertorum[ai] (desert madwort)	Astragalus calycosus (Torrey's milkvetch)	Astragalus utahensis (Utah milkvetch)	Camelina microcarpa[ai] (littlepod false flax)	Ceratocephala testiculata[ai] (curveseed butterwort)	Chenopodium album[a] (lambsquarters)	Cirsium (thistle)	Descurainia pinnata[a] (western tansymustard)	Eriogonum ovalifolium (cushion buckwheat)	Lactuca serriola[ai] (prickly lettuce)	Linum perenne[i] (blue flax)	Penstemon humilis (low beardtongue)	Phlox longifolia (longleaf phlox)	Sanguisorba minor[i] (small burnet)	Streptanthus cordatus (heartleaf twistflower)
year	Nested Frequency																
1997	2	4	406	4	9	2	-	-	1	1	-	-	10	-	5	-	4
2002	-	-	269	-	4	-	5	-	1	-	-	-	-	-	-	-	4
2007	3	-	360	-	7	-	10	-	-	3	-	-	-	-	-	-	4
2014	2	-	284	1	1	-	12	-	-	10	1	-	-	1	-	-	6
2019	1	2	386	3	18	-	27	3	1	26	-	5	-	-	-	1	4
year	Average Cover (%)																
1997	0.0	0.1	4.3	0.1	0.6	0.0	-	-	0.1	0.0	-	-	0.6	-	0.0	-	0.0
2002	-	-	0.8	-	0.0	-	0.0	-	0.0	-	-	-	-	-	-	-	0.0
2007	0.1	-	5.6	-	0.1	-	0.0	-	-	0.0	-	-	-	-	-	-	0.0
2014	0.0	-	1.4	0.0	0.0	-	0.0	-	-	0.1	0.0	-	-	0.0	-	-	0.0
2019	0.0	0.0	6.8	0.0	0.2	-	0.1	0.0	0.0	0.1	-	0.0	-	-	-	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Taraxacum officinale (common dandelion)	Tragopogon dubius[ai] (yellow salsify)	unknown perennial forb (unknown forb)	Verbascum thapsus[ai] (common mullein)
year	Nested Frequency			
1997	-	9	3	1
2002	-	-	-	-
2007	-	-	-	-
2014	-	-	-	-
2019	5	-	-	-
year	Average Cover (%)			
1997	-	0.1	0.0	0.0
2002	-	-	-	-
2007	-	-	-	-
2014	-	-	-	-
2019	0.0	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16B-05.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. speciosa[p] (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma[t] (Utah juniper)	Opuntia (pricklypear)	Symphoricarpos oreophilus[p] (mountain snowberry)
year	Line Intercept Cover (%)						
1997	-	-	-	-	-	-	-
2002	-	0.3	0.2	-	10.7	0.2	-
2007	-	0.2	0.4	-	17.5	0.2	-
2014	-	-	0.1	-	20.8	0.7	-
2019	-	-	-	-	15.1	0.2	-
year	Quadrat Cover (%)						
1997	0.1	-	-	0.0	6.1	1.2	-
2002	-	0.1	0.2	-	8.6	0.6	-
2007	0.0	0.4	0.4	-	11.4	0.5	0.1
2014	-	-	0.4	-	11.3	1.3	-
2019	-	0.1	-	-	7.8	0.8	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16B-05.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1997	-	-	-	-	-	-	-	-	157/164
2002	-	-	-	-	-	-	-	-	155/67
2007	-	-	-	-	-	-	-	-	97/75
2014	-	-	-	-	-	-	-	-	116/58
2019	-	-	-	-	-	-	-	-	117/104
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1997	20	-	0	100	0	0	0	0	38/39
2002	20	-	0	100	0	0	0	0	40/48
2007	40	-	0	50	50	0	0	0	52/58
2014	40	-	0	50	50	0	0	50	- / -
2019	20	-	0	0	100	0	100	100	23/23
Ericameria nauseosa ssp. nauseosa var. speciosa[p] -- (rubber rabbitbrush)									
1997	20	-	0	100	0	0	0	0	80/94
2002	60	-	0	0	100	0	0	33	72/111
2007	20	-	0	0	100	100	0	100	67/57
2014	20	-	0	100	0	0	0	0	80/72
2019	20	-	0	100	0	0	0	0	45/39
Gutierrezia sarothrae -- (broom snakeweed)									
1997	220	-	27	73	0	0	0	0	25/24
2002	20	-	0	0	100	0	0	100	20/29
2007	20	-	100	0	0	0	0	0	18/28
2014	40	-	0	100	0	0	0	0	12/17
2019	-	-	-	-	-	-	-	-	17/29
Juniperus osteosperma[t] -- (Utah juniper)									
1997	180	-	11	89	0	0	0	0	- / -
2002	340	-	6	94	0	0	0	6	- / -
2007	360	-	0	100	0	0	6	0	- / -
2014	260	-	0	100	0	0	0	8	- / -
2019	100	-	0	80	20	0	0	20	- / -
Opuntia -- (pricklypear)									
1997	1860	-	1	90	9	0	0	9	15/26
2002	1640	40	16	77	7	0	0	0	13/24
2007	1280	-	14	83	3	0	5	3	15/33
2014	980	20	6	90	4	2	0	18	14/28
2019	660	-	3	94	3	0	0	21	12/38
Purshia tridentata[p] -- (antelope bitterbrush)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	45/102
2019	-	-	-	-	-	-	-	-	-/-
Quercus gambelii[p] -- (Gambel oak)									
1997	40	-	0	100	0	100	0	0	49/60
2002	-	-	-	-	-	-	-	-	38/20
2007	-	-	-	-	-	-	-	-	79/37
2014	-	-	-	-	-	-	-	-	15/14
2019	-	-	-	-	-	-	-	-	65/79

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Rhus trilobata[p] -- (skunkbush sumac)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	180/240

t - Tree Species; p - Preferred Browse; i - Introduced Species

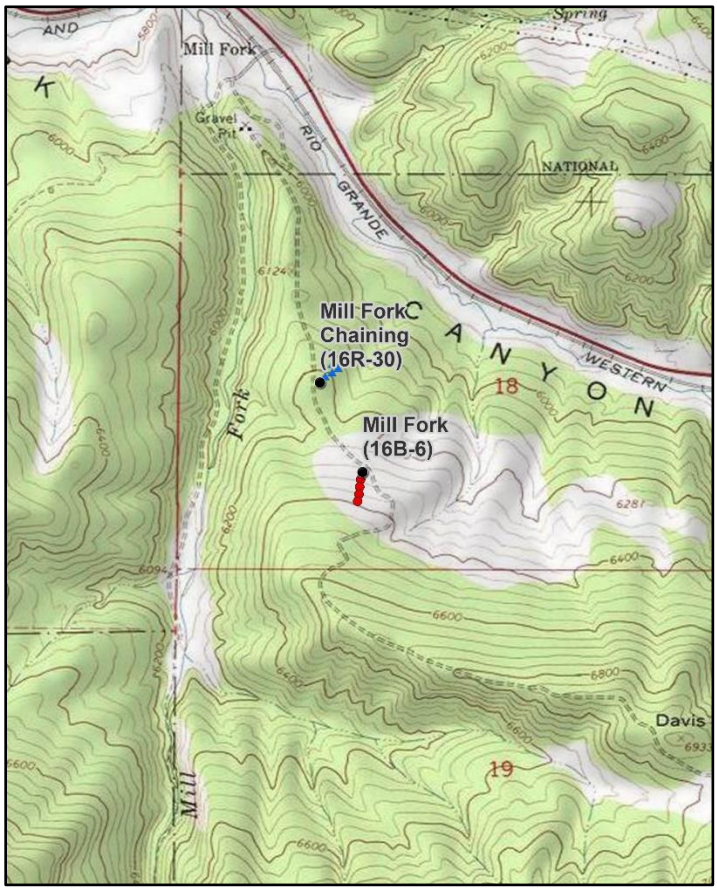
Table 16B-05.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

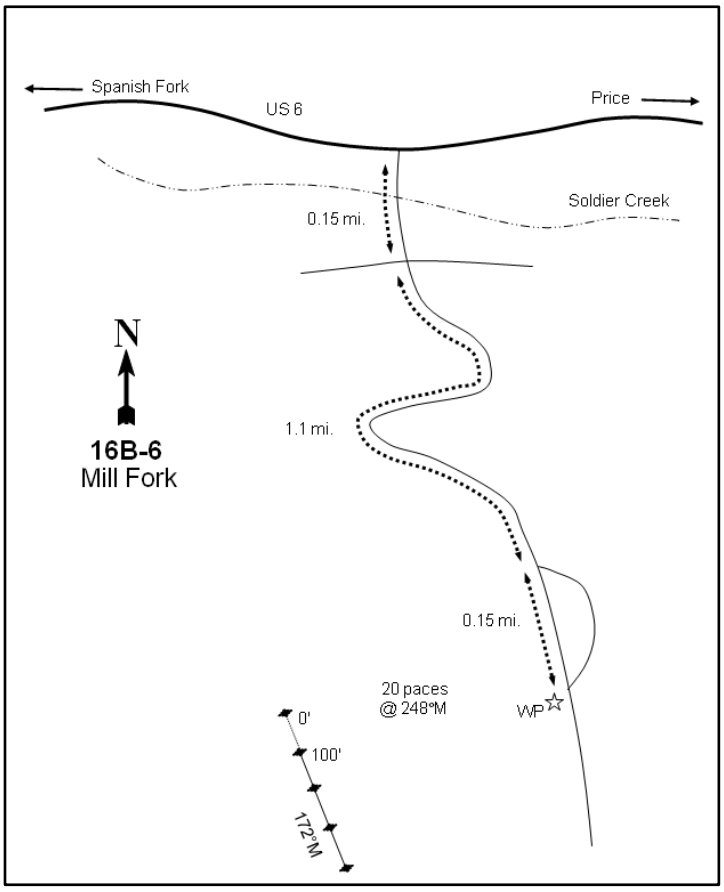
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2002	219	-	-	-	-	-	13.4
2007	192	-	15	15	55	15	18.6
2014	222	-	15	15	45	25	15.7
2019	142	15	35	10	10	30	18.2

Table 16B-05.15 – Deer Desirable Components Index: High Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1997	0.2	0.0	0.0	29.1	-0.6	3.2	0.0	31.9	Very Poor
2002	0.2	0.0	0.0	28.2	-0.3	0.1	0.0	28.2	Very Poor
2007	0.5	0.0	0.0	30.0	-0.2	0.5	0.0	30.8	Very Poor
2014	0.1	0.0	0.0	30.0	-0.1	0.2	0.0	30.3	Very Poor
2019	0.0	0.0	0.0	30.0	0.0	0.6	0.0	30.6	Very Poor

MILL FORK - STUDY NO. 16B-6





Location Information

USGS 7.5 min Map Info	Mill Fork NE; Township 10S, Range 6E, Section 18
GPS (0' Stake)	NAD 83 UTM ZONE 12, 474109 East 4422066 North

Transect Information

Browse Tag # (0' Stake)	9091
Transect Bearing	172° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

From the Sheep Creek Café and the Sheep Creek turnoff on Highway 6, travel east for 1.9 miles on Highway 6 (toward Price) to the Mill Fork turnoff on the south side of the highway. Take this road for 0.15 miles, passing through a gate and crossing a river, to a fork. Stay left (east), and travel up the hill 1.1 miles to a division in the road: here the dense pinyon and juniper forest opens into a sagebrush stand (this stand was chained in the fall of 2007). Proceed for another 0.15 miles to a witness post on the right-hand (west) side of the road. From the witness post, the 0-foot baseline stake is 20 paces away at 248 degrees magnetic and is marked by browse tag #9091.

Site Information

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	6,300ft (1,920m)
Aspect	North
Slope	10-15%
Sample Dates	06/13/1997, 07/23/2002, 07/23/2007, 05/29/2014, 05/30/2019

Table 16B-06.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Hand Crew - Lop and Scatter	Mill Fork Wildlife Habitat Improvement Project (Phase 2)	3019	August-November 2015	553
Seeding - Aerial Before	Mill Fork Wildlife Habitat Improvement Project	716	October 2007	462
Chaining - Two-Way Ely/Smooth	Mill Fork Wildlife Habitat Improvement Project	716	October-November 2007	350
Seeding - Dribbler	Mill Fork Wildlife Habitat Improvement Project	716	November 2007	350

Table 16B-06.2 SeedMix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Mill Fork Chaining			Aerial	Oct 2007	472
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Achnatherum hymenoides	Indian Ricegrass	Rimrock	0.95	0.83
G	Agropyron cristatum	Crested Wheatgrass	Douglas	0.53	0.44
G	Agropyron cristatum	Crested Wheatgrass	Ephraim	0.53	0.47
G	Agropyron cristatum	Crested Wheatgrass	Hycrest	0.42	0.39
G	Agropyron fragile	Siberian Wheatgrass	Vavilov	0.85	0.73
G	Bromus marginatus	Mountain Brome		0.85	0.79
G	Dactylis glomerata	Orchardgrass	Paiute	0.42	0.33
G	Leymus cinereus	Great Basin Wildrye	Trailhead	0.53	0.51
G	Poa secunda	Canby Bluegrass	Canbar	0.42	0.38
G	Pseudoroegneria spicata	Bluebunch Wheatgrass	Anatone	0.95	0.81
G	Thinopyrum intermedium	Intermediate Wheatgrass		0.95	0.91
F	Achillea millefolium	Western Yarrow		0.10	0.10
F	Astragalus cicer	Cicer Milkvetch	Lutana	0.53	0.49
F	Medicago sativa	Alfalfa	Ladak	0.64	0.59
F	Medicago sativa	Alfalfa	Ranger	0.64	0.57
F	Medicago sativa	Alfalfa	Spreador 4	0.64	0.61
F	Onobrychis viciifolia	Sainfoin	Eski	1.91	1.75
F	Sanguisorba minor	Small Burnet	Delar	1.87	1.74

Mix Name			Application Type	Application Date	Acres
Mill Fork Chaining Dribbler			Dribbler	Nov 2007	370
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
S	Atriplex canescens	Fourwing Saltbush	Juab/Millard UT	0.27	0.10
S	Purshia tridentata	Bitterbrush	Elko NV	0.12	0.11
S	Purshia tridentata	Bitterbrush	Millard UT	0.15	0.13

Wildlife Habitat and Vegetation History

Table 16B-06.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter/spring
Rocky Mountain Elk	crucial	winter
Shiras Moose	substantial	year-long

Table 16B-06.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1989	Mountain Big Sagebrush	Phase I
1997	Mountain Big Sagebrush	Phase I
2002	Mountain Big Sagebrush/Juniper	Phase I transitioning to Phase II
2007	Mountain Big Sagebrush/Juniper	Phase I transitioning to Phase II
2014	Mountain Big Sagebrush/Perennial Grass	Phase I
2019	Mountain Big Sagebrush/Perennial Grass	Phase I

Site Notes

There is a small perennial stream located 0.25 miles to the north of the transect. In 2007, a deer skeleton was found on the study. Domestic sheep trail through the general vicinity during spring and summer, but use by sheep on the study itself is minimal.

Soils

Table 16B-06.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay	7.3	20.7	22.7	56.6	2.8	12.3	83.2	0.5	06/13/1997

Site Potential

1981 - 2010 Average Annual Precipitation	21 inches
NRCS Ecological Site	Mountain Stony Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA461UT
States and Transitions	No state and transition model is available for this ecological site.

Upon study establishment in 1989, this site existed as a stand of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) with young Utah juniper (*Juniperus osteosperma*) scattered throughout the area. Juniper trees increased in cover over time, and they became a co-dominant site component in 2002. A chaining and seeding treatment in 2007 caused juniper cover and abundance to decrease, and cover further decreased following a 2015 lop and scatter treatment (Table 16B-06.1). However, many young trees have remained following treatment (Table 16B-06.12, Table 16B-06.14, Photos), indicating that this site may be infilled in the future. The site transitioned to a seeded perennial grass and mountain big sagebrush state in 2014. Other browse species have remained moderately abundant, but have provided little cover (Table 16B-06.12, Table 16B-06.13). The herbaceous understory was limited prior to the treatment, but has since increased substantially in both abundance and cover. The introduced and noxious annual weedy forb nodding plumeless thistle (*Carduus nutans*) has been observed in 2014 and 2019, but in low amounts (Table 16B-06.7, Table 16B-06.10, Table 16B-06.11).

Trend Summary Tables

Table 16B-06.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	30.5	1.4	2.7	-	-	-
2002	33.3	0.7	3.3	28.1	0.7	4.3
2007	20.7	0.6	2.3	35.2	0.5	4.9
2014	9.9	2.4	3.6	12.6	3.3	2.8
2019	12.4	2.4	0.5	12.8	2.9	1.1

Table 16B-06.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	-	32	13	216	-	1.0	0.0	3.7
2002	-	36	-	138	-	0.9	-	2.4
2007	2	39	12	161	0.0	1.1	0.0	3.7
2014	-	276	12	252	-	20.1	0.1	8.2
2019	3	306	61	187	0.0	27.1	0.6	4.7

Table 16B-06.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	26.9	2.3	42.5	6.3	4.9	35.6
2002	27.4	3.9	38.7	5.8	4.6	40.0
2007	30.5	4.8	38.8	10.0	3.0	29.1
2014	18.5	0.3	52.5	2.6	2.4	44.9
2019	25.9	0.1	55.5	4.3	3.8	39.8

Table 16B-06.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency			
1997	26	11	-	2
2002	30	3	-	5
2007	25	7	-	19
2014	14	13	-	3
2019	18	6	-	7
Year	Days Use Per Acre (ha)			
1997	-	-	-	-
2002	58.3 (144.0)	18.1 (44.7)	-	-
2007	69.0 (170.5)	24.8 (61.2)	-	-
2014	36.2 (89.4)	12.8 (31.5)	-	-
2019	23.4 (57.9)	2.7 (6.6)	0.6 (1.4)	-

Table 16B-06.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Achnatherum lettermanii (Letterman's needlegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bromus tectorum[ai] (cheatgrass)	Dactylis glomerata[i] (orchardgrass)	Elymus elymoides (squirreltail)	Leymus cinereus (basin wildrye)	Leymus salinus (saline wildrye)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium[i] (intermediate wheatgrass)
year	Nested Frequency											
1997	1	4	-	-	-	4	-	-	-	-	24	-
2002	-	3	-	-	-	-	-	-	-	-	34	-
2007	4	-	-	2	-	3	-	-	2	-	30	-
2014	3	1	129	-	8	3	9	0	-	16	113	115
2019	0	2	139	3	-	9	8	-	2	8	169	102
year	Average Cover (%)											
1997	0.0	0.0	-	-	-	0.0	-	-	-	-	0.9	-
2002	-	0.0	-	-	-	-	-	-	-	-	0.8	-
2007	0.0	-	-	0.0	-	0.0	-	-	0.0	-	1.1	-
2014	0.0	0.0	7.2	-	0.2	0.1	0.5	0.0	-	0.2	7.3	4.6
2019	0.0	0.2	7.3	0.0	-	0.2	0.4	-	0.0	0.2	15.6	3.2

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16B-06.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Alyssum desertorum[ai] (desert madwort)	Astragalus beckwithii (Beckwith's milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus miser (timber milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Carduus nutans[ani] (nodding plumeless thistle)	Castilleja angustifolia (northwestern Indian paintbrush)	Ceratocephala testiculata[ai] (curveseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Cirsium (thistle)	Collinsia parviflora[a] (maiden blue eyed Mary)	Collomia linearis[a] (tiny trumpet)	Cymopterus (springparsley)	Epilobium brachycarpum[a] (tall annual willowherb)	Erigeron eatonii (Eaton's fleabane)
year	Nested Frequency																
1997	5	-	7	21	-	4	38	-	2	-	30	5	1	-	7	-	-
2002	5	-	1	12	-	-	-	-	-	-	2	-	-	-	5	-	3
2007	3	-	18	28	-	-	2	-	-	8	-	-	-	-	4	4	-
2014	4	5	30	25	1	-	48	10	16	-	13	4	-	-	8	-	-
2019	3	6	24	5	2	-	36	7	10	44	22	2	-	2	10	2	-
year	Average Cover (%)																
1997	0.0	-	0.1	0.2	-	0.1	0.1	-	0.0	-	0.3	0.0	0.0	-	0.0	-	-
2002	0.0	-	0.0	0.1	-	-	-	-	-	-	0.0	-	-	-	0.0	-	0.0
2007	0.0	-	0.1	0.2	-	-	0.0	-	-	0.0	-	-	-	-	0.0	0.0	-
2014	0.0	0.0	1.1	0.2	0.0	-	0.2	0.0	0.3	-	0.0	0.1	-	-	0.1	-	-
2019	0.0	0.0	0.5	0.2	0.0	-	0.3	0.1	0.2	0.4	0.1	0.0	-	0.0	0.1	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Eriogonum brevicaule (shortstem buckwheat)	Lomatium (desertparsley)	Machaeranthera canescens (hoary tansyaster)	Medicago sativa[i] (alfalfa)	Onobrychis viciifolia[i] (sainfoin)	Penstemon caespitosus (mat penstemon)	Penstemon humilis (low beardtongue)	Phlox longifolia (longleaf phlox)	Polygonum douglasii[a] (Douglas' knotweed)	Sanguisorba minor[i] (small burnet)	Schoenocrambe linifolia (flaxleaf plainsmustard)	Symphyotrichum ascendens (western aster)	Taraxacum officinale (common dandelion)	Verbascum thapsus[ai] (common mullein)	Vicia americana (American vetch)	Viola (violet)
year	Nested Frequency															
1997	1	7	13	-	-	-	45	120	4	-	-	31	2	8	4	4
2002	4	-	7	-	-	29	34	64	-	-	-	17	-	-	2	-
2007	5	-	4	-	-	70	-	89	-	-	-	15	-	-	3	-
2014	9	-	70	2	22	91	13	30	-	26	6	26	-	-	16	-
2019	-	-	7	5	4	55	11	59	-	14	1	27	7	-	12	-
year	Average Cover (%)															
1997	0.0	0.0	0.0	-	-	-	1.6	0.6	0.0	-	-	0.5	0.0	0.0	0.0	0.0
2002	0.1	-	0.0	-	-	0.8	0.9	0.3	-	-	-	0.2	-	-	0.0	-
2007	0.0	-	0.0	-	-	2.6	-	0.5	-	-	-	0.2	-	-	0.0	-
2014	0.1	-	0.6	0.0	0.9	1.7	0.8	0.1	-	0.7	0.0	1.3	-	-	0.1	-
2019	-	-	0.0	0.2	0.1	1.6	0.1	0.6	-	0.3	0.0	0.3	0.0	-	0.2	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16B-06.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis[p] (Utah serviceberry)	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Chrysothamnus depressus[p] (longflower rabbitbrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. hololeuca[p] (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma[t] (Utah juniper)	Opuntia (pricklypear)	Symphoricarpos oreophilus[p] (mountain snowberry)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)									
1997	-	-	-	-	-	-	-	-	-	-
2002	0.2	26.9	0.1	0.3	0.4	-	4.3	-	0.5	0.4
2007	0.1	32.2	-	0.5	0.5	-	4.9	-	2.4	-
2014	-	10.2	0	2.7	-	-	2.8	-	2.4	0.6
2019	0.3	12.1	-	2	0	0.2	1.1	0	0.4	0.7
year	Quadrat Cover (%)									
1997	0.4	29.3	0.2	1.2	0.0	0.1	2.7	0.0	0.7	0.1
2002	0.0	32.9	0.0	0.5	0.1	0.0	3.3	-	0.2	0.2
2007	0.1	19.7	-	0.4	0.2	-	2.3	-	0.6	0.2
2014	0.2	8.7	0.1	1.6	-	0.0	3.6	-	1.0	0.7
2019	0.2	11.8	0.2	2.0	0.0	0.0	0.5	0.0	0.2	0.3

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16B-06.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
1997	140	-	0	100	0	29	0	0	60/65
2002	120	-	17	0	83	50	17	67	53/60
2007	60	-	0	100	0	0	100	0	66/72
2014	60	80	0	100	0	33	33	0	57/60
2019	60	-	0	67	33	0	67	33	52/57
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1997	3700	40	1	85	15	75	3	12	85/143
2002	5080	20	0	57	43	30	12	8	79/102
2007	4060	-	1	40	59	41	27	32	86/111
2014	3160	2160	36	57	7	34	35	11	52/78
2019	3840	-	31	63	7	30	16	6	49/67
Chrysothamnus depressus[p] -- (longflower rabbitbrush)									
1997	80	-	0	100	0	0	0	0	20/28
2002	200	-	0	50	50	0	0	40	8/25
2007	40	-	0	0	100	0	0	0	12/18
2014	380	-	21	79	0	0	16	0	18/32
2019	380	-	16	74	11	26	21	11	11/21
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1997	2160	40	26	74	0	0	0	0	58/33
2002	1660	-	2	89	8	0	0	1	20/25
2007	1460	120	1	53	45	8	0	26	20/27
2014	2020	140	28	72	0	16	7	0	29/48
2019	2280	20	25	75	1	18	3	1	21/37

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Eriogonum corymbosum -- (crispleaf buckwheat)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	40	-	0	100	0	0	50	0	9/10
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Ericameria nauseosa ssp. nauseosa var. hololeuca[p] -- (rubber rabbitbrush)									
1997	40	-	50	0	50	0	0	50	88/90
2002	160	-	38	50	13	0	0	0	27/29
2007	200	40	10	60	30	0	0	30	53/48
2014	20	100	0	100	0	0	0	0	79/80
2019	20	-	0	100	0	0	100	0	54/64
Gutierrezia sarothrae -- (broom snakeweed)									
1997	160	-	13	88	0	0	0	0	23/23
2002	140	-	14	71	14	0	0	0	22/25
2007	160	-	13	88	0	13	0	0	20/19
2014	80	-	75	25	0	0	0	0	19/20
2019	100	-	60	40	0	0	0	0	9/11
Juniperus osteosperma[t] -- (Utah juniper)									
1997	140	-	43	57	0	0	0	14	- / -
2002	80	-	25	75	0	0	0	0	- / -
2007	100	20	40	60	0	0	0	0	- / -
2014	160	40	75	25	0	0	0	0	- / -
2019	140	20	57	43	0	0	0	0	- / -
Mahonia repens -- (creeping barberry)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	6/13
2007	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	8/10
Opuntia -- (pricklypear)									
1997	20	-	100	0	0	0	0	0	4/3
2002	-	-	-	-	-	-	-	-	-/-
2007	20	-	0	100	0	0	0	0	8/8
2014	20	-	0	100	0	0	0	0	8/16
2019	40	-	0	100	0	0	0	0	13/33
Purshia tridentata[p] -- (antelope bitterbrush)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	29/38
2019	-	-	-	-	-	-	-	-	-/-
Quercus gambelii[p] -- (Gambel oak)									
1997	-	20	0	0	0	0	0	0	- / -
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Rosa woodsii[p] -- (Woods' rose)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	16/16

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
1997	400	-	20	80	0	0	0	0	43/68
2002	460	-	0	83	17	0	0	0	35/65
2007	480	-	8	92	0	0	4	4	48/79
2014	540	-	26	74	0	19	0	4	45/79
2019	600	-	7	90	3	33	7	3	35/56
Tetradymia canescens -- (spineless horsebrush)									
1997	320	-	19	81	0	0	0	6	26/29
2002	220	-	0	82	18	0	0	0	21/23
2007	100	-	0	60	40	0	0	80	18/21
2014	240	-	33	67	0	0	0	8	27/42
2019	260	-	15	85	0	0	0	0	21/31

t - Tree Species; p - Preferred Browse; i - Introduced Species

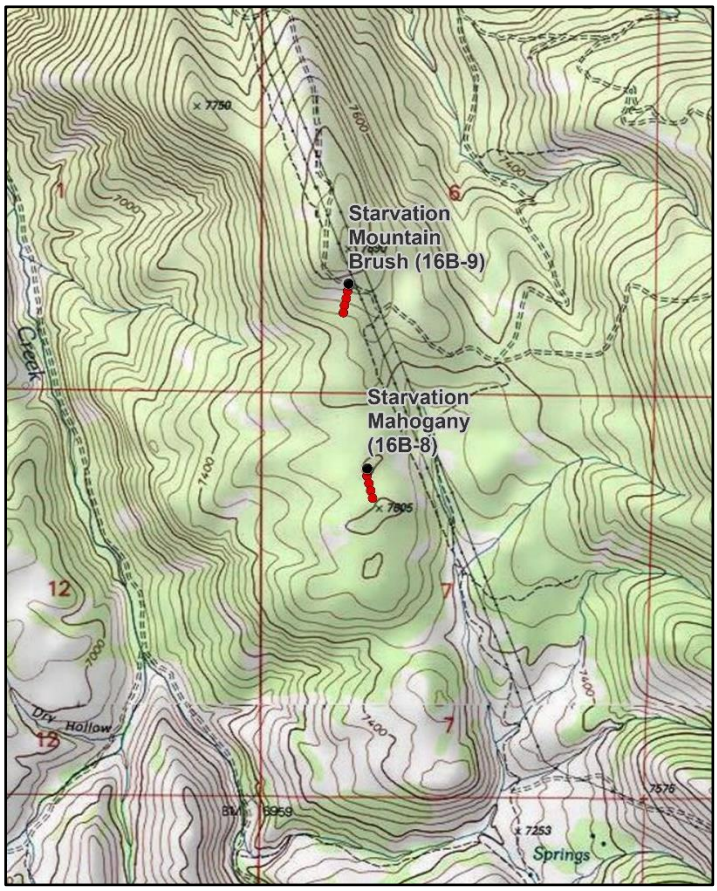
Table 16B-06.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

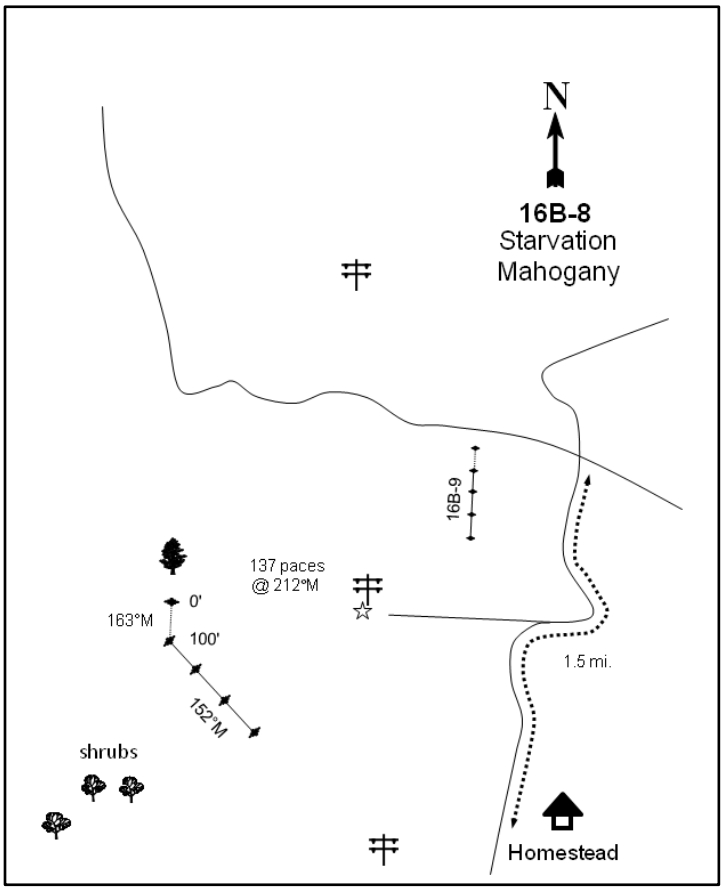
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2002	171	-	-	-	-	-	7.2
2007	141	6	39	28	6	22	8.3
2014	110	10	35	55	-	-	6.6
2019	121	41	59	-	-	-	4.4
Juniperus scopulorum (Rocky Mountain juniper)							
2019	5	50	50	-	-	-	3.5
Pinus edulis (twoneedle pinyon)							
2014	1	-	-	100	-	-	6.0

Table 16B-06.15 – Deer Desirable Components Index: High Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1997	30.0	10.8	0.5	2.0	0.0	7.4	0.0	50.6	Poor
2002	30.0	2.3	0.1	1.8	0.0	4.9	0.0	39.0	Very Poor-Poor
2007	30.0	-1.2	0.8	2.3	0.0	7.4	0.0	39.3	Very Poor-Poor
2014	15.2	13.3	15.0	30.0	0.0	10.0	-2.0	81.5	Good
2019	16.0	12.8	14.6	30.0	0.0	9.3	-2.0	80.7	Good

STARVATION MAHOGANY - STUDY NO. 16B-8





Location Information

USGS 7.5 min Map Info	Tucker SE; Township 11S, Range 7E, Section 07
GPS (0' Stake)	NAD 83 UTM ZONE 12, 484113 East 4414853 North

Transect Information

Browse Tag # (0' Stake)	9047
Transect Bearing	160° magnetic (Lines 2-4: 151° magnetic)
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Belts 2-4: No Rebar

Directions to Site

From the Tucker rest area on Highway 6 in Spanish Fork Canyon, travel on the Starvation Canyon road for 4.6 miles. Turn left and travel 0.5 miles to another fork. Turn left again and drive up a small canyon on a rough road for 1.15 miles to a fork. Proceed left, cross the creek, and continue for 0.3 miles to an old homestead site. Proceed up the road for about 1.0 mile to an old road on the left which has been seeded over: park here. From here, walk east to the double power lines on the hill. From the westernmost pole, walk 137 paces at 212 degrees magnetic to the 0-foot stake of the baseline which is marked by browse tag #9047.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	No data
Elevation	7,605ft (2,318m)
Aspect	Southwest
Slope	5%
Sample Dates	09/08/1999, 07/02/2002, 06/14/2007, 07/30/2014, 07/02/2019

Wildlife Habitat and Vegetation History

Table 16B-08.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter
Greater Sage-Grouse	occupied	year-long & Winter
Shiras Moose	substantial	year-long

Table 16B-08.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1989	Mixed Mountain Brush	Phase I
1999	Mixed Mountain Brush	Phase I
2002	Mixed Mountain Brush	Phase I
2007	Mixed Mountain Brush	Phase I
2014	Mixed Mountain Brush	Phase I
2019	Mixed Mountain Brush	Phase I

Site Notes

A large four-point buck antler shed was found while hiking to the study site in 1999, and deer were seen near the study in 2007. A deer carcass was found on the hike to the site in 2014.

Soils

Table 16B-08.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.4	36.7	28.7	34.6	3.2	2.7	156.8	0.7	09/07/1999

Site Potential

1981 - 2010 Average Annual Precipitation	17 inches
NRCS Ecological Site	Mountain Shallow Loam (Curlleaf Mountain Mahogany)
NRCS Ecological Site #	R047XA440UT
States and Transitions	A defined state and transition model is available.

Since study establishment in 1989, the shrub community on this site has consisted of a mixture of mountain brush species with curl-leaf mountain mahogany (*Cercocarpus ledifolius*), alderleaf mountain mahogany (*C. montanus*), mountain snowberry (*Symphoricarpos oreophilus*), and Gambel oak (*Quercus gambelii*) as the dominant species (Table 16B-08.12, Table 16B-08.13, Photos). The herbaceous understory has been diverse and abundant, with mainly native perennial grasses contributing the most cover throughout the study period (Table 16B-08.7, Table 16B-08.10, Table 16B-08.11). Trees such as twoneedle pinyon (*Pinus edulis*), Utah juniper (*Juniperus osteosperma*), and Rocky Mountain juniper (*J. scopulorum*) have been observed since study establishment, placing the site in Phase I of woodland succession (Table 16B-08.4, Table 16B-08.12, Table 16B-08.14, Photos). Continued tree encroachment and the absence of a tree-removing disturbance could cause the site to transition to a pinyon-juniper dominated state in the future. However, the low abundance of trees over time suggests that this ecological shift is likely not a significant threat. Barring changes in management or disturbance, this study will likely remain in this or a similar state in future sample years.

Trend Summary Tables

Table 16B-08.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1999	19.6	7.3	-	1.4	-	-
2002	19.9	9.4	0.0	35.4	11.9	-
2007	17.6	8.0	0.0	26.2	8.1	-
2014	21.0	12.4	-	27.6	13.7	-
2019	24.6	12.7	-	33.5	11.0	0.4

Table 16B-08.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1999	-	322	15	236	-	7.9	0.1	7.5
2002	-	300	49	210	-	11.2	0.1	8.7
2007	6	336	176	224	0.0	13.9	1.4	7.4
2014	-	308	16	214	-	16.6	0.1	7.9
2019	6	318	251	263	0.0	18.8	3.4	10.7

Table 16B-08.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1999	17.1	3.1	50.5	0.7	5.5	39.6
2002	18.2	1.6	46.4	1.5	3.9	45.9
2007	27.4	0.3	34.1	0.7	5.6	48.3
2014	11.8	1.3	63.5	1.6	5.4	58.0
2019	23.8	1.1	48.2	1.3	4.5	55.5

Table 16B-08.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1999	2	20	24	-
2002	2	24	12	6
2007	-	16	33	4
2014	-	8	11	2
2019	1	17	16	4
Year	Days Use Per Acre (ha)			
1999	3.6 (9.0)	33.5 (82.8)	34.2 (84.4)	-
2002	2.2 (5.4)	59.6 (147.3)	18.1 (44.7)	-
2007	2.9 (7.2)	56.3 (139.0)	59.6 (147.3)	-
2014	-	11.4 (28.1)	44.2 (109.2)	-
2019	0.7 (1.8)	15.4 (38.1)	10.7 (26.5)	-

Table 16B-08.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Achnatherum lettermanii (Letterman's needlegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bromus inermis[i] (smooth brome)	Bromus tectorum[ai] (cheatgrass)	Carex (sedge)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Koeleria macrantha (prairie Junegrass)	Pascopyrum smithii (western wheatgrass)	Poa bulbosa[i] (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis[i] (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency														
1999	2	45	10	2	-	7	12	2	13	148	-	57	59	12	104
2002	13	23	14	4	-	19	-	9	-	157	-	94	17	27	96
2007	10	38	6	7	6	5	3	13	12	185	-	31	45	49	143
2014	8	23	30	9	-	3	5	7	23	103	-	66	37	12	138
2019	4	42	23	14	6	-	2	11	17	165	1	53	44	53	137
year	Average Cover (%)														
1999	0.1	0.8	0.2	0.0	-	0.4	0.1	0.0	0.1	2.0	-	0.7	0.9	0.1	2.6
2002	0.3	0.5	0.4	0.2	-	1.0	-	0.3	-	2.3	-	2.4	0.4	0.2	3.2
2007	0.4	0.8	0.2	0.5	0.0	0.2	0.1	0.2	0.3	2.4	-	1.1	2.0	0.6	5.1
2014	0.4	0.7	0.8	1.3	-	0.0	0.2	0.1	0.4	2.7	-	2.2	1.9	0.2	5.8
2019	0.2	0.4	0.9	0.8	0.0	-	0.0	0.4	0.3	4.6	0.0	1.3	1.1	0.9	7.7

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16B-08.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum desertorum[ai] (desert madwort)	Antennaria (pussytoes)	Arabis (rockcress)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus eurekensis (Eureka milkvetch)	Astragalus miser (timber milkvetch)	Calochortus nuttallii (sego lily)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata[ai] (curveseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Cirsium (thistle)	Collinsia parviflora[a] (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawksbeard)
year	Nested Frequency																
1999	3	-	-	-	5	3	24	11	1	1	-	-	2	13	-	15	-
2002	-	6	-	-	15	2	23	10	2	3	-	-	1	12	46	-	-
2007	-	38	-	1	13	-	32	8	2	12	1	5	4	10	116	22	3
2014	6	-	-	-	8	2	19	5	0	-	3	-	-	7	1	10	-
2019	4	36	3	6	8	3	43	1	5	65	3	18	-	7	147	27	11
year	Average Cover (%)																
1999	0.1	-	-	-	0.1	0.0	0.2	0.0	0.0	0.0	-	-	0.0	0.1	-	0.1	-
2002	-	0.0	-	-	0.4	0.0	0.2	0.1	0.1	0.0	-	-	0.0	0.1	0.1	-	-
2007	-	0.1	-	0.0	0.2	-	0.3	0.1	0.0	0.0	0.1	0.0	0.0	0.4	0.7	0.2	0.0
2014	0.4	-	-	-	0.2	0.0	0.3	0.2	0.0	-	0.0	-	-	0.0	0.0	0.3	-
2019	0.0	0.2	0.0	0.0	0.2	0.0	0.7	0.0	0.3	0.3	0.0	0.1	-	0.3	0.9	0.1	0.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Cryptantha (cryptantha)	Delphinium nuttallianum (twolobe larkspur)	Draba[a] (draba)	Erigeron (fleabane)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Heliomeris multiflora var. multiflora (showy goldeneye)	Ipomopsis aggregata (scarlet gilia)	Lactuca serriola[ai] (prickly lettuce)	Lappula occidentalis[a] (flatspine stickseed)	Linum lewisii (Lewis flax)	Lithospermum ruderale (western stoneseed)	Lomatium (desertparsley)	Machaeranthera canescens (hoary tansyaster)	Mertensia (bluebells)	Microsteris gracilis[a] (slender phlox)	Orthocarpus[a] (owl's-clover)
year	Nested Frequency																
1999	-	-	3	-	-	13	4	-	-	-	-	-	5	44	-	-	7
2002	-	-	-	4	0	15	3	-	-	-	-	-	4	30	-	7	2
2007	-	-	-	-	0	17	-	-	1	4	-	0	5	23	-	86	18
2014	4	1	2	-	9	26	-	0	-	-	-	-	4	73	-	2	6
2019	-	9	-	6	17	20	2	-	-	26	3	3	2	22	18	163	13
year	Average Cover (%)																
1999	-	-	0.0	-	-	0.1	0.0	-	-	-	-	-	0.3	0.2	-	-	0.0
2002	-	-	-	0.0	0.0	0.1	0.0	-	-	-	-	-	0.2	0.2	-	0.0	0.0
2007	-	-	-	-	0.0	0.2	-	-	0.0	0.0	-	0.0	0.5	0.3	-	0.4	0.1
2014	0.0	0.0	0.0	-	0.1	0.1	-	0.0	-	-	-	-	0.3	1.1	-	0.0	0.0
2019	-	0.0	-	0.1	0.1	0.6	0.0	-	-	0.1	0.0	0.1	0.1	0.2	0.1	1.3	0.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Packera multilobata (lobeleaf groundsel)	Penstemon (beardtongue)	Penstemon caespitosus (mat penstemon)	Penstemon cyananthus (Wasatch beardtongue)	Penstemon humilis (low beardtongue)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii[a] (Douglas' knotweed)	Schoenocrambe linifolia (flaxleaf plainsmustard)	Senecio integerrimus[a] (lambstongue ragwort)	Silene (catchfly)	Solidago (goldenrod)	Symphyotrichum ascendens (western aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius[ai] (yellow salsify)	Viola (violet)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency																
1999	-	62	34	8	3	137	7	5	-	-	-	2	19	19	-	-	-
2002	10	-	23	53	-	133	10	1	-	-	-	-	28	5	2	-	0
2007	1	-	30	54	-	116	11	17	1	6	-	-	17	17	5	4	2
2014	0	-	12	35	-	101	1	5	-	-	-	-	13	6	-	-	-
2019	1	-	10	25	3	97	13	104	5	29	30	-	12	11	20	7	1
year	Average Cover (%)																
1999	-	1.0	0.5	0.0	0.0	4.5	0.0	0.0	-	-	-	0.0	0.1	0.0	-	-	-
2002	0.1	-	0.4	1.2	-	5.4	0.1	0.0	-	-	-	-	0.1	0.0	0.0	-	0.0
2007	0.0	-	0.2	0.9	-	3.6	0.1	0.0	0.0	0.1	-	-	0.2	0.1	0.0	0.0	0.0
2014	0.0	-	0.1	0.5	-	4.1	0.0	0.0	-	-	-	-	0.1	0.0	-	-	-
2019	0.0	-	0.2	0.5	0.0	5.5	0.1	0.2	0.0	0.4	0.1	-	0.1	0.1	0.2	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16B-08.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis[p] (Utah serviceberry)	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Cercocarpus ledifolius[p] (curl-leaf mountain mahogany)	Cercocarpus montanus[p] (alderleaf mountain mahogany)	Chrysothamnus depressus[p] (longflower rabbitbrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus scopulorum[t] (Rocky Mountain juniper)	Mahonia repens (creeping barberry)	Opuntia fragilis (brittle pricklypear)	Purshia tridentata[p] (antelope bitterbrush)	Quercus gambelii[p] (Gambel oak)	Symphoricarpos oreophilus[p] (mountain snowberry)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)													
1999	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2002	1	1.7	4.8	6.7	0.2	8	1.4	-	2	-	1.3	5.6	14.1	0.5
2007	1.3	1.6	4.5	4.6	0.1	6.4	0.9	-	0.3	-	1.5	2.5	10.1	0.5
2014	0.9	1.7	1.4	6.3	0.1	7.5	1.8	-	3.2	-	1	11.9	4.3	1.2
2019	0.6	1.7	3.5	8.6	0.1	7.7	0.9	0.4	1.1	-	2.1	9.8	7.1	1.3
year	Quadrat Cover (%)													
1999	0.8	1.0	0.8	3.6	0.5	3.7	0.5	-	2.8	-	1.2	4.8	6.9	0.3
2002	1.2	2.2	1.7	3.8	0.3	5.4	1.1	0.0	2.5	0.0	1.6	2.4	6.7	0.3
2007	1.8	2.0	0.4	2.3	0.1	5.3	1.2	0.0	1.1	-	1.5	2.0	7.5	0.4
2014	0.4	2.1	0.2	4.2	0.0	6.0	1.6	-	3.9	0.0	1.1	6.1	7.0	0.9
2019	0.6	2.3	0.9	3.4	0.4	6.4	1.4	0.0	2.9	0.0	1.6	7.8	7.6	2.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16B-08.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
1999	500	60	52	36	12	28	12	12	104/132
2002	580	-	17	69	14	14	55	7	49/53
2007	480	-	25	67	8	17	21	8	61/50
2014	400	20	20	80	0	0	15	0	71/52
2019	380	-	26	68	5	21	0	5	41/42
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1999	940	-	2	55	43	21	6	11	44/60
2002	900	-	2	64	33	18	7	13	47/66
2007	760	40	5	63	32	40	34	24	49/71
2014	520	-	4	81	15	42	46	15	41/73
2019	380	-	5	74	21	42	16	16	45/77
Cercocarpus ledifolius[p] -- (curl-leaf mountain mahogany)									
1999	180	60	67	22	11	11	33	11	359/382
2002	300	-	60	33	7	7	60	7	71/70
2007	220	-	46	46	9	18	64	0	56/43
2014	100	60	80	20	0	20	0	0	34/37
2019	120	2200	33	67	0	17	67	0	186/160
Ceanothus martinii -- (Martin's ceanothus)									
1999	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	24/67
2007	-	-	-	-	-	-	-	-	25/75
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	19/71

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Cercocarpus montanus[p] -- (alderleaf mountain mahogany)									
1999	740	100	57	43	0	30	19	0	106/113
2002	740	-	16	78	5	11	60	5	62/72
2007	640	20	25	72	3	6	66	3	73/82
2014	800	-	15	85	0	28	8	0	69/68
2019	1020	-	0	98	2	0	26	2	56/66
Chrysothamnus depressus[p] -- (longflower rabbitbrush)									
1999	220	-	0	100	0	0	0	0	- / -
2002	280	-	0	100	0	0	0	0	9/28
2007	60	-	0	100	0	0	0	0	9/22
2014	-	-	-	-	-	-	-	-	-/-
2019	120	-	0	100	0	67	0	0	9/26
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1999	4780	-	5	93	3	0	0	1	30/38
2002	6300	-	4	93	3	0	0	1	25/39
2007	5080	60	2	97	1	0	0	1	26/39
2014	4600	-	0	100	0	6	0	0	30/41
2019	3940	-	9	90	1	4	0	1	25/36
Gutierrezia sarothrae -- (broom snakeweed)									
1999	1020	40	24	77	0	4	0	0	17/31
2002	1440	-	1	99	0	0	0	0	9/19
2007	1800	-	1	99	0	0	0	0	16/28
2014	1540	-	7	94	0	0	0	0	15/25
2019	3120	680	5	89	7	0	0	7	14/20
Mahonia repens -- (creeping barberry)									
1999	9900	160	43	57	0	0	0	1	11/12
2002	8100	-	7	92	1	0	0	6	7/11
2007	6300	-	0	100	0	0	0	0	6/10
2014	8540	-	2	98	1	0	0	0	8/11
2019	4380	2780	1	98	1	0	0	1	9/12
Opuntia fragilis -- (brittle pricklypear)									
1999	140	20	43	43	14	0	0	14	9/23
2002	80	-	75	25	0	0	0	0	- / -
2007	60	-	0	100	0	0	0	0	8/29
2014	140	-	14	86	0	0	0	0	6/16
2019	200	-	0	60	40	0	0	40	6/20
Paxistima myrsinites -- (Oregon boxleaf)									
1999	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	20	-	0	100	0	0	0	0	14/21
2014	40	-	0	100	0	0	0	0	8/13
2019	-	-	-	-	-	-	-	-	-/-
Purshia tridentata[p] -- (antelope bitterbrush)									
1999	120	-	17	67	17	33	33	0	42/112
2002	120	-	0	100	0	17	83	0	35/88
2007	140	-	0	100	0	14	86	0	32/78
2014	160	-	0	100	0	25	63	0	40/85
2019	160	-	13	88	0	38	50	13	38/90
Quercus gambelii[p] -- (Gambel oak)									
1999	1980	500	54	44	2	1	0	9	225/99
2002	2420	40	22	53	25	1	1	17	135/56
2007	1840	60	32	32	37	7	29	50	115/51
2014	2100	-	18	82	0	30	0	0	101/58
2019	2320	40	16	83	2	17	0	2	111/71

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
1999	3120	140	26	70	5	0	0	1	44/78
2002	2420	-	4	88	7	0	13	3	35/88
2007	4380	-	14	85	1	1	0	3	39/58
2014	5420	-	2	98	0	5	1	0	33/47
2019	3160	-	8	91	1	6	0	1	28/36
Tetradymia canescens -- (spineless horsebrush)									
1999	320	-	19	63	19	0	0	0	29/37
2002	380	-	5	84	11	5	0	5	27/39
2007	380	-	5	90	5	21	42	5	26/42
2014	380	20	0	100	0	21	0	0	29/39
2019	240	20	0	92	8	0	0	0	29/50

t - Tree Species; p - Preferred Browse; i - Introduced Species

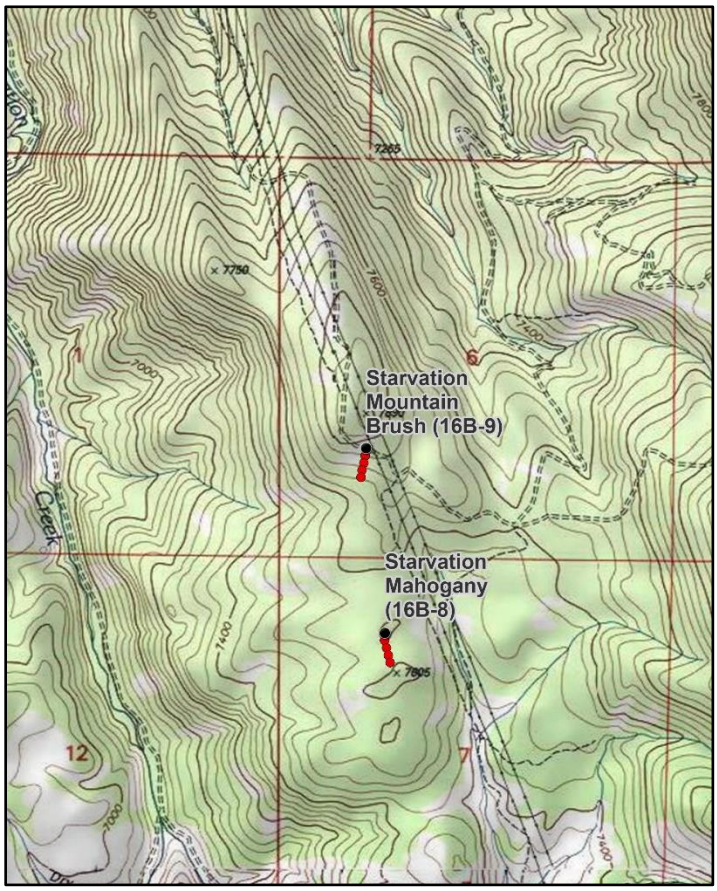
Table 16B-08.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

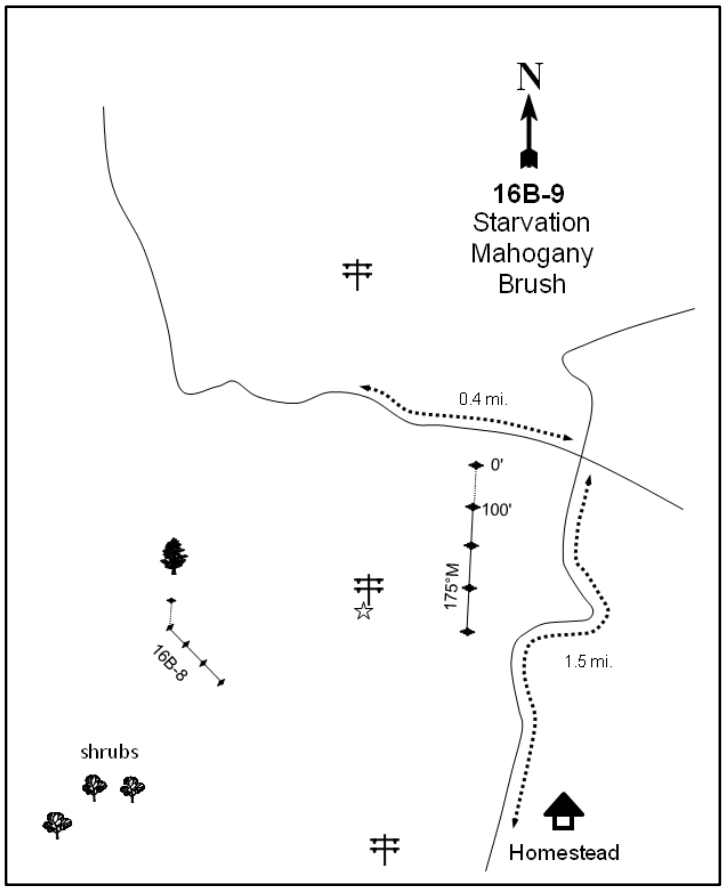
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Cercocarpus ledifolius (curl-leaf mountain mahogany)							
1999	116	-	-	-	-	-	8.1
2014	61	-	57	-	14	29	16.9
Cercocarpus montanus (alderleaf mountain mahogany)							
1999	291	-	-	-	-	-	1.0
Juniperus osteosperma & J. scopulorum (Utah and Rocky Mountain juniper)							
2014	8	-	-	-	75	25	23.8
Juniperus scopulorum (Rocky Mountain juniper)							
2019	8	-	-	-	50	50	21.8
Pinus edulis (twoneedle pinyon)							
2014	3	-	50	-	-	50	9.0
2019	2	-	-	-	100	-	10.0

Table 16B-08.15 – Deer Desirable Components Index: High Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1999	23.2	13.2	15.0	15.7	0.0	10.0	0.0	77.1	Good
2002	24.7	11.5	6.8	22.3	0.0	10.0	0.0	75.4	Good
2007	30.0	12.5	11.1	27.8	0.0	10.0	0.0	91.4	Good-Excellent
2014	30.0	14.7	8.2	30.0	0.0	10.0	0.0	92.9	Excellent
2019	30.0	14.3	5.6	30.0	0.0	10.0	0.0	89.9	Good-Excellent

STARVATION MOUNTAIN BRUSH - STUDY NO. 16B-9





Location Information

USGS 7.5 min Map Info	Tucker SE; Township 11S, Range 7E, Section 06
GPS (0' Stake)	NAD 83 UTM ZONE 12, 484037 East 4415602 North

Transect Information

Browse Tag # (0' Stake)	432
Transect Bearing	175° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

From the Tucker rest area on Highway 6 in Spanish Fork Canyon, take the Starvation Canyon road and travel for 4.6 miles. Turn left and continue for 0.5 miles to another fork. Turn left again and proceed up a small canyon on a rough road for 1.15 miles to a fork. Proceed to the left, cross the creek, and travel 0.3 miles to an old homestead site. From here, continue up the road about 1.5 miles to a four-way intersection. At the intersection, turn left, travel 0.4 miles to the power lines, and park beneath them. The 0-foot stake of the baseline is 30 feet away from the road and is marked by browse tag #432.

Site Information

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	7,800ft (2,377m)
Aspect	South
Slope	25-35%
Sample Dates	09/07/1999, 07/02/2002, 06/14/2007, 07/30/2014, 07/03/2019

Table 16B-09.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Mechanical - Bullhog	-	-	2002	-

Wildlife Habitat and Vegetation History

Table 16B-09.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter
Greater Sage-Grouse	occupied	year-long & Winter
Shiras Moose	substantial	year-long

Table 16B-09.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1989	Mixed Mountain Brush	Phase I
1999	Mixed Mountain Brush	Phase I
2002	Mixed Mountain Brush	Phase I
2007	Mixed Mountain Brush	Phase I
2014	Mixed Mountain Brush	Phase I
2019	Mixed Mountain Brush	Phase I

Site Notes

The study lies above and north of the curl-leaf mountain mahogany (*Cercocarpus ledifolius*) bench sampled by the Starvation Mahogany study (16B-08), and is within a power line easement. Starvation Creek is located 0.75 miles to the west and there is a spring 0.75 miles to the south. The surrounding area provides excellent thermal and escape cover for wildlife with large curl-leaf mountain mahogany thickets scattered in all directions.

Soils

Table 16B-09.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay	7.4	36.7	22.7	40.6	5.5	8.5	121.6	0.7	09/07/1999

Site Potential

1981 - 2010 Average Annual Precipitation	17 inches
NRCS Ecological Site	Mountain Stony Loam (Browse)
NRCS Ecological Site #	R047XA460UT
States and Transitions	No state and transition model is available for this ecological site.

Since establishment in 1989, this site has remained in a stable state with a mixed mountain brush plant community. The shrub component has been diverse in composition and abundant with mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), mountain snowberry (*Symphoricarpos oreophilus*), and alderleaf mountain mahogany (*Cercocarpus montanus*) being the dominant species (Table 16B-09.12, Table 16B-09.13). The herbaceous understory has remained abundant with a diverse mixture of grass and forb species. Herbaceous cover, most of which has been contributed by crested wheatgrass (*Agropyron cristatum*), has increased significantly over the study period (Table 16B-09.7, Table 16B-09.10, Table 16B-09.11). Utah juniper (*Juniperus osteosperma*) and Rocky Mountain juniper (*Juniperus scopulorum*) have both been observed on this site, and the study has been considered to be within Phase I of woodland succession in all sample years (Table 16B-09.4, Table 16B-09.12, Table 16B-09.14, Photos). Continued encroachment could cause the site to transition to a tree-dominated state. However, as density is low as of 2019, this shift in ecological states is likely not an immediate threat.

Trend Summary Tables

Table 16B-09.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1999	30.9	3.8	1.2	-	-	0.2
2002	28.9	3.4	0.0	28.2	4.5	-
2007	23.8	3.9	-	22.7	4.9	-
2014	25.5	3.1	0.0	31.0	2.9	-
2019	28.2	3.9	0.2	29.5	4.0	-

Table 16B-09.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1999	28	247	4	164	0.2	5.8	0.0	3.8
2002	4	251	8	137	0.0	10.2	0.0	2.5
2007	132	268	99	132	0.8	20.3	0.4	2.4
2014	2	305	11	87	0.0	17.6	0.0	1.5
2019	10	328	234	120	0.1	25.1	2.5	3.1

Table 16B-09.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1999	18.6	2.0	50.4	3.9	6.1	40.8
2002	26.1	0.1	39.7	3.0	5.6	41.1
2007	24.9	0.0	35.4	2.8	5.6	46.7
2014	10.8	2.0	54.8	6.9	5.1	48.4
2019	21.9	0.7	42.9	5.7	7.3	53.1

Table 16B-09.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer/Domestic Sheep	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1999	-	24	37	2
2002	-	32	20	7
2007	-	6	47	-
2014	-	11	27	4
2019	-	27	38	2
Year	Days Use Per Acre (ha)			
1999	0.7 (1.8)	50.2 (124.1)	64.3 (158.9)	-
2002	-	68.3 (168.8)	19.4 (48.0)	-
2007	-	30.8 (76.1)	94.5 (233.4)	-
2014	-	8.7 (21.5)	56.3 (139.0)	-
2019	-	30.2 (74.5)	52.3 (129.1)	-

Table 16B-09.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bromus inermis[i] (smooth brome)	Bromus tectorum[ai] (cheatgrass)	Carex (sedge)	Elymus elymoides (squirreltail)	Pascopyrum smithii (western wheatgrass)	Poa fendleriana (muttongrass)	Poa pratensis[i] (Kentucky bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium[i] (intermediate wheatgrass)
year	Nested Frequency										
1999	3	193	1	28	3	4	-	19	6	27	8
2002	8	208	-	4	6	1	4	20	7	10	6
2007	-	233	-	132	-	6	2	4	24	20	6
2014	-	274	5	2	-	2	12	14	1	15	6
2019	4	288	8	10	-	2	36	7	2	20	13
year	Average Cover (%)										
1999	0.0	4.3	0.0	0.2	0.0	0.0	-	0.4	0.3	0.6	0.2
2002	0.1	9.4	-	0.0	0.1	0.0	0.2	0.1	0.2	0.1	0.1
2007	-	17.5	-	0.8	-	0.2	0.0	0.0	0.7	1.1	0.6
2014	-	15.9	0.2	0.0	-	0.0	0.7	0.3	0.0	0.4	0.0
2019	0.2	21.0	0.2	0.1	-	0.0	1.7	0.2	0.2	0.8	0.7

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16B-09.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Alyssum alyssoides[ai] (pale madwort)	Alyssum desertorum[ai] (desert madwort)	Arabis (rockcress)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus tenellus (looseflower milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata[ai] (curveseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Cirsium (thistle)	Collinsia parviflora[a] (maiden blue eyed Mary)	Collomia linearis[a] (tiny trumpet)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawksbeard)	Cryptantha (cryptantha)
year	Nested Frequency																
1999	-	-	-	-	-	-	-	-	-	-	22	20	-	-	-	-	18
2002	-	2	-	-	1	1	-	-	2	3	4	7	-	3	-	-	8
2007	1	3	-	58	2	-	-	-	1	16	7	2	21	-	5	-	17
2014	-	-	-	8	3	-	1	1	-	-	2	0	2	-	-	-	1
2019	-	14	150	79	-	1	-	-	9	1	2	5	7	-	-	9	8
year	Average Cover (%)																
1999	-	-	-	-	-	-	-	-	-	-	0.1	0.1	-	-	-	-	0.5
2002	-	0.0	-	-	0.0	0.0	-	-	0.0	0.0	0.0	0.1	-	0.0	-	-	0.2
2007	0.0	0.0	-	0.2	0.0	-	-	-	0.0	0.0	0.0	0.1	0.1	-	0.0	-	0.2
2014	-	-	-	0.0	0.0	-	0.0	0.0	-	-	0.0	0.0	0.0	-	-	-	0.0
2019	-	0.1	2.0	0.5	-	0.0	-	-	0.1	0.0	0.0	0.0	0.0	-	-	0.1	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Cymopterus (springparsley)	Descurainia pinnata[a] (western tansymustard)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Heliomeris multiflora var. multiflora (showy goldeneye)	Lappula occidentalis[a] (flatspine stickseed)	Lepidium[a] (pepperweed)	Lomatium (desertparsley)	Machaeranthera canescens (hoary tansyaster)	Mertensia (bluebells)	Microsteris gracilis[a] (slender phlox)	Packera multilobata (lobeleaf groundsel)	Penstemon (beardtongue)	Penstemon caespitosus (mat penstemon)	Penstemon cyananthus (Wasatch beardtongue)	Penstemon humilis (low beardtongue)	Phlox hoodii (spiny phlox)
year	Nested Frequency																
1999	-	-	1	3	5	-	-	-	22	-	1	-	32	1	33	-	87
2002	-	-	-	3	5	-	-	-	23	-	-	-	15	2	21	4	63
2007	3	2	-	2	3	1	6	2	8	-	-	5	32	5	-	-	49
2014	-	-	-	-	4	-	1	-	19	-	-	-	20	3	2	-	47
2019	-	-	-	-	-	5	-	-	5	1	-	1	3	2	40	-	50
year	Average Cover (%)																
1999	-	-	0.0	0.0	0.1	-	-	-	0.1	-	0.0	-	0.8	0.0	0.2	-	1.9
2002	-	-	-	0.0	0.1	-	-	-	0.2	-	-	-	0.1	0.0	0.5	0.0	1.1
2007	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	0.2	-	-	0.1	0.3	0.0	-	-	1.1
2014	-	-	-	-	0.0	-	0.0	-	0.3	-	-	-	0.2	0.1	0.0	-	0.6
2019	-	-	-	-	-	0.0	-	-	0.0	0.0	-	0.0	0.0	0.0	1.2	-	1.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Phlox longifolia (longleaf phlox)	Streptanthus cordatus (heartleaf twistflower)	Symphyotrichum ascendens (western aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius[ai] (yellow salsify)	Veronica biloba[ai] (twolobe speedwell)	Viola (violet)
year	Nested Frequency						
1999	8	5	-	7	3	-	-
2002	18	3	5	-	-	3	-
2007	22	3	3	6	-	-	-
2014	3	-	6	-	-	-	-
2019	14	-	-	-	-	-	1
year	Average Cover (%)						
1999	0.0	0.0	-	0.0	0.0	-	-
2002	0.1	0.0	0.0	-	-	0.0	-
2007	0.1	0.0	0.0	0.1	-	-	-
2014	0.0	-	0.1	-	-	-	-
2019	0.1	-	-	-	-	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16B-09.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis[p] (Utah serviceberry)	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Cercocarpus montanus[p] (alderleaf mountain mahogany)	Chrysothamnus depressus[p] (longflower rabbitbrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Juniperus osteosperma[t] (Utah juniper)	Mahonia repens (creeping barberry)	Opuntia (pricklypear)	Purshia tridentata[p] (antelope bitterbrush)	Quercus gambelii[p] (Gambel oak)	Symphoricarpos oreophilus[p] (mountain snowberry)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)											
1999	-	-	-	-	-	-	-	-	-	-	-	-
2002	1.5	6.1	4	0.1	2.9	-	-	-	3.1	-	13.4	1.6
2007	1.3	8.6	2.2	-	2.9	-	0.2	-	2	-	8.6	1.8
2014	1.2	12.6	6.1	-	1.1	-	0.4	-	3.5	0.2	7.4	1.4
2019	0.6	15.5	4.8	0.1	1.4	-	0.4	-	2.6	-	5.9	2.2
year	Quadrat Cover (%)											
1999	2.3	7.0	4.3	-	2.2	1.2	0.5	0.0	3.3	0.0	14.0	1.1
2002	2.1	9.4	3.9	0.0	1.5	0.0	0.0	0.0	2.7	-	10.9	1.9
2007	2.0	8.6	3.5	-	1.4	-	0.1	-	2.5	0.0	7.2	2.4
2014	0.6	10.2	4.8	0.4	0.8	0.0	0.4	-	2.4	0.1	7.0	1.9
2019	1.1	14.4	4.8	0.1	1.5	0.2	0.4	-	2.0	-	5.8	2.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16B-09.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
1999	1060	100	25	51	25	30	36	25	64/62
2002	1400	-	30	39	31	7	60	14	46/46
2007	740	-	16	78	5	22	8	5	46/48
2014	540	-	15	85	0	7	22	4	30/30
2019	660	-	27	70	3	24	3	3	47/53
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1999	1660	40	6	75	19	36	13	10	59/76
2002	1800	-	1	73	26	31	53	18	53/71
2007	1540	-	5	79	16	34	51	13	58/81
2014	1820	240	6	87	8	57	24	7	53/83
2019	1980	-	5	79	16	32	43	16	65/100
Cercocarpus montanus[p] -- (alderleaf mountain mahogany)									
1999	1120	120	14	73	13	29	55	18	84/87
2002	1120	-	9	64	27	2	93	11	72/81
2007	1000	20	10	72	18	24	74	4	66/66
2014	1100	-	0	100	0	36	42	0	66/71
2019	1020	-	4	88	8	14	77	6	60/68
Chrysothamnus depressus[p] -- (longflower rabbitbrush)									
1999	160	-	0	88	13	0	13	13	- / -
2002	220	-	0	100	0	73	0	0	14/29
2007	-	-	-	-	-	-	-	-	-/-
2014	80	-	0	100	0	0	0	0	15/33
2019	180	-	0	100	0	0	89	0	31/33

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1999	2780	-	8	86	6	8	0	4	22/33
2002	2300	-	8	90	2	0	0	1	17/30
2007	1520	-	3	96	1	0	0	0	19/31
2014	1240	-	11	86	3	0	0	8	21/35
2019	1380	-	1	99	0	0	0	0	29/36
Juniperus osteosperma[t] -- (Utah juniper)									
1999	-	20	0	0	0	0	0	0	- / -
2002	-	20	0	0	0	0	0	0	- / -
2007	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	20	-	100	0	0	0	0	0	- / -
Mahonia repens -- (creeping barberry)									
1999	2040	-	21	79	0	0	0	0	6/12
2002	1140	-	0	100	0	0	0	0	10/9
2007	1480	-	0	100	0	0	0	0	7/9
2014	1040	-	0	100	0	0	0	0	8/16
2019	2040	-	0	100	0	0	0	0	11/12
Opuntia -- (pricklypear)									
1999	20	-	0	100	0	0	0	0	8/53
2002	60	-	67	33	0	0	0	0	5/32
2007	-	-	-	-	-	-	-	-	-/-
2014	20	-	0	100	0	0	0	100	7/18
2019	-	-	-	-	-	-	-	-	-/-
Purshia stansburiana[p] -- (Stansbury cliffrose)									
1999	-	-	-	-	-	-	-	-	111/123
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Purshia tridentata[p] -- (antelope bitterbrush)									
1999	540	-	19	82	0	63	15	0	62/131
2002	520	-	8	42	50	12	89	23	41/111
2007	500	-	20	72	8	24	68	4	52/99
2014	700	-	3	97	0	34	57	0	54/95
2019	800	-	8	80	13	13	70	13	46/87
Quercus gambelii[p] -- (Gambel oak)									
1999	-	20	0	0	0	0	0	0	- / -
2002	-	-	-	-	-	-	-	-	-/-
2007	20	-	100	0	0	0	0	0	83/39
2014	20	-	0	0	100	0	0	0	- / -
2019	-	-	-	-	-	-	-	-	85/69
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
1999	5800	320	24	72	4	2	0	5	48/85
2002	6980	-	15	81	4	0	0	3	27/44
2007	3560	40	30	70	0	3	0	0	30/47
2014	6520	20	11	89	0	8	7	0	26/39
2019	4900	-	14	86	1	14	3	1	23/31
Tetradymia canescens -- (spineless horsebrush)									
1999	960	140	23	63	15	6	0	2	35/54
2002	600	-	3	77	20	3	3	13	28/48
2007	800	40	10	85	5	0	0	0	28/53
2014	860	-	2	98	0	2	0	0	29/41
2019	980	-	14	84	2	2	0	2	38/64

t - Tree Species; p - Preferred Browse; i - Introduced Species

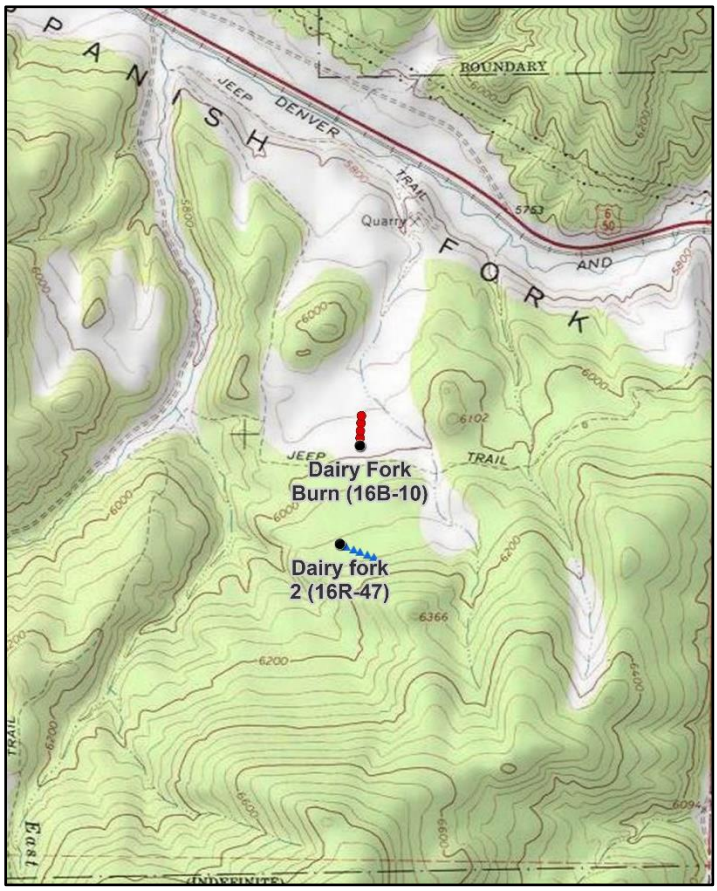
Table 16B-09.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

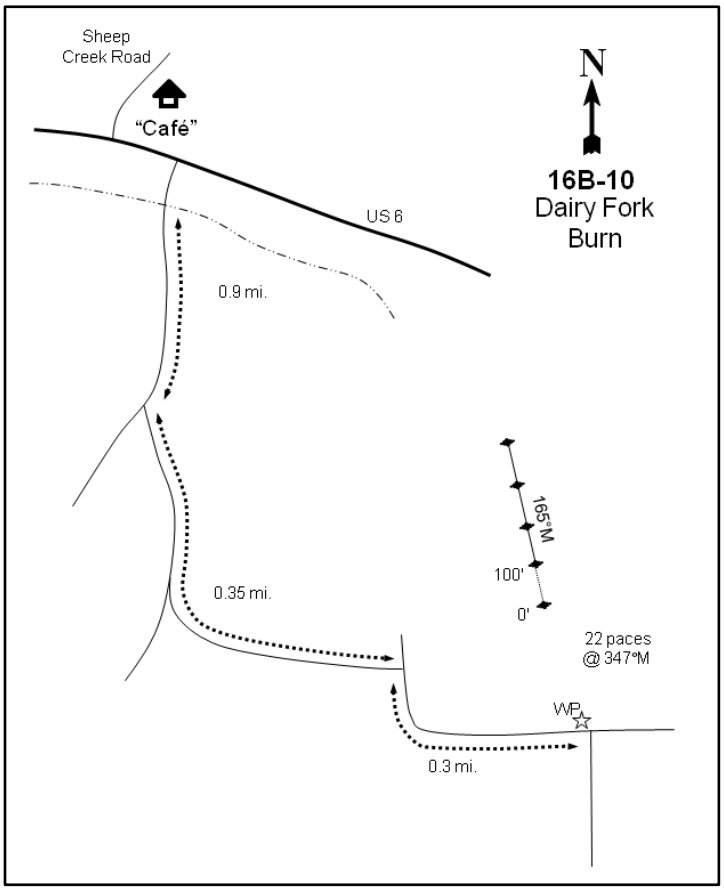
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1999	7	-	-	-	-	-	14.8
2019	9	-	-	33	33	33	16.3
Juniperus scopulorum (Rocky Mountain juniper)							
2019	4	-	-	67	33	-	12.7

Table 16B-09.15 – Deer Desirable Components Index: High Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1999	30.0	12.1	9.0	11.7	-0.2	7.7	0.0	70.3	Fair-Good
2002	30.0	8.9	5.1	20.4	0.0	5.0	0.0	69.4	Fair-Good
2007	27.6	12.4	8.5	30.0	-0.6	4.8	0.0	82.6	Good
2014	30.0	13.9	2.9	30.0	0.0	3.0	0.0	79.8	Good
2019	30.0	11.7	3.6	30.0	-0.1	6.1	0.0	81.3	Good

DAIRY FORK BURN - STUDY NO. 16B-10





Location Information

USGS 7.5 min Map Info	Mill Fork NW; Township 10S, Range 5E, Section 12
GPS (0' Stake)	NAD 83 UTM ZONE 12, 471935 East 4423126 North

Transect Information

Browse Tag # (0' Stake)	438
Transect Bearing	353° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

Near the Sheep Creek Café on Highway 6, take Dairy Fork Road on the south side of the highway for 0.9 miles to a left-hand fork. Take this fork, cross the creek, and continue for 0.35 miles staying east (left) to a sagebrush flat/burn and a three-way intersection. Turn right (south) and follow the road around the upper edge of the flat for 0.3 miles to a junction on the right and a witness post on the left-hand (north) side. Stop here and walk north into the flat about 22 paces at an azimuth of 347 degrees magnetic to the 0-foot baseline stake. The 0-foot baseline stake is marked with browse tag #438.

Site Information

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	6,000ft (1,829m)
Aspect	North
Slope	3%
Sample Dates	06/20/1997, 06/13/2002, 06/21/2007, 05/28/2014, 05/21/2019

Table 16B-10.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Disc - Disc Unknown	-	-	1988	-
Seeding - Seed Unknown	-	-	1988	-
Fire - Wildfire	-	-	1988	-
Chaining - Chain Unknown	-	-	1988	-

Wildlife Habitat and Vegetation History

Table 16B-10.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter/spring
Rocky Mountain Elk	crucial	winter
Shiras Moose	substantial	year-long

Table 16B-10.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1989	Annual Forb	Phase I
1997	Perennial Grass	Phase I
2002	Basin Big Sagebrush/Perennial Grass	Phase I
2007	Basin Big Sagebrush/Perennial Grass	Phase I
2014	Basin Big Sagebrush/Perennial Grass	Phase I
2019	Basin Big Sagebrush/Perennial Grass	Phase I

Site Notes

A line-intercept transect from 1978 is found at the north end of the flat, while the current transect was established to monitor the recovery of sagebrush following the fire in 1988.

Soils

Table 16B-10.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay	7.5	25.4	26.8	47.8	2.2	8.0	217.6	0.4	06/20/1997

Site Potential

1981 - 2010 Average Annual Precipitation	21 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA430UT
States and Transitions	A defined state and transition model is available.

The introduced and noxious annual forb nodding plumeless thistle (*Carduus nutans*) dominated this site upon study establishment in 1989 (Photos). However, the introduced perennial grass species crested wheatgrass (*Agropyron cristatum*) increased in cover as time since seeding passed, and it became a dominant vegetation component in 1997 (Table 16B-10.7, Table 16B-10.10). Basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*) has also increased over the study years and became a co-dominant component in 2002 (Table 16B-10.12, Table 16B-10.13). This site could transition to a mainly sagebrush-dominated state if sagebrush increases. Conversely, a decrease in sagebrush could cause the community to shift to one again mainly dominated by introduced perennial grasses (Jornada, 2019).

Trend Summary Tables

Table 16B-10.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	0.4	-	0.1	-	-	-
2002	1.9	-	0.6	-	-	-
2007	2.2	-	0.1	4.8	-	0.2
2014	2.8	-	-	2.6	-	-
2019	1.1	0.0	-	2.3	-	-

Table 16B-10.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	148	389	185	155	0.9	19.4	4.0	2.8
2002	20	399	35	44	0.3	21.8	0.1	0.3
2007	20	411	98	183	0.1	36.0	0.8	4.2
2014	1	443	42	170	0.0	45.4	0.1	2.2
2019	2	427	294	160	0.0	44.0	2.0	1.7

Table 16B-10.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	43.5	0.2	24.6	0.2	0.0	31.9
2002	41.2	0.0	48.7	0.1	0.0	25.7
2007	25.1	0.6	38.4	0.2	0.1	46.9
2014	28.0	1.6	44.6	0.5	0.0	53.0
2019	39.4	5.3	36.3	0.8	0.1	47.6

Table 16B-10.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit	Domestic Sheep
	Quadrat Frequency				
1997	1	9	33	12	-
2002	-	13	46	8	11
2007	-	14	43	13	-
2014	2	5	9	3	-
2019	1	8	16	26	-
Year	Days Use Per Acre (ha)				
1997	-	-	-	-	-
2002	-	5.3 (13.2)	101.9 (251.6)	-	-
2007	-	2.0 (5.0)	115.3 (284.7)	-	-
2014	-	2.0 (5.0)	16.8 (41.4)	-	-
2019	1.5 (3.6)	30.8 (76.1)	19.4 (48.0)	-	32.2 (79.5)

Table 16B-10.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bromus inermis[i] (smooth brome)	Bromus tectorum[ai] (cheatgrass)	Dactylis glomerata[i] (orchardgrass)	Elymus elymoides (squirreltail)	Poa pratensis[i] (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Thinopyrum intermedium[i] (intermediate wheatgrass)
year	Nested Frequency								
1997	6	242	90	148	10	128	32	5	124
2002	16	340	53	20	2	27	-	-	95
2007	4	338	99	20	-	24	38	1	124
2014	6	399	84	1	-	0	26	16	151
2019	3	394	29	2	-	1	9	14	175
year	Average Cover (%)								
1997	0.6	8.2	2.2	0.9	0.1	2.7	0.5	0.1	5.0
2002	0.3	15.9	0.6	0.3	0.0	0.9	-	-	4.2
2007	0.4	28.7	1.7	0.1	-	0.5	0.7	0.0	4.1
2014	0.0	37.0	1.8	0.0	-	0.0	0.8	0.1	5.6
2019	0.0	35.7	0.6	0.0	-	0.0	0.2	0.5	6.9

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16B-10.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Alyssum desertorum[ai] (desert madwort)	Astragalus cibarius (browse milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus tenellus (looseflower milkvetch)	Camelina microcarpa[ai] (littlepod false flax)	Cardaria draba[ni] (whitetop)	Carduus nutans[ani] (nodding plumeless thistle)	Ceratocephala testiculata[ai] (curveseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Cirsium (thistle)	Collinsia parviflora[a] (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)	Cymopterus (springparsley)	Descurainia pinnata[a] (western tansymustard)	Epilobium brachycarpum[a] (tall annual willowherb)	Iva axillaris (povertyweed)
year	Nested Frequency																
1997	5	6	-	64	5	45	-	110	5	25	3	2	37	-	2	5	-
2002	6	6	-	3	-	-	16	-	-	4	-	-	-	-	-	-	-
2007	4	16	-	126	3	-	14	-	91	-	3	5	3	-	-	-	30
2014	4	2	1	96	-	-	20	-	31	-	-	9	-	-	-	-	38
2019	3	62	-	60	-	-	26	11	271	-	-	6	-	1	6	2	48
year	Average Cover (%)																
1997	0.6	0.0	-	0.5	0.0	0.1	-	3.2	0.0	0.1	0.0	0.0	0.6	-	0.0	0.0	-
2002	0.0	0.0	-	0.0	-	-	0.0	-	-	0.0	-	-	-	-	-	-	-
2007	0.6	0.0	-	2.4	0.4	-	0.0	-	0.7	-	0.0	0.0	0.0	-	-	-	0.1
2014	0.4	0.0	0.0	0.6	-	-	0.1	-	0.1	-	-	0.0	-	-	-	-	0.2
2019	0.0	0.3	-	0.3	-	-	0.1	0.0	1.6	-	-	0.0	-	0.0	0.0	0.0	0.4

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Lactuca serriola[ai] (prickly lettuce)	Lomatium (desertparsley)	Machaeranthera canescens (hoary tansyaster)	Medicago sativa[i] (alfalfa)	Microsteris gracilis[a] (slender phlox)	Penstemon caespitosus (mat penstemon)	Phlox longifolia (longleaf phlox)	Sanguisorba minor[i] (small burnet)	Sisymbrium altissimum[ai] (tall tumblemustard)	Sphaeralcea coccinea (scarlet globemallow)	Symphyotrichum (aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius[ai] (yellow salsify)	Trifolium gymnocarpon (hollyleaf clover)	Vicia americana (American vetch)
year	Nested Frequency														
1997	34	-	-	1	68	14	3	9	5	-	-	9	8	-	26
2002	-	-	-	-	29	16	2	-	-	-	-	-	-	-	-
2007	-	-	-	0	25	7	8	-	-	-	-	-	-	-	20
2014	-	2	6	1	-	7	3	-	-	0	1	-	-	8	21
2019	10	-	-	-	6	7	6	-	-	2	5	-	-	-	32
year	Average Cover (%)														
1997	0.1	-	-	0.0	0.4	0.7	0.0	0.2	0.0	-	-	0.1	0.1	-	0.0
2002	-	-	-	-	0.1	0.2	0.0	-	-	-	-	-	-	-	-
2007	-	-	-	0.0	0.1	0.2	0.0	-	-	-	-	-	-	-	0.4
2014	-	0.0	0.0	0.0	-	0.2	0.0	-	-	0.0	0.0	-	-	0.3	0.3
2019	0.0	-	-	-	0.0	0.2	0.0	-	-	0.0	0.0	-	-	-	0.5

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16B-10.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. tridentata[p] (basin big sagebrush)	Ericameria nauseosa (rubber rabbitbrush)	Juniperus osteosperma[t] (Utah juniper)
year	Line Intercept Cover (%)		
1997	-	-	-
2002	-	-	-
2007	4.8	-	0.2
2014	2.6	-	-
2019	2.3	-	-
year	Quadrat Cover (%)		
1997	0.4	-	0.1
2002	1.9	-	0.6
2007	2.2	-	0.1
2014	2.8	-	-
2019	1.1	0.0	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16B-10.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

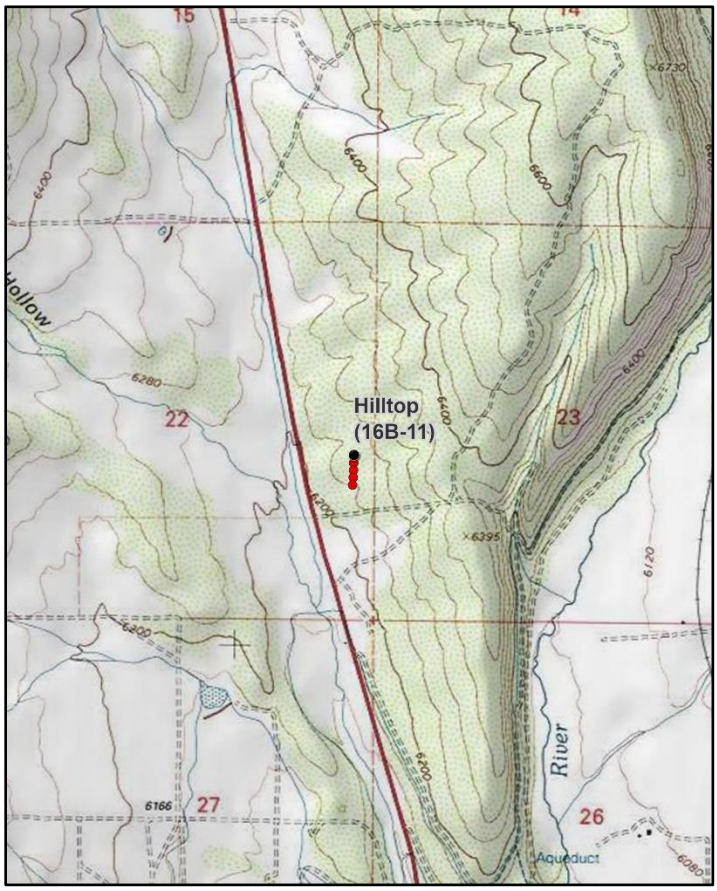
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Artemisia tridentata ssp. tridentata[p] -- (basin big sagebrush)									
1997	300	40	40	60	0	0	0	7	145/120
2002	480	-	21	67	13	25	8	8	83/78
2007	520	200	23	65	12	8	0	46	95/95
2014	560	-	18	64	18	4	0	57	84/95
2019	440	40	9	64	27	0	0	32	77/83
Chrysothamnus viscidiflorus -- (yellow rabbitbrush)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	19/19
2014	20	-	0	0	100	0	0	0	53/66
2019	20	-	0	100	0	0	0	0	27/26
Ericameria nauseosa -- (rubber rabbitbrush)									
1997	-	-	-	-	-	-	-	-	-/-
2002	20	-	0	100	0	0	100	0	60/70
2007	20	-	0	100	0	0	0	0	71/80
2014	20	-	0	100	0	100	0	100	70/72
2019	20	-	0	100	0	0	0	0	84/95
Juniperus osteosperma[t] -- (Utah juniper)									
1997	20	-	100	0	0	0	0	0	- / -

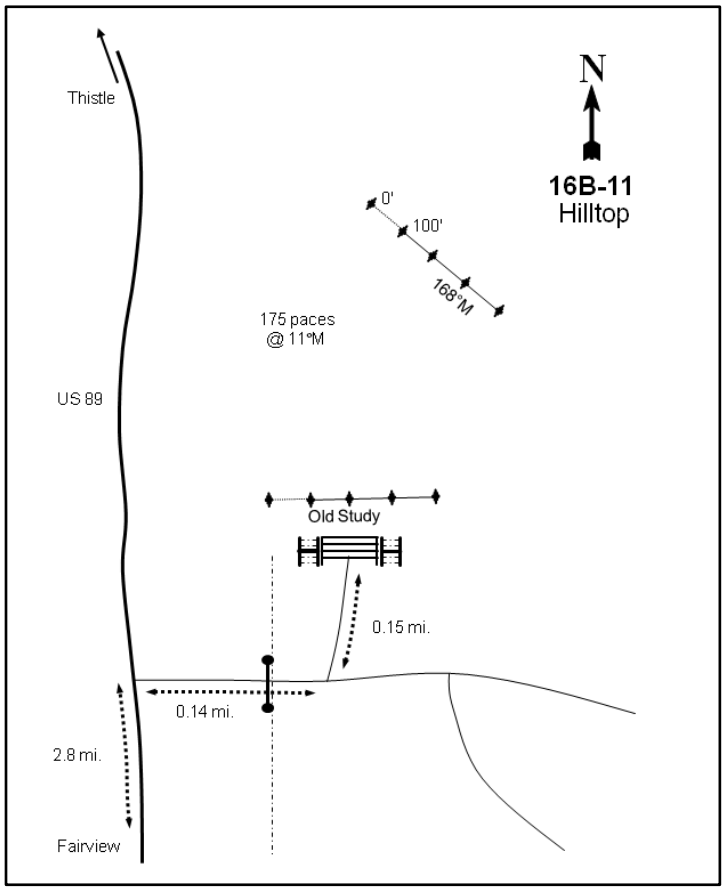
t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16B-10.15 – Deer Desirable Components Index: High Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1997	0.5	0.0	0.0	30.0	-0.7	5.7	-2.0	33.5	Very Poor
2002	2.3	0.0	0.0	30.0	-0.2	0.6	-2.0	30.6	Very Poor
2007	6.0	0.0	0.0	30.0	-0.1	8.4	-2.0	42.3	Poor
2014	3.3	0.0	0.0	30.0	0.0	4.2	-2.0	35.5	Very Poor
2019	2.9	0.0	0.0	30.0	0.0	3.2	-4.0	32.0	Very Poor

HILLTOP - STUDY NO. 16B-11





Location Information

USGS 7.5 min Map Info	Fairview SW; Township 13S, Range 4E, Section 22
GPS (0' Stake)	NAD 83 UTM ZONE 12, 461109 East 4391620 North

Transect Information

Browse Tag # (0' Stake)	439
Transect Bearing	168° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Belts 1, 3, 5: No Rebar

Directions to Site

Travel north on US-89 for 2.8 miles from Fairview at the intersection of US-89 and State Road 31. Turn right (east) onto the Division of Wildlife Resources' property. Pass through a gate and turn to the left while following the road that parallels the fence. Travel 0.15 miles to the end of the road. The 0-foot baseline stake, marked by browse tag #439, is 175 paces away at an azimuth of 11 degrees magnetic from the end of the road.

Site Information

Land Ownership	Private
Land Administrator	UDWR
Allotment	No data
Elevation	6,200ft (1,890m)
Aspect	West
Slope	5-10%
Sample Dates	06/23/1997, 06/14/2002, 06/20/2007, 05/29/2014, 05/22/2019

Table 16B-11.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Chain Unknown	-	-	1978	250
Seeding - Seed Unknown	-	-	1978	250
Mechanical - Bulllhog	Hilltop Conservation Easement Bullhog Phase 2	3047	July 2014-June 2015	269

Wildlife Habitat and Vegetation History

Table 16B-11.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter/spring
Rocky Mountain Elk	crucial	winter
Greater Sage-Grouse	occupied	year-long

Table 16B-11.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1989	Perennial Grass	Phase I
1997	Perennial Grass	Phase I
2002	Perennial Grass	Phase I
2007	Perennial Grass	Phase I
2014	Perennial Grass	Phase I transitioning to Phase II
2019	Perennial Grass	Phase I

Site Notes

The area was part of a land swap between the Division of Wildlife Resources and a private landowner. Game trails are found frequently across the site.

Soils

Table 16B-11.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.4	38.7	25.1	36.2	3.9	8.8	134.4	0.5	06/23/1997

Site Potential

1981 - 2010 Average Annual Precipitation	16 inches
NRCS Ecological Site	Upland Loam (Mountain Big Sagebrush-Indian Ricegrass)
NRCS Ecological Site #	R047XB308UT
States and Transitions	A defined state and transition model is available.

This site has remained in a stable perennial grass state (Jornada, 2019) with crested wheatgrass (*Agropyron cristatum*) and/or intermediate wheatgrass (*Thinopyrum intermedium*) as the dominant species since the study was established in 1989 (Table 16B-11.7, Table 16B-11.10, Photos). A small number of beneficial browse species are found on the site, but are not abundant and provide little cover (Table 16B-11.12, Table 16B-11.13). Utah juniper (*Juniperus osteosperma*) and a limited amount of twoneedle pinyon (*Pinus edulis*) trees encroached the site from 1989 through 2014, and the study was considered to be within Phase I transitioning to Phase II of woodland succession in 2014. A bullhog treatment between the 2014 and 2019 sample years removed some of the juniper trees, and the site is classified as being within Phase I as of 2019 (Table 16B-11.1, Table 16B-11.4, Table 16B-11.12, Table 16B-11.14). However, remaining trees indicate that there may be potential for infilling in future sample years.

Trend Summary Tables

Table 16B-11.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	1.5	0.5	0.6	-	-	-
2002	0.8	0.3	0.1	2.2	0.4	0.8
2007	0.4	0.8	0.5	1.2	1.2	1.0
2014	1.2	0.4	1.3	0.9	0.1	1.5
2019	0.0	1.4	-	1.5	0.2	-

Table 16B-11.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	57	338	245	51	0.3	16.3	2.5	0.6
2002	17	356	241	9	0.1	16.2	2.0	0.2
2007	148	344	449	65	1.7	18.0	12.6	1.1
2014	34	359	290	40	0.1	23.0	1.5	0.7
2019	173	338	449	146	3.5	27.4	11.1	1.6

Table 16B-11.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	35.3	0.0	20.8	5.3	3.0	22.6
2002	48.2	0.0	33.5	7.0	3.4	19.6
2007	29.6	0.4	33.9	6.7	1.5	38.7
2014	43.3	1.4	32.1	9.6	2.4	28.8
2019	31.3	0.7	42.1	5.5	4.5	40.4

Table 16B-11.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit	Domestic Sheep
	Quadrat Frequency				
1997	3	25	1	6	13
2002	-	4	-	21	15
2007	1	9	3	42	-
2014	-	11	1	4	-
2019	-	34	19	12	-
Year	Days Use Per Acre (ha)				
1997	-	-	-	-	-
2002	18.9 (46.6)	4.0 (9.9)	2.0 (5.0)	-	-
2007	-	10.7 (26.5)	12.1 (29.8)	-	-
2014	-	20.8 (51.3)	7.4 (18.2)	-	-
2019	-	9.4 (23.2)	39.6 (97.7)	-	-

Table 16B-11.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bromus arvensis[ai] (field brome)	Bromus briziformis[ai] (rattlesnake brome)	Bromus tectorum[ai] (cheatgrass)	Elymus elymoides (squirreltail)	Poa bulbosa[i] (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Psathyrostachys juncea[i] (Russian wildrye)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium[i] (intermediate wheatgrass)
year	Nested Frequency										
1997	26	221	5	-	52	9	-	5	-	43	145
2002	5	274	-	-	17	-	-	-	-	-	124
2007	21	217	16	4	132	-	-	2	6	-	231
2014	24	202	-	-	34	-	1	4	8	-	279
2019	22	124	5	2	166	-	0	8	8	2	279
year	Average Cover (%)										
1997	0.4	11.4	0.0	-	0.3	0.0	-	0.0	-	0.9	3.5
2002	0.2	12.3	-	-	0.1	-	-	-	-	-	3.7
2007	0.3	8.5	0.1	0.0	1.7	-	-	0.0	0.2	-	9.0
2014	0.6	7.3	-	-	0.1	-	0.0	0.0	0.0	-	15.1
2019	1.2	7.7	0.0	0.0	3.5	-	0.0	0.1	0.2	0.1	18.2

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16B-11.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Alyssum alyssoides[ai] (pale madwort)	Alyssum desertorum[ai] (desert madwort)	Antennaria dimorpha (low pussytoes)	Arabis (rockcress)	Astragalus (milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus eurekensis (Eureka milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Camelina microcarpa[ai] (littlepod false flax)	Carduus nutans[ani] (nodding plumeless thistle)	Ceratocephala testiculata[ai] (curveseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Chenopodium fremontii[a] (Fremont's goosefoot)	Cirsium (thistle)	Convolvulus arvensis[ni] (field bindweed)	Descurainia pinnata[a] (western tansymustard)
year	Nested Frequency																
1997	-	44	-	-	1	-	-	4	-	-	42	188	1	9	5	16	13
2002	-	76	-	-	-	-	-	4	-	-	-	229	-	-	-	-	-
2007	-	417	-	3	8	2	-	10	-	7	-	338	-	-	5	22	2
2014	-	231	4	-	-	3	-	3	-	-	-	224	4	-	-	1	-
2019	54	417	1	-	-	-	2	10	1	-	4	347	36	4	24	14	4
year	Average Cover (%)																
1997	-	0.4	-	-	0.0	-	-	0.0	-	-	0.4	1.0	0.0	0.0	0.0	0.1	0.0
2002	-	0.2	-	-	-	-	-	0.0	-	-	-	1.9	-	-	-	-	-
2007	-	7.4	-	0.0	0.1	0.0	-	0.3	-	0.0	-	5.0	-	-	0.1	0.4	0.0
2014	-	0.8	0.2	-	-	0.2	-	0.1	-	-	-	0.7	0.0	-	-	0.0	-
2019	0.2	5.7	0.0	-	-	-	0.0	0.1	0.0	-	0.0	3.5	0.1	0.0	0.4	0.1	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Draba[a] (draba)	Erigeron eatonii (Eaton's fleabane)	Erodium cicutarium[ai] (redstem stork's bill)	Hedysarum boreale (Utah sweetvetch)	Heliomeris multiflora var. multiflora (showy goldeneye)	Lactuca serriola[ai] (prickly lettuce)	Lappula occidentalis[a] (flatspine stickseed)	Medicago sativa[i] (alfalfa)	Penstemon (beardtongue)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Salsola tragus[ai] (prickly Russian thistle)	Sisymbrium altissimum[ai] (tall tumblemustard)	Sphaeralcea coccinea (scarlet globemallow)	Streptanthus cordatus (heartleaf twistflower)	Taraxacum officinale (common dandelion)	Tragopogon dubius[ai] (yellow salsify)
year	Nested Frequency																
1997	-	-	-	-	3	-	3	3	-	17	4	-	4	4	-	2	1
2002	-	-	-	-	-	-	-	-	-	5	-	-	-	-	-	-	-
2007	19	2	3	-	-	-	2	-	-	9	7	4	-	11	5	-	5
2014	-	-	-	5	-	-	-	-	-	9	1	-	-	9	3	-	4
2019	-	-	37	3	-	3	6	-	37	10	-	-	-	20	5	5	12
year	Average Cover (%)																
1997	-	-	-	-	0.0	-	0.0	0.1	-	0.3	0.0	-	0.0	0.0	-	0.0	0.0
2002	-	-	-	-	-	-	-	-	-	0.2	-	-	-	-	-	-	-
2007	0.0	0.0	0.0	-	-	-	0.0	-	-	0.1	0.0	0.0	-	0.0	0.1	-	0.0
2014	-	-	-	0.0	-	-	-	-	-	0.2	0.0	-	-	0.1	0.0	-	0.0
2019	-	-	1.4	0.0	-	0.0	0.0	-	0.1	0.2	-	-	-	0.4	0.0	0.0	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Verbascum thapsus[ai] (common mullein)	Veronica biloba[ai] (twolobe speedwell)
year	Nested Frequency	
1997	12	-
2002	-	-
2007	-	-
2014	-	-
2019	9	7
year	Average Cover (%)	
1997	0.5	-
2002	-	-
2007	-	-
2014	-	-
2019	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16B-11.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. speciosa[p] (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma[t] (Utah juniper)	Opuntia (pricklypear)	Quercus gambelii[p] (Gambel oak)
year	Line Intercept Cover (%)						
1997	-	-	-	-	-	-	-
2002	0.4	0.4	-	0	0.8	-	1.8
2007	0.6	0.1	-	1.1	1	-	0.6
2014	-	0.1	-	-	1.5	-	0.9
2019	0	-	-	0.2	-	0	1.5
year	Quadrat Cover (%)						
1997	0.5	0.1	0.4	0.4	0.6	-	0.6
2002	0.2	0.2	-	0.1	0.1	0.0	0.6
2007	0.0	0.3	-	0.4	0.5	0.1	0.4
2014	0.1	0.1	0.0	0.2	1.3	-	1.0
2019	0.0	-	-	1.3	-	0.1	0.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16B-11.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1997	100	-	40	40	20	20	0	20	87/94
2002	40	-	0	100	0	0	0	0	71/73
2007	160	120	38	25	38	25	0	50	63/71
2014	40	-	0	100	0	0	0	0	54/68
2019	60	-	33	67	0	0	0	0	83/109
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1997	80	-	0	100	0	0	0	0	16/23
2002	200	-	0	100	0	0	0	0	13/27
2007	220	-	18	73	9	18	0	9	19/32
2014	240	-	75	25	0	100	0	0	13/35
2019	-	-	-	-	-	-	-	-	14/37
Eriogonum microthecum[p] -- (slender buckwheat)									
1997	-	-	-	-	-	-	-	-	11/21
2002	-	-	-	-	-	-	-	-	18/27
2007	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	11/29
Ericameria nauseosa ssp. nauseosa var. speciosa[p] -- (rubber rabbitbrush)									
1997	40	-	50	50	0	50	50	0	52/86
2002	-	-	-	-	-	-	-	-	13/21
2007	-	-	-	-	-	-	-	-	59/94
2014	-	-	-	-	-	-	-	-	36/39
2019	20	-	0	100	0	0	100	0	52/67

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Gutierrezia sarothrae -- (broom snakeweed)									
1997	720	-	25	72	3	0	0	3	17/23
2002	200	-	20	60	20	30	30	0	10/18
2007	920	20	4	94	2	0	0	0	20/27
2014	420	-	29	62	10	19	24	10	10/14
2019	1560	4200	18	76	6	10	1	12	13/23
Juniperus osteosperma[t] -- (Utah juniper)									
1997	20	-	0	100	0	0	0	0	- / -
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Opuntia -- (pricklypear)									
1997	60	-	0	100	0	0	0	0	14/37
2002	40	-	0	100	0	0	0	0	11/22
2007	-	-	-	-	-	-	-	-	17/20
2014	20	-	0	100	0	0	0	0	13/30
2019	20	-	0	100	0	0	0	0	14/43
Quercus gambelii[p] -- (Gambel oak)									
1997	80	-	50	50	0	0	0	0	250/121
2002	100	-	0	100	0	0	0	0	16/8
2007	140	-	14	86	0	0	0	0	158/101
2014	160	-	50	50	0	25	13	0	96/77
2019	200	-	30	60	10	0	0	10	81/71
Rhus trilobata[p] -- (skunkbush sumac)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	82/177
2014	-	-	-	-	-	-	-	-	108/169
2019	-	-	-	-	-	-	-	-	194/317
Sambucus nigra ssp. cerulea[p] -- (blue elderberry)									
1997	-	-	-	-	-	-	-	-	301/249
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	106/70
2019	-	-	-	-	-	-	-	-	130/196

t - Tree Species; p - Preferred Browse; i - Introduced Species

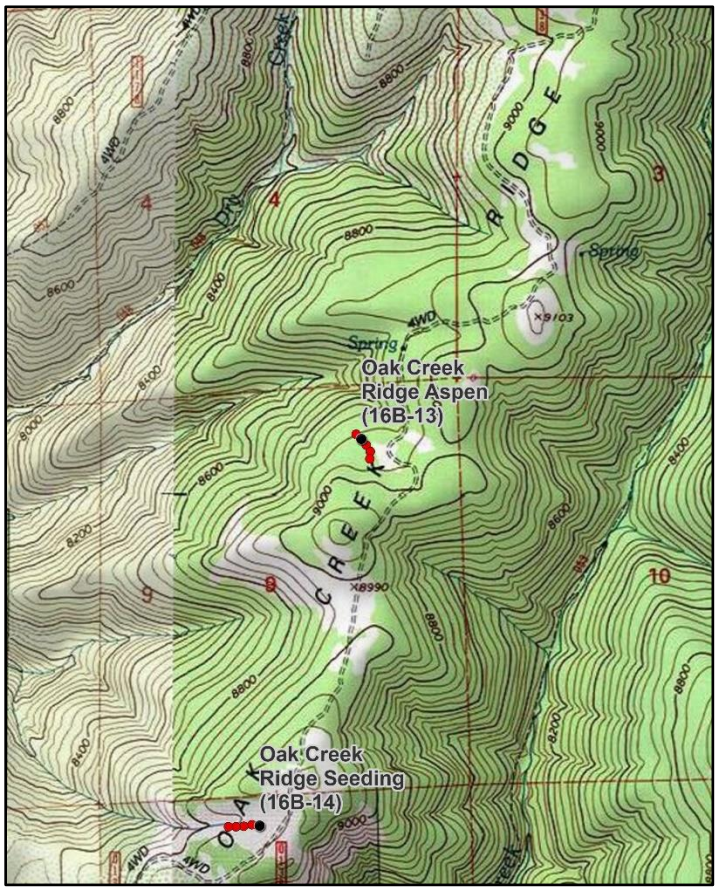
Table 16B-11.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

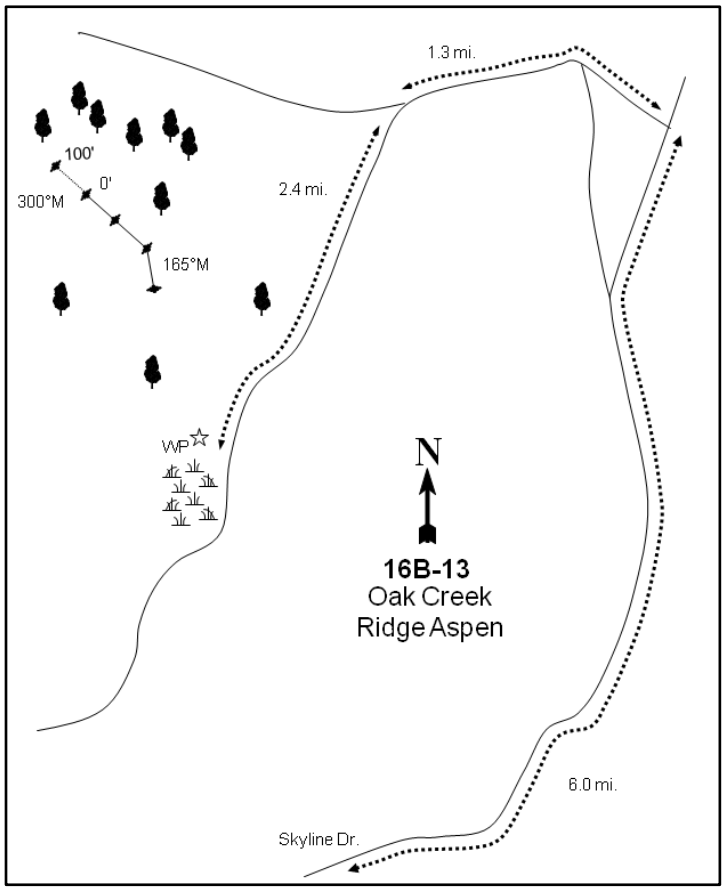
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2002	52	-	-	-	-	-	13.7
2007	58	-	-	6	56	39	20.5
2014	59	-	-	11	50	39	21.0
Pinus edulis (twoneedle pinyon)							
2002	2	-	-	-	-	-	8.7
2007	3	-	-	50	50	-	13.0
2014	7	-	-	100	-	-	12.0
2019	3	-	-	-	50	50	14.0

Table 16B-11.15 – Deer Desirable Components Index: Mid Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1997	1.7	0.0	0.0	30.0	-0.3	0.9	-4.0	28.4	Very Poor
2002	0.9	0.0	0.0	30.0	0.0	0.4	0.0	31.2	Very Poor
2007	1.4	0.0	0.0	30.0	-1.3	1.4	-2.0	29.5	Very Poor
2014	0.9	0.0	0.0	30.0	-0.1	1.4	-2.0	30.2	Very Poor
2019	1.5	0.0	0.0	30.0	-2.6	3.0	-4.0	27.9	Very Poor

OAK CREEK RIDGE ASPEN - STUDY NO. 16B-13





Location Information

USGS 7.5 min Map Info	Fairview Lakes NW; Township 13S, Range 5E, Section 09
GPS (0' Stake)	NAD 83 UTM ZONE 12, 468555 East 4395677 North

Transect Information

Browse Tag # (0' Stake)	Not Available
Transect Bearing	303° magnetic (Lines 2-3: 123° magnetic, Line 4: 165° magnetic)
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

From the intersection of Highways 89 and 31 in Fairview, take Highway 31 east for 8.4 miles to Skyline Drive. Turn north onto Skyline Drive and continue for approximately 6 miles, passing the Gooseberry Road. Turn west onto the Dry Creek Stock Driveway and travel for 1.3 miles to a fork. Proceed to the left (south), pass through a fence, and stay on the Oak Creek Ridge Road. Continue for 2.4 miles passing numerous side roads (still staying left) until a sign is reached. The sign reads “seeded area” and is on the west side of the road in a clearing: the witness post is back in the clearing. From the witness post, the 300-foot baseline stake is 8 paces away at an azimuth of 195 degrees magnetic.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	FAIRVIEW C & H
Elevation	9,000ft (2,743m)
Aspect	Northwest
Slope	5-10%
Sample Dates	06/26/1997, 07/01/2002, 06/27/2007, 09/11/2014, 07/03/2019

Wildlife Habitat and Vegetation History

Table 16B-13.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	substantial	spring/fall
Rocky Mountain Elk	crucial	summer
Shiras Moose	substantial	year-long

Table 16B-13.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1989	Quaking Aspen/Perennial Forb	NA
1997	Quaking Aspen/Perennial Forb	NA
2002	Quaking Aspen/Perennial Forb	NA
2007	Quaking Aspen/Perennial Forb	NA
2014	Quaking Aspen/Perennial Forb	NA
2019	Quaking Aspen/Perennial Forb	NA

Site Notes

The nearest water sources are Oak Creek at 0.6 miles to the east, and a stock pond at 0.9 miles to the north.

Soils

Table 16B-13.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay	6.8	24.0	27.8	48.2	6.7	22.3	182.4	0.4	06/26/1997

Site Potential

1981 - 2010 Average Annual Precipitation	26 inches
NRCS Ecological Site	High Mountain Loam (Aspen)
NRCS Ecological Site #	R047XB508UT
States and Transitions	No state and transition model is available for this ecological site.

Since establishment in 1989, this site has remained dominated by quaking aspen (*Populus tremuloides*) in the overstory, although density has generally decreased. Aspen cover has also decreased since 2002, but has remained high overall (Table 16B-13.12, Table 16B-13.13, Table 16B-13.13a, Table 16B-13.14). The herbaceous understory has been abundant and diverse, with native perennial forbs present as a co-dominant site component. However, the noxious weed gypsyflower (*Cynoglossum officinale*) was first observed on the site in 2002 and has increased in abundance and cover since that time (Table 16B-13.7, Table 16B-13.10, Table 16B-13.11). The presence of conifers such as white fir (*Abies concolor*) suggests that there may be potential for encroachment in future sample years, but density and age class data as of 2019 indicate that this is likely not an immediate concern (Table 16B-13.14).

Trend Summary Tables

Table 16B-13.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	0.3	0.0	0.2	-	-	-
2002	0.2	-	0.4	-	-	70.6
2007	0.6	-	0.3	0.7	-	60.6
2014	0.9	-	7.6	0.4	-	65.5
2019	1.4	-	0.8	1.0	-	58.2

Table 16B-13.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	-	325	327	437	-	6.0	9.0	29.7
2002	-	374	293	352	-	15.2	8.9	33.6
2007	-	291	396	341	-	9.4	19.0	24.3
2014	-	431	196	269	-	27.3	4.7	16.6
2019	-	348	308	433	-	16.0	14.7	60.2

Table 16B-13.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	8.4	0.0	63.4	0.1	0.7	47.7
2002	10.5	-	53.1	0.1	0.6	56.0
2007	16.9	-	31.5	0.0	0.4	61.7
2014	17.5	0.0	56.4	0.3	0.5	44.7
2019	6.6	-	72.3	0.1	0.5	57.6

Table 16B-13.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Dusky Grouse	Rocky Mountain Elk	Rabbit
	Quadrat Frequency				
1997	2	2	-	1	3
2002	4	-	1	1	-
2007	1	1	-	1	-
2014	6	-	-	-	1
2019	2	1	-	-	-
Year	Days Use Per Acre (ha)				
1997	-	-	-	-	-
2002	14.5 (35.9)	2.7 (6.6)	-	2.0 (5.0)	-
2007	3.6 (9.0)	2.7 (6.6)	-	2.7 (6.6)	-
2014	8.0 (19.7)	2.7 (6.6)	-	2.7 (6.6)	-
2019	3.6 (9.0)	-	-	-	-

Table 16B-13.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Achnatherum nelsonii (Columbia needlegrass)	Bromus marginatus (mountain brome)	Elymus trachycaulus (slender wheatgrass)	Poa pratensis[i] (Kentucky bluegrass)	Thinopyrum intermedium[i] (intermediate wheatgrass)
year	Nested Frequency					
1997	-	-	190	155	59	-
2002	-	35	209	163	77	-
2007	-	11	228	34	72	3
2014	-	6	305	116	100	-
2019	5	24	254	8	121	-
year	Average Cover (%)					
1997	-	-	3.2	2.0	0.7	-
2002	-	0.9	8.6	3.9	1.9	-
2007	-	0.4	7.6	0.7	0.7	0.0
2014	-	0.1	20.3	2.2	4.8	-
2019	0.0	0.3	11.4	0.2	4.1	-

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16B-13.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Aquilegia (columbine)	Chenopodium[a] (goosefoot)	Cirsium (thistle)	Claytonia lanceolata (lanceleaf springbeauty)	Collomia linearis[a] (tiny trumpet)	Cynoglossum officinale[ani] (gypsyflower)	Delphinium barbeyi (subalpine larkspur)	Delphinium nuttallianum (twolobe larkspur)	Descurainia californica[a] (Sierra tansymustard)	Epilobium brachycarpum[a] (tall annual willowherb)	Erigeron eatonii (Eaton's fleabane)	Eriogonum racemosum (redroot buckwheat)	Erodium cicutarium[ai] (redstem stork's bill)	Erythronium grandiflorum (yellow avalanche-lily)	Frasera speciosa (elkweed)
year	Nested Frequency																
1997	40	8	-	17	2	200	17	-	-	-	-	-	0	-	-	-	-
2002	54	10	0	-	-	14	157	5	-	-	-	44	23	0	-	-	5
2007	2	8	3	23	-	6	276	42	-	-	2	41	7	1	3	-	-
2014	57	3	7	-	3	-	29	114	-	-	-	1	21	-	-	-	-
2019	53	11	6	16	-	309	75	84	5	5	3	-	31	-	-	49	-
year	Average Cover (%)																
1997	1.4	0.0	-	0.2	0.1	1.4	0.2	-	-	-	-	-	0.0	-	-	-	-
2002	2.8	0.1	0.0	-	-	0.1	2.0	0.2	-	-	-	0.3	1.0	0.0	-	-	0.0
2007	0.1	0.1	0.0	0.1	-	0.0	4.2	1.2	-	-	0.0	0.3	0.1	0.0	0.0	-	-
2014	2.5	0.0	0.2	-	0.1	-	0.1	2.5	-	-	-	0.0	0.2	-	-	-	-
2019	2.0	0.4	0.2	0.0	-	6.8	0.5	2.4	0.5	0.2	0.0	-	0.9	-	-	2.8	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Fritillaria atropurpurea (spotted fritillary)	Galium aparine[a] (stickywilly)	Hackelia patens (spotted stickseed)	Hedysarum boreale (Utah sweetvetch)	Heliomeris multiflora var. multiflora (showy goldeneye)	Hydrophyllum capitatum (ballhead waterleaf)	Hymenoxys hoopesii (owl's-claws)	Lappula occidentalis[a] (flatspine stickseed)	Lathyrus lanszwertii (Nevada pea)	Ligusticum porteri (Porter's licorice-root)	Lithophragma tenellum (slender woodland-star)	Madia glomerata[a] (mountain tarweed)	Mentha arvensis (wild mint)	Mertensia ciliata (tall fringed bluebells)	Nemophila breviflora[a] (basin nemophila)	Osmorhiza depauperata (bluntseed sweetroot)	Phacelia heterophylla[a] (varileaf phacelia)
year	Nested Frequency																
1997	8	302	-	-	76	203	43	-	-	-	-	5	-	15	-	64	-
2002	-	198	-	2	10	33	49	0	-	-	-	81	-	-	-	101	4
2007	-	312	-	1	26	84	9	1	-	-	-	39	-	-	-	69	3
2014	-	-	3	-	21	4	41	-	-	-	-	67	-	1	4	61	13
2019	3	119	0	-	12	177	34	-	31	27	23	21	2	-	234	212	5
year	Average Cover (%)																
1997	2.7	8.1	-	-	0.4	4.0	1.6	-	-	-	-	0.0	-	0.1	-	1.4	-
2002	-	5.3	-	0.0	0.4	0.3	3.5	0.0	-	-	-	0.9	-	-	-	2.5	0.2
2007	-	12.6	-	0.0	0.6	0.8	0.3	0.0	-	-	-	0.3	-	-	-	2.3	0.2
2014	-	-	0.0	-	0.6	0.0	3.8	-	-	-	-	1.9	-	0.0	0.0	1.2	0.2
2019	0.0	1.9	0.1	-	0.1	7.2	1.7	-	1.2	3.1	0.1	0.4	0.1	-	9.3	10.4	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Polygonum douglasii[a] (Douglas' knotweed)	Potentilla (cinquefoil)	Pseudostellaria jamesiana (tuber starwort)	Ranunculus inamoenus (graceful buttercup)	Rudbeckia occidentalis (western coneflower)	Senecio serra (tall ragwort)	Symphyotrichum (aster)	Taraxacum officinale (common dandelion)	Thalictrum fendleri (Fendler's meadow-rue)	Tragopogon dubius[ai] (yellow salsify)	unknown annual forb[a] (unknown forb)	unknown perennial forb (unknown forb)	Vicia americana (American vetch)	Viola (violet)	Viola purpurea (goosefoot violet)	Viola vallicola (sagebrush violet)
year	Nested Frequency															
1997	3	-	288	-	81	0	19	50	1	-	12	87	92	96	-	-
2002	-	-	186	-	93	5	-	35	-	-	-	-	144	64	-	-
2007	23	-	228	-	76	4	-	13	-	0	-	-	129	61	-	-
2014	26	4	31	-	117	-	9	34	2	-	-	-	106	15	-	-
2019	-	5	274	6	32	1	-	44	-	5	-	-	110	-	28	125
year	Average Cover (%)															
1997	0.0	-	7.2	-	3.6	0.0	0.5	0.9	0.0	-	0.5	1.8	1.3	1.1	-	-
2002	-	-	5.8	-	7.4	0.8	-	1.7	-	-	-	-	6.4	0.7	-	-
2007	0.0	-	8.7	-	4.7	0.5	-	0.7	-	0.0	-	-	4.6	0.8	-	-
2014	0.1	0.1	0.2	-	5.8	-	0.1	0.6	0.0	-	-	-	1.0	0.1	-	-
2019	-	0.0	12.1	0.0	2.2	0.1	-	1.1	-	0.0	-	-	2.9	-	0.1	3.7

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16B-13.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Abies concolor[t] (white fir)	Populus tremuloides[t] (quaking aspen)	Sambucus racemosa[p] (red elderberry)	Symphoricarpos oreophilus[p] (mountain snowberry)	Vaccinium cespitosum (dwarf bilberry)
year	Line Intercept Cover (%)				
1997	-	-	-	-	-
2002	-	70.6	-	-	-
2007	-	60.6	0.6	0.1	-
2014	-	65.5	0.1	0.3	-
2019	-	58.2	0.4	0.6	-
year	Quadrat Cover (%)				
1997	0.0	0.2	0.2	0.1	0.0
2002	-	0.4	0.0	0.1	-
2007	-	0.3	0.5	0.1	-
2014	0.0	7.6	0.5	0.5	-
2019	-	0.8	0.6	0.8	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16B-13.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Abies concolor[t] -- (white fir)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2014	-	40	0	0	0	0	0	0	- / -
2019	-	-	-	-	-	-	-	-	-/-
Chrysothamnus viscidiflorus ssp. lanceolatus -- (yellow rabbitbrush)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	30/32
2019	-	-	-	-	-	-	-	-	-/-
Ericameria nauseosa -- (rubber rabbitbrush)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	55/82
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Populus tremuloides[t] -- (quaking aspen)									
1997	800	20	0	100	0	3	0	0	- / -
2002	660	-	3	97	0	0	0	0	- / -
2007	560	-	4	96	0	0	0	0	- / -
2014	See table 13a - Aspen Characteristics								
2019	See table 13a - Aspen Characteristics								

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Sambucus racemosa[p] -- (red elderberry)									
1997	240	-	8	83	8	42	17	8	79/35
2002	60	-	67	33	0	0	0	0	49/53
2007	220	-	36	64	0	0	18	9	60/64
2014	120	-	0	17	83	0	100	83	85/59
2019	120	-	0	100	0	0	0	0	52/41
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
1997	20	-	100	0	0	0	0	0	- / -
2002	20	-	0	100	0	0	0	0	17/31
2007	40	-	0	100	0	0	50	0	20/27
2014	240	-	8	92	0	8	17	0	34/38
2019	120	-	0	100	0	0	67	0	40/66

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16B-13.13a - Aspen Characteristics. Characteristics of aspen populations including density, size class distribution, and vigor of plants.

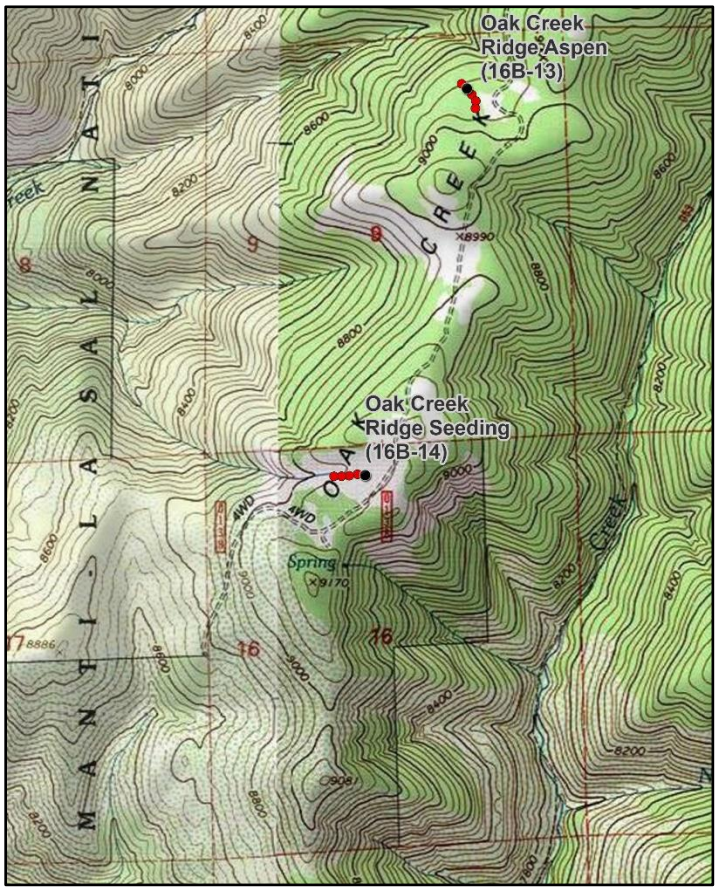
Year	Density	Size Class Distribution				Utilization		Poor Vigor (%)
	Plants per Acre	Class I (%)	Class II (%)	Class III (%)	Class IV (%)	Moderate (%)	Heavy (%)	
Populus tremuloides (quaking aspen)								
2014	420	-	5	-	95	5	0	0
2019	440	14	-	-	86	0	0	0

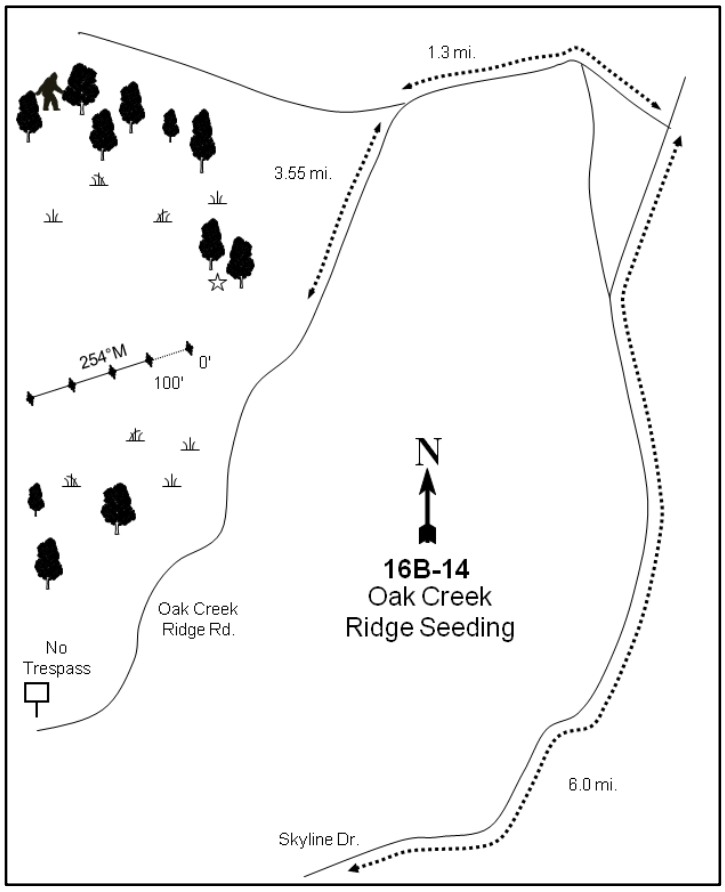
Class I - <= 1.5 feet; Class II - > 1.5 feet to 5 feet; Class III - > 5 feet and up to 1 inch diameter at breast height (dbh); Class IV - > 1 in diameter at breast height (dbh)

Table 16B-13.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Abies concolor (white fir)							
2014	43	33	33	-	33	-	2.7
2019	16	-	60	-	40	-	4.2
Populus tremuloides (quaking aspen)							
2002	590	-	-	-	-	-	20.9
2014	381	-	-	-	-	100	22.7
2019	401	-	15	-	-	85	24.5
Pseudotsuga menziesii (Douglas-fir)							
2019	32	50	50	-	-	-	2.0

OAK CREEK RIDGE SEEDING - STUDY NO. 16B-14





Location Information

USGS 7.5 min Map Info	Fairview Lakes NW; Township 13S, Range 5E, Section 16
GPS (0' Stake)	NAD 83 UTM ZONE 12, 468142 East 4394109 North

Transect Information

Browse Tag # (0' Stake)	257
Transect Bearing	254° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

From the intersection of Highways 89 and 31 in Fairview, take Highway 31 eastward for 8.4 miles to Skyline Drive. Travel north on Skyline Drive for approximately 6 miles, then turn left towards the Dry Creek Stock Driveway (FS Road #138). Drive for 0.35 miles to an intersection and continue straight for a mile to the fence marking the boundary of the Oak Creek Ridge Allotment. Travel 2.4 miles to the witness post for study #16B-13. Continue on the main road for 1.15 miles to a large meadow: this is the last meadow on the ridge. The 0-foot baseline stake is about 100 yards into the meadow and is marked by browse tag #257 (from the edge of the aspen patch the 0-foot baseline stake is 67 paces away at an azimuth of 200 degrees magnetic). Do not confuse the transect with a United States Forest Service study that runs southwest/northeast and is marked by orange and green fenceposts.

Site Information

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	9,101ft (2,774m)
Aspect	West
Slope	5-6%
Sample Dates	06/26/1997, 07/01/2002, 06/27/2007, 08/07/2014, 07/02/2019

Table 16B-14.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Herbicide - Herbicide Unknown	-	-	1988	-
Seeding - Seed Unknown	-	-	1988	-

Wildlife Habitat and Vegetation History

Table 16B-14.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	substantial	spring/fall
Rocky Mountain Elk	crucial	summer
Shiras Moose	substantial	year-long

Table 16B-14.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1989	Perennial Grass-Forb	NA
1997	Annual Weed	NA
2002	Perennial Grass	NA
2007	Perennial Grass-Annual Weed	NA
2014	Annual Weed	NA
2019	Annual Weed-Perennial Forb	NA

Site Notes

In 1988, the area was part of a restoration project with the objective of removing tarweed (*Madia glomerata*) in the area by the use of herbicide and reseeding. The nearest water sources for the area are Oak Creek, which is found 0.6 miles to the east, and a stock pond that is located 2 miles to the north.

Soils

Table 16B-14.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay	6.5	24.0	32.4	43.6	3.5	35.3	214.4	0.4	06/26/1997

Site Potential

1981 - 2010 Average Annual Precipitation	25 inches
NRCS Ecological Site	High Mountain Clay (Slender Wheatgrass)
NRCS Ecological Site #	R047XB507UT
States and Transitions	No state and transition model is available for this ecological site.

This study site has remained in an introduced grass and/or annual weed state from study establishment in 1989 through the 2014 sample year. The perennial grass species intermediate wheatgrass (*Thinopyrum intermedium*) has generally been the dominant grass, but has significantly decreased in abundance and cover since 2002. The annual forb mountain tarweed (*Madia glomerata*) was the dominant forb component through 2014 and contributed significant cover in 2019. In addition, the annual noxious weed species gypsyflower (*Cynoglossum officinale*) has been observed since 1997, but in generally low amounts. Perennial forbs, particularly lanceleaf springbeauty (*Claytonia lanceolata*) increased in cover and became a co-dominant vegetation component in 2019 (Table 16B-14.7, Table 16B-14.10, Table 16B-14.11). Shrubs have remained very limited throughout the study period (Table 16B-14.12, Table 16B-14.13). Without a disturbance or changes in management, this study site will likely continue to remain in this or a similar state in future sample years.

Trend Summary Tables

Table 16B-14.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	0.0	-	-	-	-	-
2002	-	-	-	-	-	-
2007	0.0	-	-	-	-	-
2014	-	-	-	-	-	-
2019	-	-	-	-	-	-

Table 16B-14.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	-	282	467	281	-	9.6	23.0	6.1
2002	-	338	372	332	-	24.3	6.9	9.5
2007	-	336	417	310	-	14.5	16.5	9.5
2014	-	169	446	205	-	3.3	29.5	5.6
2019	-	138	460	462	-	5.5	23.2	37.2

Table 16B-14.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	41.9	-	11.5	0.6	0.7	39.5
2002	52.7	-	16.5	0.6	2.2	41.0
2007	49.2	-	6.1	1.0	2.1	50.7
2014	62.0	-	11.7	1.6	0.7	36.6
2019	48.9	-	15.5	0.9	3.1	52.0

Table 16B-14.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk
	Quadrat Frequency		
1997	9	1	12
2002	17	2	1
2007	10	-	1
2014	20	-	2
2019	24	-	6
Year	Days Use Per Acre (ha)		
1997	-	-	-
2002	42.8 (105.8)	2.0 (5.0)	6.7 (16.6)
2007	9.4 (23.3)	2.7 (6.6)	10.0 (24.8)
2014	14.5 (35.9)	-	-
2019	41.4 (102.2)	-	1.3 (3.3)

Table 16B-14.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bromus (brome)	Bromus inermis[i] (smooth brome)	Bromus marginatus (mountain brome)	Dactylis glomerata[i] (orchardgrass)	Elymus trachycaulus (slender wheatgrass)	Phleum pratense[i] (timothy)	Poa pratensis[i] (Kentucky bluegrass)	Thinopyrum intermedium[i] (intermediate wheatgrass)
year	Nested Frequency									
1997	-	-	2	110	-	129	13	8	-	113
2002	4	1	-	41	5	27	58	14	3	299
2007	-	-	-	51	5	3	82	12	-	239
2014	-	-	-	26	-	2	37	-	-	114
2019	7	-	-	42	-	3	7	-	2	83
year	Average Cover (%)									
1997	-	-	0.0	3.4	-	3.6	0.2	0.1	-	2.3
2002	0.2	0.0	-	1.6	0.2	0.6	1.7	0.6	0.0	19.5
2007	-	-	-	2.0	0.0	0.1	1.6	0.1	-	10.7
2014	-	-	-	0.7	-	0.0	0.6	-	-	2.0
2019	0.2	-	-	1.8	-	0.0	0.1	-	0.0	3.5

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16B-14.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Arabis (rockcress)	Chenopodium album[a] (lambsquarters)	Cirsium undulatum[a] (wavyleaf thistle)	Claytonia lanceolata (lanceleaf springbeauty)	Collomia linearis[a] (tiny trumpet)	Crepis acuminata (tapertip hawksbeard)	Cynoglossum officinale[ani] (gypsyflower)	Delphinium barbeyi (subalpine larkspur)	Delphinium nuttallianum (twolobe larkspur)	Epilobium brachycarpum[a] (tall annual willowherb)	Erigeron (fleabane)	Erigeron eatonii (Eaton's fleabane)	Eriogonum brevicaule (shortstem buckwheat)	Eriogonum caespitosum (matted buckwheat)	Eriogonum racemosum (redroot buckwheat)
year	Nested Frequency																
1997	6	58	-	4	131	193	-	-	120	-	-	-	-	4	-	7	-
2002	13	63	4	-	72	237	91	-	77	-	-	153	-	23	-	-	5
2007	7	104	-	10	58	104	219	-	89	-	-	235	-	15	3	-	-
2014	18	56	-	-	63	-	3	1	28	-	-	17	18	32	-	-	-
2019	16	163	-	8	77	439	1	-	162	0	8	14	-	36	-	-	1
year	Average Cover (%)																
1997	0.3	0.6	-	0.0	2.3	1.5	-	-	2.4	-	-	-	-	0.0	-	0.2	-
2002	0.9	1.1	0.1	-	0.6	2.0	0.4	-	1.3	-	-	1.1	-	0.6	-	-	0.0
2007	0.4	2.5	-	0.2	1.3	0.7	2.8	-	1.6	-	-	2.4	-	0.1	0.0	-	-
2014	0.4	0.4	-	-	0.7	-	0.0	0.0	0.6	-	-	0.1	0.3	0.1	-	-	-
2019	1.1	7.2	-	0.0	1.4	18.4	0.0	-	1.6	0.0	0.2	0.8	-	0.4	-	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Galium aparine[a] (stickywilly)	Geranium[a] (geranium)	Heliomeris multiflora var. multiflora (showy goldeneye)	Hymenoxys hoopesii (owl's-claws)	Lactuca serriola[ai] (prickly lettuce)	Linum lewisii (Lewis flax)	Machaeranthera (tansyaster)	Machaeranthera canescens (hoary tansyaster)	Machaeranthera grindelioides (rayless tansyaster)	Madia glomerata[a] (mountain tarweed)	Medicago sativa[i] (alfalfa)	Mertensia (bluebells)	Mertensia ciliata (tall fringed bluebells)	Oenothera flava (yellow evening primrose)	Orogenia linearifolia (Great Basin Indian potato)	Penstemon (beardtongue)	Polygonum douglasii[a] (Douglas' knotweed)
year	Nested Frequency																
1997	3	4	27	-	-	2	-	-	-	455	1	-	4	4	-	0	99
2002	-	1	24	-	-	1	4	-	-	310	-	-	-	10	-	12	6
2007	-	0	102	2	4	-	-	3	16	302	-	7	-	23	-	1	228
2014	-	-	73	-	-	-	-	17	5	382	-	-	-	-	-	48	345
2019	-	-	109	0	-	-	-	-	-	454	-	4	-	5	43	26	9
year	Average Cover (%)																
1997	0.0	0.0	0.6	-	-	0.2	-	-	-	17.8	0.1	-	0.0	0.0	-	0.0	0.3
2002	-	0.0	0.7	-	-	0.1	0.0	-	-	3.4	-	-	-	0.3	-	0.2	0.0
2007	-	0.4	1.9	0.0	0.0	-	-	0.0	0.4	6.5	-	0.0	-	0.2	-	0.0	0.8
2014	-	-	1.2	-	-	-	-	0.1	0.1	20.3	-	-	-	-	-	2.0	7.8
2019	-	-	2.4	0.0	-	-	-	-	-	19.1	-	0.1	-	0.0	0.7	1.0	0.3

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Pseudostellaria jamesiana (tuber starwort)	Symphyotrichum ascendens (western aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius[ai] (yellow salsify)	unknown annual forb[a] (unknown forb)	Vicia americana (American vetch)	Viola (violet)	Viola purpurea (goosefoot violet)	Viola vallicola (sagebrush violet)
year	Nested Frequency								
1997	2	22	7	9	3	15	40	-	-
2002	-	46	4	9	-	3	17	-	-
2007	2	50	17	32	-	8	32	-	-
2014	3	29	0	6	-	-	-	-	-
2019	10	56	3	-	-	-	-	18	40
year	Average Cover (%)								
1997	0.0	2.0	0.2	0.1	0.1	0.0	0.4	-	-
2002	-	3.3	0.1	0.1	-	0.2	0.1	-	-
2007	0.2	2.5	0.2	0.5	-	0.2	0.3	-	-
2014	0.0	0.8	0.0	0.0	-	-	-	-	-
2019	0.3	4.4	0.1	-	-	-	-	0.0	0.8

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16B-14.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Sambucus racemosa[p] (red elderberry)	Symphoricarpos oreophilus[p] (mountain snowberry)
year	Line Intercept Cover (%)	
1997	-	-
2002	-	-
2007	-	-
2014	-	-
2019	-	-
year	Quadrat Cover (%)	
1997	-	0.0
2002	-	-
2007	0.0	-
2014	-	-
2019	-	-

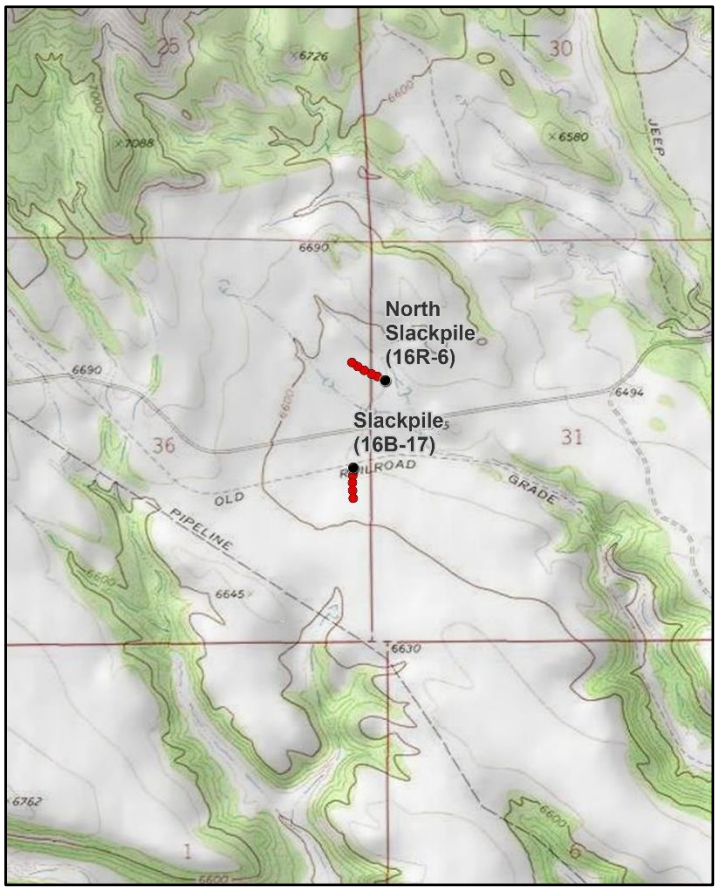
t - Tree Species; p - Preferred Browse; i - Introduced Species

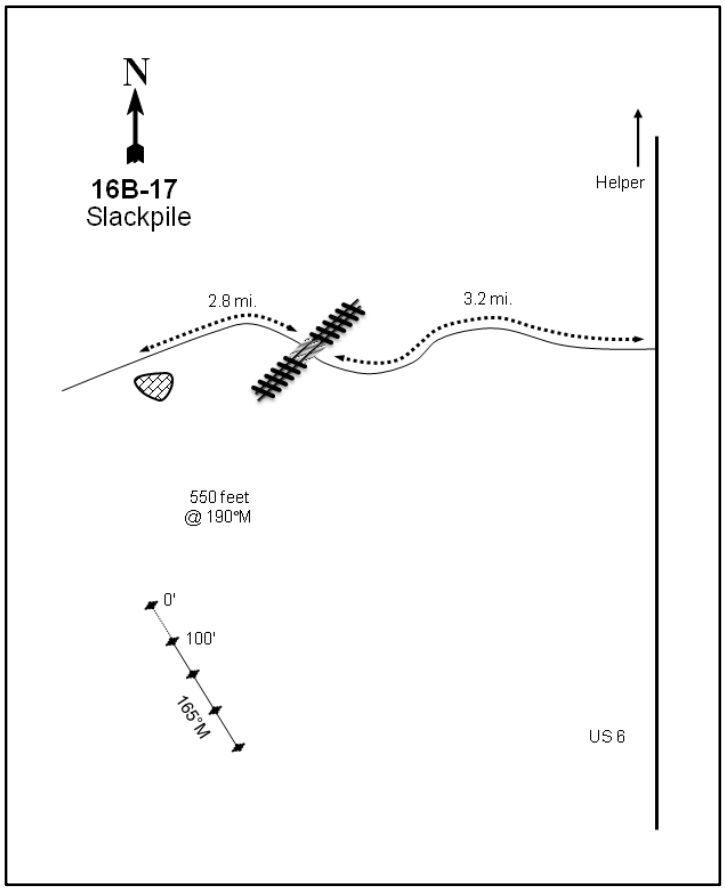
Table 16B-14.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
2002	20	-	0	100	0	0	0	0	28/39
2007	-	-	-	-	-	-	-	-	27/34
2014	20	-	0	100	0	100	0	0	47/56
2019	40	-	0	100	0	0	0	0	38/69

t - Tree Species; p - Preferred Browse; i - Introduced Species

SLACKPILE - STUDY NO. 16B-17





Location Information

USGS 7.5 min Map Info	Standardville SW; Township 13S, Range 8E, Section 36
GPS (0' Stake)	NAD 83 UTM ZONE 12, 502829 East 4388997 North

Transect Information

Browse Tag # (0' Stake)	9022
Transect Bearing	165° magnetic (Lines 3-4: 163° magnetic)
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

Turn west onto Consumers Road from US-6 south near Helper. Proceed west for 3.2 miles to the railroad tracks. Cross the tracks and continue for 2.8 miles to a large boulder on the left-hand (south) side of the road. The study is located in the sagebrush south of the fence; walk 550 feet at 190 degrees magnetic from the boulder to the start of the frequency baseline. The first stake is marked with a red browse tag #9022.

Site Information

Land Ownership	State
Land Administrator	UDWR
Allotment	GORDON CRK WITHDRAWL
Elevation	6,600ft (2,012m)
Aspect	North
Slope	5-10%
Sample Dates	08/23/1994, 05/24/1999, 05/18/2004, 05/19/2009, 07/22/2014, 05/28/2019

Wildlife Habitat and Vegetation History

Table 16B-17.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter
Greater Sage-Grouse	occupied	year-long

Table 16B-17.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1988	Mountain Big Sagebrush/Yellow Rabbitbrush	Phase I
1994	Mountain Big Sagebrush/Yellow Rabbitbrush	Phase I
1999	Mountain Big Sagebrush/Yellow Rabbitbrush	Phase I
2004	Perennial Grass	Phase I
2009	Yellow Rabbitbrush	Phase I
2014	Yellow Rabbitbrush	Phase I
2019	Yellow Rabbitbrush	Phase I

Site Notes

The Division allows spring cattle grazing on two pastures, one south of Consumers road and another north of the road. Each pasture is grazed every other year. North Slackpile (16R-6) was established to monitor the north pasture, while this site monitors the south pasture.

Soils

Table 16B-17.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	7.5	39.3	34.2	26.5	1.5	5.1	44.8	0.6	05/24/1999

Site Potential

1981 - 2010 Average Annual Precipitation	13 inches
NRCS Ecological Site	Upland Loam (Mountain Big Sagebrush-Indian Ricegrass)
NRCS Ecological Site #	R047XB308UT
States and Transitions	A defined state and transition model is available.

From establishment in 1988 through the 1999 sample year, the plant community on this study site existed as a mixed stand of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus* var. *viscidiflorus*); other shrubs were not diverse and provided little cover. Sagebrush decreased substantially because of a severe drought in 2003, but has increased overall in cover and density since 2004. Should sagebrush continue to increase over time, this site may transition to a sagebrush-dominated state in future sample years (Jornada, 2019). Yellow rabbitbrush exhibited an initial post-drought decrease, but became the dominant vegetation component in 2009 (Table 16B-17.12, Table 16B-12.13). The herbaceous understory has remained diverse with native perennial grass species contributing a majority of the cover in most years. Perennial grasses were a dominant site component in 2004, the first sample year following the drought (Table 16B-17.7, Table 16B-17.10). Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) have been observed in all sample years, placing the site within Phase I of woodland succession. Continued tree encroachment could cause this site to transition to one dominated by pinyon and juniper. However, as density has consistently remained low (Table 16B-17.4, Table 16B-17.12, Table 16B-17.14, Photos), this is likely not an immediate concern on this study site.

Trend Summary Tables

Table 16B-17.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	5.8	6.8	0.0	-	-	-
1999	7.9	9.0	-	-	-	-
2004	1.5	4.3	-	0.8	3.0	-
2009	3.3	13.8	-	1.9	18.5	-
2014	2.7	8.6	-	3.1	8.0	-
2019	5.9	15.6	-	6.9	15.3	-

Table 16B-17.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	-	350	-	179	-	14.6	-	1.3
1999	-	331	5	225	-	11.6	0.0	2.2
2004	-	205	149	282	-	4.2	1.6	5.0
2009	3	306	134	238	0.0	8.9	0.5	2.5
2014	-	318	82	92	-	16.0	0.4	0.6
2019	12	336	391	286	0.1	15.2	10.8	6.0

Table 16B-17.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	40.2	2.8	25.4	0.1	0.1	28.4
1999	42.6	9.9	21.1	0.0	0.0	30.1
2004	62.2	1.4	29.4	0.2	0.0	16.9
2009	56.7	0.9	26.3	0.0	-	26.5
2014	51.0	0.2	28.6	0.0	0.0	28.5
2019	50.7	1.9	29.9	0.2	0.0	41.5

Table 16B-17.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1994	1	48	4	8
1999	6	59	2	54
2004	2	61	-	25
2009	1	55	5	51
2014	3	35	5	19
2019	4	41	4	71
Year	Days Use Per Acre (ha)			
1994	-	-	-	-
1999	23.2 (57.4)	65.0 (160.6)	-	-
2004	6.5 (16.1)	56.3 (139.0)	-	-
2009	9.4 (23.3)	48.9 (120.8)	-	-
2014	10.9 (26.9)	2.7 (6.6)	22.8 (56.3)	-
2019	15.3 (37.7)	42.9 (105.9)	-	-

Table 16B-17.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bouteloua gracilis (blue grama)	Bromus tectorum[ai] (cheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Koeleria macrantha (prairie Junegrass)	Leymus salinus (saline wildrye)	Pascopyrum smithii (western wheatgrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Vulpia octoflora[a] (sixweeks fescue)
year	Nested Frequency											
1994	91	45	-	27	6	-	21	-	3	-	242	-
1999	57	35	-	8	3	-	26	-	3	-	268	-
2004	83	35	-	-	14	-	4	-	4	-	105	-
2009	112	39	3	9	65	-	30	15	6	-	147	-
2014	140	44	-	17	34	-	1	26	14	-	151	-
2019	91	51	11	23	96	18	-	58	13	8	99	1
year	Average Cover (%)											
1994	1.8	1.7	-	0.3	0.1	-	0.5	-	0.0	-	10.3	-
1999	0.6	1.2	-	0.0	0.0	-	0.9	-	0.0	-	8.8	-
2004	0.3	2.0	-	-	0.4	-	0.0	-	0.0	-	1.5	-
2009	1.8	2.7	0.0	0.1	0.6	-	0.7	0.3	0.0	-	2.7	-
2014	5.9	3.4	-	0.2	0.9	-	0.0	0.2	0.1	-	5.2	-
2019	2.7	2.2	0.1	0.6	2.9	0.8	-	1.8	0.1	0.2	4.0	0.0

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16B-17.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Alyssum desertorum[ai] (desert madwort)	Arabis (rockcress)	Astragalus convallarius (lesser rushy milkvetch)	Calochortus nuttallii (sego lily)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata[ai] (curveseed butterwort)	Chenopodium leptophyllum[a] (narrowleaf goosefoot)	Collinsia parviflora[a] (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)	Convolvulus arvensis[ni] (field bindweed)	Delphinium nuttallianum (twolobe larkspur)	Descurainia pinnata[a] (western tansymustard)	Eriogonum cernuum[a] (nodding buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Gayophytum ramosissimum[a] (pinyon groundsmoke)	Helianthella uniflora (oneflower helianthella)
year	Nested Frequency																
1994	-	-	-	6	-	-	-	-	-	-	-	-	-	-	4	-	-
1999	-	-	5	37	19	14	-	-	5	-	-	-	-	-	12	-	-
2004	-	-	-	50	87	8	6	52	-	-	3	-	15	3	3	49	-
2009	-	3	0	5	-	9	127	2	-	1	-	0	-	-	3	7	1
2014	-	13	-	5	-	-	-	-	-	-	-	-	40	-	3	-	-
2019	3	62	-	42	129	-	261	61	-	-	-	11	221	26	4	51	-
year	Average Cover (%)																
1994	-	-	-	0.0	-	-	-	-	-	-	-	-	-	-	0.1	-	-
1999	-	-	0.0	0.1	0.1	0.2	-	-	0.0	-	-	-	-	-	0.2	-	-
2004	-	-	-	0.7	0.3	0.0	0.0	0.3	-	-	0.0	-	0.1	0.0	0.1	0.6	-
2009	-	0.0	0.0	0.0	-	0.1	0.4	0.0	-	0.0	-	0.0	-	-	0.1	0.0	0.0
2014	-	0.0	-	0.0	-	-	-	-	-	-	-	-	0.1	-	0.1	-	-
2019	0.0	0.6	-	1.4	0.8	-	3.8	0.1	-	-	-	0.0	1.8	0.2	0.0	0.2	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Lactuca serriola[ai] (prickly lettuce)	Lappula occidentalis[a] (flatspine stickseed)	Machaeranthera grindelioides (rayless tansyaster)	Malcolmia africana[ai] (African mustard)	Noccaea fendleri ssp. glauca (alpine pennycress)	Orthocarpus[a] (owl's-clover)	Penstemon caespitosus (mat penstemon)	Penstemon carnosus (fleshy beardtongue)	Phlox austromontana (mountain phlox)	Phlox longifolia (longleaf phlox)	Physaria (twinpod)	Plantago patagonica[a] (woolly plantain)	Polygonum douglasii[a] (Douglas' knotweed)	Potentilla (cinquefoil)	Schoenocrambe linifolia (flaxleaf plainsmustard)	Sisymbrium altissimum[ai] (tall tumblemustard)	Sphaeralcea coccinea (scarlet globemallow)
year	Nested Frequency																
1994	-	-	11	-	-	-	24	-	29	118	-	-	-	-	-	-	47
1999	-	-	19	-	2	-	-	35	32	94	1	-	-	2	9	-	52
2004	-	5	2	-	-	3	-	17	2	138	-	-	85	-	10	-	71
2009	-	2	1	-	-	-	-	18	2	143	-	-	3	-	20	-	114
2014	-	48	2	-	-	-	-	-	2	7	-	9	-	-	4	-	66
2019	1	168	1	2	-	71	-	3	1	148	-	19	64	2	12	15	89
year	Average Cover (%)																
1994	-	-	0.1	-	-	-	0.1	-	0.4	0.3	-	-	-	-	-	-	0.4
1999	-	-	0.1	-	0.0	-	-	0.1	0.7	0.3	0.0	-	-	0.0	0.0	-	0.2
2004	-	0.2	0.2	-	-	0.0	-	0.1	0.0	0.7	-	-	0.4	-	0.1	-	1.9
2009	-	0.0	0.0	-	-	-	-	0.1	0.0	0.4	-	-	0.0	-	0.1	-	1.5
2014	-	0.3	0.0	-	-	-	-	-	0.0	0.0	-	0.0	-	-	0.0	-	0.3
2019	0.0	3.0	0.0	0.0	-	0.3	-	0.1	0.0	1.4	-	0.2	0.4	0.0	0.1	0.1	1.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Tragopogon dubius[ai] (yellow salsify)	Trifolium gymnocarpon (hollyleaf clover)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency		
1994	-	-	-
1999	-	51	-
2004	-	72	9
2009	1	32	4
2014	-	5	3
2019	6	65	2
year	Average Cover (%)		
1994	-	-	-
1999	-	0.2	-
2004	-	0.9	0.0
2009	0.0	0.1	0.0
2014	-	0.0	0.0
2019	0.0	0.9	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16B-17.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia nova[p] (black sagebrush)	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Atriplex canescens[p] (fourwing saltbush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Echinocereus (hedgehog cactus)	Gutierrezia sarothrae (broom snakeweed)	Opuntia polyacantha (plains pricklypear)	Pediocactus simpsonii (mountain ball cactus)	Pinus edulis[t] (twoneedle pinyon)
year	Line Intercept Cover (%)								
1994	-	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-	-
2004	-	0.8	-	3	-	-	-	-	-
2009	0.1	1.8	-	17.5	-	0.8	0.2	-	-
2014	-	3.1	-	7.8	-	0.1	0.1	-	-
2019	0.1	6.8	0	15	-	0.3	-	-	-
year	Quadrat Cover (%)								
1994	0.8	5.0	-	6.4	-	0.2	0.2	-	0.0
1999	0.4	7.5	-	8.4	0.0	0.3	0.4	-	-
2004	-	1.5	-	3.9	-	0.0	0.4	-	-
2009	0.6	2.8	-	12.4	-	1.0	0.4	0.0	-
2014	0.0	2.6	-	8.2	-	0.2	0.3	-	-
2019	0.1	5.8	0.0	13.5	-	1.1	1.0	0.0	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16B-17.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Artemisia nova[p] -- (black sagebrush)									
1994	160	-	25	50	25	50	0	13	35/76
1999	220	-	0	82	18	27	64	0	20/46
2004	80	-	0	0	100	0	0	25	23/37
2009	100	-	40	40	20	60	0	20	22/35
2014	60	-	0	100	0	33	67	0	27/41
2019	200	-	30	50	20	10	30	20	25/37
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1994	2800	-	2	41	57	52	7	13	41/58
1999	2800	-	9	55	36	31	42	11	47/68
2004	660	6440	3	9	88	39	46	67	49/59
2009	8880	3840	71	23	6	22	21	4	30/35
2014	4960	20	57	35	8	59	29	4	31/41
2019	4180	20	16	78	6	27	62	7	32/45
Atriplex canescens[p] -- (fourwing saltbush)									
1994	-	-	-	-	-	-	-	-	61/69
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	93/61
2009	-	-	-	-	-	-	-	-	67/79
2014	-	-	-	-	-	-	-	-	78/69
2019	200	-	0	100	0	0	0	0	40/42

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Bassia prostrata[pi] -- (forage kochia)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	10/21
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1994	12620	-	3	97	0	0	0	0	14/31
1999	19040	560	18	81	0	23	6	0	11/22
2004	4820	133300	13	87	0	2	1	0	17/23
2009	48040	400	20	80	1	5	5	0	12/23
2014	18000	320	21	79	0	45	8	2	13/24
2019	27320	-	14	86	0	26	19	0	13/23
Echinocereus -- (hedgehog cactus)									
1994	-	-	-	-	-	-	-	-	-/-
1999	60	-	0	100	0	0	0	0	5/9
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	6/17
Ericameria nauseosa -- (rubber rabbitbrush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	20	-	0	100	0	0	100	0	17/12
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Gutierrezia sarothrae -- (broom snakeweed)									
1994	1400	-	0	100	0	0	0	0	19/14
1999	2000	-	1	99	0	0	0	0	9/7
2004	280	-	0	100	0	0	0	0	17/17
2009	3520	-	12	83	5	0	0	2	13/17
2014	400	-	0	100	0	0	0	0	13/15
2019	1000	200	8	92	0	2	0	0	15/23
Krascheninnikovia lanata[p] -- (winterfat)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	20	-	0	100	0	0	100	0	20/15
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Opuntia polyacantha -- (plains pricklypear)									
1994	440	-	0	100	0	0	0	0	11/28
1999	540	20	19	59	22	0	4	19	8/29
2004	520	40	12	85	4	0	0	4	10/24
2009	620	100	10	87	3	0	0	0	9/28
2014	900	-	24	76	0	0	0	0	9/33
2019	860	-	2	93	5	0	0	21	8/34

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Pediocactus simpsonii -- (mountain ball cactus)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	20	-	0	100	0	0	0	0	5/5
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	20	-	0	100	0	0	0	0	3/5
Sclerocactus -- (fishhook cactus)									
1994	-	-	-	-	-	-	-	-	-/-
1999	20	-	0	100	0	0	0	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

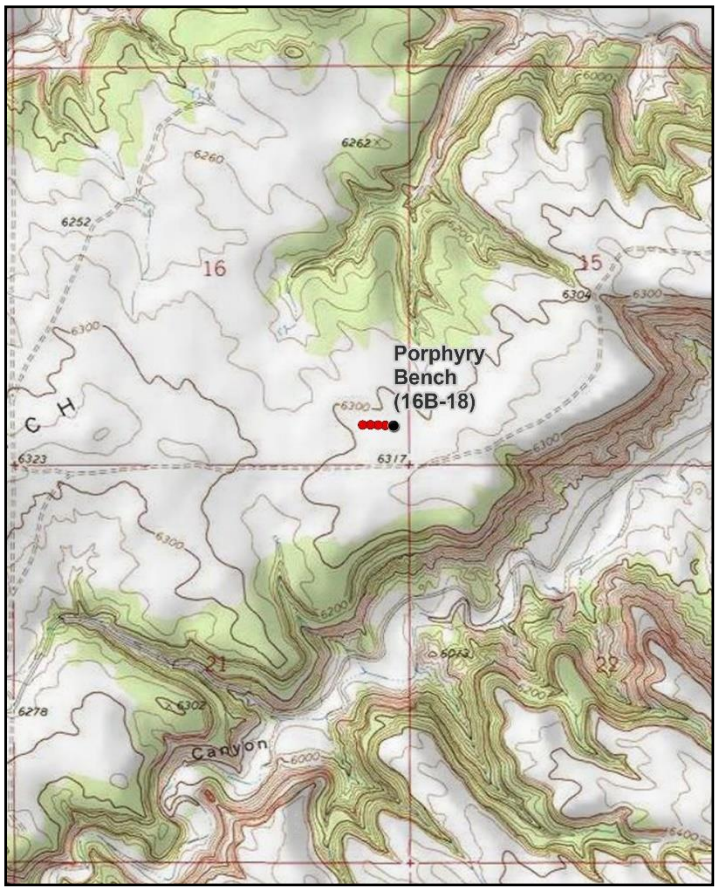
Table 16B-17.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

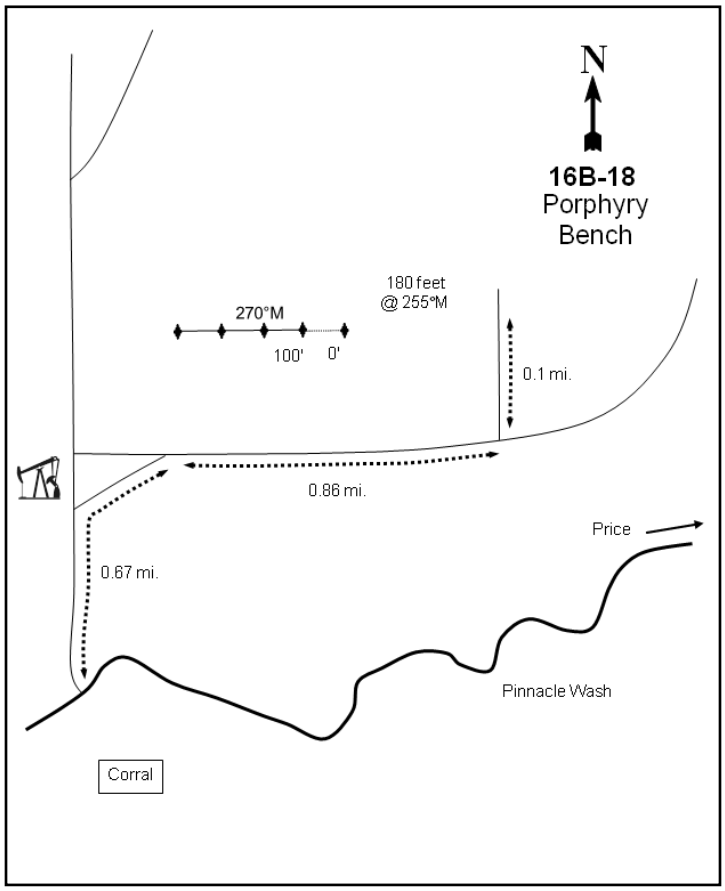
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1999	1	-	-	-	-	-	10.0
2009	1	-	-	-	100	-	16.0
2014	1	-	-	-	100	-	27.0
2019	1	-	-	-	-	100	23.0
Pinus edulis (twoneedle pinyon)							
1999	8	-	-	-	-	-	14.0
2009	6	25	-	25	25	25	15.8
2014	4	25	25	-	50	-	11.3
2019	5	-	25	-	50	25	15.8

Table 16B-17.15 – Deer Desirable Components Index: Mid Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1994	7.2	-0.9	2.5	29.2	0.0	2.6	0.0	40.7	Poor
1999	9.9	4.3	4.1	23.2	0.0	4.4	0.0	45.9	Poor
2004	1.0	0.0	0.0	8.4	0.0	10.0	-2.0	17.4	Very Poor
2009	2.4	0.0	0.0	17.9	0.0	5.1	0.0	25.3	Very Poor
2014	3.9	0.0	0.0	30.0	0.0	1.2	0.0	35.1	Very Poor-Poor
2019	8.6	13.1	8.2	30.0	-0.1	10.0	0.0	69.9	Good

PORPHYRY BENCH - STUDY NO. 16B-18





Location Information

USGS 7.5 min Map Info	Pinnacle Peak NE; Township 14S, Range 9E, Section 16
GPS (0' Stake)	NAD 83 UTM ZONE 12, 507669 East 4383587 North

Transect Information

Browse Tag # (0' Stake)	259
Transect Bearing	270° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

Take Westwood Boulevard (1550 West) northwest out of Price for 2.35 miles to a major intersection. Turn left onto Gordon Creek Road and travel for 0.45 miles to a fork. Keep left, heading away from Gordon Creek, and drive for 0.1 miles to a gravel pit. Continue 5.2 miles on the Pinnacle Peak Road to a three-way fork at the top of the bench. Proceed to the right and travel 0.35 miles to another fork. Bear right again and continue for 1.3 miles, traveling alongside a fenceline to the southeast corner of the fence. Turn left and continue along the fence 0.1 mile to the fifth wooden post from the corner. Walk west into the sagebrush for 180 feet to the 0-foot baseline stake, which is a 1 1/2-foot tall fencepost marked by browse tag #259.

Site Information

Land Ownership	State
Land Administrator	UDWR
Allotment	PORPHYRY BENCH
Elevation	6,300ft (1,920m)
Aspect	West
Slope	1-2%
Sample Dates	08/23/1994, 05/24/1999, 05/24/2004, 05/20/2009, 07/30/2014, 05/29/2019

Table 16B-18.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Aerator - Double Drum/Seed	Price West Benches Year 1--Porphyry Bench	229	November 2004, April-May 2005	1104
Seeding - Aerial After	Price West Benches Year 1--Porphyry Bench	229	December 2004	1104
Disc - One-Way	Porphyry Bench Sagebrush Planting	3616	November 2016	20
Seeding - Broadcast After	Porphyry Bench Sagebrush Planting	3616	November 2016	20

Table 16B-18.2 SeedMix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Porphyry Bench A			Aerial	Dec 2004	1160
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
		Rice Hulls		0.69	0.00
S	Bassia prostrata	Forage Kochia	Immigrant	0.75	0.50
S	Krascheninnikovia lanata	Winterfat	Duchesne/Uintah UT	0.06	0.03

Mix Name			Application Type	Application Date	Acres
Porphyry Bench B1			Broadcast	Nov 2004	85
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
S	Artemisia tridentata ssp. wyomingensis	Wyoming Big Sagebrush	Sanpete UT	0.88	0.25

Mix Name			Application Type	Application Date	Acres
Porphyry Bench B2			Broadcast	Nov 2004	495
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
S	Artemisia tridentata ssp. wyomingensis	Wyoming Big Sagebrush	Sanpete UT	0.89	0.25
S	Atriplex canescens	Fourwing Saltbush	Emery UT	0.26	0.12

Mix Name			Application Type	Application Date	Acres
Porphyry Bench C1			Broadcast	Nov 2004	410
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Agropyron cristatum	Crested Wheatgrass	Douglas	1.22	1.01
G	Agropyron fragile	Siberian Wheatgrass	Vavilov	1.10	1.00
G	Psathyrostachys juncea	Russian Wildrye	Bozoisky	2.15	2.00
F	Melilotus officinalis	Yellow Sweetclover		0.55	0.50
F	Sanguisorba minor	Small Burnet	Delar	0.52	0.50
S	Atriplex canescens	Fourwing Saltbush	Emery UT	1.50	0.68

Mix Name			Application Type	Application Date	Acres
Porphyry Bench C2			Broadcast	Nov 2004	85
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Achnatherum hymenoides	Indian Ricegrass	Rimrock	1.00	0.97
G	Festuca ovina	Sheep Fescue		1.12	0.98
G	Leymus cinereus	Great Basin Wildrye	Trailhead	1.06	0.99
G	Pascopyrum smithii	Western Wheatgrass	Arriba	1.18	0.98
F	Cleome serrulata	Rocky Mountain Beeplant	Sanpete UT	0.20	0.20
F	Linum perenne	Blue Flax	Appar	0.11	0.10

Wildlife Habitat and Vegetation History

Table 16B-18.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Greater Sage-Grouse	occupied	year-long

Table 16B-18.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1988	Wyoming Big Sagebrush	No Encroachment
1994	Wyoming Big Sagebrush	No Encroachment
1999	Wyoming Big Sagebrush	No Encroachment
2004	Perennial Grass	No Encroachment
2009	Perennial Grass	No Encroachment
2014	Perennial Grass/Cactus	No Encroachment
2019	Annual Grass-Forb/Perennial Grass	No Encroachment

Site Notes

The area was treated by an aerator and reseeded to address the long-term decline of sagebrush winter range for greater sage-grouse and mule deer. The area was treated in 100-foot strips by repeatedly alternating treated and untreated strips (WRI Database 2019). Two belts sampled treated strips and three belts sampled untreated strips.

Soils

Table 16B-18.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	8.1	47.3	30.2	22.5	1.1	12.3	25.6	0.6	05/24/1999

Site Potential

1981 - 2010 Average Annual Precipitation	11 inches
NRCS Ecological Site	Semidesert Loam (Wyoming Big Sagebrush)
NRCS Ecological Site #	R034XY212UT
States and Transitions	No state and transition model is available for this ecological site.

From establishment in 1988 through the 1999 sample year, this site was dominated by Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*); other shrubs were not diverse and provided little cover. Sagebrush decreased substantially in 2004 due to a severe drought in 2003, and despite treatment efforts (Table 16B-18.1) has continued to decrease in subsequent sample years. Brittle pricklypear cactus (*Opuntia fragilis*), however, has increased following the drought and was a co-dominant vegetation component in 2014. In addition, the preferred browse species forage kochia (*Bassia prostrata*) increased in both cover and density in 2019 (Table 16B-18.12, Table 16B-18.13). The herbaceous understory has remained diverse with annual and perennial forbs contributing the most cover in 2004. Native perennial grass species have increased in subsequent sample years and have been a dominant site component since 2009. Annual grasses and forbs increased in cover and co-dominated along with perennial grasses in 2019 (Table 16B-18.7, Table 16B-18.10, Table 16B-18.11). Without further treatments that augment the shrub component and/or decrease the herbaceous understory, this site will likely remain in a similar state in future sample years.

Trend Summary Tables

Table 16B-18.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	10.8	3.0	-	-	-	-
1999	11.8	3.9	-	-	-	-
2004	1.4	2.8	-	1.4	2.8	-
2009	0.6	2.9	-	0.5	1.7	-
2014	0.7	7.1	-	0.2	6.5	-
2019	4.5	4.8	-	5.3	3.7	-

Table 16B-18.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	3	350	74	146	0.0	12.2	0.2	1.2
1999	-	366	9	202	-	14.3	0.0	2.0
2004	-	177	349	160	-	1.4	10.1	9.3
2009	10	348	70	241	0.0	23.6	0.3	6.9
2014	-	249	27	19	-	9.9	0.2	0.1
2019	325	244	436	216	13.2	12.2	13.3	8.1

Table 16B-18.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	35.1	0.9	35.2	0.1	0.0	27.5
1999	26.4	7.3	29.0	0.0	-	31.4
2004	44.1	0.7	42.2	0.1	-	26.2
2009	41.3	0.3	39.2	0.0	-	31.9
2014	37.4	0.0	52.3	0.0	0.0	18.4
2019	37.5	0.2	33.3	0.2	0.0	50.6

Table 16B-18.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1994	-	52	11	21
1999	1	79	2	32
2004	-	67	4	19
2009	-	63	5	42
2014	-	43	4	8
2019	1	55	9	49
Year	Days Use Per Acre (ha)			
1994	-	-	-	-
1999	3.6 (9.0)	149.4 (369.1)	1.3 (3.3)	-
2004	-	-	-	-
2009	-	216.5 (534.7)	39.6 (97.7)	-
2014	5.8 (14.3)	53.6 (132.4)	12.1 (29.8)	-
2019	1.5 (3.6)	144.1 (355.9)	5.3 (13.2)	-

Table 16B-18.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bouteloua gracilis (blue grama)	Bromus tectorum[ai] (cheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Pascopyrum smithii (western wheatgrass)	Poa fendleriana (muttongrass)	Psathyrostachys juncea[i] (Russian wildrye)	Sporobolus cryptandrus (sand dropseed)	Thinopyrum intermedium[i] (intermediate wheatgrass)	Vulpia octoflora[a] (sixweeks fescue)
year	Nested Frequency											
1994	42	-	9	3	85	278	96	-	-	14	-	-
1999	74	-	11	-	14	293	98	-	-	-	-	-
2004	62	-	2	-	-	78	56	-	-	4	-	-
2009	107	109	-	10	15	208	7	-	-	-	27	-
2014	110	93	2	-	-	85	-	5	-	-	-	-
2019	2	106	3	307	22	29	71	1	67	18	-	57
year	Average Cover (%)											
1994	1.3	-	0.1	0.0	1.2	8.7	0.7	-	-	0.4	-	-
1999	2.1	-	0.2	-	0.3	9.9	1.8	-	-	-	-	-
2004	0.2	-	0.0	-	-	0.9	0.3	-	-	0.0	-	-
2009	4.7	5.2	-	0.0	0.5	12.2	0.0	-	-	-	1.0	-
2014	4.3	3.5	0.1	-	-	1.9	-	0.0	-	-	-	-
2019	0.0	4.7	0.0	12.5	0.4	1.2	1.2	0.0	4.6	0.1	-	0.7

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16B-18.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Alyssum desertorum[ai] (desert madwort)	Amaranthus[ai] (pigweed)	Astragalus convallarius (lesser rushy milkvetch)	Calochortus nuttallii (sego lily)	Castilleja (Indian paintbrush)	Ceratocephala testiculata[ai] (curveseed butterwort)	Chenopodium fremontii[a] (Fremont's goosefoot)	Chenopodium leptophyllum[a] (narrowleaf goosefoot)	Cirsium (thistle)	Cryptantha[a] (annual cryptantha)	Cymopterus (springparsley)	Descurainia pinnata[a] (western tansymustard)	Eriogonum alatum (winged buckwheat)	Eriogonum cernuum[a] (nodding buckwheat)	Gayophytum ramosissimum[a] (pinyon groundsmoke)	Lactuca serriola[ai] (prickly lettuce)	Lappula occidentalis[a] (flatspine stickseed)
year	Nested Frequency																
1994	-	-	-	-	-	-	-	19	-	-	-	-	-	8	-	-	17
1999	-	-	5	6	2	-	-	-	-	-	-	-	2	-	-	-	-
2004	-	-	4	2	-	-	9	319	-	-	-	38	-	4	100	-	40
2009	6	-	2	7	2	-	-	16	-	-	-	-	-	6	3	-	-
2014	-	-	-	-	-	-	-	-	-	-	-	5	-	-	-	-	-
2019	10	2	1	9	-	1	-	45	1	8	1	368	2	44	28	5	320
year	Average Cover (%)																
1994	-	-	-	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-	0.1
1999	-	-	0.0	0.0	0.0	-	-	-	-	-	-	-	0.0	-	-	-	-
2004	-	-	0.1	0.0	-	-	0.1	7.0	-	-	-	0.2	-	0.0	1.8	-	0.2
2009	0.0	-	0.0	0.0	0.0	-	-	0.0	-	-	-	-	-	0.0	0.0	-	-
2014	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-	-	-	-
2019	0.0	0.0	0.0	0.1	-	0.0	-	0.1	0.0	0.0	0.0	6.4	0.0	0.4	0.1	0.0	3.6

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Lesquerella (bladderpod)	Lomatium (desertparsley)	Melilotus officinalis[i] (sweetclover)	Mentzelia albicaulis[a] (whitestem blazingstar)	Packera multilobata (lobeleaf groundsel)	Penstemon caespitosus (mat penstemon)	Penstemon carnosus (fleshy beardtongue)	Phlox longifolia (longleaf phlox)	Plantago patagonica[a] (woolly plantain)	Salsola tragus[ai] (prickly Russian thistle)	Schoenocrambe linifolia (flaxleaf plainsmustard)	Sedum lanceolatum (spearleaf stonecrop)	Sisymbrium altissimum[ai] (tall tumblemustard)	Sphaeralcea coccinea (scarlet globemallow)	Taraxacum officinale (common dandelion)	Trifolium (clover)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency																
1994	7	-	-	-	6	-	-	4	41	-	-	-	-	131	12	-	-
1999	-	4	-	-	6	0	-	69	9	-	3	-	-	137	-	-	3
2004	-	4	-	-	1	-	0	13	57	16	2	-	2	149	-	-	2
2009	-	-	-	9	-	-	-	14	27	15	11	3	-	234	-	-	4
2014	-	-	-	-	-	-	-	-	16	4	-	-	2	19	-	-	-
2019	1	3	1	19	3	-	5	6	277	84	-	2	26	197	-	2	-
year	Average Cover (%)																
1994	0.0	-	-	-	0.0	-	-	0.0	0.1	-	-	-	-	1.1	0.0	-	-
1999	-	0.0	-	-	0.0	0.0	-	0.3	0.0	-	0.0	-	-	1.6	-	-	0.0
2004	-	0.0	-	-	0.0	-	0.0	0.1	0.4	0.4	0.0	-	0.0	9.1	-	-	0.0
2009	-	-	-	0.1	-	-	-	0.1	0.1	0.1	0.1	0.0	-	6.7	-	-	0.0
2014	-	-	-	-	-	-	-	-	0.1	0.1	-	-	0.0	0.1	-	-	-
2019	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	2.0	0.3	-	0.0	0.2	7.9	-	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16B-18.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. wyomingensis[p] (Wyoming big sagebrush)	Bassia prostrata[pi] (forage kochia)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Krascheninnikovia lanata[p] (winterfat)	Opuntia fragilis (brittle pricklypear)
year	Line Intercept Cover (%)					
1994	-	-	-	-	-	-
1999	-	-	-	-	-	-
2004	1.4	-	-	-	-	2.8
2009	0.5	-	0.3	-	-	1.4
2014	0	0.2	-	-	-	6.5
2019	-	4.4	-	0.3	0.9	3.4
year	Quadrat Cover (%)					
1994	10.8	-	-	0.0	-	3.0
1999	11.8	-	0.0	0.1	-	3.7
2004	1.4	-	-	-	-	2.8
2009	0.5	0.1	0.1	-	0.0	2.8
2014	0.2	0.5	-	0.0	0.0	7.0
2019	0.2	3.1	-	0.5	1.3	4.3

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16B-18.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

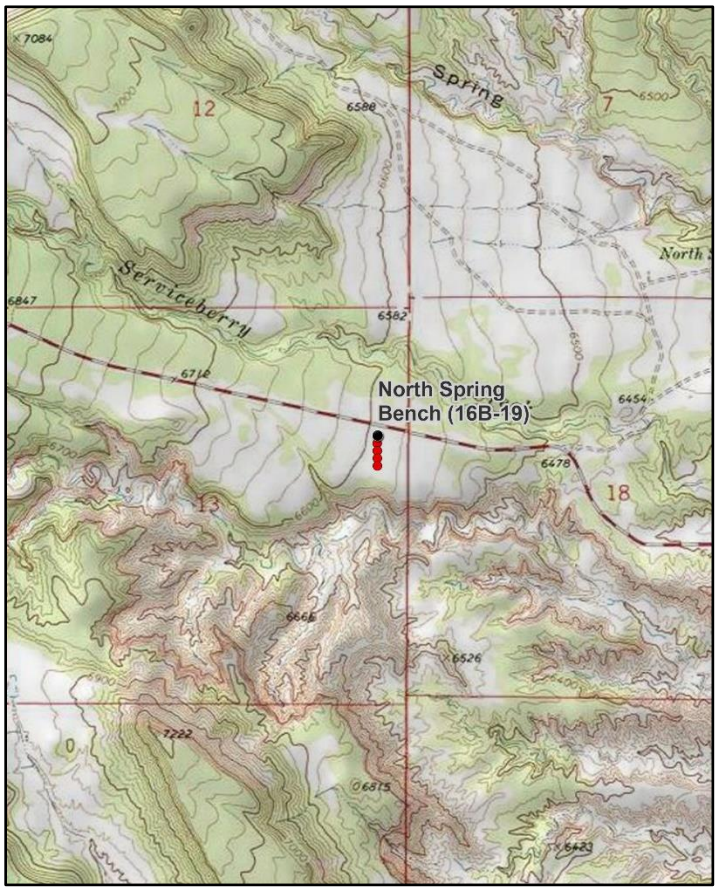
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Artemisia tridentata ssp. wyomingensis[p] -- (Wyoming big sagebrush)									
1994	6200	-	4	71	25	2	0	6	44/62
1999	7540	60	10	62	28	31	56	7	41/62
2004	1200	40	3	2	95	10	88	87	41/56
2009	1180	-	19	17	64	7	64	29	23/28
2014	200	-	0	10	90	0	4	90	22/28
2019	100	-	20	60	20	20	60	20	24/28
Atriplex canescens[p] -- (fourwing saltbush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	30/27
2014	-	-	-	-	-	-	-	-	59/78
2019	-	-	-	-	-	-	-	-	77/145
Bassia prostrata[pi] -- (forage kochia)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	220	-	0	100	0	64	27	0	16/25
2014	500	-	0	96	4	0	8	0	11/19
2019	3720	51060	49	51	0	1	0	0	18/42
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	100	-	0	100	0	0	0	0	11/26
2004	40	-	0	100	0	0	0	0	20/21
2009	440	-	50	50	0	0	5	0	13/25
2014	-	-	-	-	-	-	-	-	14/22
2019	200	-	0	100	0	0	10	0	20/48
Gutierrezia sarothrae -- (broom snakeweed)									
1994	80	-	0	100	0	0	0	0	14/19
1999	1040	-	54	46	0	0	0	0	8/13
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	17/25
2014	60	40	100	0	0	0	0	0	10/13
2019	1160	40	0	100	0	0	0	0	11/15
Krascheninnikovia lanata[p] -- (winterfat)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	30/29
2009	60	-	0	100	0	0	0	0	23/22
2014	40	-	0	50	50	50	0	50	20/30
2019	1740	220	46	54	0	6	0	0	16/26
Opuntia fragilis -- (brittle pricklypear)									
1994	6960	-	1	98	1	0	0	0	7/31
1999	7360	20	4	86	10	0	0	15	7/30
2004	5080	-	2	85	13	0	0	6	9/32
2009	4040	20	2	87	12	0	0	6	7/30
2014	3780	-	1	100	0	3	0	0	8/44
2019	3600	-	1	71	28	0	0	28	7/44

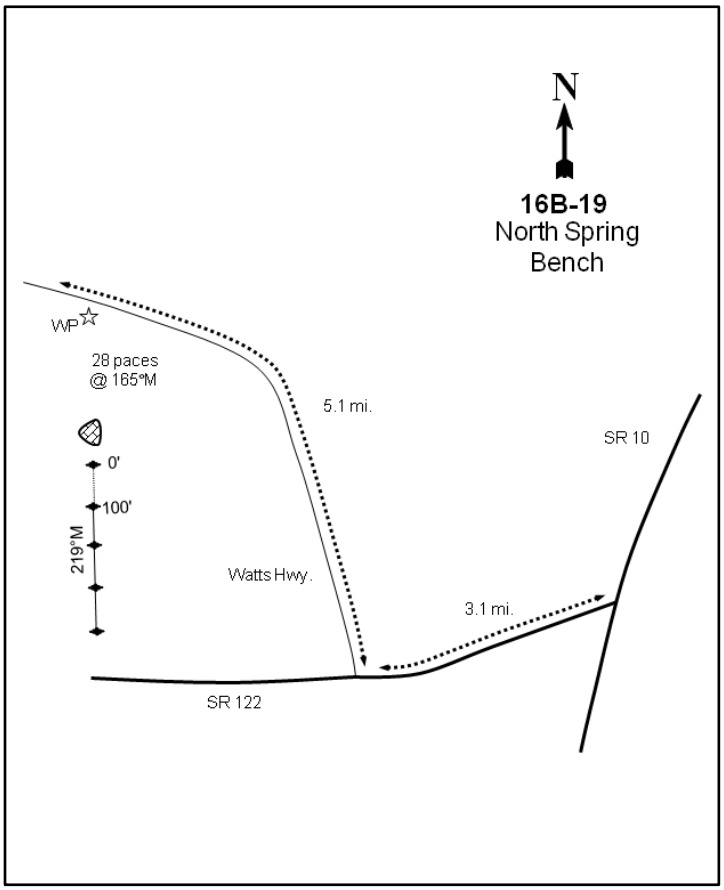
t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16B-18.15 – Deer Desirable Components Index: Low Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1994	13.4	7.4	1.7	24.4	0.0	2.4	0.0	49.5	Good
1999	14.8	6.6	5.2	28.6	0.0	4.1	0.0	59.2	Good
2004	1.8	0.0	0.0	2.7	0.0	10.0	0.0	14.5	Poor
2009	0.6	0.0	0.0	30.0	0.0	10.0	0.0	40.6	Fair
2014	0.3	0.0	0.0	19.8	0.0	0.1	0.0	20.2	Poor
2019	7.7	15.0	15.0	24.5	-9.9	10.0	0.0	62.3	Good

NORTH SPRING BENCH - STUDY NO. 16B-19





Location Information

USGS 7.5 min Map Info	Pinnacle Peak SW; Township 15S, Range 8E, Section 13
GPS (0' Stake)	NAD 83 UTM ZONE 12, 502837 East 4374797 North

Transect Information

Browse Tag # (0' Stake)	9013
Transect Bearing	165° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

From the junction of State Roads 10 and 122 south of Price, travel west on State Road 122. Drive for 3.1 miles to a major fork, turn right towards Wattis, and travel for 5.1 miles. At this point, look for a witness post 10 feet away from the south side of the road in a sagebrush flat. The first baseline stake is 28 paces south of the witness post at 165 degrees magnetic and is located behind a large rock; the 0-foot stake is marked with a red browse tag #9013. The other study posts are 18-inch tall fenceposts.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	NORTH SPRING
Elevation	6,600ft (2,012m)
Aspect	East
Slope	2-4%
Sample Dates	08/22/1994, 05/20/1999, 05/27/2004, 05/21/2009, 07/29/2014, 05/29/2019

Wildlife Habitat and Vegetation History

Table 16B-19.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter
Greater Sage-Grouse	occupied	year-long

Table 16B-19.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1988	Wyoming Big Sagebrush	Phase I
1994	Wyoming Big Sagebrush	Phase I
1999	Wyoming Big Sagebrush	Phase I
2004	Perennial Grass/Annual Forb/Pinyon	Phase I transitioning to Phase II
2009	Perennial Grass/Pinyon	Phase I transitioning to Phase II
2014	Perennial Grass/Pinyon	Phase I transitioning to Phase II
2019	Perennial Grass/Pinyon	Phase I transitioning to Phase II

Site Notes

Sheep use this area from May 1 to June 30. Deer often occupy the area until first of May; this southern end of the Gordon Creek sagebrush range receives heavy use by deer.

Soils

Table 16B-19.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	7.2	57.3	20.2	22.5	1.1	10.9	51.2	0.6	05/20/1999

Site Potential

1981 - 2010 Average Annual Precipitation	11 inches
NRCS Ecological Site	Upland Loam (Mountain Big Sagebrush-Indian Ricegrass)
NRCS Ecological Site #	R047XB308UT
States and Transitions	A defined state and transition model is available.

From study establishment in 1988 through the 1999 sample year, the plant community on this site existed as a stand of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*); other shrubs were not diverse and provided little cover. Following the severe drought in 2003, sagebrush decreased substantially in 2004 and has continued to decrease in subsequent sample years (Table 16B-19.12, Table 16B-19.13). This study site has transitioned to a perennial grass and pinyon pine community during the post-drought sample period. The herbaceous understory has remained diverse with native perennial grasses contributing a majority of the cover. The introduced annual grass species cheatgrass (*Bromus tectorum*) has been present since 1994 in generally low amounts, but cover increased by nearly 13 percent between 2014 and 2019 (Table 16B-19.7, Table 16B-19.10, Table 16B-19.11). Increased amounts of annual grasses may affect the ecological resilience of the plant community. Young twoneedle pinyon (*Pinus edulis*) were scattered across the site from 1988 through 1999, but were a minor site component. However, pinyon became a co-dominant vegetation component in 2004 as trees matured; the site has been considered to be within Phase I transitioning to Phase II of woodland succession since 2004 (Table 16B-19.4, Table 16B-19.12, Table 16B-19.14, Photos). Although not defined by the state and transition model (Jornada, 2019), this site may have the potential to progress through the phases of succession without a tree-removing disturbance and transition to a mainly tree-dominated state.

Trend Summary Tables

Table 16B-19.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	12.7	1.4	4.3	-	-	-
1999	13.6	5.4	4.5	-	-	0.9
2004	3.7	1.4	2.1	1.8	0.4	12.1
2009	2.8	1.8	11.8	1.9	1.6	12.3
2014	0.5	1.9	2.8	0.5	1.7	9.1
2019	0.4	4.3	5.0	-	2.9	11.4

Table 16B-19.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	7	339	32	24	0.0	7.9	0.1	0.1
1999	109	349	72	113	0.9	11.6	0.2	0.5
2004	15	258	304	109	0.1	6.1	8.0	1.9
2009	170	327	32	133	1.2	13.0	0.1	1.8
2014	113	297	93	79	0.9	16.2	0.8	0.4
2019	353	272	419	132	13.8	17.3	9.2	4.1

Table 16B-19.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	46.2	2.0	34.0	0.2	1.1	26.5
1999	36.0	8.3	32.2	0.3	0.8	36.1
2004	45.0	2.4	37.7	0.5	0.8	22.8
2009	39.6	1.8	47.0	0.1	0.4	33.4
2014	28.6	1.5	46.3	0.1	0.8	30.0
2019	30.9	3.7	48.3	0.3	0.8	42.8

Table 16B-19.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit	Domestic Sheep
	Quadrat Frequency				
1994	-	76	4	45	-
1999	-	82	-	54	-
2004	-	68	12	44	-
2009	-	79	11	62	1
2014	-	49	2	53	-
2019	-	25	2	54	1
Year	Days Use Per Acre (ha)				
1994	-	-	-	-	-
1999	1.5 (3.6)	159.5 (394.0)	-	-	-
2004	-	263.4 (650.5)	10.0 (24.8)	-	-
2009	-	148.1 (365.8)	27.5 (67.9)	-	18.1 (44.7)
2014	-	46.2 (114.2)	-	-	-
2019	-	24.1 (59.6)	-	-	-

Table 16B-19.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bouteloua gracilis (blue grama)	Bromus tectorum[ai] (cheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Pascopyrum smithii (western wheatgrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Sporobolus cryptandrus (sand dropseed)	Vulpia octoflora[a] (sixweeks fescue)
year	Nested Frequency								
1994	24	170	7	76	37	143	-	10	-
1999	65	157	109	88	1	195	-	-	-
2004	31	107	15	80	128	19	7	-	-
2009	60	136	170	110	197	58	12	-	4
2014	108	124	113	6	157	-	-	-	3
2019	14	130	350	19	188	17	4	1	21
year	Average Cover (%)								
1994	0.1	6.2	0.0	0.3	0.4	0.9	-	0.0	-
1999	1.2	5.7	0.9	1.7	0.2	2.8	-	-	-
2004	0.1	2.7	0.1	1.0	2.1	0.2	0.0	-	-
2009	0.7	3.3	1.2	1.9	6.7	0.4	0.1	-	0.0
2014	4.7	2.9	0.8	0.1	8.6	-	-	-	0.0
2019	0.7	5.2	13.7	0.5	10.7	0.2	0.0	0.0	0.1

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16B-19.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Alyssum desertorum[ai] (desert madwort)	Arabis (rockcress)	Astragalus convallarius (lesser rushy milkvetch)	Calochortus nuttallii (sego lily)	Castilleja angustifolia (northwestern Indian paintbrush)	Ceratocephala testiculata[ai] (curveseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Chaetopappa ericoides (rose heath)	Chenopodium fremontii[a] (Fremont's goosefoot)	Chenopodium leptophyllum[a] (narrowleaf goosefoot)	Cryptantha[a] (annual cryptantha)	Cymopterus (springparsley)	Descurainia pinnata[a] (western tansymustard)	Epilobium brachycarpum[a] (tall annual willowherb)	Eriogonum cernuum[a] (nodding buckwheat)	Gayophytum ramosissimum[a] (pinyon groundsmoke)	Gilia inconspicua[a] (shy gilia)
year	Nested Frequency																
1994	-	-	-	-	-	-	-	-	-	-	-	-	19	-	5	-	-
1999	-	-	3	-	2	-	1	-	-	-	-	1	5	-	-	-	-
2004	-	-	4	1	-	-	-	0	34	163	37	5	10	-	16	118	123
2009	-	2	1	-	-	3	4	5	-	-	5	-	-	2	5	3	-
2014	-	-	-	-	-	-	-	-	-	-	-	-	5	-	-	-	3
2019	1	-	4	2	-	2	-	-	23	45	46	2	192	-	-	12	9
year	Average Cover (%)																
1994	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	0.0	-	-
1999	-	-	0.0	-	0.1	-	0.0	-	-	-	-	0.0	0.0	-	-	-	-
2004	-	-	0.0	0.0	-	-	-	0.0	0.2	1.4	0.8	0.0	0.0	-	0.1	1.0	1.1
2009	-	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	-	-	0.0	0.0	0.0	-
2014	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-	-	0.0
2019	0.0	-	0.0	0.0	-	0.0	-	-	0.1	0.1	0.4	0.0	1.3	-	-	0.0	0.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Lappula occidentalis[a] (flatspine stickseed)	Oenothera (evening primrose)	Phlox longifolia (longleaf phlox)	Plantago patagonica[a] (woolly plantain)	Salsola tragus[ai] (prickly Russian thistle)	Schoenocrambe linifolia (flaxleaf plainsmustard)	Sisymbrium altissimum[ai] (tall tumblemustard)	Sphaeralcea coccinea (scarlet globemallow)	Townsendia incana (hoary Townsend daisy)
year	Nested Frequency								
1994	-	-	1	11	-	-	-	24	-
1999	16	-	51	54	-	24	-	52	2
2004	130	1	42	143	24	17	-	52	1
2009	1	-	11	18	-	28	-	99	1
2014	4	-	-	80	1	4	-	76	-
2019	247	-	4	296	-	3	51	123	-
year	Average Cover (%)								
1994	-	-	0.0	0.0	-	-	-	0.1	-
1999	0.1	-	0.2	0.2	-	0.0	-	0.2	0.0
2004	1.3	0.0	0.2	1.9	0.2	0.1	-	1.5	0.0
2009	0.0	-	0.0	0.1	-	0.2	-	1.4	0.0
2014	0.0	-	-	0.7	0.0	0.0	-	0.4	-
2019	2.5	-	0.1	3.4	-	0.2	1.3	3.8	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16B-19.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma[t] (Utah juniper)	Opuntia fragilis (brittle pricklypear)	Pinus edulis[t] (twoneedle pinyon)	Symphoricarpos oreophilus[p] (mountain snowberry)
year	Line Intercept Cover (%)						
1994	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-
2004	1.8	-	0.2	-	0.2	12.1	-
2009	1.9	-	1.4	-	0.2	12.3	-
2014	0.5	-	0.4	-	1.3	9.1	-
2019	-	-	0.6	0.6	2.3	10.8	-
year	Quadrat Cover (%)						
1994	12.7	-	0.1	1.3	1.3	3.1	-
1999	13.6	-	3.0	-	2.4	4.5	-
2004	3.7	-	0.3	0.1	1.0	2.0	-
2009	2.8	-	1.2	0.4	0.5	11.5	-
2014	0.5	0.0	0.6	0.1	1.3	2.6	-
2019	-	-	1.7	0.9	2.6	4.2	0.4

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16B-19.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1994	4580	1180	3	36	62	49	8	27	93/90
1999	6320	760	23	46	31	15	48	15	43/65
2004	2060	20	3	0	97	3	88	91	33/49
2009	2240	20	13	19	68	8	72	56	37/33
2014	600	-	0	27	73	3	63	60	33/44
2019	80	-	0	75	25	0	25	25	28/32
Atriplex canescens[p] -- (fourwing saltbush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	60	-	100	0	0	100	0	0	- / -
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	70/49
2014	-	-	-	-	-	-	-	-	116/71
2019	-	-	-	-	-	-	-	-	-/-
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	25/24
2009	-	-	-	-	-	-	-	-	-/-
2014	120	-	0	100	0	0	0	0	- / -
2019	-	-	-	-	-	-	-	-	-/-
Ephedra viridis[p] -- (mormon tea)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	40	-	0	100	0	0	0	0	34/45
2009	-	-	-	-	-	-	-	-	-/-
2014	20	-	0	100	0	100	0	0	- / -
2019	40	-	0	100	0	0	100	0	14/15
Gutierrezia sarothrae -- (broom snakeweed)									
1994	860	-	23	74	2	0	0	0	15/15
1999	16500	1020	24	76	0	9	0	1	11/14
2004	1340	160	8	93	0	6	0	0	14/15
2009	5480	20	13	86	1	0	1	2	15/16
2014	1240	60	11	87	2	0	0	0	11/13
2019	3380	480	24	76	0	2	0	0	13/16
Juniperus osteosperma[t] -- (Utah juniper)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	20	0	0	0	0	0	0	- / -
2004	20	-	100	0	0	0	0	0	- / -
2009	40	-	100	0	0	0	0	0	- / -
2014	-	-	-	-	-	-	-	-	-/-
2019	40	-	100	0	0	0	0	0	- / -
Opuntia fragilis -- (brittle pricklypear)									
1994	4800	-	3	97	0	0	0	0	5/21
1999	4900	-	15	78	7	0	0	19	5/16
2004	1920	-	14	81	5	0	0	3	7/19
2009	1880	-	5	83	12	0	0	13	6/18
2014	2100	-	3	97	0	0	0	0	7/23
2019	2220	-	2	98	0	0	0	4	7/31

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Pinus edulis[t] -- (twoneedle pinyon)									
1994	-	-	-	-	-	-	-	-	-/-
1999	60	-	67	33	0	0	0	0	- / -
2004	60	-	0	100	0	0	0	0	- / -
2009	60	-	67	33	0	0	0	0	- / -
2014	40	-	50	50	0	0	0	0	- / -
2019	60	-	33	67	0	33	0	0	- / -
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	40	-	0	100	0	0	0	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

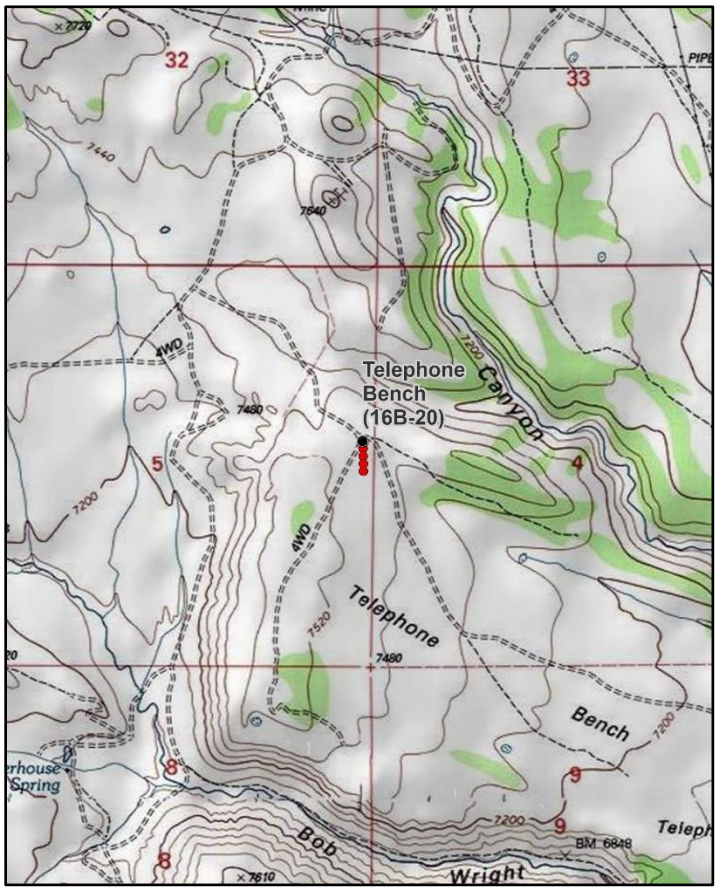
Table 16B-19.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

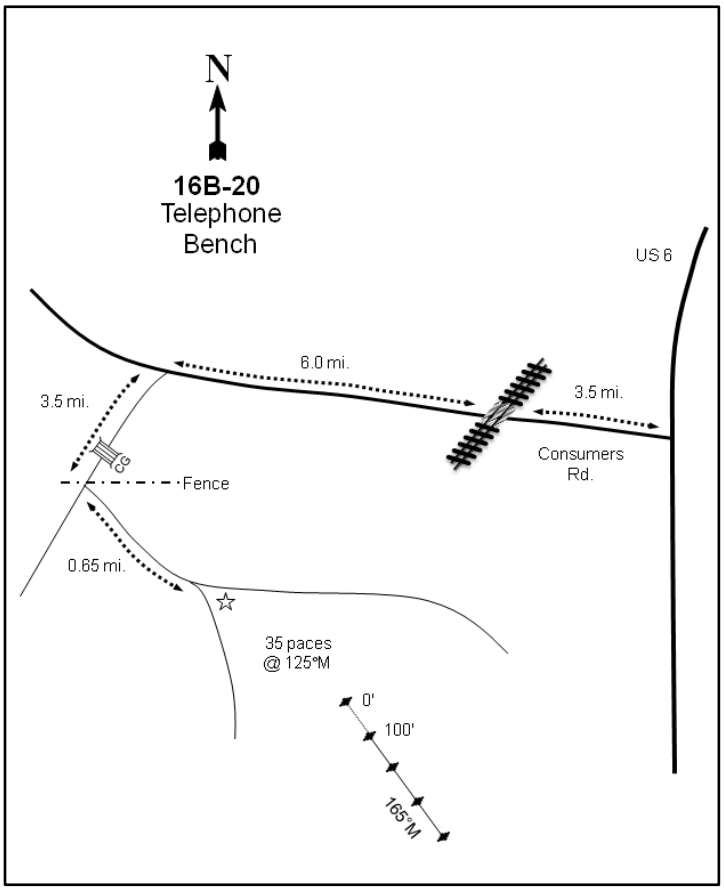
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1994	5	-	-	-	-	-	8.0
1999	3	-	-	-	-	-	5.3
2009	15	-	67	22	11	-	8.0
2014	17	10	60	10	20	-	5.0
2019	16	-	50	30	10	10	9.0
Pinus edulis (twoneedle pinyon)							
1994	154	-	-	-	-	-	3.6
1999	140	-	-	-	-	-	4.8
2004	156	-	53	37	11	-	6.6
2009	140	-	37	53	5	5	7.8
2014	119	-	21	58	21	-	7.2
2019	150	5	5	68	16	5	8.2

Table 16B-19.15 – Deer Desirable Components Index: Mid Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1994	15.8	-3.5	1.3	15.7	0.0	0.1	0.0	29.5	Very Poor
1999	17.0	5.8	11.7	23.3	-0.7	0.9	0.0	57.9	Fair
2004	2.3	0.0	0.0	12.3	-0.1	3.7	0.0	18.2	Very Poor
2009	2.4	0.0	0.0	26.0	-0.9	3.5	0.0	31.0	Very Poor
2014	0.6	0.0	0.0	30.0	-0.7	0.8	0.0	30.8	Very Poor
2019	0.0	0.0	0.0	30.0	-10.3	8.1	0.0	27.8	Very Poor

TELEPHONE BENCH - STUDY NO. 16B-20





Location Information

USGS 7.5 min Map Info	Jump Creek SE; Township 14S, Range 8E, Section 05
GPS (0' Stake)	NAD 83 UTM ZONE 12, 496377 East 4387584 North

Transect Information

Browse Tag # (0' Stake)	Not Available
Transect Bearing	165° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

From the intersection of US-6 and the Consumers Road south of Helper, travel 3.5 miles to a railroad crossing, then continue up the oil road for 6.0 miles. Turn left onto a dirt road, cross Gordon Creek, and proceed approximately 2.3 miles to a cattle guard. Drive 1.2 miles to a wire fence. Just beyond the fence, turn left at the fork and go 0.45 miles to another fence. Continue on for 0.2 miles to a fork at the top of the hill: the study site is between the forks. The 0-foot baseline stake is 35 paces southeast of the fork. The study is marked by green, 18-inch tall fenceposts.

Site Information

Land Ownership	State
Land Administrator	UDWR
Allotment	GORDON CRK WITHDRAWL
Elevation	7,470ft (2,277m)
Aspect	East
Slope	3-5%
Sample Dates	08/28/1994, 07/30/1999, 05/25/2004, 05/28/2009, 07/30/2014, 05/29/2019

Table 16B-20.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Hand Crew - Lop and Scatter	North Springs PJ Removal Phase II	3583	March-October 2018	4484

Wildlife Habitat and Vegetation History

Table 16B-20.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter
Greater Sage-Grouse	occupied	year-long

Table 16B-20.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1988	Perennial Grass/Black Sagebrush	No Encroachment
1994	Perennial Grass/Black Sagebrush	No Encroachment
1999	Perennial Grass/Black Sagebrush	Phase I
2004	Perennial Grass/Black Sagebrush	Phase I
2009	Perennial Grass/Black Sagebrush	Phase I
2014	Perennial Grass/Black Sagebrush	Phase I
2019	Perennial Grass/Black Sagebrush	Phase I

Site Notes

No Notes

Soils

Table 16B-20.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.4	38.4	29.8	31.8	1.7	5.7	83.2	0.5	07/30/1999

Site Potential

1981 - 2010 Average Annual Precipitation	15 inches
NRCS Ecological Site	Upland Shallow Loam (Black Sagebrush)
NRCS Ecological Site #	R034BY320UT
States and Transitions	No state and transition model is available for this ecological site.

Black sagebrush (*Artemisia nova*) has been the dominant browse species on this site since study establishment in 1988. A variety of other shrubs have also been present, but with much less cover (Table 16B-20.12, Table 16B-20.13, Photos). The herbaceous understory has remained abundant. Native perennial grasses have provided most of the herbaceous cover and have been a co-dominant vegetation component throughout the study period. Forbs have been diverse, but individual species have provided limited cover (Table 16B-20.7, Table 16B-20.10, Table 16B-20.11). Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) have been observed on site since 1999 and the site has been classified as being within Phase I of woodland succession since that time (Table 16B-20.4, Table 16B-20.14, Photos). Further tree encroachment could cause this site to transition to a pinyon-juniper dominated state in the future. As trees have remained relatively rare over time, however, this is likely not an immediate concern. Barring a major disturbance or changes in land management, this study site will likely remain in this or a similar state in future sample years.

Trend Summary Tables

Table 16B-20.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	9.1	2.5	-	-	-	-
1999	12.4	2.3	-	-	-	-
2004	6.0	3.2	-	6.8	2.4	-
2009	11.1	0.3	-	10.3	0.4	-
2014	15.0	1.0	-	21.2	0.7	-
2019	18.5	1.2	-	25.3	0.5	-

Table 16B-20.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	-	404	15	260	-	16.3	0.0	2.7
1999	-	395	1	223	-	21.4	0.0	4.5
2004	4	351	195	242	0.0	16.5	2.3	6.2
2009	-	365	196	189	-	21.2	1.2	2.9
2014	-	359	31	180	-	24.2	0.1	1.8
2019	12	371	321	292	0.8	20.3	4.9	5.0

Table 16B-20.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	34.4	4.6	41.7	0.5	2.3	32.3
1999	31.4	6.3	24.7	0.6	2.0	37.6
2004	45.2	2.6	28.1	0.5	2.7	32.1
2009	35.9	0.6	35.1	0.4	2.2	40.9
2014	39.9	1.2	29.5	0.4	2.4	44.3
2019	34.6	4.3	37.5	0.8	2.4	44.4

Table 16B-20.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1994	-	18	51	20
1999	-	17	37	6
2004	-	7	61	4
2009	-	24	34	9
2014	8	12	12	6
2019	3	17	4	46
Year	Days Use Per Acre (ha)			
1994	-	-	-	-
1999	0.7 (1.8)	19.4 (48.0)	72.4 (178.8)	-
2004	0.7 (1.8)	30.8 (76.1)	94.5 (233.4)	-
2009	1.5 (3.6)	32.2 (79.5)	71.1 (175.5)	-
2014	15.3 (37.7)	12.1 (29.8)	26.2 (64.6)	-
2019	-	12.1 (29.8)	4.7 (11.6)	-

Table 16B-20.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bouteloua gracilis (blue grama)	Bromus tectorum[ai] (cheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Koeleria macrantha (prairie Junegrass)	Leymus salinus (saline wildrye)	Pascopyrum smithii (western wheatgrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency											
1994	3	-	15	-	27	-	3	73	277	280	-	-
1999	4	-	25	-	22	-	3	87	78	37	167	278
2004	10	-	18	4	4	-	-	66	12	1	310	147
2009	7	-	21	-	8	-	-	125	5	20	236	182
2014	26	-	25	-	6	0	0	248	11	36	165	69
2019	3	53	15	12	-	3	-	193	37	33	294	5
year	Average Cover (%)											
1994	0.0	-	0.5	-	0.1	-	0.0	2.4	8.9	4.4	-	-
1999	0.0	-	0.5	-	0.4	-	0.0	4.2	0.7	0.4	2.3	12.8
2004	0.3	-	0.9	0.0	0.0	-	-	3.0	0.6	0.0	8.7	3.0
2009	0.0	-	1.4	-	0.2	-	-	8.8	0.0	0.5	3.8	6.4
2014	0.6	-	2.1	-	0.1	0.0	0.0	14.2	0.0	0.9	2.1	4.1
2019	0.0	1.1	0.1	0.8	-	0.0	-	9.6	0.2	0.7	8.0	0.6

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16B-20.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Alyssum desertorum[ai] (desert madwort)	Antennaria (pussytoes)	Arabis (rockcress)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus tenellus (looseflower milkvetch)	Calochortus nuttallii (sego lily)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata[ai] (curveseed butterwort)	Chenopodium album[a] (lambsquarters)	Collinsia parviflora[a] (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawksbeard)	Cymopterus (springparsley)	Delphinium nuttallianum (twolobe larkspur)	Descurainia pinnata[a] (western tansymustard)	Erigeron eatonii (Eaton's fleabane)
year	Nested Frequency																
1994	-	-	51	2	44	1	4	21	-	-	3	24	38	-	-	3	39
1999	5	-	15	4	53	9	3	29	-	-	-	34	1	-	-	1	15
2004	0	-	2	1	61	-	29	12	-	-	75	15	0	-	3	21	-
2009	1	-	-	6	8	2	7	38	2	2	187	3	7	1	1	-	1
2014	-	-	23	5	43	-	6	9	-	-	-	23	1	3	-	6	4
2019	7	13	-	4	18	-	207	9	13	4	264	5	2	10	24	25	8
year	Average Cover (%)																
1994	-	-	0.9	0.0	0.1	0.0	0.0	0.1	-	-	0.0	0.1	0.3	-	-	0.0	0.2
1999	0.0	-	0.3	0.0	0.8	0.6	0.0	0.2	-	-	-	0.4	0.0	-	-	0.0	0.0
2004	0.0	-	0.0	0.0	0.5	-	0.1	0.1	-	-	0.3	0.1	0.0	-	0.0	0.0	-
2009	0.0	-	-	0.0	0.1	0.0	0.0	0.5	0.0	0.0	1.1	0.0	0.1	0.0	0.0	-	0.0
2014	-	-	0.0	0.0	0.7	-	0.0	0.0	-	-	-	0.1	0.0	0.0	-	0.0	0.0
2019	0.1	0.1	-	0.0	0.3	-	1.8	0.1	0.1	0.1	3.0	0.0	0.0	0.1	0.3	0.4	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Eriogonum jamesii (James' buckwheat)	Eriogonum racemosum (redroot buckwheat)	Erodium cicutarium[ai] (redstem stork's bill)	Gilia inconspicua[a] (shy gilia)	Lactuca serriola[ai] (prickly lettuce)	Lappula occidentalis[a] (flatspine stickseed)	Lesquerella (bladderpod)	Lomatium (desertparsley)	Machaeranthera grindelioides (rayless tansyaster)	Orogenia linearifolia (Great Basin Indian potato)	Packera multilobata (lobeleaf groundsel)	Pedicularis centranthera (dwarf lousewort)	Penstemon carnosus (fleshy beardtongue)	Penstemon watsonii (Watson's penstemon)	Phlox longifolia (longleaf phlox)	Polygonum douglasii[a] (Douglas' knotweed)	Schoenocrambe linifolia (flaxleaf plainsmustard)
year	Nested Frequency																
1994	12	-	-	4	-	3	50	6	11	-	-	-	-	37	124	2	-
1999	10	-	-	-	-	-	67	1	16	-	5	-	-	54	9	-	-
2004	12	-	-	-	-	139	160	-	5	-	12	11	14	2	5	5	2
2009	19	-	-	-	-	32	19	-	6	-	-	12	14	2	40	-	12
2014	8	2	-	-	-	26	68	-	10	-	-	-	12	2	18	2	10
2019	-	12	1	-	4	128	42	1	3	2	3	9	5	4	83	32	1
year	Average Cover (%)																
1994	0.3	-	-	0.0	-	0.0	0.1	0.0	0.0	-	-	-	-	0.1	0.3	0.0	-
1999	0.2	-	-	-	-	-	0.5	0.0	0.4	-	0.0	-	-	0.8	0.0	-	-
2004	0.5	-	-	-	-	2.1	3.4	-	0.1	-	0.3	0.4	0.1	0.0	0.0	0.0	0.0
2009	0.6	-	-	-	-	0.1	0.0	-	0.1	-	-	0.4	0.1	0.0	0.2	-	0.1
2014	0.2	0.0	-	-	-	0.1	0.3	-	0.0	-	-	-	0.1	0.0	0.1	0.0	0.1
2019	-	0.5	0.0	-	0.0	1.1	0.1	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.6	0.1	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Sphaeralcea coccinea (scarlet globemallow)	Tetraneuris acaulis (stemless four-nerve daisy)	Trifolium gymnocarpon (hollyleaf clover)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency			
1994	5	-	17	-
1999	24	4	4	-
2004	21	3	23	5
2009	27	5	22	24
2014	4	4	5	-
2019	15	-	19	3
year	Average Cover (%)			
1994	0.1	-	0.0	-
1999	0.1	0.1	0.0	-
2004	0.4	0.0	0.2	0.0
2009	0.5	0.0	0.1	0.1
2014	0.0	0.0	0.0	-
2019	0.2	-	0.3	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16B-20.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis[p] (Utah serviceberry)	Artemisia nova[p] (black sagebrush)	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Chrysothamnus depressus[p] (longflower rabbitbrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Eriogonum corymbosum (crispleaf buckwheat)	Gutierrezia sarothrae (broom snakeweed)	Opuntia (pricklypear)	Pediocactus simpsonii (mountain ball cactus)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)									
1994	-	-	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-	-	-
2004	0.1	5.3	0.3	1.1	0.2	-	2.2	-	-	-
2009	-	8.4	0	1.9	0	-	0.4	-	-	-
2014	0.2	18.9	0.3	1.8	0.4	0.1	0.2	-	-	-
2019	0.1	24.4	0.4	0.4	0.2	-	0.3	-	-	-
year	Quadrat Cover (%)									
1994	0.6	5.2	0.8	2.5	0.9	0.0	1.5	0.0	0.0	-
1999	0.4	7.7	0.0	4.3	0.7	0.1	1.5	-	-	0.0
2004	0.6	4.3	0.0	1.2	0.0	-	3.2	-	0.0	-
2009	0.8	8.1	0.2	2.0	0.1	-	0.1	0.0	-	-
2014	0.4	12.8	0.3	1.5	0.1	0.5	0.4	-	-	-
2019	0.0	17.1	0.7	0.7	0.4	-	0.7	-	-	0.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16B-20.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
1994	180	-	0	100	0	44	22	0	43/54
1999	200	20	30	70	0	30	70	0	61/70
2004	220	-	0	100	0	0	100	0	53/66
2009	220	120	9	91	0	0	82	27	63/82
2014	260	-	23	77	0	31	39	8	72/85
2019	260	-	15	46	39	15	69	39	60/79
Artemisia nova[p] -- (black sagebrush)									
1994	6680	120	14	31	55	35	1	34	22/37
1999	6840	1460	16	70	15	40	16	3	21/42
2004	4480	8160	9	67	25	19	0	12	24/44
2009	33860	4780	77	21	2	33	4	1	20/47
2014	19940	700	41	59	1	39	34	2	26/45
2019	20700	-	8	65	27	9	21	30	16/39
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1994	180	-	0	67	33	78	0	11	41/55
1999	360	120	11	72	17	50	28	11	38/57
2004	100	-	0	40	60	20	60	20	43/70
2009	140	-	29	43	29	29	29	0	40/72
2014	200	40	20	80	0	40	50	0	42/60
2019	780	-	5	87	8	28	67	8	29/50

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Chrysothamnus depressus[p] -- (longflower rabbitbrush)									
1994	6140	-	1	98	1	0	0	0	10/19
1999	6260	680	5	94	1	19	0	0	10/25
2004	2240	20	2	78	21	21	9	15	12/21
2009	3660	40	22	76	2	30	16	1	10/25
2014	3380	240	17	81	2	36	28	1	19/24
2019	1280	-	2	67	31	31	3	31	8/14
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1994	2520	-	3	96	1	0	0	0	10/23
1999	1600	-	1	99	0	1	0	0	12/24
2004	380	-	0	100	0	5	0	0	13/26
2009	560	-	4	96	0	0	0	0	13/26
2014	900	-	13	87	0	53	2	7	13/23
2019	200	-	0	100	0	80	0	0	6/11
Eriogonum corymbosum -- (crispleaf buckwheat)									
1994	60	-	0	100	0	33	0	0	31/67
1999	180	-	0	100	0	11	0	0	25/46
2004	-	-	-	-	-	-	-	-	38/60
2009	20	-	0	100	0	0	0	0	35/59
2014	100	-	20	80	0	80	0	0	35/80
2019	-	-	-	-	-	-	-	-	-/-
Gutierrezia sarothrae -- (broom snakeweed)									
1994	2320	20	22	74	4	0	0	1	12/16
1999	5940	100	7	93	0	0	0	0	14/17
2004	14220	340	12	88	0	0	0	0	11/17
2009	1600	80	18	68	15	0	0	8	9/16
2014	540	20	15	85	0	4	0	0	13/19
2019	2080	20	8	92	0	1	0	0	9/14
Opuntia -- (pricklypear)									
1994	40	-	50	50	0	0	0	0	4/14
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	40	-	0	100	0	0	0	0	- / -
2014	-	-	-	-	-	-	-	-	9/21
2019	40	-	0	100	0	0	0	0	5/15
Pediocactus simpsonii -- (mountain ball cactus)									
1994	20	-	0	100	0	0	0	0	- / -
1999	20	-	0	100	0	0	100	0	16/8
2004	20	-	0	100	0	0	0	0	2/4
2009	80	-	0	100	0	0	0	0	4/8
2014	40	-	0	100	0	0	0	0	6/9
2019	-	-	-	-	-	-	-	-	4/5
Sambucus nigra ssp. cerulea[p] -- (blue elderberry)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	6/29
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Tetradymia canescens -- (spineless horsebrush)									
1994	40	20	0	100	0	0	0	0	27/37
1999	100	-	20	80	0	20	0	0	20/39
2004	100	-	0	80	20	0	0	0	23/41
2009	80	-	25	75	0	50	0	0	23/47
2014	60	-	0	100	0	67	33	0	24/44
2019	100	-	0	100	0	20	80	60	20/33

t - Tree Species; p - Preferred Browse; i - Introduced Species

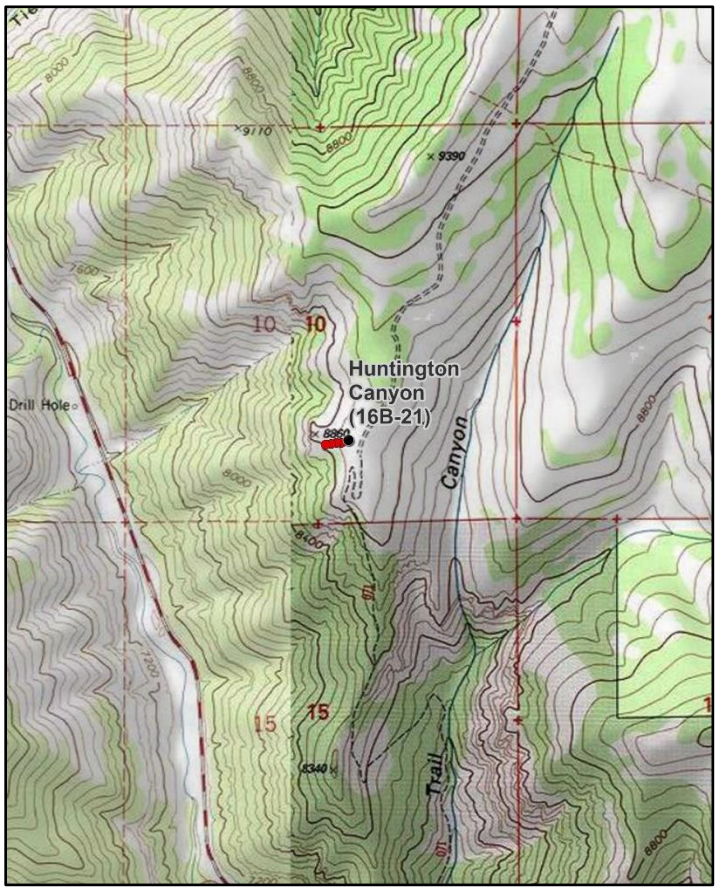
Table 16B-20.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

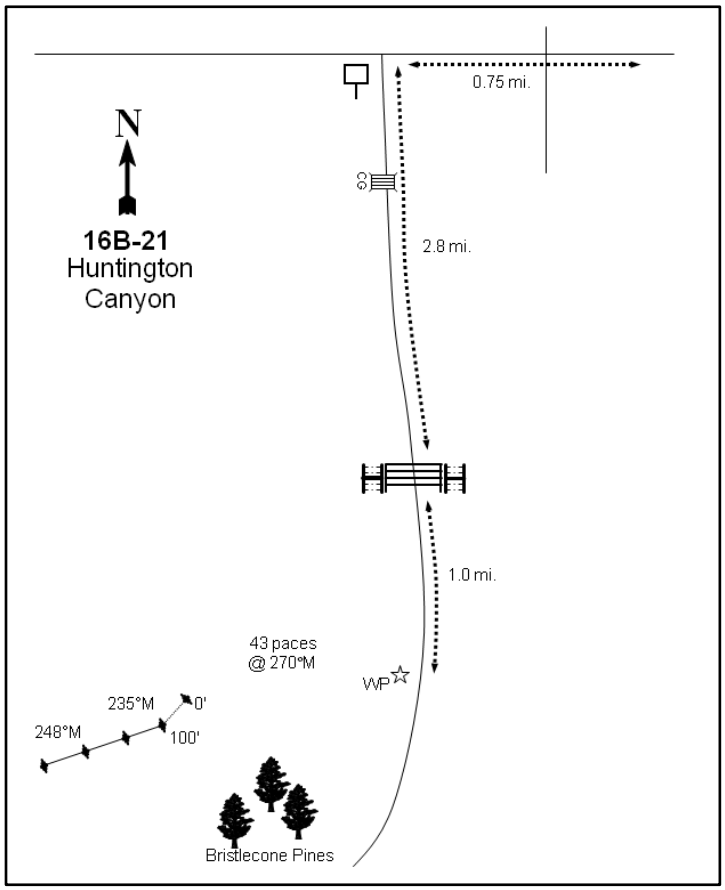
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2014	11	-	-	100	-	-	10.0
Pinus edulis (twoneedle pinyon)							
2014	10	-	86	14	-	-	5.6
2019	4	-	100	-	-	-	3.0

Table 16B-20.15 – Deer Desirable Components Index: Mid Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1994	11.5	4.4	4.0	30.0	0.0	5.4	0.0	55.3	Fair
1999	15.7	12.2	6.3	30.0	0.0	9.0	0.0	73.1	Good
2004	8.5	7.5	3.6	30.0	0.0	10.0	0.0	59.6	Fair
2009	12.9	14.4	15.0	30.0	0.0	5.8	0.0	78.0	Good-Excellent
2014	26.6	14.8	15.0	30.0	0.0	3.7	0.0	90.0	Excellent
2019	30.0	7.0	3.9	30.0	-0.6	10.0	0.0	80.4	Good-Excellent

HUNTINGTON CANYON - STUDY NO. 16B-21





Location Information

USGS 7.5 min Map Info	Hiawatha NW; Township 16S, Range 7E, Section 10
GPS (0' Stake)	NAD 83 UTM ZONE 12, 489415 East 4365800 North

Transect Information

Browse Tag # (0' Stake)	9016
Transect Bearing	235° magnetic (Lines 2-4: 248° magnetic)
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

From the ghost town of Mohrland, proceed past the coal load-out and up Cedar Creek. Travel for 4.5 miles to the top of Gentry Mountain and a three-way junction. Take the middle road (#252) and continue for 0.1 miles to a fence and cattle guard at the Forest Service Boundary. Travel for 0.65 miles to a fork with a sign, then turn right toward McCadden Hollow. Drive for 0.7 miles to a cattle guard. Continue 2.1 miles on the main road, passing a few minor forks, to a gated fence. Pass through the gate and continue down the road for one mile; there is a witness post on the right (west) side of the road. Walk west from the road for 43 paces to the edge by a patch of bristlecone pine: the 0-foot stake is just north of these trees.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	GENTRY
Elevation	8,840ft (2,694m)
Aspect	Southwest
Slope	35-50%
Sample Dates	08/23/1994, 08/09/1999, 08/02/2004, 08/05/2009, 07/23/2014, 07/02/2019

Wildlife Habitat and Vegetation History

Table 16B-21.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	summer
Rocky Mountain Elk	crucial	winter
Shiras Moose	crucial	winter

Table 16B-21.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1988	Perennial Grass/Mixed Mountain Brush	Phase I
1994	Perennial Grass/Mixed Mountain Brush	Phase I
1999	Perennial Grass/Mixed Mountain Brush	Phase I
2004	Perennial Grass/Mixed Mountain Brush	Phase I
2009	Perennial Grass/Mixed Mountain Brush	Phase I
2014	Perennial Grass/Mixed Mountain Brush	Phase I
2019	Perennial Grass/Mixed Mountain Brush	Phase I

Site Notes

The windswept ridge tops and steep side hills are important winter range for elk on Gentry Mountain. Adjacent stands of curl-leaf mountain mahogany (*Cercocarpus ledifolius*) have shown signs of heavy elk use in the past. Although mountain mahogany provides good thermal cover, much of the forage is unavailable because the mature trees are highlined.

Soils

Table 16B-21.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.5	36.0	25.4	38.6	1.6	2.8	64.0	0.6	08/09/1999

Site Potential

1981 - 2010 Average Annual Precipitation	19 inches
NRCS Ecological Site	Mountain Very Steep Stony Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA474UT
States and Transitions	A defined state and transition model is available.

Since study establishment in 1988, the plant community on this site has remained in a stable state as a mixed perennial grass and scattered mountain brush community: this state most closely resembles the Perennial Grass State illustrated by the state and transition model (Jornada, 2019). The shrub component on this site has been diverse with mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and curl-leaf mountain mahogany (*Cercocarpus ledifolius*) providing a majority of the browse cover (Table 16B-21.12, Table 16B-21.13). Conifer encroachment by limber pine (*Pinus flexilis*) and Rocky Mountain juniper (*Juniperus scopulorum*) has been occurring on this site throughout the study period, but in limited amounts; this study site has been considered to be within Phase I of woodland succession in all years (Table 16B-21.4, Table 16B-21.12, Table 16B-21.14). The herbaceous understory has been dominated by the native perennial grass species saline wildrye (*Leymus salinus*) since the outset of the study. Forbs have been diverse with fluctuating cover, and annual grasses have not been observed in any sample year (Table 16B-21.7, Table 16B-21.10, Table 16B-21.11). Barring a major disturbance or changes in management, this site will likely remain in this or a similar state in future years.

Trend Summary Tables

Table 16B-21.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	3.1	2.1	0.8	-	-	-
1999	6.5	1.3	2.2	0.4	-	0.3
2004	4.3	2.5	3.3	7.8	2.7	7.1
2009	4.5	1.6	3.1	9.3	2.8	5.7
2014	5.1	1.4	4.1	8.0	3.3	5.1
2019	8.4	3.0	1.1	8.7	2.7	1.7

Table 16B-21.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	-	290	-	154	-	12.4	-	3.5
1999	-	278	-	207	-	12.9	-	8.7
2004	-	271	3	126	-	12.2	0.0	1.5
2009	-	293	-	111	-	12.8	-	1.8
2014	-	287	-	175	-	18.5	-	5.1
2019	-	303	3	185	-	21.1	0.0	13.4

Table 16B-21.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	32.7	0.1	22.3	6.5	30.7	20.3
1999	17.3	0.0	20.5	14.1	18.6	34.6
2004	30.4	0.3	19.5	14.9	21.4	24.0
2009	29.1	0.1	26.8	8.4	17.4	24.6
2014	25.7	0.1	20.3	10.7	25.4	34.7
2019	21.8	0.0	28.5	20.6	16.3	37.9

Table 16B-21.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Coyote	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency				
1994	-	-	4	29	7
1999	-	-	3	24	7
2004	-	-	2	43	5
2009	2	-	4	36	5
2014	4	-	1	6	-
2019	1	-	2	12	-
Year	Days Use Per Acre (ha)				
1994	-	-	-	-	-
1999	1.5 (3.6)	-	2.7 (6.6)	53.0 (130.8)	-
2004	9.4 (23.3)	-	0.7 (1.7)	57.0 (140.7)	-
2009	11.6 (28.7)	8.7 (21.5)*	-	34.2 (84.4)	-
2014	-	-	2.0 (5.0)	4.0 (9.9)	-
2019	5.8 (14.3)	-	2.7 (6.6)	26.2 (64.6)	-

*Pellets per acre (ha)

Table 16B-21.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Leymus salinus (saline wildrye)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium[i] (intermediate wheatgrass)
year	Nested Frequency				
1994	283	12	1	-	3
1999	275	18	3	-	-
2004	270	2	1	3	-
2009	293	7	4	-	-
2014	283	9	13	1	-
2019	295	17	5	-	-
year	Average Cover (%)				
1994	12.1	0.2	0.0	-	0.0
1999	12.7	0.1	0.0	-	-
2004	12.2	0.0	0.0	0.0	-
2009	12.7	0.0	0.0	-	-
2014	18.0	0.1	0.0	0.4	-
2019	20.3	0.7	0.1	-	-

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16B-21.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Arabis (rockcress)	Arenaria fendleri (Fendler's sandwort)	Astragalus (milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus tenellus (looseflower milkvetch)	Castilleja linariifolia (Wyoming Indian paintbrush)	Chaenactis douglasii (Douglas' dustymaiden)	Cryptantha (cryptantha)	Descurainia pinnata[a] (western tansymustard)	Hymenopappus filifolius (fineleaf hymenopappus)	Hymenoxys richardsonii (pingue rubberweed)	Lesquerella (bladderpod)	Lupinus (lupine)	Machaeranthera canescens (hoary tansyaster)	Machaeranthera grindelioides (rayless tansyaster)	Packera multilobata (lobeleaf groundsel)	Penstemon (beardtongue)
year	Nested Frequency																
1994	-	7	-	9	28	-	2	-	-	-	102	-	0	-	20	-	1
1999	-	-	-	105	10	-	13	-	-	-	97	1	0	-	31	-	1
2004	-	-	-	20	2	-	-	2	-	16	35	-	-	2	23	-	-
2009	-	-	-	24	3	-	-	-	-	10	51	-	3	0	30	-	2
2014	5	-	-	67	6	1	-	1	-	2	75	8	-	0	23	-	7
2019	-	-	3	15	93	5	2	4	3	5	44	9	-	2	19	8	14
year	Average Cover (%)																
1994	-	0.0	-	0.1	1.2	-	0.0	-	-	-	1.9	-	0.0	-	0.2	-	0.0
1999	-	-	-	4.7	0.7	-	0.1	-	-	-	1.9	0.0	0.1	-	1.0	-	0.0
2004	-	-	-	0.2	0.0	-	-	0.0	-	0.1	0.2	-	-	0.0	0.3	-	-
2009	-	-	-	0.2	0.0	-	-	-	-	0.0	0.5	-	0.0	0.0	0.4	-	0.0
2014	0.0	-	-	2.3	0.2	0.0	-	0.0	-	0.0	1.9	0.0	-	0.0	0.2	-	0.1
2019	-	-	0.5	1.5	7.8	0.1	0.0	0.0	0.0	0.0	1.2	0.0	-	0.0	0.6	0.1	0.3

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Phlox austromontana (mountain phlox)	Phlox longifolia (longleaf phlox)	Schoenocrambe linifolia (flaxleaf plainsmustard)	Silene antirrhina[a] (sleepy silene)	Streptanthus cordatus (heartleaf twistflower)	Tetraneuris acaulis (stemless four-nerve daisy)
year	Nested Frequency					
1994	-	-	-	-	-	21
1999	4	-	-	-	-	17
2004	19	-	-	3	5	30
2009	16	10	-	-	-	5
2014	8	1	1	-	-	23
2019	16	6	21	-	-	22
year	Average Cover (%)					
1994	-	-	-	-	-	0.1
1999	0.2	-	-	-	-	0.2
2004	0.3	-	-	0.0	0.0	0.1
2009	0.5	0.1	-	-	-	0.0
2014	0.1	0.0	0.0	-	-	0.2
2019	0.3	0.0	0.1	-	-	0.7

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16B-21.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia frigida[p] (prairie sagewort)	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Cercocarpus ledifolius[p] (curl-leaf mountain mahogany)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. glabrata (rubber rabbitbrush)	Eriogonum corymbosum (crispleaf buckwheat)	Gutierrezia sarothrae (broom snakeweed)	Holodiscus dumosus (rockspirea)	Juniperus scopulorum[t] (Rocky Mountain juniper)	Pinus edulis[t] (twoneedle pinyon)	Pinus flexilis[t] (limber pine)	Pseudotsuga menziesii[t] (Douglas-fir)	Symphoricarpos oreophilus[p] (mountain snowberry)
year	Line Intercept Cover (%)												
1994	-	-	-	-	-	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-	-	-	-	-	-
2004	0.9	3.9	1.9	-	1.1	-	1.6	-	1	-	5.1	1	1.1
2009	0.4	4.8	3	0.1	2.1	0.1	0.5	-	1.2	-	4.5	-	1.1
2014	1.1	3.7	2.4	0.7	1.3	0.2	1.1	-	1.4	-	3.7	-	0.8
2019	1.7	2.8	3.3	0.5	1.1	-	1.1	-	1.7	-	-	-	0.9
year	Quadrat Cover (%)												
1994	0.6	2.4	0.0	-	1.0	-	1.1	-	0.2	-	0.5	0.1	0.2
1999	0.9	5.0	0.1	0.2	0.8	-	0.4	-	0.8	-	1.4	0.0	0.5
2004	0.6	3.2	0.0	0.2	1.2	0.0	1.1	-	0.8	-	2.1	0.4	0.5
2009	0.4	3.4	0.0	0.0	0.8	0.0	0.8	-	0.4	-	2.7	-	0.7
2014	1.6	2.9	0.0	0.1	0.6	0.0	0.5	0.1	1.0	-	3.1	-	0.6
2019	3.1	4.3	0.2	0.4	1.5	0.1	0.9	-	0.8	0.1	-	0.1	0.8

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16B-21.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Artemisia frigida[P] -- (prairie sagewort)									
1994	1720	-	1	98	1	13	0	14	11/20
1999	2300	420	24	76	0	20	0	0	24/20
2004	4200	-	4	92	4	25	10	1	9/13
2009	2660	-	17	74	8	12	14	11	12/14
2014	2400	60	3	98	0	49	0	3	22/27
2019	5220	-	2	99	0	12	0	0	13/16
Artemisia tridentata ssp. vaseyana[P] -- (mountain big sagebrush)									
1994	560	-	0	93	7	0	0	0	28/64
1999	820	-	5	76	20	42	5	2	43/76
2004	680	-	0	56	44	65	6	32	36/84
2009	700	-	9	49	43	20	11	31	42/92
2014	720	-	3	61	36	33	53	39	45/81
2019	880	-	14	59	27	32	16	25	41/68
Cercocarpus ledifolius[P] -- (curl-leaf mountain mahogany)									
1994	160	-	50	50	0	0	0	0	53/37
1999	80	20	75	25	0	0	75	0	378/307
2004	120	20	83	17	0	0	83	0	228/235
2009	140	-	57	43	0	14	14	0	50/54
2014	40	-	100	0	0	0	0	0	44/47
2019	20	20	0	100	0	0	0	0	131/123
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1994	-	-	-	-	-	-	-	-	16/42
1999	160	-	25	75	0	25	0	0	36/46
2004	240	-	0	75	25	8	25	8	22/28
2009	60	-	0	0	100	0	100	100	17/39
2014	220	40	0	82	18	0	0	0	31/40
2019	260	-	8	92	0	39	0	0	26/40
Eriogonum corymbosum -- (crispleaf buckwheat)									
1994	20	-	0	100	0	100	0	0	9/36
1999	40	-	50	50	0	0	0	0	14/38
2004	20	-	0	100	0	0	100	0	14/35
2009	40	40	0	100	0	0	0	50	23/48
2014	60	-	33	67	0	67	0	0	31/63
2019	80	60	50	50	0	50	0	0	16/45
Ericameria nauseosa ssp. nauseosa var. glabrata -- (rubber rabbitbrush)									
1994	1180	-	0	100	0	0	0	0	33/43
1999	580	-	7	86	7	0	0	0	41/49
2004	580	20	3	72	24	14	10	14	37/50
2009	780	-	3	51	46	3	0	23	37/49
2014	420	-	0	95	5	14	0	0	39/51
2019	340	-	6	71	24	41	6	18	34/47
Gutierrezia sarothrae -- (broom snakeweed)									
1994	3140	-	10	83	7	0	0	5	14/18
1999	1960	100	8	88	4	7	0	1	21/21
2004	3860	-	1	98	2	2	0	2	15/17
2009	1940	-	1	86	13	0	0	6	14/17
2014	740	100	19	78	3	22	3	3	25/30
2019	2280	140	1	99	0	0	0	0	16/18

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Holodiscus dumosus -- (rockspirea)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	20	-	0	100	0	0	0	0	69/51
2019	-	-	-	-	-	-	-	-	63/54
Juniperus scopulorum[t] -- (Rocky Mountain juniper)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	20	-	0	100	0	0	0	0	- / -
2009	40	-	50	50	0	0	0	0	- / -
2014	20	-	0	100	0	0	0	0	- / -
2019	20	-	0	100	0	0	0	0	- / -
Pinus edulis[t] -- (twoneedle pinyon)									
1994	-	-	-	-	-	-	-	-	-/-
1999	20	-	100	0	0	0	0	0	- / -
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	20	-	100	0	0	0	0	0	- / -
Pinus flexilis[t] -- (limber pine)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	40	20	0	100	0	0	0	0	- / -
2019	-	-	-	-	-	-	-	-	-/-
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
1994	80	-	25	75	0	0	0	0	41/121
1999	40	40	0	100	0	50	0	0	43/120
2004	80	-	0	100	0	0	25	0	39/102
2009	180	-	0	11	89	0	100	0	33/102
2014	60	-	0	100	0	0	0	0	39/138
2019	100	-	20	80	0	20	0	0	29/110

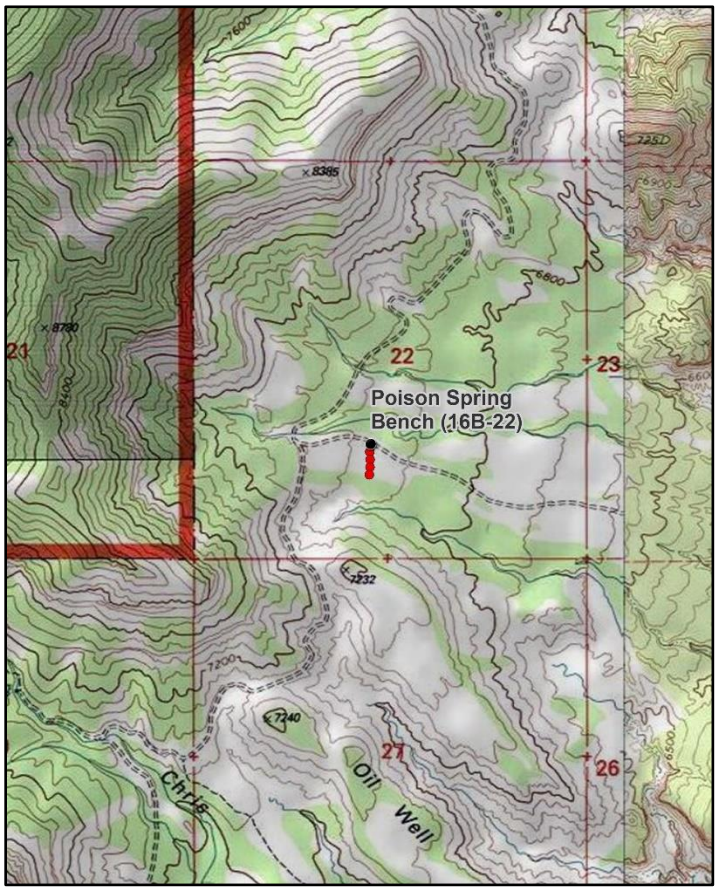
t - Tree Species; p - Preferred Browse; i - Introduced Species

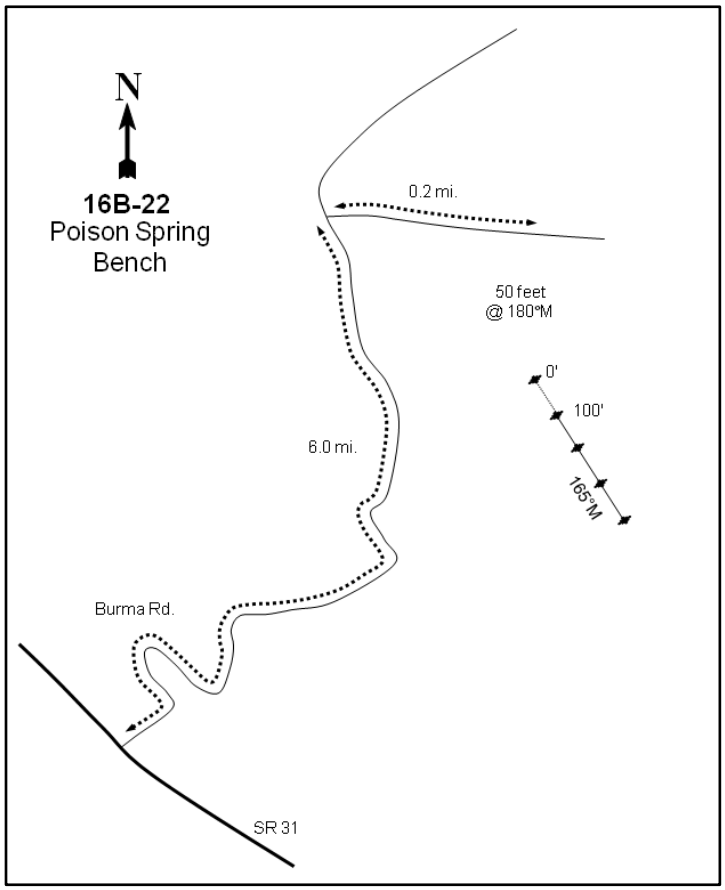
Table 16B-21.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Cercocarpus ledifolius (curl-leaf mountain mahogany)							
1999	54	-	-	-	-	-	5.4
2014	7	-	-	33	-	67	29.7
2019	33	-	38	38	13	13	9.0
Juniperus scopulorum (Rocky Mountain juniper)							
1994	10	-	-	-	-	-	7.7
1999	8	-	-	-	-	-	7.8
2014	11	-	13	88	-	-	11.1
2019	13	-	40	20	40	-	11.8
Pinus edulis (twoneedle pinyon)							
1994	19	-	-	-	-	-	4.6
1999	7	-	-	-	-	-	5.2
2014	7	-	25	75	-	-	8.8
2019	6	-	25	75	-	-	10.8

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Pinus flexilis (limber pine)							
1994	1	-	-	-	-	-	21.0
1999	1	-	-	-	-	-	37.0
2014	13	25	50	25	-	-	5.0
Pinus longaeva (Great Basin bristlecone pine)							
1994	6	-	-	-	-	-	2.0
1999	10	-	-	-	-	-	6.7
2019	19	25	50	-	-	25	6.3
Pseudotsuga menziesii (Douglas-fir)							
1999	4	-	-	-	-	-	10.5
2014	4	-	-	-	-	100	23.5
2019	4	-	-	-	50	50	23.5

POISON SPRING BENCH - STUDY NO. 16B-22





Location Information

USGS 7.5 min Map Info	Hiawatha SE; Township 16S, Range 8E, Section 22
GPS (0' Stake)	NAD 83 UTM ZONE 12, 498919 East 4362735 North

Transect Information

Browse Tag # (0' Stake)	216
Transect Bearing	165° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

Drive up Huntington Canyon Road to the Huntington research farm below the power plant. Across from the farm gate, turn right onto Burma Road. Follow Burma Road for 6 miles, then turn right onto a faint road that goes into the chaining below the road. Go down and proceed along the edge of the chaining for 0.2 miles to the study site. The 0-foot stake is about 50 feet south of the road and is marked with browse tag #216.

Site Information

Land Ownership	State
Land Administrator	SITLA
Allotment	No data
Elevation	6,900ft (2,103m)
Aspect	East
Slope	3-10%
Sample Dates	08/22/1994, 05/27/1999, 05/27/2004, 05/26/2009, 07/23/2014, 05/29/2019

Table 16B-22.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Chain Unknown	-	-	Late 1960s	-
Seeding - Seed Unknown	-	-	Late 1960s	-
Hand Crew - Lop and Scatter	Burma Rd. Pinyon/Juniper Removal	2556	October-December 2013	1312

Wildlife Habitat and Vegetation History

Table 16B-22.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter

Table 16B-22.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1988	Black Sagebrush	Phase I
1994	Black Sagebrush	Phase I
1999	Black Sagebrush	Phase I
2004	Black Sagebrush	Phase I
2009	Black Sagebrush	Phase I
2014	Black Sagebrush	Phase I
2019	Black Sagebrush	Phase I

Site Notes

Belt 1 was not treated during the 2013 lop and scatter treatment.

Soils

Table 16B-22.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	7.6	50.7	27.4	21.9	3.9	4.4	57.6	0.8	05/27/1999

Site Potential

1981 - 2010 Average Annual Precipitation	13 inches
NRCS Ecological Site	Upland Stony Loam (Pinyon-Utah Juniper)
NRCS Ecological Site #	R047XB333UT
States and Transitions	A defined state and transition model is available.

Since study establishment in 1988, the plant community on this site has existed as a black sagebrush (*Artemisia nova*) stand; other browse species have also been present to a lesser extent (Table 16B-22.12, Table 16B-22.13, Photos). The herbaceous understory has remained moderately diverse, but individual species have provided limited cover (Table 16B-22.7, Table 16B-22.10, Table 16B-22.11). Encroachment by twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) has occurred throughout the study period. A lop and scatter treatment in 2013 (Table 16B-22.1) removed many trees, but part of the transect was not treated; this study site has been classified as being within Phase I of woodland succession in all sample years (Table 16B-22.4, Table 16B-22.12, Table 16B-22.14, Photos). The continued presence of pinyon and juniper indicates that this site may have the potential to be infilled over time.

Trend Summary Tables

Table 16B-22.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	21.0	0.0	2.8	-	-	-
1999	22.5	0.0	3.5	-	-	0.1
2004	25.8	0.0	5.4	27.8	-	6.1
2009	24.0	-	6.5	27.8	-	7.3
2014	18.4	0.1	1.8	26.0	0.3	3.1
2019	24.8	0.1	1.8	26.4	0.1	3.0

Table 16B-22.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	-	167	21	79	-	2.3	0.1	0.7
1999	-	198	6	105	-	3.0	0.0	0.5
2004	-	36	23	38	-	0.1	0.1	0.3
2009	-	41	9	62	-	0.6	0.1	0.4
2014	-	31	6	66	-	0.2	0.0	1.0
2019	-	53	163	144	-	1.0	2.2	2.7

Table 16B-22.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	22.3	0.0	38.5	4.2	9.6	25.9
1999	23.6	1.0	41.7	8.3	9.8	29.4
2004	21.7	0.0	37.8	8.5	11.0	32.8
2009	21.9	0.7	40.5	13.1	10.0	31.5
2014	22.3	0.4	46.8	10.4	11.0	21.0
2019	28.2	1.0	43.9	10.5	13.4	30.3

Table 16B-22.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1994	7	24	7	26
1999	5	24	6	18
2004	2	7	7	10
2009	-	19	4	15
2014	-	8	10	2
2019	1	15	12	8
Year	Days Use Per Acre (ha)			
1994	-	-	-	-
1999	14.5 (35.9)	12.8 (31.5)	8.1 (19.9)	-
2004	6.5 (16.1)	4.7 (11.6)	18.7 (46.3)	-
2009	2.9 (7.2)	21.5 (53.0)	2.7 (6.6)	-
2014	1.5 (3.6)	4.0 (9.9)	3.4 (8.3)	-
2019	5.1 (12.6)	29.5 (72.8)	28.1 (69.5)	-

Table 16B-22.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum[i] (crested wheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Psathyrostachys juncea[i] (Russian wildrye)
year	Nested Frequency				
1994	1	156	12	3	-
1999	-	193	2	-	3
2004	-	32	4	-	-
2009	-	40	1	-	-
2014	1	27	3	-	-
2019	-	27	29	-	-
year	Average Cover (%)				
1994	0.0	2.3	0.0	0.0	-
1999	-	2.8	0.0	-	0.1
2004	-	0.1	0.0	-	-
2009	-	0.6	0.0	-	-
2014	0.0	0.2	0.0	-	-
2019	-	0.7	0.4	-	-

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16B-22.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Arabis (rockcress)	Castilleja angustifolia (northwestern Indian paintbrush)	Chenopodium fremontii[a] (Fremont's goosefoot)	Cryptantha confertiflora (basin yellow cryptantha)	Descurainia pinnata[a] (western tansymustard)	Eriogonum cemuum[a] (nodding buckwheat)	Gilia inconspicua[a] (shy gilia)	Ipomopsis aggregata (scarlet gilia)	Lappula occidentalis[a] (flatspine stickseed)	Lepidium montanum[a] (mountain pepperweed)	Machaeranthera (tansyaster)	Medicago sativa[i] (alfalfa)	Packera multilobata (lobeleaf groundsel)	Penstemon caespitosus (mat penstemon)	Penstemon carnosus (fleshy beardtongue)	Salsola tragus[ai] (prickly Russian thistle)	Schoenocrambe linifolia (flaxleaf plainsmustard)
year	Nested Frequency																
1994	12	-	-	54	1	6	-	1	-	6	-	-	-	20	-	13	-
1999	9	2	-	49	6	-	-	8	-	-	-	3	6	32	9	-	2
2004	-	-	-	18	5	10	-	4	4	7	3	-	-	-	16	2	1
2009	1	2	-	33	-	3	-	3	-	6	-	-	1	-	17	-	9
2014	5	-	-	37	6	-	-	-	-	-	-	-	-	1	22	-	10
2019	18	5	28	85	134	5	28	7	3	-	-	-	14	11	36	-	17
year	Average Cover (%)																
1994	0.1	-	-	0.6	0.0	0.0	-	0.0	-	0.0	-	-	-	0.1	-	0.1	-
1999	0.0	0.0	-	0.3	0.0	-	-	0.0	-	-	-	0.0	0.0	0.1	0.0	-	0.0
2004	-	-	-	0.2	0.0	0.0	-	0.0	0.0	0.0	0.0	-	-	-	0.1	0.0	0.0
2009	0.0	0.0	-	0.3	-	0.0	-	0.0	-	0.1	-	-	0.0	-	0.0	-	0.1
2014	0.0	-	-	0.8	0.0	-	-	-	-	-	-	-	-	0.0	0.1	-	0.0
2019	0.0	0.1	0.3	2.0	1.7	0.0	0.2	0.0	0.0	-	-	-	0.0	0.1	0.4	-	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Townsendia incana (hoary Townsend daisy)
year	Nested Frequency
1994	-
1999	-
2004	-
2009	1
2014	3
2019	-
year	Average Cover (%)
1994	-
1999	-
2004	-
2009	0.0
2014	0.0
2019	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16B-22.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis[p] (Utah serviceberry)	Artemisia nova[p] (black sagebrush)	Cercocarpus montanus[p] (alderleaf mountain mahogany)	Ephedra viridis[p] (mormon tea)	Eriogonum microthecum[p] (slender buckwheat)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma[t] (Utah juniper)	Opuntia polyacantha (plains pricklypear)	Pinus edulis[t] (twoneedle pinyon)	Purshia tridentata[p] (antelope bitterbrush)
year	Line Intercept Cover (%)									
1994	-	-	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-	-	-
2004	-	23.8	2.8	1.2	0	-	2.7	-	3.4	-
2009	-	23.3	3.3	1.2	0	-	2.7	-	4.6	-
2014	-	22.2	2.9	0.9	0	-	1.5	0.3	1.6	-
2019	-	23	2.3	1.1	-	0.1	1.3	-	1.7	-
year	Quadrat Cover (%)									
1994	-	19.6	1.1	0.2	0.1	-	1.8	0.0	1.0	0.0
1999	-	19.2	3.2	0.0	0.0	-	2.6	0.0	0.9	-
2004	-	22.8	2.5	0.4	0.1	0.0	3.0	0.0	2.3	-
2009	-	21.3	2.5	0.1	0.1	-	3.2	-	3.3	-
2014	0.1	15.5	2.2	0.4	0.1	0.0	1.1	0.1	0.6	-
2019	-	20.9	3.2	0.7	0.1	0.1	1.3	-	0.5	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16B-22.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[P] -- (Utah serviceberry)									
1994	-	-	-	-	-	-	-	-	42/53
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	72/85
2014	60	-	0	100	0	0	33	67	78/145
2019	20	-	0	100	0	0	100	0	108/165
Artemisia nova[P] -- (black sagebrush)									
1994	9740	-	9	76	15	9	0	5	26/69
1999	11200	80	4	88	9	26	0	3	24/52
2004	10700	60	2	83	15	10	10	7	24/56
2009	8860	40	0	81	19	8	0	12	22/56
2014	6980	40	2	74	24	18	74	11	25/64
2019	6640	40	2	74	24	23	9	23	24/57
Atriplex canescens[P] -- (fourwing saltbush)									
1994	-	-	-	-	-	-	-	-	111/103
1999	-	-	-	-	-	-	-	-	131/103
2004	-	-	-	-	-	-	-	-	100/124
2009	-	-	-	-	-	-	-	-	122/113
2014	-	-	-	-	-	-	-	-	62/109
2019	-	-	-	-	-	-	-	-	98/124
Atriplex confertifolia[P] -- (shadscale saltbush)									
1994	-	-	-	-	-	-	-	-	51/65
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Cercocarpus montanus[P] -- (alderleaf mountain mahogany)									
1994	300	-	0	93	7	20	7	0	87/116
1999	400	60	10	90	0	5	70	0	85/120
2004	320	20	6	81	13	31	63	13	79/100
2009	360	40	22	61	17	22	44	0	95/119
2014	300	-	13	80	7	53	20	7	93/121
2019	460	-	22	48	30	30	52	30	71/105
Ephedra viridis[P] -- (mormon tea)									
1994	160	-	0	100	0	50	25	25	62/83
1999	300	100	13	67	20	33	7	0	65/89
2004	320	-	6	63	31	0	0	6	73/102
2009	280	-	21	71	7	7	0	7	74/111
2014	680	-	41	47	12	44	21	9	79/111
2019	680	-	18	56	27	62	6	27	68/89
Eriogonum microthecum[P] -- (slender buckwheat)									
1994	620	-	16	84	0	0	0	0	9/12
1999	540	120	7	82	11	0	11	11	6/9
2004	820	-	0	90	10	10	61	2	5/8
2009	760	120	11	66	24	0	3	24	4/6
2014	760	-	37	63	0	8	5	0	8/10
2019	240	40	0	75	25	0	0	25	3/6

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Gutierrezia sarothrae -- (broom snakeweed)									
1994	-	-	-	-	-	-	-	-	21/20
1999	120	-	0	100	0	0	0	0	10/12
2004	40	20	0	100	0	0	0	0	9/9
2009	20	-	0	100	0	0	0	0	10/17
2014	20	20	0	100	0	0	0	0	16/13
2019	60	20	0	100	0	0	0	0	8/11
Juniperus osteosperma[t] -- (Utah juniper)									
1994	-	-	-	-	-	-	-	-	-/-
1999	60	20	67	33	0	0	0	0	- / -
2004	80	-	50	50	0	0	0	0	- / -
2009	80	-	25	75	0	0	0	0	- / -
2014	80	-	50	50	0	50	0	0	- / -
2019	60	-	100	0	0	0	0	0	- / -
Opuntia polyacantha -- (plains pricklypear)									
1994	100	-	20	80	0	0	0	0	9/24
1999	100	-	0	80	20	0	0	20	8/45
2004	100	-	20	80	0	0	0	0	8/35
2009	60	-	0	100	0	0	0	0	10/25
2014	80	-	25	75	0	0	0	0	10/29
2019	80	-	0	100	0	0	0	0	8/29
Pinus edulis[t] -- (twoneedle pinyon)									
1994	-	-	-	-	-	-	-	-	-/-
1999	80	-	75	25	0	0	0	0	- / -
2004	120	-	33	67	0	0	0	0	- / -
2009	60	20	33	67	0	0	0	0	- / -
2014	80	40	50	50	0	0	0	0	- / -
2019	60	-	67	33	0	0	0	33	- / -
Purshia stansburiana[p] -- (Stansbury cliffrose)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	20	0	0	0	0	0	0	- / -
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Purshia tridentata[p] -- (antelope bitterbrush)									
1994	20	-	0	100	0	0	0	0	20/21
1999	-	-	-	-	-	-	-	-	15/29
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	16/49

t - Tree Species; p - Preferred Browse; i - Introduced Species

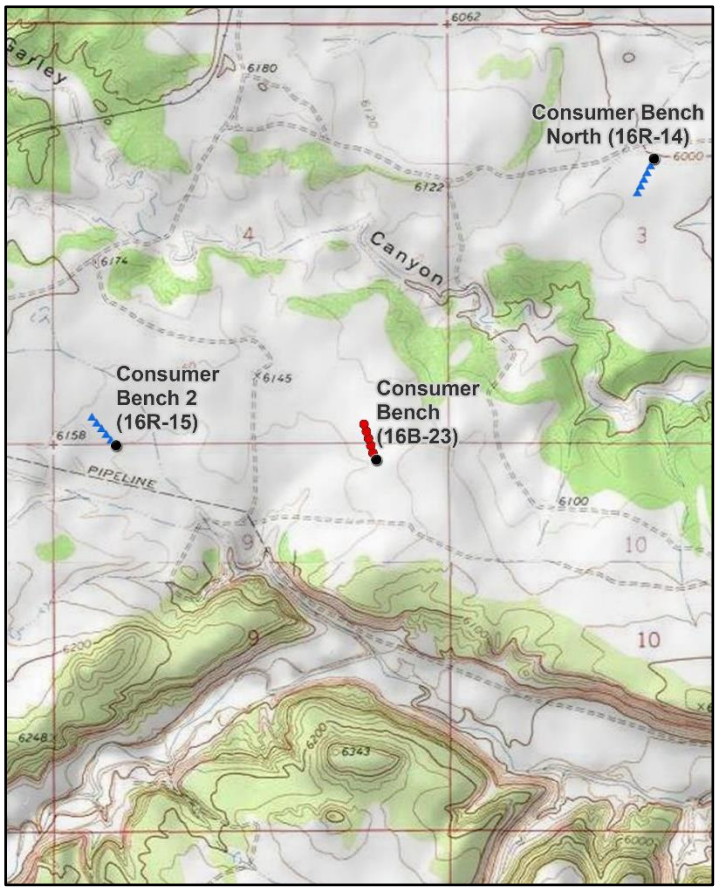
Table 16B-22.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

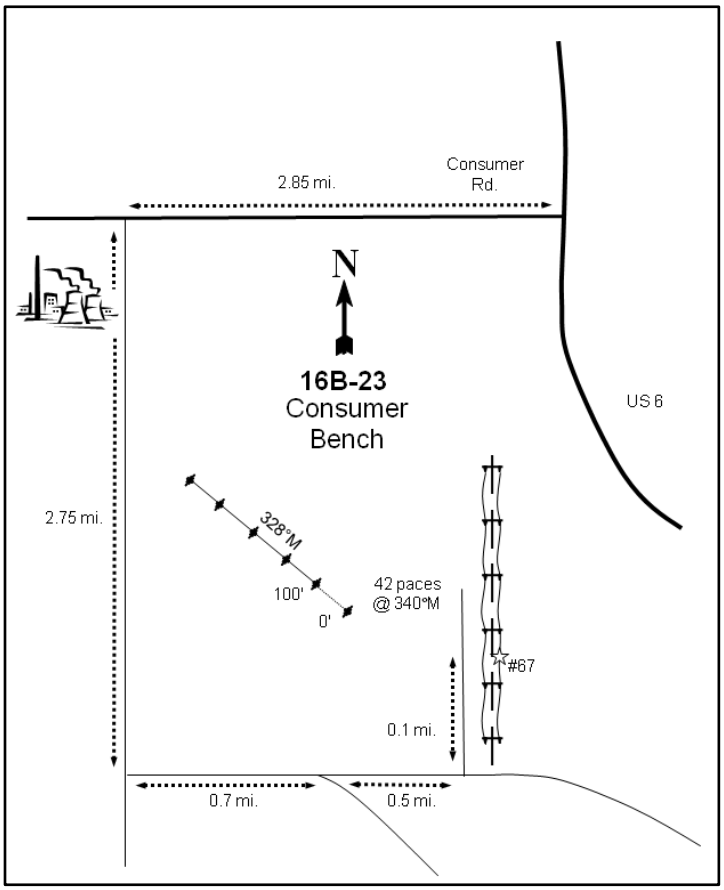
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1994	33	-	-	-	-	-	10.4
1999	72	-	-	-	-	-	6.2
2004	53	-	56	33	11	-	15.2
2009	48	6	41	41	12	-	10.8
2014	38	-	70	30	-	-	6.0
2019	48	8	62	15	15	-	8.7
Pinus edulis (twoneedle pinyon)							
1994	80	-	-	-	-	-	6.5
1999	53	-	-	-	-	-	6.8
2004	111	-	40	50	-	10	7.4
2009	109	10	35	45	5	5	8.8
2014	81	14	57	29	-	-	4.6
2019	61	21	36	21	14	7	5.6

Table 16B-22.15 – Deer Desirable Components Index: Mid Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1994	26.6	10.7	4.2	4.7	0.0	1.5	0.0	47.6	Poor
1999	28.9	12.8	2.3	6.0	0.0	1.1	0.0	51.2	Poor-Fair
2004	30.0	10.3	1.2	0.3	0.0	0.7	0.0	42.4	Poor
2009	30.0	9.5	1.8	1.1	0.0	0.9	0.0	43.3	Poor
2014	30.0	8.6	2.4	0.5	0.0	2.0	0.0	43.4	Poor
2019	30.0	7.6	2.4	2.1	0.0	5.3	0.0	47.4	Poor

CONSUMER BENCH - STUDY NO. 16B-23





Location Information

USGS 7.5 min Map Info	Standardville SE; Township 14S, Range 9E, Section 09
GPS (0' Stake)	NAD 83 UTM ZONE 12, 507432 East 4386548 North

Transect Information

Browse Tag # (0' Stake)	29
Transect Bearing	328° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Standard

Directions to Site

On US-6 south of Helper, turn right (west) onto Consumer Road and travel 2.85 miles. Turn left onto a dirt road and proceed for 2.75 miles, passing a coal plant. Turn left and travel 0.7 miles to a fork. Stay left at the fork and continue for an additional 0.5 miles to another fork. Turn left and go 0.1 miles to a telephone pole (#67). The 0-foot stake is 42 paces away from the telephone pole at 340 degrees magnetic.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	CONSUMERS WASH
Elevation	6,100ft (1,859m)
Aspect	South
Slope	5%
Sample Dates	08/31/1994, 05/24/1999, 05/26/2004, 05/28/2009, 08/01/2012, 07/30/2014, 07/17/2019

Table 16B-23.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Aerator - Double Drum/Seed	Price West Benches Year 2	228	October-December 2005	2658
Seeding - Aerial After	Price West Benches Year 2	228	March 2006	2658
Seeding - Broadcast Before	Price West Benches Year 2	228	October-December 2005	2658
Hand Crew - Lop and Scatter	Miller Creek Watershed Restoration	4207	November 2018	242

Table 16B-23.2 SeedMix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Price West Benches Year 2- Consumers-Airport			Aerial	Oct 2005	1851
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
	Achnatherum hymenoides	Indian Ricegrass	Nezpar	0.46	0.43
	Achnatherum hymenoides	Indian Ricegrass	Rimrock	0.54	0.52
	Agropyron cristatum	Crested Wheatgrass	Douglas	0.62	0.50
	Agropyron cristatum	Crested Wheatgrass	Hycrest	0.54	0.47
	Atriplex canescens	Fourwing Saltbush	Juab UT	1.08	0.37
	Medicago sativa	Alfalfa	Ladak +	0.41	0.38
	Medicago sativa	Alfalfa	Nomad	0.41	0.38
	Medicago sativa	Alfalfa	Ranger	0.41	0.36
	Onobrychis viciifolia	Sainfoin	Eski	1.35	1.27
	Pascopyrum smithii	Western Wheatgrass		0.16	0.13
	Pascopyrum smithii	Western Wheatgrass		0.84	0.69
	Psathyrostachys juncea	Russian Wildrye	Bozoisky	1.60	1.48
	Psathyrostachys juncea	Russian Wildrye		0.62	0.53
	Sanguisorba minor	Small Burnet	Delar	0.81	0.76
F	Melilotus officinalis	Yellow Sweetclover		0.22	0.16

Mix Name			Application Type	Application Date	Acres
Price West Benches Year 2- Consumers-Airport-Browse			Aerial	Mar 2006	2750
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
	Bassia prostrata	Forage Kochia	Millard UT	0.13	0.10
S	Artemisia tridentata ssp. wyomingensis	Wyoming Big Sagebrush	Sanpete UT	0.48	0.10

Wildlife Habitat and Vegetation History

Table 16B-23.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Greater Sage-Grouse	occupied	year-long

Table 16B-23.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1994	Wyoming Big Sagebrush	Phase I
1999	Wyoming Big Sagebrush	Phase I
2004	Perennial Grass-Forb	Phase I
2009	Perennial Grass	Phase I
2012	Perennial Grass	Phase I
2014	Perennial Grass	Phase I
2019	Perennial Grass	Phase I

Site Notes

Due to difficulties in differentiating between species, deer and sheep pellet groups were combined. Three dead lambs were found on the study site in 2012.

Soils

Table 16B-23.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Loam	7.8	54.7	27.4	17.8	1.7	3.3	41.6	0.6	05/20/1999

Site Potential

1981 - 2010 Average Annual Precipitation	11 inches
NRCS Ecological Site	Semidesert Loam (Wyoming Big Sagebrush)
NRCS Ecological Site #	R034XY212UT
States and Transitions	No state and transition model is available for this ecological site.

From study establishment in 1988 through the 1999 sample year, this site was dominated by Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*); other shrubs were not diverse and provided limited cover. Sagebrush decreased substantially in 2004 following the drought in 2003 and has continued to decrease in subsequent years (Table 16B-23.12, Table 16B-23.13). This post-drought sagebrush mortality caused the study site to transition to one dominated by perennial grasses in 2004. The herbaceous understory has remained diverse, and mainly native perennial grass species have contributed a majority of the herbaceous cover in most sample years. Annual grasses exhibited a significant increase in cover in 2019, but most of this was due to the native species sixweeks fescue (*Vulpia octoflora*) (Table 16B-23.7, Table 16B-23.10, Table 16B-23.11). Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) have been observed in low amounts since study establishment, placing the site within Phase I of woodland succession (Table 16B-23.4). Further tree encroachment could cause the site to transition to one mainly dominated by pinyon and juniper, but the consistently low tree abundance over time (Table 16B-23.13, Table 16B-23.14, Photos) indicates that this is likely not an immediate concern.

Trend Summary Tables

Table 16B-23.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	9.1	1.3	-	-	-	-
1999	10.3	1.8	-	-	-	-
2004	1.8	0.9	0.0	1.2	0.6	-
2009	2.1	1.4	-	1.1	0.6	-
2012	1.4	1.8	-	1.3	0.5	-
2014	0.4	1.8	-	0.6	0.8	-
2019	1.3	5.5	-	1.4	4.5	-

Table 16B-23.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	-	373	34	161	-	14.3	0.2	1.1
1999	6	386	23	235	0.0	16.1	0.3	2.0
2004	44	259	267	222	0.1	5.4	5.3	11.1
2009	70	356	61	197	0.2	23.8	0.3	4.5
2012	4	347	130	129	0.0	13.9	0.6	0.8
2014	87	317	42	67	1.0	10.3	0.5	0.2
2019	375	338	339	138	12.6	22.0	7.7	3.1

Table 16B-23.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	45.5	1.4	17.9	0.4	0.1	24.4
1999	36.2	11.0	24.2	0.3	0.0	32.1
2004	51.7	2.6	30.6	0.6	0.0	26.0
2009	45.2	0.2	32.3	0.3	0.0	31.6
2012	61.4	0.2	33.3	0.1	0.0	19.5
2014	65.0	0.5	23.8	0.1	0.2	15.4
2019	52.9	0.1	29.3	0.1	-	42.4

Table 16B-23.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer/Domestic Sheep	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
1994	-	55	20	-	6
1999	-	58	17	-	66
2004	-	62	16	-	36
2009	4	47	10	-	38
2012	1	39	3	1	10
2014	4	23	2	-	8
2019	6	17	2	3	23
Year	Days Use Per Acre (ha)				
1994	-	-	-	-	-
1999	0.7 (1.8)	91.1 (225.1)	65.0 (160.6)	-	-
2004	-	-	-	-	-
2009	1.5 (3.6)	138.7 (342.6)	17.4 (43.0)	-	-
2012	-	86.4 (213.5)	0.7 (1.7)	-	-
2014	1.5 (3.6)	21.5 (53.0)	14.1 (34.8)	-	-
2019	18.9 (46.6)	39.6 (97.7)	16.8 (41.4)	-	-

Table 16B-23.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bouteloua gracilis (blue grama)	Bromus tectorum[ai] (cheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Leymus salinus (saline wildrye)	Pascopyrum smithii (western wheatgrass)	Sporobolus cryptandrus (sand dropseed)	Vulpia octoflora[a] (sixweeks fescue)
year	Nested Frequency								
1994	114	195	-	24	181	86	-	1	-
1999	159	193	-	22	142	105	-	-	6
2004	68	109	-	1	147	1	18	1	44
2009	145	109	1	19	271	3	34	1	70
2012	198	120	-	10	109	33	20	2	4
2014	115	106	-	-	160	-	5	16	87
2019	101	99	22	17	197	-	94	12	373
year	Average Cover (%)								
1994	2.1	6.2	-	0.4	4.7	0.9	-	0.0	-
1999	3.8	4.8	-	0.6	4.3	2.6	-	-	0.0
2004	0.2	2.0	-	0.0	3.0	0.0	0.1	0.0	0.1
2009	5.1	2.9	0.0	0.5	13.7	0.1	1.4	0.0	0.2
2012	6.7	3.4	-	0.2	2.4	0.8	0.4	0.0	0.0
2014	3.4	2.9	-	-	3.4	-	0.0	0.6	1.0
2019	4.4	2.1	0.4	0.3	11.4	-	3.7	0.1	12.2

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16B-23.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Astragalus (milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Calochortus nuttallii (sego lily)	Castilleja linariifolia (Wyoming Indian paintbrush)	Chenopodium fremontii[a] (Fremont's goosefoot)	Chenopodium leptophyllum[a] (narrowleaf goosefoot)	Collinsia parviflora[a] (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)	Cordylanthus[a] (bird's-beak)	Cryptantha (cryptantha)	Cryptantha[a] (annual cryptantha)	Cymopterus (springparsley)	Descurainia pinnata[a] (western tansymustard)	Eriogonum cernuum[a] (nodding buckwheat)	Eriogonum ovalifolium (cushion buckwheat)	Gayophytum ramosissimum[a] (pinyon groundsmoke)	Gilia inconspicua[a] (shy gilia)
year	Nested Frequency																
1994	7	6	-	-	-	-	17	-	-	-	-	-	3	4	5	-	-
1999	-	39	11	17	-	-	15	10	-	-	-	3	1	-	16	-	-
2004	-	30	16	3	3	162	16	11	1	11	-	1	16	22	1	65	114
2009	-	10	-	3	-	33	-	8	-	-	-	-	-	1	3	-	-
2012	-	-	-	-	2	14	-	1	-	-	-	-	1	12	-	-	3
2014	-	-	-	-	-	-	-	-	-	9	-	-	3	-	-	-	-
2019	-	17	2	-	3	180	-	-	-	-	16	-	126	12	-	-	-
year	Average Cover (%)																
1994	0.0	0.0	-	-	-	-	0.1	-	-	-	-	-	0.0	0.0	0.0	-	-
1999	-	0.2	0.0	0.0	-	-	0.3	0.0	-	-	-	0.0	0.0	-	0.3	-	-
2004	-	1.6	0.1	0.0	0.0	1.6	0.1	0.3	0.0	0.3	-	0.0	0.1	0.1	0.0	0.7	1.0
2009	-	0.0	-	0.0	-	0.2	-	0.1	-	-	-	-	-	0.0	0.0	-	-
2012	-	-	-	-	0.0	0.0	-	0.0	-	-	-	-	0.0	0.0	-	-	0.0
2014	-	-	-	-	-	-	-	-	-	0.0	-	-	0.0	-	-	-	-
2019	-	0.5	0.0	-	0.0	0.5	-	-	-	-	0.3	-	2.5	0.2	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Lappula occidentalis[a] (flatspine stickseed)	Lepidium montanum[a] (mountain pepperweed)	Lygodesmia (skeletonplant)	Machaeranthera canescens (hoary tansyaster)	Penstemon (beardtongue)	Penstemon linarioides (toadflax penstemon)	Phlox longifolia (longleaf phlox)	Plantago patagonica[a] (woolly plantain)	Salsola tragus[ai] (prickly Russian thistle)	Schoenocrambe linifolia (flaxleaf plainsmustard)	Sisymbrium altissimum[ai] (tall tumblemustard)	Sphaeralcea coccinea (scarlet globemallow)	Taraxacum officinale (common dandelion)	Tragopogon dubius[ai] (yellow salsify)
year	Nested Frequency													
1994	-	10	-	1	11	3	26	3	-	7	-	128	-	-
1999	-	3	-	3	3	-	50	2	-	17	-	166	-	2
2004	20	3	3	2	4	-	30	103	38	5	-	173	1	1
2009	-	7	-	-	-	-	8	4	11	22	2	169	-	4
2012	-	1	-	3	-	-	-	-	106	6	-	123	-	-
2014	0	2	-	-	-	-	3	6	25	-	14	57	-	-
2019	22	2	-	2	1	-	8	146	158	-	9	117	-	3
year	Average Cover (%)													
1994	-	0.1	-	0.0	0.0	0.0	0.1	0.0	-	0.0	-	0.9	-	-
1999	-	0.0	-	0.0	0.0	-	0.1	0.0	-	0.1	-	1.1	-	0.0
2004	0.1	0.1	0.1	0.0	0.0	-	0.2	1.0	0.6	0.1	-	8.5	0.0	0.0
2009	-	0.0	-	-	-	-	0.0	0.0	0.1	0.1	0.0	4.2	-	0.0
2012	-	0.0	-	0.0	-	-	-	-	0.5	0.0	-	0.8	-	-
2014	0.0	0.0	-	-	-	-	0.0	0.0	0.2	-	0.2	0.2	-	-
2019	0.3	0.0	-	0.0	0.0	-	0.0	1.5	2.1	-	0.2	2.5	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16B-23.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. wyomingensis[p] (Wyoming big sagebrush)	Bassia prostrata[pi] (forage kochia)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Krascheninnikovia lanata[p] (winterfat)	Opuntia polyacantha (plains pricklypear)	Pinus edulis[t] (twoneedle pinyon)	Sclerocactus (fishhook cactus)
year	Line Intercept Cover (%)								
1994	-	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-	-
2004	1.2	-	-	0	0.2	0	0.4	-	-
2009	1	-	-	0.1	-	0.1	0.5	-	-
2012	0.8	0.3	-	0	0.1	0.2	0.4	-	-
2014	0.3	0.3	-	0.2	-	-	0.6	-	-
2019	0.3	0.7	0.4	0.2	3.1	0.4	0.8	-	-
year	Quadrat Cover (%)								
1994	9.1	-	-	-	0.8	-	0.5	-	-
1999	10.3	-	-	0.1	1.0	0.0	0.7	-	-
2004	1.8	-	-	0.0	0.3	0.0	0.6	0.0	-
2009	1.9	0.1	-	0.0	0.2	0.1	1.1	-	0.0
2012	1.1	0.3	-	0.0	0.3	0.0	1.5	-	-
2014	0.2	0.2	-	0.5	-	0.0	1.3	-	-
2019	0.0	0.8	0.2	0.1	3.5	0.5	1.7	-	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16B-23.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Artemisia tridentata ssp. wyomingensis[p] -- (Wyoming big sagebrush)									
1994	3820	260	17	55	28	15	0	11	41/65
1999	4480	300	17	55	27	26	47	13	47/81
2004	1040	-	2	4	94	39	54	90	44/55
2009	1940	60	35	41	24	13	6	18	28/36
2012	1440	-	44	21	35	1	90	76	26/30
2014	580	-	38	31	31	0	35	76	24/32
2019	320	-	31	63	6	19	81	6	28/31
Atriplex canescens[p] -- (fourwing saltbush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	86/65
2012	-	-	-	-	-	-	-	-	122/110
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Bassia prostrata[pi] -- (forage kochia)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	22/17
2012	300	-	20	80	0	13	67	0	10/23
2014	320	-	25	75	0	38	19	0	9/19
2019	340	940	6	94	0	0	24	0	18/38
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	240	-	0	100	0	42	58	0	17/24
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1994	60	-	0	100	0	0	0	0	18/45
1999	60	-	100	0	0	0	0	0	9/26
2004	60	140	0	100	0	0	0	0	24/34
2009	220	-	9	91	0	36	0	0	16/26
2012	420	140	43	43	14	19	71	10	10/14
2014	3060	20	10	90	0	3	86	78	6/11
2019	40	-	0	100	0	0	50	0	24/38
Gutierrezia sarothrae -- (broom snakeweed)									
1994	1020	-	0	96	4	0	4	0	19/23
1999	6460	2220	50	50	0	0	1	0	9/11
2004	340	-	6	94	0	6	0	0	17/22
2009	240	-	42	58	0	0	8	0	16/19
2012	6300	20	98	2	0	0	0	1	9/10
2014	-	-	-	-	-	-	-	-	-/-
2019	12940	4120	75	26	0	0	0	0	25/31

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Krascheninnikovia lanata[p] -- (winterfat)									
1994	60	-	0	100	0	0	0	0	24/22
1999	20	-	100	0	0	0	0	0	8/10
2004	40	20	0	100	0	0	100	0	31/39
2009	220	20	36	64	0	0	0	0	21/25
2012	280	-	21	79	0	36	36	0	18/23
2014	100	-	20	80	0	0	100	20	18/23
2019	580	-	17	83	0	14	48	0	19/26
Opuntia polyacantha -- (plains pricklypear)									
1994	920	-	4	91	4	0	0	0	6/27
1999	700	40	14	71	14	0	0	6	7/24
2004	740	40	19	81	0	0	0	0	11/31
2009	740	40	3	87	11	0	0	14	7/29
2012	820	-	10	85	5	0	0	5	8/36
2014	580	-	10	90	0	14	0	0	7/38
2019	700	-	0	89	11	0	0	43	9/48
Pediocactus simpsonii -- (mountain ball cactus)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	11/12
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Pinus edulis[t] -- (twoneedle pinyon)									
1994	-	-	-	-	-	-	-	-	-/-
1999	20	-	100	0	0	0	0	0	- / -
2004	20	-	0	100	0	0	0	0	- / -
2009	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Sclerocactus -- (fishhook cactus)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	20	0	0	0	0	0	0	4/7

t - Tree Species; p - Preferred Browse; i - Introduced Species

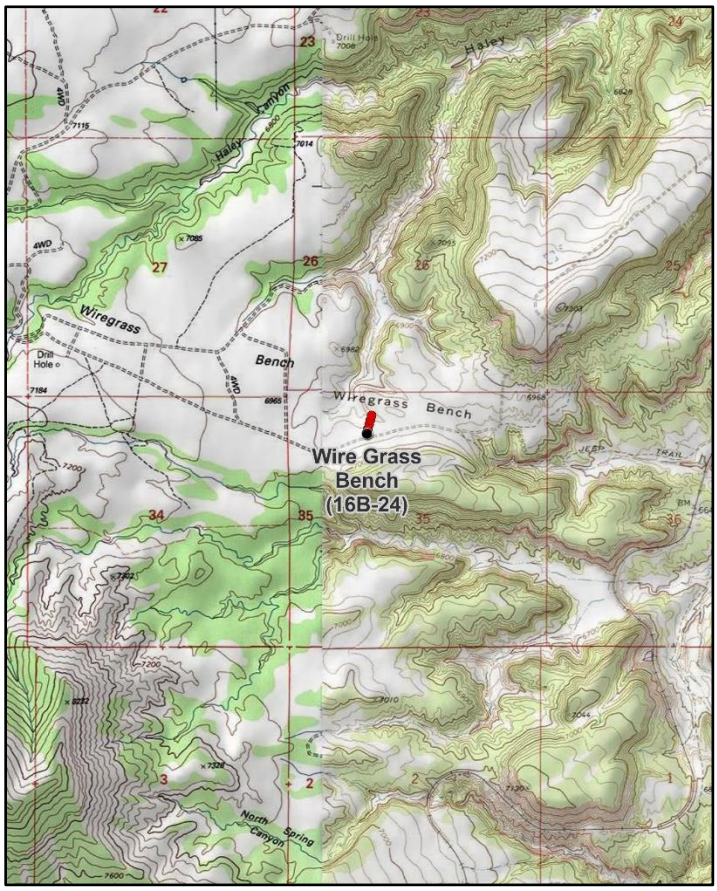
Table 16B-23.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

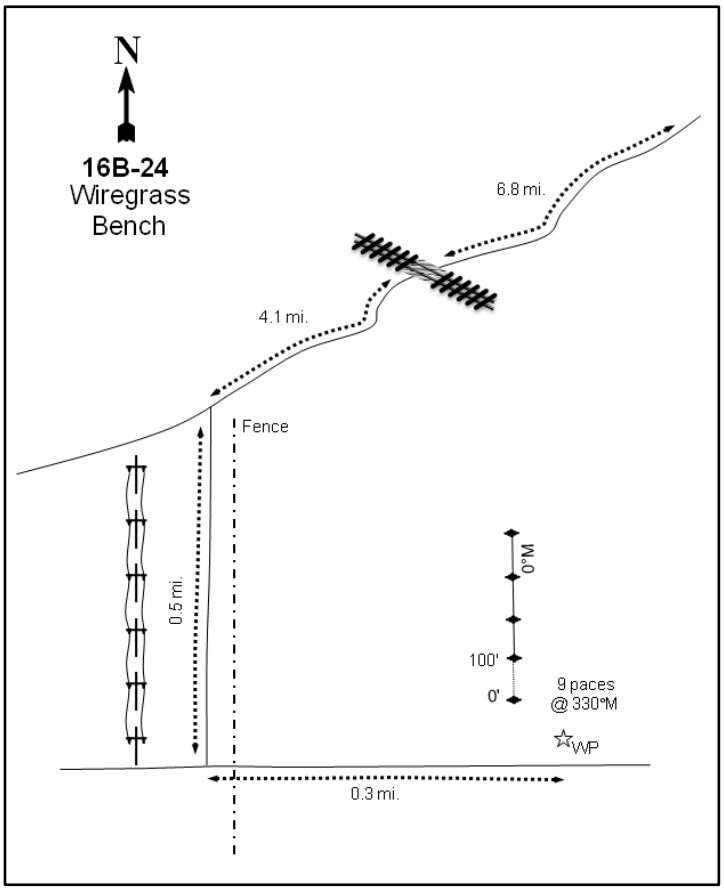
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2014	13	-	50	-	50	-	18.0
Pinus edulis (twoneedle pinyon)							
2014	4	-	50	50	-	-	5.5
2019	1	-	100	-	-	-	7.0

Table 16B-23.15 – Deer Desirable Components Index: Low Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1994	11.4	6.5	8.7	28.6	0.0	2.2	0.0	57.5	Good
1999	12.8	6.8	8.7	30.0	0.0	4.0	0.0	62.3	Good
2004	1.5	0.0	0.0	10.9	-0.1	10.0	0.0	22.3	Poor
2009	1.4	0.0	0.0	30.0	-0.2	8.9	0.0	40.1	Fair
2012	1.7	0.0	0.0	27.7	0.0	1.6	0.0	31.0	Fair
2014	0.8	0.0	0.0	20.7	-0.7	0.4	0.0	21.1	Poor
2019	1.9	0.0	0.0	30.0	-9.5	6.2	0.0	28.7	Fair

WIRE GRASS BENCH - STUDY NO. 16B-24





Location Information

USGS 7.5 min Map Info	Pinnacle Peak NW; Township 14S, Range 8E, Section 35
GPS (0' Stake)	NAD 83 UTM ZONE 12, 500228 East 4379946 North

Transect Information

Browse Tag # (0' Stake)	Not Available
Transect Bearing	0° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

Take exit 240 on US-6 in Price just past the hospital. Turn right at the stop sign, continue to another stop sign, and turn right again. Stay on this road until you pass over a canal, then turn right at the first road on the right. Proceed for 6.8 miles to a railroad crossing. From the railroad tracks, travel 4.1 miles. Just before reaching the power lines turn left and travel 0.5 miles along the fence to a “T” in the road. Turn left, pass through a gate, and travel 0.3 miles to the witness post on the left-hand (north) side of the road. The 0-foot stake is nine paces away at 330 degrees magnetic.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	HALEY CANYON
Elevation	6,940ft (2,115m)
Aspect	Northwest
Slope	5-10%
Sample Dates	08/31/1994, 05/25/1999, 05/24/2004, 05/20/2009, 08/25/2014, 05/28/2019

Wildlife Habitat and Vegetation History

Table 16B-24.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter
Greater Sage-Grouse	occupied	year-long

Table 16B-24.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1994	Perennial Grass/Mountain Big Sagebrush	Phase I
1999	Perennial Grass/Mountain Big Sagebrush	Phase I
2004	Perennial Grass/Mountain Big Sagebrush	Phase I
2009	Perennial Grass/Mountain Big Sagebrush	Phase I
2014	Perennial Grass/Mountain Big Sagebrush	Phase I
2019	Perennial Grass/Mountain Big Sagebrush	Phase I

Site Notes

Energy developments are prevalent in the area. An oil/gas pad is located about 500 feet to the north of the site. In 2019, new 100, 200, 300, and 400-foot stakes were placed; the 0-foot stake is rebar, while the rest of the stakes are half-high green fenceposts.

Soils

Table 16B-24.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	7.6	34.7	41.5	23.8	1.7	6.8	121.6	0.6	05/25/1999

Site Potential

1981 - 2010 Average Annual Precipitation	13 inches
NRCS Ecological Site	Upland Loam (Mountain Big Sagebrush-Indian Ricegrass)
NRCS Ecological Site #	R047XB308UT
States and Transitions	No state and transition model is available for this ecological site.

Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has been the dominant shrub on this site since study establishment in 1994. Other shrub species have also been observed, but have contributed less cover (Table 16B-24.12, Table 16B-24.13). The herbaceous understory has remained diverse and abundant. Native perennial grasses such as saline wildrye (*Leymus salinus*) and blue grama (*Bouteloua gracilis*) have provided most of the herbaceous cover and have been a co-dominant vegetation component in all sample years (Table 16B-24.7, Table 16B-24.10, Table 16B-24.11). Twoneedle pinyon (*Pinus edulis*) has been observed on site in low abundance, and the study has been classified as being within Phase I of woodland succession since establishment (Table 16B-24.4, Table 16B-24.13, Table 16B-24.14, Photos). This site will likely remain in this or a similar state in the future if a major disturbance or changes in land management do not occur.

Trend Summary Tables

Table 16B-24.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	5.5	3.6	0.4	-	-	-
1999	9.7	3.1	0.1	-	-	-
2004	5.3	3.0	-	5.3	3.2	-
2009	6.8	2.7	-	6.8	5.8	-
2014	5.5	2.5	-	7.7	2.6	-
2019	12.1	1.6	-	9.4	1.4	-

Table 16B-24.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	5	416	92	191	0.0	22.6	0.3	2.1
1999	20	403	72	277	0.2	16.1	0.2	3.2
2004	2	395	182	220	0.0	19.3	0.8	3.7
2009	5	411	96	226	0.0	26.2	0.3	2.7
2014	2	413	181	220	0.0	33.2	0.8	2.3
2019	42	424	413	305	0.3	29.1	7.3	4.9

Table 16B-24.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	31.5	3.8	23.2	0.4	1.3	34.0
1999	31.9	12.9	24.1	0.3	0.6	31.8
2004	47.0	1.6	25.9	3.9	0.3	33.7
2009	41.3	1.1	35.7	1.0	0.1	36.0
2014	40.7	0.8	28.6	0.9	0.3	43.2
2019	31.5	7.9	42.9	1.3	1.4	45.9

Table 16B-24.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1994	6	36	12	33
1999	7	53	5	56
2004	4	50	6	25
2009	9	49	-	69
2014	9	26	5	39
2019	5	43	2	73
Year	Days Use Per Acre (ha)			
1994	-	-	-	-
1999	15.3 (37.7)	37.5 (92.7)	22.8 (56.3)	-
2004	12.3 (30.5)	69.0 (170.5)	12.8 (31.5)	-
2009	15.3 (37.7)	123.3 (304.6)	6.7 (16.6)	-
2014	5.1 (12.6)	18.7 (46.3)	37.5 (92.7)	-
2019	10.9 (26.9)	85.1 (210.2)	-	-

Table 16B-24.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bouteloua gracilis (blue grama)	Bromus tectorum[ai] (cheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Leymus salinus (saline wildrye)	Pascopyrum smithii (western wheatgrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Sporobolus cryptandrus (sand dropseed)	Vulpia octoflora[a] (sixweeks fescue)
year	Nested Frequency											
1994	25	274	5	95	17	263	-	44	-	10	-	-
1999	19	230	20	53	4	294	-	98	-	2	-	-
2004	-	254	-	15	70	265	42	71	59	12	5	2
2009	14	245	5	15	1	306	31	-	160	9	-	-
2014	38	287	-	55	4	234	44	10	127	10	1	2
2019	15	247	14	69	14	294	59	13	188	3	-	28
year	Average Cover (%)											
1994	0.4	10.3	0.0	1.1	0.3	9.5	-	0.5	-	0.5	-	-
1999	0.2	4.8	0.2	1.2	0.0	8.7	-	1.3	-	0.0	-	-
2004	-	6.6	-	0.1	0.9	10.0	0.3	0.7	0.6	0.1	0.0	0.0
2009	0.3	7.7	0.0	0.2	0.0	16.8	0.2	-	0.9	0.2	-	-
2014	1.5	12.3	-	1.0	0.1	13.2	0.9	0.3	3.1	0.6	0.0	0.0
2019	0.3	8.8	0.2	1.0	0.5	14.3	0.5	0.1	3.6	0.2	-	0.1

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16B-24.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Alyssum desertorum[ai] (desert madwort)	Arabis (rockcress)	Astragalus (milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Calochortus nuttallii (sego lily)	Camissonia[a] (suncup)	Castilleja angustifolia (northwestern Indian paintbrush)	Ceratocephala testiculata[ai] (curveseed butterwort)	Chenopodium[a] (goosefoot)	Collinsia parviflora[a] (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawksbeard)	Cryptantha (cryptantha)	Cymopterus (springparsley)	Delphinium nuttallianum (twolobe larkspur)	Descurainia pinnata[a] (western tansymustard)
year	Nested Frequency																
1994	-	-	-	7	42	3	-	14	-	-	21	35	-	2	-	-	1
1999	55	-	-	13	38	31	-	51	-	-	27	69	3	-	7	5	-
2004	10	-	2	-	57	37	-	13	4	2	3	59	-	-	-	-	3
2009	6	-	1	1	7	3	-	34	29	-	4	5	-	-	-	1	-
2014	-	-	-	-	23	-	-	-	-	-	-	38	0	-	-	-	20
2019	11	54	8	2	72	77	11	31	128	-	1	41	-	-	8	20	222
year	Average Cover (%)																
1994	-	-	-	0.3	0.4	0.0	-	0.1	-	-	0.1	0.4	-	0.0	-	-	0.0
1999	0.2	-	-	0.2	0.1	0.1	-	0.4	-	-	0.1	0.2	0.0	-	0.0	0.0	-
2004	0.1	-	0.0	-	1.1	0.1	-	0.1	0.0	0.0	0.0	0.5	-	-	-	-	0.0
2009	0.0	-	0.0	0.0	0.1	0.0	-	0.3	0.1	-	0.0	0.0	-	-	-	0.0	-
2014	-	-	-	-	0.2	-	-	-	-	-	-	0.2	0.0	-	-	-	0.1
2019	0.3	0.2	0.1	0.1	1.0	0.4	0.0	0.2	1.3	-	0.0	0.3	-	-	0.0	0.1	1.7

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Epilobium brachycarpum[a] (tall annual willowherb)	Erigeron eatonii (Eaton's fleabane)	Eriogonum alatum (winged buckwheat)	Eriogonum brevicaule (shortstem buckwheat)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Gayophytum ramosissimum[a] (pinyon groundsmoke)	Hedysarum boreale (Utah sweetvetch)	Lappula occidentalis[a] (flatspine stickseed)	Lepidium ramosissimum[a] (manybranched pepperweed)	Lesquerella (bladderpod)	Machaeranthera grindelioides (rayless tansyaster)	Mimulus suksdorfii[a] (Suksdorf's monkeyflower)	Penstemon caespitosus (mat penstemon)	Penstemon carnosus (fleshy beardtongue)	Penstemon palmeri (Palmer's penstemon)	Phlox longifolia (longleaf phlox)
year	Nested Frequency																
1994	-	-	4	-	44	3	-	-	-	18	1	8	-	5	-	3	43
1999	-	-	33	-	45	1	-	-	3	15	-	11	-	20	-	-	74
2004	-	-	3	-	31	3	24	5	25	9	1	-	-	8	3	-	80
2009	63	1	-	-	32	4	3	7	1	-	18	13	-	7	5	2	128
2014	43	3	-	4	21	26	-	0	13	33	-	6	-	27	5	5	31
2019	38	-	-	-	12	41	187	6	208	21	21	42	22	3	4	4	147
year	Average Cover (%)																
1994	-	-	0.0	-	0.4	0.0	-	-	-	0.0	0.0	0.1	-	0.1	-	0.0	0.1
1999	-	-	0.2	-	0.3	0.0	-	-	0.0	0.0	-	0.1	-	0.1	-	-	0.6
2004	-	-	0.0	-	0.3	0.0	0.1	0.1	0.1	0.0	0.0	-	-	0.1	0.0	-	0.3
2009	0.1	0.0	-	-	0.7	0.1	0.0	0.1	0.0	-	0.1	0.2	-	0.0	0.1	0.0	0.5
2014	0.1	0.0	-	0.0	0.1	0.7	-	0.0	0.0	0.2	-	0.1	-	0.1	0.0	0.0	0.1
2019	0.1	-	-	-	0.2	0.4	1.5	0.1	1.4	0.0	0.0	0.2	0.0	0.0	0.0	0.1	1.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Plantago patagonica[a] (woolly plantain)	Polygonum douglasii[a] (Douglas' knotweed)	Schoenocrambe linifolia (flaxleaf plainsmustard)	Sisymbrium altissimum[ai] (tall tumblemustard)	Sphaeralcea coccinea (scarlet globemallow)	Taraxacum officinale (common dandelion)	Tetraneuris acaulis (stemless four-nerve daisy)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency							
1994	42	21	14	-	52	7	1	-
1999	37	6	12	-	48	12	-	24
2004	78	146	19	-	37	2	-	0
2009	8	11	20	-	55	-	6	5
2014	114	-	13	-	94	2	7	-
2019	109	81	13	2	20	-	-	-
year	Average Cover (%)							
1994	0.1	0.0	0.0	-	0.2	0.0	0.0	-
1999	0.1	0.0	0.0	-	0.5	0.0	-	0.1
2004	0.2	0.3	0.3	-	0.7	0.0	-	0.0
2009	0.0	0.0	0.1	-	0.2	-	0.2	0.0
2014	0.4	-	0.0	-	0.7	0.0	0.0	-
2019	0.7	0.4	0.1	0.0	0.1	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16B-24.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis[p] (Utah serviceberry)	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Opuntia (pricklypear)	Pediocactus simpsonii (mountain ball cactus)	Pinus edulis[t] (twoneedle pinyon)
year	Line Intercept Cover (%)						
1994	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-
2004	0.2	5.1	2.7	0.3	0.2	-	-
2009	0.2	6.6	1.8	3.6	0.4	-	-
2014	0.1	7.6	1.4	1	0.1	0.1	-
2019	-	9.4	-	1.4	0	-	-
year	Quadrat Cover (%)						
1994	-	5.5	2.9	0.6	0.0	-	0.4
1999	-	9.7	3.0	0.2	-	-	0.1
2004	0.4	4.9	3.0	0.0	0.0	-	-
2009	0.4	6.4	2.0	0.8	0.0	-	-
2014	0.1	5.4	1.7	0.8	0.0	0.0	-
2019	-	12.1	0.3	1.3	0.0	-	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16B-24.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
1994	40	-	0	100	0	50	0	0	50/59
1999	60	-	67	33	0	33	0	0	97/108
2004	60	-	0	100	0	0	100	0	77/67
2009	20	-	0	100	0	0	100	0	99/95
2014	20	-	0	100	0	0	100	0	98/96
2019	-	-	-	-	-	-	-	-	116/104
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1994	1880	20	10	42	49	16	1	15	56/84
1999	2380	260	18	54	29	50	10	4	59/86
2004	1940	30460	13	24	63	40	45	44	63/90
2009	4680	4880	59	19	22	21	17	14	50/68
2014	5180	440	56	30	14	34	44	14	50/72
2019	5420	300	43	43	14	27	67	21	40/61
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1994	4400	-	1	99	0	0	0	0	13/26
1999	7480	200	17	83	0	4	0	0	10/21
2004	6360	480	13	84	4	17	3	3	13/23
2009	5100	300	22	77	2	10	0	0	11/24
2014	2420	60	7	93	1	21	37	5	14/23
2019	160	-	13	75	13	38	13	13	10/20

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Echinocereus -- (hedgehog cactus)									
1994	-	-	-	-	-	-	-	-	-/-
1999	80	-	0	100	0	0	0	0	4/6
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	20	-	0	100	0	0	0	0	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
1994	3260	-	1	98	1	0	0	1	17/16
1999	3480	-	16	84	1	0	0	0	7/9
2004	460	-	13	87	0	0	0	0	9/12
2009	2480	480	19	81	1	1	0	1	10/17
2014	1900	340	16	84	0	0	0	0	15/23
2019	7920	40	19	80	1	6	0	1	9/15
Opuntia -- (pricklypear)									
1994	260	-	0	100	0	0	0	0	7/18
1999	80	-	0	100	0	0	0	0	6/12
2004	40	-	0	100	0	0	0	0	7/41
2009	140	-	29	71	0	29	0	0	10/36
2014	180	20	11	89	0	0	0	0	8/27
2019	20	20	0	0	100	0	0	100	7/17
Pediocactus simpsonii -- (mountain ball cactus)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	60	-	33	67	0	0	0	0	3/5
2009	20	-	0	100	0	0	0	0	- / -
2014	40	-	0	100	0	0	0	0	6/11
2019	40	-	0	100	0	0	0	0	3/6
Pinus edulis[t] -- (twoneedle pinyon)									
1994	-	-	-	-	-	-	-	-	-/-
1999	20	-	100	0	0	0	0	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

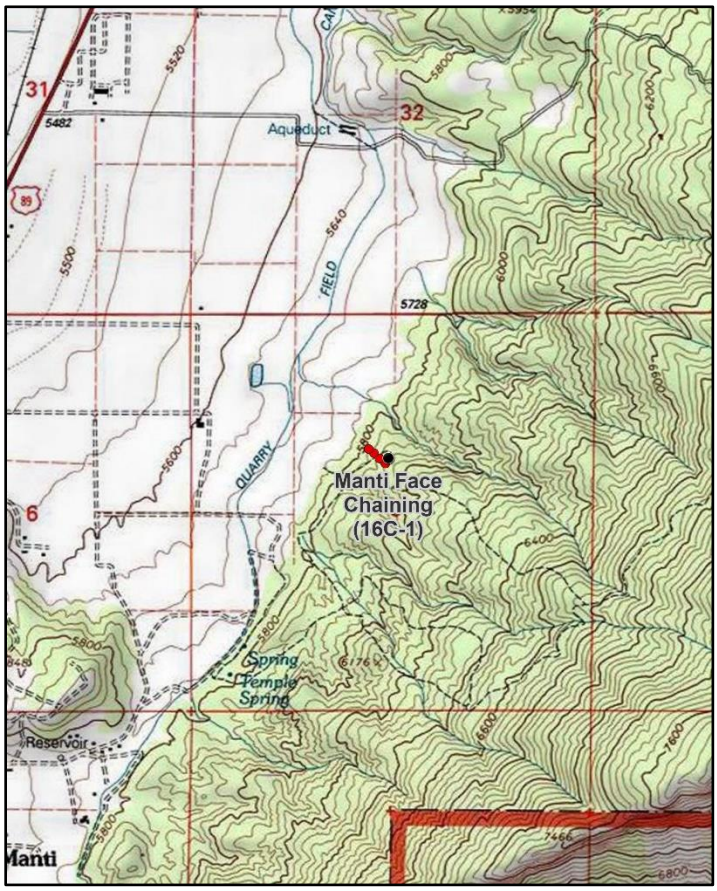
Table 16B-24.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

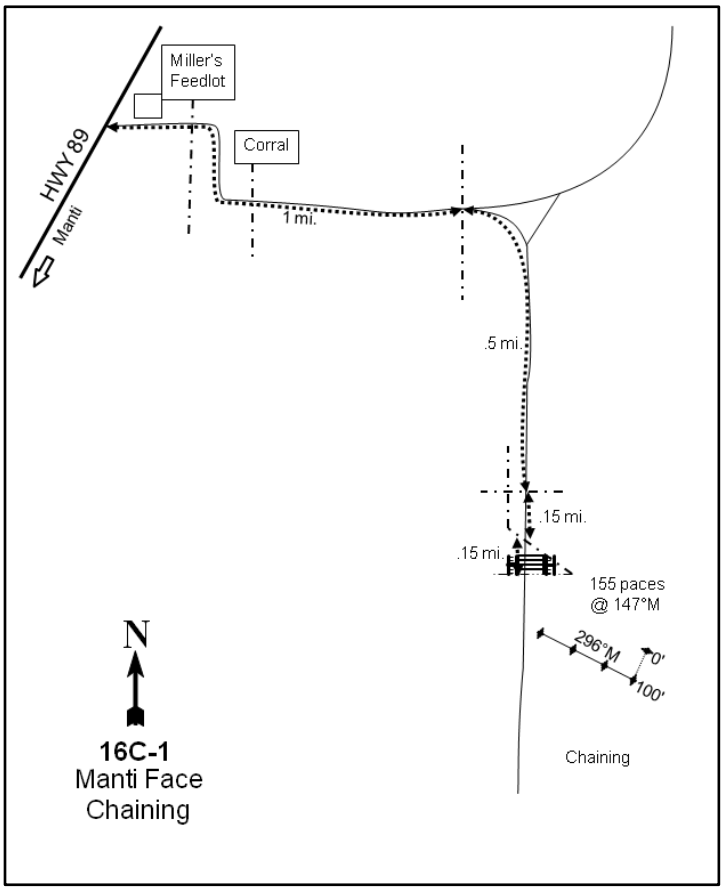
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Pinus edulis (twoneedle pinyon)							
2014	2	-	100	-	-	-	3.5
2019	7	-	50	50	-	-	7.5

Table 16B-24.15 – Deer Desirable Components Index: Mid Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1994	6.8	0.3	4.8	30.0	0.0	4.1	0.0	46.1	Poor
1999	12.1	6.4	8.8	30.0	-0.2	6.3	0.0	63.5	Fair-Good
2004	6.7	-3.2	6.4	30.0	0.0	7.5	0.0	47.4	Poor
2009	8.6	8.7	15.0	30.0	0.0	5.3	0.0	67.5	Good
2014	9.7	10.9	15.0	30.0	0.0	4.5	0.0	70.1	Good
2019	11.8	10.8	15.0	30.0	-0.2	9.8	0.0	77.1	Good

MANTI FACE CHAINING - STUDY NO. 16C-1





Location Information

USGS 7.5 min Map Info	Ephraim SW; Township 18S, Range 3E, Section 05
GPS (0' Stake)	NAD 83 UTM ZONE 12, 447654 East 4348003 North

Transect Information

Browse Tag # (0' Stake)	9043
Transect Bearing	192° magnetic (Lines 2-4: 296° magnetic)
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (59ft), Line 3 (34ft), Line 4 (71ft)
Belt Marker Placement	Belt 3: 1ft, Belt 2: 3ft

Directions to Site

Travel north out of Manti on Highway 89 for roughly 1 mile to a feedlot on the right (east) side of the road: turn right on the south side of these corrals. Drive on this county road for 1 mile, following the main road around the upper corrals, to an old fenceline. Just past the fence, bear right off of the main road onto a faint road. Follow this road for 0.5 miles to the first DWR fence. Go through this small section of DWR land for 0.15 miles to another fence. Travel for 0.15 miles to another DWR fence: stop at this gate. From here, the study site is up the hill in the chaining. Walk 155 paces at 139 degrees magnetic to the 0-foot baseline stake, which is marked by browse tag #9043.

Site Information

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	5,800ft (1,768m)
Aspect	West
Slope	30%
Sample Dates	07/02/1997, 07/09/2002, 07/19/2007, 05/15/2014, 05/15/2019

Table 16C-01.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Chain Unknown	-	-	Historic	-
Seeding - Seed Unknown	-	-	Historic	-
Hand Crew - Lop and Scatter	Manti Face Lop and Scatter	1707	September-December 2012	853

Wildlife Habitat and Vegetation History

Table 16C-01.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter

Table 16C-01.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1989	Perennial Grass	Phase I
1997	Perennial Grass	Phase I
2002	Perennial Grass	Phase I
2007	Perennial Grass	Phase I
2014	Perennial Grass	Phase I
2019	Perennial Grass	Phase I

Site Notes

No Notes

Soils

Table 16C-01.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay	7.2	25.7	29.4	44.8	4.7	10.9	246.4	0.5	07/02/1997
Clay Loam	7.3	38.0	34.4	27.6	5.5	11.8	262.4	0.5	07/02/1997

Site Potential

1981 - 2010 Average Annual Precipitation	14 inches
NRCS Ecological Site	Upland Gravelly Loam (Black Sagebrush)
NRCS Ecological Site #	R047XB306UT
States and Transitions	No state and transition model is available for this ecological site.

Since establishment in 1989, this site has remained dominated by perennial grasses with the introduced species crested wheatgrass (*Agropyron cristatum*) becoming increasingly dominant (Table 16C-01.7, Table 16C-01.10). Diversity of the browse and forb communities has remained moderate with both communities providing little cover. The exception to this is the 2019 sample year, when annual forbs provided nearly 20 percent cover due to the introduced species desert madwort (*Alyssum desertorum*) (Table 16C-01.11, Table 16C-01.12). Utah juniper (*Juniperus osteosperma*) has increased since 1989, but a 2012 lop and scatter treatment (Table 16C-01.1) removed many of the trees; the study site has been considered to be within Phase I of woodland succession in all sample years (Table 16C-01.4). Juniper cover and density exhibited slight increases between 2014 and 2019 (Table 16C-01.12, Table 16C-01.14), indicating that there may be potential for infilling in the future.

Trend Summary Tables

Table 16C-01.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	0.1	0.1	2.0	-	-	-
2002	0.2	0.3	2.5	0.4	0.1	1.3
2007	0.3	-	1.7	0.4	-	2.9
2014	0.6	0.2	0.2	0.8	0.2	0.3
2019	0.4	0.0	0.6	2.0	0.1	1.1

Table 16C-01.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	94	367	358	58	0.9	15.1	4.1	1.0
2002	16	388	148	17	0.1	21.5	0.5	0.1
2007	238	390	419	39	4.0	22.6	6.0	0.2
2014	25	407	349	55	0.1	29.8	3.2	0.7
2019	113	391	464	78	1.2	29.1	19.7	1.2

Table 16C-01.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	18.2	0.6	31.3	26.4	7.3	28.0
2002	15.5	3.3	34.0	25.4	8.0	25.7
2007	9.2	4.1	19.6	26.3	7.8	38.5
2014	11.8	2.3	27.2	20.0	10.4	33.9
2019	19.7	3.1	28.6	31.1	10.9	42.3

Table 16C-01.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1997	1	36	23	17
2002	-	54	5	27
2007	2	37	4	58
2014	2	22	6	18
2019	3	14	1	56
Year	Days Use Per Acre (ha)			
1997	-	-	-	-
2002	2.2 (5.4)	63.0 (155.6)	0.7 (1.7)	-
2007	8.7 (21.5)	28.1 (69.5)	11.4 (28.1)	-
2014	0.7 (1.8)	22.1 (54.6)	12.8 (31.5)	-
2019	0.7 (1.8)	27.5 (67.9)	1.3 (3.3)	-

Table 16C-01.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bromus arvensis[ai] (field brome)	Bromus inermis[i] (smooth brome)	Bromus tectorum[ai] (cheatgrass)	Elymus elymoides (squirreltail)	Festuca idahoensis (Idaho fescue)	Poa bulbosa[i] (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Psathyrostachys juncea[i] (Russian wildrye)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium[i] (intermediate wheatgrass)
year	Nested Frequency											
1997	7	204	6	-	88	30	15	-	173	29	46	143
2002	-	249	-	-	16	8	17	-	151	-	74	114
2007	2	232	9	-	234	6	6	-	224	5	75	113
2014	-	271	-	4	25	-	14	2	280	17	58	153
2019	-	316	5	-	111	1	20	20	224	15	11	148
year	Average Cover (%)											
1997	0.4	5.8	0.2	-	0.7	0.4	0.3	-	1.6	1.4	1.2	4.0
2002	-	10.6	-	-	0.1	0.1	0.9	-	1.4	-	5.3	3.2
2007	0.0	11.0	0.0	-	4.0	0.1	0.0	-	5.5	0.2	2.6	3.2
2014	-	18.7	-	0.1	0.1	-	0.1	0.0	4.4	0.4	2.0	3.9
2019	-	18.8	0.0	-	1.1	0.0	0.3	0.2	4.1	0.3	0.6	4.8

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16C-01.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Alyssum desertorum[ai] (desert madwort)	Antennaria dimorpha (low pussytoes)	Arenaria fendleri (Fendler's sandwort)	Astragalus (milkvetch)	Astragalus calycosus (Torrey's milkvetch)	Astragalus eurekensis (Eureka milkvetch)	Calochortus nuttallii (sego lily)	Camelina microcarpa[ai] (littlepod false flax)	Ceratocephala testiculata[ai] (curveseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Chenopodium fremontii[a] (Fremont's goosefoot)	Chorispora tenella[ai] (crossflower)	Collinsia parviflora[a] (maiden blue eyed Mary)	Convolvulus arvensis[ni] (field bindweed)	Cryptantha (cryptantha)	Descurainia pinnata[a] (western tansymustard)	Draba[a] (draba)
year	Nested Frequency																
1997	1	-	3	-	-	-	-	32	353	6	1	3	-	13	24	14	4
2002	-	-	-	-	-	-	-	-	148	-	-	-	1	12	-	-	-
2007	153	-	2	2	-	-	-	41	409	-	-	-	-	20	12	31	-
2014	185	-	1	-	6	5	1	7	332	-	7	1	1	16	18	14	-
2019	437	4	2	-	8	8	9	6	423	-	0	-	-	27	18	11	3
year	Average Cover (%)																
1997	0.0	-	0.0	-	-	-	-	0.1	3.8	0.0	0.0	0.0	-	0.4	0.2	0.0	0.0
2002	-	-	-	-	-	-	-	-	0.5	-	-	-	0.0	0.1	-	-	-
2007	0.6	-	0.0	0.0	-	-	-	0.1	5.1	-	-	-	-	0.2	0.0	0.1	-
2014	0.4	-	0.0	-	0.0	0.1	0.0	0.0	2.6	-	0.1	0.0	0.0	0.2	0.3	0.1	-
2019	9.5	0.0	0.0	-	0.2	0.2	0.2	0.0	10.0	-	0.0	-	-	0.2	0.3	0.1	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Erodium cicutarium[ai] (redstem stork's bill)	Galium aparine[a] (stickywilly)	Lactuca serriola[ai] (prickly lettuce)	Lappula occidentalis[a] (flatspine stickseed)	Medicago sativa[i] (alfalfa)	Phlox austromontana (mountain phlox)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Stenotus acaulis (stemless mock goldenweed)	Streptanthus cordatus (heartleaf twistflower)	Taraxacum officinale (common dandelion)	Tragopogon dubius[ai] (yellow salsify)
year	Nested Frequency											
1997	1	1	3	4	12	8	-	-	-	1	-	14
2002	-	-	-	-	-	1	-	1	-	-	3	1
2007	7	-	-	-	-	4	-	-	-	-	-	7
2014	-	-	-	5	-	5	-	1	5	-	4	2
2019	14	-	3	5	-	3	3	-	5	1	-	4
year	Average Cover (%)											
1997	0.0	0.0	0.0	0.0	0.3	0.0	-	-	-	0.0	-	0.1
2002	-	-	-	-	-	0.0	-	0.0	-	-	0.0	0.0
2007	0.0	-	-	-	-	0.0	-	-	-	-	-	0.0
2014	-	-	-	0.0	-	0.1	-	0.0	0.0	-	0.0	0.0
2019	0.0	-	0.0	0.0	-	0.1	0.1	-	0.0	0.0	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16C-01.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia nova[p] (black sagebrush)	Atriplex canescens[p] (fourwing saltbush)	Ephedra viridis[p] (mormon tea)	Ericameria nauseosa ssp. nauseosa var. speciosa[p] (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma[t] (Utah juniper)	Purshia tridentata[p] (antelope bitterbrush)
year	Line Intercept Cover (%)						
1997	-	-	-	-	-	-	-
2002	0.4	-	-	-	0.1	1.3	-
2007	0.4	-	-	-	-	2.9	-
2014	0.4	0.4	-	0	0.2	0.3	-
2019	1.9	0.1	-	-	0.1	1.1	0
year	Quadrat Cover (%)						
1997	0.0	-	0.0	-	0.1	2.0	0.0
2002	0.2	-	0.0	-	0.3	2.5	0.0
2007	0.3	-	-	-	-	1.7	0.0
2014	0.4	0.1	-	0.0	0.2	0.2	0.0
2019	0.3	0.0	-	-	0.0	0.6	0.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16C-01.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Artemisia nova[p] -- (black sagebrush)									
1997	500	-	48	52	0	24	0	0	34/51
2002	680	20	62	32	6	24	12	3	29/50
2007	340	-	41	41	18	24	18	12	28/53
2014	1080	380	80	20	0	9	13	0	27/53
2019	700	120	69	31	0	23	31	0	32/59
Atriplex canescens[p] -- (fourwing saltbush)									
1997	40	-	0	100	0	50	50	0	98/158
2002	40	-	0	100	0	50	0	0	113/154
2007	20	-	0	100	0	0	0	0	129/181
2014	40	-	0	0	100	0	50	50	86/137
2019	40	-	0	0	100	0	100	100	89/138
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	15/19
Ephedra viridis[p] -- (mormon tea)									
1997	40	-	50	50	0	0	50	0	- / -
2002	20	-	0	0	100	0	0	100	19/30
2007	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Ericameria nauseosa ssp. nauseosa var. speciosa[p] -- (rubber rabbitbrush)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	108/91
2007	-	-	-	-	-	-	-	-	60/102
2014	20	-	100	0	0	100	0	0	77/109
2019	40	-	100	0	0	100	0	0	140/151
Gutierrezia sarothrae -- (broom snakeweed)									
1997	700	40	63	37	0	0	0	0	21/22
2002	540	-	0	78	22	0	0	0	15/20
2007	80	-	25	75	0	0	0	0	20/20
2014	480	20	63	33	4	4	0	4	26/23
2019	320	-	63	38	0	19	6	0	10/12
Juniperus osteosperma[t] -- (Utah juniper)									
1997	240	40	58	42	0	8	0	0	39/89
2002	240	-	25	75	0	8	0	0	- / -
2007	220	-	55	46	0	0	0	0	- / -
2014	240	80	75	25	0	0	0	33	- / -
2019	180	20	89	11	0	11	11	11	- / -
Purshia tridentata[p] -- (antelope bitterbrush)									
1997	40	20	0	100	0	50	50	0	17/36
2002	60	-	33	67	0	0	67	0	13/45
2007	40	-	0	50	50	0	100	50	10/26
2014	80	-	25	75	0	0	75	25	16/35
2019	100	20	20	60	20	20	80	40	15/31

t - Tree Species; p - Preferred Browse; i - Introduced Species

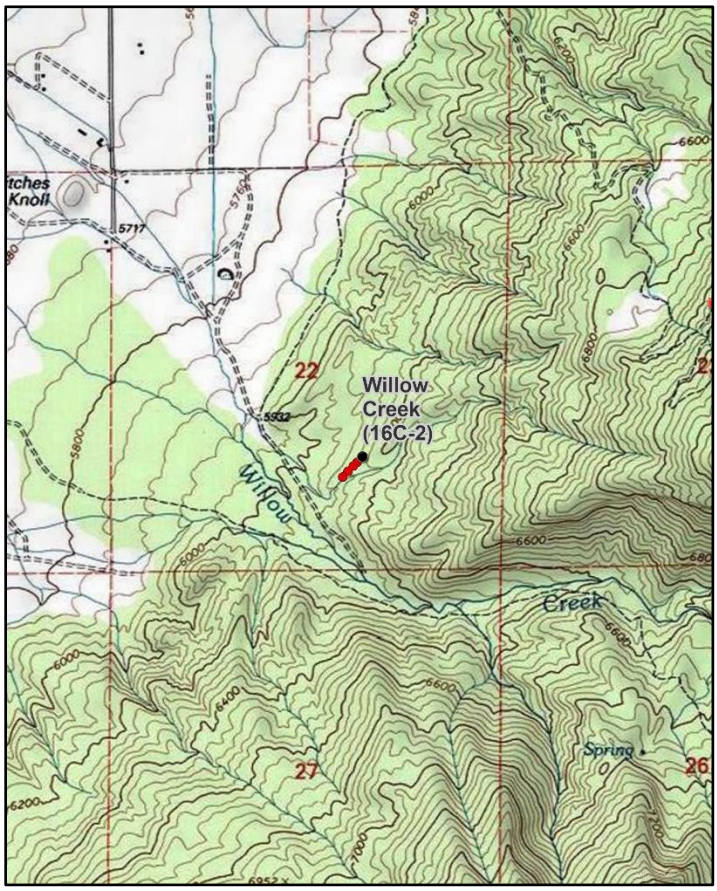
Table 16C-01.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

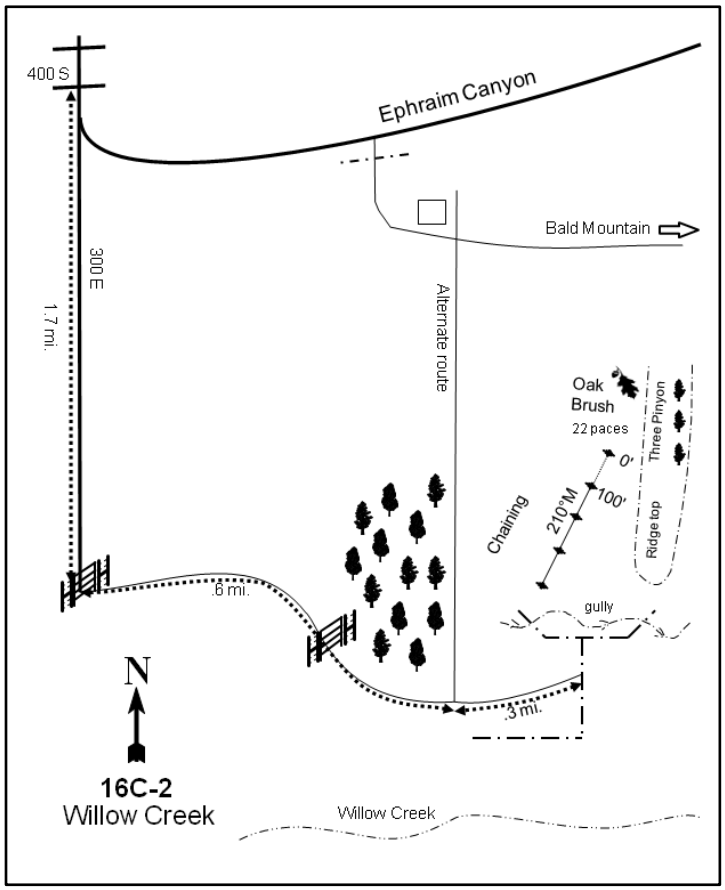
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2002	117	-	-	-	-	-	4.6
2007	133	16	42	42	-	-	6.4
2014	71	76	18	-	6	-	2.4
2019	94	5	84	11	-	-	4.1
Pinus edulis (twoneedle pinyon)							
2002	6	-	-	-	-	-	3.3
2007	9	20	60	20	-	-	4.4
2014	1	100	-	-	-	-	3.0
2019	1	-	100	-	-	-	5.0

Table 16C-01.15 – Deer Desirable Components Index: Mid Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1997	0.1	0.0	0.0	30.0	-0.7	1.2	-2.0	28.6	Very Poor
2002	0.2	0.0	0.0	30.0	0.0	0.1	-2.0	28.2	Very Poor
2007	0.5	0.0	0.0	30.0	-3.0	0.1	-2.0	25.7	Very Poor
2014	1.0	0.0	0.0	30.0	0.0	1.0	-2.0	29.9	Very Poor
2019	2.5	0.0	0.0	30.0	-0.9	2.0	-4.0	29.6	Very Poor

WILLOW CREEK - STUDY NO. 16C-2





Location Information

USGS 7.5 min Map Info	Ephraim NW; Township 17S, Range 3E, Section 22
GPS (0' Stake)	NAD 83 UTM ZONE 12, 451125 East 4352340 North

Transect Information

Browse Tag # (0' Stake)	414
Transect Bearing	210° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Line 2: 75ft Long, Belt 3: 1ft

Directions to Site

From the intersection of 400 South and 300 East in Ephraim, take 300 East south for 1.7 miles to a gate. Pass through the gate onto a gravel road and follow this road for 0.6 miles to a fork. Stay to the right at the fork, then continue for 0.3 miles to another gate: park here. Cross the fence and gully and hike up the white shale ridge to the northeast (30-35 degrees magnetic). From the gully, walk about 188 paces to a high point on the ridge where three large pinyon trees grow. You will pass the 400-foot stake en route which is near the ridge top. However, the 0-foot baseline stake is 22 paces downhill from the three pinyon trees just south of an oak clump. The 0-foot stake is marked by browse tag #414. Consult diagrammatic sketch for an alternate route.

Site Information

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	6,120ft (1,865m)
Aspect	West
Slope	3-15%
Sample Dates	06/25/1997, 07/10/2002, 07/25/2007, 05/27/2014, 05/14/2019

Table 16C-02.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Chain Unknown	Bald Mountain	-	1969	700
Seeding - Seed Unknown	Bald Mountain	-	1969	700
Hand Crew - Lop and Scatter	Bald Mountain WMA Lop and Scatter	-	2014-2015	400

Wildlife Habitat and Vegetation History

Table 16C-02.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter

Table 16C-02.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1989	Perennial Grass/Mixed Mountain Brush	Phase I
1997	Perennial Grass/Mixed Mountain Brush	Phase I
2002	Perennial Grass/Mixed Mountain Brush/Pinyon-Juniper	Phase I transitioning to Phase II
2007	Perennial Grass/Mixed Mountain Brush/Pinyon-Juniper	Phase I transitioning to Phase II
2014	Perennial Grass/Mixed Mountain Brush/Pinyon-Juniper	Phase I transitioning to Phase II
2019	Perennial Grass/Mixed Mountain Brush	Phase I

Site Notes

No Notes

Soils

Table 16C-02.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	7.4	48.0	25.4	26.6	3.3	9.2	150.4	0.5	06/25/1997

Site Potential

1981 - 2010 Average Annual Precipitation	16 inches
NRCS Ecological Site	Upland Stony Loam (Pinyon-Utah Juniper)
NRCS Ecological Site #	R047XB333UT
States and Transitions	A defined state and transition model is available.

From the time that the site was established in 1989 through 2014, it was a severely encroached perennial grass ecological state. Following treatment, tree cover was reduced significantly (Photos, Table 16C-02.1, Table 16C-02.12). Perennial grass species have remained stable or increased slightly and are dominated by the introduced species crested wheatgrass (*Agropyron cristatum*) and intermediate wheatgrass (*Thinopyrum intermedium*) as well as the native species Idaho fescue (*Festuca idahoensis*)(Table 16C-02.7, Table 16C-02.10). Forbs are rare overall with the exception of occasional flushes of weedy annual forbs desert madwort (*Alyssum desertorum*) and curveseed butterwort (*Ceratocephala testiculata*)(Table 16C-02.11). There is a mix of shrubs on the site but the most common are antelope bitterbrush (*Purshia tridentata*) and yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus* var. *stenophyllus*), there has been a decreasing trend for antelope bitterbrush and an increasing trend for yellow rabbitbrush (Table 16C-02.12). Both twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) have been present on the site, they have decreased significantly in both cover and density following the lop and scatter treatment (Table 16C-02.1, Table 16C-02.12, Table 16C-02.14). The state and transition model indicates that this in the Seeded Grassland/Shrubland state, which has potential to transition to a Seeded/PJ state depending on how quickly infill occurs on the site (Jornada 2019).

Trend Summary Tables

Table 16C-02.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	7.6	1.0	6.9	-	-	-
2002	4.6	1.4	7.6	6.0	3.3	10.8
2007	4.1	1.9	7.9	5.1	2.6	12.0
2014	4.0	1.7	10.9	4.2	2.2	16.0
2019	3.8	4.2	1.1	3.9	4.3	2.8

Table 16C-02.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	103	309	257	71	1.4	14.6	2.1	1.7
2002	13	298	27	32	0.0	15.3	0.0	0.4
2007	125	311	342	38	1.8	14.0	4.0	0.4
2014	36	309	145	67	0.2	18.5	0.6	1.1
2019	93	298	407	75	2.9	23.9	9.3	0.8

Table 16C-02.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	19.2	1.2	33.2	10.9	6.1	32.9
2002	32.3	1.7	33.5	14.1	7.2	28.8
2007	25.2	1.8	32.2	13.1	5.3	35.0
2014	32.6	1.3	36.7	6.5	5.9	35.8
2019	30.3	1.4	47.0	9.8	5.8	39.1

Table 16C-02.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Coyote	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency				
1997	-	-	56	8	19
2002	1	-	54	5	9
2007	-	-	50	13	35
2014	-	-	17	9	15
2019	-	-	24	9	19
Year	Days Use Per Acre (ha)				
1997	-	-	-	-	-
2002	-	-	172.2 (425.4)	8.1 (19.9)	-
2007	3.6 (9.0)	8.7 (21.5)*	174.9 (432.0)	49.6 (122.5)	-
2014	-	-	28.1 (69.5)	11.4 (28.1)	-
2019	0.7 (1.8)	-	25.5 (62.9)	8.7 (21.5)	-

*Pellets per acre (ha)

Table 16C-02.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bromus arvensis[ai] (field brome)	Bromus inermis[i] (smooth brome)	Bromus tectorum[ai] (cheatgrass)	Elymus elymoides (squirreltail)	Festuca idahoensis (Idaho fescue)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Psathyrostachys juncea[i] (Russian wildrye)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium[i] (intermediate wheatgrass)
year	Nested Frequency											
1997	40	126	-	10	103	2	40	-	94	9	35	135
2002	14	131	-	4	13	-	74	-	74	19	39	94
2007	12	134	3	11	123	-	99	-	82	24	47	89
2014	8	109	-	17	36	-	68	-	142	38	53	88
2019	8	146	-	-	93	-	68	3	112	10	37	99
year	Average Cover (%)											
1997	0.7	4.5	-	0.0	1.4	0.0	1.7	-	1.5	0.9	2.4	2.9
2002	0.3	5.7	-	0.2	0.0	-	3.8	-	0.8	1.2	2.1	1.3
2007	0.3	4.2	0.0	0.4	1.8	-	4.2	-	1.3	0.7	1.7	1.2
2014	0.5	3.8	-	0.4	0.2	-	5.4	-	2.3	2.6	1.8	1.6
2019	1.2	8.9	-	-	2.9	-	4.6	0.0	2.9	0.2	2.3	3.8

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16C-02.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Alyssum alyssoides[ai] (pale madwort)	Alyssum desertorum[ai] (desert madwort)	Arabis (rockcress)	Arenaria fendleri (Fendler's sandwort)	Astragalus (milkvetch)	Astragalus calycosus (Torrey's milkvetch)	Astragalus newberryi (Newberry's milkvetch)	Astragalus utahensis (Utah milkvetch)	Balsamorhiza sagittata (arrowleaf balsamroot)	Camelina microcarpa[ai] (littlepod false flax)	Ceratocephala testiculata[ai] (curveseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Chorispora tenella[ai] (crossflower)	Cirsium (thistle)	Collinsia parviflora[a] (maiden blue eyed Mary)	Convolvulus arvensis[ni] (field bindweed)
year	Nested Frequency																
1997	3	-	126	-	-	-	-	-	14	5	6	208	8	-	-	-	9
2002	-	-	1	-	-	-	-	-	1	-	-	25	-	-	-	-	0
2007	-	-	202	2	3	5	-	-	3	-	5	286	-	-	-	2	6
2014	-	-	113	1	3	-	12	-	6	-	3	55	-	6	1	-	-
2019	12	43	323	13	0	-	9	5	1	-	5	240	-	4	-	-	1
year	Average Cover (%)																
1997	0.0	-	0.3	-	-	-	-	-	0.3	0.0	0.0	1.7	0.0	-	-	-	0.1
2002	-	-	0.0	-	-	-	-	-	0.0	-	-	0.0	-	-	-	-	0.0
2007	-	-	1.0	0.0	0.1	0.0	-	-	0.0	-	0.0	2.7	-	-	-	0.0	0.0
2014	-	-	0.3	0.0	0.0	-	0.1	-	0.1	-	0.0	0.2	-	0.0	0.1	-	-
2019	0.0	0.6	6.3	0.0	0.0	-	0.2	0.1	0.0	-	0.0	2.1	-	0.0	-	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Cryptantha (cryptantha)	Cymopterus (springparsley)	Descurainia pinnata[a] (western tansymustard)	Erigeron pumilus (shaggy fleabane)	Erodium cicutarium[ai] (redstem stork's bill)	Gilia inconspicua[a] (shy gilia)	Lactuca serriola[ai] (prickly lettuce)	Lappula occidentalis[a] (flatspine stickseed)	Lomatium (desertparsley)	Machaeranthera canescens (hoary tansyaster)	Medicago sativa[i] (alfalfa)	Microsteris gracilis[a] (slender phlox)	Petradoria pumila (rock goldenrod)	Phlox austromontana (mountain phlox)	Phlox longifolia (longleaf phlox)	Tragopogon dubius[ai] (yellow salsify)
year	Nested Frequency															
1997	4	2	4	-	-	-	-	-	-	4	17	9	1	11	6	5
2002	-	-	-	-	-	-	-	-	-	-	13	-	-	6	12	1
2007	1	4	16	-	6	3	-	-	-	-	2	1	-	5	8	1
2014	1	-	5	1	2	-	-	1	19	-	5	2	3	7	15	-
2019	1	-	14	-	3	-	7	7	24	-	9	3	-	4	12	-
year	Average Cover (%)															
1997	0.2	0.0	0.0	-	-	-	-	-	-	0.1	0.8	0.0	0.0	0.2	0.0	0.1
2002	-	-	-	-	-	-	-	-	-	-	0.1	-	-	0.2	0.1	0.0
2007	0.0	0.0	0.1	-	0.1	0.0	-	-	-	-	0.0	0.0	-	0.2	0.0	0.0
2014	0.0	-	0.0	0.0	0.0	-	-	0.0	0.1	-	0.3	0.0	0.2	0.2	0.1	-
2019	0.0	-	0.1	-	0.0	-	0.0	0.2	0.2	-	0.1	0.0	-	0.2	0.1	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16C-02.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis[p] (Utah serviceberry)	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Cercocarpus montanus[p] (alderleaf mountain mahogany)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. speciosa[p] (rubber rabbitbrush)	Eriogonum microthecum[p] (slender buckwheat)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma[t] (Utah juniper)	Opuntia polyacantha (plains pricklypear)	Pinus edulis[t] (twoneedle pinyon)	Purshia tridentata[p] (antelope bitterbrush)	Quercus gambelii[p] (Gambel oak)	Rhus trilobata[p] (skunkbush sumac)
year	Line Intercept Cover (%)												
1997	-	-	-	-	-	-	-	-	-	-	-	-	-
2002	0.1	-	1.1	3	0.4	0.2	0.2	7	0.1	3.8	3.7	-	0.5
2007	0.1	-	1	2.6	0.2	0.1	-	7.7	-	4.3	3.7	-	-
2014	0.1	-	1.7	2.2	0	0.1	0	9.8	-	6.2	2.3	-	-
2019	0.1	-	1.3	4.2	0.6	-	0.1	2.8	-	-	1.9	-	-
year	Quadrat Cover (%)												
1997	0.0	0.0	0.9	0.8	0.8	0.0	0.1	5.0	0.1	2.0	5.8	0.0	-
2002	0.1	-	0.5	1.1	0.4	0.0	0.2	4.3	0.0	3.3	3.5	-	0.0
2007	0.0	-	0.7	1.5	0.1	0.0	0.4	4.6	-	3.3	3.1	-	-
2014	0.1	-	1.1	1.6	0.4	0.0	0.2	5.9	-	5.1	2.4	-	-
2019	0.1	-	0.9	4.0	0.2	0.1	0.1	1.1	0.0	-	2.4	-	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16C-02.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[P] -- (Utah serviceberry)									
1997	20	-	100	0	0	100	0	0	32/44
2002	20	-	0	100	0	0	100	0	36/50
2007	20	-	0	100	0	0	100	0	18/33
2014	40	-	0	100	0	0	100	0	52/64
2019	40	-	100	0	0	50	50	0	54/62
Artemisia tridentata ssp. vaseyana[P] -- (mountain big sagebrush)									
1997	60	-	0	100	0	33	67	0	45/65
2002	40	-	0	50	50	0	100	0	42/54
2007	60	-	0	33	67	0	100	67	37/51
2014	40	-	0	100	0	0	100	0	40/49
2019	20	-	0	100	0	0	100	0	33/47
Atriplex canescens[P] -- (fourwing saltbush)									
1997	-	-	-	-	-	-	-	-	54/45
2002	-	-	-	-	-	-	-	-	32/46
2007	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	44/29
2019	-	-	-	-	-	-	-	-	73/107
Cercocarpus montanus[P] -- (alderleaf mountain mahogany)									
1997	420	-	24	76	0	48	19	0	60/83
2002	300	-	0	87	13	0	93	0	55/74
2007	340	-	0	88	12	0	100	0	58/86
2014	280	-	29	64	7	0	100	7	54/75
2019	320	-	6	75	19	6	94	13	60/71
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
1997	1080	20	26	74	0	0	0	0	38/53
2002	1100	-	0	91	9	7	0	2	29/50
2007	1080	-	0	94	6	0	0	0	35/57
2014	1260	-	16	83	2	29	8	6	32/51
2019	1280	-	3	89	8	3	0	3	33/57
Ephedra viridis[P] -- (mormon tea)									
1997	-	-	-	-	-	-	-	-	53/101
2002	-	-	-	-	-	-	-	-	29/33
2007	-	-	-	-	-	-	-	-	42/44
2014	20	-	100	0	0	0	100	0	40/38
2019	-	-	-	-	-	-	-	-	39/56
Eriogonum microthecum[P] -- (slender buckwheat)									
1997	20	-	0	100	0	0	0	0	12/19
2002	40	-	0	100	0	0	50	0	16/37
2007	40	-	0	100	0	0	0	0	25/10
2014	40	-	0	100	0	0	0	0	28/32
2019	20	-	0	100	0	0	100	0	26/43
Ericameria nauseosa ssp. nauseosa var. speciosa[P] -- (rubber rabbitbrush)									
1997	100	-	20	80	0	20	0	0	86/91
2002	100	-	20	40	40	0	20	0	81/89
2007	120	-	0	17	83	67	17	67	88/100
2014	100	-	0	60	40	0	100	40	70/84
2019	100	-	0	60	40	40	40	20	67/75

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Gutierrezia sarothrae -- (broom snakeweed)									
1997	680	-	24	74	3	0	0	3	25/24
2002	700	-	0	100	0	0	0	0	19/23
2007	280	-	7	93	0	0	0	0	25/33
2014	180	-	11	89	0	0	0	0	22/32
2019	360	-	0	94	6	0	0	6	17/30
Juniperus osteosperma[t] -- (Utah juniper)									
1997	180	-	44	56	0	0	0	0	- / -
2002	200	-	30	70	0	0	0	0	- / -
2007	160	-	25	75	0	0	0	13	- / -
2014	120	-	0	100	0	0	0	0	- / -
2019	120	-	67	17	17	0	0	17	- / -
Opuntia polyacantha -- (plains pricklypear)									
1997	140	-	14	86	0	0	0	0	9/12
2002	40	-	0	50	50	0	0	50	12/15
2007	20	-	0	100	0	0	0	0	14/19
2014	100	-	40	60	0	0	0	0	11/20
2019	-	-	-	-	-	-	-	-	-/-
Pinus edulis[t] -- (twoneedle pinyon)									
1997	100	-	20	80	0	0	0	0	- / -
2002	140	-	43	57	0	0	0	0	- / -
2007	160	20	13	88	0	0	0	0	- / -
2014	100	60	40	60	0	0	0	0	- / -
2019	20	-	100	0	0	0	0	0	- / -
Purshia stansburiana[p] -- (Stansbury cliffrose)									
1997	40	-	0	100	0	100	0	0	60/45
2002	20	-	0	0	100	0	100	100	62/76
2007	80	-	0	25	75	0	100	0	48/74
2014	20	-	0	0	100	0	100	100	84/80
2019	40	-	0	100	0	0	100	0	50/76
Purshia tridentata[p] -- (antelope bitterbrush)									
1997	840	-	7	93	0	31	41	2	45/95
2002	640	-	6	78	16	3	91	9	37/126
2007	800	-	3	85	13	5	93	5	35/120
2014	980	-	0	84	16	12	86	18	29/80
2019	840	-	0	86	14	10	88	17	32/96
Quercus gambelii[p] -- (Gambel oak)									
1997	20	20	0	100	0	0	0	0	52/67
2002	20	-	0	100	0	0	0	0	74/41
2007	20	-	0	100	0	100	0	0	260/210
2014	20	-	0	100	0	100	0	0	42/49
2019	-	-	-	-	-	-	-	-	84/65
Rhus trilobata[p] -- (skunkbush sumac)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	109/225
2007	-	-	-	-	-	-	-	-	101/227
2014	-	-	-	-	-	-	-	-	125/144
2019	-	-	-	-	-	-	-	-	115/178

t - Tree Species; p - Preferred Browse; i - Introduced Species

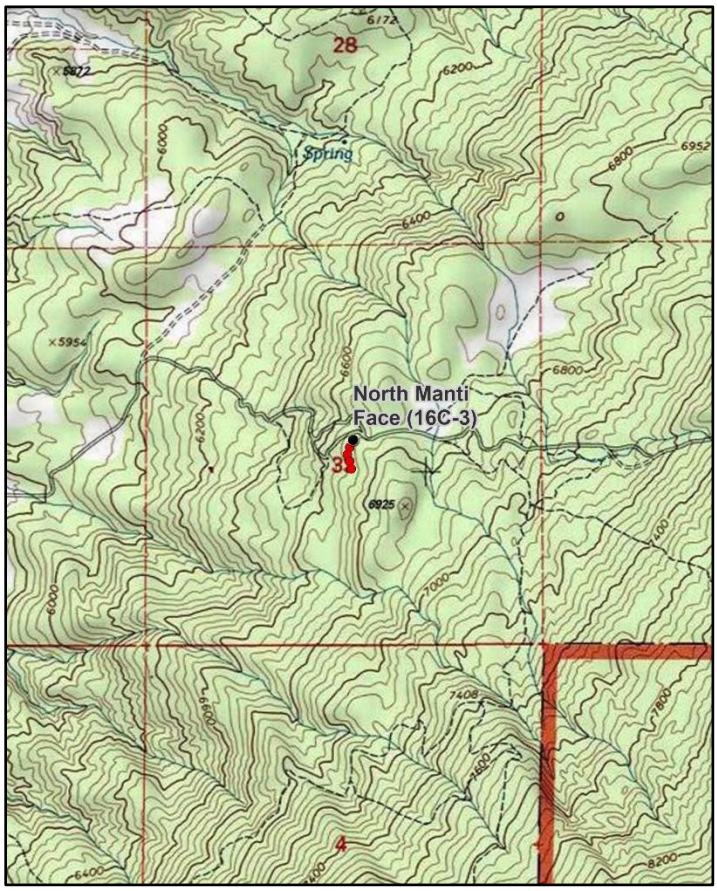
Table 16C-02.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

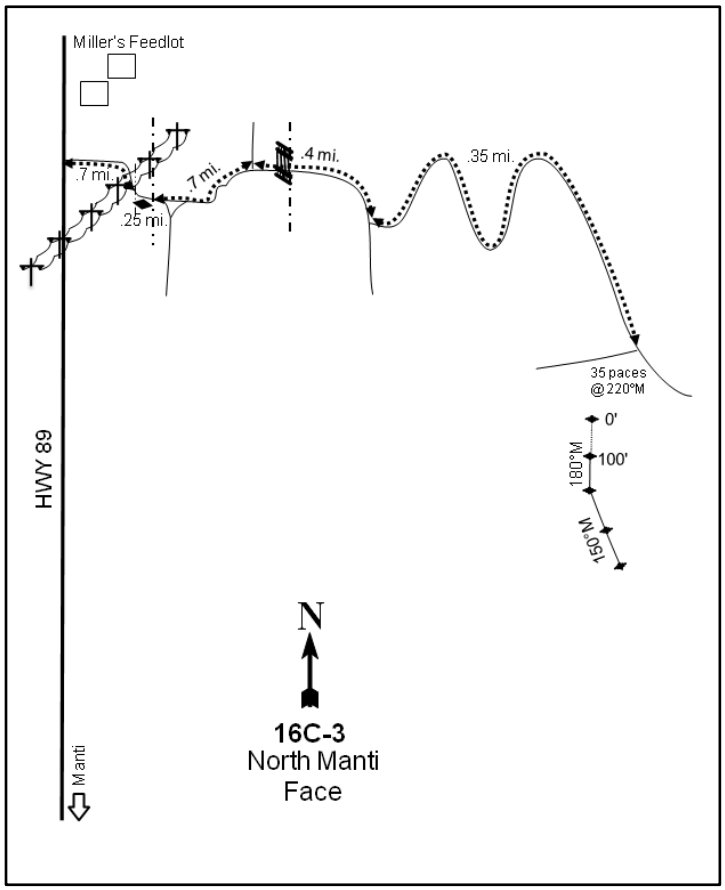
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2002	111	-	-	-	-	-	6.3
2007	174	5	30	45	20	-	7.5
2014	136	-	26	32	37	5	10.9
2019	114	-	88	12	-	-	4.1
Pinus edulis (twoneedle pinyon)							
2002	68	-	-	-	-	-	6.8
2007	60	6	19	63	6	6	8.6
2014	68	-	20	53	27	-	9.3
2019	12	33	50	-	-	17	9.0

Table 16C-02.15 – Deer Desirable Components Index: Mid Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1997	11.2	15.0	5.4	29.2	-1.0	3.3	-2.0	61.1	Fair
2002	6.9	0.0	0.0	30.0	0.0	0.8	-2.0	35.7	Very Poor-Poor
2007	7.6	10.6	0.9	28.0	-1.3	0.7	-2.0	44.5	Poor
2014	6.3	0.0	0.0	30.0	-0.1	2.2	0.0	38.4	Poor
2019	5.7	0.0	0.0	30.0	-2.2	1.7	-2.0	33.2	Very Poor-Poor

NORTH MANTI FACE - STUDY NO. 16C-3





Location Information

USGS 7.5 min Map Info	Ephraim SW; Township 17S, Range 3E, Section 33
GPS (0' Stake)	NAD 83 UTM ZONE 12, 449333 East 4349426 North

Transect Information

Browse Tag # (0' Stake)	9044
Transect Bearing	180° magnetic (Lines 3-4: 150° magnetic)
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

From the Manti LDS temple visitor's center in Manti, proceed north on Highway 89 for 1.5 miles. Just south of Miller's feedlot, turn east onto a dirt road (Miller's Lane) and continue for 0.7 miles to a gate. Travel down the road another 0.25 miles to a fence, then continue 0.7 miles to a fork in the road. Proceed right at the fork and travel for 0.4 miles, crossing a cattle guard onto DWR property, to another fork in the road. From here, stay left while following switchbacks up the mountain for 0.35 miles to another fork. Stop here and walk 35 paces at 220 degrees magnetic to the 0-foot baseline stake, which is marked by browse tag #9044.

Site Information

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	6,700ft (2,042m)
Aspect	West
Slope	24-28%
Sample Dates	07/02/1997, 07/11/2002, 07/19/2007, 05/15/2014, 05/14/2019

Table 16C-03.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Hand Crew - Lop and Scatter	Manti Face Lop and Scatter	1707	July 2010-June 2012	853

Wildlife Habitat and Vegetation History

Table 16C-03.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter

Table 16C-03.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1989	Perennial Grass/Mountain Big Sagebrush	Phase I
1997	Juniper/Perennial Grass/Mountain Big Sagebrush	Phase I transitioning to Phase II
2002	Juniper/Perennial Grass/Mountain Big Sagebrush	Phase I transitioning to Phase II
2007	Juniper/Perennial Grass/Mountain Big Sagebrush	Phase I transitioning to Phase II
2014	Juniper/Perennial Grass/Mountain Big Sagebrush	Phase I transitioning to Phase II
2019	Juniper/Perennial Grass/Mountain Big Sagebrush	Phase I transitioning to Phase II

Site Notes

No Notes

Soils

Table 16C-03.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay	7.4	32.0	27.4	40.6	4.5	9.4	201.6	0.5	07/02/1997

Site Potential

1981 - 2010 Average Annual Precipitation	17 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA430UT
States and Transitions	No state and transition model is available for this ecological site.

Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has dominated the shrub component of this site since study establishment in 1988, although density has decreased over time (Table 16C-03.12, Table 16C-03.13, Photos). The herbaceous understory has been diverse and abundant. Perennial grasses -- namely bluebunch wheatgrass (*Pseudoroegneria spicata*) -- have contributed a majority of the herbaceous cover in most years and have been a co-dominant vegetation component since study establishment (Table 16C-03.7, Table 16C-03.10, Table 16C-03.11). Utah juniper (*Juniperus osteosperma*) has also been a co-dominant vegetation component since 1997 and has gradually increased in cover over the sample years. Although cover initially decreased in 2014, encroachment of juniper has continued despite the lop and scatter treatment that occurred in 2012 (Table 16C-03.1, Table 16C-03.12, Table 16C-03.14, Photos). This continued tree presence suggests that without further tree-removing disturbances, this site may have the potential to progress through the phases of woodland succession to a juniper-dominated state over time.

Trend Summary Tables

Table 16C-03.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	5.1	0.3	8.0	-	-	-
2002	4.9	0.7	8.1	4.0	0.6	6.6
2007	1.0	0.4	4.8	3.1	0.4	17.4
2014	2.2	0.1	9.7	3.5	0.2	14.6
2019	3.6	0.0	8.0	3.8	0.1	16.3

Table 16C-03.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	89	330	190	224	0.3	12.0	0.8	5.1
2002	1	311	40	158	0.0	12.1	0.1	3.3
2007	135	296	342	124	1.2	8.1	3.0	2.6
2014	72	289	261	201	0.3	12.2	3.0	5.2
2019	114	288	448	196	1.0	15.2	16.6	7.1

Table 16C-03.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	8.1	0.6	25.8	30.1	10.7	31.1
2002	8.8	1.4	33.0	35.8	13.5	30.6
2007	11.9	0.8	30.5	33.3	8.7	24.2
2014	12.5	1.1	35.4	23.1	11.8	32.2
2019	17.4	0.8	41.8	23.1	14.2	43.7

Table 16C-03.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit	Domestic Sheep
	Quadrat Frequency				
1997	-	67	6	18	-
2002	-	58	1	30	1
2007	-	58	-	46	-
2014	1	18	9	11	-
2019	1	20	4	51	-
Year	Days Use Per Acre (ha)				
1997	-	-	-	-	-
2002	-	181.6 (448.6)	2.0 (5.0)	-	-
2007	-	117.3 (289.7)	28.1 (69.5)	-	-
2014	-	29.5 (72.8)	11.4 (28.1)	-	-
2019	-	29.5 (72.8)	8.7 (21.5)	-	-

Table 16C-03.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus arvensis[ai] (field brome)	Bromus tectorum[ai] (cheatgrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium[i] (intermediate wheatgrass)
year	Nested Frequency						
1997	1	50	40	25	145	308	-
2002	-	-	1	15	82	294	3
2007	2	28	121	14	129	222	-
2014	2	17	56	40	121	259	-
2019	1	51	78	7	49	271	12
year	Average Cover (%)						
1997	0.0	0.2	0.1	0.1	0.9	10.9	-
2002	-	-	0.0	0.2	0.5	11.4	0.0
2007	0.0	0.1	1.1	0.1	1.7	6.3	-
2014	0.0	0.2	0.1	0.6	1.2	10.3	-
2019	0.0	0.3	0.7	0.0	0.5	14.6	0.1

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16C-03.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Alyssum desertorum[ai] (desert madwort)	Antennaria dimorpha (low pussytoes)	Arabis (rockcress)	Arenaria fendleri (Fendler's sandwort)	Astragalus (milkvetch)	Astragalus calycosus (Torrey's milkvetch)	Astragalus eurekensis (Eureka milkvetch)	Astragalus megacarpus (great bladdery milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Camelina microcarpa[ai] (littlepod false flax)	Caulanthus crassicaulis[a] (thickstem wild cabbage)	Ceratocephala testiculata[ai] (curveseed butterwort)	Chaetopappa ericoides (rose heath)	Cirsium undulatum[a] (wavyleaf thistle)	Collinsia parviflora[a] (maiden blue eyed Mary)
year	Nested Frequency																
1997	-	9	4	3	123	16	-	-	5	8	4	9	-	178	46	5	-
2002	-	1	1	1	56	-	-	-	-	-	-	-	-	38	22	1	-
2007	2	125	-	-	57	-	-	-	-	-	-	2	-	284	16	2	-
2014	14	190	6	4	68	-	1	6	16	-	28	-	2	139	17	1	1
2019	16	417	3	-	47	-	1	1	2	-	40	-	-	230	19	3	13
year	Average Cover (%)																
1997	-	0.0	0.0	0.0	1.1	0.3	-	-	0.0	0.0	0.0	0.0	-	0.6	1.0	0.1	-
2002	-	0.0	0.0	0.0	0.3	-	-	-	-	-	-	-	-	0.1	0.1	0.0	-
2007	0.0	0.7	-	-	0.4	-	-	-	-	-	-	0.0	-	1.9	0.2	0.0	-
2014	0.1	2.5	0.0	0.0	0.4	-	0.0	0.1	0.1	-	0.1	-	0.1	0.3	0.1	0.0	0.0
2019	0.1	14.7	0.1	-	0.4	-	0.0	0.0	0.0	-	0.2	-	-	1.2	0.3	0.2	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Crepis acuminata (tapertip hawksbeard)	Cryptantha (cryptantha)	Descurainia pinnata[a] (western tansymustard)	Erigeron (fleabane)	Erigeron eatonii (Eaton's fleabane)	Eriogonum brevicaule (shortstem buckwheat)	Eriogonum jamesii (James' buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Gilia inconspicua[a] (shy gilia)	Hackelia patens (spotted stickseed)	Lactuca serriola[ai] (prickly lettuce)	Lappula occidentalis[a] (flatspine stickseed)	Lathyrus brachycalyx (Bonneville pea)	Linum lewisii (Lewis flax)	Lomatium foeniculaceum (desert biscuitroot)	Penstemon (beardtongue)	Penstemon humilis (low beardtongue)
year	Nested Frequency																
1997	6	5	5	4	-	-	15	2	-	-	-	2	-	-	1	12	-
2002	3	-	-	-	-	8	-	-	-	-	-	-	2	-	-	21	2
2007	-	3	43	-	-	8	-	-	-	-	-	2	2	-	-	1	4
2014	41	6	27	-	4	1	-	2	-	4	-	-	3	3	45	-	32
2019	24	12	62	-	-	8	-	-	10	2	10	5	-	-	53	-	17
year	Average Cover (%)																
1997	0.0	0.0	0.0	0.0	-	-	0.4	0.0	-	-	-	0.0	-	-	0.0	0.1	-
2002	0.0	-	-	-	-	0.1	-	-	-	-	-	-	0.0	-	-	0.1	0.0
2007	-	0.0	0.3	-	-	0.2	-	-	-	-	-	0.0	0.0	-	-	0.0	0.0
2014	0.1	0.1	0.1	-	0.0	0.0	-	0.0	-	0.0	-	-	0.0	0.0	0.2	-	0.6
2019	0.5	0.1	0.5	-	-	0.0	-	-	0.0	0.0	0.0	0.0	-	-	1.1	-	0.7

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Petradoria pumila (rock goldenrod)	Phlox austromontana (mountain phlox)	Phlox longifolia (longleaf phlox)	Stenotus acaulis (stemless mock goldenweed)	Streptanthus cordatus (heartleaf twistflower)	Townsendia leptotes (common Townsend daisy)	Trifolium (clover)	Vicia americana (American vetch)
year	Nested Frequency							
1997	49	34	19	3	1	-	-	3
2002	52	16	16	20	-	-	-	-
2007	46	15	7	-	-	-	-	-
2014	58	32	19	-	-	3	-	-
2019	58	42	10	-	-	2	1	-
year	Average Cover (%)							
1997	1.8	0.1	0.1	0.1	0.0	-	-	0.0
2002	2.2	0.2	0.1	0.2	-	-	-	-
2007	1.7	0.1	0.0	-	-	-	-	-
2014	2.0	1.1	0.1	-	-	0.0	-	-
2019	2.3	1.2	0.0	-	-	0.0	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16C-03.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis[p] (Utah serviceberry)	Artemisia nova[p] (black sagebrush)	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Atriplex canescens[p] (fourwing saltbush)	Chrysothamnus depressus[p] (longflower rabbitbrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. hololeuca[p] (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma[t] (Utah juniper)	Peraphyllum ramosissimum[p] (wild crab apple)	Pinus edulis[t] (twoneedle pinyon)	Symphoricarpos oreophilus[p] (mountain snowberry)
year	Line Intercept Cover (%)											
1997	-	-	-	-	-	-	-	-	-	-	-	-
2002	0.1	-	3.5	-	-	-	0.4	0.6	6.6	-	-	0
2007	0.1	-	2.7	-	0.1	-	-	0.4	17.4	0.2	-	-
2014	0.1	-	2.6	-	0.3	-	-	0.2	14.6	0.4	-	0.1
2019	0.2	-	2.6	-	0.3	-	-	0.1	16.3	0.6	-	0.1
year	Quadrat Cover (%)											
1997	0.0	-	3.9	0.1	0.5	0.0	0.1	0.3	8.0	0.4	-	0.0
2002	0.0	-	4.1	-	0.4	0.2	0.4	0.5	7.5	-	0.6	0.0
2007	0.0	0.2	0.6	0.0	0.1	0.0	-	0.4	4.8	0.0	-	0.0
2014	0.0	-	1.5	0.1	0.4	-	-	0.1	9.7	0.1	0.0	0.0
2019	0.0	-	2.8	-	0.4	-	-	0.0	8.0	0.1	-	0.2

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16C-03.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
1997	20	-	0	100	0	0	100	0	54/94
2002	40	-	0	50	50	0	0	50	44/60
2007	20	-	0	100	0	0	100	0	43/56
2014	20	-	0	0	100	0	100	100	36/67
2019	20	-	0	100	0	0	100	0	48/64
Artemisia nova[p] -- (black sagebrush)									
1997	40	-	0	100	0	50	0	0	30/84
2002	-	-	-	-	-	-	-	-	-/-
2007	80	-	0	0	100	25	0	100	33/66
2014	-	-	-	-	-	-	-	-	25/54
2019	-	-	-	-	-	-	-	-	-/-
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1997	1000	-	12	52	36	42	36	18	54/83
2002	840	-	0	48	52	10	76	33	44/73
2007	460	-	0	30	70	4	91	65	53/87
2014	600	-	7	63	30	20	43	27	43/69
2019	600	-	13	50	37	30	57	37	49/77
Atriplex canescens[p] -- (fourwing saltbush)									
1997	40	-	0	100	0	100	0	0	103/110
2002	-	-	-	-	-	-	-	-	65/51
2007	20	-	0	100	0	100	0	0	80/111
2014	20	-	0	0	100	0	100	100	81/114
2019	-	-	-	-	-	-	-	-	105/152

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Chrysothamnus depressus[p] -- (longflower rabbitbrush)									
1997	860	-	2	91	7	40	2	0	23/28
2002	560	-	0	100	0	0	4	0	9/21
2007	620	-	0	97	3	0	100	0	7/15
2014	560	-	4	89	7	4	82	4	11/30
2019	640	-	22	72	6	50	13	3	12/21
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	21/32
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1997	140	-	57	43	0	0	0	0	23/26
2002	100	-	20	80	0	0	20	0	12/28
2007	-	-	-	-	-	-	-	-	17/27
2014	100	-	0	100	0	0	20	0	17/30
2019	-	-	-	-	-	-	-	-	19/30
Ericameria nauseosa ssp. nauseosa var. hololeuca[p] -- (rubber rabbitbrush)									
1997	120	-	33	50	17	17	0	17	70/83
2002	100	-	0	20	80	40	40	0	57/62
2007	20	-	0	0	100	0	0	100	53/100
2014	-	-	-	-	-	-	-	-	48/50
2019	-	-	-	-	-	-	-	-	41/56
Gutierrezia sarothrae -- (broom snakeweed)									
1997	2520	160	64	36	1	0	0	0	24/22
2002	3120	-	3	85	12	0	0	2	11/14
2007	1620	-	4	89	7	0	0	3	17/18
2014	480	-	17	75	8	4	0	4	14/19
2019	100	140	40	60	0	0	0	0	13/19
Juniperus osteosperma[t] -- (Utah juniper)									
1997	100	20	0	100	0	0	0	0	- / -
2002	120	-	0	100	0	0	0	0	- / -
2007	80	-	0	100	0	0	0	0	- / -
2014	100	20	0	100	0	0	0	40	- / -
2019	100	-	20	80	0	0	0	0	- / -
Opuntia polyacantha -- (plains pricklypear)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	12/49
2014	-	-	-	-	-	-	-	-	14/47
2019	-	-	-	-	-	-	-	-	-/-
Peraphyllum ramosissimum[p] -- (wild crab apple)									
1997	20	-	0	100	0	0	0	0	45/75
2002	40	-	0	50	50	0	100	0	37/53
2007	20	-	0	100	0	0	100	0	42/61
2014	20	-	0	100	0	100	0	0	38/73
2019	40	-	0	100	0	0	100	0	38/102
Pinus edulis[t] -- (twoneedle pinyon)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2014	-	40	0	0	0	0	0	0	- / -
2019	-	-	-	-	-	-	-	-	-/-

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Purshia tridentata[p] -- (antelope bitterbrush)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	15/24
2019	-	-	-	-	-	-	-	-	-/-
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
1997	20	-	0	100	0	0	100	0	16/38
2002	40	-	0	100	0	0	0	0	7/17
2007	20	-	100	0	0	0	0	0	14/39
2014	160	-	75	25	0	0	13	0	16/39
2019	120	-	33	67	0	0	17	0	20/38

t - Tree Species; p - Preferred Browse; i - Introduced Species

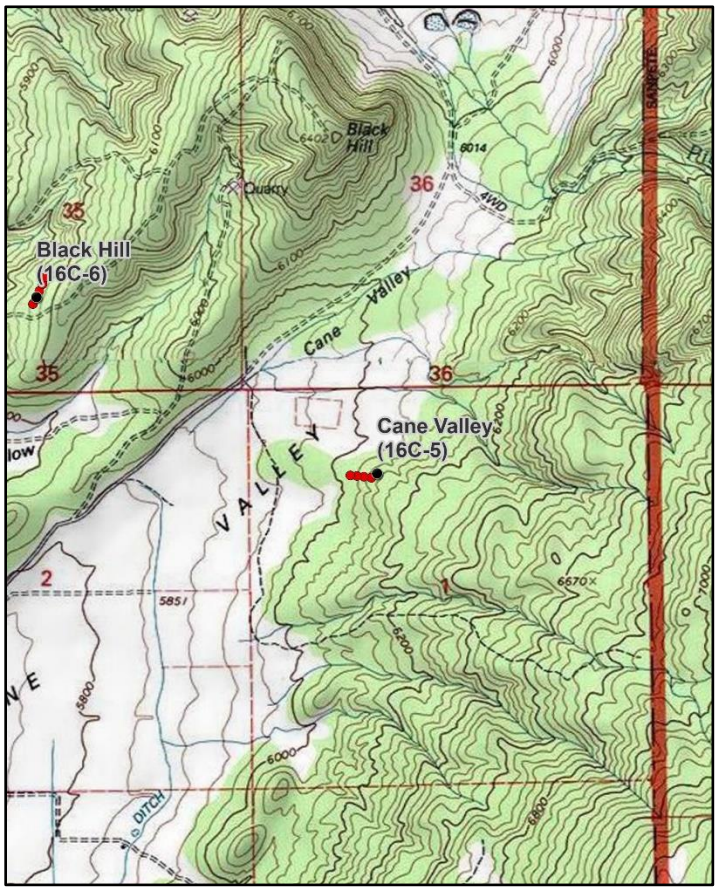
Table 16C-03.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

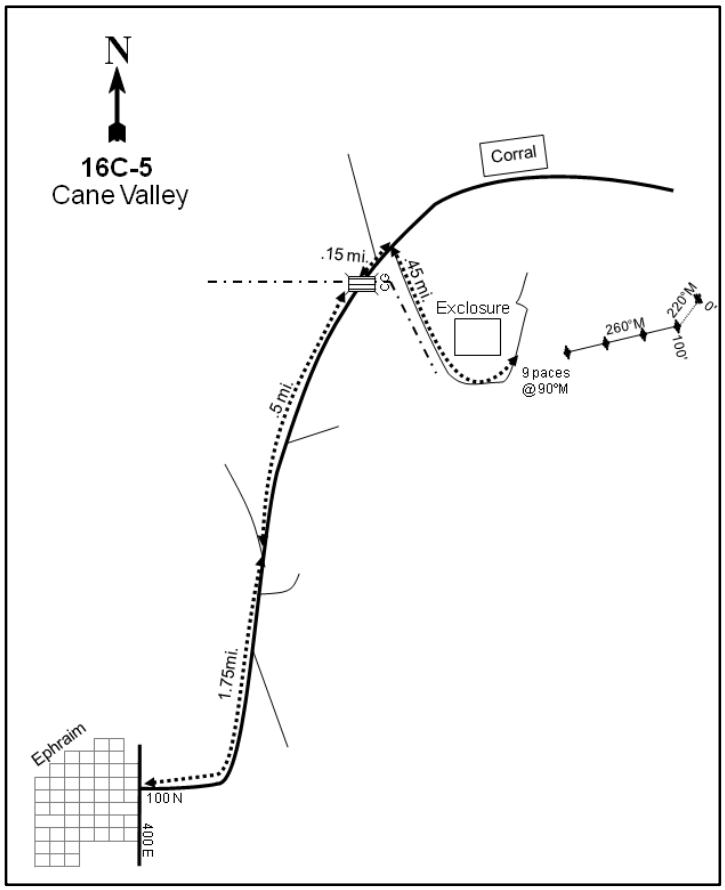
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2002	74	-	-	-	-	-	14.5
2007	94	-	15	25	40	20	19.8
2014	51	29	18	-	24	29	16.1
2019	52	-	44	-	28	28	19.0

Table 16C-03.15 – Deer Desirable Components Index: High Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1997	6.2	6.3	5.0	23.9	-0.2	10.0	0.0	51.3	Poor
2002	6.2	0.0	0.0	24.2	0.0	6.7	0.0	37.0	Very Poor
2007	3.9	0.0	0.0	16.2	-0.9	5.3	0.0	24.4	Very Poor
2014	4.3	0.0	0.0	24.4	-0.2	10.0	0.0	38.4	Very Poor-Poor
2019	4.6	0.0	0.0	30.0	-0.8	10.0	0.0	43.8	Poor

CANE VALLEY - STUDY NO. 16C-5





Location Information

USGS 7.5 min Map Info	Ephraim NE; Township 17S, Range 3E, Section 01
GPS (0' Stake)	NAD 83 UTM ZONE 12, 453814 East 4358069 North

Transect Information

Browse Tag # (0' Stake)	283
Transect Bearing	220° magnetic (Lines 2-4: 260° magnetic)
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (71ft), Line 3 (59ft), Line 4 (34ft)
Belt Marker Placement	Standard

Directions to Site

From the intersection of 400 East and 100 North in Ephraim, travel on 100 North for 1.75 miles (the pavement will end and the road will head in a northerly direction). After 1.75 miles the road will fork. Proceed to the right and continue up the road for an additional 0.50 miles until you come to a cattle guard where a fence crosses the road. At this point the road forks twice: proceed to the right and continue for 0.15 miles. Turn right and follow along the fence in a southeasterly direction for 0.25 miles to an exclosure on the east side of the road. From the exclosure, continue left up the road for 0.2 miles, at which point the 400-foot stake is 50 feet east of the road.

Site Information

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	6,110ft (1,862m)
Aspect	West
Slope	15-25%
Sample Dates	06/24/1997, 07/11/2002, 05/17/2007, 05/13/2014, 05/13/2019

Table 16C-05.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Two-Way Chain Unknown	-	-	1982	-
Seeding - Aerial Unknown	-	-	1982	-
Hand Crew - Lop and Scatter	Black Hills WMA Lop and Scatter	710	October 2007	878
Hand Crew - Lop and Scatter	Dedicated Hunter Project	-	June 2018	5

Wildlife Habitat and Vegetation History

Table 16C-05.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter

Table 16C-05.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1989	Perennial Grass	Phase I
1997	Perennial Grass	Phase I
2002	Perennial Grass/Juniper	Phase I transitioning to Phase II
2007	Perennial Grass/Juniper	Phase I transitioning to Phase II
2014	Perennial Grass	Phase I
2019	Perennial Grass	Phase I

Site Notes

A dead fawn was observed on the site in 2014.

Soils

Table 16C-05.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay	7.4	28.0	29.4	42.6	5.0	12.4	188.8	0.4	06/24/1997

Site Potential

1981 - 2010 Average Annual Precipitation	16 inches
NRCS Ecological Site	Upland Clay (Pinyon-Utah Juniper)
NRCS Ecological Site #	R047XB303UT
States and Transitions	No state and transition model is available for this ecological site.

Perennial grasses, particularly the native species bluebunch wheatgrass (*Pseudoroegneria spicata*) and introduced species intermediate wheatgrass (*Thinopyrum intermedium*), have dominated this site since study establishment in 1989. Although diverse, the forb component has generally remained rare: the exception to this was the 22 percent cover of annual forbs in 2019, much of which was provided by the introduced species pale madwort (*Alyssum alyssoides*) (Table 16C-05.7, 16C-05.10, 16C-05.11). Browse species have been present in all years, but have provided little cover. Utah juniper (*Juniperus osteosperma*) has also been observed in all sample years. Juniper cover increased over time, and the study was considered to be within Phase I transitioning to Phase II of woodland succession in 2007. However, many trees were removed by lop and scatter treatments following the 2007 sampling and again in 2018 (Table 16C-05.1), and the site has been within Phase I of encroachment since 2014 (Table 16C-05.4, Table 16C-05.12, Table 16C-05.14, Photos). However, the post-treatment presence of trees suggests that there may be potential for infilling as time since treatment increases.

Trend Summary Tables

Table 16C-05.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	0.1	3.9	3.6	-	-	-
2002	0.1	5.0	9.1	0.2	4.1	12.7
2007	0.1	3.6	6.6	-	2.8	7.5
2014	0.3	2.5	0.9	0.9	4.8	1.2
2019	1.6	3.6	0.1	1.7	3.4	0.4

Table 16C-05.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	38	303	140	171	0.2	14.8	0.7	4.0
2002	-	303	39	156	-	19.4	0.1	3.4
2007	195	338	407	166	2.4	19.4	8.0	3.9
2014	41	359	423	160	0.3	21.4	5.5	3.4
2019	28	378	469	155	0.1	24.2	22.3	3.8

Table 16C-05.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	20.6	0.3	32.8	6.4	8.6	27.4
2002	15.7	1.7	35.5	15.8	10.5	35.7
2007	20.2	0.9	29.4	12.0	12.1	40.6
2014	8.2	1.0	47.2	8.2	7.4	39.1
2019	10.9	1.2	51.6	9.9	13.5	47.0

Table 16C-05.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer/Domestic Sheep	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1997	1	27	26	4
2002	-	50	10	24
2007	1	49	12	42
2014	1	38	4	13
2019	-	19	8	25
Year	Days Use Per Acre (ha)			
1997	-	-	-	-
2002	-	75.7 (187.0)	24.8 (61.2)	-
2007	-	122.0 (301.3)	51.6 (127.5)	-
2014	2.2 (5.4)	36.8 (91.0)	0.7 (1.7)	-
2019	-	25.5 (62.9)	2.7 (6.6)	-

Table 16C-05.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bromus arvensis[ai] (field brome)	Bromus tectorum[ai] (cheatgrass)	Dactylis glomerata[i] (orchardgrass)	Elymus elymoides (squirreltail)	Festuca idahoensis (Idaho fescue)	Poa bulbosa[i] (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Psathyrostachys juncea[i] (Russian wildrye)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium[i] (intermediate wheatgrass)
year	Nested Frequency												
1997	33	19	2	36	25	32	-	-	1	16	2	136	139
2002	11	23	-	-	3	5	-	-	4	9	5	182	108
2007	17	63	-	195	5	11	4	1	1	46	-	158	134
2014	7	48	-	41	15	8	4	-	-	85	5	163	181
2019	1	83	9	19	3	-	7	5	5	63	-	150	191
year	Average Cover (%)												
1997	1.0	0.8	0.0	0.1	0.6	0.6	-	-	0.0	0.6	0.1	7.2	3.9
2002	0.3	1.5	-	-	0.0	0.0	-	-	0.0	0.0	0.2	12.6	4.7
2007	0.1	2.8	-	2.4	0.0	0.1	0.0	0.0	0.0	0.5	-	10.5	5.3
2014	0.1	2.6	-	0.3	0.4	0.1	0.0	-	-	0.6	0.1	7.3	10.1
2019	0.1	3.5	0.0	0.1	0.0	-	0.1	0.0	0.0	1.1	-	6.8	12.6

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16C-05.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Alyssum alyssoides[ai] (pale madwort)	Antennaria dimorpha (low pussytoes)	Arabis (rockcress)	Arenaria fendleri (Fendler's sandwort)	Astragalus (milkvetch)	Astragalus calycosus (Torrey's milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus newberryi (Newberry's milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Camelina microcarpa[ai] (littlepod false flax)	Carduus nutans[ani] (nodding plumeless thistle)	Castilleja linariifolia (Wyoming Indian paintbrush)	Caulanthus crassicaulis[a] (thickstem wild cabbage)	Ceratocephala testiculata[ai] (curveseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Chenopodium fremontii[a] (Fremont's goosefoot)
year	Nested Frequency																
1997	7	6	3	35	14	5	-	-	-	-	6	0	-	-	125	5	3
2002	7	5	-	25	-	2	-	-	-	-	-	-	-	-	32	-	-
2007	317	-	-	62	1	10	2	-	-	1	1	-	4	-	357	3	-
2014	420	3	3	37	-	5	-	13	3	-	1	-	1	-	93	-	-
2019	465	6	-	37	-	4	-	15	-	11	-	5	-	1	195	-	-
year	Average Cover (%)																
1997	0.0	0.0	0.0	0.1	0.1	0.0	-	-	-	-	0.0	0.0	-	-	0.7	0.0	0.0
2002	0.0	0.0	-	0.1	-	0.0	-	-	-	-	-	-	-	-	0.1	-	-
2007	2.6	-	-	0.2	0.0	0.1	0.0	-	-	0.0	0.0	-	0.0	-	5.3	0.0	-
2014	5.1	0.0	0.0	0.2	-	0.0	-	0.1	0.0	-	0.0	-	0.0	-	0.2	-	-
2019	21.5	0.0	-	0.2	-	0.0	-	0.1	-	0.0	-	0.0	-	0.0	0.7	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Cirsium (thistle)	Cryptantha (cryptantha)	Cymopterus (springparsley)	Descurainia pinnata[a] (western tansymustard)	Erigeron (fleabane)	Eriogonum (buckwheat)	Eriogonum brevicaule (shortstem buckwheat)	Erodium cicutarium[ai] (redstem stork's bill)	Lactuca serriola[ai] (prickly lettuce)	Linum lewisii (Lewis flax)	Lomatium foeniculaceum (desert biscuitroot)	Machaeranthera canescens (hoary tansyaster)	Medicago sativa[i] (alfalfa)	Penstemon humilis (low beardtongue)	Petradoria pumila (rock goldenrod)	Phlox austromontana (mountain phlox)	Phlox longifolia (longleaf phlox)
year	Nested Frequency																
1997	1	8	-	-	1	4	-	-	-	-	-	-	0	2	31	108	-
2002	-	-	-	-	-	-	-	-	-	-	-	-	-	9	52	98	5
2007	-	3	-	16	-	-	-	-	4	13	12	3	3	3	47	84	-
2014	2	-	-	3	-	-	1	-	9	-	25	-	6	3	39	80	-
2019	-	1	3	20	-	-	-	2	8	-	19	6	2	-	24	71	4
year	Average Cover (%)																
1997	0.0	0.0	-	-	0.0	0.0	-	-	-	-	-	-	0.0	0.0	1.8	1.1	-
2002	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	1.5	0.8	0.0
2007	-	0.0	-	0.1	-	-	-	-	0.0	0.0	0.2	0.0	0.0	0.0	1.7	0.8	-
2014	0.0	-	-	0.0	-	-	0.0	-	0.0	-	0.2	-	0.1	0.0	0.9	0.7	-
2019	-	0.0	0.0	0.1	-	-	-	0.0	0.0	-	0.5	0.0	0.0	-	0.6	1.1	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Salsola tragus[ai] (prickly Russian thistle)	Sanguisorba minor[i] (small burnet)	Sphaeralcea coccinea (scarlet globemallow)	Sphaeralcea grossulariifolia (gooseberryleaf globemallow)	Stenotus acaulis (stemless mock goldenweed)	Streptanthus cordatus (heartleaf twistflower)	Taraxacum officinale (common dandelion)	Tragopogon dubius[ai] (yellow salsify)	Trifolium douglasii (Douglas' clover)
year	Nested Frequency								
1997	-	3	3	-	21	-	-	3	13
2002	-	-	-	-	39	-	-	1	-
2007	0	8	5	0	17	-	-	-	8
2014	1	-	3	-	13	7	-	7	-
2019	-	-	4	-	17	5	1	5	3
year	Average Cover (%)								
1997	-	0.0	0.0	-	0.6	-	-	0.0	0.1
2002	-	-	-	-	0.9	-	-	0.0	-
2007	0.0	0.0	0.0	0.0	0.6	-	-	-	0.0
2014	0.0	-	0.0	-	1.0	0.2	-	0.1	-
2019	-	-	0.0	-	1.1	0.0	0.0	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16C-05.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Atriplex canescens[p] (fourwing saltbush)	Chrysothamnus depressus[p] (longflower rabbitbrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma[t] (Utah juniper)	Krascheninnikovia lanata[p] (winterfat)	Purshia tridentata[p] (antelope bitterbrush)
year	Line Intercept Cover (%)								
1997	-	-	-	-	-	-	-	-	-
2002	0.1	-	-	3.9	-	0.2	12.7	0	0.1
2007	-	-	-	2.7	-	0.1	7.5	-	-
2014	0.7	-	-	4.5	-	0.3	1.2	-	0.2
2019	1.6	-	-	3.3	-	0.1	0.4	-	0.1
year	Quadrat Cover (%)								
1997	-	-	-	3.9	-	-	3.6	0.1	-
2002	0.0	0.0	-	4.2	-	0.8	9.1	0.0	0.0
2007	0.0	-	0.0	3.5	-	0.1	6.6	-	-
2014	0.3	-	-	2.4	0.0	0.0	0.9	-	0.0
2019	1.6	-	0.0	2.9	0.0	0.7	0.1	0.0	0.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16C-05.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
1997	20	-	100	0	0	0	0	0	3/17
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	33/32
2019	-	-	-	-	-	-	-	-	-/-
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1997	40	-	0	100	0	50	0	0	31/29
2002	80	-	0	100	0	25	25	0	35/53
2007	360	-	94	6	0	17	6	0	21/25
2014	460	20	30	65	4	61	22	0	37/48
2019	580	-	24	76	0	24	28	3	45/63
Atriplex canescens[p] -- (fourwing saltbush)									
1997	-	-	-	-	-	-	-	-	155/195
2002	20	-	0	100	0	0	0	0	75/122
2007	-	-	-	-	-	-	-	-	87/64
2014	-	-	-	-	-	-	-	-	90/93
2019	-	-	-	-	-	-	-	-	105/86
Chrysothamnus depressus[p] -- (longflower rabbitbrush)									
1997	40	-	0	100	0	0	0	0	- / -
2002	-	-	-	-	-	-	-	-	-/-
2007	60	-	67	33	0	0	100	0	11/18
2014	60	-	0	100	0	67	0	0	13/39
2019	240	-	58	42	0	0	8	0	15/22

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
1997	3640	40	15	85	0	7	0	0	29/41
2002	4920	-	2	88	9	7	0	0	21/38
2007	4120	-	5	80	15	37	13	8	17/29
2014	3260	100	23	74	4	25	3	3	24/41
2019	2860	-	22	71	7	18	16	6	21/37
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	40	-	50	50	0	0	0	0	18/32
Ephedra viridis[p] -- (mormon tea)									
1997	-	-	-	-	-	-	-	-	-/-
2002	20	-	0	100	0	0	100	0	12/9
2007	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Ericameria nauseosa -- (rubber rabbitbrush)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	64/84
2019	-	-	-	-	-	-	-	-	47/55
Ericameria nauseosa ssp. nauseosa var. speciosa[p] -- (rubber rabbitbrush)									
1997	20	-	100	0	0	0	0	0	48/55
2002	-	-	-	-	-	-	-	-	22/25
2007	-	-	-	-	-	-	-	-	29/30
2014	-	-	-	-	-	-	-	-	55/60
2019	-	-	-	-	-	-	-	-	64/114
Gutierrezia sarothrae -- (broom snakeweed)									
1997	100	-	0	100	0	0	0	0	17/18
2002	860	-	0	93	7	0	0	0	19/26
2007	440	-	23	73	5	0	0	5	16/16
2014	600	20	50	47	3	0	0	0	13/16
2019	1420	-	7	93	0	17	0	1	16/18
Juniperus osteosperma[t] -- (Utah juniper)									
1997	380	-	63	37	0	0	0	0	- / -
2002	480	-	21	79	0	0	4	0	- / -
2007	320	-	63	38	0	0	0	0	- / -
2014	200	-	90	10	0	0	0	10	- / -
2019	80	-	75	0	25	0	0	25	- / -
Krascheninnikovia lanata[p] -- (winterfat)									
1997	140	-	0	100	0	14	71	0	11/14
2002	80	-	0	100	0	25	50	0	22/32
2007	40	-	0	100	0	0	100	0	16/20
2014	20	-	100	0	0	0	0	0	27/34
2019	-	-	-	-	-	-	-	-	18/23
Peraphyllum ramosissimum[p] -- (wild crab apple)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	40/53
2019	-	-	-	-	-	-	-	-	46/54

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Purshia tridentata[p] -- (antelope bitterbrush)									
1997	40	-	0	100	0	0	100	0	15/35
2002	40	-	0	100	0	0	100	0	20/43
2007	20	-	0	100	0	0	100	0	17/30
2014	20	-	0	100	0	100	0	0	24/36
2019	20	-	0	0	100	0	100	0	17/50
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	26/53

t - Tree Species; p - Preferred Browse; i - Introduced Species

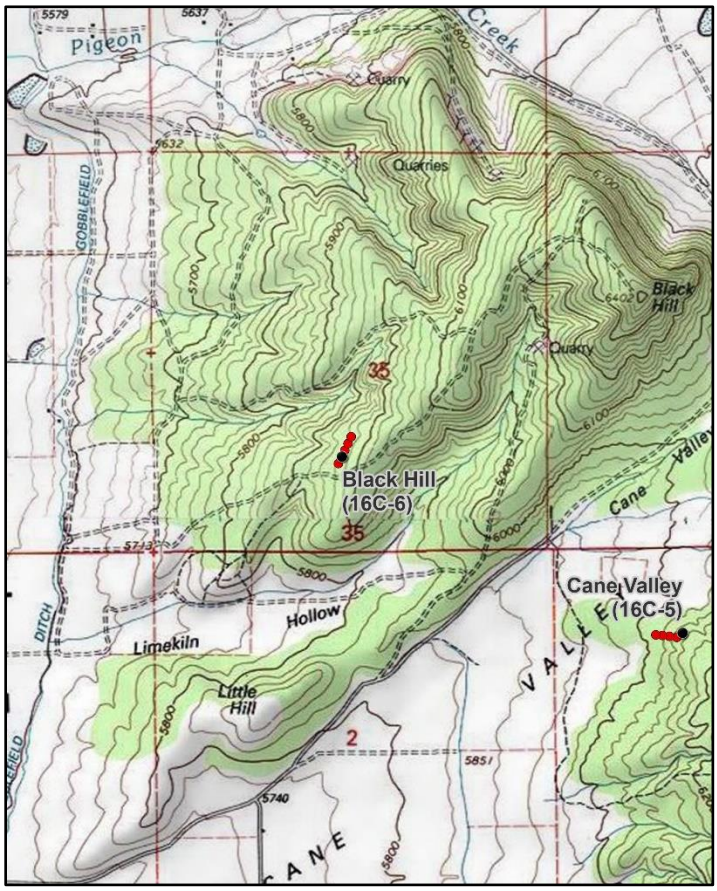
Table 16C-05.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

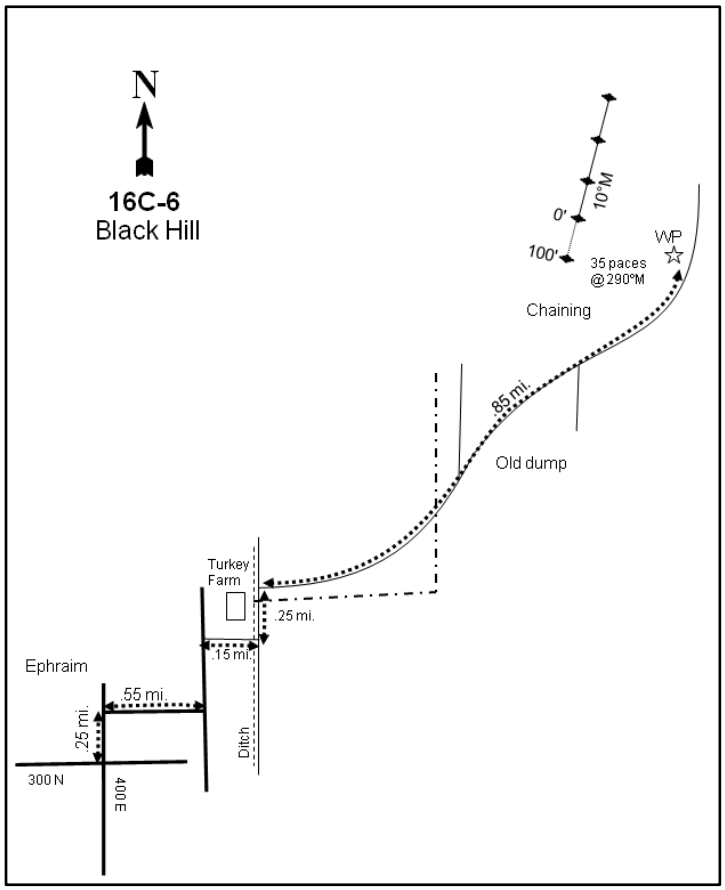
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2002	343	-	-	-	-	-	5.5
2007	262	5	55	40	-	-	7.0
2014	119	10	90	-	-	-	3.9
2019	17	33	44	22	-	-	2.8
Pinus edulis (twoneedle pinyon)							
2007	3	-	100	-	-	-	5.0

Table 16C-05.15 – Deer Desirable Components Index: Mid Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1997	0.1	0.0	0.0	29.7	-0.1	8.0	-2.0	35.6	Very Poor-Poor
2002	0.1	0.0	0.0	30.0	0.0	6.9	0.0	36.9	Very Poor-Poor
2007	0.0	0.0	0.0	30.0	-1.8	7.9	0.0	36.1	Very Poor-Poor
2014	1.2	0.0	0.0	30.0	-0.2	6.9	0.0	37.8	Poor
2019	2.2	0.0	0.0	30.0	-0.1	7.6	-2.0	37.6	Poor

BLACK HILL - STUDY NO. 16C-6





Location Information

USGS 7.5 min Map Info	Chester SE; Township 16S, Range 3E, Section 35
GPS (0' Stake)	NAD 83 UTM ZONE 12, 452433 East 4358783 North

Transect Information

Browse Tag # (0' Stake)	427
Transect Bearing	205° magnetic (Lines 2-4: 355° magnetic)
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Belt 3: 2ft

Directions to Site

From the intersection of 300 North and 400 East in Ephraim, travel north on 400 East for 0.25 miles. Just before a white brick home, turn east and drive for 0.55 miles. From here, bear left and then right, going 0.15 miles to where the road crosses the Gobble field ditch on the south side of a turkey pen. Cross the ditch, turn left (north), and drive for 0.25 miles. Turn right here and travel 0.85 miles into the chained area where you will come to a 4-foot tall green witness post on the west side of the road. Stop here and walk 35 paces westward at 290 degrees magnetic to the 0-foot baseline stake which is marked with browse tag #427.

Site Information

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	6,000ft (1,829m)
Aspect	West
Slope	8-16%
Sample Dates	06/24/1997, 07/11/2002, 05/17/2007, 05/14/2014, 05/11/2015, 05/13/2019

Table 16C-06.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Chain Unknown	-	-	1982	-
Seeding - Seed Unknown	-	-	1982	-
Hand Crew - Lop and Scatter	Black Hills WMA Lop and Scatter	710	October 2007	878

Wildlife Habitat and Vegetation History

Table 16C-06.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter

Table 16C-06.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1989	Perennial Grass/Mixed Shrub	Phase I
1997	Perennial Grass/Mixed Shrub	Phase I
2002	Perennial Grass/Mixed Shrub	Phase I
2007	Perennial Grass/Mixed Shrub	Phase I
2014	Perennial Grass/Mixed Shrub	Phase I
2015	Perennial Grass/Mixed Shrub	Phase I
2019	Perennial Grass/Mixed Shrub	Phase I

Site Notes

The sagebrush on the site appears to be a hybrid between black sagebrush (*Artemisia nova*) and Wyoming big sagebrush (*A. tridentata* ssp. *wyomingensis*), but for sampling purposes the sagebrush has all been classified as black sagebrush.

Soils

Table 16C-06.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.3	36.7	34.7	28.6	4.5	13.1	160.0	0.5	06/24/1997

Site Potential

1981 - 2010 Average Annual Precipitation	14 inches
NRCS Ecological Site	Upland Shallow Loam (Black Sagebrush)
NRCS Ecological Site #	R047XA316UT
States and Transitions	No state and transition model is available.

This site has remained dominated by introduced perennial grass species -- namely intermediate wheatgrass (*Thinopyrum intermedium*) -- since study establishment in 1989 (Table 16C-06.7, Table 16C-06.10, Table 16C-06.11). The browse component has been limited throughout the study years. Yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *stenophyllus*) has been the most abundant shrub, but other species such as black sagebrush (*Artemisia nova*) and fourwing saltbush (*Atriplex canescens*) have also been present. Utah juniper (*Juniperus osteosperma*) has been observed in all years, placing this site in Phase I of woodland succession throughout the study period (Table 16C-06.4, Table 16C-06.12, Table 16C-06.13, Table 16C-06.14, Photos). This study site may have the potential to shift to a tree-dominated state in the future should juniper encroachment increase.

Trend Summary Tables

Table 16C-06.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	0.8	5.3	2.5	-	-	-
2002	1.0	4.3	2.7	1.8	4.7	3.6
2007	1.0	1.9	3.6	1.2	2.5	4.9
2014	0.5	3.1	-	1.4	6.3	-
2015	0.5	3.1	-	1.5	4.8	0.1
2019	1.2	4.2	-	1.0	5.1	-

Table 16C-06.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	207	301	395	26	2.0	16.7	5.9	0.5
2002	60	340	235	10	0.3	21.0	2.9	0.0
2007	269	367	428	11	5.9	22.4	13.4	0.1
2014	115	401	342	23	0.6	30.4	1.9	0.1
2015	104	402	332	27	0.8	29.7	1.8	0.1
2019	283	392	479	24	8.8	26.1	28.5	0.2

Table 16C-06.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	12.7	1.4	40.3	4.4	2.7	34.7
2002	18.2	4.3	50.6	7.8	4.1	32.5
2007	17.3	3.3	38.6	6.0	4.5	43.6
2014	10.2	0.6	53.0	3.9	3.2	38.2
2015	17.1	2.0	42.2	7.5	3.3	38.7
2019	19.7	1.4	47.0	7.5	5.9	55.6

Table 16C-06.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer/Domestic Sheep	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1997	-	40	1	12
2002	2	31	9	19
2007	3	47	8	56
2014	2	36	5	17
2015	-	18	-	24
2019	1	29	3	15
Year	Days Use Per Acre (ha)			
1997	-	-	-	-
2002	10.9 (26.9)	66.4 (163.9)	13.4 (33.1)	-
2007	5.1 (12.6)	170.9 (422.1)	18.1 (44.7)	-
2014	0.7 (1.8)	61.0 (150.6)	4.0 (9.9)	-
2015	-	24.8 (61.2)	1.3 (3.3)	-
2019	0.7 (1.8)	44.2 (109.2)	2.7 (6.6)	-

Table 16C-06.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bromus inermis[i] (smooth brome)	Bromus tectorum[ai] (cheatgrass)	Elymus elymoides (squirreltail)	Poa bulbosa[i] (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Psathyrostachys juncea[i] (Russian wildrye)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium[i] (intermediate wheatgrass)
year	Nested Frequency									
1997	101	37	3	207	40	-	47	4	0	200
2002	37	58	-	60	6	-	48	5	-	262
2007	38	102	-	269	-	1	114	7	1	288
2014	20	96	2	115	4	-	193	-	-	327
2015	14	133	-	104	-	59	137	-	3	295
2019	22	60	-	283	0	-	207	4	-	320
year	Average Cover (%)									
1997	1.2	1.5	0.0	2.0	1.1	-	0.2	0.2	0.0	12.5
2002	1.5	2.3	-	0.3	0.1	-	0.3	0.0	-	16.9
2007	1.4	4.9	-	5.9	-	0.0	1.2	0.2	0.2	14.6
2014	0.7	6.2	0.0	0.6	0.2	-	3.9	-	-	19.5
2015	0.5	9.6	-	0.8	-	0.6	2.3	-	0.0	16.7
2019	0.7	3.0	-	8.8	0.1	-	5.5	0.1	-	16.6

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16C-06.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Allium (onion)	Alyssum alyssoides[ai] (pale madwort)	Alyssum desertorum[ai] (desert madwort)	Arabis (rockcress)	Camelina microcarpa[ai] (littlepod false flax)	Ceratocephala testiculata[ai] (curveseed butterwort)	Chenopodium album[a] (lambsquarters)	Chorispora tenella[ai] (crossflower)	Crepis acuminata (tapertip hawksbeard)	Cymopterus (springparsley)	Descurainia pinnata[a] (western tansymustard)	Erodium cicutarium[ai] (redstem stork's bill)	Lactuca serriola[ai] (prickly lettuce)	Linum lewisii (Lewis flax)	Lomatium foeniculaceum (desert biscuitroot)	Medicago sativa[i] (alfalfa)	Mentzelia albicaulis[a] (whitestem blazingstar)
year	Nested Frequency																
1997	-	-	327	3	5	324	1	-	-	1	-	-	4	2	-	2	3
2002	8	-	33	-	-	231	-	-	-	-	-	-	-	-	-	-	-
2007	-	-	409	-	2	349	-	-	-	11	20	-	-	-	-	-	-
2014	-	-	286	-	-	251	-	1	-	-	5	2	5	-	20	-	-
2015	-	-	330	-	-	25	-	1	-	6	-	0	-	-	20	-	-
2019	-	1	477	-	-	339	-	7	4	18	5	17	7	-	-	-	-
year	Average Cover (%)																
1997	-	-	2.0	0.0	0.0	3.5	0.0	-	-	0.0	-	-	0.0	0.0	-	0.0	0.0
2002	0.0	-	0.1	-	-	2.8	-	-	-	-	-	-	-	-	-	-	-
2007	-	-	7.7	-	0.0	5.6	-	-	-	0.0	0.1	-	-	-	-	-	-
2014	-	-	1.0	-	-	0.9	-	0.0	-	-	0.0	0.0	0.0	-	0.1	-	-
2015	-	-	1.7	-	-	0.0	-	0.0	-	0.0	-	0.0	-	-	0.1	-	-
2019	-	0.0	23.7	-	-	4.3	-	0.0	0.0	0.2	0.0	0.4	0.0	-	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Phlox longifolia (longleaf phlox)	Sanguisorba minor[i] (small burnet)	Sisymbrium altissimum[ai] (tall tumblemustard)	Sphaeralcea coccinea (scarlet globemallow)	Tragopogon dubius[ai] (yellow salsify)	Trifolium douglasii (Douglas' clover)
year	Nested Frequency					
1997	2	12	3	1	6	3
2002	1	-	-	1	-	-
2007	1	-	-	-	-	-
2014	3	-	-	-	4	-
2015	1	-	-	-	-	-
2019	5	-	-	-	-	-
year	Average Cover (%)					
1997	0.0	0.3	0.4	0.0	0.0	0.1
2002	0.0	-	-	0.0	-	-
2007	0.0	-	-	-	-	-
2014	0.0	-	-	-	0.0	-
2015	0.0	-	-	-	-	-
2019	0.0	-	-	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16C-06.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia nova[p] (black sagebrush)	Atriplex canescens[p] (fourwing saltbush)	Chrysothamnus depressus[p] (longflower rabbitbrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. speciosa[p] (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma[t] (Utah juniper)	Opuntia polyacantha (plains pricklypear)
year	Line Intercept Cover (%)							
1997	-	-	-	-	-	-	-	-
2002	1.2	0.6	-	4.6	-	0.1	3.6	-
2007	1.2	-	-	2.5	-	-	4.9	-
2014	1.2	0.2	-	6.3	-	-	-	-
2015	1.1	0.4	-	4.8	-	-	0.1	-
2019	0.8	0.2	-	5.1	-	-	-	-
year	Quadrat Cover (%)							
1997	0.8	-	-	5.3	-	0.1	2.5	-
2002	1.0	0.0	-	4.3	-	0.0	2.7	-
2007	1.0	0.0	-	1.8	-	-	3.6	0.0
2014	0.5	0.0	-	3.1	0.0	-	-	-
2015	0.5	0.0	-	3.1	0.0	-	0.0	-
2019	0.8	0.0	0.4	4.2	-	-	-	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16C-06.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Artemisia nova[p] -- (black sagebrush)									
1997	860	-	12	79	9	2	0	7	36/54
2002	800	-	0	85	15	43	15	3	26/46
2007	640	60	3	56	41	9	91	22	33/49
2014	600	-	0	83	17	20	80	3	35/57
2015	540	20	4	78	19	11	85	11	32/51
2019	420	-	0	48	52	0	100	52	35/64
Atriplex canescens[p] -- (fourwing saltbush)									
1997	60	-	0	100	0	0	0	0	103/54
2002	20	-	0	100	0	0	0	0	147/139
2007	20	-	0	100	0	100	0	0	161/126
2014	20	-	0	0	100	0	100	0	125/171
2015	20	-	0	100	0	100	0	0	121/137
2019	20	-	0	0	100	100	0	100	156/217
Chrysothamnus depressus[p] -- (longflower rabbitbrush)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2015	20	-	0	100	0	100	0	0	- / -
2019	120	20	17	67	17	17	0	0	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
1997	2920	-	14	84	3	0	0	1	37/60
2002	2460	-	1	87	12	3	0	3	31/52
2007	2000	-	5	57	38	41	37	14	23/35
2014	1780	60	23	74	3	15	2	2	32/65
2015	1900	20	27	63	10	3	2	6	34/64
2019	1400	20	13	73	14	9	9	19	33/69
Ericameria nauseosa ssp. nauseosa var. speciosa[p] -- (rubber rabbitbrush)									
1997	-	-	-	-	-	-	-	-	137/216
2002	-	-	-	-	-	-	-	-	96/113
2007	-	-	-	-	-	-	-	-	162/205
2014	60	-	100	0	0	67	0	0	122/210
2015	20	-	100	0	0	0	100	0	150/199
2019	-	-	-	-	-	-	-	-	152/197
Gutierrezia sarothrae -- (broom snakeweed)									
1997	300	60	47	53	0	0	0	0	25/24
2002	320	-	0	75	25	0	0	0	17/20
2007	20	-	0	100	0	0	0	0	24/27
2014	20	-	100	0	0	0	0	0	13/25
2015	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	20/20
Juniperus osteosperma[t] -- (Utah juniper)									
1997	160	-	38	63	0	0	0	0	- / -
2002	240	-	8	75	17	0	0	8	- / -
2007	160	-	13	88	0	0	0	25	- / -
2014	40	-	100	0	0	0	0	0	- / -
2015	40	-	100	0	0	0	0	0	- / -
2019	40	-	50	50	0	0	0	50	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Opuntia polyacantha -- (plains pricklypear)									
1997	-	-	-	-	-	-	-	-	11/46
2002	20	-	0	100	0	0	0	0	13/75
2007	100	-	20	80	0	0	0	0	8/13
2014	20	-	0	100	0	0	0	0	8/10
2015	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	7/23
Purshia tridentata[p] -- (antelope bitterbrush)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	10/26
2007	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	24/34
2015	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	4/8
Rhus trilobata[p] -- (skunkbush sumac)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2015	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	92/65

t - Tree Species; p - Preferred Browse; i - Introduced Species

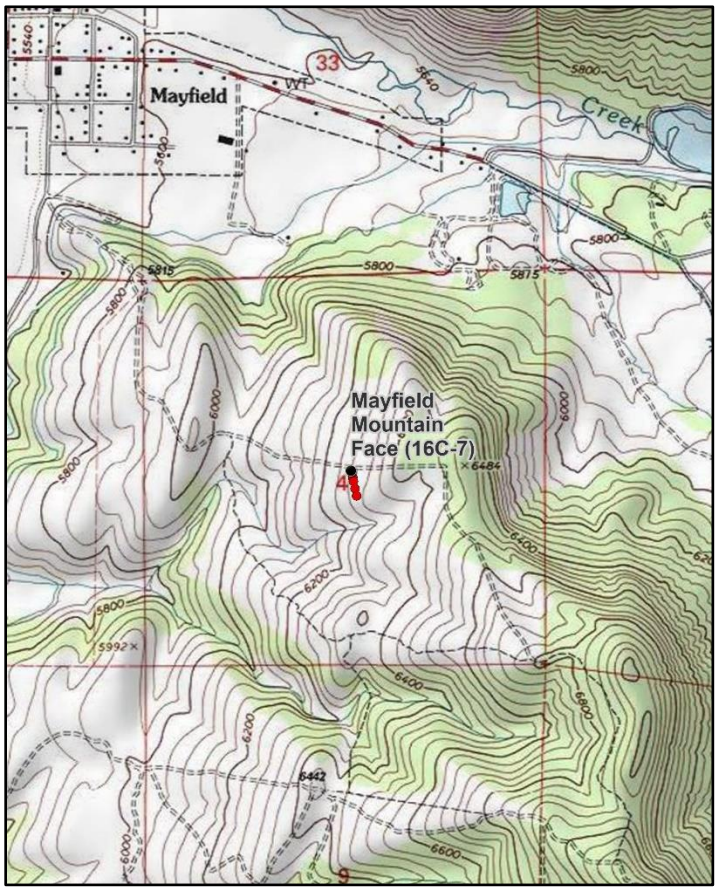
Table 16C-06.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

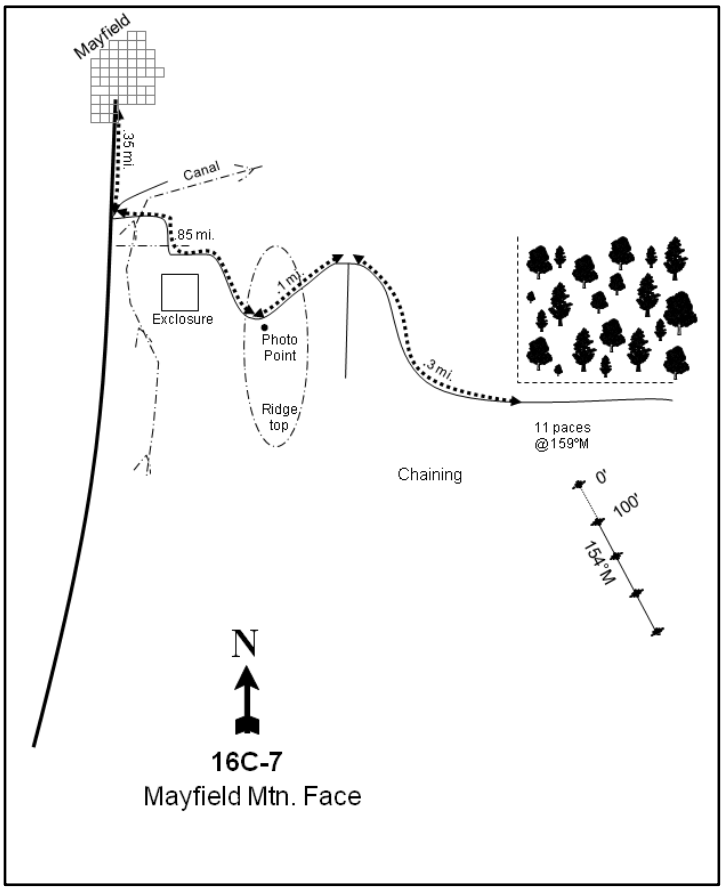
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1997	30	-	-	-	-	-	6.6
2002	72	-	-	-	-	-	8.1
2007	55	5	32	42	21	-	9.0
2014	16	-	85	15	-	-	4.7
2015	18	-	85	15	-	-	7.1
2019	22	7	53	40	-	-	5.7
Pinus edulis (twoneedle pinyon)							
2007	2	-	-	100	-	-	6.0

Table 16C-06.15 – Deer Desirable Components Index: Mid Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1997	1.1	0.0	0.0	30.0	-1.5	1.0	0.0	30.6	Very Poor
2002	1.2	0.0	0.0	30.0	-0.3	0.0	0.0	31.0	Very Poor
2007	1.5	0.0	0.0	30.0	-4.4	0.1	0.0	27.2	Very Poor
2014	1.8	0.0	0.0	30.0	-0.5	0.3	0.0	31.5	Very Poor
2015	1.9	0.0	0.0	30.0	-0.6	0.1	0.0	31.4	Very Poor
2019	1.3	0.0	0.0	30.0	-6.6	0.4	0.0	25.1	Very Poor

MAYFIELD MOUNTAIN FACE - STUDY NO. 16C-7





Location Information

USGS 7.5 min Map Info	Mayfield NW; Township 20S, Range 2E, Section 04
GPS (0' Stake)	NAD 83 UTM ZONE 12, 439948 East 4328013 North

Transect Information

Browse Tag # (0' Stake)	126
Transect Bearing	154° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

From the intersection of the main road and Twelve Mile Canyon Road in Mayfield, travel south out of town on the main road for 0.35 miles into Arapien Valley to an intersection. At the intersection, turn east and proceed up a steep four-wheel drive road that goes up the hill. Travel 0.85 miles to an old line-intercept photo point on the ridge top (a canal and fence will be crossed 0.1 miles east of the ridge top and you will come to a fork in the road). Go straight (east) and continue for 0.3 miles to a fence corner on the north side of the road. From the fence corner, walk 11 paces at 159 degrees magnetic to the 0-foot baseline stake.

Site Information

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	6,200ft (1,890m)
Aspect	West
Slope	15-20%
Sample Dates	06/30/1997, 07/09/2002, 07/17/2007, 05/20/2014, 05/21/2019

Table 16C-07.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Chain Unknown	-	-	Historic	-
Seeding - Seed Unknown	-	-	Historic	-
Hand Crew - Lop and Scatter	Twelve Mile WMA Habitat Improvement	273	July-October 2007	1294

Wildlife Habitat and Vegetation History

Table 16C-07.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter
Shiras Moose	crucial	winter

Table 16C-07.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1989	Black Sagebrush	Phase I
1997	Black Sagebrush	Phase I
2002	Black Sagebrush	Phase I
2007	Black Sagebrush	Phase I
2014	Black Sagebrush/Perennial Grass	Phase I
2019	Black Sagebrush	Phase I

Site Notes

No Notes

Soils

Table 16C-07.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.3	30.0	37.4	32.6	4.9	11.9	144.0	0.4	06/30/1997

Site Potential

1981 - 2010 Average Annual Precipitation	14 inches
NRCS Ecological Site	Upland Loam (Black Sagebrush)
NRCS Ecological Site #	R047XB309UT
States and Transitions	A defined state and transition model is available.

Black sagebrush (*Artemisia nova*) has been the dominant shrub species on this site since study establishment in 1989 (Table 16C-07.12, Table 16C-07.13, Photos). The herbaceous understory has remained diverse and abundant, and perennial grasses such as bluebunch wheatgrass (*Pseudoroegneria spicata*) have contributed a majority of the cover in most sample years; perennial grasses were a co-dominant site component in 2014 (Table 16C-07.7, Table 16C-07.10, Table 16C-07.11). Utah juniper (*Juniperus osteosperma*) trees have been observed in all sample years in low amounts, and the study has been classified as being within Phase I of woodland succession throughout the study period (Table 16C-07.4, Photos). Furthermore, juniper has decreased in density since 2002 (Table 16C-07.14); a lop and scatter treatment was performed in 2007 to mitigate the risk of further encroachment (Table 16C-07.1).

Trend Summary Tables

Table 16C-07.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	9.7	1.6	-	-	-	-
2002	9.1	0.3	0.5	8.5	0.2	0.9
2007	9.8	1.8	0.5	10.2	2.4	1.3
2014	10.2	1.5	-	13.9	1.8	-
2019	13.6	0.8	-	14.0	0.7	-

Table 16C-07.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	34	369	377	20	0.4	18.9	5.1	0.3
2002	3	336	306	2	0.0	11.0	5.8	0.0
2007	115	349	451	17	2.4	12.9	19.4	0.1
2014	83	360	295	49	1.4	27.9	2.2	0.3
2019	161	351	449	68	4.0	19.1	20.0	0.7

Table 16C-07.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	5.2	6.1	25.4	12.6	11.1	36.4
2002	21.9	2.5	29.6	15.3	13.7	26.8
2007	18.4	0.5	15.9	13.5	11.8	49.8
2014	11.9	1.1	41.9	16.4	16.4	43.2
2019	21.2	2.4	29.5	14.5	16.5	50.5

Table 16C-07.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Other	Rabbit
	Quadrat Frequency				
1997	-	47	4	-	19
2002	5	43	2	-	10
2007	5	41	7	-	30
2014	-	24	13	2	17
2019	-	37	22	-	23
Year	Days Use Per Acre (ha)				
1997	-	-	-	-	-
2002	3.6 (9.0)	57.0 (140.7)	2.7 (6.6)	-	-
2007	17.4 (43.0)	179.6 (443.6)	12.8 (31.5)	-	-
2014	-	34.9 (86.1)	22.1 (54.6)	-	-
2019	-	76.4 (188.7)	23.4 (57.9)	-	-

Table 16C-07.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bromus inermis[i] (smooth brome)	Bromus tectorum[ai] (cheatgrass)	Koeleria macrantha (prairie Junegrass)	Pascopyrum smithii (western wheatgrass)	Poa pratensis[i] (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Psathyrostachys juncea[i] (Russian wildrye)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium[i] (intermediate wheatgrass)	Vulpia octoflora[a] (sixweeks fescue)
year	Nested Frequency											
1997	8	169	39	34	-	-	-	231	7	150	40	-
2002	-	141	1	3	-	-	3	155	2	151	6	-
2007	-	83	4	112	3	-	-	243	16	115	37	3
2014	-	94	10	83	-	0	2	185	9	178	91	-
2019	0	74	1	161	1	-	25	198	13	172	59	-
year	Average Cover (%)											
1997	0.5	6.4	0.4	0.4	-	-	-	4.2	0.3	6.2	0.9	-
2002	-	4.1	0.0	0.0	-	-	0.0	1.2	0.0	5.7	0.0	-
2007	-	2.9	0.1	2.4	0.1	-	-	4.6	0.7	3.1	1.4	0.0
2014	-	6.4	0.4	1.4	-	0.0	0.0	2.2	0.6	13.7	4.5	-
2019	0.0	2.7	0.0	4.0	0.0	-	0.4	4.1	0.9	9.1	1.9	-

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16C-07.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Alyssum desertorum[ai] (desert madwort)	Antennaria dimorpha (low pussytoes)	Arabis (rockcress)	Arenaria fendleri (Fendler's sandwort)	Astragalus calycosus (Torrey's milkvetch)	Astragalus eurekensis (Eureka milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Camelina microcarpa[ai] (littlepod false flax)	Castilleja angustifolia (northwestern Indian paintbrush)	Caulanthus crassicaulis[a] (thickstem wild cabbage)	Ceratocephala testiculata[ai] (curveseed butterwort)	Collinsia parviflora[a] (maiden blue eyed Mary)	Cymopterus (springparsley)	Descurainia pinnata[a] (western tansymustard)	Draba[a] (draba)
year	Nested Frequency																
1997	-	-	-	1	-	-	-	2	5	1	-	-	377	-	-	9	-
2002	-	-	-	-	-	-	-	-	-	-	-	-	306	-	-	-	-
2007	-	80	3	-	-	-	-	9	3	6	-	-	446	4	-	37	1
2014	2	169	1	-	-	5	8	-	18	-	-	3	192	1	1	9	-
2019	1	432	-	3	0	-	4	-	39	-	2	-	385	-	9	20	-
year	Average Cover (%)																
1997	-	-	-	0.0	-	-	-	0.0	0.0	0.0	-	-	5.0	-	-	0.0	-
2002	-	-	-	-	-	-	-	-	-	-	-	-	5.8	-	-	-	-
2007	-	0.9	0.0	-	-	-	-	0.0	0.0	0.0	-	-	17.9	0.0	-	0.2	0.0
2014	0.0	1.3	0.0	-	-	0.0	0.0	-	0.0	-	-	0.0	0.8	0.0	0.0	0.0	-
2019	0.0	14.7	-	0.0	0.0	-	0.0	-	0.1	-	0.1	-	4.5	-	0.1	0.1	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Erodium cicutarium[ai] (redstem stork's bill)	Gilia inconspicua[a] (shy gilia)	Lactuca serriola[ai] (prickly lettuce)	Lappula occidentalis[a] (flatspine stickseed)	Lomatium foeniculaceum (desert biscuitroot)	Medicago sativa[i] (alfalfa)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Silene antirrhina[a] (sleepy silene)
year	Nested Frequency								
1997	-	-	4	-	-	5	7	-	1
2002	-	-	-	-	-	-	2	-	-
2007	-	22	-	-	-	-	2	-	29
2014	1	-	-	4	8	-	5	5	1
2019	31	7	9	-	11	-	4	-	11
year	Average Cover (%)								
1997	-	-	0.0	-	-	0.2	0.1	-	0.0
2002	-	-	-	-	-	-	0.0	-	-
2007	-	0.1	-	-	-	-	0.0	-	0.2
2014	0.0	-	-	0.0	0.1	-	0.0	0.0	0.0
2019	0.5	0.2	0.0	-	0.3	-	0.1	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16C-07.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia nova[p] (black sagebrush)	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Atriplex confertifolia[p] (shadscale saltbush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma[t] (Utah juniper)
year	Line Intercept Cover (%)					
1997	-	-	-	-	-	-
2002	7.8	0.6	0.1	0.2	0	0.9
2007	9.2	1	-	1.6	0.8	1.3
2014	13.6	0.3	-	0.9	0.9	-
2019	13.4	0.6	-	0.6	0.1	-
year	Quadrat Cover (%)					
1997	8.8	1.0	-	1.5	0.1	-
2002	8.2	0.9	0.0	0.3	0.0	0.5
2007	8.9	0.9	-	0.2	1.6	0.5
2014	10.1	0.1	-	1.1	0.5	-
2019	12.9	0.7	-	0.6	0.3	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16C-07.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Artemisia frigida[P] -- (prairie sagewort)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	44/66
2019	-	-	-	-	-	-	-	-	32/81
Artemisia nova[P] -- (black sagebrush)									
1997	2540	80	16	72	12	10	0	4	39/71
2002	2660	-	1	87	13	17	35	4	32/66
2007	2260	3540	29	51	20	29	28	11	35/75
2014	5380	240	33	58	9	45	32	9	32/54
2019	4580	20	27	62	11	20	15	11	36/70
Artemisia tridentata ssp. vaseyana[P] -- (mountain big sagebrush)									
1997	220	-	9	73	18	46	18	9	46/75
2002	240	-	0	75	25	33	58	8	37/73
2007	200	560	10	70	20	50	10	10	43/74
2014	60	-	0	100	0	0	100	0	28/52
2019	220	40	27	36	36	55	27	36	33/58
Atriplex canescens[P] -- (fourwing saltbush)									
1997	-	-	-	-	-	-	-	-	-/-
2002	20	-	0	0	100	100	0	100	154/202
2007	-	-	-	-	-	-	-	-	143/212
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	134/177
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
1997	760	-	5	92	3	0	0	0	28/32
2002	620	-	0	68	32	3	97	26	17/37
2007	900	380	31	67	2	2	27	0	24/36
2014	1440	-	38	63	0	40	1	0	19/32
2019	1160	320	14	85	2	3	0	2	19/31
Ephedra viridis[P] -- (mormon tea)									
1997	-	-	-	-	-	-	-	-	-/-
2002	20	-	0	100	0	0	100	0	- / -
2007	-	-	-	-	-	-	-	-	-/-
2014	40	-	100	0	0	100	0	0	4/3
2019	20	-	0	100	0	0	100	100	10/26
Ericameria nauseosa ssp. nauseosa var. speciosa[P] -- (rubber rabbitbrush)									
1997	-	-	-	-	-	-	-	-	-/-
2002	60	-	0	100	0	0	100	0	65/93
2007	-	-	-	-	-	-	-	-	164/180
2014	-	-	-	-	-	-	-	-	31/40
2019	-	-	-	-	-	-	-	-	36/45
Gutierrezia sarothrae -- (broom snakeweed)									
1997	960	120	46	54	0	0	0	0	23/25
2002	540	-	0	67	33	0	4	11	14/15
2007	1840	20	3	96	1	0	0	0	25/29
2014	1820	480	46	52	2	1	0	4	15/17
2019	640	180	16	81	3	0	0	3	14/19

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Juniperus osteosperma[t] -- (Utah juniper)									
1997	20	-	0	100	0	0	0	0	- / -
2002	20	-	0	100	0	0	0	0	- / -
2007	40	-	0	100	0	0	0	50	- / -
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Purshia tridentata[p] -- (antelope bitterbrush)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	28/49
2007	-	-	-	-	-	-	-	-	30/74
2014	-	-	-	-	-	-	-	-	23/50
2019	20	-	0	100	0	0	0	0	34/37

t - Tree Species; p - Preferred Browse; i - Introduced Species

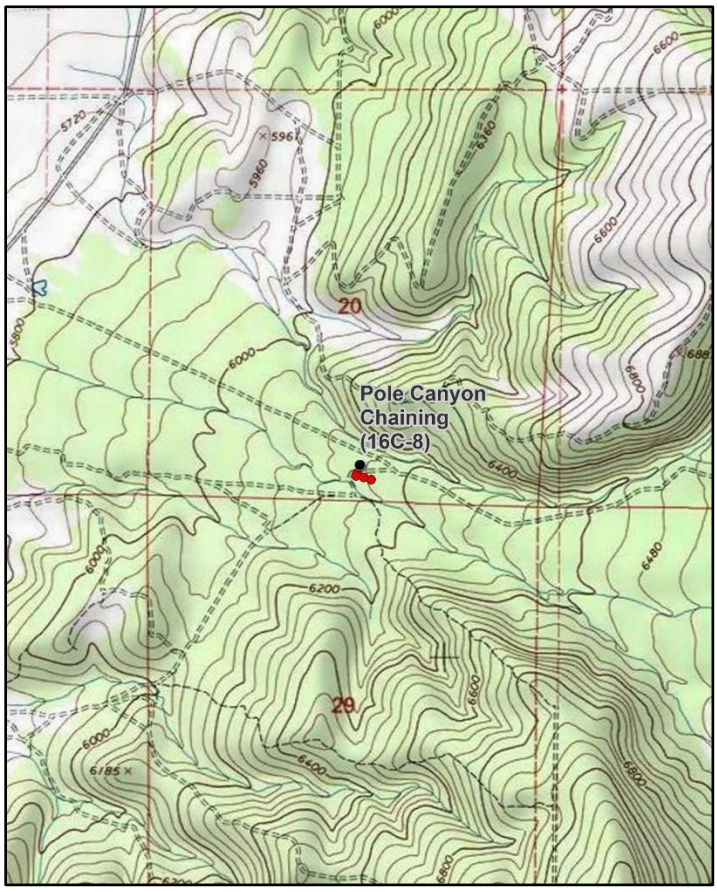
Table 16C-07.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

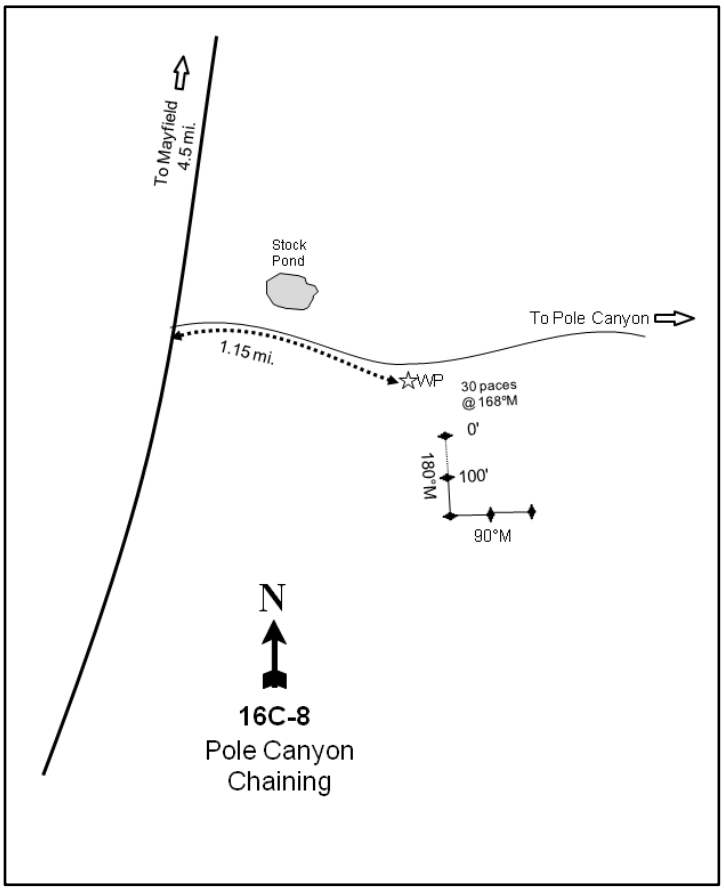
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2002	30	-	-	-	-	-	7.6
2007	28	-	29	43	21	7	9.4
2014	13	25	75	-	-	-	3.6
2019	11	-	75	25	-	-	8.1
Pinus edulis (twoneedle pinyon)							
2002	1	-	-	-	-	-	5.0
2007	3	25	-	50	25	-	9.3

Table 16C-07.15 – Deer Desirable Components Index: Mid Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1997	12.2	11.3	7.6	30.0	-0.3	0.6	0.0	61.3	Fair
2002	11.4	10.8	0.4	22.0	0.0	0.0	0.0	44.6	Poor
2007	12.8	9.1	13.7	25.8	-1.8	0.2	0.0	59.7	Fair
2014	17.4	12.4	15.0	30.0	-1.0	0.5	0.0	74.3	Good
2019	17.5	11.4	13.6	30.0	-3.0	1.5	0.0	70.9	Good

POLE CANYON CHAINING - STUDY NO. 16C-8





Location Information

USGS 7.5 min Map Info	Mayfield SW; Township 20S, Range 2E, Section 20
GPS (0' Stake)	NAD 83 UTM ZONE 12, 438289 East 4322408 North

Transect Information

Browse Tag # (0' Stake)	9041
Transect Bearing	180° magnetic (Lines 3-4: 90° magnetic)
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Belt 1: 3ft

Directions to Site

From Mayfield, travel south down Arapien Valley for 4.5 miles to the Pole Canyon Road. Turn east and drive 1.1 miles to a witness post in a chaining area: the witness post is six paces south of the road. From the witness post to the 0-foot baseline stake it is 32 paces at 215 degrees magnetic. Browse tag #4091 marks the 0-foot baseline stake.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	SOUTH HOLLOW
Elevation	6,100ft (1,859m)
Aspect	West
Slope	4%
Sample Dates	07/01/1997, 07/08/2002, 07/17/2007, 05/19/2014, 05/21/2019

Table 16C-08.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Two-Way Unknown	Pole Canyon Seeding	LTDL	September 1967	1800
Seeding - Aerial After	Pole Canyon Seeding	LTDL	September 1967	1800
Hand Crew - Lop and Scatter	-	-	Between 1997 and 2002	-

Table 16C-08.2 SeedMix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Pole Canyon Seeding			Aerial	Sep 1967	1800
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Agropyron cristatum	Desert Wheatgrass		6.00	0.00
F	Melilotus officinalis	Yellow Sweetclover		2.00	0.00
S	Atriplex canescens	Fourwing Saltbush		0.50	0.00
S	Purshia tridentata	Bitterbrush		0.50	0.00

Wildlife Habitat and Vegetation History

Table 16C-08.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter
Shiras Moose	crucial	winter

Table 16C-08.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1989	Mixed Shrub/Perennial Grass	Phase I
1997	Mixed Shrub/Perennial Grass	Phase I
2002	Mixed Shrub	Phase I
2007	Mixed Shrub/Perennial Grass	Phase I
2014	Perennial Grass/Mixed Shrub	Phase I
2019	Perennial Grass/Mixed Shrub	Phase I

Site Notes

A nearby line-intercept transect sampled the area in 1978. Grasses were heavily to severely grazed between the sample years of 1989 and 1997.

Soils

Table 16C-08.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	7.4	48.7	27.1	24.2	5.9	11.3	195.2	0.5	07/01/1997

Site Potential

1981 - 2010 Average Annual Precipitation	15 inches
NRCS Ecological Site	Upland Loam (Mountain Big Sagebrush-Indian Ricegrass)
NRCS Ecological Site #	R047XB308UT
States and Transitions	A defined state and transition model is available.

This study site has remained dominated by rubber rabbitbrush species (*Ericameria nauseosa* ssp. *consimilis* var. *oreophila* and *E. nauseosa* ssp. *nauseosa* var. *speciosa*) and broom snakeweed (*Gutierrezia sarothrae*) throughout the study period. Other shrub species have been present, but have contributed less cover (Table 16C-08.12, Table 16C-08.13). Perennial grasses, particularly the introduced species crested wheatgrass (*Agropyron cristatum*), have provided much of the cover in the herbaceous understory, and were co-dominant vegetation components in most sample years. Forbs have generally remained rare with the exception of annual forbs in 2007

and 2019 (Table 16C-08.7, Table 16C-08.10, Table 16C-08.11). Utah juniper (*Juniperus osteosperma*) was present in moderate amounts through the 1997 sample year, but a lop and scatter treatment between 1997 and 2002 removed many of the trees. The site has been considered to be within Phase I of woodland succession in all years (Table 16C-08.4, Table 16C-08.12, Table 16C-08.13, Table 16C-08.14, Photos): the continued tree presence indicates that this site may be at risk for infilling in the future and may require additional treatment.

Trend Summary Tables

Table 16C-08.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	3.4	5.2	4.8	-	-	-
2002	1.3	2.7	0.4	1.5	1.9	0.8
2007	2.5	4.7	0.9	3.0	5.8	0.7
2014	0.9	1.5	2.5	1.1	0.6	4.4
2019	1.5	2.1	2.9	1.2	1.4	8.4

Table 16C-08.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	103	298	375	44	0.6	5.9	5.1	0.7
2002	4	112	222	24	0.0	0.6	2.6	0.1
2007	186	306	436	16	2.5	10.8	15.0	0.2
2014	260	368	367	16	5.4	28.7	5.0	0.1
2019	293	353	481	7	4.5	19.6	34.4	0.1

Table 16C-08.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	19.0	1.7	44.9	6.0	4.9	29.8
2002	27.4	1.5	53.4	7.2	7.5	9.1
2007	27.1	0.0	34.9	2.0	5.5	40.8
2014	12.6	0.1	54.9	2.5	5.8	41.2
2019	19.6	0.4	43.7	5.1	7.5	54.7

Table 16C-08.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Coyote	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency					
1997	5	-	53	3	-	19
2002	2	-	49	-	-	28
2007	12	-	34	3	-	69
2014	-	-	29	2	-	18
2019	5	-	28	4	1	46
Year	Days Use Per Acre (ha)					
1997	-	-	-	-	-	-
2002	2.2 (5.4)	-	99.2 (245.0)	-	-	-
2007	46.5 (114.8)	-	49.6 (122.5)	6.0 (14.9)	-	-
2014	19.6 (48.4)	-	23.4 (57.9)	8.1 (19.9)	-	-
2019	17.4 (43.0)	8.7 (21.5)*	34.2 (84.4)	4.0 (9.9)	-	-

*Pellets per acre (ha)

Table 16C-08.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum[i] (crested wheatgrass)	Bromus inermis[i] (smooth brome)	Bromus tectorum[ai] (cheatgrass)	Elymus elymoides (squirreltail)	Pascopyrum smithii (western wheatgrass)	Poa bulbosa[i] (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Psathyrostachys juncea[i] (Russian wildrye)	Thinopyrum intermedium[i] (intermediate wheatgrass)
year	Nested Frequency									
1997	296	-	103	2	-	-	4	-	-	-
2002	111	-	4	-	-	-	-	1	-	-
2007	306	-	186	-	-	-	-	1	4	-
2014	355	8	260	-	1	1	-	4	21	20
2019	350	-	293	-	-	1	-	12	-	12
year	Average Cover (%)									
1997	5.9	-	0.6	0.0	-	-	0.0	-	-	-
2002	0.6	-	0.0	-	-	-	-	0.0	-	-
2007	10.4	-	2.5	-	-	-	-	0.0	0.3	-
2014	25.9	0.2	5.4	-	0.0	0.0	-	0.0	1.4	1.2
2019	18.9	-	4.5	-	-	0.1	-	0.3	-	0.4

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16C-08.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Alyssum desertorum[ai] (desert madwort)	Antennaria dimorpha (low pussytoes)	Astragalus calycosus (Torrey's milkvetch)	Astragalus utahensis (Utah milkvetch)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata[ai] (curveseed butterwort)	Chaetopappa ericoides (rose heath)	Chorispora tenella[ai] (crossflower)	Collinsia parviflora[a] (maiden blue eyed Mary)	Cryptantha (cryptantha)	Descurainia pinnata[a] (western tansymustard)	Draba[a] (draba)	Erodium cicutarium[ai] (redstem stork's bill)	Gilia inconspicua[a] (shy gilia)	Ipomopsis congesta (ballhead ipomopsis)	Lactuca serriola[ai] (prickly lettuce)	Lappula occidentalis[a] (flatspine stickseed)
year	Nested Frequency																
1997	55	1	-	19	2	360	-	-	12	14	28	-	9	-	-	7	-
2002	57	2	-	-	-	180	3	-	-	7	27	-	-	-	-	-	-
2007	389	-	-	3	-	378	-	1	19	1	53	4	-	10	-	1	4
2014	365	-	1	-	-	6	-	-	-	3	-	-	2	2	4	-	13
2019	477	-	-	-	-	357	-	0	1	1	21	2	15	25	-	23	30
year	Average Cover (%)																
1997	0.2	0.0	-	0.3	0.0	4.5	-	-	0.0	0.1	0.1	-	0.0	-	-	0.0	-
2002	0.3	0.0	-	-	-	2.0	0.0	-	-	0.0	0.3	-	-	-	-	-	-
2007	7.1	-	-	0.0	-	7.3	-	0.0	0.1	0.0	0.5	0.0	-	0.0	-	0.0	0.0
2014	5.0	-	0.0	-	-	0.0	-	-	-	0.1	-	-	0.0	0.0	0.0	-	0.0
2019	29.7	-	-	-	-	4.4	-	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-	0.1	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Lithospermum incisum (narrowleaf stoneseed)	Machaeranthera canescens (hoary tansyaster)	Microsteris gracilis[a] (slender phlox)	Phlox longifolia (longleaf phlox)	Streptanthus cordatus (heartleaf twistflower)	Taraxacum officinale (common dandelion)	Tragopogon dubius[ai] (yellow salsify)	unknown perennial forb (unknown forb)
year	Nested Frequency							
1997	4	3	24	-	5	-	-	1
2002	4	-	-	-	11	-	-	-
2007	-	5	3	2	5	-	2	-
2014	-	-	-	-	8	-	3	-
2019	1	-	3	-	4	1	3	-
year	Average Cover (%)							
1997	0.2	0.0	0.1	-	0.0	-	-	0.0
2002	0.1	-	-	-	0.0	-	-	-
2007	-	0.1	0.0	0.0	0.1	-	0.0	-
2014	-	-	-	-	0.0	-	0.0	-
2019	0.0	-	0.0	-	0.0	0.0	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16C-08.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis[p] (Utah serviceberry)	Atriplex canescens[p] (fourwing saltbush)	Cercocarpus montanus[p] (alderleaf mountain mahogany)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. consimilis var. oreophila (rubber rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. speciosa[p] (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma[t] (Utah juniper)	Pinus edulis[t] (twoneedle pinyon)	Purshia tridentata[p] (antelope bitterbrush)	Quercus gambelii[p] (Gambel oak)
year	Line Intercept Cover (%)										
1997	-	-	-	-	-	-	-	-	-	-	-
2002	-	-	-	-	0.8	1.5	1.1	0.2	0.6	-	-
2007	0.3	-	-	-	1.7	2.7	4.1	0.1	0.6	-	-
2014	-	-	-	-	0.1	1.1	0.5	3.4	1	-	-
2019	-	-	-	-	0.3	0.5	1.1	6.7	1.7	-	0.7
year	Quadrat Cover (%)										
1997	-	-	-	0.8	-	3.3	4.4	3.1	1.7	0.1	-
2002	-	-	-	-	1.5	1.1	1.2	0.0	0.4	0.1	0.0
2007	0.0	0.0	-	-	1.0	2.3	3.6	0.3	0.6	0.1	0.0
2014	-	-	0.0	-	0.2	0.7	1.3	1.5	1.0	0.1	0.0
2019	-	-	0.0	-	0.2	0.7	2.0	2.0	0.8	0.1	0.6

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16C-08.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Artemisia nova[P] -- (black sagebrush)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	32/73
2014	-	-	-	-	-	-	-	-	11/21
2019	-	-	-	-	-	-	-	-	12/25
Atriplex canescens[P] -- (fourwing saltbush)									
1997	-	-	-	-	-	-	-	-	129/190
2002	-	-	-	-	-	-	-	-	110/111
2007	20	-	100	0	0	0	0	0	135/211
2014	-	-	-	-	-	-	-	-	10/123
2019	-	-	-	-	-	-	-	-	134/163
Cercocarpus montanus[P] -- (alderleaf mountain mahogany)									
1997	-	-	-	-	-	-	-	-	64/81
2002	-	-	-	-	-	-	-	-	65/80
2007	-	-	-	-	-	-	-	-	71/98
2014	-	-	-	-	-	-	-	-	84/118
2019	-	-	-	-	-	-	-	-	86/118
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	20	-	0	100	0	0	100	0	13/22
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1997	200	-	10	80	10	10	0	0	81/96
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	29/58
2014	20	-	0	100	0	0	0	0	12/15
2019	20	-	0	100	0	0	100	0	19/31
Ephedra nevadensis[P] -- (Nevada jointfir)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	38/48
2019	-	-	-	-	-	-	-	-	-/-
Ephedra viridis[P] -- (mormon tea)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	29/28
2014	-	-	-	-	-	-	-	-	32/12
2019	-	-	-	-	-	-	-	-	-/-
Ericameria nauseosa ssp. consimilis var. oreophila -- (rubber rabbitbrush)									
1997	-	-	-	-	-	-	-	-	-/-
2002	740	-	5	76	19	30	0	0	46/59
2007	240	-	25	58	17	0	0	17	74/97
2014	60	-	0	0	100	33	33	100	62/104
2019	80	-	25	75	0	75	25	0	57/70

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Ericameria nauseosa ssp. nauseosa var. speciosa[p] -- (rubber rabbitbrush)									
1997	3000	40	57	41	3	22	1	1	72/78
2002	1640	20	44	38	18	16	10	5	47/53
2007	1740	40	46	39	15	16	1	8	62/77
2014	1160	-	2	59	40	22	53	35	47/57
2019	720	-	0	69	31	17	61	39	46/53
Gutierrezia sarothrae -- (broom snakeweed)									
1997	14940	120	17	83	0	0	0	0	25/24
2002	3740	-	4	78	18	0	0	9	17/21
2007	4780	2060	0	98	2	0	0	1	26/32
2014	3320	1460	30	65	5	11	1	6	12/16
2019	3140	108420	20	73	7	1	1	7	15/19
Juniperus osteosperma[t] -- (Utah juniper)									
1997	380	-	63	37	0	0	0	0	- / -
2002	20	-	0	100	0	0	0	0	- / -
2007	20	-	0	0	100	0	0	100	- / -
2014	20	-	0	100	0	0	0	0	- / -
2019	40	-	0	100	0	0	0	0	- / -
Opuntia -- (pricklypear)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	15/35
2019	-	-	-	-	-	-	-	-	13/37
Pinus edulis[t] -- (twoneedle pinyon)									
1997	120	-	83	17	0	0	0	0	- / -
2002	40	-	100	0	0	0	0	50	- / -
2007	20	-	0	100	0	0	0	0	- / -
2014	20	-	0	100	0	0	0	0	- / -
2019	20	-	100	0	0	0	0	0	- / -
Purshia tridentata[p] -- (antelope bitterbrush)									
1997	20	-	0	0	100	0	100	0	25/44
2002	20	-	0	0	100	0	100	100	21/79
2007	-	-	-	-	-	-	-	-	12/55
2014	-	-	-	-	-	-	-	-	10/36
2019	-	-	-	-	-	-	-	-	14/41
Quercus gambelii[p] -- (Gambel oak)									
1997	20	-	0	100	0	100	0	0	216/42
2002	20	-	0	100	0	0	0	0	254/56
2007	-	-	-	-	-	-	-	-	82/73
2014	20	-	0	100	0	100	0	0	44/39
2019	60	-	0	100	0	0	0	0	87/78

t - Tree Species; p - Preferred Browse; i - Introduced Species

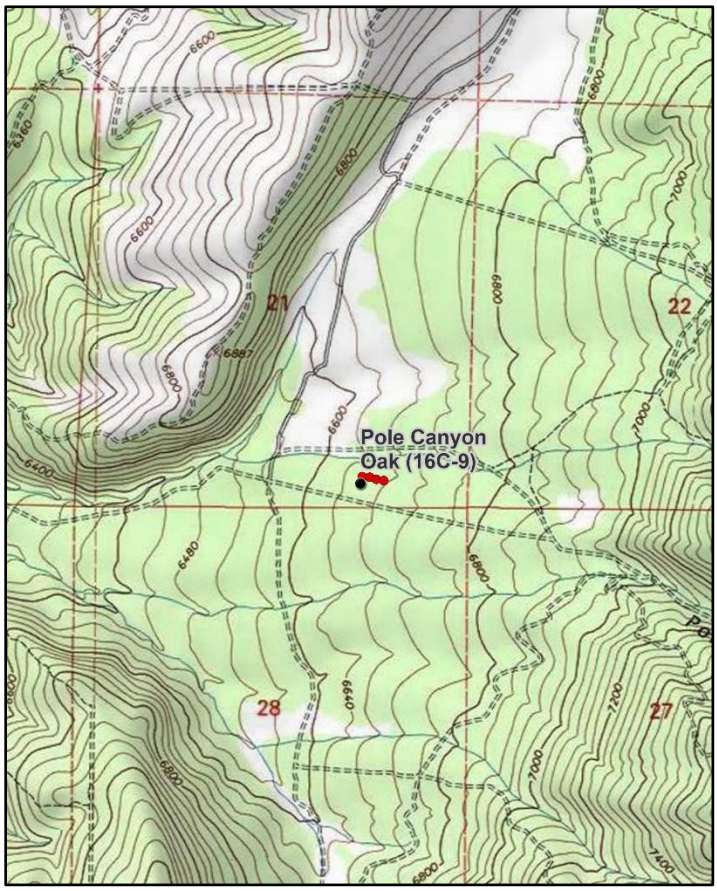
Table 16C-08.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

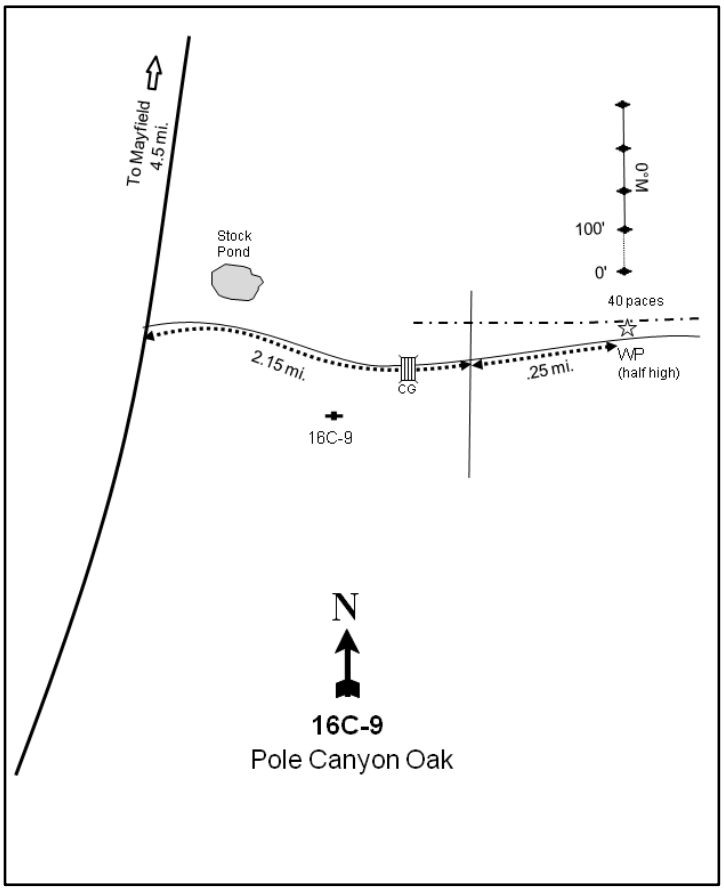
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2007	42	10	70	20	-	-	3.6
2014	40	9	45	45	-	-	3.6
2019	45	13	27	60	-	-	5.4
Pinus edulis (twoneedle pinyon)							
2007	3	-	33	67	-	-	4.3
2014	9	-	88	13	-	-	3.9
2019	8	-	29	71	-	-	5.4

Table 16C-08.15 – Deer Desirable Components Index: Mid Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1997	4.3	0.0	0.0	11.9	-0.4	1.3	0.0	17.1	Very Poor
2002	1.7	0.0	0.0	1.1	0.0	0.3	0.0	3.1	Very Poor
2007	3.8	0.0	0.0	21.5	-1.9	0.3	0.0	23.8	Very Poor
2014	1.4	0.0	0.0	30.0	-4.1	0.3	0.0	27.6	Very Poor
2019	1.3	0.0	0.0	30.0	-3.4	0.2	0.0	28.2	Very Poor

POLE CANYON OAK - STUDY NO. 16C-9





Location Information

USGS 7.5 min Map Info	Mayfield SW; Township 20S, Range 2E, Section 21
GPS (0' Stake)	NAD 83 UTM ZONE 12, 440171 East 4322329 North

Transect Information

Browse Tag # (0' Stake)	9042
Transect Bearing	0° magnetic (Lines 2-4: 90° magnetic)
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (59ft), Line 3 (71ft), Line 4 (34ft)
Belt Marker Placement	Belt 5: 1ft

Directions to Site

Go south from Main Street in Mayfield through Arapien Valley for 4.5 miles to the Pole Canyon Road. Turn east and travel for 2.15 miles, passing study #16C-8 and crossing a cattle guard to a four-way intersection (South Hollow Road). From the intersection, drive east (straight) for another 0.25 miles to a half-high witness post on the north side of the road. The 0-foot baseline stake (marked by browse tag #9042) is 40 paces due north.

Site Information

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	6,670ft (2,033m)
Aspect	West
Slope	2-7%
Sample Dates	07/01/1997, 07/08/2002, 07/18/2007, 05/19/2014, 05/20/2019

Table 16C-09.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Chain Unknown	-	-	1970s	-
Chaining - Two-Way Ely/Smooth	Twelve Mile WMA Habitat Improvement - Year 2	1059	October-November 2008	540
Seeding - Aerial Before	Twelve Mile WMA Habitat Improvement - Year 2	1059	October-November 2008	618
Seeding - Dribbler	Twelve Mile WMA Habitat Improvement - Year 2	1059	October-November 2008	540

Table 16C-09.2 SeedMix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
12-Mile Chaining mix 2			Aerial	Oct 2008	200
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Achnatherum hymenoides	Indian Ricegrass	Rimrock	1.00	0.92
G	Agropyron cristatum	Crested Wheatgrass	Douglas	1.00	0.82
G	Agropyron cristatum	Crested Wheatgrass	Nordan	1.00	0.89
G	Dactylis glomerata	Orchardgrass	Paiute	0.50	0.40
G	Elymus trachycaulus	Slender Wheatgrass	San Luis	1.00	0.85
G	Festuca ovina	Sheep Fescue		0.50	0.46
G	Poa secunda	Canby Bluegrass	Canbar	0.50	0.43
G	Pseudoroegneria spicata	Bluebunch Wheatgrass	Anatone	1.00	0.71
G	Thinopyrum intermedium	Intermediate Wheatgrass	Oahe	1.00	0.91
F	Achillea millefolium	Western Yarrow		0.10	0.10
F	Astragalus cicer	Cicer Milkvetch	Lutana	0.50	0.48
F	Linum perenne	Blue Flax	Appar	0.50	0.45
F	Medicago sativa	Alfalfa	Ladak	1.50	1.36
F	Melilotus officinalis	Yellow Sweetclover		0.25	0.22
F	Onobrychis viciifolia	Sainfoin	Eski	2.00	1.76
F	Sanguisorba minor	Small Burnet	Delar	1.47	1.26
F	Sanguisorba minor	Small Burnet	Delar	0.50	0.42

Mix Name			Application Type	Application Date	Acres
12-Mile Chaining Dribbler Mix			Dribbler	Oct 2008	540
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
F	Sanguisorba minor	Small Burnet	Delar	0.14	0.14
S	Purshia tridentata	Bitterbrush	Lincoln NV	0.09	0.07

Mix Name			Application Type	Application Date	Acres
12-Mile Chaining Dribbler Mix 2			Dribbler	Oct 2008	540
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
F	Sanguisorba minor	Small Burnet	Delar	0.05	0.05
S	Atriplex canescens	Fourwing Saltbush	Central UT	0.07	0.03

Mix Name			Application Type	Application Date	Acres
12-Mile Chaining Dribbler Mix 3			Dribbler	Oct 2008	540
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
F	Sanguisorba minor	Small Burnet	Delar	0.09	0.09
S	Cercocarpus montanus	True Mountain Mahogany	Wasatch UT	0.05	0.03

Wildlife Habitat and Vegetation History

Table 16C-09.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter
Shiras Moose	crucial	winter

Table 16C-09.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1989	Pinyon-Juniper/Gambel Oak	Phase II
1997	Pinyon-Juniper/Gambel Oak	Phase II
2002	Pinyon-Juniper/Gambel Oak	Phase II
2007	Pinyon-Juniper/Gambel Oak	Phase II
2014	Gambel Oak	Phase I
2019	Gambel Oak	Phase I

Site Notes

The area to the south of the study was treated with herbicide in strips to remove dense patches of oak. Additionally, the study is located on a 30-year old chaining that was retreated to remove encroaching twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) trees and to rejuvenate and enhance the herbaceous understory by seeding additional grasses, forbs, and shrubs (WRI Database, 2019). In 2014, a portion of the study was moved in order to fit it within the treated area.

Soils

Table 16C-09.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	7.2	46.7	28.7	24.6	3.5	9.7	108.8	0.7	07/01/1997

Site Potential

1981 - 2010 Average Annual Precipitation	17 inches
NRCS Ecological Site	Mountain Stony Loam (Oak)
NRCS Ecological Site #	R047XB463UT
States and Transitions	No state and transition model is available for this ecological site.

Gambel oak (*Quercus gambelii*) has been the dominant browse species in all sample years. Other shrub species including (but not limited to) mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), antelope bitterbrush (*Purshia tridentata*), and alderleaf mountain mahogany (*Cercocarpus montanus*) have also been present to a lesser extent. While the understory has been diverse, herbaceous species provided little cover prior to the 2008 chaining and seeding (Table 16C-09.1). However, cover of perennial grasses has increased significantly following treatment with bluebunch wheatgrass (*Pseudoroegneria spicata*), muttongrass (*Poa fendleriana*), and intermediate wheatgrass (*Thinopyrum intermedium*) as the dominant species. From 1989 through 2007, Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) were observed in high amounts and were considered to be co-dominant vegetation components; the site was classified as being in Phase II of woodland succession. Many of these trees were removed by the 2008 treatment, and the site has been within Phase I of encroachment since 2014. Point-quarter density indicates that juniper density is still moderate to high as of 2019 (Table 16C-09.4, Table 16C-09.12, Table 16C-09.14, Photos), indicating that there may be potential for future infilling without further treatment.

Trend Summary Tables

Table 16C-09.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	22.8	0.0	14.1	-	-	-
2002	14.8	0.2	12.3	19.3	0.2	25.2
2007	15.1	0.0	7.2	26.7	0.2	29.9
2014	18.6	0.8	1.9	15.3	0.8	1.2
2019	23.5	0.7	2.6	33.3	0.9	1.7

Table 16C-09.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	45	137	55	108	0.8	2.7	0.1	0.7
2002	20	110	51	44	0.0	1.9	0.1	0.3
2007	53	115	197	44	0.6	2.4	1.2	0.5
2014	141	292	146	186	1.8	16.9	0.6	2.4
2019	121	291	311	170	0.5	14.1	4.1	2.2

Table 16C-09.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	14.2	0.3	59.4	5.4	2.1	39.9
2002	17.0	0.2	66.5	5.7	2.3	29.1
2007	16.2	0.1	57.6	5.4	2.0	30.2
2014	15.3	0.0	62.1	1.3	1.9	41.0
2019	19.3	0.2	65.5	3.0	3.0	41.9

Table 16C-09.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1997	1	28	3	12
2002	1	26	1	10
2007	-	30	10	34
2014	2	16	8	10
2019	-	30	2	45
Year	Days Use Per Acre (ha)			
1997	-	-	-	-
2002	-	87.8 (216.8)	-	-
2007	0.7 (1.8)	85.1 (210.2)	8.7 (21.5)	-
2014	-	18.7 (46.3)	9.4 (23.2)	-
2019	2.2 (5.4)	26.2 (64.6)	4.0 (9.9)	-

Table 16C-09.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bromus porteri (Porter brome)	Bromus tectorum[ai] (cheatgrass)	Carex (sedge)	Elymus elymoides (squirreltail)	Festuca idahoensis (Idaho fescue)	Hesperostipa comata (needle and thread)	Muhlenbergia (muhly)	Poa fendleriana (muttongrass)	Poa pratensis[i] (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium[i] (intermediate wheatgrass)
year	Nested Frequency													
1997	16	-	-	45	-	-	-	16	-	85	14	5	15	-
2002	12	-	-	20	-	1	-	1	-	92	-	8	7	-
2007	8	-	-	53	4	7	-	4	-	37	-	1	59	-
2014	31	34	5	141	4	55	2	-	0	161	-	17	43	53
2019	25	38	-	121	5	41	-	24	-	108	14	53	34	73
year	Average Cover (%)													
1997	0.1	-	-	0.8	-	-	-	0.1	-	2.2	0.1	0.1	0.1	-
2002	0.2	-	-	0.0	-	0.0	-	0.0	-	1.6	-	0.0	0.1	-
2007	0.2	-	-	0.6	0.1	0.1	-	0.2	-	0.6	-	0.0	1.3	-
2014	1.1	0.9	0.1	1.8	0.2	1.4	0.0	-	0.0	7.0	-	0.2	3.5	2.5
2019	0.7	0.9	-	0.5	0.0	0.6	-	0.7	-	3.0	0.6	0.7	2.0	4.9

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16C-09.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Alyssum desertorum[ai] (desert madwort)	Arabis holboellii[a] (Holboell's rockcress)	Astragalus (milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus eurekensis (Eureka milkvetch)	Calochortus nuttallii (sego lily)	Carduus nutans[ani] (nodding plumeless thistle)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata[ai] (curveseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Collinsia parviflora[a] (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawksbeard)	Cymopterus (springparsley)	Delphinium nuttallianum (twolobe larkspur)	Descurainia pinnata[a] (western tansymustard)
year	Nested Frequency																
1997	4	-	6	0	-	-	-	-	2	10	9	25	34	2	20	-	-
2002	3	-	-	-	-	-	-	-	3	16	-	34	-	-	26	-	-
2007	-	-	-	-	-	-	-	-	-	74	2	163	-	-	10	-	1
2014	21	16	2	5	-	7	21	6	-	19	3	87	3	1	89	2	8
2019	24	212	6	-	0	1	34	3	-	80	9	196	-	1	110	5	4
year	Average Cover (%)																
1997	0.0	-	0.0	0.0	-	-	-	-	0.0	0.0	0.0	0.1	0.1	0.0	0.1	-	-
2002	0.0	-	-	-	-	-	-	-	0.0	0.0	-	0.1	-	-	0.1	-	-
2007	-	-	-	-	-	-	-	-	-	0.5	0.0	0.6	-	-	0.1	-	0.0
2014	0.1	0.1	0.0	0.2	-	0.0	0.1	0.0	-	0.0	0.0	0.3	0.0	0.1	0.9	0.0	0.1
2019	0.3	2.8	0.0	-	0.0	0.0	0.1	0.0	-	0.3	0.1	0.8	-	0.0	1.2	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Erigeron (fleabane)	Erigeron divergens[a] (spreading fleabane)	Eriogonum cernuum[a] (nodding buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Lactuca serriola[ai] (prickly lettuce)	Lesquerella (bladderpod)	Lomatium (desertparsley)	Machaeranthera (tansyaster)	Machaeranthera canescens (hoary tansyaster)	Medicago sativa[i] (alfalfa)	Microsteris gracilis[a] (slender phlox)	Onobrychis viciifolia[i] (sainfoin)	Orogenia linearifolia (Great Basin Indian potato)	Packera multilobata (lobeleaf groundsel)	Penstemon (beardtongue)	Penstemon comarrhenus (dusty beardtongue)	Petradoria pumila (rock goldenrod)
year	Nested Frequency																
1997	-	2	-	9	1	7	3	4	-	-	16	-	-	8	4	-	-
2002	-	3	-	1	-	-	-	-	-	-	-	-	-	-	-	-	2
2007	-	-	-	4	-	6	-	-	-	-	41	-	-	1	-	-	2
2014	3	-	1	8	28	-	-	-	4	1	9	6	2	-	-	3	-
2019	-	3	-	2	31	-	2	-	-	-	27	-	3	-	-	-	-
year	Average Cover (%)																
1997	-	0.0	-	0.1	0.0	0.0	0.0	0.0	-	-	0.0	-	-	0.1	0.0	-	-
2002	-	0.0	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-	0.2
2007	-	-	-	0.2	-	0.0	-	-	-	-	0.1	-	-	0.0	-	-	0.1
2014	0.0	-	0.0	0.0	0.1	-	-	-	0.0	0.0	0.0	0.2	0.0	-	-	0.0	-
2019	-	0.0	-	0.0	0.1	-	0.0	-	-	-	0.1	-	0.0	-	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Phlox longifolia (longleaf phlox)	Pseudocymopterus montanus (alpine false springparsley)	Sanguisorba minor[i] (small burnet)	Taraxacum officinale (common dandelion)	Tragopogon dubius[ai] (yellow salsify)	Verbascum thapsus[ai] (common mullein)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency						
1997	16	-	-	1	-	-	2
2002	12	-	-	-	-	-	-
2007	24	-	-	-	2	-	-
2014	19	-	33	-	10	4	10
2019	32	4	-	22	21	-	2
year	Average Cover (%)						
1997	0.1	-	-	0.0	-	-	0.0
2002	0.0	-	-	-	-	-	-
2007	0.1	-	-	-	0.0	-	-
2014	0.1	-	0.6	-	0.0	0.0	0.0
2019	0.4	0.1	-	0.1	0.0	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16C-09.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis[p] (Utah serviceberry)	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Cercocarpus montanus[p] (alderleaf mountain mahogany)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma[t] (Utah juniper)	Opuntia polyacantha (plains pricklypear)	Pinus edulis[t] (twoneedle pinyon)	Purshia tridentata[p] (antelope bitterbrush)	Quercus gambelii[p] (Gambel oak)
year	Line Intercept Cover (%)								
1997	-	-	-	-	-	-	-	-	-
2002	0.2	3.2	1.8	0.2	16.6	-	8.6	2	12.1
2007	0.6	2.1	2.1	0.2	17	-	12.9	1.5	20.4
2014	-	0.3	1.7	0.3	0.8	0.5	0.4	3.4	9.9
2019	0.2	1.6	2.1	0.6	0.8	0.3	0.9	3.4	26
year	Quadrat Cover (%)								
1997	0.2	2.4	1.5	0.0	6.8	-	7.3	2.8	15.9
2002	0.0	3.3	0.8	0.2	6.2	0.0	6.2	2.6	8.1
2007	0.0	0.9	1.4	0.0	3.5	0.0	3.7	2.4	10.3
2014	-	0.2	2.1	0.7	1.2	0.0	0.6	3.0	13.3
2019	0.0	1.1	1.1	0.7	1.3	0.0	1.3	2.4	18.9

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16C-09.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
1997	100	20	20	80	0	0	0	0	109/59
2002	40	-	0	100	0	0	0	0	69/41
2007	60	-	67	33	0	67	0	33	117/201
2014	-	-	-	-	-	-	-	-	-/-
2019	20	-	0	100	0	0	0	0	78/82
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1997	960	-	4	54	42	6	0	19	78/91
2002	780	-	0	28	72	10	23	31	75/87
2007	400	-	0	35	65	35	10	70	81/93
2014	500	-	32	68	0	48	16	0	34/51
2019	440	-	32	59	9	59	5	9	46/64
Cercocarpus montanus[p] -- (alderleaf mountain mahogany)									
1997	140	-	0	100	0	43	29	0	98/116
2002	180	-	0	100	0	11	78	0	91/97
2007	140	-	14	86	0	0	57	0	83/97
2014	240	-	0	100	0	58	25	0	72/88
2019	300	-	7	93	0	7	87	0	91/96
Chrysothamnus depressus[p] -- (longflower rabbitbrush)									
1997	-	-	-	-	-	-	-	-	22/30
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Ericameria nauseosa ssp. nauseosa var. speciosa[p] -- (rubber rabbitbrush)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	21/15
2019	-	-	-	-	-	-	-	-	42/33
Gutierrezia sarothrae -- (broom snakeweed)									
1997	240	-	0	100	0	0	0	0	24/20
2002	220	-	0	100	0	0	0	0	20/21
2007	140	-	0	100	0	0	0	0	25/24
2014	920	660	30	70	0	0	15	0	14/21
2019	1820	280	4	95	1	12	0	1	14/22
Juniperus osteosperma[t] -- (Utah juniper)									
1997	160	-	38	63	0	0	0	0	- / -
2002	120	-	33	67	0	17	0	17	- / -
2007	120	20	17	83	0	0	0	0	- / -
2014	60	40	67	33	0	0	0	0	- / -
2019	60	40	100	0	0	0	0	0	- / -
Opuntia fragilis -- (brittle pricklypear)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	6/47
Opuntia polyacantha -- (plains pricklypear)									
1997	40	-	0	100	0	0	0	0	18/31
2002	100	20	60	40	0	0	0	0	15/11
2007	-	-	-	-	-	-	-	-	8/36
2014	20	-	0	100	0	0	0	0	6/20
2019	160	-	75	13	13	0	0	13	11/24
Peraphyllum ramosissimum[p] -- (wild crab apple)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	44/30
2007	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Pinus edulis[t] -- (twoneedle pinyon)									
1997	120	60	50	50	0	0	0	0	- / -
2002	180	40	33	67	0	0	0	0	- / -
2007	120	80	17	83	0	0	0	0	- / -
2014	100	20	60	40	0	0	0	0	- / -
2019	100	20	80	20	0	0	0	0	- / -
Purshia tridentata[p] -- (antelope bitterbrush)									
1997	540	-	15	85	0	56	11	0	35/108
2002	520	-	0	100	0	23	77	0	33/98
2007	260	-	0	100	0	8	77	0	34/99
2014	500	-	4	96	0	60	8	0	39/95
2019	540	560	0	100	0	0	96	0	38/97
Quercus gambelii[p] -- (Gambel oak)									
1997	4980	300	37	58	5	18	0	13	146/116
2002	6260	60	42	56	3	3	4	24	98/54
2007	5860	840	23	66	11	13	0	4	86/64
2014	8060	-	3	97	0	40	2	0	93/47
2019	9920	40	4	96	0	19	14	0	114/58

t - Tree Species; p - Preferred Browse; i - Introduced Species

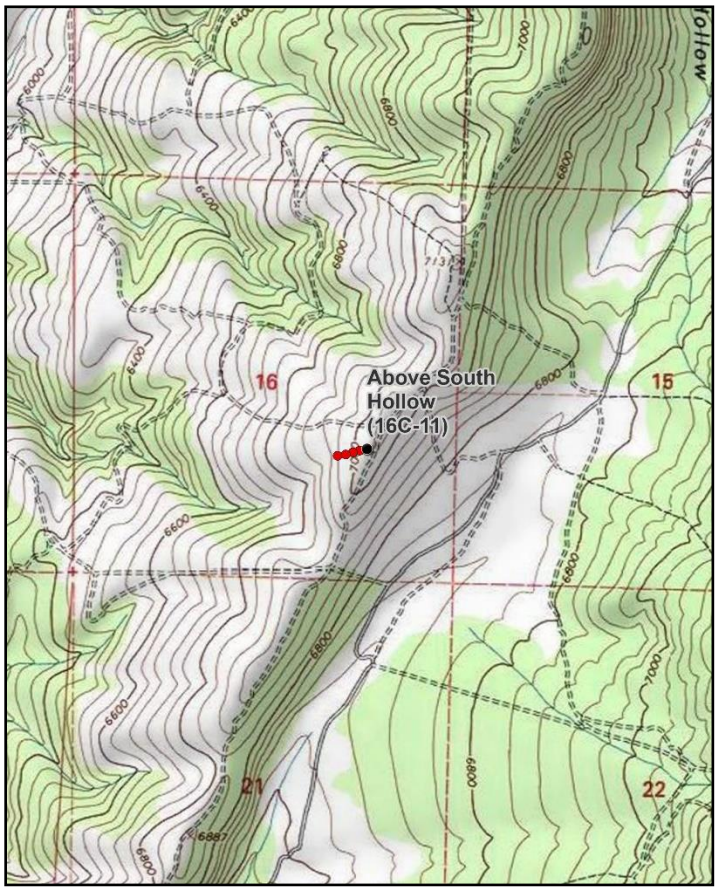
Table 16C-09.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

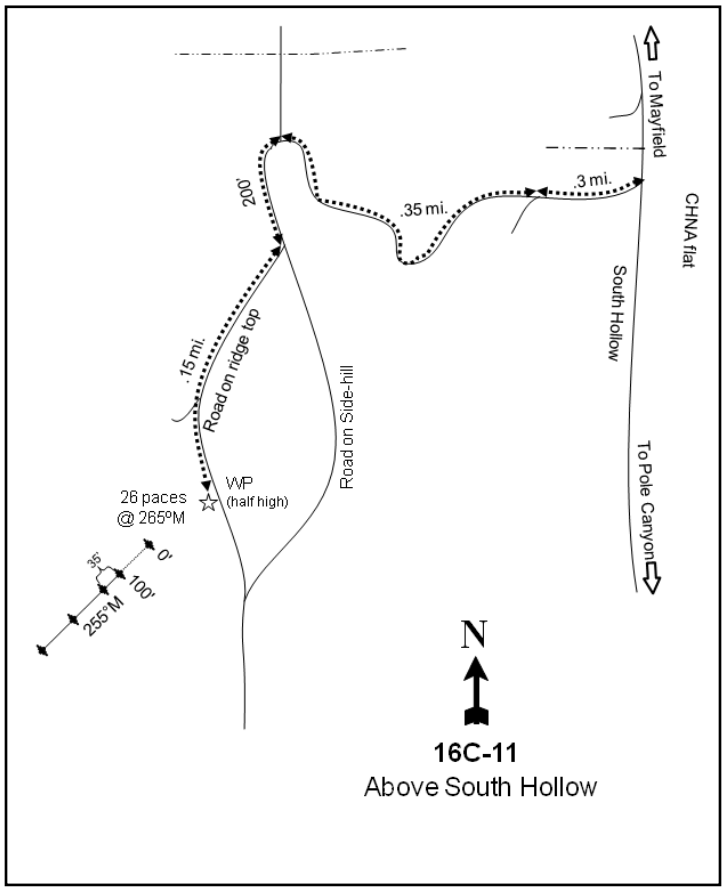
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2002	179	-	-	-	-	-	13.0
2007	174	10	15	30	25	20	13.4
2014	61	6	56	38	-	-	6.4
2019	74	6	31	63	-	-	11.4
Pinus edulis (twoneedle pinyon)							
2002	48	-	-	-	-	-	15.8
2007	78	28	6	-	22	44	17.9
2014	21	40	60	-	-	-	2.6
2019	9	20	40	40	-	-	5.2

Table 16C-09.15 – Deer Desirable Components Index: High Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1997	25.7	12.6	14.1	5.4	-0.6	1.3	0.0	58.4	Fair
2002	17.3	9.7	11.4	3.7	0.0	0.6	0.0	42.8	Poor
2007	29.3	11.0	10.2	4.8	-0.5	1.0	0.0	55.8	Poor-Fair
2014	17.9	15.0	1.6	30.0	-1.4	4.8	-2.0	66.0	Fair
2019	30.0	14.9	2.4	28.3	-0.4	4.4	-2.0	77.5	Good

ABOVE SOUTH HOLLOW - STUDY NO. 16C-11





Location Information

USGS 7.5 min Map Info	Mayfield NW; Township 20S, Range 2E, Section 16
GPS (0' Stake)	NAD 83 UTM ZONE 12, 440283 East 4324415 North

Transect Information

Browse Tag # (0' Stake)	Not Available
Transect Bearing	255° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (59ft), Line 3 (71ft), Line 4 (34ft)
Belt Marker Placement	Standard

Directions to Site

From the Mayfield post office, travel 1.75 miles up the Twelve Mile Canyon Road. Proceed right at the fork and continue south down South Hollow for 3.0 miles to a large rabbitbrush flat. Take the fork past the fence west and drive for 0.3 miles to another fork. Proceed right at the fork and continue up a steep dugway for 0.35 miles to a fenceline where the road forks again. Proceed left at this fork and continue south for 200 feet to another fork. Continue right at this fork and proceed up a very steep road for 0.15 miles to a half-high witness post on the west side of the road. From the witness post, walk 26 paces at 265 degrees magnetic to the 0-foot baseline stake.

Site Information

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	7,000ft (2,134m)
Aspect	West
Slope	23%
Sample Dates	07/01/1997, 07/08/2002, 07/18/2007, 05/20/2014, 05/20/2019

Table 16C-11.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Chain Unknown	-	-	Prior to 1960	-
Seeding - Seed Unknown	-	-	Prior to 1960	-
Chaining - Two-Way Ely/Smooth	Twelve Mile WMA Habitat Improvement - Year 2	1059	October-November 2008	540
Seeding - Aerial Before	Twelve Mile WMA Habitat Improvement - Year 2	1059	October-November 2008	618
Seeding - Dribbler	Twelve Mile WMA Habitat Improvement - Year 2	1059	October-November 2008	540

Table 16C-11.2 SeedMix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
12-Mile Chaining - previously chained			Aerial	Oct 2008	400
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Achnatherum hymenoides	Indian Ricegrass	Rimrock	1.00	0.92
G	Dactylis glomerata	Orchardgrass	Paiute	0.50	0.40
G	Festuca ovina	Sheep Fescue		0.50	0.46
G	Poa secunda	Canby Bluegrass	Canbar	0.50	0.43
G	Pseudoroegneria spicata	Bluebunch Wheatgrass	Anatone	1.00	0.71
F	Achillea millefolium	Western Yarrow		0.10	0.10
F	Linum perenne	Blue Flax	Appar	0.41	0.35
F	Linum perenne	Blue Flax	Appar	0.09	0.08
F	Medicago sativa	Alfalfa	Ladak	1.50	1.36
F	Melilotus officinalis	Yellow Sweetclover		0.25	0.22
F	Onobrychis viciifolia	Sainfoin	Eski	2.00	1.76
F	Sanguisorba minor	Small Burnet	Delar	2.00	1.71

Mix Name			Application Type	Application Date	Acres
12-Mile Chaining Dribbler Mix			Dribbler	Oct 2008	540
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
F	Sanguisorba minor	Small Burnet	Delar	0.14	0.14
S	Purshia tridentata	Bitterbrush	Lincoln NV	0.09	0.07

Mix Name			Application Type	Application Date	Acres
12-Mile Chaining Dribbler Mix 2			Dribbler	Oct 2008	540
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
F	Sanguisorba minor	Small Burnet	Delar	0.05	0.05
S	Atriplex canescens	Fourwing Saltbush	Central UT	0.07	0.03

Mix Name			Application Type	Application Date	Acres
12-Mile Chaining Dribbler Mix 3			Dribbler	Oct 2008	540
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
F	Sanguisorba minor	Small Burnet	Delar	0.09	0.09
S	Cercocarpus montanus	True Mountain Mahogany	Wasatch UT	0.05	0.03

Wildlife Habitat and Vegetation History

Table 16C-11.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter
Shiras Moose	crucial	winter

Table 16C-11.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1989	Pinyon-Juniper/Perennial Grass	Phase II
1997	Pinyon-Juniper/Perennial Grass	Phase II
2002	Pinyon-Juniper/Perennial Grass	Phase II
2007	Pinyon-Juniper/Perennial Grass	Phase II
2014	Perennial Grass	Phase I
2019	Perennial Grass	Phase I

Site Notes

A chukar was observed on the site in 2014.

Soils

Table 16C-11.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.1	36.4	31.1	32.5	6.6	17.9	268.8	0.8	07/01/1997

Site Potential

1981 - 2010 Average Annual Precipitation	17 inches
NRCS Ecological Site	Mountain Loam (Browse)
NRCS Ecological Site #	R047XB420UT
States and Transitions	No state and transition model is available for this ecological site.

Upon study establishment in 1989 through the 2007 sample year, the plant community on this site existed as a stand of Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) trees in Phase II of woodland succession (Table 16C-11.4, Table 16C-11.12, Table 16C-11.14, Photos) with a herbaceous understory primarily comprised of smooth brome (*Bromus inermis*). While the understory has been diverse, the majority of herbaceous species have provided little cover and have not been abundant (Table 16C-11.7, Table 16C-11.10, Table 16C-11.11). Many pinyon and juniper trees were removed by a 2008 chaining and seeding treatment, and the site transitioned to a perennial grass state still dominated by smooth brome with a lesser component of crested wheatgrass (*Agropyron cristatum*). Browse species have remained diverse but rare in all study years (Table 16C-11.12, Table 16C-11.13). As of the 2019 sample year, point-quarter tree density shows that juniper are moderately abundant and the study is within Phase I of encroachment (Table 16C-11.4, Table 16C-11.14). This continued tree presence indicates that this site may have the potential for infilling in future sample years if further treatments do not occur.

Trend Summary Tables

Table 16C-11.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	3.8	0.0	13.0	-	-	-
2002	2.9	0.0	13.3	2.8	-	27.7
2007	1.8	-	10.5	3.5	-	26.8
2014	0.6	0.4	1.4	0.7	-	2.2
2019	0.4	0.4	2.9	2.1	0.2	3.9

Table 16C-11.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	-	377	48	27	-	15.1	0.2	0.9
2002	3	321	8	7	0.0	6.9	0.0	0.1
2007	13	303	137	20	0.2	12.7	0.7	0.1
2014	13	428	121	97	0.0	49.1	0.8	1.3
2019	24	435	302	119	0.6	33.2	7.6	1.5

Table 16C-11.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	9.6	0.1	50.5	8.0	3.4	31.0
2002	17.5	-	52.5	20.9	9.1	23.1
2007	14.9	0.2	49.3	15.4	3.2	27.7
2014	7.3	0.1	62.5	2.5	3.7	52.6
2019	9.0	0.3	68.2	6.5	7.7	42.5

Table 16C-11.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Coyote	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency				
1997	1	-	31	9	14
2002	1	-	36	2	18
2007	-	-	30	6	31
2014	-	-	6	13	8
2019	-	-	39	29	28
Year	Days Use Per Acre (ha)				
1997	-	-	-	-	-
2002	10.9 (26.9)	-	67.0 (165.5)	8.1 (19.9)	-
2007	2.9 (7.2)	-	68.3 (168.8)	20.8 (51.3)	-
2014	-	-	30.8 (76.1)	21.5 (53.0)	-
2019	-	8.7 (21.5)*	46.9 (115.9)	28.8 (71.2)	-

*Pellets per acre (ha)

Table 16C-11.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bromus arvensis[ai] (field brome)	Bromus inermis[i] (smooth brome)	Bromus tectorum[ai] (cheatgrass)	Carex rossii (Ross' sedge)	Dactylis glomerata[i] (orchardgrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Psathyrostachys juncea[i] (Russian wildrye)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium[i] (intermediate wheatgrass)
year	Nested Frequency											
1997	-	117	-	326	-	3	-	3	19	-	1	27
2002	-	98	3	276	-	-	-	7	-	-	4	-
2007	-	98	3	260	10	1	-	11	6	-	7	-
2014	8	121	-	392	13	-	3	3	5	3	27	16
2019	-	106	10	409	14	3	-	-	18	-	5	18
year	Average Cover (%)											
1997	-	3.5	-	11.0	-	0.1	-	0.0	0.3	-	0.0	0.1
2002	-	1.0	0.0	5.7	-	-	-	0.2	-	-	0.0	-
2007	-	2.2	0.0	9.8	0.2	0.0	-	0.4	0.1	-	0.3	-
2014	0.1	7.7	-	40.0	0.0	-	0.1	0.0	0.0	0.1	1.0	0.1
2019	-	4.4	0.0	27.7	0.5	0.0	-	-	0.4	-	0.2	0.4

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16C-11.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Alyssum desertorum[ai] (desert madwort)	Astragalus (milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus eurekensis (Eureka milkvetch)	Calochortus nuttallii (sego lily)	Camelina microcarpa[ai] (littlepod false flax)	Carduus nutans[ani] (nodding plumeless thistle)	Ceratocephala testiculata[ai] (curveseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Chenopodium fremontii[a] (Fremont's goosefoot)	Cirsium (thistle)	Cirsium undulatum[a] (wavyleaf thistle)	Collinsia parviflora[a] (maiden blue eyed Mary)	Convolvulus arvensis[ni] (field bindweed)	Cryptantha (cryptantha)
year	Nested Frequency																
1997	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1	-	3
2002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	-	1
2007	-	-	-	1	-	-	-	-	-	67	-	-	-	-	12	-	1
2014	15	6	-	-	1	5	-	2	0	25	3	2	2	1	1	3	2
2019	-	-	189	1	-	3	4	2	-	133	-	-	-	-	73	1	34
year	Average Cover (%)																
1997	-	-	-	-	0.0	-	-	-	-	-	-	-	-	-	0.0	-	0.0
2002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	0.0
2007	-	-	-	0.0	-	-	-	-	-	0.4	-	-	-	-	0.0	-	0.0
2014	0.1	0.0	-	-	0.0	0.1	-	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2019	-	-	4.2	0.0	-	0.0	0.0	0.0	-	1.4	-	-	-	-	0.9	0.0	0.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Descurainia pinnata[a] (western tansymustard)	Draba[a] (draba)	Erysimum (wallflower)	Lactuca serriola[ai] (prickly lettuce)	Lappula occidentalis[a] (flatspine stickseed)	Linum perenne[i] (blue flax)	Machaeranthera canescens (hoary tansyaster)	Marrubium vulgare[i] (horehound)	Medicago sativa[i] (alfalfa)	Microsteris gracilis[a] (slender phlox)	Packera multilobata (lobeleaf groundsel)	Penstemon humilis (low beardtongue)	Phlox longifolia (longleaf phlox)	Sanguisorba minor[i] (small burnet)	Taraxacum officinale (common dandelion)	Thlaspi[ai] (pennycress)	Tragopogon dubius[ai] (yellow salsify)
year	Nested Frequency																
1997	6	-	-	-	-	-	-	-	14	33	-	-	9	-	-	-	9
2002	-	-	-	-	-	-	-	-	4	-	-	-	2	-	-	-	1
2007	49	-	-	-	4	-	-	-	-	36	3	-	15	-	-	-	-
2014	50	1	8	-	66	40	-	3	13	6	1	-	5	32	-	2	11
2019	95	-	-	17	85	12	1	-	13	38	14	10	29	15	13	-	18
year	Average Cover (%)																
1997	0.0	-	-	-	-	-	-	-	0.9	0.1	-	-	0.0	-	-	-	0.2
2002	-	-	-	-	-	-	-	-	0.0	-	-	-	0.0	-	-	-	0.0
2007	0.2	-	-	-	0.0	-	-	-	-	0.1	0.0	-	0.0	-	-	-	-
2014	0.3	0.0	0.1	-	0.2	0.3	-	0.0	0.1	0.0	0.0	-	0.0	0.4	-	0.0	0.1
2019	0.3	-	-	0.0	0.6	0.1	0.0	-	0.7	0.1	0.0	0.1	0.1	0.3	0.0	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	unknown annual forb[a] (unknown forb)	Veronica biloba[ai] (twolobe speedwell)
year	Nested Frequency	
1997	3	-
2002	-	-
2007	-	-
2014	-	-
2019	-	2
year	Average Cover (%)	
1997	0.0	-
2002	-	-
2007	-	-
2014	-	-
2019	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16C-11.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis[p] (Utah serviceberry)	Cercocarpus montanus[p] (alderleaf mountain mahogany)	Ericameria nauseosa ssp. consimilis var. oreophila (rubber rabbitbrush)	Juniperus osteosperma[t] (Utah juniper)	Opuntia (pricklypear)	Pinus edulis[t] (twoneedle pinyon)	Purshia tridentata[p] (antelope bitterbrush)	Quercus gambelii[p] (Gambel oak)	Sambucus nigra ssp. cerulea[p] (blue elderberry)
year	Line Intercept Cover (%)								
1997	-	-	-	-	-	-	-	-	-
2002	-	0.4	-	19.2	-	8.5	0.9	1.5	-
2007	-	0.6	-	16	-	10.8	1	1.9	-
2014	-	-	-	2.2	-	-	-	0.6	0.1
2019	-	-	0.2	3.9	-	-	0.3	1.7	0.1
year	Quadrat Cover (%)								
1997	-	1.5	0.0	9.5	-	3.5	0.3	2.1	-
2002	-	0.4	0.0	6.9	-	6.5	0.6	2.0	-
2007	-	0.1	-	4.3	-	6.3	0.2	1.6	-
2014	0.0	-	0.4	1.4	0.0	-	-	0.4	0.1
2019	0.0	-	0.4	2.9	0.0	-	0.0	0.3	0.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16C-11.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	40	-	50	50	0	0	100	100	32/38
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	25/56
Cercocarpus montanus[p] -- (alderleaf mountain mahogany)									
1997	100	20	0	80	20	40	20	0	143/134
2002	120	-	0	17	83	0	83	67	118/102
2007	40	-	0	100	0	50	0	0	118/111
2014	40	-	0	100	0	50	50	0	74/77
2019	-	-	-	-	-	-	-	-	109/111
Ephedra viridis[p] -- (mormon tea)									
1997	-	-	-	-	-	-	-	-	100/74
2002	-	-	-	-	-	-	-	-	88/74
2007	-	-	-	-	-	-	-	-	141/207
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	52/13
Ericameria nauseosa ssp. consimilis var. oreophila -- (rubber rabbitbrush)									
1997	40	-	50	50	0	50	0	0	102/100
2002	20	-	0	100	0	0	0	0	32/14
2007	-	-	-	-	-	-	-	-	-/-
2014	20	-	0	100	0	100	0	0	73/72
2019	20	-	0	100	0	0	100	100	70/75
Gutierrezia sarothrae -- (broom snakeweed)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	26/45
Juniperus osteosperma[t] -- (Utah juniper)									
1997	280	-	7	93	0	0	0	0	- / -
2002	200	-	10	90	0	0	10	10	- / -
2007	160	20	0	100	0	0	0	0	- / -
2014	60	20	67	0	33	0	0	33	- / -
2019	60	-	0	67	33	0	0	33	- / -
Opuntia -- (pricklypear)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2014	20	-	100	0	0	0	0	0	- / -
2019	20	-	0	100	0	0	0	0	7/9

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Pinus edulis[t] -- (twoneedle pinyon)									
1997	100	-	20	80	0	0	0	0	- / -
2002	120	-	17	83	0	0	0	0	- / -
2007	100	20	0	100	0	0	0	0	- / -
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Purshia stansburiana[p] -- (Stansbury cliffrose)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	73/94
2019	-	-	-	-	-	-	-	-	79/88
Purshia tridentata[p] -- (antelope bitterbrush)									
1997	60	-	0	100	0	0	100	0	65/152
2002	80	-	0	50	50	0	100	25	68/187
2007	80	-	0	100	0	0	100	0	96/171
2014	40	-	0	50	50	0	100	50	49/68
2019	20	100	0	100	0	0	100	100	51/109
Quercus gambelii[p] -- (Gambel oak)									
1997	280	-	0	100	0	14	0	0	122/149
2002	760	-	24	71	5	29	0	3	117/62
2007	360	240	22	67	11	0	0	50	104/90
2014	220	-	100	0	0	0	100	0	123/76
2019	100	-	0	100	0	40	60	0	119/65
Sambucus nigra ssp. cerulea[p] -- (blue elderberry)									
1997	-	-	-	-	-	-	-	-	57/78
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	203/275
2014	60	-	0	100	0	0	0	0	129/137
2019	20	-	0	0	100	0	0	100	123/111

t - Tree Species; p - Preferred Browse; i - Introduced Species

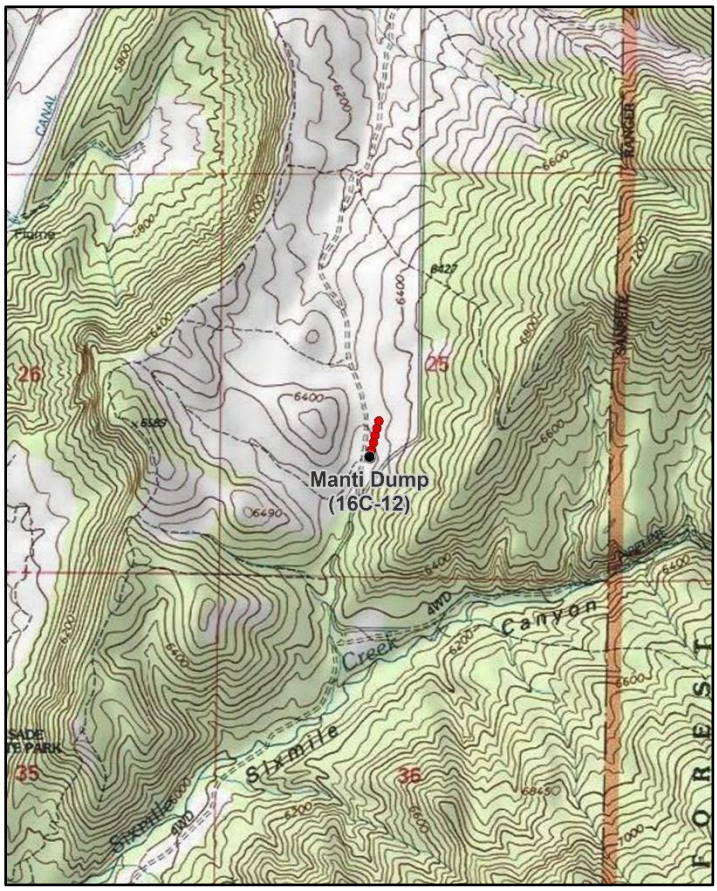
Table 16C-11.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

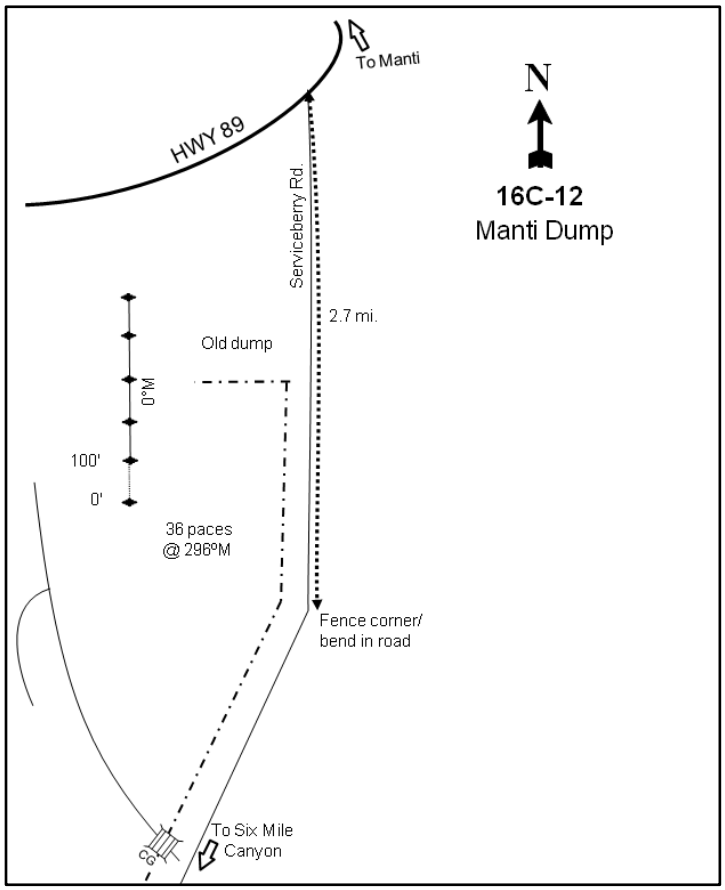
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2002	95	-	-	-	-	-	17.9
2007	108	17	-	6	50	28	19.7
2014	32	-	60	13	13	13	16.1
2019	67	17	44	22	6	11	8.4
Pinus edulis (twoneedle pinyon)							
2002	67	-	-	-	-	-	14.0
2007	75	-	5	11	47	37	16.0
2014	4	-	-	25	25	50	18.0
2019	5	-	20	40	20	20	14.6

Table 16C-11.15 – Deer Desirable Components Index: High Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1997	4.7	0.0	0.0	30.0	0.0	1.9	0.0	36.6	Very Poor
2002	3.4	0.0	0.0	13.7	0.0	0.1	0.0	17.2	Very Poor
2007	4.3	0.0	0.0	25.5	-0.1	0.1	0.0	29.8	Very Poor
2014	0.8	0.0	0.0	30.0	0.0	2.5	-4.0	29.2	Very Poor
2019	2.3	0.0	0.0	30.0	-0.4	3.0	-2.0	32.9	Very Poor

MANTI DUMP - STUDY NO. 16C-12





Location Information

USGS 7.5 min Map Info	Sterling NE; Township 18S, Range 2E, Section 25
GPS (0' Stake)	NAD 83 UTM ZONE 12, 444179 East 4341041 North

Transect Information

Browse Tag # (0' Stake)	179
Transect Bearing	0° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Belt 5: 3ft

Directions to Site

On Highway 89 south of Manti (just outside of town), the highway makes a gradual turn to the southwest. At this point, there is a graded gravel road (Serviceberry Road) that goes straight south past the old city dump and over to Six Mile Canyon. Travel on this road for approximately 2.7 miles to where the road turns rather sharply to the southwest; the fence on the west side of the road also makes a slight corner here and begins to head southwest. From where the fence makes a corner, walk 36 paces at 296 degrees magnetic to the 0-foot baseline stake marked by browse tag #179.

Site Information

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	6,400ft (1,951m)
Aspect	Southwest
Slope	8%
Sample Dates	06/30/1997, 07/09/2002, 07/19/2007, 05/22/2014, 05/16/2019

Table 16C-12.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Hand Crew - Lop and Scatter	6-Mile Habitat Improvement	1051	June-August 2009	787
Mechanical - Bullhog	Six Mile WMA In-House Bullhog Project - Phase 1 (Proposed)	4809	2019	1065
Seeding - Dribbler Unknown	Six Mile WMA In-House Bullhog Project - Phase 1 (Proposed)	4809	2019	1065
Chaining - Chain Unknown	East Manti Dump	-	1961	-
Seeding - Seed Unknown	East Manti Dump	-	1961	-

Wildlife Habitat and Vegetation History

Table 16C-12.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter/spring
Rocky Mountain Elk	crucial	winter

Table 16C-12.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1989	Wyoming Big Sagebrush	Phase I
1997	Wyoming Big Sagebrush	Phase I
2002	Wyoming Big Sagebrush	Phase I
2007	Wyoming Big Sagebrush	Phase I
2014	Wyoming Big Sagebrush/Pinyon-Juniper	Phase I transitioning to Phase II
2019	Wyoming Big Sagebrush/Pinyon-Juniper	Phase I transitioning to Phase II

Site Notes

Several deer shed antlers have been observed during past readings. From photos, the site appears to have been moved down the slope a few hundred yards in 1997.

Soils

Table 16C-12.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	7.3	38.4	35.1	26.5	3.0	8.1	137.6	0.6	06/30/1997

Site Potential

1981 - 2010 Average Annual Precipitation	16 inches
NRCS Ecological Site	Upland Loam (Wyoming Big Sagebrush)
NRCS Ecological Site #	R028AY309UT
States and Transitions	No state and transition model is available for this ecological site.

Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) and black sagebrush (*A. nova*) have been the most dominant browse species on this site in all sample years. Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) have been observed throughout the study period. A 2009 lop and scatter treatment removed a small number of trees (Table 16C-12.1), but encroachment has continued and the site has been considered to be within Phase I transitioning to Phase II of woodland succession since 2014. Black sagebrush has exhibited a slight increase in cover and density over time, while that of Wyoming big sagebrush has decreased (Table 16C-12.4, Table 16C-12.12, Table 16C-12.13, Table 16C-12.14, Photos). The herbaceous understory has increased in cover over the sample period. However, this increase is mainly due to the introduced grass species intermediate wheatgrass (*Thinopyrum intermedium*), crested wheatgrass (*Agropyron cristatum*), and bulbous bluegrass (*Poa bulbosa*) (Table 16C-12.7, Table 16C-12.10, Table 16C-12.11). Without a tree-removing disturbance, this site may have the potential to progress through the phases of woodland succession and exhibit decreased vigor and production in the shrub and herbaceous understories.

Trend Summary Tables

Table 16C-12.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	12.3	0.4	2.3	-	-	-
2002	9.1	1.2	2.2	7.5	1.7	0.8
2007	5.5	0.3	1.7	9.0	0.7	5.5
2014	5.3	0.0	3.2	6.1	-	8.7
2019	5.5	0.1	7.1	7.3	-	10.9

Table 16C-12.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	74	392	294	2	0.4	14.6	1.4	0.0
2002	4	364	301	2	0.0	13.9	1.6	0.0
2007	130	388	207	1	0.7	18.7	1.4	0.0
2014	33	389	82	12	0.1	35.8	0.3	0.1
2019	121	400	393	43	0.9	27.6	5.7	0.3

Table 16C-12.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	4.9	3.0	31.5	31.0	1.2	29.4
2002	8.8	6.0	38.0	29.9	2.4	27.9
2007	17.3	1.8	37.4	18.7	0.6	31.0
2014	3.5	1.9	47.3	25.7	3.3	47.3
2019	9.9	2.8	37.9	41.4	5.7	39.2

Table 16C-12.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit	Domestic Sheep
	Quadrat Frequency				
1997	-	53	3	7	11
2002	1	44	-	25	-
2007	-	16	7	45	-
2014	-	2	20	11	-
2019	1	13	10	50	-
Year	Days Use Per Acre (ha)				
1997	-	-	-	-	-
2002	2.2 (5.4)	37.5 (92.7)	-	-	-
2007	1.5 (3.6)	5.3 (13.2)	-	-	24.8 (61.2)
2014	-	22.1 (54.6)	3.4 (8.3)	-	-
2019	-	3.4 (8.3)	12.1 (29.8)	-	17.4 (43.0)

Table 16C-12.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bromus arvensis[ai] (field brome)	Bromus inermis[i] (smooth brome)	Bromus tectorum[ai] (cheatgrass)	Elymus elymoides (squirreltail)	Poa bulbosa[i] (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis[i] (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium[i] (intermediate wheatgrass)
year	Nested Frequency											
1997	2	263	-	-	74	24	-	-	-	30	-	212
2002	-	224	-	-	4	-	4	-	-	41	-	185
2007	0	288	4	-	126	5	32	-	-	54	-	149
2014	0	277	-	2	33	-	144	1	-	74	1	191
2019	-	229	1	-	120	-	209	4	3	68	2	221
year	Average Cover (%)											
1997	0.0	8.5	-	-	0.4	0.3	-	-	-	0.2	-	5.5
2002	-	8.3	-	-	0.0	-	0.0	-	-	0.3	-	5.3
2007	0.0	14.7	0.0	-	0.6	0.0	0.2	-	-	0.8	-	3.0
2014	0.0	20.3	-	0.1	0.1	-	4.3	0.1	-	1.3	0.0	9.6
2019	-	12.4	0.0	-	0.9	-	8.4	0.0	0.0	1.8	0.0	5.0

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16C-12.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Alyssum desertorum[ai] (desert madwort)	Astragalus calycosus (Torrey's milkvetch)	Astragalus eurekensis (Eureka milkvetch)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata[ai] (curveseed butterwort)	Collinsia parviflora[a] (maiden blue eyed Mary)	Crepis acuminata (tapertip hawksbeard)	Descurainia pinnata[a] (western tansymustard)	Draba[a] (draba)	Lactuca serriola[ai] (prickly lettuce)	Phlox longifolia (longleaf phlox)	Sphaeralcea coccinea (scarlet globemallow)
year	Nested Frequency												
1997	-	3	-	-	-	291	-	-	-	-	-	-	2
2002	-	-	-	-	-	301	-	-	-	-	-	2	-
2007	-	23	-	-	-	191	2	-	1	-	-	-	1
2014	1	23	4	3	-	69	-	1	-	-	-	2	2
2019	4	282	4	4	23	320	-	-	12	10	3	10	3
year	Average Cover (%)												
1997	-	0.0	-	-	-	1.4	-	-	-	-	-	-	0.0
2002	-	-	-	-	-	1.6	-	-	-	-	-	0.0	-
2007	-	0.1	-	-	-	1.3	0.0	-	0.0	-	-	-	0.0
2014	0.0	0.1	0.0	0.0	-	0.3	-	0.0	-	-	-	0.0	0.0
2019	0.0	3.4	0.0	0.1	0.1	2.2	-	-	0.0	0.0	0.0	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16C-12.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia nova[p] (black sagebrush)	Artemisia tridentata ssp. wyomingensis[p] (Wyoming big sagebrush)	Atriplex canescens[p] (fourwing saltbush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma[t] (Utah juniper)	Opuntia (pricklypear)	Opuntia polyacantha (plains pricklypear)	Pinus edulis[t] (twoneedle pinyon)
year	Line Intercept Cover (%)							
1997	-	-	-	-	-	-	-	-
2002	1	6.5	-	1.7	0.8	-	-	-
2007	2.1	6.9	-	0.7	3.9	-	-	1.6
2014	1.7	4.4	-	-	6.7	-	-	2
2019	4	3.3	-	-	8.2	-	-	2.7
year	Quadrat Cover (%)							
1997	1.5	10.7	0.0	0.4	2.0	-	-	0.4
2002	1.0	8.1	-	1.2	1.5	-	-	0.6
2007	0.5	5.0	-	0.3	1.7	-	-	0.0
2014	0.6	4.8	-	0.0	3.2	-	0.0	0.0
2019	1.8	3.6	-	0.1	6.1	0.0	0.0	1.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16C-12.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Artemisia nova[p] -- (black sagebrush)									
1997	400	-	20	75	5	55	0	5	43/67
2002	800	-	8	68	25	18	3	13	32/58
2007	500	-	4	56	40	36	12	16	37/63
2014	500	-	0	92	8	40	20	4	39/67
2019	580	-	7	69	24	10	3	21	38/61
Artemisia tridentata ssp. wyomingensis[p] -- (Wyoming big sagebrush)									
1997	2360	-	3	60	36	31	62	23	53/83
2002	1900	-	0	32	68	53	23	35	50/84
2007	1220	-	0	38	62	31	39	49	54/91
2014	1300	-	3	71	26	37	39	17	48/81
2019	880	-	0	46	55	57	14	55	51/75
Atriplex canescens[p] -- (fourwing saltbush)									
1997	40	-	50	50	0	0	50	0	85/110
2002	-	-	-	-	-	-	-	-	124/155
2007	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
1997	60	-	0	100	0	0	100	0	20/29
2002	-	-	-	-	-	-	-	-	-/-
2007	40	-	0	100	0	0	50	0	- / -
2014	40	-	0	100	0	0	50	0	18/36
2019	-	-	-	-	-	-	-	-	39/29

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	38/40
2019	-	-	-	-	-	-	-	-	-/-
Ephedra viridis[p] -- (mormon tea)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	54/90
2007	-	-	-	-	-	-	-	-	50/49
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	46/50
Gutierrezia sarothrae -- (broom snakeweed)									
1997	3100	60	23	77	0	0	0	0	19/17
2002	3020	-	0	40	60	0	0	21	11/17
2007	1680	-	1	96	2	0	0	2	17/19
2014	360	180	33	56	11	11	0	11	12/13
2019	260	500	23	77	0	0	0	0	18/18
Juniperus osteosperma[t] -- (Utah juniper)									
1997	60	-	33	67	0	0	0	0	- / -
2002	60	-	0	100	0	0	0	0	- / -
2007	60	-	0	100	0	0	0	0	- / -
2014	60	-	0	100	0	0	0	0	- / -
2019	60	-	0	100	0	0	0	0	- / -
Opuntia polyacantha -- (plains pricklypear)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	13/35
2014	-	-	-	-	-	-	-	-	15/26
2019	20	-	0	100	0	0	0	0	8/19

t - Tree Species; p - Preferred Browse; i - Introduced Species

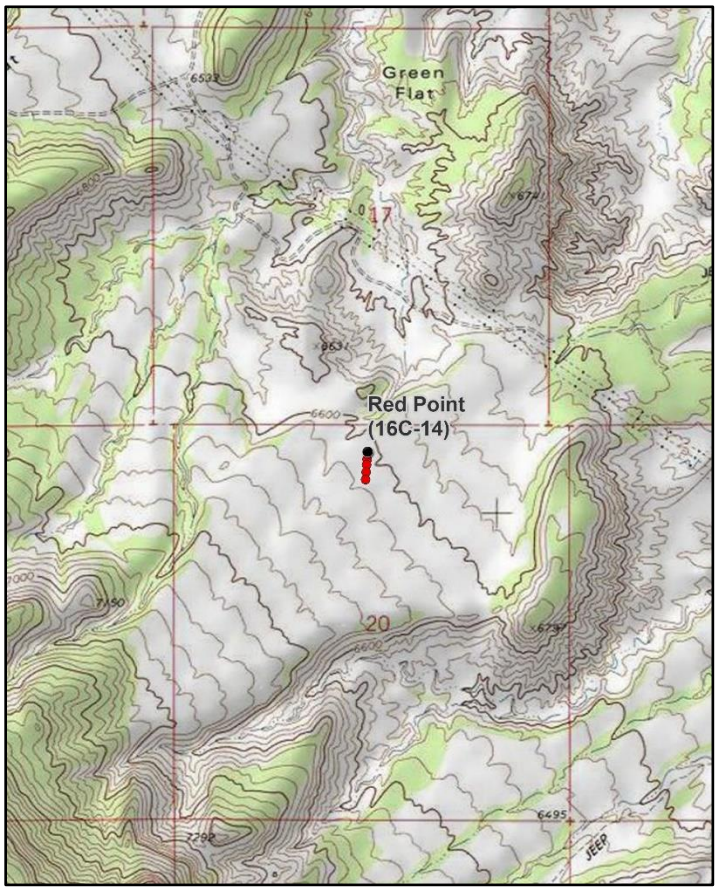
Table 16C-12.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

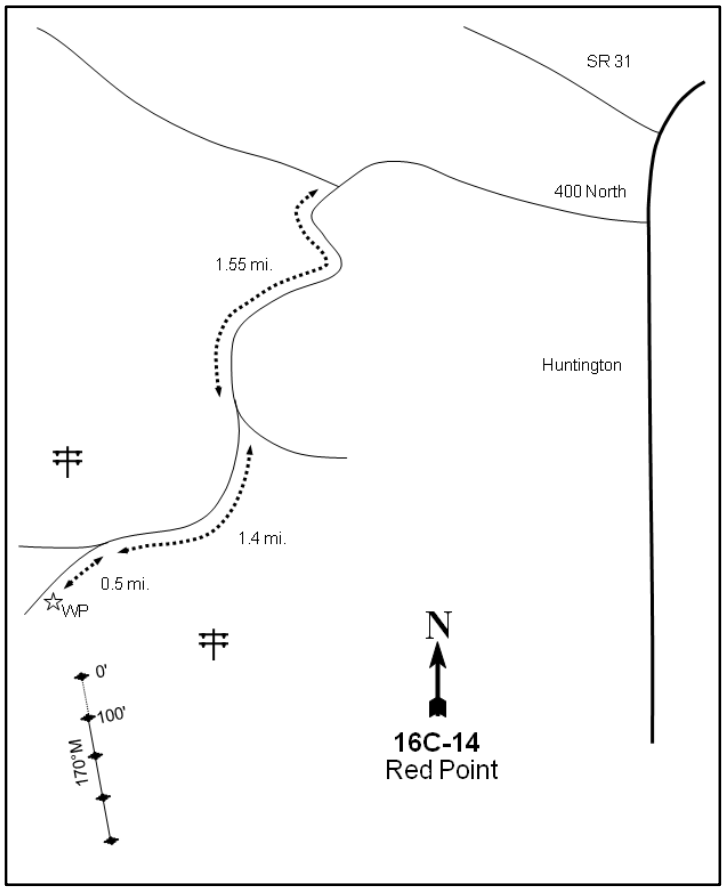
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2002	52	-	-	-	-	-	7.0
2007	41	6	6	22	67	-	11.8
2014	37	-	13	7	73	7	16.5
2019	41	-	6	19	50	25	20.6
Pinus edulis (twoneedle pinyon)							
2002	12	-	-	-	-	-	7.8
2007	17	-	20	20	40	20	14.8
2014	8	-	-	50	17	33	14.8
2019	8	-	-	29	43	29	20.1

Table 16C-12.15 – Deer Desirable Components Index: Mid Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1997	15.3	5.3	2.8	29.2	-0.3	0.0	0.0	52.3	Fair
2002	11.4	-4.1	0.4	27.8	0.0	0.0	0.0	35.5	Very Poor-Poor
2007	11.3	-2.1	0.5	30.0	-0.5	0.0	0.0	39.1	Poor
2014	7.6	8.7	1.1	30.0	-0.1	0.1	0.0	47.5	Poor
2019	9.1	3.6	1.9	30.0	-0.6	0.7	0.0	44.7	Poor

RED POINT - STUDY NO. 16C-14





Location Information

USGS 7.5 min Map Info	Red Point NE; Township 17S, Range 8E, Section 20
GPS (0' Stake)	NAD 83 UTM ZONE 12, 495833 East 4354008 North

Transect Information

Browse Tag # (0' Stake)	9012
Transect Bearing	170° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Belt 3: No Rebar

Directions to Site

From Main Street in Huntington, travel west on 400 North. Pass the old mill on the edge of town, cross the canal, and continue for 0.75 miles. Turn left off of the old Huntington River road at a major fork. Proceed 1.55 miles, turn right, and go through a gate. Continue straight for 0.2 miles to another fork and proceed left for 1 mile. From here, stay straight for an additional 0.2 miles to a two-way fork. Turn left and drive 0.5 miles to a witness post on the left-hand (southeast) side of the road in the chaining. The frequency baseline starts 138 feet south of the witness post, and the 18-inch tall fencepost marking the 0-foot baseline has browse tag #9012 attached.

Site Information

Land Ownership	State
Land Administrator	SITLA
Allotment	WEST HUNTINGTON
Elevation	6,420ft (1,957m)
Aspect	Northeast
Slope	5-7%
Sample Dates	08/15/1994, 05/26/1999, 09/27/2004, 05/26/2009, 07/28/2014, 07/09/2019

Table 16C-14.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Seeding - Aerial After	West Huntington Chain and Seed	LTDL	March 1973	1158
Chaining - Two-Way Unknown	West Huntington Chain and Seed	LTDL	September 1969-December	1158
Seeding - Aerial After	West Huntington Chain and Seed	LTDL	December 1969	1158
Hand Crew - Lop and Scatter	Burma Rd. Pinyon/Juniper Removal	2556	October-December 2013	1312

Table 16C-14.2 SeedMix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
West Huntington Chain and Seed			Aerial	Dec 1969	1158
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Agropyron desertorum	Desert Wheatgrass		9.00	0.00

Mix Name			Application Type	Application Date	Acres
West Huntington Chain and Seed			Aerial	Mar 1973	1158
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G		Alkali Sacaton		0.78	0.00
G	Agropyron cristatum	Crested Wheatgrass		4.25	0.00
G	Psathyrostachys juncea	Russian Wildrye		0.17	0.00
G	Thinopyrum intermedium	Pubescent Wheatgrass		0.18	0.00
F	Medicago sativa	Alfalfa	Nomad	0.61	0.00
F	Sanguisorba minor	Small Burnet		0.75	0.00
S	Artemisia tridentata	Big Sagebrush		0.43	0.00
S	Atriplex canescens	Fourwing Saltbush		0.61	0.00
S	Cercocarpus ledifolius	Curlleaf Mountain Mahogany		0.00	0.00
S	Cercocarpus montanus	Birchleaf Mahogany		0.00	0.00
S	Ericameria nauseosa	Rabbitbrush		0.44	0.00
S	Krascheninnikovia lanata	Winterfat		0.04	0.00
S	Purshia stansburiana	Cliffrose		0.01	0.00
S	Purshia tridentata	Bitterbrush		0.02	0.00

Wildlife Habitat and Vegetation History

Table 16C-14.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	substantial	winter

Table 16C-14.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1988	Perennial Grass/Mixed Shrub	Phase I
1994	Perennial Grass/Mixed Shrub	Phase I
1999	Perennial Grass/Mixed Shrub	Phase I
2004	Ephedra/Pinyon-Juniper	Phase I transitioning to Phase II
2009	Ephedra/Pinyon-Juniper	Phase I transitioning to Phase II
2014	Ephedra	Phase I

Site Notes

No Notes

Soils

Table 16C-14.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	7.6	46.7	29.5	23.8	3.4	4.1	102.4	0.9	05/26/1999

Site Potential

1981 - 2010 Average Annual Precipitation	11 inches
NRCS Ecological Site	Upland Stony Loam (Pinyon-Utah Juniper)
NRCS Ecological Site #	R034BY330UT
States and Transitions	No state and transition model is available for this ecological site.

Mixed shrubs dominated this site from study establishment in 1988 through the 1999 sample year. Perennial grasses, particularly the introduced species crested wheatgrass (*Agropyron cristatum*), were abundant and considered to be a co-dominant vegetation component. The browse species mormon tea (*Ephedra viridis*) and tree species Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) increased over time while perennial grasses decreased: ephedra and pinyon-juniper became dominant vegetation components in 2004. A lop and scatter treatment in the fall of 2013 removed many of the trees, causing the site to transition to one solely dominated by ephedra in 2014. Cover of perennial grasses increased and they became a co-dominant site component in 2019 (Table 16C-14.7, Table 16C-14.10, Table 16C-14.12, Table 16C-14.13, Table 16C-14.14, Photos). Although the site has remained in Phase I of woodland succession following treatment (Table 16C-14.4), this site may have the potential for infilling in future years without a further tree-removing disturbance.

Trend Summary Tables

Table 16C-14.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	1.7	2.6	5.0	-	-	-
1999	5.8	4.4	7.2	-	-	0.4
2004	7.5	3.8	10.1	10.2	3.7	11.0
2009	6.6	2.0	12.8	8.9	2.9	14.9
2014	5.9	0.2	0.3	11.1	0.6	1.0
2019	10.9	0.3	0.9	16.2	0.3	1.2

Table 16C-14.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	-	317	17	107	-	9.5	0.0	1.2
1999	-	344	3	62	-	11.9	0.0	0.5
2004	-	117	48	73	-	2.3	0.5	0.7
2009	-	97	4	37	-	1.9	0.0	0.2
2014	-	166	30	36	-	4.3	0.2	0.3
2019	15	309	247	80	0.2	17.0	3.2	1.1

Table 16C-14.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	17.5	0.0	41.6	4.2	13.5	19.4
1999	17.6	1.5	34.5	8.5	18.5	27.6
2004	27.6	-	38.3	9.9	15.6	25.1
2009	17.2	1.2	43.2	15.5	16.9	24.9
2014	27.5	0.0	48.7	8.5	15.0	11.7
2019	25.6	0.0	50.2	9.1	17.9	30.9

Table 16C-14.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Mule Deer/Domestic Sheep	Rocky Mountain Elk	Rabbit
	Quadrat Frequency				
1994	-	19	-	35	30
1999	4	33	-	40	56
2004	-	16	-	25	38
2009	-	11	-	7	26
2014	2	9	-	1	7
2019	2	12	-	8	3
Year	Days Use Per Acre (ha)				
1994	-	-	-	-	-
1999	3.6 (9.0)	25.5 (62.9)	-	57.0 (140.7)	-
2004	4.4 (10.8)	30.8 (76.1)	-	38.2 (94.4)	-
2009	-	28.8 (71.2)	-	11.4 (28.1)	-
2014	9.4 (23.3)	-	13.4 (33.1)	6.7 (16.6)	-
2019	3.6 (9.0)	6.0 (14.9)	-	14.7 (36.4)	-

Table 16C-14.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bromus tectorum[ai] (cheatgrass)	Elymus elymoides (squirreltail)	Psathyrostachys juncea[i] (Russian wildrye)	Thinopyrum intermedium[i] (intermediate wheatgrass)
year	Nested Frequency					
1994	25	309	-	1	17	1
1999	21	336	-	-	9	-
2004	20	95	-	-	11	-
2009	7	91	-	-	-	-
2014	9	144	-	10	10	1
2019	28	291	15	11	15	-
year	Average Cover (%)					
1994	0.5	8.6	-	0.0	0.3	0.0
1999	0.4	11.2	-	-	0.3	-
2004	0.3	1.9	-	-	0.2	-
2009	0.0	1.9	-	-	-	-
2014	0.3	3.5	-	0.1	0.4	0.0
2019	1.0	14.7	0.2	0.6	0.7	-

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16C-14.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Alyssum desertorum[ai] (desert madwort)	Arabis perennans (perennial rockcress)	Caulanthus crassicaulis[a] (thickstem wild cabbage)	Chaetopappa ericoides (rose heath)	Chamaesyce (sandmat)	Chenopodium album[a] (lambsquarters)	Chenopodium fremontii[a] (Fremont's goosefoot)	Chenopodium leptophyllum[a] (narrowleaf goosefoot)	Collinsia parviflora[a] (maiden blue eyed Mary)	Cryptantha (cryptantha)	Descurainia pinnata[a] (western tansymustard)	Eriogonum (buckwheat)	Eriogonum alatum (winged buckwheat)	Gilia inconspicua[a] (shy gilia)	Lappula occidentalis[a] (flatspine stickseed)	Lepidium montanum[a] (mountain pepperweed)	Machaeranthera canescens (hoary tansyaster)
year	Nested Frequency																
1994	-	2	1	3	44	1	-	-	-	47	10	4	0	-	-	-	-
1999	-	6	-	3	22	-	-	-	-	18	3	2	-	-	3	-	-
2004	-	-	-	-	29	-	7	5	-	4	21	-	-	19	3	-	3
2009	-	-	-	-	13	-	-	-	-	6	1	-	-	1	-	1	-
2014	-	-	-	5	10	-	1	-	-	11	15	-	2	2	4	-	-
2019	3	5	-	-	14	-	16	6	24	11	211	-	30	8	112	-	-
year	Average Cover (%)																
1994	-	0.0	0.0	0.1	0.2	0.0	-	-	-	0.7	0.0	0.0	0.0	-	-	-	-
1999	-	0.0	-	0.0	0.0	-	-	-	-	0.4	0.0	0.0	-	-	0.0	-	-
2004	-	-	-	-	0.5	-	0.0	0.0	-	0.0	0.2	-	-	0.2	0.0	-	0.0
2009	-	-	-	-	0.1	-	-	-	-	0.0	0.0	-	-	0.0	-	0.0	-
2014	-	-	-	0.0	0.1	-	0.0	-	-	0.1	0.0	-	0.0	0.0	0.0	-	-
2019	0.0	0.0	-	-	0.3	-	0.0	0.0	0.3	0.5	2.0	-	0.1	0.0	0.8	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Machaeranthera grindelioides (rayless tansyaster)	Malcolmia africana[ai] (African mustard)	Medicago sativa[i] (alfalfa)	Penstemon cyananthus (Wasatch beardtongue)	Salsola tragus[ai] (prickly Russian thistle)	Schoenocrambe linifolia (flaxleaf plainsmustard)	Taraxacum officinale (common dandelion)	Thelesperma subnudum (Navajo tea)	Townsendia incana (hoary Townsend daisy)
year	Nested Frequency								
1994	1	-	0	2	5	4	-	18	7
1999	-	-	-	2	-	4	-	5	5
2004	-	1	-	15	-	8	4	6	16
2009	-	-	-	1	1	12	-	-	6
2014	-	-	-	-	9	8	-	-	6
2019	-	-	-	9	-	-	-	9	11
year	Average Cover (%)								
1994	0.0	-	0.0	0.0	0.0	0.0	-	0.1	0.0
1999	-	-	-	0.0	-	0.0	-	0.0	0.0
2004	-	0.0	-	0.0	-	0.0	0.0	0.0	0.1
2009	-	-	-	0.0	0.0	0.1	-	-	0.0
2014	-	-	-	-	0.2	0.1	-	-	0.0
2019	-	-	-	0.0	-	-	-	0.1	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16C-14.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Cercocarpus montanus[p] (alderleaf mountain mahogany)	Echinocereus coccineus (scarlet hedgehog cactus)	Ephedra viridis[p] (mormon tea)	Eriogonum microthecum[p] (slender buckwheat)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma[t] (Utah juniper)	Pinus edulis[t] (twoneedle pinyon)	Purshia stansburiana[p] (Stansbury cliffrose)	Purshia tridentata[p] (antelope bitterbrush)	Yucca harrimaniae (Spanish bayonet)
year	Line Intercept Cover (%)									
1994	-	-	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-	-	-
2004	3	-	7.1	-	-	3.3	7.7	0.1	-	3.7
2009	2.8	-	5.7	-	-	4.1	10.8	0.4	-	2.9
2014	3.9	0	6.9	0	-	0.5	0.5	-	0.3	0.6
2019	4.9	-	10.9	-	0.1	0.6	0.6	-	0.4	0.2
year	Quadrat Cover (%)									
1994	0.6	-	1.1	0.0	-	1.7	3.3	-	0.0	2.6
1999	1.3	-	4.5	0.0	-	3.2	4.0	-	-	4.4
2004	1.3	-	6.1	0.0	-	3.4	6.7	0.0	-	3.8
2009	1.1	-	4.8	-	-	4.8	8.1	0.8	-	2.0
2014	1.2	0.0	4.6	0.0	-	0.3	0.0	-	0.1	0.2
2019	3.0	-	7.7	-	0.2	0.7	0.2	-	0.1	0.1

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16C-14.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Artemisia tridentata ssp. wyomingensis[p] -- (Wyoming big sagebrush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	20	-	0	100	0	0	0	0	34/54
Cercocarpus montanus[p] -- (alderleaf mountain mahogany)									
1994	120	-	33	67	0	50	33	0	109/177
1999	140	20	29	71	0	29	29	0	127/127
2004	120	-	50	50	0	17	83	0	138/138
2009	260	40	31	69	0	15	46	0	142/146
2014	180	-	11	89	0	0	67	0	112/117
2019	220	-	9	91	0	46	46	0	116/132
Echinocereus coccineus -- (scarlet hedgehog cactus)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	20	-	0	100	0	0	0	0	6/9
2019	-	-	-	-	-	-	-	-	-/-

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Ephedra viridis[p] -- (mormon tea)									
1994	520	-	15	85	0	0	0	0	101/143
1999	500	-	12	88	0	52	4	0	92/132
2004	660	-	12	82	6	6	3	6	94/157
2009	620	-	13	84	3	0	0	3	100/154
2014	980	40	47	49	4	18	25	29	97/142
2019	1060	-	13	77	9	0	0	9	95/151
Eriogonum corymbosum -- (crispleaf buckwheat)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	118/192
2019	220	-	0	100	0	0	0	0	8/10
Eriogonum microthecum[p] -- (slender buckwheat)									
1994	1280	-	45	55	0	0	0	0	7/11
1999	320	20	44	13	44	0	38	44	6/7
2004	800	-	0	83	18	0	100	15	8/13
2009	120	-	33	67	0	0	0	0	3/4
2014	240	-	0	100	0	42	0	0	7/9
2019	100	-	40	60	0	0	100	0	6/14
Ericameria nauseosa ssp. nauseosa var. hololeuca[p] -- (rubber rabbitbrush)									
1994	-	-	-	-	-	-	-	-	23/25
1999	20	-	0	100	0	0	100	0	- / -
2004	-	-	-	-	-	-	-	-	33/21
2009	40	-	0	100	0	50	0	0	23/18
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Gutierrezia sarothrae -- (broom snakeweed)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	19/32
2019	260	40	8	92	0	0	0	0	22/25
Juniperus osteosperma[t] -- (Utah juniper)									
1994	-	-	-	-	-	-	-	-	-/-
1999	120	-	83	17	0	0	0	0	- / -
2004	140	-	71	29	0	14	0	0	- / -
2009	60	-	33	67	0	0	0	0	- / -
2014	240	20	67	8	25	0	0	8	- / -
2019	220	-	46	36	18	0	9	18	- / -
Krascheninnikovia lanata[p] -- (winterfat)									
1994	-	-	-	-	-	-	-	-	34/28
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Opuntia -- (pricklypear)									
1994	40	-	0	50	50	0	0	50	20/28
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Pinus edulis[t] -- (twoneedle pinyon)									
1994	-	-	-	-	-	-	-	-	-/-
1999	260	-	39	62	0	0	0	8	- / -
2004	260	-	15	69	15	0	0	8	- / -
2009	160	-	13	75	13	0	0	13	- / -
2014	80	60	75	0	25	0	0	0	- / -
2019	40	-	0	100	0	0	0	0	- / -
Purshia stansburiana[p] -- (Stansbury cliffrose)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	40	-	0	50	50	0	100	50	64/78
2009	60	-	33	33	33	33	67	33	58/72
2014	-	-	-	-	-	-	-	-	169/156
2019	-	-	-	-	-	-	-	-	79/92
Purshia tridentata[p] -- (antelope bitterbrush)									
1994	20	-	0	100	0	0	0	0	48/51
1999	160	-	13	75	13	0	25	0	65/74
2004	-	-	-	-	-	-	-	-	37/84
2009	-	-	-	-	-	-	-	-	-/-
2014	40	-	0	100	0	0	100	0	57/78
2019	20	-	0	100	0	100	0	0	72/78
Yucca harrimaniae -- (Spanish bayonet)									
1994	1680	-	0	100	0	0	0	2	35/52
1999	2100	-	6	92	2	0	0	1	34/46
2004	2320	-	13	87	0	0	0	0	34/43
2009	1480	-	8	84	8	0	0	10	33/46
2014	460	140	30	52	17	0	0	22	22/30
2019	520	20	50	46	4	0	0	4	18/27

t - Tree Species; p - Preferred Browse; i - Introduced Species

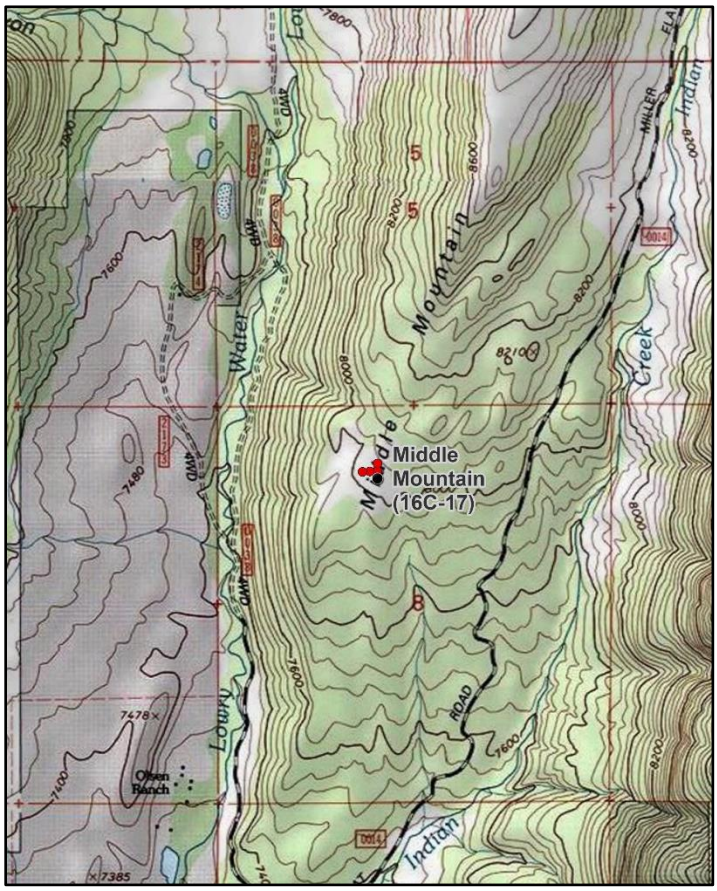
Table 16C-14.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

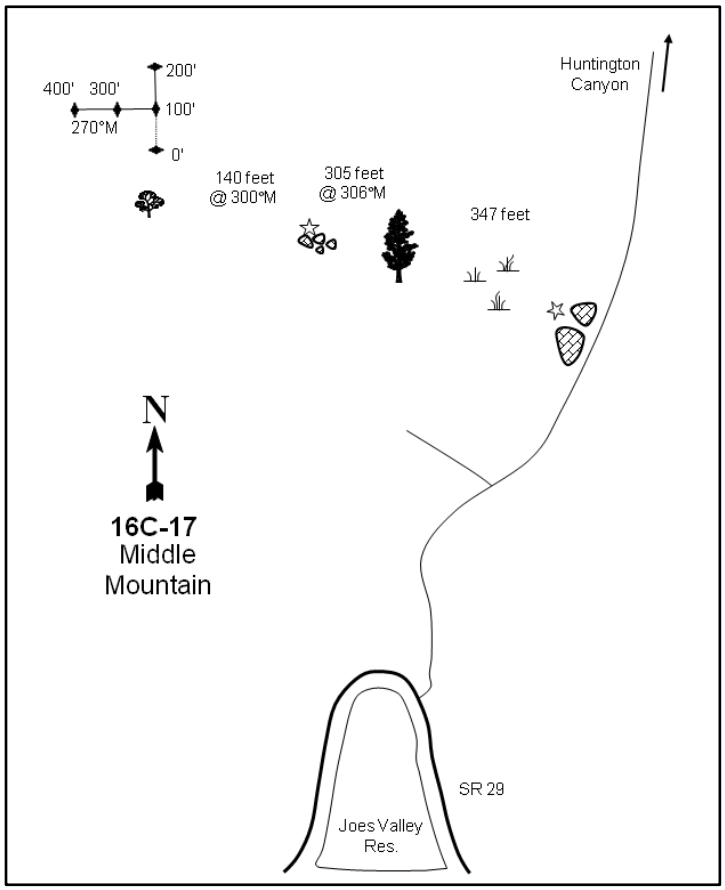
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1994	102	-	-	-	-	-	4.8
1999	100	-	-	-	-	-	4.6
2004	90	-	32	68	-	-	6.3
2009	120	11	16	63	11	-	6.7
2014	104	5	95	-	-	-	8.4
2019	84	-	94	6	-	-	10.9
Pinus edulis (twoneedle pinyon)							
1994	109	-	-	-	-	-	7.4
1999	141	-	-	-	-	-	6.4
2004	149	-	35	60	5	-	8.5
2009	166	10	30	55	5	-	7.3
2014	34	8	85	8	-	-	8.0
2019	17	-	86	14	-	-	3.1

Table 16C-14.15 – Deer Desirable Components Index: Mid Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1994	2.3	0.0	0.0	19.0	0.0	2.4	0.0	23.7	Very Poor
1999	7.5	14.9	7.9	23.7	0.0	1.0	0.0	55.1	Fair
2004	13.5	13.6	11.6	4.6	0.0	1.4	0.0	44.7	Poor
2009	11.9	13.9	9.7	3.8	0.0	0.4	0.0	39.8	Poor
2014	14.9	14.2	15.0	8.7	0.0	0.5	0.0	53.4	Fair
2019	21.6	13.1	5.8	30.0	-0.2	2.1	0.0	72.5	Good

MIDDLE MOUNTAIN - STUDY NO. 16C-17





Location Information

USGS 7.5 min Map Info	Joes Valley Reservoi; Township 17S, Range 6E, Section 08
GPS (0' Stake)	NAD 83 UTM ZONE 12, 476889 East 4357214 North

Transect Information

Browse Tag # (0' Stake)	9018
Transect Bearing	345° magnetic (Lines 3-4: 242° magnetic)
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

From the paved highway at the north end of Joes Valley Reservoir, proceed north on the Upper Joes Valley road (Millers Flat road) for 1.2 miles. Proceed right at the fork and continue l.2 miles to another fork. Stay right (on the Indian Creek side) and drive for 1.1 miles to a faint turnoff to the left. Park the truck near the witness post that is approximately 75 yards away from the main road. From the witness post, walk north-northwest to the upper end of the meadow to a lighting-scarred Ponderosa with a red arrow painted on it. From the pine tree, walk northwest 100 yards to a pile of rocks painted red. From the rock pile, walk northwest (300 degrees magnetic) for 140 feet to the 0-foot baseline stake. Alternatively, use a GPS to navigate. The first stake has a red browse tag #9018 attached.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	JOES VALLEY
Elevation	8,000ft (2,438m)
Aspect	Southwest
Slope	5%
Sample Dates	08/12/1994, 07/22/1999, 07/22/2004, 08/03/2009, 07/29/2014, 07/01/2019

Table 16C-17.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Chain Unknown	-	-	Historic	200
Mechanical - Bullhog	-	-	Spring 2009	-

Wildlife Habitat and Vegetation History

Table 16C-17.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Rocky Mountain Elk	substantial	winter	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing
Shiras Moose	crucial	winter	

Table 16C-17.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1988	Mixed Mountain Brush	Phase I
1994	Mixed Mountain Brush	Phase I
1999	Mixed Mountain Brush	Phase I
2004	Mixed Mountain Brush	Phase I
2009	Mixed Mountain Brush	No Encroachment
2014	Mixed Mountain Brush	No Encroachment
2019	Mixed Mountain Brush	Phase I

Site Notes

No Notes

Soils

Table 16C-17.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay	7.2	44.4	13.8	41.8	1.4	2.0	76.8	0.6	07/22/1999

Site Potential

1981 - 2010 Average Annual Precipitation	18 inches
NRCS Ecological Site	Mountain Shallow Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XB446UT
States and Transitions	A defined state and transition model is available.

Since study establishment in 1988, this site has remained dominated by a mixture of browse species with mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), black sagebrush (*A. nova*), and alderleaf mountain mahogany (*Cercocarpus montanus*) providing the most cover (Table 16C-17.12, Table 16C-17.13): this state is not currently described by the available state and transition model (Jornada, 2019). The herbaceous understory has been diverse and abundant with perennial grasses as the dominant component in most sample years. In the 2019 sample year, however, annual and perennial forbs and perennial grasses provided nearly equal amounts of cover (Table 16C-17.7, Table 16C-17.10, Table 16C-17.11). Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) were present from study establishment through the 2004 year and the site was considered to be within Phase I of woodland succession. Pinyon and juniper were removed by a bullhog treatment in 2009, but were again observed in 2019 (Table 16C-17.4, Table 16C-17.12, Table 16C-17.14, Photos): this infilling indicates that there may be the potential for trees to re-establish on this site.

Trend Summary Tables

Table 16C-17.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	10.1	1.7	-	-	-	-
1999	18.4	0.4	0.4	-	-	-
2004	24.3	1.4	1.0	24.1	2.7	2.5
2009	17.2	2.3	-	20.8	2.1	-
2014	17.4	1.7	-	22.4	1.8	-
2019	29.5	2.4	-	33.2	2.1	-

Table 16C-17.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	-	346	3	270	-	14.4	0.0	4.1
1999	-	357	29	276	-	14.8	0.3	11.1
2004	-	338	167	220	-	14.9	4.2	6.6
2009	-	324	70	249	-	11.9	0.6	6.7
2014	-	336	40	269	-	12.6	0.6	6.5
2019	0	321	316	308	0.0	13.8	11.4	10.2

Table 16C-17.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	43.8	0.6	19.7	0.0	2.6	29.5
1999	38.7	0.6	27.2	0.1	2.8	38.8
2004	44.4	2.8	23.9	0.1	2.3	43.1
2009	35.2	0.1	37.5	0.0	1.2	38.1
2014	38.5	0.0	32.3	0.0	1.6	42.3
2019	46.9	0.2	29.9	0.1	2.8	50.5

Table 16C-17.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer/Domestic Sheep	Rocky Mountain Elk	Shiras Moose	Rabbit	Domestic Sheep
	Quadrat Frequency					
1994	1	18	43	-	9	-
1999	-	9	21	-	30	2
2004	-	20	23	-	30	-
2009	-	12	18	-	29	-
2014	-	16	21	-	7	-
2019	19	23	41	-	13	14
Year	Days Use Per Acre (ha)					
1994	-	-	-	-	-	-
1999	-	26.2 (64.6)	34.9 (86.1)	0.5 (1.2)	-	11.4 (28.1)
2004	1.5 (3.6)	16.1 (39.7)	38.9 (96.0)	-	-	-
2009	-	13.4 (33.1)	19.4 (48.0)	-	-	2.0 (5.0)
2014	-	30.8 (76.1)	14.7 (36.4)	-	-	-
2019	-	12.1 (29.8)	22.1 (54.6)	-	-	26.2 (64.6)

Table 16C-17.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Achnatherum lettermanii (Letterman's needlegrass)	Bromus tectorum[ai] (cheatgrass)	Carex (sedge)	Elymus elymoides (squirreltail)	Elymus lanceolatus (thickspike wheatgrass)	Hesperostipa comata (needle and thread)	Koeleria macrantha (prairie Junegrass)	Leymus salinus (saline wildrye)	Pascopyrum smithii (western wheatgrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency												
1994	-	7	-	-	-	-	-	30	296	-	80	13	55
1999	-	-	-	-	2	-	-	124	302	-	25	22	35
2004	-	5	-	-	-	-	-	85	273	-	11	8	42
2009	-	26	-	-	-	-	-	10	242	-	71	50	45
2014	1	7	-	-	-	-	-	65	217	-	27	19	109
2019	11	4	0	6	10	6	3	102	118	116	16	77	45
year	Average Cover (%)												
1994	-	0.2	-	-	-	-	-	0.3	11.4	-	0.9	0.2	1.4
1999	-	-	-	-	0.0	-	-	2.4	11.3	-	0.3	0.1	0.5
2004	-	0.1	-	-	-	-	-	2.0	11.8	-	0.1	0.2	0.8
2009	-	0.9	-	-	-	-	-	0.0	8.3	-	1.5	0.2	0.9
2014	0.1	0.1	-	-	-	-	-	1.3	6.8	-	0.4	0.2	3.7
2019	0.2	0.0	0.0	0.1	0.1	0.1	0.0	3.1	4.2	3.4	0.4	1.4	0.8

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16C-17.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum desertorum[ai] (desert madwort)	Androsace septentrionalis[a] (pygmyflower rockjasmine)	Antennaria (pussytoes)	Arabis (rockcress)	Astragalus (milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Calochortus nuttallii (sego lily)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata[ai] (curveseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Chenopodium leptophyllum[a] (narrowleaf goosefoot)	Cirsium (thistle)	Collinsia parviflora[a] (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)
year	Nested Frequency																
1994	-	-	-	-	-	23	3	5	2	-	-	-	-	-	98	-	36
1999	-	-	-	-	13	97	-	7	-	3	4	-	-	-	102	-	123
2004	-	-	-	-	7	18	-	-	1	1	-	-	1	-	55	4	76
2009	3	-	1	-	2	55	-	6	4	-	9	4	-	-	49	33	79
2014	-	-	-	2	27	58	-	-	7	-	3	1	-	-	67	2	58
2019	-	12	22	109	25	53	6	11	11	99	2	45	-	4	62	27	65
year	Average Cover (%)																
1994	-	-	-	-	-	0.4	0.0	0.0	0.0	-	-	-	-	-	0.7	-	0.1
1999	-	-	-	-	0.1	1.8	-	0.2	-	0.0	0.0	-	-	-	4.1	-	2.9
2004	-	-	-	-	0.0	0.3	-	-	0.0	0.0	-	-	0.0	-	1.9	0.0	1.2
2009	0.0	-	0.0	-	0.0	0.4	-	0.2	0.0	-	0.1	0.0	-	-	1.4	0.1	1.0
2014	-	-	-	0.0	0.5	0.6	-	-	0.0	-	0.2	0.0	-	-	1.0	0.0	0.2
2019	-	0.1	0.1	1.6	0.1	0.4	0.1	0.1	0.1	0.7	0.0	0.6	-	0.0	1.3	0.1	0.5

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Crepis acuminata (tapertip hawksbeard)	Cryptantha (cryptantha)	Cymopterus (springparsley)	Epilobium brachycarpum[a] (tall annual willowherb)	Erigeron eatonii (Eaton's fleabane)	Erigeron flagellaris (trailing fleabane)	Erigeron pumilus (shaggy fleabane)	Eriogonum alatum (winged buckwheat)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Gayophytum ramosissimum[a] (pinyon groundsmoke)	Hymenopappus filifolius (fineleaf hymenopappus)	Hymenoxys richardsonii (pingue rubberweed)	Lappula occidentalis[a] (flatspine stickseed)	Lepidium[a] (pepperweed)	Lesquerella (bladderpod)	Lomatium grayi (Gray's biscuitroot)
year	Nested Frequency																
1994	1	4	5	-	84	-	-	-	-	8	-	20	-	-	-	-	2
1999	-	-	-	-	60	-	-	-	-	-	-	25	-	-	-	2	-
2004	-	-	1	-	3	4	-	-	-	-	2	19	-	-	-	-	-
2009	-	-	15	-	9	9	-	-	18	2	-	-	-	-	-	10	4
2014	-	-	-	-	29	-	3	1	-	8	-	-	10	6	5	-	-
2019	33	-	-	5	-	7	22	-	-	3	31	-	11	24	3	-	31
year	Average Cover (%)																
1994	0.0	0.0	0.0	-	0.4	-	-	-	-	0.0	-	0.3	-	-	-	-	0.0
1999	-	-	-	-	0.3	-	-	-	-	-	-	0.5	-	-	-	0.0	-
2004	-	-	0.0	-	0.1	0.0	-	-	-	-	0.0	0.4	-	-	-	-	-
2009	-	-	0.1	-	0.0	0.0	-	-	0.4	0.0	-	-	-	-	-	0.1	0.0
2014	-	-	-	-	0.3	-	0.0	0.0	-	0.1	-	-	0.1	0.1	0.0	-	-
2019	0.9	-	-	0.1	-	0.1	0.2	-	-	0.0	0.1	-	0.6	0.1	0.0	-	0.6

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Machaeranthera canescens (hoary tansyaster)	Microsteris gracilis[a] (slender phlox)	Orthocarpus[a] (owl's-clover)	Penstemon caespitosus (mat penstemon)	Penstemon lentus (handsome beardtongue)	Phlox austromontana (mountain phlox)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii[a] (Douglas' knotweed)	Sphaeralcea coccinea (scarlet globemallow)	Symphyotrichum (aster)	Taraxacum officinale (common dandelion)	Tetraneuris acaulis (stemless four-nerve daisy)
year	Nested Frequency												
1994	-	-	-	72	-	36	-	-	3	24	114	-	-
1999	-	-	21	-	-	29	-	-	-	21	42	0	-
2004	4	1	141	27	5	36	-	1	37	15	89	-	-
2009	18	9	27	42	4	43	-	3	17	13	55	-	3
2014	8	-	-	45	4	49	4	3	-	12	75	4	3
2019	4	41	234	73	10	54	-	6	69	22	82	21	2
year	Average Cover (%)												
1994	-	-	-	0.7	-	0.8	-	-	0.0	0.1	0.6	-	-
1999	-	-	0.2	-	-	0.8	-	-	-	0.1	0.3	0.0	-
2004	0.0	0.0	4.0	0.5	0.1	1.0	-	0.0	0.1	0.1	0.9	-	-
2009	0.2	0.0	0.5	0.5	0.1	0.9	-	0.0	0.0	0.1	0.9	-	0.2
2014	0.0	-	-	0.8	0.1	0.4	0.0	0.0	-	0.2	2.3	0.0	0.2
2019	0.1	0.3	8.3	1.5	0.2	0.7	-	0.0	0.2	0.5	1.3	0.0	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16C-17.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis[p] (Utah serviceberry)	Artemisia nova[p] (black sagebrush)	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Cercocarpus ledifolius[p] (curl-leaf mountain mahogany)	Cercocarpus montanus[p] (alderleaf mountain mahogany)	Chrysothamnus depressus[p] (longflower rabbitbrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Opuntia (pricklypear)	Pinus edulis[t] (twoneedle pinyon)	Purshia tridentata[p] (antelope bitterbrush)	Symphoricarpos oreophilus[p] (mountain snowberry)
year	Line Intercept Cover (%)											
1994	-	-	-	-	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-	-	-	-	-
2004	1.7	7.4	5.5	0.5	3.5	4	0.6	2.1	0	2.5	0.1	1.4
2009	0.9	5.3	5	0.1	4.5	3.6	0.3	1.8	-	-	0.1	1.3
2014	2.2	6.7	5.2	0.5	4.2	2	-	1.8	-	-	0.3	1.3
2019	1.4	12.6	7.5	0.5	4.5	5.6	0	2.1	-	-	0.2	0.9
year	Quadrat Cover (%)											
1994	0.6	2.9	2.0	-	1.6	2.1	0.2	1.5	0.0	-	-	0.8
1999	0.9	4.9	4.5	-	3.7	3.6	0.0	0.4	0.0	0.4	0.0	0.8
2004	1.3	5.3	6.4	0.0	4.6	5.4	0.5	0.9	0.0	1.0	0.0	1.3
2009	1.1	4.5	4.5	0.0	2.7	3.9	0.7	1.6	0.0	-	0.0	0.5
2014	1.8	5.6	4.1	0.0	2.4	2.8	0.3	1.4	0.0	-	0.0	0.8
2019	1.1	11.4	8.2	0.0	2.9	5.3	0.2	2.0	0.1	-	0.0	0.6

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16C-17.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
1994	440	-	9	82	9	27	32	5	28/37
1999	620	-	74	26	0	26	7	0	59/56
2004	380	-	32	63	5	32	26	0	40/55
2009	360	-	11	67	22	28	22	61	51/58
2014	380	-	16	84	0	11	11	0	49/58
2019	480	-	17	63	21	29	42	21	39/49
Artemisia nova[p] -- (black sagebrush)									
1994	1880	-	29	56	15	11	1	5	21/49
1999	2480	120	11	77	12	37	21	4	29/53
2004	3000	9820	19	65	16	28	14	7	22/51
2009	5480	1380	27	63	10	9	10	4	20/45
2014	6620	300	22	78	0	29	52	0	18/47
2019	7180	-	7	91	2	27	24	3	21/38
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1994	2180	40	5	62	33	28	5	13	35/64
1999	1540	40	17	68	16	29	18	7	49/77
2004	2720	9440	33	54	13	22	21	6	36/68
2009	3120	3140	30	47	24	6	30	26	36/62
2014	2000	-	15	78	7	46	37	1	35/58
2019	2780	-	21	68	11	40	35	10	33/59

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Cercocarpus ledifolius[p] -- (curl-leaf mountain mahogany)									
1994	40	-	0	100	0	50	0	0	36/45
1999	20	-	0	100	0	0	0	0	96/81
2004	40	-	0	100	0	0	100	0	89/87
2009	40	-	0	100	0	0	50	0	96/96
2014	20	-	0	100	0	0	0	0	79/63
2019	40	-	0	100	0	0	50	0	82/91
Cercocarpus montanus[p] -- (alderleaf mountain mahogany)									
1994	580	-	3	86	10	21	66	10	44/79
1999	760	20	16	84	0	50	26	0	74/94
2004	580	760	10	90	0	3	90	0	65/93
2009	520	180	4	96	0	46	50	8	81/108
2014	620	-	0	100	0	7	19	0	66/91
2019	700	-	9	89	3	49	6	0	74/97
Chrysothamnus depressus[p] -- (longflower rabbitbrush)									
1994	5240	-	5	88	7	3	0	3	8/22
1999	4760	60	11	86	3	17	6	0	10/30
2004	7020	280	2	97	1	16	13	0	9/26
2009	7120	-	6	92	2	9	1	9	8/23
2014	5540	-	7	93	0	25	28	0	8/22
2019	8100	-	4	96	1	24	8	1	11/23
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1994	100	-	0	80	20	0	0	20	22/23
1999	120	-	0	100	0	0	0	0	22/38
2004	1360	60	0	100	0	0	0	0	19/28
2009	2880	20	17	81	2	0	0	1	16/27
2014	380	-	5	95	0	0	0	0	19/24
2019	300	20	20	80	0	0	7	0	25/39
Gutierrezia sarothrae -- (broom snakeweed)									
1994	3220	-	6	94	0	0	0	0	15/16
1999	1500	120	19	81	0	0	0	1	15/16
2004	3640	-	9	91	0	0	0	0	18/25
2009	7820	-	0	97	3	0	0	3	15/16
2014	3500	200	15	85	0	0	0	0	16/20
2019	4180	400	5	95	1	0	1	1	18/18
Mahonia repens -- (creeping barberry)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	8/9
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Opuntia -- (pricklypear)									
1994	80	-	50	50	0	0	0	0	6/30
1999	100	-	40	40	20	0	0	20	6/21
2004	140	-	14	86	0	0	0	0	7/9
2009	60	-	33	67	0	0	0	0	- / -
2014	20	-	0	100	0	0	0	0	4/10
2019	20	-	0	100	0	0	0	0	8/20

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Pinus edulis[t] -- (twoneedle pinyon)									
1994	-	-	-	-	-	-	-	-	-/-
1999	60	-	33	67	0	0	0	0	- / -
2004	20	60	0	100	0	0	0	0	- / -
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	20	-	0	100	0	0	0	0	- / -
Purshia tridentata[p] -- (antelope bitterbrush)									
1994	140	-	14	57	29	71	14	29	32/77
1999	60	-	0	100	0	0	100	0	48/185
2004	40	-	0	50	50	50	50	0	36/126
2009	60	-	0	100	0	0	100	0	43/108
2014	40	-	0	100	0	0	100	0	42/83
2019	40	-	0	100	0	50	50	0	35/101
Quercus gambelii[p] -- (Gambel oak)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	82/95
2014	-	-	-	-	-	-	-	-	55/74
2019	-	-	-	-	-	-	-	-	100/80
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
1994	440	-	5	96	0	59	0	0	24/49
1999	240	-	17	83	0	17	0	8	30/75
2004	520	-	12	85	4	0	0	0	34/63
2009	1240	-	10	87	3	0	0	3	25/43
2014	780	-	5	95	0	26	18	0	22/36
2019	660	-	9	91	0	9	0	0	24/49

t - Tree Species; p - Preferred Browse; i - Introduced Species

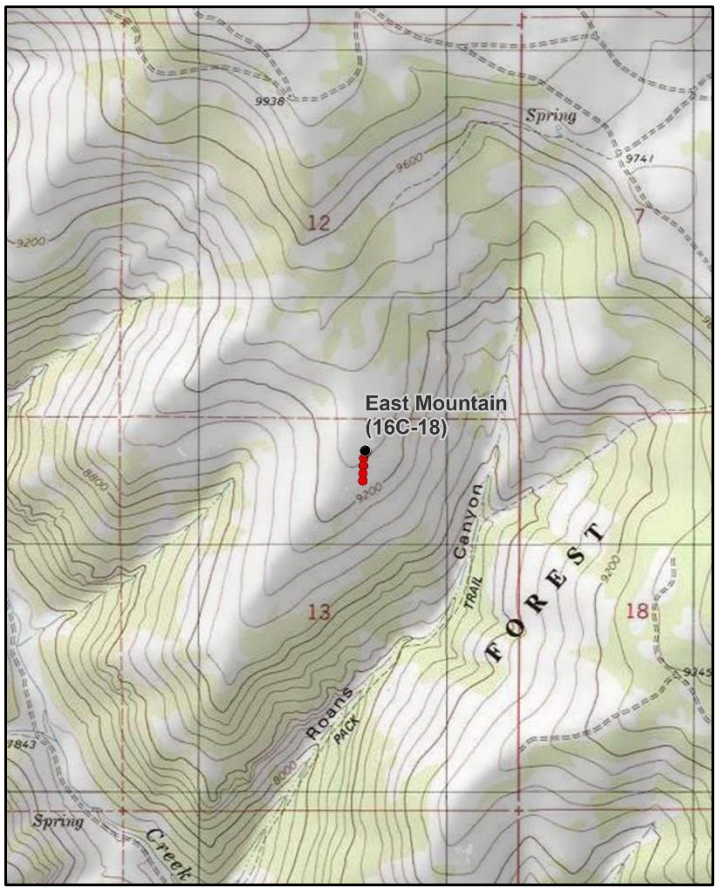
Table 16C-17.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

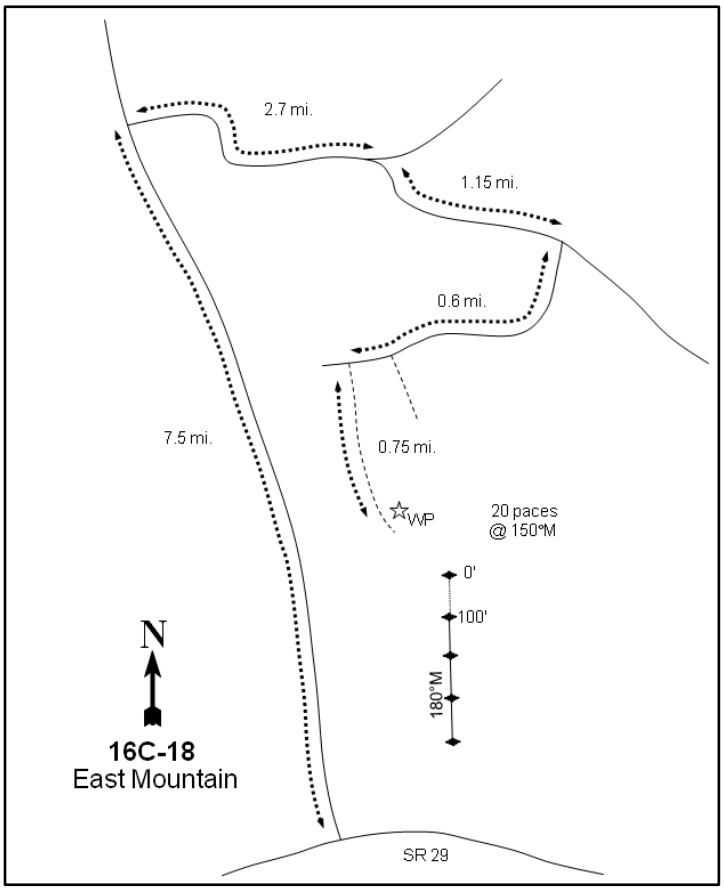
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Abies concolor (white fir)							
1999	1	-	-	-	-	-	12.0
Juniperus osteosperma (Utah juniper)							
1999	11	-	-	-	-	-	5.9
2019	3	-	67	33	-	-	3.3
Juniperus scopulorum (Rocky Mountain juniper)							
1999	9	-	-	-	-	-	5.8
Pinus edulis (twoneedle pinyon)							
1999	23	-	-	-	-	-	3.8
2019	8	33	33	33	-	-	2.7

Table 16C-17.15 – Deer Desirable Components Index: High Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1994	12.9	10.6	5.8	28.8	0.0	8.2	0.0	66.4	Fair
1999	23.9	12.7	8.4	29.5	0.0	10.0	0.0	84.5	Good
2004	30.0	12.4	9.0	29.7	0.0	10.0	0.0	91.1	Good-Excellent
2009	27.1	12.1	8.5	23.8	0.0	10.0	0.0	81.5	Good
2014	29.5	14.5	6.2	25.3	0.0	10.0	0.0	85.5	Good
2019	30.0	13.6	5.0	27.6	0.0	10.0	0.0	86.2	Good

EAST MOUNTAIN - STUDY NO. 16C-18





Location Information

USGS 7.5 min Map Info	Mahogany Point NW; Township 17S, Range 6E, Section 13
GPS (0' Stake)	NAD 83 UTM ZONE 12, 483613 East 4355578 North

Transect Information

Browse Tag # (0' Stake)	Not Available
Transect Bearing	180° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

From Orangeville, travel up Straight Canyon to a major fork at Cottonwood Creek. Bear right and continue up Cottonwood Creek for approximately 7.5 miles to Mill Canyon. Turn right and drive up Mill Canyon for 2.7 miles to a fork at the top of East Mountain. Bear right on the main road and continue 0.6 miles to a fork to Pine Springs-Snow Lake. Continue on the main road for 0.55 miles, then turn right to travel down off of the main road. Travel 0.15 miles to a spring, then continue 0.15 miles to the creek at the bottom of the dugway. Proceed 0.3 miles to a fork past the first patch of aspen clones to the second patch (second faint road), then bear left on the second faint road. Wind down through the trees and out onto the sagebrush-grass ridge for 0.75 miles; there is a witness post on the left (east) side of the road. From the witness post, walk 20 paces south-southeast to a 1 1/2-foot tall fencepost: this is the 0-foot baseline stake.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	EAST MOUNTAIN
Elevation	9,200ft (2,804m)
Aspect	Southeast
Slope	9%
Sample Dates	08/18/1994, 08/10/1999, 08/09/2004, 08/06/2009, 07/28/2014, 08/05/2019

Table 16C-18.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Herbicide - Herbicide Unknown	-	-	Late 1960s	-

Wildlife Habitat and Vegetation History

Table 16C-18.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	summer
Rocky Mountain Elk	substantial	winter
Shiras Moose	crucial	winter

Table 16C-18.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1988	Mountain Big Sagebrush	No Encroachment
1994	Mountain Big Sagebrush	No Encroachment
1999	Mountain Big Sagebrush	No Encroachment
2004	Mountain Big Sagebrush	No Encroachment
2009	Mountain Big Sagebrush	No Encroachment
2014	Mountain Big Sagebrush	No Encroachment
2019	Mountain Big Sagebrush	No Encroachment

Site Notes

No Notes

Site Potential

1981 - 2010 Average Annual Precipitation	27 inches
NRCS Ecological Site	High Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XB516UT
States and Transitions	No state and transition model is available for this ecological site.

Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has dominated this site since study establishment in 1988. Other preferred browse species such as mountain snowberry (*Symphoricarpos oreophilus*) and Woods' rose (*Rosa woodsii*) have also been present, but have provided less cover (Table 16C-18.12, Table 16C-18.13, Photos). The herbaceous understory has remained diverse, abundant, and mainly comprised of perennial grasses and forbs. The introduced annual grass species field brome (*Bromus arvensis*) was observed in 1999 and 2019, but in low amounts (Table 16C-18.7, Table 16C-18.10, Table 16C-18.11). Barring the occurrence of a major disturbance, this study site will likely remain in this or a similar state in future sample years.

Trend Summary Tables

Table 16C-18.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	14.3	2.7	-	-	-	-
1999	15.9	2.2	-	-	-	-
2004	15.0	3.3	-	14.5	3.7	-
2009	11.9	2.1	-	17.5	3.3	-
2014	12.7	2.5	-	16.1	3.3	-
2019	17.5	3.4	-	18.1	3.9	-

Table 16C-18.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	-	266	9	265	-	9.1	0.0	7.1
1999	0	255	14	253	0.0	10.3	0.1	16.6
2004	-	292	3	207	-	11.6	0.0	9.2
2009	-	264	1	252	-	8.1	0.0	11.2
2014	-	309	3	256	-	12.7	0.0	9.8
2019	15	274	1	244	0.1	10.5	0.0	13.8

Table 16C-18.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	43.3	0.3	34.3	0.8	6.0	31.1
1999	35.6	0.1	29.3	1.9	8.0	37.2
2004	44.6	0.0	28.1	1.0	6.7	34.3
2009	35.7	0.0	35.6	1.2	6.8	32.1
2014	40.5	0.2	29.0	1.3	9.2	36.8
2019	37.9	0.1	23.4	2.2	7.3	32.1

Table 16C-18.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1994	-	2	36	20
1999	-	4	24	10
2004	1	4	45	8
2009	1	2	36	4
2014	2	1	15	1
2019	3	6	14	9
Year	Days Use Per Acre (ha)			
1994	-	-	-	-
1999	-	16.8 (41.4)	56.3 (139.0)	-
2004	-	21.5 (53.0)	55.6 (137.4)	-
2009	15.3 (37.7)	2.0 (5.0)	75.7 (187.0)	-
2014	-	14.7 (36.4)	74.4 (183.7)	-
2019	13.8 (34.1)	-	19.4 (48.0)	-

Table 16C-18.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Achnatherum lettermanii (Letterman's needlegrass)	Bromus arvensis[ai] (field brome)	Bromus porteri (Porter brome)	Carex (sedge)	Elymus elymoides (squirreltail)	Koeleria macrantha (prairie Junegrass)	Leymus salinus (saline wildrye)	Pascopyrum smithii (western wheatgrass)	Poa fendleriana (muttongrass)	Poa pratensis[i] (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency												
1994	-	7	-	-	21	-	-	189	14	90	-	24	-
1999	2	15	0	7	41	-	-	130	47	70	-	13	-
2004	-	18	-	14	23	1	-	142	39	113	8	4	5
2009	-	22	-	1	40	1	-	139	35	63	9	5	7
2014	0	42	-	15	9	1	1	112	26	109	7	61	2
2019	1	32	15	24	60	3	11	109	38	64	57	53	-
year	Average Cover (%)												
1994	-	0.1	-	-	0.4	-	-	7.7	0.0	0.9	-	0.1	-
1999	0.0	0.7	0.0	0.1	1.4	-	-	5.3	0.6	2.3	-	0.0	-
2004	-	1.0	-	0.2	1.6	0.0	-	5.1	0.6	2.5	0.5	0.0	0.1
2009	-	0.4	-	0.0	1.6	0.0	-	4.4	0.2	1.2	0.1	0.0	0.1
2014	0.0	1.8	-	0.1	0.5	0.0	0.0	5.2	0.3	2.1	0.0	2.5	0.1
2019	0.0	0.6	0.1	0.3	2.9	0.0	0.2	3.6	0.2	1.0	0.6	1.0	-

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16C-18.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Androsace septentrionalis[a] (pygmyflower rockjasmine)	Antennaria (pussytoes)	Arabis (rockcress)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus megacarpus (great bladdery milkvetch)	Astragalus tenellus (looseflower milkvetch)	Castilleja angustifolia (northwestern Indian paintbrush)	Castilleja linariifolia (Wyoming Indian paintbrush)	Chaenactis douglasii (Douglas' dustymaiden)	Comandra umbellata (bastard toadflax)	Erigeron pumilus (shaggy fleabane)	Eriogonum (buckwheat)	Eriogonum alatum (winged buckwheat)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Hymenopappus filifolius (fineleaf hymenopappus)	Hymenoxys richardsonii (pingue rubberweed)
year	Nested Frequency																
1994	7	-	-	3	1	14	-	63	4	2	6	-	11	-	21	-	101
1999	14	-	3	6	4	49	-	84	15	14	3	1	10	2	17	-	38
2004	3	4	-	4	0	26	-	27	3	11	5	-	7	-	21	8	46
2009	-	-	-	15	-	40	-	89	6	26	-	-	13	-	22	2	47
2014	3	1	-	1	25	27	36	59	6	20	5	-	18	-	31	5	40
2019	1	-	-	27	4	37	3	94	-	16	-	-	26	-	44	16	27
year	Average Cover (%)																
1994	0.0	-	-	0.0	0.0	0.7	-	0.5	0.0	0.0	0.0	-	0.1	-	0.1	-	1.3
1999	0.1	-	0.0	0.0	0.0	3.2	-	3.5	0.1	0.1	0.0	0.0	0.2	0.0	0.4	-	0.6
2004	0.0	0.0	-	0.0	0.0	1.5	-	0.8	0.0	0.1	0.1	-	0.1	-	0.4	0.3	0.8
2009	-	-	-	0.1	-	1.3	-	2.7	0.2	0.5	-	-	0.1	-	0.6	0.0	0.5
2014	0.0	0.0	-	0.0	0.6	0.9	1.5	1.2	0.0	0.1	0.0	-	0.2	-	0.7	0.2	0.8
2019	0.0	-	-	0.5	0.0	2.2	0.0	3.7	-	0.1	-	-	0.3	-	1.4	0.1	0.5

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Ipomopsis aggregata (scarlet gilia)	Lesquerella alpina (alpine bladderpod)	Linum lewisii (Lewis flax)	Lupinus sericeus (silky lupine)	Machaeranthera canescens (hoary tansyaster)	Machaeranthera grindelioides (rayless tansyaster)	Packera multilobata (lobeleaf groundsel)	Penstemon comarrhenus (dusty beardtongue)	Penstemon watsonii (Watson's penstemon)	Phlox austromontana (mountain phlox)	Phlox longifolia (longleaf phlox)	Salsola tragus[ai] (prickly Russian thistle)	Schoenocrambe linifolia (flaxleaf plainsmustard)	Symphyotrichum (aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius[ai] (yellow salsify)
year	Nested Frequency															
1994	-	22	10	36	5	4	1	11	15	114	10	-	-	-	2	2
1999	1	37	12	44	5	3	8	39	-	116	-	-	-	2	7	-
2004	2	13	6	5	-	3	5	42	7	92	20	-	-	-	2	-
2009	2	17	-	5	1	8	1	36	5	127	2	1	-	-	1	-
2014	3	15	4	4	5	8	15	17	4	115	8	-	-	2	3	-
2019	2	12	-	7	2	0	10	16	39	100	12	-	0	-	15	-
year	Average Cover (%)															
1994	-	0.1	0.0	1.8	0.0	0.0	0.0	0.1	0.2	2.1	0.0	-	-	-	0.0	0.0
1999	0.0	0.2	0.1	3.1	0.1	0.0	0.0	1.4	-	3.3	-	-	-	0.0	0.1	-
2004	0.0	0.0	0.2	0.4	-	0.2	0.0	0.6	0.3	3.2	0.1	-	-	-	0.0	-
2009	0.3	0.1	-	0.2	0.0	0.1	0.0	0.9	0.1	3.2	0.0	0.0	-	-	0.0	-
2014	0.0	0.2	0.2	0.2	0.1	0.1	0.1	0.3	0.5	1.8	0.0	-	-	0.0	0.0	-
2019	0.0	0.1	-	1.2	0.1	0.0	0.1	0.1	1.3	1.8	0.1	-	0.0	-	0.1	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16C-18.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia frigida[p] (prairie sagewort)	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Rosa woodsii[p] (Woods' rose)	Symphoricarpos oreophilus[p] (mountain snowberry)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)						
1994	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-
2004	0.3	13.2	1.5	0.6	-	1	1.6
2009	0.1	16.3	2	0.2	-	1.1	1.1
2014	0.1	13.5	1.3	0.3	0.2	2.3	1.7
2019	0.4	15.4	2.6	0.6	0.1	2.2	0.7
year	Quadrat Cover (%)						
1994	0.1	13.0	0.7	0.4	-	1.2	1.6
1999	0.4	15.0	0.3	0.4	-	0.5	1.4
2004	0.6	13.8	1.5	0.4	-	0.6	1.4
2009	0.4	11.0	1.0	0.2	-	0.5	1.0
2014	0.4	11.4	0.8	0.1	0.0	0.9	1.6
2019	0.4	15.5	1.4	1.0	0.0	1.6	1.1

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16C-18.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Artemisia frigida[P] -- (prairie sagewort)									
1994	560	-	11	89	0	0	0	0	14/12
1999	660	40	21	79	0	0	0	0	12/19
2004	520	-	4	96	0	12	4	0	21/20
2009	420	-	24	76	0	24	0	0	15/19
2014	560	20	14	86	0	29	7	0	16/24
2019	1260	-	14	86	0	0	0	0	19/17
Artemisia tridentata ssp. vaseyana[P] -- (mountain big sagebrush)									
1994	3060	40	5	72	23	41	1	7	39/81
1999	3140	140	7	63	30	61	10	10	42/84
2004	3700	700	11	45	43	42	15	14	36/78
2009	3680	480	13	50	38	47	21	19	28/67
2014	3640	240	20	58	22	33	40	18	29/72
2019	3980	100	6	79	15	46	11	15	31/71
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1994	2420	-	3	98	0	0	0	0	20/22
1999	1460	20	19	75	6	0	1	1	18/28
2004	2060	20	3	84	14	8	2	4	19/28
2009	2860	20	1	97	2	0	0	1	15/20
2014	1860	-	10	89	1	0	0	1	18/28
2019	2240	-	1	96	4	4	0	4	17/26
Ericameria nauseosa -- (rubber rabbitbrush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	41/71
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	50/68
Gutierrezia sarothrae -- (broom snakeweed)									
1994	1480	-	3	89	8	0	0	0	15/17
1999	1240	-	10	90	0	0	0	0	16/23
2004	1240	-	2	98	0	0	0	0	17/24
2009	500	-	0	100	0	0	0	0	16/19
2014	220	-	9	91	0	0	0	0	17/26
2019	1400	-	6	94	0	0	0	0	17/19
Rosa woodsii[P] -- (Woods' rose)									
1994	-	-	-	-	-	-	-	-	26/45
1999	60	-	0	100	0	0	0	0	23/30
2004	80	-	100	0	0	0	0	0	13/9
2009	140	-	29	71	0	0	0	0	16/20
2014	120	-	67	33	0	0	0	0	17/25
2019	180	-	11	89	0	0	0	11	18/18
Symphoricarpos oreophilus[P] -- (mountain snowberry)									
1994	1240	60	42	56	2	14	0	0	25/52
1999	1060	120	28	59	13	34	0	0	29/66
2004	1520	-	13	70	17	18	13	1	26/46
2009	1400	40	6	91	3	9	6	0	23/36
2014	1340	-	13	87	0	5	3	0	22/38
2019	1460	140	11	89	0	34	21	0	23/41

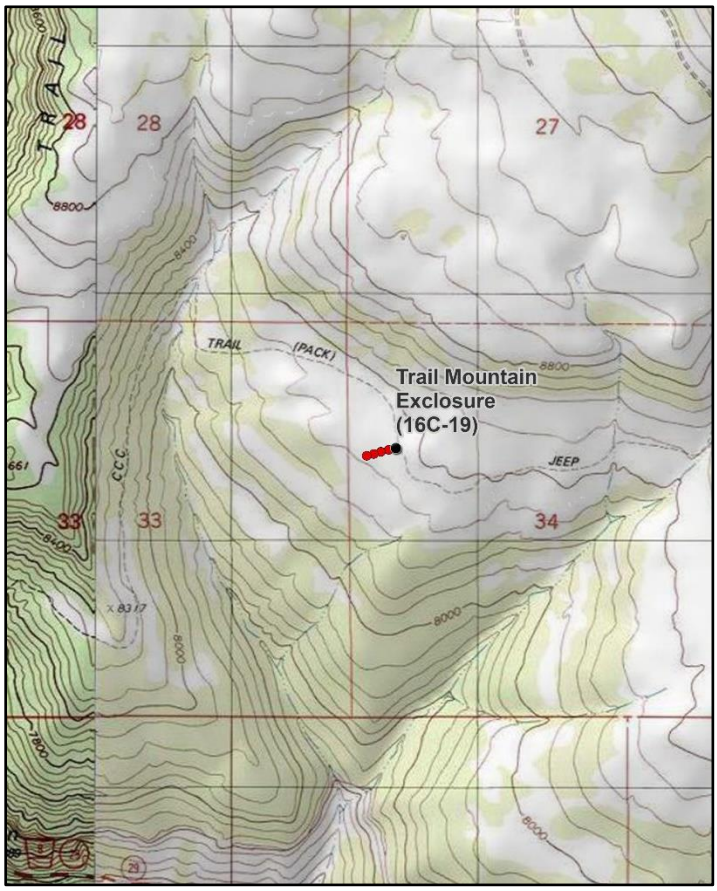
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Tetradymia canescens -- (spineless horsebrush)									
1994	1440	-	4	92	4	0	0	1	18/26
1999	1120	100	16	80	4	18	0	4	20/29
2004	1680	-	8	83	8	37	13	2	16/27
2009	1420	60	23	62	16	24	4	7	17/32
2014	1120	-	2	98	0	29	29	0	14/27
2019	920	-	0	94	7	11	0	9	18/38

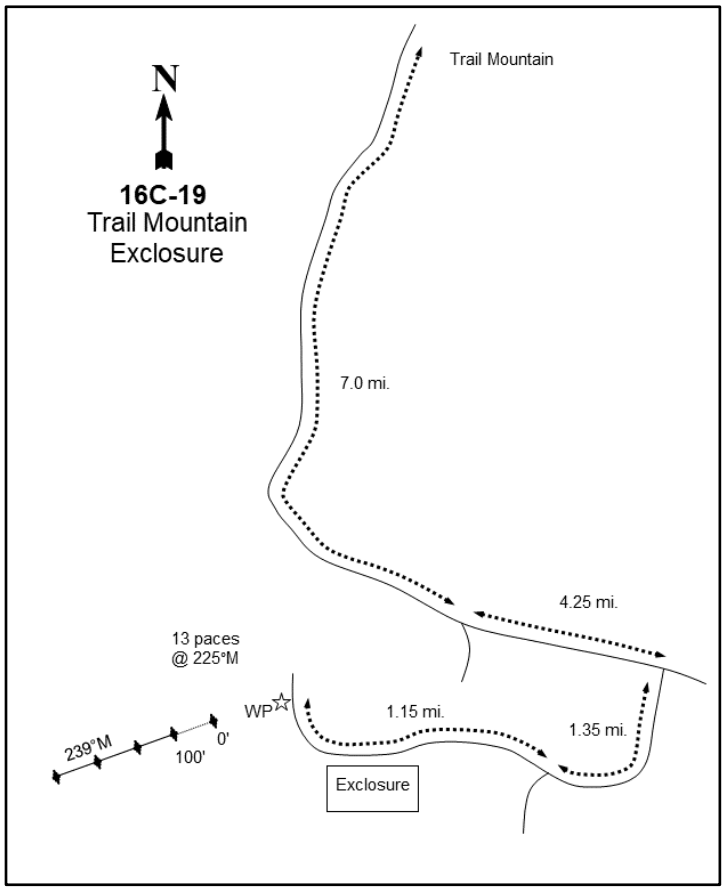
t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16C-18.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Pseudotsuga menziesii (Douglas-fir)							
2019	4	-	100	-	-	-	2.0

TRAIL MOUNTAIN EXCLOSURE - STUDY NO. 16C-19





Location Information

USGS 7.5 min Map Info	Mahogany Point SW; Township 17S, Range 6E, Section 34
GPS (0' Stake)	NAD 83 UTM ZONE 12, 479609 East 4350569 North

Transect Information

Browse Tag # (0' Stake)	9019
Transect Bearing	239° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Belt 4: 4ft

Directions to Site

From the pass between Upper Joes Valley and the head of Cottonwood Creek, travel south on the road onto Trail Mountain, driving 7.0 miles to a fork. Proceed left at the fork, towards Miles Point, then continue for 4.25 miles to another fork. Bear right down the side of the mountain for 1.35 miles. Proceed to the right at another fork and drive l.0 miles to the exclosure. Continue past the exclosure for 0.15 miles to just past where the road crosses a gully at a sharp bend in the terraces to a witness post. The 0-foot stake is located 13 paces away from the witness post at 225 degrees magnetic and is marked with browse tag #9019. There is rebar next to the 0-foot stake.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	TRAIL MT
Elevation	8,350ft (2,545m)
Aspect	Southwest
Slope	6-8%
Sample Dates	08/18/1994, 08/04/1999, 08/04/2004, 08/04/2009, 07/17/2014, 07/10/2019

Table 16C-19.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Terrace - Contour Trench	-	-	1960s	-
Seeding - Seed Unknown	-	-	1960s	-

Wildlife Habitat and Vegetation History

Table 16C-19.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	substantial	winter
Shiras Moose	crucial	winter

Table 16C-19.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1988	Mixed Mountain Brush	Phase I
1994	Mixed Mountain Brush	Phase I
1999	Mixed Mountain Brush	Phase I
2004	Mixed Mountain Brush	Phase I
2009	Mixed Mountain Brush	Phase I
2014	Mixed Mountain Brush	Phase I
2019	Mixed Mountain Brush	Phase I

Site Notes

No Notes

Soils

Table 16C-19.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.6	38.7	27.5	33.8	3.0	2.9	131.2	0.5	08/04/1999

Site Potential

1981 - 2010 Average Annual Precipitation	21 inches
NRCS Ecological Site	Mountain Loam (Browse)
NRCS Ecological Site #	R047XB420UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 1988, the plant community on this site has remained in a stable mixed mountain brush state. Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has provided much of the shrub cover throughout the study period, but other species such as Utah serviceberry (*Amelanchier utahensis*) and alderleaf mountain mahogany (*Cercocarpus montanus*) have also been present (Table 16C-19.12, Table 16C-19.13). The herbaceous understory has remained diverse with primarily native perennial grasses as the main component in most sample years; perennial forbs have also contributed a moderate amount of cover (Table 16C-19.7, Table 16C-19.10, Table 16C-19.11). Twoneedle pinyon (*Pinus edulis*), Utah juniper (*Juniperus osteosperma*), and Rocky Mountain juniper (*J. scopulorum*) have been observed throughout the duration of the study (Table 16C-19.12, Table 16C-19.13, Table 16C-19.14, Photos). Although the site has been classified as being within Phase I of woodland succession in all sample years (Table 16C-19.4), there could be potential for further tree encroachment in the future if a tree-removing disturbance does not occur.

Trend Summary Tables

Table 16C-19.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	20.1	1.0	0.0	-	-	-
1999	23.1	1.7	0.1	0.1	-	-
2004	18.0	1.9	0.4	23.8	1.7	0.3
2009	19.7	0.6	0.5	22.0	0.7	0.1
2014	15.4	1.8	0.1	24.4	0.9	-
2019	22.7	3.3	0.1	26.0	3.3	-

Table 16C-19.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	-	288	-	235	-	9.6	-	6.6
1999	-	309	5	252	-	10.2	0.2	10.5
2004	-	264	16	191	-	10.0	0.5	5.5
2009	-	287	-	247	-	8.5	-	6.8
2014	-	296	-	245	-	11.3	-	8.1
2019	-	301	34	248	-	15.2	0.2	9.8

Table 16C-19.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	28.5	0.3	38.2	1.1	3.9	34.6
1999	23.2	0.3	37.3	3.6	6.1	40.3
2004	38.2	0.5	38.0	2.8	5.0	35.3
2009	26.9	0.0	39.5	4.7	3.3	36.2
2014	34.0	-	34.5	5.3	4.7	40.5
2019	38.7	0.1	43.2	3.2	3.5	45.9

Table 16C-19.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1994	1	17	12	16
1999	1	7	20	10
2004	4	6	30	9
2009	10	4	48	29
2014	3	2	27	14
2019	2	5	31	9
Year	Days Use Per Acre (ha)			
1994	-	-	-	-
1999	8.0 (19.7)	15.4 (38.1)	44.2 (109.2)	-
2004	11.6 (28.7)	2.0 (5.0)	53.0 (130.8)	-
2009	48.6 (120.1)	-	54.3 (134.1)	-
2014	13.1 (32.3)	1.3 (3.3)	54.3 (134.1)	-
2019	2.9 (7.2)	2.0 (5.0)	26.2 (64.6)	-

Table 16C-19.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Achnatherum pinetorum (pine needlegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bromus inermis[i] (smooth brome)	Carex (sedge)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Leymus salinus (saline wildrye)	Pascopyrum smithii (western wheatgrass)	Poa fendleriana (muttongrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium[i] (intermediate wheatgrass)
year	Nested Frequency											
1994	14	65	-	31	1	5	-	86	1	144	69	1
1999	2	57	2	43	2	9	5	144	-	88	90	4
2004	5	63	-	39	1	-	8	103	43	34	76	0
2009	1	57	-	50	-	-	2	145	38	81	57	5
2014	21	13	4	50	-	8	3	122	8	100	84	13
2019	16	37	4	71	1	41	15	180	34	21	29	-
year	Average Cover (%)											
1994	0.6	0.9	-	0.5	0.0	0.0	-	1.9	0.0	4.1	1.6	0.0
1999	0.4	0.9	0.1	0.9	0.0	0.1	0.0	3.7	-	2.0	2.0	0.0
2004	0.2	1.3	-	0.8	0.0	-	0.1	3.6	0.4	0.9	2.6	0.0
2009	0.0	0.7	-	1.0	-	-	0.0	4.4	0.2	1.2	1.0	0.0
2014	0.7	0.3	0.0	1.4	-	0.1	0.0	3.2	0.2	2.5	2.6	0.3
2019	0.3	0.8	0.1	3.4	0.0	0.7	0.5	8.0	0.4	0.3	0.7	-

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16C-19.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Androsace septentrionalis[a] (pygmyflower rockjasmine)	Antennaria parvifolia (small-leaf pussytoes)	Arabis (rockcress)	Arenaria (sandwort)	Astragalus calycosus (Torrey's milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus miser (timber milkvetch)	Astragalus tenellus (looseflower milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata[ai] (curveseed butterwort)	Cirsium (thistle)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawksbeard)	Erigeron eatonii (Eaton's fleabane)	Erigeron pumilus (shaggy fleabane)
year	Nested Frequency																
1994	-	12	-	-	1	6	-	13	-	-	7	-	3	30	-	2	-
1999	3	11	-	-	6	-	-	-	-	-	17	-	2	43	-	9	-
2004	16	-	-	1	-	3	8	-	-	-	5	-	-	20	2	-	-
2009	-	34	-	-	-	5	3	-	-	1	1	-	-	25	-	3	3
2014	-	10	3	-	-	3	7	1	4	-	9	-	-	21	-	2	2
2019	-	11	9	2	6	5	1	2	1	21	5	5	-	11	6	-	-
year	Average Cover (%)																
1994	-	0.3	-	-	0.0	0.0	-	0.2	-	-	0.2	-	0.0	0.1	-	0.0	-
1999	0.0	0.4	-	-	0.2	-	-	-	-	-	0.4	-	0.1	0.4	-	0.0	-
2004	0.5	-	-	0.0	-	0.0	0.4	-	-	-	0.0	-	-	0.2	0.0	-	-
2009	-	0.5	-	-	-	0.1	0.0	-	-	0.0	0.0	-	-	0.2	-	0.0	0.0
2014	-	0.3	0.0	-	-	0.0	0.2	0.1	0.0	-	0.1	-	-	0.1	-	0.0	0.0
2019	-	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	-	0.1	0.0	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Eriogonum alatum (winged buckwheat)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Hedysarum boreale (Utah sweetvetch)	Hymenoxys richardsonii (pingue rubberweed)	Ipomopsis aggregata (scarlet gilia)	Lappula occidentalis[a] (flatspine stickseed)	Lesquerella (bladderpod)	Lithospermum (stoneseed)	Machaeranthera canescens (hoary tansyaster)	Machaeranthera grindelioides (rayless tansyaster)	Orthocarpus[a] (owl's-clover)	Packera multilobata (lobeleaf groundsel)	Pedicularis centranthera (dwarf lousewort)	Penstemon (beardtongue)	Penstemon caespitosus (mat penstemon)	Penstemon watsonii (Watson's penstemon)
year	Nested Frequency																
1994	1	-	45	-	-	-	-	2	-	8	4	-	1	-	6	159	-
1999	2	-	46	7	-	6	-	4	-	41	-	2	6	13	-	138	8
2004	3	-	26	-	-	-	-	12	-	27	14	-	4	25	-	103	13
2009	7	1	47	-	-	-	-	-	-	35	17	-	2	-	-	110	19
2014	3	-	29	-	7	0	-	15	-	17	27	-	18	66	18	121	-
2019	1	-	34	5	6	5	15	15	10	5	28	10	14	57	-	83	13
year	Average Cover (%)																
1994	0.0	-	0.8	-	-	-	-	0.0	-	0.1	0.1	-	0.0	-	0.1	3.5	-
1999	0.0	-	1.8	0.1	-	0.0	-	0.0	-	0.8	-	0.1	0.1	0.1	-	4.4	0.0
2004	0.0	-	0.6	-	-	-	-	0.3	-	0.5	0.3	-	0.0	0.2	-	1.4	0.3
2009	0.2	0.0	1.4	-	-	-	-	-	-	0.2	0.3	-	0.0	-	-	2.2	0.3
2014	0.1	-	0.6	-	0.2	0.0	-	0.1	-	0.1	0.6	-	0.2	1.0	0.3	2.4	-
2019	0.0	-	1.3	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.6	0.1	0.2	2.5	-	1.8	0.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Phlox austromontana (mountain phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii[a] (Douglas' knotweed)	Potentilla (cinquefoil)	Potentilla gracilis (slender cinquefoil)	Schoenocrambe linifolia (flaxleaf plainsmustard)	Symphyotrichum (aster)	Taraxacum officinale (common dandelion)	Tetraneuris acaulis (stemless four-nerve daisy)
year	Nested Frequency								
1994	83	-	-	-	17	-	24	-	5
1999	66	-	-	-	27	-	29	-	4
2004	66	-	-	-	12	-	-	-	1
2009	90	-	-	-	19	1	7	-	8
2014	74	-	-	20	2	-	-	-	2
2019	86	1	4	-	42	11	2	3	-
year	Average Cover (%)								
1994	1.1	-	-	-	0.1	-	0.1	-	0.1
1999	1.0	-	-	-	0.2	-	0.3	-	0.1
2004	1.2	-	-	-	0.1	-	-	-	0.0
2009	1.3	-	-	-	0.1	0.0	0.0	-	0.1
2014	1.4	-	-	0.1	0.0	-	-	-	0.0
2019	1.2	0.0	0.0	-	0.9	0.0	0.0	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16C-19.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis[p] (Utah serviceberry)	Artemisia nova[p] (black sagebrush)	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Cercocarpus ledifolius[p] (curl-leaf mountain mahogany)	Cercocarpus montanus[p] (alderleaf mountain mahogany)	Chrysothamnus depressus[p] (longflower rabbitbrush)	Chrysothamnus viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa (rubber rabbitbrush)	Ericameria parryi var. parryi (Parry's rabbitbrush)	Eriogonum microthecum[p] (slender buckwheat)	Grayia spinosa (spiny hopsage)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma[t] (Utah juniper)	Opuntia (pricklypear)	Pinus edulis[t] (twoneedle pinyon)	Purshia tridentata[p] (antelope bitterbrush)	Sambucus nigra ssp. cerulea[p] (blue elderberry)
year	Line Intercept Cover (%)																
1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2004	5.3	0.3	8.4	0.6	2.7	1.5	-	-	-	-	-	1.5	-	-	0.3	0.2	-
2009	3.2	0.9	8.8	0.5	3.5	1	-	0.4	-	-	-	0.3	-	-	0.1	0.2	-
2014	9	0.5	8.5	0.2	2.1	0.5	0.3	-	0.5	0.1	-	0	-	-	-	0.1	-
2019	3.2	1.7	11.6	0.4	4.2	2.5	0.5	-	1.4	-	-	1.1	-	-	-	0.2	-
year	Quadrat Cover (%)																
1994	3.5	0.5	10.9	1.4	1.1	1.2	0.7	0.1	-	-	-	0.1	-	0.0	0.0	0.1	-
1999	2.8	0.9	9.5	0.0	3.3	0.7	0.6	-	-	0.0	-	1.1	-	-	0.1	0.3	0.0
2004	3.0	0.0	7.0	0.3	2.8	1.6	0.0	-	-	-	-	1.9	-	-	0.4	0.0	0.0
2009	3.1	1.4	7.0	0.7	3.3	1.2	0.0	0.0	-	0.0	-	0.5	0.1	-	0.4	0.1	-
2014	4.0	0.4	6.0	0.8	1.8	0.6	0.3	-	1.1	0.0	-	0.1	0.1	-	-	0.0	-
2019	3.0	1.0	9.6	0.4	3.6	2.4	0.4	-	0.4	0.0	0.0	2.4	0.1	-	-	0.3	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

SHRUB SPECIES	Symphoricarpos oreophilus[p] (mountain snowberry)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)	
1994	-	-
1999	-	-
2004	4.8	0.2
2009	3.9	-
2014	3.4	0.1
2019	2.2	0.3
year	Quadrat Cover (%)	
1994	1.4	0.1
1999	5.6	0.0
2004	3.2	0.0
2009	2.9	0.0
2014	1.8	0.3
2019	2.3	0.1

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16C-19.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
1994	960	20	48	48	4	10	4	4	69/75
1999	760	20	24	66	11	42	21	11	94/103
2004	580	-	21	72	7	31	59	0	66/80
2009	820	140	42	56	2	46	32	15	83/93
2014	840	-	7	86	7	33	62	10	77/98
2019	420	-	19	62	19	10	67	19	82/85
Artemisia nova[p] -- (black sagebrush)									
1994	540	-	0	44	56	19	4	22	23/41
1999	420	-	10	81	10	57	0	10	22/47
2004	340	-	29	71	0	0	0	0	27/98
2009	1680	-	33	62	5	30	0	4	24/42
2014	440	-	5	86	9	0	100	9	19/42
2019	1020	-	20	77	4	29	0	4	18/33
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1994	3380	-	13	61	26	3	1	7	48/68
1999	3040	440	27	57	16	24	9	7	57/77
2004	3880	380	29	49	22	52	19	9	40/63
2009	4260	820	23	53	25	32	25	13	42/63
2014	3260	40	20	76	4	47	34	17	44/60
2019	3900	-	15	71	14	33	22	15	44/59
Cercocarpus ledifolius[p] -- (curl-leaf mountain mahogany)									
1994	140	-	29	71	0	43	0	0	55/55
1999	180	-	78	22	0	56	0	0	67/64
2004	200	-	40	60	0	20	60	0	55/53
2009	180	-	22	56	22	22	56	11	79/91
2014	120	-	0	100	0	83	17	0	75/66
2019	140	-	14	86	0	0	86	0	63/69
Cercocarpus montanus[p] -- (alderleaf mountain mahogany)									
1994	380	-	26	68	5	21	37	5	61/71
1999	680	-	12	88	0	41	59	9	57/85
2004	620	-	13	81	7	3	97	3	78/84
2009	720	-	33	67	0	6	94	0	64/91
2014	260	-	0	100	0	8	92	0	51/65
2019	740	-	11	81	8	27	62	8	68/97
Chrysothamnus depressus[p] -- (longflower rabbitbrush)									
1994	2120	-	3	96	1	25	0	1	8/20
1999	1360	60	0	99	2	19	68	4	6/15
2004	4400	-	0	99	1	23	63	1	12/22
2009	4120	20	2	88	9	2	1	22	9/21
2014	1260	-	0	100	0	3	67	0	8/15
2019	3720	-	5	95	0	36	20	0	14/22
Chrysothamnus viscidiflorus -- (yellow rabbitbrush)									
1994	300	-	0	87	13	0	13	13	14/24
1999	940	20	9	92	0	2	0	0	13/21
2004	80	-	0	100	0	0	0	0	15/22
2009	160	-	13	88	0	13	0	0	15/20
2014	1340	300	60	27	13	52	0	0	18/21
2019	800	-	0	100	0	0	0	0	18/22

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Eriogonum microthecum[p] -- (slender buckwheat)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	20	-	100	0	0	0	0	0	- / -
2014	180	40	33	67	0	11	0	0	20/32
2019	20	-	0	100	0	0	0	0	41/30
Ericameria nauseosa -- (rubber rabbitbrush)									
1994	460	-	4	87	9	4	0	9	13/22
1999	40	-	100	0	0	0	0	0	25/37
2004	-	-	-	-	-	-	-	-	19/30
2009	500	-	8	84	8	48	20	0	14/22
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Ericameria parryi var. parryi -- (Parry's rabbitbrush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	1600	-	6	94	0	70	14	0	16/24
2019	1540	-	0	100	0	0	0	0	14/26
Grayia spinosa -- (spiny hopsage)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	73/75
2019	-	-	-	-	-	-	-	-	-/-
Gutierrezia sarothrae -- (broom snakeweed)									
1994	160	-	0	100	0	0	0	0	13/15
1999	1240	20	11	89	0	0	0	0	15/20
2004	5280	20	28	72	0	0	0	0	17/21
2009	1580	-	1	96	3	0	0	4	15/16
2014	240	40	8	92	0	0	0	0	13/13
2019	4280	-	2	98	0	0	0	0	18/19
Juniperus osteosperma[t] -- (Utah juniper)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	60	-	100	0	0	0	0	0	- / -
2014	40	-	100	0	0	0	0	0	- / -
2019	40	-	100	0	0	0	0	0	- / -
Linanthus pungens -- (granite prickly phlox)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	13/10
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Mahonia repens -- (creeping barberry)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	1/24
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Opuntia -- (pricklypear)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	40	-	50	50	0	0	0	0	9/30
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	7/8
2019	-	-	-	-	-	-	-	-	11/16
Pinus edulis[t] -- (twoneedle pinyon)									
1994	-	-	-	-	-	-	-	-	-/-
1999	20	60	100	0	0	0	0	0	- / -
2004	40	-	100	0	0	0	0	0	- / -
2009	20	-	100	0	0	0	0	0	- / -
2014	-	-	-	-	-	-	-	-	-/-
2019	-	20	0	0	0	0	0	0	- / -
Purshia stansburiana[p] -- (Stansbury cliffrose)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	82/101
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	43/138
Purshia tridentata[p] -- (antelope bitterbrush)									
1994	20	-	0	100	0	0	0	0	27/83
1999	80	-	25	75	0	0	75	0	18/38
2004	80	-	0	100	0	0	0	0	35/113
2009	160	-	25	75	0	63	0	0	31/82
2014	100	-	0	100	0	0	100	0	73/140
2019	80	-	0	75	25	75	25	100	29/82
Sambucus nigra ssp. cerulea[p] -- (blue elderberry)									
1994	-	-	-	-	-	-	-	-	61/85
1999	-	-	-	-	-	-	-	-	82/79
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	86/84
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	65/72
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
1994	760	-	34	66	0	3	0	0	34/65
1999	1220	60	25	72	3	7	0	0	36/67
2004	920	-	9	89	2	20	0	0	31/65
2009	2440	20	11	87	3	38	18	3	33/55
2014	1240	-	23	74	3	31	34	3	32/58
2019	1260	-	21	78	2	8	10	2	29/43

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Tetradymia canescens -- (spineless horsebrush)									
1994	440	-	14	68	18	23	14	0	15/22
1999	360	-	0	72	28	56	0	11	15/23
2004	320	-	13	81	6	13	6	6	21/25
2009	380	380	16	42	42	16	26	26	13/15
2014	400	-	0	100	0	10	5	0	15/20
2019	520	20	15	85	0	4	0	0	19/23

t - Tree Species; p - Preferred Browse; i - Introduced Species

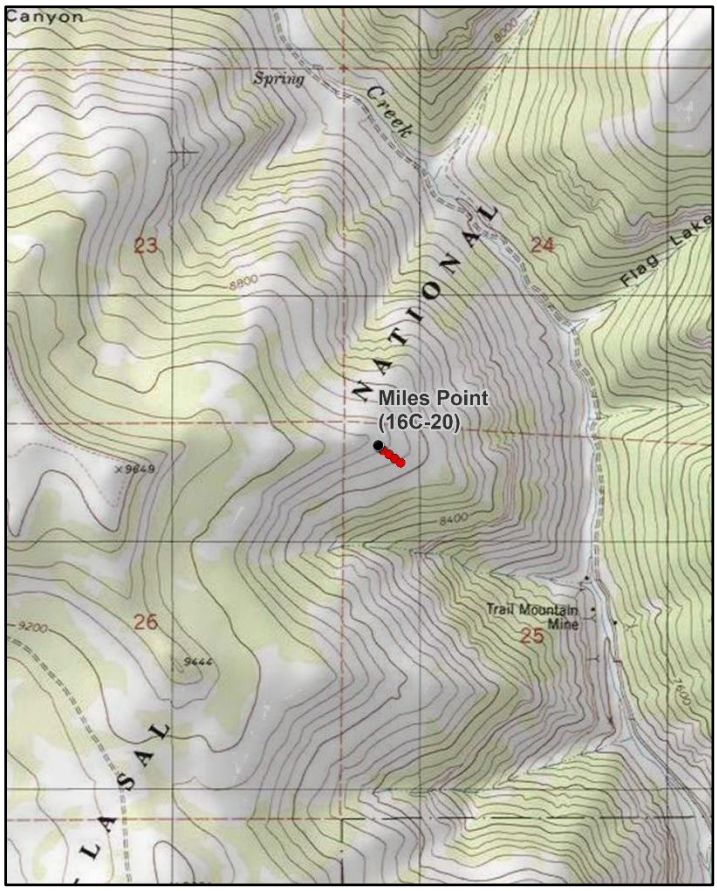
Table 16C-19.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

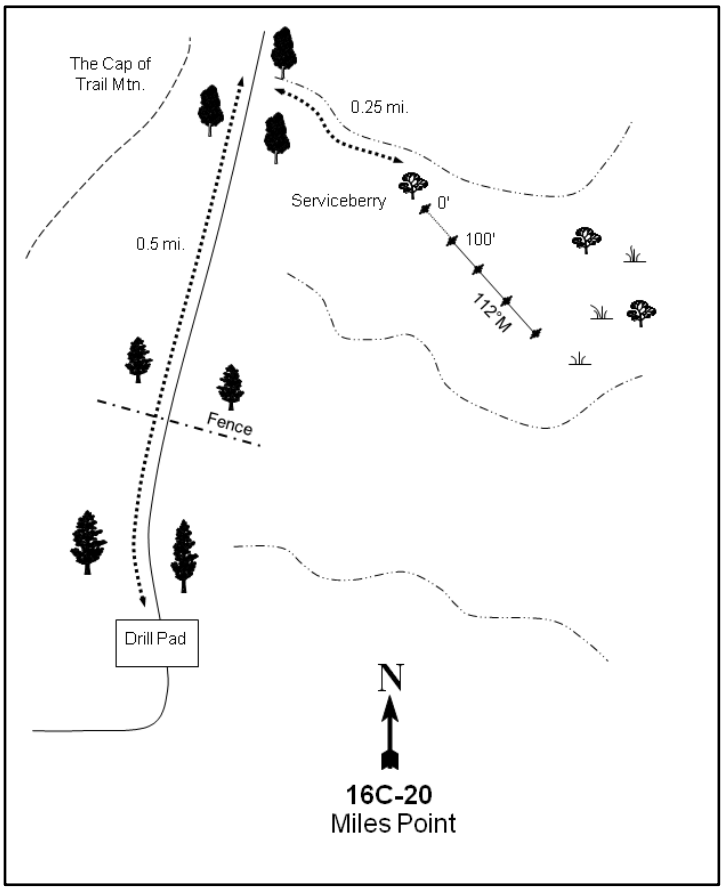
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Cercocarpus ledifolius (curl-leaf mountain mahogany)							
1999	8	-	-	-	-	-	23.0
2014	3	-	-	-	-	100	33.0
Juniperus osteosperma (Utah juniper)							
1994	4	-	-	-	-	-	15.3
2014	6	-	40	20	20	20	10.0
2019	4	-	25	75	-	-	10.3
Juniperus scopulorum (Rocky Mountain juniper)							
1999	3	-	-	-	-	-	14.3
2019	3	-	-	-	100	-	21.5
Pinus edulis (twoneedle pinyon)							
1994	6	-	-	-	-	-	6.2
1999	10	-	-	-	-	-	4.0
2014	20	-	38	13	25	25	11.6
2019	15	-	13	75	-	13	10.3
Pinus flexilis (limber pine)							
1994	3	-	-	-	-	-	9.8
1999	5	-	-	-	-	-	14.5
2019	2	-	-	-	50	50	25.5

Table 16C-19.15 – Deer Desirable Components Index: High Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1994	26.3	10.0	10.6	19.2	0.0	10.0	0.0	76.2	Good
1999	29.1	12.3	11.2	20.4	0.0	10.0	0.0	83.1	Good
2004	30.0	11.8	9.7	20.0	0.0	10.0	0.0	81.5	Good
2009	28.4	11.4	12.2	17.1	0.0	10.0	0.0	79.1	Good
2014	30.0	13.6	6.4	22.6	0.0	10.0	0.0	82.6	Good
2019	30.0	11.9	7.2	30.0	0.0	10.0	0.0	89.1	Good-Excellent

MILES POINT - STUDY NO. 16C-20





Location Information

USGS 7.5 min Map Info	Mahogany Point NW; Township 17S, Range 6E, Section 25
GPS (0' Stake)	NAD 83 UTM ZONE 12, 482771 East 4352588 North

Transect Information

Browse Tag # (0' Stake)	9030
Transect Bearing	112° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

From the pass at the top of the Cottonwood Canyon Road (10.15 miles from Straight Canyon), take the Trail Mountain road southeast for approximately 9.5 miles to the south end of the Cap of Trail Mountain. The study site is to the northeast, on the other side of this high cap. A new road leads east from the main road just past the southern point of the cap: follow this road for 0.65 miles and stop before you enter the thick timber. From here, a pack trail begins and leads to the north along the edge of Trail Mountain. Follow this trail for about 0.5 miles to an open ridge. Turn east and hike down this ridge to the southeast for 0.25 miles. The study is located on a sage-grass slope on the southeast side of the ridge. The 0-foot baseline stake, marked by browse tag #9030, is adjacent to a large clump of serviceberry. The area has a view of lower Cottonwood Canyon and the fields in Straight Canyon.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	TRAIL MT
Elevation	8,800ft (2,682m)
Aspect	Southeast
Slope	32%
Sample Dates	08/25/1994, 08/04/1999, 08/04/2004, 08/04/2009, 07/22/2014, 07/10/2019

Wildlife Habitat and Vegetation History

Table 16C-20.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	summer
Rocky Mountain Elk	substantial	winter
Shiras Moose	crucial	winter

Table 16C-20.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1988	Mountain Big Sagebrush	Phase I
1994	Mountain Big Sagebrush	Phase I
1999	Mountain Big Sagebrush	Phase I
2004	Mountain Big Sagebrush	Phase I
2009	Mountain Big Sagebrush	Phase I
2014	Mountain Big Sagebrush	Phase I
2019	Mountain Big Sagebrush	Phase I

Site Notes

No Notes

Soils

Table 16C-20.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay	7.5	24.7	29.5	45.8	3.1	6.0	128.0	0.5	08/04/1999

Site Potential

1981 - 2010 Average Annual Precipitation	22 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XB430UT
States and Transitions	No state and transition model is available for this ecological site.

This site has remained dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) since study establishment in 1988; other browse species such as Utah serviceberry (*Amelanchier utahensis*) and mountain snowberry (*Symphoricarpos oreophilus*) are also present to a lesser extent (Table 16C-20.12, Table 16C-20.13). The herbaceous understory has remained abundant and moderately diverse, with the native perennial grasses bluebunch wheatgrass (*Pseudoroegneria spicata*) and saline wildrye (*Leymus salinus*) contributing the most herbaceous cover in all sample years (Table 16C-20.7, Table 16C-20.10, Table 16C-20.11). Utah juniper (*Juniperus osteosperma*) has been observed and the site has been considered to be within Phase I of woodland succession throughout the study period (Table 16C-20.4, Table 16C-20.14, Photos). Further tree encroachment could cause the site to transition to a juniper-dominated state, but the consistently low amount of trees observed indicates that this is likely not an immediate threat.

Trend Summary Tables

Table 16C-20.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	16.1	2.9	-	-	-	-
1999	18.4	1.3	-	-	-	-
2004	12.1	3.9	-	12.2	5.7	-
2009	15.2	3.1	-	18.0	4.5	-
2014	12.0	3.2	-	12.3	5.3	-
2019	14.3	7.1	-	14.3	8.1	-

Table 16C-20.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	-	363	-	23	-	22.9	-	0.1
1999	-	395	5	42	-	23.4	0.0	1.1
2004	-	343	2	37	-	18.9	0.0	0.4
2009	-	354	-	36	-	23.8	-	0.3
2014	-	370	-	70	-	21.8	-	1.1
2019	-	353	18	134	-	25.1	0.7	3.0

Table 16C-20.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	18.8	0.0	42.2	1.2	7.7	43.8
1999	16.3	0.2	43.5	6.4	6.7	44.4
2004	34.3	1.0	32.9	5.2	9.1	35.8
2009	23.0	0.2	30.1	7.6	2.4	42.3
2014	23.1	0.0	36.2	8.0	3.5	38.4
2019	26.6	0.4	44.0	7.6	8.6	48.0

Table 16C-20.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Shiras Moose	Rabbit
	Quadrat Frequency				
1994	-	9	31	-	11
1999	2	2	24	-	10
2004	1	4	36	1	29
2009	4	1	16	-	7
2014	2	4	22	-	20
2019	3	3	29	-	3
Year	Days Use Per Acre (ha)				
1994	-	-	-	-	-
1999	1.5 (3.6)	3.4 (8.3)	69.7 (172.1)	-	-
2004	6.5 (16.1)	5.3 (13.2)	56.3 (139.0)	-	-
2009	24.7 (61.0)	2.0 (5.0)	30.8 (76.1)	-	-
2014	-	-	-	-	-
2019	12.3 (30.5)	3.4 (8.3)	35.5 (87.7)	-	-

Table 16C-20.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Leymus salinus (saline wildrye)	Poa fendleriana (muttongrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency			
1994	16	139	12	275
1999	6	63	6	372
2004	15	55	9	305
2009	8	119	7	284
2014	-	142	4	256
2019	-	205	5	219
year	Average Cover (%)			
1994	0.1	8.8	0.0	14.0
1999	0.2	4.0	0.1	19.2
2004	0.6	3.2	0.0	15.1
2009	0.1	7.5	0.3	15.9
2014	-	9.0	0.1	12.7
2019	-	11.7	0.0	13.4

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16C-20.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Androsace septentrionalis[a] (pygmyflower rockjasmine)	Astragalus (milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Calochortus nuttallii (sego lily)	Chaenactis douglasii (Douglas' dustymaiden)	Cirsium neomexicanum[a] (New Mexico thistle)	Cymopterus (springparsley)	Descurainia pinnata[a] (western tansymustard)	Hedysarum boreale (Utah sweetvetch)	Hymenoxys richardsonii (pingue rubberweed)	Lactuca serriola[ai] (prickly lettuce)	Lappula occidentalis[a] (flatspine stickseed)	Machaeranthera canescens (hoary tansyaster)	Packera multilobata (lobeleaf groundsel)	Penstemon (beardtongue)	Penstemon caespitosus (mat penstemon)
year	Nested Frequency																
1994	-	-	-	14	2	-	-	-	-	-	0	-	-	2	-	-	-
1999	-	3	3	31	1	5	2	-	-	2	0	-	-	4	-	-	6
2004	-	-	-	22	-	4	-	4	-	-	-	-	-	5	-	-	1
2009	-	-	-	17	-	-	-	3	-	2	2	-	-	4	-	1	3
2014	-	-	-	33	1	3	-	5	-	-	22	-	-	13	-	1	1
2019	57	-	-	23	21	-	-	2	14	5	3	3	2	2	4	7	3
year	Average Cover (%)																
1994	-	-	-	0.0	0.0	-	-	-	-	-	0.0	-	-	0.0	-	-	-
1999	-	0.0	0.0	0.8	0.0	0.0	0.0	-	-	0.1	0.0	-	-	0.1	-	-	0.1
2004	-	-	-	0.3	-	0.0	-	0.0	-	-	-	-	-	0.0	-	-	0.0
2009	-	-	-	0.1	-	-	-	0.0	-	0.0	0.0	-	-	0.0	-	0.0	0.0
2014	-	-	-	0.8	0.0	0.0	-	0.0	-	-	0.1	-	-	0.1	-	0.0	0.0
2019	1.1	-	-	0.8	0.2	-	-	0.0	0.5	0.0	0.0	0.0	0.2	0.0	0.0	0.1	0.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Phlox longifolia (longleaf phlox)	Polygonum douglasii[a] (Douglas' knotweed)	Schoenocrambe linifolia (flaxleaf plainsmustard)	Symphyotrichum (aster)	unknown perennial forb (unknown forb)
year	Nested Frequency				
1994	-	-	-	2	3
1999	1	-	-	-	-
2004	-	2	-	2	-
2009	-	-	1	3	-
2014	-	-	-	-	-
2019	-	-	27	7	-
year	Average Cover (%)				
1994	-	-	-	0.0	0.0
1999	0.0	-	-	-	-
2004	-	0.0	-	0.0	-
2009	-	-	0.0	0.0	-
2014	-	-	-	-	-
2019	-	-	0.4	0.2	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16C-20.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis[p] (Utah serviceberry)	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Chrysothamnus depressus[p] (longflower rabbitbrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa (rubber rabbitbrush)	Krascheninnikovia lanata[p] (winterfat)	Sambucus nigra ssp. cerulea[p] (blue elderberry)	Symphoricarpos oreophilus[p] (mountain snowberry)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)								
1994	-	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-	-
2004	-	8.9	1.5	5.2	-	-	-	1.8	0.5
2009	-	14.4	0.8	4.2	-	-	-	2.8	0.3
2014	-	8.2	0.9	4.5	-	-	-	3.2	0.8
2019	-	11.3	1.5	7.5	-	-	0.1	1.4	0.6
year	Quadrat Cover (%)								
1994	-	12.6	0.8	2.9	-	-	0.1	2.5	-
1999	-	15.7	0.8	1.3	-	-	0.1	1.7	-
2004	-	9.2	0.8	3.6	-	-	0.1	2.0	0.2
2009	0.0	12.4	0.7	3.0	0.0	0.6	0.0	1.4	0.1
2014	-	9.5	0.7	3.0	-	-	-	1.8	0.2
2019	-	11.0	1.5	6.6	0.0	-	0.1	1.7	0.4

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16C-20.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
1994	40	-	0	100	0	0	0	0	84/100
1999	-	-	-	-	-	-	-	-	92/52
2004	20	-	0	100	0	0	100	0	80/92
2009	80	-	50	50	0	25	50	0	70/81
2014	-	-	-	-	-	-	-	-	110/121
2019	20	-	0	100	0	0	100	0	127/145
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1994	3600	-	6	73	21	19	1	7	53/84
1999	3840	100	9	77	14	32	1	8	57/81
2004	2120	60	4	40	57	55	26	25	42/68
2009	2720	60	6	65	29	35	12	20	44/72
2014	2440	-	9	78	13	45	20	13	44/71
2019	2140	60	5	59	36	28	36	37	54/72
Chrysothamnus depressus[p] -- (longflower rabbitbrush)									
1994	920	20	0	91	9	20	22	0	9/20
1999	1480	-	3	91	7	18	34	4	8/19
2004	2000	-	0	96	4	34	43	0	10/25
2009	1460	-	1	88	11	11	4	19	9/21
2014	1680	20	0	100	0	18	0	0	11/28
2019	1600	-	0	98	3	14	4	3	18/25
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1994	4780	-	1	97	2	1	0	1	22/35
1999	4100	100	9	83	8	15	0	2	24/29
2004	4040	-	0	98	2	7	5	2	23/36
2009	4580	20	5	81	14	2	0	40	18/33
2014	4480	60	10	90	0	0	0	0	23/37
2019	4380	-	0	100	0	29	9	0	29/43
Ericameria nauseosa -- (rubber rabbitbrush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	20	-	0	100	0	0	0	0	47/45
2009	60	-	0	100	0	0	0	0	45/59
2014	40	-	0	100	0	0	0	0	46/51
2019	40	-	0	100	0	0	0	0	58/24
Sambucus nigra ssp. cerulea[p] -- (blue elderberry)									
1994	-	-	-	-	-	-	-	-	66/75
1999	20	-	0	100	0	0	0	0	57/61
2004	20	-	100	0	0	0	0	0	79/56
2009	20	-	0	100	0	0	0	0	57/39
2014	20	-	100	0	0	100	0	0	36/67
2019	40	-	0	100	0	0	0	0	84/32
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
1994	1600	-	4	93	4	0	8	1	29/81
1999	1720	20	16	79	5	26	0	2	26/48
2004	1320	-	3	97	0	2	2	0	25/57
2009	2160	60	22	76	2	2	14	30	25/58
2014	1060	40	6	94	0	6	0	0	28/53
2019	860	60	5	95	0	16	0	0	35/64

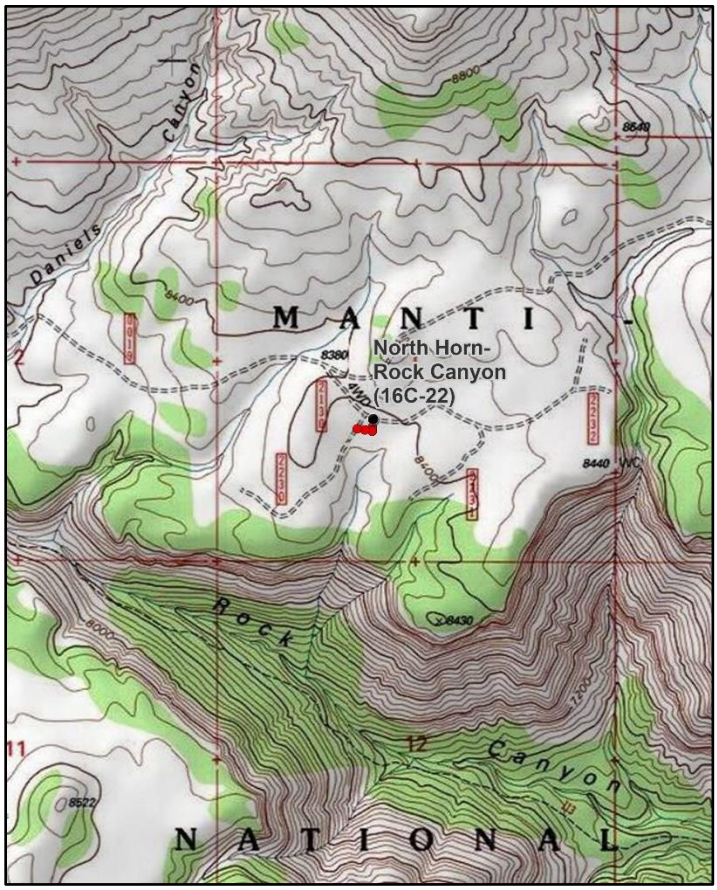
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Tetradymia canescens -- (spineless horsebrush)									
1994	180	-	0	89	11	0	0	0	21/25
1999	320	-	6	94	0	31	0	0	23/24
2004	320	-	0	94	6	63	0	0	23/33
2009	380	-	5	42	53	5	37	11	15/28
2014	420	-	10	91	0	38	0	0	18/34
2019	400	-	0	100	0	0	0	0	23/37

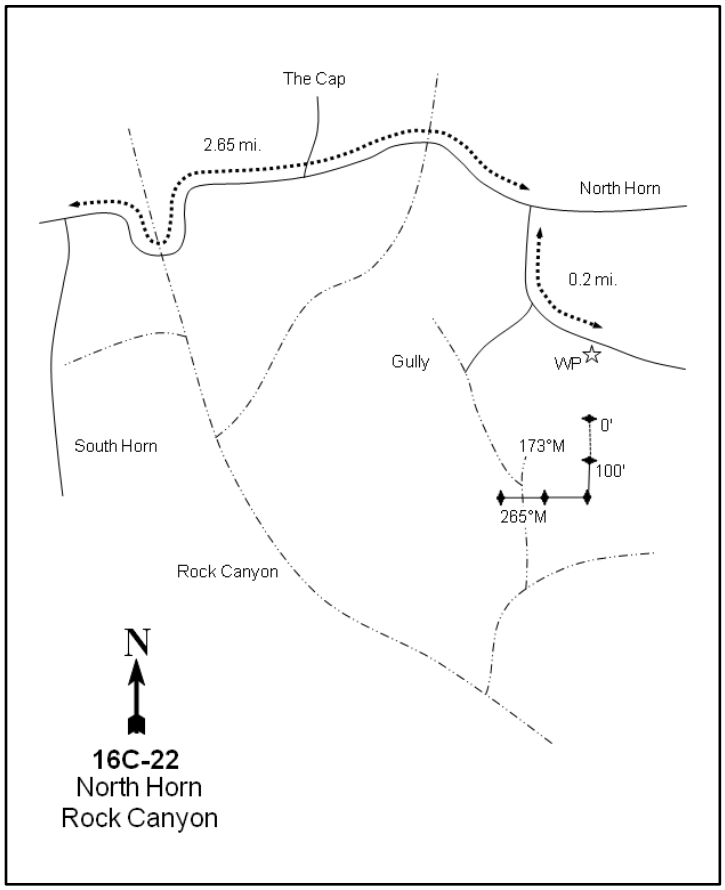
t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16C-20.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2019	1	-	-	100	-	-	8.0

NORTH HORN ROCK CANYON - STUDY NO. 16C-22





Location Information

USGS 7.5 min Map Info	The Cap NW; Township 19S, Range 6E, Section 01
GPS (0' Stake)	NAD 83 UTM ZONE 12, 482765 East 4338465 North

Transect Information

Browse Tag # (0' Stake)	9008
Transect Bearing	173° magnetic (Lines 3-4: 265° magnetic)
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard, Line 2: 50ft Long

Directions to Site

From the intersection of the North Horn and South Horn roads, continue on the graded North Horn road. Travel for 0.8 miles and cross the upper end of Rock Canyon, then continue on main road for 1.85 miles to a small fork. Bear right onto the dirt road (Forest Service Road #130) and proceed 0.2 miles to a witness post on the right-hand (south) side of the road. The frequency baseline starts 40 feet south of the tall witness post, and the 0-foot baseline stake is marked by a red browse tag #9008.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	HORN MT
Elevation	8,400ft (2,560m)
Aspect	Southwest
Slope	3-5%
Sample Dates	08/08/1994, 08/05/1999, 08/03/2004, 07/29/2009, 07/22/2014, 08/06/2019

Table 16C-22.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Mechanical - Bullhog	Swasey Wildlife Habitat Improvement and Hazardous Fuels Reduction Project Phase VII	3638	August 2016-June 2017	620

Wildlife Habitat and Vegetation History

Table 16C-22.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Rocky Mountain Elk	substantial	winter	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing
Shiras Moose	crucial	winter	

Table 16C-22.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1988	Black Sagebrush/Mountain Big Sagebrush	Phase I
1994	Black Sagebrush/Mountain Big Sagebrush	Phase I
1999	Black Sagebrush/Mountain Big Sagebrush	Phase I
2004	Black Sagebrush/Mountain Big Sagebrush	Phase I
2009	Black Sagebrush/Mountain Big Sagebrush	Phase I
2014	Black Sagebrush/Mountain Big Sagebrush	Phase I
2019	Black Sagebrush/Mountain Big Sagebrush	Phase I

Site Notes

An antler drop was found on the site in 2014.

Soils

Table 16C-22.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	7.2	60.4	17.8	21.8	1.7	5.5	73.6	0.6	08/05/1999

Site Potential

1981 - 2010 Average Annual Precipitation	19 inches
NRCS Ecological Site	Mountain Shallow Loam (Black Sagebrush)
NRCS Ecological Site #	R047XA438UT
States and Transitions	No state and transition model is available for this ecological site.

Black sagebrush (*Artemisia nova*) and mountain big sagebrush (*A. tridentata* ssp. *vaseyana*) have dominated this site since study establishment in 1988; cover of black sagebrush exhibited a nearly seven percent increase between 2014 and 2019, while that of mountain big sagebrush remained similar. Other browse species have also been present throughout the study period, but have contributed less cover (Table 16C-22.12, Table 16C-22.13). The herbaceous understory has been mainly comprised of native perennial grasses in all sample years. The introduced annual grass species cheatgrass (*Bromus tectorum*) was observed for the first time in 2019, but in low amounts. Forbs have remained diverse, but have provided little cover (Table 16C-22.7, Table 16C-22.10, Table 16C-22.11). Twoneedle pinyon (*Pinus edulis*) has been present throughout the study period, placing the site within Phase I of woodland succession (Table 16C-22.4, Table 16C-22.12, Photos). Many trees were removed by a bullhog treatment in 2016-2017 (Table 16C-22.1). However, Utah juniper (*Juniperus osteosperma*), Rocky Mountain juniper (*J. scopulorum*), and twoneedle pinyon were observed in point-quarter density measurements in 2019 (Table 16C-22.14); the continued presence of trees on this site indicates that there may be potential for infilling in future sample years.

Trend Summary Tables

Table 16C-22.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	15.0	0.2	-	-	-	-
1999	13.8	5.7	-	-	-	-
2004	16.4	6.1	-	17.6	7.9	0.1
2009	15.9	4.6	0.0	18.0	3.7	0.2
2014	13.6	6.5	-	15.7	8.2	0.3
2019	18.8	8.8	-	25.2	12.1	-

Table 16C-22.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	-	334	-	70	-	7.2	-	0.5
1999	-	335	4	140	-	11.4	0.0	1.7
2004	-	321	37	95	-	11.0	0.1	1.4
2009	-	334	-	40	-	9.8	-	0.6
2014	-	315	84	111	-	9.6	0.8	1.6
2019	14	307	193	140	0.1	9.3	1.8	1.9

Table 16C-22.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	40.1	2.5	20.2	2.7	5.9	23.6
1999	35.2	4.1	16.7	11.3	2.1	32.3
2004	42.7	3.0	21.3	8.6	3.8	34.9
2009	35.3	1.3	26.9	10.5	0.9	34.7
2014	33.0	1.8	27.0	17.0	0.3	36.9
2019	45.4	3.2	33.5	6.1	3.0	32.4

Table 16C-22.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1994	-	16	23	28
1999	3	12	12	18
2004	2	4	48	18
2009	6	15	33	44
2014	3	7	3	8
2019	3	29	12	25
Year	Days Use Per Acre (ha)			
1994	-	-	-	-
1999	14.5 (35.9)	28.8 (71.2)	13.4 (33.1)	-
2004	9.4 (23.3)	38.2 (94.4)	66.4 (163.9)	-
2009	13.1 (32.3)	34.9 (86.1)	46.2 (114.2)	-
2014	-	14.7 (36.4)	4.0 (9.9)	-
2019	13.1 (32.3)	8.1 (19.9)	31.5 (77.8)	-

Table 16C-22.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bouteloua gracilis (blue grama)	Bromus tectorum[ai] (cheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Leymus salinus (saline wildrye)	Pascopyrum smithii (western wheatgrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency									
1994	5	101	-	3	1	-	252	119	4	-
1999	5	99	-	31	0	83	193	149	3	-
2004	12	112	-	30	15	55	149	112	4	4
2009	5	97	-	-	17	87	159	113	13	-
2014	5	39	-	33	20	48	178	158	7	6
2019	24	67	14	49	35	94	103	89	9	4
year	Average Cover (%)									
1994	0.1	1.6	-	0.0	0.0	-	4.1	1.4	0.0	-
1999	0.2	2.7	-	0.7	0.0	1.4	3.1	3.3	0.0	-
2004	0.6	3.7	-	0.3	0.2	1.1	2.8	2.3	0.0	0.2
2009	0.2	2.9	-	-	1.0	2.6	1.4	1.7	0.1	-
2014	0.1	1.2	-	0.2	0.2	1.2	3.7	3.0	0.1	0.0
2019	0.4	1.2	0.1	0.8	0.3	3.0	1.3	2.0	0.1	0.2

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16C-22.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Androsace septentrionalis[a] (pygmyflower rockjasmine)	Antennaria (pussytoes)	Arabis (rockcress)	Astragalus (milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Calochortus nuttallii (sego lily)	Castilleja linariifolia (Wyoming Indian paintbrush)	Chaenactis douglasii (Douglas' dustymaiden)	Chenopodium leptophyllum[a] (narrowleaf goosefoot)	Crepis acuminata (tapertip hawksbeard)	Cryptantha (cryptantha)	Descurainia pinnata[a] (western tansymustard)	Erigeron eatonii (Eaton's fleabane)	Erigeron pumilus (shaggy fleabane)	Eriogonum alatum (winged buckwheat)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)
year	Nested Frequency																
1994	-	1	1	3	2	-	4	-	-	-	2	-	25	4	-	14	-
1999	4	-	-	2	-	-	3	19	-	6	-	-	28	3	1	23	2
2004	-	-	-	-	-	-	-	-	1	8	4	-	0	4	-	23	2
2009	-	-	-	-	-	-	-	-	-	3	-	-	2	5	2	10	1
2014	11	-	4	-	-	-	9	-	-	8	-	1	4	8	3	14	2
2019	4	-	2	3	-	11	17	6	35	13	-	-	5	32	1	14	4
year	Average Cover (%)																
1994	-	0.0	0.0	0.0	0.0	-	0.0	-	-	-	0.0	-	0.1	0.0	-	0.0	-
1999	0.0	-	-	0.0	-	-	0.0	0.2	-	0.1	-	-	0.2	0.0	0.0	0.3	0.0
2004	-	-	-	-	-	-	-	-	0.0	0.1	0.2	-	0.0	0.0	-	0.2	0.1
2009	-	-	-	-	-	-	-	-	-	0.0	-	-	0.0	0.0	0.0	0.2	0.1
2014	0.1	-	0.0	-	-	-	0.0	-	-	0.1	-	0.0	0.0	0.1	0.0	0.1	0.1
2019	0.0	-	0.0	0.0	-	0.0	0.1	0.0	0.1	0.4	-	-	0.1	0.6	0.0	0.1	0.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Gayophytum ramosissimum[a] (pinyon groundsmoke)	Ipomopsis aggregata (scarlet gilia)	Lappula occidentalis[a] (flatspine stickseed)	Lupinus argenteus (silvery lupine)	Machaeranthera canescens (hoary tansyaster)	Packera multilobata (lobeleaf groundsel)	Penstemon (beardtongue)	Penstemon watsonii (Watson's penstemon)	Phlox austromontana (mountain phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii[a] (Douglas' knotweed)	Stenotus acaulis (stemless mock goldenweed)	Tetraneuris acaulis (stemless four-nerve daisy)	Tragopogon dubius[ai] (yellow salsify)	Trifolium (clover)	unknown perennial forb (unknown forb)
year	Nested Frequency															
1994	-	-	-	-	11	6	1	7	3	-	-	12	-	-	-	-
1999	-	12	-	8	17	50	-	6	12	-	-	-	-	-	1	2
2004	18	-	9	5	3	41	-	9	12	5	19	1	5	-	3	-
2009	-	-	-	-	3	-	-	4	11	3	-	2	-	-	-	-
2014	-	-	81	4	5	48	-	11	13	-	-	5	-	-	-	-
2019	84	-	158	3	10	39	-	5	12	-	-	8	-	1	13	-
year	Average Cover (%)															
1994	-	-	-	-	0.0	0.0	0.0	0.0	0.0	-	-	0.2	-	-	-	-
1999	-	0.0	-	0.1	0.1	0.2	-	0.1	0.4	-	-	-	-	-	0.0	0.0
2004	0.0	-	0.0	0.0	0.0	0.3	-	0.1	0.1	0.0	0.0	0.0	0.1	-	0.0	-
2009	-	-	-	-	0.0	-	-	0.1	0.1	0.0	-	0.0	-	-	-	-
2014	-	-	0.7	0.0	0.1	0.8	-	0.1	0.1	-	-	0.0	-	-	-	-
2019	0.4	-	1.3	0.0	0.1	0.1	-	0.0	0.0	-	-	0.0	-	0.0	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16C-22.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis[p] (Utah serviceberry)	Artemisia nova[p] (black sagebrush)	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Chrysothamnus depressus[p] (longflower rabbitbrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Pediocactus simpsonii (mountain ball cactus)	Pinus edulis[t] (twoneedle pinyon)	Purshia tridentata[p] (antelope bitterbrush)	Sclerocactus whipplei (Whipple's fishhook cactus)
year	Line Intercept Cover (%)									
1994	-	-	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-	-	-
2004	-	10.1	5.8	0.7	6.4	1.5	-	0.1	1	-
2009	-	8.7	6.3	1.9	3.4	0.3	-	0.2	1.1	-
2014	-	8.1	6.3	0.4	8.1	-	-	0.3	0.9	0.1
2019	-	14.9	7.6	2.2	12.1	0	-	-	0.5	-
year	Quadrat Cover (%)									
1994	-	7.7	3.9	3.5	-	0.2	-	-	-	0.0
1999	0.0	8.4	4.4	0.6	5.1	0.5	-	-	0.3	0.0
2004	0.1	9.0	5.9	0.8	5.8	0.2	-	0.0	0.5	-
2009	0.1	8.6	5.1	1.7	4.2	0.4	-	0.0	0.4	-
2014	0.1	8.0	4.3	0.8	6.0	0.5	-	0.0	0.4	0.0
2019	-	10.4	6.1	2.0	8.8	0.0	0.0	-	0.4	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16C-22.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[P] -- (Utah serviceberry)									
1994	-	-	-	-	-	-	-	-	35/36
1999	40	-	0	50	50	0	100	50	62/102
2004	20	-	0	100	0	0	100	0	31/40
2009	60	-	0	100	0	67	0	0	94/105
2014	20	-	0	100	0	0	100	0	39/70
2019	20	-	0	0	100	0	100	100	76/103
Artemisia nova[P] -- (black sagebrush)									
1994	5160	40	0	76	24	16	2	5	21/49
1999	5580	20	2	76	22	25	12	6	19/45
2004	4840	13340	6	61	33	18	0	22	18/48
2009	5420	5280	11	56	33	12	41	12	18/47
2014	5920	420	36	56	9	29	27	10	19/46
2019	7400	20	3	79	18	2	17	19	23/43
Artemisia tridentata ssp. vaseyana[P] -- (mountain big sagebrush)									
1994	2940	20	1	52	46	31	2	14	22/51
1999	2520	20	4	48	48	35	21	19	28/62
2004	2040	5380	2	58	40	56	29	16	29/68
2009	2500	1420	18	43	39	24	42	17	29/68
2014	3700	80	48	46	6	38	25	4	32/71
2019	3500	-	11	70	19	27	21	21	30/63
Chrysothamnus depressus[P] -- (longflower rabbitbrush)									
1994	6900	-	4	96	0	12	4	0	7/20
1999	1320	-	6	88	6	33	33	2	7/19
2004	1240	-	2	89	10	16	14	3	12/24
2009	3140	-	8	89	4	0	0	5	8/24
2014	760	100	5	95	0	40	21	3	8/18
2019	1340	-	0	96	5	2	0	5	13/25
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	7700	-	5	89	6	0	0	0	12/27
2004	9340	80	6	93	1	0	0	1	13/29
2009	7060	360	4	94	2	0	1	4	9/31
2014	8140	-	8	92	0	1	0	0	12/30
2019	10860	-	0	100	0	0	0	0	14/29
Eriogonum microthecum[P] -- (slender buckwheat)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	120	-	0	100	0	0	0	0	- / -
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Gutierrezia sarothrae -- (broom snakeweed)									
1994	960	-	10	90	0	0	0	0	11/13
1999	2020	-	3	97	0	0	0	0	14/20
2004	1040	-	4	96	0	0	0	0	15/23
2009	1580	-	0	100	0	0	0	0	12/15
2014	200	-	20	80	0	0	0	0	15/32
2019	100	-	0	100	0	40	0	0	14/18

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Pediocactus simpsonii -- (mountain ball cactus)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	20	-	0	100	0	0	0	0	2/2
Pinus edulis[t] -- (twoneedle pinyon)									
1994	-	-	-	-	-	-	-	-	-/-
1999	40	-	100	0	0	0	0	0	- / -
2004	40	-	100	0	0	0	0	0	- / -
2009	40	-	100	0	0	0	0	0	- / -
2014	40	-	100	0	0	0	0	0	- / -
2019	-	-	-	-	-	-	-	-	-/-
Purshia tridentata[p] -- (antelope bitterbrush)									
1994	-	-	-	-	-	-	-	-	18/134
1999	200	-	0	100	0	20	80	0	24/118
2004	100	-	0	100	0	0	100	0	29/91
2009	340	-	6	94	0	41	53	0	35/78
2014	120	-	0	83	17	17	67	17	39/102
2019	160	140	0	88	13	63	0	13	37/102
Sclerocactus whipplei -- (Whipple's fishhook cactus)									
1994	20	-	0	100	0	0	0	0	4/5
1999	80	-	0	100	0	0	0	0	7/11
2004	40	-	0	100	0	0	0	0	4/10
2009	100	-	20	80	0	0	0	0	7/10
2014	120	-	17	83	0	0	0	0	6/17
2019	20	-	0	100	0	0	0	0	5/10
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
1994	-	-	-	-	-	-	-	-	-/-
1999	20	-	100	0	0	0	0	0	- / -
2004	20	-	0	100	0	0	0	0	16/26
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	32/70

t - Tree Species; p - Preferred Browse; i - Introduced Species

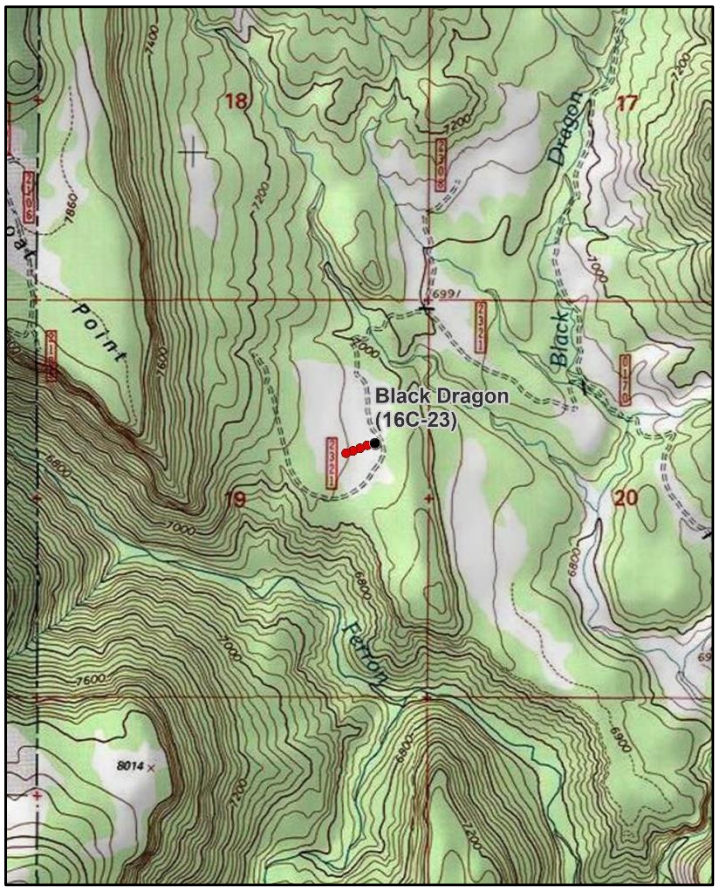
Table 16C-22.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

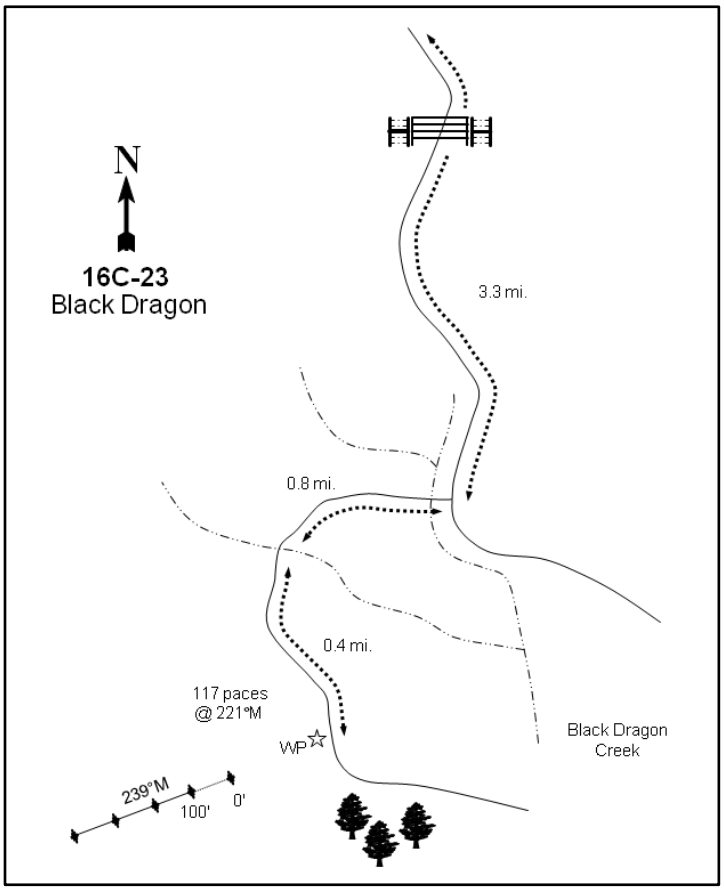
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2014	1	-	100	-	-	-	1.0
Juniperus scopulorum (Rocky Mountain juniper)							
2019	1	-	100	-	-	-	3.0
Pinus edulis (twoneedle pinyon)							
2014	24	-	89	11	-	-	3.4
2019	5	-	100	-	-	-	3.0
Pinus ponderosa (ponderosa pine)							
2019	1	-	-	100	-	-	9.0

Table 16C-22.15 – Deer Desirable Components Index: High Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1994	18.7	7.8	0.7	14.4	0.0	1.1	0.0	42.6	Poor
1999	17.3	6.4	1.4	22.7	0.0	3.4	0.0	51.3	Poor
2004	22.3	5.2	2.1	22.1	0.0	2.8	0.0	54.5	Poor-Fair
2009	22.8	6.0	6.2	19.5	0.0	1.3	0.0	55.9	Poor-Fair
2014	19.9	12.6	15.0	19.2	0.0	3.2	0.0	69.9	Fair-Good
2019	30.0	9.8	2.6	18.5	0.0	3.7	0.0	64.7	Fair

BLACK DRAGON - STUDY NO. 16C-23





Location Information

USGS 7.5 min Map Info	Ferron Canyon SE; Township 19S, Range 6E, Section 19
GPS (0' Stake)	NAD 83 UTM ZONE 12, 475481 East 4334124 North

Transect Information

Browse Tag # (0' Stake)	484
Transect Bearing	239° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

From the junction near the fence at the top of North Dragon Creek above Joes Valley, take the middle road (FS Road #170). Proceed down the Black Dragon trail 0.5 miles to a gate. Pass through the gate, then continue driving down the canyon for 2.8 miles to a fork. Bear right across the creek and proceed 0.8 miles through a chaining and down into a dry creek bottom. Cross the dry creek bottom and continue across a seeded sage flat for 0.4 miles to where the road turns to the left towards a pinyon and juniper hill. There is a green fencepost on the right (west) side of the road: this is the witness post. From the witness post, the 0-foot baseline stake is 117 feet away at a bearing of 221 degrees magnetic, and is marked by tag #484.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	HORN MT
Elevation	7,030ft (2,143m)
Aspect	South
Slope	2%
Sample Dates	08/16/1994, 07/26/1999, 07/21/2004, 07/29/2009, 08/25/2014, 07/09/2019

Table 16C-23.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Terrace - Contour Trench	-	-	1965	-
Seeding - Seed Unknown	-	-	1965	-

Wildlife Habitat and Vegetation History

Table 16C-23.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Rocky Mountain Elk	substantial	winter	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing
Shiras Moose	crucial	winter	

Table 16C-23.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1988	Mountain Big Sagebrush	No Encroachment
1994	Mountain Big Sagebrush	No Encroachment
1999	Mountain Big Sagebrush	No Encroachment
2004	Mountain Big Sagebrush	Phase I
2009	Mountain Big Sagebrush	Phase I
2014	Mountain Big Sagebrush	Phase I
2019	Mountain Big Sagebrush	Phase I

Site Notes

The road to the site is designated for UTV/ATV only; in the future, a UTV should be used to access the site.

Soils

Table 16C-23.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	7.1	57.5	16.7	25.8	1.7	6.8	60.8	0.7	07/26/1999

Site Potential

1981 - 2010 Average Annual Precipitation	13 inches
NRCS Ecological Site	Upland Loam (Mountain Big Sagebrush-Indian Ricegrass)
NRCS Ecological Site #	R047XB308UT
States and Transitions	A defined state and transition model is available.

Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has contributed a majority of the preferred browse cover and has dominated this site since study establishment in 1988 (Table 16C-23.12, Table 16C-23.13, Photos): this state is likely similar to the Mountain Big Sagebrush-Steppe/Introduced Non-Natives State as presented by the available state and transition model (Jornada, 2019). The herbaceous understory has been dominated by perennial grasses, primarily the introduced species crested wheatgrass (*Agropyron cristatum*), throughout the study period. Annual grasses have not been present in any sample year, and forbs have remained rare (Table 16C-23.7, Table 16C-23.10, Table 16C-23.11). Twoneedle pinyon (*Pinus edulis*) has been observed since 2004, placing the study site in Phase I of woodland succession since that time (Table 16C-23.4, Table 16C-23.12, Table 16C-23.13). Further encroachment and progression through phases of woodland succession may be possible in future sample years, but the consistently low amount of trees over time indicates that this is likely not an immediate threat.

Trend Summary Tables

Table 16C-23.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	5.9	7.7	-	-	-	-
1999	7.9	10.2	-	-	-	-
2004	12.4	7.8	-	12.7	5.9	0.1
2009	12.2	5.9	-	12.7	3.1	-
2014	14.2	4.3	-	14.8	4.0	-
2019	17.4	9.2	-	16.5	7.6	-

Table 16C-23.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	-	383	6	90	-	12.9	0.0	0.4
1999	-	359	3	78	-	9.9	0.0	0.5
2004	-	305	70	187	-	10.7	0.2	1.6
2009	-	341	9	112	-	7.5	0.0	0.6
2014	-	324	9	65	-	17.6	0.0	0.3
2019	-	345	8	174	-	16.1	0.0	2.3

Table 16C-23.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	36.7	0.1	19.2	0.7	4.7	24.8
1999	40.1	0.1	17.2	7.5	0.8	27.0
2004	45.0	1.3	23.7	7.6	1.3	31.5
2009	41.9	0.7	24.6	8.3	0.3	27.3
2014	44.6	2.4	24.0	8.7	0.7	31.6
2019	38.3	3.4	40.1	11.0	1.0	40.5

Table 16C-23.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1994	4	38	29	36
1999	2	22	44	14
2004	2	23	41	31
2009	3	7	43	38
2014	-	11	21	1
2019	2	12	16	2
Year	Days Use Per Acre (ha)			
1994	-	-	-	-
1999	10.2 (25.1)	40.9 (101.0)	53.0 (130.8)	-
2004	10.9 (26.9)	17.4 (43.0)	50.2 (124.1)	-
2009	6.5 (16.1)	3.4 (8.3)	91.8 (226.8)	-
2014	1.5 (3.6)	13.4 (33.1)	50.2 (124.1)	-
2019	2.2 (5.4)	8.7 (21.5)	9.4 (23.2)	-

Table 16C-23.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bouteloua gracilis (blue grama)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Pseudoroegneria spicata (bluebunch wheatgrass)	Sporobolus cryptandrus (sand dropseed)	Thinopyrum intermedium[i] (intermediate wheatgrass)
year	Nested Frequency							
1994	82	275	35	33	86	6	1	5
1999	22	278	33	56	52	18	4	8
2004	31	261	31	12	35	2	1	8
2009	11	323	29	1	-	-	-	4
2014	7	323	4	-	1	1	-	-
2019	6	341	29	1	7	9	6	-
year	Average Cover (%)							
1994	1.2	7.9	0.9	0.3	2.3	0.2	0.0	0.0
1999	0.3	6.8	0.9	0.6	0.7	0.5	0.0	0.1
2004	0.2	9.4	0.6	0.0	0.2	0.1	0.0	0.1
2009	0.0	6.8	0.6	0.0	-	-	-	0.0
2014	0.0	17.5	0.0	-	0.0	0.0	-	-
2019	0.1	15.1	0.5	0.0	0.2	0.2	0.0	-

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16C-23.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Arabis (rockcress)	Astragalus calycosus (Torrey's milkvetch)	Astragalus purshii (woollypod milkvetch)	Calochortus nuttallii (sego lily)	Castilleja angustifolia (northwestern Indian paintbrush)	Chenopodium leptophyllum[a] (narrowleaf goosefoot)	Descurainia pinnata[a] (western tansymustard)	Erigeron pumilus (shaggy fleabane)	Lappula occidentalis[a] (flatspine stickseed)	Machaeranthera canescens (hoary tansyaster)	Microsteris gracilis[a] (slender phlox)	Phlox longifolia (longleaf phlox)	Sphaeralcea coccinea (scarlet globemallow)
year	Nested Frequency												
1994	-	2	-	-	-	6	-	-	-	4	-	52	45
1999	-	7	-	1	-	-	-	8	-	3	3	17	50
2004	4	28	-	-	-	59	0	4	8	7	4	151	67
2009	-	-	-	1	-	-	2	14	-	5	8	59	55
2014	-	4	5	-	-	-	5	3	4	-	-	43	28
2019	-	12	4	12	0	2	6	25	-	-	-	130	30
year	Average Cover (%)												
1994	-	0.0	-	-	-	0.0	-	-	-	0.0	-	0.1	0.2
1999	-	0.0	-	0.0	-	-	-	0.1	-	0.1	0.0	0.1	0.2
2004	0.0	0.1	-	-	-	0.2	0.0	0.0	0.0	0.0	0.0	0.8	0.7
2009	-	-	-	0.0	-	-	0.0	0.1	-	0.0	0.0	0.3	0.1
2014	-	0.0	0.0	-	-	-	0.0	0.0	0.0	-	-	0.2	0.1
2019	-	0.2	0.1	0.1	0.0	0.0	0.0	0.5	-	-	-	1.3	0.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16C-23.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Chrysothamnus depressus[p] (longflower rabbitbrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Krascheninnikovia lanata[p] (winterfat)	Opuntia (pricklypear)	Pinus edulis[t] (twoneedle pinyon)
year	Line Intercept Cover (%)					
1994	-	-	-	-	-	-
1999	-	-	-	-	-	-
2004	12.6	-	5.9	0.1	0	0.1
2009	12.6	-	3.1	0.1	0	0
2014	14.1	0.6	3.9	0.1	0.1	-
2019	16.4	-	7.5	0.1	0.1	-
year	Quadrat Cover (%)					
1994	5.8	-	7.6	0.1	0.0	-
1999	7.8	-	10.2	0.1	0.0	-
2004	12.1	-	7.7	0.3	0.0	0.0
2009	12.1	-	5.9	0.1	0.0	0.0
2014	12.8	1.1	4.3	0.3	0.0	-
2019	16.8	-	9.2	0.7	0.0	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16C-23.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1994	9040	-	28	56	16	19	1	7	24/47
1999	10180	320	54	31	15	18	74	4	28/57
2004	13380	22560	3	90	7	46	12	4	29/49
2009	15080	11040	35	48	17	15	50	37	23/47
2014	14420	660	35	55	11	16	49	10	22/52
2019	14440	-	34	54	12	30	29	11	24/49
Chrysothamnus depressus[p] -- (longflower rabbitbrush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	20	-	0	0	100	0	0	0	7/28
2014	1800	-	13	87	0	39	6	0	11/20
2019	20	-	0	100	0	0	0	0	6/9
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1994	18780	-	12	88	0	0	0	0	11/22
1999	19680	80	7	94	0	7	0	0	14/30
2004	13300	1320	1	97	2	0	0	2	13/24
2009	14420	280	18	70	13	0	0	13	9/25
2014	6440	40	8	90	2	2	36	2	11/22
2019	12420	-	9	91	0	2	0	0	14/26

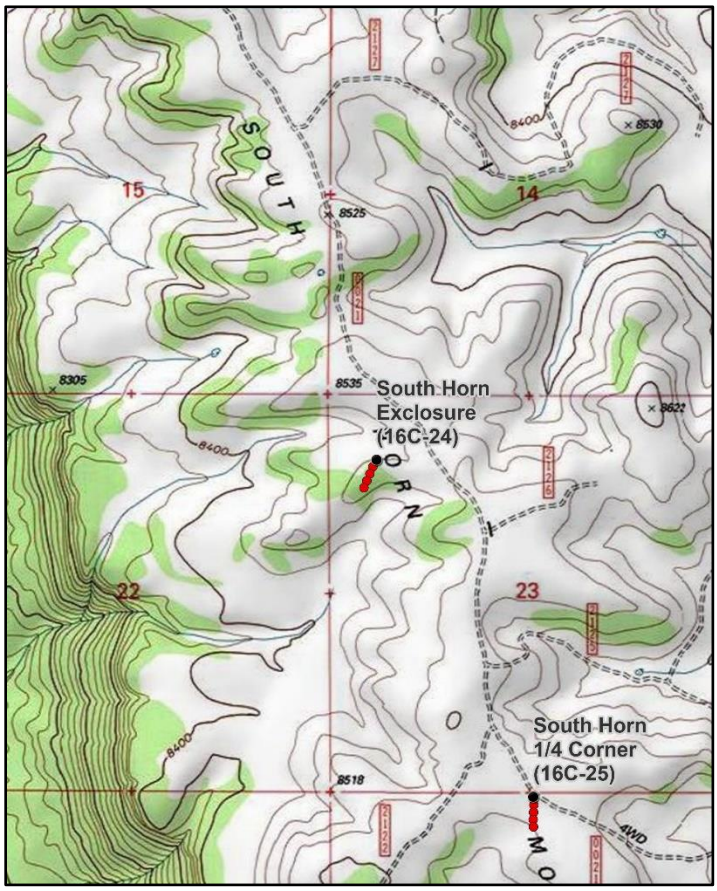
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Gutierrezia sarothrae -- (broom snakeweed)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	15/18
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	21/23
Krascheninnikovia lanata[p] -- (winterfat)									
1994	520	-	8	92	0	19	0	0	9/10
1999	620	-	3	97	0	74	13	3	17/16
2004	580	200	10	90	0	7	83	0	17/19
2009	580	-	7	86	7	26	44	4	11/13
2014	440	-	5	96	0	27	9	0	14/16
2019	440	-	5	96	0	14	0	5	22/21
Opuntia -- (pricklypear)									
1994	140	-	0	100	0	0	0	0	7/16
1999	300	-	13	80	7	0	0	7	8/54
2004	280	20	21	71	7	0	0	7	5/23
2009	300	-	27	60	13	0	0	20	7/28
2014	160	-	25	75	0	0	0	0	8/16
2019	100	-	0	100	0	0	0	0	9/17
Pinus edulis[t] -- (twoneedle pinyon)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	20	0	0	0	0	0	0	- / -
2009	20	-	100	0	0	0	0	100	- / -
2014	20	-	100	0	0	100	0	100	- / -
2019	20	-	100	0	0	0	0	100	- / -
Sclerocactus -- (fishhook cactus)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	20	-	0	100	0	0	0	0	- / -

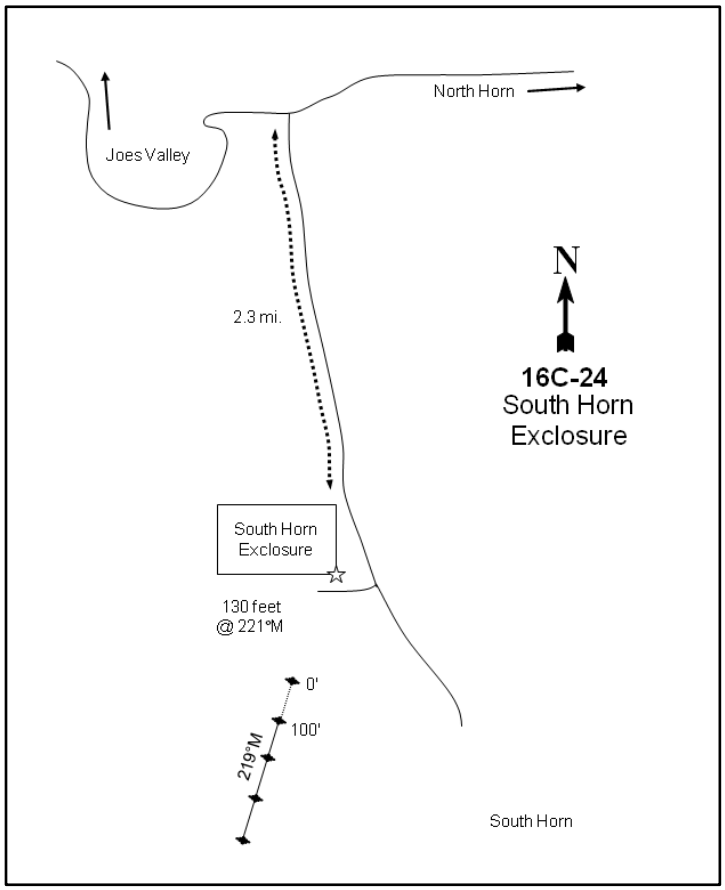
t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16C-23.15 – Deer Desirable Components Index: Mid Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1994	7.4	10.3	14.0	25.9	0.0	0.8	0.0	58.3	Fair
1999	9.8	10.4	15.0	19.8	0.0	0.9	0.0	56.0	Fair
2004	15.9	12.9	1.7	21.4	0.0	3.2	0.0	55.1	Fair
2009	15.9	9.9	15.0	14.9	0.0	1.1	0.0	56.8	Fair
2014	18.5	11.9	15.0	30.0	0.0	0.7	0.0	76.1	Good
2019	20.6	11.4	15.0	30.0	0.0	4.6	0.0	81.6	Good-Excellent

SOUTH HORN EXCLOSURE - STUDY NO. 16C-24





Location Information

USGS 7.5 min Map Info	The Cap SW; Township 19S, Range 6E, Section 23
GPS (0' Stake)	NAD 83 UTM ZONE 12, 480700 East 4334410 North

Transect Information

Browse Tag # (0' Stake)	9010
Transect Bearing	206° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Belt 2: No Rebar

Directions to Site

From the intersection of the North Horn and South Horn roads, turn right (south) onto the South Horn road (Forest Service Road #21). Proceed 2.3 miles to the northeast corner of an exclosure, then continue 0.2 miles past the exclosure to a faint road. Turn right onto this faint road and travel for 0.15 miles to the southeast corner of the exclosure. The 0-foot baseline stake is approximately 130 feet southwest of the southeast corner of the exclosure at 221 degrees magnetic.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	HORN MT
Elevation	8,530ft (2,600m)
Aspect	Northwest
Slope	5%
Sample Dates	08/10/1994, 07/29/1999, 07/29/2004, 07/29/2009, 07/16/2014, 07/02/2019

Table 16C-24.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Mechanical - Bullhog	South Horn Wildlife Habitat Improvement Project	4036	June 2017-April 2018	608

Wildlife Habitat and Vegetation History

Table 16C-24.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Rocky Mountain Elk	substantial	winter	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing
Shiras Moose	crucial	winter	

Table 16C-24.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1988	Mixed Mountain Brush/Pinyon	Phase II
1994	Mixed Mountain Brush/Pinyon	Phase II
1999	Mixed Mountain Brush/Pinyon	Phase II
2004	Mixed Mountain Brush/Pinyon	Phase II
2009	Mixed Mountain Brush/Pinyon	Phase II
2014	Mixed Mountain Brush/Pinyon	Phase II
2019	Mixed Mountain Brush/Pinyon	Phase II

Site Notes

Cattle were being driven through the area north of the study site in 2014.

Soils

Table 16C-24.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Loam	6.8	76.7	11.4	11.9	0.8	4.2	32.0	0.5	07/29/1999

Site Potential

1981 - 2010 Average Annual Precipitation	21 inches
NRCS Ecological Site	Mountain Loam (Browse)
NRCS Ecological Site #	R047XB420UT
States and Transitions	No state and transition model is available for this ecological site.

Since study establishment in 1988, the browse component of this site has been composed of a mixture of mountain brush species, including (but not limited to) mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), alderleaf mountain mahogany (*Cercocarpus montanus*), and Utah serviceberry (*Amelanchier utahensis*) (Table 16C-24.12, Table 16C-24.13). The herbaceous understory has remained stable with diverse grass and forb components, and cover has generally remained moderate (Table 16C-24.7, Table 16C-24.10, Table 16C-24.11). Twoneedle pinyon (*Pinus edulis*) has been present and has been a co-dominant vegetation component in all sample years; Utah juniper (*Juniperus osteosperma*) and Rocky Mountain juniper (*J. scopulorum*) have also been observed (Table 16C-24.12, Table 16C-24.14, Photos). A bullhog treatment in 2017-2018 removed some of the trees (Table 16C-24.1), but the site has remained within Phase II of woodland succession throughout the study period (Table 16C-24.4). This persistent tree component indicates that without further treatment, this site may be at risk for infilling in future sample years.

Trend Summary Tables

Table 16C-24.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	12.2	0.5	1.6	-	-	-
1999	19.6	1.3	2.7	0.6	-	1.5
2004	14.8	1.2	0.8	23.8	3.5	20.2
2009	15.3	1.3	1.8	22.4	2.2	24.4
2014	17.4	0.9	4.7	24.7	2.6	26.6
2019	14.1	2.0	5.8	13.5	3.0	18.9

Table 16C-24.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	-	221	106	158	-	3.3	0.3	2.1
1999	-	217	82	189	-	5.0	0.3	3.1
2004	-	115	258	145	-	1.8	2.7	2.0
2009	1	153	125	122	0.0	4.5	0.5	1.4
2014	-	176	194	176	-	3.9	1.0	2.8
2019	-	150	348	166	-	4.5	8.3	3.6

Table 16C-24.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	22.7	0.5	61.1	0.1	0.4	20.4
1999	17.2	0.5	62.5	0.7	0.9	31.5
2004	25.1	2.3	62.1	0.7	0.7	21.9
2009	22.6	1.7	62.0	0.6	0.8	24.8
2014	21.8	0.6	66.2	0.5	0.7	27.6
2019	23.8	1.6	65.6	0.4	0.6	32.0

Table 16C-24.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1994	1	23	30	52
1999	-	26	13	55
2004	-	14	16	22
2009	1	16	9	58
2014	1	7	-	14
2019	2	9	-	13
Year	Days Use Per Acre (ha)			
1994	-	-	-	-
1999	2.9 (7.2)	31.5 (77.8)	32.8 (81.1)	-
2004	5.1 (12.6)	22.8 (56.3)	29.5 (72.8)	-
2009	8.0 (19.7)	35.5 (87.7)	16.8 (41.4)	-
2014	1.5 (3.6)	6.7 (16.6)	2.7 (6.6)	-
2019	8.7 (21.5)	3.4 (8.3)	2.7 (6.6)	-

Table 16C-24.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Achnatherum lettermanii (Letterman's needlegrass)	Bromus tectorum[ai] (cheatgrass)	Carex (sedge)	Elymus elymoides (squirreltail)	Elymus lanceolatus (thickspike wheatgrass)	Festuca idahoensis (Idaho fescue)	Hesperostipa comata (needle and thread)	Koeleria macrantha (prairie Junegrass)	Leymus salinus (saline wildrye)	Pascopyrum smithii (western wheatgrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium[i] (intermediate wheatgrass)
year	Nested Frequency														
1994	17	-	-	14	7	-	35	28	39	75	2	41	34	-	9
1999	22	10	-	23	-	-	3	5	6	46	92	64	14	-	3
2004	16	3	-	2	7	-	2	8	3	21	18	43	9	-	-
2009	28	-	1	5	4	-	-	15	-	40	38	37	13	-	-
2014	13	-	-	15	7	-	-	29	-	51	35	29	30	2	-
2019	36	1	-	9	16	4	-	13	-	33	37	14	24	-	0
year	Average Cover (%)														
1994	0.4	-	-	0.1	0.0	-	0.4	0.5	0.3	0.7	0.0	0.3	0.5	-	0.0
1999	0.8	0.1	-	0.8	-	-	0.0	0.0	0.1	1.6	0.5	0.8	0.2	-	0.0
2004	0.1	0.0	-	0.0	0.0	-	0.0	0.1	0.0	0.3	0.1	0.8	0.2	-	-
2009	0.7	-	0.0	0.1	0.0	-	-	0.4	-	2.0	0.1	1.2	0.1	-	-
2014	0.2	-	-	0.6	0.2	-	-	0.6	-	0.9	0.2	0.7	0.4	0.0	-
2019	1.1	0.0	-	0.0	0.1	0.1	-	0.5	-	0.8	1.0	0.3	0.5	-	0.0

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16C-24.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Androsace septentrionalis[a] (pygmyflower rockjasmine)	Arabis (rockcress)	Calochortus nuttallii (sego lily)	Chenopodium album[a] (lambsquarters)	Chenopodium fremontii[a] (Fremont's goosefoot)	Chenopodium leptophyllum[a] (narrowleaf goosefoot)	Collinsia parviflora[a] (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawksbeard)	Cryptantha (cryptantha)	Cryptantha[a] (annual cryptantha)	Delphinium nuttallianum (twolobe larkspur)	Descurainia pinnata[a] (western tansymustard)	Draba[a] (draba)	Erigeron (fleabane)	Erigeron eatonii (Eaton's fleabane)	Erigeron pumilus (shaggy fleabane)
year	Nested Frequency																
1994	-	67	-	-	6	-	15	25	6	11	-	-	-	-	6	52	-
1999	50	61	-	-	-	-	10	21	16	17	-	-	-	-	-	43	-
2004	0	49	-	38	-	-	151	33	1	35	-	-	-	-	-	25	2
2009	-	25	-	17	3	5	71	37	1	2	-	-	-	-	-	19	12
2014	70	68	-	-	-	-	88	27	11	13	-	-	20	-	-	12	3
2019	13	17	2	-	53	32	227	31	6	9	18	6	5	3	-	20	15
year	Average Cover (%)																
1994	-	0.3	-	-	0.0	-	0.1	0.5	0.0	0.2	-	-	-	-	0.0	0.4	-
1999	0.2	0.3	-	-	-	-	0.0	0.6	0.1	0.3	-	-	-	-	-	0.2	-
2004	0.0	0.2	-	0.1	-	-	1.5	0.2	0.0	0.2	-	-	-	-	-	0.1	0.0
2009	-	0.1	-	0.1	0.0	0.0	0.2	0.4	0.0	0.1	-	-	-	-	-	0.1	0.1
2014	0.2	0.3	-	-	-	-	0.3	0.5	0.1	0.2	-	-	0.1	-	-	0.1	0.0
2019	0.0	0.1	0.0	-	0.6	0.1	4.5	0.8	0.1	0.4	0.3	0.1	0.0	0.0	-	0.2	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Eriogonum alatum (winged buckwheat)	Eriogonum cernuum[a] (nodding buckwheat)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Gayophytum ramosissimum[a] (pinyon groundsmoke)	Heterotheca villosa (hairy false goldenaster)	Ipomopsis aggregata (scarlet gilia)	Lappula occidentalis[a] (flatspine stickseed)	Lupinus (lupine)	Machaeranthera canescens (hoary tansyaster)	Oenothera (evening primrose)	Packera multilobata (lobeleaf groundsel)	Penstemon (beardtongue)	Penstemon comarrhenus (dusty beardtongue)	Penstemon humilis (low beardtongue)	Penstemon watsonii (Watson's penstemon)	Phlox austromontana (mountain phlox)
year	Nested Frequency																
1994	22	6	-	1	9	-	-	-	-	2	-	4	-	-	2	-	9
1999	16	2	-	1	-	5	-	6	-	0	-	31	-	-	6	5	13
2004	4	-	-	2	4	7	-	33	-	-	9	10	7	-	-	-	15
2009	15	-	5	2	17	6	-	3	-	3	-	4	8	-	1	-	9
2014	-	-	-	4	-	11	-	61	3	19	13	10	-	5	3	2	11
2019	4	-	3	2	109	5	3	105	-	3	-	28	-	9	9	4	12
year	Average Cover (%)																
1994	0.3	0.0	-	0.0	0.1	-	-	-	-	0.0	-	0.0	-	-	0.0	-	0.2
1999	0.3	0.0	-	0.0	-	0.2	-	0.0	-	0.0	-	0.2	-	-	0.0	0.1	0.2
2004	0.2	-	-	0.0	0.0	0.1	-	0.7	-	-	0.3	0.1	0.0	-	-	-	0.3
2009	0.1	-	0.0	0.1	0.1	0.2	-	0.0	-	0.0	-	0.0	0.0	-	0.0	-	0.1
2014	-	-	-	0.0	-	0.1	-	0.2	0.0	0.2	0.1	0.1	-	0.1	0.0	0.1	0.5
2019	0.2	-	0.1	0.1	1.2	0.2	0.0	0.5	-	0.0	-	0.1	-	0.1	0.0	0.0	0.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Polygonum douglasii[a] (Douglas' knotweed)	Potentilla (cinquefoil)	Schoenocrambe linifolia (flaxleaf plainsmustard)	Silene drummondii (Drummond's campion)	Sphaeralcea coccinea (scarlet globemallow)	Townsendia (Townsend daisy)
year	Nested Frequency					
1994	91	3	15	-	5	2
1999	24	-	48	-	9	-
2004	167	1	21	-	-	-
2009	43	-	38	-	-	-
2014	87	-	58	2	-	-
2019	159	-	32	37	-	-
year	Average Cover (%)					
1994	0.1	0.0	0.1	-	0.0	0.0
1999	0.0	-	0.4	-	0.0	-
2004	0.4	0.0	0.1	-	-	-
2009	0.1	-	0.1	-	-	-
2014	0.2	-	0.3	0.0	-	-
2019	1.1	-	0.4	0.5	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16C-24.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis[p] (Utah serviceberry)	Artemisia nova[p] (black sagebrush)	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Bassia prostrata[pi] (forage kochia)	Cercocarpus ledifolius[p] (curl-leaf mountain mahogany)	Cercocarpus montanus[p] (alderleaf mountain mahogany)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus scopulorum[t] (Rocky Mountain juniper)	Linanthus pungens (granite prickly phlox)	Mahonia repens (creeping barberry)	Opuntia fragilis (brittle prickypear)	Pinus edulis[t] (twoneedle pinyon)	Purshia tridentata[p] (antelope bitterbrush)	Symphoricarpos oreophilus[p] (mountain snowberry)
year	Line Intercept Cover (%)														
1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2004	3	-	8.8	-	2.3	7.7	2.8	0.1	3	0.3	-	0.3	17.2	0.3	1.7
2009	4.6	-	9.9	-	2.1	5	1.9	-	4.1	0.2	-	0.1	20.3	0.3	0.5
2014	5.5	-	10.6	-	2.2	5.1	1.7	-	6.3	0.4	0.2	0.3	20.3	0.3	1
2019	0.3	0	8	-	1.7	1.7	2.4	0.3	3.2	0.1	0.1	0.1	15.7	0.3	1.5
year	Quadrat Cover (%)														
1994	2.3	-	5.1	-	-	4.2	0.3	0.0	0.1	0.1	-	0.1	1.5	-	0.6
1999	1.8	-	11.0	-	0.5	4.5	0.2	0.2	0.0	0.5	-	0.3	2.7	-	1.7
2004	2.0	-	7.1	-	0.2	4.1	0.7	0.0	0.0	0.1	0.1	0.3	0.8	0.0	1.3
2009	2.3	-	9.0	-	0.6	3.1	0.9	-	1.0	0.1	0.0	0.2	0.8	0.0	0.4
2014	1.2	-	11.2	0.0	0.6	3.2	0.4	0.2	2.8	0.2	0.2	0.1	1.9	0.0	1.3
2019	0.2	0.1	9.4	0.6	1.1	0.9	0.9	0.4	0.0	0.3	0.2	0.2	5.8	0.0	1.7

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16C-24.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
1994	40	-	0	50	50	0	0	0	193/220
1999	120	480	17	67	17	50	17	17	223/220
2004	200	-	50	40	10	0	50	10	176/176
2009	220	80	18	82	0	9	46	0	217/251
2014	80	-	25	75	0	25	0	0	189/176
2019	40	420	50	50	0	0	0	0	111/129
Artemisia nova[p] -- (black sagebrush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	32/97
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	140	-	57	43	0	0	0	0	22/52
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1994	1840	20	2	59	39	3	0	11	47/69
1999	2540	160	14	80	6	33	0	5	58/84
2004	1680	20	7	66	27	29	7	19	45/70
2009	1920	140	19	47	34	28	12	21	46/80
2014	2060	100	12	74	15	36	9	15	47/75
2019	1400	1600	14	57	29	10	14	29	51/83

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Cercocarpus ledifolius[p] -- (curl-leaf mountain mahogany)									
1994	80	-	75	0	25	50	25	0	104/74
1999	100	-	40	60	0	20	20	0	38/51
2004	100	-	60	20	20	0	80	0	79/83
2009	40	-	0	50	50	0	100	0	102/105
2014	100	-	60	20	20	60	40	40	51/64
2019	60	-	0	33	67	33	67	67	83/104
Cercocarpus montanus[p] -- (alderleaf mountain mahogany)									
1994	220	-	0	91	9	46	0	0	144/161
1999	320	40	0	75	25	50	50	6	141/155
2004	340	-	0	100	0	0	71	0	140/155
2009	280	-	0	93	7	7	71	7	130/148
2014	260	220	0	92	8	46	8	8	136/147
2019	680	960	88	6	6	6	18	6	105/105
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1994	640	-	0	94	6	6	3	16	24/33
1999	580	-	14	86	0	0	0	0	28/36
2004	1020	-	2	94	4	4	4	4	27/40
2009	1740	-	2	93	5	0	0	8	25/34
2014	1020	-	0	98	2	0	0	2	30/38
2019	820	-	2	98	0	0	22	0	27/36
Gutierrezia sarothrae -- (broom snakeweed)									
1994	400	60	30	55	15	0	0	0	12/13
1999	380	-	0	100	0	0	0	0	17/20
2004	660	-	12	88	0	0	0	0	16/22
2009	-	-	-	-	-	-	-	-	-/-
2014	500	-	36	64	0	0	0	0	15/19
2019	1220	-	0	100	0	0	0	0	15/18
Juniperus scopulorum[t] -- (Rocky Mountain juniper)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	20	-	0	100	0	0	0	0	- / -
2019	-	-	-	-	-	-	-	-	-/-
Krascheninnikovia lanata[p] -- (winterfat)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	20	-	0	100	0	0	100	0	14/36
Linanthus pungens -- (granite prickly phlox)									
1994	620	-	13	87	0	0	0	0	12/18
1999	640	-	0	100	0	0	0	0	10/10
2004	520	-	0	100	0	0	0	0	16/21
2009	760	-	0	100	0	0	0	0	11/17
2014	900	-	0	100	0	0	0	0	14/18
2019	780	20	3	97	0	0	0	0	13/19

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Mahonia repens -- (creeping barberry)									
1994	-	-	-	-	-	-	-	-	7/14
1999	-	-	-	-	-	-	-	-	-/-
2004	160	-	100	0	0	0	0	0	6/14
2009	-	-	-	-	-	-	-	-	7/9
2014	320	-	0	100	0	0	0	0	6/13
2019	340	-	0	100	0	0	0	0	8/17
Opuntia fragilis -- (brittle pricklypear)									
1994	180	-	22	78	0	0	0	0	5/12
1999	480	40	17	83	0	0	0	0	6/14
2004	780	-	3	97	0	0	0	0	7/23
2009	820	-	17	81	2	0	0	7	7/26
2014	540	-	11	78	11	0	0	11	8/28
2019	500	-	8	88	4	0	0	4	6/26
Pinus edulis[t] -- (twoneedle pinyon)									
1994	-	-	-	-	-	-	-	-	-/-
1999	20	40	0	100	0	0	0	0	- / -
2004	20	20	0	100	0	0	0	0	- / -
2009	40	20	0	100	0	0	0	0	- / -
2014	60	20	33	67	0	0	0	0	- / -
2019	20	20	100	0	0	0	0	0	- / -
Purshia stansburiana[p] -- (Stansbury cliffrose)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	60/108
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Purshia tridentata[p] -- (antelope bitterbrush)									
1994	80	-	0	100	0	75	0	0	22/40
1999	80	-	25	75	0	0	100	0	42/63
2004	60	-	0	100	0	0	0	0	33/56
2009	80	-	75	25	0	100	0	0	51/121
2014	80	-	0	100	0	0	100	0	37/51
2019	40	-	0	100	0	100	0	0	38/66
Sambucus racemosa[p] -- (red elderberry)									
1994	-	-	-	-	-	-	-	-	53/125
1999	-	-	-	-	-	-	-	-	83/133
2004	-	-	-	-	-	-	-	-	104/168
2009	-	-	-	-	-	-	-	-	56/136
2014	-	-	-	-	-	-	-	-	47/110
2019	-	-	-	-	-	-	-	-	70/125
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
1994	500	-	4	96	0	12	0	0	26/58
1999	860	60	70	30	0	0	0	0	39/63
2004	760	-	32	68	0	11	0	0	26/62
2009	980	-	6	86	8	0	8	8	28/51
2014	580	-	21	79	0	0	0	0	33/60
2019	920	-	26	70	4	13	2	7	29/53

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Tetradymia canescens -- (spineless horsebrush)									
1994	20	-	0	100	0	0	0	0	26/30
1999	-	-	-	-	-	-	-	-	18/60
2004	40	-	0	100	0	0	0	0	18/36
2009	-	-	-	-	-	-	-	-	15/18
2014	20	-	0	100	0	100	0	0	23/31
2019	-	-	-	-	-	-	-	-	40/86

t - Tree Species; p - Preferred Browse; i - Introduced Species

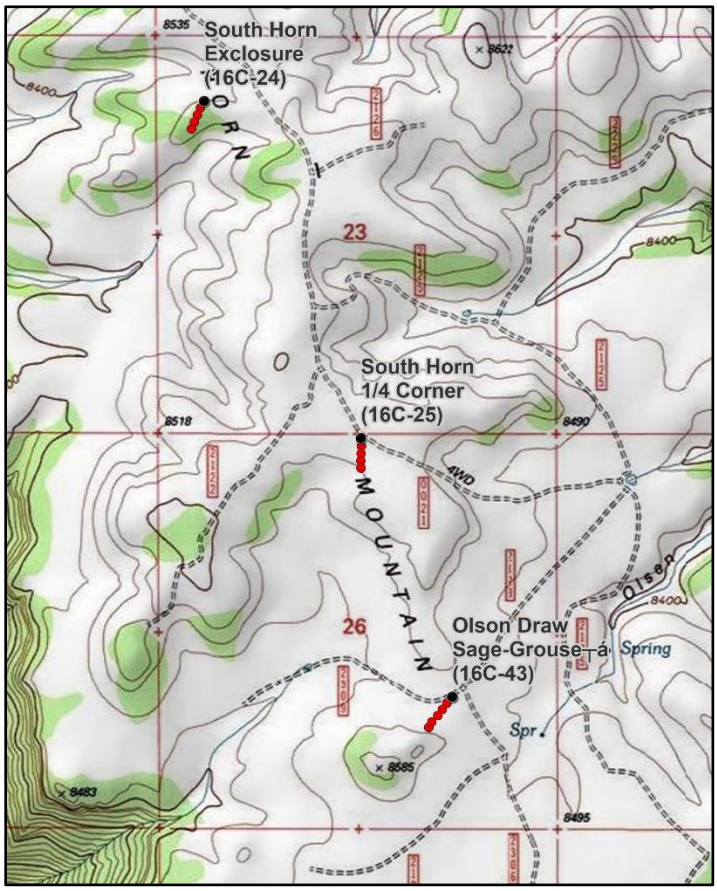
Table 16C-24.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

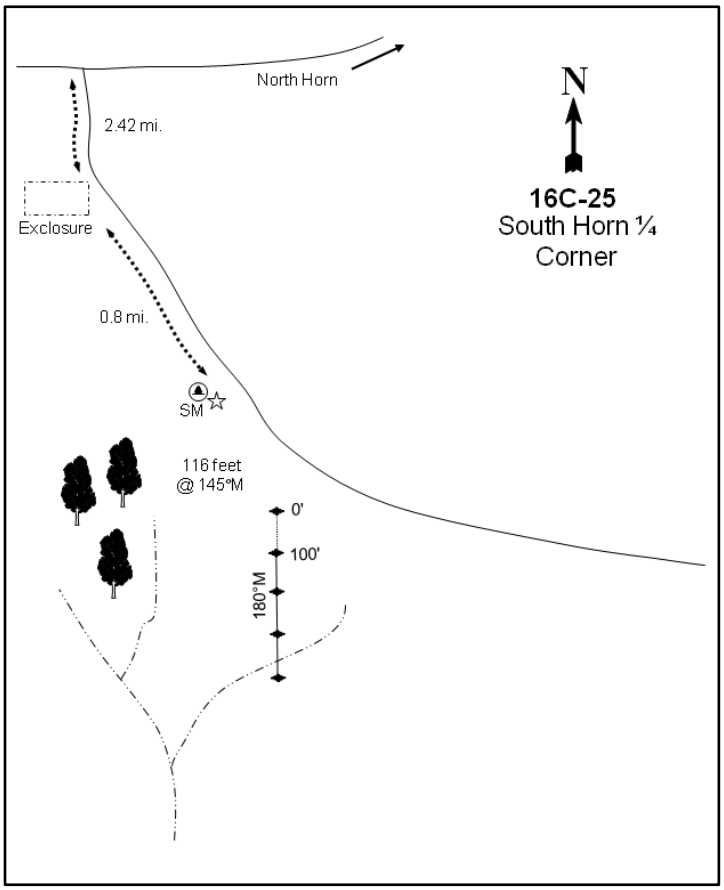
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1994	9	-	-	-	-	-	69.9
2009	18	-	9	18	18	55	42.1
Juniperus scopulorum (Rocky Mountain juniper)							
1994	2	-	-	-	-	-	21.5
1999	16	-	-	-	-	-	39.6
2014	21	-	-	10	10	80	52.5
2019	10	-	14	-	-	86	60.0
Pinus edulis (twoneedle pinyon)							
1994	26	-	-	-	-	-	29.2
1999	27	-	-	-	-	-	34.9
2004	25	-	9	-	36	55	36.3
2009	23	-	-	9	36	55	34.2
2014	26	8	-	-	15	77	39.0
2019	13	14	-	-	-	86	47.6

Table 16C-24.15 – Deer Desirable Components Index: High Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1994	16.8	6.3	0.6	6.7	0.0	4.2	0.0	34.5	Very Poor
1999	25.7	11.7	8.4	10.0	0.0	6.3	0.0	62.1	Fair
2004	30.0	11.0	8.5	3.7	0.0	4.0	0.0	57.1	Fair
2009	30.0	8.5	6.6	9.1	0.0	2.7	0.0	56.9	Poor-Fair
2014	30.0	12.1	8.4	7.8	0.0	5.5	0.0	63.8	Fair
2019	17.5	7.0	11.8	9.0	0.0	7.1	0.0	52.5	Poor

SOUTH HORN 1/4 CORNER - STUDY NO. 16C-25





Location Information

USGS 7.5 min Map Info	The Cap SW; Township 19S, Range 6E, Section 26
GPS (0' Stake)	NAD 83 UTM ZONE 12, 481335 East 4333044 North

Transect Information

Browse Tag # (0' Stake)	9011
Transect Bearing	180° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

From the South Horn exclosure (by study #16C-24), continue south on the main USGS road for 0.8 miles. On the right (west) side of the road will be a USGS landline marker by a tall red fencepost: this is the witness post for the transect. From the witness post, walk for 116 feet at 145 degrees magnetic to the 0-foot end of the baseline. The 18-inch tall green fencepost is marked by browse tag #9011.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	HORN MT
Elevation	8,570ft (2,612m)
Aspect	Southwest
Slope	5-8%
Sample Dates	08/10/1994, 07/29/1999, 07/29/2004, 07/27/2009, 07/16/2014, 07/02/2019

Wildlife Habitat and Vegetation History

Table 16C-25.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Rocky Mountain Elk	substantial	winter	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing
Shiras Moose	crucial	winter	

Table 16C-25.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1988	Mountain Big Sagebrush	No Encroachment
1994	Mountain Big Sagebrush	No Encroachment
1999	Mountain Big Sagebrush	No Encroachment
2004	Mountain Big Sagebrush	No Encroachment
2009	Mountain Big Sagebrush	No Encroachment
2014	Mountain Big Sagebrush	No Encroachment
2019	Mountain Big Sagebrush	No Encroachment

Site Notes

No Notes

Soils

Table 16C-25.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Loam	6.8	57.5	28.7	13.8	1.3	2.5	115.2	0.5	07/29/1999

Site Potential

1981 - 2010 Average Annual Precipitation	21 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XB430UT
States and Transitions	No state and transition model is available for this ecological site.

The plant community on this site has remained in a stable mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) state since study establishment in 1988; a diverse component of other shrubs have also been present, but have provided less cover (Table 16C-25.12, Table 16C-25.13, Photos). The herbaceous understory has remained abundant and diverse, with native perennial grasses contributing a majority of the cover throughout the study period; perennial forbs were co-dominant understory components in 1999 and 2019. Annual grasses have not been observed in any sample year (Table 16C-25.7, Table 16C-25.10, Table 16C-25.11). Barring a major disturbance or changes in management, this site will likely remain in this or a similar state in future sample years.

Trend Summary Tables

Table 16C-25.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	9.9	1.3	-	-	-	-
1999	10.5	1.6	-	-	-	-
2004	11.2	3.5	-	12.6	3.3	-
2009	10.2	1.9	-	11.9	2.1	-
2014	11.9	1.2	-	10.1	1.5	-
2019	17.0	2.4	-	19.2	1.6	-

Table 16C-25.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	-	368	27	262	-	8.5	0.1	4.9
1999	-	356	19	282	-	12.0	0.1	13.1
2004	-	314	203	231	-	10.3	0.8	5.8
2009	-	377	26	224	-	10.0	0.1	5.3
2014	-	373	10	253	-	17.4	0.0	7.4
2019	-	373	364	316	-	15.6	6.6	13.9

Table 16C-25.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	37.9	2.6	33.6	0.4	0.4	25.4
1999	33.1	3.8	23.9	1.6	3.5	32.4
2004	41.3	2.8	32.0	3.0	2.2	30.9
2009	40.0	1.5	35.3	1.0	2.6	28.2
2014	46.1	1.3	28.6	2.1	2.5	32.2
2019	43.7	2.1	34.6	1.6	2.5	44.7

Table 16C-25.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Greater Sage-Grouse	Rabbit
	Quadrat Frequency				
1994	-	6	38	-	23
1999	3	19	34	-	14
2004	4	4	48	-	4
2009	10	3	59	-	29
2014	5	3	20	1	2
2019	11	7	12	1	12
Year	Days Use Per Acre (ha)				
1994	-	-	-	-	-
1999	2.9 (7.2)	8.7 (21.5)	71.1 (175.5)	-	-
2004	8.7 (21.5)	4.7 (11.6)	85.8 (211.9)	-	-
2009	-	7.4 (18.2)	26.2 (64.6)	-	-
2014	-	2.0 (5.0)	14.1 (34.8)	-	-
2019	21.8 (53.8)	3.4 (8.3)	11.4 (28.1)	34.9 (86.1)*	-

*Pellets per acre (ha)

Table 16C-25.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Achnatherum pinetorum (pine needlegrass)	Bouteloua gracilis (blue grama)	Carex (sedge)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Koeleria macrantha (prairie Junegrass)	Leymus salinus (saline wildrye)	Pascopyrum smithii (western wheatgrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency											
1994	2	-	28	-	47	127	70	9	-	208	221	-
1999	3	-	16	15	59	57	40	27	5	213	147	-
2004	9	-	13	-	55	143	19	15	45	127	103	7
2009	-	-	8	-	4	166	-	28	72	133	226	1
2014	3	3	18	4	35	158	14	19	77	131	230	2
2019	20	11	42	4	61	139	44	24	75	106	160	4
year	Average Cover (%)											
1994	0.0	-	0.4	-	0.2	2.1	0.4	0.3	-	3.3	1.8	-
1999	0.2	-	0.4	0.4	0.6	1.0	1.0	0.5	0.0	6.5	1.4	-
2004	0.2	-	0.1	-	0.5	4.6	0.1	0.1	0.3	2.0	2.1	0.2
2009	-	-	0.0	-	0.0	3.2	-	0.3	0.3	1.8	4.3	0.0
2014	0.2	0.0	0.4	0.0	0.6	4.4	0.2	0.4	0.5	3.6	7.1	0.0
2019	0.3	0.1	0.5	0.0	1.2	4.9	0.8	0.8	0.4	1.8	4.7	0.0

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16C-25.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Allium (onion)	Antennaria (pussytoes)	Arabis (rockcress)	Astragalus (milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Calochortus nuttallii (sego lily)	Camissonia[a] (suncup)	Castilleja angustifolia (northwestern Indian paintbrush)	Castilleja linariifolia (Wyoming Indian paintbrush)	Chaetopappa ericoides (rose heath)	Chenopodium[a] (goosefoot)	Chorispora tenella[ai] (crossflower)	Cirsium calcareum[a] (Cainville thistle)	Collinsia parviflora[a] (maiden blue eyed Mary)	Collomia linearis[a] (tiny trumpet)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawksbeard)
year	Nested Frequency																
1994	-	-	12	5	6	-	-	38	6	-	-	-	-	-	-	-	57
1999	-	-	20	5	7	-	-	-	23	-	-	-	1	-	-	-	68
2004	0	3	18	-	8	-	-	-	2	-	6	-	-	-	143	-	69
2009	-	-	1	-	3	-	-	-	7	-	4	-	-	5	9	9	20
2014	1	-	9	-	-	-	-	14	18	1	-	-	-	2	-	-	81
2019	-	23	48	-	6	20	272	37	5	-	15	21	-	84	-	-	124
year	Average Cover (%)																
1994	-	-	0.0	0.0	0.2	-	-	0.2	0.0	-	-	-	-	-	-	-	0.3
1999	-	-	0.0	0.0	0.2	-	-	-	0.6	-	-	-	0.0	-	-	-	2.3
2004	0.0	0.0	0.1	-	0.0	-	-	-	0.0	-	0.0	-	-	-	0.4	-	1.1
2009	-	-	0.0	-	0.0	-	-	-	0.0	-	0.0	-	-	0.0	0.1	0.1	0.2
2014	0.0	-	0.0	-	-	-	-	0.1	0.3	0.0	-	-	-	0.0	-	-	1.3
2019	-	0.2	0.3	-	0.5	0.2	3.2	0.2	0.1	-	0.0	0.1	-	0.5	-	-	4.3

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Cryptantha (cryptantha)	Cymopterus (springparsley)	Delphinium nuttallianum (twolobe larkspur)	Draba[a] (draba)	Erigeron eatonii (Eaton's fleabane)	Erigeron pumilus (shaggy fleabane)	Eriogonum alatum (winged buckwheat)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Gayophytum ramosissimum[a] (pinyon groundsmoke)	Gilia inconspicua[a] (shy gilia)	Heterotheca villosa (hairy false goldenaster)	Hymenoxys richardsonii (pingue rubberweed)	Ipomopsis aggregata (scarlet gilia)	Lappula occidentalis[a] (flatspine stickseed)	Lithospermum ruderale (western stoneseed)	Lupinus (lupine)
year	Nested Frequency																
1994	8	-	9	3	123	49	16	43	15	-	6	3	-	-	-	1	-
1999	1	-	-	-	133	11	18	33	28	-	4	37	-	-	-	2	-
2004	24	-	-	-	36	12	18	28	11	-	-	32	-	-	4	3	2
2009	33	-	-	-	29	19	23	30	40	-	-	28	-	-	-	-	4
2014	15	-	-	-	35	36	32	20	61	-	-	28	3	2	5	3	3
2019	9	3	1	6	9	63	24	39	15	191	-	27	5	-	28	-	1
year	Average Cover (%)																
1994	0.0	-	0.0	0.0	0.8	0.2	0.1	0.2	0.4	-	0.0	0.1	-	-	-	0.0	-
1999	0.0	-	-	-	1.8	0.1	0.2	0.8	0.6	-	0.0	1.7	-	-	-	0.0	-
2004	0.2	-	-	-	0.2	0.1	0.3	0.5	0.4	-	-	0.8	-	-	0.0	0.0	0.0
2009	0.3	-	-	-	0.2	0.1	0.2	0.2	0.5	-	-	1.0	-	-	-	-	0.1
2014	0.2	-	-	-	0.2	0.5	0.7	0.2	0.6	-	-	1.4	0.0	0.0	0.0	0.0	0.0
2019	0.1	0.0	0.0	0.0	0.1	0.9	0.3	0.7	0.1	2.3	-	1.1	0.0	-	0.1	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Lygodesmia (skeletonplant)	Machaeranthera canescens (hoary tansyaster)	Machaeranthera grindelioides (rayless tansyaster)	Oxytropis lambertii (purple locoweed)	Packera multilobata (lobeleaf groundsel)	Penstemon comarrhenus (dusty beardtongue)	Penstemon humilis (low beardtongue)	Penstemon watsonii (Watson's penstemon)	Phlox austromontana (mountain phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii[a] (Douglas' knotweed)	Potentilla gracilis (slender cinquefoil)	Schoenocrambe linifolia (flaxleaf plainsmustard)	Sedum lanceolatum (spearleaf stonecrop)	Senecio integerrimus[a] (lambstongue ragwort)	Silene drummondii (Drummond's campion)	Symphyotrichum (aster)
year	Nested Frequency																
1994	-	-	28	-	17	-	40	-	78	1	12	-	-	-	6	-	-
1999	-	-	11	-	12	57	5	-	109	-	6	7	3	-	8	-	-
2004	6	0	-	1	7	33	15	-	67	-	124	1	-	-	3	-	19
2009	1	-	3	-	5	39	17	-	89	-	12	7	-	-	-	-	-
2014	-	11	-	-	13	20	3	12	67	-	-	1	-	-	3	-	-
2019	-	5	7	-	22	20	3	30	47	4	111	12	-	5	-	3	21
year	Average Cover (%)																
1994	-	-	0.1	-	0.0	-	0.7	-	1.5	0.0	0.1	-	-	-	0.0	-	-
1999	-	-	0.4	-	0.0	1.8	0.1	-	2.4	-	0.0	0.1	0.0	-	0.0	-	-
2004	0.1	0.0	-	0.0	0.1	0.3	0.4	-	0.9	-	0.3	0.0	-	-	0.0	-	0.2
2009	0.0	-	0.0	-	0.0	0.6	0.1	-	1.4	-	0.0	0.1	-	-	-	-	-
2014	-	0.2	-	-	0.1	0.6	0.0	0.1	0.6	-	-	0.0	-	-	0.0	-	-
2019	-	0.1	0.0	-	0.2	0.5	0.0	1.0	0.4	0.0	0.4	0.1	-	0.0	-	0.0	0.3

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Trifolium (clover)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency	
1994	22	-
1999	5	1
2004	38	3
2009	23	-
2014	44	-
2019	107	34
year	Average Cover (%)	
1994	0.1	-
1999	0.0	0.0
2004	0.1	0.0
2009	0.1	-
2014	0.1	-
2019	1.6	0.5

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16C-25.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis[p] (Utah serviceberry)	Artemisia frigida[p] (prairie sagewort)	Artemisia nova[p] (black sagebrush)	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Chrysothamnus depressus[p] (longflower rabbitbrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Eriogonum corymbosum (crispleaf buckwheat)	Gutierrezia sarothrae (broom snakeweed)	Krascheninnikovia lanata[p] (winterfat)	Linanthus pungens (granite prickly phlox)	Pediocactus simpsonii (mountain ball cactus)	Symphoricarpos oreophilus[p] (mountain snowberry)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)												
1994	-	-	-	-	-	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-	-	-	-	-	-
2004	-	0.1	0.7	9.5	1.9	1.2	-	1.1	-	0.6	-	0.4	0.4
2009	0.4	-	-	9	2	1	-	0.9	0.1	0.1	-	0.4	0.1
2014	0.7	-	0.1	7.4	1.7	0.8	-	0.6	0.1	0.1	-	0.1	-
2019	-	-	0.7	16.4	2.1	1.2	-	0.3	-	0.1	-	-	-
year	Quadrat Cover (%)												
1994	1.2	-	-	7.4	1.2	0.5	0.0	0.2	-	0.5	0.0	0.1	0.0
1999	-	-	0.3	8.2	1.9	0.6	-	0.2	-	0.6	-	-	0.1
2004	-	0.0	0.0	8.6	2.7	1.1	-	1.8	-	0.4	-	0.0	0.2
2009	0.0	-	-	8.0	2.2	0.9	-	0.8	0.0	0.1	-	0.0	0.0
2014	0.0	-	0.1	9.5	2.3	0.9	-	0.1	0.0	0.2	-	0.0	0.0
2019	-	-	0.2	14.0	2.8	1.2	-	0.8	-	0.2	-	0.0	0.1

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16C-25.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[P] -- (Utah serviceberry)									
1994	180	-	0	100	0	11	0	0	65/99
1999	40	-	0	100	0	50	50	0	97/130
2004	-	-	-	-	-	-	-	-	88/129
2009	40	-	50	50	0	0	0	0	95/112
2014	-	-	-	-	-	-	-	-	125/141
2019	40	-	0	100	0	0	0	0	39/49
Artemisia frigida[P] -- (prairie sagewort)									
1994	20	-	0	100	0	0	0	0	13/18
1999	40	-	0	100	0	0	0	0	24/22
2004	40	-	0	100	0	50	0	0	19/30
2009	40	-	0	100	0	0	0	0	- / -
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Artemisia nova[P] -- (black sagebrush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	40	-	50	50	0	0	0	0	16/45
2004	200	-	10	90	0	0	0	0	13/32
2009	20	-	0	100	0	100	0	0	14/29
2014	80	-	25	75	0	25	75	0	11/29
2019	480	-	0	92	8	67	21	8	16/33
Artemisia tridentata ssp. vaseyana[P] -- (mountain big sagebrush)									
1994	4160	-	7	39	54	23	20	36	34/60
1999	4840	60	21	67	13	30	65	6	40/64
2004	3180	19420	18	57	25	45	18	11	48/79
2009	6360	8740	54	28	18	14	23	14	39/72
2014	9460	360	64	30	6	33	22	7	39/74
2019	8940	40	14	77	9	32	37	9	35/68
Chrysothamnus depressus[P] -- (longflower rabbitbrush)									
1994	2500	-	1	98	2	11	2	0	7/17
1999	3060	40	3	95	1	5	0	0	8/19
2004	3660	-	0	93	7	7	6	1	11/23
2009	5080	-	9	85	6	3	0	4	7/18
2014	3680	-	9	88	3	4	19	5	8/21
2019	4900	-	0	98	2	1	68	2	10/20
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1994	1200	-	2	98	0	15	0	0	15/23
1999	1260	-	5	95	0	0	0	0	16/24
2004	1040	-	0	100	0	0	0	0	21/34
2009	2060	160	0	98	2	0	2	3	15/23
2014	1360	-	9	91	0	27	4	0	16/28
2019	1180	-	0	100	0	3	10	0	18/27
Gutierrezia sarothrae -- (broom snakeweed)									
1994	580	-	0	100	0	0	0	0	11/17
1999	740	-	14	87	0	0	0	0	12/18
2004	2220	400	10	89	1	0	5	7	17/25
2009	1860	60	12	84	4	0	0	2	12/17
2014	940	40	28	72	0	0	0	0	13/18
2019	1440	-	0	100	0	0	0	0	13/18

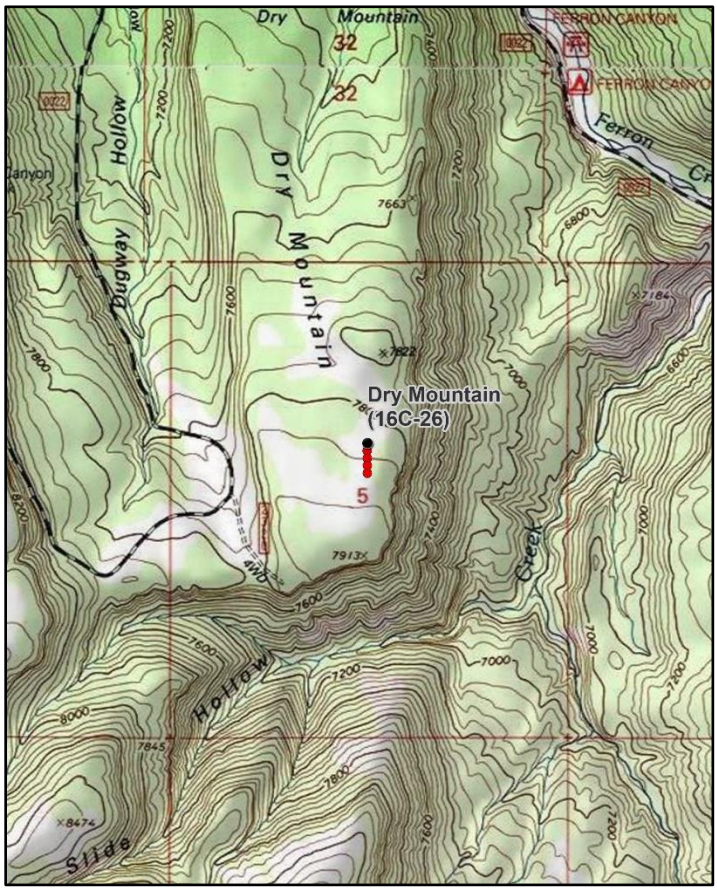
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Kraschenninnikovia lanata[p] -- (winterfat)									
1994	-	-	-	-	-	-	-	-	-/-
1999	100	-	20	80	0	60	0	0	- / -
2004	40	-	0	100	0	100	0	0	15/23
2009	60	-	0	100	0	100	0	0	6/7
2014	60	-	0	100	0	0	0	0	10/21
2019	20	-	0	100	0	0	0	0	22/22
Linanthus pungens -- (granite prickly phlox)									
1994	1380	-	1	96	3	0	0	0	9/14
1999	1320	20	9	91	0	0	0	0	9/13
2004	880	-	7	93	0	0	0	0	14/19
2009	580	-	7	93	0	0	0	0	8/12
2014	260	-	8	85	8	0	0	8	10/10
2019	260	20	8	92	0	0	0	0	12/19
Pediocactus simpsonii -- (mountain ball cactus)									
1994	20	-	0	100	0	0	0	0	3/6
1999	20	-	0	100	0	0	0	0	- / -
2004	-	-	-	-	-	-	-	-	3/8
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	6/9
2019	-	-	-	-	-	-	-	-	4/7
Purshia tridentata[p] -- (antelope bitterbrush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	30/134
2014	-	-	-	-	-	-	-	-	27/98
2019	-	-	-	-	-	-	-	-	22/112
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
1994	80	-	0	50	50	25	0	25	33/71
1999	80	-	0	100	0	0	0	0	35/48
2004	160	-	13	63	25	0	0	0	19/27
2009	120	-	0	100	0	0	17	67	24/43
2014	120	-	0	100	0	0	17	17	23/34
2019	100	-	0	100	0	0	0	0	28/41
Tetradymia canescens -- (spineless horsebrush)									
1994	180	-	22	78	0	22	0	0	10/16
1999	100	-	20	80	0	40	0	0	14/21
2004	120	-	17	67	17	17	17	17	18/26
2009	100	-	20	80	0	0	20	0	15/28
2014	100	-	40	60	0	40	0	0	12/19
2019	120	-	0	100	0	17	0	0	14/22

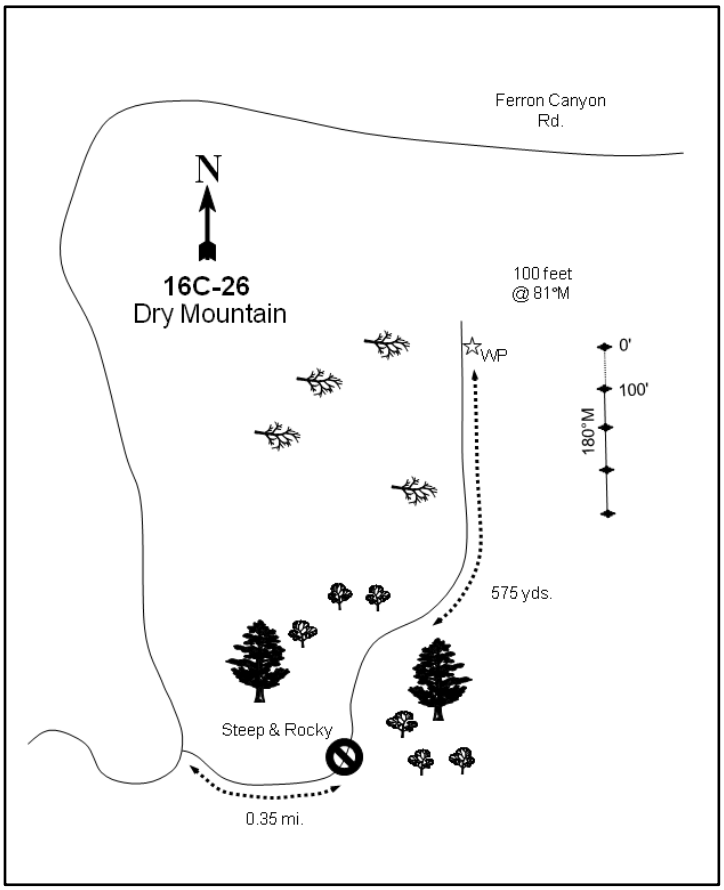
t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16C-25.15 – Deer Desirable Components Index: High Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1994	12.7	2.7	2.5	17.0	0.0	9.8	0.0	44.7	Poor
1999	13.1	11.9	9.1	24.1	0.0	10.0	0.0	68.1	Fair-Good
2004	15.6	8.8	7.1	20.6	0.0	10.0	0.0	62.0	Fair
2009	14.9	10.6	15.0	20.1	0.0	10.0	0.0	70.6	Fair-Good
2014	12.8	12.6	15.0	30.0	0.0	10.0	0.0	80.4	Good
2019	24.0	12.6	5.9	30.0	0.0	10.0	0.0	82.6	Good

DRY MOUNTAIN - STUDY NO. 16C-26





Location Information

USGS 7.5 min Map Info	Flagstaff Peak NE; Township 20S, Range 6E, Section 05
GPS (0' Stake)	NAD 83 UTM ZONE 12, 476587 East 4329154 North

Transect Information

Browse Tag # (0' Stake)	Not Available
Transect Bearing	140° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

From the junction of State Road 10 and Canyon Road in Ferron, proceed west up Ferron Canyon toward Ferron Reservoir for 12.85 miles. At this point, bear left (southeast) and travel 0.35 miles to the base of Dry Mountain, where the road becomes impassably steep and rocky. From the top of this steep section, hike north down the road approximately 575 yards to a witness post on the right (east) side of the road. Walking 100 feet from the witness post, go east at 81 degrees magnetic to the 0-foot baseline stake. The study stakes are short, green fenceposts.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	FERRON
Elevation	7,800ft (2,377m)
Aspect	North
Slope	5-8%
Sample Dates	08/11/1994, 08/10/1999, 08/05/2004, 08/12/2009, 07/16/2014, 07/08/2019

Table 16C-26.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Chain Unknown	-	-	1967	-
Seeding - Seed Unknown	-	-	1967	-
Hand Crew - Lop and Scatter	-	-	1999	-
Mechanical - Bullhog	-	-	Between 2004 and 2009	-

Wildlife Habitat and Vegetation History

Table 16C-26.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	substantial	winter
Shiras Moose	crucial	winter

Table 16C-26.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1988	Mountain Big Sagebrush	Phase I
1994	Mountain Big Sagebrush	Phase I
1999	Mountain Big Sagebrush	Phase I
2004	Mountain Big Sagebrush	Phase I
2009	Mountain Big Sagebrush	Phase I
2014	Mountain Big Sagebrush	Phase I
2019	Mountain Big Sagebrush	Phase I

Site Notes

No Notes

Soils

Table 16C-26.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loamy Fine Sand	7.3	83.6	5.8	10.6	1.0	2.9	41.6	0.7	08/10/1999

Site Potential

1981 - 2010 Average Annual Precipitation	13 inches
NRCS Ecological Site	Upland Loam (Mountain Big Sagebrush-Indian Ricegrass)
NRCS Ecological Site #	R047XB308UT
States and Transitions	A defined state and transition model is available.

Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has been the dominant vegetation component on this study site since 1988 (Table 16C-26.12, Table 16C-26.13, Photos). The herbaceous understory has remained moderately diverse and abundant throughout the study period, and native perennial grasses have contributed a majority of the herbaceous cover. The introduced annual grass species cheatgrass (*Bromus tectorum*) was observed for the first time in 2019, but in very low amounts (Table 16C-26.7, Table 16C-26.10, Table 16C-26.11). Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) have been present throughout the study period, placing this site within Phase I of woodland succession (Table 16C-26.4, Table 16C-26.12, Table 16C-26.14). As such, this site may have the potential for further encroachment: trees can compete for resources and encroachment may lead to the reduction of browse and herbaceous species that are beneficial to wildlife. However, the consistently low amount of trees following treatment (Table 16C-26.1) indicates that this is likely not an immediate concern on this study site.

Trend Summary Tables

Table 16C-26.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	25.3	1.7	1.1	-	-	-
1999	28.6	2.4	0.2	-	-	-
2004	27.7	3.6	-	32.9	4.5	-
2009	22.1	2.5	-	32.9	3.4	-
2014	23.3	2.8	-	31.0	5.9	-
2019	31.3	4.5	-	39.3	8.0	-

Table 16C-26.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	-	228	5	53	-	4.8	0.0	0.3
1999	-	182	15	186	-	4.3	0.1	2.8
2004	-	125	9	80	-	3.2	0.0	0.9
2009	-	177	7	58	-	5.3	0.0	0.6
2014	-	196	32	115	-	6.4	0.1	1.3
2019	3	234	175	128	0.0	9.9	2.7	2.4

Table 16C-26.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	24.3	3.0	46.2	0.5	2.9	37.6
1999	26.2	2.1	48.9	0.6	3.3	34.1
2004	22.5	2.2	53.7	0.8	3.9	36.7
2009	26.4	4.8	53.0	0.4	4.6	29.8
2014	24.4	2.9	48.9	0.9	4.3	36.2
2019	20.3	4.0	56.2	1.7	5.4	42.7

Table 16C-26.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1994	-	64	2	21
1999	-	34	-	42
2004	-	38	-	13
2009	1	26	-	36
2014	1	17	1	29
2019	-	22	-	29
Year	Days Use Per Acre (ha)			
1994	-	-	-	-
1999	1.5 (3.6)	71.7 (177.1)	0.7 (1.7)	-
2004	2.9 (7.2)	109.9 (271.5)	-	-
2009	1.5 (3.6)	40.9 (101.0)	2.7 (6.6)	-
2014	-	-	-	-
2019	-	38.9 (96.0)	6.0 (14.9)	-

Table 16C-26.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Achnatherum lettermanii (Letterman's needlegrass)	Bouteloua gracilis (blue grama)	Bromus tectorum[ai] (cheatgrass)	Carex rossii (Ross' sedge)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Leymus salinus (saline wildrye)	Pascopyrum smithii (western wheatgrass)	Poa fendleriana (muttongrass)	Sporobolus cryptandrus (sand dropseed)	Thinopyrum intermedium[i] (intermediate wheatgrass)
year	Nested Frequency											
1994	31	-	56	-	4	12	103	-	106	16	4	-
1999	17	7	46	-	4	6	81	3	71	10	2	-
2004	16	0	38	-	0	10	20	5	47	7	5	4
2009	57	-	44	-	-	10	41	15	39	5	-	-
2014	10	8	42	-	2	52	83	-	49	11	-	2
2019	15	16	47	3	3	84	83	24	28	2	2	-
year	Average Cover (%)											
1994	0.7	-	1.9	-	0.0	0.0	1.8	-	0.3	0.1	0.0	-
1999	0.4	0.2	1.6	-	0.2	0.0	1.3	0.0	0.4	0.0	0.1	-
2004	0.3	0.0	1.2	-	0.0	0.1	0.5	0.4	0.5	0.2	0.1	0.0
2009	1.3	-	2.1	-	-	0.2	0.7	0.5	0.3	0.1	-	-
2014	0.2	0.1	2.3	-	0.0	0.5	2.4	-	0.5	0.3	-	0.0
2019	0.6	0.4	2.1	0.0	0.1	2.5	2.7	1.0	0.2	0.1	0.0	-

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16C-26.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Androsace septentrionalis[a] (pygmyflower rockjasmine)	Antennaria (pussytoes)	Arabis (rockcress)	Arabis perennans (perennial rockcress)	Astragalus (milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Chaenactis douglasii (Douglas' dustymaiden)	Chenopodium[a] (goosefoot)	Collinsia parviflora[a] (maiden blue eyed Mary)	Crepis acuminata (tapertip hawksbeard)	Cryptantha (cryptantha)	Descurainia pinnata[a] (western tansymustard)	Erigeron pumilus (shaggy fleabane)	Eriogonum cernuum[a] (nodding buckwheat)	Eriogonum racemosum (redroot buckwheat)	Gaillardia pinnatifida (red dome blanketflower)	Gayophytum ramosissimum[a] (pinyon groundsmoke)
year	Nested Frequency																
1994	-	-	3	1	1	-	3	-	-	-	16	-	-	-	2	1	2
1999	14	-	24	-	4	-	17	-	-	1	28	1	17	-	3	-	-
2004	-	-	10	-	2	2	3	3	-	-	7	3	12	2	7	-	3
2009	-	-	23	-	-	-	-	-	-	1	4	4	6	-	1	-	3
2014	20	1	47	-	-	-	3	-	1	-	20	4	16	-	9	-	-
2019	10	2	20	-	-	-	11	5	6	4	25	6	19	-	8	-	162
year	Average Cover (%)																
1994	-	-	0.0	0.0	0.0	-	0.0	-	-	-	0.1	-	-	-	0.0	0.0	0.0
1999	0.1	-	0.1	-	0.0	-	0.1	-	-	0.0	0.7	0.0	0.1	-	0.0	-	-
2004	-	-	0.0	-	0.0	0.0	0.0	0.0	-	-	0.2	0.0	0.0	0.0	0.1	-	0.0
2009	-	-	0.1	-	-	-	-	-	-	0.0	0.0	0.0	0.1	-	0.0	-	0.0
2014	0.1	0.0	0.4	-	-	-	0.0	-	0.0	-	0.1	0.0	0.2	-	0.1	-	-
2019	0.0	0.0	0.1	-	-	-	0.1	0.0	0.0	0.3	0.4	0.0	0.5	-	0.1	-	2.3

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Heterotheca villosa (hairy false goldenaster)	Ipomopsis aggregata (scarlet gilia)	Lappula occidentalis[a] (flatspine stickseed)	Lygodesmia (skeletonplant)	Machaeranthera canescens (hoary tansyaster)	Navarretia intertexta[a] (needleleaf navarretia)	Oenothera caespitosa (tufted evening primrose)	Packera multilobata (lobeleaf groundsel)	Polygonum douglasii[a] (Douglas' knotweed)	Schoenocrambe linifolia (flaxleaf plainsmustard)	Symphyotrichum (aster)	Trifolium (clover)
year	Nested Frequency											
1994	-	-	-	1	-	-	-	10	3	25	-	-
1999	-	1	-	3	12	-	1	128	-	13	32	2
2004	1	-	-	-	1	-	-	38	-	11	-	1
2009	-	-	-	4	4	-	1	25	-	2	-	-
2014	7	2	15	3	-	-	1	36	-	8	6	1
2019	1	-	57	2	6	6	-	41	2	17	-	8
year	Average Cover (%)											
1994	-	-	-	0.0	-	-	-	0.1	0.0	0.1	-	-
1999	-	0.0	-	0.1	0.1	-	0.0	1.2	-	0.0	0.2	0.0
2004	0.0	-	-	-	0.0	-	-	0.3	-	0.1	-	0.0
2009	-	-	-	0.0	0.2	-	0.0	0.2	-	0.0	-	-
2014	0.0	0.0	0.0	0.0	-	-	0.0	0.3	-	0.0	0.1	0.0
2019	0.0	-	0.2	0.1	0.0	0.0	-	0.5	0.0	0.2	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16C-26.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Echinocereus coccineus var. coccineus (scarlet hedgehog cactus)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma[t] (Utah juniper)	Linanthus pungens (granite prickly phlox)	Opuntia fragilis (brittle pricklypear)	Pinus edulis[t] (twoneedle pinyon)	Purshia tridentata[p] (antelope bitterbrush)
year	Line Intercept Cover (%)								
1994	-	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-	-
2004	26	3.9	-	0.3	-	0.3	-	-	6.9
2009	25.3	2.5	-	0.6	-	0.3	-	-	7.6
2014	24.6	5.1	-	-	-	0.7	0.1	-	6.4
2019	27.7	6.6	-	0.5	-	0.7	0.2	-	11.6
year	Quadrat Cover (%)								
1994	19.8	1.5	-	0.0	0.7	0.1	-	0.4	5.5
1999	21.5	2.1	-	0.0	-	0.3	0.1	0.2	7.1
2004	22.8	2.4	-	0.2	-	0.8	0.2	-	4.9
2009	17.4	1.8	-	0.2	-	0.4	0.1	-	4.6
2014	16.8	2.3	0.0	0.1	-	0.4	0.0	-	6.5
2019	22.3	3.5	-	0.0	-	0.9	0.0	-	9.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16C-26.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1994	3840	20	2	64	34	42	8	21	51/92
1999	3940	20	5	73	22	53	10	5	60/91
2004	3640	520	2	65	33	67	19	12	52/92
2009	3520	120	1	72	27	40	31	22	50/93
2014	3740	80	6	84	10	48	42	6	59/87
2019	3660	20	9	73	18	25	55	20	62/97
Cercocarpus ledifolius[p] -- (curl-leaf mountain mahogany)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	196/192
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1994	1960	-	0	99	1	9	3	1	27/35
1999	2120	160	16	82	2	9	0	1	35/41
2004	2280	20	2	84	14	3	1	4	33/42
2009	2440	40	3	88	9	3	0	9	31/41
2014	2980	20	21	79	0	48	0	0	38/46
2019	3000	-	14	86	0	0	0	0	39/45
Echinocereus coccineus var. coccineus -- (scarlet hedgehog cactus)									
1994	-	-	-	-	-	-	-	-	-/-
1999	80	-	25	75	0	0	0	0	3/8
2004	-	-	-	-	-	-	-	-	-/-
2009	20	-	0	100	0	0	0	0	8/33
2014	20	20	0	100	0	0	0	100	11/17
2019	40	-	0	50	50	0	0	50	8/25
Gutierrezia sarothrae -- (broom snakeweed)									
1994	360	-	6	94	0	0	0	0	13/16
1999	400	20	30	70	0	0	0	0	19/17
2004	580	260	41	59	0	0	0	0	22/25
2009	1000	-	0	98	2	0	0	0	16/15
2014	240	20	0	100	0	0	0	0	28/39
2019	400	-	0	100	0	0	0	0	16/15
Juniperus osteosperma[t] -- (Utah juniper)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	20	0	0	0	0	0	0	- / -
Linanthus pungens -- (granite prickly phlox)									
1994	800	-	0	100	0	0	0	0	14/17
1999	1040	180	21	71	8	0	0	6	14/19
2004	900	20	7	87	7	0	0	2	18/25
2009	1120	-	0	100	0	0	0	0	13/20
2014	920	-	9	91	0	54	17	0	20/27
2019	900	-	2	98	0	2	0	0	19/23

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Opuntia fragilis -- (brittle pricklypear)									
1994	120	-	17	83	0	0	0	0	8/29
1999	280	-	21	71	7	0	0	7	6/17
2004	340	-	12	88	0	0	0	12	5/20
2009	240	-	8	83	8	0	0	8	6/30
2014	100	-	0	100	0	0	0	0	6/14
2019	260	-	23	77	0	0	0	0	5/13
Pinus edulis[t] -- (twoneedle pinyon)									
1994	-	-	-	-	-	-	-	-	-/-
1999	60	-	100	0	0	0	0	33	- / -
2004	20	20	100	0	0	0	100	0	- / -
2009	20	-	100	0	0	0	0	0	- / -
2014	20	-	100	0	0	0	0	0	- / -
2019	-	-	-	-	-	-	-	-	-/-
Purshia tridentata[p] -- (antelope bitterbrush)									
1994	1500	-	3	75	23	51	7	5	38/101
1999	1720	60	20	71	9	12	23	1	47/99
2004	1300	-	5	48	48	20	77	19	37/97
2009	1620	-	6	82	12	25	33	17	40/90
2014	1560	20	12	82	6	44	28	0	39/79
2019	1800	1620	7	92	1	32	51	2	39/86

t - Tree Species; p - Preferred Browse; i - Introduced Species

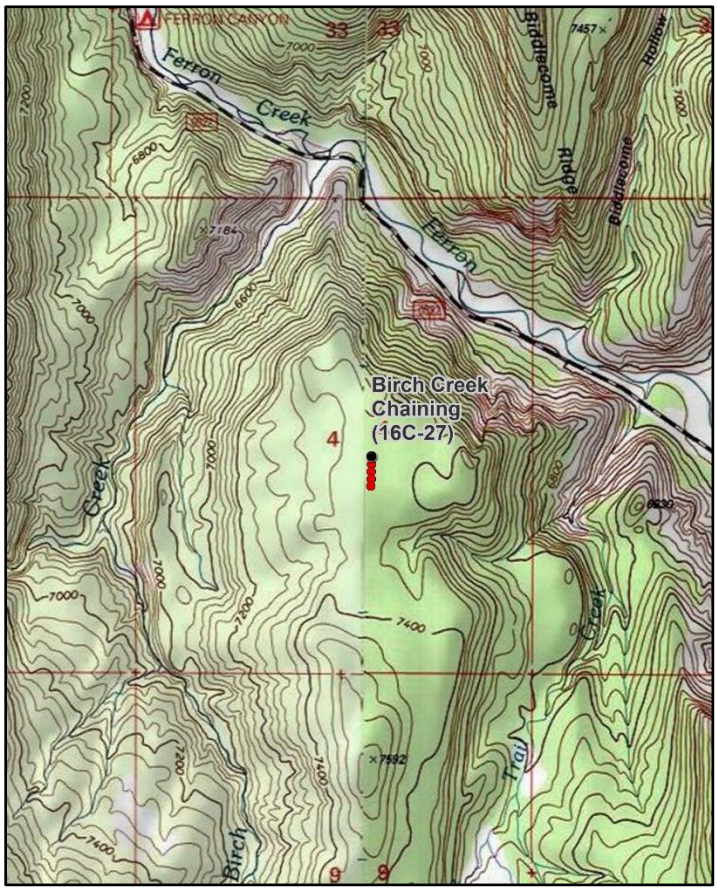
Table 16C-26.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

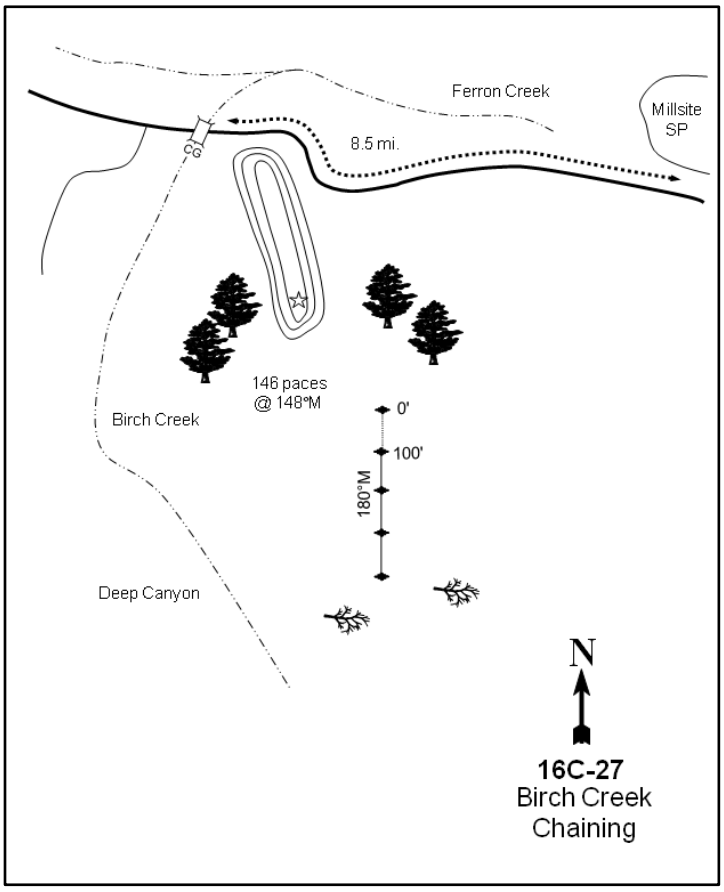
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1994	15	-	-	-	-	-	11.2
1999	9	-	-	-	-	-	11.1
2014	12	20	60	-	20	-	5.4
2019	12	33	67	-	-	-	8.3
Pinus edulis (twoneedle pinyon)							
1994	51	-	-	-	-	-	4.1
1999	29	-	-	-	-	-	4.4
2014	17	-	100	-	-	-	5.3
2019	20	50	50	-	-	-	2.7

Table 16C-26.15 – Deer Desirable Components Index: Mid Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1994	30.0	5.5	1.1	9.6	0.0	0.6	0.0	46.7	Poor
1999	30.0	9.4	4.4	8.7	0.0	5.6	0.0	58.0	Fair
2004	30.0	4.2	1.4	6.5	0.0	1.7	0.0	43.7	Poor
2009	30.0	7.8	1.1	10.6	0.0	1.2	0.0	50.8	Poor-Fair
2014	30.0	12.2	3.5	12.7	0.0	2.6	0.0	61.0	Fair
2019	30.0	11.1	4.3	19.7	0.0	4.8	0.0	69.9	Good

BIRCH CREEK CHAINING - STUDY NO. 16C-27





Location Information

USGS 7.5 min Map Info	Flagstaff Peak NE; Township 20S, Range 6E, Section 04
GPS (0' Stake)	NAD 83 UTM ZONE 12, 478355 East 4328837 North

Transect Information

Browse Tag # (0' Stake)	9026
Transect Bearing	180° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

From Ferron, travel west on Ferron Canyon Road for approximately 8.5 miles, past Millsite Reservoir and the FS boundary, to a bridge over Birch Creek. The Birch Creek chaining is located on top of the bench to the south. The easiest way to the study site is to hike up along the steep and rocky ridge to the pinyon-juniper on top. Continue south up through the pinyon-juniper to the edge of the chaining. The study site is in the middle of the chaining, marked by 18-inch tall fenceposts. From the highest point along the edge of the pinyon-juniper, walk south at 148 degrees magnetic for 146 paces to the 0-foot baseline stake. The 0-foot stake is marked by browse tag #9026.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	FERRON
Elevation	7,350ft (2,240m)
Aspect	Northwest
Slope	5%
Sample Dates	08/11/1994, 07/27/1999, 08/05/2004, 08/25/2009, 07/29/2014, 07/10/2019

Table 16C-27.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Chain Unknown	-	-	1972	-
Terrace - Contour Trench	-	-	1972	-
Seeding - Seed Unknown	-	-	1972	-
Hand Crew - Lop and Scatter	-	-	Fall 2004	-

Wildlife Habitat and Vegetation History

Table 16C-27.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	substantial	winter
Shiras Moose	crucial	winter

Table 16C-27.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1988	Mountain Big Sagebrush/Perennial Grass	Phase I
1994	Mountain Big Sagebrush/Perennial Grass	Phase I
1999	Mountain Big Sagebrush	Phase I
2004	Mountain Big Sagebrush	Phase I transitioning to Phase II
2009	Mountain Big Sagebrush	Phase I
2014	Mountain Big Sagebrush	Phase I
2019	Mountain Big Sagebrush	Phase I

Site Notes

No Notes

Soils

Table 16C-27.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	7.4	72.7	5.5	21.8	1.7	9.6	51.2	0.6	07/27/1999

Site Potential

1981 - 2010 Average Annual Precipitation	12 inches
NRCS Ecological Site	Upland Loam (Mountain Big Sagebrush-Indian Ricegrass)
NRCS Ecological Site #	R047XB308UT
States and Transitions	A defined state and transition model is available.

Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has been the dominant shrub species on this site since study establishment in 1988 (Table 16C-27.12, Table 16C-27.13). The abundant herbaceous understory has been mainly comprised of perennial grasses, which were a co-dominant vegetation component in 1988 and 1994. Much of the perennial grass cover, however, has been contributed by the introduced species crested wheatgrass (*Agropyron cristatum*). Forbs have remained rare. (Table 16C-27.7, Table 16C-27.10, Table 16C-27.11, Photos). Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) increased between 1988 and 2004 (Photos), and the site was classified as being within Phase I transitioning to Phase II of woodland succession in 2004. A lop and scatter treatment following the 2004 sampling (Table 16C-27.1) removed many of the trees, and the site has been considered to be within Phase I of encroachment since that time (Table 16C-27.4, Table 16C-27.12, Table 16C-27.14). However, the remaining tree component suggests that this site may potentially be prone to infilling in future sample years without further treatment.

Trend Summary Tables

Table 16C-27.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	7.7	-	5.0	-	-	-
1999	11.0	0.2	3.5	-	-	0.2
2004	13.3	0.0	4.6	17.4	0.1	5.9
2009	12.9	0.0	0.1	13.8	1.5	-
2014	13.0	-	0.2	15.9	-	-
2019	19.5	0.1	1.0	22.2	0.2	-

Table 16C-27.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	-	253	6	11	-	11.8	0.0	0.1
1999	-	298	-	-	-	13.6	-	-
2004	-	177	43	1	-	8.1	0.5	0.0
2009	-	245	3	3	-	10.8	0.0	0.0
2014	-	250	46	2	-	12.1	0.3	0.0
2019	-	281	105	14	-	17.1	1.7	0.1

Table 16C-27.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	26.5	0.1	43.8	0.5	2.5	25.0
1999	24.7	0.0	56.0	1.7	3.0	27.6
2004	38.7	1.1	44.8	2.0	2.8	25.9
2009	28.3	0.1	52.8	3.5	2.7	24.1
2014	36.1	0.2	47.3	2.3	3.4	26.9
2019	30.4	0.0	53.7	5.2	3.4	34.7

Table 16C-27.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1994	-	24	23	31
1999	3	14	18	40
2004	1	9	32	10
2009	4	4	21	20
2014	6	1	26	14
2019	6	2	21	12
Year	Days Use Per Acre (ha)			
1994	-	-	-	-
1999	23.2 (57.4)	10.7 (26.5)	34.9 (86.1)	-
2004	22.5 (55.6)	16.8 (41.4)	64.3 (158.9)	-
2009	10.9 (26.9)	20.8 (51.3)	12.1 (29.8)	-
2014	4.4 (10.8)	0.7 (1.7)	22.8 (56.3)	-
2019	13.8 (34.1)	1.3 (3.3)	40.2 (99.3)	-

Table 16C-27.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bromus inermis[i] (smooth brome)	Elymus elymoides (squirreltail)	Leymus salinus (saline wildrye)	Pascopyrum smithii (western wheatgrass)	Sporobolus cryptandrus (sand dropseed)	Thinopyrum intermedium[i] (intermediate wheatgrass)
year	Nested Frequency							
1994	19	174	58	3	2	-	1	87
1999	24	218	100	8	-	-	-	61
2004	17	141	26	5	0	-	3	16
2009	31	183	42	-	-	-	-	28
2014	23	210	34	5	-	-	3	9
2019	29	228	25	5	3	10	3	18
year	Average Cover (%)							
1994	0.6	8.2	1.1	0.0	0.0	-	0.0	1.9
1999	1.0	10.1	1.5	0.0	-	-	-	1.0
2004	0.6	7.0	0.3	0.0	0.0	-	0.0	0.1
2009	0.9	9.5	0.2	-	-	-	-	0.2
2014	0.9	10.3	0.8	0.1	-	-	0.0	0.1
2019	1.5	14.3	0.9	0.1	0.0	0.1	0.0	0.2

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16C-27.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Arabis (rockcress)	Chenopodium[a] (goosefoot)	Chenopodium fremontii[a] (Fremont's goosefoot)	Chenopodium salinum[a] (Rocky Mountain goosefoot)	Cryptantha (cryptantha)	Descurainia pinnata[a] (western tansymustard)	Gayophytum ramosissimum[a] (pinyon groundsmoke)	Ipomopsis aggregata (scarlet gilia)	Lappula occidentalis[a] (flatspine stickseed)	Packera multilobata (lobeleaf groundsel)	Penstemon caespitosus (mat penstemon)
year	Nested Frequency										
1994	2	-	-	1	-	5	-	3	-	-	6
1999	-	-	-	-	-	-	-	-	-	-	-
2004	-	12	2	-	-	32	-	-	-	1	-
2009	-	-	3	-	-	-	-	-	-	-	3
2014	-	-	-	-	2	44	-	-	3	-	-
2019	-	-	66	-	1	65	12	2	14	11	-
year	Average Cover (%)										
1994	0.0	-	-	0.0	-	0.0	-	0.0	-	-	0.0
1999	-	-	-	-	-	-	-	-	-	-	-
2004	-	0.2	0.0	-	-	0.2	-	-	-	0.0	-
2009	-	-	0.0	-	-	-	-	-	-	-	0.0
2014	-	-	-	-	0.0	0.3	-	-	0.0	-	-
2019	-	-	0.5	-	0.0	0.9	0.2	0.0	0.1	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16C-27.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Ericameria parryi var. parryi (Parry's rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma[t] (Utah juniper)	Opuntia (pricklypear)	Pinus edulis[t] (twoneedle pinyon)
year	Line Intercept Cover (%)					
1994	-	-	-	-	-	-
1999	-	-	-	-	-	-
2004	17.4	-	-	1.7	0.1	4.2
2009	13.8	1.4	-	-	0.1	-
2014	15.9	-	-	-	-	-
2019	22.2	-	0.1	-	0.1	-
year	Quadrat Cover (%)					
1994	7.7	-	-	2.4	-	2.6
1999	11.0	-	0.2	1.6	-	1.8
2004	13.3	-	-	1.6	0.0	3.0
2009	12.9	0.0	-	0.0	0.0	0.0
2014	13.0	-	-	0.0	-	0.1
2019	19.5	-	0.1	0.4	0.0	0.6

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16C-27.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
1994	-	-	-	-	-	-	-	-	-/-
1999	20	-	100	0	0	0	0	0	- / -
2004	20	-	0	100	0	100	0	0	42/33
2009	20	-	0	0	100	0	100	100	59/43
2014	-	-	-	-	-	-	-	-	52/43
2019	-	-	-	-	-	-	-	-	-/-
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1994	3000	40	23	65	11	31	8	1	42/68
1999	3660	-	15	73	13	26	21	2	43/69
2004	3540	1020	10	66	25	38	14	10	39/81
2009	5480	480	22	66	12	23	16	11	41/72
2014	5460	460	14	77	9	48	38	14	52/80
2019	4560	1280	8	85	8	42	30	13	50/77
Ericameria parryi var. parryi -- (Parry's rabbitbrush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	20	-	0	0	100	0	100	100	- / -
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Gutierrezia sarothrae -- (broom snakeweed)									
1994	40	-	0	100	0	0	0	0	11/16
1999	100	-	0	100	0	0	0	0	15/17
2004	140	-	29	71	0	0	0	0	14/24
2009	40	-	0	100	0	0	0	0	13/16
2014	20	-	0	100	0	0	0	0	16/18
2019	80	-	0	100	0	0	0	0	20/23
Juniperus osteosperma[t] -- (Utah juniper)									
1994	-	-	-	-	-	-	-	-	-/-
1999	40	-	0	100	0	0	0	0	- / -
2004	40	-	50	50	0	0	0	0	- / -
2009	-	-	-	-	-	-	-	-	-/-
2014	20	-	100	0	0	0	0	0	- / -
2019	-	-	-	-	-	-	-	-	-/-
Opuntia -- (pricklypear)									
1994	20	-	0	100	0	0	0	0	5/10
1999	20	-	0	100	0	0	0	0	13/29
2004	60	-	0	100	0	0	0	0	9/27
2009	60	-	0	100	0	0	0	0	9/38
2014	40	-	0	100	0	0	0	0	9/39
2019	40	-	0	100	0	0	0	0	9/20
Pinus edulis[t] -- (twoneedle pinyon)									
1994	-	-	-	-	-	-	-	-	-/-
1999	40	-	50	50	0	0	0	0	- / -
2004	40	-	50	50	0	0	0	0	- / -
2009	-	20	0	0	0	0	0	0	- / -
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Purshia tridentata[p] -- (antelope bitterbrush)									
1994	-	-	-	-	-	-	-	-	78/202
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	71/190
2014	-	-	-	-	-	-	-	-	44/104
2019	-	-	-	-	-	-	-	-	48/97
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	20	-	0	100	0	0	0	0	24/26
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	20	-	0	100	0	100	0	0	49/37

t - Tree Species; p - Preferred Browse; i - Introduced Species

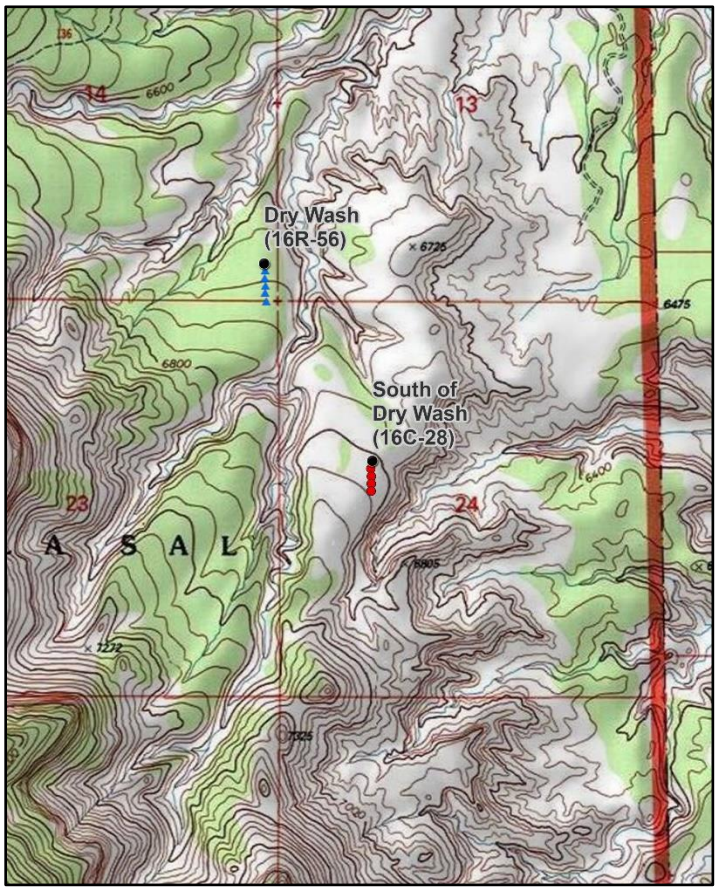
Table 16C-27.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

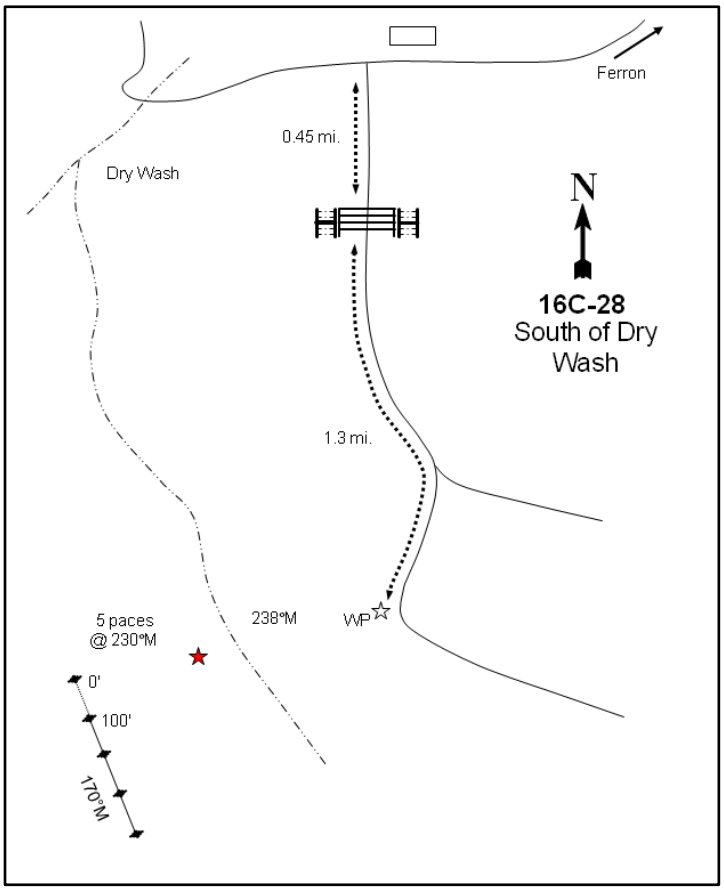
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1994	67	-	-	-	-	-	11.7
1999	76	-	-	-	-	-	8.6
2004	78	6	33	44	17	-	10.7
2009	34	7	93	-	-	-	2.7
2014	29	-	92	8	-	-	3.6
2019	34	-	85	15	-	-	9.7
Pinus edulis (twoneedle pinyon)							
1994	52	-	-	-	-	-	10.0
1999	50	-	-	-	-	-	9.2
2004	52	-	29	41	18	12	9.1
2009	10	43	29	29	-	-	3.1
2014	11	-	78	22	-	-	3.4
2019	10	-	71	29	-	-	5.7

Table 16C-27.15 – Deer Desirable Components Index: Mid Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1994	9.7	11.7	11.7	23.6	0.0	0.2	0.0	56.9	Fair
1999	13.8	11.2	7.4	27.2	0.0	0.0	0.0	59.6	Fair
2004	21.8	7.5	4.8	16.2	0.0	0.1	0.0	50.3	Poor-Fair
2009	17.3	11.3	11.0	21.6	0.0	0.0	0.0	61.1	Fair
2014	19.9	12.4	7.0	24.3	0.0	0.0	0.0	63.5	Fair-Good
2019	27.8	12.8	3.8	30.0	0.0	0.1	0.0	74.4	Good

SOUTH OF DRY WASH - STUDY NO. 16C-28





Location Information

USGS 7.5 min Map Info	Ferron NW; Township 20S, Range 6E, Section 24
GPS (0' Stake)	NAD 83 UTM ZONE 12, 482610 East 4324073 North

Transect Information

Browse Tag # (0' Stake)	9024
Transect Bearing	170° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Belts 1-2: No Rebar

Directions to Site

From the town of Ferron, proceed west up Ferron Canyon Road for 3.7 miles. Approximately 300 feet after the entrance to Millsite Golf Course, turn left onto a dirt road. Go south on the dirt road for 0.45 miles to a gate. Pass through the gate and continue 1.3 miles to a witness post on Forest Service Road #118. From the witness post, walk up the ridge to the west. There is a game trail going to the top at a bearing of 238 degrees magnetic: take this trail southwest along the edge of the chained area. The road continues up into the east edge of the chaining, where Forest Service photo plots and the trend studies are located. The Forest Service study is marked by tall, red fenceposts. The range trend study is adjacent to the Forest Service study, and is marked by two-foot tall fenceposts; the 0-foot stake is marked with browse tag #9024.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	FERRON
Elevation	6,800ft (2,073m)
Aspect	Northwest
Slope	5-7%
Sample Dates	08/09/1994, 07/27/1999, 06/03/2004, 05/27/2009, 07/16/2014, 07/11/2019

Table 16C-28.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Mechanical - Bullhog	-	-	2015-2018	-
Chaining - Chain Unknown	-	-	1972	35
Seeding - Seed Unknown	-	-	1972	35

Wildlife Habitat and Vegetation History

Table 16C-28.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	substantial	winter

Table 16C-28.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1988	True Mountain Mahogany/Black Sagebrush/Pinyon-Juniper	Phase I transitioning to Phase II
1994	True Mountain Mahogany/Black Sagebrush/Pinyon-Juniper	Phase I transitioning to Phase II
1999	True Mountain Mahogany/Black Sagebrush/Pinyon-Juniper	Phase I transitioning to Phase II
2004	True Mountain Mahogany/Black Sagebrush/Pinyon-Juniper	Phase I transitioning to Phase II
2009	True Mountain Mahogany/Black Sagebrush/Pinyon-Juniper	Phase I transitioning to Phase II
2014	True Mountain Mahogany/Black Sagebrush/Pinyon-Juniper	Phase I transitioning to Phase II
2019	True Mountain Mahogany/Black Sagebrush/Pinyon-Juniper	Phase I transitioning to Phase II

Site Notes

The study was part of a 35 acre habitat enhancement project in 1972 that was chained and seeded. An ATV trail was observed transecting the site in 2014.

Soils

Table 16C-28.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	7.5	54.7	21.5	23.8	3.9	3.0	38.4	0.7	07/27/1999

Site Potential

1981 - 2010 Average Annual Precipitation	11 inches
NRCS Ecological Site	Upland Stony Loam (Pinyon-Utah Juniper)
NRCS Ecological Site #	R047XB333UT
States and Transitions	A defined state and transition model is available.

Since the study was established in 1988, this site has been in a mixed browse state with alderleaf mountain mahogany (*Cercocarpus montanus*) and black sagebrush (*Artemisia nova*) exhibiting co-dominance. Black sagebrush has shown a decreasing trend while mountain mahogany has shown a stable trend (Table 16C-28.12, Table 16C-28.13). The herbaceous understory has been dominated by perennial grasses with forbs being comparatively rare (Table 16C-28.7). Perennial grass cover has shown fluctuations with Indian ricegrass (*Achnatherum hymenoides*) and saline wildrye (*Leymus salinus*) as the dominant species; annual grasses were only sampled in 2004 and have not been sampled since then (Table 16C-28.10). Both twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) have been present on the site in all years, although a bullhog treatment reduced the cover and density of trees in 2019 (Table 16C-28.1, Table 16C-28.6, Table 16C-28.14). It is possible that in future years there will be more infill from remaining trees on the site. The state and transition model would place the site into the Perennial Grassland/Shrubland with scattered PJ State and also indicates that there is potential to transition back into a state dominated by trees (Jornada, 2019).

Trend Summary Tables

Table 16C-28.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	15.3	0.0	6.4	-	-	-
1999	17.1	0.2	7.0	0.3	-	-
2004	20.2	0.2	7.8	20.2	-	13.0
2009	18.5	0.1	9.7	17.8	0.1	13.3
2014	12.0	0.1	9.2	11.7	0.1	19.0
2019	14.1	0.0	4.4	15.2	-	6.6

Table 16C-28.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	-	134	8	70	-	9.2	0.0	1.5
1999	-	169	9	37	-	8.6	0.1	0.4
2004	1	123	19	53	0.0	3.4	0.3	0.3
2009	-	145	8	86	-	6.8	0.4	0.7
2014	-	107	16	63	-	4.8	0.1	0.4
2019	-	211	183	85	-	11.8	4.9	1.5

Table 16C-28.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	24.3	0.2	39.2	4.2	10.9	29.1
1999	18.9	0.8	48.0	12.5	8.5	32.3
2004	28.3	0.5	40.8	9.4	8.2	31.6
2009	19.4	0.7	45.7	12.1	8.1	32.6
2014	30.5	0.2	39.1	10.3	10.9	27.2
2019	26.6	0.2	54.3	8.8	10.7	32.1

Table 16C-28.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1994	-	34	-	17
1999	-	27	6	18
2004	-	24	8	19
2009	1	16	6	30
2014	-	8	9	11
2019	-	8	16	5
Year	Days Use Per Acre (ha)			
1994	-	-	-	-
1999	-	85.1 (210.2)	11.4 (28.1)	-
2004	-	40.9 (101.0)	8.7 (21.5)	-
2009	-	44.2 (109.2)	21.5 (53.0)	-
2014	-	-	-	-
2019	-	4.7 (11.6)	43.6 (107.6)	-

Table 16C-28.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bromus tectorum[ai] (cheatgrass)	Elymus elymoides (squirreltail)	Leymus salinus (saline wildrye)	Psathyrostachys juncea[i] (Russian wildrye)
year	Nested Frequency					
1994	89	5	-	17	35	-
1999	123	1	-	19	33	-
2004	88	15	1	7	10	6
2009	84	28	-	15	31	1
2014	83	6	-	1	21	-
2019	109	32	-	41	50	16
year	Average Cover (%)					
1994	7.1	0.0	-	0.2	1.9	-
1999	6.8	0.0	-	0.2	1.6	-
2004	1.7	0.1	0.0	0.1	1.1	0.5
2009	3.5	0.6	-	0.1	2.5	0.1
2014	3.3	0.0	-	0.0	1.5	-
2019	5.9	0.5	-	1.2	3.0	1.2

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16C-28.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Arabis (rockcress)	Artemisia ludoviciana (white sagebrush)	Castilleja angustifolia (northwestern Indian paintbrush)	Chenopodium fremontii[a] (Fremont's goosefoot)	Collinsia parviflora[a] (maiden blue eyed Mary)	Cryptantha (cryptantha)	Descurainia pinnata[a] (western tansymustard)	Eriogonum ovalifolium (cushion buckwheat)	Gilia inconspicua[a] (shy gilia)	Hymenoxys richardsonii (pingue rubberweed)	Lactuca serriola[ai] (prickly lettuce)	Lepidium[a] (pepperweed)	Penstemon carnosus (fleshy beardtongue)	Schoenocrambe linifolia (flaxleaf plainsmustard)	Symphyotrichum (aster)	Thelesperma subnudum (Navajo tea)	Thelypodium sagittatum[a] (arrow thelypody)
year	Nested Frequency																
1994	-	3	-	-	-	56	-	6	3	-	-	-	9	-	-	2	5
1999	-	-	-	-	-	30	3	2	-	-	-	6	3	2	-	-	-
2004	-	-	-	8	-	22	2	-	6	-	-	5	2	12	-	2	0
2009	-	-	-	-	-	48	-	-	-	-	-	-	-	43	-	-	8
2014	2	-	-	-	-	24	16	1	-	-	-	-	6	26	9	1	-
2019	13	-	2	28	8	43	162	10	8	0	1	-	12	5	4	-	-
year	Average Cover (%)																
1994	-	0.0	-	-	-	1.5	-	0.0	0.0	-	-	-	0.0	-	-	0.0	0.0
1999	-	-	-	-	-	0.4	0.0	0.0	-	-	-	0.1	0.0	0.0	-	-	-
2004	-	-	-	0.0	-	0.1	0.0	-	0.0	-	-	0.2	0.0	0.0	-	0.0	0.0
2009	-	-	-	-	-	0.5	-	-	-	-	-	-	-	0.2	-	-	0.4
2014	0.0	-	-	-	-	0.2	0.1	0.0	-	-	-	-	0.0	0.1	0.1	0.0	-
2019	0.2	-	0.0	0.1	0.2	0.8	4.5	0.3	0.1	0.0	0.0	-	0.1	0.0	0.0	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Townsendia incana (hoary Townsend daisy)
year	Nested Frequency
1994	4
1999	-
2004	19
2009	-
2014	-
2019	8
year	Average Cover (%)
1994	0.0
1999	-
2004	0.1
2009	-
2014	-
2019	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16C-28.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis[p] (Utah serviceberry)	Artemisia nova[p] (black sagebrush)	Cercocarpus montanus[p] (alderleaf mountain mahogany)	Ephedra viridis[p] (mormon tea)	Eriogonum microthecum[p] (slender buckwheat)	Juniperus osteosperma[t] (Utah juniper)	Opuntia polyacantha (plains pricklypear)	Pinus edulis[t] (twoneedle pinyon)	Sclerocactus (fishhook cactus)
year	Line Intercept Cover (%)								
1994	-	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-	-
2004	-	8.7	9.2	2.3	-	4.3	-	8.7	-
2009	-	7.4	8.5	1.9	0	3.7	0.1	9.6	-
2014	-	4.9	4.1	2.6	0.1	4.1	0.1	14.9	-
2019	-	3.2	8.9	2.8	0.3	2	-	4.6	-
year	Quadrat Cover (%)								
1994	-	7.1	7.4	0.8	0.0	1.6	0.0	4.8	-
1999	-	8.2	7.9	1.0	0.0	2.0	0.2	5.0	-
2004	-	10.0	8.1	2.1	0.0	3.1	0.2	4.6	-
2009	-	9.3	6.8	1.9	0.6	3.5	0.1	6.2	-
2014	-	6.0	4.2	1.9	0.1	2.7	0.1	6.5	-
2019	1.0	4.9	6.6	1.5	0.1	1.5	-	2.9	0.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16C-28.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
1994	-	-	-	-	-	-	-	-	16/18
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Artemisia nova[p] -- (black sagebrush)									
1994	3440	-	2	69	30	47	20	6	18/53
1999	3800	20	8	74	17	23	2	9	21/50
2004	4280	-	3	86	12	39	4	8	21/49
2009	4480	200	1	84	15	13	0	11	19/50
2014	2880	40	8	81	12	47	37	4	20/50
2019	2600	40	5	75	20	29	20	25	23/47
Atriplex canescens[p] -- (fourwing saltbush)									
1994	-	-	-	-	-	-	-	-	50/51
1999	-	-	-	-	-	-	-	-	76/92
2004	-	-	-	-	-	-	-	-	53/65
2009	-	-	-	-	-	-	-	-	104/126
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	66/66
Cercocarpus montanus[p] -- (alderleaf mountain mahogany)									
1994	540	-	22	74	4	56	15	0	136/166
1999	620	60	48	45	7	36	7	0	146/165
2004	720	20	47	50	3	11	56	0	135/179
2009	640	80	28	38	34	13	31	9	121/147
2014	540	-	48	52	0	44	7	0	82/95
2019	480	-	25	67	8	54	13	8	95/113
Chrysothamnus viscidiflorus -- (yellow rabbitbrush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	20	-	0	100	0	0	100	0	- / -
2004	-	-	-	-	-	-	-	-	23/28
2009	-	-	-	-	-	-	-	-	131/122
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Ephedra viridis[p] -- (mormon tea)									
1994	340	20	6	82	12	18	12	6	85/106
1999	340	-	12	71	18	53	12	0	99/116
2004	500	-	4	84	12	32	4	4	101/124
2009	460	60	22	65	13	0	0	9	95/125
2014	460	-	26	61	13	39	9	4	81/103
2019	580	-	7	86	7	17	0	7	71/90
Eriogonum microthecum[p] -- (slender buckwheat)									
1994	580	-	3	93	3	3	14	3	4/7
1999	540	20	37	59	4	19	7	0	6/9
2004	600	-	13	87	0	43	10	0	5/8
2009	480	-	8	88	4	0	13	4	4/6
2014	160	120	25	75	0	50	25	0	19/21
2019	360	20	33	67	0	22	50	0	8/13

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Ericameria nauseosa -- (rubber rabbitbrush)									
1994	40	-	0	50	50	50	50	50	28/34
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	57/51
2019	-	-	-	-	-	-	-	-	-/-
Gutierrezia sarothrae -- (broom snakeweed)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	20	-	0	100	0	0	0	0	- / -
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Juniperus osteosperma[t] -- (Utah juniper)									
1994	-	-	-	-	-	-	-	-	-/-
1999	160	-	88	13	0	0	0	13	- / -
2004	160	20	50	50	0	0	0	0	- / -
2009	100	-	40	60	0	0	0	0	- / -
2014	160	20	63	38	0	13	0	0	- / -
2019	140	20	71	29	0	14	0	0	- / -
Opuntia polyacantha -- (plains pricklypear)									
1994	80	-	0	75	25	0	0	0	7/29
1999	80	-	25	75	0	0	0	0	9/25
2004	60	-	0	100	0	0	0	0	8/23
2009	80	-	0	100	0	0	0	0	8/21
2014	80	-	25	75	0	0	0	0	10/26
2019	20	-	0	100	0	0	0	0	8/18
Pinus edulis[t] -- (twoneedle pinyon)									
1994	-	-	-	-	-	-	-	-	-/-
1999	260	40	54	46	0	0	0	0	- / -
2004	220	-	36	64	0	0	0	0	- / -
2009	280	20	29	64	7	0	0	43	- / -
2014	300	-	40	60	0	0	7	0	- / -
2019	120	20	33	50	17	0	0	17	- / -
Rhus trilobata[p] -- (skunkbush sumac)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	19/19
2019	-	-	-	-	-	-	-	-	15/14
Sclerocactus -- (fishhook cactus)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	10/14
2014	-	-	-	-	-	-	-	-	-/-
2019	20	-	100	0	0	0	0	0	3/6

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Yucca harrimaniae -- (Spanish bayonet)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	22/29
2009	-	-	-	-	-	-	-	-	18/27
2014	-	-	-	-	-	-	-	-	27/26
2019	-	-	-	-	-	-	-	-	21/30

t - Tree Species; p - Preferred Browse; i - Introduced Species

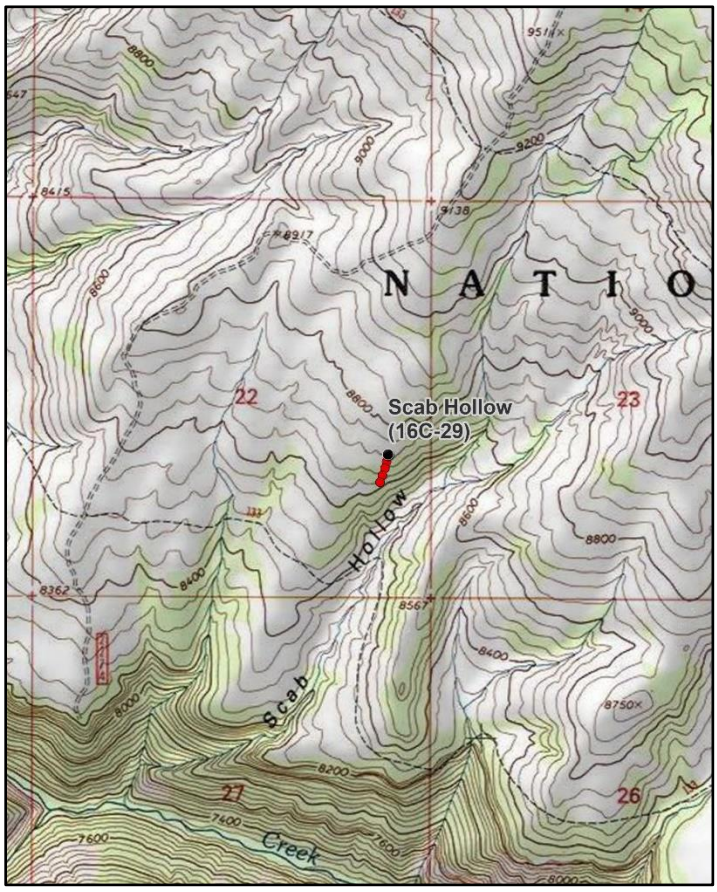
Table 16C-28.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

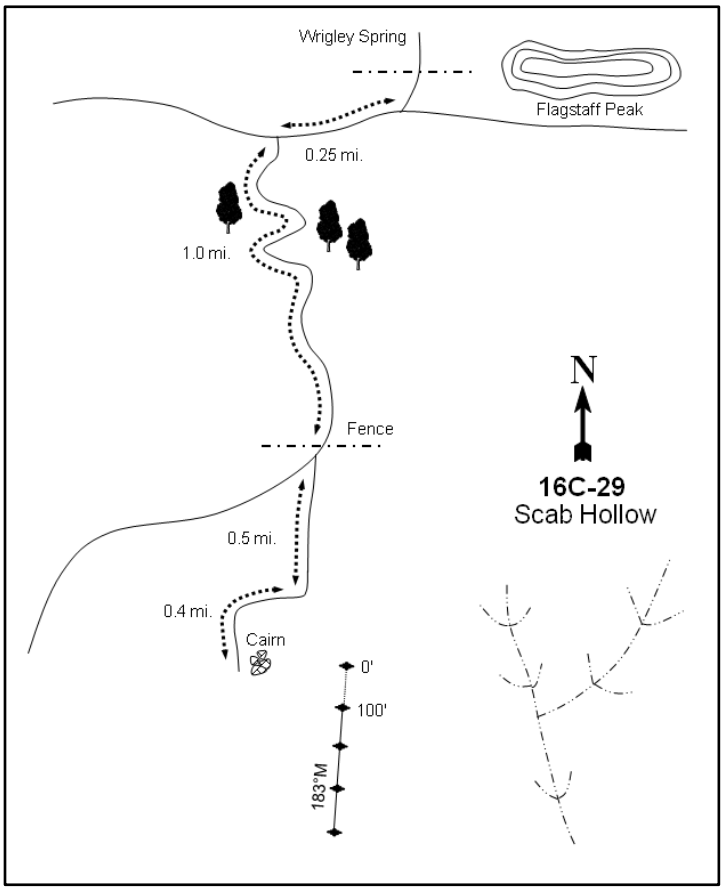
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1994	89	-	-	-	-	-	10.4
1999	116	-	-	-	-	-	8.4
2004	146	5	60	30	5	-	8.5
2009	140	10	60	25	5	-	5.4
2014	119	17	28	50	6	-	9.2
2019	55	14	64	7	14	-	5.3
Pinus edulis (twoneedle pinyon)							
1994	121	-	-	-	-	-	5.4
1999	186	-	-	-	-	-	4.8
2004	155	5	65	15	-	15	6.0
2009	165	10	75	10	5	-	5.9
2014	167	20	35	30	15	-	7.3
2019	47	13	38	38	13	-	5.8

Table 16C-28.15 – Deer Desirable Components Index: Mid Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1994	21.0	10.2	5.9	18.3	0.0	3.1	0.0	58.5	Fair
1999	23.4	11.3	13.6	17.2	0.0	0.9	0.0	66.3	Fair-Good
2004	27.6	12.7	11.6	6.9	0.0	0.5	0.0	59.2	Fair
2009	24.4	7.8	8.1	13.5	0.0	1.4	0.0	55.2	Fair
2014	15.7	12.7	13.0	9.7	0.0	0.7	0.0	51.7	Poor-Fair
2019	21.2	11.9	8.8	23.7	0.0	2.9	0.0	68.5	Good

SCAB HOLLOW - STUDY NO. 16C-29





Location Information

USGS 7.5 min Map Info	Flagstaff Peak SW; Township 20S, Range 5E, Section 22
GPS (0' Stake)	NAD 83 UTM ZONE 12, 470708 East 4322590 North

Transect Information

Browse Tag # (0' Stake)	9027
Transect Bearing	183° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Belt 3: No Rebar

Directions to Site

From the Forest Service boundary in Ferron Canyon, travel 7.8 miles to Wrigley Springs Reservoir. From Wrigley Springs Reservoir on FS Road #43, continue on the main road southwest to Wrigley Spring. Proceed south 0.9 miles to a "T"-intersection, then turn right toward Twelve Mile Flat. Proceed for 0.25 miles, then turn left onto a dirt road (Forest Service Road #274). Drive 1.0 miles down through the aspen on the steep narrow road to a fence. Just past the fence, bear left at a faint fork, then continue 0.5 miles to the end of the road (it is possible to continue driving down the ridge). Turn right and continue down the small hill, then travel down the ridge, bearing left through the clearings, for 0.4 miles to the southeast edge of the small, open ridge above Scab Hollow. A rock cairn along the edge of the ridge marks the study site. From the cairn, the 0-foot baseline stake is 15 feet to the southeast, and is identified by a red browse tag #9027 on the short fencepost. The transect runs down across the slope.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	FERRON
Elevation	8,700ft (2,652m)
Aspect	Southeast
Slope	24%
Sample Dates	08/16/1994, 08/03/1999, 07/28/2004, 08/12/2009, 07/15/2014, 07/09/2019

Wildlife Habitat and Vegetation History

Table 16C-29.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	substantial	winter
Shiras Moose	crucial	year-long

Table 16C-29.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1988	Curl-leaf Mountain Mahogany/Perennial Grass	Phase I
1994	Curl-leaf Mountain Mahogany/Perennial Grass	Phase I
1999	Curl-leaf Mountain Mahogany/Perennial Grass	Phase I
2004	Curl-leaf Mountain Mahogany/Perennial Grass	Phase I
2009	Curl-leaf Mountain Mahogany/Perennial Grass	Phase I
2014	Curl-leaf Mountain Mahogany/Perennial Grass	Phase I
2019	Curl-leaf Mountain Mahogany/Perennial Grass	Phase I

Site Notes

No Notes

Soils

Table 16C-29.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay	7.6	34.0	24.2	41.8	2.9	2.3	89.6	0.6	08/03/1999

Site Potential

1981 - 2010 Average Annual Precipitation	22 inches
NRCS Ecological Site	Mountain Stony Loam (Curlleaf Mountain Mahogany)
NRCS Ecological Site #	R047XC461UT
States and Transitions	A defined state and transition model is available.

Since study establishment in 1988, the shrub component of this site has been primarily comprised of curl-leaf mountain mahogany (*Cercocarpus ledifolius*), although other species providing less cover have also been present (Table 16C-29.12, Table 16C-29.13). The native perennial grass species Salina wildrye (*Leymus salinus*) has contributed a majority of the herbaceous cover in all sample years, and perennial grasses have been a co-dominant vegetation component over the course of the study (Table 16C-29.7, Table 16C-29.10). This curl-leaf mountain mahogany-perennial grass community most closely resembles the Curl-leaf Mountain Mahogany/Introduced Non-natives State as is illustrated by the available state and transition model (Jornada, 2019). Twoneedle pinyon (*Pinus edulis*), Utah juniper (*Juniperus osteosperma*), and/or Rocky Mountain juniper (*J. scopulorum*) have been observed in all sample years, placing the study in Phase I of woodland succession (Table 16C-29.4, Table 16C-29.12, Table 16C-29.14, Photos). Barring a major disturbance, further tree encroachment could be possible in future sample years, but the consistently low amount of trees present indicates that this is likely not an immediate concern.

Trend Summary Tables

Table 16C-29.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	3.4	0.8	3.2	-	-	-
1999	5.7	1.1	2.0	1.1	-	0.2
2004	5.5	1.7	2.2	15.9	1.9	3.2
2009	7.0	0.8	3.2	16.6	0.4	3.2
2014	6.2	0.6	2.3	13.1	0.7	3.1
2019	7.5	2.6	2.5	13.9	1.1	3.1

Table 16C-29.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	-	341	2	55	-	20.9	0.0	0.6
1999	-	322	2	141	-	18.1	0.0	5.4
2004	-	328	38	75	-	17.1	0.8	0.9
2009	-	310	8	60	-	23.5	0.0	0.8
2014	-	345	48	71	-	29.4	1.1	1.9
2019	-	350	121	108	-	28.5	4.1	2.6

Table 16C-29.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	30.5	0.0	22.6	9.3	19.5	29.2
1999	21.6	0.0	28.1	20.2	16.1	30.5
2004	30.1	0.2	22.5	15.6	14.6	29.0
2009	30.6	0.1	25.0	12.3	13.4	33.5
2014	18.6	0.8	31.5	21.7	12.8	40.1
2019	22.9	0.2	36.1	19.3	14.3	41.9

Table 16C-29.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1994	1	7	11	27
1999	-	6	29	15
2004	-	5	34	10
2009	1	1	41	10
2014	1	1	20	1
2019	-	-	38	8
Year	Days Use Per Acre (ha)			
1994	-	-	-	-
1999	1.5 (3.6)	9.4 (23.2)	60.3 (149.0)	-
2004	0.7 (1.8)	-	88.5 (218.5)	-
2009	2.2 (5.4)	7.4 (18.2)	130.0 (321.1)	-
2014	-	0.7 (1.7)	25.5 (62.9)	-
2019	0.7 (1.8)	1.3 (3.3)	54.9 (135.7)	-

Table 16C-29.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Carex (sedge)	Elymus trachycaulus (slender wheatgrass)	Leymus salinus (saline wildrye)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency				
1994	36	-	5	332	-
1999	19	2	23	312	2
2004	16	-	-	313	28
2009	25	-	-	291	50
2014	32	-	-	337	4
2019	42	-	-	315	56
year	Average Cover (%)				
1994	0.8	-	0.2	19.9	-
1999	0.4	0.0	0.7	17.0	0.0
2004	1.1	-	-	15.3	0.8
2009	1.1	-	-	20.2	2.2
2014	2.2	-	-	27.1	0.1
2019	2.1	-	-	22.9	3.5

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16C-29.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Astragalus convallarius (lesser rushy milkvetch)	Calochortus nuttallii (sego lily)	Camelina microcarpa[ai] (littlepod false flax)	Castilleja linariifolia (Wyoming Indian paintbrush)	Chaenactis douglasii (Douglas' dustymaiden)	Chenopodium fremontii[a] (Fremont's goosefoot)	Chenopodium leptophyllum[a] (narrowleaf goosefoot)	Comandra umbellata (bastard toadflax)	Cymopterus (springparsley)	Descurainia pinnata[a] (western tansymustard)	Erigeron eatonii (Eaton's fleabane)	Erigeron pumilus (shaggy fleabane)	Eriogonum alatum (winged buckwheat)	Hymenoppappus filifolius (fineleaf hymenopappus)	Hymenoxys richardsonii (pingue rubberweed)	Lappula occidentalis[a] (flatspine stickseed)	Lesquerella (bladderpod)
year	Nested Frequency																
1994	-	-	-	-	-	-	-	26	-	-	-	-	1	5	2	2	4
1999	-	3	-	2	20	-	-	100	1	-	2	3	8	-	3	-	8
2004	4	-	-	-	-	12	12	52	-	-	-	3	4	-	9	18	-
2009	-	-	-	-	-	5	1	41	-	2	-	-	1	-	3	-	-
2014	-	-	-	-	1	-	-	54	-	9	3	-	2	-	1	35	4
2019	3	11	14	2	4	52	17	80	-	10	-	-	-	-	6	67	2
year	Average Cover (%)																
1994	-	-	-	-	-	-	-	0.1	-	-	-	-	0.0	0.0	0.0	0.0	0.0
1999	-	0.0	-	0.0	0.3	-	-	3.6	0.0	-	0.0	0.0	0.1	-	0.2	-	0.1
2004	0.0	-	-	-	-	0.0	0.0	0.5	-	-	-	0.0	0.0	-	0.3	0.7	-
2009	-	-	-	-	-	0.0	0.0	0.4	-	0.0	-	-	0.0	-	0.1	-	-
2014	-	-	-	-	0.0	-	-	1.3	-	0.6	0.0	-	0.0	-	0.0	0.5	0.0
2019	0.0	0.1	0.1	0.0	0.1	1.5	0.1	1.9	-	0.1	-	-	-	-	0.1	2.4	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Linum lewisii (Lewis flax)	Machaeranthera canescens (hoary tansyaster)	Machaeranthera grindelioides (rayless tansyaster)	Madia glomerata[a] (mountain tarweed)	Mirabilis linearis (narrowleaf four o'clock)	Penstemon caespitosus (mat penstemon)	Penstemon pachyphyllus (thickleaf beardtongue)	Petradoria pumila (rock goldenrod)	Phlox hoodii (spiny phlox)	Schoenocrambe linifolia (flaxleaf plainsmustard)	Tetraneuris acaulis (stemless four-nerve daisy)	Tragopogon dubius[ai] (yellow salsify)
year	Nested Frequency											
1994	4	-	22	-	-	1	-	4	8	-	-	-
1999	3	3	22	-	-	8	-	11	4	-	-	2
2004	-	3	4	0	-	2	-	-	-	-	-	3
2009	2	9	-	-	-	8	-	-	-	-	-	-
2014	-	7	8	-	6	-	5	-	1	1	3	5
2019	7	-	8	-	-	-	1	4	-	12	-	-
year	Average Cover (%)											
1994	0.0	-	0.3	-	-	0.0	-	0.1	0.0	-	-	-
1999	0.0	0.0	0.7	-	-	0.0	-	0.3	0.1	-	-	0.0
2004	-	0.0	0.1	0.0	-	0.0	-	-	-	-	-	0.0
2009	0.1	0.1	-	-	-	0.2	-	-	-	-	-	-
2014	-	0.1	0.1	-	0.0	-	0.0	-	0.0	0.0	0.1	0.0
2019	0.0	-	0.2	-	-	-	0.0	0.2	-	0.1	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16C-29.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia nova[p] (black sagebrush)	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Cercocarpus ledifolius[p] (curl-leaf mountain mahogany)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Eriogonum corymbosum (crispleaf buckwheat)	Gutierrezia sarothrae (broom snakeweed)	Juniperus scopulorum[t] (Rocky Mountain juniper)	Mahonia repens (creeping barberry)	Pinus flexilis[t] (limber pine)	Symphoricarpos oreophilus[p] (mountain snowberry)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)										
1994	-	-	-	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-	-	-	-
2004	0.6	-	15.3	-	0	1.9	3.2	-	-	-	-
2009	0.2	0.3	16.1	0.1	0.1	0.1	3.2	0.1	-	-	-
2014	0.7	0.1	12.3	0.1	0.6	-	3.1	-	-	-	-
2019	0.6	0.1	13.2	-	0.2	0.8	3.1	0.1	-	-	-
year	Quadrat Cover (%)										
1994	0.3	-	3.1	-	0.5	0.1	2.3	0.0	1.0	-	0.1
1999	0.2	0.0	5.5	0.1	0.5	0.4	2.0	0.1	-	-	0.0
2004	0.4	-	5.1	0.0	0.2	1.1	2.2	0.2	-	0.0	0.1
2009	0.4	0.1	6.4	0.4	0.2	0.1	3.2	0.0	-	-	0.1
2014	0.3	0.1	5.7	0.1	0.3	0.1	2.3	0.0	-	-	0.1
2019	0.4	0.0	7.1	0.6	0.8	0.9	2.5	0.2	-	-	0.1

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16C-29.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	20	-	100	0	0	0	0	0	53/57
2009	-	60	0	0	0	0	0	0	- / -
2014	-	-	-	-	-	-	-	-	77/87
2019	-	-	-	-	-	-	-	-	109/115
Artemisia nova[p] -- (black sagebrush)									
1994	200	-	60	30	10	60	0	10	23/54
1999	140	-	0	86	14	57	43	0	18/45
2004	320	-	19	63	19	0	0	13	21/59
2009	300	-	27	53	20	0	0	7	23/69
2014	220	-	18	82	0	55	27	0	21/65
2019	200	20	0	90	10	10	80	10	31/70
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1994	40	-	0	100	0	50	0	0	19/31
1999	40	-	0	50	50	0	50	0	39/44
2004	-	-	-	-	-	-	-	-	64/56
2009	20	-	0	100	0	0	0	0	22/41
2014	-	40	0	0	0	0	0	0	19/40
2019	20	-	0	0	100	0	100	100	45/62
Cercocarpus ledifolius[p] -- (curl-leaf mountain mahogany)									
1994	580	20	52	48	0	17	0	0	207/185
1999	660	80	52	49	0	24	12	0	203/191
2004	620	20	45	45	10	36	52	3	167/153
2009	300	-	13	87	0	33	0	7	144/141
2014	320	-	6	88	6	44	25	13	180/184
2019	340	80	12	82	6	47	0	6	196/182
Cercocarpus montanus[p] -- (alderleaf mountain mahogany)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	19/28
2019	-	-	-	-	-	-	-	-	-/-
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1994	20	-	0	100	0	100	0	0	18/28
1999	40	-	0	50	50	100	0	0	18/22
2004	160	-	13	88	0	0	0	0	22/40
2009	420	-	5	95	0	0	0	5	22/37
2014	120	-	83	17	0	0	0	0	16/18
2019	300	-	0	100	0	0	0	0	24/26
Eriogonum corymbosum -- (crispleaf buckwheat)									
1994	920	-	39	56	4	17	9	4	19/29
1999	420	20	0	91	10	29	0	0	18/25
2004	380	-	21	63	16	5	16	0	16/27
2009	100	-	20	80	0	0	0	0	19/36
2014	220	-	0	100	0	82	0	0	18/30
2019	280	-	0	100	0	0	0	0	14/19

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Gutierrezia sarothrae -- (broom snakeweed)									
1994	380	-	42	53	5	0	0	5	11/12
1999	1720	-	12	87	1	0	0	0	16/20
2004	2300	-	6	94	0	0	0	0	18/23
2009	360	-	0	89	11	0	0	6	16/19
2014	300	20	13	87	0	0	0	0	13/14
2019	2020	-	5	95	0	0	0	0	16/16
Juniperus scopulorum[t] -- (Rocky Mountain juniper)									
1994	-	-	-	-	-	-	-	-	-/-
1999	20	-	0	100	0	0	0	0	- / -
2004	20	-	0	100	0	0	0	0	- / -
2009	20	-	0	100	0	0	0	0	- / -
2014	20	-	0	100	0	0	0	0	- / -
2019	-	-	-	-	-	-	-	-	-/-
Krascheninnikovia lanata[p] -- (winterfat)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	20	-	0	0	100	0	0	100	14/19
2014	-	-	-	-	-	-	-	-	99/76
2019	-	-	-	-	-	-	-	-	26/27
Mahonia repens -- (creeping barberry)									
1994	580	80	66	35	0	0	0	0	7/10
1999	900	20	58	42	0	0	0	0	5/9
2004	880	-	2	98	0	0	0	0	7/9
2009	580	-	7	93	0	0	0	0	8/10
2014	300	-	7	93	0	0	0	0	7/8
2019	1140	-	0	100	0	0	0	0	8/9
Pediocactus simpsonii -- (mountain ball cactus)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	20	-	0	100	0	0	0	0	- / -
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	20	-	0	100	0	0	0	0	3/6
Pinus edulis[t] -- (twoneedle pinyon)									
1994	-	-	-	-	-	-	-	-	-/-
1999	20	-	100	0	0	0	0	0	- / -
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Sambucus[p] -- (elderberry)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	56/80
2019	20	-	0	100	0	0	0	0	63/62

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
1994	120	-	67	33	0	0	33	0	17/31
1999	40	40	50	50	0	0	0	0	19/28
2004	160	-	13	75	13	0	0	0	15/27
2009	160	-	38	63	0	0	0	0	14/18
2014	60	-	33	67	0	0	0	0	17/27
2019	40	-	0	100	0	0	0	0	19/39
Tetradymia canescens -- (spineless horsebrush)									
1994	80	-	0	100	0	25	0	0	19/34
1999	40	-	0	50	50	50	0	0	19/45
2004	40	-	0	100	0	50	0	0	22/52
2009	200	-	30	40	30	0	0	10	20/30
2014	80	-	25	75	0	50	0	0	23/53
2019	60	-	0	100	0	0	0	0	21/29

t - Tree Species; p - Preferred Browse; i - Introduced Species

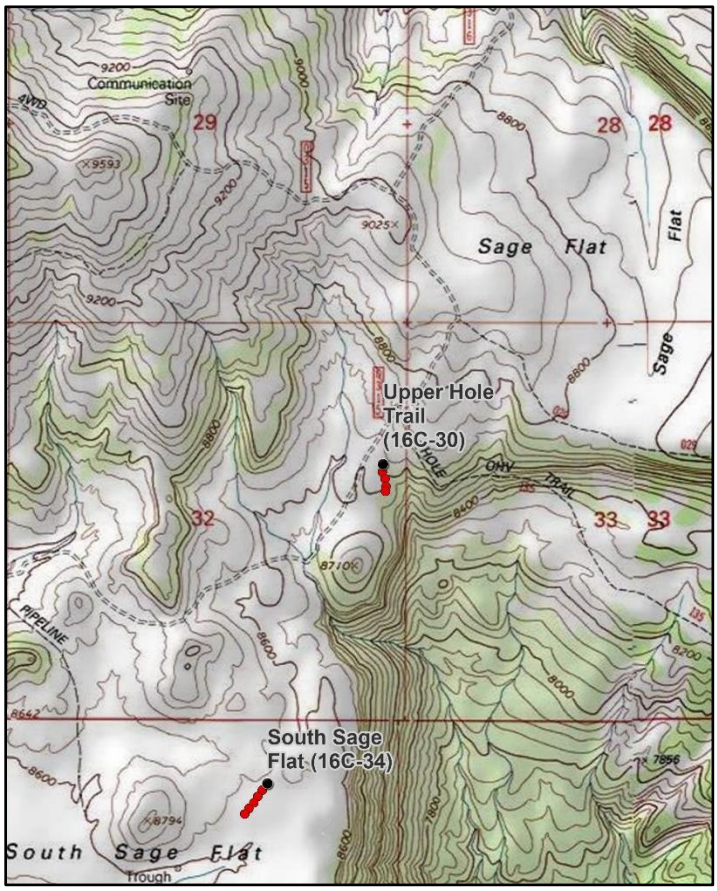
Table 16C-29.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

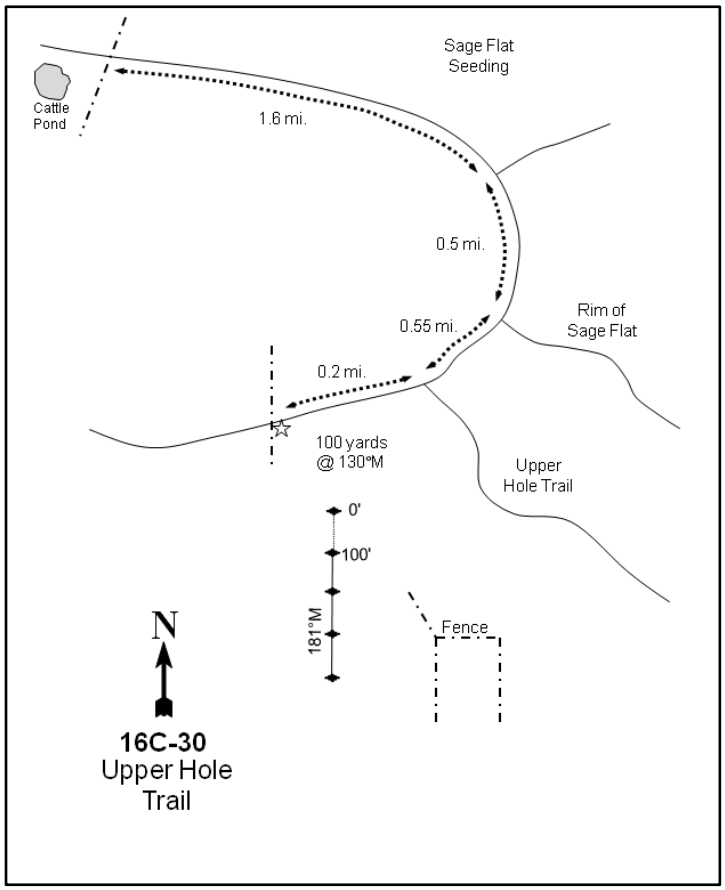
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Cercocarpus ledifolius (curl-leaf mountain mahogany)							
1999	101	-	-	-	-	-	24.8
2004	84	7	13	33	7	40	19.1
2009	64	-	19	31	19	31	18.2
2014	77	-	6	25	13	56	22.9
2019	67	-	20	40	20	20	16.9
Juniperus osteosperma (Utah juniper)							
1994	12	-	-	-	-	-	16.6
Juniperus scopulorum (Rocky Mountain juniper)							
2019	16	-	43	-	14	43	21.1
Pinus edulis (twoneedle pinyon)							
1994	3	-	-	-	-	-	3.7
2019	7	-	33	67	-	-	9.0
Pinus flexilis (limber pine)							
2019	1	-	-	100	-	-	14.0

Table 16C-29.15 – Deer Desirable Components Index: High Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1994	5.0	0.0	0.0	30.0	0.0	1.2	0.0	36.2	Very Poor
1999	8.5	14.9	15.0	30.0	0.0	10.0	0.0	78.4	Good
2004	23.7	12.0	15.0	30.0	0.0	1.7	0.0	82.4	Good
2009	24.8	14.9	6.6	30.0	0.0	1.6	0.0	77.9	Good
2014	19.5	13.1	3.4	30.0	0.0	3.7	0.0	69.7	Fair-Good
2019	20.7	13.0	5.6	30.0	0.0	5.3	0.0	74.5	Good

UPPER HOLE TRAIL - STUDY NO. 16C-30





Location Information

USGS 7.5 min Map Info	Flagstaff Peak SE; Township 20S, Range 6E, Section 32
GPS (0' Stake)	NAD 83 UTM ZONE 12, 477289 East 4320940 North

Transect Information

Browse Tag # (0' Stake)	9020
Transect Bearing	181° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Belt 3: 5ft, Belt 5: 5ft

Directions to Site

From Wrigley Springs Reservoir, continue southeast for 3.0 miles to the "T"-intersection near Flagstaff Peak. Turn left towards Sage Flat, then drive 1.65 miles and cross a cattle guard. Continue straight for 0.9 miles to a fence and cattle guard by a pond. From here, drive southeast for 1.0 miles to the Sage Flat seeding, then proceed for 0.6 miles to a fork. Continue straight on the main road for about 0.5 miles to another fork. At this point, a road that runs along the rim of Sage Flat is present on the left (#045). Turn right at 0.35 miles on Forest Service Road #046, then continue south 0.2 miles to the Hole Trail. Go another 0.2 miles on the main road to an old fenceline by an unused water trough. The study starts about 100 yards south of the road at 130 degrees magnetic. The first baseline stake is found along an old fenceline and is a two-foot, green fencepost with browse tag #9020 attached.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	FERRON
Elevation	8,620ft (2,627m)
Aspect	Southeast
Slope	12%
Sample Dates	08/09/1994, 08/03/1999, 07/28/2004, 08/11/2009, 09/16/2014, 09/03/2019

Wildlife Habitat and Vegetation History

Table 16C-30.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Rocky Mountain Elk	substantial	winter	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing
Shiras Moose	crucial	winter	

Table 16C-30.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1988	Curl-leaf Mountain Mahogany	Phase I
1994	Curl-leaf Mountain Mahogany	Phase I
1999	Curl-leaf Mountain Mahogany	Phase I
2004	Curl-leaf Mountain Mahogany	Phase I
2009	Curl-leaf Mountain Mahogany	Phase I
2014	Curl-leaf Mountain Mahogany	Phase I
2019	Curl-leaf Mountain Mahogany	Phase I

Site Notes

No Notes

Soils

Table 16C-30.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.3	44.0	22.2	33.8	2.6	2.6	54.4	0.6	08/03/1999

Site Potential

1981 - 2010 Average Annual Precipitation	20 inches
NRCS Ecological Site	Mountain Stony Loam (Curlleaf Mountain Mahogany)
NRCS Ecological Site #	R047XC461UT
States and Transitions	A defined state and transition model is available.

Curl-leaf mountain mahogany (*Cercocarpus ledifolius*) has dominated this site since study establishment in 1988. Numerous other shrub species such as mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and Utah serviceberry (*Amelanchier utahensis*) have also been present to a lesser extent (Table 16C-30.12, Table 16C-30.13). The herbaceous understory has remained abundant and very diverse, with perennial grasses and forbs providing a majority of the cover (Table 16C-30.7, Table 16C-30.10, Table 16C-30.11). Rocky Mountain juniper (*Juniperus scopulorum*) and twoneedle pinyon (*Pinus edulis*) have been present throughout the study period, placing the site within Phase I of woodland succession (Table 16C-30.4, Table 16C-30.12, Table 16C-30.14, Photos). This curl-leaf mountain mahogany and perennial herbaceous community most closely resembles the Curl-leaf Mountain Mahogany/Introduced Non-natives State as is illustrated by the available state and transition model (Jornada, 2019).

Trend Summary Tables

Table 16C-30.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	21.6	1.3	0.3	-	-	-
1999	27.0	1.1	-	1.1	-	0.2
2004	33.4	2.1	0.0	53.2	2.1	2.6
2009	32.4	1.1	0.3	52.3	1.5	2.5
2014	31.1	1.1	0.6	46.3	1.0	2.7
2019	35.6	0.6	1.0	63.2	0.5	3.0

Table 16C-30.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	-	308	12	246	-	8.5	0.0	7.9
1999	-	304	6	226	-	7.2	0.0	9.6
2004	-	289	14	181	-	8.7	0.1	10.3
2009	-	266	-	187	-	8.0	-	7.7
2014	-	259	2	183	-	8.1	0.0	9.9
2019	-	221	65	180	-	4.8	0.6	10.5

Table 16C-30.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	26.3	0.0	37.9	0.6	3.5	37.7
1999	21.4	0.0	52.3	2.9	5.5	41.8
2004	22.9	-	45.2	1.9	5.1	51.3
2009	24.4	-	52.5	1.0	3.5	46.1
2014	16.7	0.0	58.6	1.1	4.0	41.9
2019	26.5	0.1	56.5	1.3	4.8	41.1

Table 16C-30.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1994	5	3	3	15
1999	8	3	14	48
2004	7	5	17	21
2009	3	4	10	39
2014	5	2	4	25
2019	2	1	5	33
Year	Days Use Per Acre (ha)			
1994	-	-	-	-
1999	30.5 (75.3)	4.7 (11.6)	30.8 (76.1)	-
2004	8.0 (19.7)	14.7 (36.4)	29.5 (72.8)	-
2009	21.1 (52.0)	6.0 (14.9)	22.8 (56.3)	-
2014	8.0 (19.7)	4.0 (9.9)	9.4 (23.2)	-
2019	13.1 (32.3)	1.3 (3.3)	4.0 (9.9)	-

Table 16C-30.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Achnatherum lettermanii (Letterman's needlegrass)	Agropyron cristatum[i] (crested wheatgrass)	Aristida purpurea (purple threeawn)	Bouteloua gracilis (blue grama)	Carex (sedge)	Elymus elymoides (squirreltail)	Elymus lanceolatus (thickspike wheatgrass)	Hesperostipa comata (needle and thread)	Koeleria macrantha (prairie Junegrass)	Leymus salinus (saline wildrye)	Pascopyrum smithii (western wheatgrass)	Poa fendleriana (muttongrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency													
1994	14	36	1	-	1	41	9	-	9	5	189	59	92	-
1999	10	74	5	1	-	18	3	-	2	1	187	44	84	-
2004	8	48	4	-	-	22	11	9	-	-	161	6	137	8
2009	-	39	5	-	-	26	-	-	-	-	161	44	71	-
2014	26	-	-	-	-	30	-	53	1	5	114	15	66	6
2019	2	28	-	-	-	31	-	2	4	4	104	54	40	18
year	Average Cover (%)													
1994	0.1	0.6	0.0	-	0.0	0.4	0.0	-	0.0	0.1	5.1	1.1	1.1	-
1999	0.1	1.3	0.0	0.0	-	0.4	0.0	-	0.0	0.0	4.1	0.3	1.1	-
2004	0.0	0.8	0.2	-	-	0.4	0.1	0.0	-	-	4.5	0.0	2.5	0.2
2009	-	0.3	0.0	-	-	0.5	-	-	-	-	6.3	0.2	0.7	-
2014	0.4	-	-	-	-	0.6	-	1.7	0.0	0.1	3.4	0.4	1.3	0.2
2019	0.1	0.2	-	-	-	0.6	-	0.0	0.0	0.0	1.9	1.5	0.4	0.1

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16C-30.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Antennaria (pussytoes)	Arabis (rockcress)	Arenaria fendleri (Fendler's sandwort)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus miser (timber milkvetch)	Astragalus tenellus (looseflower milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Castilleja linariifolia (Wyoming Indian paintbrush)	Chaenactis douglasii (Douglas' dustymaiden)	Chenopodium leptophyllum[a] (narrowleaf goosefoot)	Cirsium (thistle)	Crepis acuminata (tapertip hawksbeard)	Cymopterus (springparsley)	Descurainia pinnata[a] (western tansymustard)	Erigeron (fleabane)	Erigeron eatonii (Eaton's fleabane)
year	Nested Frequency																
1994	-	-	5	13	8	20	-	3	30	1	-	7	7	2	-	-	49
1999	3	-	9	1	-	33	-	-	28	19	-	9	4	-	-	10	39
2004	-	-	10	1	2	19	-	-	4	-	-	4	8	0	-	-	6
2009	-	-	13	1	1	34	1	3	10	-	-	5	10	-	-	-	18
2014	2	3	9	3	-	40	-	4	10	-	-	2	4	-	2	-	9
2019	3	10	15	1	27	4	-	1	5	3	10	4	2	1	2	-	18
year	Average Cover (%)																
1994	-	-	0.0	0.1	0.2	0.2	-	0.0	0.2	0.0	-	0.0	0.0	0.0	-	-	0.3
1999	0.0	-	0.2	0.0	-	1.0	-	-	0.2	0.1	-	0.1	0.0	-	-	0.0	0.2
2004	-	-	0.1	0.0	0.0	1.5	-	-	0.1	-	-	0.0	0.1	0.0	-	-	0.0
2009	-	-	0.1	0.0	0.0	0.7	0.0	0.0	0.1	-	-	0.0	0.1	-	-	-	0.1
2014	0.0	0.0	0.3	0.1	-	0.9	-	0.0	0.1	-	-	0.0	0.0	-	0.0	-	0.0
2019	0.0	0.1	0.5	0.1	0.3	0.2	-	0.0	0.1	0.0	0.1	0.2	0.0	0.0	0.0	-	0.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Erigeron flagellaris (trailing fleabane)	Erigeron pumilus (shaggy fleabane)	Erigeron speciosus (aspen fleabane)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Hymenopappus filifolius (fineleaf hymenopappus)	Hymenoxys richardsonii (pingue rubberweed)	Ipomopsis aggregata (scarlet gilia)	Lappula occidentalis[a] (flatspine stickseed)	Lesquerella (bladderpod)	Linum lewisii (Lewis flax)	Lithospermum incisum (narrowleaf stoneseed)	Lupinus argenteus (silvery lupine)	Lygodesmia grandiflora (largeflower skeletonplant)	Machaeranthera canescens (hoary tansyaster)	Machaeranthera grindelioides (rayless tansyaster)	Orobanche fasciculata (clustered broomrape)
year	Nested Frequency																
1994	-	8	33	43	10	-	27	-	-	18	2	5	10	-	18	11	-
1999	3	5	-	36	14	2	17	-	-	21	-	-	9	-	11	9	-
2004	4	10	-	33	8	2	31	3	-	13	-	0	6	3	7	9	-
2009	3	-	-	25	14	5	32	-	-	-	-	-	13	4	7	6	-
2014	-	8	-	47	13	3	14	-	-	-	-	3	2	-	11	10	1
2019	2	6	-	37	6	1	8	-	2	4	2	10	8	-	5	8	-
year	Average Cover (%)																
1994	-	0.0	0.3	0.3	0.2	-	0.1	-	-	0.1	0.0	0.0	0.1	-	0.1	0.1	-
1999	0.0	0.1	-	0.3	0.3	0.0	0.1	-	-	0.1	-	-	0.2	-	0.1	0.1	-
2004	0.1	0.1	-	0.6	0.3	0.2	0.4	0.0	-	0.1	-	0.0	0.1	0.0	0.1	0.0	-
2009	0.0	-	-	0.3	0.3	0.0	0.2	-	-	-	-	-	0.7	0.0	0.0	0.1	-
2014	-	0.0	-	0.9	0.3	0.0	0.1	-	-	-	-	0.0	0.2	-	0.1	0.1	0.0
2019	0.0	0.0	-	1.1	0.1	0.0	0.1	-	0.0	0.0	0.0	0.0	0.7	-	0.0	0.1	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Oxytropis lambertii (purple locoweed)	Packera multilobata (lobeleaf groundsel)	Penstemon (beardtongue)	Penstemon carnosus (fleshy beardtongue)	Penstemon watsonii (Watson's penstemon)	Petradoria pumila (rock goldenrod)	Phlox austromontana (mountain phlox)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii[a] (Douglas' knotweed)	Symphyotrichum (aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius[ai] (yellow salsify)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency													
1994	1	5	41	40	-	73	82	-	-	12	-	-	-	-
1999	-	15	38	34	-	59	78	-	-	6	4	3	-	-
2004	5	4	-	10	11	79	62	-	2	14	11	2	-	3
2009	-	2	-	14	18	61	77	-	-	-	29	3	-	-
2014	8	5	-	11	13	66	51	21	1	-	-	-	-	-
2019	-	4	4	22	26	78	75	-	6	49	2	-	3	1
year	Average Cover (%)													
1994	0.0	0.0	1.2	0.2	-	2.3	1.9	-	-	0.0	-	-	-	-
1999	-	0.1	0.8	0.7	-	2.5	2.2	-	-	0.0	0.0	0.0	-	-
2004	0.0	0.0	-	0.1	0.8	3.0	2.2	-	0.0	0.1	0.1	0.0	-	0.0
2009	-	0.0	-	0.1	0.3	1.4	2.0	-	-	-	1.0	0.0	-	-
2014	0.1	0.0	-	0.1	0.5	2.4	2.5	0.9	0.0	-	-	-	-	-
2019	-	0.0	0.0	0.1	0.9	3.7	1.9	-	0.0	0.5	0.0	-	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16C-30.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis[p] (Utah serviceberry)	Artemisia nova[p] (black sagebrush)	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Cercocarpus ledifolius[p] (curl-leaf mountain mahogany)	Cercocarpus montanus[p] (alderleaf mountain mahogany)	Chrysothamnus depressus[p] (longflower rabbitbrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Eriogonum corymbosum (crispleaf buckwheat)	Eriogonum microthecum[p] (slender buckwheat)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma[t] (Utah juniper)	Juniperus scopulorum[t] (Rocky Mountain juniper)	Linanthus pungens (granite prickly phlox)	Pediocactus simpsonii (mountain ball cactus)	Pinus edulis[t] (twoneedle pinyon)	Purshia tridentata[p] (antelope bitterbrush)	Rosa woodsii[p] (Woods' rose)
year	Line Intercept Cover (%)																
1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2004	7.5	1.4	8.4	17.5	0.9	0.3	0.9	0.1	-	0.7	0.6	-	0.3	-	2	8.7	2.1
2009	6.6	0.3	8.5	17.7	0.6	0.3	0.9	-	-	0.2	0.5	-	0.4	-	2	9.2	1.3
2014	7.6	1.2	8.7	16.4	0.4	-	0.7	-	-	0.1	-	0.7	0.1	-	2	7.3	1
2019	8.9	0.8	11.8	20.1	0.6	0.3	0.1	-	-	0.1	-	0.9	0.3	-	2.1	7.4	2.9
year	Quadrat Cover (%)																
1994	3.5	0.4	3.0	5.7	0.0	0.3	0.7	0.1	-	0.2	0.1	-	0.2	-	0.1	4.7	0.8
1999	2.9	0.9	5.0	7.8	0.2	0.4	0.5	0.0	-	0.1	-	-	0.4	-	0.0	4.8	1.0
2004	4.0	2.8	5.6	9.3	0.3	0.5	0.6	0.0	-	0.7	0.0	-	0.6	0.0	0.0	6.3	1.4
2009	3.3	1.6	4.7	10.4	0.6	0.1	0.6	-	-	0.2	0.3	-	0.2	-	0.0	5.7	1.4
2014	3.4	1.1	7.3	6.9	0.0	0.1	0.4	-	-	0.2	0.6	0.0	0.3	-	0.0	5.9	1.0
2019	4.9	2.2	8.9	7.0	0.3	0.1	0.1	0.1	0.0	0.1	-	0.8	0.1	-	0.1	4.7	1.6

t - Tree Species; p - Preferred Browse; i - Introduced Species

SHRUB SPECIES	Symphoricarpos oreophilus[p] (mountain snowberry)	Tetradymia canescens (spineless horsebrush)	Yucca baileyi ssp. navajoa (Navajo yucca)
year	Line Intercept Cover (%)		
1994	-	-	-
1999	-	-	-
2004	6.4	-	0.1
2009	7.8	-	0
2014	3.7	-	0.1
2019	10.4	-	-
year	Quadrat Cover (%)		
1994	3.2	0.0	0.1
1999	4.0	-	0.2
2004	3.3	-	0.2
2009	4.6	0.0	0.0
2014	5.3	-	0.2
2019	5.9	-	0.2

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16C-30.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
1994	1180	-	22	76	2	9	2	0	72/79
1999	680	120	44	44	12	50	24	6	160/181
2004	640	-	31	56	13	19	44	3	113/120
2009	1260	-	33	65	2	19	18	5	117/121
2014	780	20	36	49	15	21	18	15	96/113
2019	1080	40	44	54	2	26	7	2	140/141
Artemisia nova[p] -- (black sagebrush)									
1994	300	-	0	60	40	0	0	33	24/36
1999	1280	140	22	64	14	22	2	11	22/38
2004	2320	40	36	46	18	1	0	8	21/43
2009	600	20	7	67	27	3	0	23	23/41
2014	1120	-	9	88	4	4	39	0	20/32
2019	940	-	9	47	45	2	0	45	26/46
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1994	2420	40	17	60	23	7	0	14	44/56
1999	2200	980	30	60	10	9	0	6	52/73
2004	2300	140	27	69	4	13	3	2	51/67
2009	2500	-	9	85	6	5	0	4	52/69
2014	2200	20	6	90	5	16	26	4	44/67
2019	1720	20	7	67	26	5	1	21	60/80
Cercocarpus ledifolius[p] -- (curl-leaf mountain mahogany)									
1994	720	-	11	89	0	3	6	0	126/127
1999	800	40	13	80	8	33	28	0	173/147
2004	480	20	8	88	4	4	50	0	168/151
2009	460	240	4	96	0	9	30	0	184/155
2014	780	20	23	77	0	62	5	0	201/173
2019	620	20	10	84	7	61	36	7	183/166
Cercocarpus montanus[p] -- (alderleaf mountain mahogany)									
1994	240	-	25	75	0	67	0	0	63/94
1999	220	40	9	91	0	9	73	0	50/60
2004	200	-	20	80	0	0	80	0	45/56
2009	200	120	20	30	50	20	10	0	52/58
2014	180	-	0	100	0	22	78	0	38/60
2019	100	-	20	80	0	60	0	0	74/64
Chrysothamnus depressus[p] -- (longflower rabbitbrush)									
1994	1000	-	0	92	8	18	0	2	19/18
1999	660	-	12	64	24	46	18	3	8/37
2004	700	-	0	100	0	3	0	0	11/22
2009	340	-	6	94	0	6	0	0	9/19
2014	240	-	8	92	0	8	8	0	9/14
2019	420	-	0	91	10	0	43	10	11/19
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1994	780	-	5	90	5	5	0	0	16/23
1999	560	-	4	79	18	54	7	18	26/29
2004	660	-	0	100	0	0	0	15	29/33
2009	580	-	0	100	0	0	3	3	24/29
2014	340	-	12	88	0	0	0	12	34/40
2019	260	-	8	92	0	0	8	0	28/29

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Echinocereus -- (hedgehog cactus)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	7/11
2019	-	-	-	-	-	-	-	-	-/-
Eriogonum corymbosum -- (crispleaf buckwheat)									
1994	140	-	0	100	0	14	0	0	23/36
1999	40	-	0	100	0	0	0	0	17/46
2004	20	20	100	0	0	0	0	0	19/30
2009	-	-	-	-	-	-	-	-	35/79
2014	-	-	-	-	-	-	-	-	-/-
2019	100	-	0	100	0	20	60	0	11/20
Eriogonum microthecum[p] -- (slender buckwheat)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	20	-	0	100	0	0	0	0	79/86
2019	40	-	0	100	0	0	0	0	9/14
Gutierrezia sarothrae -- (broom snakeweed)									
1994	480	-	8	92	0	0	0	0	17/16
1999	680	20	21	79	0	0	0	0	15/16
2004	1480	-	0	100	0	0	0	0	20/22
2009	540	-	0	100	0	0	0	0	18/18
2014	40	-	0	100	0	0	0	0	18/19
2019	280	-	0	100	0	0	0	0	18/20
Juniperus osteosperma[t] -- (Utah juniper)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	20	-	100	0	0	0	0	0	- / -
2009	20	-	0	100	0	0	0	0	- / -
2014	20	-	100	0	0	0	0	0	- / -
2019	-	-	-	-	-	-	-	-	-/-
Krascheninnikovia lanata[p] -- (winterfat)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	20	-	100	0	0	0	0	0	- / -
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Linanthus pungens -- (granite prickly phlox)									
1994	600	-	3	97	0	0	0	0	35/21
1999	800	-	5	90	5	0	0	0	16/21
2004	660	-	3	82	15	0	0	3	15/14
2009	660	-	0	100	0	0	0	0	11/15
2014	480	-	0	100	0	0	0	0	18/16
2019	380	-	5	95	0	0	0	0	14/19

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Mahonia repens -- (creeping barberry)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	6/15
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	10/15
Pediocactus simpsonii -- (mountain ball cactus)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	40	-	50	50	0	0	0	0	- / -
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	9/7
2019	-	-	-	-	-	-	-	-	-/-
Pinus edulis[t] -- (twoneedle pinyon)									
1994	-	-	-	-	-	-	-	-	-/-
1999	20	-	100	0	0	0	0	0	- / -
2004	20	-	100	0	0	0	0	0	- / -
2009	20	-	100	0	0	0	0	0	- / -
2014	140	20	100	0	0	0	0	0	- / -
2019	20	20	100	0	0	0	0	0	- / -
Purshia tridentata[p] -- (antelope bitterbrush)									
1994	2720	-	6	93	1	18	1	3	27/88
1999	1980	60	22	75	3	44	48	2	40/90
2004	2080	60	3	92	5	30	64	0	39/95
2009	1840	-	9	90	1	36	10	1	40/86
2014	1740	40	6	84	10	38	39	14	39/80
2019	1420	180	16	83	1	16	73	0	39/87
Ribes[p] -- (currant)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	103/128
Rosa woodsii[p] -- (Woods' rose)									
1994	3060	-	18	82	0	0	0	0	22/11
1999	2080	780	64	36	0	0	0	0	43/29
2004	2920	-	7	93	0	0	0	0	22/20
2009	2400	80	8	93	0	0	0	0	29/26
2014	3620	20	40	60	0	0	0	0	26/22
2019	1860	-	0	100	0	0	0	0	26/20
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
1994	2360	-	7	92	2	8	4	0	35/67
1999	1740	140	30	69	1	5	0	0	46/80
2004	1560	40	6	94	0	19	0	0	43/80
2009	2900	-	17	82	1	1	0	0	36/58
2014	2200	-	12	87	1	16	0	1	51/70
2019	2460	-	6	94	1	31	5	1	39/73

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Tetradymia canescens -- (spineless horsebrush)									
1994	40	-	100	0	0	0	0	0	11/15
1999	20	-	100	0	0	0	0	0	- / -
2004	80	-	50	50	0	0	0	0	11/17
2009	60	-	0	100	0	0	0	0	12/14
2014	-	-	-	-	-	-	-	-	-/-
2019	20	-	0	100	0	0	0	0	31/35
Yucca baileyi ssp. navajoa -- (Navajo yucca)									
1994	320	-	69	31	0	0	0	0	23/29
1999	320	-	56	44	0	0	0	0	19/35
2004	140	-	14	86	0	0	0	0	22/26
2009	240	-	0	92	8	0	0	8	13/21
2014	240	-	33	67	0	0	0	0	14/19
2019	120	-	50	50	0	0	0	0	16/22

t - Tree Species; p - Preferred Browse; i - Introduced Species

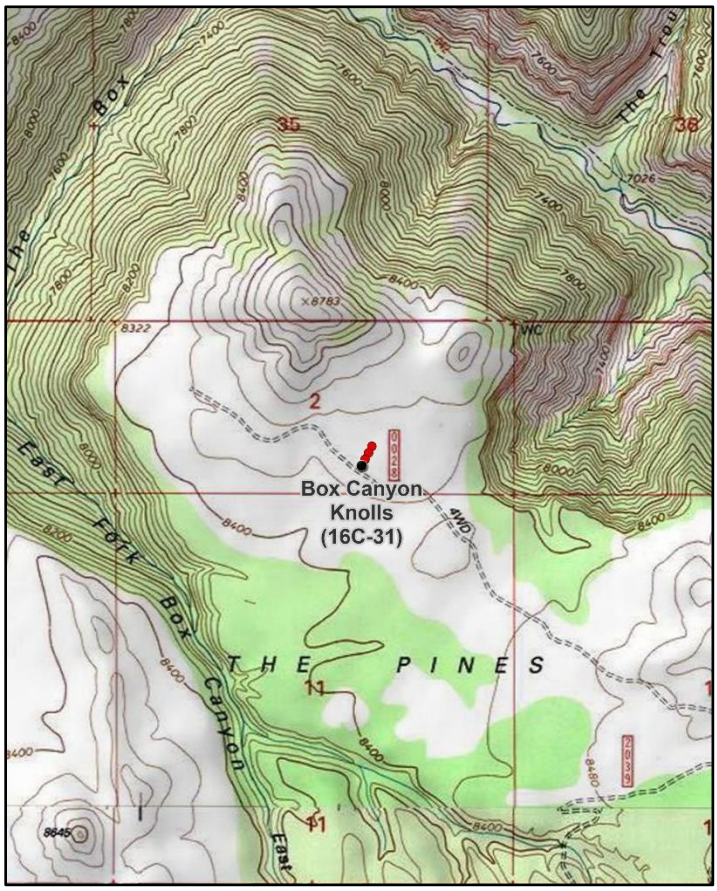
Table 16C-30.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

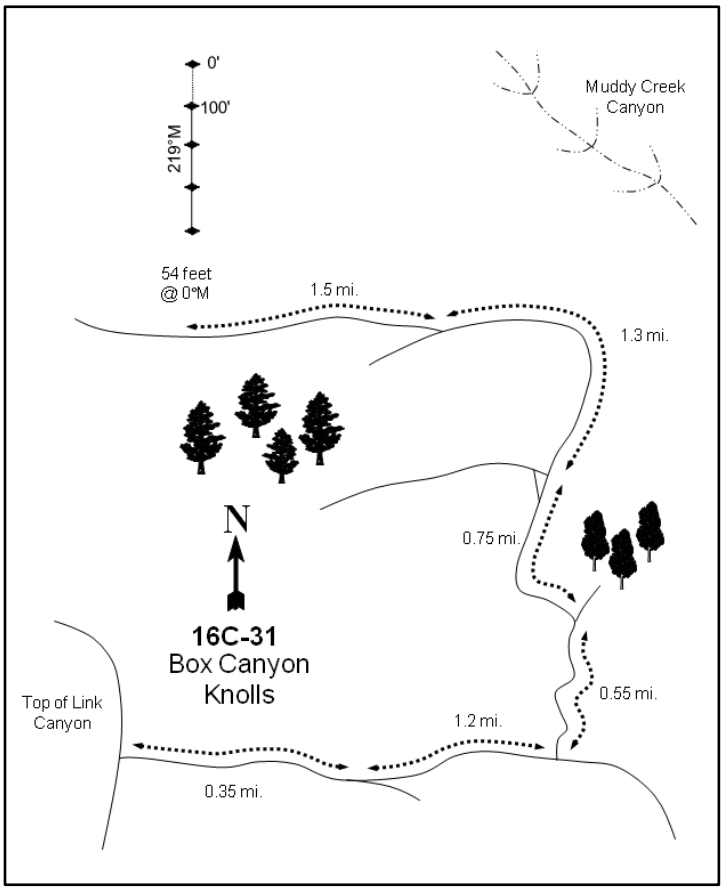
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Cercocarpus ledifolius (curl-leaf mountain mahogany)							
1999	136	-	-	-	-	-	9.7
2004	161	-	33	27	27	13	11.9
2009	103	-	41	35	6	18	6.8
2014	85	-	25	19	25	31	22.2
Juniperus scopulorum (Rocky Mountain juniper)							
1994	3	-	-	-	-	-	4.5
2014	9	-	33	-	67	-	8.7
2019	9	-	-	67	33	-	10.0
Pinus edulis (twoneedle pinyon)							
1994	5	-	-	-	-	-	15.6
1999	3	-	-	-	-	-	27.0
2014	16	13	25	-	13	50	21.8
2019	15	11	22	-	22	44	15.7
Pinus flexilis (limber pine)							
1994	3	-	-	-	-	-	15.0
1999	2	-	-	-	-	-	35.0
2019	3	-	-	33	33	33	24.0

Table 16C-30.15 – Deer Desirable Components Index: High Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1994	29.7	13.6	5.9	17.1	0.0	10.0	0.0	76.3	Good
1999	30.0	13.0	12.8	14.5	0.0	10.0	0.0	80.3	Good
2004	30.0	13.5	7.1	17.4	0.0	10.0	0.0	78.0	Good
2009	30.0	14.3	5.8	16.0	0.0	10.0	0.0	76.2	Good
2014	30.0	13.5	9.0	16.3	0.0	10.0	0.0	78.8	Good
2019	30.0	12.6	6.8	9.6	0.0	10.0	0.0	69.0	Fair-Good

BOX CANYON KNOLLS - STUDY NO. 16C-31





Location Information

USGS 7.5 min Map Info	Flagstaff Peak SW; Township 21S, Range 5E, Section 02
GPS (0' Stake)	NAD 83 UTM ZONE 12, 471967 East 4318207 North

Transect Information

Browse Tag # (0' Stake)	9028
Transect Bearing	180° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

From Center Street in the town of Emery, continue south on Highway 10 for 1.2 miles. Turn right onto a dirt road and travel 0.6 miles. Turn left and drive up Link Canyon 7 miles (4WD road) to the top. Turn right at the fork and proceed for 0.35 miles, then bear left and continue for 1.2 miles. Turn left off of the jeep trail and go 0.55 miles to a faint fork. Bear left onto Forest Service Road #28 and go 0.75 miles to a junction. Bear right and continue northwest 1.3 miles to another fork, then stay right on FS Road #278. Travel 1.5 miles and stop just past a lone limber pine. The study is located in the sage flat on the right side of the road and is marked by short fenceposts. The 400-foot baseline stake is 54 feet north of the road. The 0-foot baseline stake is marked by browse tag #9028.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	EMERY
Elevation	8,450ft (2,576m)
Aspect	South
Slope	0-2%
Sample Dates	08/17/1994, 07/28/1999, 07/27/2004, 07/28/2009, 07/15/2014, 07/10/2019

Wildlife Habitat and Vegetation History

Table 16C-31.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Rocky Mountain Elk	substantial	winter	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing
Shiras Moose	crucial	winter	

Table 16C-31.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1988	Perennial Grass/Little Sagebrush/Yellow Rabbitbrush	No Encroachment
1994	Perennial Grass/Little Sagebrush/Yellow Rabbitbrush	No Encroachment
1999	Perennial Grass/Little Sagebrush/Yellow Rabbitbrush	No Encroachment
2004	Perennial Grass/Little Sagebrush/Yellow Rabbitbrush	No Encroachment
2009	Perennial Grass/Little Sagebrush/Yellow Rabbitbrush	No Encroachment
2014	Perennial Grass/Little Sagebrush/Yellow Rabbitbrush	No Encroachment
2019	Little Sagebrush/Yellow Rabbitbrush	No Encroachment

Site Notes

In 2014, many of the perennial grasses were heavily grazed and were difficult to classify due to the lack of identifying features.

Soils

Table 16C-31.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	6.8	42.0	25.4	32.6	2.9	13.2	137.6	0.4	07/28/1999

Site Potential

1981 - 2010 Average Annual Precipitation	17 inches
NRCS Ecological Site	Mountain Shallow Loam (Low Sagebrush)
NRCS Ecological Site #	R047XA442UT
States and Transitions	No state and transition model is available for the above ecological site.

Since study establishment in 1988, little sagebrush (*Artemisia arbuscula*) and yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus* var. *viscidiflorus*) have been the most abundant shrubs on this study site: cover and density of both species have increased over time (Table 16C-31.12, Table 16C-31.13, Photos). Perennial grasses, particularly muttongrass (*Poa fendleriana*) and pine needlegrass (*Achnatherum pinetorum*), have provided the most herbaceous cover and were considered to be co-dominant vegetation components from 1988 through the 2014 sample year. Forbs have been diverse, but have contributed a low to moderate amount of cover over the course of the study (Table 16C-31.7, Table 16C-31.10, Table 16C-31.11). This little sagebrush-yellow rabbitbrush plant community could possibly be placed in the Depauperate Low Sagebrush State as is defined by the available state and transition model (Jornada, 2019). Barring a major disturbance or changes in management that would remove the shrub component, this site will likely continue to remain in this or a similar state in future sample years.

Trend Summary Tables

Table 16C-31.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	7.5	5.4	-	-	-	-
1999	11.2	8.0	-	-	-	-
2004	3.6	6.2	-	4.9	5.7	-
2009	7.1	8.8	-	6.7	3.8	-
2014	9.9	15.3	-	14.4	20.0	-
2019	22.8	22.6	-	24.0	28.4	-

Table 16C-31.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	-	384	25	218	-	14.5	0.2	1.7
1999	-	366	48	175	-	10.9	0.2	3.0
2004	-	219	255	189	-	6.5	3.3	4.1
2009	-	356	12	237	-	8.5	0.0	4.9
2014	-	315	21	187	-	8.6	0.1	2.2
2019	-	295	155	263	-	8.2	0.9	6.2

Table 16C-31.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	39.8	0.2	37.1	0.7	1.1	34.7
1999	39.2	0.8	27.7	1.4	0.8	34.5
2004	61.8	0.8	26.4	0.6	0.8	23.2
2009	39.4	0.2	36.6	1.3	0.3	33.0
2014	54.4	0.7	23.2	1.0	0.8	41.5
2019	40.6	1.9	34.0	1.4	0.3	48.0

Table 16C-31.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Greater Sage-Grouse	Rabbit
	Quadrat Frequency				
1994	1	11	62	-	16
1999	7	5	55	-	7
2004	1	4	40	-	3
2009	5	8	68	-	2
2014	3	-	50	-	1
2019	1	2	27	-	2
Year	Days Use Per Acre (ha)				
1994	-	-	-	-	-
1999	8.7 (21.5)	4.7 (11.6)	107.9 (266.5)	-	-
2004	24.7 (61.0)	0.7 (1.7)	87.1 (215.2)	-	-
2009	19.6 (48.4)	4.0 (9.9)	44.2 (109.2)	-	-
2014	8.0 (19.7)	0.7 (1.7)	61.7 (152.3)	-	-
2019	5.8 (14.3)	2.7 (6.6)	55.6 (137.4)	8.7 (21.5)*	-

*Pellets per acre (ha)

Table 16C-31.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Achnatherum nelsonii (Columbia needlegrass)	Achnatherum pinetorum (pine needlegrass)	Carex obtusata (obtuse sedge)	Elymus elymoides (squirreltail)	Elymus trachycaulus (slender wheatgrass)	Festuca idahoensis (Idaho fescue)	Hesperostipa comata (needle and thread)	Leucopoa kingii (spike fescue)	Leymus cinereus (basin wildrye)	Pascopyrum smithii (western wheatgrass)	Poa fendleriana (muttongrass)	Poa pratensis[i] (Kentucky bluegrass)
year	Nested Frequency												
1994	-	-	319	-	1	146	15	-	-	-	-	171	-
1999	-	-	228	-	22	79	123	-	-	-	-	157	-
2004	-	-	32	-	30	46	18	3	-	-	72	86	4
2009	-	-	92	-	-	7	-	-	-	-	198	196	-
2014	5	2	38	-	33	50	-	-	1	5	60	193	-
2019	26	-	123	30	15	-	20	11	-	-	74	70	35
year	Average Cover (%)												
1994	-	-	10.4	-	0.0	1.1	0.1	-	-	-	-	2.9	-
1999	-	-	4.4	-	0.1	0.8	2.9	-	-	-	-	2.6	-
2004	-	-	0.3	-	0.6	1.6	0.1	0.1	-	-	1.4	2.3	0.1
2009	-	-	1.0	-	-	0.1	-	-	-	-	3.4	3.9	-
2014	0.0	0.1	0.8	-	0.6	0.9	-	-	0.0	0.0	1.2	4.9	-
2019	0.5	-	2.1	0.8	0.6	-	1.0	0.2	-	-	0.7	1.8	0.6

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16C-31.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Alyssum desertorum[ai] (desert madwort)	Androsace septentrionalis[a] (pygmyflower rockjasmine)	Antennaria parvifolia (small-leaf pussytoes)	Arabis (rockcress)	Astragalus agrestis (purple milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Calochortus nuttallii (sego lily)	Castilleja angustifolia (northwestern Indian paintbrush)	Castilleja linariifolia (Wyoming Indian paintbrush)	Chaenactis douglasii (Douglas' dustymaiden)	Chenopodium leptophyllum[a] (narrowleaf goosefoot)	Crepis acuminata (tapertip hawksbeard)	Cryptantha (cryptantha)	Descurainia pinnata[a] (western tansymustard)	Erigeron aphanactis[a] (rayless shaggy fleabane)	Erigeron eatonii (Eaton's fleabane)
year	Nested Frequency																
1994	-	-	-	18	-	17	3	-	-	3	-	-	5	2	-	24	150
1999	-	-	36	21	3	21	2	9	-	7	1	-	4	-	-	5	70
2004	-	-	73	1	5	1	6	3	-	-	-	206	4	-	2	-	2
2009	-	-	-	11	3	4	0	2	-	-	3	5	13	-	-	-	95
2014	-	1	-	53	-	3	-	10	-	-	-	-	4	-	-	20	65
2019	7	-	3	1	18	1	23	114	29	-	-	31	16	-	-	10	63
year	Average Cover (%)																
1994	-	-	-	0.6	-	0.0	0.0	-	-	0.0	-	-	0.0	0.0	-	0.2	0.5
1999	-	-	0.1	0.8	0.0	0.2	0.0	0.0	-	0.1	0.0	-	0.1	-	-	0.0	0.6
2004	-	-	0.4	0.0	0.0	0.0	0.1	0.0	-	-	-	2.7	0.1	-	0.0	-	0.0
2009	-	-	-	0.2	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.1	-	-	-	1.2
2014	-	0.0	-	0.5	-	0.0	-	0.0	-	-	-	-	0.1	-	-	0.1	0.5
2019	0.0	-	0.0	0.0	0.1	0.0	1.5	0.7	0.3	-	-	0.1	0.4	-	-	0.2	0.5

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Eriogonum alatum (winged buckwheat)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Fritillaria atropurpurea (spotted fritillary)	Gayophytum ramosissimum[a] (pinyon groundsmoke)	Hymenoxys richardsonii (pingue rubberweed)	Lappula occidentalis[a] (flatspine stickseed)	Linum lewisii (Lewis flax)	Lupinus (lupine)	Lupinus argenteus (silvery lupine)	Lupinus brevicaulis[a] (shortstem lupine)	Machaeranthera canescens (hoary tansyaster)	Packera multilobata (lobeleaf groundsel)	Penstemon caespitosus (mat penstemon)	Penstemon carnosus (fleshy beardtongue)	Penstemon humilis (low beardtongue)	Polygonum douglasii[a] (Douglas' knotweed)
year	Nested Frequency																
1994	3	69	35	-	-	8	-	-	-	-	-	-	3	8	1	-	1
1999	3	76	17	-	-	3	-	-	-	9	-	-	8	-	11	-	-
2004	-	144	12	-	-	2	3	1	15	1	-	-	39	4	2	-	57
2009	1	171	6	-	-	-	-	-	-	1	-	3	32	51	2	-	3
2014	-	91	17	-	-	6	-	-	-	2	-	-	-	1	-	6	-
2019	-	160	11	6	3	-	8	-	-	2	27	-	-	-	1	-	95
year	Average Cover (%)																
1994	0.0	0.3	0.2	-	-	0.0	-	-	-	-	-	-	0.0	0.0	0.0	-	0.0
1999	0.0	0.9	0.1	-	-	0.0	-	-	-	0.1	-	-	0.0	-	0.1	-	-
2004	-	2.3	0.2	-	-	0.1	0.0	0.0	0.1	0.0	-	-	0.9	0.0	0.2	-	0.1
2009	0.0	1.8	0.2	-	-	-	-	-	-	0.0	-	0.0	0.3	1.1	0.0	-	0.0
2014	-	0.8	0.0	-	-	0.0	-	-	-	0.0	-	-	-	0.0	-	0.2	-
2019	-	2.0	0.2	0.0	0.0	-	0.0	-	-	0.0	0.1	-	-	-	0.4	-	0.3

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Sphaeralcea coccinea (scarlet globemallow)	Taraxacum officinale (common dandelion)	Townsendia incana (hoary Townsend daisy)	Tragopogon dubius[ai] (yellow salsify)
year	Nested Frequency			
1994	-	-	-	-
1999	2	-	-	7
2004	1	3	-	11
2009	3	-	-	4
2014	-	4	2	-
2019	-	-	-	20
year	Average Cover (%)			
1994	-	-	-	-
1999	0.0	-	-	0.0
2004	0.0	0.0	-	0.1
2009	0.0	-	-	0.0
2014	-	0.0	0.0	-
2019	-	-	-	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16C-31.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis[p] (Utah serviceberry)	Artemisia arbuscula[p] (little sagebrush)	Artemisia frigida[p] (prairie sagewort)	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Chrysothamnus depressus[p] (longflower rabbitbrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Krascheninnikovia lanata[p] (winterfat)	Opuntia polyacantha (plains pricklypear)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)										
1994	-	-	-	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-	-	-	-
2004	-	3.5	0.5	0.2	0.4	5.3	-	-	0.3	-	0.4
2009	-	5.6	0.2	0.4	-	3.6	-	-	0.5	-	0.2
2014	-	11.5	0.1	0.9	-	19.6	-	-	1.9	-	0.4
2019	0.1	23.6	0.1	-	-	27.8	-	-	0.2	-	0.6
year	Quadrat Cover (%)										
1994	-	5.5	0.0	1.8	0.2	5.2	-	0.0	0.0	-	0.2
1999	-	9.0	0.0	1.9	0.2	7.6	-	0.1	0.0	-	0.2
2004	-	2.8	0.4	0.3	0.0	5.7	-	-	0.2	-	0.5
2009	-	5.6	0.6	0.3	-	8.2	0.0	-	0.6	-	0.5
2014	-	8.3	0.2	0.9	0.2	15.1	-	-	0.4	0.0	0.2
2019	0.2	22.2	0.1	-	-	21.6	-	-	0.3	0.0	1.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16C-31.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
1994	-	-	-	-	-	-	-	-	40/52
1999	-	-	-	-	-	-	-	-	36/91
2004	-	-	-	-	-	-	-	-	41/97
2009	-	200	0	0	0	0	0	0	262/416
2014	-	-	-	-	-	-	-	-	-/-
2019	40	-	50	50	0	0	0	0	117/145
Artemisia arbuscula[p] -- (little sagebrush)									
1994	10260	20	37	56	7	14	0	6	16/34
1999	12680	1140	31	55	14	28	5	2	17/37
2004	3220	3760	1	89	11	15	0	4	21/32
2009	16940	24160	62	32	6	9	9	20	14/33
2014	20480	260	37	63	0	26	61	0	16/30
2019	23700	200	19	81	0	16	13	0	18/32
Artemisia frigida[p] -- (prairie sagewort)									
1994	80	-	0	100	0	0	0	0	6/13
1999	100	-	40	60	0	60	0	0	15/16
2004	160	360	0	88	13	13	13	0	39/48
2009	3100	320	46	54	0	12	21	37	11/17
2014	560	-	0	100	0	0	96	0	10/16
2019	720	-	39	61	0	0	0	0	13/14

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Artemisia tridentata ssp. vaseyana[P] -- (mountain big sagebrush)									
1994	820	-	10	88	2	0	0	2	27/45
1999	1060	60	8	68	25	34	23	4	35/57
2004	140	-	0	71	29	14	0	14	41/53
2009	160	140	0	75	25	75	25	50	28/54
2014	640	20	50	44	6	47	34	0	23/43
2019	120	-	0	100	0	0	0	0	44/66
Chrysothamnus depressus[P] -- (longflower rabbitbrush)									
1994	100	-	0	100	0	0	0	0	10/24
1999	160	-	13	88	0	0	0	0	8/23
2004	40	-	0	100	0	0	0	0	9/13
2009	40	-	0	100	0	0	0	0	5/17
2014	60	-	33	67	0	0	0	0	18/32
2019	1780	-	32	69	0	0	0	0	17/22
Chrysothamnus viscidiflorus ssp. viscidiflorus var. latifolius -- (yellow rabbitbrush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	34/39
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1994	22420	-	36	64	0	1	0	0	6/17
1999	19220	80	15	81	4	3	0	0	9/20
2004	9420	75960	7	91	2	1	0	0	16/25
2009	56440	3740	41	55	5	1	0	24	9/18
2014	31040	-	17	82	1	18	56	0	10/20
2019	48280	40	23	77	0	0	0	0	10/20
Eriogonum microthecum[P] -- (slender buckwheat)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	260	-	0	100	0	100	0	0	- / -
2019	-	-	-	-	-	-	-	-	7/13
Ericameria nauseosa -- (rubber rabbitbrush)									
1994	-	-	-	-	-	-	-	-	53/61
1999	-	-	-	-	-	-	-	-	46/62
2004	-	-	-	-	-	-	-	-	-/-
2009	20	-	100	0	0	0	0	0	37/28
2014	-	-	-	-	-	-	-	-	-/-
2019	20	-	0	100	0	0	0	0	40/50
Gutierrezia sarothrae -- (broom snakeweed)									
1994	220	-	9	91	0	0	0	0	8/15
1999	460	-	0	91	9	0	0	4	12/20
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	13/9

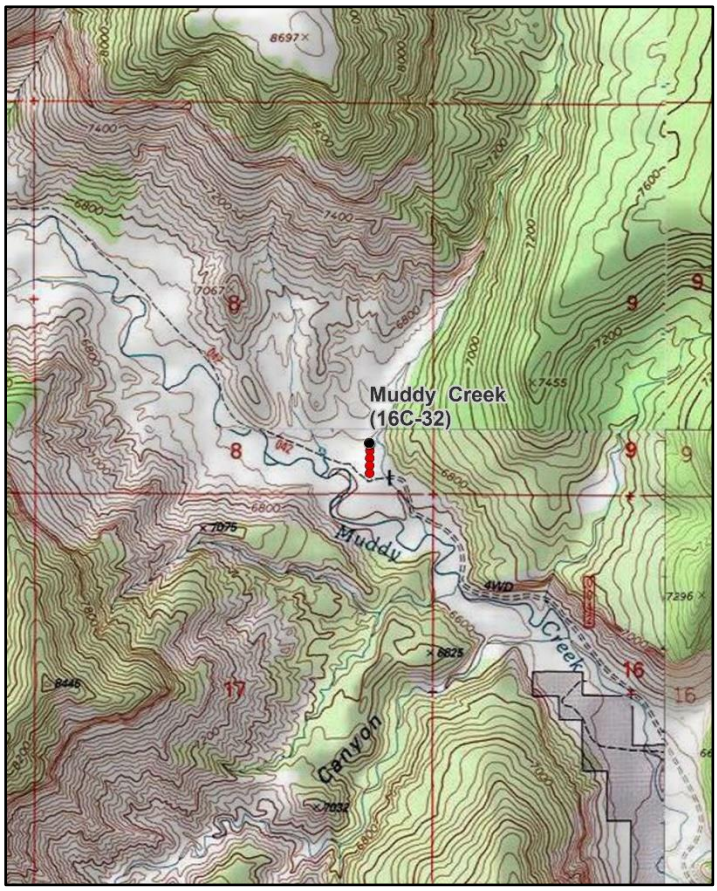
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Kraschenninnikovia lanata[p] -- (winterfat)									
1994	-	-	-	-	-	-	-	-	14/19
1999	40	-	0	100	0	100	0	0	10/14
2004	2760	560	74	26	0	34	62	0	12/26
2009	3300	240	22	78	0	72	13	0	9/13
2014	800	-	0	100	0	0	100	0	8/9
2019	1560	-	17	83	0	18	56	0	13/20
Mahonia repens -- (creeping barberry)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	8/13
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Opuntia polyacantha -- (plains pricklypear)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	20	0	0	0	0	0	0	7/39
2004	-	-	-	-	-	-	-	-	12/25
2009	-	-	-	-	-	-	-	-	8/28
2014	-	-	-	-	-	-	-	-	10/30
2019	60	-	0	100	0	0	0	0	6/19
Purshia tridentata[p] -- (antelope bitterbrush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	6/159
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Tetradymia canescens -- (spineless horsebrush)									
1994	160	-	13	88	0	13	0	0	14/22
1999	240	-	0	100	0	42	25	0	14/21
2004	300	-	0	100	0	0	20	0	23/34
2009	140	20	0	86	14	43	29	0	16/43
2014	140	-	14	86	0	86	0	0	15/22
2019	500	-	0	96	4	0	0	4	22/38

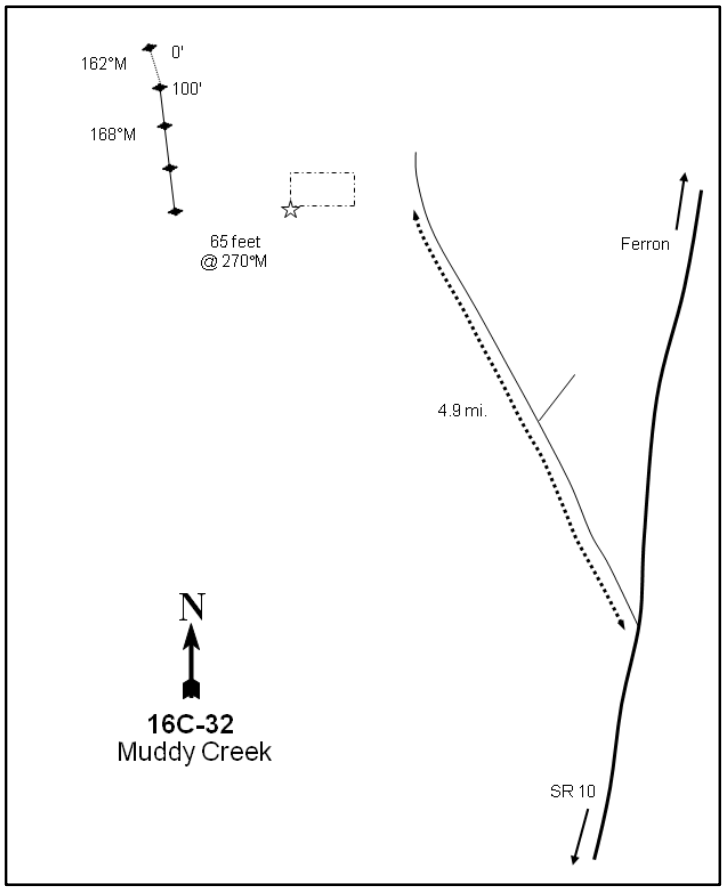
t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16C-31.15 – Deer Desirable Components Index: High Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1994	9.4	13.2	14.7	28.9	0.0	3.5	0.0	69.8	Fair-Good
1999	14.0	10.3	13.4	21.8	0.0	6.1	0.0	65.5	Fair
2004	6.0	0.0	0.0	12.9	0.0	8.3	0.0	27.2	Very Poor
2009	8.3	13.0	15.0	16.9	0.0	9.9	0.0	63.2	Fair
2014	18.0	14.9	15.0	17.3	0.0	4.4	0.0	69.6	Fair-Good
2019	30.0	14.9	9.7	16.5	0.0	10.0	0.0	81.1	Good

MUDDY CREEK - STUDY NO. 16C-32





Location Information

USGS 7.5 min Map Info	Emery West NE; Township 21S, Range 6E, Section 08
GPS (0' Stake)	NAD 83 UTM ZONE 12, 477093 East 4316751 North

Transect Information

Browse Tag # (0' Stake)	9029
Transect Bearing	162° magnetic (Lines 2-4: 168° magnetic)
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Belt 2: 1ft

Directions to Site

From Ferron, proceed south on State Route 10 for 12 miles to the turnoff to Muddy Creek, which is just across from the southern Moore Road. Turn right and travel for 4.9 miles. Once you reach Muddy Creek, turn left, crossing the creek, and continue for 0.1 miles to the site. From the small fenced exclosure, the 400-foot baseline stake is 65 feet west of the southwest corner. The baseline starts 400 feet north of this stake, and the 18-inch green fencepost marking the 0-foot end of the baseline has a red browse tag #9029 attached.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	FERRON
Elevation	6,600ft (2,012m)
Aspect	South
Slope	1-5%
Sample Dates	08/09/1994, 07/28/1999, 08/03/2004, 07/30/2009, 07/21/2014, 07/08/2019

Table 16C-32.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Seeding - Broadcast	Muddy Creek Seeding	95	February 2006	60

Table 16C-32.2 SeedMix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Muddy Creek			Broadcast	Feb 2006	60
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Achnatherum hymenoides	Indian Ricegrass	Rimrock	1.00	0.97
G	Agropyron cristatum	Crested Wheatgrass	Douglas	1.00	0.81
G	Dactylis glomerata	Orchardgrass	Paiute	1.00	0.93
G	Psathyrostachys juncea	Russian Wildrye		1.00	0.85
G	Thinopyrum intermedium	Intermediate Wheatgrass		1.00	0.83
F	Onobrychis viciifolia	Sainfoin	Eski	0.50	0.46
F	Penstemon palmeri	Palmer Penstemon	Washington UT	0.50	0.39
F	Sanguisorba minor	Small Burnet	Delar	1.00	0.93
S	Artemisia tridentata ssp. tridentata	Basin Big Sagebrush	Sanpete UT	0.10	0.03
S	Artemisia tridentata ssp. wyomingensis	Wyoming Big Sagebrush	Sanpete UT	0.30	0.06

Wildlife Habitat and Vegetation History

Table 16C-32.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	substantial	winter

Table 16C-32.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1988	Shadscale/Perennial Grass	No Encroachment
1994	Shadscale/Perennial Grass	No Encroachment
1999	Shadscale/Perennial Grass	No Encroachment
2004	Shadscale/Perennial Grass	No Encroachment
2009	Shadscale/Perennial Grass	No Encroachment
2014	Shadscale/Perennial Grass	No Encroachment
2019	Shadscale/Perennial Grass	Phase I

Site Notes

No Notes

Soils

Table 16C-32.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	7.6	56.0	23.4	20.6	0.7	5.9	89.6	3.4	07/28/1999

Site Potential

1981 - 2010 Average Annual Precipitation	11 inches
NRCS Ecological Site	Semidesert Clay (Shadscale)
NRCS Ecological Site #	R034XY203UT
States and Transitions	No state and transition model is available for this ecological site.

From study establishment in 1988 through the 1999 sample year, the plant community on this site was a mixed stand of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and shadscale saltbush (*Atriplex confertifolia*) with a modest understory of perennial grasses. Although mountain big sagebrush and shadscale saltbush were co-dominant in 1994 and 1999, shadscale saltbush has dominated in all subsequent years. Since the 2004 sample year, sagebrush has decreased significantly in both cover and density (Table 16C-32.12, Table 16C-32.13): this decrease in sagebrush is likely due to the drought that occurred in previous years. The herbaceous understory has increased over time and has been mostly comprised of perennial grasses with Indian ricegrass (*Achnatherum hymenoides*) as the dominant species. Both annual grasses and forbs increased significantly in the 2019 sample year (Table 16C-32.7, Table 16C-32.10, Table 16C-32.11).

Trend Summary Tables

Table 16C-32.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	9.2	4.8	-	-	-	-
1999	8.1	4.2	-	-	-	-
2004	7.2	2.6	-	8.4	5.1	-
2009	5.9	4.0	-	5.2	5.3	-
2014	5.2	5.5	-	5.1	7.5	-
2019	6.8	6.5	-	5.8	9.5	-

Table 16C-32.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	-	191	171	87	-	5.3	0.5	0.6
1999	11	199	231	39	0.0	6.9	1.1	0.2
2004	-	172	250	108	-	2.6	2.3	1.9
2009	4	233	17	24	0.0	10.7	0.0	0.1
2014	40	241	306	12	0.1	12.1	3.3	0.0
2019	332	216	391	101	11.1	12.0	11.2	1.2

Table 16C-32.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	56.4	3.6	14.5	0.2	0.9	22.7
1999	52.5	7.2	17.6	0.5	0.5	19.2
2004	64.5	5.5	21.9	0.3	0.5	16.4
2009	63.3	1.4	20.3	0.3	0.4	20.2
2014	58.5	2.3	19.4	0.1	0.4	25.7
2019	53.1	5.0	32.4	0.4	0.5	39.9

Table 16C-32.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1994	3	33	35	10
1999	-	9	55	12
2004	1	4	54	5
2009	-	6	43	12
2014	-	4	11	-
2019	-	3	25	3
Year	Days Use Per Acre (ha)			
1994	-	-	-	-
1999	0.7 (1.8)	10.7 (26.5)	69.7 (172.1)	-
2004	5.8 (14.3)	18.7 (46.3)	73.0 (180.4)	-
2009	2.9 (7.2)	5.3 (13.2)	79.8 (197.0)	-
2014	-	7.4 (18.2)	26.2 (64.6)	-
2019	-	6.0 (14.9)	6.7 (16.6)	-

Table 16C-32.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bouteloua gracilis (blue grama)	Bromus tectorum[ai] (cheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Pascopyrum smithii (western wheatgrass)	Psathyrostachys juncea[i] (Russian wildrye)	Pseudoroegneria spicata ssp. inermis (beardless wheatgrass)	Sporobolus cryptandrus (sand dropseed)
year	Nested Frequency									
1994	118	-	43	-	53	-	-	-	1	-
1999	121	3	66	11	35	-	2	-	-	14
2004	118	1	33	-	31	-	-	-	-	20
2009	183	9	35	4	47	-	-	-	-	18
2014	192	18	29	40	50	9	-	0	-	19
2019	141	32	17	332	20	8	3	2	0	42
year	Average Cover (%)									
1994	2.6	-	2.2	-	0.4	-	-	-	0.1	-
1999	3.3	0.0	3.1	0.0	0.3	-	0.1	-	-	0.1
2004	1.9	0.0	0.3	-	0.1	-	-	-	-	0.2
2009	7.4	0.3	1.0	0.0	1.3	-	-	-	-	0.6
2014	9.0	1.4	0.7	0.1	0.7	0.2	-	0.0	-	0.2
2019	7.8	1.5	0.7	11.1	0.8	0.2	0.1	0.1	0.0	0.9

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16C-32.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Alyssum desertorum[ai] (desert madwort)	Astragalus (milkvetch)	Calochortus nuttallii (sego lily)	Castilleja (Indian paintbrush)	Ceratocephala testiculata[ai] (curveseed butterwort)	Collinsia parviflora[a] (maiden blue eyed Mary)	Cymopterus (springparsley)	Descurainia pinnata[a] (western tansymustard)	Draba[a] (draba)	Erigeron pumilus (shaggy fleabane)	Eriogonum (buckwheat)	Erodium cicutarium[ai] (redstem stork's bill)	Hymenoxys richardsonii (pingue rubberweed)	Lappula occidentalis[a] (flatspine stickseed)	Lepidium[a] (pepperweed)	Machaeranthera canescens (hoary tansyaster)	Malcolmia africana[ai] (African mustard)
year	Nested Frequency																
1994	-	35	-	2	-	-	-	1	8	5	2	-	-	46	-	20	-
1999	-	14	4	-	-	-	-	8	-	10	-	-	-	20	-	-	-
2004	-	37	5	-	-	3	-	2	-	-	-	-	-	216	-	1	1
2009	-	2	-	-	6	1	-	-	-	-	-	-	-	4	-	-	-
2014	-	3	-	-	-	2	-	6	-	-	-	7	-	45	-	-	-
2019	22	47	45	9	16	12	8	10	1	1	-	-	1	45	4	1	2
year	Average Cover (%)																
1994	-	0.1	-	0.0	-	-	-	0.0	0.0	0.0	0.0	-	-	0.1	-	0.1	-
1999	-	0.0	0.0	-	-	-	-	0.0	-	0.0	-	-	-	0.0	-	-	-
2004	-	0.2	0.0	-	-	0.0	-	0.0	-	-	-	-	-	1.8	-	0.0	0.0
2009	-	0.0	-	-	0.0	0.0	-	-	-	-	-	-	-	0.0	-	-	-
2014	-	0.0	-	-	-	0.0	-	0.0	-	-	-	0.0	-	0.2	-	-	-
2019	0.1	0.4	0.3	0.0	0.0	0.0	0.1	0.1	0.0	0.0	-	-	0.0	0.2	0.0	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Oenothera (evening primrose)	Plantago patagonica[a] (woolly plantain)	Sphaeralcea coccinea (scarlet globemallow)	Townsendia incana (hoary Townsend daisy)	Trifolium (clover)	unknown annual forb[a] (unknown forb)
year	Nested Frequency					
1994	-	119	13	35	-	2
1999	-	223	8	9	-	-
2004	4	107	50	47	3	-
2009	-	10	22	-	-	-
2014	-	280	3	6	-	-
2019	-	382	25	2	-	-
year	Average Cover (%)					
1994	-	0.5	0.1	0.3	-	0.0
1999	-	1.1	0.0	0.1	-	-
2004	0.2	0.5	0.7	0.9	0.0	-
2009	-	0.0	0.1	-	-	-
2014	-	3.1	0.0	0.0	-	-
2019	-	10.8	0.2	0.0	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16C-32.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Atriplex confertifolia[p] (shadscale saltbush)	Chrysothamnus viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa (rubber rabbitbrush)	Krascheninnikovia lanata[p] (winterfat)	Opuntia (pricklypear)	Picrothamnus desertorum (bud sagebrush)	Sarcobatus vermiculatus (greasewood)	Sclerocactus (fishhook cactus)	Tetradymia spinosa (shortspine horsebrush)
year	Line Intercept Cover (%)									
1994	-	-	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-	-	-
2004	1	7.3	0.9	-	0.1	0.2	-	4	-	-
2009	1.1	4.1	2.2	-	0	0.2	0.2	2.5	0.2	-
2014	0.9	4.1	2.3	-	0.1	0.6	0.8	3.7	0.1	-
2019	0.9	4.8	3.3	-	0.1	1.3	0.4	4.5	0	-
year	Quadrat Cover (%)									
1994	3.6	5.5	2.1	-	0.1	0.4	0.5	1.6	0.0	0.2
1999	4.6	3.5	2.0	-	0.0	0.4	-	1.3	0.1	0.4
2004	0.7	6.3	0.5	0.0	0.2	0.1	-	2.0	-	-
2009	0.9	4.8	0.7	-	0.2	0.5	0.8	2.0	0.0	-
2014	0.8	4.1	1.5	-	0.2	0.4	0.8	2.8	0.0	0.0
2019	0.9	5.4	1.4	-	0.5	0.6	1.1	3.5	0.0	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16C-32.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1994	3120	-	7	68	25	32	3	10	32/43
1999	3200	20	6	44	50	33	48	12	32/48
2004	400	-	0	10	90	15	75	70	37/63
2009	1500	-	53	25	21	9	67	23	28/52
2014	520	-	12	81	8	31	8	8	27/43
2019	640	-	19	63	19	34	38	16	33/48
Atriplex confertifolia[p] -- (shadscale saltbush)									
1994	5580	-	5	86	9	0	0	2	21/38
1999	4340	20	17	64	20	10	1	5	18/32
2004	3480	360	2	82	16	3	0	12	26/50
2009	4780	80	13	72	15	1	1	11	19/34
2014	3780	20	12	77	12	5	0	21	21/41
2019	3060	20	5	81	14	4	0	18	25/42
Chrysothamnus viscidiflorus -- (yellow rabbitbrush)									
1994	4540	-	6	93	1	0	0	1	22/29
1999	4080	40	11	84	4	15	1	10	19/31
2004	960	20	4	69	27	0	0	29	25/38
2009	2080	-	16	72	12	0	0	44	19/33
2014	1800	-	11	81	8	4	3	6	21/34
2019	1720	-	4	95	1	38	8	1	28/44

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Ericameria nauseosa -- (rubber rabbitbrush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	56/61
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	39/42
Gutierrezia sarothrae -- (broom snakeweed)									
1994	20	-	100	0	0	0	0	0	- / -
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	18/22
2019	-	-	-	-	-	-	-	-	31/27
Krascheninnikovia lanata[P] -- (winterfat)									
1994	140	-	0	86	14	43	0	0	14/14
1999	120	20	0	17	83	0	100	0	9/13
2004	120	120	0	100	0	33	17	33	23/30
2009	420	-	14	86	0	67	10	24	14/18
2014	340	-	12	88	0	53	0	6	13/21
2019	340	-	0	88	12	29	41	24	20/23
Opuntia -- (pricklypear)									
1994	460	-	0	100	0	0	0	0	9/47
1999	760	120	18	76	5	0	0	5	12/32
2004	420	-	5	95	0	0	0	0	10/31
2009	480	-	4	92	4	0	0	8	10/33
2014	460	-	9	91	0	0	0	0	11/34
2019	720	-	0	89	11	0	0	11	13/37
Pediocactus simpsonii -- (mountain ball cactus)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	13/33
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Picrothamnus desertorum -- (bud sagebrush)									
1994	1560	-	1	71	28	46	0	10	10/24
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	1260	-	22	75	3	0	0	37	13/20
2014	1280	-	5	92	3	23	0	28	16/37
2019	900	-	0	62	38	0	0	96	12/21
Sarcobatus vermiculatus -- (greasewood)									
1994	440	-	5	91	5	0	0	0	45/73
1999	640	-	13	72	16	0	0	13	42/75
2004	580	-	10	76	14	3	0	7	45/93
2009	620	-	13	81	7	3	0	0	52/69
2014	480	40	29	71	0	0	0	0	50/91
2019	400	-	5	75	20	5	0	20	54/94

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Sclerocactus -- (fishhook cactus)									
1994	120	-	0	100	0	0	0	0	8/11
1999	220	-	0	100	0	0	0	0	7/9
2004	-	-	-	-	-	-	-	-	- / -
2009	380	-	11	84	5	0	0	74	8/27
2014	80	-	0	100	0	0	0	0	10/18
2019	140	-	0	100	0	0	0	0	11/12
Tetradymia spinosa -- (shortspine horsebrush)									
1994	440	-	5	86	9	5	5	5	29/51
1999	600	-	13	80	7	0	3	97	9/27
2004	-	-	-	-	-	-	-	-	-/-
2009	20	-	0	100	0	0	0	0	16/31
2014	40	-	0	100	0	50	0	0	16/18

t - Tree Species; p - Preferred Browse; i - Introduced Species

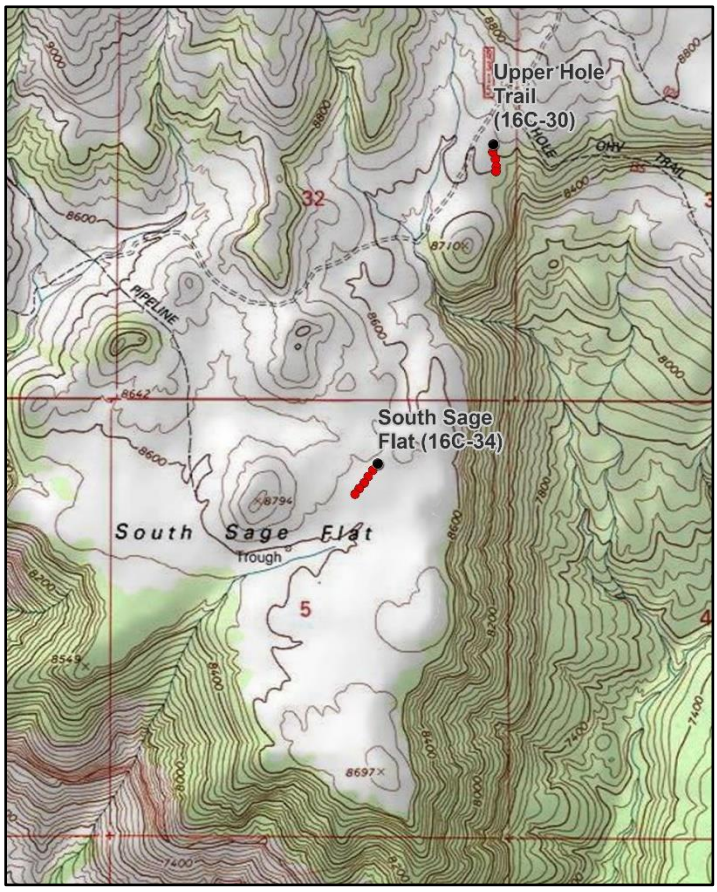
Table 16C-32.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

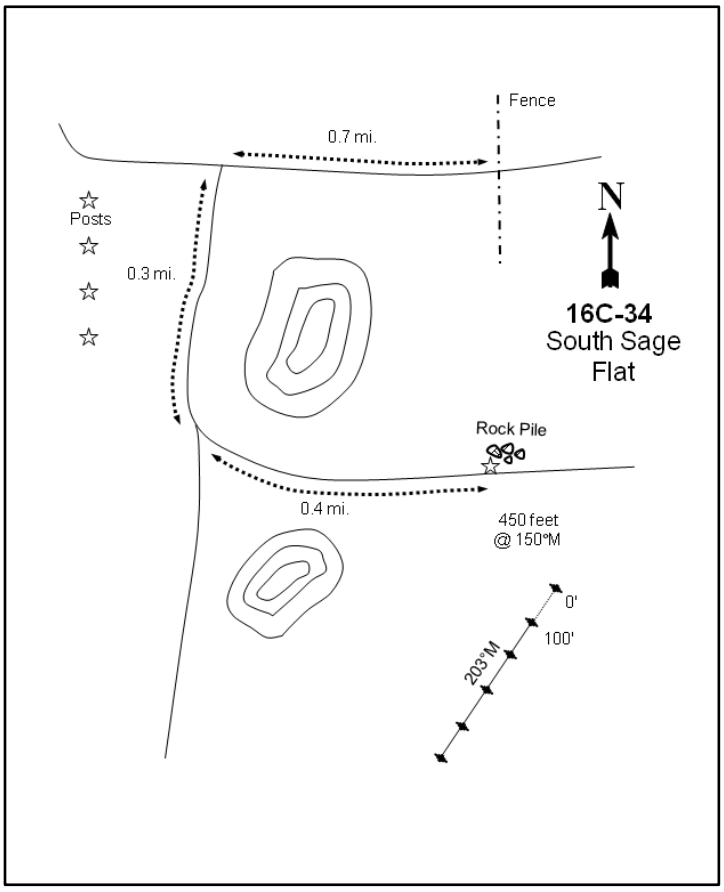
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Pinus edulis (twoneedle pinyon)							
2019	1	-	100	-	-	-	5.0

Table 16C-32.15 – Deer Desirable Components Index: Low Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1994	10.1	10.5	2.9	10.7	0.0	1.1	0.0	35.2	Fair
1999	9.3	3.9	5.1	13.8	0.0	0.4	0.0	32.5	Fair
2004	8.7	7.7	1.0	5.2	0.0	3.9	0.0	26.5	Poor-Fair
2009	5.5	10.1	10.6	21.3	0.0	0.3	0.0	47.7	Good
2014	5.4	11.8	5.8	24.1	-0.1	0.1	0.0	47.0	Good
2019	6.1	10.5	3.4	24.0	-8.3	2.3	0.0	37.9	Fair

SOUTH SAGE FLAT - STUDY NO. 16C-34





Location Information

USGS 7.5 min Map Info	Flagstaff Peak SE; Township 21S, Range 6E, Section 05
GPS (0' Stake)	NAD 83 UTM ZONE 12, 476821 East 4319646 North

Transect Information

Browse Tag # (0' Stake)	Not Available
Transect Bearing	203° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Standard

Directions to Site

From the fence and trough at study site #16C-30 (Upper Hole Trail), proceed west for 0.7 miles, then turn left. Travel along a road with fenceposts marking a water line for 0.3 miles. Turn left on a faint road, then continue 0.4 miles to a fencepost and a pile of rocks on the left (north) side of the road. From the rock pile, walk 450 feet at 150 degrees magnetic to the 0-foot baseline stake.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	FERRON
Elevation	8,630ft (2,630m)
Aspect	East
Slope	1%
Sample Dates	08/17/1994, 08/03/1999, 07/28/2004, 08/11/2009, 07/15/2014, 07/08/2019

Table 16C-34.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Seeding - Seed Unknown	-	-	Historic	-

Wildlife Habitat and Vegetation History

Table 16C-34.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Rocky Mountain Elk	substantial	winter	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing
Shiras Moose	crucial	winter	

Table 16C-34.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1994	Little Sagebrush	No Encroachment
1999	Little Sagebrush	No Encroachment
2004	Perennial Grass/Little Sagebrush/Yellow Rabbitbrush	No Encroachment
2009	Perennial Grass/Little Sagebrush/Yellow Rabbitbrush	No Encroachment
2014	Perennial Grass/Little Sagebrush/Yellow Rabbitbrush	No Encroachment
2019	Little Sagebrush/Yellow Rabbitbrush/Perennial Grass	No Encroachment

Site Notes

Water availability is limited in the area, but a water trough is found one-quarter of a mile north of the site. Heavy grazing was observed on crested wheatgrass (*Agropyron cristatum*) in 2014. In addition, a few Utah juniper (*Juniperus osteosperma*) trees were found in the area, but were not observed on the site itself.

Soils

Table 16C-34.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	6.9	62.0	15.4	22.6	1.9	10.5	115.2	0.6	08/03/1999

Site Potential

1981 - 2010 Average Annual Precipitation	18 inches
NRCS Ecological Site	Mountain Shallow Loam (Low Sagebrush)
NRCS Ecological Site #	R047XA442UT
States and Transitions	No state and transition model is available for the above ecological site.

When the study was established in 1994, the plant community on this site existed as a stand of little sagebrush (*Artemisia arbuscula*) with moderate herbaceous understory cover. However, both yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus* var. *viscidiflorus*) and the perennial grass species crested wheatgrass (*Agropyron cristatum*) increased and have been co-dominant vegetation components since 2004. Although there was a decrease in sagebrush cover and density in 2004, sagebrush has remained a significant component of this plant community and has also increased since that time (Table 16C-34.12, Table 16C-34.13, Photos). Forbs have remained diverse throughout the study period and have contributed low to moderate amounts of cover (Table 16C-34.7, Table 16C-34.10, Table 16C-34.11). This little sagebrush-yellow rabbitbrush community is most comparable to the phases within the Depauperate Low Sagebrush State as is illustrated by the available state and transition model (Jornada, 2019). This site will likely remain in this or a similar state in future sample years without a shrub-removing disturbance or changes in land management.

Trend Summary Tables

Table 16C-34.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	12.9	3.9	-	-	-	-
1999	16.0	7.5	-	-	-	-
2004	6.4	8.9	-	6.8	11.7	-
2009	6.0	7.2	-	7.4	9.5	-
2014	8.6	13.1	-	11.6	10.5	-
2019	14.3	22.4	-	18.1	22.5	-

Table 16C-34.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	-	306	-	220	-	7.4	-	3.2
1999	-	323	28	212	-	10.4	0.1	4.1
2004	-	276	54	151	-	15.9	0.3	2.1
2009	-	344	18	152	-	10.8	0.1	2.0
2014	-	350	9	189	-	18.5	0.0	2.6
2019	-	352	160	237	-	13.6	1.8	4.4

Table 16C-34.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	39.8	-	20.8	1.4	4.8	28.8
1999	37.9	0.0	27.6	8.4	1.6	33.6
2004	37.9	0.0	28.2	8.3	1.8	34.3
2009	40.3	0.1	33.9	5.0	1.7	30.1
2014	34.2	0.0	35.6	9.3	1.0	38.0
2019	31.7	0.0	39.2	7.3	1.9	41.8

Table 16C-34.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1994	4	12	48	10
1999	8	8	59	15
2004	4	3	42	3
2009	3	1	61	6
2014	9	11	31	5
2019	12	2	29	11
Year	Days Use Per Acre (ha)			
1994	-	-	-	-
1999	30.5 (75.3)	0.7 (1.7)	85.1 (210.2)	-
2004	13.8 (34.1)	8.7 (21.5)	58.3 (144.0)	-
2009	19.6 (48.4)	-	127.3 (314.5)	-
2014	13.8 (34.1)	2.0 (5.0)	26.8 (66.2)	-
2019	26.8 (66.3)	-	30.8 (76.1)	-

Table 16C-34.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Achnatherum lettermanii (Letterman's needlegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bromus inermis[i] (smooth brome)	Elymus elymoides (squirreltail)	Elymus lanceolatus (thickspike wheatgrass)	Festuca idahoensis (Idaho fescue)	Leymus salinus (saline wildrye)	Pascopyrum smithii (western wheatgrass)	Poa fendleriana (muttongrass)
year	Nested Frequency									
1994	-	133	233	8	2	-	-	15	1	64
1999	-	120	254	3	2	-	-	41	6	40
2004	1	51	234	-	9	22	-	6	20	63
2009	2	84	246	-	-	-	3	3	72	55
2014	3	56	294	-	1	-	-	-	51	136
2019	18	63	299	-	-	-	-	-	48	45
year	Average Cover (%)									
1994	-	1.9	4.2	0.0	0.0	-	-	0.1	0.0	1.0
1999	-	2.5	6.9	0.1	0.1	-	-	0.2	0.2	0.5
2004	0.0	0.5	13.9	-	0.1	0.4	-	0.1	0.2	0.8
2009	0.0	1.4	7.8	-	-	-	0.0	0.1	0.8	0.6
2014	0.0	0.6	13.5	-	0.0	-	-	-	1.0	3.4
2019	0.5	0.4	11.4	-	-	-	-	-	0.6	0.6

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16C-34.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Androsace septentrionalis[a] (pygmyflower rockjasmine)	Arabis (rockcress)	Astragalus (milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus miser (timber milkvetch)	Calochortus nuttallii (sego lily)	Castilleja angustifolia (northwestern Indian paintbrush)	Chaenactis douglasii (Douglas' dustymaiden)	Chenopodium leptophyllum[a] (narrowleaf goosefoot)	Cryptantha (cryptantha)	Descurainia pinnata[a] (western tansymustard)	Erigeron eatonii (Eaton's fleabane)	Erigeron flagellaris (trailing fleabane)	Erigeron pumilus (shaggy fleabane)	Eriogonum alatum (winged buckwheat)	Eriogonum racemosum (redroot buckwheat)
year	Nested Frequency																
1994	-	-	3	-	6	3	-	3	-	-	2	-	128	-	15	3	25
1999	-	28	3	-	-	3	-	2	4	-	-	-	49	-	2	-	65
2004	-	-	2	-	1	2	7	-	-	50	-	-	3	3	4	-	52
2009	4	-	-	-	4	5	11	-	3	18	-	-	25	-	12	4	41
2014	-	8	-	1	-	1	2	7	-	-	-	1	28	-	30	-	48
2019	-	9	1	-	-	-	56	35	-	99	4	3	54	-	19	-	45
year	Average Cover (%)																
1994	-	-	0.0	-	0.0	0.1	-	0.0	-	-	0.0	-	1.1	-	0.0	0.0	0.2
1999	-	0.1	0.0	-	-	0.0	-	0.0	0.0	-	-	-	0.4	-	0.0	-	0.6
2004	-	-	0.0	-	0.0	0.0	0.0	-	-	0.2	-	-	0.0	0.0	0.0	-	0.4
2009	0.0	-	-	-	0.0	0.1	0.0	-	0.0	0.1	-	-	0.2	-	0.1	0.0	0.4
2014	-	0.0	-	0.0	-	0.0	0.0	0.0	-	-	-	0.0	0.2	-	0.1	-	0.5
2019	-	0.0	0.0	-	-	-	0.4	0.2	-	0.2	0.0	0.0	0.6	-	0.3	-	0.8

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Gayophytum ramosissimum[a] (pinyon groundsmoke)	Hymenoxys richardsonii (pingue rubberweed)	Ipomopsis aggregata (scarlet gilia)	Linum lewisii (Lewis flax)	Lupinus argenteus (silvery lupine)	Machaeranthera canescens (hoary tansyaster)	Machaeranthera grindelioides (rayless tansyaster)	Packera multilobata (lobeleaf groundsel)	Penstemon caespitosus (mat penstemon)	Penstemon comarrhenus (dusty beardtongue)	Petradoria pumila (rock goldenrod)	Phlox longifolia (longleaf phlox)	Physaria (twinpod)	Polygonum douglasii[a] (Douglas' knotweed)	Potentilla gracilis (slender cinquefoil)	Sphaeralcea coccinea (scarlet globemallow)	Symphyotrichum (aster)
year	Nested Frequency																
1994	-	51	-	2	10	3	12	4	59	5	5	-	-	-	3	3	-
1999	-	55	2	1	3	3	10	22	54	-	2	-	-	-	9	7	14
2004	2	32	-	0	-	6	6	29	-	3	2	2	-	7	0	9	-
2009	-	55	-	-	-	10	11	4	4	-	1	4	-	-	8	14	-
2014	-	42	3	-	-	-	7	10	22	-	-	-	1	-	5	11	-
2019	50	11	-	-	-	2	-	34	8	-	1	-	1	71	9	11	2
year	Average Cover (%)																
1994	-	0.8	-	0.0	0.1	0.0	0.1	0.0	0.4	0.0	0.0	-	-	-	0.0	0.0	-
1999	-	1.2	0.0	0.0	0.1	0.0	0.1	0.1	1.2	-	0.0	-	-	-	0.1	0.1	0.1
2004	0.0	0.7	-	0.0	-	0.0	0.1	0.2	-	0.0	0.0	0.0	-	0.0	0.0	0.2	-
2009	-	0.9	-	-	-	0.0	0.1	0.0	0.0	-	0.0	0.0	-	-	0.0	0.1	-
2014	-	0.8	0.1	-	-	-	0.0	0.0	0.3	-	-	-	0.0	-	0.1	0.0	-
2019	0.6	0.1	-	-	-	0.0	-	0.1	0.1	-	0.0	-	0.0	0.9	0.2	0.2	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Tetraneuris acaulis (stemless four-nerve daisy)	Trifolium gymnocarpon (hollyleaf clover)
year	Nested Frequency	
1994	16	36
1999	4	43
2004	3	62
2009	4	31
2014	-	72
2019	-	141
year	Average Cover (%)	
1994	0.1	0.2
1999	0.0	0.1
2004	0.0	0.2
2009	0.0	0.1
2014	-	0.4
2019	-	1.3

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16C-34.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia arbuscula[p] (little sagebrush)	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Chrysothamnus depressus[p] (longflower rabbitbrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Eriogonum corymbosum (crispleaf buckwheat)	Gutierrezia sarothrae (broom snakeweed)	Linanthus pungens (granite prickly phlox)
year	Line Intercept Cover (%)						
1994	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-
2004	6.6	0.2	-	10.6	0.8	0.3	-
2009	6.6	0.3	0.5	8.4	1.1	-	-
2014	8.9	1.3	1.4	9.8	0.7	-	-
2019	16.4	1.4	0.3	21.7	0.8	-	-
year	Quadrat Cover (%)						
1994	9.8	3.1	-	3.5	0.4	0.0	-
1999	11.9	3.9	0.2	7.0	0.3	0.1	-
2004	6.0	0.4	0.0	8.1	0.3	0.5	-
2009	5.2	0.6	0.3	6.8	0.2	0.1	0.0
2014	7.6	0.8	0.1	12.8	0.3	-	-
2019	12.7	1.1	0.5	22.1	0.2	0.0	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16C-34.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
1994	-	-	-	-	-	-	-	-	28/29
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	62/91
2014	-	-	-	-	-	-	-	-	28/61
2019	-	-	-	-	-	-	-	-	78/168
Artemisia arbuscula[p] -- (little sagebrush)									
1994	13900	200	10	74	16	17	5	2	16/41
1999	14120	700	19	61	20	16	4	5	16/38
2004	6440	9020	6	71	23	0	0	16	15/28
2009	8620	6280	17	62	21	24	4	16	15/28
2014	13480	860	49	45	6	29	18	6	14/33
2019	13920	40	23	75	2	39	20	2	22/35
Artemisia frigida[p] -- (prairie sagewort)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	40	-	0	100	0	0	0	0	- / -
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	15/24

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Artemisia tridentata ssp. vaseyana[P] -- (mountain big sagebrush)									
1994	1600	-	11	84	5	30	0	3	36/72
1999	1680	140	21	70	8	13	20	1	35/67
2004	240	-	0	50	50	50	42	50	34/58
2009	240	20	0	42	58	25	33	25	26/34
2014	380	-	21	79	0	26	63	0	31/59
2019	500	240	16	76	8	28	40	8	37/51
Chrysothamnus depressus[P] -- (longflower rabbitbrush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	100	-	40	60	0	0	0	0	4/12
2004	60	-	0	100	0	0	0	0	- / -
2009	800	40	0	98	3	0	0	3	6/20
2014	180	-	22	78	0	22	33	0	7/20
2019	540	-	0	100	0	0	0	0	8/16
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1994	9560	20	5	94	1	0	0	0	8/20
1999	12480	220	11	88	1	1	0	0	8/21
2004	10420	18740	5	95	0	0	0	0	14/26
2009	14040	3360	12	88	0	6	1	0	10/22
2014	21500	760	42	58	0	15	12	0	9/26
2019	23300	-	17	83	0	2	0	0	13/29
Eriogonum corymbosum -- (crispleaf buckwheat)									
1994	320	-	0	88	13	6	0	6	24/48
1999	340	-	12	88	0	24	6	0	30/53
2004	280	40	0	86	14	7	7	7	24/51
2009	360	20	0	89	11	0	0	0	23/57
2014	320	-	6	94	0	13	0	0	21/54
2019	260	-	0	100	0	31	46	0	24/50
Eriogonum microthecum[P] -- (slender buckwheat)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	22/43
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	60	-	0	100	0	0	0	0	- / -
Ericameria nauseosa -- (rubber rabbitbrush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	42/63
Escobaria -- (foxtail cactus)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	20	-	0	100	0	0	0	0	- / -
2009	20	-	0	100	0	0	0	0	7/8
2014	-	-	-	-	-	-	-	-	-/-
2019	20	-	0	100	0	0	0	0	9/10

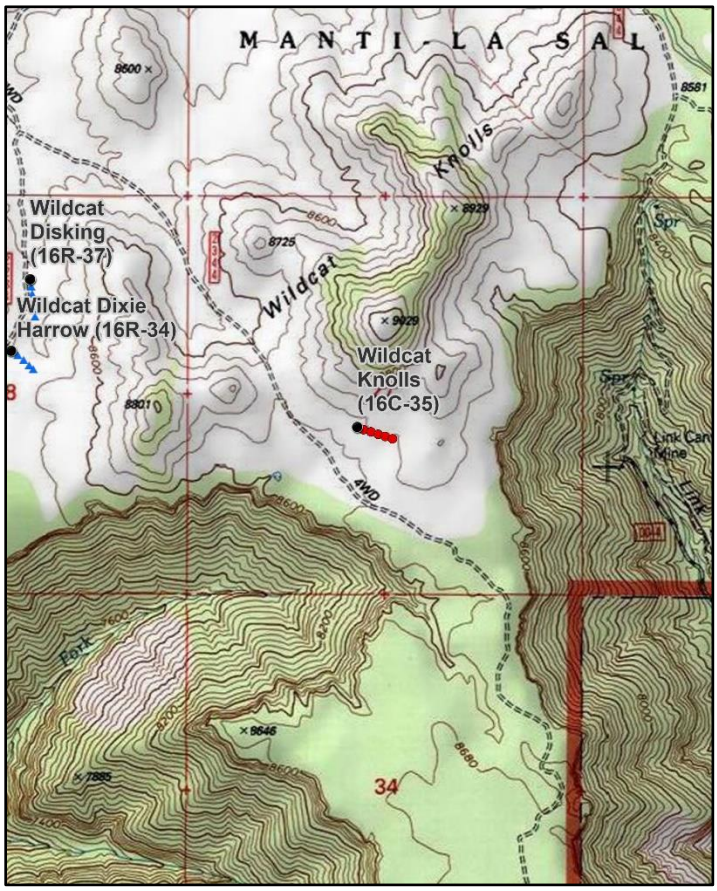
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Gutierrezia sarothrae -- (broom snakeweed)									
1994	640	-	6	88	6	0	0	6	12/15
1999	540	-	19	82	0	0	0	0	14/14
2004	1500	60	0	100	0	0	0	0	16/19
2009	600	-	3	93	3	0	10	10	14/24
2014	80	-	50	50	0	0	0	0	12/17
2019	220	-	0	100	0	0	0	0	16/17
Linanthus pungens -- (granite prickly phlox)									
1994	20	-	0	100	0	0	0	0	- / -
1999	60	-	0	67	33	0	0	33	6/15
2004	20	-	0	100	0	0	0	0	13/14
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Opuntia -- (pricklypear)									
1994	40	-	0	100	0	0	0	0	4/12
1999	40	-	0	50	50	0	0	0	- / -
2004	20	-	0	100	0	0	0	0	9/22
2009	60	-	0	33	67	0	0	67	- / -
2014	20	20	0	100	0	0	0	0	14/49
2019	20	-	0	100	0	0	0	0	11/58
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
1994	20	-	0	100	0	0	0	0	35/97
1999	20	-	0	100	0	0	0	0	32/68
2004	40	-	0	100	0	0	0	0	22/56
2009	20	-	0	100	0	0	0	0	19/40
2014	20	-	100	0	0	0	0	0	21/39
2019	-	-	-	-	-	-	-	-	31/40
Tetradymia canescens -- (spineless horsebrush)									
1994	-	-	-	-	-	-	-	-	10/21
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	11/24
2009	40	-	0	50	50	50	0	0	12/21
2014	40	-	50	50	0	50	50	100	12/19
2019	20	-	0	100	0	0	0	0	16/26

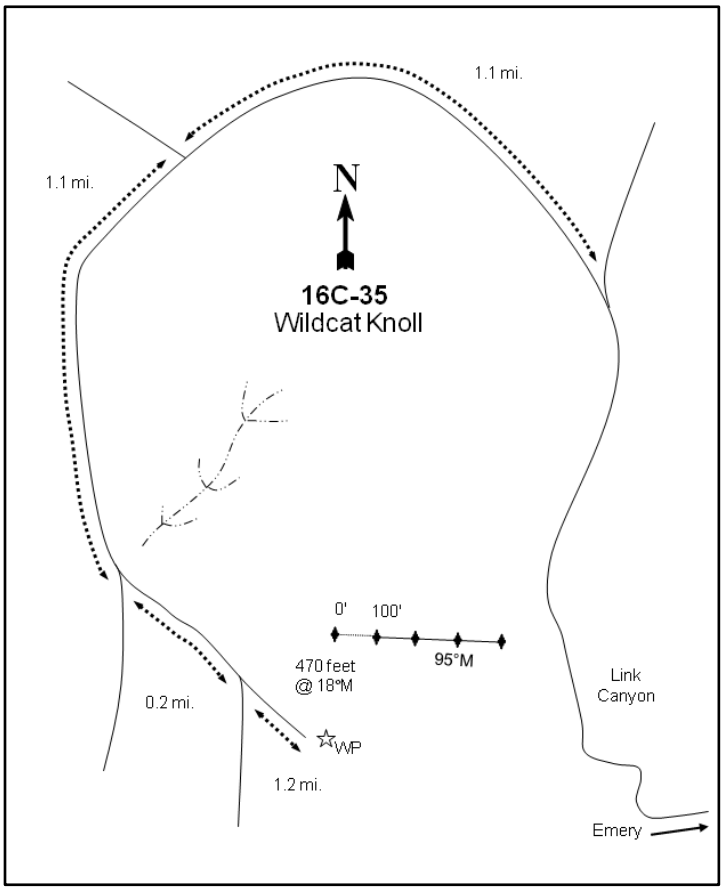
t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16C-34.15 – Deer Desirable Components Index: High Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1994	16.1	11.0	5.1	14.8	0.0	6.4	0.0	53.4	Poor-Fair
1999	20.0	9.9	9.9	20.7	0.0	8.2	0.0	68.7	Fair-Good
2004	8.5	7.9	3.0	30.0	0.0	4.2	0.0	53.6	Poor-Fair
2009	9.3	8.5	7.5	21.6	0.0	4.1	0.0	51.0	Poor
2014	14.5	13.7	15.0	30.0	0.0	5.3	0.0	78.5	Good
2019	22.6	14.4	11.2	27.1	0.0	8.9	0.0	84.2	Good

WILDCAT KNOLLS - STUDY NO. 16C-35





Location Information

USGS 7.5 min Map Info	Emery West NW; Township 21S, Range 5E, Section 27
GPS (0' Stake)	NAD 83 UTM ZONE 12, 470033 East 4312361 North

Transect Information

Browse Tag # (0' Stake)	Not Available
Transect Bearing	95° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Standard

Directions to Site

From Center Street in Emery, travel west for 1.2 miles. Turn right onto a dirt road and proceed for 0.6 miles, then turn left and travel 8.7 miles (1.7 miles from turnoff to site #16C-31). Bear left at the fork and drive 1.1 miles to another fork. Stay left on Forest Service Road #344 for 1.1 miles to another fork (at 0.1 miles on FS Road #344, go left at the fork). At the fork, bear left and travel 0.2 miles to another fork. Proceed to the left and travel 1.2 miles to the witness post. From the witness post, walk 470 feet at a bearing of 18 degrees magnetic to the 0-foot baseline stake; there is no browse tag.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	EMERY
Elevation	8,700ft (2,652m)
Aspect	South
Slope	3-5%
Sample Dates	08/17/1994, 07/28/1999, 07/27/2004, 07/28/2009, 07/15/2014, 07/10/2019

Wildlife Habitat and Vegetation History

Table 16C-35.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Rocky Mountain Elk	substantial	winter	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing

Table 16C-35.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1994	Little Sagebrush/Yellow Rabbitbrush/Perennial Grass	No Encroachment
1999	Little Sagebrush/Yellow Rabbitbrush/Perennial Grass	No Encroachment
2004	Little Sagebrush/Yellow Rabbitbrush/Perennial Grass	No Encroachment
2009	Little Sagebrush/Yellow Rabbitbrush/Perennial Grass	No Encroachment
2014	Little Sagebrush/Yellow Rabbitbrush/Perennial Grass	No Encroachment
2019	Little Sagebrush/Yellow Rabbitbrush/Perennial Grass	Phase I

Site Notes

Water is limited on and near the site, but guzzlers are found three-quarters of a mile away. It was observed in 2014 that there is some energy development in the vicinity, but it does not impact the immediate area in which the transect is located. This site is located within two ESD types, but for the purpose of this writeup it has been classified as a little/low sagebrush (*Artemisia arbuscula*) type.

Soils

Table 16C-35.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	6.4	60.0	15.4	24.6	2.7	10.9	182.4	0.5	07/28/1999

Site Potential

1981 - 2010 Average Annual Precipitation	16 inches
NRCS Ecological Site	Mountain Shallow Loam (Low Sagebrush)
NRCS Ecological Site #	R047XA442UT
States and Transitions	No state and transition model is available for the above ecological site.

Little sagebrush (*Artemisia arbuscula*) has been a dominant shrub on this site since study establishment in 1994; cover and density of little sagebrush decreased in 2004, but have since increased. Yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus* var. *viscidiflorus*) has also been present and has been a co-dominant vegetation component since 2004 (Table 16C-35.12, Table 16C-35.13, Photos). The herbaceous understory has remained abundant and diverse throughout the study period. Native perennial grasses, including (but not limited to) saline wildrye (*Leymus salinus*) and muttongrass (*Poa fendleriana*), have contributed a majority of the herbaceous cover and have also co-dominated the plant community in all sample years. Forbs have been diverse, but have generally provided low to moderate cover since study establishment (Table 16C-35.7, Table 16C-35.10, Table 16C-35.11). This little sagebrush, yellow rabbitbrush, and perennial grass community is most comparable to the phases within the Depauperate Low Sagebrush State that is illustrated by the available state and transition model (Jornada, 2019). Rocky Mountain juniper (*Juniperus scopulorum*) was observed for the first time in 2019, placing this site in Phase I of woodland succession (Table 16C-35.4, Table 16C-35.14). Further tree encroachment may be possible, but the low density of juniper indicates that this is likely not an immediate concern.

Trend Summary Tables

Table 16C-35.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	13.2	0.5	-	-	-	-
1999	16.0	3.9	-	0.3	-	-
2004	8.5	7.4	-	11.1	9.4	-
2009	12.4	4.9	-	14.3	5.7	-
2014	13.1	4.3	-	15.1	5.8	-
2019	21.4	12.0	-	25.6	11.7	-

Table 16C-35.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	-	419	-	194	-	11.1	-	2.0
1999	-	417	-	156	-	16.2	-	3.9
2004	-	334	283	139	-	13.3	5.7	2.5
2009	-	387	22	77	-	20.2	0.1	1.6
2014	-	401	16	135	-	24.0	0.2	2.6
2019	-	404	164	192	-	26.1	0.9	4.7

Table 16C-35.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	30.0	0.0	46.6	0.1	0.3	33.5
1999	24.8	-	45.4	0.1	0.0	43.4
2004	43.8	-	34.5	0.8	0.0	36.8
2009	27.3	-	42.9	0.2	0.0	43.2
2014	28.6	-	49.0	0.2	0.2	50.7
2019	19.1	-	56.7	0.1	0.1	54.1

Table 16C-35.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1994	7	24	65	10
1999	3	5	51	4
2004	6	2	51	5
2009	11	2	55	7
2014	1	3	43	2
2019	8	5	26	6
Year	Days Use Per Acre (ha)			
1994	-	-	-	-
1999	29.0 (71.7)	8.7 (21.5)	108.6 (268.2)	-
2004	29.8 (73.5)	6.0 (14.9)	97.2 (240.0)	-
2009	16.0 (39.5)	3.4 (8.3)	45.6 (112.6)	-
2014	-	4.0 (9.9)	46.2 (114.2)	-
2019	21.8 (53.8)	1.3 (3.3)	42.9 (105.9)	-

Table 16C-35.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Achnatherum lettermanii (Letterman's needlegrass)	Carex (sedge)	Carex obtusata (obtuse sedge)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Leymus salinus (saline wildrye)	Pascopyrum smithii (western wheatgrass)	Poa fendleriana (muttongrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency									
1994	20	225	99	-	11	-	253	42	177	3
1999	11	145	105	-	3	23	144	36	231	4
2004	23	111	91	-	12	8	116	74	111	26
2009	8	109	16	-	3	5	154	103	157	15
2014	37	69	200	-	5	9	91	193	129	13
2019	29	92	43	98	8	38	244	78	54	5
year	Average Cover (%)									
1994	0.3	4.4	0.2	-	0.0	-	4.1	0.1	1.9	0.0
1999	0.0	3.4	0.7	-	0.0	0.6	5.7	0.3	5.4	0.0
2004	0.2	2.6	0.9	-	0.2	0.4	4.5	1.9	2.2	0.3
2009	0.3	2.6	0.2	-	0.0	0.0	9.2	3.8	3.7	0.5
2014	1.3	1.5	3.8	-	0.0	0.1	5.2	6.3	5.2	0.6
2019	0.3	2.2	0.7	1.6	0.1	1.8	15.9	1.5	1.6	0.4

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16C-35.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Antennaria (pussytoes)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus drummondii (Drummond's milkvetch)	Astragalus miser (timber milkvetch)	Astragalus tenellus (looseflower milkvetch)	Calochortus nuttallii (sego lily)	Castilleja angustifolia (northwestern Indian paintbrush)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata[ai] (curveseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Chenopodium[a] (goosefoot)	Chenopodium leptophyllum[a] (narrowleaf goosefoot)	Cirsium (thistle)	Crepis acuminata (tapertip hawksbeard)	Cymopterus (springparsley)	Descurainia pinnata[a] (western tansymustard)
year	Nested Frequency																
1994	-	4	17	-	35	5	2	-	37	-	3	-	-	1	40	-	-
1999	8	11	8	-	38	9	6	-	24	-	-	-	-	-	-	-	-
2004	2	-	0	-	9	9	29	-	1	-	4	267	-	-	17	-	-
2009	2	5	1	-	1	3	-	-	3	-	-	13	-	-	6	-	-
2014	5	-	7	21	-	-	7	-	48	-	-	-	-	-	9	-	-
2019	7	-	1	13	3	3	42	12	13	6	-	-	53	-	41	1	1
year	Average Cover (%)																
1994	-	0.1	0.1	-	0.6	0.2	0.0	-	0.1	-	0.0	-	-	0.0	0.1	-	-
1999	0.1	0.4	0.0	-	0.9	0.7	0.0	-	0.1	-	-	-	-	-	-	-	-
2004	0.0	-	0.3	-	0.2	0.5	0.1	-	0.0	-	0.0	5.4	-	-	0.2	-	-
2009	0.0	0.0	0.0	-	0.0	0.1	-	-	0.0	-	-	0.1	-	-	0.0	-	-
2014	0.0	-	0.0	0.3	-	-	0.0	-	0.3	-	-	-	-	-	0.1	-	-
2019	0.0	-	0.0	0.8	0.0	0.2	0.2	0.1	0.1	0.0	-	-	0.1	-	0.6	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Erigeron eatonii (Eaton's fleabane)	Eriogonum alatum (winged buckwheat)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Gayophytum ramosissimum[a] (pinyon groundsmoke)	Lappula occidentalis[a] (flatspine stickseed)	Linum lewisii (Lewis flax)	Lomatium (desertparsley)	Lupinus argenteus (silvery lupine)	Lygodesmia grandiflora (largeflower skeletonplant)	Machaeranthera canescens (hoary tansyaster)	Machaeranthera grindelioides (rayless tansyaster)	Mertensia (bluebells)	Orobanche fasciculata (clustered broomrape)	Packera multilobata (lobeleaf groundsel)	Penstemon carnosus (fleshy beardtongue)	Penstemon watsonii (Watson's penstemon)
year	Nested Frequency																
1994	44	-	44	38	-	-	-	-	1	-	6	-	8	-	-	1	-
1999	16	3	38	23	-	-	6	1	10	1	9	1	-	-	2	1	8
2004	8	-	32	28	5	16	4	-	-	6	3	-	-	-	2	-	5
2009	8	-	26	19	-	-	-	-	-	-	-	-	-	-	-	-	8
2014	12	-	31	19	-	16	1	-	-	-	-	-	-	6	4	-	11
2019	29	-	45	11	26	32	4	-	-	2	-	-	-	-	-	2	11
year	Average Cover (%)																
1994	0.1	-	0.1	0.4	-	-	-	-	0.0	-	0.0	-	0.1	-	-	0.0	-
1999	0.1	0.0	0.4	0.5	-	-	0.0	0.0	0.3	0.0	0.0	0.0	-	-	0.0	0.0	0.2
2004	0.0	-	0.5	0.3	0.0	0.2	0.0	-	-	0.1	0.0	-	-	-	0.0	-	0.3
2009	0.0	-	0.3	0.6	-	-	-	-	-	-	-	-	-	-	-	-	0.3
2014	0.1	-	0.8	0.4	-	0.2	0.0	-	-	-	-	-	-	0.0	0.1	-	0.4
2019	0.5	-	1.1	0.4	0.1	0.1	0.2	-	-	0.0	-	-	-	-	-	0.0	0.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Polygonum douglasii[a] (Douglas' knotweed)	Taraxacum officinale (common dandelion)	Townsendia (Townsend daisy)	Tragopogon dubius[ai] (yellow salsify)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency				
1994	-	-	-	-	4
1999	-	3	-	-	0
2004	59	3	3	-	17
2009	9	-	-	-	5
2014	-	1	-	1	11
2019	78	5	-	2	22
year	Average Cover (%)				
1994	-	-	-	-	0.0
1999	-	0.0	-	-	0.0
2004	0.1	0.0	0.0	-	0.1
2009	0.0	-	-	-	0.0
2014	-	0.0	-	0.0	0.1
2019	0.5	0.0	-	0.0	0.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16C-35.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis[p] (Utah serviceberry)	Artemisia arbuscula[p] (little sagebrush)	Artemisia frigida[p] (prairie sagewort)	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Chrysothamnus depressus[p] (longflower rabbitbrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. hololeuca[p] (rubber rabbitbrush)	Eriogonum corymbosum (crispleaf buckwheat)	Opuntia (pricklypear)	Purshia tridentata[p] (antelope bitterbrush)	Rosa woodsii[p] (Woods' rose)	Symphoricarpos oreophilus[p] (mountain snowberry)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)												
1994	-	-	-	-	-	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-	-	-	-	-	-
2004	2.8	4	-	4.3	-	9.1	-	0.2	-	-	-	-	0.1
2009	3.8	4.9	-	5.6	-	5.3	-	0.4	-	-	-	-	-
2014	2.7	7.6	-	3.4	1	5.6	-	0	-	0.2	-	0.2	0.2
2019	3.6	16.7	0.1	5.2	-	11.5	-	0.2	-	-	-	-	-
year	Quadrat Cover (%)												
1994	1.8	3.2	-	4.3	2.7	0.4	-	0.0	0.0	0.6	0.0	0.6	0.0
1999	2.3	6.2	-	6.9	-	3.9	-	-	0.0	0.4	0.1	0.1	-
2004	3.0	2.4	-	2.9	-	7.3	0.0	0.1	0.0	0.1	0.0	0.0	0.0
2009	3.0	4.7	-	4.6	-	4.6	0.0	0.2	0.0	-	-	0.2	0.0
2014	0.3	8.4	-	2.2	1.1	4.1	0.0	0.0	0.1	0.1	-	0.9	0.0
2019	2.6	13.0	0.0	5.1	-	11.9	0.1	0.0	0.1	-	0.1	0.4	0.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16C-35.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
1994	20	-	0	100	0	100	0	0	150/169
1999	40	60	0	100	0	0	50	0	208/259
2004	40	-	0	100	0	50	0	0	150/181
2009	20	120	100	0	0	0	0	0	190/275
2014	20	-	0	100	0	100	0	0	112/102
2019	40	-	0	100	0	0	50	0	126/148
Artemisia arbuscula[p] -- (little sagebrush)									
1994	4740	680	1	86	14	58	0	6	23/37
1999	8020	100	30	53	17	53	23	3	19/39
2004	3660	600	3	89	8	5	1	4	20/29
2009	10200	6780	60	37	3	2	2	14	15/37
2014	8960	680	18	80	2	58	36	3	17/41
2019	11220	-	16	84	0	39	0	0	19/34
Artemisia frigida[p] -- (prairie sagewort)									
1994	80	-	0	100	0	0	0	0	- / -
1999	40	-	0	100	0	0	0	0	- / -
2004	40	-	0	100	0	0	0	0	- / -
2009	-	-	-	-	-	-	-	-	-/-
2014	40	-	0	100	0	0	0	0	- / -
2019	60	-	0	100	0	0	0	0	12/26

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Artemisia tridentata ssp. vaseyana[P] -- (mountain big sagebrush)									
1994	4520	-	1	90	9	77	0	1	42/51
1999	4560	400	33	55	12	47	2	4	49/73
2004	2140	1660	19	72	9	7	7	5	55/62
2009	6140	3420	53	37	10	13	9	14	39/58
2014	1740	320	13	75	13	23	67	7	51/68
2019	1760	160	21	68	11	9	8	11	44/64
Chrysothamnus depressus[P] -- (longflower rabbitbrush)									
1994	11160	60	0	98	2	0	0	0	7/16
1999	120	-	17	83	0	0	0	0	10/17
2004	20	-	0	100	0	0	0	0	- / -
2009	-	-	-	-	-	-	-	-	-/-
2014	2700	-	1	99	0	33	0	0	8/19
2019	-	-	-	-	-	-	-	-	10/19
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1994	1260	-	0	98	2	0	0	0	19/20
1999	13400	180	14	85	2	15	0	0	11/22
2004	13400	240	6	93	1	0	0	0	17/29
2009	14780	-	12	70	19	1	0	26	12/23
2014	8160	340	9	91	0	25	0	0	15/26
2019	13720	-	6	94	0	1	0	0	15/23
Eriogonum corymbosum -- (crispleaf buckwheat)									
1994	100	-	0	100	0	0	0	0	26/38
1999	160	-	38	50	13	13	0	0	28/40
2004	140	-	0	100	0	86	0	0	27/42
2009	140	20	29	71	0	0	0	0	26/51
2014	120	-	0	100	0	50	50	0	24/39
2019	80	-	0	100	0	50	0	0	26/41
Ericameria nauseosa ssp. nauseosa var. hololeuca[P] -- (rubber rabbitbrush)									
1994	60	-	0	100	0	0	0	0	46/45
1999	-	-	-	-	-	-	-	-	-/-
2004	120	-	0	83	17	33	0	17	43/44
2009	140	-	14	71	14	0	0	14	42/43
2014	20	-	0	100	0	0	0	0	38/40
2019	100	-	0	100	0	80	20	0	55/65
Linanthus pungens -- (granite prickly phlox)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	20	-	0	100	0	0	0	0	- / -
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	13/14
Opuntia -- (pricklypear)									
1994	100	-	20	80	0	0	0	0	8/25
1999	-	20	0	0	0	0	0	0	- / -
2004	60	-	0	100	0	0	0	0	4/10
2009	60	-	0	100	0	0	0	0	7/23
2014	120	-	17	83	0	0	0	0	7/19
2019	80	-	0	100	0	0	0	0	6/22

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Purshia tridentata[p] -- (antelope bitterbrush)									
1994	20	-	0	0	100	100	0	0	60/82
1999	-	-	-	-	-	-	-	-	67/188
2004	40	-	0	100	0	0	0	0	64/139
2009	-	-	-	-	-	-	-	-	68/168
2014	20	-	0	100	0	0	0	0	76/118
2019	-	-	-	-	-	-	-	-	65/146
Rosa woodsii[p] -- (Woods' rose)									
1994	-	-	-	-	-	-	-	-	-/-
1999	120	40	100	0	0	0	0	0	- / -
2004	60	-	100	0	0	0	0	0	- / -
2009	-	-	-	-	-	-	-	-	23/11
2014	-	-	-	-	-	-	-	-	-/-
2019	40	-	0	100	0	0	0	0	23/15
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
1994	300	-	0	100	0	27	0	0	34/60
1999	20	-	0	100	0	0	0	0	53/103
2004	20	-	0	100	0	0	0	0	40/82
2009	80	-	25	75	0	0	25	0	45/103
2014	260	-	0	100	0	0	8	0	30/50
2019	40	-	0	100	0	100	0	0	52/77
Tetradymia canescens -- (spineless horsebrush)									
1994	140	-	14	86	0	0	0	0	18/22
1999	120	-	67	33	0	0	33	0	16/18
2004	100	-	0	100	0	0	0	0	18/30
2009	100	-	20	60	20	20	0	20	19/23
2014	20	-	0	100	0	100	0	0	13/34
2019	100	-	0	100	0	0	0	0	17/27

t - Tree Species; p - Preferred Browse; i - Introduced Species

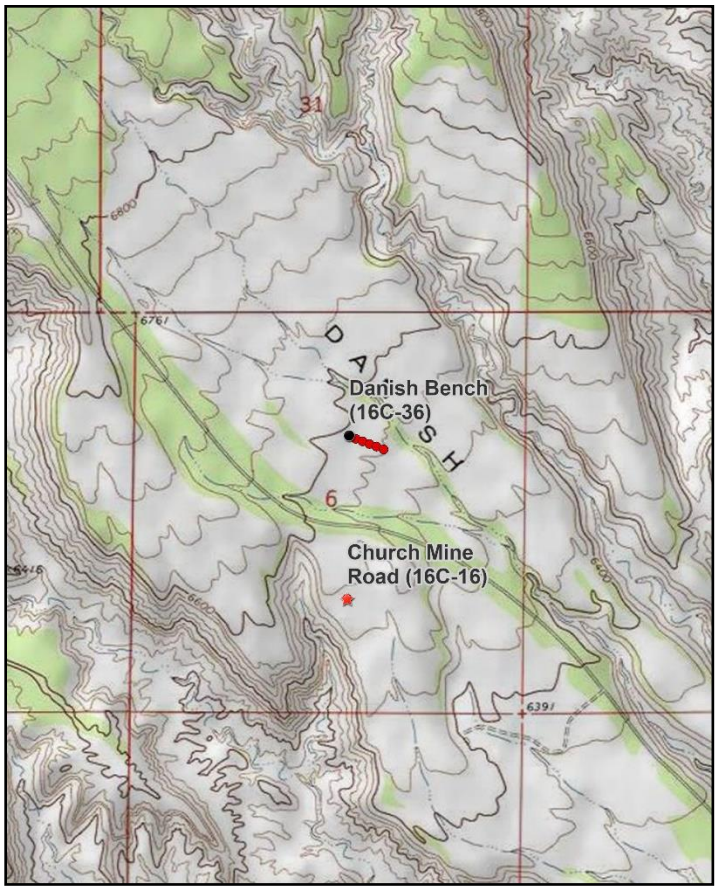
Table 16C-35.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

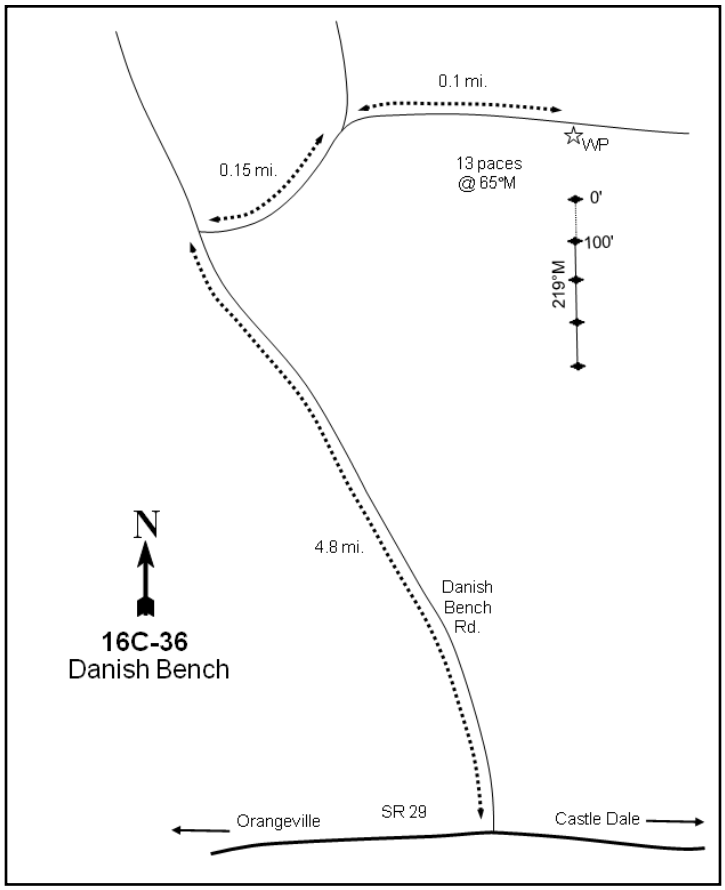
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus scopulorum (Rocky Mountain juniper)							
2019	1	-	-	100	-	-	10.0
Pinus flexilis (limber pine)							
2019	1	-	100	-	-	-	6.0

Table 16C-35.15 – Deer Desirable Components Index: High Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1994	17.0	11.7	0.3	22.1	0.0	4.0	0.0	55.1	Poor-Fair
1999	20.6	11.1	13.1	30.0	0.0	7.8	0.0	82.6	Good
2004	14.6	13.1	4.2	26.5	0.0	5.1	0.0	63.5	Fair
2009	18.8	13.5	15.0	30.0	0.0	3.2	0.0	80.5	Good
2014	19.6	13.8	6.0	30.0	0.0	5.3	0.0	74.7	Good
2019	30.0	14.2	7.2	30.0	0.0	9.4	0.0	90.8	Good-Excellent

DANISH BENCH - STUDY NO. 16C-36





Location Information

USGS 7.5 min Map Info	Red Point SW; Township 18S, Range 8E, Section 06
GPS (0' Stake)	NAD 83 UTM ZONE 12, 494321 East 4348806 North

Transect Information

Browse Tag # (0' Stake)	Not Available
Transect Bearing	96° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Standard

Directions to Site

From State Route 29 between Orangeville and Castle Dale, travel up Danish Bench Road (550 West) for 4.8 miles. Turn right and continue for 0.15 miles to a fork in the road. Proceed to the right and travel 0.1 miles to a witness post on the right-hand (south) side of the road. From the witness post, walk 13 paces at 65 degrees magnetic to the 0-foot baseline stake.

Site Information

Land Ownership	State
Land Administrator	SITLA
Allotment	WILBERG
Elevation	6,587ft (2,008m)
Aspect	South
Slope	4%
Sample Dates	08/25/1994, 05/20/1999, 06/02/2004, 08/06/2009, 07/14/2014, 07/02/2019

Table 16C-36.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Hand Crew - Lop and Scatter	-	-	Between 2014 and 2019	-
Chaining - Chain Unknown	-	LTDL	November-December 1969	1319
Seeding - Seed Unknown	-	LTDL	November-December 1969	1319
Hand Crew - Lop and Scatter	Danish Bench Lop and Scatter	1390	Spring 2009	586

Table 16C-36.2 SeedMix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Wilberge Chaining and seeding			Aerial	Nov 1969	1319
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Agropyron desertorum	Desert Wheatgrass		9.00	0.00

Wildlife Habitat and Vegetation History

Table 16C-36.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	substantial	winter

Table 16C-36.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1994	Black Sagebrush/Mormon Tea	Phase I
1999	Black Sagebrush/Mormon Tea	Phase I
2004	Black Sagebrush/Mormon Tea	Phase I
2009	Black Sagebrush/Mormon Tea	Phase I
2014	Black Sagebrush/Mormon Tea	Phase I
2019	Black Sagebrush/Mormon Tea	Phase I

Site Notes

No Notes

Soils

Table 16C-36.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	7.5	56.0	21.4	22.6	1.8	7.8	140.8	0.8	05/20/1999

Site Potential

1981 - 2010 Average Annual Precipitation	11 inches
NRCS Ecological Site	Upland Stony Loam (Pinyon-Utah Juniper)
NRCS Ecological Site #	R047XB333UT
States and Transitions	A defined state and transition model is available.

Black sagebrush (*Artemisia nova*) and mormon tea (*Ephedra viridis*) have dominated this site since study establishment in 1994; a number of other shrub species have also been present to a lesser extent (Table 16C-36.12, Table 16C-36.13). The herbaceous understory has generally provided moderate cover and diversity throughout the study period. However, overall herbaceous cover more than doubled between 2014 and 2019: this was largely due to an increase in the annual forb species western tansymustard (*Descurainia pinnata*) (Table 16C-36.7, Table 16C-36.10, Table 16C-36.11). Twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) have been observed in all sample years. Tree cover and density decreased following treatments in 2009 and again between 2014 and 2019 (Table 16C-36.1); the site has been within Phase I of woodland succession in all years (Table 16C-36.4). This sagebrush-mormon tea plant community could be comparable to the Perennial Grassland/Shrubland with scattered PJ phase within the Current Potential State as is illustrated by the available state and transition model (Jornada, 2019). Although tree cover and density are low as of 2019 (Table 16C-36.12, Table 16C-36.14), their continued presence indicates that this site may have the potential for infilling in future sample years.

Trend Summary Tables

Table 16C-36.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	4.3	0.6	2.9	-	-	-
1999	4.5	0.0	3.1	-	-	0.1
2004	7.2	0.7	4.0	5.9	1.8	3.8
2009	7.3	0.3	1.0	9.2	0.1	0.3
2014	8.8	1.5	1.0	8.7	2.6	1.6
2019	10.6	2.9	0.9	13.6	1.5	0.7

Table 16C-36.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	-	290	12	92	-	7.4	0.0	1.4
1999	-	311	6	150	-	7.3	0.0	1.3
2004	-	103	65	187	-	3.8	0.6	3.7
2009	-	95	7	66	-	3.6	0.0	0.7
2014	-	142	13	129	-	4.7	0.1	1.3
2019	-	230	255	118	-	9.1	12.5	1.6

Table 16C-36.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	29.1	0.1	23.7	7.6	16.8	16.5
1999	29.9	1.5	20.8	16.2	13.1	17.7
2004	29.4	0.0	17.6	30.2	13.5	18.8
2009	34.7	0.1	28.9	12.4	12.0	13.0
2014	34.5	0.1	24.6	17.5	11.9	18.6
2019	26.9	0.0	29.9	28.0	11.2	29.3

Table 16C-36.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1994	-	19	22	36
1999	3	10	57	29
2004	-	16	41	24
2009	1	16	24	64
2014	3	10	-	43
2019	-	-	1	35
Year	Days Use Per Acre (ha)			
1994	-	-	-	-
1999	11.6 (28.7)	17.4 (43.0)	76.4 (188.7)	-
2004	2.2 (5.4)	4.7 (11.6)	42.9 (105.9)	-
2009	1.5 (3.6)	30.8 (76.1)	93.2 (230.1)	-
2014	6.5 (16.1)	6.7 (16.6)	10.0 (24.8)	-
2019	4.4 (10.8)	2.0 (5.0)	-	-

Table 16C-36.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum[i] (crested wheatgrass)	Elymus elymoides (squirreltail)	Leymus salinus (saline wildrye)	Psathyrostachys juncea[i] (Russian wildrye)	Thinopyrum intermedium[i] (intermediate wheatgrass)
year	Nested Frequency					
1994	48	279	5	2	5	3
1999	29	299	-	-	3	-
2004	67	33	0	4	6	-
2009	48	53	-	7	4	-
2014	53	93	3	6	3	-
2019	84	152	17	22	12	-
year	Average Cover (%)					
1994	1.9	5.4	0.0	0.1	0.0	0.0
1999	0.4	6.7	-	-	0.1	-
2004	2.1	0.7	0.0	1.0	0.1	-
2009	1.5	1.1	-	0.9	0.0	-
2014	1.3	2.5	0.1	0.7	0.2	-
2019	2.1	4.8	0.3	1.4	0.5	-

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16C-36.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Aliciella hutchinsifolia[a] (desert pale gilia)	Caulanthus crassicaulis[a] (thickstem wild cabbage)	Chaetopappa ericoides (rose heath)	Chamaesyce fendleri (Fendler's sandmat)	Chenopodium fremontii[a] (Fremont's goosefoot)	Cryptantha confertiflora (basin yellow cryptantha)	Descurainia pinnata[a] (western tansymustard)	Eriogonum alatum (winged buckwheat)	Gilia inconspicua[a] (shy gilia)	Lactuca serriola[ai] (prickly lettuce)	Lappula occidentalis[a] (flatspine stickseed)	Lepidium[a] (pepperweed)	Lesquerella (bladderpod)	Lithospermum incisum (narrowleaf stoneseed)	Machaeranthera grindelioides (rayless tansyaster)	Medicago sativa[i] (alfalfa)	Penstemon (beardtongue)
year	Nested Frequency																
1994	-	12	-	21	-	53	-	9	-	-	-	-	-	-	-	-	-
1999	1	2	4	15	-	15	-	11	-	-	-	3	-	-	3	-	20
2004	42	1	-	27	25	38	20	18	-	-	-	-	-	-	-	2	-
2009	-	5	-	16	2	36	-	-	-	-	-	-	-	-	2	-	-
2014	-	-	3	31	2	44	9	15	-	-	-	2	-	8	-	2	-
2019	65	-	-	10	17	45	213	3	65	5	62	1	18	-	4	-	-
year	Average Cover (%)																
1994	-	0.0	-	0.0	-	1.2	-	0.0	-	-	-	-	-	-	-	-	-
1999	0.0	0.0	0.1	0.0	-	0.3	-	0.1	-	-	-	0.0	-	-	0.0	-	0.1
2004	0.4	0.0	-	0.3	0.1	0.5	0.1	0.1	-	-	-	-	-	-	-	0.0	-
2009	-	0.0	-	0.1	0.0	0.4	-	-	-	-	-	-	-	-	0.0	-	-
2014	-	-	0.0	0.2	0.0	0.6	0.0	0.0	-	-	-	0.0	-	0.1	-	0.0	-
2019	0.8	-	-	0.1	0.1	0.3	9.3	0.1	0.8	0.0	1.4	0.0	0.1	-	0.0	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Penstemon pachyphyllus (thickleaf beardtongue)	Salsola tragus[ai] (prickly Russian thistle)	Schoenocrambe linifolia (flaxleaf plainsmustard)	Tetraneuris acaulis (stemless four-nerve daisy)	Thelesperma subnudum (Navajo tea)	Townsendia incana (hoary Townsend daisy)	unknown perennial forb (unknown forb)
year	Nested Frequency						
1994	8	-	-	23	7	-	4
1999	2	-	2	35	16	68	-
2004	10	-	0	20	27	122	4
2009	7	-	-	16	2	-	-
2014	27	1	-	24	5	4	-
2019	18	11	-	24	9	15	-
year	Average Cover (%)						
1994	0.0	-	-	0.1	0.0	-	0.0
1999	0.0	-	0.0	0.3	0.1	0.3	-
2004	0.0	-	0.0	0.1	0.2	2.2	0.2
2009	0.1	-	-	0.1	0.0	-	-
2014	0.2	0.0	-	0.1	0.1	0.0	-
2019	0.3	0.0	-	0.5	0.1	0.1	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16C-36.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia nova[p] (black sagebrush)	Cercocarpus montanus[p] (alderleaf mountain mahogany)	Chrysothamnus viscidiflorus (yellow rabbitbrush)	Ephedra viridis[p] (mormon tea)	Eriogonum microthecum[p] (slender buckwheat)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma[t] (Utah juniper)	Opuntia polyacantha (plains pricklypear)	Pinus edulis[t] (twoneedle pinyon)	Purshia stansburiana[p] (Stansbury cliffrose)	Purshia tridentata[p] (antelope bitterbrush)	Yucca harrimaniae (Spanish bayonet)
year	Line Intercept Cover (%)											
1994	-	-	-	-	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-	-	-	-	-
2004	2.5	1.1	-	1.9	0.2	1.8	3.2	-	0.6	0.2	-	-
2009	3.5	1.6	-	3.9	0.1	0.1	0.3	-	-	-	0.1	-
2014	4.5	0.2	0	3.8	0.1	2.5	1.3	0.1	0.3	0.1	-	-
2019	8.6	0.6	-	4.1	0.1	1.3	0	0.2	0.7	0.2	-	-
year	Quadrat Cover (%)											
1994	1.2	1.1	-	2.0	0.1	-	2.8	-	0.2	-	0.0	0.6
1999	1.8	0.8	-	1.8	0.1	0.0	2.8	-	0.4	-	0.1	-
2004	3.6	0.6	-	2.3	0.6	0.7	3.6	-	0.4	0.1	-	0.0
2009	3.5	0.3	0.0	3.1	0.3	0.2	0.8	-	0.1	-	0.1	0.0
2014	6.2	0.1	0.0	2.3	0.2	1.4	0.8	0.0	0.1	0.0	-	-
2019	6.0	0.9	0.1	3.2	0.4	2.8	0.3	0.0	0.6	0.1	-	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16C-36.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Artemisia nova[P] -- (black sagebrush)									
1994	1540	20	14	86	0	3	0	0	24/56
1999	1700	-	22	65	13	42	12	1	18/48
2004	1860	560	5	85	10	68	10	8	18/47
2009	3000	140	32	56	12	24	27	8	15/44
2014	1860	20	4	87	9	74	17	12	20/46
2019	1920	80	1	91	8	51	17	8	30/49
Atriplex canescens[P] -- (fourwing saltbush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	132/136
Cercocarpus montanus[P] -- (alderleaf mountain mahogany)									
1994	20	-	0	100	0	0	100	0	132/156
1999	20	20	0	100	0	100	0	0	127/136
2004	20	-	0	0	100	0	100	100	136/140
2009	60	-	0	0	100	0	100	100	159/180
2014	60	-	67	33	0	33	0	0	130/135
2019	80	-	0	75	25	50	25	25	131/161
Chrysothamnus viscidiflorus -- (yellow rabbitbrush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	20	-	0	100	0	0	0	0	14/24
2009	340	-	77	24	0	0	0	0	13/18
2014	40	-	0	100	0	50	50	0	16/26
2019	40	-	0	100	0	50	50	0	19/32
Echinocereus coccineus -- (scarlet hedgehog cactus)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	14/44
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	12/37
2019	-	-	-	-	-	-	-	-	22/38
Ephedra viridis[P] -- (mormon tea)									
1994	60	-	0	100	0	0	0	0	78/111
1999	340	-	12	77	12	29	29	35	84/110
2004	580	-	35	52	14	38	21	14	83/109
2009	520	-	0	39	62	0	54	15	79/111
2014	400	-	0	100	0	60	15	15	79/115
2019	220	-	0	100	0	18	0	0	93/135
Eriogonum microthecum[P] -- (slender buckwheat)									
1994	1880	60	5	93	2	0	0	0	5/9
1999	1160	40	12	85	3	7	7	2	3/7
2004	2320	280	6	92	2	29	10	0	4/8
2009	940	440	13	70	17	2	32	15	5/9
2014	880	80	18	82	0	39	23	7	7/10
2019	900	-	42	58	0	9	4	0	7/10

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Gutierrezia sarothrae -- (broom snakeweed)									
1994	-	-	-	-	-	-	-	-	18/23
1999	460	140	74	26	0	0	0	0	10/8
2004	5080	-	9	91	0	1	0	1	16/22
2009	1100	-	0	67	33	0	0	44	11/14
2014	3300	3500	24	74	2	0	0	2	25/29
2019	7180	33740	70	30	0	0	0	0	19/17
Juniperus osteosperma[t] -- (Utah juniper)									
1994	-	-	-	-	-	-	-	-	-/-
1999	120	-	67	33	0	0	0	0	- / -
2004	80	-	50	50	0	0	0	0	- / -
2009	40	-	0	0	100	0	0	50	- / -
2014	40	40	50	50	0	0	0	0	- / -
2019	40	-	50	0	50	0	0	100	- / -
Linanthus pungens -- (granite prickly phlox)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	15/27
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	20	-	0	100	0	0	0	0	8/19
Opuntia polyacantha -- (plains pricklypear)									
1994	-	-	-	-	-	-	-	-	9/24
1999	-	-	-	-	-	-	-	-	10/41
2004	20	-	0	100	0	0	0	0	9/44
2009	-	-	-	-	-	-	-	-	-/-
2014	20	-	0	100	0	0	0	0	9/34
2019	20	-	0	100	0	0	0	0	10/28
Pediocactus simpsonii -- (mountain ball cactus)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	9/33
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Pinus edulis[t] -- (twoneedle pinyon)									
1994	-	-	-	-	-	-	-	-	-/-
1999	40	20	100	0	0	0	0	50	- / -
2004	40	-	50	50	0	0	0	0	- / -
2009	20	-	0	0	100	0	0	100	- / -
2014	60	-	67	33	0	0	0	33	- / -
2019	20	-	0	100	0	0	0	0	- / -
Purshia stansburiana[p] -- (Stansbury cliffrose)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	28/59
2004	20	-	0	100	0	100	0	0	49/63
2009	-	-	-	-	-	-	-	-	58/103
2014	20	-	0	100	0	100	0	0	49/95
2019	20	-	0	100	0	100	0	0	44/73

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Purshia tridentata[p] -- (antelope bitterbrush)									
1994	60	-	0	100	0	0	0	0	48/57
1999	20	-	0	100	0	0	100	0	49/56
2004	-	-	-	-	-	-	-	-	10/41
2009	20	-	0	0	100	0	100	0	47/69
2014	-	-	-	-	-	-	-	-	19/60
2019	-	-	-	-	-	-	-	-	-/-
Yucca harrimaniae -- (Spanish bayonet)									
1994	80	-	0	100	0	0	0	0	34/66
1999	40	-	0	100	0	0	0	0	22/32
2004	100	-	100	0	0	0	0	0	- / -
2009	60	-	100	0	0	0	0	0	21/30
2014	-	-	-	-	-	-	-	-	23/27
2019	40	-	50	50	0	0	0	0	22/24

t - Tree Species; p - Preferred Browse; i - Introduced Species

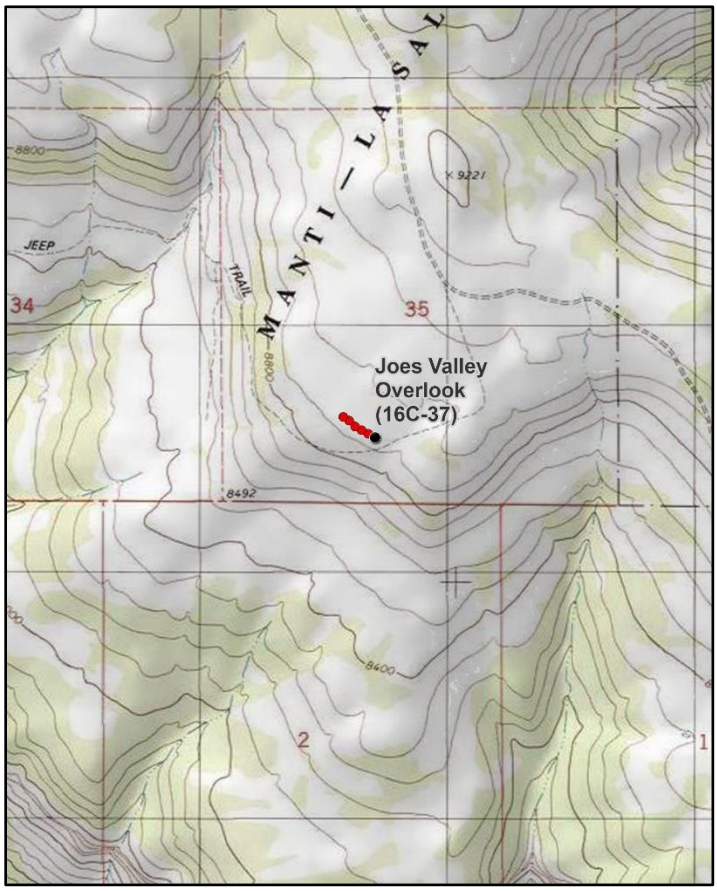
Table 16C-36.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

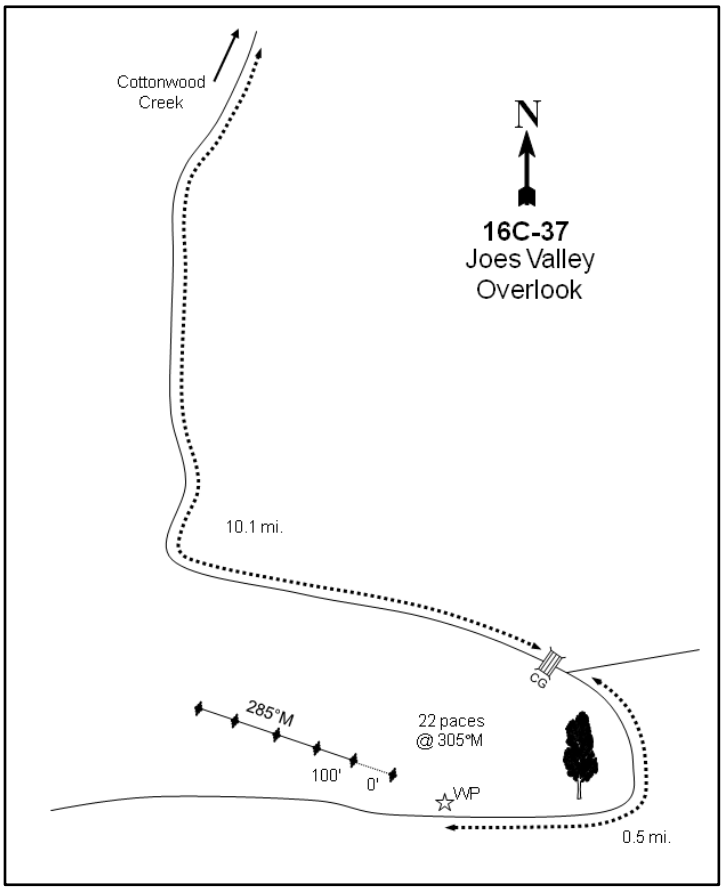
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1994	116	-	-	-	-	-	7.9
1999	104	-	-	-	-	-	6.6
2004	110	5	45	40	10	-	6.2
2009	94	10	90	-	-	-	3.2
2014	53	19	56	25	-	-	6.0
2019	44	-	82	18	-	-	7.1
Pinus edulis (twoneedle pinyon)							
1994	55	-	-	-	-	-	4.8
1999	52	-	-	-	-	-	4.7
2004	51	-	73	27	-	-	6.7
2009	38	-	100	-	-	-	2.9
2014	13	17	33	50	-	-	4.8
2019	4	-	50	50	-	-	6.5

Table 16C-36.15 – Deer Desirable Components Index: Mid Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1994	5.7	0.0	0.0	14.7	0.0	2.9	0.0	23.3	Very Poor
1999	5.9	0.0	0.0	14.6	0.0	2.6	0.0	23.0	Very Poor
2004	7.7	6.8	6.8	7.6	0.0	7.5	0.0	36.4	Very Poor-Poor
2009	11.9	0.2	6.2	7.2	0.0	1.4	0.0	26.9	Very Poor
2014	11.0	13.7	2.0	9.4	0.0	2.7	0.0	38.7	Poor
2019	17.2	13.1	0.5	18.2	0.0	3.2	0.0	52.1	Fair

JOES VALLEY OVERLOOK - STUDY NO. 16C-37





Location Information

USGS 7.5 min Map Info	Mahogany Point SW; Township 17S, Range 6E, Section 35
GPS (0' Stake)	NAD 83 UTM ZONE 12, 481645 East 4349737 North

Transect Information

Browse Tag # (0' Stake)	28
Transect Bearing	285° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Standard

Directions to Site

From the intersection of Cottonwood Canyon Road (#040) and Trail Mountain Road, travel south for 10.1 miles to a cattle guard. Continue 0.5 miles past the cattle guard to a witness post on the right-hand (north) side of the road; the witness post is a tall post on a dirt mound near the end of a contour trench. From the witness post to the 0-foot baseline stake, walk 22 paces at a bearing of 305 degrees magnetic. The 0-foot stake has browse tag #28 attached.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	TRAIL MT
Elevation	8,900ft (2,713m)
Aspect	South
Slope	7-13%
Sample Dates	08/29/1994, 08/04/1999, 08/04/2004, 08/04/2009, 07/17/2014, 07/10/2019

Table 16C-37.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Terrace - Contour Trench	-	-	Historic	-
Seeding - Seed Unknown	-	-	Historic	-

Wildlife Habitat and Vegetation History

Table 16C-37.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	substantial	winter
Shiras Moose	crucial	winter

Table 16C-37.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1994	Mountain Big Sagebrush	Phase I
1999	Mountain Big Sagebrush	Phase I
2004	Mountain Big Sagebrush	Phase I
2009	Mountain Big Sagebrush	Phase I
2014	Mountain Big Sagebrush	Phase I
2019	Mountain Big Sagebrush	Phase I

Site Notes

The area has been closed to cattle grazing since the contour treatment.

Soils

Table 16C-37.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay	7.4	26.0	29.4	44.6	2.8	5.5	108.8	0.6	08/04/1999

Site Potential

1981 - 2010 Average Annual Precipitation	21 inches
NRCS Ecological Site	Mountain Loam (Shrub)
NRCS Ecological Site #	R047XA434UT
States and Transitions	A defined state and transition model is available.

Since the site was established in 1994, the plant community has existed as a stable mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) community. The herbaceous understory has remained diverse and abundant. Perennial grasses have been a mixture of native and introduced species with saline wildrye (*Leymus salinus*) and smooth brome (*Bromus inermis*) as the dominant species -- a stable trend has been observed (Table 16C-37.10). Forbs have been diverse and have consistently provided moderate cover with mat penstemon (*Penstemon caespitosus*), mountain phlox (*Phlox austromontana*) and pingue rubberweed (*Hymenoxys richardsonii*) as the dominant species (Table 16C-37.11). Although mountain big sagebrush has been the dominant shrub species, lesser amounts of mountain snowberry (*Symphoricarpos oreophilus*), Utah serviceberry (*Amelanchier utahensis*) and longflower rabbitbrush (*Chrysothamnus depressus*) have also been noted (Table 16C-37.12). Sagebrush has shown significant increases while the other shrubs have been stable or have only slightly increased (Table 16C-37.13). There has been a continued presence of conifer trees including Rocky Mountain juniper (*Juniperus scopulorum*), twoneedle pinyon (*Pinus edulis*), and limber pine (*Pinus flexilis*) observed on the site which will likely increase in future years (Photos, Table 16C-37.14). The state and transition model places this site into the mountain big sagebrush with perennial grasses and deciduous shrubs Phase within the Current Potential State (Jornada, 2019). Without a major disturbance, it is likely that the plant community will remain in this state in future years.

Trend Summary Tables

Table 16C-37.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1994	12.9	0.5	-	-	-	-
1999	15.7	0.5	0.4	-	-	0.3
2004	21.1	0.7	-	23.5	2.4	2.6
2009	21.5	0.6	-	19.1	0.7	3.4
2014	23.7	1.3	-	26.5	2.4	-
2019	31.1	1.0	-	30.3	2.0	-

Table 16C-37.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1994	-	336	1	158	-	12.3	0.0	2.5
1999	-	368	38	173	-	12.2	0.1	5.2
2004	-	324	7	165	-	9.5	0.1	4.3
2009	-	331	9	193	-	10.2	0.0	5.5
2014	-	344	11	207	-	15.7	0.0	6.7
2019	-	324	12	217	-	14.5	0.0	6.3

Table 16C-37.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1994	25.2	-	30.9	0.5	4.4	27.9
1999	32.1	0.0	35.3	7.4	1.7	35.6
2004	40.2	-	34.0	8.1	2.3	35.3
2009	30.5	0.6	36.4	7.1	1.7	35.2
2014	25.1	-	34.9	13.0	2.1	47.8
2019	33.5	0.0	46.8	7.7	2.2	46.4

Table 16C-37.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1994	1	19	40	25
1999	3	7	40	14
2004	4	11	54	17
2009	13	6	29	15
2014	2	1	17	5
2019	2	3	23	7
Year	Days Use Per Acre (ha)			
1994	-	-	-	-
1999	19.6 (48.4)	9.4 (23.2)	83.1 (205.3)	-
2004	21.8 (53.8)	4.7 (11.6)	75.1 (185.4)	-
2009	39.9 (98.6)	1.3 (3.3)	68.3 (168.8)	-
2014	26.8 (66.3)	-	51.6 (127.5)	-
2019	5.1 (12.6)	1.3 (3.3)	27.5 (67.9)	-

Table 16C-37.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Achnatherum pinetorum (pine needlegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bromus inermis[i] (smooth brome)	Carex (sedge)	Leymus cinereus (basin wildrye)	Leymus salinus (saline wildrye)	Pascopyrum smithii (western wheatgrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium[i] (intermediate wheatgrass)
year	Nested Frequency											
1994	-	24	31	49	9	6	239	-	114	5	16	5
1999	-	58	59	83	7	5	185	-	96	-	22	11
2004	-	16	32	74	3	-	158	-	16	-	97	27
2009	-	30	20	93	15	-	166	18	65	6	74	12
2014	1	12	8	98	10	-	173	26	128	3	43	2
2019	7	34	26	100	12	30	170	11	41	1	18	7
year	Average Cover (%)											
1994	-	0.3	0.5	0.9	0.2	0.2	8.2	-	1.5	0.0	0.4	0.0
1999	-	0.9	0.8	2.5	0.3	0.1	5.4	-	1.8	-	0.3	0.0
2004	-	0.2	0.5	1.8	0.2	-	4.1	-	0.2	-	2.3	0.2
2009	-	0.2	0.1	2.0	0.1	-	5.4	0.3	1.0	0.1	0.9	0.1
2014	0.1	0.3	0.0	4.4	0.4	-	5.5	0.8	2.7	0.0	1.5	0.0
2019	0.3	0.3	0.6	3.3	0.4	2.0	5.8	0.1	0.6	0.0	0.9	0.0

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16C-37.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Androsace septentrionalis[a] (pygmyflower rockjasmine)	Arenaria fendleri (Fendler's sandwort)	Astragalus (milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus miser (timber milkvetch)	Astragalus tenellus (looseflower milkvetch)	Astragalus utahensis (Utah milkvetch)	Castilleja linariifolia (Wyoming Indian paintbrush)	Chaenactis douglasii (Douglas' dustymaiden)	Collinsia parviflora[a] (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawksbeard)	Cymopterus (springparsley)	Descurainia pinnata[a] (western tansymustard)	Erigeron eatonii (Eaton's fleabane)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)
year	Nested Frequency																
1994	-	24	-	3	10	8	-	-	-	-	-	-	-	-	2	-	12
1999	38	31	3	-	11	6	-	-	7	-	-	-	-	-	3	-	17
2004	7	8	-	7	7	2	3	-	2	-	-	-	-	-	-	-	8
2009	5	11	10	11	5	1	3	-	12	1	3	-	-	-	1	1	19
2014	11	27	14	16	3	-	5	0	-	-	-	5	-	-	7	-	15
2019	-	25	15	13	1	6	3	3	-	3	-	9	0	9	24	-	18
year	Average Cover (%)																
1994	-	0.2	-	0.0	0.3	0.0	-	-	-	-	-	-	-	-	0.0	-	0.1
1999	0.1	0.4	0.1	-	0.3	0.2	-	-	0.0	-	-	-	-	-	0.0	-	0.3
2004	0.1	0.1	-	0.4	0.2	0.0	0.0	-	0.0	-	-	-	-	-	-	-	0.1
2009	0.0	0.1	0.1	0.2	0.1	0.0	0.0	-	0.0	0.0	0.0	-	-	-	0.0	0.0	0.4
2014	0.0	1.0	0.6	0.2	0.0	-	0.0	0.0	-	-	-	0.0	-	-	0.0	-	0.4
2019	-	0.5	0.1	0.4	0.0	0.2	0.0	0.0	-	0.0	-	0.1	0.0	0.0	0.2	-	0.3

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Gilia inconspicua[a] (shy gilia)	Hymenoxys richardsonii (pingue rubberweed)	Lesquerella (bladderpod)	Lomatium (desertparsley)	Lupinus argenteus (silvery lupine)	Machaeranthera canescens (hoary tansyaster)	Medicago sativa[i] (alfalfa)	Packera multilobata (lobeleaf groundsel)	Penstemon (beardtongue)	Penstemon caespitosus (mat penstemon)	Phlox austromontana (mountain phlox)	Polygonum douglasii[a] (Douglas' knotweed)	Potentilla (cinquefoil)	Schoenocrambe linifolia (flaxleaf plainsmustard)	Taraxacum officinale (common dandelion)	unknown annual forb[a] (unknown forb)	unknown perennial forb (unknown forb)
year	Nested Frequency																
1994	-	33	-	-	8	-	13	-	3	41	48	-	3	-	-	1	7
1999	-	41	4	4	5	-	7	2	-	79	41	-	11	2	-	-	-
2004	-	55	5	-	3	4	6	3	-	55	54	-	4	3	-	-	-
2009	2	51	-	-	-	4	5	1	6	80	75	1	5	3	-	-	-
2014	-	38	5	4	-	7	8	23	7	103	43	-	13	5	5	-	-
2019	-	45	2	5	-	5	4	14	8	97	60	-	20	4	1	-	-
year	Average Cover (%)																
1994	-	0.6	-	-	0.2	-	0.0	-	0.0	0.5	0.5	-	0.0	-	-	0.0	0.0
1999	-	0.8	0.0	0.0	0.1	-	0.2	0.0	-	2.3	0.3	-	0.1	0.0	-	-	-
2004	-	0.8	0.0	-	0.4	0.1	0.2	0.0	-	1.2	0.6	-	0.0	0.0	-	-	-
2009	0.0	1.2	-	-	-	0.0	0.0	0.0	0.1	2.0	1.3	0.0	0.0	0.0	-	-	-
2014	-	0.5	0.0	0.0	-	0.1	0.3	0.2	0.5	2.2	0.6	-	0.1	0.0	0.0	-	-
2019	-	0.9	0.0	0.1	-	0.0	0.2	0.1	0.0	2.0	1.1	-	0.1	0.0	0.0	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16C-37.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis[p] (Utah serviceberry)	Artemisia nova[p] (black sagebrush)	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Chrysothamnus depressus[p] (longflower rabbitbrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Pinus flexilis[t] (limber pine)	Symphoricarpos oreophilus[p] (mountain snowberry)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)								
1994	-	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-	-
2004	1.7	-	13.4	0.5	2.2	0.2	2.6	7.9	-
2009	1.2	-	11.1	0.5	0.7	-	3.4	6.3	-
2014	2.3	-	15	0.4	2.4	-	-	8.8	-
2019	2.3	-	19.7	1.4	2	-	-	6.9	-
year	Quadrat Cover (%)								
1994	0.6	-	8.7	0.1	0.4	-	-	3.5	0.0
1999	0.7	0.4	8.7	0.4	0.3	0.0	0.4	5.6	0.1
2004	0.6	0.3	12.2	0.7	0.6	0.1	0.0	7.3	0.0
2009	1.1	0.4	13.7	0.6	0.5	0.0	0.0	5.9	0.0
2014	1.5	0.4	15.5	0.6	1.3	0.0	-	5.8	0.0
2019	1.1	-	21.7	1.8	0.9	0.1	-	6.5	0.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16C-37.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[P] -- (Utah serviceberry)									
1994	280	-	14	86	0	36	21	0	79/102
1999	180	-	0	100	0	78	22	0	77/95
2004	180	-	22	78	0	11	78	0	72/100
2009	200	-	0	80	20	10	80	10	94/122
2014	280	-	21	79	0	43	36	0	98/120
2019	260	40	8	92	0	0	92	0	99/125
Artemisia nova[P] -- (black sagebrush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	40	-	0	100	0	50	0	0	16/38
2004	40	-	0	50	50	0	0	0	23/61
2009	100	-	0	100	0	20	0	0	21/49
2014	140	-	0	100	0	14	86	0	16/43
2019	20	-	0	100	0	0	100	0	24/48
Artemisia tridentata ssp. vaseyana[P] -- (mountain big sagebrush)									
1994	2460	20	3	76	20	30	0	3	42/81
1999	2960	260	16	60	25	39	24	6	43/74
2004	3080	20	13	56	31	50	29	10	37/69
2009	4460	5040	30	56	14	35	32	15	41/75
2014	5560	100	44	54	3	55	23	4	48/82
2019	7720	660	35	56	9	47	15	8	45/73
Chrysothamnus depressus[P] -- (longflower rabbitbrush)									
1994	800	-	5	90	5	3	0	0	8/21
1999	560	-	4	82	14	32	29	11	5/18
2004	1100	-	0	100	0	47	27	0	11/27
2009	1180	-	2	88	10	2	3	9	8/26
2014	980	-	4	96	0	55	16	0	10/22
2019	3320	-	9	90	1	18	40	1	13/23
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1994	1240	-	2	95	3	8	7	2	14/27
1999	1300	-	6	86	8	19	5	3	16/23
2004	1640	-	0	100	0	16	2	0	18/33
2009	1680	20	2	91	7	13	1	8	13/26
2014	2280	-	18	83	0	44	11	0	18/30
2019	2120	-	11	89	0	0	3	0	25/31
Ericameria parryi var. parryi -- (Parry's rabbitbrush)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	100	-	0	100	0	0	100	0	12/26
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Gutierrezia sarothrae -- (broom snakeweed)									
1994	-	-	-	-	-	-	-	-	-/-
1999	40	-	0	100	0	0	0	0	- / -
2004	300	-	0	100	0	0	0	0	17/25
2009	380	-	0	100	0	0	0	0	14/18
2014	40	-	50	50	0	0	0	0	22/25
2019	320	-	6	94	0	0	0	0	16/16

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Kraschenninnikovia lanata[p] -- (winterfat)									
1994	-	-	-	-	-	-	-	-	-/-
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	40	0	0	0	0	0	0	- / -
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
1994	3120	-	1	98	1	41	3	0	31/64
1999	2300	100	10	90	0	4	0	6	36/72
2004	2840	-	6	94	0	16	2	0	25/57
2009	3820	60	16	73	11	24	30	27	27/57
2014	2220	-	1	99	0	42	7	0	33/61
2019	2900	40	13	86	1	6	9	1	32/58
Tetradymia canescens -- (spineless horsebrush)									
1994	40	-	50	50	0	0	0	0	28/19
1999	60	-	33	67	0	33	0	0	10/18
2004	120	-	33	67	0	0	17	0	20/26
2009	20	-	0	0	100	0	100	100	20/22
2014	60	20	33	67	0	0	33	0	13/35
2019	20	-	0	100	0	0	0	0	22/34

t - Tree Species; p - Preferred Browse; i - Introduced Species

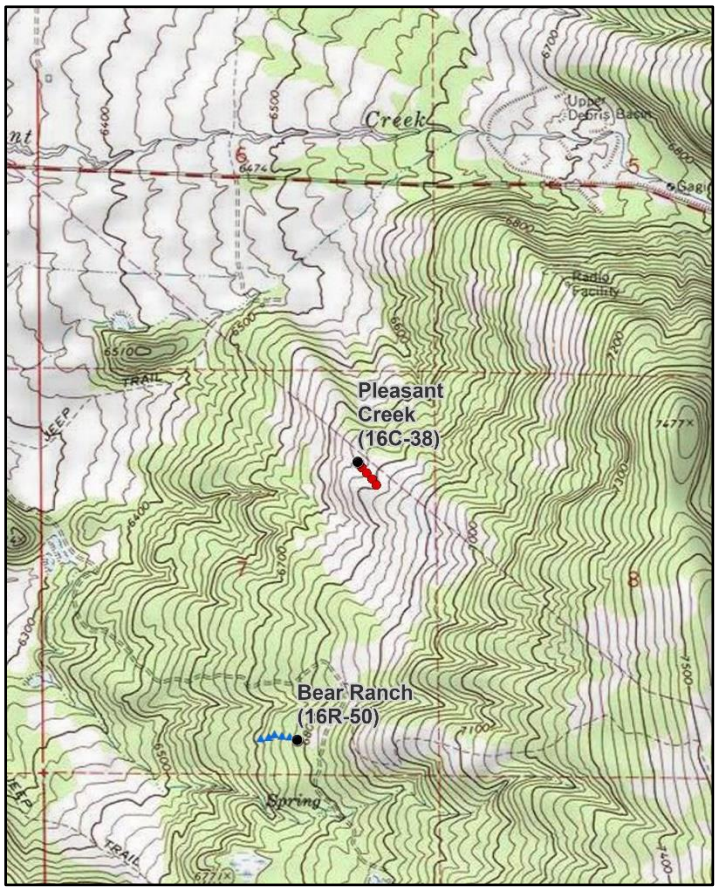
Table 16C-37.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

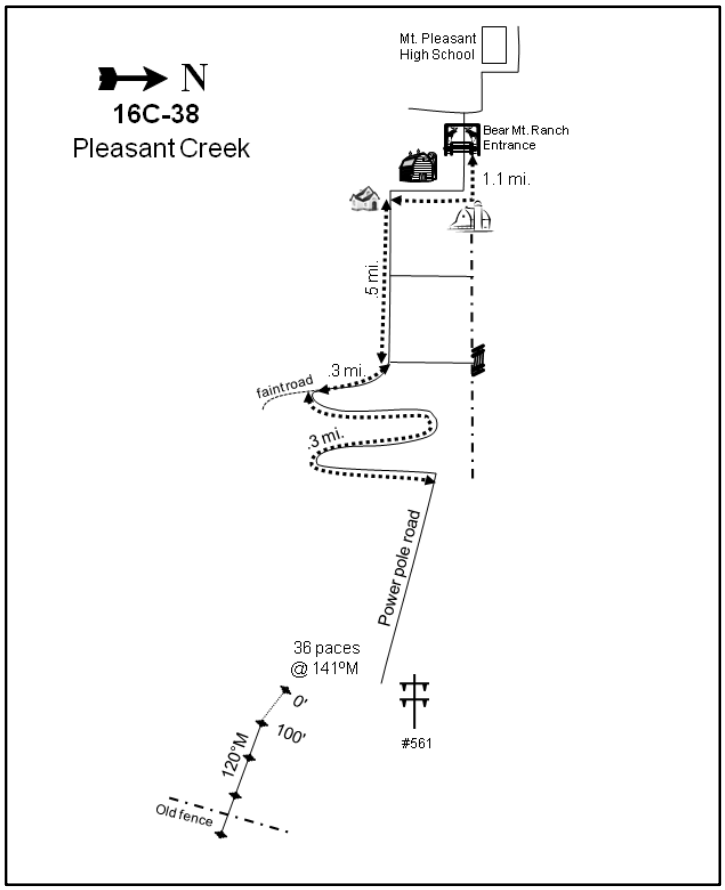
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus scopulorum (Rocky Mountain juniper)							
2014	4	-	50	50	-	-	4.5
2019	4	-	-	50	50	-	13.0
Pinus edulis (twoneedle pinyon)							
2014	3	-	50	-	25	25	16.5
Pinus flexilis (limber pine)							
2019	1	-	100	-	-	-	5.0

Table 16C-37.15 – Deer Desirable Components Index: High Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1994	15.3	10.8	1.6	24.6	0.0	5.0	0.0	57.4	Fair
1999	18.4	10.8	6.0	24.3	0.0	10.0	0.0	69.6	Fair-Good
2004	27.8	9.8	5.6	19.0	0.0	8.6	0.0	70.8	Fair-Good
2009	22.6	11.0	11.4	20.5	0.0	10.0	0.0	75.5	Good
2014	30.0	14.6	13.4	30.0	0.0	10.0	0.0	98.0	Excellent
2019	30.0	13.2	13.4	29.0	0.0	10.0	0.0	95.6	Excellent

PLEASANT CREEK - STUDY NO. 16C-38





Location Information

USGS 7.5 min Map Info	Mount Pleasant SE; Township 15S, Range 5E, Section 07
GPS (0' Stake)	NAD 83 UTM ZONE 12, 465742 East 4375986 North

Transect Information

Browse Tag # (0' Stake)	561
Transect Bearing	133° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

From Mt. Pleasant High School (on 700 South three blocks east of State Street in Mt. Pleasant), continue east on Hawk Boulevard (same as 700 South), following several turns in the road until an eastbound dirt road jutting off at one of the curves leads the way to Bear Mountain Ranch. Enter the ranch and travel 1.1 miles to some barns and house(s). Continue on this road (alongside a fence) and drive 0.5 miles to the second intersection, the left side of which leads to a gate. Take the right side and go 0.1 miles to another "Y" intersection with a faint road. Continue on the clearer road (to the left) for 0.3 miles. At 0.3 miles you will see to your left an old intersection where the road is in poor condition, behind which is the gate and road leading to the old way to the site. Continue straight on the road you're on for 0.2 miles; the road will become a power line road. Stop at power pole #561. The 0-foot baseline stake is 36 paces from the power pole at an azimuth of 141 degrees magnetic.

Site Information

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	6,800ft (2,073m)
Aspect	West
Slope	7-15%
Sample Dates	07/03/1997, 07/23/2002, 08/22/2007, 05/29/2014, 05/30/2019

Table 16C-38.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Two-Way Ely	Bear Mountain CWMU Habitat Enhancement	2602	October-December 2013	232
Seeding - Aerial Before	Bear Mountain CWMU Habitat Enhancement	2602	October-December 2013	232
Seeding - Dribbler	Bear Mountain CWMU Habitat Enhancement	2602	October-December 2013	232
Seeding - Aerial After	Bear Mountain CWMU Habitat Bear Mountain CWMU Habitat	2602	February 2014	232

Table 16C-38.2 SeedMix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Bear Mtn CWMU			Aerial	Oct 2013	300
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Achnatherum hymenoides	Indian Ricegrass	Nezpar	1.00	0.97
G	Agropyron cristatum	Crested Wheatgrass	Hycrest	1.00	0.87
G	Dactylis glomerata	Orchardgrass	Paiute	0.50	0.43
G	Leymus cinereus	Great Basin Wildrye	UDWR IntMtn Tetra	0.50	0.43
G	Pascopyrum smithii	Western Wheatgrass	Arriba	1.00	0.89
G	Poa secunda	Sandberg Bluegrass	UP Colorado Plateau	0.52	0.38
G	Pseudoroegneria spicata	Bluebunch Wheatgrass	Anatone	1.50	1.35
F	Helianthus annuus	Annual Sunflower	Utah UT	0.50	0.48
F	Linum lewisii	Lewis Flax	Maple Grove	0.49	0.43
F	Medicago sativa	Alfalfa	Ladak	2.00	1.83
F	Melilotus officinalis	Yellow Sweetclover		0.50	0.44
F	Onobrychis viciifolia	Sainfoin	Delaney	2.00	1.96
F	Sanguisorba minor	Small Burnet		2.00	1.84

Mix Name			Application Type	Application Date	Acres
Bear Mtn CWMU Dribbler			Dribbler	Oct 2013	300
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
S	Atriplex canescens	Fourwing Saltbush	Juab/Utah/Carbon UT	0.25	0.12
S	Cercocarpus ledifolius	Curlleaf Mountain Mahogany	Sevier UT	0.25	0.20
S	Ephedra viridis	Green Ephedra	Emery UT	0.25	0.23
S	Purshia tridentata	Bitterbrush	Oneida ID	0.25	0.21

Mix Name			Application Type	Application Date	Acres
Bear Mountiain Shrubs			Aerial	Feb 2014	300
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
F	Medicago sativa	Alfalfa	Ranger NC	0.50	0.47
S	Artemisia tridentata ssp. vaseyana	Mountain Big Sagebrush	Beaver UT	0.53	0.23
S	Bassia prostrata	Forage Kochia	Beaver UT	0.50	0.31
S	Bassia prostrata	Forage Kochia	Snowstorm	0.67	0.36

Wildlife Habitat and Vegetation History

Table 16C-38.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter
Shiras Moose	substantial	year-long

Table 16C-38.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1989	Mixed Shrub	Phase I
1997	Mixed Shrub	Phase I
2002	Mixed Shrub/Pinyon-Juniper	Phase I transitioning to Phase II
2007	Mixed Shrub/Pinyon-Juniper	Phase I transitioning to Phase II
2014	Mixed Shrub/Perennial Grass-Forb	Phase I
2019	Mixed Shrub/Perennial Grass-Forb	Phase I

Site Notes

No Notes

Site Potential

1981 - 2010 Average Annual Precipitation	19 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XB430UT
States and Transitions	No state and transition model is available for this ecological site.

From time of establishment in 1989 through 2012, this site was a mixed shrub community that was being encroached by trees with a robust understory. A chaining occurred in 2013 which reduced the tree cover (Table 16C-38.1). As of 2019, the site remains in the mixed shrub community. Introduced and native perennial grasses have been a dominant component of the understory with bluebunch wheatgrass (*Pseudoroegneria spicata*) and Kentucky bluegrass (*Poa pratensis*) as the dominant species. Annual grasses have been present in fluctuating numbers but are rare overall (Table 16C-38.7, Table 16C-38.10). Forbs are plentiful and abundant with low beardtongue (*Penstemon humilis*) and western aster (*Symphyotrichum ascendens*) being the dominant species (Table 16C-38.11). Browse species provide a moderate amount of cover with mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), antelope bitterbrush (*Purshia tridentata*), and mountain snowberry (*Symphoricarpos oreophilus*) dominating the shrub component. Shrub cover decreased following the chaining but has increased in subsequent sample years. Utah juniper (*Juniperus osteosperma*) has consistently been present on the site with a reduction in cover and density following the chaining treatment (Table 16C-38.6, Table 16C-38.12, Table 16C-38.13, Table 16C-38.14).

Trend Summary Tables

Table 16C-38.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	17.1	7.4	5.6	-	-	-
2002	18.9	6.0	7.7	20.0	9.7	10.8
2007	9.4	7.3	6.1	17.3	8.6	10.8
2014	8.0	5.2	10.0	7.3	4.1	6.4
2019	11.6	9.8	7.5	14.2	13.4	7.7

Table 16C-38.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	179	342	274	350	1.6	14.0	1.7	7.5
2002	15	306	74	294	0.0	12.1	0.4	6.7
2007	162	265	264	307	3.2	9.6	1.6	8.1
2014	90	268	249	256	0.7	12.9	6.1	12.4
2019	90	288	380	333	0.5	12.1	10.9	17.5

Table 16C-38.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	23.9	1.6	42.6	1.1	0.6	46.5
2002	26.6	3.6	37.6	1.6	1.1	51.0
2007	11.9	1.9	40.2	3.4	0.7	51.5
2014	19.6	1.0	56.8	0.6	0.4	50.6
2019	13.0	2.1	53.2	1.2	0.8	55.3

Table 16C-38.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Coyote	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency				
1997	1	-	17	11	3
2002	-	-	24	11	4
2007	-	-	29	18	7
2014	1	-	10	9	-
2019	6	-	21	10	15
Year	Days Use Per Acre (ha)				
1997	-	-	-	-	-
2002	-	-	79.8 (197.0)	27.5 (67.9)	-
2007	-	-	63.7 (157.3)	57.7 (142.4)	-
2014	-	8.7 (21.5)*	13.4 (33.1)	26.8 (66.2)	-
2019	14.5 (35.9)	-	48.9 (120.8)	13.4 (33.1)	-

*Pellets per acre (ha)

Table 16C-38.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Achnatherum lettermanii (Letterman's needlegrass)	Achnatherum nelsonii (Columbia needlegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bromus arvensis[ai] (field brome)	Bromus tectorum[ai] (cheatgrass)	Carex (sedge)	Elymus elymoides (squirreltail)	Melica bulbosa (oniongrass)	Pascopyrum smithii (western wheatgrass)	Poa bulbosa[i] (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis[i] (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium[i] (intermediate wheatgrass)
year	Nested Frequency															
1997	9	26	2	7	110	82	-	31	2	-	-	-	121	54	194	-
2002	5	8	19	6	8	8	1	2	2	-	-	1	51	35	226	-
2007	1	5	3	6	27	148	4	1	8	1	1	9	79	10	188	-
2014	8	19	3	20	-	90	0	4	5	2	5	8	89	41	155	3
2019	24	8	0	31	45	45	-	11	14	111	8	9	50	43	84	13
year	Average Cover (%)															
1997	0.1	0.7	0.0	0.1	1.0	0.6	-	0.3	0.0	-	-	-	3.8	0.5	8.5	-
2002	0.2	0.2	0.8	0.2	0.0	0.0	0.0	0.0	0.2	-	-	0.0	1.5	0.6	8.5	-
2007	0.0	0.1	0.2	0.2	0.1	3.1	0.2	0.0	0.0	0.0	0.0	0.1	1.5	0.1	7.3	-
2014	0.3	0.3	0.1	0.6	-	0.7	0.0	0.0	0.0	0.0	0.0	0.1	3.2	0.4	7.6	0.0
2019	0.3	0.1	0.0	1.2	0.2	0.3	-	0.2	0.3	4.7	0.1	0.4	0.5	0.8	2.9	0.7

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16C-38.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium (onion)	Alyssum alyssoides[ai] (pale madwort)	Alyssum desertorum[ai] (desert madwort)	Antennaria (pussytoes)	Arabis (rockcress)	Arenaria (sandwort)	Astragalus (milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus eurekensis (Eureka milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Carduus nutans[ani] (nodding plumeless thistle)	Ceratocephala testiculata[ai] (curveseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Cirsium (thistle)
year	Nested Frequency																
1997	5	3	14	-	7	-	2	-	1	48	-	5	-	11	149	17	17
2002	5	5	16	-	3	-	-	-	2	35	-	5	-	12	4	4	13
2007	5	3	33	-	53	-	-	-	-	40	-	7	-	-	225	1	15
2014	5	25	24	-	212	-	-	8	-	31	6	-	6	-	20	-	12
2019	5	55	138	339	22	1	-	-	-	24	1	1	15	19	122	1	25
year	Average Cover (%)																
1997	0.4	0.0	0.1	-	0.0	-	0.0	-	0.0	0.6	-	0.0	-	0.2	0.5	0.1	0.1
2002	0.1	0.0	0.1	-	0.0	-	-	-	0.0	0.4	-	0.0	-	0.1	0.0	0.0	0.1
2007	0.1	0.0	0.1	-	0.2	-	-	-	-	0.9	-	0.1	-	-	0.9	0.0	0.1
2014	0.6	0.2	0.1	-	4.9	-	-	0.1	-	0.7	0.0	-	0.0	-	0.1	-	0.2
2019	0.5	1.1	0.9	8.1	0.2	0.0	-	-	-	0.2	0.0	0.0	0.1	0.4	0.4	0.0	0.3

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Collinsia parviflora[a] (maiden blue eyed Mary)	Collomia linearis[a] (tiny trumpet)	Convolvulus arvensis[ni] (field bindweed)	Crepis acuminata (tapertip hawksbeard)	Cymopterus (springparsley)	Cynoglossum officinale[ani] (gypsyflower)	Delphinium nuttallianum (twolobe larkspur)	Epilobium brachycarpum[a] (tall annual willowherb)	Erigeron eatonii (Eaton's fleabane)	Eriogonum heracleoides (parsnipflower buckwheat)	Eriogonum ovalifolium (cushion buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Hackelia patens (spotted stickseed)	Heliomeris multiflora var. multiflora (showy goldeneye)	Lactuca serriola[ai] (prickly lettuce)	Lepidium[a] (pepperweed)	Linum kingii (King's flax)
year	Nested Frequency																
1997	66	16	3	-	2	23	-	3	-	-	-	0	96	4	-	7	-
2002	46	-	-	-	16	12	-	3	1	0	3	9	32	6	-	-	-
2007	79	7	-	-	3	9	-	-	-	1	-	-	26	1	-	-	-
2014	35	19	15	10	3	11	-	4	-	-	2	-	55	-	-	-	0
2019	83	-	3	5	21	10	10	-	-	-	-	2	84	-	1	-	5
year	Average Cover (%)																
1997	0.1	0.0	0.0	-	0.0	0.2	-	0.0	-	-	-	0.0	0.8	0.1	-	0.0	-
2002	0.2	-	-	-	0.1	0.1	-	0.0	0.0	0.0	0.0	0.1	0.5	0.0	-	-	-
2007	0.3	0.0	-	-	0.0	0.1	-	-	-	0.0	-	-	0.4	0.0	-	-	-
2014	0.2	0.1	0.5	0.1	0.0	0.1	-	0.0	-	-	0.1	-	1.1	-	-	-	0.0
2019	0.2	-	0.0	0.1	0.3	0.3	0.1	-	-	-	-	0.0	1.7	-	0.0	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Lithospermum ruderale (western stoneseed)	Lupinus argenteus (silvery lupine)	Machaeranthera canescens (hoary tansyaster)	Mertensia (bluebells)	Microsteris gracilis[a] (slender phlox)	Packera multilobata (lobeleaf groundsel)	Penstemon humilis (low beardtongue)	Petradoria pumila (rock goldenrod)	Phlox longifolia (longleaf phlox)	Polygonum douglasii[a] (Douglas' knotweed)	Sanguisorba minor[i] (small burnet)	Senecio integerrimus[a] (lambstongue ragwort)	Silene antirrhina[a] (sleepy silene)	Sphaeralcea coccinea (scarlet globemallow)	Symphyotrichum ascendens (western aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius[ai] (yellow salsify)
year	Nested Frequency																
1997	4	-	46	-	32	-	216	-	130	8	-	-	-	20	84	10	20
2002	6	-	3	-	3	3	203	-	96	-	-	-	-	26	59	-	2
2007	2	-	-	-	3	-	203	-	158	-	-	-	2	22	52	-	-
2014	3	1	-	-	-	-	119	3	20	-	2	28	-	26	75	7	15
2019	13	-	3	77	3	4	139	-	60	1	7	37	-	11	95	4	31
year	Average Cover (%)																
1997	0.0	-	0.3	-	0.1	-	3.3	-	0.3	0.0	-	-	-	0.1	1.2	0.0	0.0
2002	0.2	-	0.1	-	0.0	0.0	3.9	-	0.3	-	-	-	-	0.2	0.5	-	0.0
2007	0.0	-	-	-	0.0	-	4.5	-	1.0	-	-	-	0.0	0.1	0.6	-	-
2014	0.2	0.0	-	-	-	-	3.9	0.1	0.1	-	0.0	0.4	-	0.4	2.7	0.0	0.2
2019	0.4	-	0.1	0.9	0.0	0.0	3.9	-	0.4	0.0	0.1	1.0	-	0.2	2.5	0.0	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	unknown annual forb[a] (unknown forb)	Veronica biloba[ai] (twolobe speedwell)	Vicia americana (American vetch)	Viola (violet)
year	Nested Frequency			
1997	2	122	36	3
2002	-	-	22	-
2007	-	27	1	-
2014	-	11	21	33
2019	-	44	52	86
year	Average Cover (%)			
1997	0.0	0.5	0.3	0.0
2002	-	-	0.1	-
2007	-	0.0	0.0	-
2014	-	0.0	0.3	0.9
2019	-	0.3	1.7	1.9

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16C-38.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis[p] (Utah serviceberry)	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Bassia prostrata[pi] (forage kochia)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. speciosa[p] (rubber rabbitbrush)	Eriogonum heracleoides (parsnipflower buckwheat)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma[t] (Utah juniper)	Mahonia repens (creeping barberry)	Purshia tridentata[p] (antelope bitterbrush)	Quercus gambelii[p] (Gambel oak)	Rosa woodsii[p] (Woods' rose)	Symphoricarpos oreophilus[p] (mountain snowberry)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)													
1997	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2002	-	9.8	-	9.4	0.8	0	-	10.8	0.1	6.7	-	0	2.7	0.2
2007	-	10	-	8.1	0.1	-	0.2	10.8	0.1	4.1	-	-	3.1	0.2
2014	-	3.2	-	4	0.6	-	-	6.4	-	1.2	-	-	2.3	0.1
2019	-	6.1	-	13.4	0.5	-	-	7.7	0	4.4	-	-	3.2	0
year	Quadrat Cover (%)													
1997	0.0	8.1	-	7.2	0.4	-	0.1	5.6	-	5.6	-	0.3	2.6	0.1
2002	-	10.6	-	5.8	0.7	0.0	0.2	7.7	0.0	4.8	-	0.0	2.8	0.0
2007	0.0	5.0	-	6.8	0.0	-	0.3	6.1	0.1	2.0	-	-	2.3	0.0
2014	-	3.1	-	5.1	0.8	-	-	10.0	-	1.3	0.0	0.0	2.9	0.2
2019	-	4.9	0.0	9.4	0.7	-	0.2	7.5	0.0	3.8	-	-	2.2	0.1

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16C-38.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
1997	40	-	50	50	0	0	50	0	54/68
2002	60	-	0	33	67	0	67	67	39/47
2007	20	-	0	100	0	0	100	0	39/44
2014	-	-	-	-	-	-	-	-	38/41
2019	-	-	-	-	-	-	-	-	41/54
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1997	2180	320	29	56	15	26	2	8	85/93
2002	3280	20	17	75	9	11	4	4	60/72
2007	2340	40	11	56	33	28	7	47	66/81
2014	1360	20	7	85	7	56	4	27	43/48
2019	1940	-	5	75	20	27	28	24	48/76
Bassia prostrata[pi] -- (forage kochia)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	20	-	0	100	0	0	0	0	21/46
Chrysothamnus depressus[p] -- (longflower rabbitbrush)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	20	-	0	100	0	100	0	0	15/22

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1997	13140	380	18	81	2	3	0	0	24/31
2002	12340	-	1	96	3	2	0	2	23/30
2007	7500	-	3	82	16	2	0	48	28/35
2014	7720	140	10	90	0	28	0	0	23/29
2019	8760	-	1	99	1	5	0	1	26/44
Eriogonum heracleoides -- (parsnipflower buckwheat)									
1997	-	-	-	-	-	-	-	-	-/-
2002	40	-	0	100	0	0	0	0	9/15
2007	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Ericameria nauseosa ssp. nauseosa var. speciosa[p] -- (rubber rabbitbrush)									
1997	40	-	0	50	50	100	0	50	76/100
2002	440	-	0	100	0	0	0	0	37/38
2007	60	-	33	33	33	0	0	0	48/52
2014	200	-	0	100	0	30	10	10	49/60
2019	220	-	0	64	36	0	0	36	42/58
Gutierrezia sarothrae -- (broom snakeweed)									
1997	180	-	33	67	0	0	0	0	21/18
2002	240	-	0	92	8	0	0	0	21/22
2007	400	-	0	100	0	0	0	0	25/26
2014	-	-	-	-	-	-	-	-	-/-
2019	100	-	0	100	0	0	0	0	12/17
Juniperus osteosperma[t] -- (Utah juniper)									
1997	120	-	33	67	0	0	0	0	- / -
2002	160	60	25	75	0	0	0	13	- / -
2007	160	40	0	100	0	0	0	0	- / -
2014	80	-	50	25	25	0	0	50	- / -
2019	260	-	31	31	39	0	0	31	- / -
Mahonia repens -- (creeping barberry)									
1997	-	-	-	-	-	-	-	-	-/-
2002	360	-	0	100	0	0	0	0	5/7
2007	1760	-	0	100	0	0	0	0	6/8
2014	-	-	-	-	-	-	-	-	-/-
2019	460	-	4	96	0	0	0	0	6/9
Purshia tridentata[p] -- (antelope bitterbrush)									
1997	720	-	0	100	0	17	83	0	94/130
2002	940	-	0	98	2	0	64	0	31/115
2007	620	40	10	65	26	39	48	7	37/125
2014	780	-	0	97	3	13	26	21	25/49
2019	700	-	0	100	0	34	63	11	29/75
Rosa woodsii[p] -- (Woods' rose)									
1997	200	-	20	80	0	0	0	0	27/43
2002	200	-	0	100	0	0	0	0	16/19
2007	-	-	-	-	-	-	-	-	23/19
2014	140	-	43	57	0	0	0	0	18/16
2019	-	-	-	-	-	-	-	-	-/-
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
1997	2340	-	21	79	1	20	1	0	27/54
2002	2020	-	4	93	3	3	1	1	34/56
2007	1820	-	21	74	6	14	2	11	34/51
2014	2300	40	30	70	0	32	0	0	28/31
2019	1480	-	4	96	0	1	0	0	27/40

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Tetradymia canescens -- (spineless horsebrush)									
1997	440	40	55	46	0	0	0	0	31/63
2002	560	-	14	86	0	0	0	0	29/45
2007	160	-	13	0	88	0	0	38	32/57
2014	360	-	22	78	0	0	0	0	20/22
2019	200	-	10	80	10	0	0	10	29/32

t - Tree Species; p - Preferred Browse; i - Introduced Species

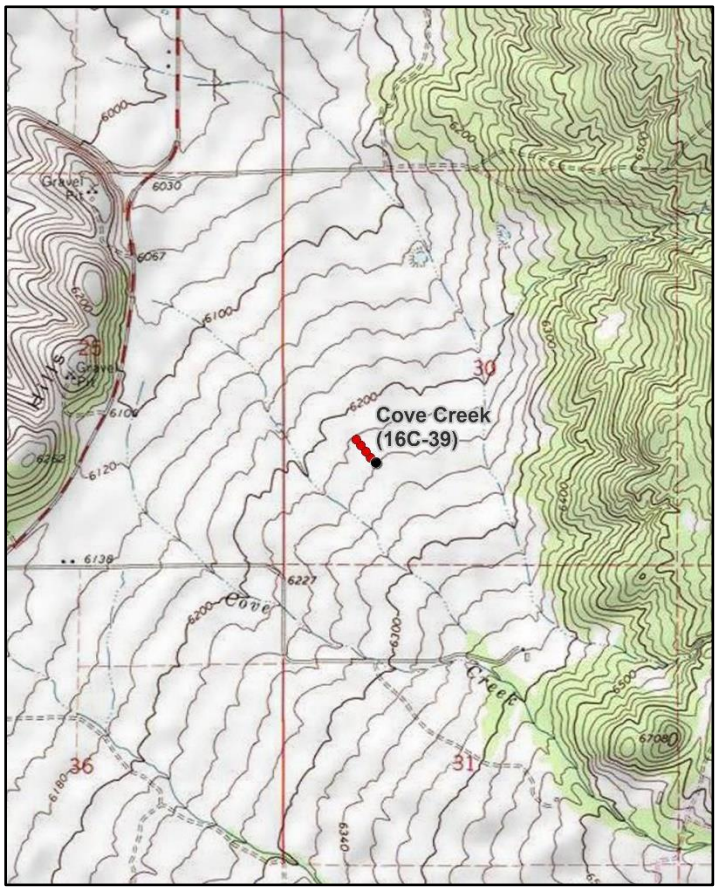
Table 16C-38.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

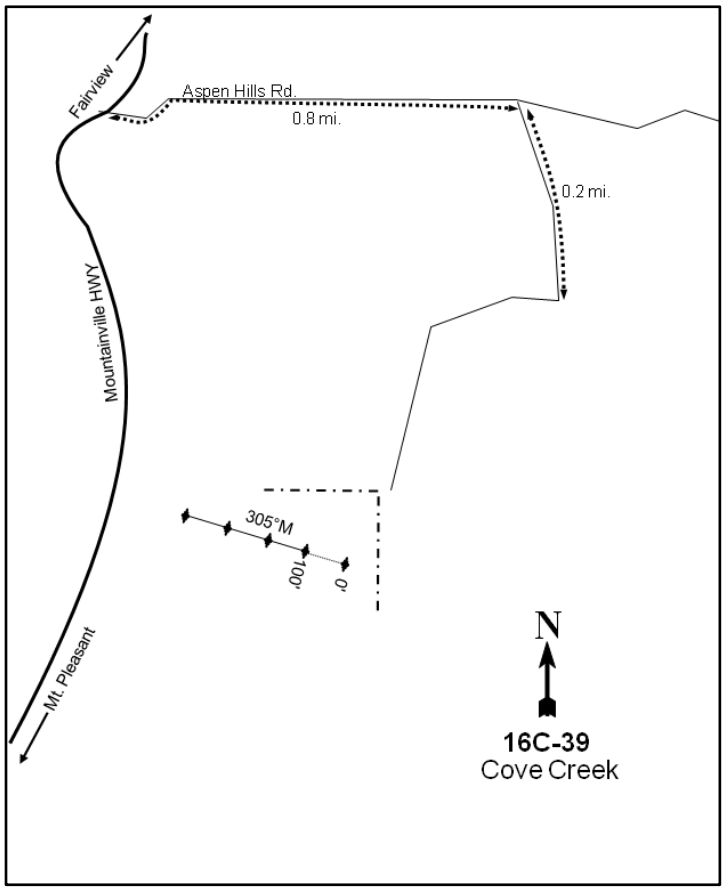
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2002	80	-	-	-	-	-	12.2
2007	101	5	20	45	20	10	12.1
2014	65	6	69	25	-	-	13.8
2019	69	-	61	39	-	-	12.6

Table 16C-38.15 – Deer Desirable Components Index: High Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1997	22.1	12.5	8.8	28.0	-1.2	10.0	-6.0	74.1	Good
2002	24.1	13.3	4.9	24.2	0.0	10.0	-4.0	72.5	Good
2007	21.9	7.2	6.3	19.2	-2.4	10.0	-2.0	60.2	Fair
2014	8.9	13.9	6.3	25.7	-0.5	10.0	-4.0	60.2	Fair
2019	18.1	12.1	1.6	24.0	-0.4	10.0	-6.0	59.4	Fair

COVE CREEK - STUDY NO. 16C-39





Location Information

USGS 7.5 min Map Info	Mount Pleasant NE; Township 14S, Range 5E, Section 30
GPS (0' Stake)	NAD 83 UTM ZONE 12, 464817 East 4380047 North

Transect Information

Browse Tag # (0' Stake)	227
Transect Bearing	305° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Belts 2, 4: No Rebar

Directions to Site

From State Street (Highway 89) and 200 North in Mt. Pleasant, proceed east on 200 North which curves northward and becomes the old highway to Fairview. Follow this road for 2.2 miles, turn east onto a gravel road, and drive for 0.75 miles to an intersection at the first curve in the road. Turn left and drive for approximately 0.3 miles to a fence. Park here and walk north across the ditch and along the fence until the road ends or a place where three fences intersect and the road ends (about 0.25 miles). The 0-foot baseline stake, which is red and marked with browse tag #227, is 12 paces west of the fence corner. The 100-foot baseline stake is a rod of rebar.

Site Information

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	6,250ft (1,905m)
Aspect	Northwest
Slope	0-6%
Sample Dates	06/25/1997, 07/12/2002, 07/16/2007, 08/28/2014, 07/18/2019

Wildlife Habitat and Vegetation History

Table 16C-39.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Rocky Mountain Elk	crucial	winter

Table 16C-39.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1989	Mixed Shrub	No Encroachment
1997	Mixed Shrub/Annual Grass	No Encroachment
2002	Mixed Shrub/Bulbous Bluegrass	No Encroachment
2007	Mixed Shrub/Bulbous Bluegrass	No Encroachment
2014	Mixed Shrub/Bulbous Bluegrass	No Encroachment
2019	Mixed Shrub/Bulbous Bluegrass	No Encroachment

Site Notes

The study site is landlocked by private land and is nearly inaccessible. In 2014, a dead fawn and doe were observed on the site. The cause of death of the doe was due to being caught in a fence.

Site Potential

1981 - 2010 Average Annual Precipitation	17 inches
NRCS Ecological Site	Upland Loam (Shrub)
NRCS Ecological Site #	R047XB310UT
States and Transitions	No state and transition model is available for this ecological site.

Since this site was established in 1989, the plant community has existed as a mixed stand of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and antelope bitterbrush (*Purshia tridentata*) with a herbaceous understory dominated by the perennial grass species bulbous bluegrass (*Poa bulbosa*) and the annual species cheatgrass (*Bromus tectorum*). Shrub cover has shown an overall decreasing trend, with mountain big sagebrush decreasing significantly in the 2019 sample year (Table 16C-39.12). There are some perennial native grasses as of 2019, but the introduced grasses bulbous bluegrass and cheatgrass dominate the understory (Table 16C-39.7, Table 16C-39.10). Perennial forbs have remained moderately diverse, but the forb community has provided only a small amount of cover (Table 16C-39.7, Table 16C-39.11). Due to the considerable presence of bulbous bluegrass, reduced recruitment of browse species and the loss of future forage for big game may be possible.

Trend Summary Tables

Table 16C-39.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1997	16.2	6.0	-	-	-	-
2002	25.6	3.9	-	28.8	2.9	-
2007	17.1	4.0	-	32.3	1.5	-
2014	18.8	5.1	-	28.1	4.4	-
2019	18.0	6.5	-	22.8	3.1	-

Table 16C-39.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1997	369	306	299	242	15.8	17.4	5.6	12.8
2002	191	426	145	159	4.8	56.8	1.5	3.7
2007	314	413	177	170	8.4	35.8	2.5	3.3
2014	339	410	127	108	13.8	45.4	0.6	0.4
2019	390	288	270	77	27.4	22.3	8.1	1.3

Table 16C-39.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1997	5.5	0.3	49.5	0.1	1.2	62.2
2002	3.6	0.7	28.4	0.3	0.7	80.0
2007	7.9	0.0	21.7	0.1	1.1	75.3
2014	4.6	0.6	45.6	0.3	1.1	78.2
2019	9.6	-	58.1	0.0	0.5	61.3

Table 16C-39.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer/Domestic Sheep	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
1997	-	42	11	-	18
2002	2	23	3	1	29
2007	1	15	11	-	35
2014	1	39	1	-	29
2019	8	16	11	2	6
Year	Days Use Per Acre (ha)				
1997	-	-	-	-	-
2002	0.7 (1.8)	36.2 (89.4)	8.1 (19.9)	-	-
2007	-	91.8 (226.8)	12.1 (29.8)	-	-
2014	-	80.4 (198.6)	8.7 (21.5)	-	-
2019	6.5 (16.1)	22.8 (56.3)	49.6 (122.5)	-	-

Table 16C-39.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bromus arvensis[ai] (field brome)	Bromus tectorum[ai] (cheatgrass)	Hesperostipa comata (needle and thread)	Poa bulbosa[i] (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis[i] (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Sporobolus cryptandrus (sand dropseed)	Thinopyrum intermedium[i] (intermediate wheatgrass)	Vulpia octoflora[a] (sixweeks fescue)
year	Nested Frequency												
1997	0	-	2	369	16	257	10	20	34	19	17	-	-
2002	5	-	31	185	71	370	-	3	73	11	34	10	-
2007	-	-	17	304	31	404	5	-	25	24	13	5	9
2014	-	-	3	339	50	405	4	7	12	7	32	-	-
2019	-	3	9	383	14	253	13	-	5	8	24	-	17
year	Average Cover (%)												
1997	0.0	-	0.0	15.8	0.7	14.4	0.1	0.3	1.1	0.8	0.1	-	-
2002	0.2	-	0.1	4.8	7.0	47.0	-	0.0	1.1	0.4	0.8	0.2	-
2007	-	-	0.0	8.4	1.6	32.5	0.0	-	0.2	0.9	0.4	0.0	0.0
2014	-	-	0.0	13.8	1.3	42.8	0.0	0.2	0.1	0.0	1.1	-	-
2019	-	0.1	0.3	27.0	0.6	19.3	0.2	-	0.1	0.2	1.8	-	0.1

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16C-39.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Allium (onion)	Alyssum alyssoides[ai] (pale madwort)	Alyssum desertorum[ai] (desert madwort)	Carduus nutans[ani] (nodding plumeless thistle)	Ceratocephala testiculata[ai] (curveseed butterwort)	Cirsium (thistle)	Collinsia parviflora[a] (maiden blue eyed Mary)	Convolvulus arvensis[ni] (field bindweed)	Cryptantha (cryptantha)	Epilobium brachycarpum[a] (tall annual willowherb)	Eriogonum racemosum (redroot buckwheat)	Erodium cicutarium[ai] (redstem stork's bill)	Galium aparine[a] (stickywilly)	Hackelia patens (spotted stickseed)	Heliomeris multiflora var. multiflora (showy goldeneye)	Lactuca serriola[ai] (prickly lettuce)	Lepidium[a] (pepperweed)
year	Nested Frequency																
1997	10	-	-	11	62	7	-	225	5	11	9	259	-	-	1	-	61
2002	-	-	86	-	11	-	1	153	-	6	7	9	-	-	-	-	35
2007	-	-	129	-	8	-	3	159	-	-	4	34	3	5	-	-	38
2014	-	-	53	-	-	-	-	100	-	3	-	79	-	2	-	-	5
2019	-	130	78	-	4	4	-	67	-	5	0	117	-	-	-	1	-
year	Average Cover (%)																
1997	0.1	-	-	0.4	0.3	0.2	-	12.1	0.0	0.0	0.2	3.8	-	-	0.0	-	0.9
2002	-	-	1.0	-	0.1	-	0.0	3.6	-	0.0	0.0	0.0	-	-	-	-	0.4
2007	-	-	1.0	-	0.0	-	0.0	3.1	-	-	0.0	0.5	0.2	0.0	-	-	0.7
2014	-	-	0.1	-	-	-	-	0.4	-	0.0	-	0.4	-	0.0	-	-	0.0
2019	-	3.3	2.1	-	0.0	0.0	-	1.2	-	0.2	0.0	2.3	-	-	-	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Machaeranthera canescens (hoary tansyaster)	Phlox longifolia (longleaf phlox)	Polygonum douglasii[a] (Douglas' knotweed)	Sisymbrium altissimum[ai] (tall tumblemustard)	Sphaeralcea coccinea (scarlet globemallow)	Taraxacum officinale (common dandelion)	Tragopogon dubius[ai] (yellow salsify)
year	Nested Frequency						
1997	10	3	42	0	2	3	3
2002	2	6	11	3	4	-	-
2007	4	-	-	2	3	-	-
2014	-	4	3	-	2	-	3
2019	-	9	6	3	-	-	4
year	Average Cover (%)						
1997	0.0	0.0	0.1	0.0	0.1	0.0	0.0
2002	0.0	0.0	0.0	0.0	0.0	-	-
2007	0.1	-	-	0.0	0.0	-	-
2014	-	0.0	0.0	-	0.0	-	0.0
2019	-	0.1	0.0	0.0	-	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16C-39.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Opuntia (pricklypear)	Purshia tridentata[p] (antelope bitterbrush)	Quercus gambelii[p] (Gambel oak)	Rosa woodsii[p] (Woods' rose)
year	Line Intercept Cover (%)						
1997	-	-	-	-	-	-	-
2002	15.2	-	-	2.9	12.6	0.9	0.1
2007	17.3	-	0.1	1.4	13.2	1.8	-
2014	16.6	-	0.1	4.3	9.1	2.4	-
2019	8.6	-	0	3.1	12.4	1.8	-
year	Quadrat Cover (%)						
1997	5.7	-	0.0	5.9	10.0	0.5	-
2002	11.8	-	0.0	3.9	12.8	1.0	0.0
2007	10.5	-	0.0	4.0	5.6	1.0	-
2014	12.4	-	0.0	5.1	5.9	0.5	-
2019	9.3	0.0	0.0	6.4	8.2	0.5	-

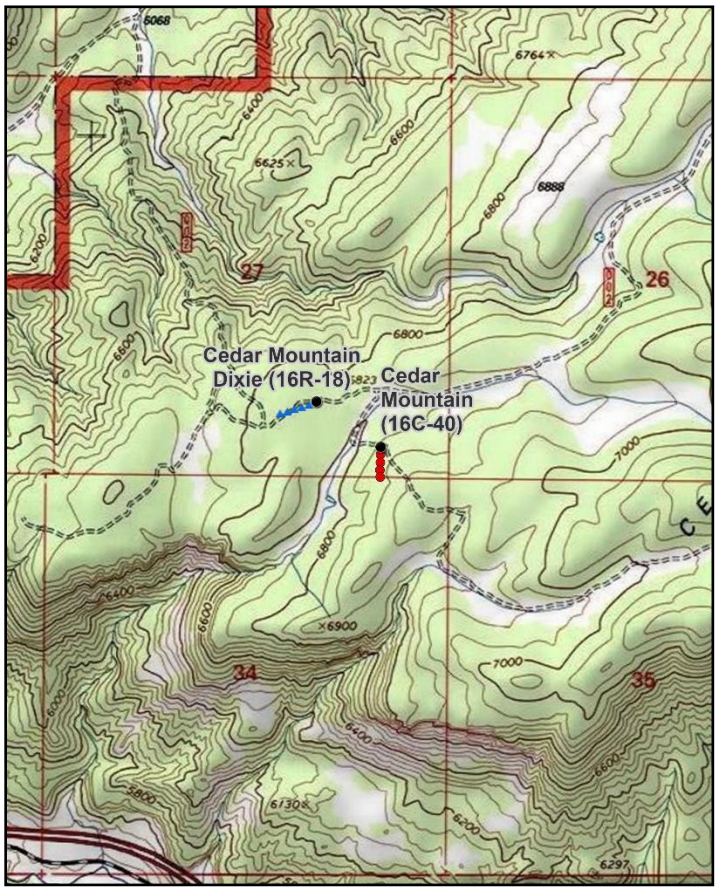
t - Tree Species; p - Preferred Browse; i - Introduced Species

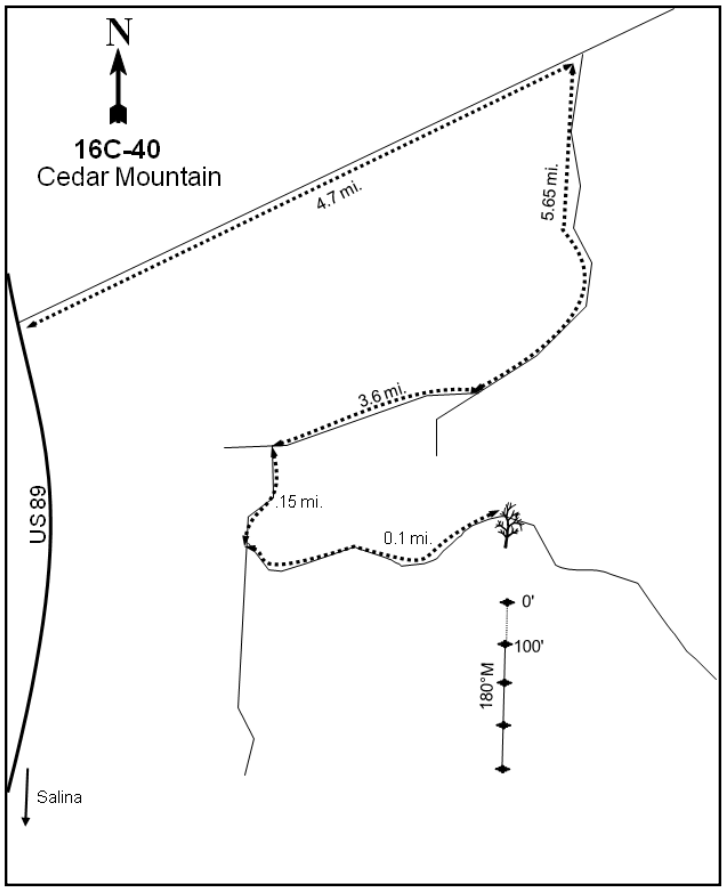
Table 16C-39.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1997	2400	60	22	78	1	5	0	0	86/98
2002	2940	100	22	74	3	0	0	1	78/96
2007	1560	180	10	74	15	51	3	58	95/112
2014	2880	80	22	59	19	17	77	18	82/110
2019	1960	20	8	26	66	13	78	64	65/75
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	39/52
Ericameria nauseosa ssp. nauseosa var. speciosa[p] -- (rubber rabbitbrush)									
1997	-	-	-	-	-	-	-	-	-/-
2002	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	46/58
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Gutierrezia sarothrae -- (broom snakeweed)									
1997	340	-	0	100	0	0	0	0	41/38
2002	20	-	0	100	0	0	0	0	27/33
2007	200	-	20	80	0	0	0	0	31/35
2014	360	40	94	6	0	0	6	0	16/17
2019	140	60	14	86	0	0	0	0	21/28
Opuntia -- (pricklypear)									
1997	6840	20	0	94	6	0	0	5	19/53
2002	5400	-	4	86	9	0	0	4	17/37
2007	2720	-	2	96	2	4	0	2	16/26
2014	4780	120	11	89	0	0	0	2	18/44
2019	3900	-	0	90	10	0	0	57	18/33
Purshia tridentata[p] -- (antelope bitterbrush)									
1997	960	-	4	83	13	4	90	2	121/171
2002	940	-	0	92	9	28	51	6	95/147
2007	800	40	5	83	13	38	55	15	109/142
2014	1360	60	6	62	32	4	87	32	91/112
2019	1460	20	0	69	32	11	86	33	85/108
Quercus gambelii[p] -- (Gambel oak)									
1997	940	-	17	83	0	57	0	0	44/42
2002	1640	-	16	40	44	0	0	0	64/39
2007	440	-	18	77	5	55	0	14	105/45
2014	820	20	88	12	0	0	100	100	56/42
2019	440	340	46	18	36	18	27	32	82/42
Rosa woodsii[p] -- (Woods' rose)									
1997	80	-	0	100	0	0	0	0	33/30
2002	140	-	0	100	0	0	0	0	27/17

t - Tree Species; p - Preferred Browse; i - Introduced Species

CEDAR MOUNTAIN - STUDY NO. 16C-40





Location Information

USGS 7.5 min Map Info	Salina NE; Township 21S, Range 1E, Section 27
GPS (0' Stake)	NAD 83 UTM ZONE 12, 432517 East 4311188 North

Transect Information

Browse Tag # (0' Stake)	7039
Transect Bearing	180° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

From mile marker 198 on US-89 north of Salina, travel east on Willow Creek Road for 4.7 miles to a fork near a reservoir. Turn right and go south along the dike. Continue on this road for 5.65 miles up switchbacks to the top of the hill and southwest along the top until the road forks. Proceed right at the fork and continue through some oak and juniper and across a chained area, staying on the main road for 3.6 miles until another fork is reached. Proceed left and drive down the bottom of the draw 0.15 miles southwest to another fork. Turn left and go uphill 0.1 miles to the second bend to the right. The frequency baseline starts 33 feet south of the road beyond a large dead tree. The transect is marked by rebar approximately 2 feet tall, and the 0-foot baseline stake has a red browse tag #7039 attached.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	North Post Mountain Allo
Elevation	6,800ft (2,073m)
Aspect	Northwest
Slope	15%
Sample Dates	08/13/1999, 08/12/2004, 08/24/2009, 05/24/2014, 07/17/2019

Table 16C-40.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Seeding - Seed Unknown	-	-	1979-1980	-
Chaining - Chain Unknown	-	-	1979-1980	-
Harrow - One-Way Dixie	Fishlake NF PJ Maintenance-Sagebrush Enhancement - Year 1	216	June-December 2005	4445
Mechanical - Brush Saw	-	-	2005-2008	-
Mechanical - Bullhog	-	-	2009-2014	-

Wildlife Habitat and Vegetation History

Table 16C-40.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	substantial	winter

Table 16C-40.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1985	Pinyon-Juniper/Perennial Grass	Phase I
1991	Pinyon-Juniper/Perennial Grass	Phase I
1999	Pinyon-Juniper/Perennial Grass	Phase I transitioning to Phase II
2004	Pinyon-Juniper/Perennial Grass	Phase I transitioning to Phase II
2009	Perennial Grass	Phase I
2014	Perennial Grass	Phase I
2019	Perennial Grass	Phase I

Site Notes

In 2014, an unidentified parasitic plant was observed growing on the sagebrush in the area.

Soils

Table 16C-40.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay Loam	7.6	31.3	32.1	36.6	5.4	5.0	217.6	0.7	08/13/1999

Site Potential

1981 - 2010 Average Annual Precipitation	15 inches
NRCS Ecological Site	Upland Stony Loam (Pinyon-Utah Juniper)
NRCS Ecological Site #	R047XB333UT
States and Transitions	A defined state and transition model is available.

Since the study was established in 1985, this has transitioned from a tree-encroached perennial grass community to a perennial grass community without significant encroachment following a series of treatments (Photos, Table 16C-40.1, Table 16C-40.6, Table 16C-40.7). Introduced perennial grasses are the dominant component on the site and have shown an increasing trend with the dominant species being smooth brome (*Bromus inermis*) and intermediate wheatgrass (*Thinopyrum intermedium*) (Table 16C-40.7, Table 16C-40.10). Forbs are moderately diverse but mostly have not provided significant cover with the exception of desert madwort (*Alyssum desertorum*) (Table 16C-40.11). Shrubs do not provide a significant amount of cover: a small amount of black sagebrush (*Artemisia nova*) has been sampled but otherwise shrub cover is nominal (Table 16C-40.12, Table 16C-40.13). Trees have been sampled in all years, although a significant decrease was noted in the years following the harrow and bullhog treatments (Table 16C-40.1, Table 16C-40.14). The state and transition model indicates that this site is in the Seeded with PJ Phase within the Seeded State. Without significant inputs, it is probable that the site will remain in this state in the future (Jornada, 2019).

Trend Summary Tables

Table 16C-40.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1999	-	-	4.2	-	-	0.1
2004	0.0	-	5.7	-	-	10.4
2009	0.0	-	0.7	0.2	-	1.0
2014	0.4	-	-	-	-	-
2019	0.6	0.2	0.0	-	-	-

Table 16C-40.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1999	-	401	61	44	-	12.5	0.1	0.7
2004	-	343	103	55	-	14.2	0.3	0.5
2009	-	392	269	69	-	29.0	2.0	1.1
2014	2	432	354	127	0.0	34.6	3.1	2.4
2019	10	422	422	48	0.0	33.8	9.1	0.6

Table 16C-40.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1999	9.7	0.2	49.5	6.4	6.4	22.1
2004	32.0	0.0	37.5	13.0	9.6	20.7
2009	11.0	-	55.1	4.9	4.4	36.8
2014	5.0	0.0	70.2	2.5	3.4	42.3
2019	9.5	0.1	67.5	3.0	8.5	40.7

Table 16C-40.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer/Domestic Sheep	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1999	1	18	15	27
2004	-	4	40	62
2009	-	3	7	16
2014	-	2	18	4
2019	1	7	14	10
Year	Days Use Per Acre (ha)			
1999	-	10.0 (24.8)	34.2 (84.4)	-
2004	-	4.0 (9.9)	37.5 (92.7)	-
2009	-	10.7 (26.5)	16.1 (39.7)	-
2014	-	6.0 (14.9)	37.5 (92.7)	-
2019	-	1.3 (3.3)	25.5 (62.9)	-

Table 16C-40.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bromus inermis[i] (smooth brome)	Bromus tectorum[ai] (cheatgrass)	Elymus elymoides (squirreltail)	Koeleria macrantha (prairie Junegrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Psathyrostachys juncea[i] (Russian wildrye)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium[i] (intermediate wheatgrass)
year	Nested Frequency										
1999	-	162	187	-	1	0	8	7	2	8	274
2004	-	74	101	-	-	-	6	7	0	2	295
2009	-	107	176	-	-	1	3	12	-	8	261
2014	1	52	250	2	-	-	-	42	2	4	346
2019	4	34	288	10	-	-	-	31	0	-	330
year	Average Cover (%)										
1999	-	3.2	1.3	-	0.0	0.0	0.0	0.0	0.0	0.2	7.7
2004	-	2.6	1.7	-	-	-	0.2	0.2	0.0	0.4	9.1
2009	-	5.9	5.9	-	-	0.0	0.1	0.1	-	0.5	16.4
2014	0.1	1.8	15.1	0.0	-	-	-	0.6	0.2	0.1	16.8
2019	0.1	0.6	14.1	0.0	-	-	-	0.4	0.0	-	18.5

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16C-40.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Alyssum desertorum[ai] (desert madwort)	Arabis (rockcress)	Astragalus eurekensis (Eureka milkvetch)	Astragalus piutensis (Sevier milkvetch)	Calochortus nuttallii (sego lily)	Carduus nutans[ani] (nodding plumeless thistle)	Caulanthus crassicaulis[a] (thickstem wild cabbage)	Ceratocephala testiculata[ai] (curveseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Cirsium (thistle)	Collinsia parviflora[a] (maiden blue eyed Mary)	Crepis acuminata (tapertip hawksbeard)	Cryptantha (cryptantha)	Cynoglossum officinale[ani] (gypsyflower)	Descurainia pinnata[a] (western tansymustard)	Eriogonum umbellatum (sulphur-flower buckwheat)
year	Nested Frequency																
1999	-	53	-	-	-	-	-	-	-	1	-	-	-	9	3	-	6
2004	-	-	3	-	1	-	-	-	5	1	5	-	-	24	-	-	-
2009	-	266	-	-	-	-	-	-	12	5	3	-	-	47	-	-	-
2014	5	351	1	8	-	8	7	2	4	4	1	2	4	67	1	11	-
2019	-	422	4	-	-	5	6	-	42	-	8	-	3	31	-	-	-
year	Average Cover (%)																
1999	-	0.1	-	-	-	-	-	-	-	0.0	-	-	-	0.0	0.0	-	0.0
2004	-	-	0.0	-	0.0	-	-	-	0.0	0.0	0.0	-	-	0.2	-	-	-
2009	-	2.0	-	-	-	-	-	-	0.0	0.0	0.0	-	-	0.8	-	-	-
2014	0.1	2.6	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	1.2	0.0	0.2	-
2019	-	8.8	0.0	-	-	0.0	0.0	-	0.2	-	0.2	-	0.0	0.4	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Gilia inconspicua[a] (shy gilia)	Ipomopsis congesta (ballhead ipomopsis)	Lactuca serriola[ai] (prickly lettuce)	Lepidium[a] (pepperweed)	Lomatium (desertparsley)	Machaeranthera canescens (hoary tansyaster)	Medicago sativa[i] (alfalfa)	Packera multilobata (lobeleaf groundsel)	Penstemon humilis (low beardtongue)	Phlox austromontana (mountain phlox)	Physaria acutifolia (sharpleaf twinpod)	Tragopogon dubius[ai] (yellow salsify)	Trifolium (clover)	Wyethia amplexicaulis (mule-ears)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency														
1999	3	-	-	-	-	-	8	-	-	11	12	3	-	-	-
2004	-	-	-	99	-	-	-	-	2	16	16	1	-	-	-
2009	-	-	-	-	8	-	-	-	-	8	11	3	-	1	-
2014	-	14	-	-	19	7	-	34	1	7	18	16	1	-	1
2019	-	-	3	-	-	-	-	-	-	2	-	10	-	-	-
year	Average Cover (%)														
1999	0.0	-	-	-	-	-	0.5	-	-	0.1	0.1	0.0	-	-	-
2004	-	-	-	0.3	-	-	-	-	0.0	0.2	0.0	0.0	-	-	-
2009	-	-	-	-	0.0	-	-	-	-	0.1	0.0	0.0	-	0.1	-
2014	-	0.0	-	-	0.4	0.1	-	0.2	0.1	0.0	0.1	0.2	0.0	-	0.0
2019	-	-	0.0	-	-	-	-	-	-	0.0	-	0.0	-	-	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16C-40.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia nova[p] (black sagebrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma[t] (Utah juniper)	Pinus edulis[t] (twoneedle pinyon)
year	Line Intercept Cover (%)			
1999	-	-	-	-
2004	-	-	7.6	2.8
2009	0.2	-	1	-
2014	-	-	-	-
2019	-	0	-	-
year	Quadrat Cover (%)			
1999	-	-	2.4	1.9
2004	0.0	-	1.9	3.8
2009	0.0	-	0.7	-
2014	0.4	-	-	-
2019	0.6	0.2	0.0	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16C-40.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Artemisia nova[p] -- (black sagebrush)									
1999	60	20	33	67	0	0	0	0	14/36
2004	120	-	0	33	67	67	0	0	32/73
2009	20	-	0	100	0	0	0	0	35/60
2014	40	-	0	100	0	50	50	0	27/65
2019	40	-	0	100	0	0	0	0	33/53
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1999	-	-	-	-	-	-	-	-	- / -
2004	-	-	-	-	-	-	-	-	27/25
2009	-	-	-	-	-	-	-	-	78/101
2014	-	-	-	-	-	-	-	-	56/128
2019	-	-	-	-	-	-	-	-	54/67
Cercocarpus ledifolius[p] -- (curl-leaf mountain mahogany)									
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	73/71
2019	-	-	-	-	-	-	-	-	104/100
Chrysothamnus depressus[p] -- (longflower rabbitbrush)									
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	15/38
Chrysothamnus viscidiflorus -- (yellow rabbitbrush)									
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	22/19
2014	-	-	-	-	-	-	-	-	58/63
2019	-	-	-	-	-	-	-	-	-/-
Ericameria nauseosa -- (rubber rabbitbrush)									
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	64/71
2019	-	-	-	-	-	-	-	-	90/97
Gutierrezia sarothrae -- (broom snakeweed)									
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	20	-	0	100	0	0	0	0	24/29
2014	20	-	0	100	0	0	0	0	14/23
2019	120	-	0	100	0	0	0	0	28/32
Juniperus osteosperma[t] -- (Utah juniper)									
1999	300	-	33	67	0	0	0	0	- / -
2004	120	-	17	83	0	0	0	0	- / -
2009	60	-	0	67	33	0	33	33	- / -
2014	-	-	-	-	-	-	-	-	-/-
2019	20	20	100	0	0	0	0	0	- / -

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Pinus edulis[t] -- (twoneedle pinyon)									
1999	40	-	50	50	0	0	0	0	- / -
2004	60	-	33	67	0	0	0	0	- / -
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Purshia tridentata[p] -- (antelope bitterbrush)									
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	84/144
2014	-	-	-	-	-	-	-	-	59/166
2019	-	-	-	-	-	-	-	-	73/282
Quercus gambelii[p] -- (Gambel oak)									
1999	40	-	100	0	0	0	0	0	- / -
2004	-	-	-	-	-	-	-	-	107/32
2009	-	-	-	-	-	-	-	-	129/123
2014	-	-	-	-	-	-	-	-	86/91
2019	-	-	-	-	-	-	-	-	105/89
Sambucus[p] -- (elderberry)									
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	37/40
2014	-	-	-	-	-	-	-	-	59/77

t - Tree Species; p - Preferred Browse; i - Introduced Species

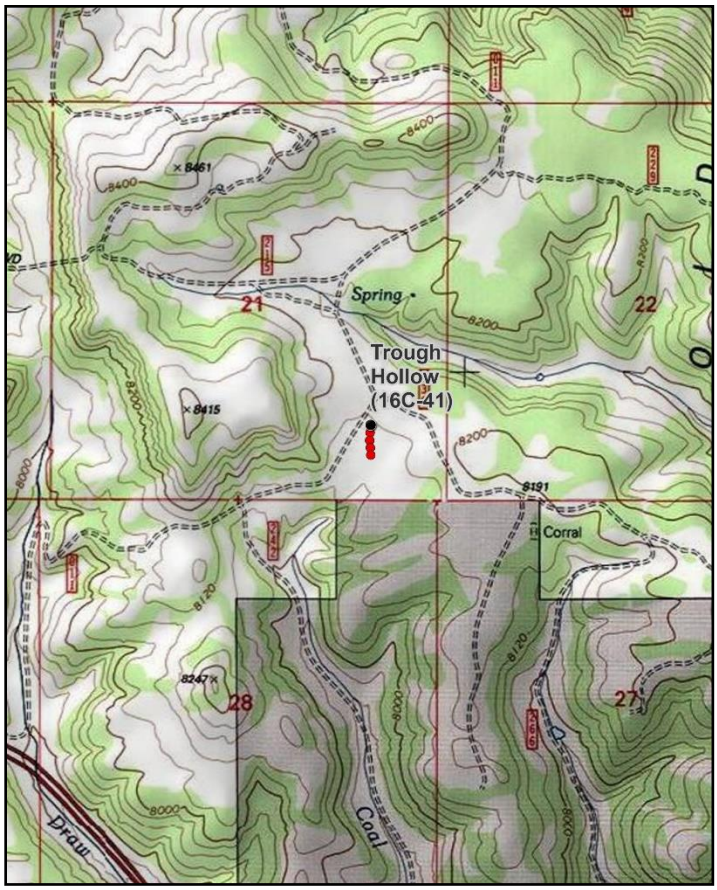
Table 16C-40.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

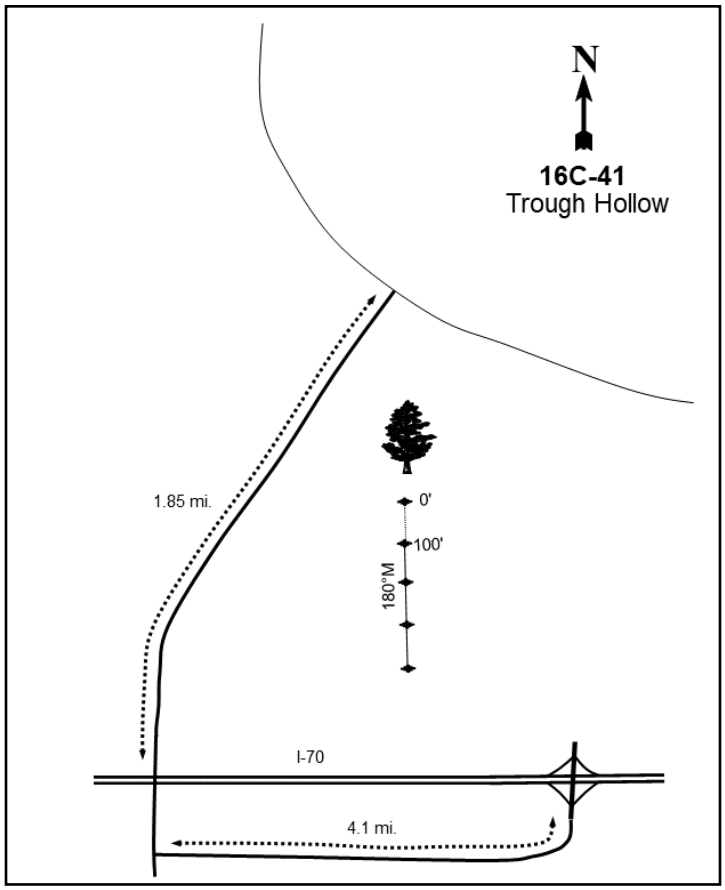
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
1999	89	-	-	-	-	-	12.3
2004	77	-	6	39	56	-	11.3
2009	23	-	56	44	-	-	8.4
2014	16	-	100	-	-	-	3.0
2019	24	33	67	-	-	-	3.2
Pinus edulis (twoneedle pinyon)							
1999	37	-	-	-	-	-	9.4
2004	41	-	7	67	27	-	8.5
2009	2	-	-	-	100	-	16.5
2014	1	-	100	-	-	-	4.0
2019	2	50	50	-	-	-	2.5

Table 16C-40.15 – Deer Desirable Components Index: Mid Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1999	0.0	0.0	0.0	25.0	0.0	1.4	-2.0	24.4	Very Poor
2004	0.0	0.0	0.0	28.4	0.0	1.0	0.0	29.4	Very Poor
2009	0.3	0.0	0.0	30.0	0.0	2.2	0.0	32.4	Very Poor
2014	0.0	0.0	0.0	30.0	0.0	4.8	-4.0	30.8	Very Poor
2019	0.0	0.0	0.0	30.0	0.0	1.2	-2.0	29.2	Very Poor

TROUGH HOLLOW - STUDY NO. 16C-41





Location Information

USGS 7.5 min Map Info	Old Woman Plateau SW; Township 23S, Range 4E, Section 21
GPS (0' Stake)	NAD 83 UTM ZONE 12, 459750 East 4293535 North

Transect Information

Browse Tag # (0' Stake)	7192
Transect Bearing	180° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

From Salina, drive about 37.5 miles east on I-70 to a rest area exit. From the exit, turn right and travel back west on the frontage road paralleling the freeway for 4.1 miles to an intersection. Turn right on Forest Service Road #011 and drive 0.25 miles to cross under the freeway. From the tunnel proceed 1.85 miles to a major intersection. Stop here and look back at a bearing of 185 degrees magnetic to the largest juniper nearest to the road, which is about 75 yards from the intersection. Walk to this juniper to find the 0-foot baseline stake, 10 feet south of the tree out in the sagebrush flat. The 0-foot stake is marked with browse tag #7192.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	Beaver Dams Allotment
Elevation	8,200ft (2,499m)
Aspect	South
Slope	2%
Sample Dates	08/17/1999, 08/25/2004, 08/10/2009, 07/21/2014, 07/08/2019

Wildlife Habitat and Vegetation History

Table 16C-41.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	substantial	summer
Rocky Mountain Elk	substantial	winter
Shiras Moose	crucial	year-long

Table 16C-41.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1985	Mountain Big Sagebrush/Bitterbrush	Phase I
1991	Mountain Big Sagebrush/Bitterbrush	Phase I
1999	Mountain Big Sagebrush/Bitterbrush	Phase I
2004	Mountain Big Sagebrush/Bitterbrush	Phase I
2010	Mountain Big Sagebrush/Bitterbrush	Phase I
2014	Mountain Big Sagebrush/Bitterbrush	Phase I
2019	Mountain Big Sagebrush/Bitterbrush	Phase I

Site Notes

In 2014, cattle were found in the area of the study and it was noted that grasses were heavily grazed.

Soils

Table 16C-41.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	6.9	48.0	25.4	26.6	2.3	8.5	163.2	0.6	08/17/1999

Site Potential

1981 - 2010 Average Annual Precipitation	14 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA430UT
States and Transitions	A defined state and transition model is available.

Since the study was established in 1985, this site has remained dominated by a stable stand of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and antelope bitterbrush (*Purshia tridentata*) with a diverse understory composed of perennial grasses and forbs. The grass component of the understory is dominated by muttongrass (*Poa fendleriana*) and Kentucky bluegrass (*Poa pratensis*), and perennial grasses have shown an overall increasing trend (Table 16C-41.7, Table 16C-41.10). Forbs are a diverse mixture of mostly native plants with pussytoes (*Antennaria sp.*) being the dominant species (Table 16C-41.7, Table 16C-41.11). Preferred browse species are dominated by mountain big sagebrush and antelope bitterbrush with cover remaining stable over the study period (Table 16C-41.6, Table 16C-41.12). Rocky Mountain juniper (*Juniperus scopulorum*) has been present on the site in all years, but a trend is difficult to determine due to point-quarter density data not being gathered in multiple years (Photos, Table 16C-41.14). The state and transition model places this community in the Mountain big sagebrush-steppe/Introduced Non-natives state. In addition, the model indicates that improper livestock grazing could have the potential to alter the resiliency of this site due to a change in the composition of a robust and diverse understory. However, with proper management it is likely that this site will remain in the present state in future sample years (Jornada, 2019).

Trend Summary Tables

Table 16C-41.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1999	31.2	1.4	0.4	-	-	0.1
2004	31.5	2.6	0.4	38.2	3.3	1.8
2009	29.4	2.0	0.6	39.7	2.6	2.0
2014	27.5	2.4	0.2	34.6	2.0	1.2
2019	23.1	2.3	0.8	33.0	2.0	2.8

Table 16C-41.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1999	-	435	81	199	-	19.3	0.5	4.8
2004	-	410	192	174	-	14.4	0.9	3.9
2009	-	411	95	178	-	17.9	0.2	4.5
2014	-	451	123	203	-	36.4	0.8	7.5
2019	-	434	308	273	-	26.6	5.6	12.2

Table 16C-41.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1999	13.2	0.2	59.1	0.2	-	56.4
2004	11.0	-	61.0	0.1	0.0	51.0
2009	15.1	0.1	63.2	0.0	0.0	47.3
2014	8.3	0.0	53.2	0.2	-	63.5
2019	12.0	0.2	65.4	0.1	0.0	58.6

Table 16C-41.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
1999	7	13	11	5
2004	10	32	10	24
2009	10	18	14	22
2014	12	4	9	2
2019	16	11	21	5
Year	Days Use Per Acre (ha)			
1999	37.7 (93.2)	31.5 (77.8)	55.6 (137.4)	-
2004	26.8 (66.3)	19.4 (48.0)	9.4 (23.2)	-
2009	31.9 (78.9)	24.1 (59.6)	26.8 (66.2)	-
2014	13.1 (32.3)	14.7 (36.4)	22.1 (54.6)	-
2019	24.7 (61.0)	16.1 (39.7)	16.1 (39.7)	-

Table 16C-41.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Achnatherum nelsonii (Columbia needlegrass)	Bromus ciliatus (fringed brome)	Bromus inermis[i] (smooth brome)	Carex (sedge)	Elymus elymoides (squirreltail)	Elymus trachycaulus (slender wheatgrass)	Festuca idahoensis (Idaho fescue)	Hesperostipa comata (needle and thread)	Pascopyrum smithii (western wheatgrass)	Poa fendleriana (muttongrass)	Poa pratensis[i] (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency													
1999	106	6	72	9	17	13	29	-	-	100	204	193	-	-
2004	40	-	12	-	3	2	5	1	-	77	230	277	4	1
2009	71	-	-	-	7	6	-	29	-	87	243	138	17	-
2014	68	14	28	3	14	23	12	27	-	67	313	113	2	-
2019	78	9	10	6	14	44	18	-	5	106	281	180	13	6
year	Average Cover (%)													
1999	2.2	0.2	0.7	0.0	0.2	0.2	0.9	-	-	1.1	7.5	6.2	-	-
2004	0.3	-	0.1	-	0.0	0.0	0.1	0.0	-	0.9	6.5	6.2	0.1	0.0
2009	3.5	-	-	-	0.0	0.0	-	1.0	-	0.7	8.0	4.1	0.5	-
2014	1.4	0.6	0.5	0.1	0.9	0.4	0.2	0.6	-	1.4	23.3	7.0	0.2	-
2019	1.9	0.0	0.1	0.2	0.2	0.9	0.2	-	0.2	2.3	12.8	7.4	0.4	0.1

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16C-41.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Allium (onion)	Androsace septentrionalis[a] (pygmyflower rockjasmine)	Antennaria (pussytoes)	Arabis (rockcress)	Astragalus (milkvetch)	Astragalus beckwithii (Beckwith's milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Calochortus nuttallii (sego lily)	Castilleja angustifolia (northwestern Indian paintbrush)	Ceratocephala testiculata[ai] (curveseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Cirsium (thistle)	Cirsium wheeleri (Wheeler's thistle)	Collinsia parviflora[a] (maiden blue eyed Mary)	Crepis acuminata (tapertip hawksbeard)	Draba[a] (draba)
year	Nested Frequency																
1999	-	-	68	14	13	12	-	19	-	3	-	2	-	2	3	-	-
2004	1	-	30	29	-	1	-	10	2	-	-	-	-	3	158	-	-
2009	-	-	5	42	2	3	-	17	-	-	-	-	-	-	63	10	-
2014	-	-	84	66	3	-	1	4	4	2	-	-	9	-	45	2	-
2019	85	1	-	85	12	-	1	7	85	-	9	-	0	-	183	16	1
year	Average Cover (%)																
1999	-	-	0.4	0.6	0.1	0.2	-	0.2	-	0.1	-	0.0	-	0.0	0.0	-	-
2004	0.0	-	0.2	1.3	-	0.0	-	0.1	0.0	-	-	-	-	0.0	0.6	-	-
2009	-	-	0.0	1.4	0.0	0.0	-	0.0	-	-	-	-	-	-	0.1	0.1	-
2014	-	-	0.5	4.6	0.0	-	0.0	0.0	0.0	0.0	-	-	0.0	-	0.2	0.0	-
2019	0.3	0.0	-	6.1	0.2	-	0.0	0.1	0.4	-	0.1	-	0.0	-	3.1	0.1	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Erigeron caespitosus (tufted fleabane)	Erigeron eatonii (Eaton's fleabane)	Erigeron flagellaris (trailing fleabane)	Erigeron pumilus (shaggy fleabane)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Ipomopsis aggregata (scarlet gilia)	Lupinus (lupine)	Lupinus argenteus (silvery lupine)	Machaeranthera canescens (hoary tansyaster)	Microsteris gracilis[a] (slender phlox)	Packera multilobata (lobeleaf groundsel)	Penstemon comarrhenus (dusty beardtongue)	Penstemon pachyphyllus (thickleaf beardtongue)	Penstemon watsonii (Watson's penstemon)	Petradoria pumila (rock goldenrod)	Polygonum douglasii[a] (Douglas' knotweed)
year	Nested Frequency																
1999	-	23	16	21	92	20	1	-	9	2	-	1	-	1	22	2	18
2004	-	28	7	20	105	14	-	-	1	-	7	-	-	0	4	-	45
2009	-	18	21	-	79	16	-	-	11	2	39	-	-	1	18	-	16
2014	20	20	26	19	54	27	-	0	3	1	26	-	-	25	5	-	1
2019	-	33	20	33	81	21	-	-	9	7	234	-	1	10	11	1	40
year	Average Cover (%)																
1999	-	0.3	0.1	0.5	1.4	0.2	0.0	-	0.5	0.0	-	0.0	-	0.1	0.3	0.0	0.0
2004	-	0.2	0.0	0.1	1.3	0.8	-	-	0.0	-	0.0	-	-	0.0	0.0	-	0.1
2009	-	0.1	0.1	-	0.8	0.9	-	-	0.2	0.0	0.1	-	-	0.0	0.8	-	0.0
2014	0.4	0.2	0.2	0.1	0.5	0.6	-	0.1	0.2	0.0	0.1	-	-	0.3	0.0	-	0.0
2019	-	0.3	0.1	0.1	1.2	1.0	-	-	0.4	0.0	2.4	-	0.0	0.0	0.5	0.0	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Silene drummondii (Drummond's campion)	Symphyotrichum (aster)	Taraxacum officinale (common dandelion)	Vicia americana (American vetch)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency				
1999	3	-	28	-	-
2004	-	-	11	2	-
2009	-	2	7	-	-
2014	7	-	22	10	-
2019	3	3	49	4	5
year	Average Cover (%)				
1999	0.0	-	0.1	-	-
2004	-	-	0.0	0.0	-
2009	-	0.0	0.0	-	-
2014	0.0	-	0.1	0.0	-
2019	0.0	0.0	0.8	0.0	0.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16C-41.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis[p] (Utah serviceberry)	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. hololeuca[p] (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus scopulorum[t] (Rocky Mountain juniper)	Mahonia repens (creeping barberry)	Purshia tridentata[p] (antelope bitterbrush)	Rosa woodsii[p] (Woods' rose)	Symphoricarpos oreophilus[p] (mountain snowberry)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)										
1999	-	-	-	-	-	-	-	-	-	-	-
2004	0.4	18.9	2.7	0.1	-	1.8	0.4	17.6	0.3	0.9	0.2
2009	0.7	17.1	1.6	0.2	0.1	2	0.8	20.1	0	1.6	0.1
2014	0.3	16.2	1.7	0.1	0.1	1.2	0.2	15.7	0.3	2	0
2019	0.2	17.8	1.4	0.2	0.3	2.8	0.1	13.3	0.2	1.3	0.2
year	Quadrat Cover (%)										
1999	0.7	19.3	1.1	-	-	0.4	0.2	10.3	0.5	0.5	0.1
2004	0.7	18.3	1.7	0.0	0.2	0.4	0.3	11.5	0.5	0.5	0.4
2009	0.2	16.2	1.0	0.5	0.3	0.6	0.5	11.4	0.4	0.7	0.2
2014	0.3	13.6	1.5	0.0	0.2	0.2	0.3	11.5	0.6	1.6	0.4
2019	0.0	11.9	1.2	0.0	0.6	0.8	0.2	8.8	0.5	1.8	0.3

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16C-41.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
1999	600	-	47	53	0	27	33	7	53/48
2004	480	-	8	58	33	17	50	8	40/44
2009	480	80	25	75	0	42	8	46	41/46
2014	380	-	42	58	0	42	26	26	65/53
2019	160	100	38	38	25	13	50	25	47/40
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1999	5260	520	21	61	19	4	1	3	88/108
2004	4540	240	8	68	24	16	0	8	73/83
2009	4280	120	11	70	20	32	5	17	79/86
2014	4060	500	20	62	18	49	20	18	77/86
2019	4120	920	20	53	26	46	6	25	84/78
Cercocarpus ledifolius[p] -- (curl-leaf mountain mahogany)									
1999	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	84/69
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1999	2120	-	6	94	0	0	0	0	22/28
2004	2280	20	1	98	1	0	0	0	24/34
2009	2520	-	7	93	0	0	0	0	20/29
2014	1160	20	5	95	0	9	14	0	27/36
2019	1340	-	2	99	0	2	0	0	29/40

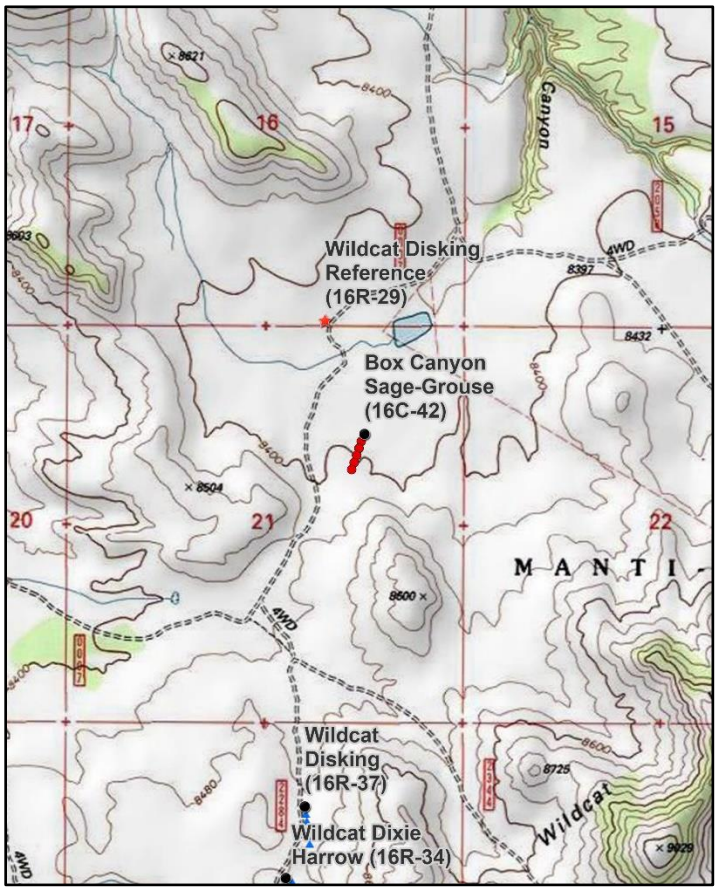
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Ericameria nauseosa ssp. nauseosa var. hololeuca[p] -- (rubber rabbitbrush)									
1999	-	-	-	-	-	-	-	-	-/-
2004	220	20	18	82	0	0	0	0	32/55
2009	340	-	6	88	6	12	0	6	33/42
2014	60	-	0	100	0	0	0	0	26/35
2019	120	-	17	83	0	0	0	0	33/29
Gutierrezia sarothrae -- (broom snakeweed)									
1999	-	-	-	-	-	-	-	-	-/-
2004	60	-	0	100	0	0	0	0	18/22
2009	-	-	-	-	-	-	-	-	25/32
2014	200	-	0	100	0	0	0	0	22/30
2019	440	-	0	100	0	0	0	0	16/22
Juniperus scopulorum[t] -- (Rocky Mountain juniper)									
1999	40	-	100	0	0	0	0	0	- / -
2004	40	-	50	50	0	0	0	0	- / -
2009	40	-	50	50	0	0	0	0	- / -
2014	20	-	100	0	0	0	0	0	- / -
2019	80	-	50	50	0	0	0	0	- / -
Mahonia repens -- (creeping barberry)									
1999	2080	-	25	75	0	0	0	0	5/10
2004	1420	20	14	86	0	0	0	0	5/9
2009	2180	-	11	89	0	0	0	7	10/12
2014	1300	-	23	77	0	0	0	0	8/13
2019	1780	-	0	100	0	0	0	0	7/9
Purshia tridentata[p] -- (antelope bitterbrush)									
1999	2680	80	25	74	2	14	68	0	52/98
2004	2560	120	15	81	5	13	66	1	49/101
2009	3140	20	10	87	3	31	43	5	51/96
2014	2660	40	6	90	5	28	45	7	50/83
2019	2700	480	4	84	12	47	28	12	52/90
Rosa woodsii[p] -- (Woods' rose)									
1999	620	-	45	55	0	0	0	0	27/21
2004	580	-	52	48	0	0	0	0	20/21
2009	760	-	16	84	0	0	0	0	31/38
2014	680	-	3	97	0	0	0	0	26/26
2019	500	20	0	100	0	0	0	0	19/23
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
1999	580	20	48	52	0	3	0	0	50/53
2004	520	-	15	69	15	0	0	4	36/45
2009	760	-	40	61	0	42	0	3	40/50
2014	820	20	7	93	0	2	2	0	51/64
2019	680	-	6	94	0	9	6	0	45/54
Tetradymia canescens -- (spineless horsebrush)									
1999	120	-	0	83	17	0	0	0	20/21
2004	280	-	29	64	7	0	7	7	23/29
2009	320	-	19	81	0	13	0	0	32/29
2014	320	-	6	94	0	13	0	0	29/29
2019	280	-	7	93	0	0	0	0	32/36

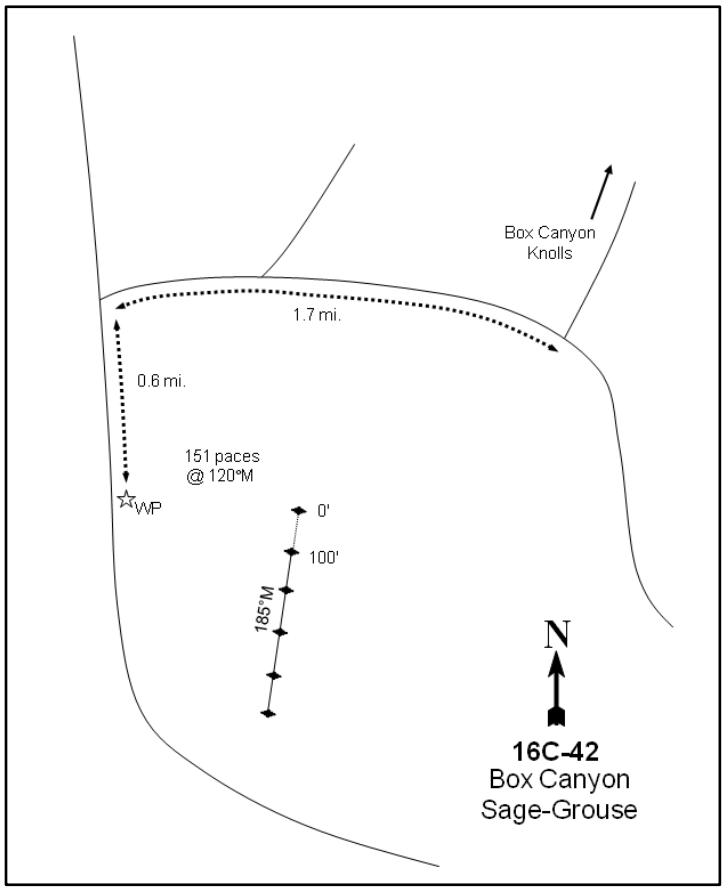
t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16C-41.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus scopulorum (Rocky Mountain juniper)							
1999	25	-	-	-	-	-	7.4
2014	38	-	25	50	17	8	21.3
2019	29	-	29	29	29	14	12.9
Populus tremuloides (quaking aspen)							
1999	6	-	-	-	-	-	4.0

BOX CANYON SAGE-GROUSE - STUDY NO. 16C-42





Location Information

USGS 7.5 min Map Info	Emery West NW; Township 21S, Range 5E, Section 21
GPS (0' Stake)	NAD 83 UTM ZONE 12, 468949 East 4314470 North

Transect Information

Browse Tag # (0' Stake)	49
Transect Bearing	185° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Standard

Directions to Site

From Center Street in the town of Emery, continue south on Highway 10 for 1.2 miles. Turn right onto a dirt road and go 0.6 miles. Turn left and travel up Link Canyon for 7 miles (4WD road) to the top. Stay left at the fork, then continue west for 1.7 miles to another fork. Proceed to the left and travel south for 0.6 miles to a witness post on the left-hand (east) side of the road. The 0-foot post is 151 paces from the witness post at 120 degrees magnetic and is marked with a blue browse tag #49.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	EMERY
Elevation	8,400ft (2,560m)
Aspect	North
Slope	2-5%
Sample Dates	07/27/2004, 07/28/2009, 07/15/2014, 07/09/2019

Table 16C-42.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Seeding - Aerial Before	GH Olsen Chaining	LTDL	September 1967	800
Harrow - One-Way Dixie	Wildcat Knolls Habitat Improvement	1161	September-November 2008	435
Seeding - Broadcast Before	Wildcat Knolls Habitat Improvement	1161	September-November 2008	810
Seeding - Rangeland Drill	Wildcat Sagebrush Restoration Project Phase II	1392	August-September 2009	466
Chaining - Two-Way Ely	GH Olsen Chaining	LTDL	September 1967	800

Table 16C-42.2 SeedMix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Quitchumpah Seeding			Aerial	Sep 1967	805
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Agropyron cristatum	Crested Wheatgrass		7.00	0.00
F	Melilotus officinalis	Yellow Sweetclover		1.00	0.00
S	Atriplex canescens	Fourwing Saltbush		2.00	0.00

Mix Name			Application Type	Application Date	Acres
Wildcat Knolls Habitat Improvement			Broadcast	Sep 2008	1000
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Elymus elymoides	Bottlebrush Squirreltail	Toe Jam	0.50	0.42
G	Elymus trachycaulus	Slender Wheatgrass	San Luis	0.98	0.88
G	Elymus trachycaulus	Slender Wheatgrass	San Luis	1.05	0.89
G	Leymus cinereus	Great Basin Wildrye	Trailhead	1.00	0.91
G	Pascopyrum smithii	Western Wheatgrass	Arriba	1.00	0.94
G	Poa secunda	Sandberg Bluegrass	Toole MT	1.00	0.84
F	Achillea millefolium	Western Yarrow		0.10	0.10
F	Astragalus cicer	Cicer Milkvetch	Lutana	1.00	0.76
F	Hedysarum boreale	Utah Sweetvetch		0.25	0.22
F	Heliomeris multiflora	Showy Goldeneye	Sanpete UT	0.03	0.02
F	Lactuca serriola	Prickly Lettuce		0.14	0.11
F	Linum perenne	Blue Flax	Appar	0.27	0.22
F	Linum perenne	Blue Flax	Appar	0.20	0.18
F	Linum perenne	Blue Flax	Appar	0.54	0.48
F	Penstemon strictus	Rocky Mountain Penstemon	Bandera	0.02	0.01
F	Penstemon strictus	Rocky Mountain Penstemon	Bandera	0.05	0.05
F	Sanguisorba minor	Small Burnet	Delar	1.50	1.39
S	Artemisia tridentata ssp. vaseyana	Mountain Big Sagebrush	Sanpete UT	0.22	0.04
S	Artemisia tridentata ssp. vaseyana	Mountain Big Sagebrush	Sevier/Wayne UT	0.28	0.08

Mix Name			Application Type	Application Date	Acres
Wildcat Sagebrush Restoration Project Phase 2			Drill	Sep 2009	500
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Elymus elymoides	Bottlebrush Squirreltail	Toe Jam	0.50	0.43
G	Elymus trachycaulus	Slender Wheatgrass	San Luis	2.00	1.93
G	Leymus cinereus	Great Basin Wildrye	Trailhead	1.00	0.85
G	Pascopyrum smithii	Western Wheatgrass	Arriba	1.00	0.87
G	Poa secunda	Sandberg Bluegrass	Toole MT	0.75	0.63
F	Achillea millefolium	Western Yarrow		0.10	0.09
F	Astragalus cicer	Cicer Milkvetch	Lutana	1.00	0.97
F	Hedysarum boreale	Utah Sweetvetch	Timp	0.25	0.19

Mix Name			Application Type	Application Date	Acres
Wildcat Sagebrush Restoration Project Phase 2			Drill	Sep 2009	500
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
F	Heliomeris multiflora	Showy Goldeneye		0.03	0.02
F	Lactuca serriola	Prickly Lettuce		0.10	0.09
F	Linum perenne	Blue Flax	Appar	1.00	0.87
F	Penstemon strictus	Rocky Mountain Penstemon	Bandera	0.10	0.08
F	Sanguisorba minor	Small Burnet	Delar	1.50	1.39

Mix Name			Application Type	Application Date	Acres
Wildcat Sagebrush Restoration Project Phase 2 - Sagebrush			Drill	Sep 2009	500
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
S	Artemisia tridentata ssp. vaseyana	Mountain Big Sagebrush	Sanpete UT	0.50	0.09

Wildlife Habitat and Vegetation History

Table 16C-42.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Rocky Mountain Elk	substantial	winter	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing

Table 16C-42.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2004	Mountain Big Sagebrush/ Perennial Grass	No Encroachment
2009	Perennial Grass	No Encroachment
2014	Perennial Grass	No Encroachment
2019	Perennial Grass	No Encroachment

Site Notes

No Notes

Soils

Table 16C-42.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	6.8	55.4	18.8	25.8	3.1	21.0	304.0	1.0	07/27/2004

Site Potential

1981 - 2010 Average Annual Precipitation	18 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA430UT
States and Transitions	A defined state and transition model is available.

This site was dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and the introduced perennial grass species smooth brome (*Bromus inermis*) upon study establishment in 2004. The dixie harrow treatment in 2008 (Table 16C-42.1) removed much of the sagebrush, and the site has been solely dominated by perennial grasses since 2009. Forbs have been diverse, but have provided low to moderate amounts of cover (Table 16C-42.7, Table 16C-42.10, Table 16C-42.11). The perennial grass community that characterizes this site is most comparable to the Introduced Grassland State as described by the available state and transition model (Jornada, 2019). Increases in sagebrush following treatment (Table 16C-42.12, Table 16C-42.13, Photos) suggest that this site may have the potential to transition to one again dominated by sagebrush barring a further shrub-removing disturbance.

Trend Summary Tables

Table 16C-42.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2004	16.8	1.1	-	16.7	0.6	-
2009	6.6	1.7	-	9.7	0.7	-
2014	4.9	1.2	-	7.7	0.4	-
2019	10.5	1.3	-	11.4	0.7	-

Table 16C-42.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2004	-	438	67	202	-	21.3	0.3	4.0
2009	-	414	30	218	-	24.4	0.1	7.9
2014	-	454	89	163	-	38.0	0.7	3.6
2019	-	456	306	196	-	31.8	4.7	4.6

Table 16C-42.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2004	22.3	0.2	55.0	0.0	-	44.7
2009	23.3	0.2	46.7	-	-	44.0
2014	13.8	0.6	65.9	0.0	1.3	54.7
2019	20.8	0.7	61.5	0.6	-	45.6

Table 16C-42.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Greater Sage-Grouse	Rabbit
	Quadrat Frequency				
2004	8	8	11	4	6
2009	17	2	10	6	21
2014	14	-	14	-	1
2019	35	-	2	1	11
Year	Days Use Per Acre (ha)				
2004	28.3 (69.9)	4.7 (11.6)	29.5 (72.8)	130.7 (322.8)*	-
2009	13.8 (34.1)	2.0 (5.0)	12.8 (31.5)	139.4 (344.3)*	-
2014	4.4 (10.8)	-	22.8 (56.3)	17.4 (43.0)*	-
2019	52.3 (129.1)	-	0.7 (1.7)	52.3 (129.1)*	-

*Pellets per acre (ha)

Table 16C-42.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Achnatherum pinetorum (pine needlegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bromus inermis[i] (smooth brome)	Bromus porteri (Porter brome)	Carex (sedge)	Carex obtusata (obtuse sedge)	Elymus elymoides (squirreltail)	Festuca idahoensis (Idaho fescue)	Hesperostipa comata (needle and thread)	Leymus cinereus (basin wildrye)	Pascopyrum smithii (western wheatgrass)	Poa fendleriana (muttongrass)	Poa pratensis[i] (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium[i] (intermediate wheatgrass)
year	Nested Frequency																
2004	37	-	47	333	3	160	-	8	50	-	-	-	147	-	-	7	-
2009	73	3	76	337	-	41	-	-	57	-	-	-	199	-	-	8	-
2014	55	-	39	372	-	273	-	0	14	-	1	-	135	-	10	6	5
2019	112	-	69	376	-	26	167	-	15	1	-	17	152	8	5	-	12
year	Average Cover (%)																
2004	0.9	-	1.0	12.1	0.0	2.2	-	0.1	0.8	-	-	-	4.2	-	-	0.1	-
2009	1.3	0.1	1.3	13.4	-	0.5	-	-	0.6	-	-	-	7.1	-	-	0.0	-
2014	1.6	-	1.3	24.3	-	5.5	-	0.0	0.4	-	0.0	-	4.4	-	0.2	0.1	0.0
2019	1.7	-	1.9	17.9	-	0.6	5.1	-	0.4	0.0	-	0.1	3.8	0.1	0.1	-	0.1

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16C-42.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Androsace septentrionalis[a] (pygmyflower rockjasmine)	Antennaria (pussytoes)	Antennaria microphylla (littleleaf pussytoes)	Antennaria parvifolia (small-leaf pussytoes)	Arabis (rockcress)	Astragalus agrestis (purple milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus miser (timber milkvetch)	Castilleja angustifolia (northwestern Indian paintbrush)	Castilleja linariifolia (Wyoming Indian paintbrush)	Chaenactis douglasii (Douglas' dustymaiden)	Chenopodium leptophyllum[a] (narrowleaf goosefoot)	Collinsia parviflora[a] (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawksbeard)	Descurainia pinnata[a] (western tansymustard)	Erigeron eatonii (Eaton's fleabane)
year	Nested Frequency																
2004	4	58	-	-	6	7	25	-	-	4	6	7	-	6	4	-	17
2009	-	55	-	-	1	26	34	-	-	23	12	11	1	5	1	-	46
2014	33	29	-	-	3	16	29	1	-	8	4	-	3	7	1	-	6
2019	4	-	21	9	3	22	11	-	15	2	6	64	-	11	3	4	10
year	Average Cover (%)																
2004	0.0	0.7	-	-	0.0	0.1	0.2	-	-	0.0	0.1	0.0	-	0.0	0.0	-	0.1
2009	-	1.9	-	-	0.0	0.4	0.4	-	-	0.2	0.2	0.0	0.0	0.1	0.0	-	0.8
2014	0.2	0.5	-	-	0.0	0.5	0.2	0.0	-	0.1	0.0	-	0.0	0.1	0.0	-	0.0
2019	0.0	-	0.7	0.3	0.0	0.3	0.1	-	0.1	0.0	0.0	0.2	-	0.0	0.0	0.0	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Erigeron pumilus (shaggy fleabane)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Erodium cicutarium[ai] (redstem stork's bill)	Gayophytum ramosissimum[a] (pinyon groundsmoke)	Hedysarum boreale (Utah sweetvetch)	Lupinus argenteus (silvery lupine)	Machaeranthera canescens (hoary tansyaster)	Machaeranthera grindelioides (rayless tansyaster)	Microsteris gracilis[a] (slender phlox)	Oenothera pallida[a] (pale evening primrose)	Orthocarpus luteus[a] (yellow owl's-clover)	Packera multilobata (lobeleaf groundsel)	Penstemon comarrhenus (dusty beardtongue)	Penstemon watsonii (Watson's penstemon)	Polygonum douglasii[a] (Douglas' knotweed)	Potentilla (cinquefoil)
year	Nested Frequency																
2004	10	61	14	-	-	3	12	2	-	-	11	16	5	12	12	33	48
2009	-	43	19	-	1	1	31	7	6	-	-	-	9	11	3	17	39
2014	18	45	34	3	-	3	20	-	-	-	57	1	-	15	4	-	20
2019	5	36	32	-	120	-	31	3	-	4	28	12	5	1	-	215	-
year	Average Cover (%)																
2004	0.0	0.5	0.2	-	-	0.1	0.4	0.0	-	-	0.0	0.1	0.0	0.1	0.3	0.1	0.8
2009	-	0.9	0.4	-	0.0	0.0	1.9	0.2	0.0	-	-	-	0.1	0.3	0.0	0.0	0.2
2014	0.2	0.4	0.5	0.0	-	0.0	0.6	-	-	-	0.5	0.0	-	0.2	0.0	-	0.3
2019	0.0	0.7	0.9	-	1.2	-	0.1	0.0	-	0.0	0.1	0.1	0.0	0.0	-	3.2	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Potentilla gracilis (slender cinquefoil)	Potentilla hippiana (woolly cinquefoil)	Silene drummondii (Drummond's campion)	Sisymbrium altissimum[ai] (tall tumblemustard)	Symphyotrichum ascendens (western aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius[ai] (yellow salsify)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency							
2004	-	-	21	-	-	17	-	-
2009	-	-	1	0	-	-	-	-
2014	-	-	-	-	-	1	-	3
2019	47	3	21	-	9	15	1	4
year	Average Cover (%)							
2004	-	-	0.1	-	-	0.1	-	-
2009	-	-	0.0	0.0	-	-	-	-
2014	-	-	-	-	-	0.0	-	0.0
2019	0.4	0.0	0.2	-	0.2	0.2	0.0	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16C-42.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia nova[p] (black sagebrush)	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Chrysothamnus depressus[p] (longflower rabbitbrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa (rubber rabbitbrush)	Ericameria parryi (Parry's rabbitbrush)	Symphoricarpos oreophilus[p] (mountain snowberry)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)							
2004	0.7	16	-	0.2	0.4	-	-	-
2009	0.4	9.3	-	0.7	-	-	-	-
2014	0.8	6.8	-	0.4	-	-	0.1	0
2019	0.8	10.5	-	0.2	0.2	0.1	0.1	0.2
year	Quadrat Cover (%)							
2004	1.1	15.7	-	0.8	0.2	-	0.0	0.0
2009	0.2	6.4	0.0	1.7	-	-	0.0	0.0
2014	0.3	4.5	-	1.0	0.1	-	0.0	0.0
2019	0.8	9.4	0.1	1.1	0.1	0.0	0.0	0.0

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16C-42.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	110/127
Artemisia nova[p] -- (black sagebrush)									
2004	420	780	24	48	29	0	0	14	39/50
2009	40	-	0	100	0	0	100	100	17/26
2014	360	60	0	100	0	0	100	0	25/57
2019	500	40	0	100	0	0	0	0	26/38
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
2004	3580	3680	10	68	23	9	1	15	76/100
2009	4140	500	40	41	19	24	9	16	50/66
2014	1800	-	19	59	22	52	41	18	61/77
2019	2580	1160	41	46	13	23	0	14	57/76
Atriplex confertifolia[p] -- (shadscale saltbush)									
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	- / -
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
2004	1180	180	5	95	0	5	0	0	23/35
2009	1520	40	5	88	7	0	0	43	22/31
2014	1240	-	8	92	0	26	0	0	24/35
2019	980	-	0	98	2	63	6	2	20/33

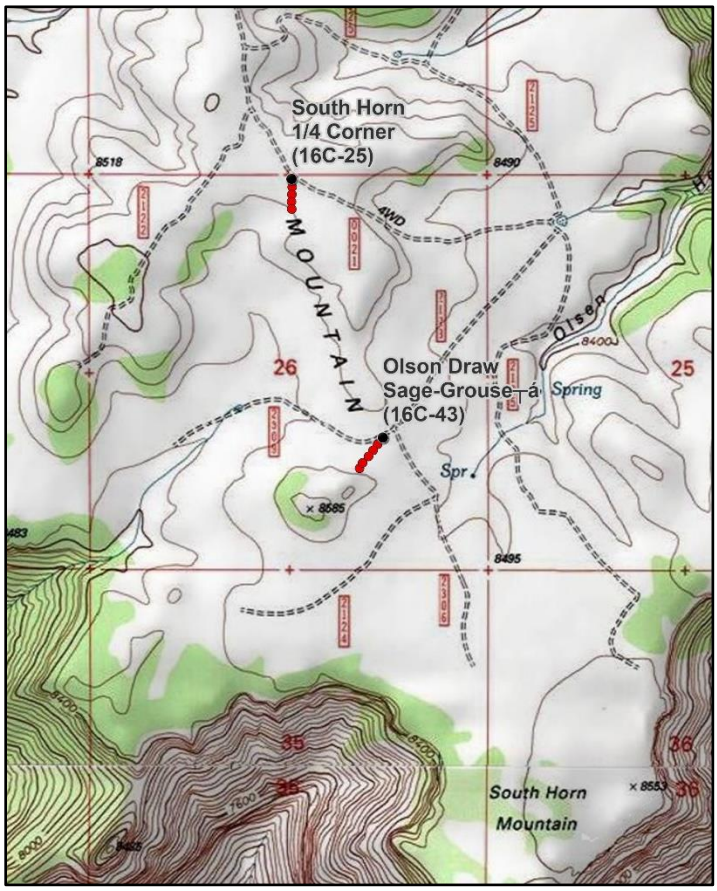
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Ericameria nauseosa -- (rubber rabbitbrush)									
2004	220	-	9	91	0	0	0	0	39/45
2009	20	-	0	100	0	0	0	0	63/52
2014	20	-	0	100	0	100	0	0	29/39
2019	400	-	10	90	0	20	0	0	28/40
Ericameria parryi -- (Parry's rabbitbrush)									
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	22/38
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
2004	40	-	100	0	0	0	0	0	13/16
2009	-	-	-	-	-	-	-	-	48/91
2014	60	-	33	67	0	0	0	0	38/76
2019	60	-	0	100	0	33	0	0	37/56
Tetradymia canescens -- (spineless horsebrush)									
2004	20	-	100	0	0	0	0	0	17/19
2009	60	-	33	33	33	0	33	33	13/14
2014	80	-	0	100	0	75	25	50	11/21
2019	40	-	50	50	0	0	50	0	15/31

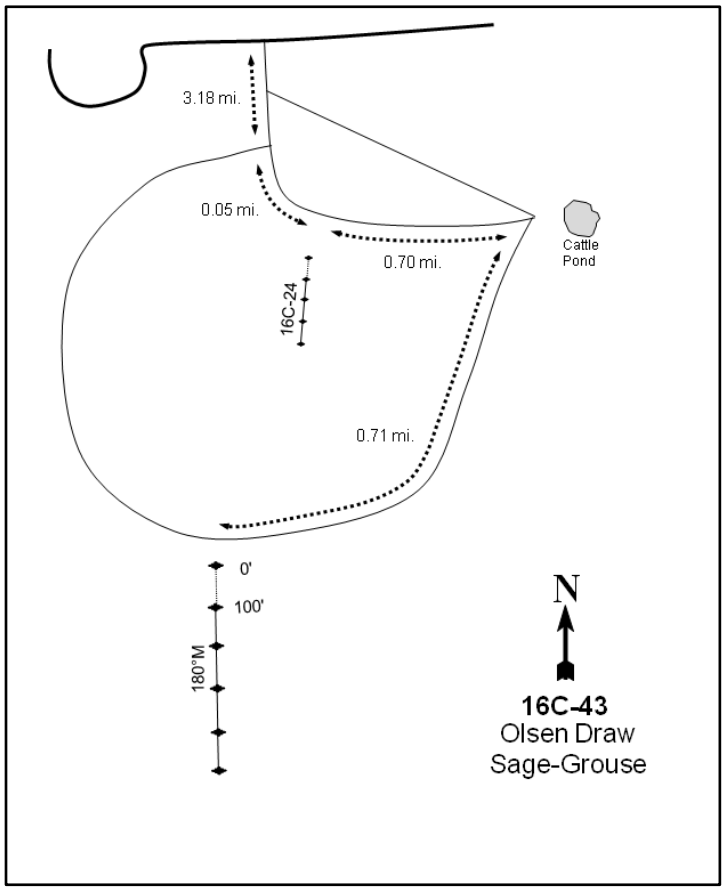
t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16C-42.15 – Deer Desirable Components Index: High Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
2004	20.9	8.1	5.0	30.0	0.0	7.9	0.0	71.9	Fair-Good
2009	12.1	9.4	15.0	30.0	0.0	10.0	0.0	76.6	Good
2014	9.6	9.1	8.6	30.0	0.0	7.3	0.0	64.6	Fair
2019	14.2	11.4	15.0	30.0	0.0	9.2	0.0	79.8	Good

OLSON DRAW SAGE-GROUSE - STUDY NO. 16C-43





Location Information

USGS 7.5 min Map Info	The Cap SW; Township 19S, Range 6E, Section 26
GPS (0' Stake)	NAD 83 UTM ZONE 12, 481705 East 4331995 North

Transect Information

Browse Tag # (0' Stake)	50
Transect Bearing	200° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Standard

Directions to Site

From the South Horn exclosure (by study #16C-24), continue south on the main USGS road for 0.8 miles to a USGS landline marker by a tall red fencepost on the right side of the road. Continue 0.68 miles and turn right onto a two-track before the cattle pond. There may be a faint road going off to the left, but stay right and travel for 0.7 miles. The site is on the left-hand (south) side of the road; use a GPS unit to get to the beginning of the baseline.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	HORN MT
Elevation	8,472ft (2,582m)
Aspect	North
Slope	2-6%
Sample Dates	07/29/2004, 07/27/2009, 07/16/2014, 07/02/2019

Wildlife Habitat and Vegetation History

Table 16C-43.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Rocky Mountain Elk	substantial	winter	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing
Shiras Moose	crucial	winter	

Table 16C-43.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2004	Mountain Big Sagebrush	No Encroachment
2009	Mountain Big Sagebrush	No Encroachment
2014	Mountain Big Sagebrush	No Encroachment
2019	Mountain Big Sagebrush	No Encroachment

Site Notes

The study site was established to monitor sage-grouse nesting and brooding habitat; an active lek is found southeast of the site.

Soils

Table 16C-43.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Clay Loam	7.1	61.3	15.2	23.6	2.0	14.3	249.6	0.8	07/28/2004

Site Potential

1981 - 2010 Average Annual Precipitation	19 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XB430UT
States and Transitions	No state and transition model is available for this ecological site.

Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has dominated this site since study establishment in 2004; other shrubs have provided limited cover (Table 16C-43.12, Table 16C-43.13). The herbaceous understory has remained diverse and abundant throughout the study period. Perennial grasses -- mainly the native species saline wildrye (*Leymus salinus*), western wheatgrass (*Pascopyrum smithii*), and muttongrass (*Poa fendleriana*) -- have provided a majority of the herbaceous cover in all sample years. Forbs have generally been present in moderate amounts: the exception to this is the 2019 sample year, when perennial forbs provided 13 percent cover (Table 16C-43.7, Table 16C-43.10, Table 16C-43.11). Barring a major shrub-removing disturbance or changes in land management, this site will likely remain in this or a similar state in future sample years.

Trend Summary Tables

Table 16C-43.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2004	16.0	4.0	-	16.6	5.1	-
2009	12.1	3.3	-	12.5	4.2	-
2014	13.1	3.2	-	15.4	4.6	-
2019	13.6	3.9	-	16.9	4.4	-

Table 16C-43.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2004	-	301	98	190	-	11.8	0.3	5.1
2009	-	341	13	161	-	13.8	0.0	2.9
2014	-	371	31	225	-	24.5	0.3	6.3
2019	-	385	285	262	-	18.1	3.4	13.1

Table 16C-43.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2004	35.0	0.2	44.6	1.2	0.1	33.0
2009	34.5	0.5	45.7	0.6	0.5	30.6
2014	31.4	0.7	50.2	0.9	0.0	42.7
2019	30.9	0.5	50.7	1.8	0.1	44.9

Table 16C-43.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Greater Sage-Grouse	Rabbit
	Quadrat Frequency				
2004	1	4	42	-	5
2009	7	7	59	2	20
2014	3	1	29	1	4
2019	11	6	16	5	15
Year	Days Use Per Acre (ha)				
2004	4.4 (10.8)	4.0 (9.9)	136.7 (337.7)	95.8 (236.7)*	-
2009	0.7 (1.8)	5.3 (13.2)	28.8 (71.2)	43.6 (107.6)*	-
2014	-	0.7 (1.7)	14.1 (34.8)	-	-
2019	4.4 (10.8)	3.4 (8.3)	16.8 (41.4)	-	-

*Pellets per acre (ha)

Table 16C-43.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum (needlegrass)	Achnatherum hymenoides (Indian ricegrass)	Achnatherum pinetorum (pine needlegrass)	Bouteloua gracilis (blue grama)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Koeleria macrantha (prairie Junegrass)	Leymus salinus (saline wildrye)	Pascopyrum smithii (western wheatgrass)	Poa fendleriana (muttongrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency										
2004	12	19	-	-	28	5	1	132	92	106	7
2009	-	12	-	-	5	3	-	193	126	150	6
2014	-	15	26	2	33	34	2	113	159	159	-
2019	13	23	3	2	36	83	4	146	220	115	-
year	Average Cover (%)										
2004	0.5	0.8	-	-	0.7	0.0	0.0	5.0	1.3	3.5	0.0
2009	-	0.8	-	-	0.0	0.0	-	8.1	1.4	3.3	0.0
2014	-	1.1	0.4	0.0	0.7	2.0	0.0	9.1	5.3	5.8	-
2019	0.1	1.0	0.2	0.0	0.6	1.8	0.0	6.8	6.1	1.5	-

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16C-43.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Androsace septentrionalis[a] (pygmyflower rockjasmine)	Arabis (rockcress)	Artemisia dracunculus (tarragon)	Astragalus (milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus tenellus (looseflower milkvetch)	Calochortus nuttallii (sego lily)	Chaenactis douglasii (Douglas' dustymaiden)	Chenopodium album[a] (lambsquarters)	Chenopodium leptophyllum[a] (narrowleaf goosefoot)	Collinsia parviflora[a] (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawksbeard)	Cryptantha (cryptantha)	Erigeron eatonii (Eaton's fleabane)	Erigeron pumilus (shaggy fleabane)	Eriogonum racemosum (redroot buckwheat)
year	Nested Frequency																
2004	-	9	-	5	12	16	-	-	69	-	1	4	43	6	17	1	10
2009	-	-	-	1	10	2	-	-	-	13	-	3	30	-	17	10	17
2014	18	3	0	3	8	1	1	2	-	6	4	7	50	1	24	7	9
2019	2	6	-	7	14	10	30	-	2	132	12	0	85	2	38	20	16
year	Average Cover (%)																
2004	-	0.0	-	0.1	0.1	0.5	-	-	0.2	-	0.0	0.0	0.8	0.0	0.3	0.0	0.3
2009	-	-	-	0.0	0.0	0.0	-	-	-	0.0	-	0.0	0.2	-	0.1	0.0	0.2
2014	0.1	0.2	0.0	0.0	0.1	0.0	0.0	0.0	-	0.2	0.0	0.1	1.5	0.0	0.2	0.0	0.1
2019	0.0	0.0	-	0.0	0.5	0.4	0.1	-	0.0	0.3	0.0	0.0	2.9	0.1	0.5	0.1	0.3

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Eriogonum umbellatum (sulphur-flower buckwheat)	Gayophytum ramosissimum[a] (pinyon groundsmoke)	Hedysarum boreale (Utah sweetvetch)	Lappula occidentalis[a] (flatspine stickseed)	Lithospermum ruderale (western stoneseed)	Lupinus (lupine)	Machaeranthera canescens (hoary tansyaster)	Packera multilobata (lobeleaf groundsel)	Penstemon caespitosus (mat penstemon)	Penstemon comarrhenus (dusty beardtongue)	Penstemon watsonii (Watson's penstemon)	Phlox austromontana (mountain phlox)	Polygonum douglasii[a] (Douglas' knotweed)	Potentilla gracilis (slender cinquefoil)	Schoenocrambe linifolia (flaxleaf plainsmustard)	Silene drummondii (Drummond's campion)	Trifolium longipes (longstalk clover)
year	Nested Frequency																
2004	15	2	-	3	-	-	1	2	11	-	24	22	27	12	36	-	62
2009	23	-	-	-	-	-	3	-	10	-	26	26	-	16	30	-	21
2014	32	-	1	6	-	-	4	3	11	-	26	35	-	16	58	3	90
2019	32	196	-	40	3	3	6	10	9	1	33	28	80	23	52	13	119
year	Average Cover (%)																
2004	0.2	0.0	-	0.0	-	-	0.0	0.0	0.2	-	1.2	0.2	0.1	0.2	0.2	-	0.6
2009	0.8	-	-	-	-	-	0.0	-	0.3	-	0.3	0.4	-	0.2	0.1	-	0.1
2014	0.8	-	0.0	0.0	-	-	0.2	0.0	0.1	-	1.3	0.6	-	0.1	0.2	0.0	0.7
2019	0.8	2.8	-	0.1	0.0	0.0	0.2	0.1	0.2	0.0	1.7	0.9	0.2	0.3	0.5	0.1	3.3

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16C-43.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Chrysothamnus depressus[p] (longflower rabbitbrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)
year	Line Intercept Cover (%)				
2004	16.6	-	-	5.1	-
2009	12.4	0.1	-	4.2	-
2014	15.3	0.1	-	4.6	-
2019	16.9	-	2.7	1.7	-
year	Quadrat Cover (%)				
2004	16.0	-	-	3.9	0.1
2009	12.1	0.0	-	3.3	-
2014	13.1	0.0	-	3.2	-
2019	13.6	0.0	2.2	1.7	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16C-43.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

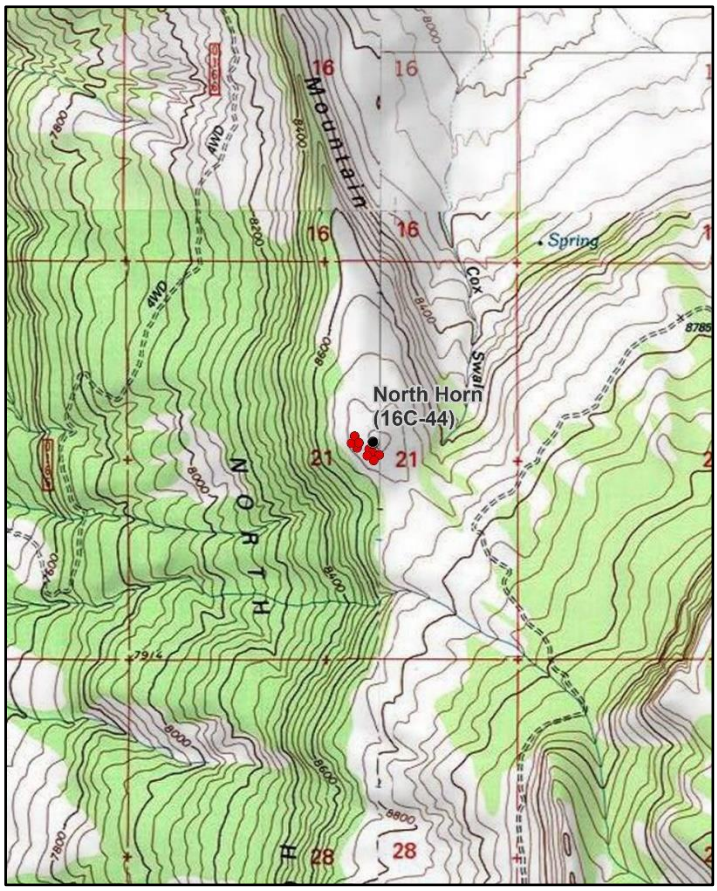
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
2004	-	-	-	-	-	-	-	-	10/29
2009	20	-	0	100	0	0	0	100	61/72
2014	20	-	100	0	0	0	0	0	65/100
2019	20	-	0	100	0	0	0	0	59/71
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
2004	3480	15700	2	50	48	35	37	24	61/87
2009	4420	1740	19	44	38	31	36	27	51/80
2014	5660	240	39	43	18	17	23	15	52/85
2019	5100	560	20	53	27	23	31	25	51/85
Chrysothamnus depressus[p] -- (longflower rabbitbrush)									
2004	20	-	0	100	0	0	0	0	12/23
2009	400	-	0	100	0	25	20	15	18/32
2014	40	-	50	50	0	0	100	0	7/25
2019	-	-	-	-	-	-	-	-	2/11
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	2860	-	0	99	1	4	0	7	17/34
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
2004	3800	80	1	100	0	0	0	0	22/34
2009	5540	20	10	86	5	2	0	8	16/29
2014	5060	140	11	89	0	4	6	0	20/30
2019	1900	-	2	97	1	2	0	1	24/33
Gutierrezia sarothrae -- (broom snakeweed)									
2004	720	60	0	100	0	0	0	0	14/24
2009	20	-	0	100	0	0	0	0	17/40
2014	-	-	-	-	-	-	-	-	-/-
2019	20	-	0	100	0	0	0	0	15/24
Pediocactus simpsonii -- (mountain ball cactus)									
2004	20	-	0	100	0	0	0	0	6/9
2009	20	-	0	100	0	0	0	0	6/8
2014	-	-	-	-	-	-	-	-	12/12
2019	20	-	0	100	0	0	0	0	8/12
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
2004	20	-	0	100	0	0	0	0	- / -
2009	20	-	0	100	0	0	0	0	44/57
2014	20	-	0	100	0	0	100	0	54/103
2019	-	-	-	-	-	-	-	-	51/86
Tetradymia canescens -- (spineless horsebrush)									
2004	20	-	0	100	0	0	0	0	14/21
2009	20	-	0	100	0	0	0	0	12/17
2014	20	-	0	100	0	0	0	0	10/14
2019	40	-	50	50	0	0	0	0	13/17

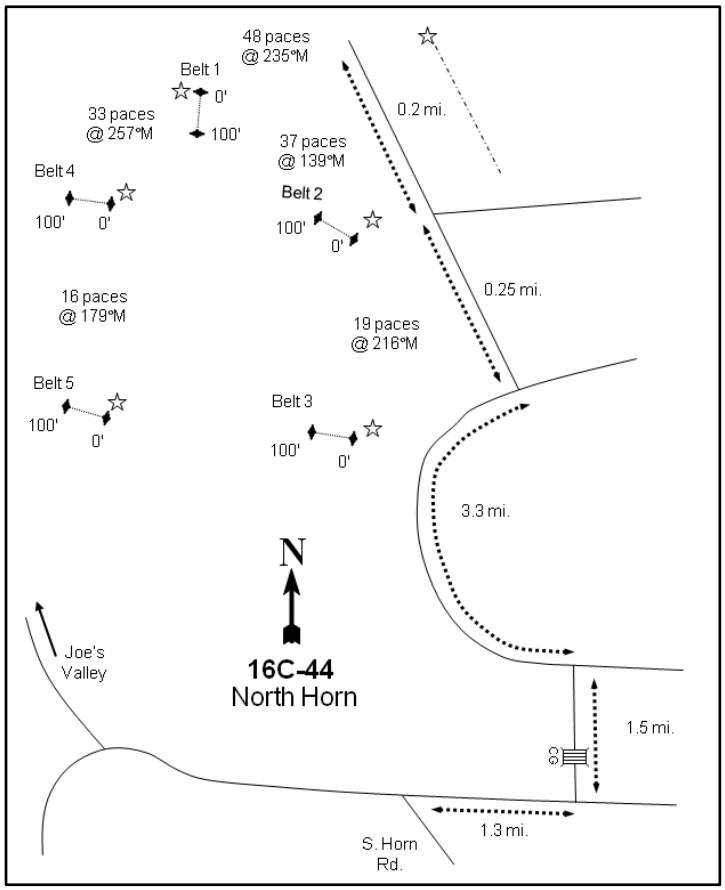
t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16C-43.15 – Deer Desirable Components Index: High Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
2004	20.8	0.7	1.2	23.6	0.0	10.0	0.0	56.2	Poor-Fair
2009	15.6	3.8	9.2	27.5	0.0	5.9	0.0	62.1	Fair
2014	19.3	9.6	15.0	30.0	0.0	10.0	0.0	83.9	Good
2019	21.1	7.0	10.2	30.0	0.0	10.0	0.0	78.3	Good

NORTH HORN - STUDY NO. 16C-44





Location Information

USGS 7.5 min Map Info	Ferron Canyon NE; Township 18S, Range 6E, Section 21
GPS (0' Stake)	NAD 83 UTM ZONE 12, 478339 East 4343611 North

Transect Information

Browse Tag # (0' Stake)	221
Transect Bearing	195° magnetic (Line 2: 279° magnetic; Line 3: 300° magnetic; Line 4: 319° magnetic; Line 5: 299° magnetic)
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	No Rebar

Directions to Site

Starting on the southwest side of Joes Valley Reservoir, follow the main road up North Dragon Creek to a three-way fork at the upper end. Bear left and follow the main road for about 4.0 miles to an intersection. From the intersection of the North Horn and South Horn roads, continue on the North Horn road towards the Emery County TV towers for 1.3 miles to a fork. Proceed left (north) towards The Cap and travel for 1.5 miles to an intersection. Turn left and drive 3.3 miles to a fork on the left (northwest). Turn left and proceed for 0.25 miles to a fork on the right. Stay left at this fork and drive 0.2 miles to the top of the hill. The fenceline to the east has a 20-foot section of wooden posts. From the wooden posts, walk 48 feet at 235 degrees magnetic to the 0-foot stake for belt 1, which is marked with browse tag #221.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	HORN MT
Elevation	8,770ft (2,673m)
Aspect	Southwest
Slope	15%
Sample Dates	08/31/2005, 08/25/2009, 07/22/2014, 07/01/2019

Table 16C-44.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Terrace - Contour Trench	-	-	Historic	-

Wildlife Habitat and Vegetation History

Table 16C-44.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	summer	
Rocky Mountain Elk	substantial	winter	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing
Shiras Moose	crucial	winter	

Table 16C-44.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2005	True Mountain Mahogany	No Encroachment
2009	True Mountain Mahogany	No Encroachment
2014	True Mountain Mahogany	Phase I
2019	True Mountain Mahogany	Phase I

Site Notes

Due to suspected heavy use by big game, this site was established to monitor the effect that big game may have on the alderleaf mountain mahogany (*Cercocarpus montanus*) population in the area.

Soils

Table 16C-44.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Clay	7.4	26.0	30.2	43.8	1.9	2.5	67.2	0.5	08/31/2005

Site Potential

1981 - 2010 Average Annual Precipitation	20 inches
NRCS Ecological Site	Mountain Shallow Loam (Birchleaf Mountain Mahogany)
NRCS Ecological Site #	R047XA441UT
States and Transitions	No state and transition model is available for this ecological site.

Alderleaf mountain mahogany (*Cercocarpus montanus*) has dominated this site since study establishment in 2005. A diverse number of other shrubs have also been present, but have provided less cover (Table 16C-44.12, Table 16C-44.13). The herbaceous component has remained diverse and abundant, with the perennial grass species saline wildrye (*Leymus salinus*) providing a majority of the understory cover throughout the study period. Forbs have generally contributed low to moderate amounts of cover except in 2019, when perennial forb cover was nearly 11 percent (Table 16C-44.7, Table 16C-44.10, Table 16C-44.11). Rocky Mountain juniper (*Juniperus scopulorum*) and/or twoneedle pinyon (*Pinus edulis*) have been observed in all sample years, placing this site in Phase I of woodland succession (Table 16C-44.4, Table 16C-44.12, Table 16C-44.14, Photos). Although density is low as of 2019, further tree encroachment may be possible over time.

Trend Summary Tables

Table 16C-44.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2005	26.4	2.6	0.3	33.5	3.6	0.4
2009	23.3	2.0	0.4	34.0	3.2	0.6
2014	20.1	2.4	2.1	19.5	3.5	3.2
2019	27.3	4.7	2.4	31.9	2.4	3.8

Table 16C-44.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2005	-	241	1	191	-	11.6	0.0	4.2
2009	-	242	-	198	-	13.4	-	2.7
2014	-	303	7	194	-	13.6	0.2	4.5
2019	-	298	6	232	-	17.7	0.1	10.6

Table 16C-44.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2005	24.1	0.0	28.1	14.5	9.7	38.3
2009	24.6	0.0	35.8	8.7	7.8	39.7
2014	24.3	0.0	36.4	12.0	10.6	45.3
2019	24.1	0.6	38.9	12.1	10.2	49.3

Table 16C-44.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
2005	3	7	4	8
2009	4	1	4	10
2014	3	2	2	2
2019	2	3	2	9
Year	Days Use Per Acre (ha)			
2005	2.2 (5.4)	17.4 (43.0)	16.8 (41.4)	-
2009	9.4 (23.3)	9.4 (23.2)	17.4 (43.0)	-
2014	5.1 (12.6)	2.7 (6.6)	14.1 (34.8)	-
2019	2.2 (5.4)	4.0 (9.9)	6.0 (14.9)	-

Table 16C-44.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bromus inermis[i] (smooth brome)	Carex (sedge)	Carex rossii (Ross' sedge)	Leymus salinus (saline wildrye)	Pascopyrum smithii (western wheatgrass)	Poa secunda (Sandberg bluegrass)
year	Nested Frequency							
2005	10	3	4	99	-	196	-	2
2009	5	3	5	79	-	205	-	2
2014	20	16	10	35	-	271	8	19
2019	41	6	21	61	26	235	7	3
year	Average Cover (%)							
2005	0.2	0.0	0.2	3.0	-	8.2	-	0.0
2009	0.2	0.0	0.0	1.8	-	11.3	-	0.0
2014	0.5	0.4	0.1	0.8	-	11.3	0.2	0.4
2019	1.3	0.5	0.5	2.0	0.8	12.1	0.2	0.1

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16C-44.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Arabis (rockcress)	Arenaria (sandwort)	Calochortus nuttallii (sego lily)	Chaetopappa ericoides (rose heath)	Comandra umbellata (bastard toadflax)	Draba[a] (draba)	Erigeron eatonii (Eaton's fleabane)	Eriogonum alatum (winged buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Hedysarum boreale (Utah sweetvetch)	Hymenopappus filifolius (fineleaf hymenopappus)	Lappula occidentalis[a] (flatspine stickseed)	Lesquerella (bladderpod)	Linum kingii (King's flax)	Linum lewisii (Lewis flax)	Machaeranthera canescens (hoary tansyaster)	Machaeranthera grindelioides (rayless tansyaster)
year	Nested Frequency																
2005	6	67	-	2	27	1	-	14	-	4	82	-	12	-	1	-	78
2009	-	59	-	-	18	-	-	13	-	13	76	-	18	-	-	-	82
2014	-	72	-	-	36	6	1	14	-	4	39	-	8	10	-	3	76
2019	-	65	6	4	33	-	2	32	1	3	58	1	23	6	-	-	94
year	Average Cover (%)																
2005	0.0	0.6	-	0.0	0.2	0.0	-	0.1	-	0.5	1.2	-	0.0	-	0.0	-	1.1
2009	-	0.5	-	-	0.1	-	-	0.0	-	0.2	0.5	-	0.0	-	-	-	0.9
2014	-	0.8	-	-	0.3	0.2	0.0	0.4	-	0.1	0.9	-	0.1	0.1	-	0.0	1.0
2019	-	0.8	0.0	0.1	0.8	-	0.0	0.3	0.0	0.1	1.4	0.0	0.2	0.2	-	-	1.8

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Microsteris gracilis[a] (slender phlox)	Pedicularis centranthera (dwarf lousewort)	Penstemon caespitosus (mat penstemon)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Potentilla gracilis (slender cinquefoil)	Schoenocrambe linifolia (flaxleaf plainsmustard)	Taraxacum officinale (common dandelion)	Tetraneuris acaulis (stemless four-nerve daisy)
year	Nested Frequency								
2005	-	1	19	25	-	-	-	-	2
2009	-	-	31	18	1	-	-	-	-
2014	1	46	10	21	-	-	-	-	3
2019	5	60	23	48	-	1	3	5	-
year	Average Cover (%)								
2005	-	0.0	0.2	0.2	-	-	-	-	0.0
2009	-	-	0.3	0.1	0.0	-	-	-	-
2014	0.0	0.3	0.0	0.3	-	-	-	-	0.1
2019	0.1	3.6	0.1	1.0	-	0.0	0.0	0.0	-

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16C-44.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Amelanchier utahensis[p] (Utah serviceberry)	Artemisia nova[p] (black sagebrush)	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Cercocarpus ledifolius[p] (curl-leaf mountain mahogany)	Cercocarpus montanus[p] (alderleaf mountain mahogany)	Chrysothamnus depressus[p] (longflower rabbitbrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa (rubber rabbitbrush)	Ericameria parryi var. parryi (Parry's rabbitbrush)	Eriogonum corymbosum (crispleaf buckwheat)	Gutierrezia sarothrae (broom snakeweed)	Kraschenninikovia lanata[p] (winterfat)	Mahonia repens (creeping barberry)	Pinus edulis[t] (twoneedle pinyon)	Pinus flexilis[t] (limber pine)	Pseudotsuga menziesii[t] (Douglas-fir)	Symphoricarpos oreophilus[p] (mountain snowberry)
year	Line Intercept Cover (%)																
2005	-	-	-	-	33.2	-	-	0.1	0.8	1.4	1.3	-	0	-	0.4	-	0.3
2009	-	0.2	-	-	33.6	-	0.1	0.1	0.6	1.1	1.2	-	-	-	0.6	-	0.2
2014	-	0.6	0.5	-	17.8	-	0.2	0.2	-	1.6	1.1	-	-	3.2	-	-	0.6
2019	-	-	1.5	-	29.9	-	0.4	0.2	-	0.8	0.3	-	0.3	3.8	-	-	0.5
year	Quadrat Cover (%)																
2005	-	0.0	-	-	25.9	-	0.0	0.1	1.3	0.4	0.5	0.0	0.0	-	0.2	0.1	0.5
2009	-	0.0	-	-	23.1	-	0.0	0.0	0.8	0.6	0.4	-	-	-	0.4	-	0.2
2014	-	1.4	0.6	-	17.6	0.2	0.2	0.0	0.0	1.3	0.8	-	0.1	2.1	-	-	0.3
2019	0.4	0.7	0.8	0.4	24.8	0.0	0.3	0.3	-	1.4	1.9	-	0.4	2.4	-	-	0.3

t - Tree Species; p - Preferred Browse; i - Introduced Species

SHRUB SPECIES	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)
2005	0
2009	0.1
2014	0.4
2019	0.4
year	Quadrat Cover (%)
2005	0.2
2009	0.1
2014	0.0
2019	0.5

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16C-44.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
2005	20	40	0	100	0	100	0	0	135/137
2009	20	-	0	100	0	0	0	0	128/137
2014	20	-	0	100	0	0	0	0	68/123
2019	20	-	0	100	0	100	0	0	75/78
Artemisia frigida[p] -- (prairie sagewort)									
2005	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	20	-	100	0	0	100	0	0	17/21
2019	40	-	0	100	0	0	0	0	14/18
Artemisia nova[p] -- (black sagebrush)									
2005	100	-	0	100	0	0	0	0	25/44
2009	60	20	0	100	0	0	0	0	26/37
2014	260	20	31	62	8	54	8	8	22/49
2019	260	-	8	85	8	0	69	8	31/68
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
2005	-	-	-	-	-	-	-	-	40/67
2009	-	-	-	-	-	-	-	-	44/60
2014	220	-	73	27	0	9	0	0	46/96
2019	160	-	25	75	0	50	25	0	51/116
Atriplex confertifolia[p] -- (shadscale saltbush)									
2005	-	-	-	-	-	-	-	-	11/19
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Cercocarpus ledifolius[P] -- (curl-leaf mountain mahogany)									
2005	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	30/54
2019	20	-	0	100	0	0	100	0	47/51
Cercocarpus montanus[P] -- (alderleaf mountain mahogany)									
2005	3120	800	30	65	5	32	47	0	95/123
2009	3020	160	12	70	18	30	42	22	80/115
2014	2560	1420	22	74	4	32	30	3	85/107
2019	3860	420	47	50	3	14	31	3	91/128
Chrysothamnus depressus[P] -- (longflower rabbitbrush)									
2005	40	-	0	100	0	0	100	0	6/14
2009	-	-	-	-	-	-	-	-	-/-
2014	380	-	5	95	0	53	26	0	9/19
2019	180	-	11	89	0	44	0	0	11/25
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
2005	80	-	0	100	0	0	25	0	10/16
2009	160	-	25	63	13	0	0	38	9/18
2014	440	20	0	100	0	0	0	0	15/24
2019	300	-	20	80	0	0	0	0	21/30
Eriogonum corymbosum -- (crispleaf buckwheat)									
2005	1440	20	29	71	0	21	4	0	21/31
2009	1520	20	5	92	3	14	3	1	16/28
2014	700	20	9	91	0	26	0	0	16/31
2019	740	-	11	84	5	35	14	5	15/30
Ericameria nauseosa -- (rubber rabbitbrush)									
2005	40	-	0	100	0	0	0	0	23/32
2009	220	-	9	91	0	0	0	0	10/24
2014	180	-	0	100	0	56	44	0	22/31
2019	140	-	29	71	0	0	0	0	110/140
Ericameria parryi var. parryi -- (Parry's rabbitbrush)									
2005	1340	-	9	91	0	24	12	13	18/30
2009	880	-	0	100	0	5	0	0	16/30
2014	40	-	0	100	0	0	0	0	13/32
2019	40	-	0	100	0	0	0	0	12/28
Gutierrezia sarothrae -- (broom snakeweed)									
2005	3080	120	8	92	0	0	0	0	17/19
2009	3180	-	1	99	0	0	0	1	13/14
2014	1460	-	6	93	1	0	0	1	14/17
2019	2580	-	5	95	0	0	0	0	12/14
Krascheninnikovia lanata[P] -- (winterfat)									
2005	-	-	-	-	-	-	-	-	11/10
2009	-	-	-	-	-	-	-	-	9/19
2014	-	-	-	-	-	-	-	-	-/-
2019	20	-	0	0	100	0	100	100	11/15
Mahonia repens -- (creeping barberry)									
2005	460	-	0	100	0	0	0	0	3/5
2009	20	240	100	0	0	0	0	0	- / -
2014	120	-	0	100	0	0	0	0	- / -
2019	680	-	3	97	0	0	0	0	6/7

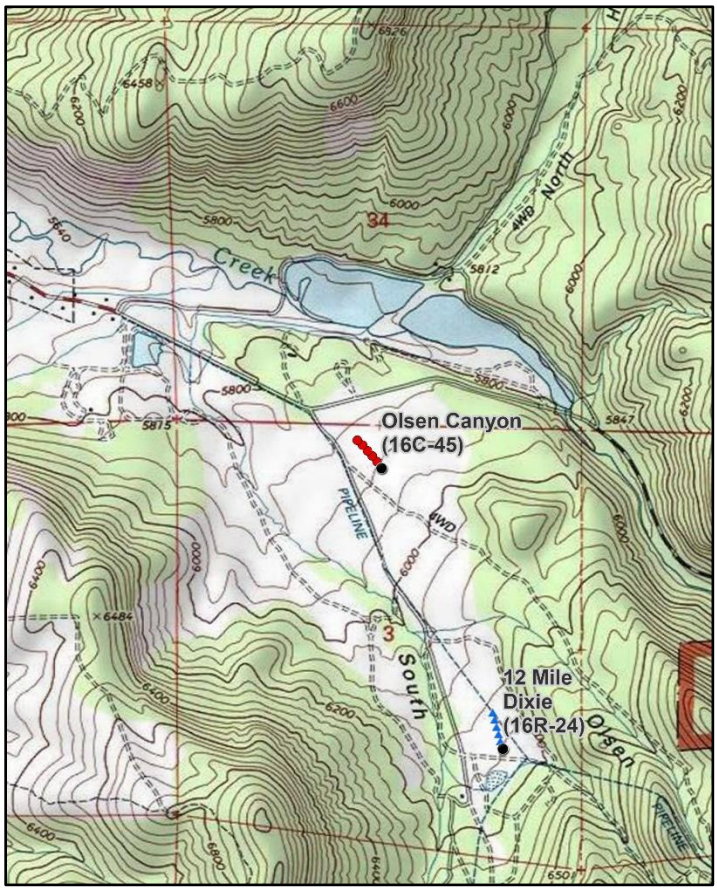
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Pinus edulis[t] -- (twoneedle pinyon)									
2005	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	60	-	33	67	0	0	0	0	- / -
Pinus flexilis[t] -- (limber pine)									
2005	60	20	67	33	0	0	0	0	- / -
2009	80	-	25	75	0	0	0	0	- / -
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Pseudotsuga menziesii[t] -- (Douglas-fir)									
2005	20	-	100	0	0	0	0	0	- / -
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Rosa woodsii[p] -- (Woods' rose)									
2005	-	-	-	-	-	-	-	-	25/34
2009	-	-	-	-	-	-	-	-	-/-
2014	20	-	0	100	0	0	0	0	- / -
2019	-	-	-	-	-	-	-	-	-/-
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
2005	160	-	13	88	0	0	0	0	24/44
2009	160	-	25	75	0	0	0	25	25/52
2014	420	-	43	57	0	0	5	0	19/38
2019	240	20	25	75	0	25	33	0	25/58
Tetradymia canescens -- (spineless horsebrush)									
2005	480	-	25	71	4	8	21	0	19/29
2009	340	-	0	88	12	0	0	29	13/21
2014	240	20	8	92	0	50	25	0	13/23
2019	160	-	25	75	0	0	0	0	18/29

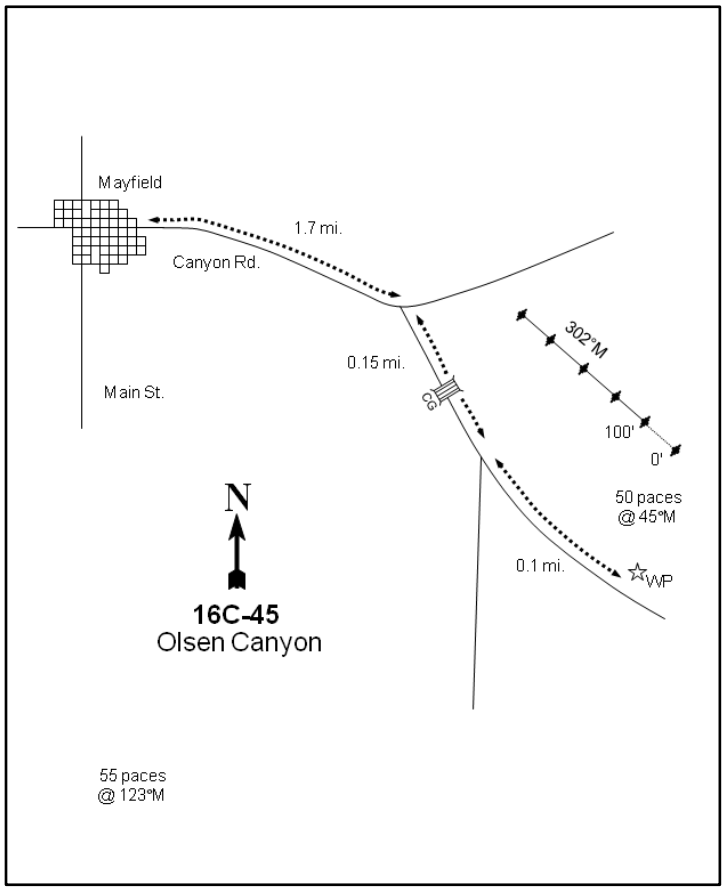
t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16C-44.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus scopulorum (Rocky Mountain juniper)							
2019	4	-	-	100	-	-	6.0
Pinus edulis (twoneedle pinyon)							
2014	29	-	33	42	25	-	7.3
2019	17	-	36	55	9	-	8.6
Pinus flexilis (limber pine)							
2019	13	20	60	20	-	-	5.4
Pseudotsuga menziesii (Douglas-fir)							
2019	1	-	100	-	-	-	3.0

OLSEN CANYON - STUDY NO. 16C-45





Location Information

USGS 7.5 min Map Info	Mayfield NE; Township 20S, Range 2E, Section 03
GPS (0' Stake)	NAD 83 UTM ZONE 12, 441564 East 4328634 North

Transect Information

Browse Tag # (0' Stake)	196
Transect Bearing	302° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Belt 4: 1ft

Directions to Site

Traveling south on Main Street in Mayfield, turn left (east) onto Canyon Road. Travel for 1.7 miles to a “Y” intersection. Proceed to the right (a dirt road) and continue for 0.15 miles, crossing a cattle guard along the way, then take the left fork of another “Y” intersection. Travel for 0.1 miles to a witness post on the left (north) side of the road. From the witness post the 0-foot baseline stake is 50 paces away at 45 degrees magnetic and is marked by browse tag #196.

Site Information

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	5,900ft (1,798m)
Aspect	West
Slope	5%
Sample Dates	07/18/2007, 05/14/2014, 05/16/2019

Table 16C-45.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Seeding - Seed Unknown	-	-	Historic	-
Chaining - Chain Unknown	-	-	Historic	-
Hand Crew - Lop and Scatter	Twelve Mile Wma Habitat Improvement	273	July 2007-October 2008	1254

Wildlife Habitat and Vegetation History

Table 16C-45.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter/spring
Rocky Mountain Elk	crucial	winter
Shiras Moose	crucial	winter

Table 16C-45.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2007	Wyoming Big Sagebrush	Phase I
2014	Wyoming Big Sagebrush	Phase I
2019	Wyoming Big Sagebrush	Phase I

Site Notes

No Notes

Soils

Table 16C-45.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	7.2	46.2	31.0	22.8	2.8	11.6	188.8	0.9	07/18/2007

Site Potential

1981 - 2010 Average Annual Precipitation	15 inches
NRCS Ecological Site	Upland Gravelly Loam (Wyoming Big Sagebrush)
NRCS Ecological Site #	R028AY307UT
States and Transitions	A defined state and transition model is available.

When this site was established in 2007, it was a stable Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) ecological site with some encroachment by Utah juniper (*Juniperus osteosperma*) occurring. The understory has been mostly composed of perennial grasses with a depleted forb layer (Table 16C-45.7). Perennial grasses have been dominated by Sandberg bluegrass (*Poa secunda*) and the introduced species crested wheatgrass (*Agropyron cristatum*), although bulbous bluegrass (*P. bulbosa*) became a co-dominant species in 2019 (Table 16C-45.10). Forbs have remained relatively rare with curveseed butterwort (*Ceratocephala testiculata*) as the dominant species (Table 16C-45.11). Wyoming big sagebrush is the dominant browse species present, but a lesser amount of black sagebrush (*A. nova*) is sub-dominant (Table 16C-45.12). Although twoneedle pinyon (*Pinus edulis*) and Utah juniper have both been present, cover and density were significantly reduced following the lop and scatter treatment which occurred in 2007 and 2008 (Table 16C-45.1, Table 16C-45.14).

Trend Summary Tables

Table 16C-45.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2007	5.8	2.5	-	9.8	1.9	-
2014	5.4	0.4	-	9.3	0.7	-
2019	7.6	1.5	-	6.6	1.6	-

Table 16C-45.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2007	110	406	292	62	0.8	22.9	1.5	0.5
2014	51	420	95	104	0.2	26.5	0.2	1.3
2019	168	434	379	113	2.6	31.5	9.7	1.1

Table 16C-45.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2007	21.5	4.0	27.3	12.8	3.5	39.8
2014	13.7	1.1	37.4	14.2	3.3	38.1
2019	28.3	3.9	33.5	14.7	7.1	44.9

Table 16C-45.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
2007	3	68	4	39
2014	-	47	-	16
2019	2	57	4	47
Year	Days Use Per Acre (ha)			
2007	5.8 (14.3)	252.0 (622.4)	6.0 (14.9)	-
2014	2.9 (7.2)	57.0 (140.7)	0.7 (1.7)	-
2019	-	55.6 (137.4)	-	-

Table 16C-45.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bromus tectorum[ai] (cheatgrass)	Hesperostipa comata (needle and thread)	Poa bulbosa[i] (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium[i] (intermediate wheatgrass)
year	Nested Frequency							
2007	8	252	110	49	3	289	46	92
2014	9	245	51	153	109	310	48	114
2019	1	237	168	36	196	263	32	128
year	Average Cover (%)							
2007	0.5	10.1	0.8	1.4	0.0	6.5	1.4	2.9
2014	0.1	10.2	0.2	4.3	1.3	5.5	2.8	2.3
2019	0.0	8.9	2.6	0.9	10.0	6.2	2.2	3.4

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16C-45.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Allium (onion)	Alyssum desertorum[ai] (desert madwort)	Antennaria dimorpha (low pussytoes)	Astragalus calycosus (Torrey's milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus eurekensis (Eureka milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Castilleja linariifolia (Wyoming Indian paintbrush)	Ceratocephala testiculata[ai] (curveseed butterwort)	Collinsia parviflora[a] (maiden blue eyed Mary)	Draba[a] (draba)	Erodium cicutarium[ai] (redstem stork's bill)	Gilia inconspicua[a] (shy gilia)	Lactuca serriola[ai] (prickly lettuce)	Lesquerella (bladderpod)	Lithospermum incisum (narrowleaf stoneseed)
year	Nested Frequency																
2007	-	-	-	-	48	-	1	-	-	292	3	-	-	-	-	1	-
2014	1	16	5	88	-	-	-	-	1	84	-	-	-	-	-	3	2
2019	-	155	9	73	-	1	-	19	-	363	-	4	4	3	9	3	1
year	Average Cover (%)																
2007	-	-	-	-	0.3	-	0.0	-	-	1.5	0.0	-	-	-	-	0.0	-
2014	0.0	0.0	0.1	0.9	-	-	-	-	0.0	0.2	-	-	-	-	-	0.0	0.1
2019	-	2.0	0.1	0.5	-	0.0	-	0.1	-	7.6	-	0.0	0.0	0.0	0.0	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Lomatium (desertparsley)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Sanguisorba minor[i] (small burnet)	Solanum triflorum[a] (cutleaf nightshade)	Tragopogon dubius[ai] (yellow salsify)
year	Nested Frequency					
2007	-	17	-	-	-	-
2014	3	12	-	3	2	1
2019	4	18	3	-	-	1
year	Average Cover (%)					
2007	-	0.1	-	-	-	-
2014	0.1	0.1	-	0.0	0.0	0.0
2019	0.0	0.2	0.0	-	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16C-45.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia nova[p] (black sagebrush)	Artemisia tridentata ssp. wyomingensis[p] (Wyoming big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	Ephedra nevadensis[p] (Nevada jointfir)	Ericameria nauseosa ssp. nauseosa var. speciosa[p] (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Opuntia (pricklypear)
year	Line Intercept Cover (%)						
2007	2.5	6.6	0.4	0.7	-	1.5	-
2014	2	7.1	0.5	0.2	-	0.2	0
2019	1.8	4.5	1.2	0.1	0.2	0.4	-
year	Quadrat Cover (%)						
2007	1.6	4.0	0.1	0.0	0.1	2.4	-
2014	1.1	4.1	0.2	0.0	0.1	0.2	0.0
2019	2.0	5.5	0.7	0.0	0.1	0.8	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16C-45.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Artemisia nova[p] -- (black sagebrush)									
2007	420	400	0	100	0	52	0	0	45/88
2014	540	-	30	44	26	44	26	19	35/78
2019	700	20	23	60	17	31	40	9	38/71
Artemisia tridentata ssp. wyomingensis[p] -- (Wyoming big sagebrush)									
2007	980	60	0	80	20	53	18	6	63/99
2014	1060	20	2	76	23	6	79	8	56/90
2019	820	40	0	51	49	5	90	49	51/85
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
2007	520	-	4	89	8	19	27	0	26/41
2014	1020	100	28	71	2	29	6	4	17/35
2019	1100	-	22	64	14	16	31	14	19/36
Ephedra nevadensis[p] -- (Nevada jointfir)									
2007	80	-	50	0	50	50	50	0	33/57
2014	120	-	17	50	33	0	100	100	36/60
2019	260	-	0	46	54	0	100	100	29/40
Ericameria nauseosa -- (rubber rabbitbrush)									
2007	-	-	-	-	-	-	-	-	-/-
2014	20	-	0	0	100	100	0	100	51/53
2019	40	-	50	50	0	0	0	0	- / -
Ericameria nauseosa ssp. nauseosa var. speciosa[p] -- (rubber rabbitbrush)									
2007	40	-	0	0	100	50	50	100	73/112
2014	20	20	0	100	0	0	100	0	33/25
2019	20	-	0	100	0	0	100	0	73/85
Gutierrezia sarothrae -- (broom snakeweed)									
2007	6000	-	4	95	1	3	0	1	21/22
2014	1760	480	82	17	1	3	0	0	12/15
2019	3120	6480	33	63	4	10	1	4	17/21

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Opuntia -- (pricklypear)									
2007	20	-	0	100	0	0	0	0	10/28
2014	-	20	0	0	0	0	0	0	9/18
2019	-	-	-	-	-	-	-	-	9/20
Tetradymia canescens -- (spineless horsebrush)									
2007	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	40	-	100	0	0	0	0	0	34/64

t - Tree Species; p - Preferred Browse; i - Introduced Species

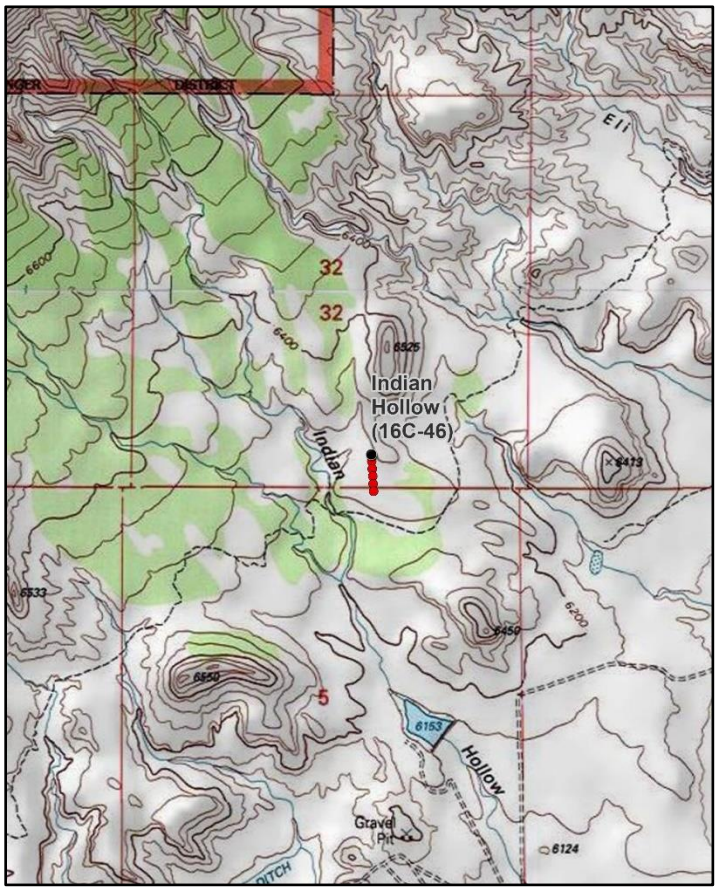
Table 16C-45.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

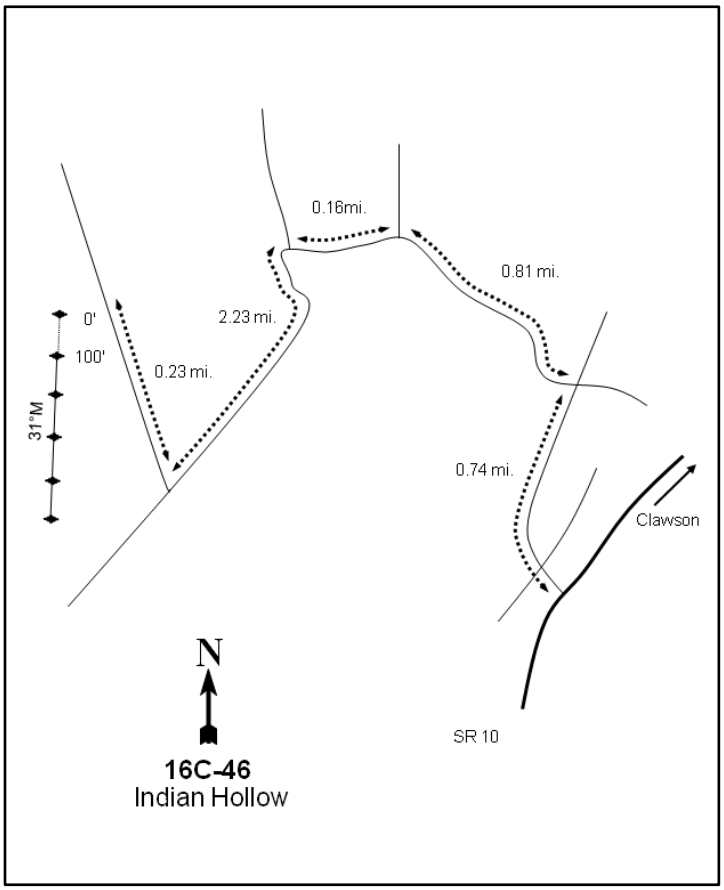
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2007	20	-	11	11	78	-	14.7
2014	1	-	100	-	-	-	2.5
2019	1	-	100	-	-	-	3.0
Pinus edulis (twoneedle pinyon)							
2014	1	-	100	-	-	-	1.0
2019	1	-	100	-	-	-	2.0

Table 16C-45.15 – Deer Desirable Components Index: Mid Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
2007	12.3	9.8	1.8	30.0	-0.6	1.0	0.0	54.2	Fair
2014	11.6	7.9	4.1	30.0	-0.2	2.6	0.0	56.1	Fair
2019	8.3	3.4	3.1	30.0	-1.9	2.1	0.0	44.9	Poor

INDIAN HOLLOW - STUDY NO. 16C-46





Location Information

USGS 7.5 min Map Info	Ferron NE; Township 19S, Range 7E, Section 32
GPS (0' Stake)	NAD 83 UTM ZONE 12, 486346 East 4329989 North

Transect Information

Browse Tag # (0' Stake)	134
Transect Bearing	175° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Standard

Directions to Site

On State Road 10 (SR-10) south of the town of Clawson, enter onto the ditch road that parallels SR-10 and travel southeast for approximately 2.03 miles to an intersection. Turn right and travel 0.74 miles to a two-track road on the right (if you come to a sharp turn to the south that is just before the dry holding pond, you have gone too far). Turn right and travel northwest for 0.86 miles to a sagebrush flat. The study transect is located in the flat and the 0-foot stake is marked by browse tag #134.

Site Information

Land Ownership	State
Land Administrator	SITLA
Allotment	NORTHWEST FERRON
Elevation	6,318ft (1,926m)
Aspect	South
Slope	5%
Sample Dates	07/31/2014, 07/08/2019

Wildlife Habitat and Vegetation History

Table 16C-46.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter

Table 16C-46.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2014	Black Sagebrush	Phase I
2019	Black Sagebrush	Phase I

Site Notes

No Notes

Site Potential

1981 - 2010 Average Annual Precipitation	10 inches
NRCS Ecological Site	Semidesert Shallow Loam (Black Sagebrush)
NRCS Ecological Site #	R034XY227UT
States and Transitions	No state and transition model is available for this ecological site.

This site has existed as a black sagebrush (*Artemisia nova*) community since study establishment in 2014. The understory is a sparse mixture of native perennial grasses; forbs are present, but provide little cover (Table 16C-46.7, Table 16C-46.10). James' galleta (*Pleuraphis jamesii*) has been the dominant grass species with an increase being noted between the two sample years (Table 16C-46.10). Black sagebrush is the dominant browse species present with Bigelow sage (*Artemisia bigelovii*) being sub-dominant, and both species have shown a slight increase over the sample period (Table 16C-46.12, Table 16C-46.13). Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) have been sampled on the study in both sample years with a slight increase in density being observed (Table 16C-46.14). Without a major disturbance, it is likely that this site will remain in this state in future years, although further tree encroachment may occur.

Trend Summary Tables

Table 16C-46.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2014	12.1	0.7	-	11.8	1.2	0.1
2019	16.8	1.7	0.0	15.2	1.4	0.1

Table 16C-46.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2014	-	109	26	49	-	2.5	0.1	0.2
2019	-	149	88	167	-	4.4	1.2	2.0

Table 16C-46.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2014	42.1	0.1	8.6	24.0	10.8	16.8
2019	25.4	0.0	13.8	43.5	13.9	23.1

Table 16C-46.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
2014	-	47	1	7
2019	1	21	1	14
Year	Days Use Per Acre (ha)			
2014	-	-	-	-
2019	-	29.5 (72.8)	-	-

Table 16C-46.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Aristida purpurea (purple threeawn)	Elymus elymoides (squirreltail)	Leymus salinus (saline wildrye)	Pleuraphis jamesii (James' galleta)
year	Nested Frequency				
2014	3	9	-	-	101
2019	4	9	15	5	127
year	Average Cover (%)				
2014	0.2	0.1	-	-	2.3
2019	0.2	0.2	0.2	0.1	3.8

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16C-46.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Astragalus cymboides (canoe milkvetch)	Chaetopappa ericoides (rose heath)	Chamaesyce (sandmat)	Cryptantha (cryptantha)	Descurainia pinnata[a] (western tansymustard)	Eriogonum umbellatum (sulphur-flower buckwheat)	Halogeton glomeratus[ai] (saltlover)	Hymenoxys richardsonii (pingue rubberweed)	Ipomopsis aggregata (scarlet gilia)	Ipomopsis congesta (ballhead ipomopsis)	Lappula occidentalis[a] (flatspine stickseed)	Lepidium montanum[a] (mountain pepperweed)	Packera multilobata (lobeleaf groundsel)	Penstemon (beardtongue)	Penstemon caespitosus (mat penstemon)	Phacelia[a] (phacelia)	Phlox longifolia (longleaf phlox)
year	Nested Frequency																
2014	9	-	23	11	-	1	-	-	-	-	-	6	-	5	3	21	3
2019	19	7	18	48	4	-	3	66	1	44	8	14	2	2	-	69	3
year	Average Cover (%)																
2014	0.0	-	0.1	0.1	-	0.0	-	-	-	-	-	0.0	-	0.0	0.0	0.1	0.0
2019	0.2	0.0	0.4	0.7	0.0	-	0.0	0.5	0.0	0.1	0.0	0.3	0.0	0.0	-	0.9	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Physaria (twinpod)	Sphaeralcea coccinea (scarlet globemallow)	Townsendia incana (hoary Townsend daisy)
year	Nested Frequency		
2014	1	1	-
2019	1	-	14
year	Average Cover (%)		
2014	0.0	0.0	-
2019	0.0	-	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16C-46.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia bigelovii[p] (Bigelow sage)	Artemisia nova[p] (black sagebrush)	Atriplex confertifolia[p] (shadscale saltbush)	Chrysothamnus depressus[p] (longflower rabbitbrush)	Chrysothamnus viscidiflorus (yellow rabbitbrush)	Ephedra viridis[p] (mormon tea)	Eriogonum microthecum[p] (slender buckwheat)	Grayia spinosa (spiny hopsage)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma[t] (Utah juniper)	Opuntia (pricklypear)	Pediocactus simpsonii (mountain ball cactus)
year	Line Intercept Cover (%)											
2014	3.3	7.7	0.6	-	-	-	0.2	-	1.2	0.1	-	-
2019	4	9.6	0.9	-	0.1	-	0.7	-	1.3	0.1	-	-
year	Quadrat Cover (%)											
2014	2.7	8.5	0.7	0.0	-	0.0	0.2	0.0	0.5	0.0	0.1	0.0
2019	4.2	11.1	0.6	0.0	0.0	-	0.9	-	1.6	0.0	0.1	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16C-46.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia bigelovii[p] -- (Bigelow sage)									
2014	2140	40	4	95	1	58	22	2	15/40
2019	3260	100	2	98	1	25	25	1	19/33
Artemisia nova[p] -- (black sagebrush)									
2014	5640	40	4	74	22	21	72	24	15/52
2019	4380	-	6	88	6	24	54	6	18/48
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
2014	40	-	0	100	0	100	0	0	- / -
2019	-	-	-	-	-	-	-	-	-/-
Atriplex confertifolia[p] -- (shadscale saltbush)									
2014	380	-	11	90	0	21	5	0	18/45
2019	300	-	0	87	13	0	7	13	23/46

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Chrysothamnus depressus[p] -- (longflower rabbitbrush)									
2014	100	-	40	60	0	0	100	0	9/17
2019	120	-	0	100	0	83	0	0	11/11
Chrysothamnus viscidiflorus -- (yellow rabbitbrush)									
2014	40	-	0	50	50	0	0	50	9/12
2019	80	-	0	100	0	0	50	25	12/19
Eriogonum microthecum[p] -- (slender buckwheat)									
2014	1280	-	22	78	0	11	55	6	5/7
2019	2900	-	3	97	1	25	26	1	7/10
Grayia spinosa -- (spiny hopsage)									
2014	460	-	13	87	0	0	22	0	12/21
2019	60	-	0	100	0	33	67	0	16/40
Gutierrezia sarothrae -- (broom snakeweed)									
2014	3040	100	16	84	1	0	0	1	13/16
2019	4080	2220	6	93	1	0	0	1	15/14
Juniperus osteosperma[t] -- (Utah juniper)									
2014	60	-	100	0	0	0	0	0	- / -
2019	80	-	100	0	0	0	0	0	- / -
Opuntia -- (pricklypear)									
2014	40	-	0	100	0	0	0	0	8/45
2019	60	-	0	100	0	0	0	0	13/36
Pinus edulis[t] -- (twoneedle pinyon)									
2014	-	-	-	-	-	-	-	-	-/-
2019	20	-	100	0	0	0	0	0	- / -
Tetradymia canescens -- (spineless horsebrush)									
2014	200	-	0	100	0	0	0	0	15/34

t - Tree Species; p - Preferred Browse; i - Introduced Species

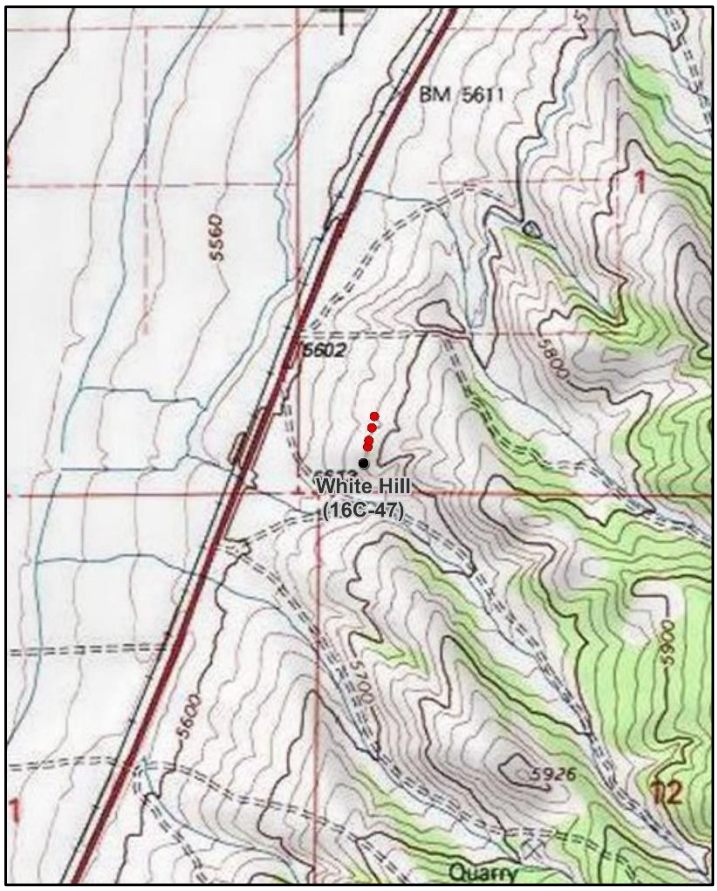
Table 16C-46.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

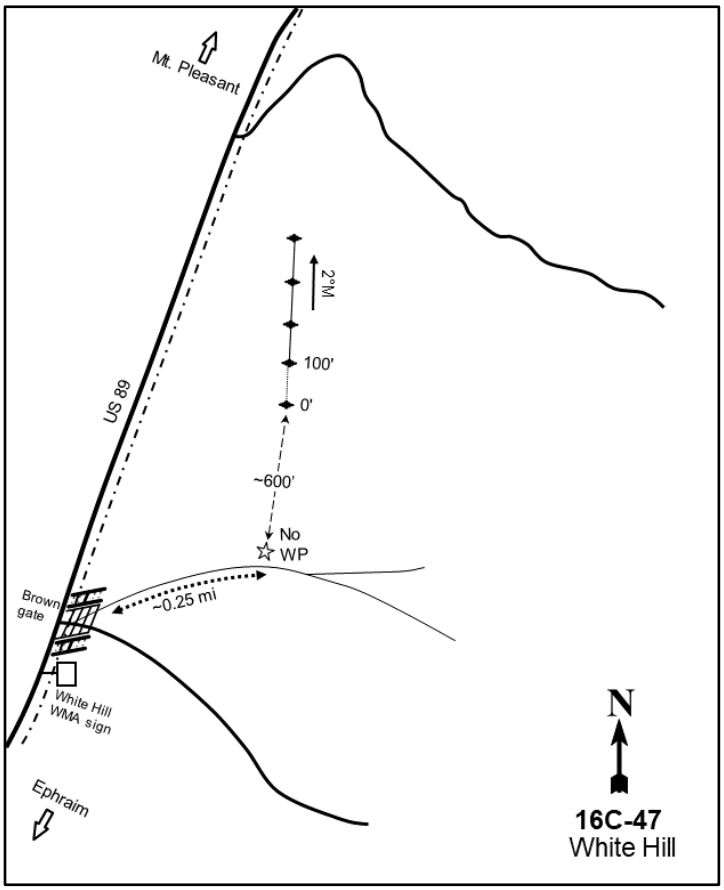
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2014	24	23	62	15	-	-	3.9
2019	31	12	88	-	-	-	3.7
Pinus edulis (twoneedle pinyon)							
2014	7	-	43	57	-	-	5.6
2019	9	38	38	25	-	-	4.8

Table 16C-46.15 – Deer Desirable Components Index: Low Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
2014	14.6	10.6	2.2	5.0	0.0	0.4	0.0	32.9	Fair
2019	18.8	13.5	2.0	8.9	0.0	3.9	0.0	47.1	Good

WHITE HILL - STUDY NO. 16C-47





Location Information

USGS 7.5 min Map Info	Chester NE; Township 16S, Range 3E, Section 01
GPS (0' Stake)	NAD 83 UTM ZONE 12, 453393 East 4366605 North

Transect Information

Browse Tag # (0' Stake)	723
Transect Bearing	2° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

From the Pigeon Hollow Junction, drive north for 1.8 miles to the White Hill WMA sign with a brown gate. Turn right and bear left at the "Y" junction, then proceed for 0.25 miles. Park along the road and cross the bottom of the gulch, then hike north up the hill: the site is past the top of the hill.

Site Information

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	6,320ft (1,926m)
Aspect	Northwest
Slope	1%
Sample Dates	08/08/2019

Wildlife Habitat and Vegetation History

Table 16C-47.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter

Table 16C-47.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2019	Mountain Big Sagebrush/Annual Forb	Phase I

Site Notes

No Notes

Soils

Table 16C-47.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	7.5	37.4	39.4	23.2	2.7	10.3	323.0	0.4	08/08/2019

Site Potential

1981 - 2010 Average Annual Precipitation	13 inches
NRCS Ecological Site	Upland Loam (Mountain Big Sagebrush-Indian Ricegrass)
NRCS Ecological Site #	R047XB308UT
States and Transitions	A defined state and transition model is available.

As of study establishment in 2019, this plant community on this site is a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) stand with a depleted and reduced understory. The perennial grass species present are a mixture of seeded and native species with Indian ricegrass (*Achnatherum hymenoides*) being the dominant species (Table 16C-47.10). Cheatgrass (*Bromus tectorum*) is prevalent on the site and provides a moderate amount of cover (Table 16C-47.10). The dominant annual forbs are the undesirable species desert madwort (*Alyssum desertorum*), pale madwort (*A. alyssoides*) and curveseed butterwort (*Ceratocephala testiculata*) (Table 16C-47.11). Mountain big sagebrush is the dominant browse species and provides a moderate amount of cover. Utah juniper (*Juniperus osteosperma*) is only tree species present, with low density and providing a small amount of cover (Table 16C-47.12, Table 16C-47.13, Table 16C-47.14).

Trend Summary Tables

Table 16C-47.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2019	9.2	0.6	1.5	15.1	0.3	2.4

Table 16C-47.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2019	340	148	476	1	9.7	3.9	24.1	0.0

Table 16C-47.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2019	27.1	6.2	33.3	14.9	1.6	41.9

Table 16C-47.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency		
2019	33	5	40
Year	Days Use Per Acre (ha)		
2019	43.6 (107.6)	3.4 (8.3)	-

Table 16C-47.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bromus tectorum[ai] (cheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Vulpia octoflora[a] (sixweeks fescue)
year	Nested Frequency							
2019	46	11	338	64	4	34	8	7
year	Average Cover (%)							
2019	1.2	1.0	9.7	0.7	0.2	0.5	0.3	0.0

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16C-47.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Allium (onion)	Alyssum alyssoides[ai] (pale madwort)	Alyssum desertorum[ai] (desert madwort)	Arabis (rockcress)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata[ai] (curveseed butterwort)	Descurainia pinnata[a] (western tansymustard)	Erodium cicutarium[ai] (redstem stork's bill)	Lactuca serriola[ai] (prickly lettuce)	Sisymbrium altissimum[ai] (tall tumblemustard)
year	Nested Frequency									
2019	0	186	422	0	1	280	2	92	1	1
year	Average Cover (%)									
2019	0.0	6.0	12.0	0.0	0.0	4.3	0.1	1.6	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16C-47.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus	Juniperus osteosperma[t] (Utah juniper)	Krascheninnikovia lanata[p] (winterfat)
year	Line Intercept Cover (%)			
2019	14.6	0.3	2.4	0.5
year	Quadrat Cover (%)			
2019	9.0	0.6	1.5	0.2

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16C-47.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
2019	1960	-	24	53	24	27	22	24	82/115
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
2019	980	-	16	71	12	0	6	12	30/37
Juniperus osteosperma[t] -- (Utah juniper)									
2019	20	-	0	100	0	0	0	0	- / -
Krascheninnikovia lanata[p] -- (winterfat)									
2019	80	-	0	100	0	0	100	0	36/36
Sarcobatus vermiculatus -- (greasewood)									
2019	-	-	-	-	-	-	-	-	101/145

t - Tree Species; p - Preferred Browse; i - Introduced Species

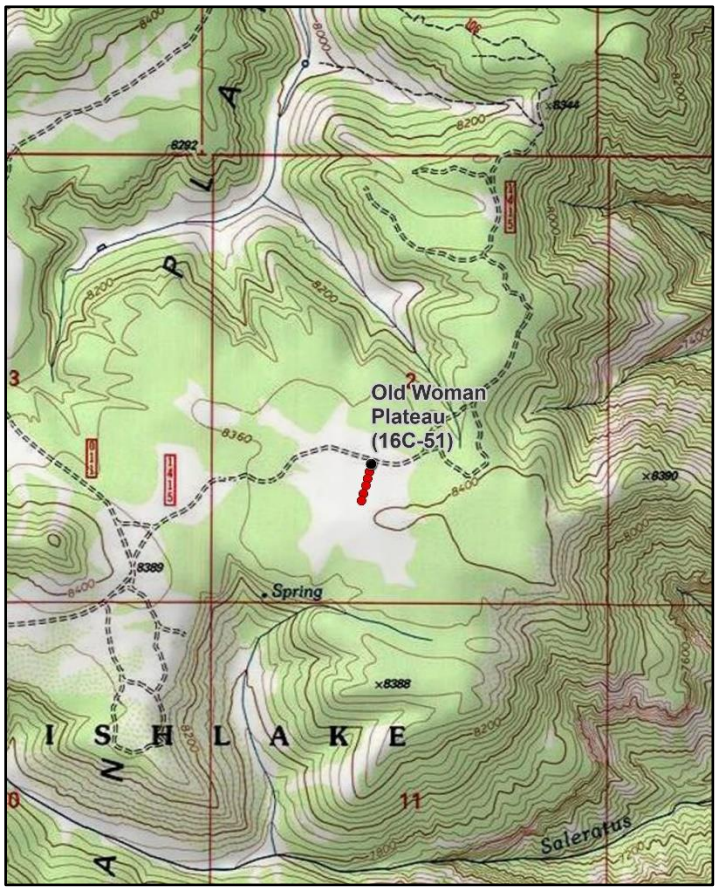
Table 16C-47.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

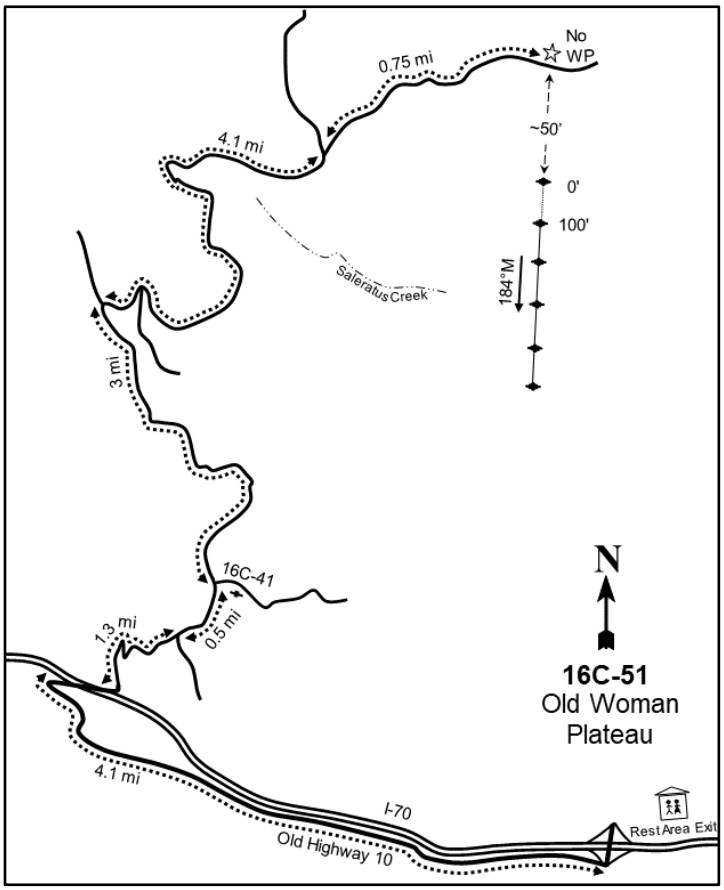
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2019	4	-	-	50	50	-	18.8

Table 16C-47.15 – Deer Desirable Components Index: Mid Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
2019	18.9	8.2	11.4	7.8	-7.3	0.1	0.0	39.0	Poor

OLD WOMAN PLATEAU - STUDY NO. 16C-51





Location Information	
USGS 7.5 min Map Info	Old Woman Plateau NE; Township 23S, Range 4E, Section 02
GPS (0' Stake)	NAD 83 UTM ZONE 12, 462342 East 4298620 North

Transect Information	
Browse Tag # (0' Stake)	Not Available
Transect Bearing	184° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Standard

Directions to Site

From Salina, drive about 37.5 miles east on I-70 to a rest area exit. From the exit, turn right and travel back west on the frontage road paralleling the freeway for 4.1 miles to an intersection. Turn right on Forest Service Road #011 and drive 0.25 miles to cross under the freeway. From the tunnel, proceed 1.85 miles to a "Y" junction. Turn left and proceed on the Broad Hollow-Sheep Valley road for 0.8 miles to another "Y" junction. Proceed left again and drive on FS Road #011 for 2.2 miles to a "Y" junction, then turn right onto FS Road #011 continuing for 2.7 miles to another "Y". Proceed right and go 1.5 miles to a "Y" junction in an opening. Proceed right again onto FS Road #1415 and go 0.8 miles into a sagebrush opening: the site will be in this clearing.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	South Water Hollow Allot
Elevation	8,380ft (2,554m)
Aspect	West
Slope	0-2%
Sample Dates	08/07/2019

Wildlife Habitat and Vegetation History

Table 16C-51.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	substantial	summer
Rocky Mountain Elk	substantial	winter
Shiras Moose	crucial	year-long

Table 16C-51.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2019	Mountain Big Sagebrush/Perennial Grass	No Encroachment

Site Notes

No Notes

Soils

Table 16C-51.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Sandy Loam	6.7	67.4	19.5	13.1	2.6	15.2	305.0	0.3	08/07/2019

Site Potential

1981 - 2010 Average Annual Precipitation	14 inches
NRCS Ecological Site	Mountain Shallow Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XB446UT
States and Transitions	A defined state and transition model is available.

At the time of study establishment in 2019, this site was a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) ecological site with a moderately robust understory. Smooth brome (*Bromus inermis*) was the dominant perennial grass species (Table 16C-51.10). Forbs were moderately diverse with redroot buckwheat (*Eriogonum racemosum*), dusty beardtongue (*Penstemon comarrhenus*), and slender phlox (*Microsteris gracilis*) being the dominant species (Table 16C-51.11). Mountain big sagebrush was the dominant browse species on the site with significant cover also provided by antelope bitterbrush (*Purshia tridentata*) (Table 16C-51.12, Table 16C-51.13). The state and transition model shows that the site is currently in the scattered lower statured mountain big sagebrush/patchy native perennial grasses and forbs Phase within the Mountain Big Sagebrush/Introduced Non-natives State. In addition, the model indicates that with proper livestock and wildlife management, the site will continue in this state in the future.

Trend Summary Tables

Table 16C-51.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
2019	30.3	1.2	-	40.6	2.2	-

Table 16C-51.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
2019	-	397	230	245	-	16.7	2.0	6.0

Table 16C-51.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
2019	28.5	0.2	44.0	1.5	0.1	47.5

Table 16C-51.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Coyote	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency				
2019	16	-	14	38	13
Year	Days Use Per Acre (ha)				
2019	52.3 (129.1)	8.7 (21.5)*	12.1 (29.8)	37.5 (92.7)	-

*Pellets per acre (ha)

Table 16C-51.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bouteloua gracilis (blue grama)	Bromus inermis[i] (smooth brome)	Bromus porteri (Porter brome)	Carex (sedge)	Hesperostipa comata (needle and thread)	Poa fendleriana (muttongrass)	Poa pratensis[i] (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Thinopyrum intermedium[i] (intermediate wheatgrass)
year	Nested Frequency										
2019	3	58	39	217	1	11	10	25	59	89	133
year	Average Cover (%)										
2019	0.0	1.1	0.5	8.8	0.0	0.0	0.3	0.5	0.7	2.0	2.7

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16C-51.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Androsace septentrionalis[a] (pygmyflower rockjasmine)	Antennaria (pussytoes)	Antennaria microphylla (littleleaf pussytoes)	Arabis (rockcress)	Artemisia carruthii (Carruth's sagewort)	Astragalus (milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus miser (timber milkvetch)	Astragalus newberryi (Newberry's milkvetch)	Calochortus nuttallii (sego lily)	Chenopodium leptophyllum[a] (narrowleaf goosefoot)	Collinsia parviflora[a] (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)	Crepis acuminata (tapertip hawksbeard)	Erigeron eatonii (Eaton's fleabane)	Erigeron pumilus (shaggy fleabane)	Eriogonum racemosum (redroot buckwheat)
year	Nested Frequency																
2019	12	6	11	81	2	0	7	9	1	6	11	19	3	20	26	10	80
year	Average Cover (%)																
2019	0.0	0.1	0.4	0.5	0.0	0.0	0.2	0.1	0.0	0.0	0.0	0.2	0.0	0.1	0.4	0.1	1.3

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Eriogonum umbellatum (sulphur-flower buckwheat)	Gayophytum ramosissimum[a] (pinyon groundsmoke)	Hymenoxys richardsonii (pingue rubberweed)	Ipomopsis aggregata (scarlet gilia)	Lappula occidentalis[a] (flatspine stickseed)	Linum lewisii (Lewis flax)	Lupinus argenteus (silvery lupine)	Machaeranthera canescens (hoary tansyaster)	Microsteris gracilis[a] (slender phlox)	Packera multilobata (lobeleaf groundsel)	Penstemon comarrhenus (dusty beardtongue)	Polygonum douglasii[a] (Douglas' knotweed)	Potentilla gracilis (slender cinquefoil)	Taraxacum officinale (common dandelion)	Tragopogon dubius[ai] (yellow salsify)
year	Nested Frequency														
2019	6	33	4	3	2	5	7	2	196	24	71	71	3	16	4
year	Average Cover (%)														
2019	0.2	0.1	0.2	0.0	0.0	0.1	0.8	0.0	1.4	0.2	1.2	0.2	0.0	0.0	0.0

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16C-51.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus	Gutierrezia sarothrae (broom snakeweed)	Purshia tridentata[p] (antelope bitterbrush)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)					
2019	33.8	1	0.6	-	6.8	0.6
year	Quadrat Cover (%)					
2019	24.9	0.5	0.7	0.0	5.3	0.1

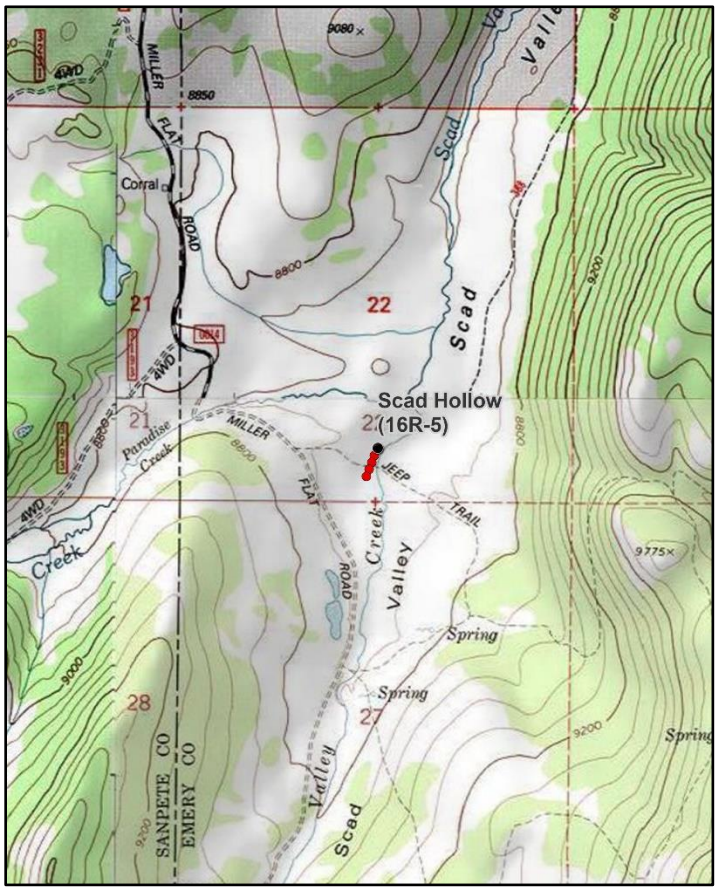
t - Tree Species; p - Preferred Browse; i - Introduced Species

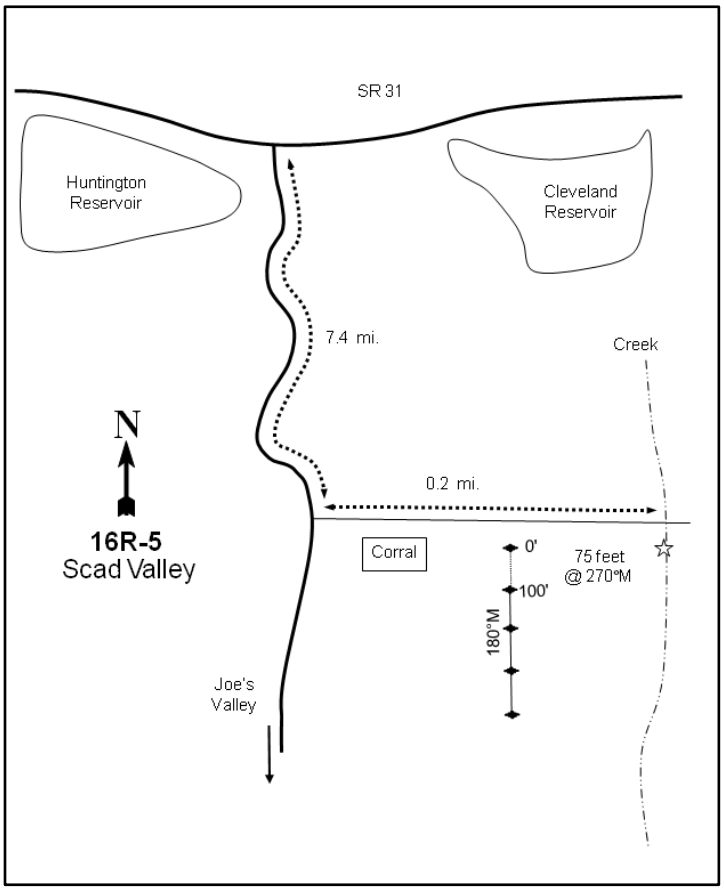
Table 16C-51.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Amelanchier utahensis[p] -- (Utah serviceberry)									
2019	20	-	0	100	0	100	0	0	81/84
Artemisia frigida[p] -- (prairie sagewort)									
2019	100	-	0	100	0	0	0	0	23/19
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
2019	24040	60	5	93	2	19	15	2	36/53
Cercocarpus ledifolius[p] -- (curl-leaf mountain mahogany)									
2019	-	-	-	-	-	-	-	-	192/125
Chrysothamnus depressus[p] -- (longflower rabbitbrush)									
2019	-	-	-	-	-	-	-	-	17/29
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
2019	360	-	6	94	0	0	0	0	20/36
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
2019	1080	-	0	100	0	0	0	0	30/52
Gutierrezia sarothrae -- (broom snakeweed)									
2019	60	-	33	67	0	0	0	0	17/20
Purshia tridentata[p] -- (antelope bitterbrush)									
2019	1040	140	17	83	0	19	33	2	49/113
Rosa woodsii[p] -- (Woods' rose)									
2019	-	-	-	-	-	-	-	-	19/17
Symphoricarpos oreophilus[p] -- (mountain snowberry)									
2019	-	-	-	-	-	-	-	-	58/127
Tetradymia canescens -- (spineless horsebrush)									
2019	60	-	0	100	0	0	0	0	38/61

t - Tree Species; p - Preferred Browse; i - Introduced Species

SCAD HOLLOW - STUDY NO. 16R-5





Location Information

USGS 7.5 min Map Info	Rilda Canyon NW; Township 15S, Range 6E, Section 22
GPS (0' Stake)	NAD 83 UTM ZONE 12, 479508 East 4372085 North

Transect Information

Browse Tag # (0' Stake)	Not Available
Transect Bearing	190° magnetic
Length	400ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Belt Marker Placement	Standard

Directions to Site

Turn south between Huntington and Cleveland Reservoirs from State Route 31 and travel 7.4 miles toward Joe's Valley. There will be a twin track on the left-hand side of the road: turn onto this and drive 0.2 miles to the creek. Walk 75 feet west of the creek to the beginning of the frequency baseline. The 0-foot stake is not marked with a browse tag.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	HORSE CREEK
Elevation	8,680ft (2,646m)
Aspect	Southeast
Slope	1%
Sample Dates	08/21/1998, 07/22/2004, 08/03/2009, 07/17/2014, 08/06/2019

Wildlife Habitat and Vegetation History

Table 16R-05.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	summer	
Rocky Mountain Elk	crucial	summer	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing
Shiras Moose	crucial	year-long	

Table 16R-05.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1998	Perennial Grass-Forb	No Encroachment
2004	Perennial Grass-Forb	No Encroachment
2009	Perennial Grass-Forb	No Encroachment
2014	Perennial Grass-Forb	No Encroachment
2019	Perennial Grass-Forb/Silver Sagebrush	No Encroachment

Site Notes

Sheep were observed on the site in 2014.

Soils

Table 16R-05.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	6.3	44.7	28.7	26.6	5.1	5.9	3.2	0.5	08/21/1998

Site Potential

1981 - 2010 Average Annual Precipitation	28 inches
NRCS Ecological Site	High Mountain Loam (Silver Sagebrush)
NRCS Ecological Site #	R047XA517UT
States and Transitions	A defined state and transition model is available.

Since study establishment in 1998, this site has been in a perennial grass-forb state with lesser amounts of silver sagebrush (*Artemisia cana*). The understory is dominated by a mixture of native and introduced grasses and forbs. Kentucky bluegrass (*Poa pratensis*) is the dominant grass species with sedge (*Carex sp.*) and tufted hairgrass (*Deschampsia cespitosa*) as sub-dominant components of the understory. Forbs are diverse and abundant with slender cinquefoil (*Potentilla gracilis*) as the dominant species. Perennial grasses and forbs have shown increases in cover over time. Shrubs are dominated by silver sagebrush. Silver sagebrush is a co-dominant site component as of 2019, and increases in cover and density have been observed in most years (Table 16R-05.12, Table 16R-05.13).

Trend Summary Tables

Table 16R-05.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1998	3.7	-	-	-	-	-
2004	2.5	-	-	6.1	-	-
2009	6.3	0.0	-	9.6	-	-
2014	8.4	0.0	-	10.2	-	-
2019	10.2	0.0	-	16.4	-	-

Table 16R-05.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1998	-	457	159	431	-	24.2	6.7	32.6
2004	-	453	114	408	-	27.4	5.9	34.9
2009	2	455	174	415	0.0	28.4	7.7	33.5
2014	-	475	103	436	-	46.0	5.1	41.2
2019	-	468	112	432	-	40.0	5.0	42.4

Table 16R-05.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1998	7.7	6.6	2.6	0.0	-	81.3
2004	21.5	4.9	7.3	0.0	0.0	72.5
2009	21.4	0.4	14.4	0.0	0.0	68.2
2014	10.8	0.5	27.8	-	0.0	85.8
2019	14.9	2.1	11.1	0.0	0.0	80.0

Table 16R-05.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Cattle	Mule Deer/Domestic Sheep	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
1998	-	6	-	-	-
2004	1	10	-	-	-
2009	-	2	-	2	-
2014	-	19	-	-	1
2019	7	8	-	-	-
Year	Days Use Per Acre (ha)				
1998	-	-	-	-	-
2004	-	32.8 (81.1)	-	-	-
2009	-	18.7 (46.3)	2.0 (5.0)	4.0 (10.0)	-
2014	-	142.8 (352.6)	-	-	-
2019	4.4 (10.8)	17.4 (43.0)	-	-	-

Table 16R-05.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Achnatherum nelsonii (Columbia needlegrass)	Bromus tectorum[ai] (cheatgrass)	Carex (sedge)	Deschampsia cespitosa (tufted hairgrass)	Elymus trachycaulus (slender wheatgrass)	Festuca idahoensis (Idaho fescue)	Hordeum brachyantherum (meadow barley)	Juncus arcticus (arctic rush)	Koeleria macrantha (prairie Junegrass)	Muhlenbergia montana (mountain muhly)	Phleum alpinum (alpine timothy)	Phleum pratense[i] (timothy)	Poa pratensis[i] (Kentucky bluegrass)	Trisetum wolfii (Wolf's trisetum)
year	Nested Frequency														
1998	-	10	-	140	114	11	19	-	109	-	8	-	16	389	-
2004	-	7	-	77	80	13	3	5	105	-	-	6	3	425	-
2009	-	38	2	179	83	42	33	6	135	3	9	-	-	370	-
2014	4	15	-	146	149	93	91	9	85	-	22	2	-	423	32
2019	36	38	-	71	46	15	49	-	203	9	2	-	14	424	9
year	Average Cover (%)														
1998	-	0.1	-	3.3	0.9	0.1	2.0	-	1.2	-	0.3	-	0.1	16.2	-
2004	-	0.2	-	3.3	2.7	0.2	0.0	0.2	2.9	-	-	0.1	0.0	17.9	-
2009	-	0.7	0.0	6.6	2.1	0.4	0.5	0.0	2.6	0.0	0.1	-	-	15.4	-
2014	0.2	0.3	-	7.1	7.7	2.2	2.8	0.2	1.2	-	0.1	0.0	-	23.6	0.6
2019	0.8	1.7	-	1.9	1.2	0.3	1.1	-	3.7	0.2	0.0	-	0.8	28.3	0.1

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16R-05.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris (agoseris)	Ambrosia[a] (ragweed)	Androsace septentrionalis[a] (pygmyflower rockjasmine)	Antennaria microphylla (littleleaf pussytoes)	Arabis (rockcress)	Cirsium scariosum[a] (meadow thistle)	Epilobium ciliatum ssp. glandulosum (fringed willowherb)	Equisetum (horsetail)	Erigeron pumilus (shaggy fleabane)	Erigeron ursinus (Bear River fleabane)	Fragaria virginiana (Virginia strawberry)	Hymenoxys hoopesii (owl's-claws)	Leucocrinum montanum (common starlily)	Penstemon (beardtongue)	Polygonum douglasii[a] (Douglas' knotweed)	Polygonum polygaloides ssp. kelloggii[a] (Kellogg's knotweed)
year	Nested Frequency																
1998	254	-	-	-	11	-	159	-	-	-	-	-	90	-	-	-	-
2004	225	94	-	-	11	3	110	-	-	1	-	5	73	-	-	4	-
2009	235	108	-	-	14	-	169	-	-	11	26	87	90	-	-	5	-
2014	286	-	-	4	21	12	89	-	-	-	15	22	80	1	-	6	-
2019	194	43	3	3	20	-	90	2	1	-	13	3	119	-	3	2	16
year	Average Cover (%)																
1998	3.1	-	-	-	0.6	-	6.7	-	-	-	-	-	5.2	-	-	-	-
2004	3.6	2.6	-	-	0.3	0.0	5.9	-	-	0.0	-	0.1	2.8	-	-	0.0	-
2009	3.5	6.0	-	-	0.2	-	7.7	-	-	0.2	0.7	3.0	2.1	-	-	0.0	-
2014	8.5	-	-	0.0	1.0	0.0	5.1	-	-	-	0.2	1.6	4.4	0.0	-	0.0	-
2019	1.8	0.2	0.0	0.0	0.7	-	4.8	0.0	0.0	-	0.0	0.0	5.1	-	0.0	0.0	0.1

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Potentilla gracilis (slender cinquefoil)	Potentilla pensylvanica (Pennsylvania cinquefoil)	Prunella vulgaris (common selfheal)	Pyrrocoma uniflora (plantain goldenweed)	Ranunculus acriformis (sharpleaf buttercup)	Ranunculus inamoenus (graceful buttercup)	Senecio integerrimus[a] (lambstongue ragwort)	Symphyotrichum ascendens (western aster)	Taraxacum officinale (common dandelion)	Trifolium (clover)	Viola (violet)
year	Nested Frequency										
1998	-	210	-	-	-	-	-	181	307	97	-
2004	52	200	-	-	-	-	-	196	236	91	-
2009	-	197	-	-	-	-	-	84	225	95	2
2014	277	6	1	75	-	6	5	171	206	177	6
2019	277	-	60	17	6	6	2	114	228	242	30
year	Average Cover (%)										
1998	-	11.3	-	-	-	-	-	3.4	7.9	1.1	-
2004	1.7	11.2	-	-	-	-	-	5.2	6.7	0.8	-
2009	-	10.1	-	-	-	-	-	1.4	5.8	0.4	0.0
2014	15.6	0.2	0.0	0.7	-	0.0	0.0	3.1	4.1	1.7	0.1
2019	17.0	-	0.7	0.3	0.0	0.0	0.1	1.6	7.3	7.2	0.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16R-05.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia cana[p] (silver sagebrush)	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)
year	Line Intercept Cover (%)		
1998	-	-	-
2004	6.1	-	-
2009	9.4	0.2	-
2014	10.2	-	-
2019	15.7	0.7	-
year	Quadrat Cover (%)		
1998	3.7	-	-
2004	2.5	-	-
2009	6.3	0.0	0.0
2014	8.3	0.1	0.0
2019	9.4	0.8	0.0

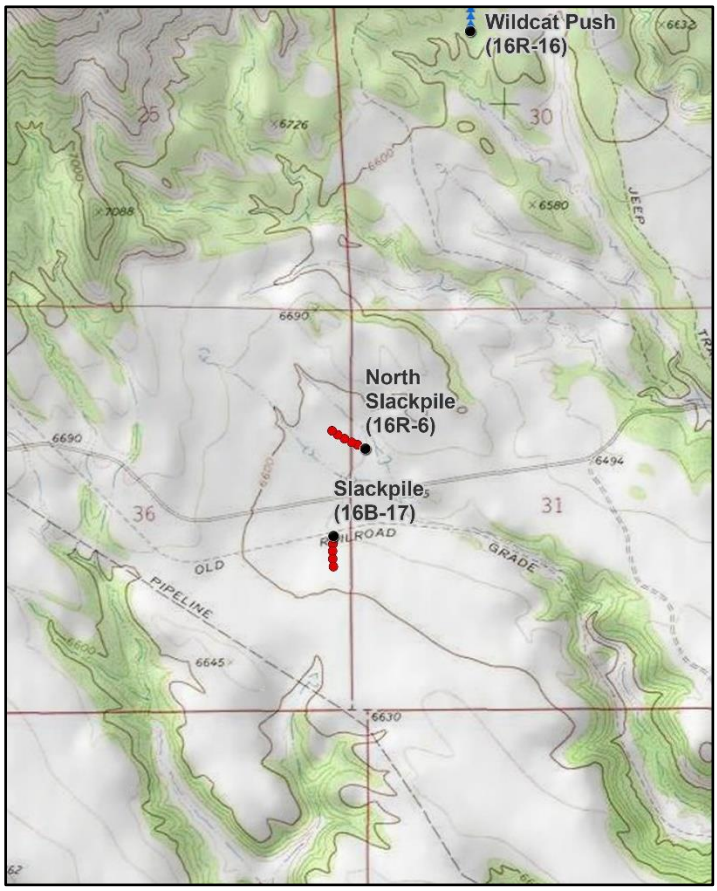
t - Tree Species; p - Preferred Browse; i - Introduced Species

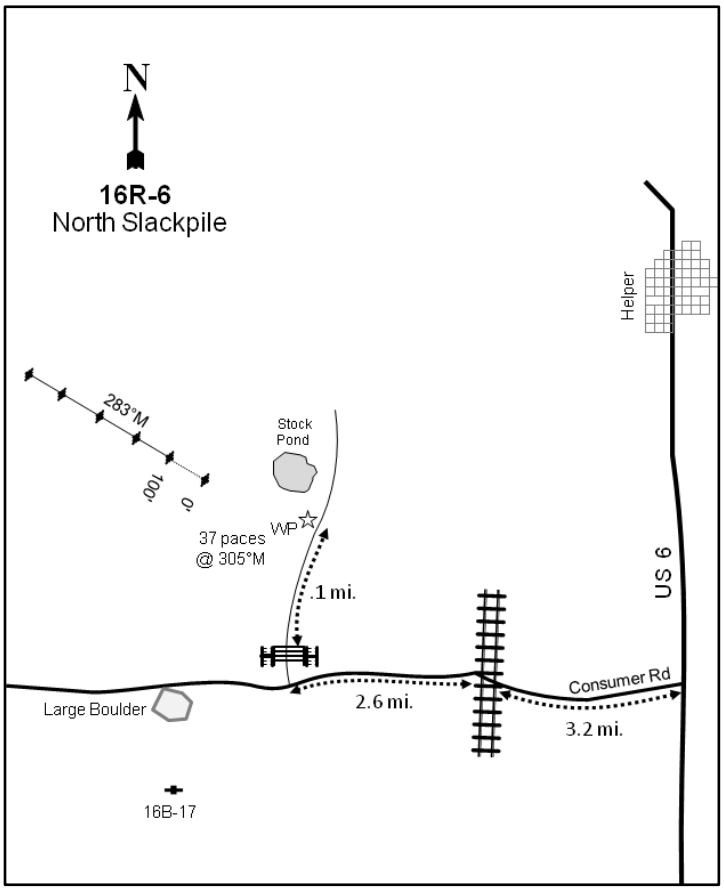
Table 16R-05.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Artemisia cana[p] -- (silver sagebrush)									
1998	2980	820	44	56	0	0	0	0	33/40
2004	4300	-	10	87	3	3	0	0	32/51
2009	5720	20	2	84	14	5	0	6	37/50
2014	5440	500	29	70	2	1	0	2	34/56
2019	7700	580	10	84	6	6	0	5	36/39
Artemisia tridentata ssp. vaseyana[p] -- (mountain big sagebrush)									
1998	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	40/87
2009	20	-	0	100	0	0	0	0	38/59
2014	20	-	0	100	0	100	0	0	39/69
2019	60	-	0	100	0	0	0	0	57/100
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1998	-	-	-	-	-	-	-	-	-/-
2004	20	-	0	100	0	0	0	0	- / -
2009	60	-	0	100	0	0	0	0	23/29
2014	60	-	0	100	0	0	0	0	17/10
2019	40	-	0	100	0	0	0	0	25/26
Dasiphora fruticosa -- (shrubby cinquefoil)									
1998	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	30/104
2009	-	-	-	-	-	-	-	-	29/72
2014	-	-	-	-	-	-	-	-	34/105
2019	-	-	-	-	-	-	-	-	36/72

t - Tree Species; p - Preferred Browse; i - Introduced Species

NORTH SLACKPILE - STUDY NO. 16R-6





Location Information

USGS 7.5 min Map Info	Standardville SW; Township 13S, Range 9E, Section 31
GPS (0' Stake)	NAD 83 UTM ZONE 12, 502958 East 4389352 North

Transect Information

Browse Tag # (0' Stake)	453
Transect Bearing	283° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Belt 2, 4: No Rebar

Directions to Site

On US-6 south of Helper, turn west onto Consumer Road. Proceed west 3.2 miles to railroad tracks. Cross the tracks and continue 2.6 miles to a road on the right (north) with a gate. Go through the gate and travel 0.1 miles to a witness post on the left-hand (west) side of the road, just before a stock pond. Walk 37 paces at 305 degrees magnetic to the start of the frequency baseline; the first stake is marked with browse tag #453.

Site Information

Land Ownership	State
Land Administrator	UDWR
Allotment	GORDON CRK WITHDRAWL
Elevation	6,620ft (2,018m)
Aspect	Southeast
Slope	3-5%
Sample Dates	08/24/1998, 05/25/2004, 08/27/2009, 07/22/2014, 05/28/2019

Table 16R-06.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Mechanical - Roller Chopper	Gordon Creek Roller Chopper	513	October 2006	199

Wildlife Habitat and Vegetation History

Table 16R-06.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter
Greater Sage-Grouse	occupied	year-long

Table 16R-06.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1998	Mountain Big Sagebrush	Phase I
2004	Perennial Grass	Phase I
2009	Perennial Grass	Phase I
2014	Perennial Grass	Phase I
2019	Mountain Big Sagebrush	Phase I

Site Notes

A stock pond is located about 150 feet from the zero stake of the transect. Due to the rotation of cattle from year to year and the close proximity of water, it is likely that the site experiences variable use depending on the synchrony of the range trend visits and pasture rotations.

Soils

Table 16R-06.5 - Soil Analysis Data. List of chemical and textural soil characteristics determined by laboratory analysis.

Texture	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m	Sample Date
Loam	6.4	40.7	34.7	24.6	1.2	9.7	83.2	1.0	08/24/1998

Site Potential

1981 - 2010 Average Annual Precipitation	13 inches
NRCS Ecological Site	Upland Loam (Mountain Big Sagebrush-Indian Ricegrass)
NRCS Ecological Site #	R047XB308UT
States and Transitions	A defined state and transition model is available.

The plant community on this site existed as a stand of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) upon study establishment in 1998. In 2004, both sagebrush cover and density exhibited a significant decrease, likely due to drought. The native perennial grass species blue grama (*Bouteloua gracilis*) has consistently provided the most cover in the herbaceous understory; the study site shifted to one dominated by perennial grasses and remained in that state from 2004 to 2014 (Table 16R-06.7, Table 16R-06.10). However, sagebrush has increased in the years following the drought, and in 2019 the study transitioned to a sagebrush-dominated state (Table 16R-06.12, Table 16R-06.13). Utah juniper (*Juniperus osteosperma*) and/or twoneedle pinyon (*Pinus edulis*) have been observed in all sample years, and the study site has been considered to be within Phase I of woodland succession (Table 16R-06.4, Table 16R-06.14, Photos). Further encroachment may be possible, but the consistently low tree density over time suggests this is not an immediate concern. This study site will likely remain in the current state (or one similar) in the future without further tree encroachment, a shrub-removing disturbance, or changes in management.

Trend Summary Tables

Table 16R-06.6 - Shrub/Tree Summary. Average modified Daubenmire quadrat and line intercept cover by year for shrubs/trees

Year	Quadrat Cover (%)			Line-intercept Cover (%)		
	Preferred Shrub	Other Shrub	Tree	Preferred Shrub	Other Shrub	Tree
1998	13.7	5.3	-	-	-	-
2004	3.6	1.1	-	2.8	0.8	-
2009	6.5	2.8	-	5.8	3.3	-
2014	6.7	1.5	-	5.9	1.6	-
2019	14.6	5.8	-	17.5	5.1	-

Table 16R-06.7 - Herbaceous Summary. Nested frequency and average modified Daubenmire quadrat cover by year for herbaceous functional groups

Year	Nested Frequency				Quadrat Cover (%)			
	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb	Annual Grass	Perennial Grass	Annual/Biennial Forb	Perennial Forb
1998	-	384	-	114	-	11.9	-	0.6
2004	-	277	100	144	-	12.0	0.7	3.0
2009	2	346	32	140	0.0	23.5	0.2	2.5
2014	-	373	244	123	-	23.5	1.8	0.7
2019	-	352	382	200	-	12.9	7.7	1.7

Table 16R-06.8 - Basic Ground Cover. Average modified Daubenmire quadrat cover by year for basic ground cover types.

Year	Cover Type (%)					
	Bare Ground	Cryptogams	Litter	Pavement	Rock	Vegetation
1998	49.7	5.5	13.5	0.4	0.4	34.2
2004	51.8	2.0	23.6	0.8	0.4	19.3
2009	40.9	0.4	35.2	0.2	0.1	38.4
2014	47.6	0.6	26.3	0.4	0.5	32.8
2019	47.3	3.1	33.2	1.1	0.7	34.9

Table 16R-06.9 - Pellet Group Data. Quadrat frequency and pellet group transect data for animal pellets. Rabbit pellet groups are not sampled in the pellet group transect.

Year	Pronghorn	Cattle	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency					
1998	1	4	41	3	-	15
2004	-	1	35	3	-	22
2009	-	-	17	9	-	17
2014	-	1	37	2	-	26
2019	-	3	54	-	-	57
Year	Days Use Per Acre (ha)					
1998	-	-	-	-	-	-
2004	-	2.9 (7.2)	42.2 (104.3)	2.0 (5.0)	-	-
2009	-	2.9 (7.2)	27.5 (67.9)	2.0 (5.0)	0.6 (1.4)	-
2014	-	3.6 (9.0)	3.4 (8.3)	40.2 (99.3)	-	-
2019	-	2.2 (5.4)	49.6 (122.5)	8.1 (19.9)	-	-

Table 16R-06.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum[i] (crested wheatgrass)	Bouteloua gracilis (blue grama)	Bromus tectorum[ai] (cheatgrass)	Elymus elymoides (squirreltail)	Hesperostipa comata (needle and thread)	Leymus salinus (saline wildrye)	Pascopyrum smithii (western wheatgrass)	Psathyrostachys juncea[i] (Russian wildrye)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency									
1998	5	-	301	-	37	10	-	148	-	5
2004	11	-	240	-	28	29	2	9	-	22
2009	33	20	287	2	68	27	-	16	10	22
2014	8	12	317	-	72	10	-	17	1	20
2019	16	31	299	-	32	18	-	21	16	23
year	Average Cover (%)									
1998	0.0	-	10.0	-	0.3	0.1	-	1.3	-	0.0
2004	0.1	-	10.4	-	0.6	0.5	0.1	0.2	-	0.1
2009	0.6	0.3	18.6	0.0	1.3	1.1	-	0.2	0.1	1.3
2014	0.3	0.1	21.2	-	1.0	0.3	-	0.2	0.0	0.3
2019	0.3	0.6	10.5	-	0.4	0.3	-	0.1	0.4	0.3

a - Annual; n - Noxious Weed; i - Introduced Species

Table 16R-06.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Alyssum desertorum[ai] (desert madwort)	Ambrosia psilostachya (Cuman ragweed)	Arabis (rockcress)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata[ai] (curveseed butterwort)	Chenopodium fremontii[a] (Fremont's goosefoot)	Chenopodium leptophyllum[a] (narrowleaf goosefoot)	Cryptantha (cryptantha)	Cymopterus (springparsley)	Descurainia pinnata[a] (western tansymustard)	Gayophytum ramosissimum[a] (pinyon groundsmoke)	Lactuca serriola[ai] (prickly lettuce)	Lappula occidentalis[a] (flatspine stickseed)	Lomatium (desertparsley)	Lygodesmia grandiflora (largeflower skeletonplant)	Phlox longifolia (longleaf phlox)	Plantago patagonica[a] (woolly plantain)
year	Nested Frequency																
1998	-	-	0	-	-	-	-	-	-	-	-	-	-	-	-	40	-
2004	-	-	-	33	19	0	67	-	-	9	5	-	3	2	4	48	12
2009	2	-	-	-	16	-	6	-	-	3	-	-	2	-	-	8	9
2014	1	2	-	-	-	-	-	1	-	33	-	-	42	-	-	-	227
2019	3	-	-	69	185	1	120	12	7	245	45	3	127	-	-	67	268
year	Average Cover (%)																
1998	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-	0.1	-
2004	-	-	-	0.1	0.0	0.0	0.4	-	-	0.1	0.0	-	0.0	0.0	0.0	0.2	0.1
2009	0.0	-	-	-	0.1	-	0.0	-	-	0.0	-	-	0.0	-	-	0.0	0.0
2014	0.0	0.1	-	-	-	-	-	0.0	-	0.1	-	-	0.3	-	-	-	1.4
2019	0.0	-	-	0.3	2.1	0.0	0.2	0.0	0.0	2.4	0.1	0.0	0.4	-	-	0.5	2.3

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

FORB SPECIES	Salsola tragus[ai] (prickly Russian thistle)	Schoenocrambe linifolia (flaxleaf plainsmustard)	Sphaeralcea coccinea (scarlet globemallow)	Tragopogon dubius[ai] (yellow salsify)	Trifolium gymnocarpon (hollyleaf clover)
year	Nested Frequency				
1998	-	-	76	-	-
2004	-	2	73	1	19
2009	2	-	137	-	-
2014	-	-	121	-	-
2019	2	3	96	6	18
year	Average Cover (%)				
1998	-	-	0.5	-	-
2004	-	0.0	2.5	0.0	0.1
2009	0.0	-	2.5	-	-
2014	-	-	0.6	-	-
2019	0.0	0.0	0.7	0.0	0.2

a - Annual/Biennial; n - Noxious Weed; i - Introduced Species

Table 16R-06.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia tridentata ssp. vaseyana[p] (mountain big sagebrush)	Atriplex canescens[p] (fourwing saltbush)	Bassia prostrata[pi] (forage kochia)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Krascheninnikovia lanata[p] (winterfat)	Opuntia polyacantha (plains pricklypear)	Pediocactus simpsonii (mountain ball cactus)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)								
1998	-	-	-	-	-	-	-	-	-
2004	2.1	0.7	-	0.1	0.5	-	-	0.1	0.1
2009	4.8	0.9	-	0.1	3.2	0.1	0	-	-
2014	5.4	0.4	-	1	0.6	0.1	-	-	-
2019	17.4	0.1	-	0.6	4.3	-	0.2	0	-
year	Quadrat Cover (%)								
1998	13.7	0.0	-	1.1	3.9	-	0.4	-	-
2004	3.0	0.6	-	0.1	0.7	-	0.3	0.0	0.0
2009	6.1	0.3	-	0.2	2.5	0.0	0.0	0.0	0.0
2014	6.5	0.1	0.1	0.9	0.4	0.0	0.2	0.0	-
2019	14.4	0.1	0.0	0.6	4.8	0.0	0.4	0.0	-

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16R-06.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Artemisia tridentata ssp. vaseyana[P] -- (mountain big sagebrush)									
1998	3180	280	26	55	19	48	20	20	69/107
2004	1080	820	6	15	80	33	35	65	49/66
2009	18200	4540	71	27	3	0	0	3	27/30
2014	14560	-	54	42	4	47	33	4	33/46
2019	14200	280	31	68	1	36	47	1	27/41
Atriplex canescens[P] -- (fourwing saltbush)									
1998	20	-	0	100	0	0	100	0	69/115
2004	40	-	0	0	100	100	0	0	60/83
2009	140	-	14	71	14	43	0	14	58/109
2014	140	-	0	100	0	0	43	43	57/81
2019	60	-	0	67	33	0	67	33	28/54
Atriplex confertifolia[P] -- (shadscale saltbush)									
1998	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	52/61
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Bassia prostrata[Pi] -- (forage kochia)									
1998	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	20	-	0	100	0	0	0	0	17/33
2014	280	-	79	21	0	14	7	0	9/21
2019	100	-	0	100	0	0	20	0	10/17
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1998	2360	-	20	79	1	36	47	1	17/29
2004	720	620	11	81	8	0	0	3	15/20
2009	700	-	14	66	20	0	0	69	15/29
2014	3740	2800	64	36	0	62	16	4	13/19
2019	1040	-	31	69	0	31	8	0	15/24
Ericameria nauseosa -- (rubber rabbitbrush)									
1998	60	-	67	33	0	0	0	0	- / -
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	100	-	60	40	0	0	0	0	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
1998	15440	-	3	97	0	0	0	0	24/20
2004	1600	300	10	88	3	8	4	1	15/17
2009	4740	-	2	74	25	6	0	24	20/20
2014	3720	980	16	84	0	1	0	4	12/12
2019	19220	9620	57	43	0	8	0	0	14/17
Krascheninnikovia lanata[P] -- (winterfat)									
1998	-	-	-	-	-	-	-	-	-/-
2004	-	-	-	-	-	-	-	-	-/-
2009	40	-	0	100	0	0	0	0	18/25
2014	40	-	0	100	0	50	0	0	8/12
2019	20	-	0	100	0	0	100	0	14/18

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings						
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)	Moderate (%)	Heavy (%)		
Opuntia polyacantha -- (plains pricklypear)									
1998	220	-	18	73	9	0	0	9	7/13
2004	240	-	17	83	0	0	0	0	9/27
2009	380	20	5	95	0	0	11	26	7/27
2014	240	20	25	67	8	0	0	33	6/22
2019	280	-	14	79	7	0	0	14	9/25
Pediocactus simpsonii -- (mountain ball cactus)									
1998	-	-	-	-	-	-	-	-	-/-
2004	60	-	0	100	0	0	0	0	3/6
2009	80	-	0	100	0	0	0	0	2/6
2014	60	-	0	100	0	0	0	0	6/8
2019	20	-	0	100	0	0	0	0	4/6
Ribes[p] -- (currant)									
1998	220	-	0	100	0	0	0	0	- / -
2004	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2019	-	-	-	-	-	-	-	-	-/-
Tetradymia canescens -- (spineless horsebrush)									
1998	-	-	-	-	-	-	-	-	-/-
2004	20	-	0	100	0	100	0	0	25/26
2009	-	40	0	0	0	0	0	0	- / -

t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16R-06.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2014	1	-	-	100	-	-	15.0
Pinus edulis (twoneedle pinyon)							
2014	6	-	100	-	-	-	2.2
2019	4	-	100	-	-	-	5.0

Table 16R-06.15 – Deer Desirable Components Index: Mid Potential Scale.

Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	**Total Score**	Ranking
1998	17.2	9.4	12.9	23.8	0.0	1.3	0.0	64.5	Fair-Good
2004	3.5	0.0	0.0	24.1	0.0	6.0	0.0	33.6	Very Poor-Poor
2009	7.3	13.7	15.0	30.0	0.0	5.0	0.0	70.9	Good
2014	7.4	13.9	15.0	30.0	0.0	1.4	0.0	67.7	Good
2019	21.9	14.7	15.0	25.9	0.0	3.5	0.0	80.9	Good-Excellent

REFERENCES

PRISM Climate Group, Oregon State University. (n.d.). *1981-2010 Climatology Normals , Created 2013*.

Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. (n.d.). Soil Survey Geographic (SSURGO) Database for all Survey Areas in UT.

Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. (n.d.). U.S. General Soil Map (STATSGO2).

Tausch, R. J., Miller, R. F., Roundy, B. A., & Chambers, J. C. (2009). Piñon and Juniper Field Guide: Asking the Right Questions to Select Appropriate Management Actions. *Circular 1335* , 96. U.S. Geological Survey.

Tiedemann, A. R., & Lopez, C. F. (2004). Assessing soil factors in wildland improvement programs. In S. B. Monsen, R. Stevens, & N. L. Shaw, *Restoring western ranges and wildlands* (Gen. Tech. Rep. RMRS-GTR-136-vol-1 ed., Vol. 1, pp. 39-56). Fort Collins, Colorado: U.S. Department of Agiculture, Forest Dervice, Rocky Mountain Research Station.

USDA-NRCS. (2011, September 15). *Approved ESD Reports*. Retrieved from NRCS Ecological Site Description: https://esis.sc.egov.usda.gov/Welcome/pgReportLocation.aspx?type=ESD

WRI Projects Database. (2019). Retrieved from Utah's Watershed Restoration Initiative: http://wri.utah.gov

APPENDIX A - VEGETATION TYPE

VEGETATION COMMUNITY TYPE CLASSIFICATION--

Vegetation Type Code	Vegetation Community Type Name*	Description
ANN GRASS	Annual Grass	Annual grasses provide the dominant vegetation cover.
PER GRASS	Perennial Grass	Perennial grasses provide the dominant vegetation cover.
ANN-PER GRASS	Annual-Perennial Grass	Mixture of Annual and Perennial grass species provide the dominant vegetation cover.
ANN GRASS-FORB	Annual Grass-Forb	Mixture of Annual grass and forb species provide the dominant vegetation cover.
PER GRASS-FORB	Perennial Grass-Forb	Mixture of Perennial grass and forb species provide the dominant vegetation cover.
ANN FORB	Annual Forb	Annual forbs provide the dominant vegetation cover
PER FORB	Perennial Forb	Perennial forbs provide the dominant vegetation cover
ANN-PER FORB	Annual-Perennial Forb	Mixture of Annual and Perennial forb species provide the dominant vegetation cover.
WEED	Annual-Perennial Weed	Annual and/or Perennial weedy species provide the dominant vegetation cover.
WET MEADOW	Wet Meadow	Riparian vegetation species provide the dominant vegetation cover
DRY MEADOW	Dry Meadow	High elevation subalpine meadow
RIPAR	Riparian	Riparian vegetation species provide the dominant vegetation cover.
ALP GRASS	Alpine Grass	Grass or grass-like species provide the dominant vegetation cover
ALP FORB	Alpine Forb	Forb species provide the dominant vegetation cover
ALP SHRUB	Alpine Shrub	Alpine shrub species provide the dominant vegetation cover
ALP MIX	Alpine-Mixed	Mixture of grass, forb, or shrub species provide the dominant vegetation cover
ARTRT	Basin Big Sagebrush	Major component of the site (typically >5% cover).
ARTRV	Mountain Big Sagebrush	Major component of the site (typically > 5% cover).
ARTRW	Wyoming Big Sagebrush	Major component of the site (typically >5% cover).
ARAR	Low Sagebrush	Major component of the site (typically >5% cover).
ARCA	Silver Sagebrush	Major component of the site (typically >5% cover).
ARNO	Black Sagebrush	Major component of the site (typically >5% cover).
ARSP	Bud Sagebrush	Major component of the site (typically >5% cover).
ARFR	Fringed Sagebrush	Major component of the site (typically >5% cover).
CHNA	Rubber Rabbitbrush	Major component of the site (typically >5% cover).
CHPA	Parry Rabbitbrush	Major component of the site (typically >5% cover).
CHVI	Low Rabbitbrush	Major component of the site (typically >5% cover).
GUSA	Broom Snakeweed	Major component of the site (typically >5% cover).
SAVE	Black Greasewood	Major component of the site (typically >5% cover).
CELA	Winterfat	Major component of the site (typically >5% cover).
ATCO	Shadscale	Major component of the site (typically >5% cover).
ATCA	Fourwing Saltbush	Major component of the site (typically >5% cover).
GRSP	Spiny Hopsage	Major component of the site (typically >5% cover).
MSDS	Mixed Salt Desert Shrub	Mixture of one or more Salt Desert species (ATCO, ATCA, GRSP, etc.) with no one species expressing dominance.
LARRE	Creosote Bush	Major component of the site (typically >5% cover).
CORA	Blackbrush	Major component of the site (typically >5% cover).
PRFA	Desert Almond	Major component of the site (typically >5% cover).
EPHED	Ephedra	Major component of the site (typically >5% cover).
QUGA	Gambel Oak	Major component of the site (typically >5% cover).

Vegetation Type Code	Vegetation Community Type Name*	Description
QUTU	Live Oak	Major component of the site (typically >5% cover).
SYOR	Snowberry	Major component of the site (typically >5% cover).
AMAL	Serviceberry	Major component of the site (typically >5% cover).
PUTR	Bitterbrush	Major component of the site (typically >5% cover).
PUGL	Desert Bitterbrush	Major component of the site (typically >5% cover).
ARCT2	Manzanita	Major component of the site (typically >5% cover).
CEMOM	True Mountain Mahogany	Major component of the site (typically >5% cover).
CELEL	Curlleaf Mountain Mahogany	Major component of the site (typically >5% cover).
COMES	Stansbury Cliffrose	Major component of the site (typically >5% cover).
KOPR	Forage Kochia	Major component of the site (typically >5% cover).
TAMARIX	Tamarix	Major component of the site (typically >5% cover).
MMB	Mixed Mountain Brush	Mixture of one or more Mountain brush species (ARTRV, AMAL, CEMOM, etc.) with no one species expressing dominance.
MB	Mixed Shrub	Mixture of various shrub species with none expressing dominance.
CHAPARRAL	Chaparral	Mixture of fire tolerant shrub species.
JUNIPER	Juniper	Major component of the site (Phase III[1]). No pinyon present.
PINYON	Pinyon	Major component of the site (Phase III[1]). No juniper present.
PJ	Pinyon-Juniper	Major components of the site (Phase III[1]). Pinyon and Juniper present.
POTR	Quaking Aspen	POTR provides the dominant overstory (typically >5% cover).
POTR-CE	Quaking Aspen-Conifer Encroached	Mixture of QUGA and Conifers (conifers typically provide >5% cover).
PIPO	Ponderosa Pine	PIPO provides the dominant overstory (typically >5% cover).
PSMEM	Douglas Fir	Major component of the site (typically >5% cover).
ABCO	White Fir	Major component of the site (typically >5% cover).
PIFL	Limber Pine	Major component of the site (typically >5% cover).
PICO	Lodgepole Pine	Major component of the site (typically >5% cover).
PILO	Bristlecone Pine	Major component of the site (typically >5% cover).
PIEN	Engelmann Spruce	Major component of the site (typically >5% cover).
ABLA	Subalpine Fir	Major component of the site (typically >5% cover).
SUBALP	Subalpine Forest	Mixture of PIEN and ABLA provide the dominant vegetation cover
MIX CON	Mixed Conifer Forest	Mixture of conifer tree species provide the dominant vegetation cover
AG-PAST	Agricultural-Pasture	Active or abandoned agricultural pasture
AG-CL	Agricultural-Cropland	Active or abandoned agricultural cropland

*Vegetation types can be co-dominant on the study site and when more than one vegetation community types are co-dominant and are major components of the site a (/) is used to separate vegetation community types.
[1]Phase of woodland succession