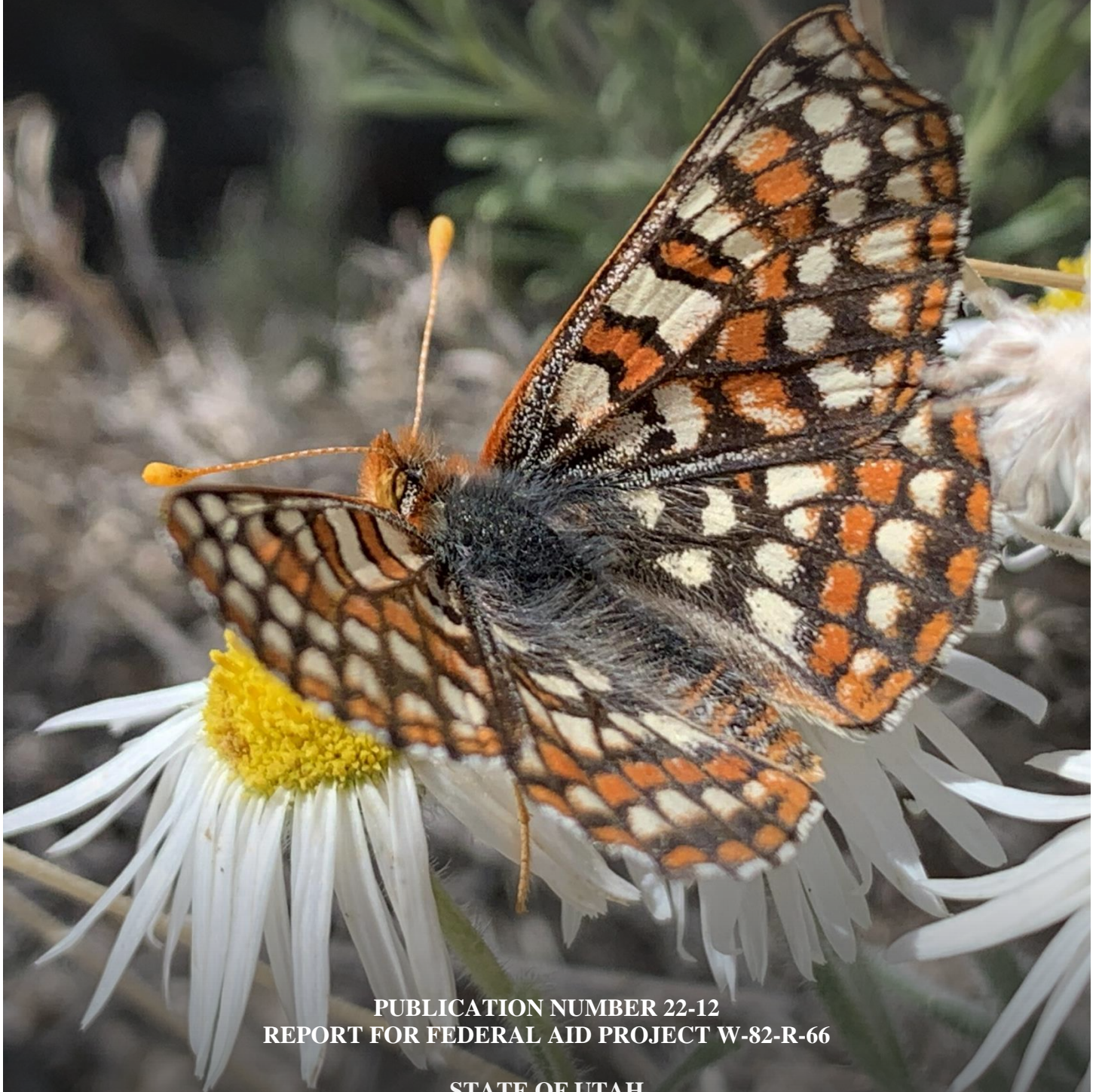


UTAH WATERSHED RESTORATION INITIATIVE VEGETATION MONITORING 2021



PUBLICATION NUMBER 22-12
REPORT FOR FEDERAL AID PROJECT W-82-R-66

STATE OF UTAH
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WILDLIFE RESOURCES

Utah Watershed Restoration Initiative Vegetation Monitoring 2021

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Shaggy Fleabane (*Erigeron pumilus*) and Variable Checkerspot Butterfly (*Euphydryas chalcedona*) by Jason Cox (2021)

Performance Report for Federal Aid Project W-82-R-66

Publication No. 22-12

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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-66

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.

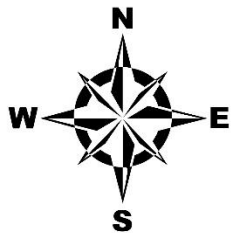
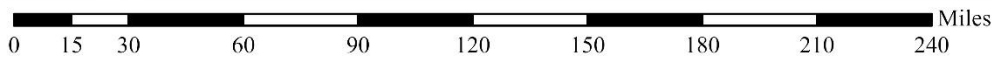
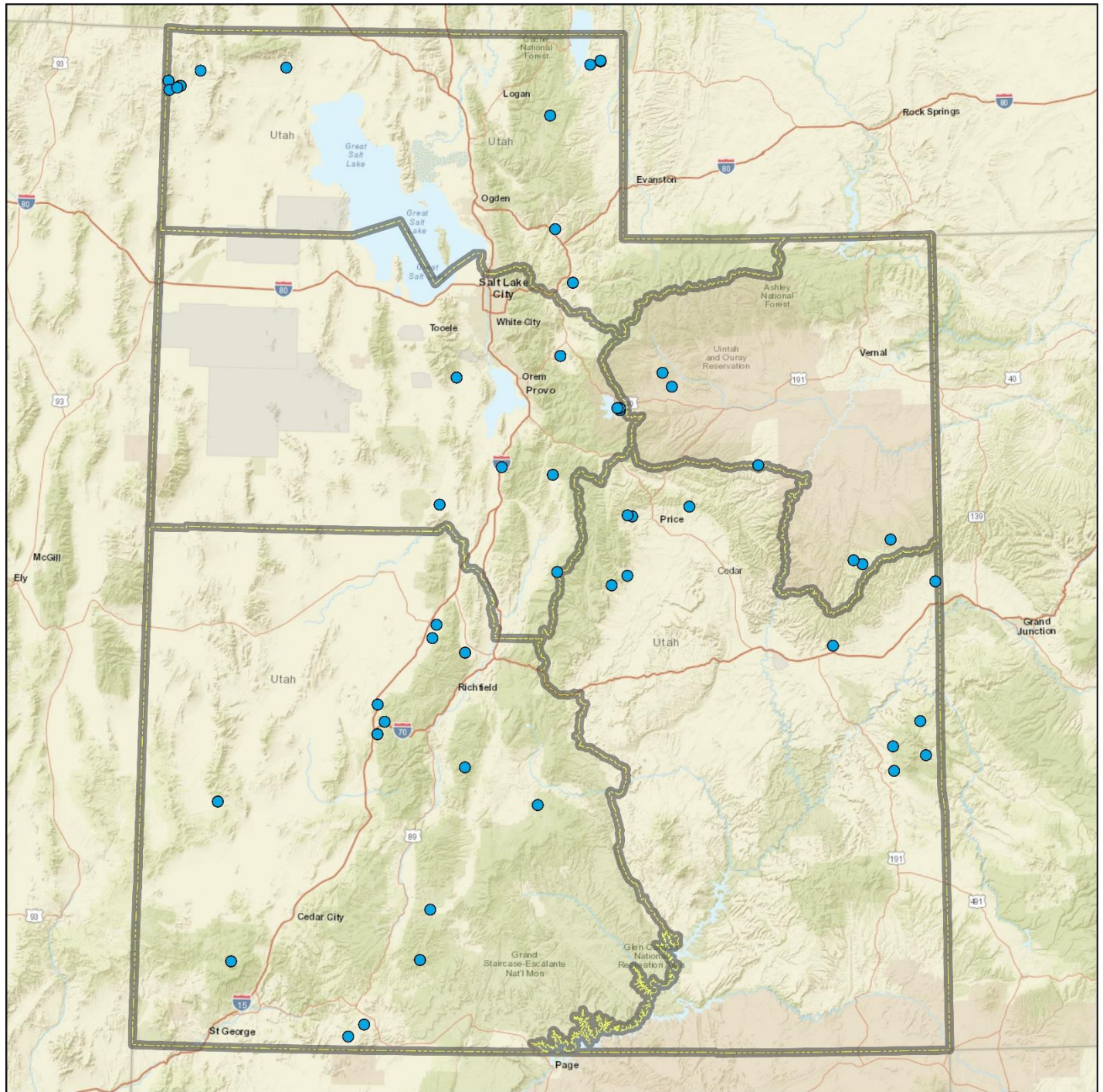
Expected Results or Benefits: Range trend studies in each region will be reread every five years, and vegetation condition and trend assessments will be made for key areas. UDWR biologists, land management personnel from the USFS and BLM, and private landowners will use the range trend database to evaluate 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 2021 field season and reported in this publication is vegetation monitoring data of habitat restoration projects initiated as part of the Watershed Restoration Initiative, which occurred throughout the state of Utah.

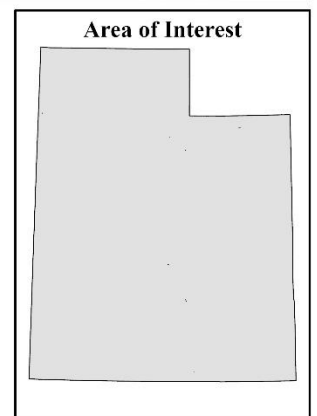
The BLM and USFS offices provided information and/or assistance in completion of the trend studies, which added to the value of this interagency report. Private landowners were cooperative in allowing access to study sites located on their land.

WRI SITES SURVEYED IN 2021



Study Locations

- 2021 WRI Study Sites
- ▭ Region Boundaries



Credits: Esri, HERE, Garmin, NGA, USGS

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 Initiative (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 m² 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.

Total canopy cover of shrubs or trees is also estimated using the line-intercept method (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 et al., 2007).

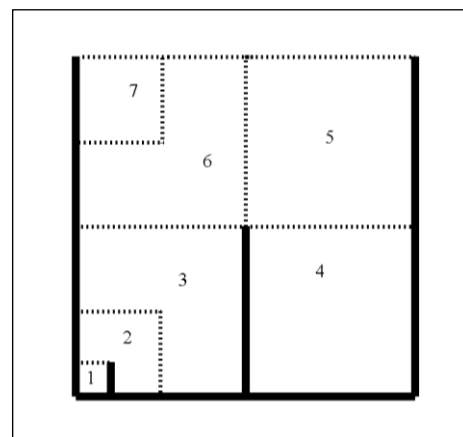


Figure 1 Cover classes of the 1/4 m² sampling quadrat

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).

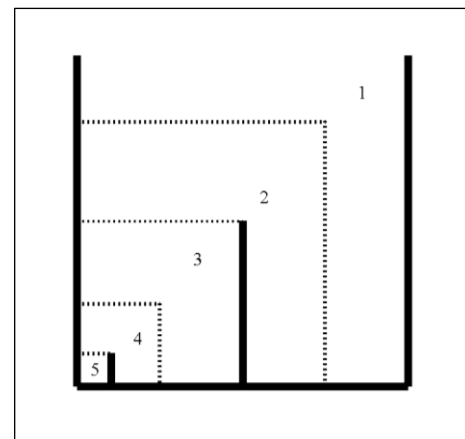


Figure 2 Nested frequency sub-quadrats of the 1/4 m² sampling quadrat.

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 (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 <i>Seedling</i> 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 <i>Young</i> 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 <i>Mature</i> 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 <i>Decadent</i> 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) 100ft² 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 taxonomic 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 descriptions. 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 "Seed Mix." *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 01-11 and 13R-08.

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 its 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 01-11.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	Goose Creek Fire	-	July 2018	132127
Seeding - Aerial Before	Goose Creek Fire Rehabilitation	4758	November 2018	13191
Chaining - One-Way Ely Chaining	Goose Creek Fire Rehabilitation	4758	Between	13191

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 01-11.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Goose Creek Fire Private/SITLA Aerial			Aerial	Nov 2018	5675
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS lbs/acr
G	Achnatherum hymenoides	Indian Ricegrass	Nezpar	0.59	0.50
G	Achnatherum hymenoides	Indian Ricegrass	Nezpar	0.66	0.60
G	Achnatherum hymenoides	Indian Ricegrass	Nezpar	0.41	0.33
G	Achnatherum hymenoides	Indian Ricegrass	Rimrock	0.06	0.05
G	Achnatherum hymenoides	Indian Ricegrass	Rimrock	0.28	0.26
G	Agropyron cristatum	Crested Wheatgrass	Hycrest	1.18	1.08
G	Agropyron cristatum	Crested Wheatgrass	Nordan	0.29	0.24
G	Agropyron cristatum	Crested Wheatgrass	Nordan	0.53	0.50
G	Agropyron fragile	Siberian Wheatgrass	Vavilov	1.34	1.24
G	Agropyron fragile	Siberian Wheatgrass	Vavilov II	0.66	0.56
G	Elymus trachycaulus	Thickspike Wheatgrass	Bannock II	1.00	0.91
G	Elymus wawawaiensis	Snake River Wheatgrass	Discovery	1.52	1.34
G	Elymus wawawaiensis	Snake River Wheatgrass	Secar	0.48	0.44
G	Poa secunda	Sandberg Bluegrass	Vale	0.25	0.23
G	Poa secunda	Nevada Bluegrass	Opportunity	0.25	0.21
G	Psathyrostachys juncea	Russian Wildrye	Bozoisky	0.82	0.73
F	Achillea millefolium	Western Yarrow	Yakima	0.04	0.04
F	Achillea millefolium	Western Yarrow	Eagle	0.03	0.03
F	Medicago sativa	Alfalfa	Ladak DL	2.00	1.94
F	Sanguisorba minor	Small Burnet	Delar	0.63	0.55
F	Sanguisorba minor	Small Burnet	Delar	0.44	0.41
F	Sanguisorba minor	Small Burnet	Delar	0.90	0.75
F	Sanguisorba minor	Small Burnet	Delar	0.53	0.50

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 01-11.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	year-long
Greater Sage-Grouse	occupied	year-long
Pronghorn	substantial	summer

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 its corresponding species listed in the adjacent cell. Most vegetation types will have one dominant species listed: this 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 a subordinate 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 01-11.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
1984	Black Sagebrush	Phase I
1990	Black Sagebrush	Phase I
1996	Black Sagebrush	Phase I
2001	Black Sagebrush	Phase I
2006	Black Sagebrush	Phase I
2011	Black Sagebrush	Phase I
2016	Black Sagebrush	Phase I
2021	Perennial Grass	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 01-11.5 - 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	7.8	42.9	29.1	28.0	1.9	7.0	134.4	0.5	06/04/1996

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 1/4m² 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 01-11.6 - 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
1996	16.1	0.4	1.6	-	-	-
2001	16.1	0.5	1.6	-	-	0.2
2006	14.3	0.6	1.6	15.8	1.5	1.7
2011	13.7	0.7	2.3	14.7	1.2	3.7
2016	12.1	1.3	2.0	17.4	2.9	5.5
2021	4.6	-	-	3.6	0.1	-

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 01-11.7 - 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
1996	392	155	7	58	3.2	1.7	0.0	0.3
2001	450	114	138	23	11.1	1.2	0.4	0.2
2006	427	114	2	17	10.7	4.1	0.0	0.1
2011	275	125	212	36	5.0	2.5	1.7	0.4
2016	318	135	122	51	5.4	4.2	0.4	0.4
2021	387	173	21	146	8.5	11.2	0.2	5.8

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 01-11.8 - 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
1996	6.7	0.1	12.9	37.5	17.6	25.0
2001	10.0	0.0	16.2	35.1	19.1	30.9
2006	22.9	0.4	19.9	21.6	17.9	31.6
2011	16.5	1.1	15.2	30.5	20.4	28.6
2016	9.5	0.0	16.5	48.8	22.5	23.9
2021	6.7	0.2	28.2	30.0	22.4	30.0

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 100ft² 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 01-11.9 - 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	Elk	Horse	Rabbit
	Quadrat Frequency				
1996	-	17	-	1	6
2001	7	15	-	-	-
2006	1	22	2	-	15
2011	4	21	-	-	8
2016	2	35	5	-	30
2021	1	30	-	-	2
Year	Days Use Per Acre (ha)				
1996	-	-	-	-	-
2001	2.2 (5.4)	26.8 (66.2)	-	-	-
2006	1.5 (3.6)	34.9 (86.1)	-	-	-
2011	11.6 (28.7)	47.6 (117.5)	6.7 (16.6)	-	-
2016	1.5 (3.6)	50.2 (124.1)	8.1 (19.9)	-	-
2021	0.7 (1.8)	38.9 (96.0)	0.7 (1.7)	-	-

*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 01-11.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Achnatherum thurberianum (Thurber's needlegrass)	Agropyron cristatum ⁱ (crested wheatgrass)	Bromus tectorum ⁿⁱ (cheatgrass)	Elymus elymoides (squirreltail)	Pascopyrum smithii (western wheatgrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Vulpia octoflora ^a (sixweeks fescue)
year	Nested Frequency								
1996	26	31	-	388	47	-	0	68	27
2001	8	13	-	450	22	2	11	64	24
2006	38	6	-	427	30	-	-	54	-
2011	41	-	-	275	13	-	1	80	3
2016	47	5	-	314	31	-	3	72	11
2021	87	23	18	387	26	-	5	55	-
year	Average Cover (%)								
1996	0.3	0.2	-	3.1	0.4	-	0.0	0.7	0.0
2001	0.1	0.2	-	11.0	0.2	0.0	0.1	0.7	0.1
2006	1.1	0.4	-	10.7	0.7	-	-	1.9	-
2011	0.7	-	-	5.0	0.1	-	0.0	1.6	0.0
2016	1.5	0.5	-	5.4	0.5	-	0.0	1.8	0.0
2021	5.5	0.5	1.0	8.5	0.5	-	0.0	3.8	-

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

Table 11: The “Forb Species” 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 01-11.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Antennaria (pussytoes)	Astragalus (milkvetch)	Astragalus cibirius (browse milkvetch)	Astragalus iodanthus (Humboldt River milkvetch)	Astragalus newberryi (Newberry's milkvetch)	Astragalus utahensis (Utah milkvetch)	Balsamorhiza hookeri (Hooker's balsamroot)	Castilleja angustifolia (northwestern Indian naintbrush)	Collinsia parviflora ^a (maiden blue eyed Mary)	Crepis acuminata (tapertip hawksbeard)	Cryptantha (cryptantha)	Cryptantha watsonii ^a (Watson's cryptantha)	Descurainia pinnata ^a (western tansymustard)	Eriastrum sparsiflorum ^a (Great Basin woollystar)	Erigeron aphanactis ^a (rayless shaggy fleabane)	
year	Nested Frequency																	
1996	-	-	-	-	-	4	-	25	-	7	-	-	3	-	3	2	-	
2001	-	-	2	-	-	-	-	3	1	-	-	1	-	-	12	-	1	
2006	-	-	-	-	-	-	-	6	0	1	-	1	2	-	-	-	-	
2011	-	3	-	7	-	-	-	12	1	1	11	7	-	-	91	4	5	
2016	-	-	-	-	3	1	-	20	1	0	1	7	-	12	12	1	-	
2021	98	-	-	-	-	3	5	9	0	-	-	5	-	-	-	-	16	
year	Average Cover (%)																	
1996	-	-	-	-	-	0.0	-	0.1	-	0.0	-	-	0.0	-	0.0	0.0	-	
2001	-	-	0.0	-	-	-	-	0.0	0.0	-	-	0.0	-	-	0.1	-	0.0	
2006	-	-	-	-	-	-	-	0.1	0.0	0.0	-	0.0	0.0	-	-	-	-	
2011	-	0.0	-	0.1	-	-	-	0.0	0.0	0.0	0.0	0.2	-	-	0.5	0.0	0.0	
2016	-	-	-	-	0.0	0.0	-	0.1	0.0	0.0	0.0	0.1	-	0.0	0.0	0.0	-	
2021	4.4	-	-	-	-	0.0	0.1	0.2	0.1	-	-	0.1	-	-	-	-	0.2	

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 01-11.12 - 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 confertifolia ^p (shadscale saltbush)	Bassia americana ^p (green molly)	Bassia prostrata ^{pi} (forage kochia)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus (yellow rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma ^t (Utah juniper)	Krascheninikovia lanata ^p (winterfat)	Opuntia polyacantha (plains pricklypear)
year	Line Intercept Cover (%)									
1996	-	-	-	-	-	-	-	-	-	-
2001	-	-	-	-	-	-	-	-	-	-
2006	14.6	0.6	0.6	-	-	1.5	-	1.7	-	-
2011	11.4	2.8	0.5	-	-	1.2	-	3.7	-	-
2016	15.8	0.6	1	-	-	2.6	0.3	5.5	-	-
2021	-	0.2	-	-	3.4	-	0.1	-	-	-
year	Quadrat Cover (%)									
1996	14.8	-	1.3	0.1	-	0.4	0.0	1.6	-	0.0
2001	15.1	0.5	0.5	0.1	-	0.5	-	1.6	-	-
2006	13.2	0.7	0.2	0.2	-	0.6	-	1.6	0.0	-
2011	11.6	1.6	0.5	0.0	-	0.7	0.0	2.3	-	-
2016	11.2	0.1	0.7	0.0	-	1.3	0.0	2.0	-	-
2021	0.8	0.3	0.0	-	3.4	-	0.0	-	0.0	-

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 01-11.13 - 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			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia nova^p -- (black sagebrush)									
1996	7980	340	11	72	17	56	2	3	30/61
2001	7200	-	16	62	23	3	2	8	22/50
2006	6040	1760	8	59	33	10	4	17	26/58
2011	5500	-	4	75	21	40	1	19	21/55
2016	5320	40220	3	70	27	6	0	15	27/61
2021	120	240	83	17	0	0	0	0	- / -
Artemisia tridentata ssp. wyomingensis^p -- (Wyoming big sagebrush)									
1996	-	-	-	-	-	-	-	-	- / -
2001	60	-	0	67	33	0	0	33	60/58
2006	100	-	0	100	0	40	0	20	47/73
2011	340	-	6	82	12	47	6	6	38/77
2016	40	-	0	50	50	0	0	0	62/108
2021	2140	320	99	1	0	0	0	0	- / -

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 13R-08.13a - 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)								
2013	19140	17	80	3	-	3	1	0
2016	20520	4	31	64	0	1	1	1
2021	19040	8	18	41	33	0	0	0

- 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 01-11.14 - 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)							
1996	53	-	-	-	-	-	10.8
2001	62	-	-	-	-	-	13.1
2006	57	-	35	35	24	6	16.1
2011	57	-	33	50	17	-	13.1
2016	70	-	17	61	17	6	15.4

2021 BIG GAME RANGE TREND STUDIES - WRI PROJECTS

The following table is a list of big game range trend studies that were read in 2021 which had a Watershed Restoration Initiative (WRI) habitat treatment associated with them. The site report for each of these studies can be found in the “[Utah Big Game Range Trend Studies 2021 Wildlife Management Units 0, 1, 2, 3, 4, 5, 6, 7, 18A & 18B](https://wildlife.utah.gov/range-trends-archives.html)” which is available on the range trend website, <https://wildlife.utah.gov/range-trends-archives.html>.

Study #	Study Name	Type	Disturbance Name (If Available)	Date	Acres	WRI Project #
01-2	Rosette	Lop and Scatter	Park Valley PJ Treatment Project Phase 2	December 2015-March 2016	680	3400
01-4	Chokecherry Springs	Lop and Scatter	Emigrant Pass Sagebrush Habitat Enhancement	Fall 2018	895	4359
01-10	Kilgore Basin	Rangeland Drill	Goose Creek Fire Rehabilitation	Between September 2018 and May 2021	10,195	4758
01-18	Bedke Spring	Bullhog	Grouse Creek Bullhog Phase 2	Winter 2012	1,031	1938
02-2	Mouth of Blacksmith Fork	Aerial	Millville WMA Fire Rehab	November 2013	410	2839
		Plateau	Millville WMA Fire Rehabilitation Project	September 2007	792	972
		Aerial	Millville WMA Fire Rehabilitation Project	December 2007	792	972
		Transplant	Millville WMA Fire Rehabilitation Project	Spring 2008	792	972
		Plateau	Millville WMA Fire Rehab	September 2013	410	2839
		Aerial	Millville WMA Fire Rehab	January 2014	410	2839
02-12	Second Dam Blacksmith Fork	Lop and Scatter	UWC FS North Zone Watershed Improvements (Proposed)	2022	1,444	5548
		Lop and Scatter	Blacksmith Fork Juniper Thinning and Shrub Restoration	October-November 2013	1,200	2697
02-19	Right Fork Logan Canyon	Lop and Scatter	Temple Fork Juniper Restoration 4	October 2018 and June 2019	2,142	4420
02-32	Wood Pass	Bullhog	Crawford Mountain Sage-Grouse Habitat Enhancement	Fall 2016-Summer 2017	1,205	3867
		Bullhog	Crawford Mountain Bullhog	October 2011-August 2012	1,103	1936
02-39	Pole Hollow Spring	Lop and Scatter	Hardware Plateau Lop and Scatter	September-November 2016	2,143	3701
		Milestone	Hardware Ranch WMA Weed Abatement	July 2019-June 2020	269	4762
02-40	Warrens Spring	Lop and Scatter	Hardware Plateau Lop and Scatter	Fall 2016	2,143	3701
02-43	Woodruff Longhill	Lop and Scatter	Woodruff Longhill Sagebrush Improvement	Fall 2009	3,069	1477
02R-5	Coldwater WMA	Plateau/Laramie/Roundup	Cold Water WMA Fire Rehab	December 2017	491	4366
		Roundup	Cold Water WMA Fire Rehab	May 2018	491	4366
		Aerial	Cold Water WMA Fire Rehab Phase II	November 2018	473	4598
		Roundup	Cold Water WMA Fire Rehab	March 2018	491	4366
02R-15	Curtis Ridge Control	Lop and Scatter	Curtis Ridge Lop and Scatter	2019	400	4730
04-2	Echo Canyon	Aerial After	Henefer Echo - Roadshed Fire, Rehab	November 2016	315	3895
04-3	Tank Canyon	Aerial After	Henefer Echo WMA Project	December 2008	261	1212
		Two-Way Ely	Henefer Echo WMA Project	November-December 2008	261	1212
		Glyphosate	Henefer Echo WMA Fire Canyon Rehab	April-May 2021	43	5541
		Aerial After	Henefer Echo WMA Fire Canyon Rehab	October 2021	43	5541
04-13	Wheatgrass Hollow	Lop and Scatter	Home Ranch Bullhog	Winter 2019-2020	1,866	4025
04R-4	Claypit South Slope	Broadcast	Henefer WMA Browse Scalping and Pipeline Arc C	November 2018-January 2019	378	4590
		Dozer	Henefer WMA Browse Scalping and Pipeline Arc C	November 2018-January 2019	378	4590
06-2	Echo Canyon Rest Area	Herd Seeder	Tervels Fire Rehab	November 2018	19	4766
09-24	Brush Creek Substation	Rangeland Drill	Brush Creek Bench Seeding	October 2010	408	1659
		Plateau	Brush Creek Bench Sage Restoration	September 2008	279	315
		Aerial After	Brush Creek Bench Sage Restoration	March 2009	279	315
		One-Way Dixie	Brush Creek Bench Sage Restoration	December 2008	279	315
		Broadcast Before	Brush Creek Bench Sage Restoration	December 2008	279	315
11R-21	Stone Cabin Gasfield	Lop and Scatter	Interplanetary Airstrip Lop and Scatter	October-November 2011	1295	2163

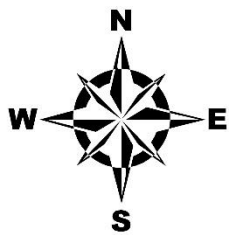
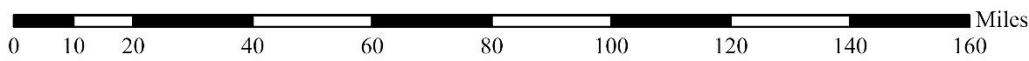
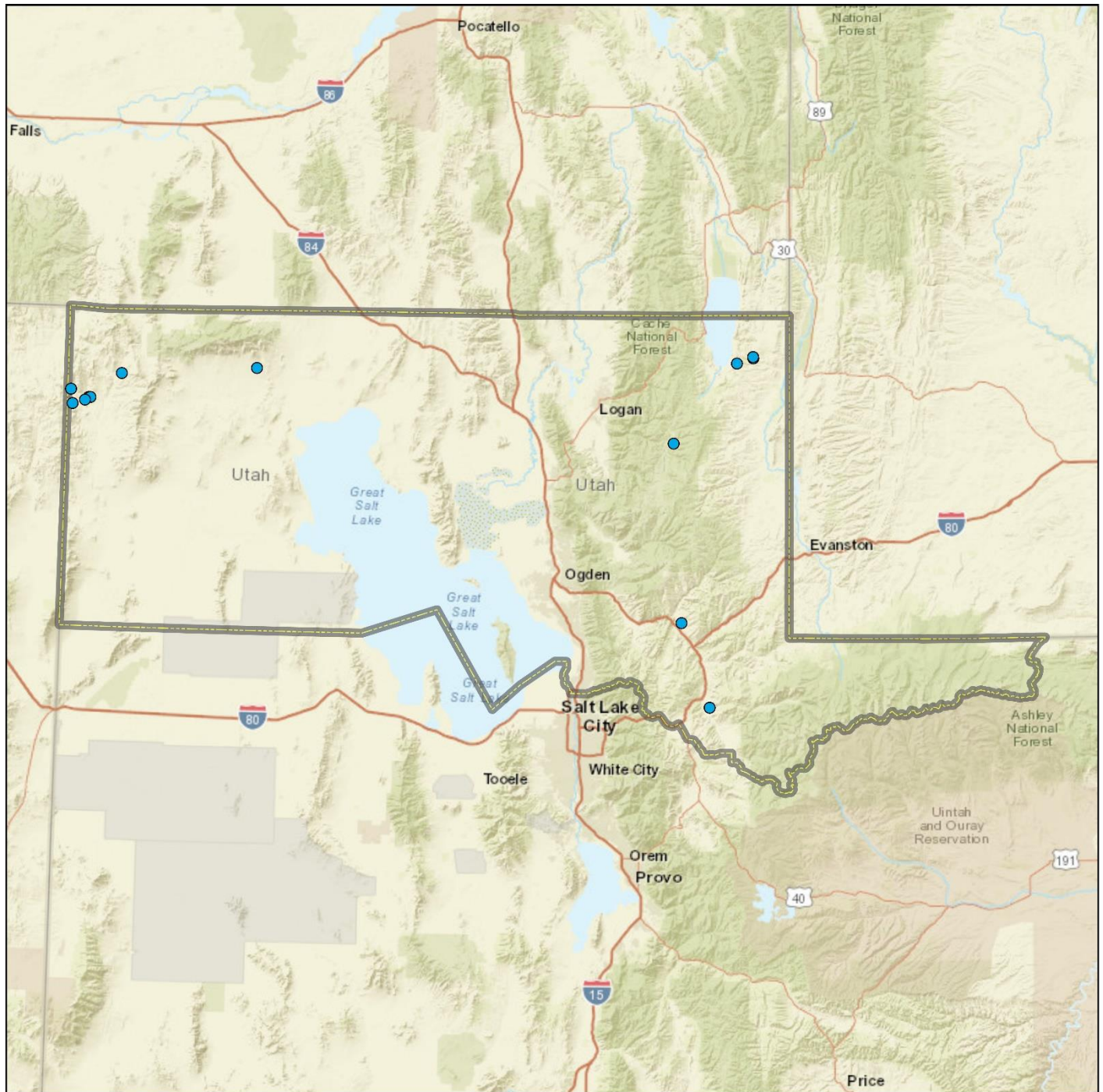
Study #	Study Name	Type	Disturbance Name (If Available)	Date	Acres	WRI Project #
18A-23	South Palmer Point	Harrow Unknown	Stansbury Mountains Winter Range Improvement and Solar Farm Mitigation (Proposed)	Fall 2021	6,747	5625
		Hand Transplant	Stansbury Mountains Winter Range Improvement and Solar Farm Mitigation (Proposed)	Fall 2021	6,747	5625
		Broadcast	Stansbury Mountains Winter Range Improvement and Solar Farm Mitigation (Proposed)	Fall 2021	6,747	5625
18A-30	Hatch Ranch	Bullhog	Terra East Juniper Thinning-Phase 2	October 2009-February 2010	2,190	1362
18B-3	Manning Canyon	Aerial	Pole Canyon Fire Rehabilitation	November 2020	487	5482
18B-6	South of Soldier Canyon	Bullhog	Stockton Bullhog	January-May 2012	1,561	1929
		Transplant	Stockton Bullhog	April 2012		1929

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NORTHERN REGION

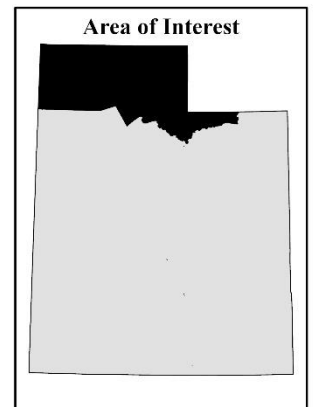


Region Boundaries

- Northern Region

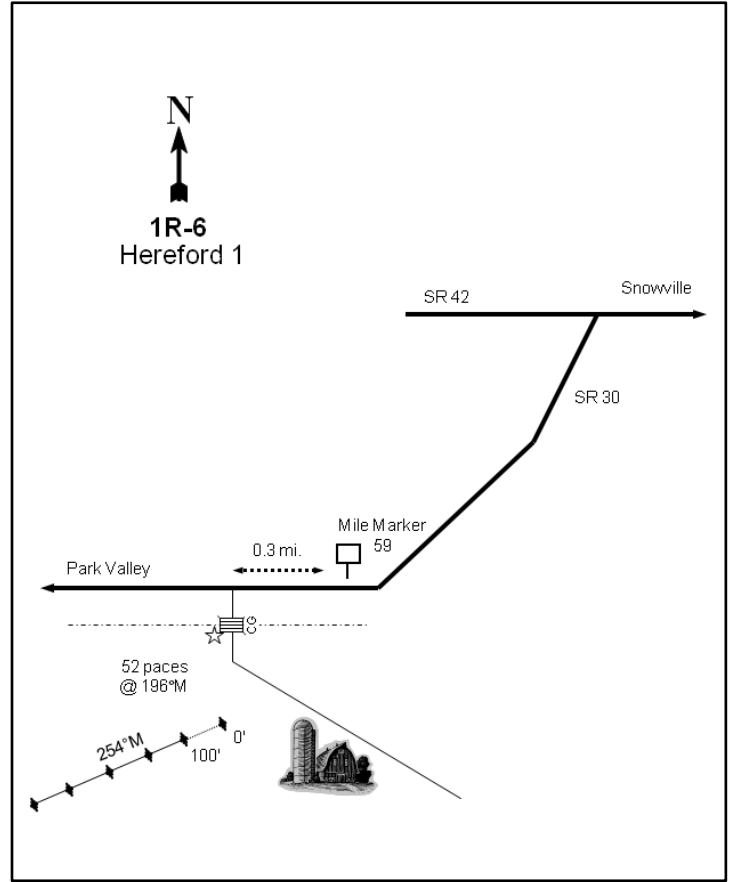
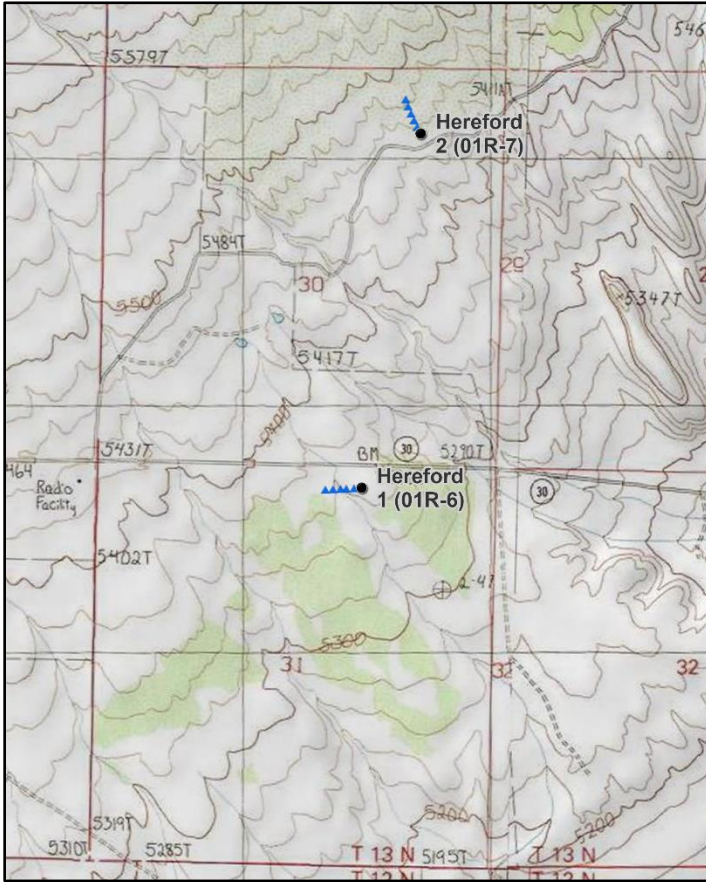
Study Locations

- 2021 WRI Study Site



Credits: Esri, HERE, Garmin, NGA, USGS, NPS

HEREFORD 1 - STUDY NO. 01R-6



Location Information

USGS 7.5 min Map Info Park Valley NE; Township 13N, Range 12W, Section 31
 GPS (0' Stake) NAD 83 UTM ZONE 12, 312425 East 4631864 North

Transect Information

Browse Tag # (0' Stake) 263
 Transect Bearing 254° 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

Drive west on State Route 42 from Snowville, UT to Curlew Junction, then turn south (left) onto State Route 30 and drive toward Park Valley, UT. Drive to mile marker 59 and proceed another 0.3 miles to a green metal gate on the south (left) side of the road. There is a small burn area just inside the gate; from the west (right) gatepost, walk 52 paces at 196 degrees magnetic to the 0-foot stake. The 0-foot stake is marked with browse tag #263.

Site Information

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	5,350ft (1,631m)
Aspect	Southwest
Slope	3%
Sample Dates	06/21/2005, 08/12/2008, 07/08/2013, 07/18/2017, 08/18/2021

Table 01R-06.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	Park Valley	-	July 2005	18421
Seeding - Rangeland Drill	Park Valley Burn Rehab	348	October-December 2005	3152
Seeding - Aerial	Park Valley Burn Rehab	348	January 2006	3152

Table 01R-06.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Hereford Grazing Association			Drill	Nov 2005	1200
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Agropyron cristatum	Crested Wheatgrass	Hycrest	2.48	2.32
G	Agropyron fragile	Siberian Wheatgrass	Vavilov	1.00	0.92
G	Leymus cinereus	Great Basin Wildrye	Trailhead	1.16	1.08
G	Psathyrostachys juncea	Russian Wildrye	Bozoisky	1.17	1.08
F	Medicago sativa	Alfalfa	Ladak+	1.17	1.11
F	Onobrychis viciifolia	Sainfoin	Eski	2.33	2.19
F	Sanguisorba minor	Small Burnet		2.33	2.25
S	Atriplex canescens	Fourwing Saltbush	Juab/Millard UT	0.19	0.09
S	Atriplex canescens	Fourwing Saltbush	Juab UT	0.38	0.11
S	Atriplex canescens	Fourwing Saltbush	Juab/Tooele UT	0.58	0.33
S	Bassia prostrata	Forage Kochia	Millard UT	0.88	0.68

Mix Name			Application Type	Application Date	Acres
Hereford Grazing Association - Kochia			Aerial	Jan 2006	1920
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
S	Bassia prostrata	Forage Kochia	Beaver UT	0.68	0.46
S	Bassia prostrata	Forage Kochia	Millard UT	0.32	0.28

Wildlife Habitat and Vegetation History

Table 01R-06.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Greater Sage-Grouse		undefined & undefined
Pronghorn	substantial	summer

Table 01R-06.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2005	Wyoming Big Sagebrush	Phase I
2008	Perennial Grass/Forage Kochia	Phase I
2013	Perennial Grass/Forage Kochia	Phase I
2017	Perennial Grass/Forage Kochia	Phase I
2021	Perennial Grass/Forage Kochia	Phase I

Site Notes

The site was established in 2005 to monitor a Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) dominated system which was originally prescribed to be disked and drill seeded in fall 2005. However, the study burned in the Park Valley fire. There is a cell phone tower a quarter of a mile from the transect.

Soils**Table 01R-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	7.5	37.2	39.0	23.8	1.5	6.5	640.0	0.6	06/21/2005

Site Potential

1981 - 2010 Average Annual Precipitation	11 inches
NRCS Ecological Site	Semidesert Loam (Wyoming Big Sagebrush)
NRCS Ecological Site #	R028AY220UT
States and Transitions	Current State: Community Phase 6.1

When the study was established in 2005, the site existed as a stand of Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) with a number of other shrub species present that provided limited cover (Table 01R-06.6, Table 01R-06.12). In addition, curvseed butterwort (*Ceratocephala testiculata*) and introduced perennial and annual grass species made up the majority of the herbaceous understory prior to treatment (Table 01R-06.7, Table 01R-06.10, Table 01R-06.11). The site burned in the summer of 2005, removing a majority of the sagebrush; rehabilitation seedings then took place in the fall and winter of 2005/2006 (Table 01R-06.1). Following the fire and subsequent seeding treatment, the site transitioned to a state dominated by forage kochia (*Bassia prostrata*) and crested wheatgrass (*Agropyron cristatum*) with minimal cover being provided by other species (Table 01R-06.10, Table 01R-06.12, Table 01R-06.13). Without a disturbance, it is predicted that sagebrush will increase and again become dominant within the plant community (USDA-ARS Jornada Experimental Range et al., 2021). Deer winter range condition has increased in quality from fair to excellent over the course of the study. further improvement to deer wintering range can be accomplished through efforts that diversify the perennial grass and forb communities while reducing cheatgrass (Table 01R-06.15).

Trend Summary Tables**Table 01R-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
2005	13.1	2.0	0.4	14.9	2.7	0.7
2008	10.6	0.4	-	12.0	0.5	-
2013	13.5	0.9	-	17.7	1.2	-
2017	13.7	0.2	-	18.9	0.9	-
2021	13.0	1.3	-	18.0	1.7	-

Table 01R-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
2005	328	230	435	23	7.2	7.6	27.8	0.2
2008	55	231	62	32	1.0	8.7	1.1	1.1
2013	108	283	231	26	0.3	10.8	0.7	0.2
2017	206	301	285	13	3.2	16.5	1.5	0.1
2021	4	328	2	13	0.0	23.4	0.0	0.3

Table 01R-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
2005	35.2	0.7	22.3	4.7	0.3	51.7
2008	60.6	-	22.6	5.9	0.2	21.1
2013	41.0	-	31.4	2.2	0.8	28.9
2017	43.0	0.1	30.2	6.4	1.0	37.5
2021	38.1	0.4	20.6	10.8	1.0	37.4

Table 01R-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			
2005	10	7	1	35
2008	6	2	-	32
2013	8	9	-	10
2017	10	-	-	52
2021	13	3	-	27
Year	Days Use Per Acre (ha)			
2005	12.3 (30.5)	18.1 (44.7)	-	-
2008	22.5 (55.6)	0.7 (1.7)	-	-
2013	9.4 (23.3)	4.7 (11.6)	-	-
2017	17.4 (43.0)	-	-	-
2021	19.6 (48.4)	1.3 (3.3)	-	-

Table 01R-06.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency									
Achnatherum hymenoides (Indian ricegrass)	21	193	-	328	12	0	-	1	57	-
Agropyron cristatum ⁱ (crested wheatgrass)	4	221	-	55	1	5	-	-	13	1
Agropyron fragile ⁱ (Siberian wheatgrass)	-	243	21	108	-	1	14	1	17	40
Bromus tectorum ^{ai} (cheatgrass)	-	279	3	206	-	7	-	-	29	32
Elymus elymoides (squirreltail)	-	255	53	4	2	7	-	4	53	51
Elymus lanceolatus (thickspike wheatgrass)										
Leymus cinereus (basin wildrye)										
Poa bulbosa ⁱ (bulbous bluegrass)										
Poa secunda (Sandberg bluegrass)										
Psathyrostachys juncea ⁱ (Russian wildrye)										

year	Average Cover (%)									
2005	0.0	5.9	-	7.2	0.1	0.0	-	0.0	1.5	-
2008	0.0	8.4	-	1.0	0.0	0.0	-	-	0.0	0.1
2013	-	8.9	0.3	0.3	-	0.1	0.5	0.0	0.1	0.8
2017	-	14.1	0.2	3.2	-	0.1	-	-	0.7	1.4
2021	-	16.8	3.0	0.0	0.0	0.2	-	0.0	0.5	2.8

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

Table 01R-06.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																
Allium (onion)	1	4	-	0	435	32	1	-	-	13	1	5	-	7	-	8	2
Alyssum desertorum ^{ai} (desert madwort)	-	-	-	-	32	1	-	-	14	14	3	-	10	-	5	-	22
Astragalus (milkvetch)	2	9	2	-	221	16	6	-	2	13	9	-	-	-	-	9	1
Calochortus nuttallii (sego lily)	-	62	-	-	260	6	-	-	-	13	2	-	-	-	-	-	-
Ceratocephala testiculata ^{ai} (curvseed butterwort)	-	-	-	-	-	-	-	0	-	13	-	-	-	-	-	-	-
Descurainia pinnata ^a (western tansymustard)																	
Gilia inconspicua ^a (shy gilia)																	
Grindelia squarrosa (curlycup gumweed)																	
Halogeton glomeratus ^{ai} (saltlover)																	
Iva axillaris (povertyweed)																	
Lactuca serriola ^{ai} (prickly lettuce)																	
Lepidium ^a (pepperweed)																	
Medicago sativa ^a (alfalfa)																	
Microsteris gracilis ^a (slender phlox)																	
Onobrychis vicifolia ⁱ (sainfoin)																	
Phlox longifolia (longleaf phlox)																	
Salsola tragus ^{ai} (prickly Russian thistle)																	

year	Average Cover (%)																
2005	0.0	0.0	-	0.0	27.6	0.1	0.0	-	-	0.1	0.0	0.1	-	0.0	-	0.0	0.0
2008	-	-	-	-	0.1	0.0	-	-	0.4	0.8	0.0	-	0.2	-	0.1	-	0.6
2013	0.0	0.0	0.0	-	0.5	0.1	0.0	-	0.0	0.1	0.0	-	-	-	-	0.0	0.0
2017	-	0.1	-	-	1.3	0.0	-	-	-	0.1	0.0	-	-	-	-	-	-
2021	-	-	-	-	-	-	-	-	0.0	-	-	-	-	-	-	-	-

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

FORB SPECIES			
	Sanguisorba minor ⁱ (small burnet)		
	Tragopogon dubius ^{ai} (yellow salsify)		
	Zizgadenus paniculatus (foothill deathcamas)		
year	Nested Frequency		
2005	-	-	1
2008	5	-	-
2013	-	-	-
2017	-	1	-
2021	-	2	-
year	Average Cover (%)		
2005	-	-	0.0
2008	0.1	-	-
2013	-	-	-
2017	-	0.0	-
2021	-	0.0	-

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

Table 01R-06.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES								
	Artemisia tridentata ssp. wyomingensis ^p (Wyoming big sagebrush)							
	Atriplex canescens ^p (fourwing saltbush)							
	Bassia prostrata ^{pi} (forage kochia)							
	Chrysothamnus viscidiflorus sp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)							
	Ericameria nauseosa ssp. nauseosa var. hololeuca ^p (rubber rabbitbrush)							
	Gutierrezia sarothrae (broom snakeweed)							
	Juniperus osteosperma ⁱ (Utah juniper)							
	Sarcobatus vermiculatus (greasewood)							
year	Line Intercept Cover (%)							
2005	14.4	-	-	0.2	0.5	-	0.7	2.5
2008	0.6	0.4	10.8	-	0.2	-	-	0.5
2013	1.3	-	16.3	-	0.1	-	-	1.2
2017	3.5	-	15.4	-	-	-	-	0.9
2021	4	-	13.6	0.4	0.4	-	-	1.3
year	Quadrat Cover (%)							
2005	12.7	-	-	0.0	0.5	-	0.4	2.0
2008	0.3	0.0	10.3	0.0	0.0	-	-	0.4
2013	1.1	-	12.5	-	0.0	-	-	0.9
2017	1.1	-	12.6	-	0.0	0.0	-	0.1
2021	2.9	-	10.0	0.3	0.0	-	-	1.0

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

Table 01R-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.

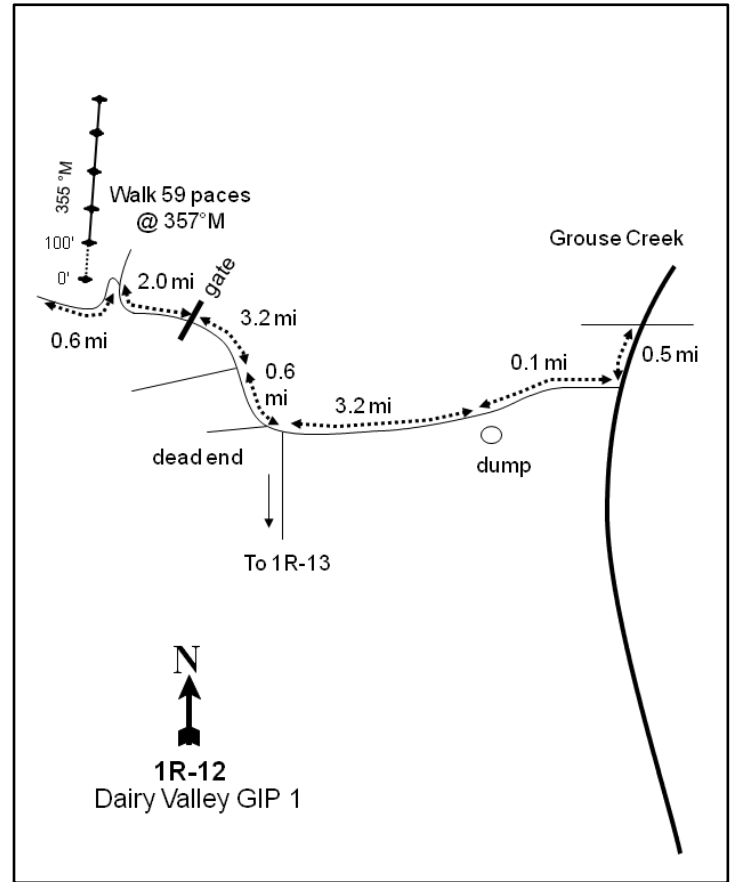
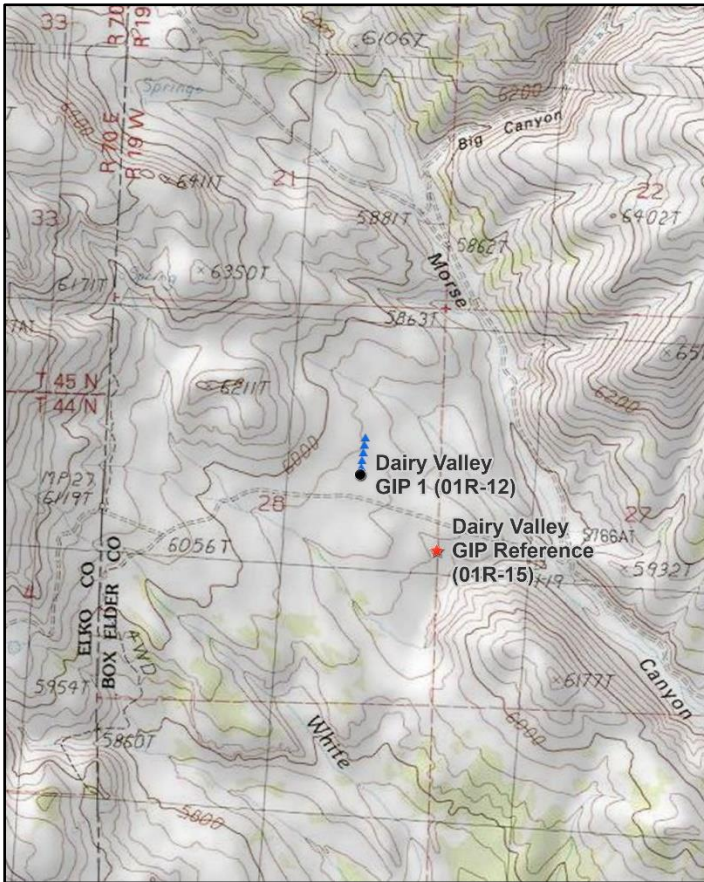
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. wyomingensis^p -- (Wyoming big sagebrush)									
2005	2540	20660	5	59	36	5	0	20	90/104
2008	1460	60	8	92	0	6	0	0	25/24
2013	1020	60	4	92	4	73	6	22	35/41
2017	820	-	7	81	12	0	2	10	48/60
2021	1060	-	19	64	17	17	11	23	- / -
Atriplex canescens^p -- (fourwing saltbush)									
2005	-	-	-	-	-	-	-	-	-/-
2008	100	-	0	80	20	0	0	20	49/65
2013	20	-	100	0	0	0	0	0	89/137
2017	-	-	-	-	-	-	-	-	116/176
2021	-	-	-	-	-	-	-	-	-/-
Bassia prostrata^{pi} -- (forage kochia)									
2005	-	-	-	-	-	-	-	-	-/-
2008	8220	39000	5	91	4	4	26	3	32/45
2013	27280	3820	51	49	0	17	4	1	22/36
2017	26160	600	12	88	0	29	13	0	14/30
2021	47300	1560	28	70	2	20	10	2	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
2005	20	-	0	100	0	0	0	0	36/51
2008	20	-	0	100	0	0	0	0	28/56
2013	-	-	-	-	-	-	-	-	28/60
2017	20	-	0	100	0	0	0	0	33/52
2021	80	-	0	100	0	0	0	0	- / -
Ericameria nauseosa ssp. nauseosa var. hololeuca^p -- (rubber rabbitbrush)									
2005	220	40	18	82	0	18	9	0	56/80
2008	40	-	50	50	0	0	0	0	41/42
2013	60	-	33	67	0	33	0	33	50/86
2017	60	-	0	100	0	0	0	0	61/87
2021	60	-	33	33	33	0	0	67	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
2005	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	-/-
2013	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	- / -
2021	-	-	-	-	-	-	-	-	-/-
Opuntia -- (pricklypear)									
2005	20	-	0	100	0	0	0	0	22/28
2008	-	-	-	-	-	-	-	-	-/-
2013	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
Sarcobatus vermiculatus -- (greasewood)									
2005	120	620	33	67	0	0	0	0	86/121
2008	60	-	0	100	0	0	0	0	56/98
2013	20	-	0	100	0	0	100	0	70/143
2017	40	-	0	100	0	0	0	0	78/134
2021	40	-	0	50	50	0	0	50	- / -

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

Table 01R-06.15 - Deer Desirable Components Index: Semidesert 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
2005	18.6	4.5	2.6	15.2	-5.4	0.3	0.0	35.8	Fair
2008	17.7	13.6	2.9	17.3	-0.7	2.2	0.0	53.0	Good
2013	26.2	14.9	15.0	21.6	-0.2	0.3	0.0	77.8	Excellent
2017	27.5	14.2	5.6	30.0	-2.4	0.3	0.0	75.2	Excellent
2021	25.9	13.1	12.9	30.0	0.0	0.5	0.0	82.5	Excellent

DAIRY VALLEY GIP 1 - STUDY NO. 01R-12

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Death Creek Reservoir; Township 12N, Range 19W, Section 28
NAD 83 UTM ZONE 12, 248235 East 4624739 North

Transect Information

Browse Tag # (0' Stake)	247
Transect Bearing	350° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Belts 4-5: No Rebar

Directions to Site

Drive west on State Route 42 from Snowville to Curlew Junction, turn south (left) onto State Route 30, and drive toward Park Valley. Turn left onto Grouse Creek Road and follow it until the pavement ends. From the pavement, drive 0.5 miles to a right turn and then go 0.1 miles to a dump on the left side of the road. Continue 3.2 miles to the road leading to study 1R-13 and stay to the right. Drive 0.6 miles to another fork and stay on the main road (right). Go 1.7 miles, take the right fork, and continue 1.5 miles to a gate. From the gate, drive 2.0 miles, staying left at the fork. Drive 0.6 miles to a witness post on the right (north) side of the road. From the witness post, walk 59 paces at 357 degrees magnetic to the 0-foot stake. The 0-foot stake is marked with browse tag #247.

Site Information

Land Ownership	State
Land Administrator	SITLA
Allotment	GROUSE CREEK
Elevation	5,933ft (1,808m)
Aspect	Southeast
Slope	3%
Sample Dates	08/12/2008, 08/04/2009, 05/25/2011, 07/27/2016, 08/17/2021

Table 01R-12.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	Goose Creek Wildfire	-	2018	132230
Fire - Wildfire	Winecup complex	-	2007	234413
Chaining - One-Way Ely	Dairy Valley Fire Rehabilitation	992	June 2008	2700
Seeding - Aerial Before	Dairy Valley Fire Rehabilitation	992	December 2007	6900

Table 01R-12.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Dairy Valley			Aerial	Dec 2007	6300
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Agropyron cristatum	Crested Wheatgrass	Hycrest	0.87	0.67
G	Agropyron cristatum	Crested Wheatgrass	Nordan	0.87	0.83
G	Dactylis glomerata	Orchardgrass	Paiute	0.51	0.44
G	Elymus wawawaiensis	Snake River Wheatgrass	Secar	1.00	0.94
G	Leymus cinereus	Great Basin Wildrye	Trailhead	0.54	0.49
G	Poa secunda	Canby Bluegrass	Canbar	0.04	0.03
G	Poa secunda	Canby Bluegrass	Canbar	0.32	0.24
G	Pseudoroegneria spicata	Bluebunch Wheatgrass	P-7	1.00	0.92
G	Thinopyrum intermedium	Pubescent Wheatgrass		1.00	0.91
G	Thinopyrum intermedium	Intermediate Wheatgrass	Oahe	1.00	0.89
F	Medicago sativa	Alfalfa	Ladak	1.13	1.12
F	Medicago sativa	Alfalfa	Ranger	0.37	0.34
F	Melilotus officinalis	Yellow Sweetclover		0.51	0.41
F	Onobrychis viciifolia	Sainfoin	Eski	0.75	0.69
F	Onobrychis viciifolia	Sainfoin	Eski	0.25	0.22
F	Sanguisorba minor	Small Burnet	Delar	0.92	0.85
F	Sanguisorba minor	Small Burnet	Delar	0.08	0.07
S	Bassia prostrata	Forage Kochia	Immigrant	0.37	0.21

Wildlife Habitat and Vegetation History**Table 01R-12.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Rocky Mountain Elk	crucial	year-long	
Greater Sage-Grouse	occupied	year-long	brood-rearing

Table 01R-12.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2008	Yellow Rabbitbrush	Phase I
2011	Yellow Rabbitbrush	Phase I
2016	Yellow Rabbitbrush	Phase I
2021	Perennial Grass	Phase I

Site Notes

No Notes

Site Potential

1981 - 2010 Average Annual Precipitation	12 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.

When the study was established in 2008, this site was a Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) flat that had burned. Following the fire, much of the site was dominated by yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus* var. *viscidiflorus*). Wyoming big sagebrush increased in cover, but was confined to the end of the transect in distribution (Photos, Table 01R-12.12, Table 01R-12.13). The herbaceous understory has been moderately diverse and abundant over the sample years (Table 01R-12.10, Table 01R-12.11). Despite recovery efforts, the site burned again in the 2018 Goose Creek wildfire (Table 01R-12.1). In 2021, the site transitioned to a community dominated by native and introduced grasses, namely, Sandberg bluegrass (*Poa secunda*) and crested wheatgrass (*Agropyron cristatum*) (Table 01R-12.7, Table 01R-12.10). Many of the preferred browse species have been reduced to small populations by wildfire (Table 01R-12.6, 01R-12.13). It is expected that with time, proper management, and less fire frequency, the native herbaceous and browse communities will have an opportunity to re-establish. Due to the lack of preferred browse and forbs, current conditions of this site indicate that it is not favorable wintering habitat for mule deer.

Trend Summary Tables

Table 01R-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
2008	2.9	13.6	-	4.3	17.8	-
2009	5.2	17.5	-	7.9	15.4	-
2011	5.4	12.6	-	5.7	13.2	-
2016	13.9	22.3	-	18.6	24.8	-
2021	0.4	12.2	-	0.1	12.9	-

Table 01R-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
2008	60	289	79	385	0.3	7.6	0.6	7.4
2009	137	291	133	326	2.2	17.1	2.5	12.6
2011	18	286	363	403	0.1	10.1	11.0	18.4
2016	306	315	187	175	12.0	14.6	2.5	2.2
2021	27	335	62	180	0.3	10.9	0.5	1.9

Table 01R-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
2008	41.8	0.0	24.3	11.2	2.3	32.2
2009	35.0	-	24.0	10.3	0.4	47.9
2011	33.1	0.0	13.1	1.2	0.4	54.8
2016	25.2	-	22.6	4.4	0.2	60.8
2021	30.7	0.3	27.7	11.6	1.7	30.3

Table 01R-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				
2008	20	1	-	1	2
2009	7	3	-	-	4
2011	6	1	-	-	1
2016	7	2	1	-	3
2021	13	2	-	-	11
Days Use Per Acre (ha)					
2008	3.6 (9.0)	1.3 (3.3)	-	-	-
2009	27.6 (68.1)	-	1.3 (3.3)	-	-
2011	34.1 (84.3)	-	-	-	-
2016	5.1 (12.6)	1.3 (3.3)	-	-	-
2021	7.2 (17.9)	-	-	-	-

Table 01R-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 tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Koeleria macrantha (prairie Junegrass)	Pascopyrum smithii (western wheatgrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium ⁱ (intermediate wheatgrass)
year	Nested Frequency									
2008	4	-	60	39	5	77	3	232	5	-
2009	1	3	137	25	19	23	-	239	18	53
2011	-	4	18	15	-	71	2	260	1	8
2016	17	37	306	39	8	62	-	267	20	-
2021	14	63	27	21	-	52	-	295	21	-
year	Average Cover (%)									
2008	0.0	-	0.3	0.5	0.0	1.3	0.1	5.6	0.0	-
2009	0.0	0.3	2.2	1.1	0.5	0.7	-	12.5	0.2	1.9
2011	-	0.0	0.1	0.1	-	1.1	0.1	8.5	0.0	0.2
2016	0.2	0.9	12.0	1.1	0.0	0.7	-	10.9	0.8	-
2021	0.2	1.8	0.3	0.3	-	1.1	-	7.2	0.3	-

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

Table 01R-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)	Alyssum desertorum ^{ai} (desert madwort)	Antennaria (pussytoes)	Astragalus (milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Camelina microcarpa ^{ai} (littledod false flax)	Ceratocephala testiculata ^{ai} (curveseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Chenopodium leptophyllum ^a (narrowleaf goosefoot)	Cirsium (thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Comandra umbellata (bastard toadflax)	Cordylanthus ramosus ^a (bushy bird's beak)	Crepis acuminata (tapertip hawksbeard)
year	Nested Frequency																
2008	3	96	40	-	-	14	4	4	1	3	5	1	-	-	18	-	5
2009	-	22	133	-	-	3	10	15	-	23	-	2	-	-	21	9	7
2011	-	278	171	3	1	33	-	-	42	13	-	7	287	22	15	-	13
2016	-	12	88	43	-	4	4	3	2	-	-	5	19	6	32	9	5
2021	-	22	6	-	-	2	-	-	-	-	3	1	-	-	-	-	-
year	Average Cover (%)																
2008	0.0	1.0	0.1	-	-	0.1	0.1	0.0	0.0	0.0	0.0	0.0	-	-	0.1	-	0.0
2009	-	0.0	2.0	-	-	0.1	0.1	0.1	-	0.1	-	0.0	-	-	0.3	0.3	0.1
2011	-	5.3	1.6	0.1	0.0	0.7	-	-	0.9	0.2	-	0.0	3.6	0.2	0.1	-	0.1
2016	-	0.1	0.8	0.3	-	0.0	0.0	0.0	0.0	-	-	0.2	0.1	0.1	0.4	0.4	0.2
2021	-	0.0	0.0	-	-	0.0	-	-	-	-	0.1	0.0	-	-	-	-	-

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

FORB SPECIES	Cryptantha (cryptantha)	Descurainia pinnata ^a (western tansymustard)	Epilobium brachycarpum ^a (tall annual willowherb)	Erodium cicutarium ^{ai} (redstem stork's bill)	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Hackelia patens (spotted stickseed)	Lactuca serriola ^{ai} (prickly lettuce)	Lappula occidentalis ^a (flatspine stickseed)	Linum perenne ⁱ (blue flax)	Lomatium triternatum (nineleaf biscuitroot)	Machaeranthera grindelioides (rayless tansyaster)	Microsteris gracilis ^a (slender phlox)	Onobrychis vicifolia ⁱ (sainfoin)	Orogenia linearifolia (Great Basin Indian potato)	Orthocarpus ^a (owl's-clover)	Penstemon (beardtongue)	Phlox hoodii (spiny phlox)
year	Nested Frequency																
2008	-	-	-	-	3	-	8	5	-	-	-	-	-	-	-	16	-
2009	-	13	-	-	11	-	80	12	-	-	-	-	-	-	-	14	-
2011	6	14	25	-	-	4	10	5	-	12	-	121	6	13	-	16	23
2016	-	-	8	-	-	1	2	-	-	-	-	16	1	3	7	3	-
2021	-	10	-	5	-	9	2	-	9	-	1	5	-	-	-	3	-
year	Average Cover (%)																
2008	-	-	-	-	0.0	-	0.1	0.0	-	-	-	-	-	-	-	0.1	-
2009	-	0.5	-	-	0.1	-	1.1	0.2	-	-	-	-	-	-	-	0.1	-
2011	0.0	0.0	0.1	-	-	0.0	0.0	0.0	-	0.0	-	0.6	0.0	0.1	-	0.1	0.8
2016	-	-	0.1	-	-	0.0	0.0	-	-	-	-	0.0	0.0	0.0	0.3	0.0	-
2021	-	0.2	-	0.0	-	0.0	0.0	-	0.0	-	0.0	0.0	-	-	-	0.0	-

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

FORB SPECIES	Phlox longifolia (longleaf phlox)	Polygonum douglasii ⁱⁿ (Douglas' knotweed)	Senecio integerrimus ^a (lambstongue ragwort)	Sisymbrium altissimum ^{ai} (tall tumbledustard)	Symphyotrichum (aster)	Taraxacum officinale (common dandelion)	Tragopogon dubius ^{ai} (yellow salsify)	Trifolium (clover)	Veronica biloba ^{ai} (twolobe speedwell)	Viola (violet)
year	Nested Frequency									
2008	356	18	-	-	9	7	25	-	25	-
2009	288	20	-	-	-	1	5	-	-	-
2011	282	7	81	-	3	28	37	-	67	66
2016	58	27	-	1	-	-	13	1	115	10
2021	149	-	1	1	-	2	43	-	-	6
year	Average Cover (%)									
2008	5.8	0.0	-	-	0.0	0.0	0.3	-	0.1	-
2009	9.8	0.1	-	-	-	0.0	0.1	-	-	-
2011	7.9	0.0	3.6	-	0.0	0.4	0.7	-	0.9	0.9
2016	0.5	0.1	-	0.0	-	-	0.0	0.0	1.1	0.0
2021	1.7	-	0.0	0.0	-	0.0	0.2	-	-	0.0

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

Table 01R-12.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)								
	Artemisia nova ^p (black sagebrush)	Artemisia tridentata ssp. wyomingensis ^p (Wyoming big sagebrush)	Bassia prostrata ^{pi} (forage kochia)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa (rubber rabbitbrush)	Eriogonum corymbosum (crisp-leaf buckwheat)	Eriogonum microthecum ^p (slender buckwheat)	Opuntia (pricklypear)	Purshia tridentata ^p (antelope bitterbrush)
year	Line Intercept Cover (%)								
2008	-	3.9	-	17.8	-	-	-	-	0.4
2009	-	7.3	-	15.4	-	-	-	-	0.6
2011	2.9	2.4	-	13.2	-	-	-	-	0.4
2016	8.7	8.8	-	24.4	0.4	-	-	-	1.1
2021	-	0.1	-	12.2	0.6	-	-	0.1	-
year	Quadrat Cover (%)								
2008	-	2.9	-	13.6	-	0.0	-	0.0	0.0
2009	-	5.0	-	17.5	-	-	-	0.0	0.1
2011	2.5	2.7	-	12.5	0.0	-	0.1	0.1	0.0
2016	3.2	10.4	-	22.2	0.0	-	0.1	0.0	0.2
2021	0.0	0.3	0.0	12.1	0.0	-	0.0	0.1	-

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

Table 01R-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			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis^p -- (Utah serviceberry)									
2008	-	-	-	-	-	-	-	-	56/61
2009	-	-	-	-	-	-	-	-	71/78
2011	-	-	-	-	-	-	-	-	76/105
2016	-	-	-	-	-	-	-	-	73/96
2021	-	-	-	-	-	-	-	-	-/-
Artemisia nova^p -- (black sagebrush)									
2008	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2011	3540	-	23	77	0	0	0	9	17/33
2016	2720	-	1	98	2	2	0	2	31/47
2021	80	-	100	0	0	0	0	0	-/-
Artemisia tridentata ssp. wyomingensis^p -- (Wyoming big sagebrush)									
2008	3320	2580	19	49	31	37	8	13	34/49
2009	-	-	-	-	-	-	-	-	32/45
2011	3380	140	37	63	1	0	0	4	31/39
2016	3060	140	33	66	1	11	12	1	59/74
2021	1000	-	96	4	0	0	0	4	-/-
Bassia prostrata^{pi} -- (forage kochia)									
2008	-	-	-	-	-	-	-	-	-/-
2009	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	17/35
2016	-	-	-	-	-	-	-	-	-/-
2021	20	-	0	100	0	0	0	0	-/-

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 (%)				
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
2008	14340	3740	24	69	6	1	0	2	29/44
2009	-	-	-	-	-	-	-	-	27/45
2011	8220	1000	27	53	20	13	0	13	29/47
2016	10440	60	12	85	3	0	0	27	35/53
2021	15020	40	2	15	83	4	0	78	- / -
Eriogonum corymbosum -- (crisp-leaf buckwheat)									
2008	80	20	0	100	0	0	0	0	20/32
2009	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	- / -
2021	-	-	-	-	-	-	-	-	- / -
Eriogonum microthecum^P -- (slender buckwheat)									
2008	-	-	-	-	-	-	-	-	- / -
2009	-	-	-	-	-	-	-	-	- / -
2011	40	-	0	50	50	0	0	0	10/13
2016	140	-	0	100	0	0	0	0	30/29
2021	100	-	20	80	0	0	20	0	- / -
Ericameria nauseosa -- (rubber rabbitbrush)									
2008	-	-	-	-	-	-	-	-	70/90
2009	-	-	-	-	-	-	-	-	43/68
2011	-	-	-	-	-	-	-	-	74/91
2016	60	-	67	33	0	0	0	67	63/62
2021	40	-	50	0	50	0	0	50	- / -
Juniperus osteosperma¹ -- (Utah juniper)									
2008	-	-	-	-	-	-	-	-	- / -
2009	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	- / -
2021	-	-	-	-	-	-	-	-	- / -
Opuntia -- (pricklypear)									
2008	140	-	0	43	57	0	0	57	11/32
2009	-	-	-	-	-	-	-	-	13/32
2011	60	-	0	100	0	0	0	0	11/36
2016	220	-	9	91	0	0	0	0	13/18
2021	140	-	14	86	0	0	0	0	- / -
Purshia tridentata^P -- (antelope bitterbrush)									
2008	60	20	33	67	0	33	33	0	44/123
2009	-	-	-	-	-	-	-	-	53/102
2011	120	-	0	100	0	83	0	0	42/115
2016	60	-	33	67	0	33	0	0	48/105
2021	140	-	86	14	0	14	14	0	- / -
Symphoricarpos oreophilus^P -- (mountain snowberry)									
2008	-	-	-	-	-	-	-	-	14/39
2009	-	-	-	-	-	-	-	-	- / -
2011	-	-	-	-	-	-	-	-	29/76

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

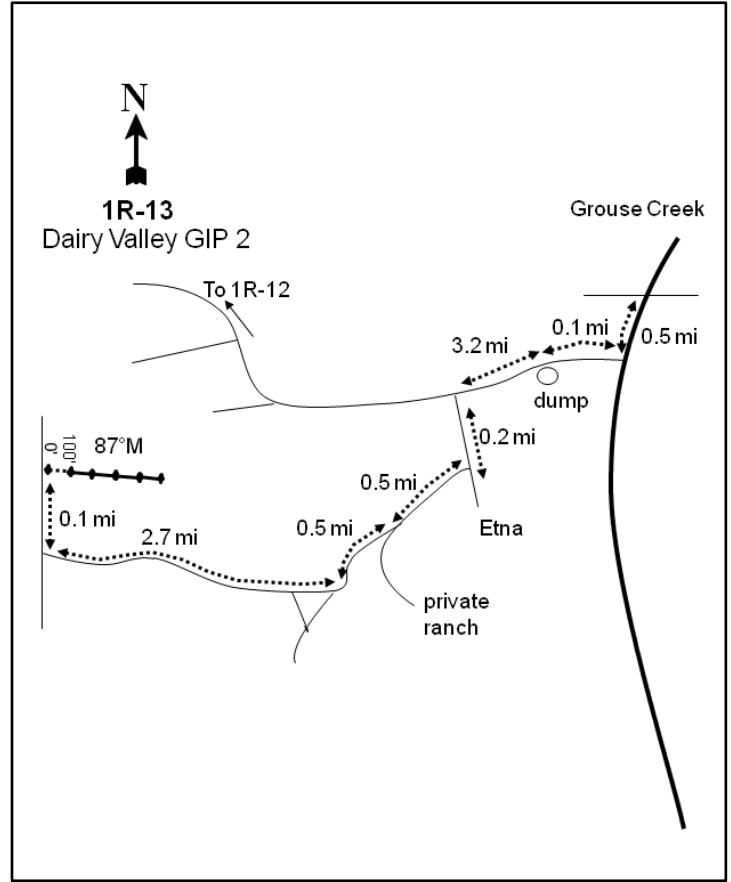
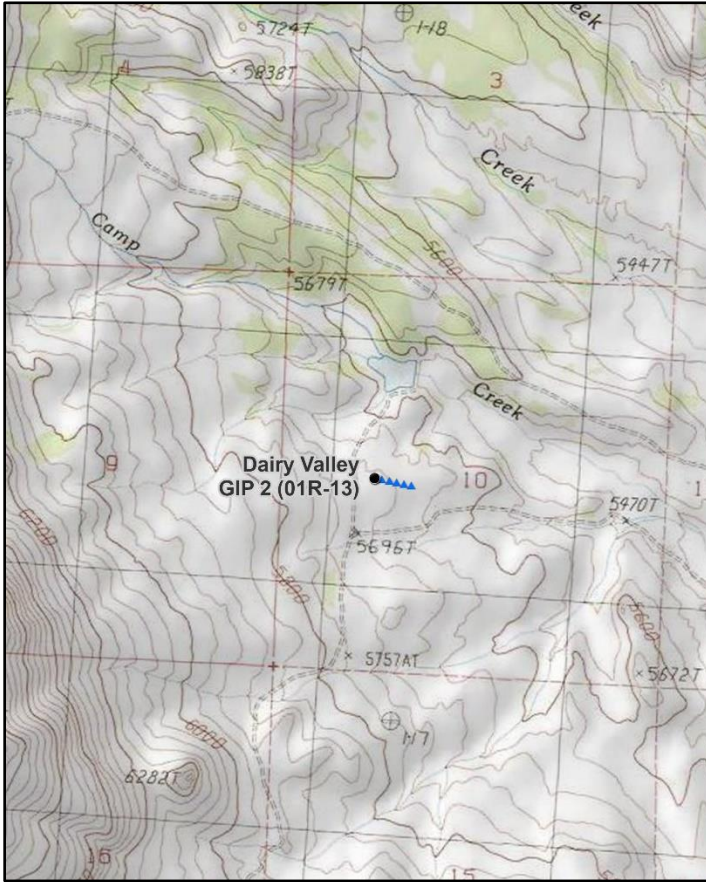
Table 01R-12.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2008	1	-	-	-	100	-	48.0
2011	20	50	-	50	-	-	5.3
2016	16	-	100	-	-	-	2.5

Table 01R-12.15 - Deer Desirable Components Index: Upland 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
2008	5.5	0.0	0.0	15.1	-0.2	10.0	0.0	30.4	Very Poor
2009	10.0	0.0	0.0	30.0	-1.7	10.0	0.0	48.3	Poor-Fair
2011	7.2	14.9	13.6	20.1	-0.1	10.0	0.0	65.8	Fair-Good
2016	23.5	14.7	9.0	29.3	-9.0	4.5	0.0	72.0	Good
2021	0.1	0.0	0.0	21.9	-0.2	3.8	0.0	25.5	Very Poor

DAIRY VALLEY GIP 2 - STUDY NO. 01R-13



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Death Creek Reservoir; Township 11N, Range 19W, Section 10
NAD 83 UTM ZONE 12, 248771 East 4619741 North

Transect Information

Browse Tag # (0' Stake)	250
Transect Bearing	87° magnetic
Length	500ft
Belt Placement	Belt 1 (11ft), Belt 2 (34ft), Belt 3 (59ft), Belt 4 (71ft), Belt 5 (95ft)
Belt Marker Placement	Standard

Directions to Site

From Grouse Creek, follow the Grouse Creek Road south out of town until the pavement ends. From the pavement, drive 0.5 miles to a right turn, and then go 0.1 miles to a dump on the left side of the road. Continue 3.2 miles and proceed to the road on the left (78800 W). Drive for 0.2 miles to Etna, turn right in front of the mailboxes, and continue for 0.2 miles to a gate with a private ranch on the left. From the gate, go 0.3 miles to a fork and stay right. Drive 0.1 miles to another gate and continue 0.4 miles past it, staying right at the fork. From the fork, go 1.3 miles to the next gate and drive 0.3 miles to another gate. Continue 0.9 miles to the next gate. Go 0.2 miles, turn right, and drive 0.1 miles to the witness post on the right (east) side of the road. From the witness post, walk 96 paces to the 0-foot stake at 71 degrees magnetic. The 0-foot stake is marked with browse tag #250.

Site Information

Land Ownership	Private
Land Administrator	Private
Allotment	DEATH CREEK
Elevation	5,676ft (1,730m)
Aspect	Northeast
Slope	8%
Sample Dates	08/12/2008, 05/25/2011, 07/27/2016, 08/17/2021

Table 01R-13.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	Winecup complex	-	2007	234413
Chaining - One-Way Ely	Dairy Valley Fire Rehabilitation	992	June 2008	2700
Seeding - Aerial Before	Dairy Valley Fire Rehabilitation	992	December 2007	6900

Table 01R-13.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Dairy Valley			Aerial	Dec 2007	6300
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Agropyron cristatum	Crested Wheatgrass	Hycrest	0.87	0.67
G	Agropyron cristatum	Crested Wheatgrass	Nordan	0.87	0.83
G	Dactylis glomerata	Orchardgrass	Paiute	0.51	0.44
G	Elymus wawawaiensis	Snake River Wheatgrass	Secar	1.00	0.94
G	Leymus cinereus	Great Basin Wildrye	Trailhead	0.54	0.49
G	Poa secunda	Canby Bluegrass	Canbar	0.04	0.03
G	Poa secunda	Canby Bluegrass	Canbar	0.32	0.24
G	Pseudoroegneria spicata	Bluebunch Wheatgrass	P-7	1.00	0.92
G	Thinopyrum intermedium	Pubescent Wheatgrass		1.00	0.91
G	Thinopyrum intermedium	Intermediate Wheatgrass	Oahe	1.00	0.89
F	Medicago sativa	Alfalfa	Ladak	1.13	1.12
F	Medicago sativa	Alfalfa	Ranger	0.37	0.34
F	Melilotus officinalis	Yellow Sweetclover		0.51	0.41
F	Onobrychis viciifolia	Sainfoin	Eski	0.75	0.69
F	Onobrychis viciifolia	Sainfoin	Eski	0.25	0.22
F	Sanguisorba minor	Small Burnet	Delar	0.92	0.85
F	Sanguisorba minor	Small Burnet	Delar	0.08	0.07
S	Bassia prostrata	Forage Kochia	Immigrant	0.37	0.21

Wildlife Habitat and Vegetation History**Table 01R-13.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Rocky Mountain Elk	crucial	year-long	
Greater Sage-Grouse	occupied	year-long	brood-rearing

Table 01R-13.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2008	Perennial Grass	Phase I
2011	Annual Grass/Perennial Grass	Phase I
2016	Perennial Grass/Annual Grass	Phase I
2021	Perennial Grass	Phase I

Site Notes

No Notes

Site Potential

1981 - 2010 Average Annual Precipitation	11 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.

When the study was established in 2008, this site existed as a Utah juniper (*Juniperus osteosperma*) woodland that had burned. Browse species were slow to establish between 2008 and 2016. However, perennial grasses steadily increased in abundance and have been the main vegetation component since study establishment. Forbs were moderately diverse and abundant in 2011 and 2016 (Table 01R-13.7, Table 01R-13.10, Table 01R-13.11). The site then burned again in the 2018 Goose Creek wildfire (Table 01R-13.1). The community remained dominated by native and introduced grasses in 2021, namely, Sandberg bluegrass (*Poa secunda*) and crested wheatgrass (*Agropyron cristatum*) (Table 01R-12.7, Table 01R-13.10). Many of the preferred browse species were nearly removed by the Goose Creek wildfire (Table 01R-12.6, 01R-12.13). It is expected that with time, proper management, and less fire frequency, the native herbaceous and browse communities will have an opportunity to re-establish. Due to the lack of preferred browse and forbs, current conditions as of 2021 indicate that this site is not favorable wintering habitat for mule deer.

Trend Summary Tables

Table 01R-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
2008	0.0	0.3	-	-	-	-
2011	0.0	0.2	-	-	0.3	-
2016	0.2	3.6	-	0.3	4.2	-
2021	0.2	3.8	-	0.4	3.2	-

Table 01R-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
2008	14	171	18	139	0.0	2.0	0.1	1.1
2011	372	243	409	192	9.5	8.8	8.6	3.8
2016	361	323	339	100	18.3	21.1	4.2	2.4
2021	84	382	35	71	0.8	16.8	0.3	0.7

Table 01R-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
2008	28.8	-	18.7	56.8	3.9	3.7
2011	29.5	0.0	19.8	9.6	2.3	31.0
2016	25.0	0.4	18.1	20.3	0.5	49.3
2021	17.9	0.2	29.8	32.3	1.6	25.3

Table 01R-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	Greater Sage-Grouse	Rabbit
	Quadrat Frequency			
2008	-	-	-	6
2011	7	-	-	-
2016	6	1	-	6
2021	4	-	1	12
Year	Days Use Per Acre (ha)			
2008	2.9 (7.2)	-	-	-
2011	13.8 (34.1)	-	-	-
2016	19.6 (48.4)	0.7 (1.7)	-	-
2021	0.7 (1.8)	1.3 (3.3)	-	-

Table 01R-13.10 - 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)	Elymus elymoides (squirreltail)	Leymus cinereus (basin wildrye)	Pascopyrum smithii (western wheatgrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium ⁱ (intermediate wheatgrass)
year	Nested Frequency									
2008	23	-	-	14	19	-	7	134	20	-
2011	25	70	-	372	18	-	8	156	20	33
2016	50	164	9	361	45	3	15	148	61	47
2021	42	207	-	84	31	4	34	229	33	37
year	Average Cover (%)									
2008	0.4	-	-	0.0	0.2	-	0.0	1.2	0.2	-
2011	0.9	2.0	-	9.5	0.4	-	0.2	3.8	0.7	0.9
2016	3.5	8.1	0.2	18.1	0.9	0.4	0.6	2.9	2.4	2.2
2021	1.3	6.9	-	0.8	0.2	0.2	0.9	4.8	1.1	1.4

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

Table 01R-13.11 - 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)	Arabis (rockcress)	Astragalus (milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus utahensis (Utah milkvetch)	Balsamorhiza hookeri (Hooker's balsamroot)	Camelina microcarpa ^{ai} (litlepod false flax)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Comandra umbellata (bastard toadflax)	Cordylanthus ramosus ^a (bushy bird's beak)	Crepis acuminata (tapertip hawkbeard)
year	Nested Frequency																
2008	-	-	9	2	-	-	3	-	5	-	-	-	-	1	12	-	11
2011	27	7	314	12	-	14	6	3	19	-	51	3	191	-	10	-	31
2016	5	-	331	-	-	7	5	2	-	2	6	4	5	-	23	1	12
2021	6	-	7	-	1	-	2	-	5	-	-	4	-	-	9	-	5
year	Average Cover (%)																
2008	-	-	0.0	0.0	-	-	0.1	-	0.0	-	-	-	-	0.0	0.2	-	0.2
2011	0.4	0.0	2.6	0.2	-	0.1	0.0	0.0	0.2	-	0.7	0.0	0.8	-	0.1	-	0.5
2016	0.1	-	3.6	-	-	0.2	0.1	0.0	-	0.0	0.0	0.0	0.0	-	0.7	0.0	0.1
2021	0.0	-	0.0	-	0.0	-	0.0	-	0.0	-	-	0.0	-	-	0.1	-	0.0

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

FORB SPECIES	Nested Frequency																
Cryptantha (cryptantha)	-	7	-	4	-	-	-	0	-	-	1	-	-	1	6	95	-
Descurainia pinnata ^a (western tansymustard)	8	179	4	82	4	-	14	17	7	5	-	28	13	8	5	94	1
Gayophytum ramosissimum ^a (pinyon groundsmoke)	-	7	-	12	-	-	27	2	-	-	-	-	3	-	12	25	-
Gilia inconspicua ^a (shy gilia)	3	-	-	-	-	8	-	-	-	-	-	-	-	-	1	27	-
Heterotheca villosa (hairy false goldenaster)	Average Cover (%)																
Ionactis alpina (Lava aster)	-	0.0	-	0.0	-	-	-	0.0	-	-	0.0	-	-	0.0	0.0	0.4	-
Lactuca serriola ^{ai} (prickly lettuce)	0.1	1.2	0.0	0.3	0.0	-	0.1	0.2	0.2	0.0	-	0.1	0.1	0.0	0.2	0.9	0.0
Lappula occidentalis ^a (flatspine stickseed)	-	0.0	-	0.1	-	-	0.2	0.0	-	-	-	-	0.0	-	0.6	0.1	-
Lomatium (desertparsley)	0.0	-	-	-	-	0.1	-	-	-	-	-	-	-	-	0.1	0.2	-
Lomatium triternatum (nineleaf biscuitroot)	Nested Frequency																
Medicago sativa ⁱ (alfalfa)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Microsteris gracilis ^a (slender phlox)	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Onobrychis viciifolia ⁱ (sainfoin)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Penstemon (beardtongue)	1	6	95	-	8	5	94	1	5	94	1	5	94	1	5	94	1
Phlox hoodii (spiny phlox)	6	95	-	8	5	94	1	5	94	1	5	94	1	5	94	1	5
Phlox longifolia (longleaf phlox)	1	6	95	-	8	5	94	1	5	94	1	5	94	1	5	94	1
Sanguisorba minor ⁱ (small burnet)	1	6	95	-	8	5	94	1	5	94	1	5	94	1	5	94	1

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

FORB SPECIES	Nested Frequency				
Sisymbrium altissimum ^{ai} (tall tumbledmustard)	-	16	2	-	-
Symphotrichum (aster)	127	22	1	2	-
Taraxacum officinale (common dandelion)	5	4	-	14	7
Townsendia (Townsend daisy)	1	-	2	1	27
Tragopogon dubius ^{ai} (yellow salsify)	Average Cover (%)				
2008	-	0.1	0.0	-	-
2011	2.8	0.8	0.0	0.0	-
2016	0.2	0.2	-	0.2	0.1
2021	0.1	-	0.0	0.0	0.2

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

Table 01R-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)	Bassia prostrata ^{pi} (forage kochia)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Opuntia (pricklypear)
year	Line Intercept Cover (%)					
2008	-	-	0	-	-	-
2011	-	-	0.3	-	-	-
2016	0.1	0.2	4.2	-	-	-
2021	0.2	0.2	3.2	-	-	-
year	Quadrat Cover (%)					
2008	-	0.0	0.1	-	-	0.2
2011	0.0	-	0.2	-	-	-
2016	0.0	0.2	3.6	-	-	0.0
2021	0.0	0.2	3.7	0.1	0.0	0.0

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

Table 01R-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			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis^p -- (Utah serviceberry)									
2008	-	-	-	-	-	-	-	-	23/50
2011	-	-	-	-	-	-	-	-	37/53
2016	-	-	-	-	-	-	-	-	56/112
2021	-	-	-	-	-	-	-	-	-/-
Artemisia tridentata ssp. wyomingensis^p -- (Wyoming big sagebrush)									
2008	-	-	-	-	-	-	-	-	-/-
2011	20	-	100	0	0	0	0	0	24/33
2016	20	-	0	100	0	0	0	0	48/64
2021	80	20	75	25	0	0	0	0	-/-
Bassia prostrata^{pi} -- (forage kochia)									
2008	20	40	0	100	0	0	0	0	8/16
2011	60	-	33	67	0	0	67	0	6/17
2016	240	-	8	92	0	0	0	0	43/70
2021	580	-	7	93	0	17	35	0	-/-
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
2008	400	-	10	90	0	0	0	0	15/21
2011	360	-	11	83	6	6	0	0	26/43
2016	1620	-	9	91	0	0	0	0	36/59
2021	1900	-	14	34	53	16	1	61	-/-
Ericameria nauseosa -- (rubber rabbitbrush)									
2008	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	61/88
2021	60	-	0	67	33	33	0	67	-/-

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 (%)				
Gutierrezia sarothrae -- (broom snakeweed)									
2008	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
Juniperus osteosperma¹ -- (Utah juniper)									
2008	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
Opuntia -- (pricklypear)									
2008	280	-	29	21	50	0	0	57	9/26
2011	80	-	25	75	0	0	0	0	6/18
2016	80	-	0	100	0	0	0	0	15/41
2021	160	-	0	100	0	0	0	0	-/-
Purshia tridentata^p -- (antelope bitterbrush)									
2008	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	12/44
2016	-	-	-	-	-	-	-	-	42/111

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

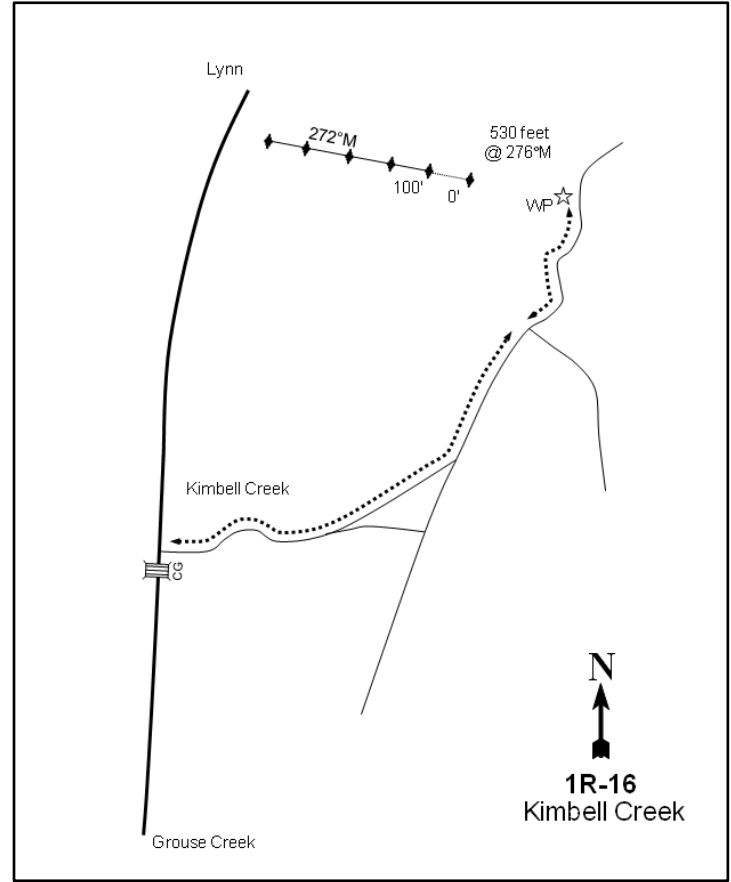
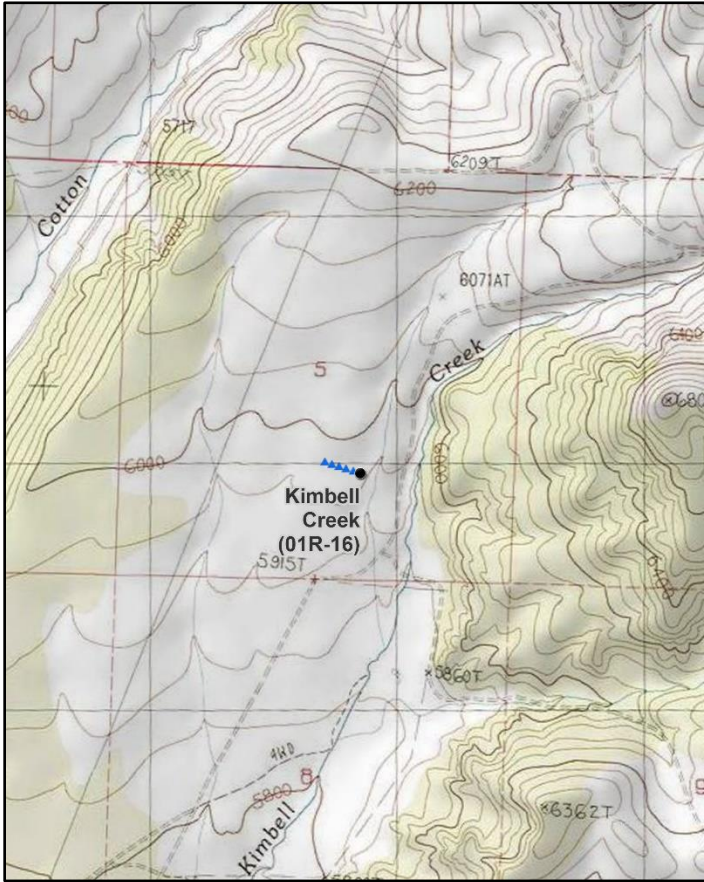
Table 01R-13.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2008	1	-	100	-	-	-	12.0
2011	1	-	50	50	-	-	11.5
2016	1	-	100	-	-	-	12.0
2021	1	100	-	-	-	-	18.0

Table 01R-13.15 - Deer Desirable Components Index: Upland 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
2008	0.0	0.0	0.0	4.1	0.0	2.2	0.0	6.2	Very Poor
2011	0.0	0.0	0.0	17.6	-7.1	7.6	0.0	18.2	Very Poor
2016	0.4	0.0	0.0	30.0	-13.7	4.8	0.0	21.5	Very Poor
2021	0.6	0.0	0.0	30.0	-0.6	1.4	0.0	31.3	Very Poor

KIMBELL CREEK - STUDY NO. 01R-16



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Kimbell Creek SW; Township 12N, Range 17W, Section 05
NAD 83 UTM ZONE 12, 265795 East 4630153 North

Transect Information

Browse Tag # (0' Stake)	Not Available
Transect Bearing	272° 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

Drive north from Grouse Creek to the Kimbell Creek sign and a cattleguard. Turn right and continue for 2.3 miles, then turn left. Continue for 0.1 miles to a witness post on the left (west) side of the road. From the witness post, walk 530 feet (over a ridge and up a drainage) at 96 degrees magnetic to the 0-foot stake.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	KIMBALL CREEK
Elevation	5,930ft (1,807m)
Aspect	Southeast
Slope	3-7%
Sample Dates	07/19/2010, 07/09/2013, 07/17/2017, 08/18/2021

Table 01R-16.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Seeding - Broadcast Unknown	Kimball Creek Greater Sage-Grouse Brood Rearing Habitat Enhancement	1739	October 2010	106
Harrow - One-Way Chain	Kimball Creek Greater Sage-Grouse Brood Rearing Habitat Enhancement	1739	October 2010	106

Table 01R-16.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Kimball Creek Sage-Grouse Habitat Enhancement			Broadcast	Oct 2010	144
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	<i>Pascopyrum smithii</i>	Western Wheatgrass	Arriba	2.08	1.72
G	<i>Pseudoroegneria spicata</i>	Bluebunch Wheatgrass	Anatone	2.08	1.89
F	<i>Achillea millefolium</i>	Western Yarrow	Eagle Mountain	0.14	0.12
F	<i>Astragalus cicer</i>	Cicer Milkvetch	Lutana	2.08	1.89
F	<i>Balsamorhiza sagittata</i>	Arrowleaf Balsamroot		0.01	0.01
F	<i>Balsamorhiza sagittata</i>	Arrowleaf Balsamroot	Sanpete/Millard UT	1.04	0.84
F	<i>Cleome serrulata</i>	Rocky Mountain Beeplant	Millard UT	1.04	0.97
F	<i>Linum perenne</i>	Blue Flax	Appar	0.52	0.46
F	<i>Medicago sativa</i>	Alfalfa	Ladak	1.04	0.97
F	<i>Onobrychis viciifolia</i>	Sainfoin	Eski	3.13	2.97
F	<i>Penstemon palmeri</i>	Palmer Penstemon	White Pine NV	0.52	0.48
F	<i>Sanguisorba minor</i>	Small Burnet	Delar	3.13	2.97

Wildlife Habitat and Vegetation History**Table 01R-16.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Greater Sage-Grouse	occupied	year-long	brood-rearing

Table 01R-16.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2010	Basin Big Sagebrush/Low Sagebrush/Juniper	Phase I transitioning to Phase II
2013	Low Sagebrush	Phase I
2017	Low Sagebrush/Annual Grass	Phase I
2021	Low Sagebrush	Phase I

Site Notes

This study was established to monitor the Kimbell Creek Sage-Grouse Brood Rearing Habitat Enhancement project.

Site Potential

1981 - 2010 Average Annual Precipitation	12 inches
NRCS Ecological Site	Upland Loam (Bonneville Big Sagebrush)
NRCS Ecological Site #	R028AY310UT
States and Transitions	Current State: Community Phase 5.2

When the study was established in 2010, this site was dominated by a mixed stand of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), low sagebrush (*A. arbuscula*), and Utah juniper (*Juniperus osteosperma*) (Table 01R-16.12, Table 01R-16.13). In most sample years, Sandberg bluegrass (*Poa secunda*) has made up a majority of the herbaceous understory with a small component of perennial and annual forb species also present (Table 01R-16.7). Following the tree-removing treatment in October 2010 (Table 01R-16.1), low sagebrush became the dominant species, while basin big sagebrush and Utah juniper cover decreased substantially (Table 01R-16.12). Perennial grasses initially decreased as well, while perennial forbs increased in cover. As time since treatment has increased, perennial grasses have also increased. However, annual grass cover was high in 2017, and it was considered

to be a co-dominant site component in that year (Table 01R-16.7, Table 01R-16.10, Table 01R-16.11). Tree encroachment remains active as of 2021 with density and percentage of seedlings increasing since treatment to remove trees in 2010 (Table 01R-16.14); further infilling is likely to occur over time without additional treatment.

Trend Summary Tables

Table 01R-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
2010	20.7	6.4	5.2	28.1	8.9	6.9
2013	16.1	4.2	0.0	21.5	5.4	0.2
2017	17.3	3.6	0.4	26.8	6.1	0.2
2021	15.6	3.5	0.2	23.0	3.0	0.4

Table 01R-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
2010	69	343	153	206	0.6	13.1	1.1	2.8
2013	97	298	254	292	0.6	4.4	1.1	3.6
2017	312	322	257	203	21.4	12.8	4.4	3.4
2021	59	349	35	183	0.5	10.9	0.1	4.1

Table 01R-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
2010	30.2	-	39.1	9.8	1.3	47.6
2013	21.9	-	43.7	4.7	2.8	35.2
2017	17.8	0.0	34.4	3.4	2.2	53.2
2021	23.2	1.8	42.1	5.3	2.9	34.2

Table 01R-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	Rabbit
	Quadrat Frequency			
2010	1	-	-	-
2013	5	2	-	2
2017	7	1	-	6
2021	11	8	-	5
Year	Days Use Per Acre (ha)			
2010	5.8 (14.3)	1.3 (3.3)	0.7 (1.7)	-
2013	12.3 (30.5)	5.3 (13.2)	-	-
2017	16.0 (39.5)	-	-	-
2021	8.7 (21.5)	11.4 (28.1)	-	-

Table 01R-16.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Koeleria macrantha (prairie Junegrass)	Pascopyrum smithii (western wheatgrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency							
2010	-	69	26	-	61	2	334	3
2013	1	97	13	-	142	-	242	9
2017	-	312	2	6	136	2	277	21
2021	4	59	7	1	156	3	251	92
year	Average Cover (%)							
2010	-	0.6	0.5	-	0.4	0.0	12.2	0.0
2013	0.0	0.6	0.2	-	0.9	-	3.1	0.2
2017	-	21.4	0.0	0.1	2.4	0.0	9.9	0.4
2021	0.1	0.5	0.1	0.0	1.5	0.0	6.0	3.1

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

Table 01R-16.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Agoseris glauca (pale agoseris)	Allium acuminatum (tapertip onion)	Alyssum desertorum ^{ai} (desert madwort)	Arabis (rockcress)	Astragalus (milkvetch)	Balsamorhiza sagittata (arrowleaf balsamroot)	Calochortus nuttallii (sego lily)	Camelina microcarpa ^{ai} (litlepod false flax)	Castilleja angustifolia (northwestern Indian paintbrush)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Cleome serrulata ^a (Rocky Mountain beeplant)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Comandra umbellata (bastard toadflax)	Cordylanthus ^a (bird's-beak)
year	Nested Frequency																
2010	-	22	52	29	11	12	8	-	-	-	-	1	-	-	-	39	6
2013	5	11	30	7	1	-	9	3	2	-	15	7	7	26	-	34	24
2017	37	1	75	41	2	7	15	-	33	7	50	-	-	151	9	44	35
2021	48	-	2	22	-	3	10	-	-	-	-	-	-	-	-	32	-
year	Average Cover (%)																
2010	-	0.0	0.1	0.2	0.1	0.2	0.3	-	-	-	-	0.0	-	-	-	0.3	0.0
2013	0.0	0.0	0.1	0.0	0.0	-	0.1	0.0	0.0	-	0.1	0.0	0.0	0.1	-	0.1	0.1
2017	0.8	0.0	0.3	1.3	0.0	0.1	0.2	-	0.3	0.0	0.4	-	-	0.8	0.0	0.5	0.8
2021	2.2	-	0.0	0.0	-	0.0	0.1	-	-	-	-	-	-	-	-	0.3	-

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

FORB SPECIES	Crepis acuminata (tapertip hawkbeard)	Cryptantha gracilis ^a (narrowstem cryptantha)	Cymopterus (springparsley)	Delphinium nuttalianum (two-lobed larkspur)	Descurainia pinnata ^a (western tansymustard)	Epilobium brachycarpum ^a (tall annual willowherb)	Eriogonum brevicaulis (shortstem buckwheat)	Fritillaria pudica (yellow fritillary)	Gilia inconspicua ^a (shy gilia)	Hackelia patens (spotted stickseed)	Hedysarum boreale (Utah sweetvetch)	Ionactis alpina (Lava aster)	Lactuca serriola ^{at} (prickly lettuce)	Lappula occidentalis ^a (flatspine stickseed)	Lesquerella (bladderpod)	Linum perenne ⁱ (blue flax)	Lomatium (desertparsley)
year	Nested Frequency																
2010	-	8	-	-	-	-	-	-	20	-	1	-	-	4	3	-	-
2013	2	6	9	5	1	21	5	-	5	1	-	-	4	6	3	37	-
2017	-	7	-	-	6	-	-	3	-	1	-	10	10	4	1	45	3
2021	-	-	-	-	-	-	-	-	-	-	-	4	1	-	-	21	4
year	Average Cover (%)																
2010	-	0.1	-	-	-	-	-	-	0.1	-	0.0	-	-	0.0	0.0	-	-
2013	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	-	-	0.0	0.0	0.0	0.6	-
2017	-	0.0	-	-	0.0	-	-	0.0	-	0.0	-	0.1	0.0	0.0	0.0	0.5	0.0
2021	-	-	-	-	-	-	-	-	-	-	-	0.2	0.0	-	-	0.1	0.1

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

FORB SPECIES	Lupinus argenteus (silvery lupine)	Machaeranthera canescens (hoary tansyaster)	Medicago sativa ⁱ (alfalfa)	Microseris nutans (nodding microseris)	Microsteris gracilis ^a (slender phlox)	Onobrychis viciifolia ⁱ (sainfoin)	Penstemon (beardtongue)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)	Sanguisorba minor ⁱ (small burnet)	Tragopogon dubius ^{at} (yellow salsify)	Veronica biloba ^{at} (two-lobed speedwell)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency													
2010	5	-	-	-	112	-	4	-	131	6	-	-	-	-
2013	8	1	9	-	119	13	3	-	246	49	10	-	106	0
2017	5	-	9	23	44	2	-	3	20	5	1	3	42	-
2021	4	-	-	-	2	-	-	5	114	5	2	6	4	2
year	Average Cover (%)													
2010	0.0	-	-	-	0.7	-	0.2	-	1.6	0.0	-	-	-	-
2013	0.0	0.0	0.0	-	0.3	0.1	0.0	-	2.2	0.1	0.2	-	0.4	0.0
2017	0.4	-	0.2	0.1	0.2	0.0	-	0.0	0.1	0.0	0.0	0.0	0.5	-
2021	0.3	-	-	-	0.0	-	-	0.0	0.8	0.0	0.0	0.0	0.0	0.0

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

Table 01R-16.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)									
	year	2010	2013	2017	2021	year	2010	2013	2017	2021
Amelanchier utahensis ^p (Utah serviceberry)	-	14.7	13.4	8.3	-	6.9	0.6	-	-	-
Artemisia arbuscula ^p (litttle sagebrush)	-	19.9	1.6	4.8	0.2	0.2	0.4	-	-	-
Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	-	24.5	2.3	5.3	0.6	0.2	0.2	-	-	-
Chrysothamnus viscidiflorus (yellow rabbitbrush)	0	21	2	2.3	0.2	0.4	0.5	-	-	-
Ericameria nauseosa (rubber rabbitbrush)	-	-	-	-	-	-	-	-	-	-
Juniperus osteosperma ^t (Utah juniper)	-	-	-	-	-	-	-	-	-	-
Opuntia polyacantha (plains pricklypear)	-	-	-	-	-	-	-	-	-	-
Purshia tridentata ^p (antelope bitterbrush)	-	-	-	-	-	-	-	-	-	-

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

Table 01R-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			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis^p -- (Utah serviceberry)									
2010	-	20	0	0	0	0	0	0	94/127
2013	-	-	-	-	-	-	-	-	115/149
2017	20	-	100	0	0	0	100	0	85/120
2021	-	-	-	-	-	-	-	-	-/-
Artemisia arbuscula^p -- (litttle sagebrush)									
2010	2320	300	59	41	0	4	0	9	38/58
2013	9280	200	17	77	6	9	0	6	24/49
2017	10920	-	8	88	4	4	1	3	29/51
2021	10320	-	5	37	59	7	11	61	-/-
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
2010	6660	100	38	61	2	33	0	29	65/85
2013	560	40	18	79	4	32	0	21	65/72
2017	520	-	8	77	15	4	4	12	77/82
2021	620	20	0	36	65	7	3	61	-/-
Chrysothamnus viscidiflorus -- (yellow rabbitbrush)									
2010	2860	20	3	94	4	0	0	18	32/48
2013	3260	-	1	90	9	19	4	26	29/42
2017	2120	-	3	94	3	1	0	0	35/47
2021	1920	-	1	6	93	4	6	96	-/-
Ericameria nauseosa -- (rubber rabbitbrush)									
2010	80	-	0	75	25	0	0	25	42/51
2013	100	-	40	60	0	0	0	60	54/64
2017	80	-	0	100	0	0	0	0	68/72
2021	120	-	0	0	100	33	0	100	-/-

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 (%)				
Juniperus osteosperma¹ -- (Utah juniper)									
2010	100	20	40	60	0	0	0	0	- / -
2013	20	40	100	0	0	0	0	0	- / -
2017	120	-	17	83	0	0	0	0	- / -
2021	120	-	83	17	0	0	0	0	- / -
Opuntia polyacantha -- (plains pricklypear)									
2010	360	-	0	100	0	0	0	6	12/38
2013	600	60	30	57	13	0	3	13	12/25
2017	840	-	0	100	0	0	0	17	11/25
2021	360	-	11	83	6	0	0	22	- / -
Purshia tridentata^P -- (antelope bitterbrush)									
2010	-	-	-	-	-	-	-	-	77/150
2013	-	-	-	-	-	-	-	-	- / -
2017	20	-	0	100	0	0	100	0	59/123
2021	40	-	50	50	0	100	0	0	- / -

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

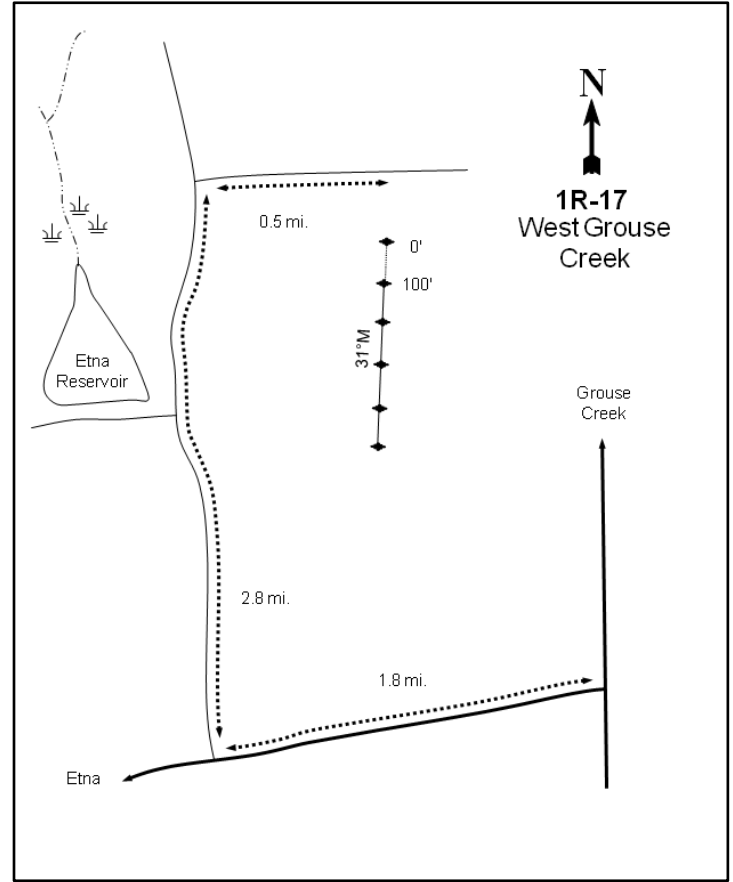
Table 01R-16.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2010	54	-	32	53	11	5	9.8
2013	42	50	50	-	-	-	3.3
2017	53	13	75	13	-	-	5.6
2021	78	56	33	11	-	-	3.6

Table 01R-16.15 - Deer Desirable Components Index: Upland 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
2010	30.0	14.8	15.0	26.1	-0.5	5.6	0.0	91.0	Excellent
2013	26.9	13.3	8.6	8.8	-0.4	7.3	0.0	64.5	Fair-Good
2017	30.0	13.5	3.8	25.6	-16.0	6.8	0.0	63.6	Fair-Good
2021	28.8	-2.8	2.1	21.7	-0.4	8.1	0.0	57.4	Fair

WEST GROUSE CREEK - STUDY NO. 01R-17



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Grouse Creek NW; Township 11N, Range 18W, Section 06
NAD 83 UTM ZONE 12, 254366 East 4621842 North

Transect Information

Browse Tag # (0' Stake)	789
Transect Bearing	180° 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: 1ft

Directions to Site

Travel north towards Grouse Creek and turn left (west) toward Etna. Drive 1.8 miles, then turn right. Drive for 2.8 miles and then turn right again (east). Drive another 0.5 miles. The transect will be to the south of the road.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	GROUSE CREEK
Elevation	5,520ft (1,682m)
Aspect	Southeast
Slope	7-8%
Sample Dates	07/09/2013, 07/28/2016, 08/17/2021

Table 01R-17.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Mechanical - Bullhog	West Grouse Creek Bullhog Phase 2	2574	October-December 2013	1079
Seeding - Aerial Before	West Grouse Creek Bullhog Phase 2	2574	October 2013	1079
Herbicide - Aerial (Fixed-wing)	Etna Sage-grouse Habitat Restoration Phase 1	4028	November 2020	701
Seeding - Rangeland Drill	Goose Creek Fire Rehabilitation	4758	Between September 2018 and August 2021	10195
Fire - Wildfire	Goose Creek Wildfire	-	July-August 2018	132230

Table 01R-17.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
West Grouse Creek Bullhog 11			Aerial	Oct 2013	1079
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	<i>Elymus lanceolatus</i>	Thickspike Wheatgrass		0.79	0.72
G	<i>Elymus lanceolatus</i>	Thickspike Wheatgrass	Bannock	1.16	1.01
G	<i>Elymus wawawaiensis</i>	Snake River Wheatgrass	Secar	1.44	1.28
G	<i>Poa secunda</i>	Canby Bluegrass	Canbar	0.51	0.42
G	<i>Psathyrostachys juncea</i>	Russian Wildrye		1.02	0.88
G	<i>Pseudoroegneria spicata</i>	Bluebunch Wheatgrass	Anatone	0.97	0.75
F	<i>Linum perenne</i>	Blue Flax	Appar	0.20	0.17
F	<i>Medicago sativa</i>	Alfalfa	Ladak	1.02	0.93
F	<i>Onobrychis viciifolia</i>	Sainfoin	Eski	0.37	0.31
F	<i>Onobrychis viciifolia</i>	Sainfoin	Delaney	1.58	1.54
F	<i>Sanguisorba minor</i>	Small Burnet		1.95	1.79

Mix Name			Application Type	Application Date	Acres
Goose Creek Fire BLM Mid Drill			Drill	Nov 2018	1069
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	<i>Achnatherum hymenoides</i>	Indian Ricegrass	Nezpar	0.42	0.40
G	<i>Achnatherum hymenoides</i>	Indian Ricegrass	Rimrock	0.42	0.39
G	<i>Agropyron fragile</i>	Siberian Wheatgrass	Vavilov II	1.54	1.30
G	<i>Agropyron fragile</i>	Siberian Wheatgrass	Vavilov II	0.05	0.04
G	<i>Elymus trachycaulus</i>	Thickspike Wheatgrass	Critana	1.64	1.52
G	<i>Elymus wawawaiensis</i>	Snake River Wheatgrass	Secar	0.80	0.74
G	<i>Poa secunda</i>	Canby Bluegrass	Canbar	0.12	0.10
G	<i>Poa secunda</i>	Canby Bluegrass	Canbar	0.05	0.04
G	<i>Poa secunda</i>	Sandberg Bluegrass	Mountain Home	0.15	0.14
G	<i>Psathyrostachys juncea</i>	Russian Wildrye	Bozoisky II	0.80	0.76
G	<i>Pseudoroegneria spicata</i>	Bluebunch Wheatgrass	Anatone	1.39	1.25
G	<i>Pseudoroegneria spicata</i>	Bluebunch Wheatgrass	Anatone	0.19	0.15
F	<i>Cleome serrulata</i>	Rocky Mountain Beeplant	BLM	0.05	0.04
F	<i>Linum perenne</i>	Blue Flax		0.16	0.08
F	<i>Medicago sativa</i>	Alfalfa	Ladak DL	0.80	0.77
F	<i>Onobrychis viciifolia</i>	Sainfoin	Shoshone	0.47	0.44
F	<i>Penstemon eatonii</i>	Firecracker Penstemon	BLM	0.05	0.04
F	<i>Penstemon pachyphyllus</i>	Thickleaf Penstemon	BLM	0.05	0.04
F	<i>Penstemon pachyphyllus</i>	Thickleaf Penstemon	BLM	0.03	0.03
F	<i>Penstemon palmeri</i>	Palmer Penstemon	BLM	0.05	0.04
F	<i>Sanguisorba minor</i>	Small Burnet	Delar	0.80	0.75
F	<i>Sphaeralcea grossulariifolia</i>	Gooseberryleaf Globemallow	BLM	0.01	0.00

Wildlife Habitat and Vegetation History**Table 01R-17.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Rocky Mountain Elk	crucial	year-long	
Greater Sage-Grouse	occupied	year-long	brood-rearing
Pronghorn	substantial	summer	

Table 01R-17.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2013	Black Sagebrush/Juniper	Phase I transitioning to Phase II
2016	Black Sagebrush	Phase I
2021	Perennial Grass	NA

Site Notes

No Notes

Site Potential

1981 - 2010 Average Annual Precipitation	11 inches
NRCS Ecological Site	Upland Shallow Loam (Black Sagebrush)
NRCS Ecological Site #	R028AY325UT
States and Transitions	Current State: Community Phase 3.2

When the study was established in 2013, this site was dominated by black sagebrush (*Artemisia nova*) and Utah juniper (*Juniperus osteosperma*). Encroachment of Utah juniper was active prior to treatment. More specifically, the site was transitioning to Phase II of woodland succession (Table 01R-17.4) that posed a risk to the resistance of the community to wildfire and invasion of non-native species. After the bullhog treatment in the fall of 2013 (Table 01R-17.1), juniper cover was reduced substantially in 2016 (Table 01R-17.12, Table 01R-17.13). There was not much change in the black sagebrush population following treatment. However, there was a shift in the age class of black sagebrush from a decadent population to one that was more mature (Table 01R-17.13). There was a very limited herbaceous understory prior to the bullhog and seeding treatments, but following treatment, herbaceous diversity and abundance increased significantly (Table 01R-17.7, Table 01R-17.11). After the 2018 Goose Creek Wildfire, much of the black sagebrush population was removed. However, small young and mature Wyoming big sagebrush (*A. tridentata* ssp. *wyomingensis*) are found throughout the site as of 2021 (Table 01R-17.13). As a result of a post-fire seeding (Table 01R-17.1, Table 01R-17.2), crested wheatgrass (*Agropyron cristatum*) has been the dominant species within the herbaceous community (Table 01R-17.10). Juniper trees were also removed from the area by the wildfire in 2018 (Photos, Table 01R-17.14), and will likely take a long time to return and become an influential community component.

Trend Summary Tables**Table 01R-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
2013	12.6	1.5	13.3	9.6	2.0	15.4
2016	12.8	2.5	0.3	12.8	1.9	0.5
2021	1.5	-	-	1.8	-	-

Table 01R-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
2013	37	182	34	151	0.1	2.9	0.2	1.0
2016	283	269	95	124	7.6	13.3	0.7	4.5
2021	2	283	1	25	0.0	16.2	0.0	0.7

Table 01R-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
2013	11.6	2.9	39.0	20.6	8.2	33.6
2016	12.5	1.6	44.4	17.7	0.7	34.0
2021	33.3	0.3	24.9	19.9	3.1	19.8

Table 01R-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	Horse	Rabbit
	Quadrat Frequency				
2013	-	-	-	-	9
2016	-	7	1	-	24
2021	9	-	-	-	1
Year	Days Use Per Acre (ha)				
2013	0.7 (1.8)	5.3 (13.2)	-	-	-
2016	1.5 (3.6)	8.7 (21.5)	-	-	-
2021	21.1 (52.0)	-	-	2.3 (5.7)	-

Table 01R-17.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum ⁱ (crested wheatgrass)	Agropyron fragile ⁱ (Siberian wheatgrass)	Bromus inermis ⁱ (smooth brome)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Elymus trachycaulus (slender wheatgrass)	Pascopyrum smithii (western wheatgrass)	Poa secunda (Sandberg bluegrass)	Psathyrostachys juncea ⁱ (Russian wildrye)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency										
2013	1	-	-	-	37	34	-	18	157	-	1
2016	3	-	-	0	283	80	41	47	136	1	81
2021	3	150	74	-	2	19	2	9	36	11	75
year	Average Cover (%)										
2013	0.0	-	-	-	0.1	0.3	-	0.1	2.4	-	0.0
2016	0.2	-	-	0.0	7.6	2.9	2.3	1.0	4.2	0.1	2.6
2021	0.0	7.9	3.8	-	0.0	0.2	0.0	0.1	0.2	0.5	3.5

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

Table 01R-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)	Astragalus (milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus utahensis (Utah milkvetch)	Camelina microcarpa ^{ai} (littledod false flax)	Ceratocephala testiculata ^{ai} (curveseed butterwort)	Chaetopappa ericoides (rose heath)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Cordylanthus ^a (bird's-beak)	Crepis acuminata (tapertip hawkbeard)	Cynoglossum officinale ^{ansi} (gypsyflower)
year	Nested Frequency																
2013	-	3	3	-	12	8	26	6	3	-	-	-	-	-	11	-	1
2016	-	-	1	10	3	5	2	8	3	1	4	1	3	6	22	2	-
2021	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
year	Average Cover (%)																
2013	-	0.0	0.0	-	0.0	0.0	0.2	0.0	0.0	-	-	-	-	-	0.1	-	0.0
2016	-	-	0.0	0.1	0.0	0.2	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	-
2021	0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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

FORB SPECIES	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)	Gilia inconspicua ^a (shy gilia)	Halogeton glomeratus ^{ai} (saltflower)	Lactuca serriola ^{ai} (prickly lettuce)	Lappula occidentalis ^a (flatspine stickseed)	Lepidium ^a (pepperweed)	Linum perenne ⁱ (blue flax)	Medicago sativa ⁱ (alfalfa)	Microsteris gracilis ^a (slender phlox)	Onobrychis vicifolia ⁱ (sainfoin)	Orthocarpus ^a (owl's-clover)	Petradoria pumila (rock goldenrod)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)	Sanguisorba minor ⁱ (small burnet)
year	Nested Frequency																
2013	-	-	-	0	-	-	-	-	-	12	-	-	3	15	113	3	-
2016	5	5	30	-	-	1	18	61	2	8	10	3	-	20	24	4	12
2021	-	-	-	-	1	-	-	-	14	-	0	-	-	-	9	-	-
year	Average Cover (%)																
2013	-	-	-	0.0	-	-	-	-	-	0.0	-	-	0.0	0.1	0.5	0.0	-
2016	0.0	0.0	0.1	-	-	0.0	0.1	2.4	0.0	0.0	0.6	0.1	-	0.3	0.1	0.0	0.1
2021	-	-	-	-	0.0	-	-	-	0.5	-	0.0	-	-	-	0.0	-	-

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

FORB SPECIES	Symphotrichum (aster)	Townsendia (Townsend daisy)
year	Nested Frequency	
2013	-	-
2016	3	3
2021	-	-
year	Average Cover (%)	
2013	-	-
2016	0.2	0.1
2021	-	-

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

Table 01R-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. wyomingensis ^p (Wyoming big sagebrush)	Bassia prostrata ^{pi} (forage kochia)	Chrysothamnus depressus ^p (longflower rabbitbrush)	Chrysothamnus viscidiflorus (yellow rabbitbrush)	Juniperus osteosperma ^t (Utah juniper)	Linanthus pungens (granite prickly phlox)	Opuntia (pricklypear)
year	Line Intercept Cover (%)							
2013	8	1.6	-	-	1.7	15.4	-	0.3
2016	10.8	2	-	-	1.9	0.5	-	-
2021	0.3	1.2	0.3	-	-	-	-	-
year	Quadrat Cover (%)							
2013	10.6	1.9	-	0.0	0.8	13.3	0.5	0.1
2016	12.4	0.4	-	-	2.4	0.3	-	0.0
2021	0.0	1.3	0.2	-	-	-	-	-

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

Table 01R-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			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia nova^p -- (black sagebrush)									
2013	5920	320	37	43	20	12	3	14	26/52
2016	4920	140	22	69	9	0	20	13	25/50
2021	40	-	100	0	0	0	0	0	- / -
Artemisia tridentata ssp. wyomingensis^p -- (Wyoming big sagebrush)									
2013	380	20	5	42	53	0	21	5	67/96
2016	320	880	31	56	13	6	0	31	54/95
2021	2420	20	65	34	1	0	0	3	- / -
Bassia prostrata^{pi} -- (forage kochia)									
2013	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	- / -
2021	980	20	27	74	0	25	22	0	- / -
Chrysothamnus viscidiflorus -- (yellow rabbitbrush)									
2013	1020	-	6	77	18	8	2	24	23/36
2016	1100	-	2	95	4	0	0	6	30/45
2021	-	-	-	-	-	-	-	-	- / -
Ericameria nauseosa -- (rubber rabbitbrush)									
2013	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	64/81
2021	-	-	-	-	-	-	-	-	- / -
Juniperus osteosperma^t -- (Utah juniper)									
2013	380	40	32	68	0	37	16	58	- / -
2016	60	-	67	0	33	0	0	0	- / -
2021	-	-	-	-	-	-	-	-	- / -
Linanthus pungens -- (granite prickly phlox)									
2013	60	20	0	100	0	0	67	0	28/33
2016	40	-	0	100	0	0	0	0	22/20
2021	-	-	-	-	-	-	-	-	- / -

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 (%)				
Opuntia -- (pricklypear)									
2013	160	-	0	88	13	0	0	0	12/25
2016	120	-	0	100	0	0	0	0	12/23

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

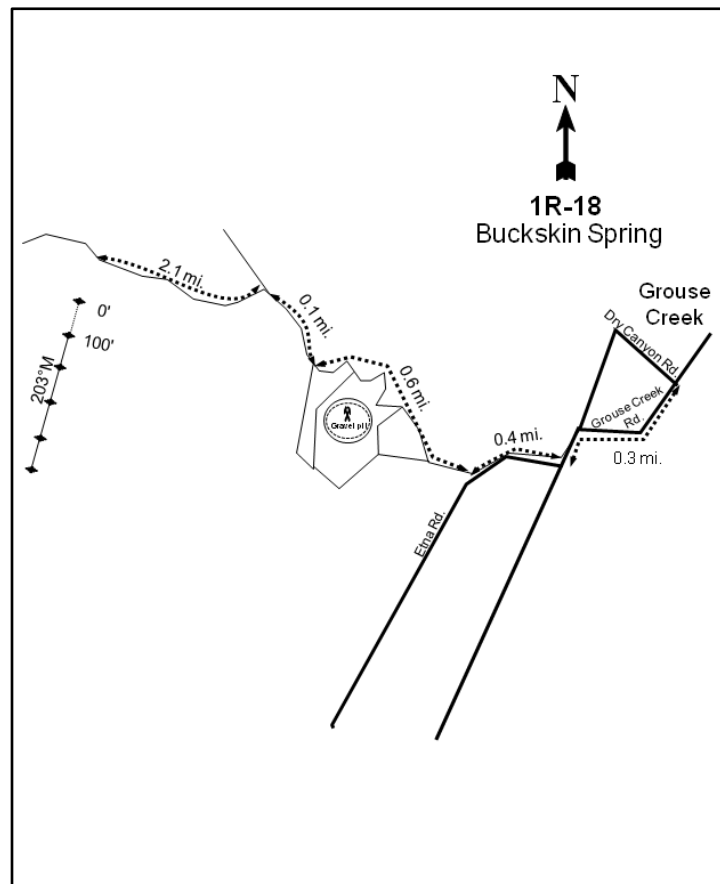
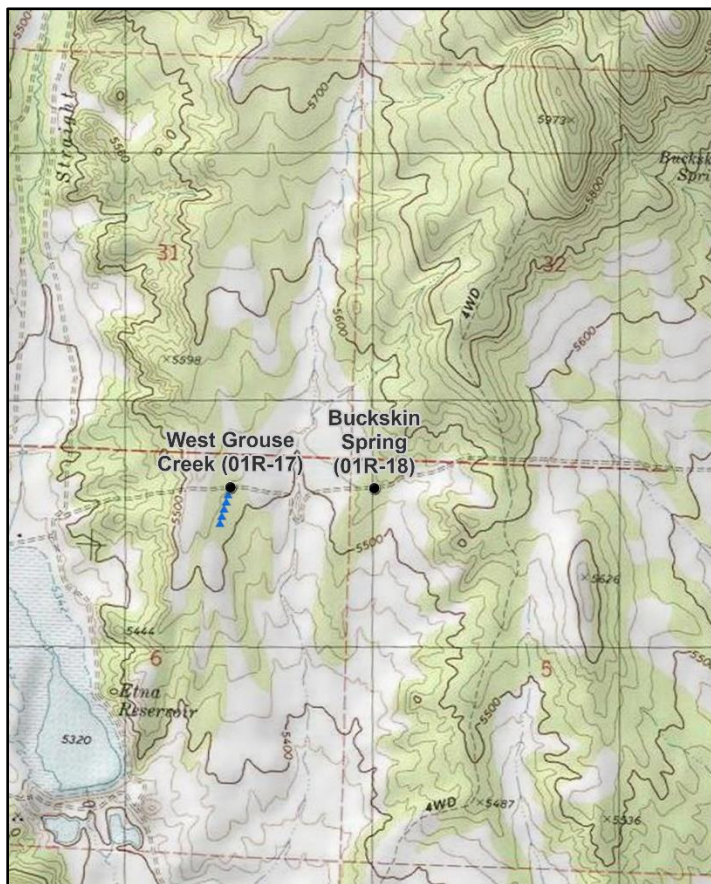
Table 01R-17.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2013	146	13	38	33	8	8	13.1
2016	41	17	83	-	-	-	2.6

Table 01R-17.15 - Deer Desirable Components Index: Upland 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
2013	12.0	7.3	15.0	5.8	-0.1	1.9	-2.0	39.9	Poor
2016	16.0	12.3	11.9	26.5	-5.7	9.1	0.0	70.0	Good
2021	2.3	0.0	0.0	30.0	0.0	1.4	0.0	33.7	Very Poor-Poor

BUCKSKIN SPRING - STUDY NO. 01R-18



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Grouse Creek NW; Township 11N, Range 18W, Section 05
NAD 83 UTM ZONE 12, 254950 East 4621838 North

Transect Information

Browse Tag # (0' Stake)	629
Transect Bearing	190° 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 Dry Canyon Road and Grouse Creek Road in the town of Grouse Creek, travel southwest on Grouse Creek Road for 0.3 miles. Turn right and continue for 0.4 miles. Turn right again and drive for 0.6 miles, going around some gravel pits. While there are many side roads, stay on the main road for 0.1 miles until there is a fork in the road. Travel left at the fork and drive for 2.1 miles. The site is south of the road.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	GROUSE CREEK
Elevation	5,538ft (1,688m)
Aspect	South
Slope	4%
Sample Dates	09/03/2014, 07/18/2017, 08/16/2021

Table 01R-18.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Seeding - Aerial Before	West Grouse Creek Bullhog Phase 3	2900	January 2015	949
Mechanical - Bullhog	West Grouse Creek Bullhog Phase 3	2900	January-April 2015	949
Seeding - Rangeland Drill	Goose Creek Fire Rehabilitation	4758	Between September 2018 and August 2021	10195
Fire - Wildfire	Goose Creek Fire	-	July-August 2018	132230

Table 01R-18.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
West Grouse Creek Bullhog 3			Aerial	Jan 2015	959
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Achnatherum hymenoides	Indian Ricegrass	Rimrock	0.52	0.44
G	Agropyron cristatum	Crested Wheatgrass	Hycrest II	0.99	0.85
G	Elymus wawawaiensis	Snake River Wheatgrass	Secar	1.04	0.95
G	Poa secunda	Canby Bluegrass	Canbar	0.52	0.40
G	Psathyrostachys juncea	Russian Wildrye	Bozoisky II	0.16	0.13
G	Psathyrostachys juncea	Russian Wildrye	Bozoisky II	0.36	0.30
G	Pseudoroegneria spicata	Bluebunch Wheatgrass	Anatone	1.04	0.90
G	Thinopyrum intermedium	Thickspike Wheatgrass	Critana	1.98	1.72
F	Linum perenne	Blue Flax	Appar	0.21	0.18
F	Medicago sativa	Alfalfa	Ladak	0.21	0.20
F	Medicago sativa	Alfalfa	Ladak +	0.52	0.49
F	Onobrychis viciifolia	Sainfoin	Eski	2.03	1.97
F	Sanguisorba minor	Small Burnet		2.03	1.68

Mix Name			Application Type	Application Date	Acres
Goose Creek Fire BLM Mid Drill			Drill	Nov 2018	1069
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Achnatherum hymenoides	Indian Ricegrass	Nezpar	0.42	0.40
G	Achnatherum hymenoides	Indian Ricegrass	Rimrock	0.42	0.39
G	Agropyron fragile	Siberian Wheatgrass	Vavilov II	1.54	1.30
G	Agropyron fragile	Siberian Wheatgrass	Vavilov II	0.05	0.04
G	Elymus trachycaulus	Thickspike Wheatgrass	Critana	1.64	1.52
G	Elymus wawawaiensis	Snake River Wheatgrass	Secar	0.80	0.74
G	Poa secunda	Sandberg Bluegrass	Mountain Home	0.15	0.14
G	Poa secunda	Canby Bluegrass	Canbar	0.12	0.10
G	Poa secunda	Canby Bluegrass	Canbar	0.05	0.04
G	Psathyrostachys juncea	Russian Wildrye	Bozoisky II	0.80	0.76
G	Pseudoroegneria spicata	Bluebunch Wheatgrass	Anatone	1.39	1.25
G	Pseudoroegneria spicata	Bluebunch Wheatgrass	Anatone	0.19	0.15
F	Cleome serrulata	Rocky Mountain Beeplant	BLM	0.05	0.04
F	Linum perenne	Blue Flax		0.16	0.08
F	Medicago sativa	Alfalfa	Ladak DL	0.80	0.77
F	Onobrychis viciifolia	Sainfoin	Shoshone	0.47	0.44
F	Penstemon eatonii	Firecracker Penstemon	BLM	0.05	0.04
F	Penstemon pachyphyllus	Thickleaf Penstemon	BLM	0.05	0.04
F	Penstemon pachyphyllus	Thickleaf Penstemon	BLM	0.03	0.03
F	Penstemon palmeri	Palmer Penstemon	BLM	0.05	0.04
F	Sanguisorba minor	Small Burnet	Delar	0.80	0.75
F	Sphaeralcea grossulariifolia	Gooseberryleaf Globemallow	BLM	0.01	0.00

Wildlife Habitat and Vegetation History**Table 01R-18.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Rocky Mountain Elk	crucial	year-long	
Greater Sage-Grouse	occupied	year-long	brood-rearing
Pronghorn	substantial	summer	

Table 01R-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	Juniper	Phase II transitioning to Phase III
2017	Annual-Perennial Grass-Forb/Black Sagebrush	Phase I
2021	Perennial Grass/Forage Kochia	No Encroachment

Site Notes

No Notes

Site Potential

1981 - 2010 Average Annual Precipitation	11 inches
NRCS Ecological Site	Semidesert Gravelly Sandy Loam (Black Sagebrush)
NRCS Ecological Site #	R028AY227UT
States and Transitions	Current State: Community Phase 2.3

This study site was established in 2014 and was dominated by Utah Juniper (*Juniperus osteosperma*) with a small component of black sagebrush (*Artemisia nova*) also present (Table 01R-18.12, Table 01R-18.13, Table 01R-18.14). Herbaceous cover was low, likely due to competition with the juniper. Following the bullhog and seeding treatment in 2015 (Table 01R-18.1), the site transitioned to an annual-perennial grass/forb community with black sagebrush sparsely scattered across the area. The introduced annual grass species cheatgrass (*Bromus tectorum*) increased substantially in cover following the treatment, as did perennial grasses and forbs (Table 01R-18.7, Table 01R-18.10, Table 01R-18.11). After the 2018 Goose Creek Wildfire, the black sagebrush population was substantially reduced. However, as of 2021 young Wyoming big sagebrush (*A. tridentata* ssp. *wyomingensis*) and forage kochia (*Bassia prostrata*) can be found throughout the site (Table 01R-17.13). As a result of a post-fire seeding (Table 01R-18.1), crested wheatgrass (*Agropyron cristatum*) was abundant while bluebunch wheatgrass (*Pseudoroegneria spicata*) was the dominant herbaceous species in 2021 (Table 01R-18.10). Juniper trees were also removed from the site by the wildfire (Photos, Table 01R-18.14), and will likely take a long time to return and become an influential community component.

Trend Summary Tables**Table 01R-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	3.1	1.3	14.2	4.4	1.2	29.5
2017	2.5	2.4	0.3	2.6	2.6	0.2
2021	7.9	0.1	-	6.6	-	-

Table 01R-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	26	120	23	115	0.1	2.4	0.1	3.4
2017	244	166	213	195	7.6	6.6	4.5	7.9
2021	39	294	14	137	0.2	10.6	0.0	2.5

Table 01R-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	18.0	5.7	39.6	30.3	3.1	22.4
2017	15.7	1.1	57.7	11.2	0.5	26.6
2021	29.9	0.4	19.3	26.0	5.0	22.8

Table 01R-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/Pronghorn	Mule Deer	Rabbit
	Quadrat Frequency			
2014	2	-	-	2
2017	1	-	-	25
2021	2	-	2	-
Days Use Per Acre (ha)				
2014	-	-	-	-
2017	0.7 (1.8)	2.0 (5.0)	-	-
2021	23.2 (57.4)	-	-	-

Table 01R-18.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Agropyron cristatum ⁱ (crested wheatgrass)	Agropyron fragile ⁱ (Siberian wheatgrass)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Elymus lanceolatus (thickspike wheatgrass)	Poa secunda (Sandberg bluegrass)	Psathyrostachys juncea ⁱ (Russian wildrye)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency								
2014	31	-	-	26	47	-	60	-	3
2017	34	21	0	244	43	26	44	1	34
2021	46	95	37	39	39	37	14	10	125
year	Average Cover (%)								
2014	0.9	-	-	0.1	0.5	-	0.9	-	0.1
2017	1.2	1.0	0.0	7.6	1.3	1.3	1.1	0.0	0.6
2021	1.5	2.9	0.9	0.2	0.5	0.4	0.1	0.1	4.2

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

Table 01R-18.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Alyssum desertorum ^{ai} (desert madwort)	Antennaria dimorpha (low pussytoes)	Arabis (rockcross)	Astragalus anserinus (Goose Creek milkvetch)	Astragalus beckwithii (Beckwith's milkvetch)	Astragalus calycosus (Torrey's milkvetch)	Caulanthus crassicaulis ^a (thickstem wild cabbage)	Chaenactis douglasii (Douglas' dustymaiden)	Collinsia parviflora ^a (maiden blue eyed Mary)	Cryptantha (cryptantha)	Cryptantha gracilis ^a (narrowstem cryptantha)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)	Erigeron (fleabane)	Eriogonum (buckwheat)	Gilia inconspicua ^a (shy gilia)
year	Nested Frequency																
2014	-	-	1	6	1	-	24	-	-	-	15	-	23	-	-	26	-
2017	-	13	2	-	11	9	26	-	2	75	14	19	17	2	-	4	103
2021	45	-	-	-	-	-	29	1	3	-	15	13	-	-	1	-	-
year	Average Cover (%)																
2014	-	-	0.0	0.0	0.0	-	0.1	-	-	-	0.1	-	0.1	-	-	0.2	-
2017	-	0.2	0.0	-	0.1	0.2	0.1	-	0.0	1.0	0.3	0.2	0.5	0.0	-	0.2	2.2
2021	0.4	-	-	-	-	-	0.1	0.0	0.0	-	0.1	0.0	-	-	0.0	-	-

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

FORB SPECIES										
<i>Lactuca serriola</i> ^{ai} (prickly lettuce)										
<i>Lesquerella</i> (bladderpod)										
<i>Linum perenne</i> ⁱ (blue flax)										
<i>Lupinus argenteus</i> (silvery lupine)										
<i>Medicago sativa</i> ⁱ (alfalfa)										
<i>Penstemon</i> (beardtongue)										
<i>Phlox austromontana</i> (mountain phlox)										
<i>Phlox longifolia</i> (longleaf phlox)										
<i>Sanguisorba minor</i> ⁱ (small burnet)										
<i>Sisymbrium altissimum</i> ^{ai} (tall tumblemustard)										
year	Nested Frequency									
2014	-	2	-	-	-	1	75	3	-	-
2017	40	3	89	23	13	3	66	1	12	4
2021	-	-	17	-	16	6	38	6	7	-
year	Average Cover (%)									
2014	-	0.0	-	-	-	0.0	2.9	0.0	-	-
2017	0.3	0.0	1.9	1.4	0.8	0.0	2.1	0.0	0.7	0.2
2021	-	-	0.3	-	0.3	0.0	1.0	0.1	0.2	-

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

Table 01R-18.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES									
<i>Artemisia nova</i> ^p (black sagebrush)									
<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> ^p (Wyoming big sagebrush)									
<i>Bassia prostrata</i> ^{ai} (forage kochia)									
<i>Chrysothamnus viscidiflorus</i> ssp. <i>viscidiflorus</i> var. <i>stenophyllus</i> (yellow rabbitbrush)									
<i>Ericameria nauseosa</i> (rubber rabbitbrush)									
<i>Juniperus osteosperma</i> ^t (Utah juniper)									
<i>Linanthus pungens</i> (granite prickly phlox)									
<i>Opuntia polyacantha</i> (plains pricklypear)									
year	Line Intercept Cover (%)								
2014	3.4	1	-	0.5	-	29.5	0.6	0.1	
2017	2.6	-	-	2.3	-	0.2	0.3	-	
2021	0.2	0.5	5.9	-	-	-	-	-	
year	Quadrat Cover (%)								
2014	3.1	0.1	-	0.5	-	14.2	0.4	0.4	
2017	2.5	-	-	1.0	-	0.3	1.3	0.1	
2021	0.1	0.7	7.1	-	0.0	-	0.0	-	

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

Table 01R-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			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia nova ^p -- (black sagebrush)									
2014	1780	20	24	39	37	15	8	56	28/57
2017	1620	40	22	77	1	0	0	1	29/48
2021	560	80	79	21	0	21	4	0	- / -
Artemisia tridentata ssp. <i>wyomingensis</i> ^p -- (Wyoming big sagebrush)									
2014	300	20	33	20	47	47	0	60	37/49
2017	40	-	0	100	0	0	0	0	41/78
2021	2900	40	83	17	0	2	0	2	- / -

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 (%)				
Bassia prostrata^{pi} -- (forage kochia)									
2014	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
2021	29340	1120	22	78	0	57	28	0	-/-
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
2014	800	20	5	83	13	8	0	65	18/26
2017	1320	20	6	94	0	0	0	2	25/37
2021	-	-	-	-	-	-	-	-	-/-
Ericameria nauseosa -- (rubber rabbitbrush)									
2014	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
2021	40	-	0	100	0	0	100	50	-/-
Juniperus osteospermaⁱ -- (Utah juniper)									
2014	700	80	54	37	9	3	0	46	-/-
2017	100	60	80	20	0	0	0	0	-/-
2021	-	-	-	-	-	-	-	-	-/-
Linanthus pungens -- (granite prickly phlox)									
2014	1080	40	2	74	24	11	2	65	19/24
2017	680	-	0	100	0	0	0	0	19/30
2021	240	-	0	100	0	0	0	0	-/-
Opuntia polyacantha -- (plains pricklypear)									
2014	220	-	0	91	9	0	0	18	11/26
2017	80	-	0	100	0	0	0	25	8/19

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

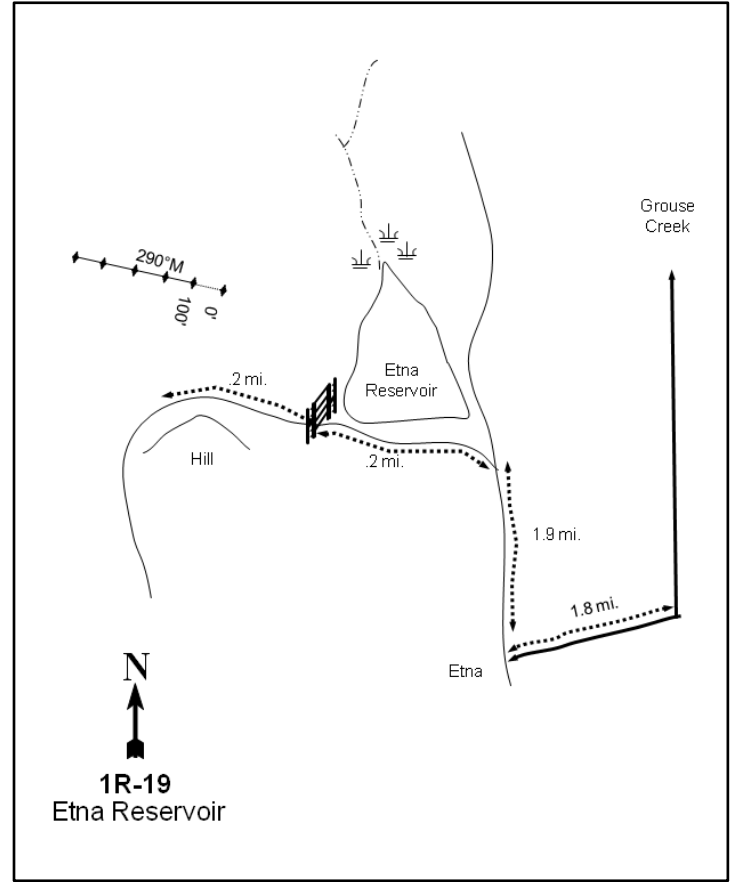
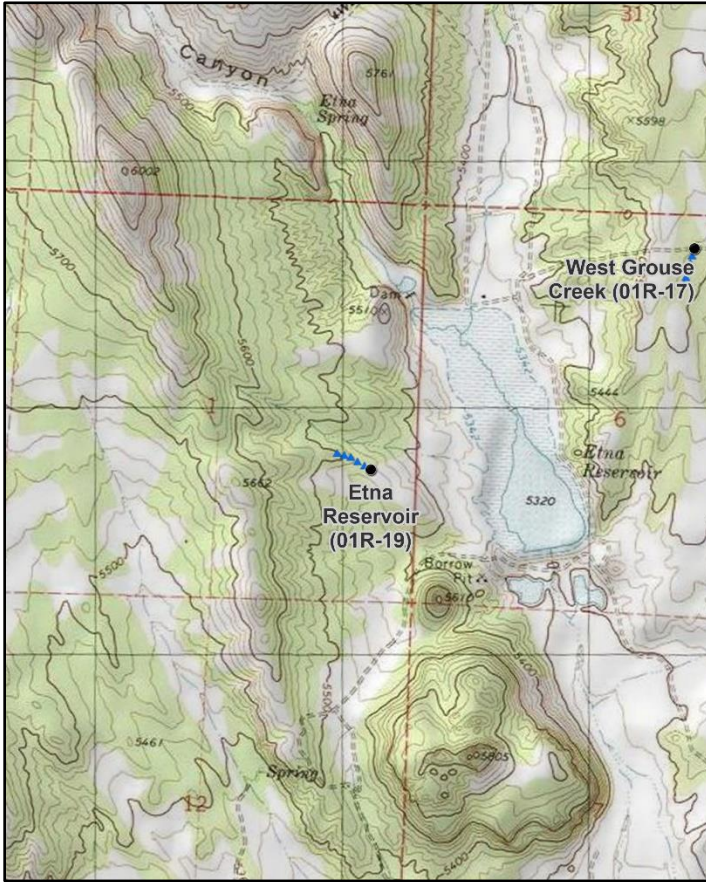
Table 01R-18.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2014	305	5	10	60	25	-	21.7
2017	34	43	57	-	-	-	2.9

Table 01R-18.15 - Deer Desirable Components Index: Semidesert 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	5.5	0.0	0.0	4.9	0.0	6.8	0.0	17.1	Poor
2017	3.3	0.0	0.0	13.2	-5.7	10.0	0.0	20.7	Poor
2021	9.7	14.9	14.1	21.1	-0.2	5.0	0.0	64.7	Good-Excellent

ETNA RESERVOIR - STUDY NO. 01R-19



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Grouse Creek NW; Township 11N, Range 19W, Section 01
NAD 83 UTM ZONE 12, 253054 East 4620946 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

Not Available
290° magnetic (Lines 4-5: 270° magnetic)
500ft
Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Standard

Directions to Site

From the town of Grouse Creek, drive south on Grouse Creek Road for approximately 0.3 miles. Turn right on Etna Road and drive for 1.8 miles. Turn right again, traveling toward Etna Reservoir. Turn left on the road just south of the reservoir and proceed for 0.6 miles at which point you will come to a gate. Drive through the gate and continue for another 0.2 miles. The site is located northwest of the road.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	GROUSE CREEK
Elevation	5,460ft (1,664m)
Aspect	Southeast
Slope	4%
Sample Dates	09/03/2014, 07/18/2017, 08/18/2021

Table 01R-19.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Seeding - Aerial Before	West Grouse Creek Bullhog Phase 3	2900	Fall 2015	949
Mechanical - Bullhog	West Grouse Creek Bullhog Phase 3	2900	January- April 2015	949
Fire - Wildfire	Goose Creek Wildfire	-	2018	132230
Herbicide - Plateau	Goose Creek Fire Rehabilitation	4758	Spring 2019	534

Table 01R-19.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
West Grouse Creek Bullhog 3			Aerial	Jan 2015	959
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Achnatherum hymenoides	Indian Ricegrass	Rimrock	0.52	0.44
G	Agropyron cristatum	Crested Wheatgrass	Hycrest II	0.99	0.85
G	Elymus lanceolatus	Thickspike Wheatgrass	Critana	1.98	1.72
G	Elymus wawawaiensis	Snake River Wheatgrass	Secar	1.04	0.95
G	Poa secunda	Canby Bluegrass	Canbar	0.52	0.40
G	Psathyrostachys juncea	Russian Wildrye	Bozoisky II	0.16	0.13
G	Psathyrostachys juncea	Russian Wildrye	Bozoisky II	0.36	0.30
G	Pseudoroegneria spicata	Bluebunch Wheatgrass	Anatone	1.04	0.90
F	Linum perenne	Blue Flax	Appar	0.21	0.18
F	Medicago sativa	Alfalfa	Ladak	0.21	0.20
F	Medicago sativa	Alfalfa	Ladak +	0.52	0.49
F	Onobrychis viciifolia	Sainfoin	Eski	2.03	1.97
F	Sanguisorba minor	Small Burnet		2.03	1.68

Wildlife Habitat and Vegetation History**Table 01R-19.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Rocky Mountain Elk	crucial	year-long	
Greater Sage-Grouse	occupied	year-long	brood-rearing
Pronghorn	substantial	summer	

Table 01R-19.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2014	Juniper	Phase I transitioning to Phase II
2017	Black Sagebrush	Phase I
2021	Perennial Grass	Phase I

Site Notes

Elk and deer sign were observed on the site in 2017, but pellets were not captured in sampling methods.

Site Potential

1981 - 2010 Average Annual Precipitation	10 inches
NRCS Ecological Site	Semidesert Loam (Wyoming Big Sagebrush)
NRCS Ecological Site #	R028AY220UT
States and Transitions	Current State: Community Phase 6.1

This study site was established in 2014 and was dominated by Utah Juniper (*Juniperus osteosperma*) with a component of black sagebrush (*Artemisia nova*) also present (Table 01R-19.12, Table 01R-19.13, Table 01R-19.14). The herbaceous understory was not overly diverse and provided little cover (Table 01R-19.7). Following the bullhog and seeding treatment in 2015 (Table 01R-19.1), cover of juniper decreased substantially while that of black sagebrush slightly increased (Table 01R-19.12). The herbaceous understory increased in diversity and cover in 2017, although cheatgrass (*Bromus tectorum*) was sampled with moderate cover (Table 01R-19.10, Table 01R-19.11). After the Goose Creek wildfire in 2018, much of the black and Wyoming big sagebrush populations survived and remained on site (Table 01R-19.13). Crested wheatgrass (*Agropyron cristatum*) increased within the herbaceous community, but the understory was dominated by squirreltail (*Elymus elymoides*) and Sandberg bluegrass (*Poa secunda*) during the most recent sampling (Table 01R-17.10). Seedlings and young juniper trees were found on the site in 2021 (Photos, Table 01R-19.14). Trees will likely infill over time and again become an influential community component without frequent fire return. However, black and Wyoming big sagebrush are also expected to return to become a dominant component in the community without frequent fire return.

Trend Summary Tables**Table 01R-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
2014	4.8	0.6	7.5	6.1	0.8	16.9
2017	8.1	0.5	0.3	7.2	0.8	0.3
2021	4.9	0.5	0.4	5.7	0.5	0.4

Table 01R-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
2014	3	180	16	179	0.0	3.6	0.1	4.6
2017	154	223	262	211	5.5	6.8	3.6	7.0
2021	37	266	36	137	0.5	7.1	0.6	3.4

Table 01R-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
2014	20.9	1.2	30.1	37.8	4.6	20.1
2017	16.9	0.0	45.9	18.9	1.1	26.6
2021	18.2	1.0	35.0	22.5	4.0	17.7

Table 01R-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			
2014	3	-	-	10
2017	2	-	-	6
2021	10	-	1	5
Year	Days Use Per Acre (ha)			
2014	-	-	-	-
2017	5.1 (12.6)	-	-	-
2021	22.5 (55.6)	2.0 (5.0)	-	-

Table 01R-19.10 - 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 lanceolatus (thickspike wheatgrass)									
Leymus cinereus (basin wildrye)									
Poa secunda (Sandberg bluegrass)									
Psathyrostachys juncea ⁱ (Russian wildrye)									
Pseudoroegneria spicata (bluebunch wheatgrass)									
year	Nested Frequency								
2014	12	-	3	54	-	-	122	-	27
2017	10	7	154	76	15	3	134	-	24
2021	15	36	37	137	19	5	116	1	41
year	Average Cover (%)								
2014	0.4	-	0.0	0.8	-	-	1.9	-	0.6
2017	0.1	0.2	5.5	1.1	0.2	0.1	4.1	-	0.9
2021	0.3	0.9	0.5	2.4	0.4	0.2	1.7	0.1	1.0

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

Table 01R-19.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES																		
Allium acuminatum (tapertip onion)																		
Alyssum desertorum ^{ai} (desert madwort)																		
Antennaria dimorpha (low pussytoes)																		
Arabis (rockcross)																		
Astragalus anserinus (Goose Creek milkvetch)																		
Astragalus calycosus (Torrey's milkvetch)																		
Astragalus filipes (basalt milkvetch)																		
Camelina microcarpa ^{ai} (littlepod false flax)																		
Castilleja angustifolia (northwestern Indian paintbrush)																		
Ceratocephala testiculata ^{ai} (curveseed butterwort)																		
Chaenactis douglasii (Douglas' dustymaiden)																		
Chaetopappa ericoides (rose heath)																		
Collinsia parviflora ^a (maiden blue eyed Mary)																		
Collomia linearis ^a (tiny trumpet)																		
Cordylanthus ^a (bird's-beak)																		
Crepis acuminata (tapertip hawkbeard)																		
Cryptantha (cryptantha)																		
year	Nested Frequency																	
2014	-	-	56	-	4	8	-	-	-	-	-	4	-	-	-	4	10	
2017	3	78	25	7	-	18	39	4	3	32	1	3	20	2	20	2	6	
2021	-	-	15	-	-	4	-	-	-	-	7	-	-	-	-	-	11	
year	Average Cover (%)																	
2014	-	-	1.3	-	0.0	0.1	-	-	-	-	-	0.0	-	-	-	0.0	0.1	
2017	0.0	0.8	1.0	0.2	-	0.1	1.9	0.0	0.0	0.6	0.0	0.0	0.3	0.0	0.1	0.0	0.1	
2021	-	-	0.3	-	-	0.0	-	-	-	-	0.0	-	-	-	-	-	0.1	

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

FORB SPECIES																		
Cryptantha gracilis ^a (narrowstem cryptantha)																		
Descurainia pinnata ^a (western tansymustard)																		
Draba ^a (draba)																		
Erigeron (fleabane)																		
Eriogonum (buckwheat)																		
Eriogonum ovalifolium (cushion buckwheat)																		
Gayophytum ramosissimum ^a (pinyon groundsmoke)																		
Gilia inconspicua ^a (shy gilia)																		
Heterotheca villosa (hairy false goldenaster)																		
Ionactis alpina (Lava aster)																		
Lactuca serriola ^{ai} (prickly lettuce)																		
Lappula occidentalis ^a (flatspine stickseed)																		
Lepidium ^a (pepperweed)																		
Lesquerella (bladderpod)																		
Linum perenne ⁱ (blue flax)																		
Lupinus argenteus (silvery lupine)																		
Medicago sativa ⁱ (alfalfa)																		
year	Nested Frequency																	
2014	-	15	-	29	3	-	-	-	-	-	-	1	-	12	-	-	-	
2017	6	19	4	25	3	4	6	91	12	-	70	-	4	-	59	7	12	
2021	-	-	-	20	6	-	-	-	-	16	33	7	-	-	2	-	45	
year	Average Cover (%)																	
2014	-	0.1	-	0.2	0.0	-	-	-	-	-	-	0.0	-	0.0	-	-	-	
2017	0.1	0.1	0.0	0.4	0.0	0.0	0.0	0.9	0.6	-	0.3	-	0.1	-	0.9	0.2	0.3	
2021	-	-	-	0.2	0.0	-	-	-	-	0.4	0.6	0.0	-	-	0.0	-	1.4	

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

FORB SPECIES													
Microsteris gracilis ^{ai} (slender phlox)													
Onobrychis viciifolia ⁱ (sainfoin)													
Petrorhiza pumila (rock goldenrod)													
Phlox austromontana (mountain phlox)													
Phlox longifolia (longleaf phlox)													
Sanguisorba minor ⁱ (small burnet)													
Silene antirrhina ^a (sleepy silene)													
Sisymbrium altissimum ^{ai} (tall tumblermustard)													
Stenotus acaulis (stemless mock goldenweed)													
Symphotrichum (aster)													
Tragopogon dubius ^{ai} (yellow salsify)													
Veronica bitoba ^{ai} (two-lobed speedwell)													
year	Nested Frequency												
2014	-	-	13	107	12	-	-	-	5	8	1	-	
2017	5	4	-	68	1	9	0	8	8	-	1	2	
2021	2	-	-	43	6	-	-	-	-	-	-	-	
year	Average Cover (%)												
2014	-	-	0.2	2.2	0.1	-	-	-	0.3	0.2	0.0	-	
2017	0.0	0.1	-	1.1	0.0	0.1	0.0	0.2	0.1	-	0.0	0.0	
2021	0.0	-	-	1.0	0.0	-	-	-	-	-	-	-	

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

Table 01R-19.12 - 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)	Eriogonum microthecum ^p (slender buckwheat)	Juniperus osteosperma ⁱ (Utah juniper)	Linanthus pungens (granite prickly phlox)	Opuntia polyacantha (plains pricklypear)	Pinus edulis ⁱ (twoneedle pinyon)
year	Line Intercept Cover (%)							
2014	5.7	0.4	0.8	-	16.9	-	0	-
2017	6.1	1.1	0.7	-	0.3	0.1	-	-
2021	3.9	1.8	0.5	-	0.4	-	-	-
year	Quadrat Cover (%)							
2014	4.5	0.2	0.3	0.0	7.4	0.0	0.2	0.0
2017	7.3	0.8	0.3	-	0.3	0.2	0.0	-
2021	4.0	1.0	0.5	-	0.4	-	0.0	-

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

Table 01R-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			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia nova^p -- (black sagebrush)									
2014	5460	80	54	33	14	23	10	18	32/53
2017	5180	40	7	89	4	1	0	3	26/42
2021	4220	140	37	46	17	12	0	28	- / -
Artemisia tridentata ssp. wyomingensis^p -- (Wyoming big sagebrush)									
2014	440	-	18	46	36	5	5	77	36/53
2017	2780	2240	89	12	0	0	0	0	45/58
2021	5780	-	77	21	2	0	0	3	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus -- (yellow rabbitbrush)									
2014	780	-	31	39	31	8	8	67	18/20
2017	340	-	18	82	0	0	0	0	27/35
2021	620	20	10	13	77	0	0	81	- / -
Eriogonum microthecum^p -- (slender buckwheat)									
2014	20	-	0	100	0	0	100	100	- / -
2017	-	-	-	-	-	-	-	-	- / -
2021	-	-	-	-	-	-	-	-	- / -
Juniperus osteospermaⁱ -- (Utah juniper)									
2014	340	20	18	82	0	0	0	94	- / -
2017	100	60	80	20	0	0	0	0	- / -
2021	200	-	90	10	0	0	0	10	- / -
Linanthus pungens -- (granite prickly phlox)									
2014	80	-	0	100	0	0	0	0	11/21
2017	80	-	0	100	0	0	0	0	16/27
2021	-	-	-	-	-	-	-	-	- / -
Opuntia polyacantha -- (plains pricklypear)									
2014	260	40	8	92	0	0	0	15	12/27
2017	80	-	0	100	0	0	0	50	8/19
2021	120	-	0	50	50	0	0	50	- / -

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 (%)				
Pinus edulis ^t -- (twoneedle pinyon)									
2014	-	-	-	-	-	-	-	-	-/-
2017	20	-	100	0	0	0	0	0	-/-

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

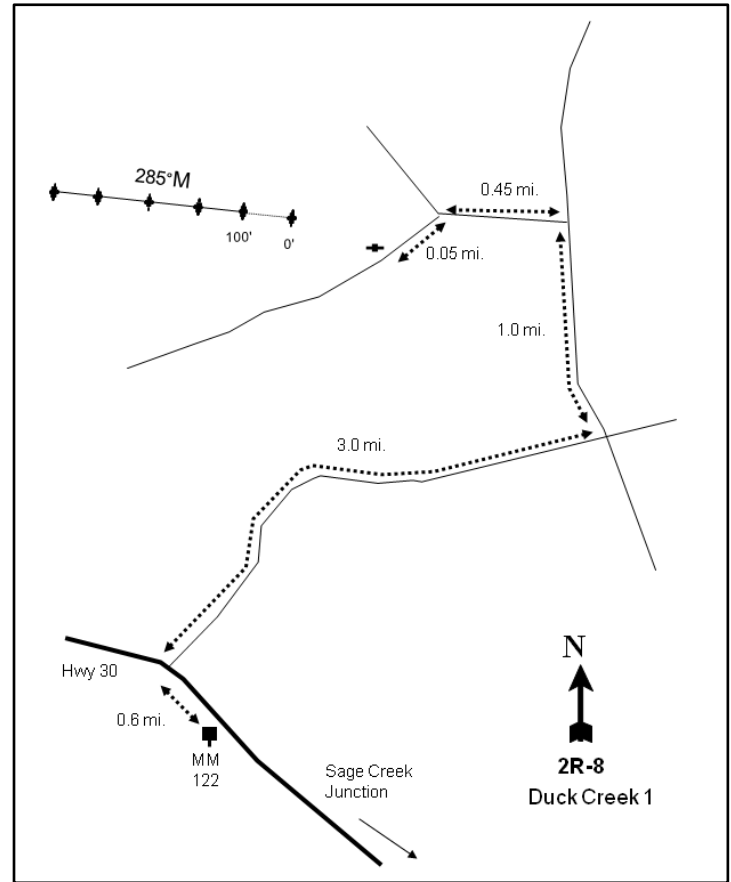
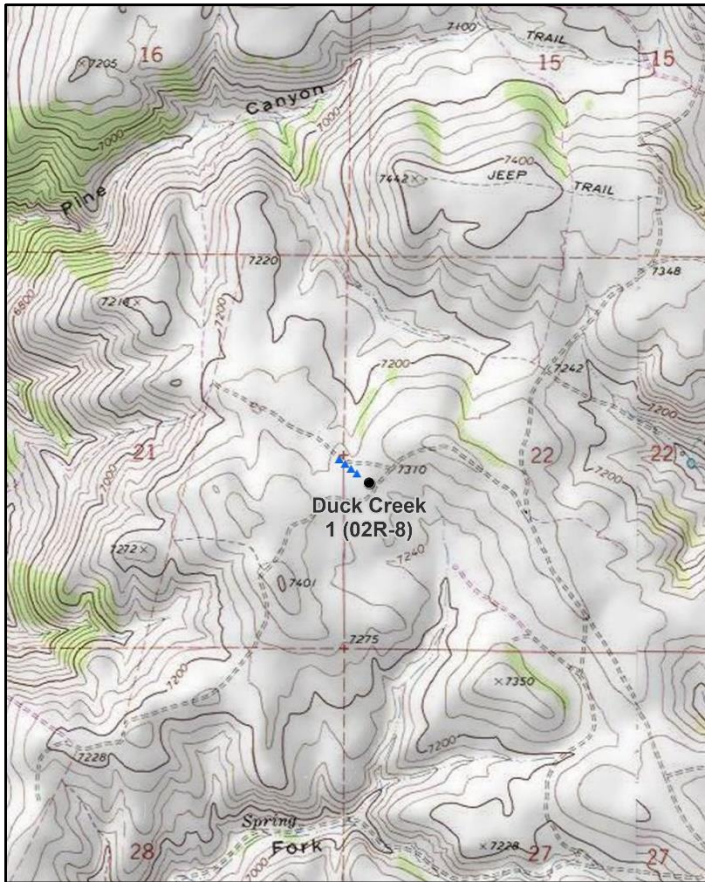
Table 01R-19.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2014	342	-	15	75	10	-	17.0
2017	55	69	31	-	-	-	4.2
2021	47	55	45	-	-	-	1.7

Table 01R-19.15 - Deer Desirable Components Index: Semidesert 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	10.5	15.0	7.2	0.0	9.2	0.0	49.6	Good
2017	9.0	14.0	9.7	13.6	-4.2	10.0	0.0	52.1	Good
2021	7.1	11.4	15.0	14.1	-0.4	6.8	0.0	54.0	Good

DUCK CREEK 1 - STUDY NO. 02R-8

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Laketown NE; Township 13N, Range 6E, Section 22
NAD 83 UTM ZONE 12, 478101 East 4633415 North

Transect Information

Browse Tag # (0' Stake)	9151
Transect Bearing	300° 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, 3, 4, 5: No Rebar

Directions to Site

On Highway 30, drive to mile marker 122 and continue north for 0.6 miles to a road to the right (east): take this road for 3.0 miles to an intersection. At the intersection, turn left (north) and drive 1.0 miles to a fork. Take the left fork and proceed for 0.45 miles to another fork. Take the left fork again and continue for 0.05 miles to the witness post on the right (north) side of the road. The 0-foot stake is 13 paces away at 311 degrees magnetic and is marked by browse tag #9151.

Site Information

Land Ownership	Private
Land Administrator	Private
Allotment	DUCK CREEK
Elevation	7,300ft (2,225m)
Aspect	Northwest
Slope	3%
Sample Dates	10/01/2003, 08/02/2006, 08/03/2011, 07/28/2016, 07/13/2021

Table 02R-08.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Aerator - Double Drum/Seed	Duck Creek	1321	2004	2850

Table 02R-08.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Duck Creek A			Aerator	Mar 2004	325
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Achnatherum hymenoides	Indian Ricegrass	Nezpar	0.51	0.45
G	Dactylis glomerata	Orchardgrass	Paiute	1.00	0.88
G	Leymus cinereus	Great Basin Wildrye	Trailhead	0.90	0.76
G	Leymus cinereus	Great Basin Wildrye	Trailhead	0.15	0.13
G	Psathyrostachys juncea	Russian Wildrye	Bozoisky	1.00	0.75
G	Pseudoroegneria spicata	Bluebunch Wheatgrass	Goldar	1.00	0.93
F	Medicago sativa	Alfalfa	Ranger	1.00	0.96
F	Melilotus officinalis	Yellow Sweetclover		0.26	0.23
F	Onobrychis viciifolia	Sainfoin		2.00	1.91
F	Sanguisorba minor	Small Burnet	Delar	2.00	1.85
S	Atriplex canescens	Fourwing Saltbush	Juab UT	0.51	0.25
S	Purshia tridentata	Antelope Bitterbrush		0.15	0.13

Mix Name			Application Type	Application Date	Acres
Duck Creek B			Aerator	Mar 2004	650
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Achnatherum hymenoides	Indian Ricegrass	Rimrock	0.42	0.41
G	Achnatherum hymenoides	Indian Ricegrass	Rimrock	0.08	0.07
G	Dactylis glomerata	Orchardgrass	Paiute	1.00	0.88
G	Leymus cinereus	Great Basin Wildrye	Trailhead	1.00	0.86
G	Psathyrostachys juncea	Russian Wildrye	Bozoisky	1.00	0.75
G	Pseudoroegneria spicata	Bluebunch Wheatgrass	Goldar	0.57	0.53
G	Pseudoroegneria spicata	Bluebunch Wheatgrass	Goldar	0.46	0.43
F	Medicago sativa	Alfalfa	Ranger	1.00	0.96
F	Melilotus officinalis	Yellow Sweetclover		0.26	0.23
F	Onobrychis viciifolia	Sainfoin		2.00	1.91
F	Sanguisorba minor	Small Burnet	Delar	2.00	1.85
S	Atriplex canescens	Fourwing Saltbush	Juab UT	0.52	0.25
S	Purshia tridentata	Antelope Bitterbrush		0.13	0.11

Wildlife Habitat and Vegetation History**Table 02R-08.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	substantial	winter	
Greater Sage-Grouse	occupied	year-long	brood-rearing

Table 02R-08.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2003	Mountain Big Sagebrush	NA
2006	Mountain Big Sagebrush/Perennial Grass	NA
2011	Mountain Big Sagebrush/Perennial Grass-Forb	NA
2016	Mountain Big Sagebrush/Perennial Grass	NA
2021	Mountain Big Sagebrush/Perennial Grass	NA

Site Notes

This study is located on privately-owned land on top of the ridge east of Bear Lake. The study was established in the fall of 2003 within a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) dominated flat. In the spring of 2004, approximately 2,850 acres were treated with a single pass of a Lawson Pasture Aerator; a seed mix of grass, forb, and browse species was broadcast seeded during the aeration treatment. In 2016, the fresh leg of a deer fawn was seen on the site and an older sheep skull was found.

Soils**Table 02R-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
Loam	7.1	40.6	35.2	24.2	2.5	32.0	512.0	0.7	10/01/2003

Site Potential

1981 - 2010 Average Annual Precipitation	21 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 browse component on this site since study establishment in 2003; a variety of other shrub species have been present, but in lesser amounts. Sagebrush cover and density initially decreased following a 2004 aerator and seeding treatment (Table 02R-08.1), but have since increased. However, 39% of sagebrush plants were considered to have poor vigor in 2021 (Table 02R-08.12, Table 02R-08.13), likely due to drought stress; losses in sagebrush could occur if similar climatic conditions are sustained in future sample years. The herbaceous understory provided little cover prior to treatment (Table 02R-08.7). However, mainly native perennial grass species have been a co-dominant vegetation component in all post-treatment sample years. The introduced annual grass species cheatgrass (*Bromus tectorum*) was observed with low abundance in 2011, but has not been observed in any other year (Table 02R-08.10). Perennial forbs have contributed considerable cover in many years, and co-dominated along with perennial grasses in 2011 (Table 02R-08.11). Deer winter range condition has steadily improved from fair to excellent; this can be attributed largely to increases in recruitment into the preferred browse community, namely sagebrush. As of 2021, deer winter range conditions were considered to be excellent. Maintaining excellent deer wintering range can be accomplished through efforts to decrease sagebrush decadence (Table 02R-08.15).

Trend Summary Tables**Table 02R-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
2003	37.4	5.4	-	33.0	5.1	-
2006	10.3	6.6	-	10.2	8.3	-
2011	16.1	6.8	-	23.4	15.3	-
2016	22.1	6.6	-	25.5	8.0	-
2021	21.1	6.3	-	26.6	4.1	-

Table 02R-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
2003	-	378	14	269	-	9.6	0.1	9.6
2006	-	401	41	324	-	15.8	0.7	11.1
2011	2	416	191	372	0.0	18.8	8.1	22.1
2016	-	437	144	297	-	21.6	4.2	9.7
2021	-	428	47	346	-	19.1	0.3	11.2

Table 02R-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
2003	9.8	0.3	57.5	0.4	0.5	55.6
2006	19.2	0.2	48.7	0.3	0.4	44.0
2011	12.6	0.0	35.0	0.1	0.4	62.2
2016	17.6	-	33.1	0.2	0.3	60.7
2021	16.5	2.4	50.3	0.4	0.1	51.4

Table 02R-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	Greater Sage-Grouse	Horse	Rabbit	Domestic Sheep
	Quadrat Frequency						
2003	10	2	-	-	-	19	-
2006	8	3	-	1	-	9	18
2011	5	8	10	-	-	10	-
2016	7	1	-	-	-	-	-
2021	9	8	2	-	-	5	-
Year	Days Use Per Acre (ha)						
2003	24.0 (59.2)	2.7 (6.6)	-	-	-	-	-
2006	29.0 (71.7)	3.4 (8.3)	-	17.4 (43.0)*	-	-	21.5 (53.0)
2011	28.3 (69.9)	0.7 (1.7)	3.4 (8.3)	-	-	-	-
2016	16.0 (39.5)	10.7 (26.5)	-	-	-	-	-
2021	34.1 (84.3)	2.0 (5.0)	1.3 (3.3)	-	4.7 (11.5)	-	-

*Pellets per acre (ha)

Table 02R-08.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency														
Achnatherum lettermanii (Letterman's needlegrass)															
Bromus tectorum ^{ai} (cheatgrass)															
Carex (sedge)															
Dactylis glomerata ⁱ (orchardgrass)															
Elymus elymoides (squirreltail)															
Hesperostipa comata (needle and thread)															
Koeleria macrantha (prairie Junegrass)															
Muhlenbergia richardsonis (mat muhly)															
Pascopyrum smithii (western wheatgrass)															
Poa fendleriana (muttongrass)															
Poa pratensis ⁱ (Kentucky bluegrass)															
Poa secunda (Sandberg bluegrass)															
Psathyrostachys juncea ⁱ (Russian wildrye)															
Pseudoroegneria spicata (bluebunch wheatgrass)															
year	Average Cover (%)														
2003	135	-	35	-	2	4	24	-	206	63	-	187	-	1	
2006	123	-	73	22	5	1	51	-	270	84	23	132	-	5	
2011	170	2	71	-	3	1	28	-	315	63	8	178	6	15	
2016	171	-	24	-	-	-	98	-	314	2	6	200	0	14	
2021	198	-	70	-	-	10	39	19	338	35	2	140	0	14	
year	Average Cover (%)														
2003	2.3	-	0.7	-	0.0	0.0	0.3	-	2.0	0.6	-	3.7	-	0.0	
2006	3.7	-	1.8	0.1	0.0	0.0	0.9	-	4.5	1.2	0.6	2.9	-	0.1	
2011	6.7	0.0	2.7	-	0.0	0.0	0.4	-	4.6	0.5	0.1	3.7	0.0	0.1	
2016	7.1	-	0.8	-	-	-	1.4	-	6.1	0.0	0.0	5.9	0.0	0.3	
2021	4.5	-	1.4	-	-	0.4	0.4	0.2	6.6	0.2	0.0	4.7	0.0	0.5	

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

Table 02R-08.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																	
Achillea millefolium (Common yarrow)																		
Alyssum desertorum ^{ai} (desert madwort)																		
Antennaria microphylla (littleaf pussytoes)																		
Arabis (rockcress)																		
Astragalus (milkvetch)																		
Astragalus convallarius (lesser rushy milkvetch)																		
Astragalus miser (timber milkvetch)																		
Calochortus nuttallii (sego lily)																		
Ceratocephala testiculata ^{ai} (curvseed butterwort)																		
Cirsium (thistle)																		
Collinsia parviflora ^a (maiden blue eyed Mary)																		
Collomia linearis ^a (tiny trumpet)																		
Comandra umbellata (bastard toadflax)																		
Cordylanthus ramosus ^a (bushy bird's beak)																		
Descurainia pinnata ^a (western tansymustard)																		
Erigeron eatonii (Eaton's fleabane)																		
Eriogonum heracleoides (parsnipflower buckwheat)																		
year	Average Cover (%)																	
2003	12	-	120	5	40	2	-	-	-	-	9	-	-	-	3	168	44	
2006	24	-	136	1	41	7	-	6	-	1	8	-	-	32	-	214	56	
2011	23	-	147	10	6	-	-	-	7	-	56	-	-	159	-	291	85	
2016	29	-	112	5	11	7	-	-	4	1	5	-	2	142	-	70	59	
2021	15	1	118	-	18	27	3	1	-	-	10	3	-	16	-	235	105	
year	Average Cover (%)																	
2003	0.1	-	4.5	0.0	0.9	0.0	-	-	-	-	0.0	-	-	-	0.0	1.7	1.4	
2006	0.1	-	4.2	0.0	0.9	0.0	-	0.0	-	0.0	0.0	-	-	0.6	-	2.8	2.0	
2011	1.4	-	5.5	0.0	0.0	-	-	-	0.0	-	0.1	-	-	8.0	-	8.4	4.2	
2016	0.4	-	4.2	0.0	0.1	0.0	-	-	0.0	0.0	0.0	-	0.0	4.2	-	0.7	1.6	
2021	0.4	0.0	2.5	-	0.1	0.2	0.0	0.0	-	-	0.0	0.0	-	0.0	-	4.5	2.9	

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

FORB SPECIES	Eriogonum umbellatum (sulphur-flower buckwheat)	Ipomopsis aggregata (scarlet gilia)	Lupinus argenteus (silvery lupine)	Packera multilobata (lobeleaf groundsel)	Penstemon (beardtongue)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)	Sanguisorba minor ⁱ (small burnet)	Senecio integerrimus ^a (lambstongue ragwort)	Symphotrichum (aster)	Veronica biloba ^{ai} (two-lobed speedwell)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency												
2003	-	-	-	28	-	21	51	2	-	-	-	-	-
2006	-	-	5	0	-	22	39	-	7	5	2	-	3
2011	3	3	40	-	-	16	14	32	-	-	46	2	-
2016	-	-	18	-	-	15	1	3	-	-	149	-	-
2021	4	-	9	-	3	17	19	-	-	19	3	-	4
year	Average Cover (%)												
2003	-	-	-	0.1	-	0.6	0.3	0.0	-	-	-	-	-
2006	-	-	0.2	0.0	-	0.6	0.2	-	0.0	0.1	0.0	-	0.1
2011	0.1	0.0	1.1	-	-	0.4	0.0	0.1	-	-	0.9	0.0	-
2016	-	-	0.7	-	-	0.4	0.0	0.0	-	-	1.5	-	-
2021	0.0	-	0.1	-	0.1	0.2	0.1	-	-	0.2	0.0	-	0.0

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

Table 02R-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)	Atriplex canescens ^p (fourwing saltbush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Eriogonum heracleoides (parsnipflower buckwheat)	Eriogonum microthecum ^p (slender buckwheat)	Symphoricarpos oreophilus ^p (mountain snowberry)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)							
2003	-	32.2	-	4.8	-	-	0.8	0.3
2006	-	9.2	-	6.7	0.5	-	1	1.1
2011	0.1	18.7	-	11	3	-	4.6	1.3
2016	0.2	23.5	-	4.8	2.2	-	1.8	1
2021	-	24.3	-	3.2	-	-	2.3	0.9
year	Quadrat Cover (%)							
2003	0.0	36.2	-	4.9	-	-	1.1	0.5
2006	0.1	8.8	-	5.6	0.0	-	1.4	1.0
2011	0.0	14.3	0.1	5.8	0.0	-	1.6	1.0
2016	0.0	21.3	-	6.2	0.0	-	0.8	0.4
2021	0.3	19.2	-	5.1	-	0.0	1.6	1.1

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

Table 02R-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			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis^p -- (Utah serviceberry)									
2003	60	-	100	0	0	0	0	0	157/196
2006	60	-	100	0	0	0	0	0	119/106
2011	20	-	0	100	0	0	0	0	83/92
2016	40	-	0	100	0	50	0	0	76/84
2021	40	-	0	50	50	0	0	50	- / -
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
2003	12100	200	6	63	31	0	0	8	61/68
2006	4380	780	11	65	23	21	2	9	42/54
2011	5860	2220	16	71	13	32	1	4	45/64
2016	6660	1000	28	70	2	11	5	1	57/81
2021	9360	120	34	39	27	6	8	39	- / -
Atriplex canescens^p -- (fourwing saltbush)									
2003	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	-/-
2011	20	-	0	100	0	100	0	0	39/63
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
2003	5100	-	0	98	1	0	0	0	24/32
2006	5840	100	10	89	2	0	0	0	25/36
2011	6340	-	11	86	2	3	0	4	23/34
2016	3840	-	5	95	0	0	0	2	25/38
2021	4940	-	12	60	29	4	0	29	- / -
Eriogonum heracleoides -- (parsnipflower buckwheat)									
2003	1960	20	4	95	1	0	0	1	7/17
2006	2560	100	8	88	5	2	2	2	9/31
2011	3520	-	0	100	0	0	0	0	11/31
2016	2080	-	3	97	0	0	0	0	14/23
2021	-	-	-	-	-	-	-	-	-/-
Eriogonum microthecum^p -- (slender buckwheat)									
2003	-	-	-	-	-	-	-	-	-/-
2006	-	-	-	-	-	-	-	-	18/23
2011	40	-	0	100	0	50	0	50	15/31
2016	-	-	-	-	-	-	-	-	-/-
2021	40	-	50	0	50	0	50	50	- / -
Purshia tridentata^p -- (antelope bitterbrush)									
2003	-	-	-	-	-	-	-	-	-/-
2006	-	40	0	0	0	0	0	0	- / -
2011	-	-	-	-	-	-	-	-	58/152
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
Symphoricarpos oreophilus^p -- (mountain snowberry)									
2003	380	-	16	84	0	0	0	0	43/55
2006	280	-	7	93	0	14	0	0	47/95
2011	460	-	9	91	0	39	0	4	43/69
2016	320	-	31	69	0	13	0	6	48/85
2021	480	-	0	92	8	8	0	46	- / -

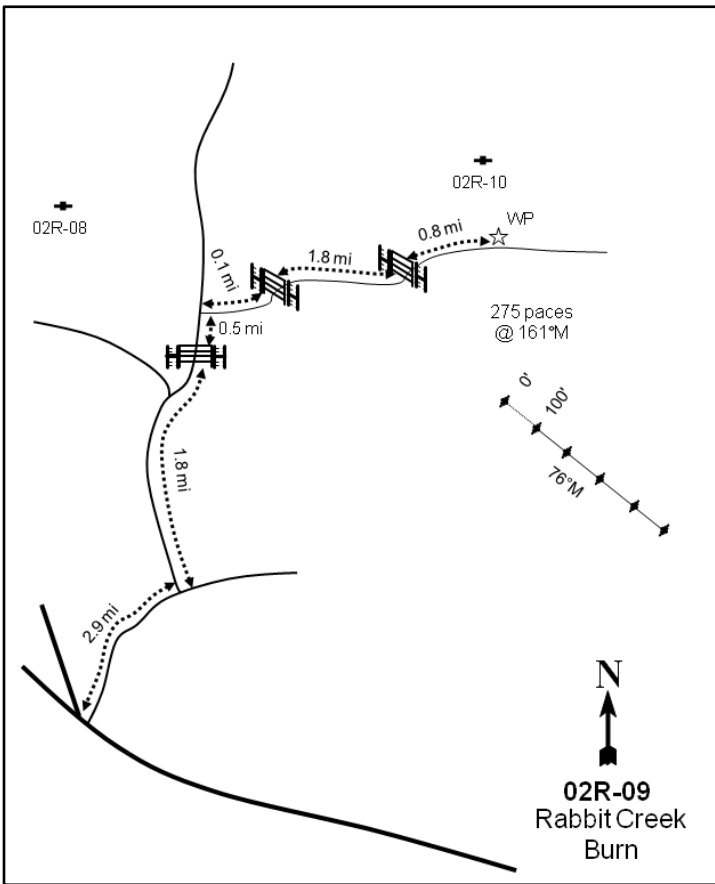
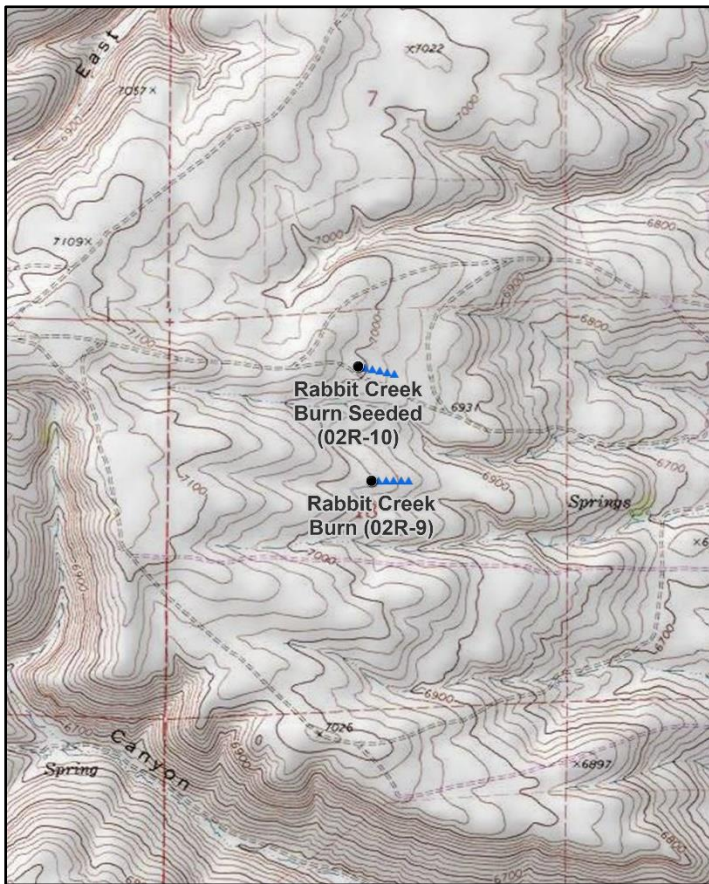
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Tetradymia canescens -- (spineless horsebrush)									
2003	400	-	5	75	20	0	0	5	32/33
2006	880	40	27	68	5	7	0	5	24/37
2011	800	20	18	75	8	0	0	8	25/36
2016	720	-	8	92	0	0	0	8	28/35
2021	560	-	14	46	39	4	4	46	- / -

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

Table 02R-08.15 - Deer Desirable Components Index: Mountain 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
2003	30.0	5.9	2.9	19.3	0.0	10.0	0.0	68.0	Fair-Good
2006	12.5	8.7	5.5	30.0	0.0	10.0	0.0	66.7	Fair
2011	28.1	11.9	7.2	30.0	0.0	10.0	0.0	87.3	Good
2016	30.0	14.4	14.1	30.0	0.0	10.0	0.0	98.5	Excellent
2021	30.0	7.5	15.0	30.0	0.0	10.0	0.0	92.5	Excellent

RABBIT CREEK BURN - STUDY NO. 02R-9



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Sage Creek NW; Township 13N, Range 7E, Section 18
NAD 83 UTM ZONE 12, 483723 East 4635212 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

33
76° magnetic
500ft
Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
No Rebar

Directions to Site

Traveling on Highway 30 toward Bear Lake from Sage Creek Junction, turn right onto a road that turns off of the highway along with a runaway truck ramp; the road turns to the west of the ramp. Follow this road for 2.9 miles to a road that comes in on the left. Turn left onto this road and drive 1.8 miles to a gate. Pass through the gate and continue 0.5 miles to a two-track road on the right. Turn onto this two-track and follow it for 0.1 miles to a gate, then continue 1.8 miles to another gate. Pass through the gate and travel 0.8 miles to the witness post on the left (north) side of the road. The 0-foot post is 275 paces away from the witness post at 161 degrees magnetic and is marked with browse tag #33.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	RABBIT CREEK
Elevation	7,000ft (2,134m)
Aspect	East
Slope	8%
Sample Dates	06/24/2004, 07/11/2007, 07/26/2012, 07/27/2016, 07/13/2021

Table 02R-09.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	East Bear	PDB	Fall 2003	887

Wildlife Habitat and Vegetation History**Table 02R-09.3 - 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	brood-rearing
Pronghorn	substantial	summer	

Table 02R-09.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2004	Yellow Rabbitbrush/Perennial Grass-Forb	NA
2007	Yellow Rabbitbrush/Perennial Grass	NA
2012	Yellow Rabbitbrush/Perennial Grass	NA
2016	Yellow Rabbitbrush/Perennial Grass	NA
2021	Yellow Rabbitbrush/Perennial Grass	NA

Site Notes

No Notes

Soils**Table 02R-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	6.8	34.6	47.9	17.5	3.2	7.2	336.0	0.8	06/24/2004

Site Potential

1981 - 2010 Average Annual Precipitation	18 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA430UT
States and Transitions	No state and transition model is available for this ecological site.

Yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus* var. *viscidiflorus*) has been the dominant shrub species on this site since study establishment in 2004. Preferred browse species such as mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) have been present in many years, but with little cover and density (Table 02R-09.12, Table 02R-09.13). Perennial grasses, primarily the native species thickspike wheatgrass (*Elymus lanceolatus*) and Sandberg bluegrass (*Poa secunda*), have been a co-dominant vegetation component throughout the duration of the study. Forbs have remained diverse, but have generally been sparse. The exception to this was during the 2004 sampling, in which perennial forb species were co-dominant along with perennial grasses. The introduced annual grass species cheatgrass (*Bromus tectorum*) has been present throughout the duration of the study, but with low abundance in most samplings (Table 02R-09.7, Table 02R-09.10, Table 02R-09.11). Barring the occurrence of a major disturbance, this site will likely remain in this or a similar state in future sample years.

Trend Summary Tables**Table 02R-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
2004	0.2	5.3	-	0.5	5.1	-
2007	0.7	9.1	-	0.9	11.3	-
2012	0.4	8.8	-	1.0	10.1	-
2016	1.2	12.9	-	1.7	17.7	-
2021	1.3	10.6	-	1.8	12.0	-

Table 02R-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
2004	1	318	85	332	0.0	5.9	0.9	7.6
2007	16	390	245	353	0.0	17.3	2.1	11.4
2012	32	437	-	150	0.3	17.4	-	3.0
2016	124	435	18	139	3.3	18.1	0.0	3.3
2021	51	415	4	269	0.4	12.7	0.0	3.7

Table 02R-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
2004	53.8	-	1.6	28.3	0.6	22.8
2007	33.9	0.0	28.5	5.4	0.8	42.7
2012	36.1	-	43.7	3.0	0.4	30.9
2016	43.1	-	10.1	12.4	0.6	42.2
2021	47.8	0.7	28.6	9.6	0.8	26.5

Table 02R-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/Pronghorn	Greater Sage-Grouse	Rabbit
	Quadrat Frequency			
2004	-	-	1	1
2007	4	1	-	13
2012	4	15	9	17
2016	11	5	-	15
2021	13	5	1	11
Year	Days Use Per Acre (ha)			
2004	0.7 (1.8)	-	-	-
2007	19.6 (48.4)	-	8.7 (21.5)*	-
2012	23.2 (57.4)	17.4 (43.0)	17.4 (43.0)*	-
2016	55.2 (136.3)	1.3 (3.3)	8.7 (21.5)*	-
2021	25.4 (62.8)	5.3 (13.2)	8.7 (21.5)*	-

*Pellets per acre (ha)

Table 02R-09.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Bromus tectorum ^{ai} (cheatgrass)	Dactylis glomerata ⁱ (orchardgrass)	Elymus elymoides (squirreltail)	Elymus lanceolatus (thickspike wheatgrass)	Hesperostipa comata (needle and thread)	Koeleria macrantha (prairie Junegrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa secunda (Sandberg bluegrass)	Psathyrostachys juncea ⁱ (Russian wildrye)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency										
2004	7	1	-	6	274	-	-	-	124	-	1
2007	13	16	2	2	318	-	33	3	175	-	36
2012	6	32	1	-	405	-	8	-	280	-	2
2016	1	124	-	-	284	1	10	-	355	1	69
2021	15	51	-	8	361	4	2	-	284	8	29
year	Average Cover (%)										
2004	0.0	0.0	-	0.0	4.3	-	-	-	1.5	-	0.0
2007	0.1	0.0	0.0	0.0	10.3	-	0.7	0.0	5.0	-	1.2
2012	0.2	0.3	0.0	-	10.1	-	0.2	-	6.9	-	0.0
2016	0.0	3.3	-	-	6.4	0.1	0.2	-	9.2	0.1	2.0
2021	0.2	0.4	-	0.2	4.8	0.1	0.0	-	7.0	0.2	0.2

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

Table 02R-09.11 - 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 microphylla (littleleaf pussytoes)	Arabis (rockerness)	Astragalus cibirarius (browse milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus miser var. tenuifolius (timber milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Chenopodium album ^a (lambsquarters)	Cirsium (thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Comandra umbellata (bastard toadflax)	Cordylanthus ^a (bird's-beak)
year	Nested Frequency																
2004	174	8	3	3	-	2	24	123	-	5	-	6	55	8	13	-	6
2007	194	-	-	-	-	12	26	132	-	-	-	-	28	64	68	-	-
2012	9	-	-	5	-	1	3	18	-	-	-	-	12	-	-	-	-
2016	-	-	-	3	-	9	5	4	-	-	5	-	17	8	1	2	-
2021	30	-	3	5	3	3	14	45	4	-	1	-	4	-	-	3	-
year	Average Cover (%)																
2004	1.1	0.0	0.0	0.0	-	0.0	0.1	1.9	-	0.0	-	0.0	1.7	0.0	0.0	-	0.0
2007	1.8	-	-	-	-	0.1	0.3	1.8	-	-	-	-	0.9	0.2	0.3	-	-
2012	0.0	-	-	0.0	-	0.0	0.0	0.1	-	-	-	-	0.1	-	-	-	-
2016	-	-	-	0.1	-	0.3	0.0	0.1	-	-	0.0	-	0.2	0.0	0.0	0.0	-
2021	0.1	-	0.0	0.1	0.0	0.0	0.0	0.3	0.0	-	0.0	-	0.0	-	-	0.1	-

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

FORB SPECIES	Crepis acuminata (tapertip hawkbeard)	Cryptantha (cryptantha)	Cymopterus (springparsley)	Delphinium nuttallianum (twolobe larkspur)	Descurainia pinnata ^a (western tansymustard)	Erigeron filifolius (threadleaf fleabane)	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Lactuca serriola ^{ai} (prickly lettuce)	Linum perenne ⁱ (blue flax)	Lithospermum ruderale (western stoneseed)	Lomatium (desertparsley)	Lupinus argenteus (silvery lupine)	Machaeranthera canescens (hoary tansyaster)	Medicago sativa ⁱ (alfalfa)	Microsteris gracilis ^a (slender phlox)	Penstemon radicosus (matroot penstemon)	Phlox hoodii (spiny phlox)
year	Nested Frequency																
2004	10	-	-	-	29	-	3	-	-	-	15	4	-	-	2	24	48
2007	3	4	-	6	209	-	12	3	-	-	19	5	1	-	25	15	84
2012	-	7	-	-	-	-	-	-	-	-	-	1	-	-	-	2	91
2016	-	5	9	-	-	-	-	-	3	0	-	5	-	14	-	15	57
2021	-	26	-	-	-	78	-	-	-	-	11	6	-	-	-	20	63
year	Average Cover (%)																
2004	0.2	-	-	-	0.5	-	0.0	-	-	-	0.3	0.0	-	-	0.0	0.1	0.3
2007	0.3	0.1	-	0.0	1.3	-	0.1	0.0	-	-	0.4	0.0	0.0	-	0.1	0.5	1.4
2012	-	0.1	-	-	-	-	-	-	-	-	-	0.0	-	-	-	0.0	2.4
2016	-	0.2	0.0	-	-	-	-	-	0.0	0.0	-	0.5	-	0.0	-	0.3	1.3
2021	-	0.3	-	-	-	0.7	-	-	-	-	0.1	0.0	-	-	-	0.2	0.9

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

FORB SPECIES	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^{ai} (Douglas' knotweed)	Sanguisorba minor ⁱ (small burnet)	Schoenocrambe limifolia (flaxleaf plainsmustard)	Senecio integerrimus ^{ai} (lambstongue ragwort)	Symphyotrichum (aster)	Tragopogon dubius ^{ai} (yellow salsify)	Trifolium (clover)	Veronica biloba ^{ai} (twolobe speedwell)	Viola (violet)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency										
2004	72	2	-	36	15	-	9	146	2	5	3
2007	171	4	-	48	1	-	3	97	13	-	-
2012	30	-	-	7	-	-	-	-	-	-	-
2016	9	6	2	2	-	8	-	14	3	-	-
2021	104	-	-	16	-	2	-	28	-	2	-
year	Average Cover (%)										
2004	0.3	0.0	-	0.3	0.1	-	0.1	1.1	0.0	0.0	0.0
2007	2.3	0.0	-	0.2	0.0	-	0.0	1.3	0.0	-	-
2012	0.1	-	-	0.1	-	-	-	-	-	-	-
2016	0.0	0.0	0.0	0.0	-	0.1	-	0.2	0.0	-	-
2021	0.6	-	-	0.1	-	0.0	-	0.1	-	0.0	-

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

Table 02R-09.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)					
	year	2004	2007	2012	2016	2021
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> ^p (mountain big sagebrush)	-	4.5	-	-	0.5	0.6
<i>Chrysothamnus viscidiflorus</i> ssp. <i>viscidiflorus</i> var. <i>viscidiflorus</i> (yellow rabbitbrush)	-	9.3	-	-	0.9	2
<i>Eriogonum corymbosum</i> (crisp-leaf buckwheat)	-	7.8	-	0	1	2.3
<i>Eriogonum microthecum</i> ^p (slender buckwheat)	0.5	14.4	-	-	1.2	3.3
<i>Symphoricarpos oreophilus</i> ^p (mountain snowberry)	0.7	10.6	-	-	1.1	1.4
<i>Tetradymia canescens</i> (spineless horsebrush)	-	-	-	-	-	-

year	Quadrat Cover (%)					
	2004	2007	2012	2016	2021	
2004	-	4.0	0.7	-	0.2	0.7
2007	0.0	6.1	1.6	0.1	0.5	1.4
2012	-	7.0	0.0	0.2	0.2	1.9
2016	0.0	10.1	0.3	0.0	1.2	2.5
2021	0.1	9.7	-	0.1	1.1	0.8

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

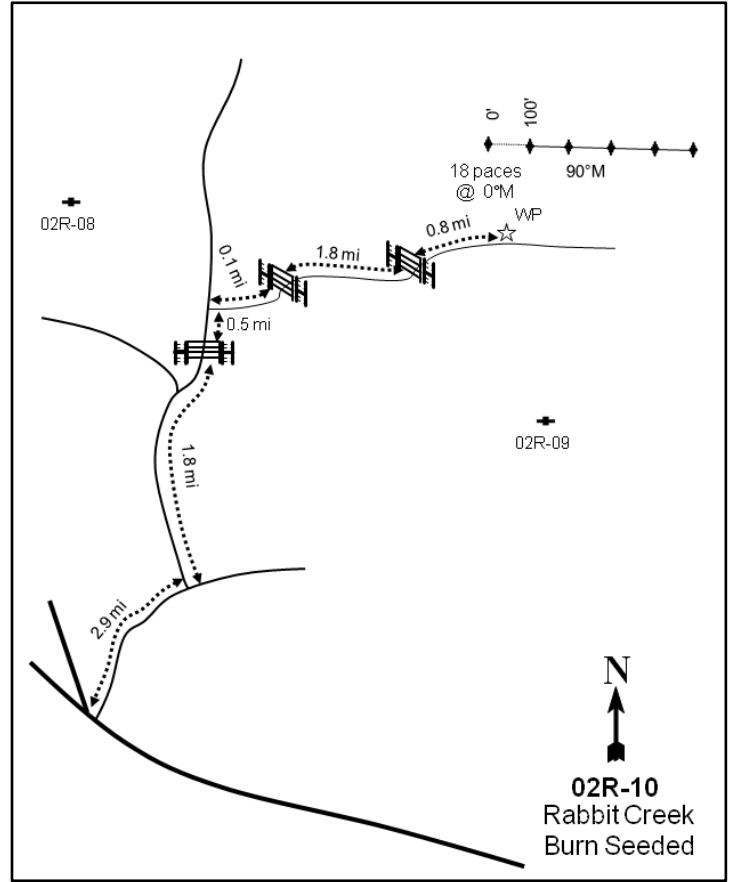
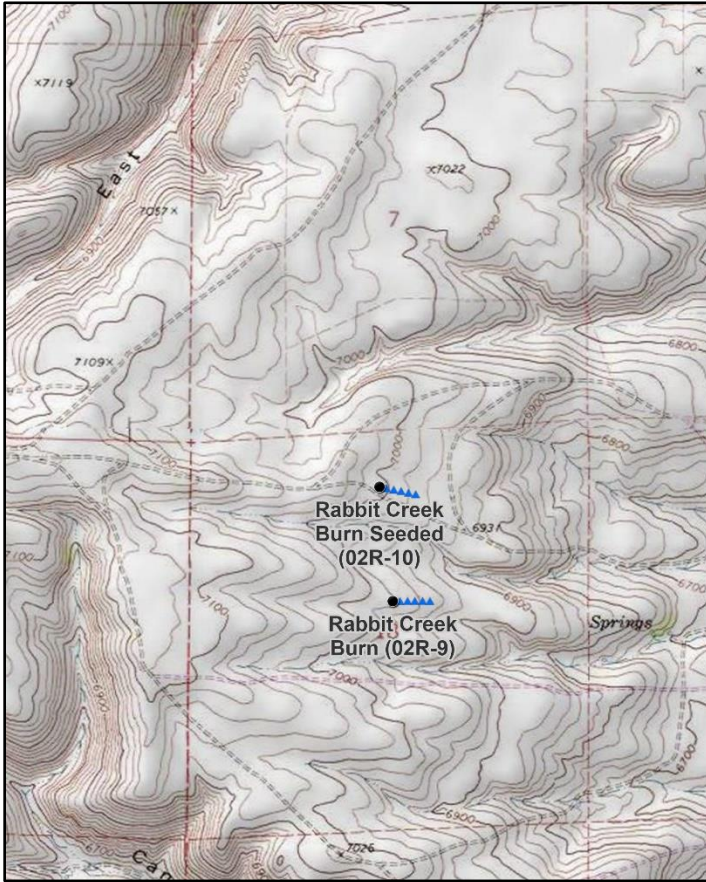
Table 02R-09.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<i>Amelanchier utahensis</i>^p -- (Utah serviceberry)									
2004	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	56/64
2012	-	-	-	-	-	-	-	-	67/80
2016	-	-	-	-	-	-	-	-	71/81
2021	-	-	-	-	-	-	-	-	-/-
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i>^p -- (mountain big sagebrush)									
2004	-	-	-	-	-	-	-	-	-/-
2007	-	60	0	0	0	0	0	0	-/-
2012	100	-	0	80	20	0	0	40	36/46
2016	60	-	0	100	0	33	0	0	42/64
2021	240	-	33	67	0	75	0	0	-/-
<i>Chrysothamnus viscidiflorus</i> ssp. <i>viscidiflorus</i> var. <i>viscidiflorus</i> -- (yellow rabbitbrush)									
2004	8340	200	62	38	0	0	0	0	21/27
2007	8620	20	3	88	9	0	0	6	25/39
2012	7580	120	1	91	8	29	6	53	22/37
2016	7600	-	4	96	1	3	0	12	27/46
2021	9080	320	16	68	16	12	4	22	-/-
<i>Eriogonum microthecum</i>^p -- (slender buckwheat)									
2004	20	-	100	0	0	0	0	0	12/19
2007	120	20	0	100	0	33	0	0	16/16
2012	140	20	0	100	0	0	0	29	17/22
2016	40	-	0	100	0	50	0	0	22/31
2021	60	40	0	100	0	33	67	0	-/-

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 (%)				
Purshia tridentata^p -- (antelope bitterbrush)									
2004	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	38/139
2016	-	-	-	-	-	-	-	-	35/135
2021	-	-	-	-	-	-	-	-	-/-
Symphoricarpos oreophilus^p -- (mountain snowberry)									
2004	180	-	89	11	0	0	0	0	37/52
2007	180	-	11	89	0	0	0	0	40/73
2012	280	-	7	93	0	14	0	36	43/92
2016	340	-	0	100	0	53	0	65	52/99
2021	340	-	0	59	41	6	0	53	- / -
Tetradymia canescens -- (spineless horsebrush)									
2004	1160	380	79	21	0	0	0	0	19/24
2007	1220	-	12	82	7	10	0	8	25/45
2012	1240	-	10	61	29	13	5	26	28/55
2016	1680	-	26	70	4	11	0	14	30/55
2021	1280	-	14	47	39	41	23	45	- / -

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

RABBIT CREEK BURN SEEDED - STUDY NO. 02R-10



Location Information

USGS 7.5 min Map Info Sage Creek NW; Township 13N, Range 7E, Section 18
 GPS (0' Stake) NAD 83 UTM ZONE 12, 483669 East 4635675 North

Transect Information

Browse Tag # (0' Stake) 34
 Transect Bearing 90° 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

Traveling on Highway 30 toward Bear Lake from Sage Creek Junction, turn right onto a road that turns off of the highway along with a runaway truck ramp; the road turns to the west of the ramp. Follow this road for 2.9 miles to a road that comes in on the left. Turn here and drive 1.8 miles to a gate. Pass through the gate and continue 0.5 miles to a two-track road on the right. Turn onto this road and follow it for 0.1 miles to a gate, continuing 1.8 miles to another gate. Pass through the gate and travel 0.8 miles to the witness post on the left (north) side of the road. The 0-foot post is 18 paces at 0 degrees magnetic from the witness post and is marked with browse tag #34.

Site Information

Land Ownership	Private
Land Administrator	Private
Allotment	RABBIT CREEK
Elevation	7,000ft (2,134m)
Aspect	East
Slope	5%
Sample Dates	06/24/2004, 07/11/2007, 07/26/2012, 07/27/2016, 07/13/2021

Table 02R-10.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Wildfire	East Bear	PDB	Fall 2003	887
Seeding - Rangeland Drill	Rabbit Creek	PDB	Fall 2003	500

Table 02R-10.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Rabbit Creek			Drill	Sep 2003	500
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	<i>Dactylis glomerata</i>	Orchardgrass		1.00	0.00
G	<i>Leymus cinereus</i>	Great Basin Wildrye		1.00	0.00
G	<i>Psathyrostachys juncea</i>	Russian Wildrye		2.00	0.00
G	<i>Thinopyrum intermedium</i>	Intermediate Wheatgrass		1.00	0.00
F	<i>Medicago sativa</i>	Alfalfa	Ranger	1.00	0.96
F	<i>Sanguisorba minor</i>	Small Burnet	VNS	2.37	2.11
S	<i>Atriplex canescens</i>	Fourwing Saltbush		0.50	0.18
S	<i>Purshia tridentata</i>	Bitterbrush		0.24	0.21

Wildlife Habitat and Vegetation History**Table 02R-10.3 - 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	brood-rearing
Pronghorn	substantial	summer	

Table 02R-10.4 - 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
2007	Yellow Rabbitbrush/Perennial Grass	NA
2012	Yellow Rabbitbrush/Perennial Grass	NA
2016	Yellow Rabbitbrush/Perennial Grass	NA
2021	Yellow Rabbitbrush/Perennial Grass	NA

Site Notes

The study is located approximately five miles east of Bear Lake within a burned mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) flat. This study was established on private land in 2004 to monitor the vegetation response to a naturally-caused fire (East Bear fire) which burned about 887 acres east of Bear Lake in the fall of 2003.

Soils**Table 02R-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 Loam	6.6	32.6	40.1	27.3	3.9	19.1	195.2	0.8	06/24/2004

Site Potential

1981 - 2010 Average Annual Precipitation	18 inches
NRCS Ecological Site	Mountain Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA430UT
States and Transitions	No state and transition model is available for this ecological site.

Perennial grasses such as thickspike wheatgrass (*Elymus lanceolatus*) and various seeded species have been a dominant vegetation component on this site since study establishment in 2004. Annual grasses have been rare in most sample years: the exception to this is 2007, when the introduced species cheatgrass (*Bromus tectorum*) provided 7% cover. Forbs have generally remained abundant, and perennial species co-dominated the understory along with perennial grasses during the 2004 sampling (Table 02R-10.7, Table 02R-10.10, Table 02R-10.11). Yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus* var. *viscidiflorus*) has been the most prominent shrub species throughout the duration of the study and has been a co-dominant vegetation component since 2007. However, mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) cover and density have increased each sample year (Table 02R-10.12, Table 02R-10.13), indicating that the vegetation community may have the potential to transition back to a sagebrush type in the future.

Trend Summary Tables**Table 02R-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
2004	0.1	4.8	-	0.4	2.8	-
2007	0.8	8.7	-	0.9	6.8	-
2012	1.2	8.4	-	2.2	9.3	-
2016	3.9	10.5	-	3.3	15.5	-
2021	7.3	12.0	-	6.9	10.4	-

Table 02R-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
2004	14	326	184	345	0.2	9.6	5.3	8.6
2007	46	408	320	340	0.2	17.2	3.0	9.6
2012	68	442	22	120	0.2	16.0	0.1	1.4
2016	178	444	116	200	7.0	22.2	1.2	3.0
2021	21	412	104	306	0.1	14.9	1.3	4.7

Table 02R-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
2004	65.0	-	1.8	9.0	0.5	31.8
2007	34.9	-	31.0	3.3	0.3	43.3
2012	37.1	-	45.0	3.1	0.9	27.1
2016	42.0	0.0	14.3	4.6	0.1	48.2
2021	37.1	0.9	42.1	3.6	0.3	34.7

Table 02R-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	Greater Sage-Grouse	Rabbit	Sharp-tailed Grouse
	Quadrat Frequency				
2004	-	-	1	-	-
2007	5	-	2	15	-
2012	12	4	16	10	-
2016	10	-	1	6	-
2021	21	3	2	9	-
Year	Days Use Per Acre (ha)				
2004	1.5 (3.6)	-	-	-	8.7 (21.5)*
2007	48.6 (120.1)	0.7 (1.7)	8.7 (21.5)*	-	-
2012	68.3 (168.6)	3.4 (8.3)	78.4 (193.7)*	-	-
2016	77.7 (191.9)	2.0 (5.0)	17.4 (43.0)*	-	-
2021	13.8 (34.1)	4.0 (9.9)	8.7 (21.5)*	-	-

*Pellets per acre (ha)

Table 02R-10.10 - 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 arvensis ^{ai} (field brome)	Bromus tectorum ^{ai} (cheatgrass)	Dactylis glomerata ⁱ (orchardgrass)	Elymus elymoides (squirreltail)	Elymus lanceolatus (thickspike wheatgrass)	Hesperostipa comata (needle and thread)	Koeleria macrantha (prairie Junegrass)	Leymus cinereus (basin wildrye)	Melica bulbosa (oniongrass)	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																
2004	3	16	5	-	14	116	1	228	19	-	-	0	-	64	-	-	30
2007	1	16	2	9	39	29	1	337	-	4	5	-	0	131	84	8	8
2012	0	13	2	-	68	8	-	381	6	14	5	-	-	248	46	33	-
2016	1	1	31	-	178	-	-	256	-	27	-	-	-	267	40	62	53
2021	7	41	63	-	21	-	-	346	12	7	-	-	-	283	28	13	8
year	Average Cover (%)																
2004	0.0	0.1	0.2	-	0.2	2.2	0.0	4.4	0.4	-	-	0.0	-	1.6	-	-	0.6
2007	0.0	0.3	0.1	0.0	0.1	1.3	0.0	10.2	-	0.2	0.0	-	0.0	2.5	2.3	0.3	0.0
2012	0.0	0.2	0.1	-	0.2	0.1	-	7.8	0.0	0.1	0.0	-	-	5.4	1.4	0.8	-
2016	0.0	0.0	0.9	-	7.0	-	-	7.0	-	1.2	-	-	-	7.4	1.7	1.7	2.3
2021	0.0	0.2	0.5	-	0.1	-	-	4.4	0.1	0.0	-	-	-	9.1	0.2	0.3	0.1

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

Table 02R-10.11 - 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)	Astragalus cibirius (browse milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus miser var. tenuifolius (timber milkvetch)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Chenopodium album ^a (lambquarters)	Chenopodium fremontii ^a (Fremont's goosefoot)	Chenopodium leptophyllum ^a (narrowleaf goosefoot)	Cirsium (thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Cordylanthus ^a (bird's-beak)
year	Nested Frequency																
2004	2	124	0	-	15	6	104	-	3	7	18	2	1	12	52	-	3
2007	-	127	-	2	-	6	69	3	-	36	-	-	-	8	64	23	-
2012	10	1	-	-	-	3	2	-	-	8	-	-	-	2	1	-	-
2016	6	-	-	3	-	12	56	-	-	81	-	-	-	13	5	-	5
2021	4	-	-	3	-	5	75	2	-	102	-	-	-	20	-	-	-
year	Average Cover (%)																
2004	0.1	1.0	0.0	-	1.0	0.0	1.1	-	0.0	0.0	0.1	0.0	0.0	0.1	0.4	-	0.0
2007	-	1.3	-	0.0	-	0.0	0.8	0.0	-	0.2	-	-	-	0.2	0.2	0.0	-
2012	0.1	0.0	-	-	-	0.0	0.0	-	-	0.0	-	-	-	0.0	0.0	-	-
2016	0.2	-	-	0.0	-	0.1	0.8	-	-	0.9	-	-	-	0.3	0.0	-	0.0
2021	0.0	-	-	0.0	-	0.0	0.6	0.0	-	1.2	-	-	-	0.1	-	-	-

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

FORB SPECIES	Crepis acuminata (tapertip hawkbeard)	Cryptantha (cryptantha)	Cymopterus (springparsley)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)	Eriogon filifolius (threadleaf fleabane)	Eriogonum umbellatum (sulphur-flower buckwheat)	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Lactuca serriola ^{ai} (prickly lettuce)	Linum lewisii (Lewis flax)	Lithospermum ruderale (western stoneseed)	Lupinus argenteus (silvery lupine)	Medicago sativa ⁱ (alfalfa)	Microsteris gracilis ^a (slender phlox)	Penstemon radicosus (matroot penstemon)	Phlox hoodii (spiny phlox)	Phlox longifolia (longleaf phlox)	
year	Nested Frequency																	
2004	14	5	-	129	1	8	1	4	0	1	-	-	50	2	1	24	73	
2007	-	-	4	277	-	-	-	-	-	9	-	0	18	14	2	20	207	
2012	-	-	-	-	-	6	5	-	-	-	-	-	-	-	-	47	56	
2016	-	-	-	-	1	64	-	1	-	-	0	1	23	-	-	41	51	
2021	7	-	-	-	-	138	-	-	-	-	-	1	-	-	-	57	192	
year	Average Cover (%)																	
2004	0.0	0.0	-	3.7	0.0	0.2	0.0	0.0	0.0	0.0	-	-	0.4	0.0	0.0	0.1	0.3	
2007	-	-	0.0	2.5	-	-	-	-	-	0.1	-	0.0	0.1	0.1	0.0	0.4	2.8	
2012	-	-	-	-	-	0.0	0.0	-	-	-	-	-	-	-	-	0.8	0.5	
2016	-	-	-	-	0.0	0.3	-	0.0	-	-	0.0	0.1	0.1	-	-	0.8	0.3	
2021	0.0	-	-	-	-	1.2	-	-	-	-	-	0.0	-	-	-	0.7	1.5	

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

FORB SPECIES	Polygonum douglasii ⁿ (Douglas' knotweed)	Sanguisorba minor ⁱ (small burnet)	Schoenocrambe limifolia (flaxleaf plainsmustard)	Senecio integerrimus ^a (lambstongue ragwort)	Silene antirrhina ^a (sleepy silene)	Sisymbrium altissimum ^{ai} (tall tumblemustard)	Sphaeralcea grossularifolia (gooseberryleaf globemallow)	Taraxacum officinale (common dandelion)	Tragopogon dubius ^{ai} (yellow salsify)	Trifolium (clover)	Veronica biloba ^{ai} (twolobe speedwell)	Viola (violet)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency												
2004	25	110	14	20	-	-	3	3	0	198	-	26	-
2007	5	12	21	2	-	-	1	-	-	198	23	-	1
2012	14	-	-	-	-	-	-	-	-	-	-	-	-
2016	59	-	-	-	5	1	2	-	-	43	-	-	-
2021	-	-	-	-	-	-	3	-	2	75	3	12	-
year	Average Cover (%)												
2004	0.2	1.6	0.6	0.8	-	-	0.0	0.1	0.0	1.8	-	0.2	-
2007	0.0	0.1	0.2	0.0	-	-	0.0	-	-	3.4	0.1	-	0.0
2012	0.0	-	-	-	-	-	-	-	-	-	-	-	-
2016	0.3	-	-	-	0.0	0.0	0.0	-	-	0.2	-	-	-
2021	-	-	-	-	-	-	0.0	-	0.0	0.4	0.0	0.0	-

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

Table 02R-10.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)						
	year	Line Intercept Cover (%)					
Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	2004	-	2.5	-	0.1	0.3	0.3
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	2007	0.1	5.2	-	0.2	0.6	1.6
Eriogonum corymbosum (crisp-leaf buckwheat)	2012	1	7.1	-	0.6	0.6	2.2
Eriogonum microthecum ^p (slender buckwheat)	2016	2.9	12	-	0.3	0.1	3.5
Symphoricarpos oreophilus ^p (mountain snowberry)	2021	5.9	9.3	-	0.4	0.6	1.1
Tetradymia canescens (spineless horsebrush)	year	Quadrat Cover (%)					
	2004	0.0	2.2	2.3	0.0	0.0	0.3
	2007	0.1	5.2	2.3	0.6	0.0	1.2
	2012	0.9	5.3	0.1	0.2	0.0	3.0
	2016	3.3	7.7	0.2	0.6	0.0	2.7
	2021	6.9	10.3	-	0.3	0.1	1.7

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

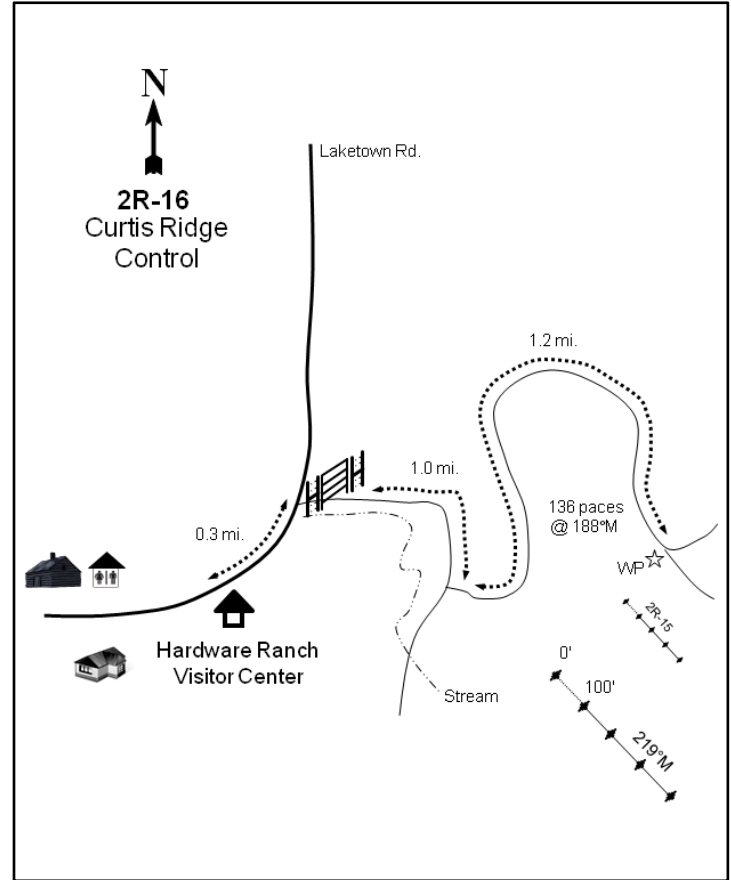
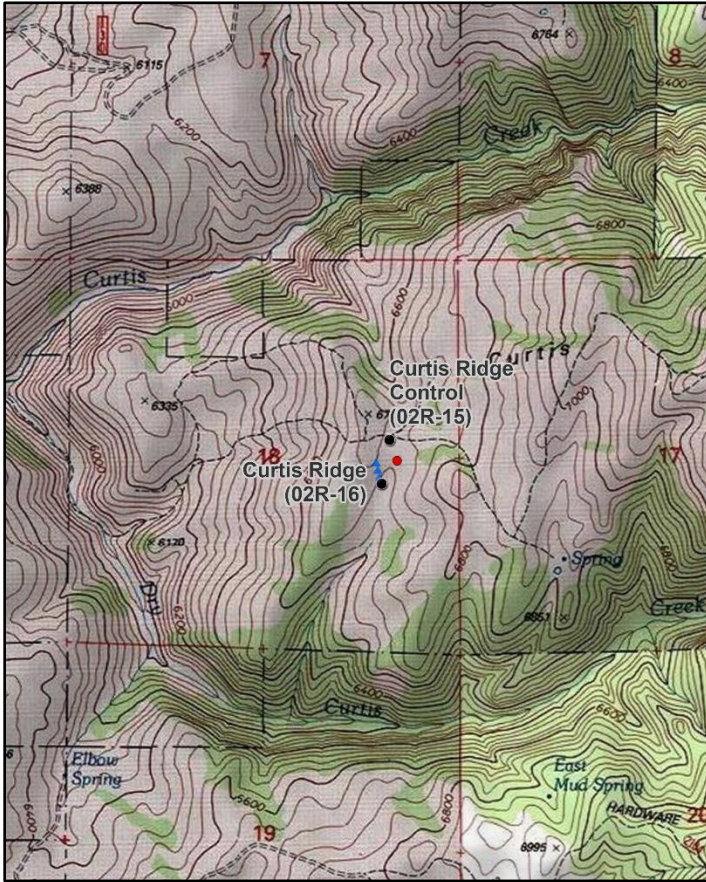
Table 02R-10.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis^p -- (Utah serviceberry)									
2004	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	43/64
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
2004	20	120	100	0	0	0	0	0	-/-
2007	360	180	61	39	0	17	6	0	25/27
2012	560	140	21	79	0	11	14	18	40/50
2016	800	160	43	57	0	5	0	5	52/69
2021	1640	-	34	62	4	1	2	6	-/-
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
2004	5780	720	49	51	0	0	0	0	20/22
2007	6000	-	2	83	15	0	3	9	24/38
2012	6360	-	3	93	4	18	2	36	24/46
2016	5520	-	7	92	1	0	0	8	29/45
2021	6880	320	11	55	34	12	6	47	-/-
Eriogonum microthecum^p -- (slender buckwheat)									
2004	60	-	100	0	0	0	0	0	15/15
2007	200	-	0	100	0	0	0	0	22/32
2012	340	-	0	100	0	53	0	0	19/36
2016	480	-	0	100	0	0	0	0	16/26
2021	220	-	0	91	9	18	18	18	-/-

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 (%)				
Purshia tridentata^p -- (antelope bitterbrush)									
2004	-	-	-	-	-	-	-	-	-/-
2007	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	28/47
2021	-	-	-	-	-	-	-	-	-/-
Symphoricarpos oreophilus^p -- (mountain snowberry)									
2004	40	-	100	0	0	0	0	0	61/105
2007	40	-	0	100	0	0	0	0	58/107
2012	20	-	0	100	0	0	0	0	50/101
2016	40	-	0	100	0	100	0	0	52/102
2021	20	-	0	100	0	0	100	0	- / -
Tetradymia canescens -- (spineless horsebrush)									
2004	900	60	76	24	0	0	0	0	20/25
2007	1000	-	12	88	0	6	0	2	28/54
2012	1020	80	6	90	4	18	12	26	32/70
2016	1060	-	6	87	8	4	2	15	37/69
2021	920	80	7	35	59	15	35	61	- / -

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

CURTIS RIDGE - STUDY NO. 02R-16

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Hardware Ranch NE; Township 10N, Range 4E, Section 18
NAD 83 UTM ZONE 12, 456243 East 4605754 North

Transect Information

Browse Tag # (0' Stake)	700
Transect Bearing	334° magnetic
Length	300ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft & 71ft), Line 3 (59ft)
Belt Marker Placement	No Rebar

Directions to Site

From the Hardware Ranch Visitor Center drive 0.3 miles to a fork in the road. Turn right and pass through a gate (this road follows a stream a short ways), then continue 1.0 miles to a fork. Proceed to the left and drive 1.2 miles to a witness post on the right-hand (south) side of the road. From the witness post walk 136 paces at 188 degrees magnetic to the 0-foot stake that is marked with browse tag #700.

Site Information

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	6,700ft (2,042m)
Aspect	South
Slope	11%
Sample Dates	07/12/2006, 07/22/2013, 06/30/2021

Table 02R-16.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Grazing - Intensive grazing	Hardware Grazing project	-	2005	-
Hand Crew - Lop and Scatter	Curtis Ridge Lop and Scatter	4730	2019	400

Wildlife Habitat and Vegetation History**Table 02R-16.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Rocky Mountain Elk	crucial	winter	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing
Shiras Moose	crucial	winter	

Table 02R-16.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2006	Little Sagebrush	Phase I
2013	Little Sagebrush/Perennial Grass	Phase I
2021	Little Sagebrush/Perennial Grass	Phase I

Site Notes

This study was established as part of an intensive grazing project conducted on Hardware Ranch to improve browse composition. The study was positioned approximately 600ft south of Curtis Ridge Control (2R-15) which has not been grazed and has therefore acted as a control. The Curtis Ridge study was established in 2006 prior to the intensive grazing that took place later that summer. The vegetation type on much of the site is low sagebrush (*Artemisia arbuscula*). Belt 1, however, is in a meadow vegetation type (Photos).

Soils**Table 02R-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
Clay Loam	6.7	26.6	36.2	37.3	3.0	12.1	217.6	0.7	07/11/2006

Site Potential

1981 - 2010 Average Annual Precipitation	26 inches
NRCS Ecological Site	Mountain Shallow Loam (Low Sagebrush)
NRCS Ecological Site #	R047XA442UT
States and Transitions	Low Sagebrush/Introduced Non-Natives State: Community Phase 2.1

Although cover and density have decreased overall, little sagebrush (*Artemisia arbuscula*) has been the dominant browse species on this site since study establishment in 2006. Additional species such as mountain big sagebrush (*A. tridentata* ssp. *vaseyana*) and antelope bitterbrush (*Purshia tridentata*) are also present to a lesser extent (Table 02R-16.12, Table 02R-16.13). The herbaceous understory has remained diverse and abundant. Perennial grasses have been a co-dominant site component in all sample years. However, the introduced species bulbous bluegrass (*Poa bulbosa*) provided the most cover of any perennial grass in 2013 and 2021 (Table 02R-16.10). Perennial forbs, particularly the native species common yarrow (*Achillea millefolium*) and western aster (*Symphotrichum ascendens*), have provided significant cover in all sample years; annual forbs have remained comparatively rare (Table 02R-16.7, Table 02R-16.11). According to the available ESD model, heavy grazing could lead to a reduced herbaceous understory and a denser shrub component (Jornada, 2021). However, 56% of low sagebrush plants were considered to have poor vigor in 2021 (Table 02R-16.13), possibly due to drought stress; decreases in sagebrush could potentially occur if similar climatic conditions are sustained in the future. Deer winter range condition has remained good since site establishment; however, sagebrush decadence has increased and may affect future recruitment. As of 2021, deer winter range conditions were considered to be good. Improvement to deer wintering range can be accomplished through efforts that support mature sagebrush and reproduction; and diversifying native perennial grasses would also improve winter range conditions (Table 02R-16.15).

Trend Summary Tables**Table 02R-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
2006	35.5	-	-	40.8	0.3	-
2013	26.2	-	-	34.3	0.1	-
2021	28.6	-	-	26.6	-	-

Table 02R-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
2006	-	310	222	363	-	9.3	3.0	17.9
2013	-	323	170	355	-	13.5	2.1	10.8
2021	-	371	113	387	-	29.1	1.2	16.6

Table 02R-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
2006	18.6	0.1	43.8	1.3	2.2	57.0
2013	13.7	0.0	46.9	0.2	2.9	59.7
2021	14.7	4.4	38.2	2.1	2.0	58.4

Table 02R-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/Domestic Sheep	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
2006	9	9	13	2
2013	3	6	11	1
2021	4	38	24	-
Days Use Per Acre (ha)				
2006	29.8 (73.5)	16.8 (41.4)	10.7 (26.5)	-
2013	9.4 (23.3)	8.1 (19.9)	34.2 (84.4)	-
2021	0.7 (1.8)	46.2 (114.2)	10.0 (24.8)	-

Table 02R-16.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum lettermanii (Letterman's needlegrass)	Achnatherum nelsonii (Columbia needlegrass)	Agropyron cristatum ⁱ (crested wheatgrass)	Bromus inermis ⁱ (smooth brome)	Carex (sedge)	Danthonia unispicata (onespike danthonia)	Elymus elymoides (squirreltail)	Elymus lanceolatus (thickspike wheatgrass)	Elymus trachycaulus (slender wheatgrass)	Festuca idahoensis (Idaho fescue)	Juncus (rush)	Koeleria macrantha (prairie Junegrass)	Melica bulbosa (oniongrass)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)
year	Nested Frequency																
2006	113	-	-	-	4	3	5	81	11	29	-	61	51	13	5	66	49
2013	98	-	0	-	21	-	14	98	-	2	-	79	26	153	-	37	16
2021	144	20	-	3	23	-	47	13	17	-	7	31	76	235	7	46	7
year	Average Cover (%)																
2006	3.4	-	-	-	0.0	0.0	0.2	0.7	0.3	0.8	-	1.0	0.5	0.3	0.0	1.3	0.8
2013	3.6	-	0.0	-	0.1	-	0.2	1.9	-	0.0	-	1.2	0.2	5.2	-	0.8	0.3
2021	3.8	0.4	-	0.0	0.1	-	1.8	0.2	0.5	-	0.0	0.5	1.8	15.9	0.1	0.7	0.1

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

GRASS SPECIES	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency
2006	5
2013	1
2021	82
year	Average Cover (%)
2006	0.0
2013	0.0
2021	3.2

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

Table 02R-16.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																
Achillea millefolium (Common yarrow)	242	77	75	-	-	-	6	-	3	-	27	25	1	-	-	30	-
Agoseris glauca (pale agoseris)	241	60	2	3	5	-	3	-	5	1	50	19	-	1	8	7	6
Allium acuminatum (tapertip onion)	276	8	1	3	2	2	-	2	5	-	-	17	-	-	-	3	-
Alyssum desertorum ^{ai} (desert madwort)	Average Cover (%)																
Antennaria (pussytoes)	7.0	0.8	0.5	-	-	-	0.0	-	0.0	-	0.1	0.1	0.0	-	-	0.2	-
Antennaria microphylla (littleaf pussytoes)	6.3	0.5	0.0	0.0	0.2	-	0.0	-	0.0	0.0	0.5	0.1	-	0.0	0.0	0.4	0.0
Astragalus (milkvetch)	2021	9.4	0.1	0.0	0.0	0.1	-	0.0	0.0	-	-	0.6	-	-	-	0.0	-
Astragalus purshii (woollypod milkvetch)	Nested Frequency																
Astragalus utahensis (Utah milkvetch)	242	77	75	-	-	-	6	-	3	-	27	25	1	-	-	30	-
Camelina microcarpa ^{ai} (littleaf false flax)	241	60	2	3	5	-	3	-	5	1	50	19	-	1	8	7	6
Collinsia parviflora ^a (maiden blue eyed Mary)	276	8	1	3	2	2	-	2	5	-	-	17	-	-	-	3	-
Collomia linearis ^a (tiny trumpet)	Average Cover (%)																
Comandra umbellata (bastard toadflax)	7.0	0.8	0.5	-	-	-	0.0	-	0.0	-	0.1	0.1	0.0	-	-	0.2	-
Descurainia pinnata ^a (western tansymustard)	6.3	0.5	0.0	0.0	0.2	-	0.0	-	0.0	0.0	0.5	0.1	-	0.0	0.0	0.4	0.0
Draba ^a (draba)	2021	9.4	0.1	0.0	0.0	0.1	-	0.0	0.0	-	-	0.6	-	-	-	0.0	-
Epilobium brachycarpum ^a (tall annual willowherb)	Nested Frequency																
Eriogonum brevicaulle (shortstem buckwheat)	242	77	75	-	-	-	6	-	3	-	27	25	1	-	-	30	-

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

FORB SPECIES	Nested Frequency																	
Eriogonum heracleoides (parsnipflower buckwheat)	10	18	4	21	-	-	3	31	-	-	17	18	85	102	1	217	8	
Eriogonum umbellatum (sulphur-flower buckwheat)	-	21	-	7	-	-	1	8	-	-	67	31	18	17	1	265	1	
Galium ^a (bedstraw)	5	15	-	14	3	20	-	3	59	24	-	45	45	4	-	294	46	
Geranium richardsonii (Richardson's geranium)	Average Cover (%)																	
Hackelia patens (spotted stickseed)	0.3	2.2	0.0	0.4	-	-	0.0	0.1	-	-	0.1	0.5	0.5	1.4	0.0	6.5	0.1	
Heuchera rubescens (pink alumroot)	-	0.7	-	0.0	-	-	0.0	0.1	-	-	0.2	0.4	0.1	0.2	0.0	3.0	0.0	
Lactuca serriola ^{ai} (prickly lettuce)	2021	0.1	0.5	-	0.1	0.0	0.1	-	0.0	0.4	0.2	-	0.5	0.1	0.0	-	4.9	0.4
Madia glomerata ^a (mountain tarweed)	Nested Frequency																	
Mertensia (bluebells)	10	18	4	21	-	-	3	31	-	-	17	18	85	102	1	217	8	
Microseris nutans (nodding microseris)	-	21	-	7	-	-	1	8	-	-	67	31	18	17	1	265	1	
Microsteris gracilis ^a (slender phlox)	5	15	-	14	3	20	-	3	59	24	-	45	45	4	-	294	46	
Orthocarpus luteus ^a (yellow owl's-clover)	Average Cover (%)																	
Polygonum douglasii ^a (Douglas' knotweed)	0.3	2.2	0.0	0.4	-	-	0.0	0.1	-	-	0.1	0.5	0.5	1.4	0.0	6.5	0.1	
Senecio integerrimus ^a (lambstongue ragwort)	-	0.7	-	0.0	-	-	0.0	0.1	-	-	0.2	0.4	0.1	0.2	0.0	3.0	0.0	
Silene antirrhina ^a (sleepy silene)	2021	0.1	0.5	-	0.1	0.0	0.1	-	0.0	0.4	0.2	-	0.5	0.1	0.0	-	4.9	0.4
Symphyotrichum ascendens (western aster)	Nested Frequency																	
Taraxacum officinale (common dandelion)	10	18	4	21	-	-	3	31	-	-	17	18	85	102	1	217	8	

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

FORB SPECIES	Nest Frequency		
Tragopogon dubius ^{ai} (yellow salsify)	6	-	2
Wyethia amplexicaulis (mule-ears)	12	-	4
Zigadenus paniculatus (foothill deathcamas)	2	10	4
year	Average Cover (%)		
2006	0.0	-	0.0
2013	0.1	-	0.1
2021	0.0	0.0	0.1

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

Table 02R-16.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)						
Amelanchier utahensis ^p (Utah serviceberry)	-	30	9.9	0.3	-	0.9	-
Artemisia arbuscula ^p (little sagebrush)	-	24.5	7.1	-	0.1	2.6	0.1
Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	-	14.8	7.4	-	-	4.1	0.3
Eriogonum heracleoides (parsnipflower buckwheat)	-	-	-	-	-	-	-
Mahonia repens (creeping barberry)	-	-	-	-	-	-	-
Purshia tridentata ^p (antelope bitterbrush)	-	-	-	-	-	-	-
Symphoricarpos oreophilus ^p (mountain snowberry)	-	-	-	-	-	-	-
year	Quadrat Cover (%)						
2006	-	23.5	11.5	0.0	-	0.6	-
2013	-	17.8	7.4	-	0.0	1.0	0.0
2021	0.4	15.9	9.6	-	-	2.7	0.0

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

Table 02R-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			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis^p -- (Utah serviceberry)									
2006	20	-	0	100	0	0	0	0	44/51
2013	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
Artemisia arbuscula^p -- (little sagebrush)									
2006	9920	200	10	74	16	5	0	9	31/52
2013	6980	120	14	81	5	18	4	29	26/57
2021	9100	120	16	28	56	2	0	56	-/-

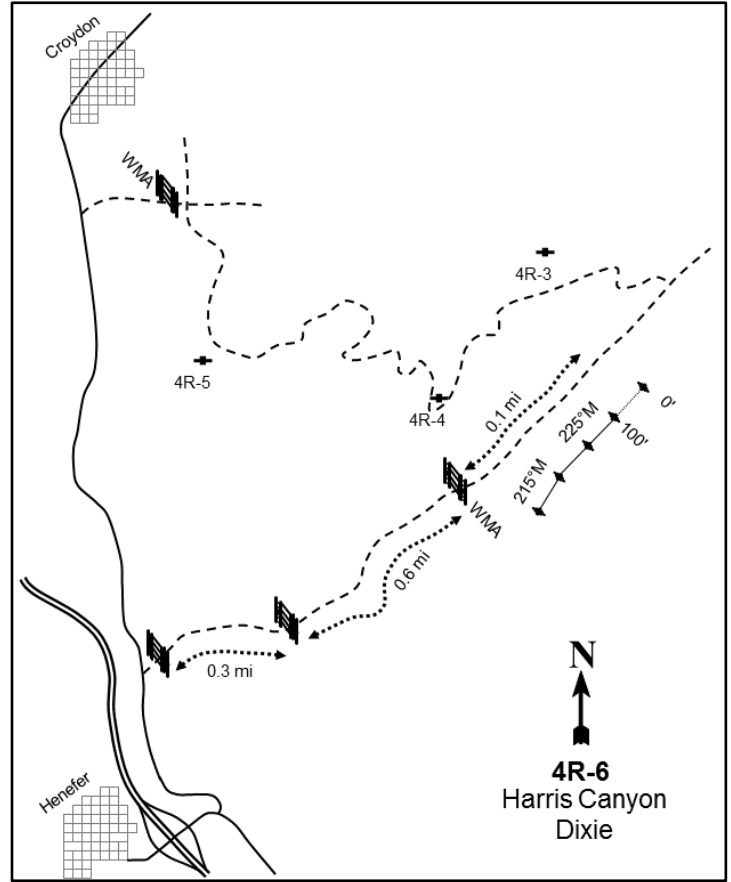
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
2006	2080	80	5	78	17	3	0	4	61/84
2013	1520	-	1	92	7	28	0	37	60/80
2021	1520	20	11	53	37	5	7	29	- / -
Eriogonum heracleoides -- (parsnipflower buckwheat)									
2006	60	-	0	100	0	0	0	0	21/54
2013	160	-	0	100	0	0	0	0	20/32
2021	-	-	-	-	-	-	-	-	-/-
Purshia tridentata^p -- (antelope bitterbrush)									
2006	140	-	0	71	29	0	86	0	75/143
2013	120	-	0	83	17	50	33	0	82/152
2021	240	-	17	50	33	0	8	50	- / -
Symphoricarpos oreophilus^p -- (mountain snowberry)									
2006	20	-	0	100	0	0	0	0	35/44
2013	40	-	0	100	0	0	100	0	37/50
2021	80	-	50	50	0	0	0	0	- / -

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

Table 02R-16.15 - Deer Desirable Components Index: Mountain 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
2006	30.0	10.1	4.3	18.1	0.0	10.0	0.0	72.5	Good
2013	30.0	13.2	5.2	16.5	0.0	10.0	0.0	75.0	Good
2021	30.0	1.0	7.4	26.5	0.0	10.0	0.0	74.9	Good

HARRIS CANYON DIXIE - STUDY No. 04R-6



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Henefer SW; Township 4N, Range 4E, Section 34
NAD 83 UTM ZONE 12, 458988 East 4543777 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

Not Available
225° magnetic (Line 4: 215° magnetic)
400ft
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
No Rebar

Directions to Site

Drive west on I-84 toward Ogden. Take exit 111 onto Lost Creek Road, take a slight right at North Lost Creek Road, then turn right again onto East 1900 North to Croydon. From Croydon, turn right onto 6800 East and drive for 2.4 miles, passing a ruined old house, to a gate. From the gate, proceed for 0.3 miles to another gate with a group of trees on the left (north). From this gate, continue for 0.6 miles to a gate to a Wildlife Management Area. Pass through the gate and drive for 0.1 miles to a witness post on the right (east) side of the road. The 0-foot stake is 33 paces from the witness post at 150 degrees magnetic.

Site Information

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	5,599ft (1,707m)
Aspect	Northwest
Slope	5%
Sample Dates	08/14/2008, 07/26/2017, 06/21/2021

Table 04R-06.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Insect - Aroga Moth	Aroga Moth	-	Approximately 2006	-
Discing - One-Way	Henefer-Echo WMA	1471	September-October 2010	28
Seeding - Rangeland Drill	Henefer-Echo WMA	1471	September-October 2010	28
Seeding - Broadcast	Henefer-Echo WMA	1471	September-October 2010	28

Table 04R-06.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Henfer Echo WMA - Bottoms			Drill	Oct 2010	95
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	<i>Elymus trachycaulus</i>	Slender Wheatgrass	San Luis	1.05	0.87
G	<i>Elymus wawawaiensis</i>	Snake River Wheatgrass	Secar	1.05	0.97
G	<i>Leymus cinereus</i>	Great Basin Wildrye	Trailhead	1.05	0.94
G	<i>Pascopyrum smithii</i>	Western Wheatgrass	Arriba	1.05	0.87
G	<i>Poa secunda</i>	Canby Bluegrass	Canbar	0.21	0.18
F	<i>Astragalus cicer</i>	Cicer Milkvetch	Lutana	1.05	1.02
F	<i>Linum perenne</i>	Blue Flax	Appar	0.21	0.20
F	<i>Medicago sativa</i>	Alfalfa	Ranger	1.05	0.97
F	<i>Onobrychis viciifolia</i>	Sainfoin	Eski	2.11	1.96
F	<i>Sanguisorba minor</i>	Small Burnet	Delar	2.11	1.77
S	<i>Amelanchier alnifolia</i>	Saskatoon Serviceberry	Wasatch UT	0.53	0.32

Mix Name			Application Type	Application Date	Acres
Henfer Echo WMA - Bottoms - Sage and Kochia			Drill	Oct 2010	95
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
S	<i>Artemisia tridentata</i> ssp. <i>tridentata</i>	Basin Big Sagebrush	Sanpete UT	0.42	0.11
S	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i>	Mountain Big Sagebrush	Sanpete UT	0.53	0.10
S	<i>Bassia prostrata</i>	Forage Kochia	Elko/Humboldt/Lander	1.05	0.54

Wildlife Habitat and Vegetation History**Table 04R-06.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	crucial	winter	
Rocky Mountain Elk	crucial	winter	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing
Shiras Moose	crucial	summer	

Table 04R-06.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2008	Mountain Big Sagebrush/Bulbous Bluegrass	NA
2017	Bulbous Bluegrass/Rubber Rabbitbrush	NA
2021	Bulbous Bluegrass/Rubber Rabbitbrush-Mountain Big Sagebrush	NA

Site Notes

No Notes

Site Potential

1981 - 2010 Average Annual Precipitation	17 inches
NRCS Ecological Site	Mountain Gravelly Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA406UT
States and Transitions	No state and transition model is available for this ecological site.

Upon establishment in 2008, this study site was dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*); many of the plants were in poor health due to Aroga moth defoliation that took place in approximately 2006. Much of the sagebrush was removed by a disking and seeding treatment in 2010 (Table 04R-06.1). Rubber rabbitbrush (*Ericameria nauseosa* ssp. *nauseosa* var. *hololeuca*) was the dominant browse species in 2017. Sagebrush cover has increased slightly since treatment and it co-dominated along with rabbitbrush in 2021, but density has decreased (Photos, Table 04R-06.12, Table 04R-06.13). The herbaceous understory has remained abundant, but most of the cover has been contributed by the introduced perennial grass species bulbous bluegrass (*Poa bulbosa*), which has been considered to be a co-dominant vegetation component in all sample years. Forb diversity has increased following treatment, but they have remained rare in comparison to grasses; alfalfa (*Medicago sativa*) provided the most cover of any single species throughout the duration of the study (Table 04R-06.7, Table 04R-06.10, Table 04R-06.11). Over the sample years, mule deer winter range has ranged between very poor and fair condition, which is largely due to low cover amounts of mountain big sagebrush with much of the sagebrush population generally displaying high decadence and little recruitment most sample years; wintering conditions could be improved by decreasing decadence and diversifying sagebrush age classes; mule deer winter range condition was considered poor in 2021 (Table 04R-06.15).

Trend Summary Tables**Table 04R-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
2008	6.6	-	-	7.6	-	-
2017	3.6	0.0	-	4.2	-	-
2021	3.0	-	-	6.2	-	-

Table 04R-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
2008	-	483	-	78	-	51.0	-	3.7
2017	99	463	99	130	2.8	51.0	1.1	5.1
2021	14	482	28	95	0.4	62.8	0.4	6.5

Table 04R-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
2008	11.1	0.2	31.2	2.0	3.1	64.4
2017	4.5	0.8	38.9	3.2	5.2	64.2
2021	6.1	1.1	34.6	1.7	4.3	64.0

Table 04R-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	Greater Sage-Grouse	Rabbit
	Quadrat Frequency				
2008	30	12	7	1	6
2017	8	5	2	-	11
2021	1	16	3	-	9
Year	Days Use Per Acre (ha)				
2008	54.5 (134.5)	38.9 (96.0)	23.4 (57.9)	-	-
2017	8.7 (21.5)	5.3 (13.2)	-	-	-
2021	16.0 (39.5)	14.7 (36.4)	2.0 (5.0)	-	-

Table 04R-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)								
Elymus wawawaiensis (Snake River wheatgrass)								
Pascopyrum smithii (western wheatgrass)								
Poa bulbosa ⁱ (bulbous bluegrass)								
Psathyrostachys juncea ⁱ (Russian wildrye)								
Thinopyrum intermedium ⁱ (intermediate wheatgrass)								
year	Nested Frequency							
2008	22	-	-	-	-	467	-	365
2017	3	2	99	19	7	446	-	265
2021	3	2	14	18	37	455	11	313
year	Average Cover (%)							
2008	0.3	-	-	-	-	38.2	-	12.6
2017	0.0	0.0	2.8	1.0	0.3	37.8	-	11.7
2021	0.1	0.0	0.4	1.5	1.8	39.7	0.9	18.7

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

Table 04R-06.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES																		
Agoseris glauca (pale agoseris)																		
Alyssum desertorum ^{ai} (desert madwort)																		
Carduus nutans ^{ai} (nodding plumeless thistle)																		
Collomia linearis ^{ai} (tiny trumpet)																		
Comandra umbellata (bastard toadflax)																		
Erigeron pumilus (shaggy fleabane)																		
Erodium cicutarium ^{ai} (redstem stork's bill)																		
Lactuca serriola ^{ai} (prickly lettuce)																		
Lupinus argenteus (silvery lupine)																		
Medicago sativa ⁱ (alfalfa)																		
Microsteris gracilis ^a (slender phlox)																		
Onobrychis viciifolia ⁱ (sainfoin)																		
Sanguisorba minor ⁱ (small burnet)																		
Sisymbrium altissimum ^{ai} (tall tumbled mustard)																		
Sphaeralcea grossularifolia (gooseberry/leaf globemallow)																		
Taraxacum officinale (common dandelion)																		
Tragopogon dubius ^{ai} (yellow salsify)																		
year	Nested Frequency																	
2008	-	-	-	-	1	-	-	-	4	73	-	-	-	-	-	-	-	-
2017	-	4	1	5	-	34	44	36	-	64	-	28	3	12	14	-	-	5
2021	2	-	-	-	-	-	4	-	-	75	3	6	0	-	20	5	-	21
year	Average Cover (%)																	
2008	-	-	-	-	0.1	-	-	-	0.5	3.0	-	-	-	-	-	-	-	-
2017	-	0.0	0.0	0.0	-	0.2	0.7	0.1	-	3.9	-	0.7	0.0	0.2	0.3	-	-	0.1
2021	0.0	-	-	-	-	-	0.0	-	-	5.7	0.0	0.1	0.2	-	0.5	0.0	-	0.4

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

Table 04R-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 viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. hololeuca ^p (rubber rabbitbrush)
year	Line Intercept Cover (%)			
2008	-	6.4	0	1.2
2017	-	1.7	-	2.5
2021	-	3.2	-	3
year	Quadrat Cover (%)			
2008	0.1	6.1	0.0	0.4
2017	-	1.4	0.0	2.2
2021	-	1.6	-	1.5

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

Table 04R-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.

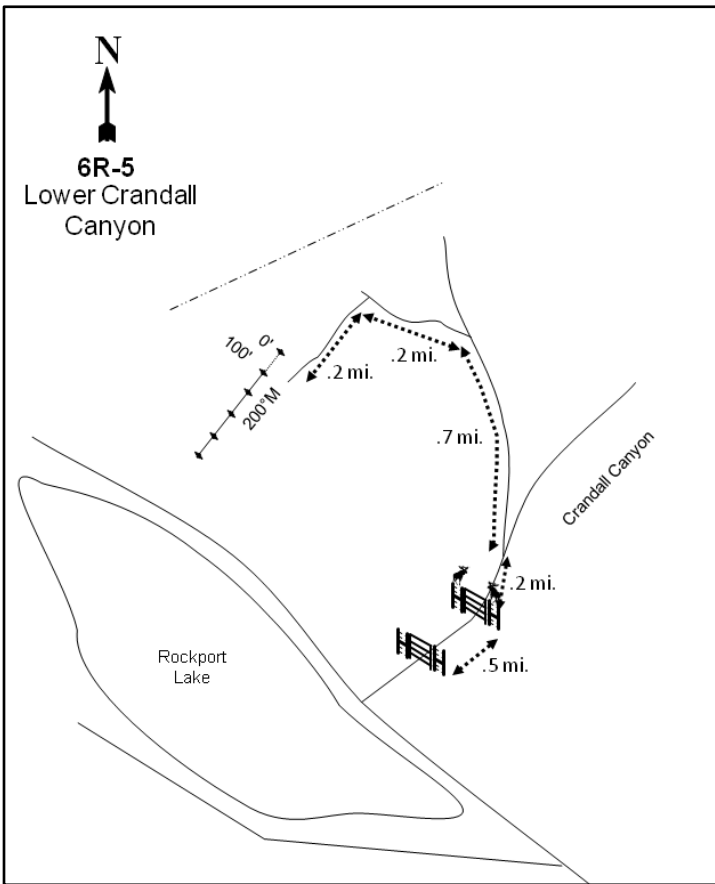
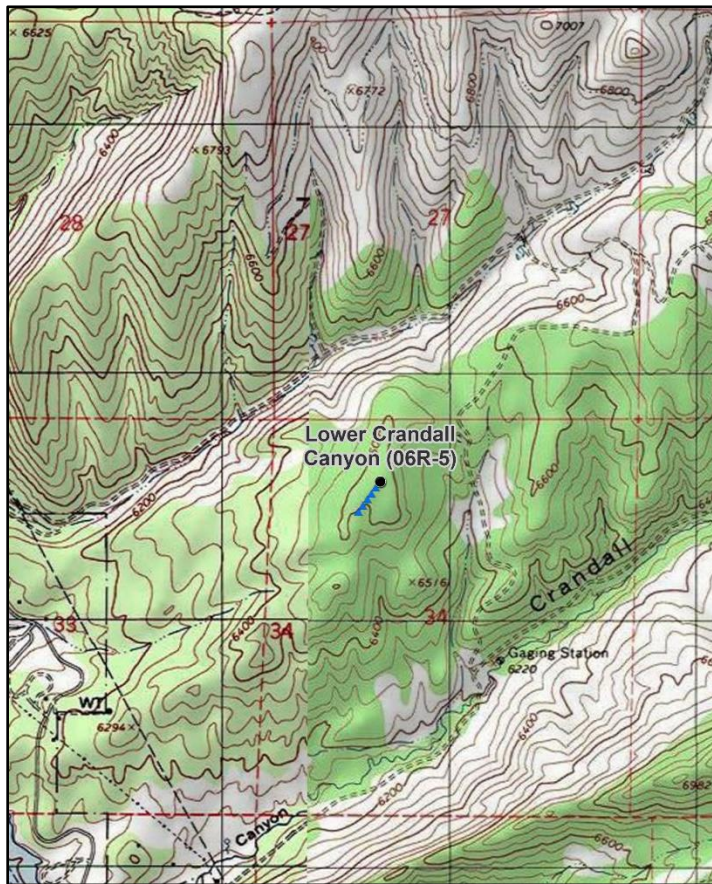
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis^p -- (Utah serviceberry)									
2008	20	-	0	100	0	0	100	0	131/19
2017	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
2008	1000	20	2	4	94	14	52	60	65/108
2017	480	-	8	71	21	21	0	21	57/78
2021	240	-	8	50	42	0	8	42	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
2008	20	-	0	100	0	100	0	0	25/34
2017	-	-	-	-	-	-	-	-	42/72
2021	-	-	-	-	-	-	-	-	-/-
Ericameria nauseosa ssp. nauseosa var. hololeuca^p -- (rubber rabbitbrush)									
2008	100	-	0	100	0	0	20	0	76/107
2017	200	-	10	90	0	0	0	0	78/114
2021	260	-	8	77	15	0	0	23	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
2008	-	-	-	-	-	-	-	-	-/-
2017	20	-	0	100	0	0	0	0	25/26
2021	20	-	0	0	100	0	0	100	- / -

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

Table 04R-06.15 - Deer Desirable Components Index: Mountain 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
2008	9.5	-8.7	0.8	25.6	0.0	7.3	0.0	34.6	Very Poor
2017	5.3	0.0	0.0	26.3	-2.1	10.0	-2.0	37.4	Very Poor
2021	7.8	6.3	4.0	30.0	-0.3	10.0	0.0	57.7	Fair

LOWER CRANDALL CANYON - STUDY NO. 06R-5



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Crandall Canyon SW; Township 1N, Range 5E, Section 34
NAD 83 UTM ZONE 12, 468648 East 4514551 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

105
200° magnetic
500ft
Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (95ft), Line 5 (71ft)
Belt 5: South side of litter pile

Directions to Site

Drive northwest on State Route (SR) 32 toward River Valley Drive. Turn right onto SR-302 and take the first left to stay on SR-302. Continue to follow this road for approximately 1.07 miles and turn right onto Crandall Canyon Road. Pass through the first gate and drive for 0.5 miles to a larger gate on private property (**contact the landowner for entry**). After 0.2 miles the road will fork: continue on the left side of the fork for 0.7 miles. At this point the road will fork again, and again, stay left. Drive for 0.2 miles at which point there will be a road off to the left. Proceed on this road for another 0.2 miles. The site is on the right (northwest) side of the road. The road to the site in the chained area is very faint and may not be visible in future sample years.

Site Information

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	6,603ft (2,013m)
Aspect	Southwest
Slope	5-6%
Sample Dates	09/02/2014, 07/26/2017, 06/23/2021

Table 06R-05.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Two-Way Ely	Crandall Canyon Juniper Thinning	2360	October-November 2013	354
Seeding - Aerial After	Crandall Canyon Juniper Thinning	2360	December 2013	354
Seeding - Drill	Crandall Canyon Juniper Thinning	2360	November-December 2013	-

Table 06R-05.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Crandall Canyon			Aerial	Dec 2013	400
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Dactylis glomerata	Orchardgrass	Paiute	0.49	0.43
G	Elymus wawawaiensis	Snake River Wheatgrass	Secar	1.00	0.82
G	Poa secunda	Big Bluegrass	Sherman	0.50	0.41
G	Poa secunda	Canby Bluegrass	Canbar	0.75	0.58
F	Achillea millefolium	Western Yarrow	Hanford WA	0.10	0.09
F	Linum perenne	Blue Flax	Appar	0.50	0.45
F	Medicago sativa	Alfalfa	Ranger NC	1.18	1.11
F	Onobrychis viciifolia	Sainfoin	Eski	1.05	0.90
F	Onobrychis viciifolia	Sainfoin	Eski	0.88	0.80
F	Sanguisorba minor	Small Burnet		2.00	1.82
S	Artemisia tridentata ssp. vaseyana	Mountain Big Sagebrush	Summit UT	0.55	0.12
S	Artemisia tridentata ssp. wyomingensis	Wyoming Big Sagebrush	Sanpete UT	0.13	0.03
S	Artemisia tridentata ssp. wyomingensis	Wyoming Big Sagebrush	Sanpete UT	0.88	0.15
S	Bassia prostrata	Forage Kochia	Sanpete UT	1.00	0.65

Mix Name			Application Type	Application Date	Acres
Crandall Canyon			Drill	Nov 2014	
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
S	Purshia tridentata	Bitterbrush		NaN	NaN

Wildlife Habitat and Vegetation History

Table 06R-05.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	substantial	winter
Rocky Mountain Elk	crucial	winter
Shiras Moose	crucial	winter

Table 06R-05.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2014	Perennial Grass	Phase I
2017	Perennial-Annual Grass	Phase I
2021	Perennial Grass	Phase I

Site Notes

A partial deer shed was found in 2017.

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.

This site has been dominated by native perennial grasses including bluebunch wheatgrass (*Pseudoroegneria spicata*), Sandberg bluegrass (*Poa secunda*), and squirreltail (*Elymus elymoides*) since study establishment in 2014. The introduced annual grass species cheatgrass (*Bromus tectorum*) was a co-dominant site component in 2017, but cover has been low in other years (Table 06R-05.10). Forbs have remained diverse. Annual forb species such as desert madwort (*Alyssum desertorum*), western tansymustard (*Descurainia pinnata*), and pepperweed (*Lepidium sp.*) contributed nearly 11% cover in 2017, but forb cover has generally been low in other sample years. In addition, the noxious weed and introduced annual forb nodding plumeless thistle (*Carduus nutans*) has been present with low abundance since 2017 (Table 06R-05.7, Table 06R-05.11). Yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus* var. *viscidiflorus*) has been the dominant shrub species throughout the duration of the study. Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has increased each sample year: this may indicate that the vegetation community could possibly shift to a sagebrush type in the future. Utah juniper (*Juniperus osteosperma*) has still been present following treatment (Table 06R-05.1), but in low amounts (Table 06R-05.12, Table 06R-05.13, Table 06R-05.14). Although the study site is considered to be within Phase I of woodland succession as of 2021 (Table 06R-05.4), the extant tree component indicates that there may be potential for infilling over time. Deer winter range condition has generally remained very poor since site establishment primarily due to a lacking preferred browse component. Improvement to deer wintering range can be accomplished through efforts that support mature sagebrush and sagebrush reproduction (Table 06R-05.15).

Trend Summary Tables

Table 06R-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
2014	0.5	1.5	0.3	0.9	2.1	1.8
2017	1.0	5.9	1.2	2.3	6.7	1.6
2021	3.1	5.7	1.8	3.3	7.9	2.1

Table 06R-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
2014	11	252	25	159	0.0	7.2	0.3	1.6
2017	244	323	354	173	13.1	17.7	11.2	5.2
2021	116	348	203	212	0.8	20.5	2.0	5.7

Table 06R-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
2014	38.5	0.0	53.1	0.6	1.0	12.3
2017	17.1	0.1	47.4	0.4	0.7	53.6
2021	35.1	0.8	36.3	0.4	0.7	36.1

Table 06R-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	Shiras Moose	Rabbit
	Quadrat Frequency				
2014	-	20	1	-	41
2017	1	15	26	-	22
2021	4	29	39	-	54
Year	Days Use Per Acre (ha)				
2014	-	12.1 (29.8)	2.7 (6.6)	-	-
2017	5.8 (14.3)	7.4 (18.2)	20.8 (51.3)	0.5 (1.2)	-
2021	5.1 (12.6)	40.2 (99.3)	33.5 (82.8)	-	-

Table 06R-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)										
Dactylis glomerata ⁱ (orchardgrass)										
Elymus elymoides (squirreltail)										
Elymus lanceolatus (thickspike wheatgrass)										
Poa fendleriana (muttongrass)										
Poa pratensis ⁱ (Kentucky bluegrass)										
Poa secunda (Sandberg bluegrass)										
Pseudoroegneria spicata (bluebunch wheatgrass)										
year	Nested Frequency									
2014	18	68	11	5	19	2	47	21	106	89
2017	41	-	244	8	69	37	57	-	75	181
2021	22	-	116	-	72	77	76	-	196	171
year	Average Cover (%)									
2014	0.4	1.5	0.0	0.0	0.3	0.0	0.9	0.3	1.2	2.5
2017	1.1	-	13.1	0.1	3.2	1.1	2.0	-	1.6	8.6
2021	0.7	-	0.8	-	1.7	2.7	2.1	-	5.7	7.6

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

Table 06R-05.11 - 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)																	
Alyssum szovitsianum ^{ai} (Szowitz' madwort)																	
Antennaria dimorpha (low pussytoes)																	
Arenaria (sandwort)																	
Astragalus 2 (Milkvetch)																	
Astragalus convallarius (lesser rushy milkvetch)																	
Astragalus tenellus (looseflower milkvetch)																	
Balsamorhiza sagittata (arrowleaf balsamroot)																	
Calochortus nuttallii (sego lily)																	
Camelina microcarpa ^{ai} (littlepod false flax)																	
Carduus nutans ⁿⁱ (nodding plumeless thistle)																	
Ceratocephala testiculata ^{ai} (curvseed butterwort)																	
Chenopodium album ^a (lambquarters)																	
year	Nested Frequency																
2014	16	4	-	-	-	-	30	50	6	8	5	0	-	-	-	-	-
2017	26	-	12	-	243	-	9	63	3	28	7	3	10	9	13	20	-
2021	44	5	15	3	134	14	45	49	-	10	6	1	5	-	27	105	6
year	Average Cover (%)																
2014	0.4	0.0	-	-	-	-	0.2	0.2	0.0	0.0	0.0	0.0	-	-	-	-	-
2017	0.6	-	0.1	-	6.5	-	0.2	1.4	0.0	0.4	0.2	0.4	0.0	0.0	0.8	0.1	-
2021	0.9	0.0	0.0	0.0	0.4	0.1	1.1	1.1	-	0.1	0.0	0.0	0.2	-	0.9	0.5	0.0

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

FORB SPECIES	Nest Frequency																
Chenopodium leptophyllum ^a (narrowleaf goosefoot)	5	4	1	-	8	-	-	6	-	13	-	39	-	-	4	-	4
Cirsium (thistle)	-	33	3	13	16	2	1	6	2	3	-	8	5	92	77	13	5
Collinsia parviflora ^a (maiden blue eyed Mary)	8	28	5	-	10	-	1	2	-	29	3	8	1	-	-	6	-
Collomia linearis ^a (tiny trumpet)	Average Cover (%)																
Comandra umbellata (bastard toadflax)	0.0	0.0	0.0	-	0.1	-	-	0.0	-	0.0	-	0.2	-	-	0.2	-	0.0
Cordylanthus ^a (bird's-beak)	-	0.4	0.1	0.1	0.5	0.0	0.0	1.1	0.0	0.0	-	0.2	0.0	0.9	1.2	0.1	0.0
Crepis acuminata (tapertip hawkbeard)	0.0	0.7	0.0	-	0.1	-	0.0	0.0	-	0.6	0.0	0.1	0.1	-	-	0.1	-
Descurainia pinnata ^a (western tansymustard)	Nest Frequency																
Draba ^a (draba)	5	4	1	-	8	-	-	6	-	13	-	39	-	-	4	-	4
Erigeron engelmannii (Engelmann's fleabane)	-	33	3	13	16	2	1	6	2	3	-	8	5	92	77	13	5
Erigeron pumilus (shaggy fleabane)	8	28	5	-	10	-	1	2	-	29	3	8	1	-	-	6	-
Erigonum umbellatum (sulphur-flower buckwheat)	Average Cover (%)																
Hackelia patens (spotted stickseed)	0.0	0.0	0.0	-	0.1	-	-	0.0	-	0.0	-	0.2	-	-	0.2	-	0.0
Lactuca serriola ^{ai} (prickly lettuce)	-	0.4	0.1	0.1	0.5	0.0	0.0	1.1	0.0	0.0	-	0.2	0.0	0.9	1.2	0.1	0.0
Lepidium ^a (pepperweed)	0.0	0.7	0.0	-	0.1	-	0.0	0.0	-	0.6	0.0	0.1	0.1	-	-	0.1	-
Linum perenne ⁱ (blue flax)	Nest Frequency																
Lithospermum incisum (narrowleaf stoneseed)	5	4	1	-	8	-	-	6	-	13	-	39	-	-	4	-	4

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

FORB SPECIES	Nest Frequency															
Lomatium (desertparsley)	-	-	-	-	-	27	11	9	7	-	-	0	4	-	16	
Microsteris gracilis ^{ai} (slender phlox)	-	-	-	1	6	13	-	-	1	1	5	5	9	-	6	
Onopordum acanthium ^{ai} (Scotch cottonthistle)	2	1	3	-	3	9	2	-	-	-	-	-	13	5	52	
Packera multilobata (lobeleaf groundsel)	Average Cover (%)															
Penstemon humilis (low beardtongue)	-	-	-	-	-	0.3	0.0	0.0	0.0	-	-	0.0	0.0	-	0.1	
Phlox hoodii (spiny phlox)	-	-	-	0.0	0.2	0.3	-	-	0.0	0.0	0.2	0.0	0.1	-	0.0	
Phlox longifolia (longleaf phlox)	0.0	0.0	0.0	-	0.1	0.2	0.0	-	-	-	-	-	0.1	0.0	0.1	
Polygonum douglasii ^a (Douglas' knotweed)	Nest Frequency															
Sanguisorba minor ⁱ (small burnet)	-	-	-	-	-	27	11	9	7	-	-	0	4	-	16	
Schoenocrambe linifolia (flaxleaf plainsmustard)	-	-	-	1	6	13	-	-	1	1	5	5	9	-	6	
Sisymbrium altissimum ^{ai} (tall tumbermustard)	2	1	3	-	3	9	2	-	-	-	-	-	13	5	52	
Solanum triflorum ^a (cutleaf nightshade)	Average Cover (%)															
Symphyotrichum (aster)	-	-	-	-	-	0.3	0.0	0.0	0.0	-	-	0.0	0.0	-	0.1	
Symphyotrichum ascendens (western aster)	-	-	-	0.0	0.2	0.3	-	-	0.0	0.0	0.2	0.0	0.1	-	0.0	
Trifolium (clover)	0.0	0.0	0.0	-	0.1	0.2	0.0	-	-	-	-	-	0.1	0.0	0.1	

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

Table 06R-05.12 - 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)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma ^t (Utah juniper)	Opuntia (pricklypear)	Purshia tridentata ^p (antelope bitterbrush)	Symphoricarpos oreophilus ^p (mountain snowberry)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)									
2014	-	0.8	0.1	1.8	-	1.8	0.1	-	-	0.2
2017	-	1.8	0.4	6.2	-	1.6	-	-	0.1	0.5
2021	-	2.6	0.6	7.5	0.2	2.1	0	-	0.1	0.2
year	Quadrat Cover (%)									
2014	0.0	0.4	0.0	1.4	-	0.3	0.1	0.0	0.0	0.0
2017	-	0.8	0.1	5.3	0.0	1.2	0.0	0.0	0.1	0.5
2021	-	2.4	0.4	5.5	0.1	1.8	0.0	0.2	0.2	0.1

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

Table 06R-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			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis^p -- (Utah serviceberry)									
2014	100	20	100	0	0	40	0	0	28/28
2017	100	-	80	20	0	0	0	0	25/31
2021	80	-	100	0	0	50	50	0	- / -
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
2014	320	80	13	19	69	13	19	25	32/41
2017	320	20	6	94	0	31	6	0	39/47
2021	700	40	26	51	23	20	0	23	- / -
Bassia prostrata^{pi} -- (forage kochia)									
2014	380	200	26	74	0	0	0	0	7/18
2017	460	-	4	96	0	4	0	0	19/33
2021	300	-	13	87	0	7	20	7	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
2014	3980	540	40	60	0	4	1	1	19/20
2017	3580	-	7	92	1	0	0	1	24/37
2021	3520	-	17	58	26	32	18	26	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
2014	-	-	-	-	-	-	-	-	23/31
2017	140	-	0	100	0	0	0	0	20/28
2021	260	-	8	92	0	8	0	0	- / -
Juniperus osteosperma^t -- (Utah juniper)									
2014	100	60	80	0	20	0	0	40	- / -
2017	100	-	40	60	0	20	0	20	- / -
2021	100	-	40	60	0	0	0	0	- / -
Opuntia -- (pricklypear)									
2014	860	-	42	58	0	0	0	5	12/17
2017	260	-	15	69	15	0	0	23	11/20
2021	80	-	0	100	0	25	0	0	- / -

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 (%)				
Purshia tridentata^p -- (antelope bitterbrush)									
2014	60	660	100	0	0	0	0	0	5/5
2017	80	-	75	25	0	0	0	0	14/26
2021	120	-	100	0	0	33	50	0	- / -
Symphoricarpos oreophilus^p -- (mountain snowberry)									
2014	540	100	78	15	7	7	0	19	18/26
2017	280	-	36	64	0	0	0	0	23/36
2021	180	-	22	78	0	33	56	0	- / -
Tetradymia canescens -- (spineless horsebrush)									
2014	480	-	58	42	0	29	8	0	18/20
2017	420	-	24	76	0	0	0	0	24/36
2021	120	-	0	100	0	0	0	0	- / -

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

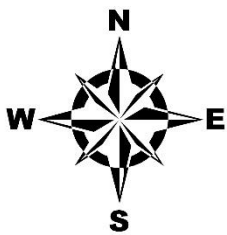
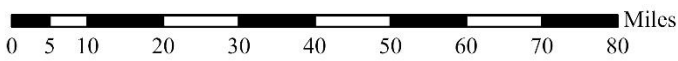
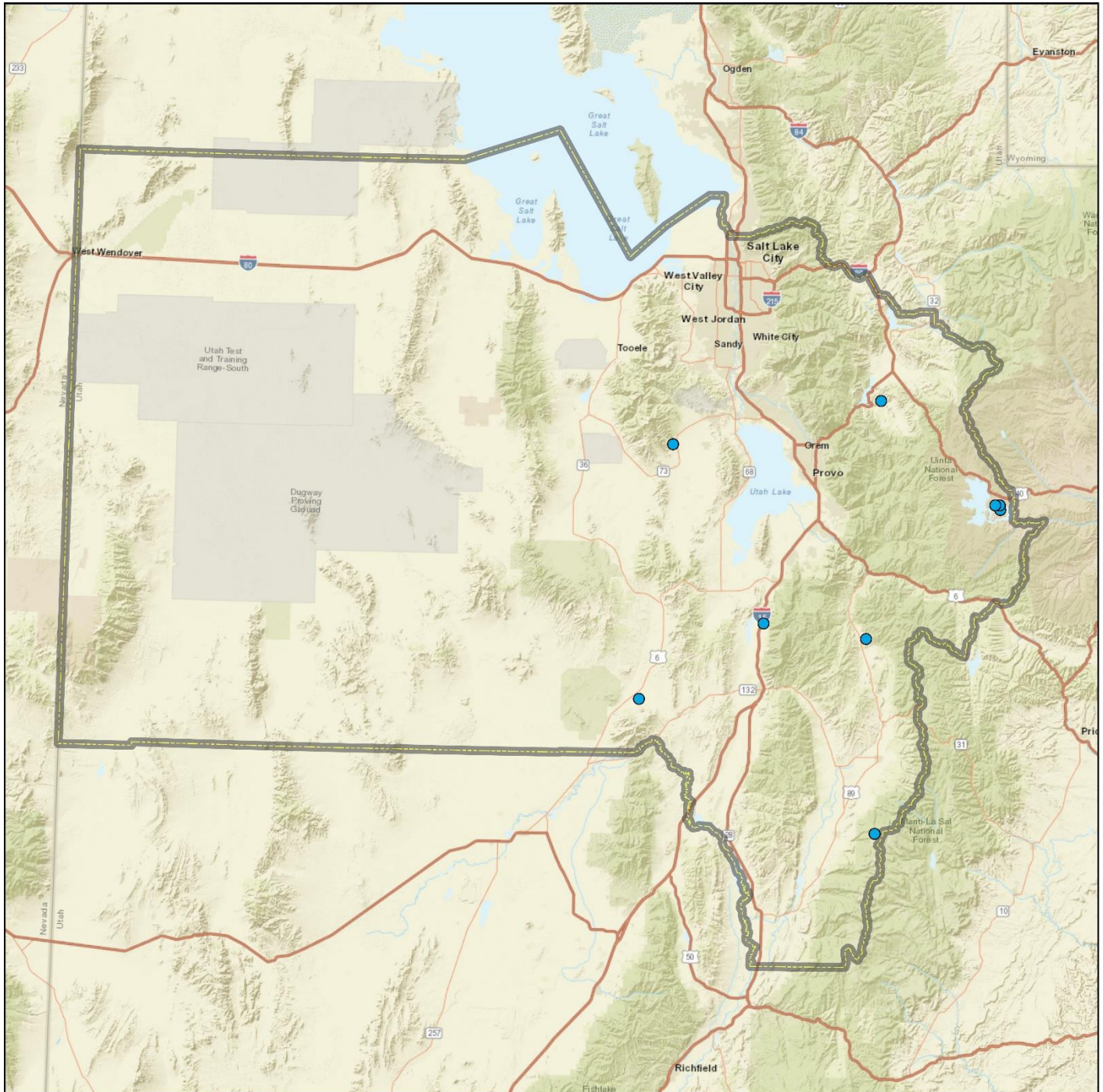
Table 06R-05.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.


Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2014	79	10	70	15	5	-	4.7
2017	69	-	70	30	-	-	8.6
2021	80	11	53	37	-	-	6.3


Table 06R-05.15 - Deer Desirable Components Index: Mountain Potential Scale.

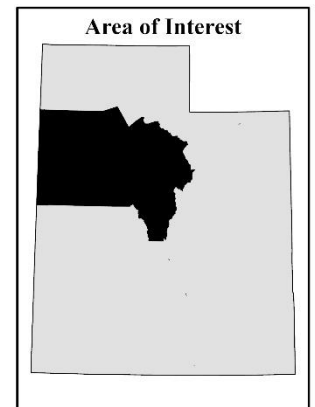
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
2014	1.2	0.0	0.0	14.3	0.0	3.2	0.0	18.6	Very Poor
2017	3.0	0.0	0.0	30.0	-9.8	10.0	-2.0	31.1	Very Poor
2021	4.3	0.0	0.0	30.0	-0.6	10.0	-4.0	39.6	Very Poor-Poor

CENTRAL REGION



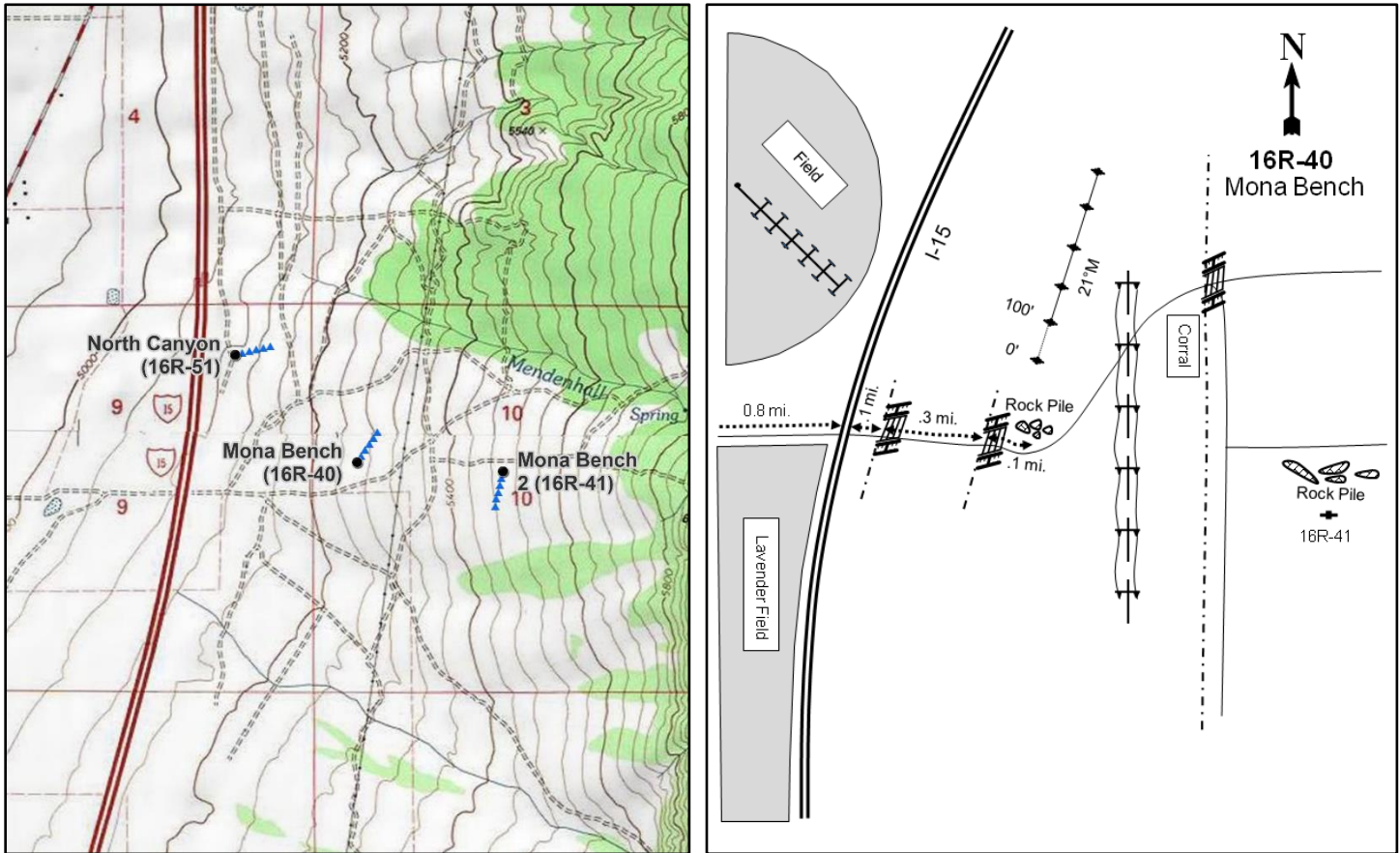
Region Boundaries
 Central Region

Study Locations
 2021 WRI Study Site



Credits: Esri, HERE, Garmin, NGA, USGS, NPS

MONA BENCH - STUDY NO. 16R-40

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Mona NW; Township 11S, Range 1E, Section 10
NAD 83 UTM ZONE 12, 429839 East 4414083 North

Transect Information

Browse Tag # (0' Stake)	Not Available
Transect Bearing	21° 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: No Rebar

Directions to Site

From Mona drive north for 3 miles. Turn right onto the road to the east by the lavender farms, then proceed for 0.8 miles and drive under the freeway. Continue for another 0.1 miles to a panel gate. Proceed through gate and go another 0.3 miles to a wire gate. Continue for another 0.1 miles to a rock pile on the north side of the road; there is no witness post. The 0-foot stake is 18 paces to the north of the road and there is no browse tag.

Site Information

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	5,181ft (1,579m)
Aspect	West
Slope	8%
Sample Dates	07/06/2011, 08/11/2014, 07/30/2018, 07/15/2021

Table 16R-40.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Herbicide - Milestone	Mona Bench Project	1934	May 2011	62
Herbicide - Plateau	Mona Bench Project	1934	November 2011	190
Harrow - Two-Way Chain	Mona Bench Project	1934	October 2011	190
Seeding - Broadcast Before	Mona Bench Project	1934	October 2011	190
Seeding - Aerial After	Mona Bench Project	1934	January 2012	190
Herbicide - Milestone	Mona Bench Project	1934	May 2012	62

Table 16R-40.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Mona Bench - Grass Mix			Broadcast	Oct 2011	62
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	<i>Achnatherum hymenoides</i>	Indian Ricegrass	Rimrock	1.61	1.53
G	<i>Agropyron cristatum</i>	Crested Wheatgrass	Hycrest	1.61	1.45
G	<i>Elymus lanceolatus</i>	Thickspike Wheatgrass	Bannock	1.61	1.29
G	<i>Leymus cinereus</i>	Great Basin Wildrye	Trailhead	1.61	1.48
G	<i>Pascopyrum smithii</i>	Western Wheatgrass	Arriba	1.61	1.38
G	<i>Poa secunda</i>	Canby Bluegrass	Canbar	0.40	0.19
G	<i>Poa secunda</i>	Sandberg Bluegrass	Mountain Home	0.40	0.36
G	<i>Psathyrostachys juncea</i>	Russian Wildrye		1.61	1.26
G	<i>Pseudoroegneria spicata</i>	Bluebunch Wheatgrass	Anatone	1.61	1.58

Mix Name			Application Type	Application Date	Acres
Mona Bench - Browse Mix			Aerial	Jan 2012	235
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
F	<i>Medicago sativa</i>	Alfalfa	Nomad	0.28	0.25
S	<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i>	Wyoming Big Sagebrush	Sevier UT	0.17	0.03
S	<i>Bassia prostrata</i>	Forage Kochia	Beaver UT	0.55	0.32

Wildlife Habitat and Vegetation History**Table 16R-40.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Rocky Mountain Elk	crucial	winter

Table 16R-40.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2011	Annual Grass/Mountain Big Sagebrush	No Encroachment
2014	Annual Grass	No Encroachment
2018	Annual Grass/Mountain Big Sagebrush	No Encroachment
2021	Mountain Big Sagebrush	No Encroachment

Site Notes

No Notes

Site Potential

1981 - 2010 Average Annual Precipitation	18 inches
NRCS Ecological Site	Upland Gravelly Loam (Bonneville Big Sagebrush)
NRCS Ecological Site #	R028AY306UT
States and Transitions	Current State: Community Phase 6.1

Upon study establishment in 2011, the plant community on this site was a stand of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) co-dominant with the annual grasses cheatgrass (*Bromus tectorum*) and field brome (*B. arvensis*). Following a chaining, herbicide, and seeding treatment (Table 16R-40.1), sagebrush cover decreased as did that of the perennial herbaceous understory (Table 16R-40.7, Table 16R-40.12). Cheatgrass became the dominant species in 2014 and filled the interspaces, creating continuous fuels and possibly influencing the fire potential (Table 16R-40.10). However, sagebrush cover increased and it became a co-dominant component on the site in 2018 and the sole dominant component in 2021 (Table 16R-40.12). Treatment may be needed to reduce cheatgrass if amounts are high in the future.

Trend Summary Tables

Table 16R-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
2011	8.6	9.8	-	11.8	10.2	-
2014	2.1	0.2	-	2.0	-	-
2018	7.0	1.0	-	6.1	0.6	-
2021	9.3	2.1	-	8.0	1.5	-

Table 16R-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
2011	451	145	276	84	38.1	5.0	3.6	1.2
2014	461	126	204	30	33.8	4.3	3.2	0.5
2018	447	227	407	43	19.3	6.7	12.8	0.3
2021	392	249	217	77	8.9	10.9	4.8	1.1

Table 16R-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
2011	14.7	0.1	29.5	15.4	4.4	57.3
2014	10.6	0.0	52.9	14.7	5.4	46.5
2018	15.9	-	44.3	11.0	7.9	37.8
2021	18.9	1.9	49.2	8.2	8.8	33.9

Table 16R-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	Horse	Rabbit
	Quadrat Frequency			
2011	1	16	1	3
2014	-	2	-	3
2018	2	5	1	6
2021	6	16	1	5
Year	Days Use Per Acre (ha)			
2011	-	7.4 (18.2)	-	-
2014	3.6 (9.0)	1.3 (3.3)	-	-
2018	11.6 (28.7)	10.0 (24.8)	1.7 (4.3)	-
2021	47.9 (118.4)	24.8 (61.2)	-	-

Table 16R-40.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Aegilops cylindrica ^{ai} (jointed goatgrass)	Agropyron cristatum ⁱ (crested wheatgrass)	Aristida purpurea (purple threeawn)	Bromus arvensis ^{ai} (field brome)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Poa bulbosa ⁱ (bulbous bluegrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Sporobolus cryptandrus (sand dropseed)	Thinopyrum intermedium ⁱ (intermediate wheatgrass)	Vulpia myuros ^{ai} (annual fescue)
year	Nested Frequency												
2011	-	8	-	67	234	311	-	45	1	45	8	12	7
2014	2	-	3	85	49	457	2	11	-	12	5	23	-
2018	-	-	17	189	59	446	-	6	-	9	6	35	17
2021	4	-	9	187	61	381	1	50	3	20	14	31	4
year	Average Cover (%)												
2011	-	0.4	-	3.6	16.1	21.6	-	0.5	0.0	0.3	0.5	0.1	0.0
2014	0.1	-	0.0	2.9	0.4	33.4	0.0	0.2	-	0.5	0.2	0.5	-
2018	-	-	0.3	5.8	0.4	18.6	-	0.0	-	0.0	0.1	0.4	0.2
2021	0.1	-	0.2	8.6	0.2	8.8	0.0	1.1	0.1	0.3	0.1	0.5	0.0

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

Table 16R-40.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Alyssum desertorum ^{ai} (desert madwort)	Arenaria (sandwort)	Artemisia ludoviciana (white sagebrush)	Asclepias subverticillata (horsetail milkweed)	Astragalus utahensis (Utah milkvetch)	Calochortus nuttallii (sego lily)	Castilleja angustifolia (northwestern Indian paintbrush)	Centaurea virgata ^{ai} (squarrose knapweed)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Chaetopappa ericoides (rose heath)	Cirsium (thistle)	Crepis acuminata (tapertip hawkbeard)	Draba ^a (draba)	Erigeron flagellaris (trailing fleabane)	Erodium cicutarium ^{ai} (redstem stork's bill)	Helianthus annuus ^a (common sunflower)	Lactuca serriola ^{ai} (prickly lettuce)
year	Nested Frequency																
2011	197	-	1	0	0	25	1	15	26	-	4	3	98	3	17	9	29
2014	20	-	-	-	-	1	-	15	5	-	1	-	-	-	195	-	-
2018	112	7	-	-	1	10	-	-	104	21	-	-	17	1	359	-	-
2021	23	-	-	2	-	26	-	-	60	32	-	2	5	-	185	6	-
year	Average Cover (%)																
2011	1.2	-	0.0	0.0	0.0	0.1	0.0	0.5	0.2	-	0.2	0.0	1.0	0.0	0.3	0.0	0.1
2014	0.0	-	-	-	-	0.0	-	0.5	0.0	-	0.0	-	-	-	3.2	-	-
2018	0.3	0.0	-	-	0.0	0.0	-	-	0.4	0.1	-	-	0.4	0.0	11.7	-	-
2021	0.1	-	-	0.1	-	0.1	-	-	0.1	0.5	-	0.0	0.1	-	4.4	0.0	-

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

FORB SPECIES	Phlox longifolia (longleaf phlox)	Silene antirrhina ^a (sleepy silene)	Sphaeralcea coccinea (scarlet globemallow)	Tragopogon dubius ^{ai} (yellow salsify)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency				
2011	8	128	19	2	14
2014	-	-	12	2	4
2018	-	2	-	1	8
2021	2	1	3	3	16
year	Average Cover (%)				
2011	0.0	0.7	0.2	0.0	0.1
2014	-	-	0.0	0.0	0.0
2018	-	0.0	-	0.0	0.1
2021	0.0	0.0	0.0	0.0	0.3

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

Table 16R-40.12 - 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)	Gutierrezia sarothrae (broom snakeweed)
year	Line Intercept Cover (%)		
2011	2.5	9.3	10.2
2014	0.3	1.7	-
2018	0.6	5.5	0.6
2021	1.6	6.4	1.5
year	Quadrat Cover (%)		
2011	1.8	6.8	9.8
2014	0.4	1.7	0.2
2018	0.5	6.6	1.0
2021	1.8	7.5	2.1

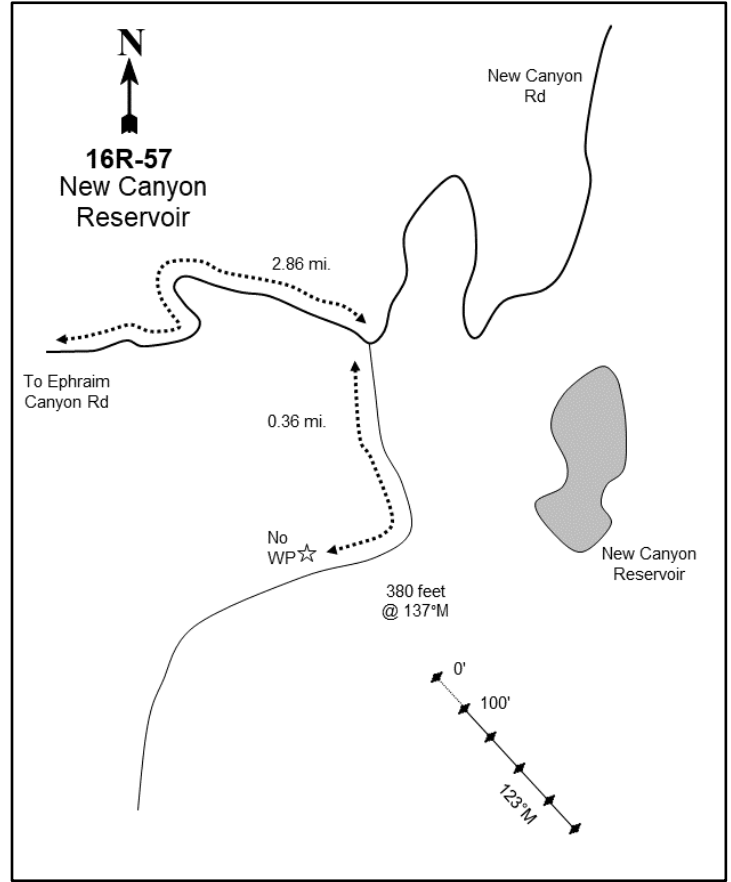
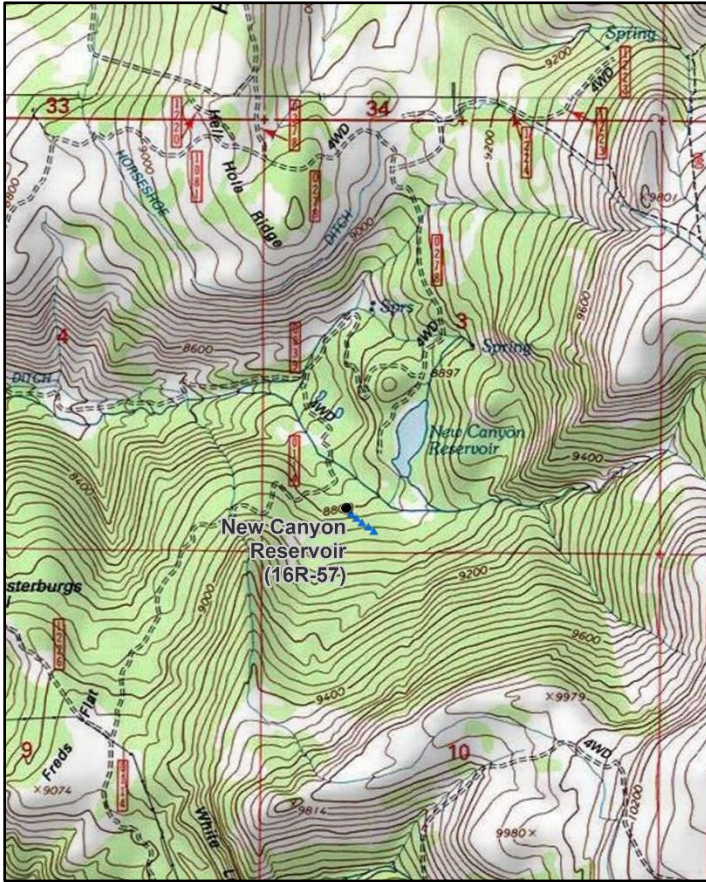
t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 16R-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			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia nova^p -- (black sagebrush)									
2011	140	-	0	100	0	0	0	0	42/69
2014	100	-	0	100	0	80	20	0	27/50
2018	180	-	0	100	0	0	0	0	39/81
2021	200	-	0	100	0	0	0	0	- / -
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
2011	1480	60	22	73	5	45	8	3	54/79
2014	940	-	11	87	2	51	6	11	38/52
2018	980	-	0	90	10	0	0	10	60/83
2021	920	-	0	63	37	15	0	39	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
2011	8160	980	15	80	4	3	0	4	24/31
2014	80	-	0	100	0	50	0	75	23/43
2018	1300	-	6	92	2	0	0	2	24/25
2021	1700	-	17	75	8	1	0	15	- / -
Opuntia -- (pricklypear)									
2011	-	-	-	-	-	-	-	-	5/12

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

NEW CANYON RESERVOIR - STUDY NO. 16R-57



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Danish Knoll NW; Township 17S, Range 4E, Section 03
NAD 83 UTM ZONE 12, 460023 East 4356829 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

Not Available
123° magnetic
500ft
Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
No Stakes or Rebar

Directions to Site

From the intersection of Ephraim Canyon Road and New Canyon Road, turn left onto New Canyon Road and travel 2.8 miles to a right (south) turn (the turn is just before the turn for New Canyon Reservoir). Turn right and travel for another 0.36 miles and park adjacent to the GPS point. From the road, the 0-foot baseline stake is approximately 380 feet away at 137 degrees magnetic.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	BROWNS HOLE S & G
Elevation	8,800ft (2,682m)
Aspect	Northwest
Slope	25%
Sample Dates	08/09/2021

Table 16R-57.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Logging - Mechanical Cut and Pile	New Canyon Watershed Restoration Phase 2 (Proposed)	5196	Fall 2021	88

Wildlife Habitat and Vegetation History**Table 16R-57.3 - 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 16R-57.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2021	Quaking Aspen-Conifer Encroached	NA

Site Notes

No Notes

Site Potential

1981 - 2010 Average Annual Precipitation	25 inches
NRCS Ecological Site	High Mountain Stony Loam (Aspen)
NRCS Ecological Site #	F047XA531UT
States and Transitions	Current State: Community Phase 1.4

This study was established in 2021 to monitor a logging treatment occurring in the fall of the same year (Table 16R-57.1). The understory was sparse in some locations along the transect due to overstory shading and duff accumulation; few grasses were present in the community (Table 16R-57.10). However, perennial forbs were prevalent in areas where light reached the understory with Canadian white violet (*Viola canadensis*) and tuber starwort (*Pseudostellaria jamesiana*) as the most abundant species (Table 16R-57.7, Table 16R-57.11). Decadent or aged subalpine fir (*Abies lasiocarpa*) and quaking aspen (*Populus tremuloides*) are in competition that is suppressing aspen recruitment as of 2021 (Table 16R-57.12, Table 16R-57.13, Table 16R-57.13a, Table 16R-57.14). Following the logging treatment, it is expected that the canopy will be open enough to allow increases in aspen density, and reinvigorate the browse and herbaceous understory's health by increasing diversity and abundance.

Trend Summary Tables**Table 16R-57.6 - 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
2021	20.5	-	6.9	35.8	-	68.2

Table 16R-57.7 - 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
2021	-	34	49	283	-	0.5	0.9	18.6

Table 16R-57.8 - 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
2021	3.0	0.3	70.7	0.0	0.2	42.1

Table 16R-57.9 - 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	Shiras Moose
	Quadrat Frequency		
2021	1	-	-
Year	Days Use Per Acre (ha)		
	2021	4.7 (11.6)	3.4 (8.3)

Table 16R-57.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES			
	Bromus marginatus (mountain brome)		
	Bromus porteri (Porter brome)		
	Carex (sedge)		
year	Nested Frequency		
2021	4	28	3
year	Average Cover (%)		
2021	0.2	0.2	0.1

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

Table 16R-57.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES																																		
	Achillea millefolium (Common yarrow)		Actaea rubra (red baneberry)		Chenopodium fremontii ^a (Fremont's goosefoot)		Collinsia parviflora ^a (maiden blue eyed Mary)		Collomia linearis ^a (tiny trumpet)		Crepis acuminata (tapertip hawkbeard)		Cynoglossum officinale ^{im} (gypsyflower)		Delphinium barbeyi (subalpine larkspur)		Descurainia californica ^a (Sierra tansymustard)		Erigeron speciosus (aspen fleabane)		Fragaria virginiana (Virginia strawberry)		Galium aparine ^a (stickywilly)		Gentianella amarella ssp. heterosepala ^a (autumn dwarf gentian)		Geranium richardsonii (Richardson's geranium)		Hackelia patens (spotted stickseed)		Helianthus multiflorus (showy goldeneye)		Heuchera parvifolia (littleleaf alumroot)	
year	Nested Frequency																																	
2021	22	6	13	3	8	6	11	26	15	2	5	9	5	26	3	3	27																	
year	Average Cover (%)																																	
2021	1.1	0.6	0.0	0.0	0.1	0.3	0.2	0.6	0.2	0.1	0.0	0.4	0.0	1.6	0.4	0.0	0.9																	

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

FORB SPECIES																								
	Lupinus argenteus (silvery lupine)		Mertensia oblongifolia (oblongleaf bluebells)		Osmorhiza depauperata (bluntseed sweetroot)		Polemonium pulcherrimum (Jacob's-ladder)		Pseudostellaria jamesiana (tuber starwort)		Ranunculus inamoenus (graceful buttercup)		Rudbeckia occidentalis (western coneflower)		Taraxacum officinale (common dandelion)		Thalictrum fendleri (Fendler's meadow-rue)		Vicia americana (American vetch)		Viola (violet)		Viola canadensis (Canadian white violet)	
year	Nested Frequency																							
2021	9	4	71	10	110	2	35	3	2	19	58	166												
year	Average Cover (%)																							
2021	0.7	0.2	1.4	0.1	2.4	0.0	2.7	0.0	0.0	0.7	0.5	4.2												

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

Table 16R-57.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Abies lasiocarpa ^t (subalpine fir)	Picea engelmannii ^t (Engelmann spruce)	Populus tremuloides ^t (quaking aspen)	Ribes cereum ^p (wax currant)	Ribes montigenum ^p (gooseberry currant)	Sambucus racemosa ^p (red elderberry)	Symphoricarpos oreophilus ^p (mountain snowberry)
year	Line Intercept Cover (%)						
2021	28.7	15.5	24	12.3	16	5.9	1.6
year	Quadrat Cover (%)						
2021	2.3	1.7	2.9	7.4	7.3	4.6	1.3

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

Table 16R-57.13 - 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 (%)				
Abies lasiocarpa ^t -- (subalpine fir)									
2021	180	-	44	33	22	0	0	22	- / -
Picea engelmannii ^t -- (Engelmann spruce)									
2021	240	-	25	75	0	0	0	25	- / -
Pseudotsuga menziesii ^t -- (Douglas-fir)									
2021	120	-	0	100	0	0	0	0	- / -
Ribes cereum ^p -- (wax currant)									
2021	2200	40	6	95	0	0	0	0	- / -
Ribes montigenum ^p -- (gooseberry currant)									
2021	3380	240	11	89	0	0	0	0	- / -
Sambucus racemosa ^p -- (red elderberry)									
2021	1220	-	10	89	2	0	0	2	- / -
Symphoricarpos oreophilus ^p -- (mountain snowberry)									
2021	260	-	15	85	0	0	0	0	- / -

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

Table 16R-57.13a - Aspen Characteristics. Characteristics of aspen populations including density, size class distribution, and vigor of plants.

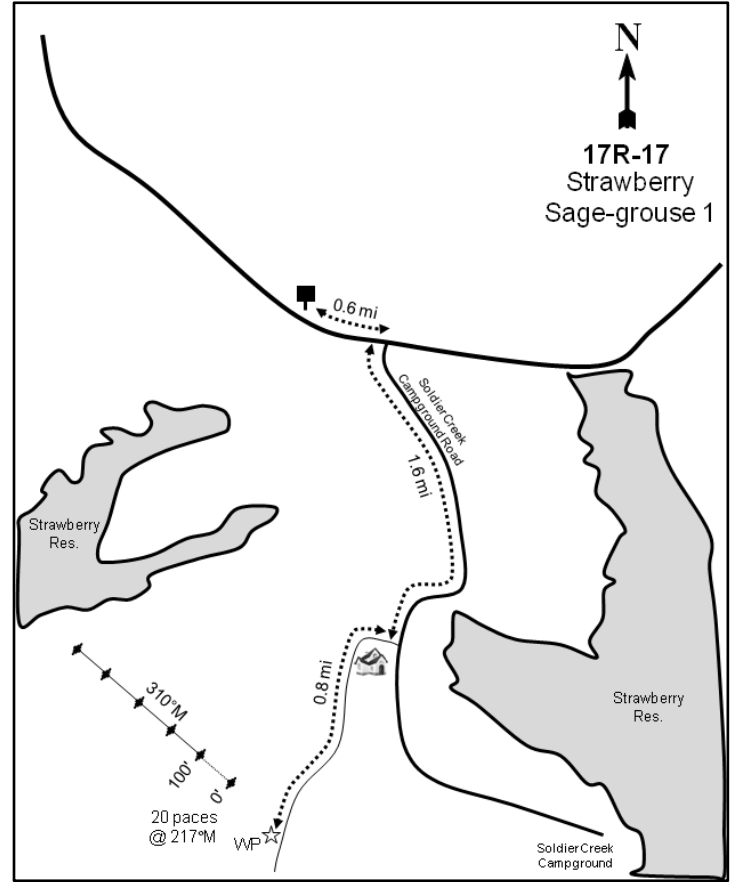
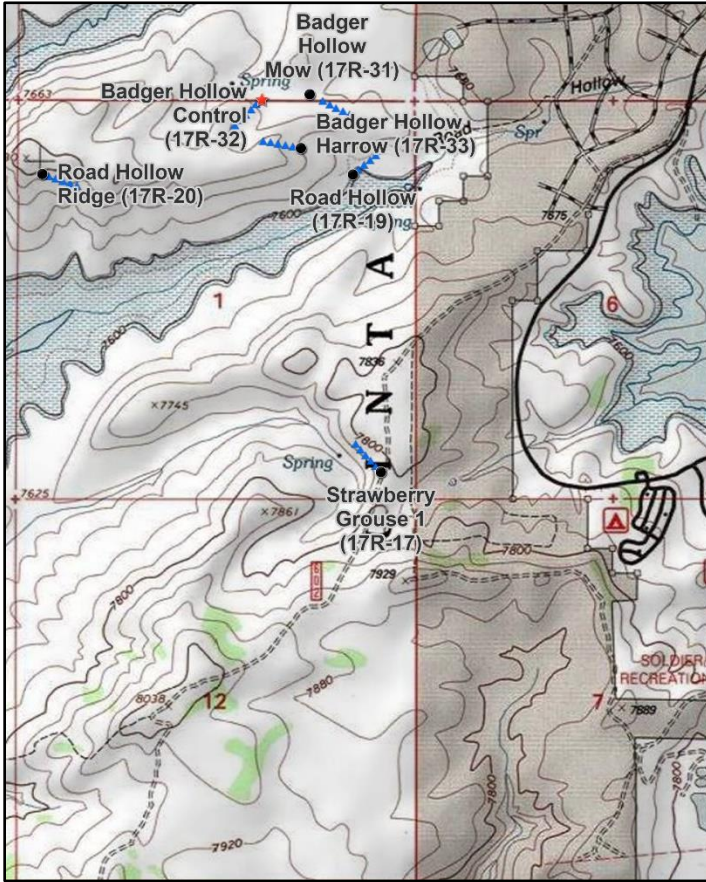
Year	Density	Size Class Distribution				Utilization		Poor Vigor (%)
	Plants per Acre	Class I (%)	Class II (%)	Class III (%)	Class IV (%)	Moderate (%)	Heavy (%)	
Populus tremuloides (quaking aspen)								
2021	1920	22	63	4	11	1	0	5

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 16R-57.14 - 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)							
2021	186	-	15	10	-	75	30.8
Picea engelmannii (Engelmann spruce)							
2021	23	-	-	-	20	80	39.0
Populus tremuloides (quaking aspen)							
2021	157	-	42	25	-	33	13.8

STRAWBERRY GROUSE 1 - STUDY NO. 17R-17



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Strawberry Reservoir; Township 4S, Range 11W, Section 01
NAD 83 UTM ZONE 12, 494219 East 4444987 North

Transect Information

Browse Tag # (0' Stake)	93
Transect Bearing	310° 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 40, drive past Strawberry Reservoir to mile marker 49 (not positive on mile marker number). Continue for 0.6 miles past the mile marker to Soldier Creek Campground Road (FS 480) on the right (south). Turn right and drive 1.6 miles to another road on the right (west). Turn right and drive 0.1 miles to an intersection, then turn left (southwest). Drive 0.8 miles on this two-track road to the witness post on the right-hand (northwest) side of the road. From the witness post, walk 20 feet at 217 degrees to the 0-foot stake that is marked with browse tag #93.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	No data
Elevation	7,440ft (2,268m)
Aspect	Southwest
Slope	8-10%
Sample Dates	08/11/2005, 07/12/2012, 08/01/2016, 08/12/2021

Wildlife Habitat and Vegetation History

Table 17R-17.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	substantial	summer/fall
Rocky Mountain Elk	crucial	summer
Greater Sage-Grouse		undefined & undefined
Shiras Moose	crucial	spring/fall

Table 17R-17.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2005	Mountain Big Sagebrush/Perennial Grass	No Encroachment
2012	Mountain Big Sagebrush/Perennial Grass	No Encroachment
2016	Mountain Big Sagebrush/Perennial Grass	No Encroachment
2021	Mountain Big Sagebrush/Perennial Grass	No Encroachment

Site Notes

The Strawberry Sage-Grouse 1 study is one of four established in 2005 to monitor habitat for sage-grouse in the Strawberry Valley and surrounding brood area.

Soils

Table 17R-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	7.3	47.4	34.7	17.9	1.3	10.3	150.4	0.5	08/11/2005

Site Potential

1981 - 2010 Average Annual Precipitation	21 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.

Since study establishment in 2005, the shrub overstory on this site has been mainly comprised of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), although numerous other species have also been present (Table 17R-17.12, Table 17R-17.13). The introduced perennial grass species crested wheatgrass (*Agropyron cristatum*) has consistently contributed the most herbaceous cover. Perennial forbs have been fairly abundant in all sample years, with looseflower milkvetch (*Astragalus tenellus*) and mountain phlox (*Phlox austromontana*) as the most prevalent species. Annual grasses are not a concern on this study site (Table 17R-17.7, Table 17R-17.10, Table 17R-17.11).

Trend Summary Tables**Table 17R-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
2005	17.4	5.6	-	26.8	6.8	-
2012	18.4	7.3	-	25.1	6.7	-
2016	16.3	5.8	-	23.2	7.1	-
2021	20.9	5.1	-	23.4	6.0	-

Table 17R-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
2005	-	386	64	261	-	16.1	0.7	13.5
2012	-	381	20	191	-	21.6	0.1	6.9
2016	-	409	40	186	-	27.5	1.1	8.4
2021	-	391	-	143	-	21.5	-	5.2

Table 17R-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
2005	22.3	3.3	47.7	0.6	4.9	45.6
2012	21.2	0.6	45.0	0.8	6.5	52.0
2016	17.2	2.0	34.2	0.6	5.8	50.7
2021	20.2	1.1	42.8	1.4	5.7	45.2

Table 17R-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	Greater Sage-Grouse	Rabbit
	Quadrat Frequency				
2005	1	10	4	17	30
2012	-	2	1	8	2
2016	-	8	1	7	5
2021	-	5	2	4	27
Days Use Per Acre (ha)					
2005	1.5 (3.6)	7.4 (18.2)	10.7 (26.5)	200.4 (494.9)*	-
2012	-	8.1 (19.9)	-	52.3 (129.1)*	-
2016	-	8.7 (21.5)	2.0 (5.0)	8.7 (21.5)*	-
2021	-	12.1 (29.8)	2.0 (5.0)	104.5 (258.2)*	-

Pellets per acre (ha)

Table 17R-17.10 - 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 porteri (Porter brome)	Carex (sedge)	Carex obtusata (obtuse sedge)	Carex rossii (Ross' sedge)	Elymus lanceolatus (thickspike wheatgrass)	Festuca idahoensis (Idaho fescue)	Hesperostipa comata (needle and thread)	Koeleria macrantha (prairie Junegrass)	Poa fendleriana (muttongrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency														
2005	14	8	149	2	38	-	-	94	4	15	56	162	13	68	17
2012	6	6	235	7	39	-	-	61	9	12	54	67	3	78	30
2016	-	16	249	12	10	-	-	37	3	-	18	5	12	169	14
2021	8	7	312	-	-	42	20	85	7	-	9	10	20	59	3
year	Average Cover (%)														
2005	0.1	0.1	6.9	0.0	0.7	-	-	0.7	0.0	0.6	0.7	4.7	0.2	0.7	0.4
2012	0.6	0.1	14.1	0.0	0.4	-	-	0.9	0.1	0.1	1.6	1.1	0.0	1.1	1.6
2016	-	0.9	18.2	0.1	0.2	-	-	0.4	0.0	-	0.4	0.0	0.1	6.3	0.8
2021	0.0	0.0	18.0	-	-	0.7	0.6	1.3	0.1	-	0.0	0.1	0.1	0.4	0.1

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

Table 17R-17.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Androsace septentrionalis ^a (pygmy flower rockjasmine)	Antennaria microphylla (littleleaf pussytoes)	Arabis (rockcross)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus kentrophyta (spiny milkvetch)	Astragalus tenellus (looseflower milkvetch)	Calochortus nuttallii (sego lily)	Camissonia ^a (suncup)	Chaenactis douglasii (Douglas' dustymaiden)	Collinsia parviflora ^a (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)	Cryptantha (cryptantha)	Eriogonum brevicaulis (shortstem buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Lappula occidentalis ^a (flatspine stickseed)	Lesquerella (bladderpod)
year	Nested Frequency																
2005	2	11	5	10	3	112	3	6	3	15	85	2	13	6	28	10	3
2012	8	5	4	5	-	55	-	-	7	2	50	2	14	3	15	-	-
2016	1	-	-	-	-	60	-	-	-	19	50	-	3	16	-	-	-
2021	-	5	-	-	-	38	-	-	-	-	29	2	5	2	-	-	-
year	Average Cover (%)																
2005	0.0	0.1	0.0	0.1	0.0	4.8	0.0	0.0	0.0	0.0	0.8	0.2	0.4	0.1	0.1	0.0	0.0
2012	0.1	0.0	0.0	0.0	-	1.0	-	-	0.0	0.0	0.2	0.0	0.3	0.0	0.0	-	-
2016	0.0	-	-	-	-	2.7	-	-	-	0.1	0.5	-	0.0	0.5	-	-	-
2021	-	0.0	-	-	-	0.7	-	-	-	-	0.2	0.0	0.2	0.0	-	-	-

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

FORB SPECIES	Nested Frequency														
year	Average Cover (%)														
Lupinus argenteus (silvery lupine)															
Machaeranthera grindelioides (rayless tansyaster)															
Orobanche (broomrape)															
Orthocarpus luteus ^a (yellow owl's-clover)															
Orthocarpus tolmiei ^a (Tolmie's owl's-clover)															
Packera multiflora (lobeleaf groundsel)															
Penstemon (beardtongue)															
Penstemon caespitosus (mat penstemon)															
Phlox austromontana (mountain phlox)															
Phlox longifolia (longleaf phlox)															
Polygonum douglasii ^a (Douglas' knotweed)															
Potentilla gracilis (slender cinquefoil)															
Symphotrichum ascendens (western aster)															
Taraxacum officinale (common dandelion)															
Tragopogon dubius ^a (yellow salsify)															
year	Nested Frequency														
2005	0	46	1	7	17	1	7	-	126	3	34	4	0	4	0
2012	-	55	-	-	-	4	5	12	116	-	-	1	7	-	-
2016	2	41	-	-	21	5	-	13	104	0	5	-	9	-	-
2021	1	50	-	-	-	3	3	8	89	1	-	-	-	4	-
year	Average Cover (%)														
2005	0.0	1.6	0.0	0.0	0.4	0.0	0.1	-	5.3	0.0	0.1	0.0	0.0	0.0	0.0
2012	-	1.2	-	-	-	0.0	0.0	0.2	3.5	-	-	0.0	0.4	-	-
2016	0.1	1.2	-	-	1.0	0.0	-	0.1	2.4	0.0	0.0	-	0.7	-	-
2021	0.0	1.0	-	-	-	0.0	0.0	0.1	2.9	0.0	-	-	-	0.0	-

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

Table 17R-17.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)									
year	Quadrat Cover (%)									
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 parryi var. parryi (Parry's rabbitbrush)										
Gutierrezia sarothrae (broom snakeweed)										
Mahonia repens (creeping barberry)										
Rosa woodsii ^p (Woods rose)										
Tetradymia canescens (spineless horsebrush)										
year	Line Intercept Cover (%)									
2005	1.1	25.7	-	4.6	0.9	0.9	-	-	0.4	
2012	0.3	24.8	-	3.7	2.1	0.3	0.2	-	0.4	
2016	1.2	21.9	-	4.9	0.5	0.6	0.5	0.1	0.6	
2021	0.7	22.7	-	3	1.8	-	0.2	-	1	
year	Quadrat Cover (%)									
2005	1.1	16.3	0.0	2.8	1.1	0.4	0.2	-	1.1	
2012	0.1	17.9	0.3	4.5	2.1	0.2	0.2	-	0.4	
2016	1.1	15.2	0.0	3.6	0.7	0.6	0.4	0.0	0.5	
2021	0.6	20.4	-	2.8	1.2	-	0.4	-	0.8	

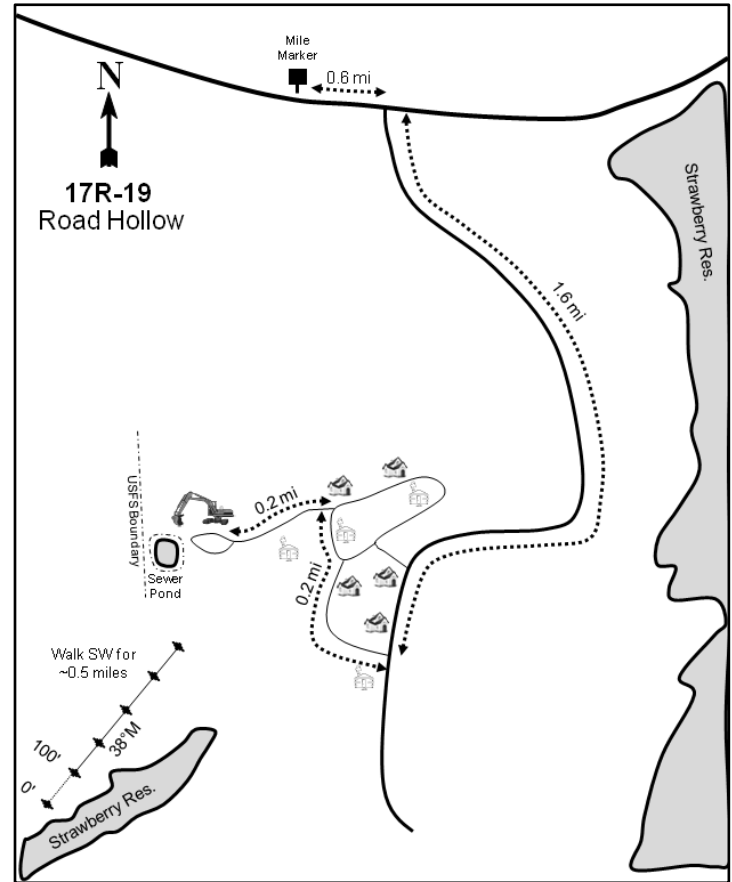
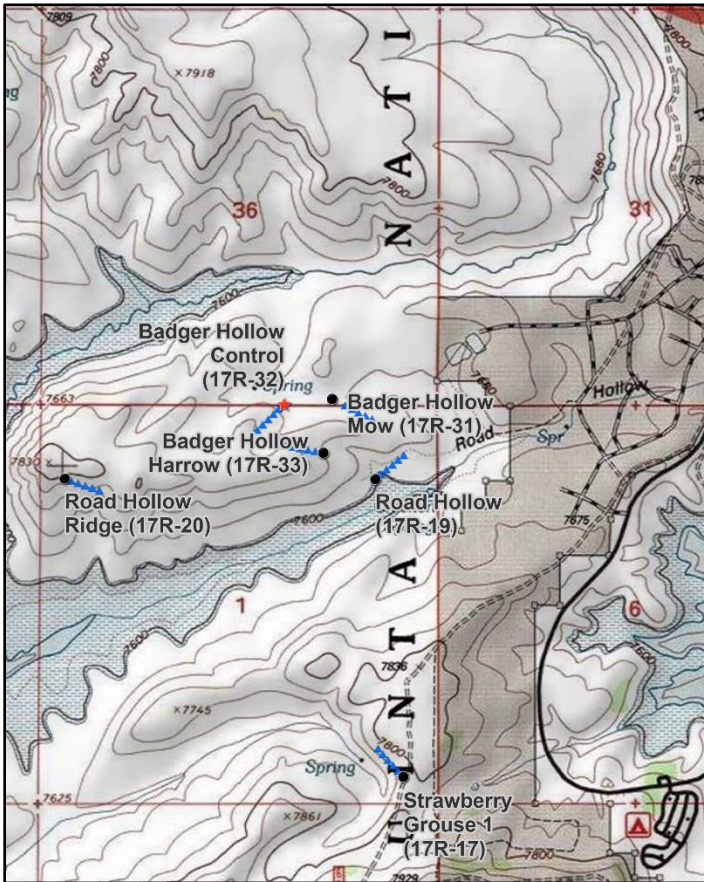
t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 17R-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			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia frigida^P -- (prairie sagewort)									
2005	3880	40	12	83	5	3	0	5	17/25
2012	880	20	0	100	0	34	9	14	11/17
2016	1540	-	3	97	0	13	12	0	13/24
2021	1500	-	29	67	4	0	0	4	- / -
Artemisia tridentata ssp. vaseyana^P -- (mountain big sagebrush)									
2005	6740	-	3	59	38	2	0	20	42/60
2012	4520	-	4	79	17	9	1	34	46/73
2016	4480	-	4	75	21	18	55	17	51/87
2021	4280	-	8	35	57	8	0	65	- / -
Cercocarpus montanus^P -- (alderleaf mountain mahogany)									
2005	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	39/89
2016	-	-	-	-	-	-	-	-	- / -
2021	-	-	-	-	-	-	-	-	- / -
Chrysothamnus depressus^P -- (longflower rabbitbrush)									
2005	80	-	0	100	0	0	0	0	19/14
2012	340	-	6	94	0	0	0	0	15/19
2016	40	-	0	100	0	0	0	0	17/24
2021	-	-	-	-	-	-	-	-	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
2005	4660	-	1	87	12	0	0	5	23/31
2012	4160	20	1	89	10	0	0	38	23/27
2016	3560	-	1	94	5	0	0	6	27/37
2021	2560	-	4	33	63	0	0	73	- / -
Ericameria parryi var. parryi -- (Parry's rabbitbrush)									
2005	1860	-	5	90	4	5	1	1	18/28
2012	1520	-	7	93	0	0	0	0	16/28
2016	720	-	0	100	0	0	0	0	16/23
2021	2260	-	7	81	12	3	1	15	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
2005	1320	-	17	83	0	0	0	0	14/21
2012	820	-	0	100	0	0	0	0	14/18
2016	720	20	31	69	0	0	0	0	19/31
2021	-	-	-	-	-	-	-	-	- / -
Mahonia repens -- (creeping barberry)									
2005	720	-	0	100	0	0	0	0	7/8
2012	920	-	0	100	0	0	0	0	9/13
2016	2720	-	0	100	0	0	0	0	10/13
2021	2780	-	4	96	0	0	0	21	- / -
Rosa woodsii^P -- (Woods' rose)									
2005	-	-	-	-	-	-	-	-	19/20
2012	60	-	0	100	0	0	0	0	23/22
2016	80	-	0	100	0	0	0	0	31/17
2021	20	-	0	100	0	0	0	0	- / -
Tetradymia canescens -- (spineless horsebrush)									
2005	520	-	8	77	15	0	0	8	25/34
2012	520	-	0	69	31	0	0	31	24/26
2016	460	-	17	78	4	26	0	4	26/37
2021	580	-	7	48	45	0	0	45	- / -

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

ROAD HOLLOW - STUDY NO. 17R-19

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Strawberry Reservoir; Township 4S, Range 11W, Section 01
NAD 83 UTM ZONE 12, 494105 East 4446193 North

Transect Information

Browse Tag # (0' Stake)	138
Transect Bearing	38° 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, 5: No Rebar

Directions to Site

On US 40, drive east past Strawberry Reservoir to mile marker 49 (not positive on mile marker number). Continue for 0.6 miles past the mile marker to Soldier Creek Campground Road (FS 480) on the right (south). Turn right and drive 1.6 miles to another road on the right (west). Turn right and proceed 0.1 miles to an intersection. Turn right at this intersection and travel for 0.1 miles to a two-track road on the left (northwest). Turn left and drive up to the pump house. From the pump house, walk along the two-track road for 0.54 miles at 250 degrees magnetic to the 0-foot stake which is marked with browse tag #138. There are no 300 or 500-foot stakes, although a rock cairn indicates where the 300-foot stake should be.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	No data
Elevation	7,600ft (2,316m)
Aspect	Southeast
Slope	5-10%
Sample Dates	08/22/2005, 07/10/2012, 08/03/2016, 08/11/2021

Table 17R-19.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Mechanical - Mower	Badger Hollow /Chicken Spring Ridge Habitat Improvement	1816	August-September 2011	60
Harrow - One-Way Chain	Badger Hollow /Chicken Spring Ridge Habitat Improvement	1816	August-September 2011	125

Wildlife Habitat and Vegetation History**Table 17R-19.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	substantial	summer/fall
Rocky Mountain Elk	crucial	summer
Shiras Moose	crucial	spring/fall

Table 17R-19.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2005	Mountain Big Sagebrush/Perennial Grass	NA
2012	Mountain Big Sagebrush/Perennial Grass	NA
2016	Mountain Big Sagebrush/Perennial Grass	NA
2021	Mountain Big Sagebrush/Perennial Grass	NA

Site Notes

The study is located approximately twelve miles west of Fruitland on the east side of Strawberry Reservoir. The study was established in 2005 to monitor habitat for sage-grouse.

Soils**Table 17R-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 Loam	6.9	54.4	26.8	18.8	2.3	21.8	185.6	0.5	08/22/2005

Site Potential

1981 - 2010 Average Annual Precipitation	21 inches
NRCS Ecological Site	Mountain Shallow Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA446UT
States and Transitions	No state and transition model is available for this site.

This study site has remained dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) since study establishment in 2005 (Table 17R-18.12, Table 17R-18.13). The herbaceous understory has been comprised mainly of perennial grasses with some perennial forbs to a lesser degree that have fluctuated in abundance and cover over the sample period (Table 17R-19.7, Table 17R-19.10, Table 17R-19.11). Although the understory has generally increased over time, prolonged absence of fire and continuous heavy grazing could cause this site to transition a point where mountain big sagebrush is overly dominant.

Trend Summary Tables**Table 17R-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
2005	28.3	3.3	-	36.4	3.2	-
2012	17.0	1.7	-	19.7	1.8	-
2016	16.8	4.9	-	23.2	6.8	-
2021	16.5	3.2	-	20.9	4.5	-

Table 17R-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
2005	-	373	172	241	-	13.7	3.0	9.1
2012	-	378	37	213	-	24.2	0.3	5.7
2016	-	364	51	247	-	26.5	0.5	11.2
2021	-	343	3	199	-	14.8	0.0	6.0

Table 17R-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
2005	24.4	4.2	32.9	0.5	0.7	51.2
2012	22.3	1.0	49.5	0.1	0.4	44.8
2016	16.0	1.7	40.3	0.5	0.8	52.8
2021	21.1	1.1	52.7	0.4	0.5	40.6

Table 17R-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	Greater Sage-Grouse	Rabbit
	Quadrat Frequency				
2005	1	4	-	4	8
2012	-	-	-	-	12
2016	-	11	1	15	25
2021	-	13	2	12	37
Days Use Per Acre (ha)					
2005	0.7 (1.8)	2.0 (5.0)	-	52.3 (129.1)*	-
2012	-	0.7 (1.7)	-	-	-
2016	-	12.1 (29.8)	-	61.0 (150.6)*	-
2021	-	2.0 (5.0)	0.7 (1.7)	200.4 (494.9)*	-

Pellets per acre (ha)

Table 17R-19.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES																		
Achnatherum lettermanii (Letterman's needlegrass)																		
Achnatherum nelsonii (Columbia needlegrass)																		
Carex (sedge)																		
Carex geyeri (Geyer's sedge)																		
Carex nebrascensis (Nebraska sedge)																		
Carex obtusata (obtuse sedge)																		
Deschampsia cespitosa (tufted hairgrass)																		
Elymus elymoides (squirreltail)																		
Elymus lanceolatus (thickspike wheatgrass)																		
Festuca idahoensis (Idaho fescue)																		
Hesperostipa comata (needle and thread)																		
Juncus (rush)																		
Koeleria macrantha (prairie Junegrass)																		
Muhlenbergia richardsonis (mat muhly)																		
Poa fendleriana (muttongrass)																		
Poa pratensis ⁱ (Kentucky bluegrass)																		
Poa secunda (Sandberg bluegrass)																		
year	Nested Frequency																	
2005	100	30	70	-	-	-	14	10	17	97	10	24	118	-	45	80	1	
2012	140	1	-	22	-	52	34	21	61	35	7	-	108	-	17	100	46	
2016	151	2	11	3	-	27	7	24	120	12	-	9	61	-	-	71	62	
2021	125	2	10	48	9	129	23	33	60	45	15	25	14	14	37	26	29	
year	Average Cover (%)																	
2005	3.0	0.9	1.4	-	-	-	0.2	0.3	0.1	3.2	0.2	0.3	2.2	-	0.7	1.1	0.0	
2012	2.2	0.0	-	0.5	-	0.7	5.2	0.2	2.1	0.3	0.2	-	5.0	-	0.3	6.5	1.2	
2016	7.1	0.1	0.2	0.0	-	0.3	0.4	1.0	5.0	0.2	-	0.2	5.8	-	-	4.4	1.8	
2021	2.8	0.0	0.1	1.0	0.1	4.0	1.6	0.8	0.6	2.0	0.4	0.1	0.1	0.1	0.6	0.5	0.1	

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

Table 17R-19.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES																		
Achillea millefolium (Common yarrow)																		
Androsace septentrionalis ^a (pygmy flower rockjasmine)																		
Antennaria (pussytoes)																		
Arenaria fendleri (Fendler's sandwort)																		
Astragalus convallarius (lesser rushy milkvetch)																		
Astragalus tenellus (looseflower milkvetch)																		
Chaenactis douglasii (Douglas' dustymaiden)																		
Cirsium scariosum ^a (meadow thistle)																		
Collinsia parviflora ^a (maiden blue eyed Mary)																		
Comandra umbellata (bastard toadflax)																		
Cymopterus (springparsley)																		
Eriogonum heracleoides (parsnipflower buckwheat)																		
Eriogonum umbellatum (sulphur-flower buckwheat)																		
Gayophytum ramosissimum ^a (pinyon groundsmoke)																		
Gentiana calycosa (Rainier pleated gentian)																		
Gilia inconspicua ^a (shy gilia)																		
Lactuca serriola ^a (prickly lettuce)																		
year	Nested Frequency																	
2005	-	-	44	67	-	-	-	2	-	1	-	-	25	25	6	7	-	
2012	1	3	40	52	3	1	5	4	-	-	3	-	26	15	3	1	1	
2016	2	-	37	54	4	1	4	7	4	1	-	2	39	-	5	-	-	
2021	-	-	52	17	3	-	3	3	-	1	-	-	49	-	7	-	-	
year	Average Cover (%)																	
2005	-	-	1.6	1.0	-	-	-	0.0	-	0.0	-	-	0.8	0.1	0.2	0.0	-	
2012	0.0	0.0	0.6	0.8	0.0	0.0	0.0	0.0	-	-	0.1	-	0.8	0.0	0.0	0.0	0.0	
2016	0.0	-	0.8	2.7	0.0	0.0	0.0	0.1	0.0	0.0	-	0.4	1.6	-	0.0	-	-	
2021	-	-	0.8	0.2	0.0	-	0.0	0.0	-	0.0	-	-	1.6	-	0.2	-	-	

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

FORB SPECIES	Linum lewisii (Lewis flax)	Lupinus caespitosus var. utahensis (Utah lupine)	Machaeranthera canescens (hoary tansyaster)	Orthocarpus luteus ^a (yellow owl's-clover)	Pedicularis groenlandica (elephanthead lousewort)	Penstemon caespitosus (mat penstemon)	Penstemon procerus (littelflower penstemon)	Penstemon watsonii (Watson's penstemon)	Phlox austromontana (mountain phlox)	Phlox longifolia (longleaf phlox)	Physaria (twinpod)	Polygonum douglasii ^a (Douglas' knotweed)	Potentilla gracilis (slender cinquefoil)	Symphotrichum ascendens (western aster)	Trifolium (clover)	Viola (violet)
year	Nested Frequency															
2005	2	-	2	153	15	5	-	12	65	3	-	17	5	76	-	6
2012	1	1	13	21	-	9	-	-	69	-	2	-	10	63	3	-
2016	2	5	10	43	16	-	-	-	84	-	-	-	7	73	-	-
2021	-	-	-	-	2	-	29	8	64	-	-	-	5	43	-	-
year	Average Cover (%)															
2005	0.0	-	0.0	2.8	0.2	0.0	-	0.1	3.5	0.0	-	0.0	0.0	1.4	-	0.1
2012	0.0	0.0	0.0	0.2	-	0.1	-	-	2.5	-	0.0	-	0.1	0.5	0.0	-
2016	0.0	0.0	0.1	0.4	0.3	-	-	-	3.6	-	-	-	0.0	1.6	-	-
2021	-	-	-	-	0.0	-	0.8	0.2	1.9	-	-	-	0.0	0.4	-	-

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

Table 17R-19.12 - 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 sp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa (rubber rabbitbrush)	Ericameria parryi var. parryi (Parry's rabbitbrush)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)					
2005	7.6	28.8	1.6	-	1.6	-
2012	5.2	14.5	0.7	-	1.1	-
2016	5.6	17.6	5.2	-	1.5	0.1
2021	4.5	16.4	3.4	-	1.1	-
year	Quadrat Cover (%)					
2005	5.9	22.4	1.4	0.0	1.8	0.0
2012	4.6	12.4	0.7	-	1.0	0.0
2016	3.1	13.7	3.5	-	1.5	0.0
2021	5.3	11.2	2.3	-	1.0	-

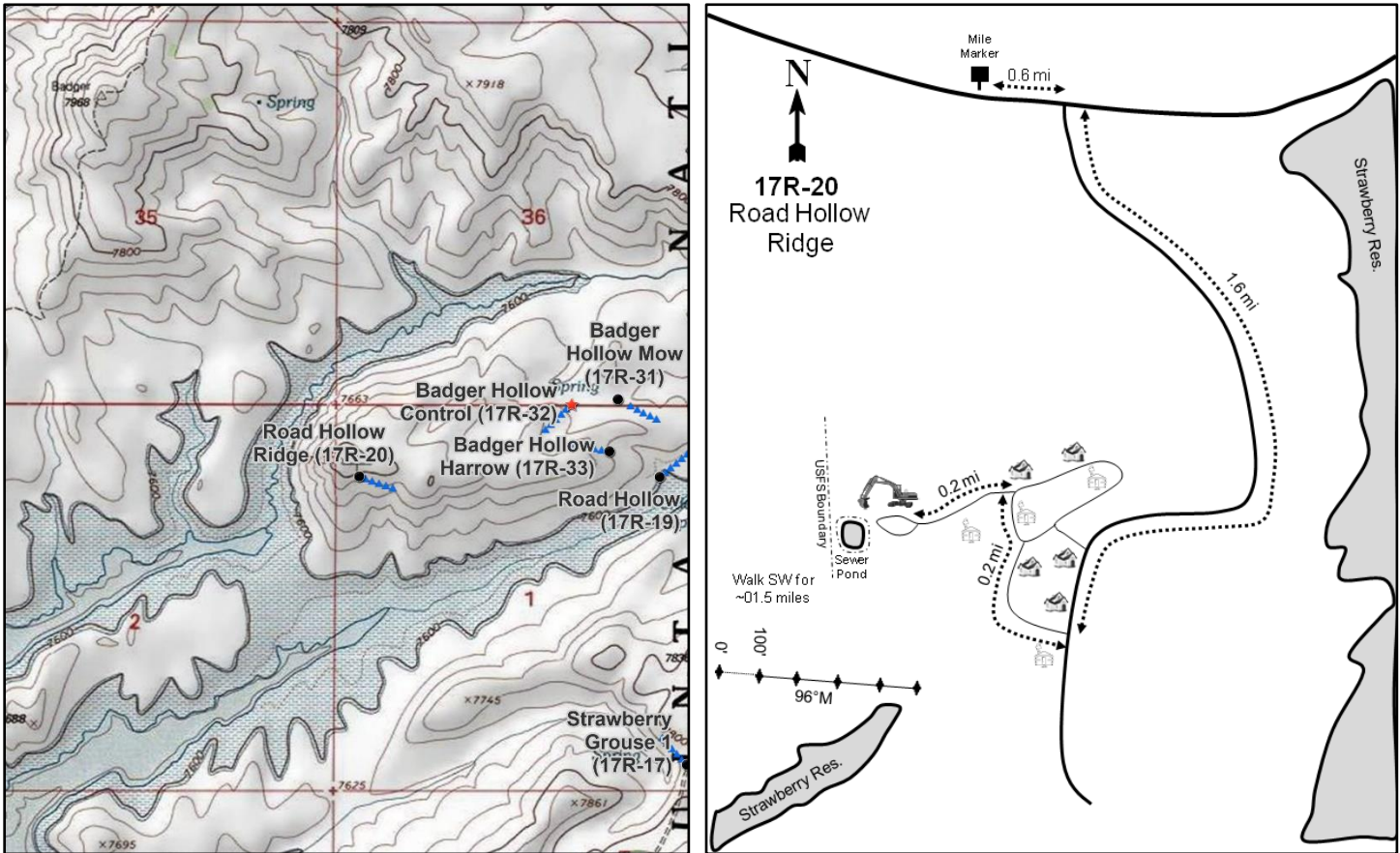
t - Tree Species; p - Preferred Browse; i - Introduced Species

Table 17R-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			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia cana^p -- (silver sagebrush)									
2005	2220	80	5	73	23	4	0	4	37/62
2012	2800	20	6	92	2	0	0	0	27/35
2016	2140	-	23	62	15	15	0	14	38/52
2021	2420	-	27	17	55	0	0	56	- / -
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
2005	7020	3440	2	66	31	2	17	13	45/72
2012	3580	20	7	59	35	0	0	22	31/46
2016	4720	-	2	65	33	29	30	30	37/54
2021	4000	-	4	60	37	7	0	62	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
2005	3460	-	1	81	18	0	0	9	17/25
2012	2000	20	8	92	0	0	0	0	12/20
2016	5660	-	0	99	1	0	0	1	18/29
2021	3780	-	1	42	57	0	0	78	- / -
Eriogonum heracleoides -- (parsnipflower buckwheat)									
2005	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	14/28
2021	-	-	-	-	-	-	-	-	-/-
Ericameria nauseosa -- (rubber rabbitbrush)									
2005	60	-	67	33	0	0	0	0	13/48
2012	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
Ericameria parryi var. parryi -- (Parry's rabbitbrush)									
2005	1780	-	1	81	18	0	0	16	17/32
2012	2660	-	5	96	0	0	0	0	12/22
2016	2780	40	4	96	0	0	0	0	11/19
2021	1520	-	13	65	22	22	0	22	- / -
Tetradymia canescens -- (spineless horsebrush)									
2005	60	-	0	67	33	0	0	33	27/25
2012	60	-	0	100	0	0	0	0	14/20
2016	60	-	0	100	0	0	0	0	25/29

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

ROAD HOLLOW RIDGE - STUDY NO. 17R-20

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Strawberry Reservoir; Township 4S, Range 11W, Section 01
NAD 83 UTM ZONE 12, 492846 East 4446195 North

Transect Information

Browse Tag # (0' Stake)	94
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

On US 40, drive east past Strawberry Reservoir to mile marker 49 (not positive on mile marker number). Continue 0.6 miles past the mile marker to Soldier Creek Campground Road (FS 480) on the right (south). Turn right and drive 1.6 miles to another road on the right (west). Turn right and drive to an intersection. Turn right at this intersection and continue for 0.1 miles to a two-track road on the left (northwest). Turn left onto this road and drive up to the pump house. From the pump house, walk along the two-track road for 1.3 miles at 260 degrees magnetic to the 0-foot stake which is marked with browse tag #94. The site is north of the two-track near a rock outcrop and runs through a stand of Great Basin wildrye.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	No data
Elevation	7,760ft (2,365m)
Aspect	South
Slope	25%
Sample Dates	08/22/2005, 07/10/2012, 08/03/2016, 08/10/2021

Wildlife Habitat and Vegetation History**Table 17R-20.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Mule Deer	substantial	summer/fall	
Rocky Mountain Elk	crucial	summer	
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing
Shiras Moose	crucial	spring/fall	

Table 17R-20.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2005	Mountain Big Sagebrush/Perennial Grass	NA
2012	Mountain Big Sagebrush/Perennial Grass	NA
2016	Mountain Big Sagebrush/Perennial Grass	NA
2021	Mountain Big Sagebrush/Perennial Grass	NA

Site Notes

This study is located approximately thirteen miles west of Fruitland on the east side of Strawberry Reservoir. The study was established in 2005 to monitor sage-grouse habitat.

Soils**Table 17R-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
Loam	7.4	44.7	33.1	22.2	2.2	9.3	140.8	0.7	08/22/2005

Site Potential

1981 - 2010 Average Annual Precipitation	22 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.

This study site has remained dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) since study establishment in 2005 (Table 17R-20.12, Table 17R-20.13). The herbaceous understory has been mainly comprised of perennial grasses. Perennial forbs have also been present to a lesser extent than grasses and have fluctuated in abundance and cover over the sample years (Table 17R-19.7, Table 17R-19.10, Table 17R-19.11). Although the understory has generally increased over time, prolonged absence of fire and continuous heavy grazing could cause this site to transition a point where mountain big sagebrush is overly dominant.

Trend Summary Tables**Table 17R-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
2005	20.5	12.9	-	25.0	14.8	-
2012	24.0	10.9	-	26.8	9.1	-
2016	19.2	12.3	-	26.7	19.4	-
2021	15.2	10.2	-	22.7	14.9	-

Table 17R-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
2005	40	304	170	166	0.4	10.3	3.7	8.6
2012	29	297	65	176	0.1	13.5	0.4	3.5
2016	89	295	243	161	3.6	18.1	3.2	7.6
2021	12	257	19	126	0.0	9.7	0.0	4.1

Table 17R-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
2005	23.3	1.3	35.3	1.3	3.4	51.5
2012	25.9	0.4	40.9	0.5	2.8	51.6
2016	19.9	0.0	33.6	1.6	2.0	54.9
2021	32.0	0.1	34.7	0.9	2.7	41.0

Table 17R-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	Mule Deer	Rocky Mountain Elk	Greater Sage-Grouse	Rabbit
	Quadrat Frequency			
2005	7	1	6	6
2012	1	-	3	1
2016	5	-	3	14
2021	6	6	2	7
Days Use Per Acre (ha)				
2005	7.4 (18.2)	0.7 (1.7)	426.9 (1054.4)*	-
2012	8.1 (19.9)	-	191.7 (473.4)*	-
2016	20.1 (49.7)	-	113.2 (279.7)*	-
2021	17.4 (43.0)	-	52.3 (129.1)*	-

Pellets per acre (ha)

Table 17R-20.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Achnatherum lettermanii (Letterman's needlegrass)	Bromus porteri (Porter brome)	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)	Poa fendleriana (muttongrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency													
2005	12	161	-	40	42	1	55	15	30	23	52	10	-	5
2012	25	79	-	29	16	3	80	10	1	34	48	3	35	110
2016	24	30	7	89	2	-	82	0	-	3	4	57	62	124
2021	64	22	5	12	32	8	111	5	7	4	28	3	21	53
year	Average Cover (%)													
2005	0.7	4.2	-	0.4	0.9	0.0	1.0	0.5	1.3	0.2	1.2	0.1	-	0.2
2012	0.7	2.9	-	0.1	0.2	0.0	1.2	0.2	0.1	0.6	1.2	0.0	0.5	6.0
2016	1.2	1.2	0.1	3.6	0.0	-	0.9	0.0	-	0.0	0.0	2.6	1.8	10.2
2021	3.3	0.6	0.1	0.0	1.3	0.2	1.5	0.0	0.2	0.0	0.8	0.0	0.2	1.3

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

Table 17R-20.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Allium (onion)	Alyssum desertorum ^{ai} (desert madwort)	Antennaria (pussytoes)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus tenellus (looseflower milkvetch)	Castilleja linariifolia (Wyoming Indian paintbrush)	Chaenactis douglasii (Douglas' dustymaiden)	Cirsium (thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Comandra umbellata (bastard toadflax)	Cryptantha (cryptantha)	Descurainia pinnata ^a (western tansymustard)	Eriogonum alatum (winged buckwheat)	Eriogonum brevicaulis (shortstem buckwheat)	Eriogonum heracleoides (parsnipflower buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)
year	Nested Frequency																
2005	61	128	11	3	16	9	3	8	3	-	12	11	-	2	-	25	1
2012	2	49	7	11	20	3	4	11	5	3	20	13	1	5	14	3	8
2016	-	239	5	0	16	8	6	9	7	-	22	1	-	2	19	11	15
2021	-	15	-	7	6	6	-	1	-	4	26	2	-	12	13	-	4
year	Average Cover (%)																
2005	0.3	2.3	0.2	0.0	0.7	0.1	0.2	0.5	0.0	-	0.1	0.4	-	0.1	-	0.9	0.0
2012	0.0	0.1	0.2	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.0	0.1	0.2	0.2	0.2
2016	-	3.1	0.0	0.0	1.0	0.1	0.0	0.0	0.0	-	0.3	0.0	-	0.0	0.4	0.7	0.3
2021	-	0.0	-	0.0	0.1	0.1	-	0.0	-	0.0	0.1	0.0	-	0.1	0.4	-	0.1

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

FORB SPECIES	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Geranium richardsonii (Richardson's geranium)	Grindelia squarrosa (curlycup gumweed)	Lappula occidentalis ^a (flatspine stickseed)	Lesquerella (bladderpod)	Linum lewisii (Lewis flax)	Lithospermum ruderale (western stone seed)	Lupinus argenteus (silvery lupine)	Machaeranthera grindelioides (rayless tansyaster)	Orthocarpus tolimiei ^a (Tolmie's owl's-clover)	Packera multilobata (lobeleaf groundsel)	Penstemon caespitosus (mat penstemon)	Phacelia hastata (silverleaf phacelia)	Phlox austromontana (mountain phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)	Potentilla gracilis (slender cinquefoil)
year	Nested Frequency																
2005	1	-	-	2	-	4	35	10	8	52	-	-	-	42	1	5	3
2012	2	1	3	-	2	6	39	9	28	2	6	1	8	56	-	6	23
2016	-	-	-	-	-	-	30	19	45	12	3	-	-	44	-	-	-
2021	-	-	-	-	-	-	32	4	27	-	4	-	7	41	-	-	3
year	Average Cover (%)																
2005	0.0	-	-	0.0	-	0.1	1.7	0.8	0.4	1.4	-	-	-	1.9	0.0	0.0	0.0
2012	0.1	0.0	0.0	-	0.0	0.0	0.7	0.0	0.3	0.0	0.0	0.0	0.0	1.0	-	0.0	0.1
2016	-	-	-	-	-	-	1.3	0.7	1.1	0.1	0.0	-	-	1.5	-	-	-
2021	-	-	-	-	-	-	1.1	0.2	1.1	-	0.0	-	0.1	0.7	-	-	0.0

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

FORB SPECIES	Schoenocrambe limifolia (flaxleaf plainsmustard)	Symphoricarichum (aster)	Tragopogon dubius ^a (yellow salsify)
year	Nested Frequency		
2005	1	6	1
2012	4	3	-
2016	-	9	1
2021	-	1	-
year	Average Cover (%)		
2005	0.0	0.0	0.0
2012	0.0	0.0	-
2016	-	0.0	0.0
2021	-	0.0	-

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

Table 17R-20.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)										
	year	Line Intercept Cover (%)									
Artemisia frigida ^p (prairie sagewort)	2005	-	24.8	8.7	2.1	1.3	1	1.5	-	0.2	0.2
Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	2012	-	26.7	5.9	1.2	-	0.4	1.5	-	0.1	0.1
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	2016	-	26.4	7.9	0.8	1.5	3.7	5.3	-	0.3	0.2
Ericameria parryi var. parryi (Parry's rabbitbrush)	2021	-	22.5	10	0.4	-	1.6	2.5	-	0.2	0.4
Eriogonum heracleoides (parsnipflower buckwheat)	year	Quadrat Cover (%)									
Gutierrezia sarothrae (broom snakeweed)	2005	0.0	19.9	9.1	0.9	0.0	0.7	2.0	0.0	0.6	0.2
Mahonia repens (creeping barberry)	2012	0.1	23.7	8.0	0.2	-	0.9	1.8	0.0	0.1	0.0
Rosa woodsii ^p (Wood's rose)	2016	0.0	18.8	6.2	0.2	0.0	3.3	2.7	0.0	0.4	0.0
Symphoricarpos oreophilus ^p (mountain snowberry)	2021	0.2	15.0	7.4	0.1	-	1.2	1.5	-	0.0	0.0
Tetradymia canescens (spineless horsebrush)											

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

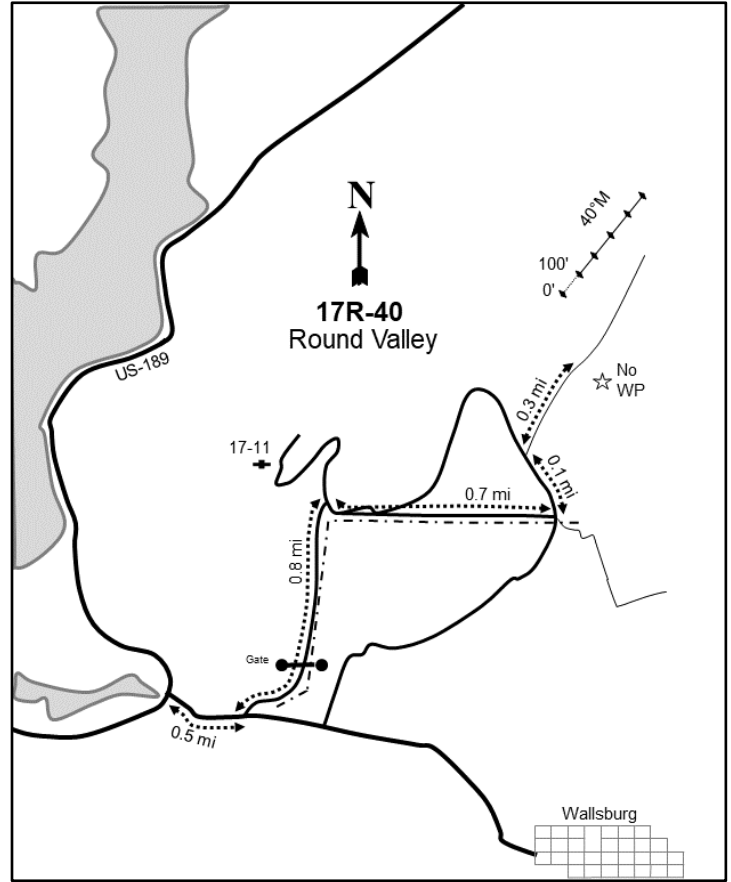
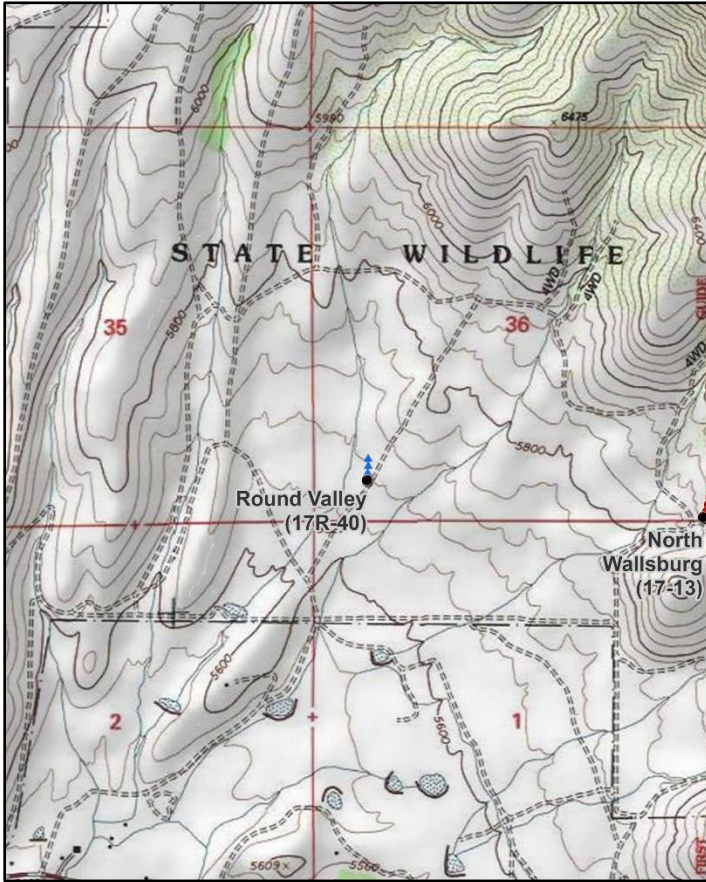
Table 17R-20.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia frigida^p -- (prairie sagewort)									
2005	40	-	0	0	100	0	0	0	13/28
2012	20	-	0	100	0	0	0	0	- / -
2016	40	-	0	100	0	0	0	0	4/20
2021	100	-	0	100	0	0	0	0	- / -
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
2005	3320	-	1	75	25	24	19	9	57/92
2012	3420	-	2	82	16	33	5	25	49/89
2016	3300	-	1	81	18	31	30	32	51/83
2021	4120	-	2	46	53	0	0	68	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
2005	5100	20	6	87	7	0	0	2	29/48
2012	3420	20	1	91	9	0	0	14	26/46
2016	2720	-	1	98	2	0	0	5	31/45
2021	4660	-	2	61	37	0	0	69	- / -
Eriogonum heracleoides -- (parsnipflower buckwheat)									
2005	780	-	0	100	0	10	0	0	20/39
2012	40	-	50	0	50	0	0	50	- / -
2016	900	20	0	100	0	0	0	0	13/28
2021	-	-	-	-	-	-	-	-	- / -
Ericameria parryi var. parryi -- (Parry's rabbitbrush)									
2005	960	-	2	98	0	0	0	0	15/28
2012	780	-	0	100	0	0	0	0	16/26
2016	880	-	2	98	0	0	0	0	15/29
2021	300	-	0	87	13	0	0	13	- / -

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 (%)				
Gutierrezia sarothrae -- (broom snakeweed)									
2005	820	-	0	95	5	0	0	0	13/23
2012	1060	20	8	93	0	0	0	0	10/18
2016	3400	20	1	99	0	0	0	1	21/37
2021	1220	-	0	95	5	0	0	5	- / -
Mahonia repens -- (creeping barberry)									
2005	9180	-	2	98	1	0	0	0	8/11
2012	6300	-	0	100	0	0	0	1	8/10
2016	11580	-	0	100	0	0	0	0	8/10
2021	11920	-	0	100	0	0	0	10	- / -
Pediocactus simpsonii -- (mountain ball cactus)									
2005	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	6/10
2016	-	-	-	-	-	-	-	-	- / -
2021	-	-	-	-	-	-	-	-	- / -
Purshia tridentata^p -- (antelope bitterbrush)									
2005	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	16/64
2016	-	-	-	-	-	-	-	-	- / -
2021	-	-	-	-	-	-	-	-	- / -
Rosa woodsii^p -- (Woods' rose)									
2005	180	-	78	22	0	0	22	0	20/12
2012	60	-	0	100	0	33	0	0	30/10
2016	80	-	0	100	0	0	0	0	25/12
2021	40	-	0	100	0	0	0	0	- / -
Symphoricarpos oreophilus^p -- (mountain snowberry)									
2005	180	-	0	44	56	0	0	11	42/79
2012	140	-	14	43	43	29	14	43	37/47
2016	140	-	0	100	0	0	14	0	32/46
2021	60	-	0	0	100	0	0	100	- / -
Tetradymia canescens -- (spineless horsebrush)									
2005	220	-	0	73	27	0	0	9	25/53
2012	140	-	0	100	0	0	0	0	22/35
2016	160	-	13	75	13	0	0	38	28/46
2021	200	-	0	60	40	0	0	40	- / -

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

ROUND VALLEY - STUDY NO. 17R-40



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Charleston SW; Township 4S, Range 4E, Section 36
NAD 83 UTM ZONE 12, 461831 East 4474631 North

Transect Information

Browse Tag # (0' Stake)	561
Transect Bearing	358° magnetic
Length	300ft
Belt Placement	Line 1 (11ft & 95ft), Line 2 (34ft & 71ft), Line 3 (59ft)
Belt Marker Placement	Standard

Directions to Site

Beginning at the intersection of US-189 and the Wallsburg turnoff, proceed 0.50 miles towards Wallsburg to an intersection. Turn left at the intersection and proceed northerly for 0.8 miles to an intersection, passing through a DWR gate. Turn right at the intersection and drive for 0.7 miles to another intersection and turn left (north). Drive for 0.1 miles to a fork and bear right. Proceed for 0.3 miles and park; there is no witness post. The transect is on the left (west) side of the road.

Site Information

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	5,700ft (1,737m)
Aspect	Southwest
Slope	4-7%
Sample Dates	09/06/2018, 06/24/2021

Table 17R-40.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Harrow - One-Way	Wallsburg WMA Shrub Planting	4556	October 2019	9
Seeding - Broadcast	Wallsburg WMA Shrub Planting	4556	October 2019	9
Seeding - Hand Transplant	Wallsburg WMA Shrub Restoration Project	5618	July 2020-June 2021	52
Seeding - Hand Transplant	Wallsburg WMA Shrub Planting	4556	November 2019	9
Seeding - Unknown	-	-	Historic	-

Table 17R-40.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Pole Creek Fire Dribbler			Broadcast	Oct 2019	200
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
F	Onobrychis viciifolia	Sainfoin	Shoshone	0.25	0.23
F	Sanguisorba minor	Small Burnet	Delar	0.50	0.47
S	Atriplex canescens	Fourwing Saltbush		0.50	0.38
S	Purshia tridentata	Bitterbrush	Elko NV	0.50	0.48

Mix Name			Application Type	Application Date	Acres
Wallsburg WMA Shrub Planting			Seedling Transplant	Nov 2019	9
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
S	Artemisia tridentata ssp. vaseyana	Mountain Big Sagebrush		0.00	0.00
S	Cercocarpus montanus	Alderleaf Mountain Mahogany		0.00	0.00
S	Purshia tridentata	Antelope Bitterbrush		0.00	0.00

Mix Name			Application Type	Application Date	Acres
Wallsburg WMA Shrub Restoration Project - FY-22			Seedling Transplant	Oct 2020	52
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
S	Artemisia tridentata ssp. vaseyana	Mountain Big Sagebrush		0.00	0.00
S	Atriplex canescens	Fourwing Saltbush		0.00	0.00
S	Purshia tridentata	Antelope Bitterbrush		0.00	0.00
S	Shepherdia argentea	Silver Buffaloberry		0.00	0.00

Wildlife Habitat and Vegetation History

Table 17R-40.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

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

Table 17R-40.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2018	Perennial Grass	NA
2021	Perennial Grass	NA

Site Notes

In 2021, the study was moved to the opposite side of the two-track and shortened to 300 feet in length to stay within the treatment area and to avoid crossing the two-track. In addition, it was noted in 2021 that differentiating between bulbous bluegrass (*Poa bulbosa*) and Sandberg bluegrass (*P. secunda*) was extremely difficult.

Site Potential

1981 - 2010 Average Annual Precipitation 19 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.

Upon establishment in 2018, this study site was dominated by the introduced perennial grass species crested wheatgrass (*Agropyron cristatum*) with a minor component of Sandberg bluegrass (*Poa secunda*) and Idaho fescue (*Festuca idahoensis*). Crested wheatgrass had a notable decrease in abundance and cover in 2021, and bulbous bluegrass (*Poa bulbosa*) was observed for the first time that same year. However, this shift could partially be due to the fact that the study site was moved to the other side of the two-track road in 2021 to stay within the treatment area. Species diversity in the herbaceous understory overall have been low, and forbs have not been abundant. The introduced perennial forb and noxious weed squarrose knapweed (*Centaurea virgata*) was observed in 2021, but in low amounts (Table 17R-40.7, Table 17R-40.10, Table 17R-40.11). Shrubs were also rare, with broom snakeweed (*Gutierrezia sarothrae*) as the most abundant species in 2018. A shrub planting project occurred in the fall of 2018 (17R-40.1) which augmented the shrub component by increasing mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) density and cover (Table 17R-40.12, Table 17R-40.13). Drought conditions in the years surrounding 2021 have likely contributed to the decrease in the herbaceous understory's abundance for this site.

Trend Summary Tables

Table 17R-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
2018	0.1	0.1	-	0.1	0.8	-
2021	1.3	0.2	-	0.7	-	-

Table 17R-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
2018	-	427	105	77	-	39.8	0.4	1.8
2021	-	362	-	62	-	16.8	-	1.6

Table 17R-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
2018	25.6	0.3	47.4	4.7	2.1	41.8
2021	36.6	0.1	47.0	2.3	3.7	19.1

Table 17R-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			
2018	7	7	6	5
2021	12	14	7	13
Year	Days Use Per Acre (ha)			
	2018	24.0 (59.2)	10.7 (26.5)	18.7 (46.3)
2021	16.7 (41.2)	6.0 (14.9)	10.0 (24.8)	-

Table 17R-40.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES						
Agropyron cristatum ⁱ (crested wheatgrass)						
Bromus inermis ⁱ (smooth brome)						
Festuca idahoensis (Idaho fescue)						
Poa bulbosa ⁱ (bulbous bluegrass)						
Poa secunda (Sandberg bluegrass)						
Psathyrostachys juncea ⁱ (Russian wildrye)						
year	Nested Frequency					
2018	395	-	10	-	293	-
2021	224	7	-	293	119	2
year	Average Cover (%)					
2018	33.0	-	0.4	-	6.5	-
2021	5.0	0.0	-	9.0	2.9	0.0

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

Table 17R-40.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES							
Alyssum desertorum ^{ai} (desert madwort)							
Astragalus (milkvetch)							
Astragalus convallarius (lesser rushy milkvetch)							
Centaurea virgata ^{ai} (squarrose knapweed)							
Eriogonum racemosum (redroot buckwheat)							
Lathyrus brachycalyx (Bonneville pea)							
Medicago sativa ⁱ (alfalfa)							
year	Nested Frequency						
2018	105	-	-	-	1	9	67
2021	-	2	6	2	-	-	54
year	Average Cover (%)						
2018	0.4	-	-	-	0.0	0.3	1.4
2021	-	0.0	0.1	0.0	-	-	1.5

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

Table 17R-40.12 - 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)	Gutierrezia sarothrae (broom snakeweed)	Krascheninnikovia lanata ^p (winterfat)	Opuntia polyacantha (plains pricklypear)
year	Line Intercept Cover (%)				
2018	-	-	0.5	0.1	0.3
2021	0.7	-	-	-	-
year	Quadrat Cover (%)				
2018	-	-	0.0	0.1	0.0
2021	1.2	0.1	0.2	-	-

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

Table 17R-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.

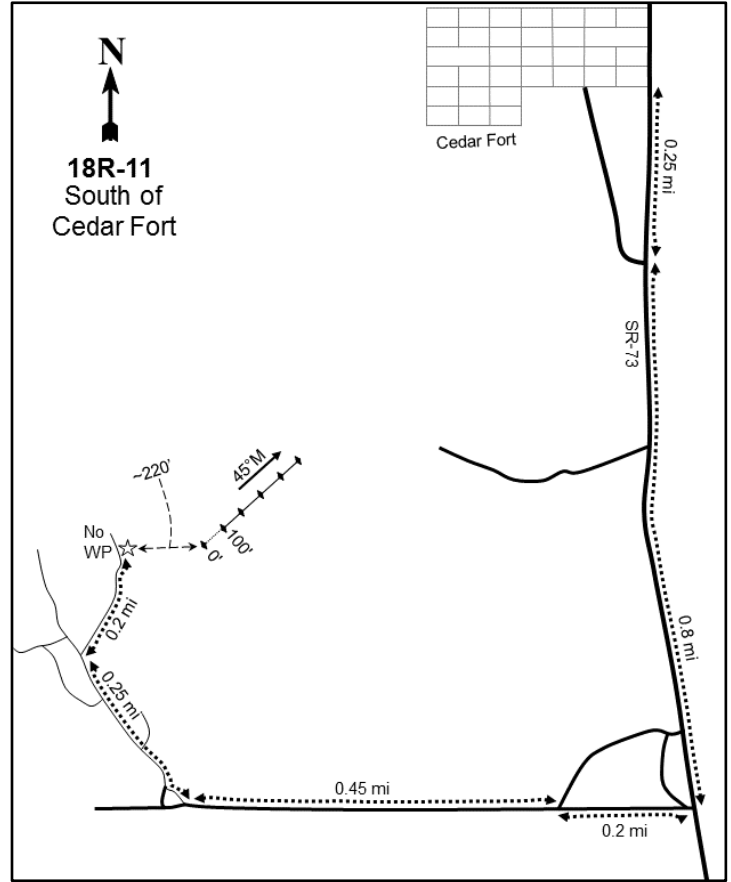
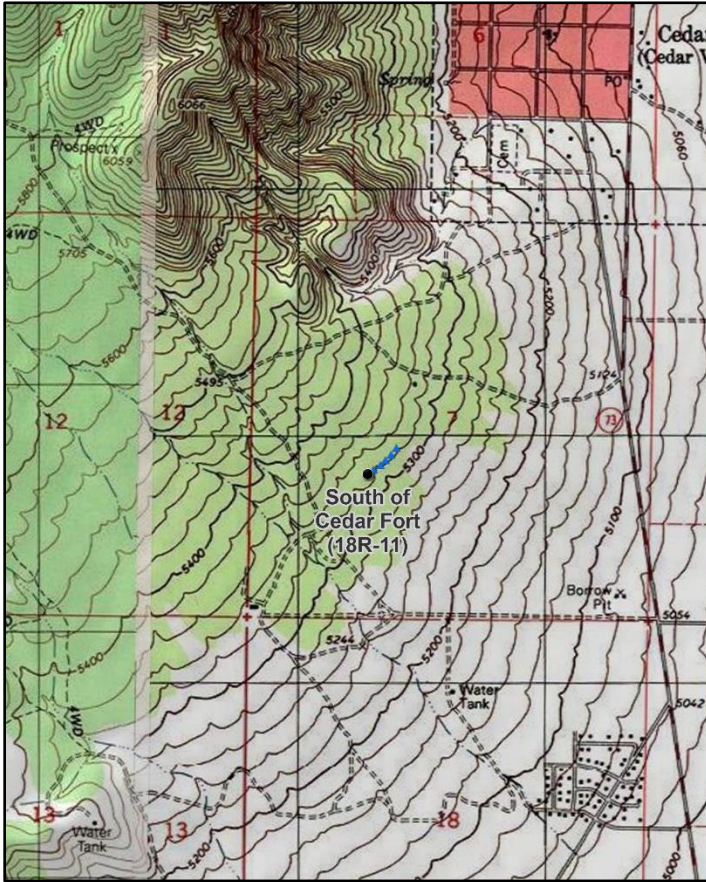
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
2018	20	-	0	0	100	0	0	100	36/46
2021	540	-	44	37	19	0	0	22	- / -
Atriplex canescens^p -- (fourwing saltbush)									
2018	-	-	-	-	-	-	-	-	- / -
2021	60	-	100	0	0	0	0	0	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
2018	380	-	11	79	11	0	0	53	23/27
2021	80	-	0	100	0	0	0	0	- / -
Krascheninnikovia lanata^p -- (winterfat)									
2018	100	-	0	100	0	0	0	0	20/28
2021	-	-	-	-	-	-	-	-	- / -
Opuntia polyacantha -- (plains pricklypear)									
2018	80	-	0	100	0	0	0	0	15/44

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

Table 17R-40.15 - Deer Desirable Components Index: Mountain 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
2018	0.1	0.0	0.0	30.0	0.0	3.6	0.0	33.7	Very Poor
2021	0.9	0.0	0.0	15.8	0.0	3.1	-2.0	17.8	Very Poor

SOUTH OF CEDAR FORT - STUDY NO. 18R-11



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Cedar Fort SW; Township 6S, Range 2W, Section 07
NAD 83 UTM ZONE 12, 405279 East 4462840 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

Not Available
45° magnetic (Lines 2-5: 42° magnetic)
500ft
Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Standard

Directions to Site

From the town of Cedar Fort, drive south for approximately 1 mile to West 4000 North which is near a gravel pit. Turn right and proceed for 0.5 miles to a fork. Bear right and proceed approximately 0.25 miles to another fork. Continue another 0.2 miles to where the road begins to end: there is a small opening where it is possible to park. Stop here and walk approximately 220 feet at 80 degrees magnetic to the transect.

Site Information

Land Ownership	State
Land Administrator	SITLA
Allotment	DIAMOND VALLEY
Elevation	5,320ft (1,622m)
Aspect	Southeast
Slope	5-10%
Sample Dates	09/05/2018, 06/24/2021

Table 18R-11.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Mechanical - Bullhog	Cedar Fort PJ Removal Phase 2	4524	2018	703
Seeding - Aerial Before	Cedar Fort PJ Removal Phase 2	4524	September 2018	703

Table 18R-11.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Cedar Fort			Aerial	Sep 2018	760
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Achnatherum hymenoides	Indian Ricegrass	Rimrock	0.99	0.94
G	Agropyron cristatum	Crested Wheatgrass	Nordan	0.99	0.88
G	Dactylis glomerata	Orchardgrass	Paiute	0.46	0.42
G	Leymus cinereus	Great Basin Wildrye	UDWR IntMtn Tetra	0.03	0.02
G	Leymus cinereus	Great Basin Wildrye	UDWR IntMtn Tetra	0.50	0.44
G	Pascopyrum smithii	Western Wheatgrass	Arriba	0.99	0.88
G	Poa secunda	Big Bluegrass	Sherman	0.46	0.35
G	Psathyrostachys juncea	Russian Wildrye	Bozoisky II	0.99	0.94
G	Pseudoroegneria spicata	Bluebunch Wheatgrass	Anatone	1.51	1.42
F	Achillea millefolium	Western Yarrow	Eagle	0.10	0.08
F	Helianthus annuus	Annual Sunflower		0.53	0.51
F	Linum perenne	Blue Flax	Appar	0.13	0.10
F	Medicago sativa	Alfalfa	Ladak DL	0.75	0.69
F	Medicago sativa ssp. falcata	Yellow Alfalfa	Don	0.33	0.29
F	Onobrychis viciifolia	Sainfoin	Eski	1.97	1.81
F	Sanguisorba minor	Small Burnet	Delar	2.04	1.73
S	Artemisia tridentata ssp. wyomingensis	Wyoming Big Sagebrush	Juab UT	0.26	0.09
S	Artemisia tridentata ssp. wyomingensis	Wyoming Big Sagebrush	Rocky Mountain	0.26	0.05
S	Atriplex canescens	Fourwing Saltbush	Lincoln NV	0.33	0.18
S	Purshia tridentata	Antelope Bitterbrush	Wasatch UT	0.30	0.23

Wildlife Habitat and Vegetation History**Table 18R-11.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
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Table 18R-11.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2018	Pinyon/Juniper	Phase II transitioning to Phase III
2021	Perennial Grass	Phase I

Site Notes

The site was established in order to monitor the response of a Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) reduction and seeding project that took place in the Fall of 2018.

Site Potential

1981 - 2010 Average Annual Precipitation	14 inches
NRCS Ecological Site	Upland Gravelly Loam (Bonneville Big Sagebrush)
NRCS Ecological Site #	R028AY306UT
States and Transitions	Seeded Range State: Community Phase 6.1

The plant community on this site was dominated by Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) upon study establishment in 2018 (Photos, Table 18R-11.12, Table 18R-11.14). Although dominated by sagebrush, the shrub community was sparse and in poor condition overall with a majority of the plants being classified as decadent or with poor vigor. However, a bullhog and seeding treatment took place later that year (Table 18R-11.1). Cover and density of sagebrush decreased slightly, but the population did exhibit a small amount of diversification in age classes as of 2021 (Table 18R-11.12, Table 18R-11.13). The herbaceous component was depauperate in diversity and quantity in 2018. As is expected with a seeding, the understory diversified and increased following treatment. Perennial grasses were the dominant vegetation component in 2021, with much of the cover being provided by the native species bluebunch wheatgrass (*Pseudoroegneria spicata*) and squirreltail (*Elymus elymoides*). The introduced perennial grass species bulbous bluegrass (*Poa bulbosa*) was observed in the understory for the first time in 2021, but with low abundance. The introduced annual grass cheatgrass (*Bromus tectorum*) has been present in both sample years: cover is low as of 2021, while abundance is moderate (Table 18R-11.10). The forb community was depleted prior to treatment, but has since increased slightly with perennial forbs providing moderate cover (Table 18R-11.7, Table 18R-11.11). Although the site is considered to be within Phase I of woodland succession (Table 18R-11.4) following the bullhog, the extant tree component (Table 18R-11.13, Table 18R-11.14) indicates that there may be potential for infilling in future sample years.

Trend Summary Tables**Table 18R-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
2018	3.0	0.1	11.0	4.6	0.1	29.7
2021	2.8	0.7	-	4.0	0.4	-

Table 18R-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
2018	97	105	210	90	0.4	1.1	1.8	1.0
2021	226	269	241	166	2.5	15.1	2.2	6.6

Table 18R-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
2018	28.1	7.1	43.8	12.9	14.3	19.8
2021	15.9	3.8	51.2	3.7	9.4	29.3

Table 18R-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	Coyote	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency			
2018	-	2	-	28
2021	1	16	2	42
Year	Days Use Per Acre (ha)			
2018	-	4.7 (11.6)	-	-
2021	-	10.0 (24.8)	-	-

Table 18R-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 tectorum ^{ai} (cheatgrass)													
Dactylis glomerata ⁱ (orchardgrass)													
Elymus elymoides (squirreltail)													
Leymus cinereus (basin wildrye)													
Pascopyrum smithii (western wheatgrass)													
Poa bulbosa ⁱ (bulbous bluegrass)													
Poa secunda (Sandberg bluegrass)													
Psathyrostachys juncea ⁱ (Russian wildrye)													
Pseudoroegneria spicata (bluebunch wheatgrass)													
Secale cereale ^{ai} (cereal rye)													
year	Nested Frequency												
2018	4	-	97	-	49	-	-	-	70	-	-	-	
2021	10	49	226	3	101	10	31	2	95	2	151	6	
year	Average Cover (%)												
2018	0.0	-	0.4	-	0.7	-	-	-	0.4	-	-	-	
2021	0.4	1.2	2.3	0.0	3.2	0.1	0.5	0.0	2.4	0.2	7.0	0.2	

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

Table 18R-11.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES																		
Alyssum desertorum ^{ai} (desert madwort)																		
Astragalus purshii (woollypod milkvetch)																		
Calochortus nuttallii (sego lily)																		
Camelina microcarpa ^{ai} (litttlepod false flax)																		
Ceratocephala testiculata ^{ai} (curveseed butterwort)																		
Chaenactis douglasii (Douglas' dustymaiden)																		
Chaetopappa ericoides (rose heath)																		
Chorispura tenella ^{ai} (crossflower)																		
Cirsium undulatum ⁿ (wavyleaf thistle)																		
Cryptantha (cryptantha)																		
Draba ⁿ (draba)																		
Lactuca serricola ^{ai} (prickly lettuce)																		
Lappula occidentalis ^{ai} (flatspine stickseed)																		
Lathyrus brachycalyx (Bonneville pea)																		
Linum perenne ⁱ (blue flax)																		
Medicago sativa ⁱ (alfalfa)																		
Melilotus officinalis ⁱ (sweetclover)																		
year	Nested Frequency																	
2018	207	-	-	-	-	-	13	-	-	13	3	-	-	55	-	-	-	
2021	224	5	8	14	112	4	15	1	0	19	-	3	1	56	11	19	10	
year	Average Cover (%)																	
2018	1.8	-	-	-	-	-	0.1	-	-	0.1	0.0	-	-	0.5	-	-	-	
2021	1.7	0.1	0.0	0.0	0.4	0.0	0.4	0.0	0.0	0.4	-	0.0	0.0	2.0	0.1	0.4	0.2	

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

FORB SPECIES	Nest Frequency							
<i>Oenothera caespitosa</i> (tufted evening primrose)								
<i>Onobrychis vicifolia</i> ⁱ (sainfoin)								
<i>Petrorhiza pumila</i> (rock goldenrod)								
<i>Phlox longifolia</i> (longleaf phlox)								
<i>Sanguisorba minor</i> ⁱ (small burnet)								
<i>Streptanthus cordatus</i> (heartleaf twistflower)								
<i>Tragopogon dubius</i> ^{ai} (yellow salsify)								
<i>Zigadenus paniculatus</i> (foothill deathcamas)								
year	Average Cover (%)							
2018	-	-	8	-	-	3	-	9
2021	9	9	6	8	58	4	5	1
year	Average Cover (%)							
2018	-	-	0.3	-	-	0.0	-	0.1
2021	0.2	0.3	0.4	0.0	2.1	0.0	0.0	0.0

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

Table 18R-11.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)				
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> ^p (mountain big sagebrush)					
<i>Gutierrezia sarothrae</i> (broom snakeweed)					
<i>Juniperus osteosperma</i> ⁱ (Utah juniper)					
<i>Opuntia polyacantha</i> (plains pricklypear)					
<i>Pinus monophylla</i> ⁱ (singleleaf pinyon)					
year	Quadrat Cover (%)				
2018	4.6	0.1	29.7	0	-
2021	4	0.4	0	0	-
year	Quadrat Cover (%)				
2018	3.0	0.0	10.3	0.1	0.7
2021	2.8	0.5	0.0	0.1	-

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

Table 18R-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			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. <i>vaseyana</i> ^p -- (mountain big sagebrush)									
2018	980	-	2	45	53	6	0	59	45/56
2021	900	120	22	36	42	22	18	38	- / -
Ericameria nauseosa ssp. <i>nauseosa</i> var. <i>hololeuca</i> ^p -- (rubber rabbitbrush)									
2018	-	-	-	-	-	-	-	-	- / -
2021	20	-	0	100	0	0	0	0	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
2018	200	-	10	90	0	0	0	0	14/14
2021	780	-	10	90	0	5	0	0	- / -
Juniperus osteosperma ⁱ -- (Utah juniper)									
2018	400	20	55	40	5	5	0	0	- / -
2021	60	-	67	0	33	0	0	67	- / -

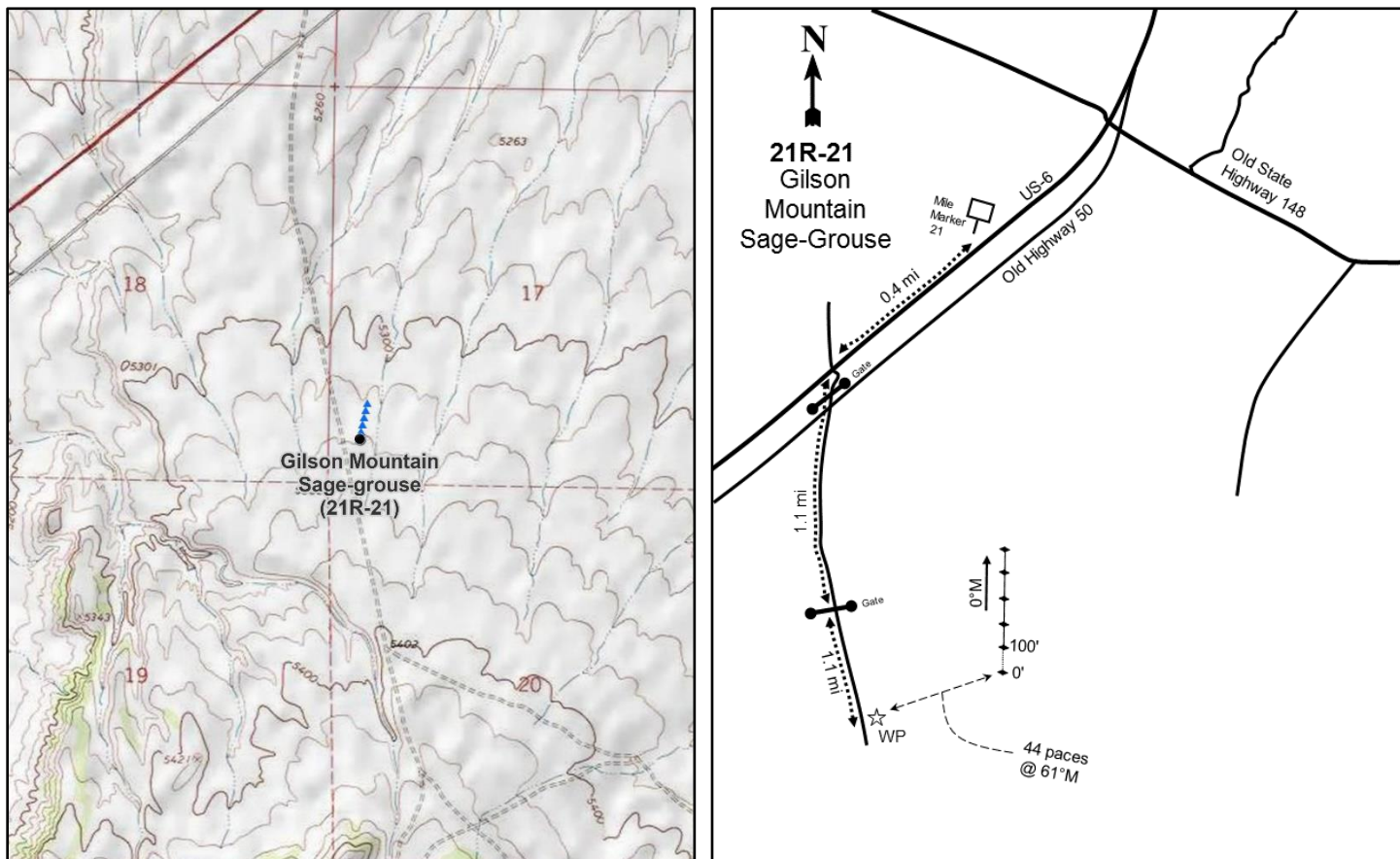
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Opuntia polyacantha -- (plains pricklypear)									
2018	140	-	0	100	0	0	0	14	11/27
2021	140	-	0	86	14	0	0	29	- / -
Pinus monophylla^t -- (singleleaf pinyon)									
2018	60	-	100	0	0	0	0	0	- / -
2021	-	-	-	-	-	-	-	-	- / -
Purshia tridentata^p -- (antelope bitterbrush)									
2018	-	-	-	-	-	-	-	-	- / -
2021	20	-	100	0	0	100	0	0	- / -

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

Table 18R-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)							
2018	176	10	10	20	50	10	13.7
2021	28	29	71	-	-	-	13.2
Pinus monophylla (singleleaf pinyon)							
2018	19	-	33	33	33	-	8.7
2021	1	100	-	-	-	-	2.0

GILSON MOUNTAIN SAGE-GROUSE - STUDY NO. 21R-21

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Jericho SW; Township 13S, Range 3W, Section 17
NAD 83 UTM ZONE 12, 395995 East 4393581 North

Transect Information

Browse Tag # (0' Stake)	228
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	No Rebar

Directions to Site

Traveling south on Highway 6, drive 0.4 miles past mile marker 21 to a gate on the left. From the gate, drive 0.2 miles to an old paved road. Continue straight for 0.9 miles to another gate. Drive 0.1 miles to a witness post on the left-hand (east) side of the road. The 0-foot stake is 44 paces from the witness post at 61 degrees magnetic and is marked with browse tag #228.

Site Information

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	5,350ft (1,631m)
Aspect	North
Slope	0-2%
Sample Dates	07/01/2008, 08/29/2011, 08/10/2016, 08/11/2021

Table 21R-21.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Seeding - Rangeland Drill	Gilson Mountain Sage-grouse Habitat Improvement	1103	March 2009	657
Fire - Wildfire	-	-	1996	-
Herbicide - Plateau	Gilson Mountain Sage-grouse Habitat Improvement	1103	September 2008	657
Seeding - Rangeland Drill	Gilson Mountain Sage-grouse Habitat Improvement	1103	November-December 2008	657

Table 21R-21.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Gilson Mountain			Drill	Nov 2008	640
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Agropyron cristatum	Crested Wheatgrass	Hycrest	2.97	2.81
G	Leymus cinereus	Great Basin Wildrye	Trailhead	0.47	0.40
G	Pascopyrum smithii	Western Wheatgrass	Arriba	1.02	0.88
G	Psathyrostachys juncea	Russian Wildrye	Bozoisky	1.02	0.96
G	Pseudoroegneria spicata	Bluebunch Wheatgrass	Anatone	1.02	0.83
G	Thinopyrum intermedium	Pubescent Wheatgrass	Luna	2.03	1.83
F	Medicago sativa	Alfalfa	Ladak	1.48	1.35
F	Melilotus officinalis	Yellow Sweetclover		0.23	0.21
F	Sphaeralcea coccinea	Scarlet Globemallow	Duchesne/Uintah UT	0.03	0.03
S	Atriplex canescens	Fourwing Saltbush	Central UT	0.55	0.23

Mix Name			Application Type	Application Date	Acres
Gilson Mountain - Sagebrush/Kochia			Drill	Mar 2009	640
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
S	Artemisia tridentata ssp. wyomingensis	Wyoming Big Sagebrush	Beaver UT	0.55	0.09
S	Bassia prostrata	Forage Kochia	Harney OR	1.02	0.73

Wildlife Habitat and Vegetation History**Table 21R-21.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
Greater Sage-Grouse	occupied	year-long & Winter	brood-rearing

Table 21R-21.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2008	Annual Forb	NA
2011	Annual Forb	NA
2016	Annual Grass	NA
2021	Rubber Rabbitbrush/Annual Forb	NA

Site Notes

No Notes

Soils**Table 21R-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
Loam	7.1	44.0	29.4	26.6	0.7	4.8	320.0	0.6	07/01/2008

Site Potential

1981 - 2010 Average Annual Precipitation	11 inches
NRCS Ecological Site	Semidesert Loam (Wyoming Big Sagebrush)
NRCS Ecological Site #	R028AY220UT
States and Transitions	Annual State: Community Phase 4.2

Since study establishment in 2008 through the 2011 sample year, this site was dominated by annual forbs with the introduced species prickly Russian thistle (*Salsola tragus*) contributing the most cover (Table 21R-21.11). The introduced annual grass species cheatgrass (*Bromus tectorum*) increased in cover and the site transitioned to an annual grassland in 2016. However, cheatgrass was rare in 2021, and the community transitioned back to one dominated by Russian thistle (Table 21R-21.7, Table 21R-21.10, Table 21R-21.11). The browse component of this site is significantly limited as of 2021 and rubber rabbitbrush (*Ericameria nauseosa*) contributes the most cover of any shrub species (Table 21R-21.12). Without treatment to reduce invasive species, it is expected that this site will remain in this or a similar state in the future.

Trend Summary Tables

Table 21R-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
2008	-	-	-	-	-	-
2011	0.7	0.2	-	0.5	0.6	-
2016	0.0	1.0	-	-	1.1	-
2021	-	5.5	-	-	6.3	-

Table 21R-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
2008	344	39	477	16	6.5	1.6	24.7	0.1
2011	383	83	457	13	13.1	3.9	21.7	0.3
2016	441	145	284	56	34.3	6.3	5.5	0.6
2021	57	55	54	21	1.0	1.8	11.9	0.3

Table 21R-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
2008	31.3	1.1	31.1	10.5	0.3	36.4
2011	22.6	0.6	27.3	11.2	1.4	40.2
2016	31.1	-	32.9	3.2	0.9	45.0
2021	31.2	0.0	53.7	7.3	1.1	19.6

Table 21R-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	Mule Deer	Rocky Mountain Elk	Greater Sage-Grouse	Horse	Rabbit
	Quadrat Frequency					
2008	11	3	-	-	-	3
2011	2	-	1	-	-	-
2016	6	1	-	-	1	2
2021	3	1	-	-	-	6
Year	Days Use Per Acre (ha)					
2008	5.1 (12.6)	4.0 (9.9)	-	-	-	-
2011	2.9 (7.2)	-	-	-	-	-
2016	9.4 (23.3)	-	-	-	-	-
2021	1.5 (3.6)	19.4 (48.0)	0.7 (1.7)	8.7 (21.5)*	-	-

*Pellets per acre (ha)

Table 21R-21.10 - 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 cinereus (basin wildrye)	Pascopyrum smithii (western wheatgrass)	Psathyrostachys juncea ⁱ (Russian wildrye)	Thinopyrum intermedium ⁱ (intermediate wheatgrass)
year	Nested Frequency							
2008	-	4	344	13	-	23	-	-
2011	-	47	383	16	1	9	-	18
2016	0	46	441	5	3	98	0	4
2021	-	21	57	-	36	-	0	-
year	Average Cover (%)							
2008	-	0.2	6.5	0.1	-	1.3	-	-
2011	-	1.0	13.1	0.8	0.0	0.2	-	1.9
2016	0.0	2.0	34.3	0.2	0.0	4.0	0.0	0.1
2021	-	0.8	1.0	-	1.0	-	0.0	-

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

Table 21R-21.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Alyssum desertorum ^{ai} (desert madwort)	Bassia scoparia ^{ai} (burningbush)	Ceratocephala testiculata ^{ai} (curvseed butterwort)	Chenopodium fremontii ^a (Fremont's goosefoot)	Cryptantha (cryptantha)	Erodium cicutarium ^{ai} (redstem stork's bill)	Lactuca serriola ^{ai} (prickly lettuce)	Machaeranthera canescens (hoary tansyaster)	Oenothera (evening primrose)	Phlox longifolia (longleaf phlox)	Plantago patagonica ^a (woolly plantain)	Salsola tragus ^{ai} (prickly Russian thistle)	Sisymbrium altissimum ^{ai} (tall tumblemustard)	Sphaeralcea munroana (Munro's globemallow)	Tragopogon dubius ^{ai} (yellow safsify)
year	Nested Frequency														
2008	336	-	-	2	2	47	3	-	-	5	1	452	90	9	28
2011	422	8	26	-	10	-	42	-	2	-	-	302	32	1	8
2016	172	-	1	-	-	96	-	-	-	1	-	123	9	56	11
2021	7	-	3	-	-	14	-	2	-	13	-	31	-	6	0
year	Average Cover (%)														
2008	4.3	-	-	0.0	0.0	1.2	0.0	-	-	0.0	0.0	17.7	1.0	0.1	0.5
2011	6.5	0.2	0.0	-	0.3	-	1.2	-	0.0	-	-	12.9	0.6	0.0	0.3
2016	0.4	-	0.0	-	-	3.3	-	-	-	0.0	-	1.6	0.0	0.6	0.1
2021	0.0	-	0.0	-	-	0.5	-	0.0	-	0.0	-	11.3	-	0.3	0.0

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

Table 21R-21.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)		
	Bassia prostrata ^{pt} (forage kochia)	Ericameria nauseosa (rubber rabbitbrush)	Opuntia (pricklypear)
year	Line Intercept Cover (%)		
2008	-	-	-
2011	0.5	-	0.6
2016	-	1.1	-
2021	-	6.3	-
year	Quadrat Cover (%)		
2008	-	-	-
2011	0.7	0.1	0.0
2016	0.0	0.9	0.1
2021	-	5.1	0.4

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

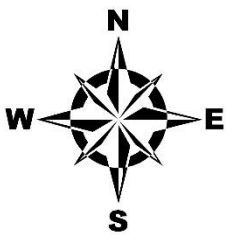
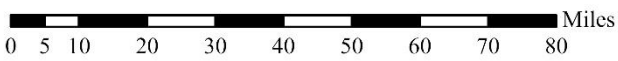
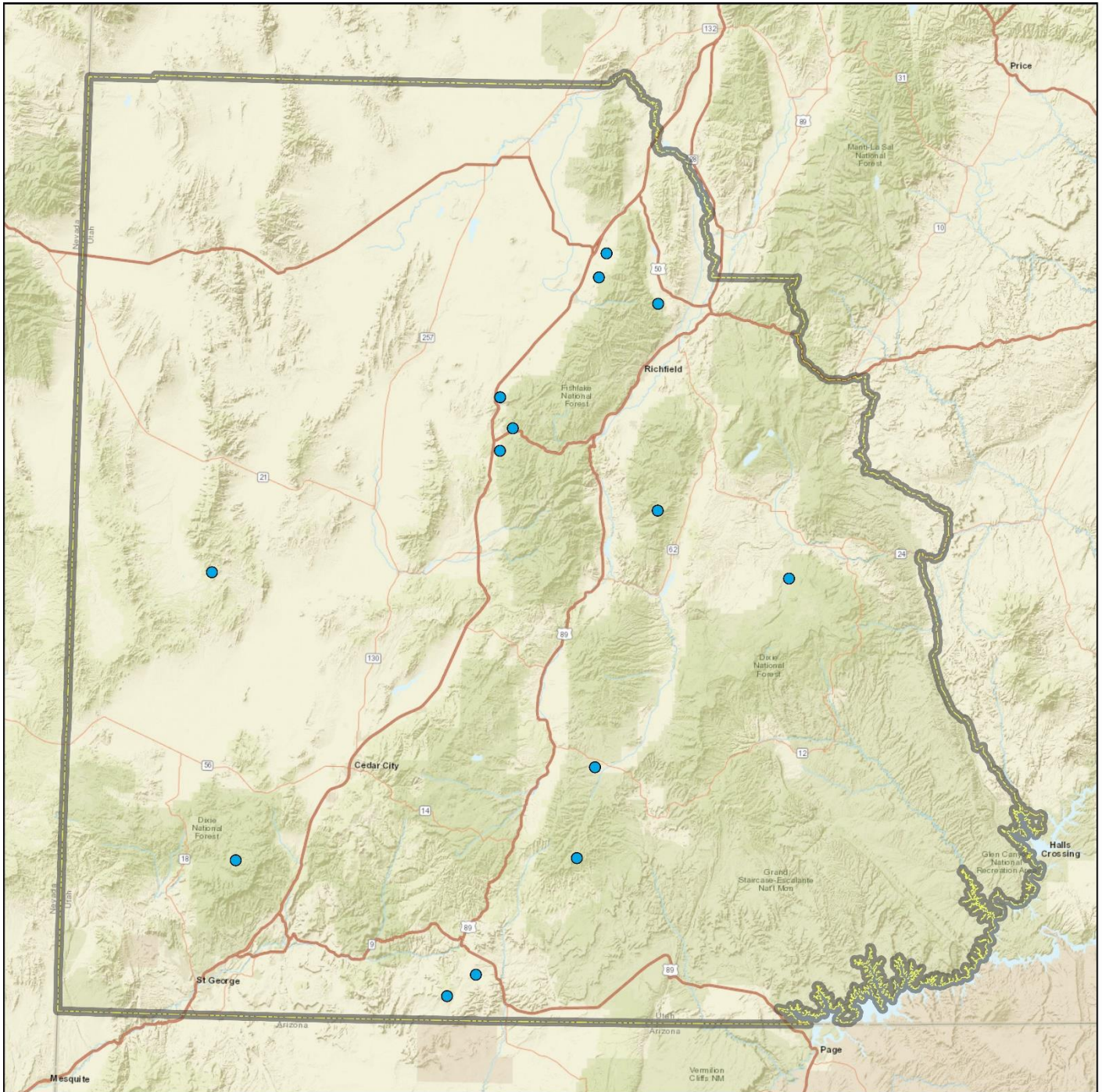
Table 21R-21.13 - Shrub/Tree Characteristics. Population characteristics of shrub/tree species populations including density reproduction (seedlings), age distribution, utilization, vigor and average size (height/crown) of plants.

Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. wyomingensis^p -- (Wyoming big sagebrush)									
2008	-	-	-	-	-	-	-	-	37/47
2011	-	-	-	-	-	-	-	-	20/15
2016	-	-	-	-	-	-	-	-	37/56
2021	-	-	-	-	-	-	-	-	-/-
Bassia prostrata^{pt} -- (forage kochia)									
2008	-	-	-	-	-	-	-	-	-/-
2011	340	-	65	35	0	0	0	29	36/63
2016	-	20	0	0	0	0	0	0	-/-
2021	-	-	-	-	-	-	-	-	-/-
Chrysothamnus viscidiflorus -- (yellow rabbitbrush)									
2008	-	-	-	-	-	-	-	-	19/20
2011	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
Ericameria nauseosa -- (rubber rabbitbrush)									
2008	20	-	0	100	0	0	0	100	38/54
2011	40	-	0	100	0	0	0	0	60/89
2016	60	-	67	33	0	0	0	0	57/80
2021	800	-	10	90	0	0	0	0	-/-
Gutierrezia sarothrae -- (broom snakeweed)									
2008	-	-	-	-	-	-	-	-	-/-
2011	-	-	-	-	-	-	-	-	-/-
2016	-	20	0	0	0	0	0	0	28/38
2021	20	-	0	100	0	0	0	0	-/-

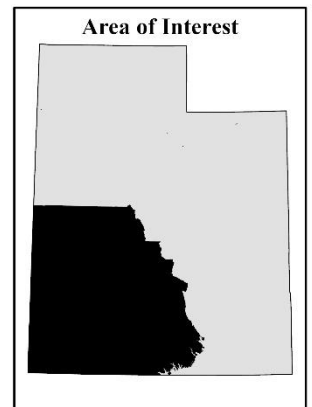
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Opuntia -- (pricklypear)									
2008	40	-	50	50	0	0	0	0	19/57
2011	260	-	0	100	0	0	0	0	12/34
2016	100	-	0	100	0	0	0	0	13/51
2021	60	-	0	100	0	0	0	0	- / -

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

SOUTHERN REGION

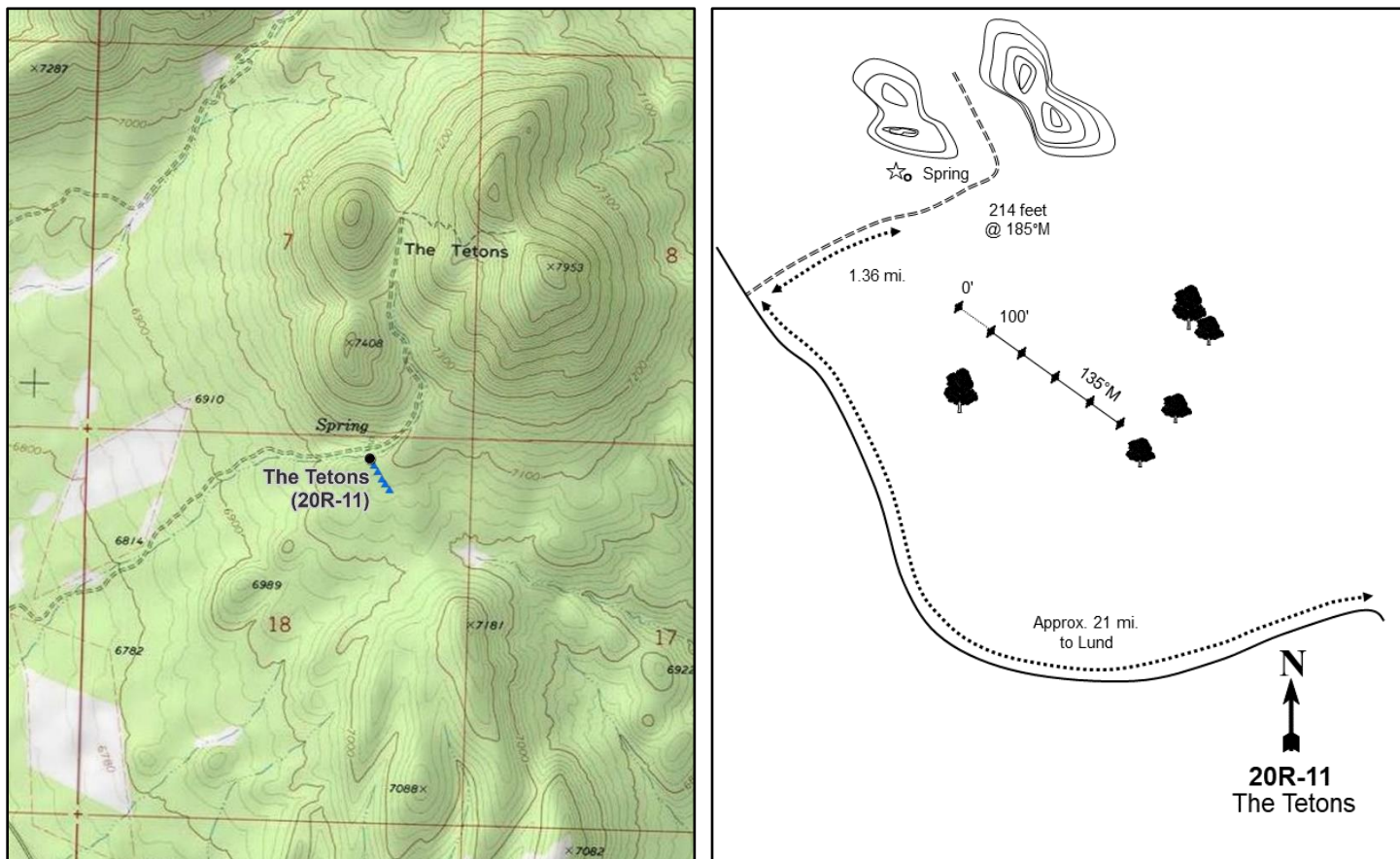


Region Boundaries
Southern Region
Study Locations
2021 WRI Study Site



Credits: Esri, HERE, Garmin, NGA, USGS, NPS

THE TETONS - STUDY NO. 20R-11

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

The Tetons NW; Township 30S, Range 15W, Section 18
NAD 83 UTM ZONE 12, 275145 East 4231767 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

Not Available
135° magnetic
500ft
Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
No Rebar or Stakes

Directions to Site

From the town of Lund, travel west on Pine Valley Road for approximately 1.3 miles. Turn right (north) on to Blue Mountain Road and travel approximately 22 miles to a jeep trail that intersects the main road; right turn (east). Travel 1.4 miles to a spring and water tank: park here. The site is located across the road to the south. Use the GPS to locate the 0-foot and baseline stakes, as there are no permanent stakes or rebar placed.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	JOCKEYS
Elevation	7,120ft (2,170m)
Aspect	Southwest
Slope	2%
Sample Dates	08/24/2021

Table 20R-11.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Seeding - Aerial Before	Blawn Mountain Wildlife Habitat and Watershed Enhancement Phase I (Proposed)	5669	Fall 2021	3474
Chaining - Two-Way Ely Chaining	Blawn Mountain Wildlife Habitat and Watershed Enhancement Phase I (Proposed)	5669	Fall 2021	3474

Table 20R-11.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Blawn Mountain BLM			Aerial	Nov 2021	2885
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Achnatherum hymenoides	Indian Ricegrass	Nezpar	1.59	1.43
G	Agropyron cristatum	Crested Wheatgrass	Hycrest II	1.01	0.87
G	Elymus lanceolatus	Thickspike Wheatgrass	Bannock II	0.52	0.45
G	Elymus lanceolatus	Thickspike Wheatgrass	Bannock II	0.97	0.82
G	Pascopyrum smithii	Western Wheatgrass	Recovery	0.34	0.29
G	Pascopyrum smithii	Western Wheatgrass	Recovery	0.68	0.61
G	Poa secunda	Sandberg Bluegrass	Reliable	0.28	0.26
G	Poa secunda	Sandberg Bluegrass	Reliable	0.21	0.18
G	Psathyrostachys juncea	Russian Wildrye	Bozoisky II	0.80	0.70
G	Pseudoroegneria spicata	Bluebunch Wheatgrass	Anatone	1.40	1.28
G	Pseudoroegneria spicata	Bluebunch Wheatgrass	Anatone	0.09	0.08
F	Linum perenne	Blue Flax	Appar	0.42	0.34
F	Medicago sativa	Alfalfa	Big Sky Ladak	0.52	0.51
F	Melilotus officinalis	Yellow Sweetclover		0.52	0.51
F	Penstemon palmeri	Palmer Penstemon	Iron UT	0.09	0.08
F	Sanguisorba minor	Small Burnet	Delar	0.47	0.44
F	Sanguisorba minor	Small Burnet	Delar	0.54	0.49
S	Atriplex canescens	Fourwing Saltbush	Beaver UT	0.50	0.22
S	Bassia prostrata	Forage Kochia	Box Elder, UT	0.38	0.23
S	Bassia prostrata	Forage Kochia	Humboldt, NV	0.12	0.10
S	Purshia tridentata	Antelope Bitterbrush	Elko NV	0.50	0.49

Wildlife Habitat and Vegetation History**Table 20R-11.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Rocky Mountain Elk	substantial	year-long

Table 20R-11.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2021	Pinyon-Juniper	Phase III

Site Notes

No Notes

Site Potential

1981 - 2010 Average Annual Precipitation	19 inches
NRCS Ecological Site	Mountain Gravelly Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XA406UT
States and Transitions	No state and transition model is available for this ecological site.

When the study was established in 2021, the site was considered to be in Phase III of woodland succession (Table 20R-11.4), being encroached by Utah juniper (*Juniperus osteosperma*) and singleleaf pinyon (*Pinus monophylla*) (Photos, Table 20R-11.12, Table 20R-11.14). The herbaceous understory was not particularly abundant and provided little cover, with both grasses and forbs being rare (Table 20R-11.7, Table 20R-11.10, Table 20R-11.11). Shrubs were sparse and contributed little to the community (Table 20R-11.12, Table 20R-11.13). A chaining and seeding treatment is scheduled for the fall of 2021 (Table 20R-11.1). It is expected that removal of juniper and pinyon will lead to an increase in understory abundance and diversity, and allow a rebound in the community's health.

Trend Summary Tables**Table 20R-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
2021	0.1	0.0	11.8	0.2	0.2	27.9

Table 20R-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
2021	-	82	13	27	-	0.9	0.1	0.2

Table 20R-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
2021	3.9	0.3	56.4	36.0	4.3	12.9

Table 20R-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	Mule Deer	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency			
2021	1	16	5	23
Year	Days Use Per Acre (ha)			
	2021	2.0 (5.0)	22.8 (56.3)	7.0 (17.2)

Table 20R-11.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES					
	Achnatherum hymenoides (Indian ricegrass)				
	Elymus elymoides (squirreltail)				
	Hesperostipa comata (needle and thread)				
	Poa fendleriana (muttongrass)				
	Poa secunda (Sandberg bluegrass)				
year	Nested Frequency				
2021	0	74	6	1	2
year	Average Cover (%)				
2021	0.0	0.9	0.0	0.0	0.0

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

Table 20R-11.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES									
	Astragalus purshii (woollypod milkvetch)								
	Descurainia pinnata ^a (western tansymustard)								
	Erigeron caespitosus (tufted fleabane)								
	Eriogonum umbellatum (sulphur-flower buckwheat)								
	Ipomopsis aggregata (scarlet gilia)								
	Lappula occidentalis ^a (flatspine stickseed)								
	Penstemon pachyphyllus (thickleaf beardtongue)								
	Polygonum douglasii ^a (Douglas' knotweed)								
	Streptanthus cordatus (heartleaf twistflower)								
year	Nested Frequency								
2021	1	2	7	10	1	4	6	8	5
year	Average Cover (%)								
2021	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0

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

Table 20R-11.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES				
	Artemisia nova ^p (black sagebrush)			
	Juniperus osteosperma ^t (Utah juniper)			
	Opuntia polyacantha (plains pricklypear)			
	Pinus monophylla ^t (singleleaf pinyon)			
year	Line Intercept Cover (%)			
2021	0.2	19.3	0.2	8.6
year	Quadrat Cover (%)			
2021	0.1	8.6	0.0	3.2

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

Table 20R-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.

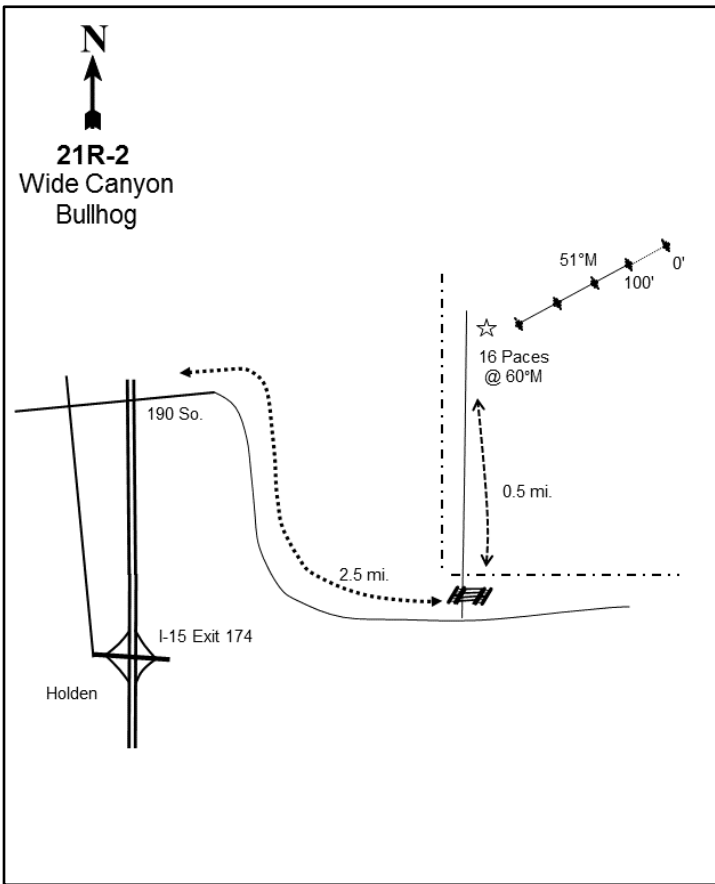
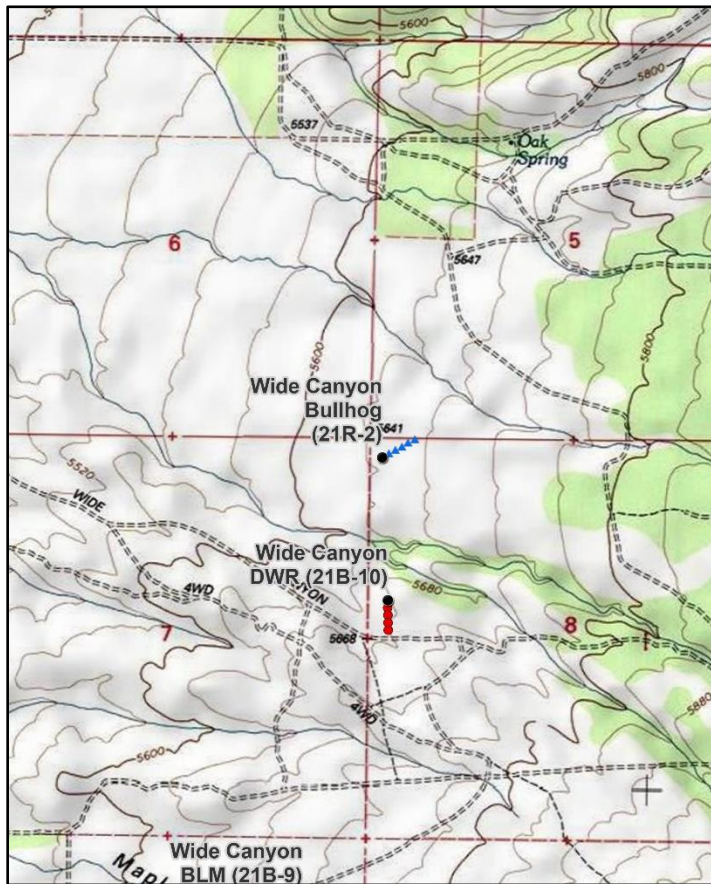
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia nova ^p -- (black sagebrush)									
2021	100	20	0	80	20	40	0	20	- / -
Juniperus osteosperma ⁱ -- (Utah juniper)									
2021	480	-	21	63	17	0	4	17	- / -
Opuntia polyacantha -- (plains pricklypear)									
2021	180	-	0	100	0	0	0	11	- / -
Pinus monophylla ^t -- (singleleaf pinyon)									
2021	560	80	89	11	0	0	0	4	- / -

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

Table 20R-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)							
2021	341	-	20	15	35	30	25.8
Pinus monophylla (singleleaf pinyon)							
2021	224	45	20	15	15	5	7.0

WIDE CANYON BULLHOG - STUDY NO. 21R-2



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Coffee Peak NW; Township 20S, Range 3W, Section 08
NAD 83 UTM ZONE 12, 394351 East 4328066 North

Transect Information

Browse Tag # (0' Stake)	546
Transect Bearing	51° 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 Holden exit off of I-15 (174), go north into town and turn right at 200 South. Follow the road one block east, then north a few yards, then immediately east again up the hill to an overpass. From the overpass, travel 2.4 miles east to the fence corner of DWR property. Turn left, passing through the gate, and travel 0.45 miles to a witness post on the right (east) side of the road. The 0-foot stake is 16 paces from the witness post at 60 degrees magnetic.

Site Information

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	5,680ft (1,731m)
Aspect	West
Slope	5%
Sample Dates	07/13/2004, 06/25/2008, 07/22/2013, 07/31/2017, 08/11/2021

Table 21R-02.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Chain Unknown	-	-	Late 1950s	-
Seeding - Seed Unknown	-	-	Historic	-
Mechanical - Bullhog	Fillmore WMA Bullhog	85	March-April 2005	488

Wildlife Habitat and Vegetation History**Table 21R-02.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

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

Table 21R-02.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2004	Juniper/Wyoming Big Sagebrush/ Stansbury Cliffrose	Phase II
2008	Stansbury Cliffrose/Wyoming Big Sagebrush	Phase I
2013	Stansbury Cliffrose/Wyoming Big Sagebrush	Phase I
2017	Stansbury Cliffrose/Wyoming Big Sagebrush	Phase I
2021	Wyoming Big Sagebrush/Perennial Grass	Phase I

Site Notes

The land to the west is managed by the Bureau of Land Management and was bullhogged during the fall of 2003. Pellet groups were sampled in high abundance for deer in 2004 and 2008 (Table 21B-19.9).

Soils**Table 21R-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	7.2	48.3	29.5	22.2	2.7	9.4	188.8	0.6	07/13/2004

Site Potential

1981 - 2010 Average Annual Precipitation	15 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.

When the study was established in 2004, this site was dominated by a mixture of Utah juniper (*Juniperus osteosperma*), Stansbury cliffrose (*Purshia stansburiana*) and Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) with other browse species present that contributed minimal cover (Table 21R-2.12). With the exception of the introduced perennial grass species bulbous bluegrass (*Poa bulbosa*), herbaceous cover was relatively low, especially forb cover (Table 21R-02.10, Table 21R-02.11). After the bullhog treatment, Stansbury cliffrose and Wyoming big sagebrush remained the dominant browse species (Table 21R-2.12). While bulbous bluegrass has generally decreased, it continues to be the largest component of the herbaceous understory as of the 2021 sample year (Table 21R-2.7, Table 21R-2.10).

Trend Summary Tables

Table 21R-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
2004	6.4	1.1	10.4	9.8	2.0	14.4
2008	5.7	5.9	-	7.7	5.5	-
2013	4.5	4.3	-	11.0	3.7	-
2017	4.3	4.1	-	9.8	5.3	-
2021	8.4	2.2	0.0	11.5	3.2	-

Table 21R-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
2004	98	428	40	30	2.9	35.8	0.1	0.7
2008	149	432	68	54	4.5	39.9	0.8	1.0
2013	72	445	76	45	0.8	25.9	0.6	1.7
2017	45	453	94	56	1.5	40.1	1.1	1.8
2021	27	448	28	36	0.3	38.4	0.1	1.1

Table 21R-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
2004	18.8	1.1	32.4	3.2	1.6	56.4
2008	9.1	2.4	42.8	3.0	1.1	56.0
2013	10.2	0.3	62.4	1.0	0.6	38.6
2017	10.4	1.0	54.1	2.0	0.6	53.2
2021	9.9	1.4	48.0	4.8	1.0	51.2

Table 21R-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				
2004	5	-	51	-	42
2008	2	-	42	2	52
2013	3	-	23	2	14
2017	5	-	19	2	38
2021	1	-	35	1	20
Year	Days Use Per Acre (ha)				
2004	10.9 (26.9)	-	191.0 (471.8)	4.7 (11.6)	-
2008	3.6 (9.0)	-	65.7 (162.2)	0.7 (1.7)	-
2013	6.5 (16.1)	-	18.1 (44.7)	3.4 (8.3)	-
2017	10.2 (25.1)	-	28.8 (71.2)	4.0 (9.9)	-
2021	18.1 (44.8)	8.7 (21.5)*	44.2 (109.2)	7.4 (18.2)	-

*Pellets per acre (ha)

Table 21R-02.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency							
Agropyron cristatum ⁱ (crested wheatgrass)								
Bromus tectorum ^{ai} (cheatgrass)								
Elymus elymoides (squirreltail)								
Pascopyrum smithii (western wheatgrass)								
Poa bulbosa ⁱ (bulbous bluegrass)								
Poa secunda (Sandberg bluegrass)								
Pseudoroegneria spicata (bluebunch wheatgrass)								
Thinopyrum intermedium ⁱ (intermediate wheatgrass)								
year	Average Cover (%)							
2004	38	98	-	-	403	10	81	82
2008	9	149	1	-	378	34	148	150
2013	18	72	-	11	379	5	62	229
2017	-	45	2	-	429	9	64	186
2021	6	27	-	-	384	12	70	246
year	Average Cover (%)							
2004	1.1	2.9	-	-	29.5	0.2	2.9	2.1
2008	0.3	4.5	0.0	-	26.5	0.4	7.3	5.3
2013	0.5	0.8	-	0.0	17.4	0.0	1.8	6.1
2017	-	1.5	0.0	-	30.0	0.2	1.4	8.5
2021	0.1	0.3	-	-	22.6	0.6	2.8	12.3

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

Table 21R-02.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																	
Alyssum alyssoides ^{ai} (pale madwort)																		
Astragalus beckwithii (Beckwith's milkvetch)																		
Calochortus nuttallii (sego lily)																		
Ceratocephala testiculata ^{ai} (curvseed butterwort)																		
Cirsium (thistle)																		
Collinsia parviflora ^a (maiden blue eyed Mary)																		
Convolvulus arvensis ^{ai} (field bindweed)																		
Cryptantha (cryptantha)																		
Descurainia pinnata ^a (western tansymustard)																		
Erodium cicutarium ^{ai} (redstem stork's bill)																		
Hedysarum boreale (Utah sweetvetch)																		
Lactuca serriola ^{ai} (prickly lettuce)																		
Petradoria pumila (rock goldenrod)																		
Phlox austromontana (mountain phlox)																		
Silene antirrhina ^a (sleepy silene)																		
Sphaeralcea coccinea (scarlet globemallow)																		
Streptanthus cordatus (heartleaf twistflower)																		
year	Average Cover (%)																	
2004	16	-	-	18	-	5	-	0	-	4	-	-	20	12	5	-	1	
2008	17	1	8	7	-	-	7	3	4	33	-	4	20	15	-	3	-	
2013	20	8	5	-	1	5	-	5	-	44	-	5	17	8	6	-	-	
2017	18	3	4	1	7	5	-	9	-	65	-	5	20	4	-	-	-	
2021	20	3	2	-	-	-	-	7	-	5	1	-	19	11	-	-	-	
year	Average Cover (%)																	
2004	0.1	-	-	0.0	-	0.0	-	0.0	-	0.0	-	-	0.6	0.1	0.0	-	0.0	
2008	0.0	0.0	0.0	0.0	-	-	0.1	0.0	0.0	0.3	-	0.2	0.7	0.1	-	0.0	-	
2013	0.0	0.0	0.0	-	0.0	0.0	-	0.0	-	0.5	-	0.0	1.5	0.1	0.0	-	-	
2017	0.1	0.0	0.0	0.0	0.2	0.1	-	0.2	-	0.9	-	0.0	1.1	0.1	-	-	-	
2021	0.0	0.0	0.0	-	-	-	-	0.1	-	0.0	0.0	-	0.9	0.1	-	-	-	

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

FORB SPECIES		
Tragopogon dubius ^{ai} (yellow salsify)		
Vicia americana (American vetch)		
year	Nested Frequency	
2004	-	2
2008	11	4
2013	7	5
2017	3	16
2021	3	-
year	Average Cover (%)	
2004	-	0.0
2008	0.3	0.0
2013	0.0	0.0
2017	0.0	0.1
2021	0.0	-

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

Table 21R-02.12 - 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 var. viscidiflorus (yellow rabbitbrush)									
Ephedra nevadensis ^p (Nevada jointfir)									
Gutierrezia sarothrae (broom snakeweed)									
Juniperus osteosperma ⁱ (Utah juniper)									
Linanthus pungens (granite prickly phlox)									
Purshia stansburiana ^p (Stansbury cliffrose)									
Purshia tridentata ^p (antelope bitterbrush)									
year	Line Intercept Cover (%)								
2004	4.5	1.3	-	0.4	14.4	0.3	5	0.3	
2008	2.8	1.4	-	3.8	-	0.3	4.7	0.2	
2013	4	1.6	-	1.7	-	0.4	6.6	0.4	
2017	4.6	1.8	-	2.7	-	0.8	4.2	1	
2021	5.8	1.7	-	0.7	-	0.8	5.6	0.1	
year	Quadrat Cover (%)								
2004	3.3	0.4	-	0.3	10.4	0.4	2.8	0.4	
2008	2.9	0.9	-	4.3	-	0.7	2.7	0.1	
2013	2.7	1.1	-	2.3	-	1.0	1.8	0.0	
2017	2.4	1.7	-	1.6	-	0.8	1.3	0.5	
2021	5.7	0.9	0.4	0.7	0.0	0.6	2.2	0.1	

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

Table 21R-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			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. wyomingensis^p -- (Wyoming big sagebrush)									
2004	1060	-	4	57	40	34	49	32	71/86
2008	840	140	12	48	41	10	38	36	60/77
2013	840	-	7	67	26	26	10	17	64/90
2017	720	40	6	81	14	33	8	8	75/106
2021	720	-	11	61	28	14	6	25	- / -
Bassia prostrata^{pi} -- (forage kochia)									
2004	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	-/-
2013	-	-	-	-	-	-	-	-	32/62
2017	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
Cercocarpus montanus^p -- (alderleaf mountain mahogany)									
2004	-	-	-	-	-	-	-	-	-/-
2008	20	-	100	0	0	0	0	0	- / -
2013	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
2004	420	-	0	95	5	10	5	0	33/50
2008	460	40	9	87	4	26	17	0	36/56
2013	360	-	6	94	0	0	0	0	41/64
2017	440	-	5	96	0	0	0	0	49/83
2021	440	-	0	23	77	0	0	77	- / -
Ephedra nevadensis^p -- (Nevada jointfir)									
2004	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	254/245
2013	-	-	-	-	-	-	-	-	65/105
2017	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
Gutierrezia sarothrae -- (broom snakeweed)									
2004	620	-	39	61	0	0	0	0	19/21
2008	4360	220	3	94	3	0	0	1	23/36
2013	1840	100	2	94	4	2	0	4	24/35
2017	2340	-	27	73	0	0	0	0	25/33
2021	440	-	18	64	18	0	0	41	- / -
Juniperus osteosperma¹ -- (Utah juniper)									
2004	80	-	0	100	0	25	0	0	- / -
2008	-	-	-	-	-	-	-	-	- / -
2013	-	-	-	-	-	-	-	-	- / -
2017	20	-	100	0	0	0	0	0	- / -
2021	20	20	0	100	0	0	0	0	- / -
Linanthus pungens -- (granite prickly phlox)									
2004	540	-	0	100	0	0	0	0	16/27
2008	660	-	0	100	0	0	0	0	19/31
2013	460	-	4	96	0	0	0	17	21/33
2017	640	-	0	100	0	16	0	0	27/34
2021	500	-	4	16	80	0	0	96	- / -

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 (%)				
Purshia stansburiana^p -- (Stansbury cliffrose)									
2004	220	-	18	82	0	0	100	0	185/201
2008	200	40	10	90	0	10	50	0	193/247
2013	120	40	17	67	17	17	0	0	181/172
2017	120	40	17	67	17	17	0	17	207/171
2021	100	-	40	60	0	20	20	0	- / -
Purshia tridentata^p -- (antelope bitterbrush)									
2004	20	-	0	100	0	0	100	0	101/151
2008	20	-	0	100	0	0	100	0	82/176
2013	40	-	50	50	0	50	0	0	53/87
2017	40	-	0	100	0	0	50	0	64/99
2021	20	-	0	0	100	100	0	100	- / -

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

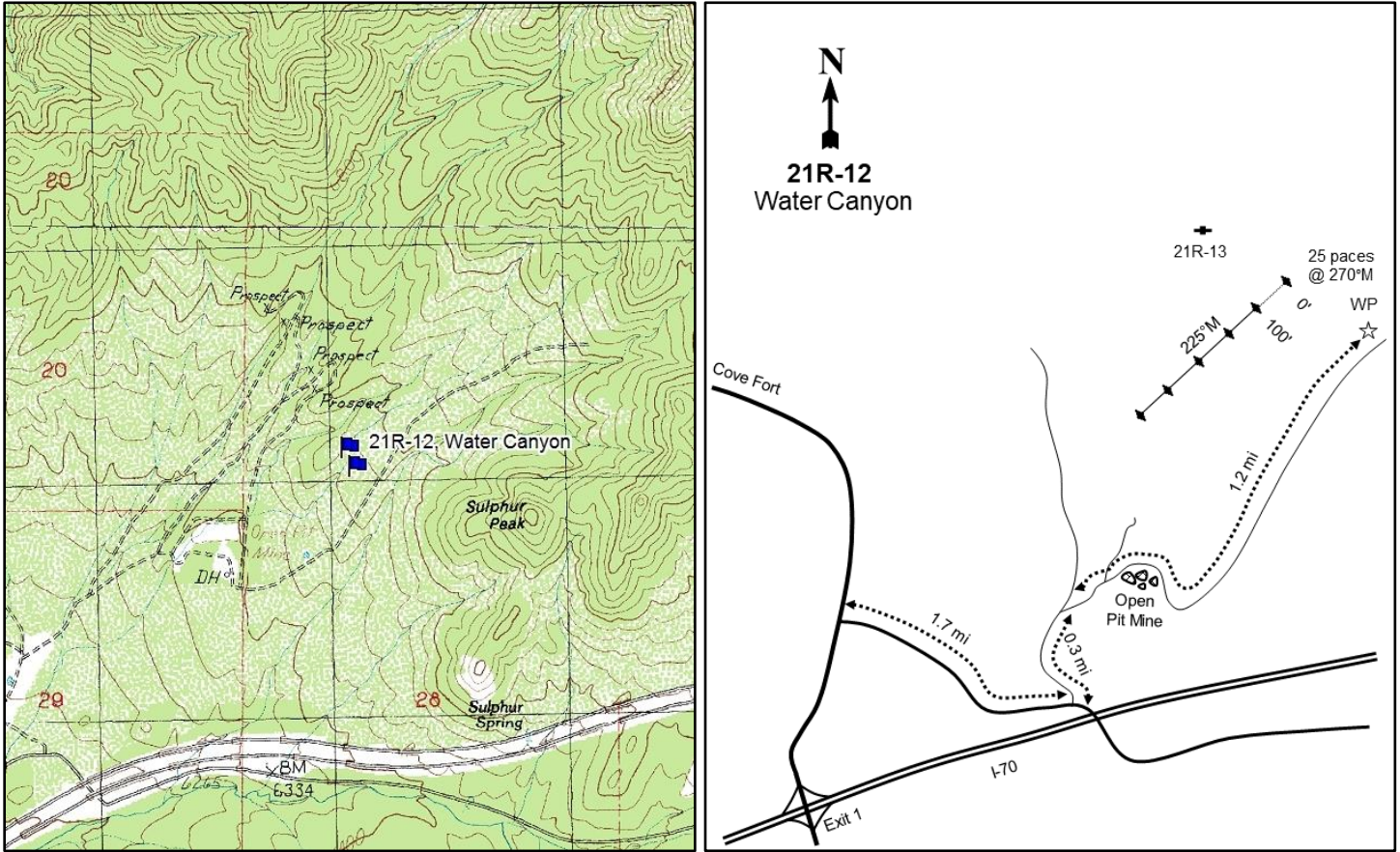
Table 21R-02.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2004	77	-	18	18	41	24	14.5
2008	33	-	70	30	-	-	7.1
2013	33	-	83	17	-	-	5.0
2017	33	-	9	91	-	-	9.0
2021	30	-	8	75	17	-	13.9

Table 21R-02.15 - Deer Desirable Components Index: Upland 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	13.6	9.5	5.5	12.7	-2.2	1.3	0.0	40.5	Poor
2008	10.9	10.6	5.2	26.8	-3.4	1.8	-2.0	49.9	Poor-Fair
2013	15.5	9.1	7.2	17.0	-0.6	3.4	0.0	51.7	Poor-Fair
2017	13.6	10.9	4.9	20.2	-1.1	3.5	0.0	52.0	Poor-Fair
2021	15.8	10.5	12.5	30.0	-0.2	2.3	0.0	70.9	Good

WATER CANYON - STUDY NO. 21R-12



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Cove Fort NE; Township 25S, Range 6W, Section 43
NAD 83 UTM ZONE 12, 366013 East 4275219 North

Transect Information

Browse Tag # (0' Stake)	155
Transect Bearing	222° 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 Cove Fort, turn east at the road opposite a barn. Drive 1.7 miles and turn left. Proceed for 0.3 miles and continue right at the fork. Drive another 1.4 miles, staying to the right (there may be an attempted road closure on one of these roads). There is no witness post: please place one. The site runs parallel to the hillside. Please note that there are two routes to get to this site.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	Grass Creek Allotment
Elevation	6,479ft (1,975m)
Aspect	South
Slope	4%
Sample Dates	08/13/2009, 06/25/2012, 08/08/2016, 08/09/2021

Table 21R-12.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Fire - Prescribed	-	-	Fall 2012-Spring 2013	-
Mechanical - Bullhog	Cancelled (Water Canyon Forage Enhancement WRI #1493)	USFS	Spring 2009	-

Wildlife Habitat and Vegetation History**Table 21R-12.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

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

Table 21R-12.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2009	Mountain Big Sagebrush	Phase I
2012	Annual Grass	Phase I
2016	Perennial Grass	Phase I
2021	Perennial Grass	Phase I

Site Notes

This study is located approximately two and a half miles east of Cove Fort within a sagebrush flat that was invaded by twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*). The study was established in 2009 to monitor the Water Canyon Forage Enhancement Phase #1, which was cancelled as a Watershed Restoration Initiative project, but the USFS finished the brushsaw/bullhog portion of the treatment. Data was collected only along the baseline on studies established in 2009. In subsequent sample years data was collected along the standard sample belts, so there may be slight variation in comparison with the 2009 data.

Site Potential

1981 - 2010 Average Annual Precipitation	17 inches
NRCS Ecological Site	Upland Loam (Bonneville Big Sagebrush)
NRCS Ecological Site #	R028AY310UT
States and Transitions	A defined state and transition model is available.

When the study was established in 2009, the site was dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) while being encroached upon by Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) (Table 21R-12.12, Table 21R-12.13). Following the removal of many of the pinyon and juniper trees in 2012 (Table 21R-12.1), the community was dominated by the introduced annual grass cheatgrass (*Bromus tectorum*) that filled in many of the interspaces. The herbaceous understory was not overly diverse, but following a controlled burn, the community transitioned to a one dominated by the introduced perennial grass intermediate wheatgrass (*Thinopyrum intermedium*) (Table 21R-12.7, Table 21R-12.10, Table 21R-12.11). Although sagebrush has increased in cover, density has decreased, which indicates that the existing sagebrush are becoming larger with little to no recruitment occurring (Table 21R-12.12, Table 21R-12.13). It is predicted that over time sagebrush will increase and become the dominant component in the community.

Trend Summary Tables**Table 21R-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
2009	2.9	0.0	0.7	5.3	-	1.3
2012	6.6	0.0	2.4	6.4	0.1	3.7
2016	1.2	0.4	-	1.1	1.0	-
2021	6.8	0.6	-	6.7	0.9	-

Table 21R-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
2009	49	130	132	89	0.8	3.8	0.9	1.6
2012	286	167	264	139	11.3	9.1	3.5	5.6
2016	321	259	400	157	11.8	19.1	6.1	4.0
2021	216	338	31	18	3.4	27.9	0.5	0.6

Table 21R-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
2009	18.9	-	59.7	8.5	2.2	12.3
2012	11.6	-	69.1	0.8	2.1	37.7
2016	13.1	-	48.6	2.7	1.9	44.6
2021	17.5	0.9	43.7	10.5	4.2	39.5

Table 21R-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			
2009	2	3	1	22
2012	-	1	-	14
2016	4	5	-	50
2021	8	3	-	14
Year	Days Use Per Acre (ha)			
2009	-	-	-	-
2012	5.8 (14.3)	2.0 (5.0)	2.0 (5.0)	-
2016	34.9 (86.1)	4.7 (11.6)	0.7 (1.7)	-
2021	4.4 (10.8)	8.1 (19.9)	4.0 (9.9)	-

Table 21R-12.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency								
Agropyron cristatum ⁱ (crested wheatgrass)	10	14	49	21	13	27	22	69	
Bromus inermis ⁱ (smooth brome)	13	2	286	42	1	27	11	102	
Bromus tectorum ^{ai} (cheatgrass)	59	1	321	10	-	18	5	204	
Elymus elymoides (squirreltail)	2021	51	15	216	18	2	31	13	278
Poa fendleriana (muttongrass)	year	Average Cover (%)							
Poa secunda (Sandberg bluegrass)	2009	0.1	0.1	0.8	0.9	0.3	0.1	0.4	1.9
Pseudoroegneria spicata (bluebunch wheatgrass)	2012	0.8	0.0	11.3	0.7	0.1	0.4	0.5	6.6
Thinopyrum intermedium ⁱ (intermediate wheatgrass)	2016	2.7	0.0	11.8	0.2	-	0.1	0.4	15.7
	2021	2.1	0.3	3.4	0.3	0.0	0.4	0.8	24.0

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

Table 21R-12.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																
Alyssum desertorum ^{ai} (desert madwort)	112	-	-	-	-	8	-	-	-	32	2	-	7	-	-	85	-
Arabis (rockcress)	261	2	-	-	15	31	5	-	3	11	-	-	-	-	2	117	1
Argemone (pricklypoppy)	400	-	3	5	2	-	-	3	7	-	-	8	-	-	47	124	7
Astragalus (milkvetch)	2021	-	-	-	-	-	-	-	0	-	-	13	-	16	-	3	1
Astragalus beckwithii (Beckwith's milkvetch)	year	Average Cover (%)															
Ceratocephala testiculata ^{ai} (curvseed butterwort)	2009	0.5	-	-	-	0.0	-	-	-	0.1	0.0	-	0.2	-	-	1.6	-
Chaenactis douglasii (Douglas' dustymaiden)	2012	3.3	0.0	-	-	0.3	0.1	0.0	-	0.1	0.0	-	-	-	0.0	5.0	0.1
Chenopodium fremontii ^a (Fremont's goosefoot)	2016	5.6	-	0.4	0.0	0.0	-	-	0.0	0.2	-	-	0.0	-	0.2	3.2	0.2
Cirsium (thistle)	2021	-	-	-	-	-	-	-	0.0	-	-	0.5	-	0.1	-	0.0	0.1
Collinsia parviflora ^a (maiden blue eyed Mary)																	
Eriogonum umbellatum (sulphur-flower buckwheat)																	
Erodium cicutarium ^{ai} (redstem stork's bill)																	
Gayophytum ramosissimum ^a (pinyon groundsmoke)																	
Helianthus annuus ^a (common sunflower)																	
Lactuca serriola ^{ai} (prickly lettuce)																	
Lathyrus brachycalyx (Bonneville pea)																	
Lithospermum ruderale (western stoneseed)																	

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

FORB SPECIES	Microsteris gracilis ^a (slender phlox)	Penstemon (beardtongue)	Phlox longifolia (longleaf phlox)	Physalis crassifolia (yellow nightshade groundcherry)	Polygonum douglasii ^a (Douglas' knotweed)	Sisymbrium altissimum ^{ai} (tall tumblemustard)	Sphaeralcea coccinea (scarlet globemallow)	Sphaeralcea grossularifolia (gooseberry/leaf globemallow)	Tragopogon dubius ^{ai} (yellow salsify)
year	Nested Frequency								
2009	3	2	-	-	4	-	-	-	-
2012	6	4	2	-	-	-	-	-	-
2016	-	-	-	-	4	20	4	8	0
2021	-	-	-	12	-	-	4	-	3
year	Average Cover (%)								
2009	0.0	0.0	-	-	0.0	-	-	-	-
2012	0.0	0.0	0.0	-	-	-	-	-	-
2016	-	-	-	-	0.0	0.3	0.0	0.0	0.0
2021	-	-	-	0.2	-	-	0.2	-	0.0

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

Table 21R-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)	Ericameria nauseosa (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma ^t (Utah juniper)	Purshia tridentata ^p (antelope bitterbrush)
year	Line Intercept Cover (%)				
2009	4.9	-	-	1.3	0.4
2012	6.4	-	0.1	3.7	-
2016	1.1	0.9	0.1	-	-
2021	6.7	0.9	-	-	-
year	Quadrat Cover (%)				
2009	2.7	0.0	-	0.7	0.2
2012	6.6	0.0	0.0	2.4	-
2016	1.2	0.4	0.0	-	-
2021	6.8	0.3	0.3	-	-

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

Table 21R-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			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
2009	-	-	-	-	-	-	-	-	54/70
2012	3500	240	62	35	3	7	0	4	60/79
2016	540	-	22	78	0	7	0	4	36/50
2021	500	-	12	88	0	0	0	0	- / -
Ericameria nauseosa -- (rubber rabbitbrush)									
2009	-	-	-	-	-	-	-	-	25/13
2012	80	-	50	50	0	0	0	0	39/42
2016	80	-	25	75	0	0	0	0	63/104
2021	80	-	0	50	50	0	0	50	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
2009	-	-	-	-	-	-	-	-	28/26
2012	20	-	0	100	0	0	0	0	29/35
2016	160	-	0	100	0	0	0	0	30/38
2021	60	-	0	67	33	0	0	33	- / -
Juniperus osteospermaⁱ -- (Utah juniper)									
2009	-	-	-	-	-	-	-	-	-/-
2012	320	40	56	44	0	0	0	13	- / -
2016	20	-	0	100	0	0	0	0	- / -
2021	40	-	100	0	0	0	0	0	- / -
Opuntia -- (pricklypear)									
2009	-	-	-	-	-	-	-	-	13/39
2012	20	-	0	100	0	0	0	0	16/27
2016	20	-	0	100	0	0	0	0	16/26
2021	20	-	0	100	0	0	0	0	- / -
Purshia tridentata^p -- (antelope bitterbrush)									
2009	-	-	-	-	-	-	-	-	36/93
2012	-	-	-	-	-	-	-	-	70/151
2016	-	-	-	-	-	-	-	-	42/100
2021	-	-	-	-	-	-	-	-	-/-
Sambucus nigra ssp. cerulea^p -- (blue elderberry)									
2009	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	85/122

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

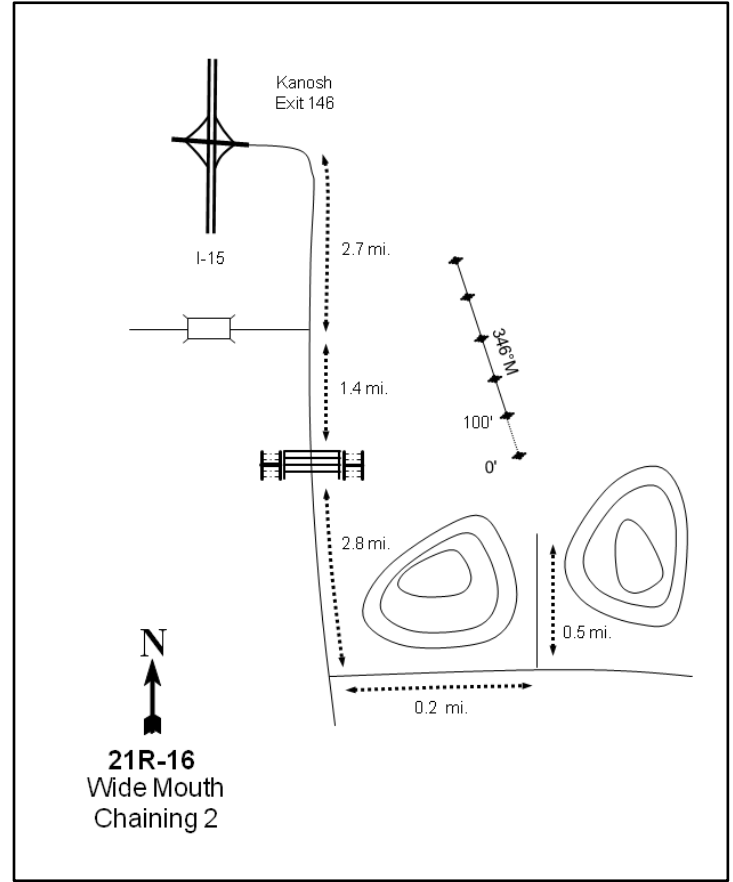
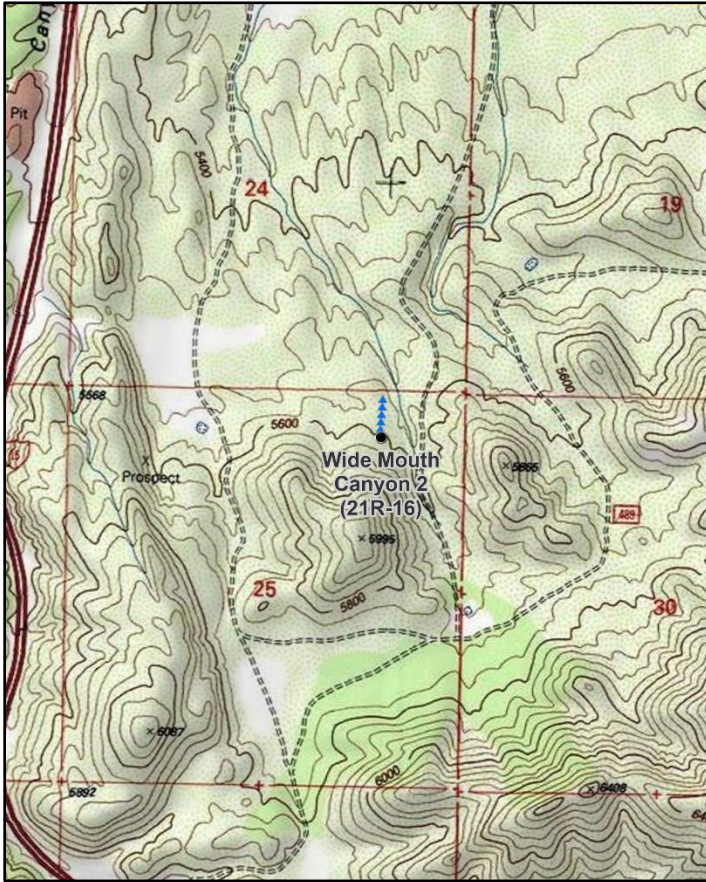
Table 21R-12.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2009	118	15	55	25	5	-	4.6
2012	82	5	63	26	-	5	6.1
2016	10	67	33	-	-	-	1.3
2021	8	25	75	-	-	-	2.1
Pinus edulis (twoneedle pinyon)							
2009	4	-	-	-	-	100	15.0
2012	3	-	50	-	-	50	13.5
2016	4	-	-	-	-	100	24.0
2021	5	-	-	-	-	100	24.0

Table 21R-12.15 - Deer Desirable Components Index: Upland 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	6.7	0.0	0.0	7.6	-0.6	3.2	0.0	17.0	Very Poor
2012	8.0	14.1	15.0	18.3	-8.4	10.0	0.0	57.0	Fair
2016	1.4	0.0	0.0	30.0	-8.8	8.1	0.0	30.6	Very Poor
2021	8.4	15.0	6.0	30.0	-2.6	1.1	0.0	58.0	Fair

WIDE MOUTH CANYON 2 - STUDY NO. 21R-16



21R-16
Wide Mouth
Chaining 2

Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Dog Valley Peak NW; Township 24S, Range 7W, Section 25
NAD 83 UTM ZONE 12, 362221 East 4284568 North

Transect Information

Browse Tag # (0' Stake)	124
Transect Bearing	4° magnetic
Length	500ft
Belt Placement	Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Belt Marker Placement	Belt 3, 4: 1ft

Directions to Site

From I-15, take the Kanosh exit (146) and follow the road east and then south for 2.7 miles. In another 1.4 miles there will be a gate. Pass through the gate, continue for another 2.8 miles, and then turn left (east). Drive for 0.2 miles and turn left again (north), passing between two small hills. Drive for another 0.5 miles: the study will be slightly northwest of this point.

Site Information

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	5,628ft (1,715m)
Aspect	Northwest
Slope	8-9%
Sample Dates	07/29/2013, 08/08/2016, 08/10/2021

Table 21R-16.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Two-Way Ely	Widemouth Canyon Chaining Phase V	2727	September-October 2013	1155
Seeding - Aerial Before	Widemouth Canyon Chaining Phase V	2727	September-October 2013	1155
Seeding - Aerial After	Widemouth Canyon Chaining Phase V	2727	February 2014	1155
Seeding - Dribbler	Widemouth Canyon Chaining Phase V	2727	September-October 2013	1155
Hand Crew - Lop and Scatter	Central Utah Chaining Maintenance Project Phase II	5761	May-June 2021	5219

Wildlife Habitat and Vegetation History**Table 21R-16.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

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

Table 21R-16.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2013	Juniper	Phase III
2016	Perennial Grass	Phase I
2021	Perennial Grass	Phase I

Site Notes

In 2016 the transect bearing was shifted to 4 degrees magnetic from 352 degrees magnetic. A couple of small deer shed antlers were found on the site in 2013.

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	Current State: Community Phase 6.1

Upon study establishment in 2013, this site was encroached by Utah juniper (*Juniperus osteosperma*); the shrub understory was sparse (Table 21R-16.12). When the site was sampled in 2016, it was observed that the chaining and seeding that occurred in the fall and winter of 2013-2014 (Table 21R-16.1, Table 21R-16.2) caused the community to transition to one dominated by perennial grasses. The introduced annual grass species cheatgrass increased in cover and abundance in 2016, but decreased in 2021 (Table 21R-16.7, Table 21R-16.10). With proper grazing practices and appropriate climate conditions this site could transition to a community phase where Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) is co-dominant with introduced perennial grasses (USDA-ARS Jornada Experimental Range, 2021). Although it was seeded, Wyoming big sagebrush has not been recorded in either cover or density measurements as of 2021. Notably, however, Stansbury cliffrose (*Purshia stansburiana*) appears to have rebounded in both cover and density following the chaining disturbance in 2013 (Table 21R-16.12, Table 21R-16.13). Juniper has been present in lower amounts following the chaining and a subsequent lop and scatter treatment in 2021 (Table 21R-16.1). Although the site is in Phase I of woodland succession as of 2021 (Table 21R-16.4), 53% of juniper trees were classified as seedlings during the most recent sampling (Table 21R-16.14): this indicates that infilling could be possible in future sample years.

Trend Summary Tables

Table 21R-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
2013	3.1	-	9.3	4.3	-	36.7
2016	1.4	-	2.1	1.6	-	3.4
2021	2.9	-	0.2	3.7	-	0.7

Table 21R-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
2013	194	197	353	22	0.9	3.5	1.0	0.1
2016	284	294	314	65	7.4	16.5	2.1	1.3
2021	158	290	18	8	1.9	24.9	0.1	0.1

Table 21R-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
2013	18.7	1.7	49.2	14.6	10.5	16.9
2016	19.1	-	48.0	9.6	5.5	30.9
2021	13.4	0.1	49.7	11.5	5.1	30.6

Table 21R-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	Rabbit
	Quadrat Frequency			
2013	-	17	1	22
2016	4	6	1	14
2021	4	28	4	11
Days Use Per Acre (ha)				
2013	-	13.4 (33.1)	4.7 (11.6)	-
2016	15.3 (37.7)	18.1 (44.7)	2.0 (5.0)	-
2021	11.6 (28.7)	53.0 (130.8)	8.7 (21.5)	-

Table 21R-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 arvensis ^{ai} (field brome)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Elymus trachycaulus (slender wheatgrass)	Pascopyrum smithii (western wheatgrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)	Thinopyrum intermedium ⁱ (intermediate wheatgrass)
year	Nested Frequency									
2013	-	-	-	194	4	-	10	192	1	-
2016	11	166	1	284	-	53	17	40	39	60
2021	4	93	-	158	8	40	-	74	189	13
year	Average Cover (%)									
2013	-	-	-	0.9	0.2	-	0.4	2.8	0.1	-
2016	0.3	6.5	0.0	7.4	-	2.9	0.4	1.0	1.9	3.5
2021	0.0	5.3	-	1.9	0.1	0.4	-	1.2	17.6	0.3

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

Table 21R-16.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Allium (onion)	Alyssum desertorum ^{ai} (desert madwort)	Arabis (rockcross)	Arenaria (sandwort)	Astragalus eurekaensis (Eureka milkvetch)	Calochortus nuttallii (sego lily)	Ceratocephala testiculata ^{ai} (curveseed butterwort)	Cirsium (thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Descurainia pinnata ^a (western tansymustard)	Draba ^a (draba)	Gilia inconspicua ^a (shy gilia)	Helianthus annuus ^a (common sunflower)	Lactuca serriola ^{ai} (prickly lettuce)	Linum perenne ⁱ (blue flax)	Medicago sativa ⁱ (alfalfa)	Microsteris gracilis ^a (slender phlox)
year	Nested Frequency																
2013	0	299	17	5	2	-	75	-	28	7	1	2	-	1	-	-	37
2016	-	305	-	5	4	2	-	1	-	5	-	-	44	8	26	3	-
2021	-	-	-	-	-	5	-	-	-	-	-	-	16	2	-	-	-
year	Average Cover (%)																
2013	0.0	0.6	0.1	0.0	0.0	-	0.2	-	0.0	0.0	0.0	0.0	-	0.0	-	-	0.1
2016	-	1.8	-	0.2	0.0	0.0	-	0.0	-	0.1	-	-	0.1	0.0	0.6	0.1	-
2021	-	-	-	-	-	0.0	-	-	-	-	-	-	0.1	0.0	-	-	-

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

FORB SPECIES	Onobrychis vicifolia ^a (sainfoin)	Phlox hoodii (spiny phlox)	Sanguisorba minor ⁱ (small burnet)	Sisymbrium altissimum ^{ai} (tall tumblemustard)	Zizadenus paniculatus (foothill deathcamas)
year	Nested Frequency				
2013	-	-	-	-	1
2016	12	1	19	1	-
2021	-	5	-	-	-
year	Average Cover (%)				
2013	-	-	-	-	0.0
2016	0.2	0.0	0.3	0.0	-
2021	-	0.1	-	-	-

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

Table 21R-16.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia nova ^p (black sagebrush)	Juniperus osteosperma ^t (Utah juniper)	Purshia stansburiana ^p (Stansbury cliffrose)	Purshia tridentata ^p (antelope bitterbrush)
year	Line Intercept Cover (%)			
2013	0.5	36.7	3.8	-
2016	0.9	3.4	0.6	0.1
2021	0.2	0.7	3.5	-
year	Quadrat Cover (%)			
2013	0.7	9.3	2.3	0.0
2016	0.2	2.1	1.0	0.2
2021	0.2	0.2	2.7	0.0

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

Table 21R-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			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia nova^p -- (black sagebrush)									
2013	340	-	6	65	29	12	0	12	25/56
2016	240	-	0	92	8	33	0	0	24/62
2021	300	20	13	73	13	7	20	13	- / -
Bassia prostrata^{pi} -- (forage kochia)									
2013	-	-	-	-	-	-	-	-	-/-
2016	20	-	0	100	0	0	0	0	13/24
2021	-	-	-	-	-	-	-	-	-/-

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 (%)				
Chrysothamnus viscidiflorus -- (yellow rabbitbrush)									
2013	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	43/47
2021	-	-	-	-	-	-	-	-	-/-
Gutierrezia sarothrae -- (broom snakeweed)									
2013	-	-	-	-	-	-	-	-	31/36
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
Juniperus osteosperma¹ -- (Utah juniper)									
2013	480	100	29	71	0	0	0	4	- / -
2016	120	100	33	33	33	0	17	17	- / -
2021	240	-	58	25	17	0	0	17	- / -
Purshia stansburiana^p -- (Stansbury cliffrose)									
2013	220	320	64	36	0	9	0	9	166/199
2016	840	-	52	45	2	17	10	0	43/65
2021	900	-	4	89	7	22	20	7	- / -
Purshia tridentata^p -- (antelope bitterbrush)									
2013	20	-	100	0	0	0	0	0	16/32
2016	100	-	40	60	0	0	0	0	18/30
2021	60	-	0	100	0	0	67	0	- / -

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

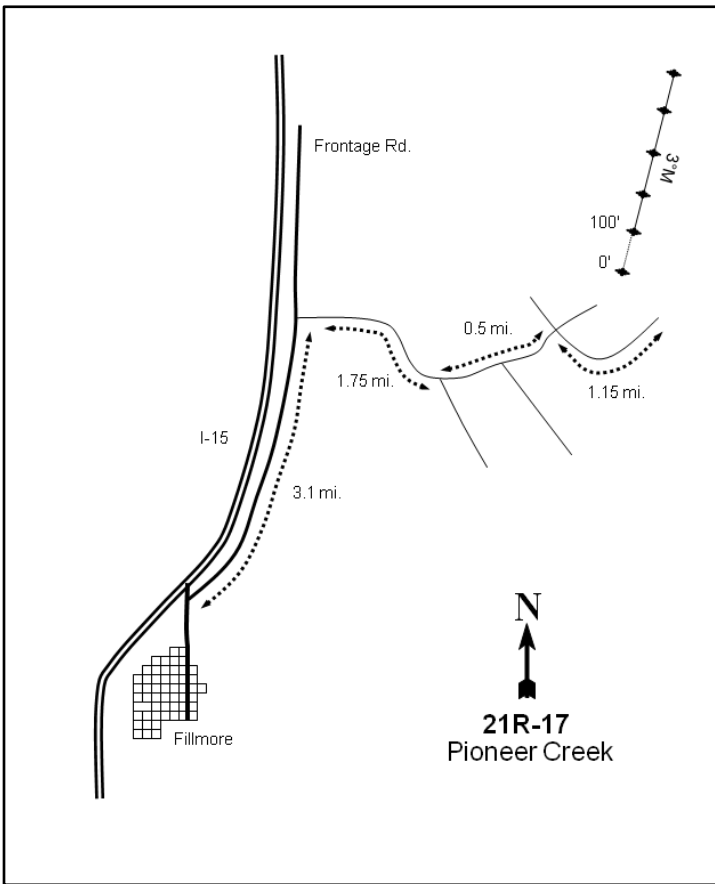
Table 21R-16.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2013	386	-	10	20	25	45	37.0
2016	173	-	84	16	-	-	6.9
2021	61	53	41	6	-	-	1.6

Table 21R-16.15 - Deer Desirable Components Index: Upland 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
2013	6.3	0.0	0.0	7.0	-0.7	0.2	0.0	12.9	Very Poor
2016	2.2	0.0	0.0	30.0	-5.6	2.5	0.0	29.1	Very Poor
2021	5.5	0.0	0.0	30.0	-1.4	0.2	0.0	34.3	Very Poor-Poor

PIONEER CREEK - STUDY NO. 21R-17



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Coffee Peak SW; Township 20S, Range 4W, Section 36
NAD 83 UTM ZONE 12, 392056 East 4320853 North

Transect Information

Browse Tag # (0' Stake)	586
Transect Bearing	2° 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

Drive north out of Fillmore on Main Street until just before I-15, then turn right onto Frontage Road. Follow Frontage Road for 3.1 miles and then turn right (east). Drive for 1.75 miles to a fork in the road: stay left and continue for 0.5 miles. Turn right and drive for another 1.15 miles. The study will be on the left-hand (west) side of the road.

Site Information

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	5,718ft (1,743m)
Aspect	North
Slope	3%
Sample Dates	07/22/2013, 08/10/2016, 08/11/2021

Table 21R-17.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Two-Way Ely	Pioneer WMA Bullhog	2665	November 2013-March 2014	102
Seeding - Aerial Before	Pioneer WMA Bullhog	2665	November 2013	102

Table 21R-17.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Pioneer Bullhog			Aerial	Nov 2013	188
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Achnatherum hymenoides	Indian Ricegrass	Nezpar	1.06	1.03
G	Agropyron cristatum	Crested Wheatgrass	CDII	0.80	0.73
G	Bouteloua gracilis	Blue Grama	Hachita	1.06	0.60
G	Pascopyrum smithii	Western Wheatgrass	Arriba	1.06	0.93
G	Poa secunda	Sandberg Bluegrass	Mountain Home	0.27	0.22
G	Pseudoroegneria spicata	Bluebunch Wheatgrass	Anatone	1.06	0.96
G	Thinopyrum intermedium	Intermediate Wheatgrass		0.27	0.24
G	Thinopyrum ponticum	Tall Wheatgrass		0.27	0.25
F	Medicago sativa	Alfalfa	Big Sky Ladak	1.06	1.00
F	Medicago sativa	Alfalfa	Ranger (NC)	1.06	0.98
F	Melilotus officinalis	Yellow Sweetclover		0.53	0.52
F	Sanguisorba minor	Small Burnet	Delar	1.86	1.65

Wildlife Habitat and Vegetation History**Table 21R-17.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

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

Table 21R-17.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2013	Gambel Oak/Utah Juniper	Phase II
2016	Gambel Oak/Annual Grass-Forb	Phase I
2021	Gambel Oak/Perennial Grass	Phase I

Site Notes

In 2016, it was noted that Gambel oak (*Quercus gambelii*) plants often had galls on the leaves in moderate to substantial amounts.

Site Potential

1981 - 2010 Average Annual Precipitation	17 inches
NRCS Ecological Site	Mountain Loam (Oak)
NRCS Ecological Site #	R047XB432UT
States and Transitions	No state and transition model is available for this ecological site.

Upon study establishment in 2013, this site was dominated by Gambel oak (*Quercus gambelii*), Utah juniper (*Juniperus osteosperma*), and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and was considered to be in Phase II of woodland succession (Table 21R-17.4, Table 21R-17.12). Following a chaining and seeding treatment (Table 21R-17.1), shrub and tree cover decreased, and that of annual forbs and grasses increased; the site was dominated by oak and annual forbs and grasses in 2016. A mixture of native and introduced perennial grasses increased and they became the dominant herbaceous component in 2021 (Table 21R-17.7, Table 21R-17.10, Table 21R-17.11). Although density and cover of juniper were low in the most recent sample year, the site is still considered to be in Phase I of woodland succession as of 2021 and has the potential for future infilling (Table 21R-17.4, Table 21R-17.12, Table 21R-17.14).

Trend Summary Tables

Table 21R-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
2013	31.9	1.3	2.5	56.1	1.6	6.6
2016	26.5	4.9	0.6	35.5	4.0	0.3
2021	35.2	1.0	0.2	49.8	0.1	0.6

Table 21R-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
2013	105	222	306	139	0.7	4.0	2.3	1.2
2016	287	145	388	60	10.1	4.3	10.8	0.9
2021	191	229	88	54	4.2	13.1	0.8	0.4

Table 21R-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
2013	18.5	0.0	61.3	0.3	0.9	43.1
2016	17.4	-	49.9	0.3	0.1	51.5
2021	7.3	0.4	71.3	0.4	1.0	53.7

Table 21R-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			
2013	1	6	3	9
2016	-	1	-	18
2021	-	5	-	15
Days Use Per Acre (ha)				
2013	4.4 (10.8)	14.7 (36.4)	4.7 (11.6)	-
2016	1.5 (3.6)	2.0 (5.0)	2.0 (5.0)	-
2021	-	24.1 (59.6)	6.0 (14.9)	-

Table 21R-17.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Agropyron cristatum ⁱ (crested wheatgrass)	Bromus arvensis ^{ai} (field brome)	Bromus tectorum ^{ai} (cheatgrass)	Elymus elymoides (squirreltail)	Elymus trachycaulus (slender wheatgrass)	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											
2013	-	-	105	6	-	-	108	2	16	74	36	65
2016	1	86	241	2	4	76	24	-	4	53	3	19
2021	20	65	168	1	0	89	98	-	18	8	25	53
year	Average Cover (%)											
2013	-	-	0.7	0.0	-	-	2.3	0.0	0.0	1.3	0.2	0.2
2016	0.1	2.5	7.6	0.0	0.3	1.7	0.4	-	0.0	0.6	0.3	0.9
2021	0.6	0.6	3.6	0.0	0.1	3.4	2.5	-	0.5	0.0	3.2	2.6

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

Table 21R-17.11 - 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)	Arabis (rockcross)	Astragalus convallarius (lesser rushy milkvetch)	Calochortus nuttallii (sego lily)	Castilleja angustifolia (northwestern Indian paintbrush)	Ceratocephala testiculata ^{ai} (curveseed butterwort)	Cirsium (thistle)	Collinsia parviflora ^a (maiden blue eyed Mary)	Collomia linearis ^a (tiny trumpet)	Descurainia pinnata ^a (western tansymustard)	Epilobium brachycarpum ^a (tall annual willowherb)	Galium ^a (bedstraw)	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Lactuca serriola ^{ai} (prickly lettuce)
year	Nested Frequency																
2013	6	39	178	9	2	8	20	0	24	-	62	86	-	34	26	2	-
2016	-	17	283	-	-	3	16	-	-	2	19	73	3	7	148	-	61
2021	-	22	57	-	-	3	3	-	-	-	6	17	-	1	4	-	-
year	Average Cover (%)																
2013	0.0	0.2	1.0	0.0	0.0	0.1	0.4	0.0	0.0	-	0.1	0.5	-	0.1	0.0	0.0	-
2016	-	0.1	5.2	-	-	0.1	0.1	-	-	0.0	0.0	0.4	0.0	0.1	4.6	-	0.3
2021	-	0.2	0.2	-	-	0.0	0.0	-	-	-	0.2	0.1	-	0.0	0.1	-	-

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

FORB SPECIES											
<i>Lappula occidentalis</i> ^a (flatspine stickseed)											
<i>Lomatium</i> (desertparsley)											
<i>Microsteris gracilis</i> ^a (slender phlox)											
<i>Phlox longifolia</i> (longleaf phlox)											
<i>Polygonum douglasii</i> ^a (Douglas' knotweed)											
<i>Sanguisorba minor</i> ⁱ (small burnet)											
<i>Silene antirrhina</i> ^a (sleepy silene)											
<i>Tragopogon dubius</i> ^{ai} (yellow salsify)											
<i>Veronica biloba</i> ^{ai} (two-lobed speedwell)											
<i>Vicia americana</i> (American vetch)											
<i>Zigadenus paniculatus</i> (foothill deathcamas)											
year	Nested Frequency										
2013	31	5	23	15	20	-	4	4	-	59	15
2016	-	4	-	3	12	11	-	9	2	16	4
2021	-	-	7	6	-	0	-	9	-	12	10
year	Average Cover (%)										
2013	0.4	0.0	0.0	0.1	0.0	-	0.0	0.0	-	0.3	0.1
2016	-	0.0	-	0.0	0.0	0.2	-	0.1	0.0	0.3	0.1
2021	-	-	0.0	0.0	-	0.0	-	0.0	-	0.1	0.0

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

Table 21R-17.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES				
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> ^p (mountain big sagebrush)				
<i>Gutierrezia sarothrae</i> (broom snakeweed)				
<i>Juniperus osteosperma</i> ^t (Utah juniper)				
<i>Quercus gambelii</i> ^p (Gambel oak)				
year	Line Intercept Cover (%)			
2013	3.9	1.6	6.6	52.2
2016	1.7	4	0.3	33.8
2021	4.2	0.1	0.6	45.6
year	Quadrat Cover (%)			
2013	1.6	1.3	2.5	30.3
2016	1.9	4.9	0.6	24.6
2021	3.1	1.0	0.2	32.1

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

Table 21R-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			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
<i>Artemisia frigida</i> ^p -- (prairie sagewort)									
2013	120	-	0	100	0	0	0	0	- / -
2016	-	-	-	-	-	-	-	-	- / -
2021	-	-	-	-	-	-	-	-	- / -
<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> ^p -- (mountain big sagebrush)									
2013	860	100	28	63	9	19	0	7	64/95
2016	600	-	13	83	3	10	0	3	41/62
2021	540	-	4	93	4	7	22	0	- / -

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 (%)				
Gutierrezia sarothrae -- (broom snakeweed)									
2013	2620	-	5	95	0	0	0	0	25/27
2016	1800	20	4	94	1	0	0	0	34/50
2021	160	-	13	88	0	0	13	0	- / -
Juniperus osteosperma¹ -- (Utah juniper)									
2013	100	-	0	100	0	0	0	0	- / -
2016	60	60	67	0	33	0	0	0	- / -
2021	360	-	11	83	6	0	0	6	- / -
Quercus gambelii^p -- (Gambel oak)									
2013	10440	1040	31	69	0	0	0	0	149/98
2016	11740	1020	73	27	0	0	0	1	81/67
2021	10080	-	3	94	3	4	4	3	- / -

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

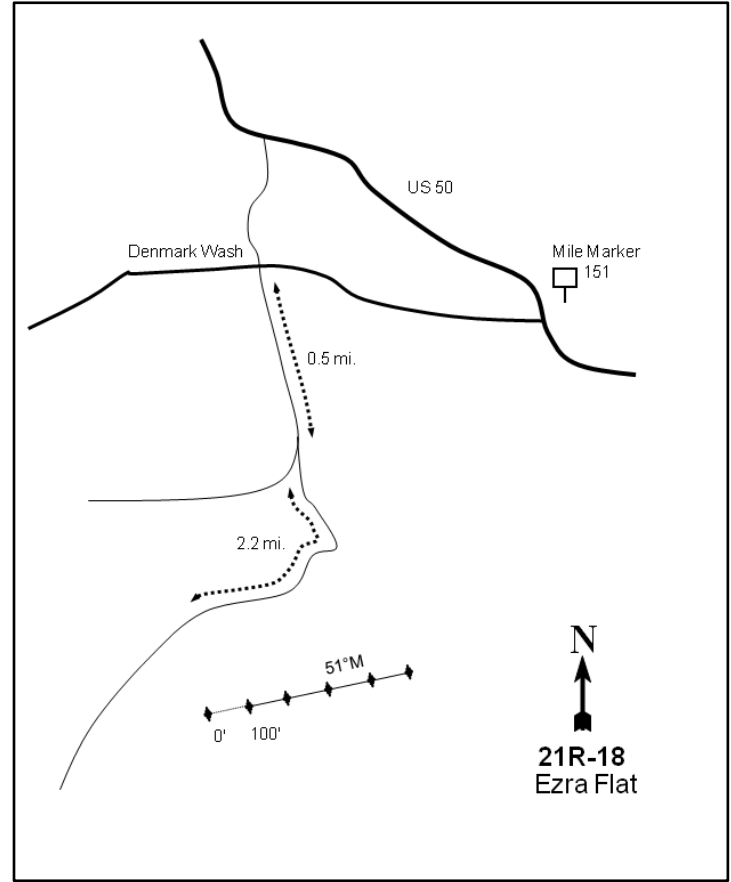
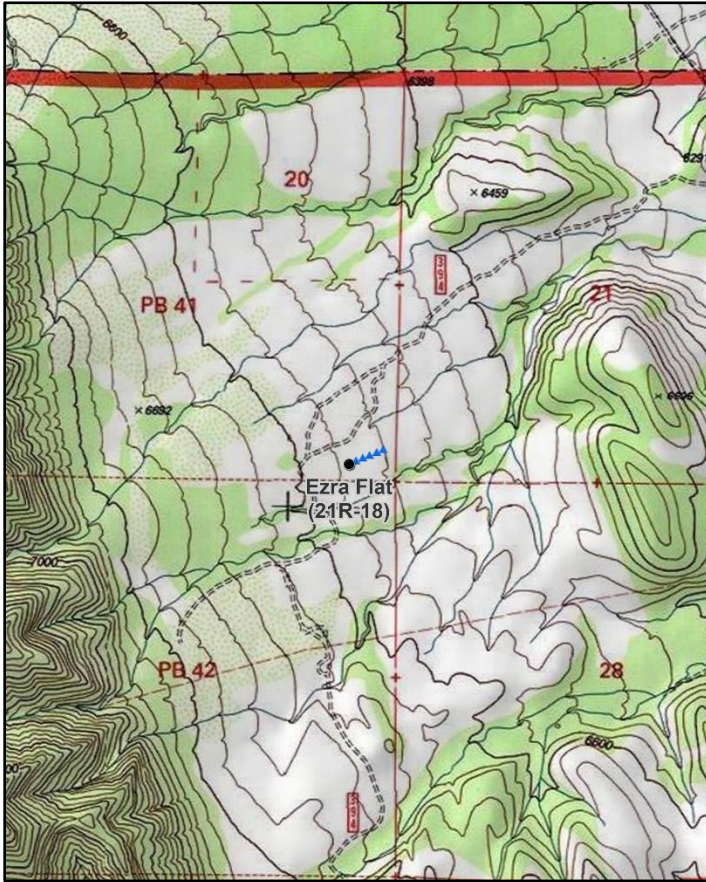
Table 21R-17.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2013	80	6	12	29	12	41	18.4
2016	18	20	50	30	-	-	4.2
2021	41	25	50	25	-	-	3.5

Table 21R-17.15 - Deer Desirable Components Index: Mountain 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
2013	30.0	14.8	15.0	3.5	-0.6	2.4	0.0	65.2	Fair
2016	30.0	14.9	15.0	7.9	-7.6	1.8	0.0	62.0	Fair
2021	30.0	14.2	1.5	21.2	-3.1	0.8	0.0	64.6	Fair

EZRA FLAT - STUDY NO. 21R-18

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Beehive Peak NE; Township 21S, Range 2W, Section 41
NAD 83 UTM ZONE 12, 409930 East 4312838 North

Transect Information

Browse Tag # (0' Stake)	585
Transect Bearing	51° 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

Traveling west out of Salina on Highway 50, drive just past mile marker 151. Turn left and continue until the road forks. Keep left and drive 0.5 miles until the road forks again. Stay left again and proceed for 2.2 miles. The study will be on the left (south) side of the road.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	Cedar Ridge Allotment
Elevation	6,560ft (1,999m)
Aspect	Northeast
Slope	4%
Sample Dates	07/29/2013, 08/11/2016, 08/12/2021

Table 21R-18.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Unknown	-	-	Historic	1100
Mechanical - Bullhog	Ezra Flat Winter Range Restoration	2623	November 2013-April 2014	1048
Chaining - One-Way Ely Chaining	Red Canyon Habitat Restoration Project Phase I	4625	Fall 2019	470
Seeding - Aerial Before	Red Canyon Habitat Restoration Project Phase I	4625	Fall 2019	470
Seeding - Aerial After	Red Canyon Habitat Restoration Project Phase I	4625	Fall 2019	470
Herbicide - Spike	Red Canyon Habitat Restoration Project Phase I	4625	Spring 2021	177

Table 21R-18.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Red Canyon			Aerial	Oct 2019	1060
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	<i>Achnatherum hymenoides</i>	Indian Ricegrass	Rimrock	0.99	0.91
G	<i>Elymus elymoides</i>	Bottlebrush Squirreltail	Pueblo	0.28	0.25
G	<i>Elymus lanceolatus</i>	Thickspike Wheatgrass	Bannock	1.51	1.42
G	<i>Elymus wawawaiensis</i>	Snake River Wheatgrass	Discovery	1.51	0.97
G	<i>Pascopyrum smithii</i>	Western Wheatgrass	Arriba	1.51	1.38
G	<i>Poa secunda</i>	Sandberg Bluegrass	Mountain Home	0.75	0.68
G	<i>Psathyrostachys juncea</i>	Russian Wildrye		0.75	0.60
G	<i>Pseudoroegneria spicata</i>	Bluebunch Wheatgrass	Columbia	1.98	1.75
F	<i>Achillea millefolium</i>	Western Yarrow	Eagle	0.09	0.08
F	<i>Astragalus cicer</i>	Cicer Milkvetch	Lutana	0.24	0.23
F	<i>Helianthus annuus</i>	Annual Sunflower		0.14	0.14
F	<i>Linum perenne</i>	Blue Flax	Appar	0.24	0.17
F	<i>Medicago sativa</i>	Alfalfa	Ladak DL	1.51	1.28
F	<i>Melilotus officinalis</i>	Yellow Sweetclover		0.24	0.23
F	<i>Onobrychis viciifolia</i>	Sainfoin	Eski	2.03	1.86
F	<i>Sanguisorba minor</i>	Small Burnet	Delar	2.03	1.96

Mix Name			Application Type	Application Date	Acres
Red Canyon Shrub			Aerial	Dec 2019	1060
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
F	<i>Medicago sativa</i>	Alfalfa	Ladak 65	0.50	0.49
S	<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i>	Wyoming Big Sagebrush	Iron, UT	0.50	0.18
S	<i>Bassia prostrata</i>	Forage Kochia	Box Elder, UT	0.21	0.16
S	<i>Bassia prostrata</i>	Forage Kochia	Sanpete, UT	0.04	0.03

Wildlife Habitat and Vegetation History**Table 21R-18.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter

Table 21R-18.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2013	Black Sagebrush/Pinyon-Juniper	Phase I transitioning to Phase II
2016	Black Sagebrush	Phase I
2021	Black Sagebrush	Phase I

Site Notes

No Notes

Site Potential

1981 - 2010 Average Annual Precipitation	14 inches
NRCS Ecological Site	Upland Stony Loam (Black Sagebrush)
NRCS Ecological Site #	R047XA332UT
States and Transitions	No state and transition model is available for this ecological site.

This study site was established in 2013 and was dominated by black sagebrush (*Artemisia nova*) with Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) scattered throughout; the site was considered to be transitioning from Phase I to Phase II of woodland succession (Table 21R-18.4). The 2013 bullhog treatment (Table 21R-18.1) removed most of the tree cover, and black sagebrush was the sole dominant site component in the 2016 and 2021 sample years (Table 21R-18.12). The herbaceous understory has been sparse throughout the study period (Table 21R-18.7, Table 21R-18.10, Table 21R-18.11). In 2016 and 2021, cover and density of pinyon-juniper was low. However, their post-treatment presence indicates that this site has the potential to be infilled in the future (Table 21R-18.12, Table 21R-18.13, Table 21R-18.14).

Trend Summary Tables**Table 21R-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
2013	16.5	0.3	7.3	21.8	0.4	16.7
2016	15.7	0.3	0.9	23.6	0.1	0.2
2021	12.4	0.1	0.2	14.5	0.2	0.2

Table 21R-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
2013	15	92	33	111	0.1	0.7	0.1	1.7
2016	0	60	19	45	0.0	0.6	0.5	1.2
2021	67	130	17	47	1.0	3.2	0.3	0.4

Table 21R-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
2013	28.0	7.8	43.5	4.4	9.1	23.9
2016	23.6	0.8	59.2	2.6	4.0	17.9
2021	23.1	2.6	61.5	4.7	5.1	16.3

Table 21R-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	Rabbit
	Quadrat Frequency		
2013	-	6	19
2016	-	1	35
2021	-	3	7
Year	Days Use Per Acre (ha)		
2013	-	2.0 (5.0)	-
2016	-	8.1 (19.9)	-
2021	2.2 (5.4)	2.7 (6.6)	-

Table 21R-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)	Carex (sedge)	Elymus elymoides (squirreltail)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)
year	Nested Frequency						
2013	2	40	15	1	19	3	41
2016	4	6	0	27	14	3	8
2021	2	53	67	11	61	10	17
year	Average Cover (%)						
2013	0.0	0.3	0.1	0.0	0.1	0.0	0.3
2016	0.0	0.1	0.0	0.2	0.2	0.0	0.1
2021	0.0	1.8	1.0	0.2	0.9	0.2	0.1

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

Table 21R-18.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Alyssum desertorum ^{ai} (desert madwort)	Arabis (rockcross)	Arenaria (sandwort)	Astragalus calycosus (Torrey's milkvetch)	Carduus nutans ^{ai} (nodding plumeless thistle)	Ceratocephala testiculata ^{ai} (curveseed butterwort)	Chaenactis douglasii (Douglas' dustymaiden)	Cymopterus (springparsley)	Descurainia pinnata ^a (western tansymustard)	Epilobium brachycarpum ^a (tall annual willowherb)	Erigeron eatonii (Eaton's fleabane)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Gilia inconspicua ^a (shy gilia)	Helianthus annuus ^a (common sunflower)	Ipomopsis aggregata (scarlet gilia)
year	Nested Frequency																
2013	1	2	15	1	2	-	18	5	2	6	2	3	0	10	8	-	7
2016	-	-	2	-	-	-	-	3	-	10	-	-	-	-	1	-	-
2021	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	5	-
year	Average Cover (%)																
2013	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0
2016	-	-	0.1	-	-	-	-	0.1	-	0.0	-	-	-	-	0.0	-	-
2021	-	-	-	-	-	0.1	-	-	-	-	-	-	-	-	-	0.0	-

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

FORB SPECIES	FORB SPECIES	FORB SPECIES	FORB SPECIES	FORB SPECIES	FORB SPECIES	FORB SPECIES	FORB SPECIES	FORB SPECIES	FORB SPECIES	FORB SPECIES	FORB SPECIES	FORB SPECIES	FORB SPECIES	FORB SPECIES	FORB SPECIES	FORB SPECIES	FORB SPECIES
Ipomopsis congesta (ballhead ipomopsis)	Lactuca serriola ^{ai} (prickly lettuce)	Lesquerella (bladderpod)	Linum perenne ⁱ (blue flax)	Lithospermum incisum (narrowleaf stone seed)	Machaeranthera canescens (hoary tansyaster)	Nicotiana attenuata ^a (coyote tobacco)	Orobanche fasciculata (clustered broomrape)	Packera multilobata (lobeleaf groundsel)	Pedicularis centranchera (dwarf lousewort)	Penstemon comarrhenus (dusty beardtongue)	Penstemon pachyphyllus (thickleaf beardtongue)	Phlox austromontana (mountain phlox)	Sanguisorba minor ⁱ (small burnet)	Schoenocrambe linifolia (flaxleaf plainsmustard)	Solanum triflorum ⁱ (cutleaf nightshade)	Streptanthus cordatus (heartleaf twistflower)	
year	Nested Frequency																
2013	13	-	1	-	-	3	-	1	12	2	3	3	47	-	1	-	20
2016	-	5	1	-	3	-	2	-	6	-	1	5	12	-	4	3	15
2021	-	5	-	3	-	-	-	-	2	-	3	5	33	1	-	-	-
year	Average Cover (%)																
2013	0.1	-	0.0	-	-	0.0	-	0.0	0.1	0.0	0.0	0.0	1.2	-	0.0	-	0.1
2016	-	0.0	0.0	-	0.0	-	0.0	-	0.3	-	0.1	0.3	0.1	-	0.0	0.4	0.1
2021	-	0.0	-	0.0	-	-	-	-	0.0	-	0.0	0.0	0.4	0.0	-	-	-

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

FORB SPECIES	FORB SPECIES
Tragopogon dubius ^{ai} (yellow salsify)	
year	Nested Frequency
2013	-
2016	-
2021	6
year	Average Cover (%)
2013	-
2016	-
2021	0.0

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

Table 21R-18.12 - 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)	Juniperus osteosperma ⁱ (Utah juniper)	Linanthus pungens (granite prickly phlox)	Opuntia (pricklypear)	Pinus edulis ⁱ (twoneedle pinyon)	Quercus gambelii ^p (Gambel oak)
year	Line Intercept Cover (%)						
2013	21	0.8	7	0.4	-	9.7	-
2016	19.6	-	-	-	0.1	0.2	4
2021	12.3	-	0.2	0.2	-	-	2.2
year	Quadrat Cover (%)						
2013	16.1	0.4	2.5	0.3	0.0	4.8	-
2016	12.9	-	-	-	0.3	0.9	2.8
2021	10.7	-	0.2	0.0	0.1	-	1.7

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

Table 21R-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			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia nova^p -- (black sagebrush)									
2013	6260	260	11	74	15	19	3	15	37/63
2016	6220	120	8	78	14	16	0	3	34/63
2021	6300	140	26	50	25	8	4	24	- / -
Artemisia tridentata ssp. wyomingensis^p -- (Wyoming big sagebrush)									
2013	100	40	60	40	0	0	0	0	54/61
2016	20	-	0	100	0	0	0	0	64/90
2021	20	-	0	0	100	0	0	100	- / -
Cercocarpus ledifolius^p -- (curl-leaf mountain mahogany)									
2013	-	-	-	-	-	-	-	-	89/142
2016	-	-	-	-	-	-	-	-	86/87
2021	-	-	-	-	-	-	-	-	- / -
Cercocarpus montanus^p -- (alderleaf mountain mahogany)									
2013	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	80/99
2021	-	-	-	-	-	-	-	-	- / -
Ericameria nauseosa -- (rubber rabbitbrush)									
2013	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	74/111
2021	-	-	-	-	-	-	-	-	- / -
Juniperus osteospermaⁱ -- (Utah juniper)									
2013	180	-	44	56	0	0	0	0	- / -
2016	20	-	100	0	0	0	0	0	- / -
2021	60	40	100	0	0	0	0	0	- / -
Linanthus pungens -- (granite prickly phlox)									
2013	300	-	7	93	0	0	0	7	16/26
2016	-	-	-	-	-	-	-	-	- / -
2021	20	-	0	0	100	0	0	100	- / -

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 (%)				
Opuntia -- (pricklypear)									
2013	100	-	20	80	0	0	0	0	12/19
2016	180	-	0	100	0	0	0	0	9/28
2021	120	-	0	100	0	0	0	0	- / -
Pinus edulis^t -- (twoneedle pinyon)									
2013	200	60	50	50	0	0	0	0	- / -
2016	-	60	0	0	0	0	0	0	- / -
2021	20	-	100	0	0	0	0	100	- / -
Quercus gambelii^p -- (Gambel oak)									
2013	-	-	-	-	-	-	-	-	94/85
2016	1280	240	38	63	0	31	55	0	69/63
2021	1160	-	7	91	2	0	0	2	- / -

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

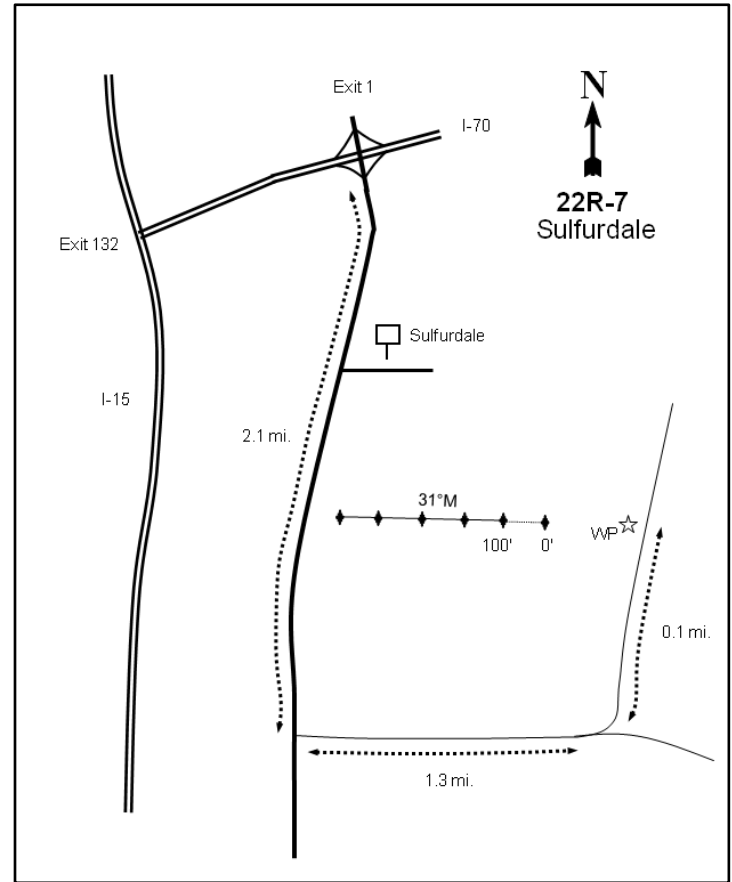
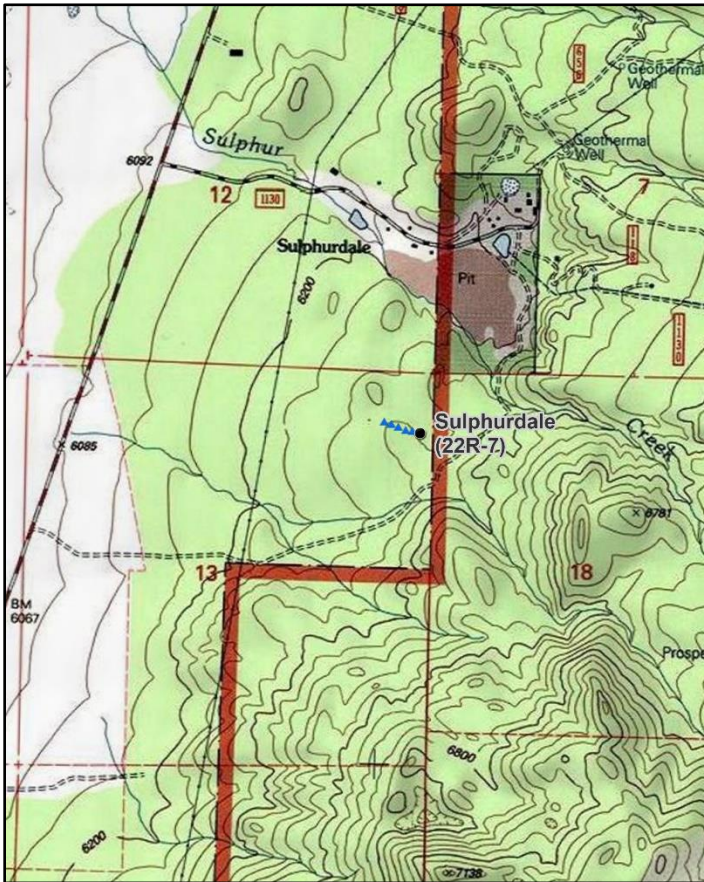
Table 21R-18.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2013	160	10	15	15	45	15	14.8
2016	14	33	50	17	-	-	4.0
2021	29	36	55	9	-	-	2.5
Pinus edulis (twoneedle pinyon)							
2013	108	6	12	35	24	24	16.3
2016	5	60	40	-	-	-	2.6
2021	3	-	67	33	-	-	4.5

Table 21R-18.15 - Deer Desirable Components Index: Upland 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
2013	27.3	10.6	6.4	1.4	0.0	3.5	0.0	49.0	Poor-Fair
2016	28.5	11.6	6.5	1.2	0.0	2.4	0.0	50.2	Poor-Fair
2021	17.6	8.6	11.4	6.4	-0.8	0.9	-2.0	42.0	Poor

SULPHURDALE - STUDY NO. 22R-7

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Cove Fort SW; Township 26S, Range 7W, Section 13
NAD 83 UTM ZONE 12, 362125 East 4268439 North

Transect Information

Browse Tag # (0' Stake)	71
Transect Bearing	274° 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

From Exit 1 off of I-70, proceed south on Highway 161 for 2.1 miles to a road on the left (east). Turn left and drive 1.3 miles to a fork. Take the left fork and drive for 0.1 miles to the witness post on the left (west) side of the road. From the witness post, walk 15 paces at 233 degrees magnetic to the 0-foot stake, marked with browse tag #71.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	PINE CREEK/INDIAN CREEK
Elevation	6,300ft (1,920m)
Aspect	West
Slope	10-15%
Sample Dates	07/11/2005, 06/26/2008, 06/03/2013, 08/02/2017, 08/10/2021

Table 22R-07.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Chain Unknown	Pine Creek Chaining	-	1983-1984	2800
Seeding - Seed Unknown	Pine Creek Chaining	-	1983-1984	2800
Hand Crew - Lop and Scatter	Sulphurdale	-	Fall 2005	-

Table 22R-07.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Pine Creek Chaining			Aerial	Sep 1983	2800
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Agropyron cristatum	Crested Wheatgrass	Nordan	2.30	0.00
G	Bromus inermis	Smooth Brome		0.77	0.00
G	Psathyrostachys juncea	Russian Wildrye		0.77	0.00
G	Thinopyrum intermedium	Pubescent Wheatgrass		0.09	0.00
G	Thinopyrum intermedium	Intermediate Wheatgrass		0.77	0.00
F	Medicago sativa	Alfalfa		1.18	0.00
F	Melilotus officinalis	Yellow Sweetclover		0.07	0.00
F	Sanguisorba minor	Small Burnett		0.25	0.00

Wildlife Habitat and Vegetation History**Table 22R-07.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

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

Table 22R-07.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2005	Juniper/Antelope Bitterbrush	Phase I transitioning to Phase II
2008	Antelope Bitterbrush/Mountain Big Sagebrush	Phase I
2013	Antelope Bitterbrush/Mountain Big Sagebrush	Phase I
2017	Antelope Bitterbrush/Mountain Big Sagebrush	Phase I
2021	Mountain Big Sagebrush/Antelope Bitterbrush	Phase I

Site Notes

The project area was chained in the 50s and 60s. Over time, pinyon and juniper encroached back into the area, reducing the forage available to the wintering mule deer and elk. Originally this area was part of the Sulphurdale PJ Thin and Seed WRI project #105, but the project was cancelled and the BLM completed the project without WRI funding. In 2008 and 2013, high pellet group abundance was estimated for deer (Table 22R-07.9).

Soils**Table 22R-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
Loam	7.0	49.4	28.4	22.2	3.6	15.2	374.4	0.7	07/11/2005

Site Potential

1981 - 2010 Average Annual Precipitation	16 inches
NRCS Ecological Site	Upland Loam (Bonneville Big Sagebrush)
NRCS Ecological Site #	R028AY310UT
States and Transitions	Current State: Community Phase 5.2

When this study site was established in 2005, the shrub and tree component was composed mainly of Utah juniper (*Juniperus osteosperma*) and antelope bitterbrush (*Purshia tridentata*) with a number of other shrubs contributing small amounts of cover (Table 22R-07.12). Annual grasses and forbs were a major part of the herbaceous component, of which cheatgrass (*Bromus tectorum*) was a substantial part (Table 22R-07.10, Table 22R-07.11). After a lop and scatter treatment (Table 22R-07.1), antelope bitterbrush and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) were the main browse species, with sagebrush increasing in both cover and density over the duration of the study. Other shrub species contributed little cover over the same period (Table 22R-07.12, Table 22R-07.13). Perennial grasses have increased in post-treatment sample years while annual grasses have decreased, although they are still prevalent in the understory (Table 22R-07.7). Tree cover decreased significantly and the remaining Utah juniper trees have become more mature following treatment (22R-07.14). The site is at a high risk for tree infilling in the future, which would likely reduce the potential for increased shrub growth and understory productivity.

Trend Summary Tables**Table 22R-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
2005	5.2	1.3	9.7	8.4	0.6	15.3
2008	8.2	1.9	0.0	9.5	2.2	-
2013	11.6	1.8	0.4	15.6	1.8	0.6
2017	11.4	1.5	0.3	17.4	1.1	-
2021	14.7	1.6	1.1	20.0	0.4	1.0

Table 22R-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
2005	283	239	371	118	7.9	7.5	5.7	3.3
2008	299	266	213	99	6.8	13.6	2.0	4.0
2013	308	302	358	133	4.2	11.8	4.3	3.4
2017	265	316	343	97	9.5	16.4	9.1	3.2
2021	237	294	110	93	3.6	10.9	0.4	1.9

Table 22R-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
2005	19.8	0.1	34.0	16.9	4.9	34.7
2008	11.8	0.1	51.5	12.5	4.4	32.2
2013	9.9	-	50.8	10.4	4.7	39.4
2017	9.7	0.1	50.0	15.7	7.6	44.5
2021	10.4	0.7	42.9	21.7	6.3	30.7

Table 22R-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	Rabbit
	Quadrat Frequency			
2005	2	19	12	59
2008	6	24	8	59
2013	-	33	7	28
2017	4	18	1	26
2021	2	28	2	19
Year	Days Use Per Acre (ha)			
2005	8.0 (19.7)	21.5 (53.0)	6.0 (14.9)	-
2008	6.5 (16.1)	57.0 (140.7)	16.8 (41.4)	-
2013	1.5 (3.6)	53.0 (130.8)	12.1 (29.8)	-
2017	5.1 (12.6)	30.8 (76.1)	12.8 (31.5)	-
2021	0.7 (1.8)	54.9 (135.7)	7.4 (18.2)	-

Table 22R-07.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency												
Achnatherum hymenoides (Indian ricegrass)	5	93	3	147	282	53	9	-	-	49	-	3	24
Agropyron cristatum ⁱ (crested wheatgrass)	0	62	-	160	299	67	-	2	-	62	2	0	42
Bromus arvensis ^{ai} (field brome)	2	55	-	216	308	46	-	4	-	70	10	-	48
Bromus inermis ⁱ (smooth brome)	1	62	-	244	265	9	-	5	-	113	10	-	16
Bromus tectorum ^{ai} (cheatgrass)	1	86	5	213	232	3	-	4	2	125	6	-	30
Elymus elymoides (squirreltail)	Average Cover (%)												
Elymus lanceolatus (thickspike wheatgrass)	0.0	1.7	0.0	3.9	7.9	0.6	0.1	-	-	0.7	-	0.0	0.4
Poa bulbosa ⁱ (bulbous bluegrass)	0.0	1.3	-	7.8	6.8	1.9	-	0.1	-	1.3	0.2	0.0	0.9
Poa fendleriana (muttongrass)	0.0	1.6	-	6.6	4.2	1.0	-	0.0	-	1.1	0.4	-	1.0
Poa secunda (Sandberg bluegrass)	0.0	1.7	-	10.4	9.5	0.1	-	0.0	-	3.3	0.4	-	0.4
Psathyrostachys juncea ⁱ (Russian wildrye)	0.0	2.3	0.0	5.7	3.6	0.2	-	0.1	0.0	2.2	0.2	-	0.3
Pseudoroegneria spicata (bluebunch wheatgrass)													
Thinopyrum intermedium ⁱ (intermediate wheatgrass)													

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

Table 22R-07.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																
Agoseris glauca (pale agoseris)	-	-	-	359	-	1	-	-	10	-	69	8	33	18	-	31	4
Allium (onion)	1	-	-	195	-	-	-	-	8	3	60	-	24	-	-	11	-
Alyssum alyssoides ^{ai} (pale madwort)	16	7	-	342	-	-	5	27	5	15	60	13	33	16	2	5	-
Alyssum desertorum ^{ai} (desert madwort)	2	-	21	328	-	-	-	-	-	-	20	7	26	9	-	10	-
Amaranthus retroflexus ^a (redroot amaranth)	-	-	36	61	1	9	-	-	6	-	8	8	5	-	-	-	-
Antennaria (pussytoes)	Average Cover (%)																
Arabis (rockcress)	-	-	-	4.4	-	0.0	-	-	0.4	-	0.6	0.0	0.3	0.4	-	0.3	0.0
Astragalus cibirarius (browse milkvetch)	0.0	-	-	1.1	-	-	-	-	0.3	0.0	0.8	-	0.7	-	-	0.1	-
Astragalus convallarius (lesser rushy milkvetch)	0.1	0.0	-	3.5	-	-	0.0	0.4	0.0	0.2	0.2	0.0	0.7	0.1	0.0	0.2	-
Astragalus newberryi (Newberry's milkvetch)	0.0	-	0.1	7.8	-	-	-	-	-	-	0.1	0.0	0.4	0.0	-	0.5	-
Ceratocephala testiculata ^{ai} (curvseed butterwort)	-	-	0.1	0.3	0.0	0.0	-	-	0.0	-	0.0	0.0	0.0	-	-	-	-
Collinsia parviflora ^a (maiden blue eyed Mary)																	
Cryptantha (cryptantha)																	
Descurainia pinnata ^a (western tansymustard)																	
Epilobium brachycarpum ^a (tall annual willowherb)																	
Eriogonum caespitosum (matted buckwheat)																	
Eriogonum umbellatum (sulphur-flower buckwheat)																	

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

FORB SPECIES																		
<i>Erodium cicutarium</i> ^{ai} (redstem stork's bill)																		
<i>Galium aparine</i> ^a (stickywilly)																		
<i>Gayophytum ramosissimum</i> ^a (pinyon groundsmoke)																		
<i>Gilia inconspicua</i> ^a (shy gilia)																		
<i>Hedysarum boreale</i> (Utah sweetvetch)																		
<i>Holosteum umbellatum</i> ^{ai} (jagged chickweed)																		
<i>Lactuca serriola</i> ^{ai} (prickly lettuce)																		
<i>Lomatium</i> (desertparsley)																		
<i>Machaeranthera canescens</i> (hoary tansyaster)																		
<i>Microsteris gracilis</i> ^a (slender phlox)																		
<i>Packera multilobata</i> (lobeleaf groundsel)																		
<i>Petradoria pumila</i> (rock goldenrod)																		
<i>Phlox austromontana</i> (mountain phlox)																		
<i>Phlox longifolia</i> (longleaf phlox)																		
<i>Polygonum douglasii</i> ^a (Douglas' knotweed)																		
<i>Sphaeralcea coccinea</i> (scarlet globemallow)																		
<i>Streptanthus cordatus</i> (heartleaf twistflower)																		
year	Nested Frequency																	
2005	-	-	4	37	8	-	2	-	3	41	2	11	83	1	3	4	-	
2008	6	-	1	-	32	-	1	1	1	-	4	4	58	-	-	1	-	
2013	7	5	-	-	8	-	10	9	-	50	-	1	60	-	-	-	3	
2017	12	6	-	-	4	-	4	-	-	4	7	2	60	3	-	2	-	
2021	1	-	-	-	-	5	-	-	-	3	-	-	73	5	1	6	1	
year	Average Cover (%)																	
2005	-	-	0.0	0.1	0.1	-	0.0	-	0.0	0.1	0.0	0.6	1.6	0.0	0.0	0.0	-	
2008	0.0	-	0.0	-	0.7	-	0.0	0.0	0.0	-	0.0	0.5	1.6	-	-	0.0	-	
2013	0.0	0.3	-	-	0.2	-	0.0	0.0	-	0.1	-	0.0	1.5	-	-	-	0.0	
2017	0.4	0.5	-	-	0.0	-	0.1	-	-	0.0	0.1	0.2	2.0	0.0	-	0.0	-	
2021	0.0	-	-	-	-	0.0	-	-	-	0.0	-	-	1.6	0.0	0.0	0.2	0.0	

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

FORB SPECIES																		
<i>Tragopogon dubius</i> ^{ai} (yellow salsify)																		
year	Nested Frequency																	
2005	-																	
2008	2																	
2013	2																	
2017	-																	
2021	-																	
year	Average Cover (%)																	
2005	-																	
2008	0.0																	
2013	0.0																	
2017	-																	
2021	-																	

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

Table 22R-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)	Chrysothamnus depressus ^p (longflower rabbitbrush)	Chrysothamnus viscidiflorus (yellow rabbitbrush)	Ericameria nauseosa (rubber rabbitbrush)	Ericameria nauseosa ssp. nauseosa var. hololeuca ^p (rubber rabbitbrush)	Ericameria parryi (Parry's rabbitbrush)	Eriogonum microthecum ^p (slender buckwheat)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma ⁱ (Utah juniper)	Opuntia (pricklypear)	Pinus edulis ⁱ (twoneedle pinyon)	Purshia tridentata ^p (antelope bitterbrush)
year	Line Intercept Cover (%)											
2005	2.5	-	-	0.5	0.3	-	-	0.1	15.2	-	0.1	5.6
2008	3.3	-	1.6	-	0.7	-	-	0.6	-	-	-	5.5
2013	6.8	-	0.4	-	0.6	-	-	1.3	0.6	0.1	-	8.2
2017	8.3	-	-	-	0.3	-	-	1.1	-	-	-	8.8
2021	10.3	-	-	0.3	0.5	-	-	0.1	1	-	-	9.2
year	Quadrat Cover (%)											
2005	2.1	-	-	0.8	0.0	-	-	0.5	9.7	-	0.0	3.1
2008	3.2	-	1.5	-	0.9	-	-	0.4	0.0	0.0	-	4.1
2013	6.9	0.0	0.8	-	1.0	-	0.0	0.9	0.4	0.0	-	3.7
2017	5.4	0.2	0.2	-	0.1	-	-	1.3	0.3	-	-	5.8
2021	8.1	-	-	0.9	0.2	0.1	-	0.5	1.1	-	-	6.4

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

Table 22R-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			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
2005	860	100	30	65	5	40	0	2	73/100
2008	740	160	35	62	3	24	8	5	62/91
2013	940	20	32	66	2	6	0	0	55/90
2017	940	40	15	83	2	40	6	9	58/95
2021	1180	-	20	75	5	10	31	3	- / -
Chrysothamnus depressus^p -- (longflower rabbitbrush)									
2005	-	-	-	-	-	-	-	-	- / -
2008	-	-	-	-	-	-	-	-	- / -
2013	20	-	0	100	0	0	0	0	25/49
2017	120	-	0	100	0	0	0	0	13/27
2021	-	-	-	-	-	-	-	-	- / -
Chrysothamnus viscidiflorus -- (yellow rabbitbrush)									
2005	-	-	-	-	-	-	-	-	- / -
2008	200	-	0	100	0	40	40	0	43/77
2013	40	-	0	100	0	0	0	0	47/87
2017	120	-	0	100	0	0	0	0	66/105
2021	-	-	-	-	-	-	-	-	- / -
Eriogonum microthecum^p -- (slender buckwheat)									
2005	-	-	-	-	-	-	-	-	- / -
2008	-	-	-	-	-	-	-	-	- / -
2013	20	-	100	0	0	0	0	0	4/13
2017	140	-	0	100	0	0	0	0	22/45
2021	-	-	-	-	-	-	-	-	- / -

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 (%)				
Ericameria nauseosa -- (rubber rabbitbrush)									
2005	140	-	0	100	0	0	0	0	67/89
2008	20	-	100	0	0	100	0	0	100/88
2013	20	-	0	100	0	0	0	0	49/78
2017	-	-	-	-	-	-	-	-	70/91
2021	220	-	9	82	9	46	0	9	- / -
Ericameria nauseosa ssp. nauseosa var. hololeuca^p -- (rubber rabbitbrush)									
2005	40	20	0	100	0	0	0	0	62/84
2008	60	40	0	100	0	33	33	0	67/91
2013	20	-	0	100	0	0	0	0	62/81
2017	40	-	0	50	50	50	0	0	66/86
2021	280	-	57	36	7	0	71	7	- / -
Ericameria parryi -- (Parry's rabbitbrush)									
2005	-	-	-	-	-	-	-	-	- / -
2008	-	-	-	-	-	-	-	-	- / -
2013	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	- / -
2021	40	-	0	100	0	0	100	0	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
2005	620	-	7	94	0	0	0	0	25/25
2008	720	20	8	89	3	0	0	3	32/41
2013	1120	-	34	66	0	0	0	0	22/30
2017	1700	-	29	71	0	0	0	0	21/27
2021	240	-	8	58	33	0	0	33	- / -
Juniperus osteosperma¹ -- (Utah juniper)									
2005	400	-	30	70	0	0	0	0	- / -
2008	20	40	100	0	0	0	0	0	- / -
2013	40	-	100	0	0	0	0	0	- / -
2017	20	-	0	100	0	0	0	0	- / -
2021	40	-	100	0	0	0	0	0	- / -
Linanthus pungens -- (granite prickly phlox)									
2005	-	-	-	-	-	-	-	-	19/17
2008	-	-	-	-	-	-	-	-	- / -
2013	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	- / -
2021	-	-	-	-	-	-	-	-	- / -
Opuntia -- (pricklypear)									
2005	80	-	0	100	0	0	0	0	13/28
2008	60	-	0	100	0	0	0	0	19/28
2013	20	-	0	100	0	0	0	0	11/18
2017	-	-	-	-	-	-	-	-	11/26
2021	-	-	-	-	-	-	-	-	- / -
Pinus edulis¹ -- (twoneedle pinyon)									
2005	40	20	100	0	0	0	0	0	- / -
2008	-	-	-	-	-	-	-	-	- / -
2013	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	- / -
2021	-	-	-	-	-	-	-	-	- / -
Purshia tridentata^p -- (antelope bitterbrush)									
2005	400	-	15	80	5	20	65	0	75/148
2008	360	-	17	78	6	6	50	6	93/175
2013	360	60	28	72	0	28	11	6	84/150
2017	620	-	19	77	3	26	52	7	84/164
2021	540	-	11	59	30	15	33	37	- / -

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 (%)				
Quercus gambelii^p -- (Gambel oak)									
2005	-	-	-	-	-	-	-	-	-/-
2008	-	-	-	-	-	-	-	-	74/45
2013	-	-	-	-	-	-	-	-	104/107
2017	-	-	-	-	-	-	-	-	63/57

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

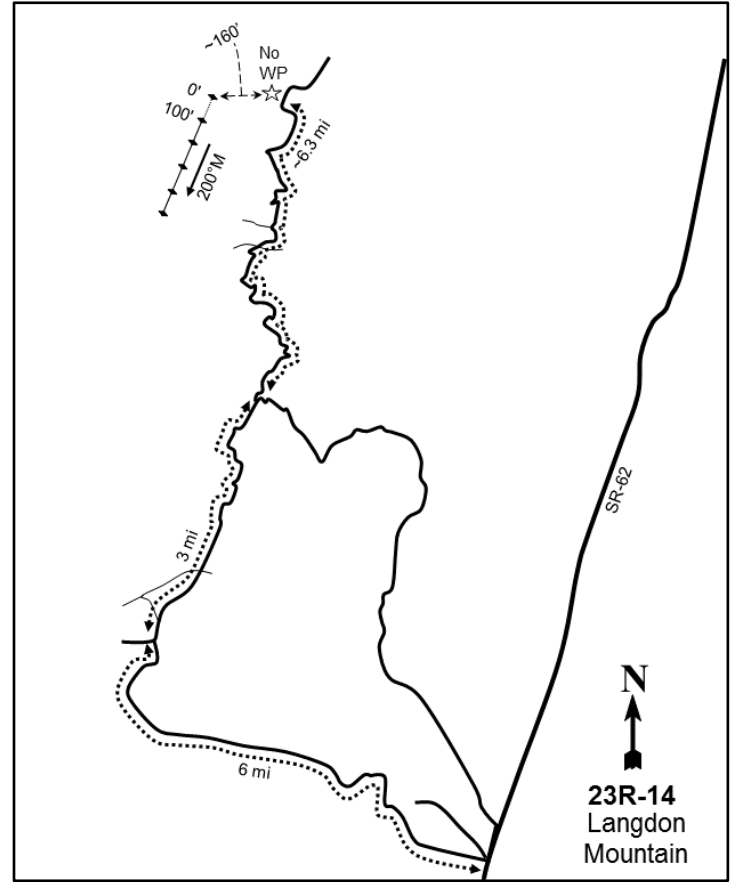
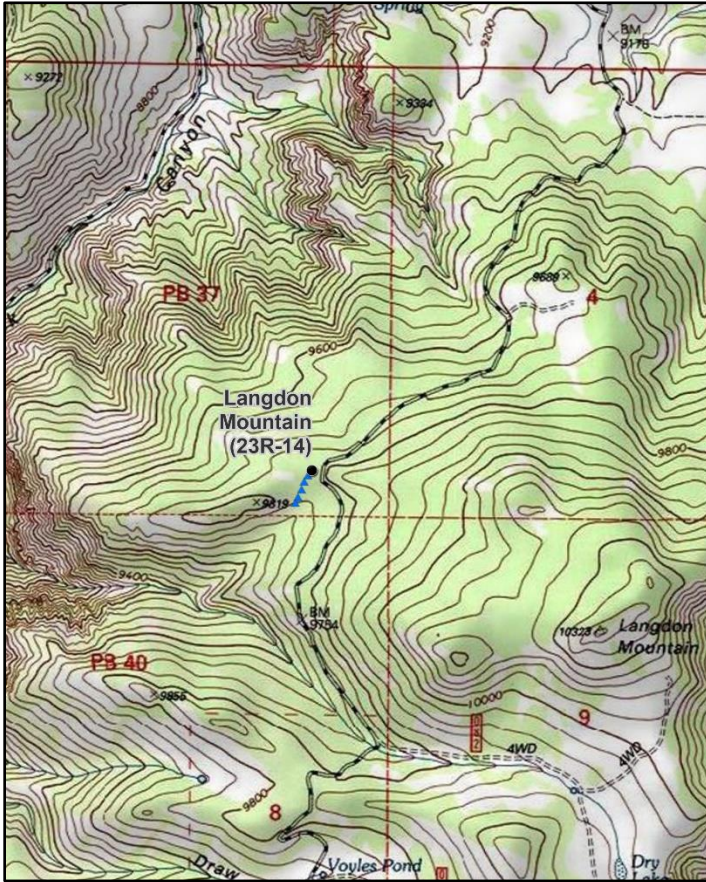
Table 22R-07.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2008	20	33	67	-	-	-	4.2
2013	24	-	64	36	-	-	3.5
2017	24	8	83	8	-	-	5.2
2021	28	14	36	50	-	-	6.1
Pinus edulis (twoneedle pinyon)							
2017	1	100	-	-	-	-	2.0
2021	2	-	100	-	-	-	3.5

Table 22R-07.15 - Deer Desirable Components Index: Upland 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
2005	11.9	13.6	9.5	15.0	-6.0	6.6	0.0	50.6	Poor-Fair
2008	13.3	13.7	10.9	26.9	-5.1	8.1	0.0	67.8	Good
2013	21.6	14.7	14.3	23.5	-3.2	6.9	0.0	77.7	Good
2017	24.0	14.0	8.5	30.0	-7.1	6.5	0.0	75.7	Good
2021	27.3	10.1	8.5	21.7	-2.7	3.8	0.0	68.7	Good

LANGDON MOUNTAIN - STUDY NO. 23R-14

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Marysville Peak SE; Township 28S, Range 2W, Section 37
NAD 83 UTM ZONE 12, 409800 East 4250349 North

Transect Information

Browse Tag # (0' Stake)	233
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

Traveling south on State Route 62, turn right (east) onto Pole Canyon Road. Continue on this road for 6 miles to a "T" junction, then turn right (north) onto Forshea Monroe Mountain Road. Proceed for 3 miles to a fork and stay left to continue onto Langdon Monroe Mountain Road (the right fork, Rock Canyon Road, leads back to SR-62). Travel for about 6.3 miles and park. The transect is about 160 feet west of the road.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	Dry Lake Allotment
Elevation	No data
Aspect	Southeast
Slope	2-10%
Sample Dates	07/30/2018, 08/23/2021

Table 23R-14.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Prescribed Fire - Prescribed	South Monroe Rx	4777	January 2019	13114

Wildlife Habitat and Vegetation History**Table 23R-14.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

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

Table 23R-14.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2018	Quaking Aspen-Conifer Encroached	NA
2021	Quaking Aspen	NA

Site Notes

No Notes

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.

This study site was established in 2018 and was dominated by subalpine fir (*Abies lasiocarpa*) with a lesser component of quaking aspen (*Populus tremuloides*); other tree and shrub species were rare (Table 23R-14.12, Table 23R-14.13, Table 23R-14.13a, Table 23R-14.14). The herbaceous understory was abundant and diverse, with native perennial forbs contributing most of the cover (Table 23R-14.7, Table 23R-14.11). Following the controlled burn (Table 23R-14.1), reductions in cover and density for subalpine fir and quaking aspen were observed. Despite aspen also exhibiting a decrease in cover, density of aspen increased significantly among the seedling and young age classes (Table 23R-14.12, Table 23R-14.13, Table 23R-14.13a). The herbaceous understory remained abundant and diverse, but there were no notable increases of any particular species (Table 23R-14.10, Table 23R-14.11). Without excessive herbivory or active encroachment by conifer, it is expected that aspen will continue to rejuvenate as a key species within the community.

Trend Summary Tables**Table 23R-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
2018	0.8	4.6	34.6	0.8	3.6	109.0
2021	1.0	1.3	10.9	1.2	2.7	37.5

Table 23R-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
2018	-	114	3	214	-	4.2	0.0	16.9
2021	-	53	1	109	-	0.7	0.2	8.1

Table 23R-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
2018	0.3	0.2	90.0	-	0.0	52.7
2021	15.7	0.1	66.5	0.1	1.0	21.0

Table 23R-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		
2018	-	1	-
2021	1	1	3
Year	Days Use Per Acre (ha)		
2018	0.7 (1.8)	11.4 (28.1)	6.0 (14.9)
2021	2.2 (5.4)	1.3 (3.3)	8.1 (19.9)

Table 23R-14.10 - 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 rossii (Ross' sedge)									
Deschampsia cespitosa (tufted hairgrass)									
Elymus trachycaulus (slender wheatgrass)									
Hesperostipa comata (needle and thread)									
Poa secunda (Sandberg bluegrass)									
year	Nested Frequency								
2018	0	23	-	78	41	7	9	8	7
2021	12	5	9	23	10	-	-	-	-
year	Average Cover (%)								
2018	0.0	0.5	-	2.4	0.6	0.1	0.1	0.6	0.1
2021	0.0	0.1	0.2	0.2	0.2	-	-	-	-

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

Table 23R-14.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES																	
Achillea millefolium (Common yarrow)																	
Agoseris glauca (pale agoseris)																	
Antennaria microphylla (littleleaf pussytoes)																	
Aquilegia coerulea (Colorado blue columbine)																	
Arabis (rockcross)																	
Astragalus miser (timber milkvetch)																	
Chenopodium fremontii ^a (Fremont's goosefoot)																	
Collomia linearis ^a (tiny trumpet)																	
Fragaria virginiana (Virginia strawberry)																	
Helianthus multiflorus (showy goldeneye)																	
Lupinus argenteus (silvery lupine)																	
Maianthemum (mayflower)																	
Osmorhiza depauperata (bluntseed sweetroot)																	
Phacelia sericea ^a (silky phacelia)																	
Potentilla gracilis (slender cinquefoil)																	
Pseudocymopterus montanus (alpine false springparsley)																	
Senecio (ragwort)																	
year	Nested Frequency																
2018	86	1	16	3	3	82	-	3	36	7	44	83	33	-	8	9	50
2021	20	-	-	5	2	39	0	-	9	0	40	12	8	1	2	0	3
year	Average Cover (%)																
2018	1.8	0.0	0.6	0.1	0.0	2.6	-	0.0	0.8	0.1	3.1	2.0	1.1	-	0.1	0.4	1.2
2021	0.8	-	-	0.2	0.0	1.0	0.0	-	0.2	0.0	4.4	0.1	0.2	0.1	0.2	0.0	0.0

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

FORB SPECIES	Silene drummondii (Drummond's campion)	Symphoricarichum ascendens (western aster)	Taraxacum officinale (common dandelion)	Trifolium longipes (longstalk clover)
year	Nested Frequency			
2018	2	4	57	36
2021	-	12	44	-
year	Average Cover (%)			
2018	0.0	0.3	1.9	0.7
2021	-	0.1	1.0	-

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

Table 23R-14.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Abies lasiocarpa ^a (subalpine fir)	Juniperus communis (common juniper)	Mahonia repens (creeping barberry)	Populus tremuloides ^a (quaking aspen)	Pseudotsuga menziesii ^a (Douglas-fir)	Rosa woodsii ^p (Woods' rose)	Symphoricarpos oreophilus ^p (mountain snowberry)
year	Line Intercept Cover (%)						
2018	62.4	3.6	-	44.6	2	0.2	0.6
2021	6.3	-	2.7	28.7	2.5	0.7	0.5
year	Quadrat Cover (%)						
2018	32.0	4.6	-	2.6	0.0	0.2	0.6
2021	1.5	-	1.3	8.7	0.8	0.7	0.3

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

Table 23R-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			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Abies lasiocarpa^a -- (subalpine fir)									
2018	3120	940	81	19	1	0	0	10	- / -
2021	320	-	63	13	25	0	0	50	- / -
Juniperus communis -- (common juniper)									
2018	200	-	20	80	0	0	0	0	69/113
2021	-	-	-	-	-	-	-	-	- / -
Mahonia repens -- (creeping barberry)									
2018	40	-	0	100	0	0	0	0	11/18
2021	1880	-	0	99	1	0	0	1	- / -
Pseudotsuga menziesii^a -- (Douglas-fir)									
2018	20	-	0	100	0	0	0	0	- / -
2021	40	-	50	50	0	0	0	50	- / -

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 (%)				
Rosa woodsii ^p -- (Woods' rose)									
2018	320	-	25	75	0	6	0	0	35/21
2021	840	-	36	64	0	0	0	0	- / -
Symphoricarpos oreophilus ^p -- (mountain snowberry)									
2018	320	20	19	81	0	0	0	0	60/63
2021	340	-	53	47	0	0	6	0	- / -

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

Table 23R-14.13a - Aspen Characteristics. Characteristics of aspen populations including density, size class distribution, and vigor of plants.

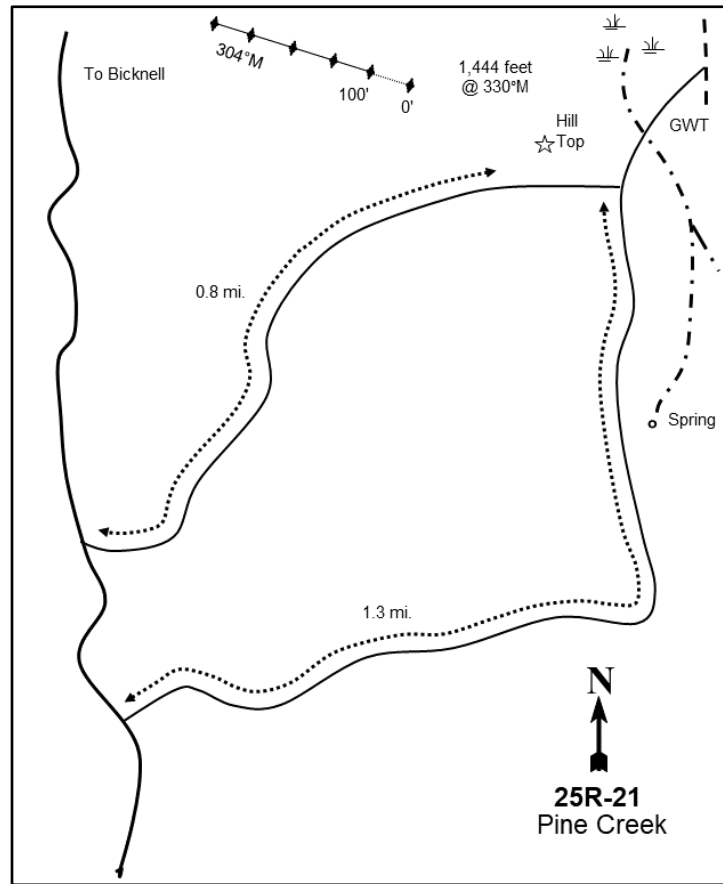
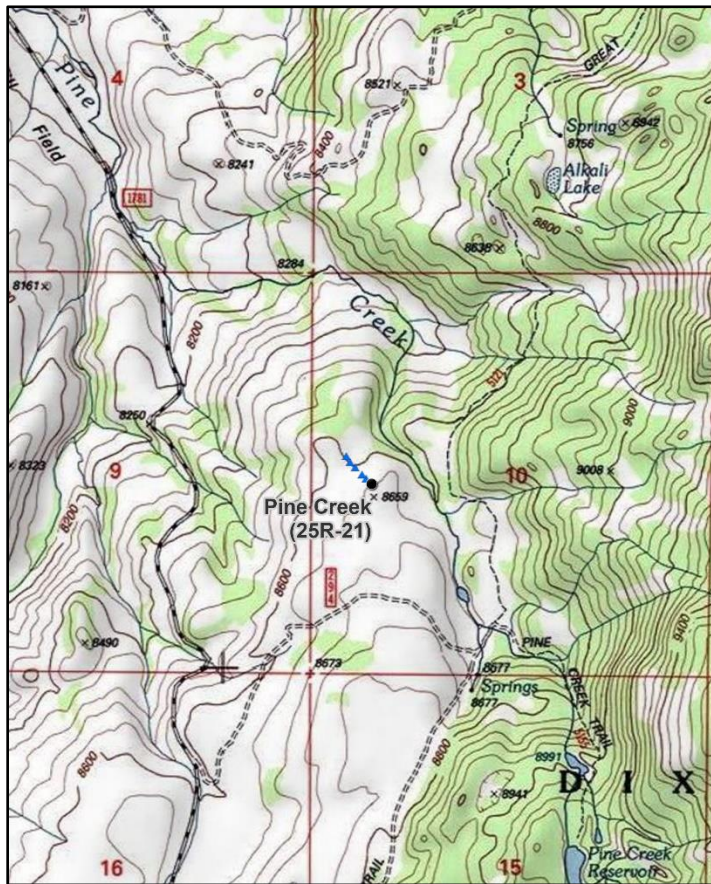
Year	Density	Size Class Distribution				Utilization		Poor Vigor (%)
	Plants per Acre	Class I (%)	Class II (%)	Class III (%)	Class IV (%)	Moderate (%)	Heavy (%)	
Populus tremuloides (quaking aspen)								
2018	2260	19	66	-	15	16	0	17
2021	6040	47	47	2	4	2	2	3

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 23R-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' (%)	
Abies lasiocarpa (subalpine fir)							
2018	1253	15	35	25	5	20	5.3
2021	119	-	31	31	8	31	8.4
Populus tremuloides (quaking aspen)							
2018	1684	25	25	5	-	45	9.9
2021	6093	40	55	5	-	-	1.1

PINE CREEK - STUDY NO. 25R-21



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Government Point NW; Township 30S, Range 3E, Section 10
NAD 83 UTM ZONE 12, 449464 East 4229836 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

Not Available
304° magnetic
500ft
Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
No Stakes or Rebar

Directions to Site

From the intersection of State Route 24 and Hatchery Road just south of the town of Bicknell, travel 6.7 miles along Hatchery Road until the road turns into Smooth Knoll Road and stay left (south). Travel for approximately 1.3 miles and stay left onto Pine Creek Road. Drive for another 5.1 miles along Pine Creek Road to a jeep trail (Great Western OHV Alt/Pine Creek Reservoir Road) on the left; turn left (east) and drive another 1.3 miles to where Pine Creek crosses the road. Turn left (west) before the creek crossing and park on top of the hill. Use the GPS to find the original stake locations.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	Dark Valley Common Use
Elevation	8,659ft (2,639m)
Aspect	Northwest
Slope	5-15%
Sample Dates	08/25/2021

Table 25R-21.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Mechanical - Bullhog	Government Creek Improvement Phase II (Proposed)	5533	Fall 2021	2097

Wildlife Habitat and Vegetation History**Table 25R-21.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

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

Table 25R-21.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2021	Pinyon	Phase II

Site Notes

No Notes

Site Potential

1981 - 2010 Average Annual Precipitation	17 inches
NRCS Ecological Site	Mountain Stony Loam (Black Sagebrush)
NRCS Ecological Site #	R048AY449UT
States and Transitions	No state and transition model is available for this ecological site.

At the time of study establishment in 2021, the vegetation on this site existed as a black sagebrush (*Artemisia nova*) plant community in Phase II of woodland succession, being encroached mainly by twoneedle pinyon (*Pinus edulis*) (Table 25R-21.4, Table 25R-21.12, Table 25R-21.14). Perennial grasses were present in moderate amounts, with blue grama (*Bouteloua gracilis*) contributing a majority of the cover within the grass community (Table 25R-21.10). Perennial forbs were rare, yet the community was diverse (Table 25R-21.11). The browse component was dominated by mature black sagebrush with many individuals in the population displaying poor vigor (Table 25R-21.12, Table 25R-21.13). The upcoming bullhog treatment (Table 25R-21.1) is expected to reduce tree cover and will likely allow for increased sagebrush cover and improved vigor.

Trend Summary Tables**Table 25R-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
2021	7.2	1.3	16.4	9.5	2.3	35.0

Table 25R-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
2021	-	217	83	63	-	4.1	0.3	0.4

Table 25R-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
2021	15.6	1.8	48.4	6.9	18.7	29.0

Table 25R-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	Mule Deer	Rocky Mountain Elk	Rabbit
	2021	3	11	-
Year	Days Use Per Acre (ha)			
2021	4.4 (10.8)	8.1 (19.9)	2.0 (5.0)	-

Table 25R-21.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency						
Achnatherum hymenoides (Indian ricegrass)	3	26	110	79	19	51	6
Achnatherum lettermanii (Letterman's needlegrass)							
Bouteloua gracilis (blue grama)							
Carex obtusata (obtuse sedge)							
Elymus elymoides (squirreltail)							
Pascopyrum smithii (western wheatgrass)							
Poa fendleriana (muttongrass)							
year	Average Cover (%)						
2021	0.0	0.5	2.5	0.4	0.2	0.1	0.3

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

Table 25R-21.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency															
Androsace septentrionalis ^a (pygmyflower rockjasmine)	42	10	1	3	2	5	48	10	2	3	4	3	6	16	17	1
Antennaria parvifolia (small-leaf pussytoes)																
Astragalus argophyllus (silverleaf milkvetch)																
Astragalus beckwithii (Beckwith's milkvetch)																
Cirsium (thistle)																
Cryptantha (cryptantha)																
Descurainia incana ^a (mountain tansymustard)																
Erigeron aphanactis ^a (rayless shaggy fleabane)																
Eriogonum racemosum (redroot buckwheat)																
Hymenoxys richardsonii (pingue rubberweed)																
Packera multilobata (lobeleaf groundsel)																
Penstemon (beardtongue)																
Penstemon pachyphyllus (thickleaf beardtongue)																
Petradonia pumila (rock goldenrod)																
Phlox longifolia (longleaf phlox)																
Sphaeralcea coccinea (scarlet globemallow)																
year	Average Cover (%)															
2021	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0

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

Table 25R-21.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)											
Artemisia nova ^p (black sagebrush)	9	0.6	-	0.6	1.4	0.7	-	30	3.6	0.5	-	0.4
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus												
Echinocereus engelmannii (Engelmann's hedgehog cactus)												
Ericameria nauseosa (rubber rabbitbrush)												
Juniperus scopulorum ⁱ (Rocky Mountain juniper)												
Linanthus pungens (granite prickly phlox)												
Pediocactus simpsonii (mountain ball cactus)												
Pinus edulis ⁱ (twoneedle pinyon)												
Pinus ponderosa ⁱ (ponderosa pine)												
Purshia tridentata ^p (antelope bitterbrush)												
Tetradymia canescens (spineless horsebrush)												
Yucca baccata (banana yucca)												
year	Quadrat Cover (%)											
2021	7.2	0.2	0.0	0.2	0.3	0.5	0.0	15.8	0.3	0.0	0.1	0.2

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

Table 25R-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.

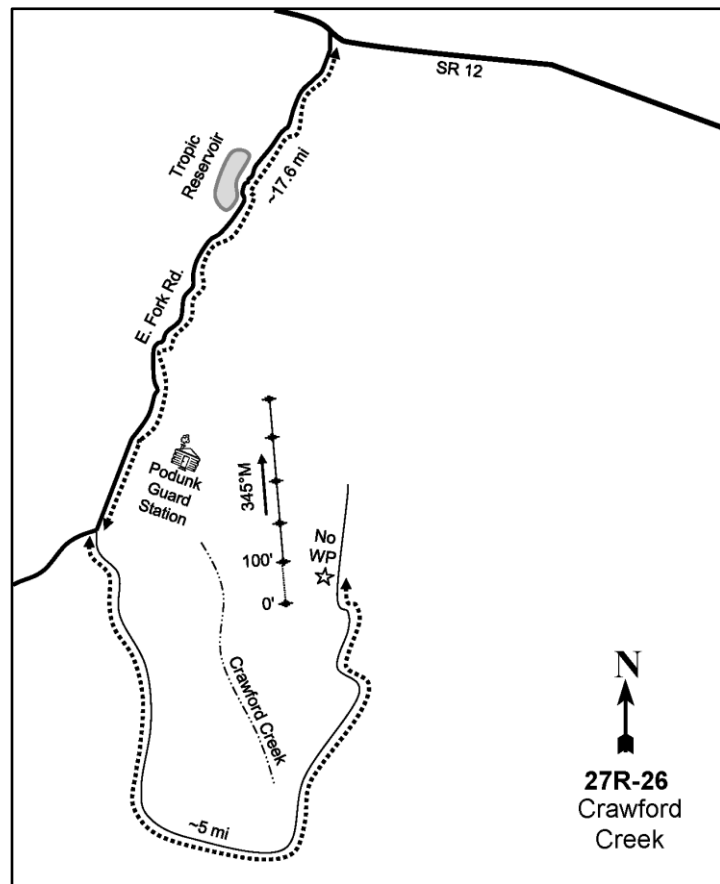
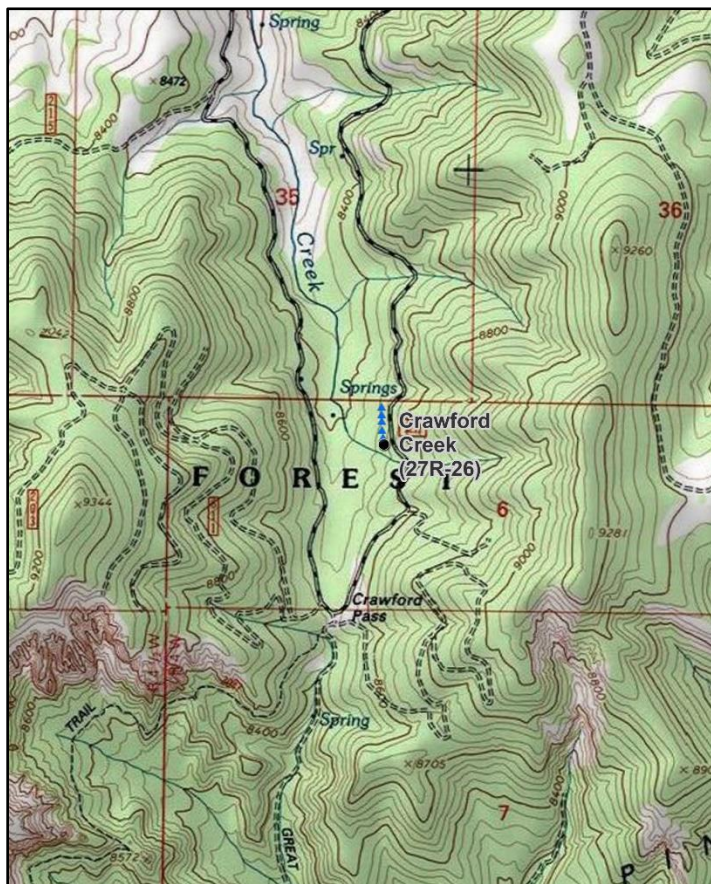
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia nova^P -- (black sagebrush)									
2021	6020	-	12	46	43	2	0	47	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
2021	860	-	5	58	37	0	0	47	- / -
Echinocereus engelmannii -- (Engelmann's hedgehog cactus)									
2021	20	-	0	100	0	0	0	0	- / -
Eriogonum microthecum^P -- (slender buckwheat)									
2021	20	-	0	100	0	0	0	0	- / -
Ericameria nauseosa -- (rubber rabbitbrush)									
2021	260	-	23	54	23	8	0	39	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
2021	140	-	14	71	14	0	0	14	- / -
Juniperus scopulorum^t -- (Rocky Mountain juniper)									
2021	20	-	0	100	0	0	0	100	- / -
Linanthus pungens -- (granite prickly phlox)									
2021	1200	-	0	85	15	0	0	17	- / -
Pediocactus simpsonii -- (mountain ball cactus)									
2021	160	-	63	38	0	0	0	0	- / -
Pinus edulis^t -- (twoneedle pinyon)									
2021	260	120	46	54	0	8	0	23	- / -
Pinus ponderosa^t -- (ponderosa pine)									
2021	40	-	0	100	0	0	0	50	- / -
Purshia tridentata^P -- (antelope bitterbrush)									
2021	100	-	40	40	20	20	20	60	- / -
Tetradymia canescens -- (spineless horsebrush)									
2021	20	-	0	0	100	0	0	100	- / -
Yucca baccata -- (banana yucca)									
2021	260	-	23	77	0	0	0	0	- / -

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

Table 25R-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' (%)	
Juniperus osteosperma (Utah juniper)							
2021	1	-	-	-	100	-	11.0
Juniperus scopulorum (Rocky Mountain juniper)							
2021	10	-	20	60	20	-	8.2
Pinus edulis (twoneedle pinyon)							
2021	365	21	26	11	21	21	12.2
Pinus ponderosa (ponderosa pine)							
2021	1	-	-	-	-	100	43.0

CRAWFORD CREEK - STUDY NO. 27R-26

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Podunk Creek NE; Township 39S, Range 4W, Section 06
NAD 83 UTM ZONE 12, 385359 East 4145391 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

564
350° magnetic
500ft
Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Standard

Directions to Site

From State Route 12, turn right onto East Fork Road and drive about 17.6 miles, passing Tropic Reservoir and the Podunk Guard Station, to a fork in the road. Turn left and proceed for about 5 miles. Park on the shoulder of the road and walk down the small slope into the flat and enclosure near Crawford Creek. There is no witness post. Navigate to the site using a GPS.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	East Fork/Crawford
Elevation	8,503ft (2,592m)
Aspect	West
Slope	9-12%
Sample Dates	08/24/2016, 07/29/2021

Table 27R-26.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Logging - Selective	Paunsaugut Boreal Toad Habitat Improvement Project	3631	2016-2019	28

Wildlife Habitat and Vegetation History**Table 27R-26.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

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

Table 27R-26.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2016	Quaking Aspen-Conifer Encroached	NA
2021	Quaking Aspen-Conifer Encroached	NA

Site Notes

In 2021, the study site was shifted approximately 75 feet north of it's original position to fit within the new enclosure.

Site Potential

1981 - 2010 Average Annual Precipitation	25 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.

This site was dominated by quaking aspen (*Populus tremuloides*) and conifers when it was established in 2016, with a few shrub species providing much less cover than trees (Table 27R-26.12). The understory was depauperate in both species diversity and abundance, and most herbaceous cover was provided by perennial forbs (Table 27R-26.7, Table 27R-26.11). Following a selective logging treatment (Table 27R-26.1), quaking aspen rebounded with an increase in density comprised mainly of young trees (Table 27R-26.13a, 27R-26.14). Diversity increased in the herbaceous understory, yet no one species was particularly abundant (Table 27R-26.10, Table 27R-26.11). Without excessive herbivory and continued conifer encroachment, it is expected that aspen will increase in density and vigor and become the key species in the community. Although present in lesser amounts, however, conifers were still observed in 2021 (Photos, Table 27R-26.14); this indicates that there may be potential for infilling in the future.

Trend Summary Tables**Table 27R-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
2016	1.4	7.4	16.4	1.5	11.0	70.9
2021	3.0	7.4	20.9	1.6	7.8	40.1

Table 27R-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
2016	-	83	-	88	-	1.3	-	3.3
2021	-	91	45	125	-	3.4	0.8	5.0

Table 27R-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
2016	3.0	0.2	84.5	1.1	0.2	29.5
2021	3.1	0.3	73.7	1.7	1.2	38.5

Table 27R-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	Rabbit
	Quadrat Frequency		
2016	-	2	-
2021	-	1	2
Year	Days Use Per Acre (ha)		
2016	1.5 (3.6)	4.0 (9.9)	-
2021	-	0.7 (1.7)	-

Table 27R-26.10 - 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 porteri (Porter brome)	Carex rossii (Ross' sedge)	Elymus elymoides (squirreltail)	Elymus trachycaulus (slender wheatgrass)	Festuca thurberi (Thurber's fescue)	Poa fendleriana (muttongrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Thinopyrum intermedium ⁱ (intermediate wheatgrass)
year	Nested Frequency										
2016	6	2	10	16	49	6	-	-	0	18	3
2021	16	10	8	2	18	2	7	14	16	8	2
year	Average Cover (%)										
2016	0.0	0.0	0.4	0.1	0.6	0.1	-	-	0.0	0.1	0.0
2021	0.6	0.5	0.2	0.1	0.1	0.3	0.6	0.4	0.5	0.2	0.0

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

Table 27R-26.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Antennaria parvifolia (small-leaf pussytoes)	Astragalus (milkvetch)	Astragalus miser var. oblongifolius (timber milkvetch)	Chenopodium album ^a (lambsquarters)	Cirsium wheeleri (Wheeler's thistle)	Cryptantha (cryptantha)	Erigeron flagellaris (trailing fleabane)	Fragaria (strawberry)	Lactuca scariola ^{ai} (prickly lettuce)	Ligusticum porteri (Porter's licorice-root)	Lotus utahensis (Utah bird's-foot trefoil)	Maianthemum (mayflower)	Orogenia linearifolia (Great Basin Indian potato)	Packera multilobata (lobeleaf groundsel)	Penstemon (beardtongue)	Phlox austromontana (mountain phlox)
year	Nested Frequency																
2016	-	18	-	5	-	4	-	43	-	-	0	5	8	-	17	-	1
2021	28	14	11	24	31	-	6	13	3	11	-	8	2	17	14	1	5
year	Average Cover (%)																
2016	-	0.6	-	0.1	-	0.2	-	1.6	-	-	0.0	0.0	0.3	-	0.1	-	0.0
2021	0.9	0.5	0.2	0.7	0.6	-	0.1	0.2	0.2	0.1	-	0.1	0.0	0.0	0.4	0.0	0.4

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

FORB SPECIES	Polygonum douglasii ^a (Douglas' knotweed)	Potentilla gracilis (slender cinquefoil)	Silene drummondii (Drummond's campion)	Symphotrichum (aster)	Taraxacum officinale (common dandelion)	Thalictrum fendleri (Fendler's meadow-rue)	Trifolium (clover)	Vicia americana (American vetch)
year	Nested Frequency							
2016	-	-	2	-	3	-	-	15
2021	8	10	0	1	30	4	1	16
year	Average Cover (%)							
2016	-	-	0.0	-	0.0	-	-	0.3
2021	0.1	0.1	0.0	0.0	1.1	0.0	0.0	0.3

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

Table 27R-26.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Abies lasiocarpa ^t (subalpine fir)	Amelanchier utahensis ^p (Utah serviceberry)	Arctostaphylos (manzanita)	Ceanothus fendleri (Fendler's ceanothus)	Juniperus communis (common juniper)	Mahonia repens (creeping barberry)	Paxistima myrsinites (Oregon boxleaf)	Picea engelmannii ^t (Engelmann spruce)	Pinus ponderosa ^t (ponderosa pine)	Populus tremuloides ^t (quaking aspen)	Pseudotsuga menziesii ^t (Douglas-fir)	Rosa woodsii ^p (Woods' rose)	Symphoricarpos oreophilus ^p (mountain snowberry)
year	Line Intercept Cover (%)												
2016	35.5	-	1.3	-	6	2.1	1.6	1.4	0.4	18.6	15	0	1.5
2021	16.9	-	0.7	0.9	5.2	0.9	0.1	0.3	1	19.1	2.8	0.3	1.3
year	Quadrat Cover (%)												
2016	10.5	0.0	0.1	-	3.4	3.1	0.7	0.6	0.0	1.4	3.9	0.2	1.1
2021	6.8	-	0.6	0.2	3.9	2.4	0.3	0.2	0.6	12.9	0.5	0.3	2.7

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

Table 27R-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			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Abies lasiocarpa^t -- (subalpine fir)									
2016	1400	340	47	53	0	3	0	1	- / -
2021	1680	40	52	46	1	0	0	2	- / -
Amelanchier utahensis^p -- (Utah serviceberry)									
2016	100	-	80	20	0	20	0	0	29/49
2021	-	-	-	-	-	-	-	-	- / -
Arctostaphylos -- (manzanita)									
2016	120	-	17	83	0	0	0	0	74/144
2021	60	-	33	67	0	0	0	0	- / -
Ceanothus fendleri -- (Fendler's ceanothus)									
2016	-	-	-	-	-	-	-	-	27/80
2021	140	-	57	43	0	0	0	0	- / -

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 (%)				
Juniperus communis -- (common juniper)									
2016	680	-	0	97	3	0	0	3	63/143
2021	540	-	4	93	4	0	0	4	- / -
Mahonia repens -- (creeping barberry)									
2016	8000	60	4	96	0	0	0	0	14/18
2021	7640	-	4	96	0	1	0	0	- / -
Paxistima myrsinites -- (Oregon boxleaf)									
2016	1400	20	9	91	0	0	0	0	16/19
2021	980	20	0	100	0	0	0	0	- / -
Picea engelmannii^t -- (Engelmann spruce)									
2016	-	-	-	-	-	-	-	-	- / -
2021	60	-	67	0	33	0	0	33	- / -
Pinus ponderosa^t -- (ponderosa pine)									
2016	20	-	0	100	0	0	0	0	- / -
2021	40	-	100	0	0	0	0	0	- / -
Pseudotsuga menziesii^t -- (Douglas-fir)									
2016	100	-	20	80	0	0	0	40	- / -
2021	380	20	63	32	5	0	0	11	- / -
Ribes^p -- (currant)									
2016	20	-	0	100	0	100	0	0	87/47
2021	-	-	-	-	-	-	-	-	- / -
Rosa woodsii^p -- (Woods' rose)									
2016	420	-	48	52	0	5	29	0	29/23
2021	160	-	13	88	0	25	0	0	- / -
Symphoricarpos oreophilus^p -- (mountain snowberry)									
2016	1140	-	23	77	0	4	7	4	27/41
2021	1400	20	6	94	0	0	0	0	- / -

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

Table 27R-26.13a - Aspen Characteristics. Characteristics of aspen populations including density, size class distribution, and vigor of plants.

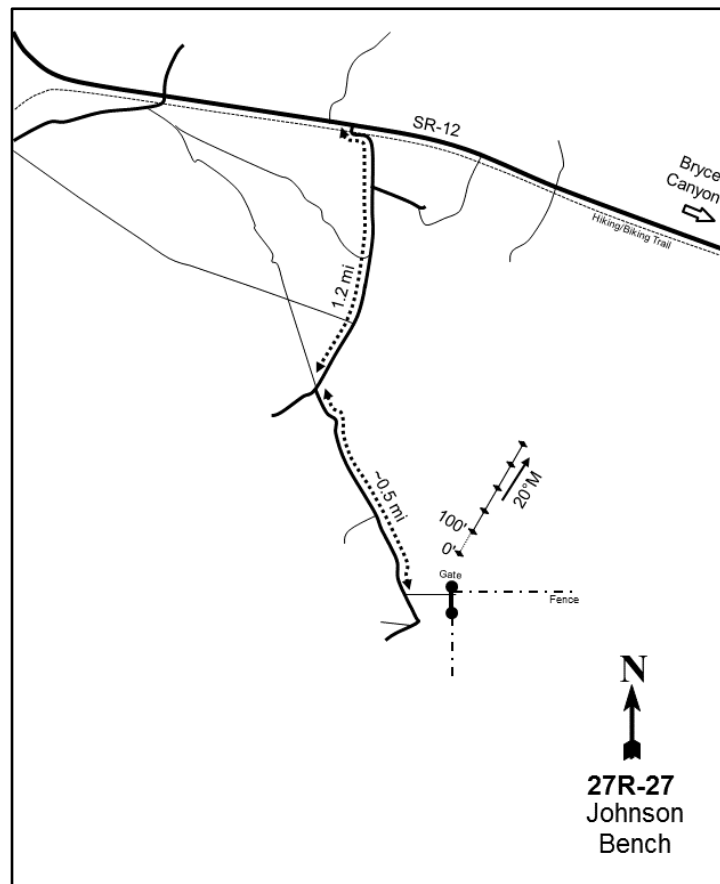
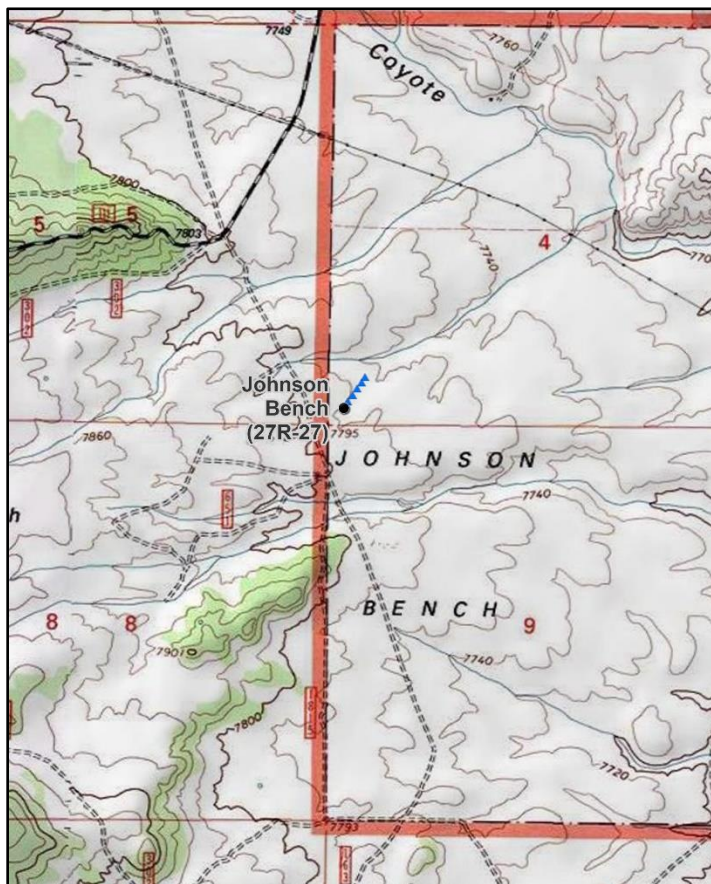
Year	Density	Size Class Distribution				Utilization		Poor Vigor (%)
	Plants per Acre	Class I (%)	Class II (%)	Class III (%)	Class IV (%)	Moderate (%)	Heavy (%)	
Populus tremuloides (quaking aspen)								
2016	1300	32	43	15	9	9	11	18
2021	6780	31	58	9	1	0	0	0

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 27R-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' (%)	
Abies lasiocarpa (subalpine fir)							
2016	498	20	20	-	10	50	5.6
2021	213	10	65	5	10	10	5.2
Pinus flexilis (limber pine)							
2016	4	-	100	-	-	-	3.0
Pinus ponderosa (ponderosa pine)							
2016	17	-	11	11	11	67	28.3
2021	12	14	29	14	29	14	8.3
Populus tremuloides (quaking aspen)							
2016	502	75	15	-	-	10	3.0
2021	2220	5	80	15	-	-	1.6
Pseudotsuga menziesii (Douglas-fir)							
2016	67	-	-	6	-	94	26.6
2021	21	-	15	23	23	38	12.8

JOHNSON BENCH - STUDY NO. 27R-27

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Bryce Canyon NW; Township 36S, Range 4W, Section 04
NAD 83 UTM ZONE 12, 390833 East 4172797 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

587
20° magnetic
500ft
Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Standard

Directions to Site

From State Route 12, turn right onto a road that runs south. Continue on this road for 1.2 miles to an intersection. At the intersection, turn left and drive for 0.5 miles. Park here; there is no witness post. The 0-foot stake is north of a two-track, across a fence-line, and is marked by browse tag #587.

Site Information

Land Ownership	Private
Land Administrator	Private
Allotment	No data
Elevation	7,680ft (2,341m)
Aspect	Northeast
Slope	2%
Sample Dates	07/10/2018, 07/27/2021

Table 27R-27.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Harrow - Two-Way Chain Harrow	Johnson Bench UPD Habitat Enhancement Phase II	4429	October 2018-May 2019	243
Seeding - Aerial Before	Johnson Bench UPD Habitat Enhancement Phase II	4429	October 2018	243
Herbicide - Spike	-	-	2015	270

Table 27R-27.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Johnson Bench			Broadcast	Oct 2018	270
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	<i>Achnatherum hymenoides</i>	Indian Ricegrass	Rimrock	1.11	0.96
G	<i>Bouteloua gracilis</i>	Blue Grama	Hachita	0.36	0.27
G	<i>Bouteloua gracilis</i>	Blue Grama	Hachita	0.01	0.01
G	<i>Elymus trachycaulus</i>	Slender Wheatgrass	First Strike	0.56	0.52
G	<i>Koeleria macrantha</i>	Prairie junegrass	Blue Mtn	0.19	0.15
G	<i>Poa fendleriana</i>	Muttongrass	Montezuma CO	0.19	0.16
G	<i>Poa secunda</i>	Big Bluegrass	Sherman	0.50	0.38
F	<i>Achillea millefolium</i>	Western Yarrow	Eagle	0.05	0.04
F	<i>Gaillardia aristata</i>	Blanket Flower		0.19	0.17
F	<i>Hedysarum boreale</i>	Utah Sweetvetch	Timp	0.22	0.17
F	<i>Heliomeris multiflora</i>	Showy Goldeneye	White Pine NV	0.33	0.32
F	<i>Linum lewisii</i>	Lewis Flax	Maple Grove	0.37	0.34
F	<i>Penstemon comarrhenus</i>	Dusty Penstemon	Kane UT	0.19	0.17
F	<i>Ratibida columnifera</i>	Prairie Coneflower	Stillwater	0.13	0.11
F	<i>Ratibida columnifera</i>	Prairie Coneflower	Stillwater	0.24	0.21
F	<i>Sphaeralcea munroana</i>	Munro Globemallow	Washington UT	0.19	0.17

Wildlife Habitat and Vegetation History**Table 27R-27.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter
Greater Sage-Grouse		
Pronghorn	crucial	year-long

Table 27R-27.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2018	Perennial Grass/Yellow Rabbitbrush	Phase I
2021	Perennial Grass	Phase I

Site Notes

No Notes

Site Potential

1981 - 2010 Average Annual Precipitation	15 inches
NRCS Ecological Site	Upland Loam (Black Sagebrush)
NRCS Ecological Site #	R047XB309UT
States and Transitions	No state and transition model is available for this ecological site.

When the study was established in 2018, yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus* var. *viscidiflorus*) was the most abundant shrub, but cover decreased substantially following a harrow treatment in 2019. Black sagebrush (*Artemisia nova*) was also common at establishment, but increased in both density and cover following treatment (Table 27R-27.12, Table 27R-27.13). In addition, photos reveal that most shrubs were in poor health in 2018, which was likely due to a combination of a 2015 herbicide treatment and drought conditions (Table 27R-27.1). The herbaceous understory was abundant in both sample years and dominated by a diverse mixture of native and introduced perennial grasses, including crested wheatgrass (*Agropyron cristatum*), blue grama (*Bouteloua gracilis*), and muttongrass (*Poa fendleriana*). In 2018, annual and perennial forbs were scarce by comparison, but diversity within the forb community had a slight increase in 2021 following the seeding and harrow that occurred in 2019 (Table 27R-27.7, Table 27R-27.10, Table 27R-27.11). Although not reflected much in the data, photos show that Rocky Mountain juniper (*Juniperus scopulorum*) trees are present in low amounts on the study, placing the site in Phase I of woodland succession (Table 27R-27.4).

Trend Summary Tables**Table 27R-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
2018	3.9	8.8	-	2.8	8.2	-
2021	4.5	5.0	-	3.8	4.1	-

Table 27R-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
2018	-	385	4	146	-	29.1	0.0	3.3
2021	-	373	4	244	-	17.1	0.0	5.4

Table 27R-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
2018	41.2	0.8	38.9	2.9	0.4	42.6
2021	33.4	0.1	41.6	1.9	0.5	32.2

Table 27R-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/Pronghorn	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
2018	5	10	-	1	4
2021	7	20	1	1	1
Year	Days Use Per Acre (ha)				
2018	19.6 (48.4)	11.4 (28.1)	4.0 (9.9)	3.5 (8.6)	-
2021	14.5 (35.9)	6.0 (14.9)	2.0 (5.0)	12.2 (30.1)	-

Table 27R-27.10 - 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 inermis ⁱ (smooth brome)	Carex (sedge)	Carex obtusata (obtuse 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 secunda (Sandberg bluegrass)	Thinopyrum intermedium ⁱ (intermediate wheatgrass)
year	Nested Frequency														
2018	3	6	138	175	14	17	36	8	-	78	2	54	220	-	39
2021	21	5	195	208	5	15	20	2	7	-	23	-	90	15	57
year	Average Cover (%)														
2018	0.0	0.2	6.8	8.5	0.3	0.1	0.2	0.1	-	2.8	0.0	0.6	8.4	-	0.9
2021	0.2	0.1	5.8	9.3	0.0	0.0	0.1	0.0	0.0	-	0.3	-	0.8	0.1	0.4

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

Table 27R-27.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Antennaria microphylla (littleleaf pussytoes)	Arabis (rockcross)	Cryptantha (cryptantha)	Eriogonum eatonii (Eaton's fleabane)	Eriogonum pumilus (shaggy fleabane)	Eriogonum alatum (winged buckwheat)	Eriogonum racemosum (redroot buckwheat)	Eriogonum umbellatum (sulphur-flower buckwheat)	Gilia inconspicua ^a (shy gilia)	Linum lewisii (Lewis flax)	Lotus utahensis (Utah bird's-foot trefoil)	Microsteris gracilis ^a (slender phlox)	Oenothera (evening primrose)	Packera multilobata (lobeleaf groundsel)	Penstemon comarrhenus (dusty beardtongue)	Phlox austromontana (mountain phlox)	Phlox longifolia (longleaf phlox)
year	Nested Frequency																
2018	14	1	-	1	5	2	69	69	1	-	16	3	-	-	-	5	4
2021	12	-	3	-	16	0	91	86	-	13	60	-	7	2	66	8	10
year	Average Cover (%)																
2018	0.7	0.0	-	0.0	0.3	0.0	0.6	1.1	0.0	-	0.3	0.0	-	-	-	0.3	0.0
2021	0.2	-	0.1	-	0.1	0.0	0.8	1.6	-	0.1	1.7	-	0.1	0.0	0.6	0.1	0.1

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

FORB SPECIES	Polygonum douglasii ^a (Douglas' knotweed)	Ratibida columnifera (upright prairie coneflower)	Trifolium (clover)
year	Nested Frequency		
2018	-	-	6
2021	4	2	-
year	Average Cover (%)		
2018	-	-	0.0
2021	0.0	0.0	-

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

Table 27R-27.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Artemisia nova ^p (black sagebrush)	Chrysothamnus depressus ^p (longflower rabbitbrush)	Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Eriogonum microthecum ^p (slender buckwheat)	Gutierrezia sarothrae (broom snakeweed)	Linanthus pungens (granite prickly phlox)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)						
2018	2.7	0.1	6.4	-	-	0.7	1.1
2021	3.8	-	2.1	-	-	0.4	1.6
year	Quadrat Cover (%)						
2018	3.9	0.0	6.7	0.0	0.0	1.2	0.9
2021	4.5	0.0	3.2	0.0	-	0.5	1.3

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

Table 27R-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			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia nova^p -- (black sagebrush)									
2018	5580	60	27	37	37	5	1	60	18/26
2021	6300	40	4	80	16	2	0	16	- / -
Chrysothamnus depressus^p -- (longflower rabbitbrush)									
2018	220	-	9	64	27	55	36	27	8/11
2021	160	-	0	38	63	13	63	63	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
2018	8320	-	3	89	8	15	1	31	13/26
2021	5800	20	1	88	10	14	5	11	- / -
Eriogonum microthecum^p -- (slender buckwheat)									
2018	-	-	-	-	-	-	-	-	13/11
2021	80	-	0	100	0	0	0	0	- / -

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 (%)				
Gutierrezia sarothrae -- (broom snakeweed)									
2018	20	-	0	100	0	0	0	0	6/10
2021	-	-	-	-	-	-	-	-	-/-
Linanthus pungens -- (granite prickly phlox)									
2018	2140	20	7	84	9	0	0	63	11/16
2021	1380	-	3	73	25	20	6	23	-/-
Tetradymia canescens -- (spineless horsebrush)									
2018	740	-	11	51	38	27	0	62	24/39
2021	1040	-	2	35	64	35	52	65	-/-

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

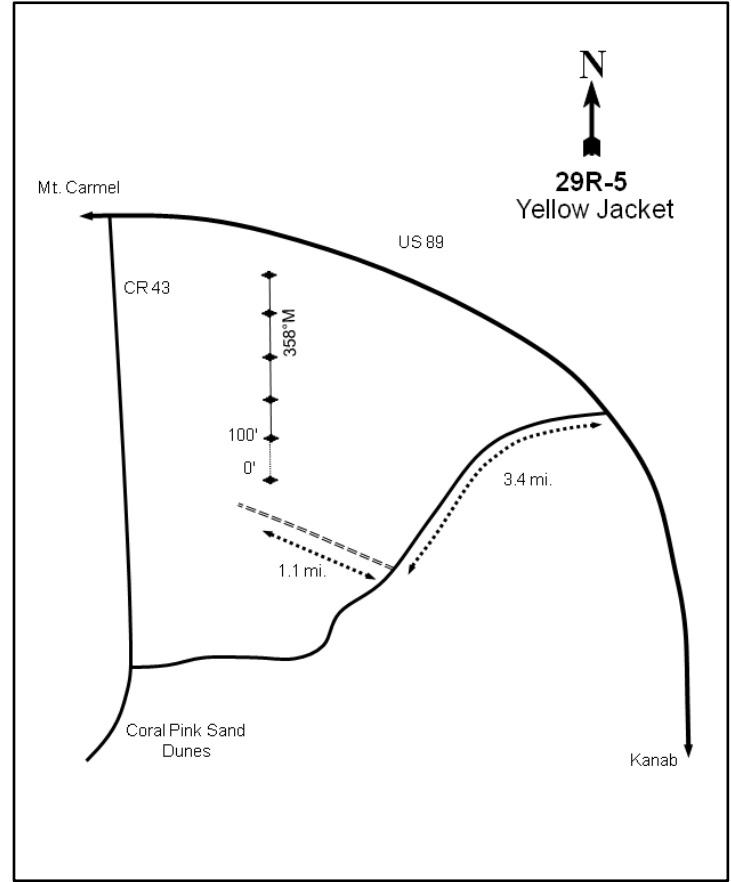
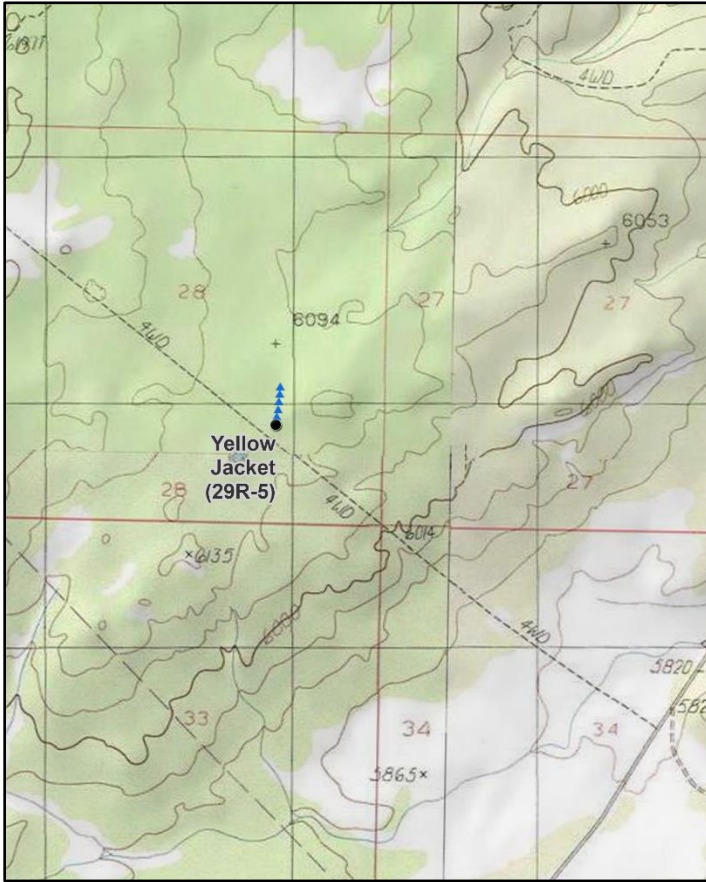
Table 27R-27.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus scopulorum (Rocky Mountain juniper)							
2021	1	-	-	-	100	-	33.0

Table 27R-27.15 - Deer Desirable Components Index: Upland 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
2018	3.5	0.0	0.0	30.0	0.0	6.6	0.0	40.1	Poor
2021	4.8	0.0	0.0	30.0	0.0	10.0	0.0	44.8	Poor

YELLOW JACKET - STUDY NO. 29R-5



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Mount Carmel SE; Township 42S, Range 7W, Section 28
NAD 83 UTM ZONE 12, 354878 East 4110107 North

Transect Information

Browse Tag # (0' Stake)	39
Transect Bearing	358° 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-89 between Kanab and Mt. Carmel, turn west on the road to the Coral Pink Sand Dunes. Continue on this road for 3.4 miles and turn right onto a sandy two-track road. Drive for 1.1 miles and the study will be to the north on the right side of the road.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	KINNIKINNIC SPRING
Elevation	6,089ft (1,856m)
Aspect	South
Slope	2%
Sample Dates	07/30/2013, 08/22/2016, 07/28/2021

Table 29R-05.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Mechanical - Bullhog	Yellowjacket (Kinnickinnic)	2687	2014	2147
Seeding - Aerial Before	Yellowjacket (Kinnickinnic)	2687	January 2014	2147

Table 29R-05.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Yellowjacket			Aerial	Jan 2014	2146
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Achnatherum hymenoides	Indian Ricegrass	Nezpar	0.26	0.25
G	Achnatherum hymenoides	Indian Ricegrass	Rimrock	0.12	0.11
G	Achnatherum hymenoides	Indian Ricegrass	Rimrock	0.93	0.84
G	Achnatherum hymenoides	Indian Ricegrass	Rio Grande CO	1.06	1.00
G	Achnatherum hymenoides	Indian Ricegrass	Emery UT	0.02	0.02
G	Achnatherum hymenoides	Indian Ricegrass	Nezpar	0.58	0.55
G	Agropyron fragile	Siberian Wheatgrass	Vavilov	1.30	1.09
G	Agropyron fragile	Siberian Wheatgrass	Vavilov	0.75	0.68
G	Pascopyrum smithii	Western Wheatgrass	Arriba	1.49	1.30
G	Sporobolus cryptandrus	Sand Dropseed	Washington CO	0.12	0.11
G	Thinopyrum intermedium	Pubescent Wheatgrass	Luna	0.91	0.77
F	Linum perenne	Blue Flax	Appar	1.03	0.92
F	Onobrychis viciifolia	Sainfoin	Eski	0.04	0.03
F	Onobrychis viciifolia	Sainfoin	Eski	1.00	0.92
F	Penstemon palmeri	Palmer Penstemon	White Pine NV	0.05	0.04
F	Penstemon palmeri	Palmer Penstemon	Washington UT	0.09	0.06
F	Penstemon palmeri	Palmer Penstemon	White Pine NV	0.14	0.12
F	Sanguisorba minor	Small Burnet		1.03	0.93

Wildlife Habitat and Vegetation History**Table 29R-05.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter

Table 29R-05.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2013	Juniper/Mountain Big Sagebrush	Phase II
2016	Perennial Grass/Mountain Big Sagebrush	Phase I
2021	Perennial Grass/Mountain Big Sagebrush	Phase I

Site Notes

No Notes

Site Potential

1981 - 2010 Average Annual Precipitation	15 inches
NRCS Ecological Site	Upland Sand (Mountain Big Sagebrush)
NRCS Ecological Site #	R035XY307UT
States and Transitions	No state and transition model is available for this ecological site.

This site was established in 2013 and was dominated by a mixed community of Utah juniper (*Juniperus osteosperma*) and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) with a fairly sparse herbaceous understory. The majority of trees were removed by a bullhog treatment in 2014 (Table 29R-05.1). Following treatment, native perennial grasses were dominant with sagebrush scattered throughout the area (Photos, Table 29R-05.7, Table 29R-05.10, Table 29R-05.12, Table 29R-05.13). Sagebrush and herbaceous cover are expected to continue to increase as time since treatment passes. Although the site is considered to be within Phase I of woodland succession as of 2021 (Table 29R-05.14), point-quarter density shows that juniper is still present in low amounts (Table 29R-05.14). This extant tree component indicates that there may be potential for infilling in future sample years.

Trend Summary Tables**Table 29R-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
2013	3.6	0.8	5.2	4.6	0.9	19.9
2016	1.4	1.7	-	2.1	0.9	-
2021	2.1	1.1	-	3.7	1.3	-

Table 29R-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
2013	30	200	116	93	0.1	5.8	0.6	1.2
2016	18	257	240	119	0.1	12.9	4.0	2.6
2021	14	288	16	118	0.2	11.0	0.3	1.2

Table 29R-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
2013	56.2	2.2	29.5	-	-	17.0
2016	46.5	0.3	38.6	0.0	-	19.9
2021	49.2	0.1	40.3	0.1	-	15.7

Table 29R-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	Horse	Rabbit
	Quadrat Frequency				
2013	2	9	-	-	14
2016	-	11	1	-	25
2021	3	25	1	-	16
Year	Days Use Per Acre (ha)				
2013	10.9 (26.9)	6.7 (16.6)	-	-	-
2016	2.2 (5.4)	6.0 (14.9)	0.7 (1.7)	-	-
2021	14.5 (35.9)	17.4 (43.0)	3.4 (8.3)	1.2 (2.9)	-

Table 29R-05.10 - 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)	Hesperostipa comata (needle and thread)	Muhlenbergia pungens (sandhill muly)	Pascopyrum smithii (western wheatgrass)	Phleum alpinum (alpine timothy)	Poa secunda (Sandberg bluegrass)	Sporobolus cryptandrus (sand dropseed)	Thinopyrum intermedium ⁱ (intermediate wheatgrass)	Vulpia octoflora ^a (sixweeks fescue)
year	Nested Frequency													
2013	33	-	14	67	8	9	11	54	27	6	5	27	-	22
2016	14	4	32	81	15	20	33	63	54	1	-	36	25	12
2021	60	21	24	60	14	7	13	51	71	-	-	10	48	-
year	Average Cover (%)													
2013	0.4	-	0.3	1.7	0.0	0.3	0.2	2.4	0.1	0.0	0.0	0.3	-	0.1
2016	0.5	0.2	1.1	2.6	0.1	0.4	1.5	2.6	2.1	0.0	-	0.9	1.0	0.0
2021	1.1	0.4	1.0	1.2	0.2	0.0	0.3	2.4	1.6	-	-	0.0	3.1	-

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

Table 29R-05.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Abronia fragrans (snowball sand verbena)	Arabis (rockcress)	Artemisia dracunculus (tarragon)	Castilleja linariifolia (Wyoming Indian paintbrush)	Chamaesyce (sandmat)	Comandra umbellata (bastard toadflax)	Cryptantha (cryptantha)	Descurainia pinnata ^a (western tansymustard)	Erigeron (fleabane)	Erigeron divergens ⁿ (spreading fleabane)	Eriogonum cernuum ^a (nodding buckwheat)	Eriogonum racemosum (redroot buckwheat)	Erysimum capitatum ^a (sanddune wallflower)	Heterotheca villosa (hairy false goldenaster)	Hymenopappus filifolius (fineleaf hymenopappus)	Linum kingii (King's flax)	Linum perenne ⁱ (blue flax)
year	Nested Frequency																
2013	6	5	5	-	12	1	-	-	4	-	-	-	7	-	33	32	-
2016	6	1	-	-	8	-	1	0	5	3	10	-	-	-	69	8	8
2021	3	-	-	2	72	-	1	-	16	1	3	1	-	2	31	-	-
year	Average Cover (%)																
2013	0.5	0.0	0.0	-	0.0	0.0	-	-	0.0	-	-	-	0.0	-	0.2	0.1	-
2016	0.0	0.0	-	-	0.0	-	0.0	0.0	0.3	0.1	0.2	-	-	-	1.5	0.1	0.0
2021	0.0	-	-	0.0	0.1	-	0.0	-	0.3	0.0	0.0	0.0	-	0.1	0.4	-	-

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

FORB SPECIES	Lygodesmia (skeletonplant)	Nama densum var. parviflorum ^a (leafy fiddleleaf)	Oenothera pallida ^a (pale evening primrose)	Phemeranthus confertiflorus (New Mexico fameflower)	Plantago patagonica ^a (woolly plantain)	Polygonum douglasii ^a (Douglas' knotweed)	Sanguisorba minor ⁱ (small burnet)	Senecio spartioides (broom-like ragwort)	Sphaeralcea parvifolia (smallflower globemallow)	Townsendia annua ^a (annual Townsend daisy)	Tradescantia occidentalis (prairie spiderwort)
year	Nested Frequency										
2013	-	-	4	6	111	4	-	-	1	-	20
2016	1	-	44	1	202	4	0	1	7	3	25
2021	-	6	-	-	-	-	-	-	-	6	19
year	Average Cover (%)										
2013	-	-	0.0	0.0	0.5	0.0	-	-	0.0	-	0.2
2016	0.0	-	2.0	0.0	1.6	0.1	0.1	0.1	0.1	0.0	0.3
2021	-	0.0	-	-	-	-	-	-	-	0.2	0.2

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

Table 29R-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)	Ephedra viridis ^p (mormon tea)	Ericameria nauseosa (rubber rabbitbrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma ^t (Utah juniper)	Linanthus pungens (granite prickly phlox)	Opuntia (pricklypear)	Purshia tridentata ^p (antelope bitterbrush)	Tetradymia canescens (spineless horsebrush)
year	Line Intercept Cover (%)								
2013	4	0.4	-	0.8	19.9	-	0.1	0.2	-
2016	1.3	-	0.1	0.4	-	0.4	-	0.8	-
2021	2.9	0.1	0.6	0.2	-	0.4	-	0.7	0.1
year	Quadrat Cover (%)								
2013	2.9	0.6	-	0.8	5.2	0.0	0.0	0.0	-
2016	0.8	0.2	0.4	1.1	-	0.2	0.0	0.4	-
2021	0.8	0.5	0.9	0.0	-	0.2	0.0	0.8	0.0

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

Table 29R-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			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
2013	780	240	13	64	23	28	3	23	76/100
2016	320	-	13	81	6	13	0	6	52/88
2021	420	20	19	76	5	0	0	5	- / -
Ephedra viridis^p -- (mormon tea)									
2013	40	-	0	100	0	0	100	0	88/146
2016	120	-	0	83	17	0	0	17	66/105
2021	60	-	0	100	0	0	0	0	- / -

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 (%)				
Ericameria nauseosa -- (rubber rabbitbrush)									
2013	-	-	-	-	-	-	-	-	53/86
2016	60	-	0	100	0	0	0	0	63/101
2021	40	-	0	100	0	0	0	50	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
2013	800	340	38	60	3	0	0	3	22/26
2016	860	40	12	88	0	0	0	0	28/44
2021	160	-	0	38	63	0	0	63	- / -
Juniperus osteosperma¹ -- (Utah juniper)									
2013	180	-	22	78	0	0	0	11	- / -
2016	-	-	-	-	-	-	-	-	- / -
2021	-	-	-	-	-	-	-	-	- / -
Linanthus pungens -- (granite prickly phlox)									
2013	40	-	0	100	0	0	0	0	19/12
2016	380	-	0	100	0	0	0	0	20/31
2021	560	20	4	89	7	0	0	61	- / -
Opuntia -- (pricklypear)									
2013	60	20	0	100	0	0	0	0	8/23
2016	-	-	-	-	-	-	-	-	7/19
2021	20	-	100	0	0	0	0	0	- / -
Purshia tridentata^p -- (antelope bitterbrush)									
2013	20	-	0	100	0	100	0	0	40/133
2016	80	-	0	100	0	0	25	0	84/148
2021	20	-	0	100	0	100	0	0	- / -
Tetradymia canescens -- (spineless horsebrush)									
2013	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	- / -
2021	20	-	0	100	0	0	0	0	- / -
Yucca -- (yucca)									
2013	-	-	-	-	-	-	-	-	25/47
2016	-	-	-	-	-	-	-	-	62/94

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

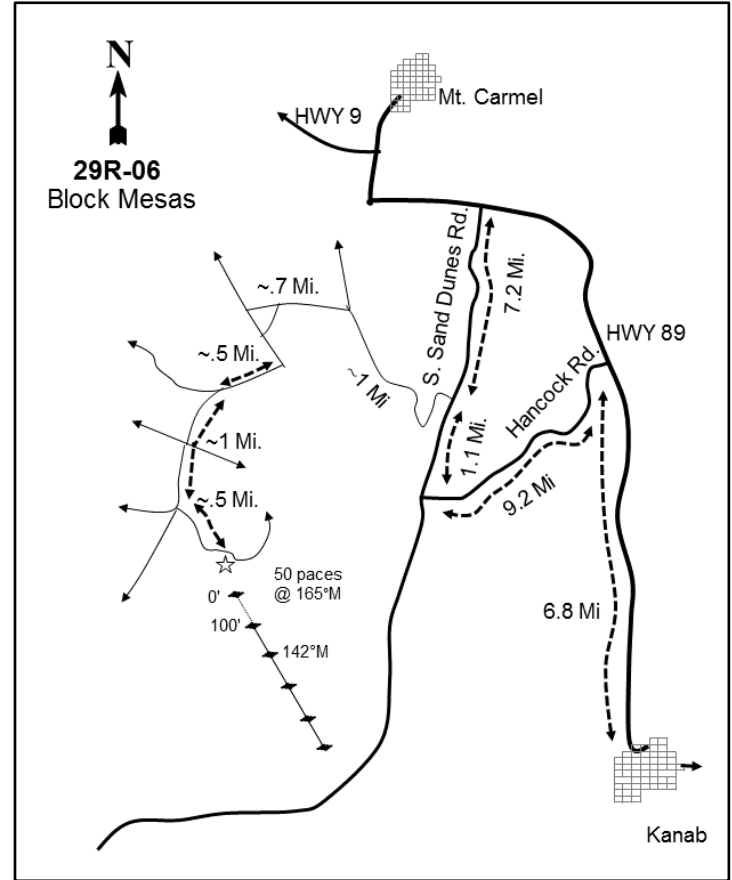
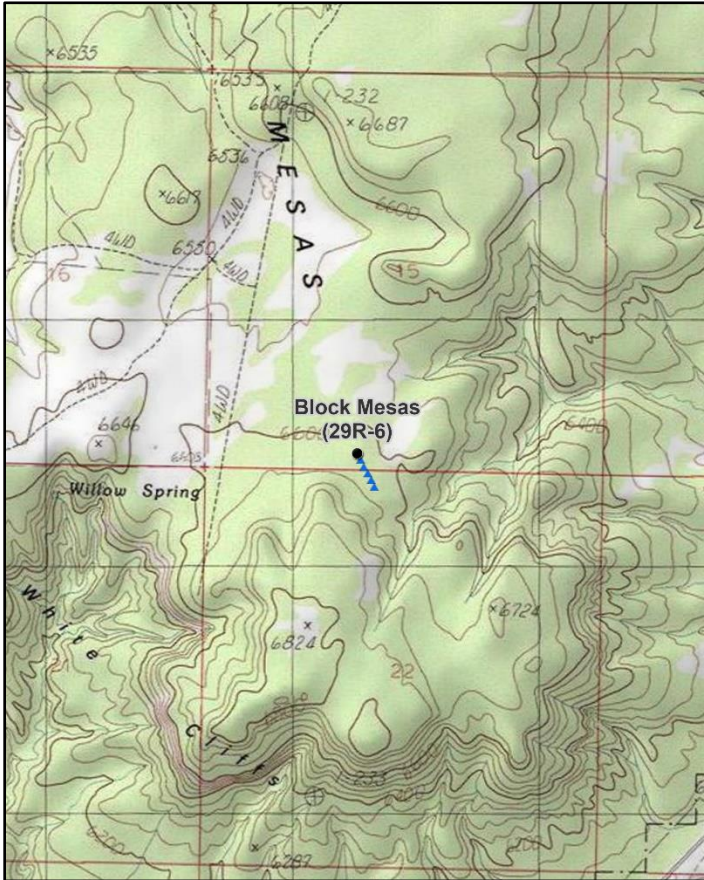
Table 29R-05.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2013	84	-	21	5	21	53	38.2
2016	4	50	50	-	-	-	2.0
2021	8	13	63	25	-	-	3.7
Pinus edulis (twoneedle pinyon)							
2016	5	-	100	-	-	-	2.0

Table 29R-05.15 - Deer Desirable Components Index: Upland 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
2013	5.8	0.0	0.0	11.5	-0.1	2.4	0.0	19.6	Very Poor
2016	2.8	0.0	0.0	25.9	-0.1	5.2	0.0	33.8	Very Poor-Poor
2021	4.8	0.0	0.0	22.1	-0.1	2.5	0.0	29.2	Very Poor

BLOCK MESAS - STUDY NO. 29R-6

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Yellowjacket Canyon ; Township 43S, Range 8W, Section 15
NAD 83 UTM ZONE 12, 346193 East 4103656 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

565
142° magnetic
500ft
Line 1 (11ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft), Line 5 (95ft)
Standard

Directions to Site

From Kanab, travel on Highway 89 for 6.8 miles to Hancock Road. Turn left and drive west on Hancock Road for 9.2 miles. Turn right on South Sand Dunes Road and continue north for 1.1 miles to a road on the left. Turn left onto this road, travel east for approximately 1.1 miles to a fork in the road, and bear left. Take this road for 0.7 miles to a "T" junction. Turn left (south), then drive for approximately 0.5 miles to a "Y". Bear left and continue for 1 mile through an opening and ponderosa pine patch. In this patch there is a small road that turns left: continue for 0.5 miles up this road to the top of a hill, park on the side of the road, and walk 50 paces to the study site.

NOTE: The access road is very sandy, and as such, experienced drivers are recommended.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	BUCK PASTURE
Elevation	6,614ft (2,016m)
Aspect	North
Slope	2-5%
Sample Dates	08/29/2017, 07/28/2021

Table 29R-06.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Seeding - Aerial Before	Yellow Jacket (Buck Pasture)	3977	November 2017	3500
Mechanical - Bullhog	Yellow Jacket (Buck Pasture)	3977	January-March 2018	1599

Table 29R-06.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Yellowjacket Buck Pasture			Aerial	Nov 2017	3126
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Achnatherum hymenoides	Indian Ricegrass	Rimrock	3.01	2.75
G	Agropyron cristatum	Crested Wheatgrass	Nordan	1.50	1.30
G	Elymus wawawaiensis	Snake River Wheatgrass	Secar	0.70	0.60
G	Elymus wawawaiensis	Snake River Wheatgrass	Discovery	0.80	0.70
G	Pascopyrum smithii	Western Wheatgrass	Recovery	0.83	0.76
G	Pascopyrum smithii	Western Wheatgrass	Recovery	0.18	0.16
G	Poa fendleriana	Muttongrass	Montezuma CO	0.26	0.22
G	Sporobolus cryptandrus	Sand Dropseed		0.01	0.01
G	Sporobolus cryptandrus	Sand Dropseed		0.09	0.08
G	Thinopyrum intermedium	Intermediate Wheatgrass		0.50	0.46
F	Cleome serrulata	Rocky Mountain Beeplant	Kane UT	0.13	0.13
F	Linum perenne	Blue Flax	Appar	0.78	0.69
F	Linum perenne	Blue Flax	Appar	0.22	0.19
F	Medicago sativa	Alfalfa	Ladak DL	0.80	0.77
F	Medicago sativa	Yellow Alfalfa	Don	0.19	0.19
F	Onobrychis viciifolia	Sainfoin	Eski	0.51	0.44
F	Penstemon palmeri	Palmer Penstemon	Duchesne UT	0.16	0.13
F	Sanguisorba minor	Small Burnet	Delar	0.51	0.50
F	Sphaeralcea munroana	Munro Globemallow	Washington UT	0.10	0.09

Wildlife Habitat and Vegetation History**Table 29R-06.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter

Table 29R-06.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2017	Pinyon-Juniper/Mountain Big Sagebrush	Phase II transitioning to Phase III
2021	Rubber Rabbitbrush	Phase I

Site Notes

No Notes

Site Potential

1981 - 2010 Average Annual Precipitation	18 inches
NRCS Ecological Site	Upland Sand (Mountain Big Sagebrush)
NRCS Ecological Site #	R035XY307UT
States and Transitions	No state and transition model is available for this ecological site.

Upon study establishment in 2017, this site was dominated by a twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*)-encroached mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) plant community (Photos, Table 29R-06.6, Table 29R-06.13, Table 29R-06.14). Perennial grass cover was moderate, and blue grama (*Bouteloua gracilis*) was the dominant species (Table 29R-06.10). Perennial forb cover was also moderate, with sandmat (*Chamaesyce* sp.) contributing the most cover (Table 29R-06.11). Following the bullhog and seeding treatment (Table 29R-06.1), grasses and forbs remained similar in abundance, but cover decreased overall for both life forms (Table 29R-06.7). Upon establishment, trees provided a significant amount of cover, and the site was considered to be within Phase II transitioning to Phase III of woodland succession. As is expected with a bullhog treatment, many of the trees had been removed as of 2021 and the site was considered to be in Phase I of woodland succession (Table 29R-06.4). Sagebrush also decreased in cover and density (Table 29R-06.12, Table 29R-06.13, Table 29R-06.14). Despite these decreases it is expected that sagebrush and the understory will rebound with increased cover and abundance as time since last treatment increases.

Trend Summary Tables**Table 29R-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
2017	1.7	1.9	13.1	2.5	2.5	35.5
2021	1.3	2.7	0.2	3.1	4.9	0.4

Table 29R-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
2017	189	166	28	136	2.1	5.7	0.1	3.1
2021	81	167	59	76	1.1	3.7	0.8	2.0

Table 29R-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
2017	40.8	1.8	50.2	0.1	0.0	25.7
2021	33.5	0.0	61.8	0.4	0.0	10.7

Table 29R-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	Horse	Rabbit
	Quadrat Frequency				
2017	-	-	32	-	21
2021	1	-	32	-	2
Year	Days Use Per Acre (ha)				
	2017	5.1 (12.6)	-	36.8 (91.0)	-
2021	16.7 (41.2)	8.7 (21.5)*	45.6 (112.6)	4.0 (10.0)	-

*Pellets per acre (ha)

Table 29R-06.10 - 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)	Elymus wawawaiensis (Snake River wheatgrass)	Muhlenbergia pungens (sandhill mully)	Munroa squarrosa ^a (false buffalograss)	Pascopyrum smithii (western wheatgrass)	Poa fendleriana (muttongrass)	Sporobolus cryptandrus (sand dropseed)	Thinopyrum intermedium ⁱ (intermediate wheatgrass)	Vulpia octoflora ^a (sixweeks fescue)
year	Nested Frequency													
2017	53	-	4	84	111	30	-	-	3	16	-	20	-	84
2021	80	22	-	51	81	12	1	7	-	13	6	10	7	2
year	Average Cover (%)													
2017	0.8	-	0.1	3.7	1.9	0.5	-	-	0.0	0.6	-	0.2	-	0.2
2021	1.1	0.3	-	1.3	1.1	0.1	0.0	0.3	-	0.1	0.0	0.2	0.2	0.0

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

Table 29R-06.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Abronia fragrans (snowball sand verbena)	Arabis (rockcress)	Castilleja linariifolia (Wyoming Indian paintbrush)	Chamaesyce (sandmat)	Chenopodium atrovirens ^{ai} (pinyon goosefoot)	Comandra umbellata (bastard toadflax)	Cryptantha (cryptantha)	Descurainia pinnata ^a (western tansymustard)	Eriogonum cernuum ^a (nodding buckwheat)	Gilia inconspicua ^a (shy gilia)	Lappula occidentalis ^a (flatspine stickseed)	Linum perenne ⁱ (blue flax)	Microsteris gracilis ^a (slender phlox)	Packera multilobata (lobeleaf groundsel)	Penstemon palmeri (Palmer's penstemon)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)
year	Nested Frequency																
2017	5	4	2	88	2	6	6	5	19	1	1	-	1	7	-	-	4
2021	-	-	3	22	-	12	4	-	58	-	-	6	1	-	2	4	-
year	Average Cover (%)																
2017	0.0	0.1	0.1	1.5	0.0	0.3	0.2	0.0	0.1	0.0	0.0	-	0.0	0.0	-	-	0.0
2021	-	-	0.6	0.4	-	0.2	0.1	-	0.8	-	-	0.0	0.0	-	0.0	0.0	-

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

FORB SPECIES	Senecio spartioides (broom-like ragwort)	Sphaeralcea parvifolia (smallflower globemallow)	Townsendia (Townsend daisy)	Tridactmia occidentalis (prairie spiderwort)	Vicia americana (American vetch)
year	Nested Frequency				
2017	7	7	3	-	30
2021	8	-	-	1	16
year	Average Cover (%)				
2017	0.4	0.1	0.1	-	0.4
2021	0.6	-	-	0.0	0.1

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

Table 29R-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 viscidiflorus ssp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Ephedra viridis ^p (mormon tea)	Ericameria nauseosa (rubber rabbitbrush)	Juniperus osteosperma ^t (Utah juniper)	Opuntia (pricklypear)	Pinus edulis ^t (twoneedle pinyon)
year	Line Intercept Cover (%)							
2017	0.8	1.7	0.2	0	1.6	19.2	0.7	16.3
2021	0.7	2	1	0.4	3.9	-	0	0.4
year	Quadrat Cover (%)							
2017	0.3	1.4	0.0	0.0	0.9	6.2	0.9	6.9
2021	1.0	0.3	0.7	0.0	1.9	-	0.0	0.2

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

Table 29R-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			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis^p -- (Utah serviceberry)									
2017	60	40	0	67	33	0	0	0	148/227
2021	60	-	0	67	33	100	0	33	- / -
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
2017	780	-	18	46	36	28	36	33	64/71
2021	460	-	4	56	39	9	22	39	- / -
Cercocarpus montanus var. montanus^p -- (alderleaf mountain mahogany)									
2017	-	-	-	-	-	-	-	-	157/117
2021	-	-	-	-	-	-	-	-	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
2017	40	-	50	50	0	0	50	0	58/52
2021	180	-	0	44	56	11	0	67	- / -

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 (%)				
Ephedra viridis^p -- (mormon tea)									
2017	120	-	50	50	0	67	0	0	66/79
2021	80	-	50	50	0	0	0	25	- / -
Eriogonum microthecum^p -- (slender buckwheat)									
2017	40	-	0	100	0	0	0	0	10/16
2021	20	-	100	0	0	0	0	0	- / -
Ericameria nauseosa -- (rubber rabbitbrush)									
2017	160	-	0	100	0	50	13	25	65/133
2021	380	-	5	79	16	0	5	16	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
2017	-	-	-	-	-	-	-	-	31/41
2021	-	-	-	-	-	-	-	-	- / -
Juniperus osteospermaⁱ -- (Utah juniper)									
2017	100	60	60	40	0	0	0	20	- / -
2021	20	-	100	0	0	0	0	0	- / -
Opuntia -- (pricklypear)									
2017	1260	-	0	100	0	10	0	11	9/31
2021	180	-	0	22	78	0	0	89	- / -
Pinus edulis^t -- (twoneedle pinyon)									
2017	260	240	46	46	8	0	0	8	- / -
2021	60	-	100	0	0	0	0	0	- / -
Purshia tridentata^p -- (antelope bitterbrush)									
2017	-	-	-	-	-	-	-	-	36/81
2021	-	-	-	-	-	-	-	-	- / -
Tetradymia canescens -- (spineless horsebrush)									
2017	20	-	0	100	0	0	100	0	98/145
2021	40	-	0	50	50	0	0	50	- / -
Yucca angustissima -- (narrowleaf yucca)									
2017	-	-	-	-	-	-	-	-	52/97
2021	-	-	-	-	-	-	-	-	- / -
Yucca -- (yucca)									
2017	-	-	-	-	-	-	-	-	88/126

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

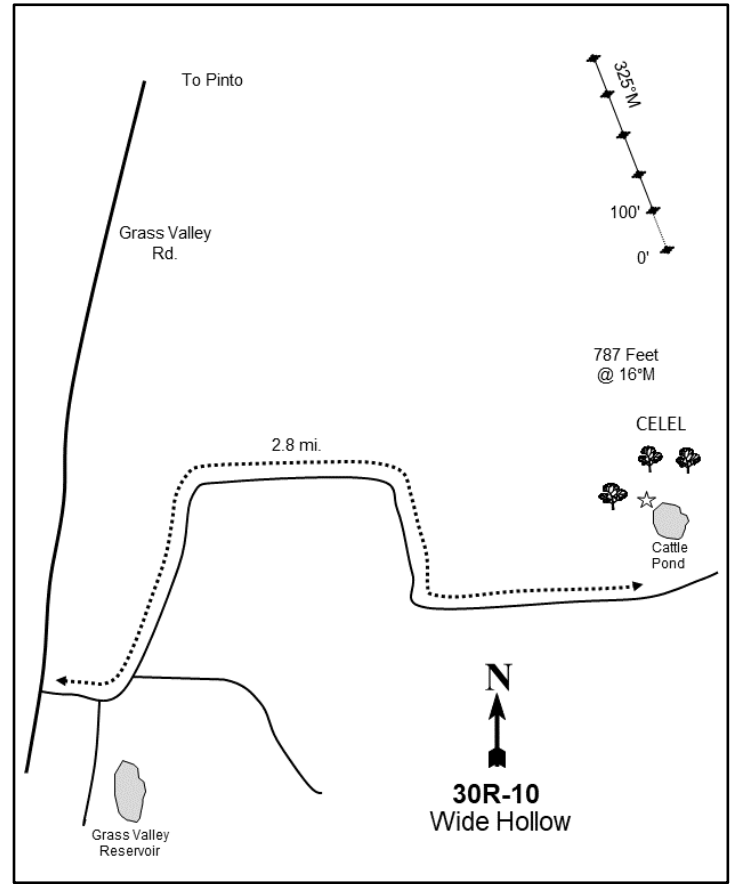
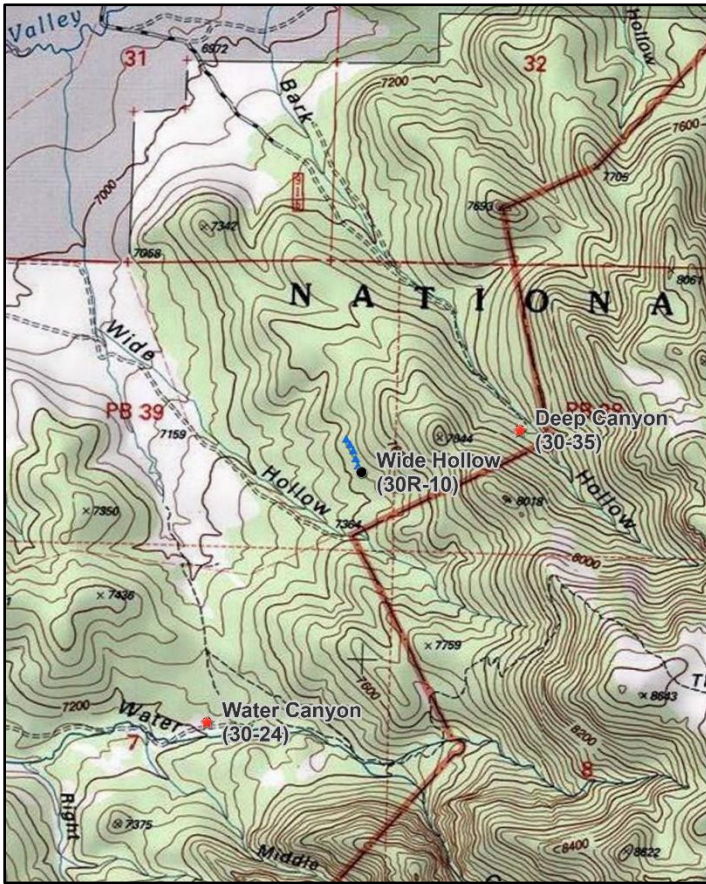
Table 29R-06.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2017	31	7	13	13	7	60	31.7
2021	5	50	50	-	-	-	2.8
Pinus edulis (twoneedle pinyon)							
2017	287	32	21	32	5	11	6.2
2021	36	64	36	-	-	-	2.1

Table 29R-06.15 - Deer Desirable Components Index: Upland 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
2017	3.3	0.0	0.0	11.3	-1.6	6.3	0.0	19.4	Very Poor
2021	4.1	0.0	0.0	7.4	-0.8	4.1	0.0	14.7	Very Poor

WIDE HOLLOW - STUDY NO. 30R-10



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Grass Valley SW; Township 39S, Range 14W, Section 06
NAD 83 UTM ZONE 12, 282373 East 4144682 North

Transect Information

Browse Tag # (0' Stake)	Not Available
Transect Bearing	325° 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 or Stakes

Directions to Site

From the intersection of Pine Valley Road and Grass Valley Road in Pine Valley, Utah, travel north along Grass Valley Road for approximately 1.9 miles to the road that leads to Grass Valley Reservoir. Turn right (west) and travel 1.2 miles along this road (while passing the right turn to the reservoir and staying left) to a fence-line. Turn right (west) at the fence-line and drive for 0.6 miles to a right turn. Turn right (south) and follow the road up Wide Hollow for 0.93 miles to the USFS boundary: park here. Use a GPS to find the original stake locations. The site is approximately 790 feet north of the stock pond that is located on the north side of the road.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	Pine Valley
Elevation	7,380ft (2,249m)
Aspect	Southwest
Slope	25%
Sample Dates	08/25/2021

Table 30R-10.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Seeding - Aerial Before	Upper Santa Clara Watershed Restoration and Defensible Fire Space project Phase I (Proposed)	5588	Fall 2021	742
Mechanical - Bullhog	Upper Santa Clara Watershed Restoration and Defensible Fire Space project Phase I (Proposed)	5588	Fall 2021	742

Table 30R-10.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name		Application Type	Application Date	Acres	
Upper Santa Clara		Aerial	Nov 2021	907	
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	<i>Achnatherum hymenoides</i>	Indian Ricegrass	Nezpar	0.77	0.72
G	<i>Agropyron cristatum</i>	Crested Wheatgrass	Hycrest	0.99	0.93
G	<i>Bouteloua gracilis</i>	Blue Grama	Alma	0.33	0.22
G	<i>Elymus elymoides</i>	Bottlebrush Squirreltail	Pueblo	0.77	0.67
G	<i>Elymus lanceolatus</i>	Thickspike Wheatgrass	Bannock II	0.99	0.86
G	<i>Pascopyrum smithii</i>	Western Wheatgrass	Recovery	0.99	0.86
G	<i>Poa fendleriana</i>	Muttongrass	Montezuma CO	0.50	0.42
G	<i>Poa secunda</i>	Big Bluegrass	Sherman	0.77	0.65
G	<i>Psathyrostachys juncea</i>	Russian Wildrye	Bozoisky	0.77	0.71
G	<i>Pseudoroegneria spicata</i>	Bluebunch Wheatgrass	Anatone	1.98	1.79
G	<i>Sporobolus cryptandrus</i>	Sand Dropseed		0.20	0.19
F	<i>Linum perenne</i>	Blue Flax	Appar	0.50	0.40
F	<i>Medicago sativa</i>	Alfalfa	Big Sky Ladak	1.98	1.94
F	<i>Medicago sativa ssp. falcata</i>	Yellow Alfalfa	Don	0.50	0.49
F	<i>Ratibida columnifera</i>	Prairie Coneflower	Stillwater	0.50	0.39
F	<i>Sanguisorba minor</i>	Small Burnet	Delar	1.98	1.82

Wildlife Habitat and Vegetation History**Table 30R-10.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	substantial	summer

Table 30R-10.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2021	Pinyon	Phase III

Site Notes

In 2021, it was noted that both singleleaf pinyon (*Pinus monophylla*) and twoneedle pinyon (*P. edulis*) were present on site, but for purposes of the study everything was called singleleaf pinyon.

Site Potential

1981 - 2010 Average Annual Precipitation	23 inches
NRCS Ecological Site	Mountain Stony Loam (Curlleaf Mountainmahogany)
NRCS Ecological Site #	R047XC461UT
States and Transitions	No state and transition model is available for this ecological site.

When the study was established in 2021, this site was a twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*)-dominated ecological site within Phase III of woodland succession; pinyon was present in higher amounts than juniper (Table 30R-10.4, Table 30R-10.12, Table 30R-10.14). The herbaceous understory was especially depauperate and provided little cover (Table 30R-10.7), and muttongrass (*Poa fendleriana*) was the only grass species observed (Table 30R-10.10). Browse species were present in low amounts with Gambel oak (*Quercus gambelii*), curl-leaf mountain mahogany (*Cercocarpus ledifolius*), and Utah serviceberry (*Amelanchier utahensis*) as the representative preferred browse species (Table 30R-10.12, Table 30R-10.13). Without disturbance, it is likely that this site would continue to remain in this tree-dominated state with reduced understory vigor in future sample years. However, a bullhog and seeding project scheduled for 2021 (Table 30R-10.1) will likely remove many of the trees and augment the understory components.

Trend Summary Tables**Table 30R-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
2021	0.0	0.0	6.2	4.3	-	43.7

Table 30R-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
2021	-	3	3	13	-	0.0	0.0	0.1

Table 30R-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
2021	5.0	0.2	66.2	16.4	15.6	6.3

Table 30R-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	Rabbit
	Quadrat Frequency		
2021	-	7	3
Year	Days Use Per Acre (ha)		
	2021	0.7 (1.8)	6.0 (14.9)

Table 30R-10.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Poa fendleriana (muttongrass)
year	Nested Frequency
2021	3
year	Average Cover (%)
2021	0.0

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

Table 30R-10.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Chenopodium atrovirens ^a (pinyon goosefoot)	Polygonum douglasii ^a (Douglas' knotweed)	Sphaeralcea grossularifolia (gooseberry/leaf globemallow)	Viola (violet)
year	Nested Frequency			
2021	3	0	1	12
year	Average Cover (%)			
2021	0.0	0.0	0.0	0.0

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

Table 30R-10.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Cercocarpus ledifolius ^p (curl-leaf mountain mahogany)	Juniperus osteosperma ^t (Utah juniper)	Juniperus scopulorum ^t (Rocky Mountain juniper)	Mahonia repens (creeping barberry)	Pinus monophylla ^t (singleleaf pinyon)	Quercus gambelii ^p (Gambel oak)
year	Line Intercept Cover (%)					
2021	3	7.9	1.8	-	34	1.3
year	Quadrat Cover (%)					
2021	0.0	0.1	0.5	0.0	5.5	0.0

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

Table 30R-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.

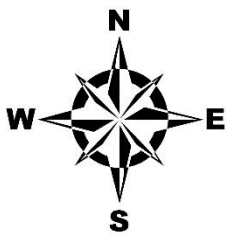
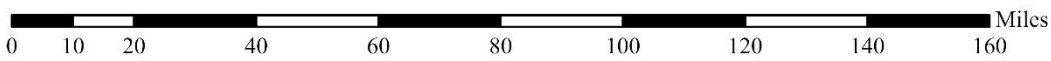
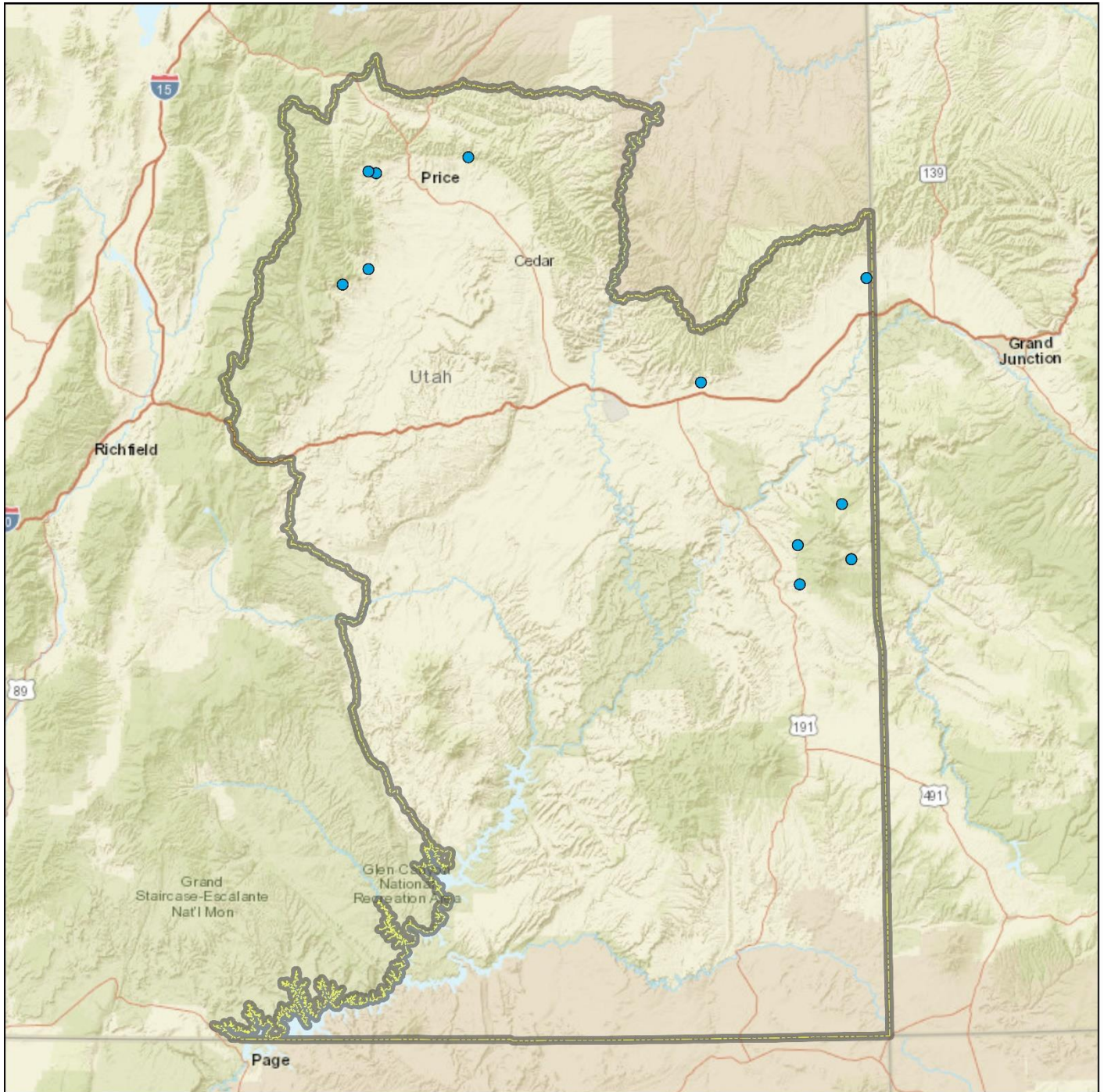
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis ^p -- (Utah serviceberry)									
2021	20	-	100	0	0	0	0	0	- / -
Cercocarpus ledifolius ^p -- (curl-leaf mountain mahogany)									
2021	40	20	0	0	100	0	0	100	- / -
Juniperus osteosperma ⁱ -- (Utah juniper)									
2021	80	-	75	0	25	0	0	25	- / -
Mahonia repens -- (creeping barberry)									
2021	260	-	0	100	0	0	0	0	- / -
Opuntia polyacantha -- (plains pricklypear)									
2021	60	-	0	100	0	0	0	100	- / -
Pinus monophylla ⁱ -- (singleleaf pinyon)									
2021	1020	240	75	20	6	0	0	6	- / -
Quercus gambelii ^p -- (Gambel oak)									
2021	120	40	67	17	17	0	0	17	- / -

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

Table 30R-10.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

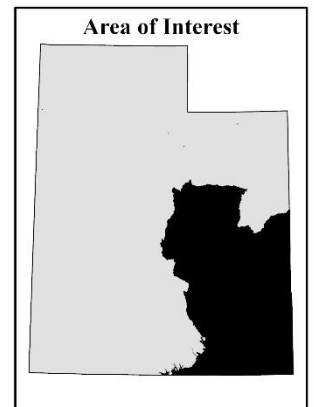
Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2021	47	-	-	7	29	64	35.1
Pinus monophylla (singleleaf pinyon)							
2021	536	33	17	22	6	22	7.5

SOUTHEASTERN REGION



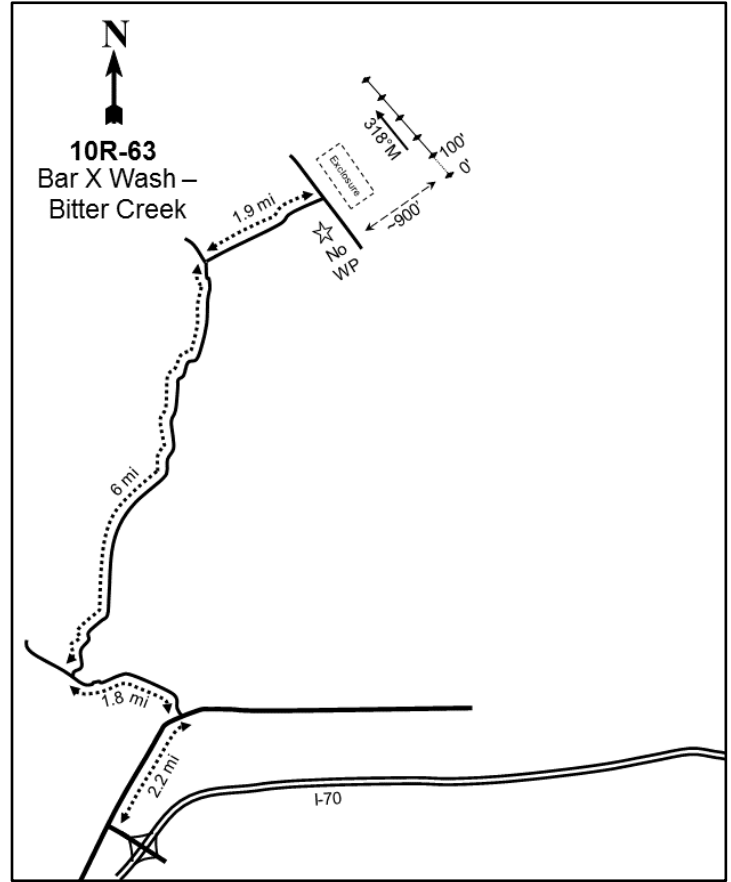
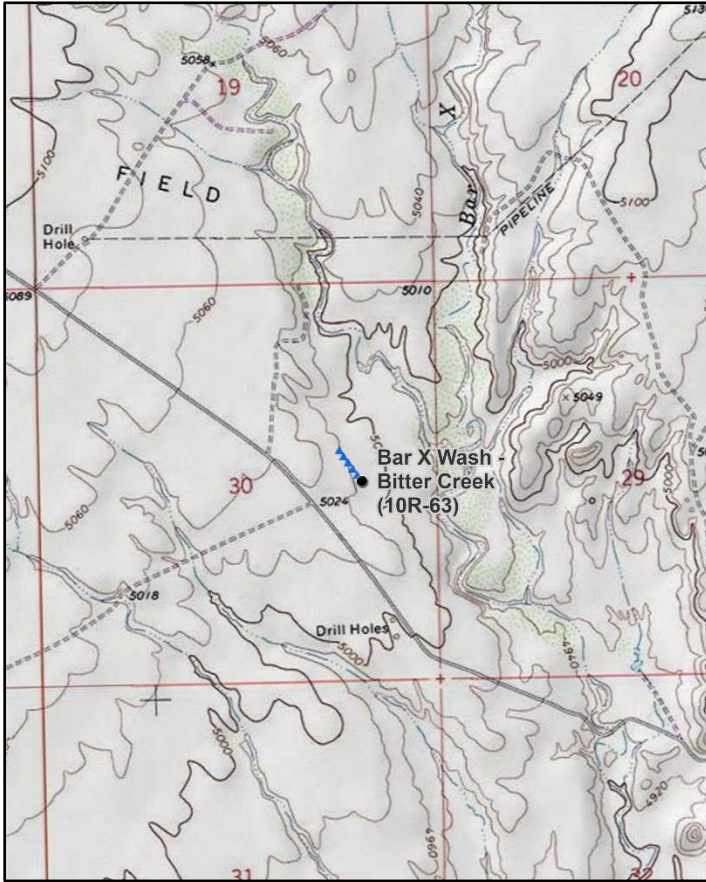
Region Boundaries
Southeastern Region

Study Locations
2021 WRI Study Site



Credits: Esri, HERE, Garmin, NGA, USGS, NPS

BAR X WASH - BITTER CREEK - STUDY NO. 10R-63



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Bar X Wash SW; Township 17S, Range 26E, Section 30
NAD 83 UTM ZONE 12, 666068 East 4351770 North

Transect Information

Browse Tag # (0' Stake)	Not Available
Transect Bearing	318° 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 I-70, take exit #227 (Harley Dome), go under the interstate, and turn right (east) onto the old Harley Dome highway. Drive 2.2 miles to Book Cliff Road. Turn left and drive for another 1.8 miles to Macintyre Cutoff. Bear right and proceed for 6 miles to a "T"-junction, then turn right. Continue for another 1.9 miles to another "T"-junction near an enclosure. Turn right and park near the south edge of the enclosure; there is no witness post. Walk 300 paces northeast to the transect.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	SAN ARROYO
Elevation	5,020ft (1,530m)
Aspect	Northeast
Slope	3-5%
Sample Dates	08/23/2018, 07/28/2021

Table 10R-63.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Herbicide - Plateau	Bitter Creek Restoration Phase 3	4465	October 2018	1869
Herbicide - Plateau	Bitter Creek Phase 3 Seeding	4673	November 2019	4739

Wildlife Habitat and Vegetation History

Table 10R-63.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	substantial	year-long
Rocky Mountain Elk	substantial	year-long
Pronghorn	crucial	year-long

Table 10R-63.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2018	Annual Grass	NA
2021	Annual Forb	NA

Site Notes

No Notes

Site Potential

1981 - 2010 Average Annual Precipitation	11 inches
NRCS Ecological Site	Semidesert Loam (Wyoming Big Sagebrush)
NRCS Ecological Site #	R034BY212UT
States and Transitions	Current State: Community Phase 4.1

At the time of study establishment in 2018, the plant community on this site was dominated by the introduced annual grass species cheatgrass (*Bromus tectorum*). The perennial grass species James' galleta (*Pleuraphis jamesii*) provided moderate amounts of cover, and blue grama (*Bouteloua gracilis*) was also observed in very low amounts. James' galleta increased in abundance and cover in 2021 and was the only perennial grass observed (Table 10R-63.10). Forbs exhibited a lack of diversity prior to treatment with most of the cover provided by ruderal annual species. Perennial forb cover in particular was low at 0.9 percent, and was entirely contributed by rose heath (*Chaetopappa ericoides*) and scarlet globemallow (*Sphaeralcea coccinea*). However, the introduced annual species prickly Russian thistle (*Salsola tragus*) was the sole forb species observed in 2021 and was considered to be the dominant site component in that year (Table 10R-63.7, Table 10R-63.11). Broom snakeweed (*Gutierrezia sarothrae*) and plains pricklypear (*Opuntia polyacantha*) were the only shrub species sampled, neither of which have contributed much cover (Table 10R-63.6, Table 10R-63.12). The herbicide treatment that occurred in 2018 (Table 10R-63.1) appears to have had a limited impact on community phase. Without further treatments to augment and diversify shrub and herbaceous components, this site will likely continue to remain in an ecologically degraded state in future sample years. Moreover, no current transitional pathway is proposed for transitioning away from the Invasive Annual phase according to the available model (USDA-ARS Jornada Experimental Range et al., 2021).

Trend Summary Tables

Table 10R-63.6 - 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
2018	-	1.7	-	-	0.8	-
2021	-	0.0	-	-	-	-

Table 10R-63.7 - 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
2018	262	193	105	56	10.6	3.5	3.5	0.9
2021	-	270	247	-	-	6.3	7.9	-

Table 10R-63.8 - 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
2018	41.8	2.8	51.1	0.1	-	19.7
2021	79.7	0.3	10.6	0.0	-	14.5

Table 10R-63.9 - 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/Pronghorn	Horse	Rabbit
	Quadrat Frequency			
2018	1	8	-	51
2021	8	8	-	13
Days Use Per Acre (ha)				
2018	0.7 (1.8)	4.7 (11.6)	-	-
2021	14.5 (35.9)	2.7 (6.6)	0.6 (1.4)	-

Table 10R-63.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES			
<i>Bouteloua gracilis</i> (blue grama)			
<i>Bromus tectorum</i> ^{ai} (cheatgrass)			
<i>Pleuraphis jamesii</i> (James' galleta)			
year	Nested Frequency		
2018	1	262	192
2021	-	-	270
year	Average Cover (%)		
2018	0.0	10.6	3.4
2021	-	-	6.3

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

Table 10R-63.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES							
<i>Alyssum desertorum</i> ^{ai} (desert madwort)							
<i>Chaetopappa ericoides</i> (rose heath)							
<i>Chenopodium fremontii</i> ^a (Fremont's goosefoot)							
<i>Descurainia pinnata</i> ^a (western tansymustard)							
<i>Erodium cicutarium</i> ^{ai} (redstem stork's bill)							
<i>Salsola tragus</i> ^{ai} (prickly Russian thistle)							
<i>Sphaeralcea coccinea</i> (scarlet globemallow)							
year	Nested Frequency						
2018	2	25	62	1	3	51	31
2021	-	-	-	-	-	247	-
year	Average Cover (%)						
2018	0.0	0.6	1.1	0.0	0.0	2.3	0.3
2021	-	-	-	-	-	7.9	-

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

Table 10R-63.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)	
	Gutierrezia sarothrae (broom snakeweed)	Opuntia polyacantha (plains pricklypear)
year	Line Intercept Cover (%)	
2018	0.8	0
2021	-	-
year	Quadrat Cover (%)	
2018	1.7	0.0
2021	0.0	-

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

Table 10R-63.13 - 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.

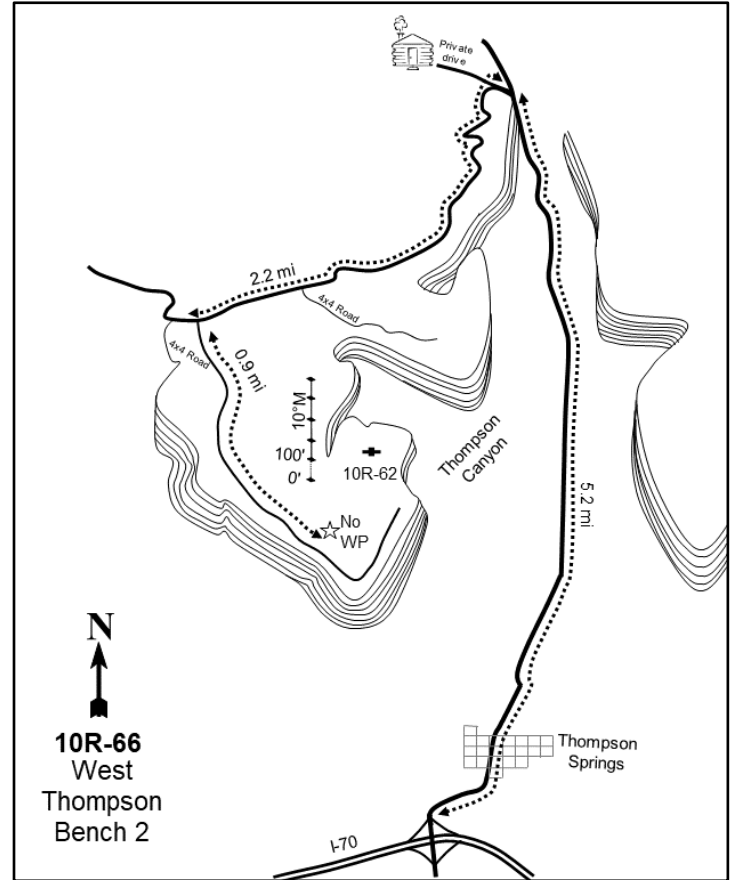
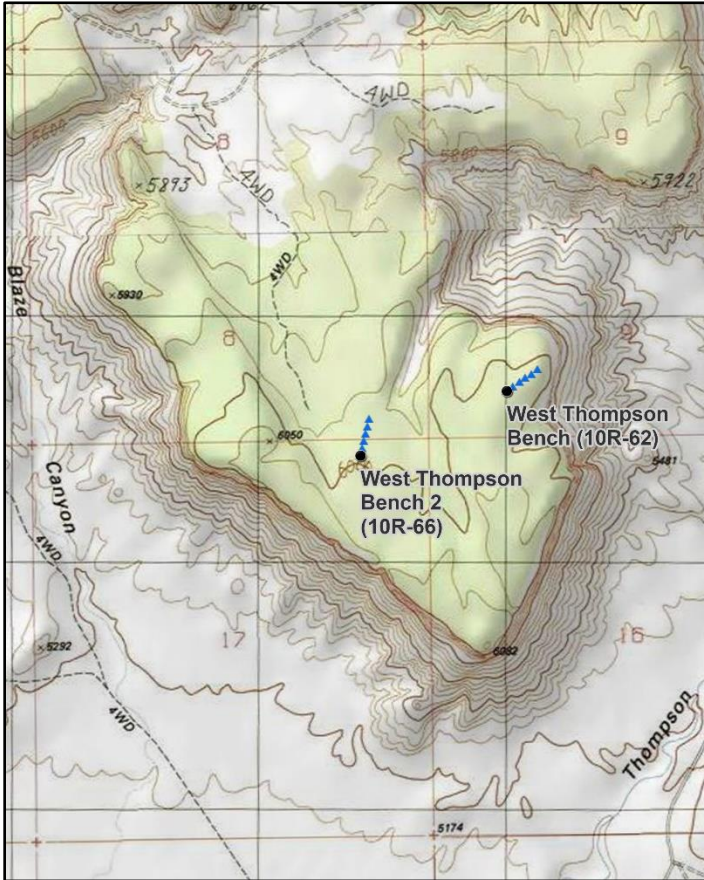
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Gutierrezia sarothrae -- (broom snakeweed)									
2018	1080	-	2	65	33	0	2	41	22/30
2021	240	20	92	8	0	0	0	75	- / -
Opuntia polyacantha -- (plains pricklypear)									
2018	100	-	0	100	0	0	0	0	10/13
2021	40	-	0	100	0	0	0	0	- / -

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

Table 10R-63.15 - Deer Desirable Components Index: Semidesert 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
2018	0.0	0.0	0.0	6.9	-7.9	1.8	0.0	0.8	Very Poor
2021	0.0	0.0	0.0	12.6	0.0	0.0	0.0	12.6	Poor

WEST THOMPSON BENCH 2 - STUDY NO. 10R-66

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Thompson Springs NW; Township 21S, Range 20E, Section 17
NAD 83 UTM ZONE 12, 610352 East 4316640 North

Transect Information

Browse Tag # (0' Stake)

Transect Bearing

15° 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 town of Thompson Springs, travel north on Thompson Canyon road for approximately 5.2 miles, crossing through the wash/dry creek bed four times. After the fourth crossing, there will be a four-way split in the road. Turn left at the split and cross the wash. Immediately after the wash there will be a fork: bear left again and follow this road south. After 2.2 miles, turn left onto a two-track road. Follow this two-track for roughly 0.9 miles, at which point the road will fade away. Park here and walk roughly 478 feet east to where the site is located on the bench. There is no witness post.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	CRESCENT CANYON
Elevation	6,000ft (1,829m)
Aspect	South
Slope	No data
Sample Dates	07/27/2021

Table 10R-66.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Seeding - Aerial Before	South Bookcliffs Phase 6 (Blaze)	4522	October 2018	730
Seeding - Aerial After	South Bookcliffs Phase 6 (Blaze)	4522	March 2019	730
Mechanical - Bullhog	South Bookcliffs Phase 6 (Blaze)	4522	January-March 2019	730

Table 10R-66.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
South Bookcliffs Blaze			Aerial	Oct 2018	730
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	<i>Achnatherum hymenoides</i>	Indian Ricegrass	Emery, UT	1.03	0.95
G	<i>Bouteloua gracilis</i>	Blue Grama	Hachita	0.48	0.35
G	<i>Elymus trachycaulus</i>	Thickspike Wheatgrass	Bannock II	0.55	0.45
G	<i>Poa secunda</i>	Nevada Bluegrass	Opportunity	0.48	0.41
G	<i>Sporobolus cryptandrus</i>	Sand Dropseed		0.10	0.10
F	<i>Achillea millefolium</i>	Western Yarrow	Eagle	0.01	0.01
F	<i>Cleome serrulata</i>	Rocky Mountain Beeplant		0.68	0.67
F	<i>Dalea purpurea</i>	Purple Prairie Clover		0.21	0.18
F	<i>Dalea purpurea</i>	Purple Prairie Clover		0.27	0.25
F	<i>Helianthus annuus</i>	Annual Sunflower		0.55	0.50
F	<i>Linum perenne</i>	Blue Flax		0.41	0.33
F	<i>Medicago sativa</i>	Alfalfa	Ladak DL	0.48	0.44
F	<i>Onobrychis viciifolia</i>	Sainfoin	Shoshone	1.03	0.90
F	<i>Penstemon palmeri</i>	Palmer Penstemon	Carbon UT	0.07	0.05
F	<i>Ratibida columnifera</i>	Prairie Coneflower	Stillwater	0.75	0.64
F	<i>Sanguisorba minor</i>	Small Burnet	Delar	1.03	0.90
F	<i>Sphaeralcea munroana</i>	Munro Globemallow	Uintah UT	0.07	0.05
S	<i>Atriplex canescens</i>	Fourwing Saltbush	Kane UT	0.29	0.12
S	<i>Atriplex canescens</i>	Fourwing Saltbush	Lincoln NV	0.62	0.33

Mix Name			Application Type	Application Date	Acres
South Bookcliffs Blaze Shrub			Aerial	Mar 2019	730
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
F	<i>Medicago sativa</i>	Alfalfa	Ladak DL	0.48	0.41
S	<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i>	Wyoming Big Sagebrush	Carbon UT	0.12	0.05
S	<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i>	Wyoming Big Sagebrush	Beaver, UT	0.38	0.11

Wildlife Habitat and Vegetation History**Table 10R-66.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Bighorn	RMBS	year-long

Table 10R-66.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2021	Broom Snakeweed/Wyoming Big Sagebrush	Phase I

Site Notes

This study site was established to replace 10R-62 which fell outside the treatment area, and is intended to be used as response reference for the bullhog treatment that was supposed to occur on 10R-62.

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.

When the study was established in 2021, this site was dominated by broom snakeweed (*Gutierrezia sarothrae*) and plains pricklypear (*Opuntia polyacantha*) with Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) as the subordinate species. The establishment of this site followed a bullhog treatment (Table 10R-66.1) that was intended for the companion study 10R-62, which was in Phase III of woodland succession (Table 10R-62.4, Table 10R-62.12, Table 10R-62.13, Table 10R-62.14). Judging by the amount of masticated tree litter on the site and the fact that the area was treated, this site was likely in a similar woodland phase prior to treatment. Although not directly comparable, site response is likely similar to how 10R-62 would have responded following tree mastication. Perennial grasses and forbs were limited following treatment, and grass diversity was particularly lacking (Table 10R-66.7, Table 10R-66.10, Table 10R-66.11). Decadence and poor vigor was high for the sagebrush population: this may be due to the recent disturbance influencing the appearance of mature sagebrush, and may not accurately represent the true condition of the sagebrush population (Table 10R-66.13). Few Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) were found on the site, and those that remained following mastication were seedlings and young trees (Table 10R-66.14). Encroachment will likely remain active and future input in tree removal will likely be necessary to ensure this shrub community's recovery.

Trend Summary Tables**Table 10R-66.6 - 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
2021	2.3	10.0	-	2.6	9.7	-

Table 10R-66.7 - 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
2021	38	64	63	103	0.6	0.4	1.6	1.4

Table 10R-66.8 - 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
2021	34.4	3.4	54.0	0.0	0.1	15.4

Table 10R-66.9 - 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		
2021	39	3	20
Year	Days Use Per Acre (ha)		
	2021	53.0 (130.8)	-

Table 10R-66.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES				
	Achnatherum hymenoides (Indian ricegrass)			
	Bromus tectorum ^{ai} (cheatgrass)			
	Elymus elymoides (squirreltail)			
	Pascopyrum smithii (western wheatgrass)			
year	Nested Frequency			
2021	36	38	17	12
year	Average Cover (%)			
2021	0.2	0.6	0.1	0.0

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

Table 10R-66.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES																																		
	Arabis (rockcress)		Astragalus convallarius (lesser rushy milkvetch)		Calochortus nuttallii (sego lily)		Cleome serulata ^a (Rocky Mountain beeplant)		Collinsia parviflora ^a (maiden blue eyed Mary)		Eriogonum cernuum ^a (nodding buckwheat)		Helianthus annuus ^a (common sunflower)		Ipomopsis aggregata (scarlet gilia)		Lappula occidentalis ^a (flatspine stickseed)		Lepidium ^a (pepperweed)		Linum perenne ⁱ (blue flax)		Medicago sativa ⁱ (alfalfa)		Microsteris gracilis ^a (slender phlox)		Packera multilobata (lobeleaf groundsel)		Penstemon (beardtongue)		Penstemon palmeri (Palmer's penstemon)		Penstemon speciosus (royal penstemon)	
year	Nested Frequency																																	
2021	4	7	1	0	3	35	2	3	3	7	3	2	5	76	8	1	3																	
year	Average Cover (%)																																	
2021	0.2	0.3	0.0	0.0	0.0	1.3	0.0	0.0	0.0	0.1	0.2	0.0	0.0	0.6	0.0	0.0	0.0																	

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

FORB SPECIES		
	Salsola tragus ^{ai} (prickly Russian thistle)	
	Townsendia (Townsend daisy)	
year	Nested Frequency	
2021	17	3
year	Average Cover (%)	
2021	0.2	0.0

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

Table 10R-66.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)			
	Artemisia tridentata ssp. wyomingensis ^p (Wyoming big sagebrush)	Ephedra viridis ^p (mormon tea)	Gutierrezia sarothrae (broom snakeweed)	Opuntia polyacantha (plains pricklypear)
year	Line Intercept Cover (%)			
2021	2.5	0.1	6.5	3.2
year	Quadrat Cover (%)			
2021	2.3	0.0	5.7	4.3

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

Table 10R-66.13 - 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 tridentata ssp. wyomingensis ^p -- (Wyoming big sagebrush)									
2021	980	-	4	35	61	14	16	65	- / -
Ephedra viridis ^p -- (mormon tea)									
2021	20	-	0	100	0	0	100	0	- / -
Eriogonum microthecum ^p -- (slender buckwheat)									
2021	40	-	0	100	0	0	0	0	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
2021	9800	-	21	74	6	0	0	6	- / -
Opuntia polyacantha -- (plains pricklypear)									
2021	9240	-	1	71	28	0	0	25	- / -

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

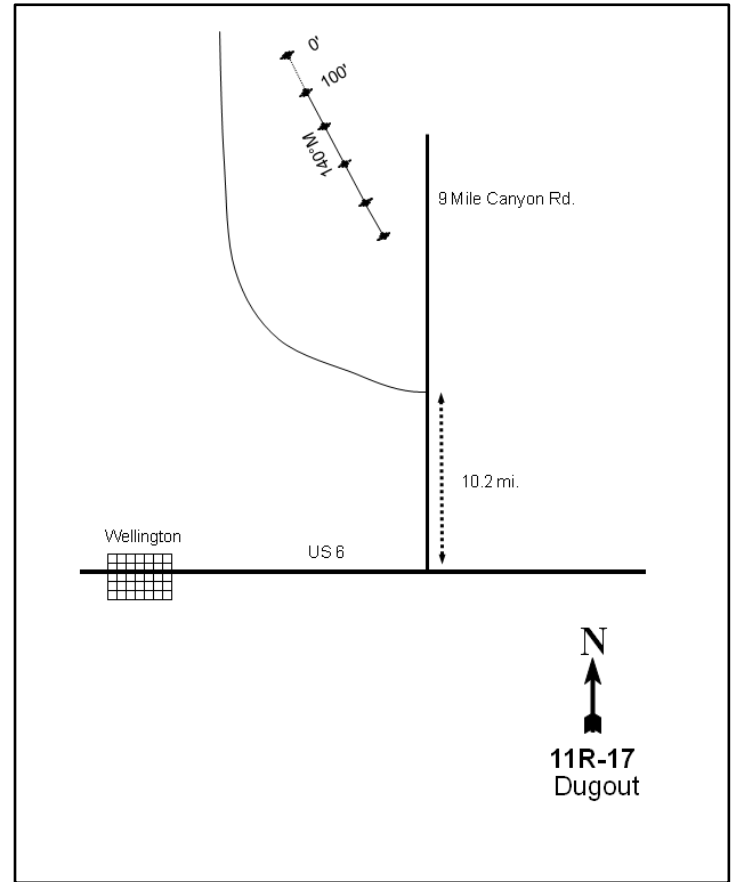
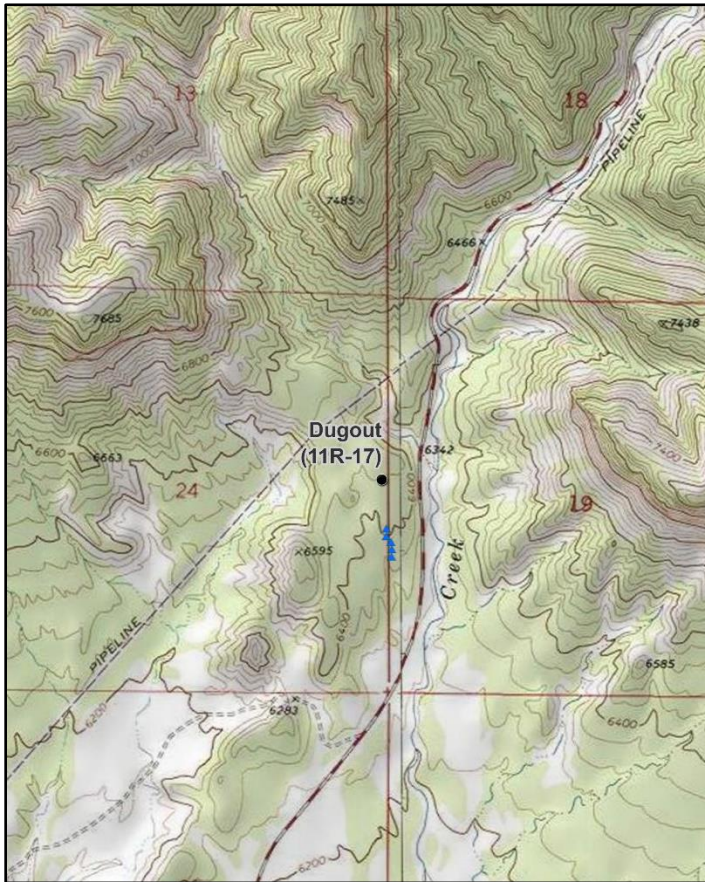
Table 10R-66.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2021	17	75	13	13	-	-	4.8
Pinus edulis (twoneedle pinyon)							
2021	2	-	100	-	-	-	2.0

Table 10R-66.15 - Deer Desirable Components Index: Semidesert 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
2021	3.3	0.0	0.0	0.8	-0.4	2.8	0.0	6.4	Very Poor

DUGOUT - STUDY NO. 11R-17

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Deadman Canyon SE; Township 13S, Range 11E, Section 24
NAD 83 UTM ZONE 12, 532029 East 4392485 North

Transect Information

Browse Tag # (0' Stake)	229
Transect Bearing	168° magnetic (Line 3: 130° magnetic, Line 4-5: 167° 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

Travel east out of Wellington and turn left (north) onto 9 Mile Canyon Road. Drive 10.2 miles and turn left (west) onto a power line road. The study will be an indeterminate distance and bearing to the right.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	SOLDIERS CANYON
Elevation	6,323ft (1,927m)
Aspect	Southeast
Slope	2-8%
Sample Dates	07/03/2013, 08/15/2016, 08/03/2021

Table 11R-17.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Mechanical - Bullhog	Dugout Creek Fuels Reduction and Habitat Restoration: Phase III	2540	Fall 2013	395
Seeding - Aerial Before	Dugout Creek Fuels Reduction and Habitat Restoration: Phase III	2540	Fall 2013	395

Table 11R-17.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Dugout Creek Fuels Reduction			Aerial	Oct 2013	395
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Achnatherum hymenoides	Indian Ricegrass	Emery UT	0.10	0.06
G	Achnatherum hymenoides	Indian Ricegrass	Emery UT	1.01	0.71
G	Achnatherum hymenoides	Indian Ricegrass	Emery UT	2.53	1.79
G	Elymus elymoides	Bottlebrush Squirreltail	Fish Creek	1.56	1.14
G	Elymus elymoides	Bottlebrush Squirreltail	Juab UT	0.25	0.23
G	Hesperostipa comata	Needle and Threadgrass	Beaver UT	0.88	0.54
G	Hesperostipa comata	Needle and Threadgrass	Iron UT	0.25	0.15
G	Poa secunda	Big Bluegrass	Sherman	0.51	0.44
G	Sporobolus cryptandrus	Sand Dropseed	Washington CO	0.10	0.10
F	Penstemon comarrhenus	Dusty Penstemon	UP Delta CO	0.13	0.09
F	Sphaeralcea munroana	Munro Globemallow	Emery UT	0.13	0.08
S	Atriplex confertifolia	Shadscale Saltbrush	Sevier UT	0.63	0.29
S	Atriplex confertifolia	Shadscale Saltbrush		0.38	0.18
S	Krascheninnikovia lanata	Winterfat	Torrance NM	1.52	0.79

Wildlife Habitat and Vegetation History**Table 11R-17.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	year-long

Table 11R-17.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2013	Pinyon-Juniper	Phase III
2016	Pinyon-Juniper	Phase I
2021	Pinyon-Juniper	Phase I transitioning to Phase II

Site Notes

The original site was not treated so the study was moved approximately 200 feet southwest of the previous transect's 500-foot stake in order to capture the treated area. In addition, the new transect doglegs in order to accommodate for the patchiness of the treatment.

Site Potential

1981 - 2010 Average Annual Precipitation	13 inches
NRCS Ecological Site	Upland Shallow Loam (Birchleaf Mountain Mahogany)
NRCS Ecological Site #	R034BY321UT
States and Transitions	No state and transition model is available for this ecological site.

When the study was established in 2013, twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) trees were encroaching the site and it was considered to be within Phase III of woodland succession (Table 11R-17.4, Table 11R-17.6, Table 11R-17.12). The majority of the shrub and herbaceous understory species were sparse with no single species being dominant; no grasses were sampled prior to treatment. With the removal of some of the pinyon and juniper trees in 2013, the herbaceous understory increased in diversity. However, most of that increase was due to annual species being observed following the bullhog treatment (Table 11R-17.7, Table 11R-17.10, Table 11R-17.11). The shrub community has displayed relatively little change (Table 11R-17.12, Table 11R-17.13). If focused tree removal is continued, community health is expected to improve with increasing abundance and cover of preferred browse and herbaceous species. However, the extant tree community and increasing density of pinyon (Table 11R-17.14) indicate that there remains a high risk of infilling in future sample years.

Trend Summary Tables**Table 11R-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
2013	0.8	0.5	16.2	2.9	0.2	45.8
2016	1.1	0.1	4.6	2.7	-	7.2
2021	2.3	-	3.2	3.7	-	8.0

Table 11R-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
2013	-	-	7	35	-	-	0.0	0.2
2016	-	1	61	45	-	0.0	2.4	0.7
2021	-	15	81	120	-	0.1	3.6	4.7

Table 11R-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
2013	23.2	0.5	52.7	5.1	12.9	19.5
2016	12.6	-	63.9	4.1	12.8	9.5
2021	11.8	1.8	59.1	4.3	16.5	13.0

Table 11R-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	Mule Deer	Rabbit
	Quadrat Frequency	
2013	14	4
2016	13	28
2021	32	2
Year	Days Use Per Acre (ha)	
2013	20.1 (49.7)	-
2016	10.0 (24.8)	-
2021	24.1 (59.6)	-

Table 11R-17.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES		
	Achnatherum hymenoides (Indian ricegrass)	Elymus elymoides (squirreltail)
year	Nested Frequency	
2013	-	-
2016	1	-
2021	4	11
year	Average Cover (%)	
2013	-	-
2016	0.0	-
2021	0.1	0.1

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

Table 11R-17.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES																	
	Achillea millefolium (Common yarrow)	Arabis (rockcress)	Carduus nutans ^{ai} (nodding plumeless thistle)	Caulanthus crassicaulis ^a (thickstem wild cabbage)	Chaenactis douglasii (Douglas' dustymaiden)	Chaenactis fremontii ^a (pincushion flower)	Chamaesyce (sandmat)	Cryptantha (cryptantha)	Descurainia pinnata ^a (western tansymustard)	Eriogonum alatum (winged buckwheat)	Eriogonum cernuum ^a (nodding buckwheat)	Euphorbia (spurge)	Hedysanum boreale (Utah sweetvetch)	Ipomopsis aggregata (scarlet gilia)	Lactuca serriola ^{ai} (prickly lettuce)	Lepidium ^a (pepperweed)	Machaeranthera canescens (hoary tansyaster)
year	Nested Frequency																
2013	-	11	-	-	1	-	7	11	3	-	-	-	-	2	-	2	-
2016	2	12	-	2	-	-	13	2	22	-	-	2	2	5	43	-	-
2021	-	12	6	-	0	8	49	59	-	1	29	-	2	1	7	-	3
year	Average Cover (%)																
2013	-	0.0	-	-	0.0	-	0.1	0.1	0.0	-	-	-	-	0.0	-	0.0	-
2016	0.0	0.1	-	0.1	-	-	0.2	0.0	0.4	-	-	0.1	0.0	0.2	1.9	-	-
2021	-	0.1	0.1	-	0.0	0.2	1.2	1.9	-	0.0	0.3	-	0.4	0.0	0.0	-	0.0

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

FORB SPECIES	Packera multilobata (lobeleaf groundsel)	Penstemon (beardtongue)	Penstemon comarhenus (dusty beardtongue)	Penstemon pachyphylus (thickleaf beardtongue)	Physaria (twinpod)	Salsola tragus ^{at} (prickly Russian thistle)	Sisymbrium altissimum ^{at} (tall tumblemustard)	Streptanthus cordatus (heartleaf twistflower)	Taraxacum officinale (common dandelion)	Tragopogon dubius ^{at} (yellow salsify)
year	Nested Frequency									
2013	5	3	-	-	2	2	-	1	-	-
2016	10	-	-	7	6	-	-	-	1	2
2021	27	-	3	8	3	50	3	-	1	-
year	Average Cover (%)									
2013	0.0	0.0	-	-	0.0	0.0	-	0.0	-	-
2016	0.1	-	-	0.1	0.0	-	-	-	0.0	0.0
2021	0.8	-	0.2	0.0	0.1	2.7	0.2	-	0.0	-

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

Table 11R-17.12 - 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)	Ephedra viridis ^p (mormon tea)	Juniperus osteosperma ^t (Utah juniper)	Opuntia polyacantha (plains pricklypear)	Pinus edulis ^t (twoneedle pinyon)	Rhus trilobata var. trilobata ^p (skunkbush sumac)
year	Line Intercept Cover (%)						
2013	-	2	0.9	26.2	0.2	19.6	-
2016	-	2.2	-	4.3	-	2.9	0.5
2021	-	2.1	-	5.2	-	2.8	1.6
year	Quadrat Cover (%)						
2013	-	0.4	0.4	7.4	0.5	8.8	-
2016	-	1.0	-	2.8	0.1	1.8	0.1
2021	0.0	0.8	0.0	2.1	-	1.0	1.5

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

Table 11R-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			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Cercocarpus montanus ^p -- (alderleaf mountain mahogany)									
2013	180	-	22	67	11	22	56	11	132/146
2016	80	-	50	50	0	0	75	0	96/121
2021	120	-	50	50	0	33	50	0	- / -
Ephedra viridis ^p -- (mormon tea)									
2013	20	-	0	100	0	0	0	0	113/117
2016	40	-	100	0	0	0	0	0	80/95
2021	20	-	0	100	0	0	0	0	- / -

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 (%)				
Gutierrezia sarothrae -- (broom snakeweed)									
2013	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
2021	20	-	0	100	0	0	0	0	-/-
Juniperus osteosperma^t -- (Utah juniper)									
2013	240	-	0	92	8	0	0	0	-/-
2016	80	200	0	50	50	0	0	0	-/-
2021	280	-	71	7	21	0	0	21	-/-
Opuntia polyacantha -- (plains pricklypear)									
2013	320	-	0	100	0	0	0	13	9/30
2016	160	-	0	100	0	0	0	0	9/31
2021	120	-	0	100	0	0	0	0	-/-
Pinus edulis^t -- (twoneedle pinyon)									
2013	500	-	52	48	0	0	0	0	-/-
2016	140	80	57	43	0	0	0	14	-/-
2021	260	-	77	15	8	0	0	8	-/-
Purshia stansburiana^p -- (Stansbury cliffrose)									
2013	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	230/290
2021	-	-	-	-	-	-	-	-	-/-
Rhus trilobata var. trilobata^p -- (skunkbush sumac)									
2013	-	-	-	-	-	-	-	-	-/-
2016	20	-	0	100	0	0	0	0	91/129
2021	60	-	33	67	0	0	0	0	-/-

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

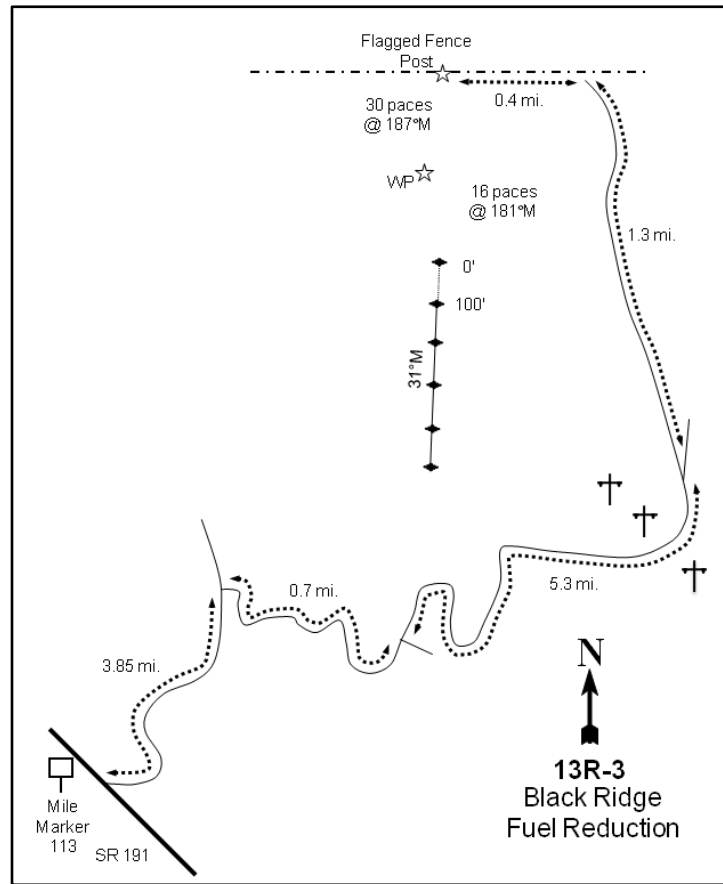
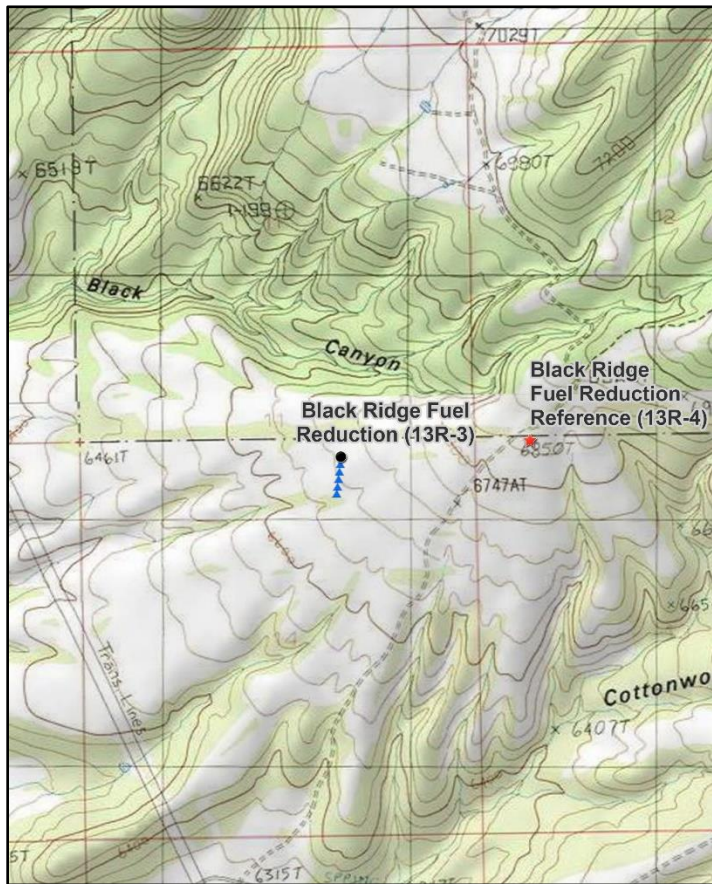
Table 11R-17.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2013	157	-	-	5	5	90	49.0
2016	162	21	21	-	16	42	28.1
2021	141	20	15	10	30	25	37.7
Pinus edulis (twoneedle pinyon)							
2013	409	5	50	10	10	25	9.1
2016	207	20	75	5	-	-	2.5
2021	235	-	95	5	-	-	4.8

Table 11R-17.15 - Deer Desirable Components Index: Upland 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
2013	4.1	0.0	0.0	0.0	0.0	0.5	0.0	4.6	Very Poor
2016	3.8	0.0	0.0	0.0	0.0	1.4	0.0	5.2	Very Poor
2021	4.8	0.0	0.0	0.3	0.0	9.4	-2.0	12.5	Very Poor

BLACK RIDGE FUEL REDUCTION - STUDY NO. 13R-3



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

La Sal West NW; Township 28S, Range 23E, Section 14
NAD 83 UTM ZONE 12, 643665 East 4248461 North

Transect Information

Browse Tag # (0' Stake)	285
Transect Bearing	180° 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 Moab, travel south on State Route 191 just past mile marker 113 where a road turns off to Black Ridge and Yellow Circle Mine. Turn left (east) and go 3.85 miles on the main road. Turn right and continue 0.7 miles up the ridge to a fork. Go left and stay on the main road for 5.3 miles (passing a gate at 2.6 miles). Turn left onto a jeep trail 0.1 miles after crossing under some power lines, and continue on the main trail for 1.3 miles to a cattleguard at the Forest Service boundary. Turn left before the cattleguard onto a two-track and continue for 0.4 miles (a fence post should be wrapped in flagging). From the marked post, walk 30 paces at 187 degrees magnetic to a witness post. From the witness post, walk 16 paces at 181 degrees magnetic to the 0-foot stake that is marked with browse tag #285.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	BLACK RIDGE
Elevation	6,635ft (2,022m)
Aspect	West
Slope	10%
Sample Dates	06/17/2010, 06/26/2013, 08/03/2016, 08/05/2021

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

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Seeding - Aerial Before	Black Ridge Tree Chaining and Seeding	LTDL	Fall 1966	3043
Chaining - Two-Way Ely	Black Ridge Tree Chaining and Seeding	LTDL	Fall 1966	3043
Mechanical - Bullhog	Black Ridge Fuels Reduction and Vegetation Restoration	1408	Fall 2010	1803
Seeding - Aerial Unknown	Black Ridge Fuels Reduction and Vegetation Restoration	1408	Fall 2010	1471

Table 13R-03.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name		Application Type	Application Date	Acres	
Black Ridge Phase 1		Aerial	Sep 2010	1473	
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	×Triticosecale rimpaii	Sterile Triticale	Quickguard	0.68	0.66
G	Achnatherum hymenoides	Indian Ricegrass	Emery UT	1.73	1.43
G	Agropyron cristatum	Crested Wheatgrass	Hycrest	0.07	0.06
G	Agropyron cristatum	Crested Wheatgrass	Hycrest	0.17	0.15
G	Bouteloua gracilis	Blue Grama	Alma	0.68	0.52
G	Hesperostipa comata	Needle and Threadgrass	Utah UT	0.07	0.05
G	Hesperostipa comata	Needle and Threadgrass	Kane UT	0.68	0.49
G	Pascopyrum smithii	Western Wheatgrass	Arriba	2.75	2.27
G	Poa secunda	Sandberg Bluegrass	UP/Colorado Plateau	0.41	0.38
G	Sporobolus cryptandrus	Sand Dropseed		0.05	0.05
G	Sporobolus cryptandrus	Sand Dropseed		0.07	0.07
G	Sporobolus cryptandrus	Sand Dropseed		0.03	0.03
F	Astragalus cicer	Cicer Milkvetch	Lutana	1.49	1.36
F	Linum perenne	Blue Flax	Appar	0.58	0.56
F	Linum perenne	Blue Flax	Appar	0.14	0.11
F	Onobrychis viciifolia	Sainfoin	Eski	2.00	1.90
F	Penstemon strictus	Rocky Mountain Penstemon		0.14	0.12
F	Sanguisorba minor	Small Burnet	Delar	0.88	0.84
F	Sanguisorba minor	Small Burnet	Delar	0.14	0.12
F	Sanguisorba minor	Small Burnet	Delar	0.22	0.19
S	Atriplex canescens	Fourwing Saltbush	Emery UT	1.73	0.87
S	Atriplex canescens	Fourwing Saltbush	Emery UT	0.27	0.13
S	Purshia stansburiana	Stansbury Cliffrose	Millard UT	0.09	0.07
S	Purshia stansburiana	Stansbury Cliffrose	Millard UT	0.05	0.04
S	Purshia tridentata	Bitterbrush		0.10	0.07
S	Purshia tridentata	Bitterbrush	Beaver UT	0.80	0.62
S	Purshia tridentata	Bitterbrush	Elko NV	0.19	0.13

Wildlife Habitat and Vegetation History**Table 13R-03.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

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

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

Year	Vegetation Type	Woodland Succession
2010	Pinyon-Juniper	Phase II transitioning to Phase III
2013	Broom Snakeweed/Green Ephedra	Phase I
2016	Perennial Grass/Broom Snakeweed	Phase I
2021	Broom Snakeweed	Phase I

Site Notes

In 2013 the transect was moved slightly to better represent the treatment.

Site Potential

1981 - 2010 Average Annual Precipitation	13 inches
NRCS Ecological Site	Upland Gravelly Loam (Pinyon-Utah Juniper)
NRCS Ecological Site #	R035XY303UT
States and Transitions	No state and transition model is available for this ecological site.

When the study was established in 2010, this site was in Phase II of woodland succession (Table 13R-03.4), being encroached by twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*); shrubs and forbs provided minimal cover (Table 13R-03.12). Crested wheatgrass (*Agropyron cristatum*) was the dominant herbaceous species (Table 13R-03.10) prior to treatment. The bullhog treatment (Table 13R-03.1) removed most of the trees from the study area, setting woodland succession back to Phase I. Some of the shrubs increased in cover following treatment. Broom snakeweed (*Gutierrezia sarothrae*) in particular increased substantially in cover and density in 2021. In addition, Mormon tea (*Ephedra viridis*) density has responded well with values doubling in 2021 (Table 13R-03.12, Table 13R-03.13). Few seeded species (Table 13R-03.2) were sampled in the browse or herbaceous understory with the exception of crested wheatgrass, which was present pre-treatment and has consistently provided the majority of understory cover (Table 13R-03.10). With the removal of pinyon and juniper, the herbaceous and shrub layers will likely increase in abundance. However, point-quarter density shows that trees are still present as of 2021, albeit with low density (Table 13R-03.14). The extant tree component indicates that infilling may occur in future sample years without further management.

Trend Summary Tables**Table 13R-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
2010	4.2	0.5	15.3	4.7	0.2	20.6
2013	0.8	1.6	-	4.3	5.4	-
2016	1.1	3.4	-	4.3	4.3	-
2021	2.4	10.1	-	5.9	13.3	-

Table 13R-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
2010	27	249	24	46	0.3	11.1	0.1	2.5
2013	7	231	2	84	0.0	8.8	0.0	3.4
2016	47	289	6	101	0.4	16.8	0.1	5.2
2021	32	212	2	86	0.1	5.8	0.0	3.4

Table 13R-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
2010	24.1	0.2	54.5	7.4	6.1	31.2
2013	17.8	0.0	62.2	3.6	4.5	15.2
2016	19.1	0.0	60.7	4.0	3.7	26.0
2021	11.9	0.0	63.3	7.4	5.3	20.1

Table 13R-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	Black Bear	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency				
2010	-	-	26	1	4
2013	-	2	10	7	9
2016	-	2	10	8	44
2021	-	7	37	5	2
Year	Days Use Per Acre (ha)				
2010	-	3.6 (9.0)	63.7 (157.3)	2.0 (5.0)	-
2013	-	5.1 (12.6)	35.5 (87.7)	8.1 (19.9)	-
2016	-	7.2 (17.9)	19.4 (48.0)	3.4 (8.3)	-
2021	8.7 (21.5)*	2.9 (7.2)	30.8 (76.1)	4.7 (11.6)	-

*Pellets per acre (ha)

Table 13R-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 tectorum ^{ai} (cheatgrass)	Hesperostipa comata (needle and thread)	Pascopyrum smithii (western wheatgrass)	Psathyrostachys juncea ⁱ (Russian wildrye)
year	Nested Frequency					
2010	-	249	27	-	-	-
2013	10	218	7	1	15	-
2016	10	277	47	1	24	4
2021	7	190	32	-	40	2
year	Average Cover (%)					
2010	-	11.1	0.3	-	-	-
2013	0.1	8.5	0.0	0.1	0.1	-
2016	0.0	16.0	0.4	0.1	0.5	0.1
2021	0.0	5.4	0.1	-	0.4	0.0

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

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

FORB SPECIES	Antennaria (pussytoes)	Astragalus (milkvetch)	Astragalus cicer ⁱ (chickpea milkvetch)	Chamaesyce (sandmat)	Chenopodium fremontii ^a (Fremont's goosefoot)	Collinsia parviflora ^a (maiden blue eyed Mary)	Cordylanthus ^{sa} (bird's-beak)	Draba ^a (draba)	Gilia inconspicua ^a (shy gilia)	Ipomopsis aggregata (scarlet gilia)	Lactuca serriola ^{ai} (prickly lettuce)	Lappula occidentalis ^{sa} (flatspine stickseed)	Lepidium ^{sa} (pepperweed)	Lesquerella (bladderpod)	Linum perenne ⁱ (blue flax)	Lithospermum ruderale (western stoneseed)	Packera multilobata (lobeleaf groundsel)
year	Nested Frequency																
2010	-	-	-	-	5	4	-	5	12	-	-	3	-	4	-	-	-
2013	3	-	2	16	-	-	1	-	-	-	-	-	-	-	15	2	-
2016	1	-	7	41	-	-	-	5	-	3	1	-	0	-	1	2	-
2021	-	5	1	41	2	-	-	-	-	-	-	-	-	-	-	1	1
year	Average Cover (%)																
2010	-	-	-	-	0.0	0.0	-	0.0	0.1	-	-	0.0	-	0.0	-	-	-
2013	0.0	-	0.0	0.1	-	-	0.0	-	-	-	-	-	-	-	0.3	0.0	-
2016	0.0	-	0.9	0.4	-	-	-	0.0	-	0.0	0.0	-	0.0	-	0.0	0.0	-
2021	-	0.0	0.0	0.8	0.0	-	-	-	-	-	-	-	-	-	-	0.0	0.0

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

FORB SPECIES	Penstemon strictus (Rocky Mountain penstemon)	Petradoria pumila (rock goldenrod)	Phlox longifolia (longleaf phlox)	Salsola tragus ^{ai} (prickly Russian thistle)	Tetraneris acaulis (stemless four-nerve daisy)	Townsendia (Townsend daisy)
year	Nested Frequency					
2010	-	45	-	-	-	-
2013	1	53	-	1	3	1
2016	-	64	-	-	-	6
2021	-	56	3	-	-	-
year	Average Cover (%)					
2010	-	2.5	-	-	-	-
2013	0.0	2.9	-	0.0	0.0	0.0
2016	-	3.8	-	-	-	0.0
2021	-	2.5	0.0	-	-	-

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

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

SHRUB SPECIES	Artemisia frigida ^p (prairie sagewort)	Atriplex canescens ^p (fourwing saltbush)	Ephedra viridis ^p (mormon tea)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma ^t (Utah juniper)	Opuntia (pricklypear)	Pinus edulis ^t (twoneedle pinyon)
year	Line Intercept Cover (%)						
2010	-	-	4.7	0.2	5.9	-	14.7
2013	-	0.1	4.2	5.4	-	-	-
2016	-	1.2	3.1	4.3	-	-	-
2021	-	1.6	4.3	13.2	-	0.1	-
year	Quadrat Cover (%)						
2010	0.4	-	3.8	0.5	4.6	-	10.7
2013	-	0.0	0.8	1.6	-	0.0	-
2016	-	0.2	0.9	3.4	-	0.0	-
2021	-	0.5	1.9	10.0	-	0.1	-

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

Table 13R-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			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia frigida^p -- (prairie sagewort)									
2010	-	-	-	-	-	-	-	-	-/-
2013	-	-	-	-	-	-	-	-	23/32
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
Atriplex canescens^p -- (fourwing saltbush)									
2010	-	-	-	-	-	-	-	-	46/55
2013	40	-	50	50	0	0	0	0	64/76
2016	100	40	40	60	0	40	20	0	63/76
2021	160	-	50	50	0	13	0	0	-/-
Echinocereus -- (hedgehog cactus)									
2010	-	-	-	-	-	-	-	-	-/-
2013	-	-	-	-	-	-	-	-	2/5
2016	-	-	-	-	-	-	-	-	14/13
2021	20	-	0	0	100	0	100	100	-/-
Ephedra viridis^p -- (mormon tea)									
2010	380	-	26	74	0	0	11	0	107/142
2013	860	-	30	70	0	0	0	0	69/86
2016	700	-	26	74	0	0	17	0	68/86
2021	1400	-	0	96	4	16	0	4	-/-
Gutierrezia sarothrae -- (broom snakeweed)									
2010	520	40	19	81	0	0	0	0	16/21
2013	2340	20	23	77	0	1	0	0	22/29
2016	5080	40	17	79	4	0	0	4	21/30
2021	27360	-	1	99	1	0	0	1	-/-
Juniperus osteosperma^t -- (Utah juniper)									
2010	160	20	0	100	0	0	0	0	-/-
2013	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
Opuntia -- (pricklypear)									
2010	-	-	-	-	-	-	-	-	13/100
2013	40	-	0	100	0	0	0	50	10/28
2016	40	-	0	100	0	0	0	0	8/34
2021	140	-	0	100	0	0	0	0	-/-
Pediocactus simpsonii -- (mountain ball cactus)									
2010	-	-	-	-	-	-	-	-	-/-
2013	20	-	0	100	0	0	0	0	-/-
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
Pinus edulis^t -- (twoneedle pinyon)									
2010	160	-	25	75	0	0	0	0	-/-
2013	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
Purshia stansburiana^p -- (Stansbury cliffrose)									
2010	-	-	-	-	-	-	-	-	-/-
2013	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	57/61

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

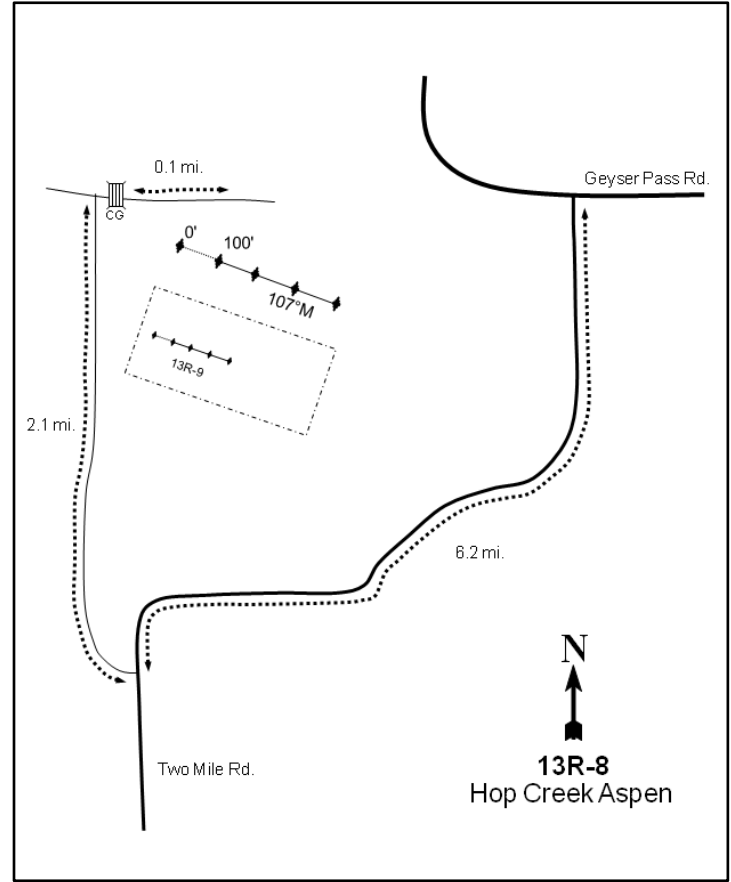
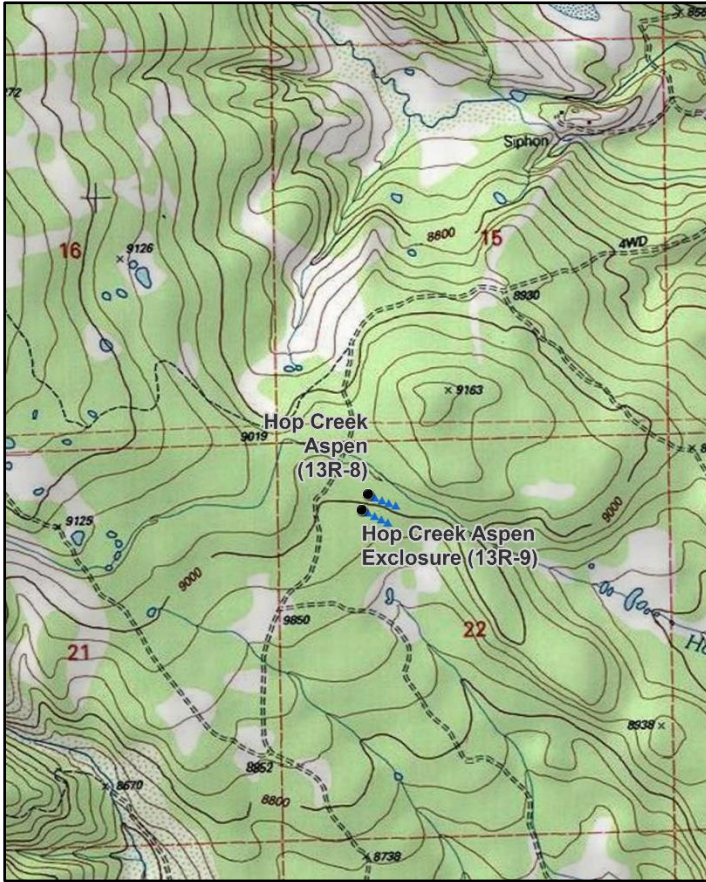
Table 13R-03.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2010	71	-	22	67	6	6	7.1
2013	33	-	100	-	-	-	5.5
2016	39	-	100	-	-	-	12.1
2021	34	10	70	20	-	-	6.6
Pinus edulis (twoneedle pinyon)							
2010	178	-	10	45	35	10	9.3
2013	5	-	100	-	-	-	3.0
2016	7	-	100	-	-	-	9.5
2021	8	-	100	-	-	-	3.8

Table 13R-03.15 - Deer Desirable Components Index: Upland 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
2010	5.9	0.0	0.0	22.2	-0.2	4.9	0.0	32.8	Very Poor
2013	5.4	0.0	0.0	17.6	0.0	6.7	0.0	29.7	Very Poor
2016	5.4	0.0	0.0	30.0	-0.3	10.0	0.0	45.1	Poor
2021	7.4	14.1	6.8	11.6	-0.1	6.8	0.0	46.5	Poor

HOP CREEK ASPEN - STUDY NO. 13R-8

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Mount Peale NE; Township 27S, Range 25E, Section 22
NAD 83 UTM ZONE 12, 661010 East 4257063 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

165
90° magnetic
400ft
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Standard

Directions to Site

From Geyser Pass Road, turn south onto Two Mile Road (do not access this site from the north). Drive for 6.2 miles and then turn right. Drive for 2.1 miles; there will be a "T" intersection in the road. Turn right (east), cross the cattleguard, and drive for 0.1 miles. The study will be south of the road and north of the exclosure. The baseline 0-stake is located approximately 270 feet at 200 degrees magnetic from the road at its closest point. The 0-foot stake is marked with browse tag #165.

Site Information

Land Ownership	State
Land Administrator	SITLA
Allotment	No data
Elevation	9,032ft (2,753m)
Aspect	South
Slope	6-7%
Sample Dates	08/27/2013, 08/02/2016, 08/02/2021

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

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Logging - Logging/Clear-Cut	-	-	2011-2012	-

Wildlife Habitat and Vegetation History**Table 13R-08.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

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

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

Year	Vegetation Type	Woodland Succession
2013	Quaking Aspen	NA
2016	Quaking Aspen	NA
2021	Quaking Aspen	NA

Site Notes

This site was established in conjunction with 13R-9. This study is outside the exclosure while 13R-9 is inside the exclosure.

Site Potential

1981 - 2010 Average Annual Precipitation	25 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.

This study was established in 2013 following a 2011/2012 logging treatment (Table 13R-08.1). In 2013, the vegetation community on this site consisted of healthy seedling/young quaking aspen (*Populus tremuloides*) trees. There was also a diverse component of other browse species which provided some cover. Preferred browse has had consecutive increase in cover over time, which can be attributed to increases in mountain snowberry (*Symphoricarpos oreophilus*) cover and density (Table 13R-08.12, Table 13R-08.13). In 2016, the herbaceous understory increased substantially in cover and was diverse for both grasses and forbs. However, herbaceous cover decreased substantially in 2021; the perennial grass species Kentucky bluegrass (*Poa pratensis*) was the main contributor to the increase and decrease in herbaceous cover in 2016 and 2021, respectively (Table 13R-08.7, Table 13R-08.10). Aspen has continued to increase in both size and cover since the initial sampling (Table 13R-08.12, Table 13R-08.13a).

Trend Summary Tables**Table 13R-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
2013	5.3	0.5	27.4	5.7	0.8	37.3
2016	8.6	0.9	47.6	10.1	0.6	78.5
2021	11.9	2.3	36.5	16.6	2.2	77.9

Table 13R-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
2013	-	388	6	319	-	21.7	0.2	19.3
2016	-	458	1	335	-	39.6	0.0	25.1
2021	-	360	9	375	-	12.6	0.2	32.1

Table 13R-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
2013	4.5	0.0	58.2	0.0	0.0	66.5
2016	3.3	0.0	54.8	-	0.0	79.0
2021	1.5	0.1	58.3	0.0	0.2	77.3

Table 13R-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
	Quadrat Frequency		
2013	-	2	6
2016	-	-	-
2021	3	2	-
Days Use Per Acre (ha)			
2013	1.5 (3.6)	2.0 (5.0)	17.4 (43.0)
2016	13.8 (34.1)	3.4 (8.3)	10.0 (24.8)
2021	2.9 (7.2)	-	-

Table 13R-08.10 - 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 lanceolatus (thickspike wheatgrass)	Elymus trachycaulus (slender wheatgrass)	Festuca thurberi (Thurber's fescue)	Leucopoa kingii (spike fescue)	Muhlenbergia montana (mountain muhly)	Phleum alpinum (alpine timothy)	Poa pratensis ⁱ (Kentucky bluegrass)
year	Nested Frequency											
2013	1	72	2	3	109	11	14	-	10	-	-	292
2016	-	8	2	1	141	-	44	0	35	0	10	395
2021	20	10	10	48	111	1	21	6	4	-	-	243
year	Average Cover (%)											
2013	0.0	2.1	0.0	0.0	5.0	0.3	0.4	-	0.5	-	-	13.4
2016	-	0.3	0.1	0.1	5.1	-	1.1	0.0	1.1	0.0	0.4	31.4
2021	0.7	0.1	0.2	0.4	2.9	0.0	0.2	0.1	0.0	-	-	8.0

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

Table 13R-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)	Aquilegia (columbine)	Cirsium (thistle)	Cymopterus (springparsley)	Cynoglossum officinale ^{ami} (gypsyflower)	Frasera speciosa (elkweed)	Galium boreale (northern bedstraw)	Hymenoxys hoopesii (owl's-claws)	Iris missouriensis (Rocky Mountain iris)	Lathyrus lanszwertii (Nevada pea)	Ligusticum porteri (Porter's licorice-root)	Lomatium (desertparsley)	Lupinus argenteus (silvery lupine)	Potentilla gracilis (slender cinquefoil)	Pseudostellaria jamesiana (tuber starwort)
year	Nested Frequency																
2013	49	1	1	2	65	100	-	-	32	33	25	50	6	116	7	2	25
2016	70	3	-	-	92	179	1	3	64	72	46	67	24	-	-	12	17
2021	73	-	13	-	128	24	-	-	46	57	63	36	179	-	2	4	34
year	Average Cover (%)																
2013	1.1	0.0	0.0	0.0	2.1	1.8	-	-	0.3	2.1	0.5	0.7	0.5	2.2	0.1	0.0	0.1
2016	1.9	0.4	-	-	2.2	1.9	0.0	0.1	0.8	4.1	0.9	1.4	1.3	-	-	0.1	0.3
2021	1.9	-	0.1	-	4.4	0.2	-	-	0.7	5.5	4.0	0.4	3.8	-	0.0	0.2	0.3

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

FORB SPECIES	Nested Frequency						
Senecio integerrimus ^a (lambstongue ragwort)	6	12	-	83	79	43	91
Symphyotrichum eatonii (Eaton's aster)	-	50	-	60	77	4	109
Symphyotrichum spathulatum (western mountain aster)	9	21	3	118	83	5	110
Taraxacum officinale (common dandelion)	Average Cover (%)						
Thermopsis montana (mountain goldenbanner)	0.2	0.2	-	2.7	2.3	0.6	1.9
Vicia americana (American vetch)	-	0.9	-	1.0	4.6	0.0	3.0
Viola (violet)	0.2	0.3	0.0	3.2	4.1	0.1	2.8

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

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

SHRUB SPECIES	Line Intercept Cover (%)				
Amelanchier utahensis ^p (Utah serviceberry)	1.1	0.8	37.3	0.3	4.3
Mahonia repens (creeping barberry)	0.7	0.6	78.5	0.2	9.2
Populus tremuloides ^t (quaking aspen)	2.4	2.2	77.9	0.5	13.7
Rosa woodsii ^p (Woods' rose)	Quadrat Cover (%)				
Symphoricarpos oreophilus ^p (mountain snowberry)	1.0	0.5	27.4	0.4	3.9
	0.9	0.9	47.6	0.4	7.2
	1.1	2.3	36.5	0.3	10.5

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

Table 13R-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			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis^p -- (Utah serviceberry)									
2013	1700	120	67	29	4	12	18	11	51/40
2016	760	100	24	76	0	13	0	0	57/46
2021	680	-	29	71	0	0	3	0	- / -
Mahonia repens -- (creeping barberry)									
2013	2820	-	4	97	0	0	0	0	11/16
2016	2900	240	0	100	0	0	0	0	11/14
2021	5740	-	0	100	0	0	0	0	- / -

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 (%)				
Rosa woodsii^p -- (Woods' rose)									
2013	780	60	15	85	0	0	8	0	36/25
2016	560	-	4	96	0	0	0	0	41/24
2021	380	-	5	90	5	5	0	21	- / -
Symphoricarpos oreophilus^p -- (mountain snowberry)									
2013	4960	260	37	63	0	5	1	0	36/42
2016	5820	240	19	81	0	1	0	0	48/50
2021	7640	-	3	96	1	3	0	1	- / -

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

Table 13R-08.13a - Aspen Characteristics. Characteristics of aspen populations including density, size class distribution, and vigor of plants.

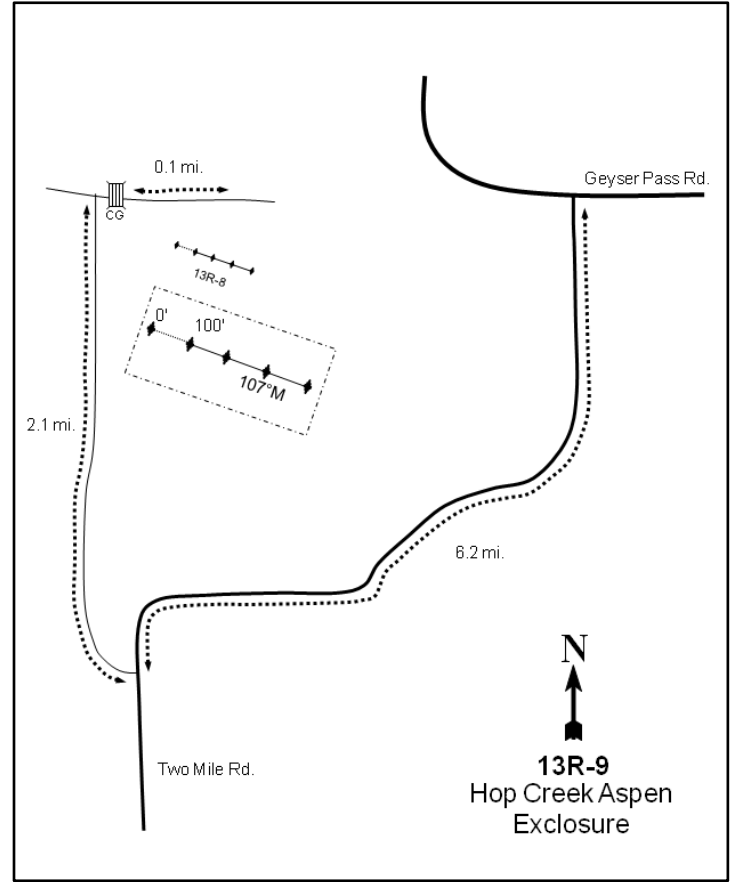
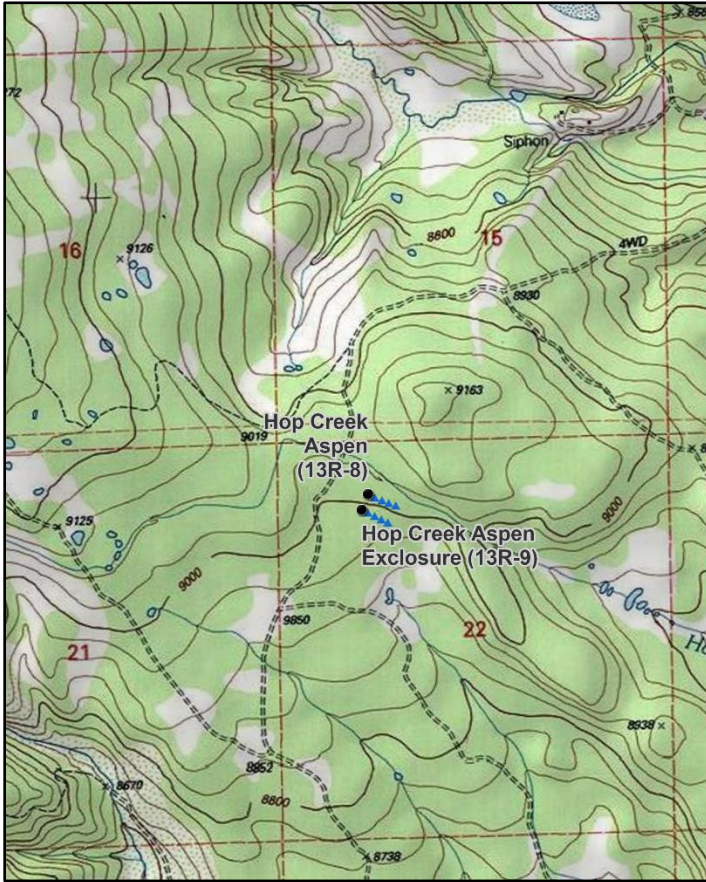
Year	Density	Size Class Distribution				Utilization		Poor Vigor (%)
	Plants per Acre	Class I (%)	Class II (%)	Class III (%)	Class IV (%)	Moderate (%)	Heavy (%)	
Populus tremuloides (quaking aspen)								
2013	19140	17	80	3	-	3	1	0
2016	20520	4	31	64	0	1	1	1
2021	19040	8	18	41	33	0	0	0

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 13R-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' (%)	
Populus tremuloides (quaking aspen)							
2013	14094	40	60	-	-	-	1.8
2016	11825	-	40	60	-	-	6.0
2021	8512	5	15	80	-	-	2.2

HOP CREEK ASPEN EXCLOSURE - STUDY NO. 13R-9



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Mount Peale NE; Township 27S, Range 25E, Section 22
NAD 83 UTM ZONE 12, 660984 East 4257000 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

176
90° magnetic
400ft
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Standard

Directions to Site

From Geyser Pass Road, turn south onto Two Mile Road (do not access this site from the north). Drive for 6.2 miles and then turn right. Drive for 2.1 miles; there will be a "T"-intersection in the road. Turn right (east), cross the cattleguard, and drive for 0.1 miles. The study will be in the exclosure. The baseline 0-stake is located approximately 485 feet at 200 degrees magnetic from the road at its closest point. The 0-foot stake is marked with browse tag #176.

Site Information

Land Ownership	State
Land Administrator	SITLA
Allotment	No data
Elevation	9,009ft (2,746m)
Aspect	South
Slope	6-7%
Sample Dates	08/27/2013, 08/02/2016, 08/04/2021

Table 13R-09.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Logging - Logging/Clear-Cut	-	-	2011-2012	-

Wildlife Habitat and Vegetation History**Table 13R-09.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

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

Table 13R-09.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2013	Quaking Aspen	NA
2016	Quaking Aspen	NA
2021	Quaking Aspen	NA

Site Notes

This site was established in conjunction with 13R-8. This study is inside the enclosure while 13R-8 is outside the enclosure; in 2021, the enclosure was down in parts.

Site Potential

1981 - 2010 Average Annual Precipitation	25 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.

This study was established in 2013 following a 2011/2012 logging treatment (Table 13R-09.1). In 2013, the vegetation community on this site consisted of healthy seedling/young quaking aspen (*Populus tremuloides*) trees. There was also a diverse component of other browse species which provided some cover. Preferred browse has had consecutive increase in cover, which can be attributed to increases in mountain snowberry (*Symphoricarpos oreophilus*) cover and density (Table 13R-09.12, Table 13R-09.13). In 2016, the herbaceous understory increased substantially in cover and was diverse for both grasses and forbs. However, herbaceous cover decreased substantially in 2021. The perennial grass Kentucky bluegrass (*Poa pratensis*) was the main contributor to the increase and decrease in herbaceous cover in 2016 and 2021, respectively (Table 13R-09.7, Table 13R-08.10). Aspen has continued to increase in both size and cover since the initial sampling (Table 13R-09.12, Table 13R-09.13a).

Trend Summary Tables**Table 13R-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
2013	3.8	0.2	30.1	6.2	0.3	40.5
2016	9.8	0.2	48.0	12.9	0.1	85.9
2021	13.5	1.0	34.3	13.4	0.2	75.7

Table 13R-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
2013	-	404	8	331	-	20.9	0.5	23.8
2016	-	454	-	333	-	40.6	-	28.0
2021	-	360	5	379	-	11.0	0.0	35.9

Table 13R-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
2013	1.4	0.2	64.4	-	0.1	71.0
2016	2.3	-	61.7	-	0.0	79.5
2021	0.6	0.3	54.8	0.0	0.0	75.4

Table 13R-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	Black Bear	Cattle	Mule Deer	Dusky Grouse	Rocky Mountain Elk
	Quadrat Frequency				
2013	-	-	2	-	1
2016	-	-	-	-	-
2021	-	1	-	-	-
Year	Days Use Per Acre (ha)				
2013	-	1.5 (3.6)	2.7 (6.6)	8.7 (21.5)*	10.0 (24.8)
2016	-	0.7 (1.8)	-	-	-
2021	8.7 (21.5)*	7.2 (17.9)	-	-	-

*Pellets per acre (ha)

Table 13R-09.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum nelsonii (Columbia needlegrass)	Bromus marginatus (mountain brome)	Bromus porteri (Porter brome)	Carex (sedge)	Dactylis glomerata ⁱ (orchardgrass)	Elymus lanceolatus (thickspike wheatgrass)	Elymus trachycaulus (slender wheatgrass)	Festuca thurberi (Thurber's fescue)	Hesperostipa comata (needle and thread)	Leucopoa kingii (spike fescue)	Phleum alpinum (alpine timothy)	Poa fendleriana (muttongrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Poa secunda (Sandberg bluegrass)
year	Nested Frequency													
2013	139	27	4	64	37	64	17	-	1	-	7	5	319	-
2016	20	18	-	6	32	-	102	9	-	24	5	-	402	14
2021	74	-	-	45	45	-	76	25	-	-	-	18	228	2
year	Average Cover (%)													
2013	4.0	0.5	0.1	0.9	0.9	2.2	0.2	-	0.0	-	0.2	0.0	12.0	-
2016	1.0	0.3	-	0.2	1.5	-	2.9	0.7	-	0.9	0.1	-	32.1	0.9
2021	1.6	-	-	0.2	1.5	-	1.7	0.4	-	-	-	0.2	5.5	0.0

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

Table 13R-09.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Achillea millefolium (Common yarrow)	Allium (onion)	Aquilegia coerulea (Colorado blue columbine)	Cirsium (thistle)	Cymopterus (springparsley)	Fragaria virginiana (Virginia strawberry)	Galium boreale (northern bedstraw)	Hackelia patens (spotted stickseed)	Hieracium fendleri (yellow hawkweed)	Hymenoxys hoopesii (owl's-claws)	Iris missouriensis (Rocky Mountain iris)	Lathyrus lanszwertii (Nevada pea)	Ligusticum porteri (Porter's licorice-root)	Lomatium (desertparsley)	Nemophila breviflora ^a (basin nemophila)	Pseudostellaria jamesiana (tuber starwort)	Senecio integerrimus ^a (lambstongue ragwort)
year	Nested Frequency																
2013	28	9	7	9	100	1	72	-	-	22	32	73	-	128	-	24	8
2016	64	-	1	44	162	-	99	0	-	33	38	33	15	3	-	8	-
2021	52	18	-	30	20	-	104	-	1	37	54	2	200	-	5	38	-
year	Average Cover (%)																
2013	0.6	0.0	0.3	0.5	3.1	0.0	0.9	-	-	0.5	0.5	2.1	-	3.7	-	0.2	0.5
2016	1.1	-	0.0	0.9	2.2	-	1.8	0.0	-	1.6	1.5	0.4	0.6	0.1	-	0.1	-
2021	1.2	0.1	-	1.0	0.7	-	1.4	-	0.0	3.0	2.9	0.1	3.5	-	0.0	0.2	-

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

FORB SPECIES	Solidago (goldenrod)	Symphyotrichum eatonii (Eaton's aster)	Taraxacum officinale (common dandelion)	Thermopsis montana (mountain goldenbanner)	Vicia americana (American vetch)	Viola (violet)
year	Nested Frequency					
2013	-	17	65	146	22	120
2016	-	19	37	168	3	175
2021	3	31	86	218	41	173
year	Average Cover (%)					
2013	-	0.5	1.6	5.5	0.4	3.5
2016	-	0.6	0.4	11.2	0.1	5.3
2021	0.1	1.2	1.4	13.1	0.7	5.2

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

Table 13R-09.12 - 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)	Populus tremuloides ^t (quaking aspen)	Rosa woodsii ^p (Woods' rose)	Symphoricarpos oreophilus ^p (mountain snowberry)
year	Line Intercept Cover (%)				
2013	0.4	0.3	40.5	0.1	5.7
2016	0.4	0.1	85.9	0.4	12.1
2021	0.7	0.2	75.7	0.1	12.6
year	Quadrat Cover (%)				
2013	0.7	0.2	30.1	0.0	3.1
2016	0.5	0.2	48.0	0.5	8.8
2021	0.5	1.0	34.3	0.2	12.8

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

Table 13R-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			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis^p -- (Utah serviceberry)									
2013	540	-	48	52	0	26	0	11	42/31
2016	500	-	84	16	0	0	0	0	57/43
2021	680	-	21	79	0	18	6	0	- / -
Mahonia repens -- (creeping barberry)									
2013	580	-	10	90	0	0	0	0	9/13
2016	1060	-	0	100	0	0	0	0	10/15
2021	2560	-	0	100	0	0	0	0	- / -

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 (%)				
Rosa woodsii^p -- (Woods' rose)									
2013	320	-	38	63	0	13	0	0	25/17
2016	340	-	0	100	0	0	0	0	58/35
2021	240	-	17	83	0	8	0	0	- / -
Symphoricarpos oreophilus^p -- (mountain snowberry)									
2013	4420	100	48	52	0	5	0	7	40/40
2016	4780	-	8	93	0	0	0	1	50/48
2021	8660	-	4	96	0	2	0	0	- / -

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

Table 13R-09.13a - Aspen Characteristics. Characteristics of aspen populations including density, size class distribution, and vigor of plants.

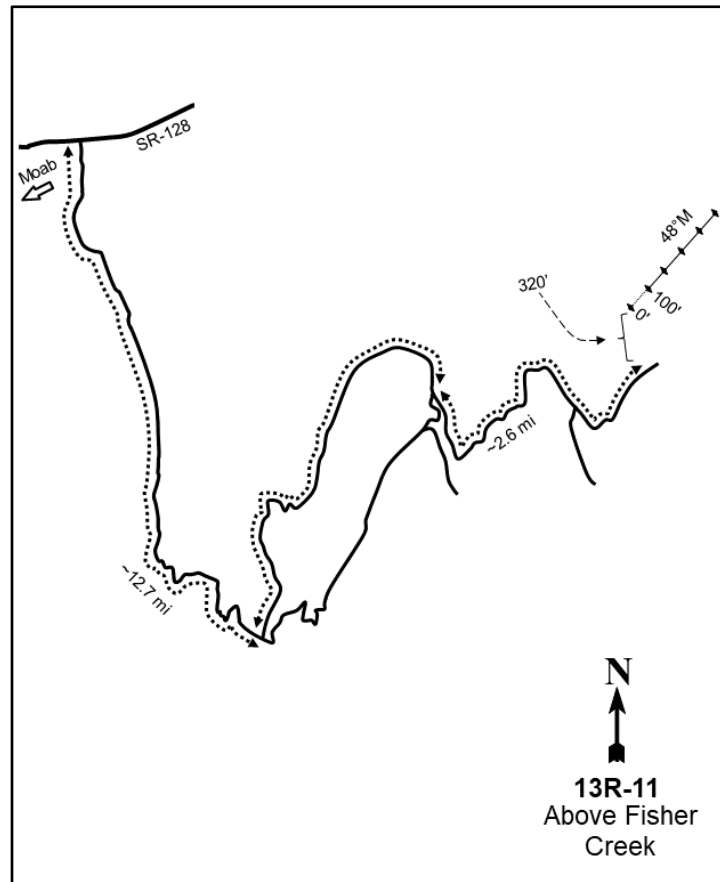
Year	Density	Size Class Distribution				Utilization		Poor Vigor (%)
	Plants per Acre	Class I (%)	Class II (%)	Class III (%)	Class IV (%)	Moderate (%)	Heavy (%)	
Populus tremuloides (quaking aspen)								
2013	26920	21	77	2	0	0	0	15
2016	17440	2	29	65	4	0	0	0
2021	14940	3	13	48	35	0	0	1

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 13R-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' (%)	
Populus tremuloides (quaking aspen)							
2013	14682	45	50	5	-	-	1.6
2016	14682	-	50	30	20	-	6.7
2021	10528	-	20	70	10	-	3.7

ABOVE FISHER CREEK - STUDY NO. 13R-11



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Mount Waas NE; Township 25S, Range 25E, Section 20
NAD 83 UTM ZONE 12, 657863 East 4275588 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

525
48° magnetic
500ft
Line 1 (11ft), Line 2 (34ft), Line 3 (57ft), Line 4 (71ft), Line 5 (95ft)
Standard

Directions to Site

From State Route 128, turn onto Castleton Road and travel south for about 12.7 miles, passing numerous intersections and crossing Castle Creek, to a fork. Proceed left at the fork onto North End Road and continue for approximately 3.2 miles (the road on the right will eventually lead to the same place, but it passes through private property) to another fork. Stay left again and drive for 2.6 miles, then park. The transect is approximately 320 feet north of the road; use a GPS to navigate.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	BEAVER
Elevation	7,900ft (2,408m)
Aspect	South
Slope	4-8%
Sample Dates	08/22/2018, 08/02/2021

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

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Mechanical - Bullhog	North End La Sal (Brush Hole Phase 3)	4614	November 2018-June 2019	747
Mechanical - Bullhog	Brush Hole Shrub Treatment	3630	April-May 2017	1248

Wildlife Habitat and Vegetation History

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

Species	Habitat	Season
Mule Deer	crucial	summer
Rocky Mountain Elk	crucial	spring/fall

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

Year	Vegetation Type	Woodland Succession
2018	Mixed Mountain Brush/Pinyon-Juniper	Phase II
2021	Mixed Mountain Brush	Phase I transitioning to Phase II

Site Notes

In 2021, belt 3 was moved to the 57-foot mark to avoid bending around a tree trunk.

Site Potential

1981 - 2010 Average Annual Precipitation	21 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.

Upon study establishment in 2018, this site was dominated by a mixture of mountain browse species including Utah serviceberry (*Amelanchier utahensis*), Gambel oak (*Quercus gambelii*), and wild crab apple (*Peraphyllum ramosissimum*). Following the bullhog treatment later that year (Table 13R-11.1), preferred shrubs remained the dominant component in the community while exhibiting a sizable decrease in cover. Preferred shrub species, excluding mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), had notable increases in density in 2021 (Table 13R-11.12, Table 13R-11.13). In addition, the site was considered to be within Phase II of woodland succession in 2016, being encroached by twoneedle pinyon (*Pinus edulis*) with lesser amounts of Utah juniper (*Juniperus osteosperma*) and Rocky Mountain juniper (*J. scopulorum*). The bullhog treatment removed many of the trees and the site is considered to be in Phase I transitioning to Phase II of woodland succession as of 2021 (Photos, Table 13R-11.4, Table 13R-11.14). The herbaceous understory in 2016 was lacking in abundance, although perennial forbs were moderately diverse. However, forb diversity increased between 2016 and 2021 (Table 13R-11.7, Table 13R-11.10, Table 13R-11.11). Continued sampling following treatment will likely show continued improvement within the browse and herbaceous communities.

Trend Summary Tables

Table 13R-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
2018	36.7	1.0	5.6	61.1	0.8	38.5
2021	26.8	0.2	2.4	36.4	0.2	10.6

Table 13R-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
2018	-	120	-	47	-	3.0	-	0.8
2021	-	123	94	142	-	3.8	1.0	1.7

Table 13R-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
2018	17.2	1.5	77.0	1.0	0.5	37.9
2021	7.4	0.2	73.0	1.0	0.3	32.5

Table 13R-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	Black Bear	Cattle	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency				
2018	-	-	-	1	1
2021	-	-	2	2	11
Year	Days Use Per Acre (ha)				
2018	17.4 (43.0)*	-	2.0 (5.0)	0.7 (1.7)	-
2021	26.2 (64.6)*	2.9 (7.2)	10.7 (26.5)	6.7 (16.6)	-

*Pellets per acre (ha)

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

GRASS SPECIES	Nested Frequency				
Carex obtusata (obtuse sedge)	13	55	12	-	60
Carex rossii (Ross' sedge)	32	27	24	5	58
Elymus elymoides (squirreltail)	Average Cover (%)				
Koeleria macrantha (prairie Junegrass)	0.2	1.6	0.1	-	1.1
Poa fendleriana (muttongrass)	0.2	1.0	0.5	0.3	1.8

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

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

FORB SPECIES	Nested Frequency																	
Allium (onion)	0	-	22	2	-	-	-	-	-	4	1	1	-	-	-	-	-	
Androsace septentrionalis ^a (pygmyflower rockjasmine)	42	1	27	9	2	24	5	44	6	22	13	-	6	8	19	1	20	
Arenaria (sandwort)	Average Cover (%)																	
Astragalus lentiginosus (freckled milkvetch)	0.0	-	0.5	0.2	-	-	-	-	-	0.1	0.0	0.0	-	-	-	-	-	
Chenopodium album ^a (lambsquarters)	0.3	0.0	0.1	0.1	0.0	0.3	0.0	0.1	0.1	0.3	0.4	-	0.0	0.1	0.4	0.0	0.1	
Chenopodium leptophyllum ^a (narrowleaf goosefoot)																		
Clematis (leather flower)																		
Collinsia parviflora ^a (maiden blue eyed Mary)																		
Comandra umbellata (bastard toadflax)																		
Erigeron eatonii (Eaton's fleabane)																		
Erigeron flagellaris (trailing fleabane)																		
Eriogonum racemosum (redroot buckwheat)																		
Gayophytum ramosissimum ^a (pinyon groundsmoke)																		
Ipomopsis aggregata (scarlet gilia)																		
Lactuca scariola ^{ai} (prickly lettuce)																		
Lappula occidentalis ^a (flatspine stickseed)																		
Lathyrus brachycalyx (Bonneville pea)																		

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

FORB SPECIES	Lesquerella (bladderpod)	Penstemon (beardtongue)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)	Senecio integerrimus ^a (lambstongue ragwort)	Sphaeralcea coccinea (scarlet globemallow)	Taraxacum officinale (common dandelion)	Townsendia (Townsend daisy)	Veronica biloba ^{ai} (two-lobed speedwell)	Zigadenus paniculatus (foothill deathcamas)
year	Nested Frequency									
2018	5	-	3	-	-	5	-	3	-	1
2021	6	5	35	16	11	1	2	-	1	5
year	Average Cover (%)									
2018	0.0	-	0.0	-	-	0.0	-	0.0	-	0.0
2021	0.0	0.0	0.2	0.1	0.0	0.0	0.0	-	0.0	0.0

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

Table 13R-11.12 - 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)	Juniperus osteosperma ⁱ (Utah juniper)	Juniperus scopulorum ⁱ (Rocky Mountain juniper)	Opuntia fragilis (brittle pricklypear)	Opuntia polyacantha (plains pricklypear)	Peraphyllum ramosissimum ^p (wild crab apple)	Pinus edulis ⁱ (two-needle pinyon)	Quercus gambelii ^p (Gambel oak)	Symphoricarpos oreophilus ^p (mountain snowberry)
year	Line Intercept Cover (%)										
2018	18.8	1.2	10.3	6	0.8	0.6	0.2	10.7	31.7	11.2	8.9
2021	7.6	1.3	3.3	1.9	-	0.2	-	3.9	8.7	7.4	12.9
year	Quadrat Cover (%)										
2018	9.4	0.5	8.7	0.7	0.5	0.5	0.6	7.5	4.4	4.8	5.9
2021	5.4	1.1	2.7	1.3	-	0.2	-	3.8	1.1	5.5	8.4

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

Table 13R-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			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis^p -- (Utah serviceberry)									
2018	1240	40	5	73	23	0	0	10	170/151
2021	2380	-	16	82	3	33	3	3	- / -
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
2018	420	20	52	33	14	0	0	10	36/63
2021	340	280	18	82	0	0	0	0	- / -
Cercocarpus montanus^p -- (alderleaf mountain mahogany)									
2018	960	-	10	63	27	0	0	23	157/141
2021	1620	20	22	77	1	15	11	1	- / -
Juniperus osteospermaⁱ -- (Utah juniper)									
2018	80	20	25	75	0	0	0	25	- / -
2021	-	-	-	-	-	-	-	-	- / -

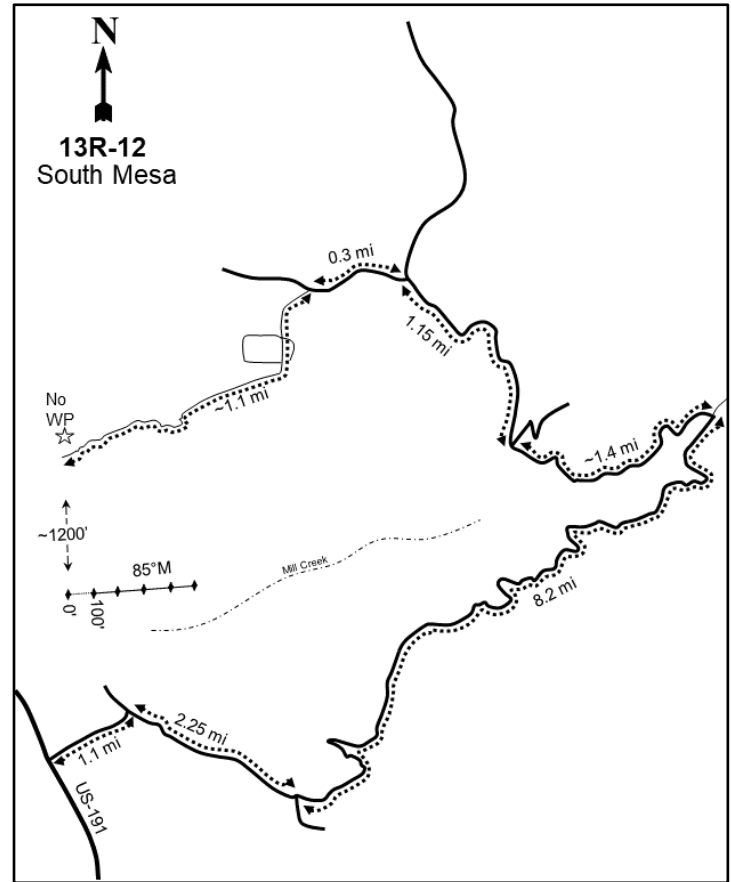
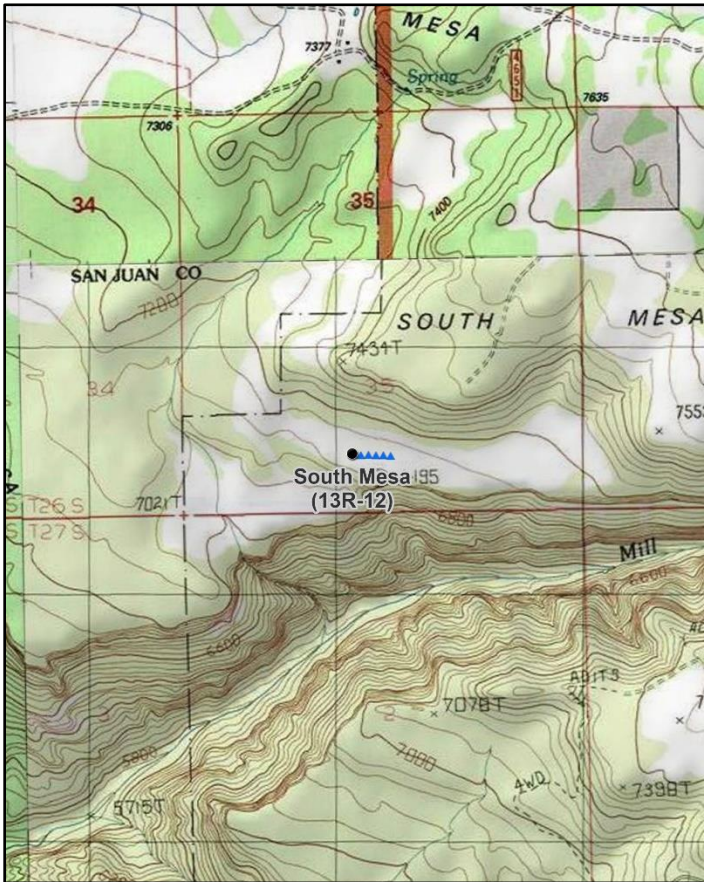
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Juniperus scopulorum^t -- (Rocky Mountain juniper)									
2018	20	-	100	0	0	0	0	0	- / -
2021	-	-	-	-	-	-	-	-	- / -
Opuntia fragilis -- (brittle pricklypear)									
2018	220	-	18	82	0	0	0	0	13/44
2021	500	-	0	96	4	0	0	20	- / -
Opuntia polyacantha -- (plains pricklypear)									
2018	200	-	20	80	0	10	0	0	12/27
2021	-	-	-	-	-	-	-	-	- / -
Peraphyllum ramosissimum^p -- (wild crab apple)									
2018	1140	-	7	84	9	0	0	39	119/122
2021	1320	-	11	88	2	3	0	2	- / -
Pinus edulis^t -- (twoneedle pinyon)									
2018	200	400	80	20	0	0	0	0	- / -
2021	40	-	50	50	0	0	0	0	- / -
Quercus gambelii^p -- (Gambel oak)									
2018	2200	-	36	65	0	3	0	3	117/75
2021	3640	-	13	86	1	12	0	1	- / -
Symphoricarpos oreophilus^p -- (mountain snowberry)									
2018	3380	-	10	77	13	4	1	4	40/57
2021	5120	-	7	90	4	3	0	4	- / -

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

Table 13R-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)							
2018	55	-	-	57	29	14	12.1
2021	6	33	33	-	-	33	15.9
Juniperus scopulorum (Rocky Mountain juniper)							
2018	13	33	-	-	33	33	16.0
Pinus edulis (twoneedle pinyon)							
2018	116	-	-	10	30	60	18.7
2021	17	22	-	-	11	67	29.0
Pseudotsuga menziesii (Douglas-fir)							
2018	5	-	-	-	-	100	20.0

SOUTH MESA - STUDY NO. 13R-12

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Mount Tukuhiwivatz; Township 26S, Range 23E, Section 35
NAD 83 UTM ZONE 12, 643003 East 4261778 North

Transect Information

Browse Tag # (0' Stake)	Not Available
Transect Bearing	85° 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

Traveling south on US-191, turn left (east) onto Pack Creek Cutoff road and drive for about 1.1 miles. At the "T"-junction, turn right onto La Sal Loop. Proceed for 2.25 miles to a road on the right (south) (Pack Creek Road); continue straight on La Sal Loop. Travel for about 9.6 miles, staying on the main road, to a fork: the right fork is Warner Lake Road, while the left fork turns into Loop Road. Bear left and drive for 1.15 miles, then turn left (west) onto South Mesa road. Continue for 0.3 miles to a two-track on the left (south). Turn onto this two-track, travel for about 1.1 miles, and park; there is no witness post. Use a GPS to navigate to the transect, which is approximately 1200 feet south of the road.

Site Information

Land Ownership	Federal
Land Administrator	USFS
Allotment	BRUMLEY RIDGE
Elevation	7,000ft (2,134m)
Aspect	South
Slope	2-6%
Sample Dates	08/22/2018, 08/04/2021

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

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Mechanical - Bullhog	West Slope WUI Phase 4	4491	June 2019	375

Wildlife Habitat and Vegetation History**Table 13R-12.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

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

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

Year	Vegetation Type	Woodland Succession
2018	Black Sagebrush/Pinyon-Juniper	Phase II
2021	Black Sagebrush	Phase I

Site Notes

In 2021, it was observed that black sagebrush (*Artemisia nova*) that was producing many inflorescences had very little leaf growth and was distressed. In addition, there was some confusion between black sagebrush and mountain big sagebrush (*A. tridentata* ssp. *vaseyana*) on belt 3 in 2021, and all sagebrush was identified as black sagebrush on that belt.

Site Potential

1981 - 2010 Average Annual Precipitation	17 inches
NRCS Ecological Site	Mountain Shallow Loam (Black Sagebrush)
NRCS Ecological Site #	R048AY433UT
States and Transitions	No state and transition model is available for this ecological site.

This study site was dominated by black sagebrush (*Artemisia nova*) upon establishment in 2018, with other browse species present to a lesser extent. Twoneedle pinyon (*Pinus edulis*) was also a co-dominant site component, and the study site was considered to be within Phase II of woodland succession in 2018. Utah juniper (*Juniperus osteosperma*) trees were also present, but in low amounts. Following a 2019 bullhog treatment (Table 13R-12.1), preferred shrub cover remained similar with black sagebrush decreasing slightly in cover and density. Pinyon pine was reduced significantly following treatment, with a small number of seedlings and young trees remaining; the site was considered to be in Phase I of woodland succession in 2021 (Table 13R-12.4, Table 13R-12.12, Table 13R-12.13, Table 13R-12.14). The herbaceous understory was moderately diverse, but not very abundant in both sample years. The perennial grass muttongrass (*Poa fendleriana*) has provided the most cover of any single herbaceous species throughout the duration of the study (Table 13R-12.7, Table 13R-12.10, Table 13R-12.11).

Trend Summary Tables**Table 13R-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
2018	17.3	0.0	12.9	19.7	0.1	18.1
2021	17.1	0.0	-	17.3	-	0.4

Table 13R-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
2018	-	132	-	53	-	5.0	-	1.5
2021	29	174	3	79	0.3	5.7	0.0	1.8

Table 13R-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
2018	33.9	3.0	46.3	5.7	4.9	33.3
2021	15.1	0.2	65.2	2.9	1.8	21.1

Table 13R-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			
2018	-	3	18	1
2021	-	6	5	3
Year	Days Use Per Acre (ha)			
2018	-	2.0 (5.0)	17.4 (43.0)	-
2021	2.9 (7.2)	7.4 (18.2)	11.4 (28.1)	-

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

GRASS SPECIES	Nested Frequency							
Achnatherum hymenoides (Indian ricegrass)	8	28	13	-	4	9	79	-
Agropyron cristatum ⁱ (crested wheatgrass)	33	35	40	29	29	-	79	1
Bromus inermis ⁱ (smooth brome)	Average Cover (%)							
Bromus tectorum ^{ai} (cheatgrass)	0.7	0.6	0.1	-	0.1	0.1	3.5	-
Elymus elymoides (squirreltail)	2018	2021	2018	2021	2018	2021	2018	2021
Hesperostipa comata (needle and thread)	1.2	1.0	0.9	0.3	0.4	-	2.0	0.1
Poa fendleriana (muttongrass)	Average Cover (%)							
Thinopyrum intermedium ⁱ (intermediate wheatgrass)	0.7	0.6	0.1	-	0.1	0.1	3.5	-
	2018	2021	2018	2021	2018	2021	2018	2021

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

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

FORB SPECIES	Nested Frequency															
Arabis (rockcress)	1	8	2	-	-	1	-	2	-	-	1	1	4	32	5	3
Astragalus (milkvetch)	-	1	20	1	7	2	9	6	2	9	6	-	20	19	-	-
Astragalus convallarius (lesser rushy milkvetch)	Average Cover (%)															
Chenopodium leptophyllum ^a (narrowleaf goosefoot)	0.0	0.1	0.0	-	-	0.0	-	0.0	-	-	0.0	0.0	0.0	1.1	0.3	0.0
Cirsium (thistle)	2018	2021	2018	2021	2018	2021	2018	2021	2018	2021	2018	2021	2018	2021	2018	2021
Cryptantha (cryptantha)	-	0.0	0.2	0.0	0.0	0.0	0.4	0.2	0.0	0.1	0.0	-	0.3	0.6	-	-
Erigeron (fleabane)	Average Cover (%)															
Ipomopsis aggregata (scarlet gilia)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lappula occidentalis ^a (flatspine stickseed)	2018	2021	2018	2021	2018	2021	2018	2021	2018	2021	2018	2021	2018	2021	2018	2021
Lesquerella (bladderpod)	-	0.0	0.0	0.0	0.0	0.0	0.4	0.2	0.0	0.1	0.0	-	0.3	0.6	-	-
Machaeranthera canescens (hoary tansyaster)	Average Cover (%)															
Packera multilobata (lobeleaf groundsel)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Penstemon (beardtongue)	2018	2021	2018	2021	2018	2021	2018	2021	2018	2021	2018	2021	2018	2021	2018	2021
Petroradia pumila (rock goldenrod)	-	0.0	0.2	0.0	0.0	0.0	0.4	0.2	0.0	0.1	0.0	-	0.3	0.6	-	-
Stenotus acaulis (stemless mock goldenweed)	Average Cover (%)															
Townsendia incana (hoary Townsend daisy)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

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

Table 13R-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. vaseyana ^p (mountain big sagebrush)	Ephedra viridis ^p (mormon tea)	Juniperus osteosperma ⁱ (Utah juniper)	Opuntia polyacantha (plains pricklypear)	Pinus edulis ⁱ (twoneedle pinyon)	Purshia stansburiana ^p (Stansbury cliffrose)	Sclerocactus (fishhook cactus)
year	Line Intercept Cover (%)							
2018	19.4	-	-	1.2	-	16.9	0.3	0.1
2021	16.8	0.2	0.1	0.4	-	-	0.2	-
year	Quadrat Cover (%)							
2018	17.0	0.1	-	0.4	-	12.6	0.1	0.0
2021	16.0	0.9	0.1	0.0	0.0	-	0.0	-

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

Table 13R-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			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis^p -- (Utah serviceberry)									
2018	-	-	-	-	-	-	-	-	110/74
2021	40	-	0	100	0	0	0	0	- / -
Artemisia nova^p -- (black sagebrush)									
2018	6160	-	6	63	31	10	2	45	32/58
2021	4800	40	8	69	23	10	0	25	- / -
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
2018	40	-	50	0	50	50	50	100	- / -
2021	140	-	0	86	14	43	0	14	- / -
Atriplex canescens^p -- (fourwing saltbush)									
2018	-	-	-	-	-	-	-	-	42/37
2021	-	-	-	-	-	-	-	-	- / -
Echinocereus coccineus -- (scarlet hedgehog cactus)									
2018	-	-	-	-	-	-	-	-	12/13
2021	-	-	-	-	-	-	-	-	- / -
Ephedra viridis^p -- (mormon tea)									
2018	40	-	0	100	0	0	0	0	55/76
2021	220	-	0	100	0	36	0	0	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
2018	-	-	-	-	-	-	-	-	21/25
2021	-	-	-	-	-	-	-	-	- / -
Juniperus osteospermaⁱ -- (Utah juniper)									
2018	80	40	100	0	0	0	0	0	- / -
2021	40	-	50	0	50	0	0	50	- / -
Opuntia polyacantha -- (plains pricklypear)									
2018	60	20	0	100	0	0	0	0	12/24
2021	80	-	0	100	0	0	0	0	- / -
Pinus edulisⁱ -- (twoneedle pinyon)									
2018	380	40	37	63	0	0	0	5	- / -
2021	20	-	100	0	0	0	0	0	- / -

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 (%)				
Purshia stansburiana^p -- (Stansbury cliffrose)									
2018	40	-	0	0	100	0	0	100	90/153
2021	20	-	0	100	0	100	0	0	- / -
Purshia tridentata^p -- (antelope bitterbrush)									
2018	20	-	0	100	0	0	0	100	47/91
2021	-	-	-	-	-	-	-	-	- / -
Sclerocactus -- (fishhook cactus)									
2018	80	-	0	100	0	0	0	0	13/11

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

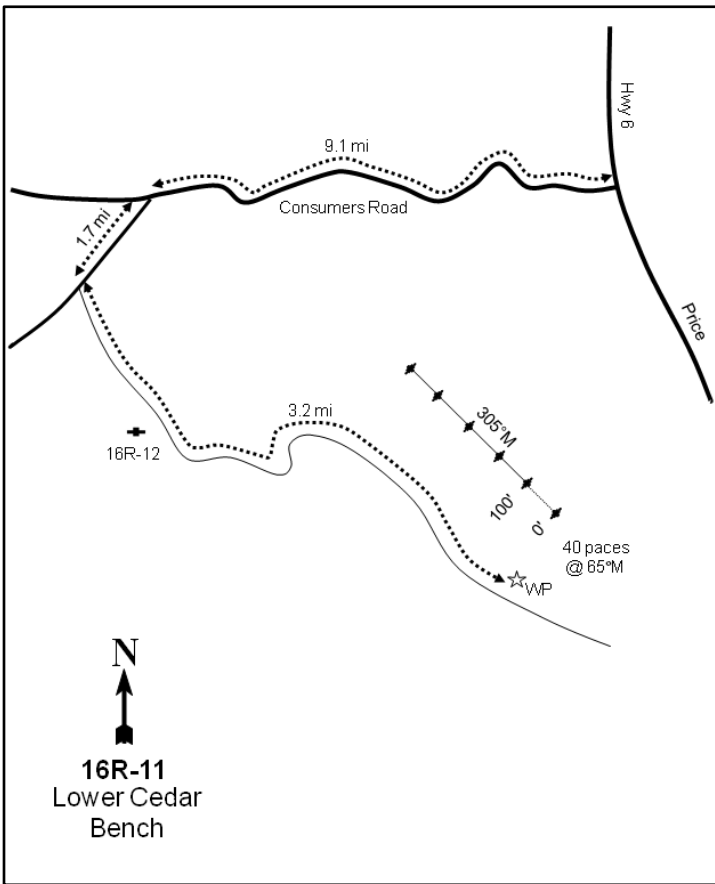
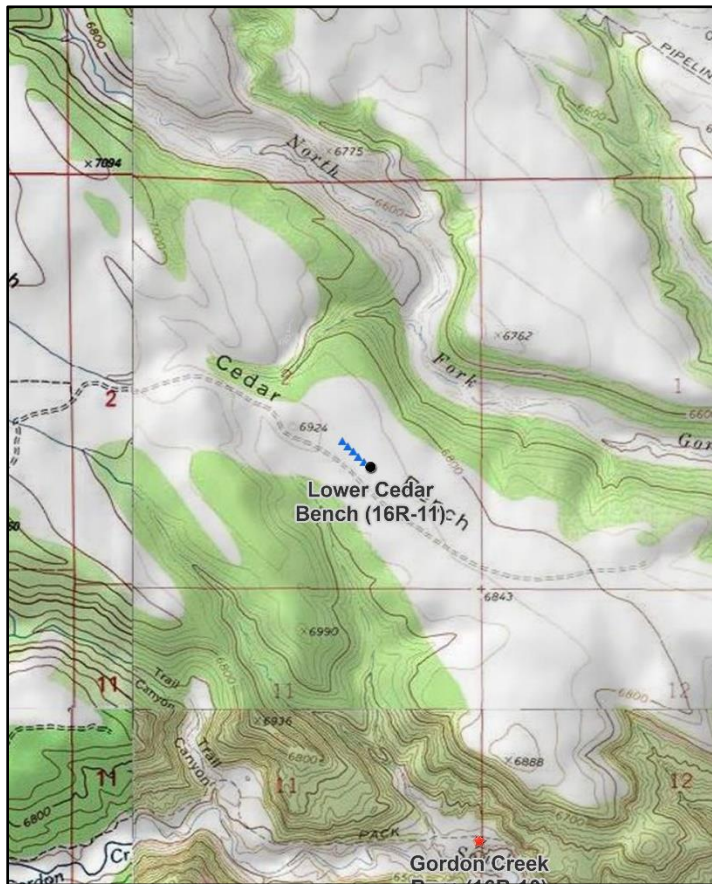
Table 13R-12.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2018	49	7	57	36	-	-	8.0
2021	25	75	17	-	-	8	4.2
Pinus edulis (twoneedle pinyon)							
2018	255	5	30	65	-	-	8.1
2021	26	18	73	-	-	9	2.5

Table 13R-12.15 - Deer Desirable Components Index: Mountain 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
2018	24.7	5.4	2.9	9.9	0.0	3.1	0.0	46.0	Poor
2021	21.7	8.3	4.0	11.4	-0.3	3.7	0.0	48.8	Poor

LOWER CEDAR BENCH - STUDY NO. 16R-11



Location Information

USGS 7.5 min Map Info Standardville SW; Township 14S, Range 8E, Section 02
 GPS (0' Stake) NAD 83 UTM ZONE 12, 500911 East 4387112 North

Transect Information

Browse Tag # (0' Stake) 47
 Transect Bearing 305° 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 US Route 6 north of Price, turn west onto Consumers Road. Travel 9.1 miles to a road that comes in from the left (south). Turn here and follow this road for 1.7 miles to another road that comes in from the left. Turn onto this road and travel 1.3 miles to a witness post on the right (south) side of the road, passing study 16R-12. Continue for 1.9 miles to another witness post on the left-hand (north) side of the road. The 0-foot stake is 40 paces from the witness post at 65 degrees magnetic and is marked with browse tag #47.

Site Information

Land Ownership	State
Land Administrator	UDWR
Allotment	GORDON CRK WITHDRAWAL
Elevation	6,800ft (2,073m)
Aspect	Northeast
Slope	1-5%
Sample Dates	07/26/2004, 06/28/2007, 07/30/2012, 08/16/2016, 08/02/2021

Table 16R-11.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Mechanical - Push	Cedar Bench	PDB	Spring 2005	-
Seeding - Broadcast Before	Cedar Bench	PDB	Spring 2005	-
Hand Crew - Lop and Scatter	North Springs PJ Removal Phase II	3583	March-October 2018	4484

Table 16R-11.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Cedar Bench			Broadcast	Apr 2005	150
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Leymus cinereus	Great Basin Wildrye	Trailhead	0.53	0.50
F	Linum perenne	Blue Flax	Appar	0.22	0.20
F	Medicago sativa	Alfalfa	Spredor 3	1.17	0.99
S	Artemisia tridentata ssp. wyomingensis	Wyoming Big Sagebrush	Sanpete UT	0.67	0.19
S	Atriplex canescens	Fourwing Saltbush	Emery UT	0.67	0.30
S	Purshia tridentata	Bitterbrush	Ada/Boise ID	0.36	0.30

Wildlife Habitat and Vegetation History**Table 16R-11.3 - 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-11.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2004	Pinyon	Phase II transitioning to Phase III
2007	Wyoming Big Sagebrush	Phase I
2012	Wyoming Big Sagebrush	Phase I
2016	Wyoming Big Sagebrush	Phase I
2021	Wyoming Big Sagebrush	Phase I

Site Notes

This study is located approximately ten miles west of Price on Cedar Bench and about one mile south of Consumers Road (State Route 139). In 2021 it was noted that there may have been some confusion when identifying grasses, particularly between needle and thread (*Hesperostipa comata*) and saline wildrye (*Leymus salinus*).

Soils**Table 16R-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	6.8	45.6	27.3	27.1	1.4	14.9	105.6	0.6	07/26/2004

Site Potential

1981 - 2010 Average Annual Precipitation	13 inches
NRCS Ecological Site	Upland Loam (Wyoming Big Sagebrush)
NRCS Ecological Site #	R034BY306UT
States and Transitions	Current State: Community Phase 5.2

Upon study establishment in 2004, this site was a Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) shrubland that had been encroached by twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) (Photos, Table 16R-11.12). The herbaceous understory was moderately diverse and abundant (Table 16R-11.7, Table 16R-11.10, Table 16R-11.11). Following the tree-removing disturbances, the community transitioned to a Phase I woodland community with cover and density of pinyon and juniper decreasing substantially (Table 16R-11.4, Table 16R-11.13, Table 16R-11.14). With the canopy open, sagebrush has generally increased in cover and density (Table 16R-11.6, Table 16R-11.12, Table 16R-11.13). The herbaceous understory has also increased after treatment, with perennial grasses as the dominant component (Table 16R-11.7, Table 16R-11.10, Table 16R-11.11). Despite successful treatments that removed much of the encroaching conifer trees, many young trees remain and will likely continue to encroach on the community without frequent maintenance in the area.

Trend Summary Tables

Table 16R-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
2004	3.3	2.8	19.8	4.2	3.0	26.8
2007	5.6	2.1	3.6	7.8	3.2	5.4
2012	8.0	1.6	0.5	12.0	3.6	1.0
2016	5.3	1.0	2.5	10.3	2.2	1.6
2021	11.7	1.8	-	20.0	2.7	-

Table 16R-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
2004	9	184	187	66	0.2	5.1	1.0	1.0
2007	28	235	136	106	0.3	14.4	3.8	2.9
2012	25	268	23	74	0.3	16.9	0.1	1.2
2016	5	269	7	74	0.0	15.2	0.0	0.7
2021	3	285	8	58	0.1	13.8	0.0	0.3

Table 16R-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
2004	32.7	5.0	49.7	0.3	1.4	33.1
2007	29.4	1.6	51.5	0.1	0.2	32.3
2012	27.0	0.9	60.4	0.0	1.4	28.9
2016	34.5	0.5	45.0	0.0	-	25.8
2021	31.1	4.8	48.9	0.2	1.0	26.3

Table 16R-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
	Quadrat Frequency			
2004	-	33	3	20
2007	-	26	8	41
2012	-	22	9	1
2016	-	41	1	51
2021	-	45	5	25
Year	Days Use Per Acre (ha)			
2004	-	120.0 (296.3)	12.8 (31.5)	-
2007	-	93.8 (231.7)	25.5 (62.9)	-
2012	-	72.4 (178.8)	24.1 (59.6)	-
2016	0.7 (1.8)	65.7 (162.2)	18.1 (44.7)	-
2021	-	79.8 (197.0)	-	-

Table 16R-11.10 - 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)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency										
2004	10	-	31	9	60	71	26	9	8	6	0
2007	21	-	23	28	113	122	2	3	27	-	15
2012	50	-	46	25	52	130	34	9	25	9	28
2016	51	5	24	5	95	142	23	10	0	22	6
2021	25	-	30	3	12	175	37	36	41	4	1
year	Average Cover (%)										
2004	0.3	-	0.9	0.2	0.9	1.4	1.2	0.2	0.1	0.1	0.0
2007	1.3	-	0.8	0.3	3.0	6.6	0.4	0.0	1.2	-	1.2
2012	2.1	-	2.5	0.3	1.3	5.5	3.0	0.5	0.9	0.1	1.1
2016	1.8	0.0	0.8	0.0	1.9	7.3	2.7	0.3	0.0	0.2	0.3
2021	0.5	-	1.0	0.1	0.2	7.5	2.8	0.2	1.3	0.0	0.1

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

Table 16R-11.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Ambrosia psilostachya (Cuman ragweed)	Arabis (rockcress)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus tenellus (looseflower milkvetch)	Calochortus nuttallii (sego lily)	Castilleja linariifolia (Wyoming Indian paintbrush)	Chaenactis douglasii (Douglas' dustymaiden)	Chenopodium fremontii ^a (Fremont's goosefoot)	Collinsia parviflora ^a (maiden blue eyed Mary)	Descurainia pinnata ^a (western tansymustard)	Eriogonum cernuum ^a (nodding buckwheat)	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Lactuca serriola ^{ai} (prickly lettuce)	Lappula occidentalis ^a (flatspine stickseed)	Lepidium ^a (pepperweed)	Lesquerella (bladderpod)	Machaeranthera canescens (hoary tansyaster)
year	Nested Frequency																
2004	-	10	8	2	3	-	0	55	0	13	-	38	-	11	-	7	8
2007	-	13	9	3	4	2	5	1	-	23	1	11	88	37	4	18	20
2012	-	2	1	4	-	5	3	3	-	10	9	1	-	-	-	7	10
2016	0	2	-	-	1	-	-	4	-	1	-	-	-	2	-	-	6
2021	-	9	-	-	-	0	1	-	-	-	-	-	-	-	-	-	5
year	Average Cover (%)																
2004	-	0.0	0.4	0.0	0.0	-	0.0	0.2	0.0	0.1	-	0.2	-	0.1	-	0.0	0.1
2007	-	0.1	0.3	0.1	0.0	0.1	0.2	0.0	-	0.2	0.0	0.2	2.9	0.2	0.0	0.4	0.4
2012	-	0.0	0.0	0.2	-	0.0	0.0	0.0	-	0.1	0.0	0.0	-	-	-	0.0	0.1
2016	0.0	0.0	-	-	0.0	-	-	0.0	-	0.0	-	-	-	0.0	-	-	0.0
2021	-	0.1	-	-	-	0.0	0.0	-	-	-	-	-	-	-	-	-	0.0

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

FORB SPECIES							
Penstemon comarrhenus (dusty beardtongue)							
Penstemon pachyphylus (thickleaf beardtongue)							
Phlox longifolia (longleaf phlox)							
Polygonum douglasii ^a (Douglas' knotweed)							
Schoenocrambe linifolia (flaxleaf plainsmustard)							
Sphaeralcea coccinea (scarlet globemallow)							
Streptanthus cordatus (heartleaf twistflower)							
year	Nested Frequency						
2004	3	10	4	151	3	16	-
2007	8	14	6	21	6	33	-
2012	5	7	13	-	3	48	-
2016	-	5	-	-	-	47	24
2021	-	6	3	8	-	38	-
year	Average Cover (%)						
2004	0.0	0.1	0.0	0.5	0.0	0.3	-
2007	0.0	0.4	0.0	0.2	0.1	0.8	-
2012	0.2	0.0	0.0	-	0.0	0.6	-
2016	-	0.0	-	-	-	0.3	0.4
2021	-	0.0	0.0	0.0	-	0.1	-

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

Table 16R-11.12 - 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 var. viscidiflorus (yellow rabbitbrush)							
Gutierrezia sarothrae (broom snakeweed)							
Juniperus osteosperma ^t (Utah juniper)							
Opuntia (pricklypear)							
Pedroactus simpsonii (mountain ball cactus)							
Pinus edulis ^t (twoneedle pinyon)							
year	Line Intercept Cover (%)						
2004	4.2	2.8	-	5.8	0.1	0.1	21
2007	7.8	3.1	-	1.9	0.1	-	3.5
2012	12	3.4	-	1	0.2	-	-
2016	10.3	1.5	0.2	1.6	0.5	0	-
2021	20	2.7	-	-	-	-	-
year	Quadrat Cover (%)						
2004	3.3	1.9	-	3.9	0.9	0.0	15.9
2007	5.6	2.1	0.0	1.7	0.0	-	1.9
2012	8.0	1.6	0.0	0.5	0.0	-	-
2016	5.3	0.6	0.1	2.5	0.3	0.0	-
2021	11.7	1.8	-	-	0.0	-	-

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

Table 16R-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			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia tridentata ssp. wyomingensis^p -- (Wyoming big sagebrush)									
2004	2200	100	6	28	66	44	34	49	48/60
2007	2800	13660	39	36	24	14	11	16	59/78
2012	8480	1100	64	33	4	16	10	2	49/69
2016	7300	-	24	64	12	15	64	7	38/61
2021	6900	-	37	47	16	25	5	48	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
2004	2520	-	3	96	1	0	0	1	21/34
2007	2700	740	10	90	0	0	2	0	20/32
2012	2820	-	16	81	3	24	31	1	15/35
2016	2340	-	4	92	3	22	40	3	16/24
2021	2300	-	8	55	37	19	44	53	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
2004	20	-	0	100	0	0	0	0	22/27
2007	-	40	0	0	0	0	0	0	25/31
2012	20	-	0	100	0	0	0	0	20/20
2016	940	-	0	100	0	0	0	0	14/26
2021	40	-	50	50	0	0	0	0	- / -
Juniperus osteosperma^t -- (Utah juniper)									
2004	220	-	36	64	0	0	0	0	- / -
2007	120	20	33	67	0	0	0	50	- / -
2012	100	20	100	0	0	0	0	0	- / -
2016	40	-	0	100	0	0	0	0	- / -
2021	20	-	100	0	0	0	0	0	- / -
Opuntia -- (pricklypear)									
2004	520	-	15	85	0	0	0	0	10/34
2007	320	-	31	56	13	0	0	6	8/21
2012	320	-	0	100	0	0	0	0	8/21
2016	300	-	7	60	33	0	0	33	7/21
2021	200	-	20	60	20	0	0	30	- / -
Pediocactus simpsonii -- (mountain ball cactus)									
2004	80	-	50	50	0	0	0	0	6/10
2007	-	-	-	-	-	-	-	-	- / -
2012	20	-	0	100	0	0	0	0	9/16
2016	-	-	-	-	-	-	-	-	2/6
2021	-	-	-	-	-	-	-	-	- / -
Pinus edulis^t -- (twoneedle pinyon)									
2004	340	-	47	47	6	0	0	6	- / -
2007	160	-	13	88	0	0	0	50	- / -
2012	-	-	-	-	-	-	-	-	- / -

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

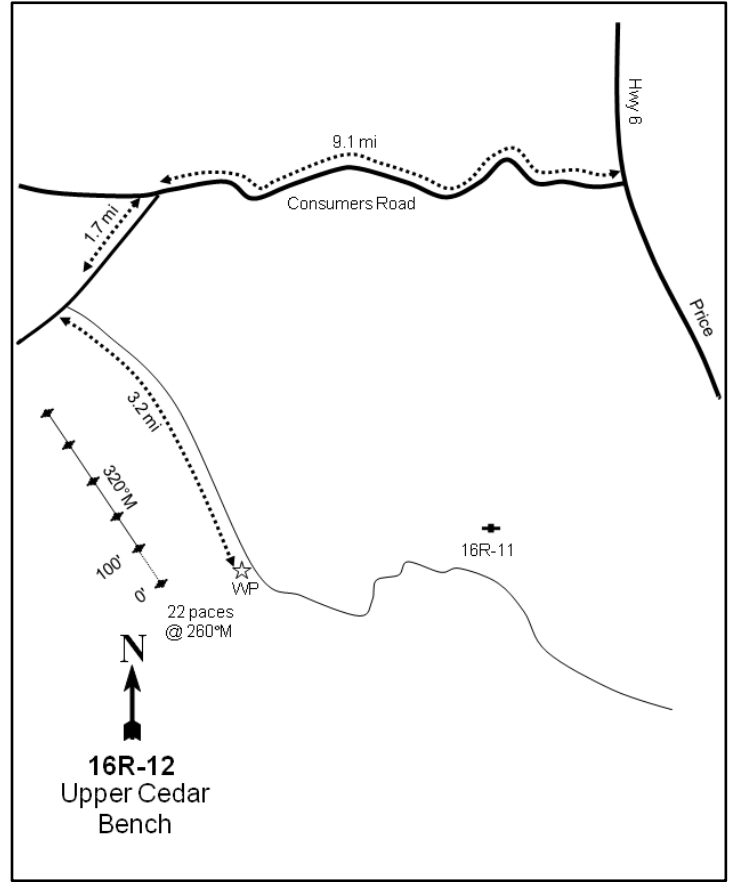
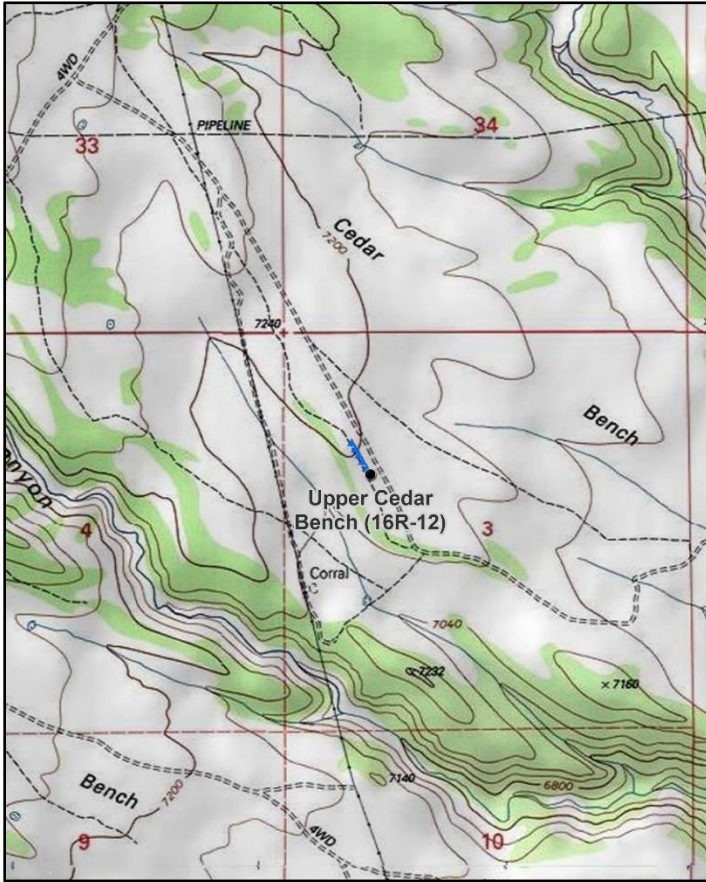
Table 16R-11.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2004	84	6	39	39	6	11	8.4
2007	48	-	47	35	12	6	7.3
2012	41	-	53	47	-	-	5.9
2016	44	-	63	38	-	-	4.9
2021	13	50	50	-	-	-	3.1
Pinus edulis (twoneedle pinyon)							
2004	285	5	45	20	-	30	10.8
2007	56	-	83	17	-	-	3.8
2012	43	6	76	18	-	-	2.9
2016	61	11	67	22	-	-	3.1
2021	3	-	100	-	-	-	2.7

Table 16R-11.15 - Deer Desirable Components Index: Upland 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	5.3	0.0	0.0	10.2	-0.1	1.9	0.0	17.2	Very Poor
2007	9.8	7.7	15.0	28.9	-0.2	5.8	0.0	66.9	Fair-Good
2012	15.0	13.9	15.0	30.0	-0.2	2.4	0.0	76.0	Good
2016	12.9	11.5	11.9	30.0	0.0	1.5	0.0	67.7	Good
2021	25.0	10.1	15.0	27.5	0.0	0.5	0.0	78.1	Good-Excellent

UPPER CEDAR BENCH - STUDY NO. 16R-12



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Jump Creek SE; Township 14S, Range 8E, Section 03
NAD 83 UTM ZONE 12, 498400 East 4387722 North

Transect Information

Browse Tag # (0' Stake)	48
Transect Bearing	320° 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

From US Route 6 north in Price, turn west onto Consumers Road. Travel 9.1 miles to a road that comes in from the left (south). Turn here and follow this road 1.7 miles to another road that comes in from the left. Turn onto this road and travel 1.3 miles to a witness post on the right-hand (south) side of the road. The 0-foot stake is 22 paces from the witness post at 260 degrees magnetic and is marked with browse tag #48.

Site Information

Land Ownership	State
Land Administrator	UDWR
Allotment	GORDON CRK WITHDRAWAL
Elevation	7,200ft (2,195m)
Aspect	Southwest
Slope	3%
Sample Dates	07/26/2004, 07/02/2007, 07/30/2012, 08/16/2016, 08/02/2021

Table 16R-12.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Mechanical - Push	Cedar Bench	PDB	Spring 2005	-
Seeding - Broadcast Before	Cedar Bench	PDB	Spring 2005	-

Table 16R-12.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Cedar Bench			Broadcast	Apr 2005	150
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	<i>Leymus cinereus</i>	Great Basin Wildrye	Trailhead	0.53	0.50
F	<i>Linum perenne</i>	Blue Flax	Appar	0.22	0.20
F	<i>Medicago sativa</i>	Alfalfa	Spredor 3	1.17	0.99
S	<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i>	Wyoming Big Sagebrush	Sanpete UT	0.67	0.19
S	<i>Atriplex canescens</i>	Fourwing Saltbush	Emery UT	0.67	0.30
S	<i>Purshia tridentata</i>	Bitterbrush	Ada/Boise ID	0.36	0.30

Wildlife Habitat and Vegetation History**Table 16R-12.3 - 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-12.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2004	Black Sagebrush/Pinyon	Phase I transitioning to Phase II
2007	Black Sagebrush	Phase I
2012	Black Sagebrush	Phase I
2016	Black Sagebrush	Phase I
2021	Black Sagebrush	Phase I

Site Notes

This study is located approximately ten miles west of Price on Cedar Bench. In the spring of 2005, seed was hand-broadcast on the treatment area and trees were removed by pushing with D-6 CAT bulldozers. When speaking with the habitat biologist in 2007, it was mentioned that the treatment may not have been seeded. However, in 2012 there were portions of the treatment area that had stands of Great Basin wildrye (*Leymus cinereus*), which was in the seed mix.

Soils**Table 16R-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 Loam	7.1	39.6	29.1	31.3	2.1	11.2	70.4	0.6	07/26/2004

Site Potential

1981 - 2010 Average Annual Precipitation	14 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.

Upon study establishment in 2004, this site was a black sagebrush (*Artemisia nova*) and mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) shrubland that had been encroached by twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) (Photos, Table 16R-12.12). The herbaceous understory was lacking in abundance, but was moderately diverse (Table 16R-12.7, Table 16R-12.10, Table 16R-12.11). Following the tree-removing disturbances (Table 16R-12.1), the community transitioned to a Phase I woodland community with cover and density of pinyon and juniper decreasing substantially (Table 16R-12.4, Table 16R-12.13, Table 16R-12.14). With the canopy open, sagebrush has steadily increased in cover and density (Table 16R-12.6, Table 16R-12.12, Table 16R-12.13). The herbaceous understory has also increased in the post-treatment sample period and has mainly been comprised of native perennial grasses (Table 16R-12.7, Table 16R-12.10). Despite successful treatments that removed much of the encroaching conifer trees, many young trees remain and will likely continue to infill the community without frequent maintenance in the area.

Trend Summary Tables**Table 16R-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
2004	8.8	2.5	7.5	6.5	3.2	7.9
2007	6.4	2.1	-	7.0	2.3	-
2012	7.7	1.3	-	7.1	1.8	-
2016	8.3	1.8	-	9.0	2.7	-
2021	11.1	2.4	-	13.3	2.4	0.4

Table 16R-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
2004	-	351	47	180	-	13.7	0.1	3.2
2007	15	380	29	217	0.1	22.1	0.1	4.2
2012	1	405	19	137	0.0	23.7	0.1	0.8
2016	-	402	5	158	-	30.3	0.0	0.9
2021	-	358	-	128	-	20.1	-	1.4

Table 16R-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
2004	32.9	3.9	41.5	1.4	0.2	36.1
2007	27.8	3.6	41.6	0.2	0.1	37.2
2012	35.7	0.7	52.3	0.6	0.1	37.7
2016	27.3	1.5	34.9	0.4	0.1	43.1
2021	35.0	2.9	41.0	0.4	0.1	30.9

Table 16R-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			
2004	-	32	28	12
2007	-	20	28	34
2012	-	16	25	-
2016	4	25	3	52
2021	-	43	5	18
Year	Days Use Per Acre (ha)			
2004	-	53.6 (132.4)	53.0 (130.8)	-
2007	-	40.2 (99.3)	28.8 (71.2)	-
2012	-	48.3 (119.2)	85.8 (211.9)	-
2016	2.9 (7.2)	27.5 (67.9)	2.0 (5.0)	-
2021	2.2 (5.4)	19.4 (48.0)	6.7 (16.6)	-

Table 16R-12.10 - 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									
2004	6	11	-	6	39	222	28	147	11	17
2007	6	5	15	16	32	109	46	257	86	97
2012	23	10	1	3	78	202	70	130	74	137
2016	2	-	-	1	101	129	36	66	63	149
2021	16	15	-	2	120	143	96	71	43	89
year	Average Cover (%)									
2004	0.3	0.4	-	0.1	1.1	7.0	0.2	4.1	0.1	0.5
2007	0.0	0.2	0.1	0.3	1.4	4.0	0.4	10.4	1.4	3.9
2012	0.6	0.1	0.0	0.0	1.5	9.8	0.8	3.2	1.6	6.0
2016	0.0	-	-	0.0	6.5	8.2	1.7	3.3	1.5	9.1
2021	0.5	0.3	-	0.0	3.9	7.5	0.5	1.8	0.5	5.0

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

Table 16R-12.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Arabis (rockcress)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus tenellus (looseflower milkvetch)	Calochortus nuttallii (sego lily)	Castilleja linariifolia (Wyoming Indian paintbrush)	Chaenactis douglasii (Douglas' dustymaiden)	Collinsia parviflora ^a (maiden blue eyed Mary)	Comandra umbellata (bastard toadflax)	Cymopterus (springparsley)	Descurainia pinnata ^a (western tansymustard)	Eriogonum racemosum (redroot buckwheat)	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Hedysarum boreale (Utah sweetvetch)	Lactuca serriola ^{ai} (prickly lettuce)	Lappula occidentalis ^a (flatspine stickseed)	Machaeranthera canescens (hoary tansyaster)
year	Nested Frequency																
2004	-	2	60	8	2	-	-	-	64	1	-	2	1	-	-	7	1
2007	12	-	55	23	4	9	-	3	89	1	2	-	-	-	2	21	5
2012	-	-	4	12	-	-	8	-	60	-	-	3	15	-	-	-	-
2016	-	-	13	-	-	4	-	2	53	-	-	-	-	1	-	2	-
2021	-	-	12	-	-	2	-	-	84	-	-	1	-	-	-	-	-
year	Average Cover (%)																
2004	-	0.0	1.4	0.2	0.0	-	-	-	0.8	0.0	-	0.0	0.0	-	-	0.0	0.0
2007	0.1	-	0.7	0.7	0.0	0.0	-	0.0	1.4	0.0	0.0	-	-	-	0.0	0.1	0.1
2012	-	-	0.0	0.1	-	-	0.0	-	0.3	-	-	0.0	0.1	-	-	-	-
2016	-	-	0.1	-	-	0.0	-	0.0	0.3	-	-	-	-	0.0	-	0.0	-
2021	-	-	0.1	-	-	0.0	-	-	1.1	-	-	0.0	-	-	-	-	-

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

FORB SPECIES	Packera multilobata (lobeleaf groundsel)	Penstemon pachyphyllus (thickleaf beardtongue)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)	Schoenocrambe linifolia (flaxleaf plainsmustard)	Sedum lanceolatum (spearleaf stonecrop)	Sphaeralcea coccinea (scarlet globemallow)	Symphotrichum (aster)	Tragopogon dubius ^{at} (yellow salsify)	Trifolium (clover)
year	Nested Frequency									
2004	43	9	41	40	1	-	8	-	1	23
2007	26	11	96	-	11	2	1	1	1	30
2012	9	13	59	4	-	-	12	5	-	-
2016	30	10	88	-	-	-	6	1	1	2
2021	-	1	44	-	-	-	3	-	-	2
year	Average Cover (%)									
2004	0.2	0.1	0.1	0.1	0.0	-	0.0	-	0.0	0.3
2007	0.4	0.1	0.5	-	0.1	0.0	0.0	0.0	0.0	0.1
2012	0.1	0.1	0.2	0.0	-	-	0.1	0.0	-	-
2016	0.1	0.0	0.3	-	-	-	0.0	0.0	0.0	0.0
2021	-	0.0	0.1	-	-	-	0.0	-	-	0.0

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

Table 16R-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)	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)
year	Line Intercept Cover (%)							
2004	-	5.2	1.3	1.5	1.7	0.6	-	7.3
2007	0.3	5.7	1	1.4	0.9	-	-	-
2012	0.2	5.3	1.6	1.7	0.1	-	0	-
2016	-	7.3	1.7	1.6	1	-	0.1	-
2021	0.6	9.4	3.3	2.2	0.2	-	-	0.4
year	Quadrat Cover (%)							
2004	0.2	6.4	2.3	1.4	1.0	0.0	-	7.5
2007	0.3	5.3	0.8	1.3	0.8	-	-	-
2012	0.2	5.8	1.7	1.3	0.0	-	0.0	-
2016	0.0	6.6	1.7	1.8	0.0	-	0.0	-
2021	0.2	8.0	2.9	1.8	0.6	-	-	0.0

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

Table 16R-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			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Amelanchier utahensis^P -- (Utah serviceberry)									
2004	40	-	0	100	0	0	100	0	69/82
2007	40	-	0	100	0	50	50	0	85/97
2012	40	-	0	100	0	50	50	0	93/112
2016	20	-	0	0	100	0	100	100	84/100
2021	40	-	0	100	0	0	100	50	- / -
Artemisia nova^P -- (black sagebrush)									
2004	4000	10400	40	38	22	11	1	15	31/53
2007	2200	8120	9	60	31	21	8	25	31/55
2012	6700	700	64	29	7	54	10	3	29/58
2016	5320	-	21	68	11	13	35	9	23/47
2021	6240	-	20	59	21	10	11	32	- / -
Artemisia tridentata ssp. vaseyana^P -- (mountain big sagebrush)									
2004	980	440	27	31	43	22	16	39	47/60
2007	580	2440	10	35	55	48	17	31	50/82
2012	1560	600	56	33	10	14	14	6	46/59
2016	1640	-	12	76	12	27	33	7	38/59
2021	960	-	25	48	27	10	4	35	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
2004	1320	-	5	96	0	0	0	0	18/30
2007	1340	100	9	90	2	22	0	2	21/38
2012	1180	40	25	68	7	22	25	9	18/37
2016	2060	-	2	97	1	3	18	18	16/34
2021	1360	-	6	88	6	6	4	43	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
2004	2820	-	4	97	0	0	0	0	18/26
2007	2080	140	7	91	2	0	0	1	14/20
2012	560	40	11	89	0	0	11	0	14/23
2016	160	-	0	100	0	0	0	0	91/26
2021	620	-	3	97	0	0	0	7	- / -
Juniperus osteosperma¹ -- (Utah juniper)									
2004	20	-	100	0	0	0	0	0	- / -
2007	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	- / -
2016	-	-	-	-	-	-	-	-	- / -
2021	-	-	-	-	-	-	-	-	- / -
Opuntia fragilis -- (brittle pricklypear)									
2004	100	-	0	100	0	0	0	0	8/25
2007	100	-	60	40	0	0	0	0	11/22
2012	80	-	0	100	0	0	0	25	8/21
2016	40	20	0	100	0	0	0	0	8/28
2021	60	-	0	100	0	0	0	0	- / -
Pediocactus simpsonii -- (mountain ball cactus)									
2004	20	-	0	100	0	0	0	0	4/6
2007	20	-	100	0	0	0	0	0	9/20
2012	40	-	50	50	0	0	0	0	3/4
2016	-	-	-	-	-	-	-	-	- / -
2021	-	-	-	-	-	-	-	-	- / -

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 (%)				
Pinus edulis ^t -- (twoneedle pinyon)									
2004	120	-	67	33	0	0	0	0	- / -
2007	60	-	33	67	0	0	0	0	- / -
2012	20	-	100	0	0	0	0	0	- / -
2016	20	-	100	0	0	0	0	0	- / -
2021	60	-	67	33	0	0	0	0	- / -

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

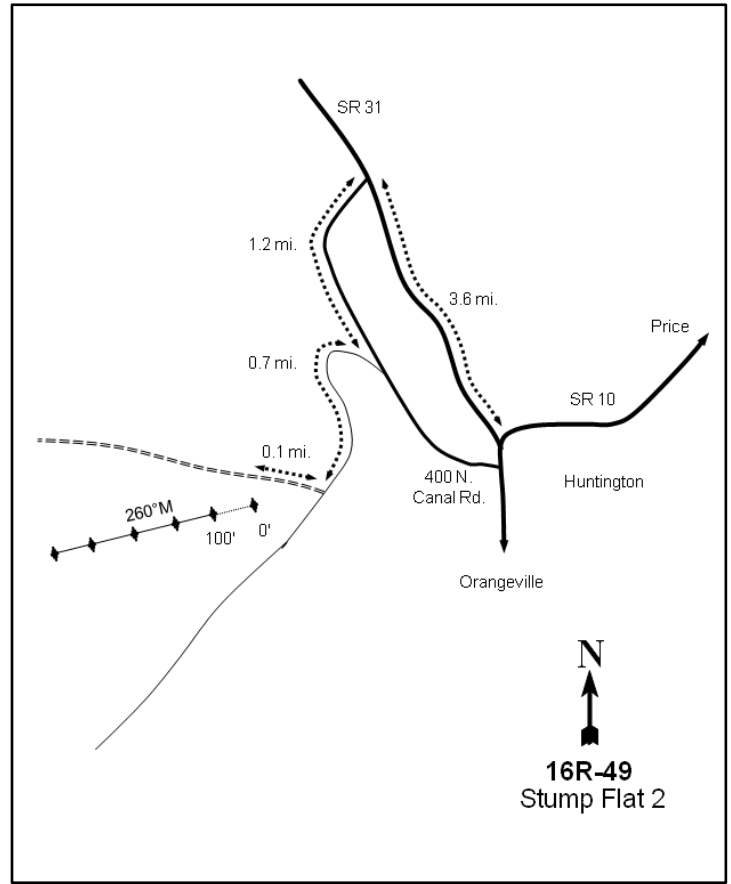
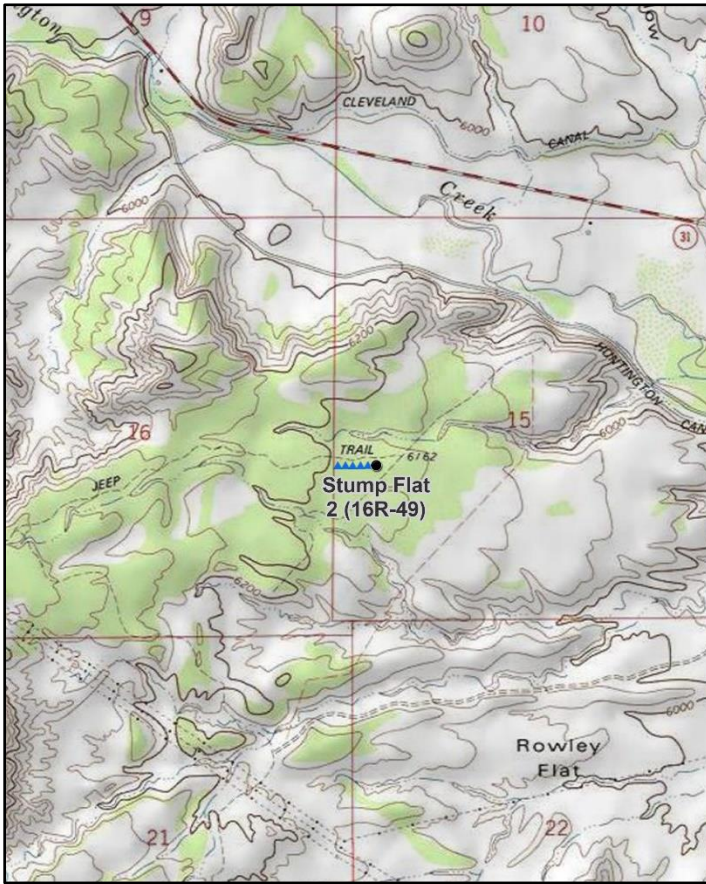
Table 16R-12.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2004	72	5	11	47	26	11	10.2
2007	24	8	54	38	-	-	7.5
2012	14	22	67	11	-	-	3.6
2016	16	-	83	17	-	-	4.6
2021	18	-	82	18	-	-	7.2
Pinus edulis (twoneedle pinyon)							
2004	84	6	24	35	6	29	9.4
2007	29	8	92	-	-	-	3.8
2012	12	20	80	-	-	-	2.0
2016	14	-	100	-	-	-	1.8
2021	14	-	100	-	-	-	4.4

Table 16R-12.15 - Deer Desirable Components Index: Upland 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	8.1	7.1	15.0	27.3	0.0	6.4	0.0	64.0	Fair-Good
2007	8.8	5.1	4.4	30.0	-0.1	8.4	0.0	56.6	Fair
2012	8.9	12.7	15.0	30.0	0.0	1.7	0.0	68.3	Good
2016	11.3	11.8	9.8	30.0	0.0	1.8	0.0	64.7	Fair-Good
2021	16.8	8.5	10.1	30.0	0.0	2.8	0.0	68.2	Good

STUMP FLAT 2 - STUDY NO. 16R-49



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Red Point NE; Township 17S, Range 8E, Section 15
NAD 83 UTM ZONE 12, 498338 East 4354819 North

Transect Information

Browse Tag # (0' Stake)	Not Available
Transect Bearing	260° 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 Route 10 between Price and Huntington, turn west onto Huntington Canyon Road (State Route 31). Drive for 3.6 miles and turn left onto 400 N (Canal Road). Travel for 1.2 miles and turn right onto an unnamed road. Continue for 0.7 miles, turn right (west) onto another unnamed road, and drive for 0.1 miles. The transect will be to the left (south) of the road.

Site Information

Land Ownership	State
Land Administrator	SITLA
Allotment	WEST HUNTINGTON
Elevation	6,164ft (1,879m)
Aspect	Southeast
Slope	3-4%
Sample Dates	07/03/2013, 08/16/2016, 07/22/2021

Table 16R-49.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Seeding - Aerial After	Stump Flat Pinyon/Juniper Removal Project	2693	December 2013	460
Mechanical - Bullhog	Stump Flat Pinyon/Juniper Removal Project	2693	October 2013	460
Seeding - Aerial Before	Stump Flat Pinyon/Juniper Removal Project	2693	October 2013	460

Table 16R-49.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Stump Flat			Aerial	Oct 2013	460
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	<i>Achnatherum hymenoides</i>	Indian Ricegrass	Emery UT	1.41	1.00
G	<i>Agropyron fragile</i>	Siberian Wheatgrass	Vavilov	0.56	0.47
G	<i>Elymus lanceolatus</i>	Thickspike Wheatgrass	Bannock	0.60	0.52
G	<i>Poa secunda</i>	Sandberg Bluegrass	UP/Colorado Plateau	0.60	0.44
F	<i>Achillea millefolium</i>	Western Yarrow	Hanford WA	0.11	0.10
F	<i>Linum perenne</i>	Blue Flax	Appar	0.65	0.49
F	<i>Medicago sativa</i>	Alfalfa	Ranger (NC)	1.58	1.50
F	<i>Melilotus officinalis</i>	Yellow Sweetclover		1.52	1.34
F	<i>Sphaeralcea grossulariifolia</i>	Gooseberryleaf Globemallow	Beaver UT	0.33	0.27
S	<i>Atriplex canescens</i>	Fourwing Saltbush	Juab/Utah/Carbon	1.09	0.53
S	<i>Krascheninnikovia lanata</i>	Winterfat	Torrance NM	0.48	0.25

Mix Name			Application Type	Application Date	Acres
Stump Flat Shrub			Aerial	Dec 2013	460
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
S	<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i>	Wyoming Big Sagebrush	Sanpete UT	0.50	0.09
S	<i>Bassia prostrata</i>	Forage Kochia	Beaver UT	0.50	0.33

Wildlife Habitat and Vegetation History**Table 16R-49.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter

Table 16R-49.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2013	Pinyon-Juniper	Phase III
2016	Annual Forb	Phase I
2021	Mixed Shrub/Juniper	Phase I

Site Notes

Several dead deer carcasses were found near the site in 2013. There is also oil and gas development in this area.

Site Potential

1981 - 2010 Average Annual Precipitation	9 inches
NRCS Ecological Site	Semidesert Shallow Loam (Black Sagebrush)
NRCS Ecological Site #	R034BY227UT
States and Transitions	A defined state and transition model is available.

When the study was established in 2013, this site was dominated by encroaching twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*). Other browse species were present, but provided little cover (Table 16R-49.12, Table 16R-49.13). The herbaceous understory was also sparse (Table 16R-49.7). Following the bullhog treatment in the fall of 2013 (Table 16R-49.1), cover and density of conifer trees decreased substantially, but shrubs were also sampled in lower abundance. The density of seedling and young juniper trees has increased since treatment, and they were considered to be a co-dominant site component in 2021 (Table 16R-49.4, Table 16R-49.14). The herbaceous understory increased significantly in cover in 2016, but was sparse again in 2021. However, much of the herbaceous understory was comprised of annual species in 2016 (Table 16R-49.7, Table 16R-49.11). The preferred browse community, particularly black sagebrush (*Artemisia nova*) and slender buckwheat (*Eriogonum microthecum*), has increased in density and cover following the bullhog treatment (Table 16R-49.12, Table 16R-49.13). However, rehabilitation will likely be slow due to the lower potential of the site. In addition, continued tree removal will likely need to occur to avoid infilling and the associated loss of gained shrub and herbaceous communities.

Trend Summary Tables**Table 16R-49.6 - 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
2013	0.4	0.1	10.6	0.2	0.2	18.7
2016	0.7	0.6	0.0	0.3	0.5	0.6
2021	1.9	1.9	0.8	1.9	2.0	0.8

Table 16R-49.7 - 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
2013	-	2	9	11	-	0.0	0.2	0.1
2016	-	13	355	62	-	0.5	12.2	1.0
2021	-	86	134	127	-	0.8	0.9	1.5

Table 16R-49.8 - 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
2013	55.5	1.5	19.3	10.6	10.2	11.1
2016	53.6	0.2	25.7	8.5	4.0	13.2
2021	42.1	0.3	35.8	14.3	6.4	8.0

Table 16R-49.9 - 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			
2013	-	13	1	7
2016	-	4	-	41
2021	2	23	-	44
Year	Days Use Per Acre (ha)			
2013	-	22.8 (56.3)	-	-
2016	-	8.7 (21.5)	-	-
2021	7.2 (17.9)	13.4 (33.1)	-	-

Table 16R-49.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Dactylis glomerata ⁱ (orchardgrass)	Elymus elymoides (squirreltail)	Pleuraphis jamesii (James' galleta)
year	Nested Frequency			
2013	-	-	2	-
2016	4	1	8	-
2021	22	7	60	1
year	Average Cover (%)			
2013	-	-	0.0	-
2016	0.3	0.0	0.1	-
2021	0.1	0.0	0.7	0.0

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

Table 16R-49.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Arabis (rockcress)	Caulanthus crassicaulis ^a (thickstem wild cabbage)	Chamaesyce (sandmat)	Cryptantha (cryptantha)	Descurainia pinnata ^a (western tansymustard)	Eriogonum (buckwheat)	Eriogonum cernuum ^a (nodding buckwheat)	Euphorbia (spurge)	Halogeton glomeratus ^{ai} (saltlover)	Hymenoxys richardsonii (pingue rubberweed)	Lactuca scariola ^{ai} (prickly lettuce)	Lepidium ^a (pepperweed)	Lomatium (desertparsley)	Melilotus officinalis ⁱ (sweetclover)	Penstemon pachyphyllus (thickleaf beardtongue)	Physaria (twinpod)	Salsola tragus ^{ai} (prickly Russian thistle)
year	Nested Frequency																
2013	-	2	3	8	-	-	-	-	-	0	-	3	-	-	-	-	4
2016	6	2	11	5	22	6	9	10	32	23	20	36	5	-	2	-	350
2021	-	4	21	85	-	2	4	-	-	-	-	-	-	1	7	3	131
year	Average Cover (%)																
2013	-	0.0	0.0	0.0	-	-	-	-	-	0.0	-	0.1	-	-	-	-	0.0
2016	0.1	0.0	0.1	0.3	0.1	0.0	0.1	0.1	0.1	0.1	0.5	0.8	0.1	-	0.2	-	10.6
2021	-	0.0	0.1	1.2	-	0.0	0.0	-	-	-	-	-	-	0.0	0.1	0.0	0.8

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

FORB SPECIES		
	Taraxacum officinale (common dandelion)	
	Townsendia incana (hoary Townsend daisy)	
year	Nested Frequency	
2013	-	-
2016	4	-
2021	2	21
year	Average Cover (%)	
2013	-	-
2016	0.1	-
2021	0.0	0.1

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

Table 16R-49.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)									
	year									
Artemisia nova ^p (black sagebrush)	0.2	-	-	0	0.1	-	0	14.9	0.1	3.8
Artemisia tridentata ssp. wyomingensis ^p (Wyoming big sagebrush)	0.1	-	0	0.2	0.1	0.1	0.3	0.6	-	-
Ephedra nevadensis ^p (Nevada jointfir)	0.5	0.3	0.1	1	-	-	2	0.7	-	0.1
Eriogonum microthecum ^p (slender buckwheat)	0.4	-	0.0	0.0	0.0	-	0.0	8.9	0.0	1.7
Glossopetalon spinescens var. aridum (spiny greasewood)	0.2	-	0.0	0.5	0.2	0.0	0.5	0.0	-	-
Grayia spinosa (spiny hopsage)	0.2	0.0	0.0	1.6	0.4	0.0	1.5	0.8	-	0.0
Gutierrezia sarothrae (broom snakeweed)										
Juniperus osteosperma ^t (Utah juniper)										
Opuntia (pricklypear)										
Pinus edulis ^t (twoneedle pinyon)										
year	Quadrat Cover (%)									
2013	0.4	-	0.0	0.0	0.0	-	0.0	8.9	0.0	1.7
2016	0.2	-	0.0	0.5	0.2	0.0	0.5	0.0	-	-
2021	0.2	0.0	0.0	1.6	0.4	0.0	1.5	0.8	-	0.0

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

Table 16R-49.13 - 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 nova^p -- (black sagebrush)									
2013	500	-	8	32	60	8	36	56	10/26
2016	160	-	25	38	38	38	0	0	17/41
2021	420	-	48	43	10	10	24	19	- / -
Artemisia tridentata ssp. wyomingensis^p -- (Wyoming big sagebrush)									
2013	-	-	-	-	-	-	-	-	- / -
2016	140	-	14	86	0	0	0	0	36/28
2021	40	-	0	100	0	0	0	0	- / -

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 (%)				
Bassia prostrata^{PI} -- (forage kochia)									
2013	-	-	-	-	-	-	-	-	-/-
2016	40	-	0	100	0	0	50	0	7/17
2021	40	-	0	100	0	0	100	0	-/-
Cercocarpus montanus^P -- (alderleaf mountain mahogany)									
2013	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	52/54
2021	-	-	-	-	-	-	-	-	-/-
Ephedra nevadensis^P -- (Nevada jointfir)									
2013	80	-	100	0	0	0	0	0	22/24
2016	20	-	0	100	0	100	0	0	33/48
2021	20	-	0	100	0	0	100	0	-/-
Eriogonum microthecum^P -- (slender buckwheat)									
2013	720	-	25	75	0	8	0	3	7/8
2016	1420	100	0	100	0	1	0	0	11/19
2021	10900	420	43	46	11	14	3	26	-/-
Glossopetalon spinescens var. aridum -- (spiny greasewood)									
2013	140	-	0	100	0	0	43	0	14/25
2016	180	-	11	89	0	0	89	0	16/35
2021	240	-	8	42	50	0	67	50	-/-
Grayia spinosa -- (spiny hopsage)									
2013	-	-	-	-	-	-	-	-	-/-
2016	-	-	-	-	-	-	-	-	18/40
2021	120	-	50	50	0	0	0	50	-/-
Gutierrezia sarothrae -- (broom snakeweed)									
2013	260	-	100	0	0	0	0	0	13/17
2016	240	-	0	100	0	0	0	0	27/36
2021	6120	-	6	86	9	0	0	48	-/-
Juniperus osteosperma^I -- (Utah juniper)									
2013	800	40	63	35	3	0	0	3	-/-
2016	280	120	71	14	14	7	29	21	-/-
2021	460	-	83	17	0	0	0	4	-/-
Opuntia -- (pricklypear)									
2013	20	-	0	0	100	0	0	0	9/18
2016	40	-	0	100	0	0	0	0	8/24
2021	-	-	-	-	-	-	-	-	-/-
Pinus edulis^I -- (twoneedle pinyon)									
2013	200	-	70	20	10	0	0	20	-/-
2016	-	-	-	-	-	-	-	-	-/-
2021	20	-	100	0	0	0	0	0	-/-

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

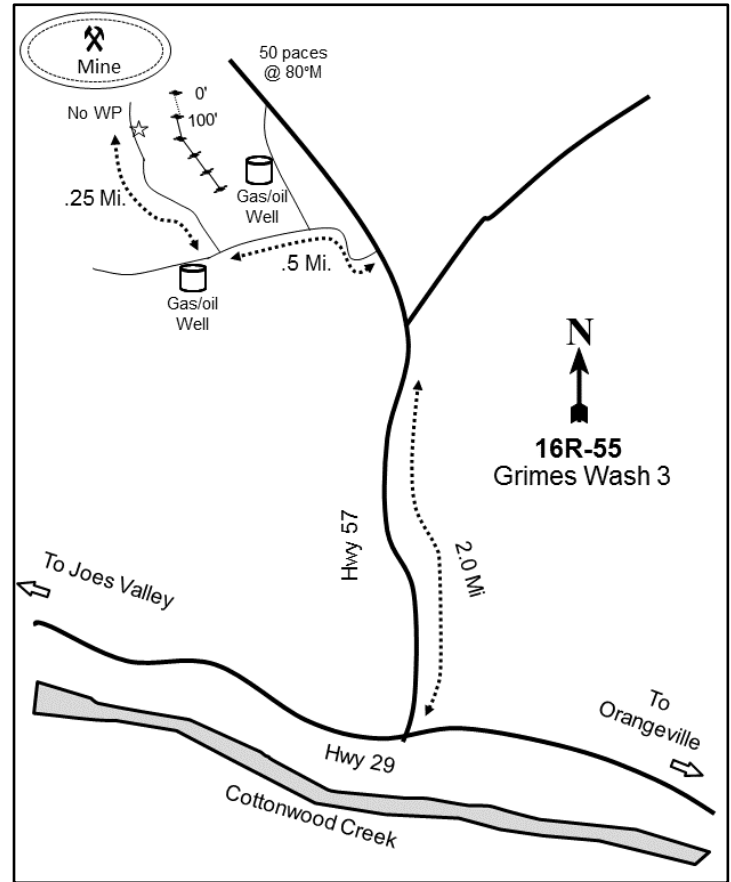
Table 16R-49.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density Trees per Acre	Size Class Distribution					Average Diameter (cm)
		Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2013	561	5	55	25	15	-	8.0
2016	242	35	65	-	-	-	5.5
2021	436	42	58	-	-	-	2.9
Pinus edulis (twoneedle pinyon)							
2013	97	11	37	42	11	-	7.1
2016	8	-	100	-	-	-	5.3
2021	7	-	100	-	-	-	4.3

Table 16R-49.15 - Deer Desirable Components Index: Semidesert 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
2013	0.3	0.0	0.0	0.0	0.0	0.1	0.0	0.4	Very Poor
2016	0.4	0.0	0.0	0.9	0.0	2.1	0.0	3.4	Very Poor
2021	2.4	0.0	0.0	1.7	0.0	3.0	0.0	7.1	Very Poor

GRIMES WASH 3 - STUDY NO. 16R-55

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Red Point SW; Township 17S, Range 7E, Section 34
NAD 83 UTM ZONE 12, 489712 East 4349604 North

Transect Information

Browse Tag # (0' Stake)	228
Transect Bearing	175° magnetic (Lines 3-5: 130° 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 Orangeville, travel west on Highway 29 for 3.25 miles to North Coal Haul Road. Turn right and proceed for 2.8 miles. There is a road on the left that runs past an oil pad: take this road for 0.34 miles, bearing left at a "Y". There is a small road heading north: take this road and proceed for 0.2 miles to the site, which will be on the right-hand (east) side of the road.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	WEST GRIMES
Elevation	6,776ft (2,065m)
Aspect	Southeast
Slope	3-5%
Sample Dates	08/15/2017, 07/22/2021

Table 16R-55.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Mechanical - Bullhog	Grimes Wash Phase 2	4041	October-November 2017	111
Seeding - Aerial Before	Grimes Wash Phase 2	4041	October 2017	111
Seeding - Broadcast Before	Grimes Wash BLM Stewardship P/J Removal	2866	October-November 2013	181
Seeding - Aerial After	Grimes Wash Phase 2	4041	January 2018	111

Table 16R-55.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Grimes Wash BLM Stewardship P/J Removal			Broadcast	Oct 2013	65
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	<i>Achnatherum hymenoides</i>	Indian Ricegrass	Rio Grande CO	1.00	0.95
G	<i>Agropyron fragile</i>	Siberian Wheatgrass	Vavilov	1.00	0.79
G	<i>Elymus lanceolatus</i>	Thickspike Wheatgrass	Critana	1.00	0.91
G	<i>Poa secunda</i>	Canby Bluegrass	Canbar	0.51	0.42
F	<i>Linum perenne</i>	Blue Flax	Appar	0.51	0.45
F	<i>Medicago sativa</i>	Alfalfa	Ranger NC	1.00	0.92
F	<i>Melilotus officinalis</i>	Yellow Sweetclover		0.51	0.45
F	<i>Sphaeralcea munroana</i>	Munro Globemallow	Piute UT	0.35	0.21
S	<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i>	Wyoming Big Sagebrush	Uintah UT	0.51	0.07
S	<i>Atriplex canescens</i>	Fourwing Saltbush	Juab/Utah/Carbon	0.51	0.25
S	<i>Bassia prostrata</i>	Forage Kochia	Beaver/Millard UT	0.51	0.43
S	<i>Krascheninnikovia lanata</i>	Winterfat	Torrance NM	0.51	0.26

Mix Name			Application Type	Application Date	Acres
Grimes Wash			Aerial	Oct 2017	181
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	<i>Achnatherum hymenoides</i>	Indian Ricegrass	Emery UT	1.10	1.06
G	<i>Agropyron fragile</i>	Siberian Wheatgrass	Vavilov II	0.28	0.24
G	<i>Agropyron fragile</i>	Siberian Wheatgrass	Vavilov II	0.28	0.25
G	<i>Elymus lanceolatus</i>	Thickspike Wheatgrass	Bannock II	0.55	0.48
G	<i>Poa secunda</i>	Sandberg Bluegrass	UP Colorado Plateau	0.55	0.48
G	<i>Poa secunda</i>	Canby Bluegrass	Canbar	0.55	0.45
F	<i>Achillea millefolium</i>	Western Yarrow	Yakima	0.11	0.09
F	<i>Cleome serrulata</i>	Rocky Mountain Beeplant	Sanpete UT	0.66	0.55
F	<i>Cleome serrulata</i>	Rocky Mountain Beeplant	Sanpete UT	0.44	0.42
F	<i>Helianthus annuus</i>	Annual Sunflower		0.55	0.49
F	<i>Linum perenne</i>	Blue Flax	Appar	1.10	0.86
F	<i>Medicago sativa</i>	Alfalfa	Ladak	0.41	0.39
F	<i>Medicago sativa</i> ssp. <i>falcata</i>	Yellow Alfalfa	Don	0.41	0.41
F	<i>Penstemon palmeri</i>	Palmer Penstemon	Carbon UT	0.22	0.14
F	<i>Ratibida columnifera</i>	Prairie Coneflower	Stillwater	0.83	0.67
F	<i>Sanguisorba minor</i>	Small Burnet	Delar	0.83	0.76
F	<i>Sphaeralcea grossulariifolia</i>	Gooseberryleaf Globemallow	Grand UT	0.41	0.28
F	<i>Sphaeralcea grossulariifolia</i>	Gooseberryleaf Globemallow	Uintah UT	0.14	0.04
S	<i>Atriplex canescens</i>	Fourwing Saltbush	Carbon UT	1.10	0.54

Mix Name			Application Type	Application Date	Acres
Grimes Wash Shrub			Aerial	Jan 2018	352
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
F	<i>Medicago sativa</i>	Alfalfa	Ladak	0.43	0.40
S	<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i>	Wyoming Big Sagebrush	Duchesne UT	0.42	0.08
S	<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i>	Wyoming Big Sagebrush	Sevier UT	0.08	0.03

Wildlife Habitat and Vegetation History

Table 16R-55.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

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

Table 16R-55.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2017	Pinyon-Juniper	Phase III
2021	Mixed Shrub	Phase I

Site Notes

Oil and gas development is occurring in the area.

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	No state and transition model is available for the above ecological site.

This site was established in 2017 to monitor the Grimes Wash Phase 2 treatment (Table 16R-55.1) that removed twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*). In 2017, the site had very little herbaceous cover, and no introduced species were sampled. Forbs increased following treatment, but still provided little cover (Table 16R-55.10, 16R-55.11). Prior to treatment, browse species were depleted and had low amounts of cover: Mormon tea (*Ephedra viridis*) was the dominant species and black sagebrush (*Artemisia nova*) was a subordinate ally. Young, seeded Wyoming big sagebrush (*A. tridentata* ssp. *wyomingensis*) and fourwing saltbush (*Atriplex canescens*) appeared on site following treatment (Table 16R-55.12). Tree cover was high, placing the site in Phase III of woodland succession at the time of study establishment. Tree cover and density decreased substantially after the bullhog treatment and the site was considered to be in Phase I of woodland succession in 2021 (Table 16R-55.4, Table 16R-55.14). The open canopy is expected to improve the health of the browse and herbaceous understory while bolstering wildlife habitat.

Trend Summary Tables**Table 16R-55.6 - 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
2017	3.9	-	10.5	5.1	-	32.4
2021	4.7	-	-	5.1	-	-

Table 16R-55.7 - 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
2017	-	1	33	27	-	0.0	0.1	0.1
2021	-	128	11	93	-	2.2	0.0	1.9

Table 16R-55.8 - 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
2017	20.2	0.5	46.6	18.5	12.9	17.0
2021	20.5	0.1	55.5	5.9	9.0	9.0

Table 16R-55.9 - 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			
2017	-	13	-	34
2021	1	32	2	24
Year	Days Use Per Acre (ha)			
2017	-	16.8 (41.4)	-	-
2021	1.5 (3.6)	33.5 (82.8)	2.0 (5.0)	-

Table 16R-55.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Nested Frequency				
Achnatherum hymenoides (Indian ricegrass)	-	-	-	1	-
Agropyron fragile ⁱ (Siberian wheatgrass)	6	76	47	-	25
Elymus lanceolatus (thickspike wheatgrass)	Average Cover (%)				
Pascopyrum smithii (western wheatgrass)	-	-	-	0.0	-
Poa secunda (Sandberg bluegrass)	0.1	1.6	0.4	-	0.1

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

Table 16R-55.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Nested Frequency																	
Arabis holboellii ^a (Holboell's rockcress)	1	1	1	4	23	1	-	8	-	-	-	18	-	-	-	-	-	-
Caulanthus crassicaulis ^a (thickstem wild cabbage)	-	-	4	-	-	3	4	-	62	16	3	-	2	22	1	10	3	-
Chenopodium fremontii ^a (Fremont's goosefoot)	Average Cover (%)																	
Cryptantha (cryptantha)	0.0	0.0	0.0	0.0	0.1	0.0	-	0.0	-	-	-	0.1	-	-	-	-	-	-
Descurainia pinnata ^a (western tansymustard)	-	-	0.0	-	-	0.0	0.0	-	0.9	0.2	0.2	-	0.0	0.5	0.0	0.1	0.0	-
Eriogonum alatum (winged buckwheat)																		
Helianthus annuus ^a (common sunflower)																		
Lepidium ^a (pepperweed)																		
Linum perenne ⁱ (blue flax)																		
Medicago sativa ⁱ (alfalfa)																		
Medicago sativa ssp. falcata ⁱ (yellow alfalfa)																		
Penstemon (beardtongue)																		
Penstemon pachyphyllus (thickleaf beardtongue)																		
Penstemon palmeri (Palmer's penstemon)																		
Physaria (twinpod)																		
Ratibida columnifera (upright prairie coneflower)																		
Salsola tragus ⁿⁱ (prickly Russian thistle)																		

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

FORB SPECIES	Sanguisorba minor ⁱ (small burnet)	Stanleya viridiflora (green princesplume)	Trifolium (clover)
year	Nested Frequency		
2017	-	4	-
2021	1	-	0
year	Average Cover (%)		
2017	-	0.0	-
2021	0.0	-	0.0

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

Table 16R-55.12 - 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)	Ephedra viridis ^p (mormon tea)	Eriogonum microthecum ^p (slender buckwheat)	Juniperus osteosperma ⁱ (Utah juniper)	Pinus edulis ⁱ (twoneedle pinyon)
year	Line Intercept Cover (%)						
2017	1.4	-	-	3.6	0.1	10.5	21.9
2021	1	-	-	3.8	0.3	-	-
year	Quadrat Cover (%)						
2017	0.5	-	-	3.2	0.1	1.0	9.5
2021	1.2	0.0	0.0	3.1	0.4	-	-

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

Table 16R-55.13 - 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 nova^p -- (black sagebrush)									
2017	900	-	0	51	49	27	7	33	12/37
2021	1040	120	42	42	15	4	27	17	- / -
Artemisia tridentata ssp. wyomingensis^p -- (Wyoming big sagebrush)									
2017	-	-	-	-	-	-	-	-	- / -
2021	420	-	91	10	0	14	10	0	- / -
Atriplex canescens^p -- (fourwing saltbush)									
2017	-	-	-	-	-	-	-	-	- / -
2021	80	-	25	75	0	0	0	0	- / -
Cercocarpus montanus^p -- (alderleaf mountain mahogany)									
2017	-	-	-	-	-	-	-	-	84/92
2021	20	-	0	0	100	0	100	100	- / -

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 (%)				
Ephedra viridis^p -- (mormon tea)									
2017	600	-	17	63	20	20	0	7	78/98
2021	740	-	3	78	19	22	0	35	- / -
Eriogonum microthecum^p -- (slender buckwheat)									
2017	1920	-	13	88	0	3	1	0	5/7
2021	4320	980	54	41	5	1	0	5	- / -
Juniperus osteospermaⁱ -- (Utah juniper)									
2017	140	20	29	57	14	0	0	0	- / -
2021	20	-	100	0	0	0	0	0	- / -
Opuntia -- (pricklypear)									
2017	-	-	-	-	-	-	-	-	6/11
2021	-	-	-	-	-	-	-	-	- / -
Pinus edulis^t -- (twoneedle pinyon)									
2017	300	20	53	40	7	0	0	0	- / -
2021	100	-	100	0	0	0	0	0	- / -

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

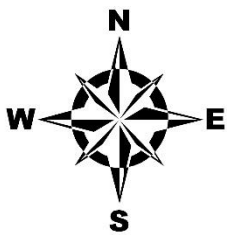
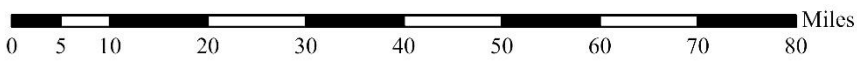
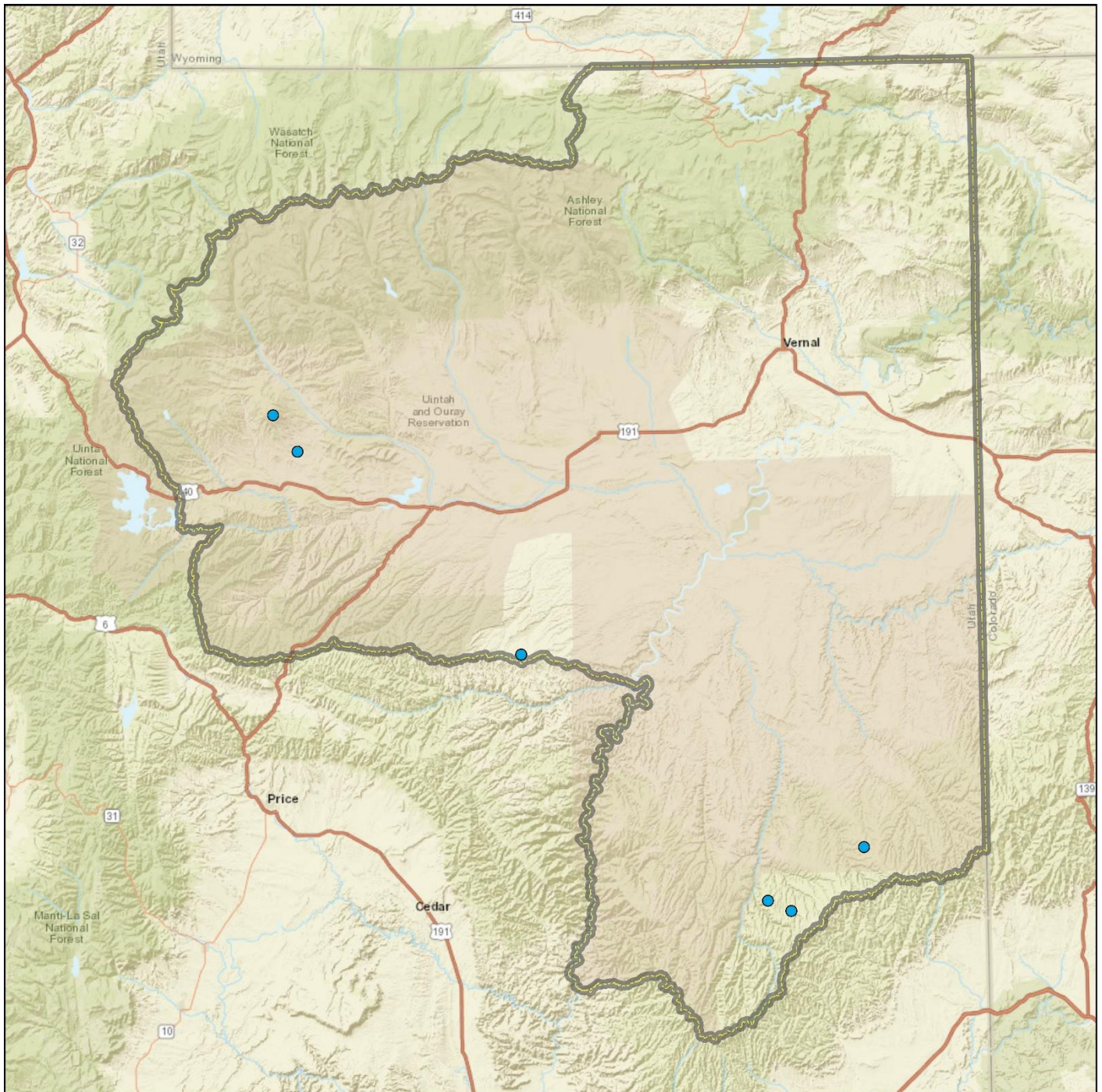
Table 16R-55.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2017	177	10	10	30	35	15	44.9
2021	48	50	25	6	6	13	17.7
Pinus edulis (twoneedle pinyon)							
2017	221	15	40	30	15	-	12.3
2021	108	35	60	-	5	-	2.5

Table 16R-55.15 - Deer Desirable Components Index: Upland Potential Scale.

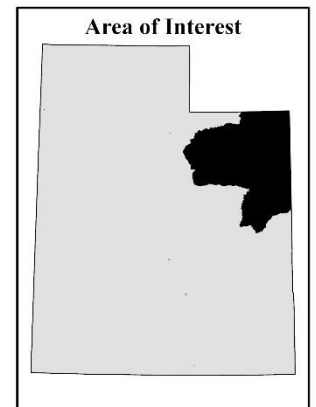
Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
2017	6.4	6.7	6.0	0.0	0.0	0.2	0.0	19.4	Very Poor
2021	6.4	9.8	6.7	4.4	0.0	3.8	0.0	31.0	Very Poor

NORTHEASTERN REGION



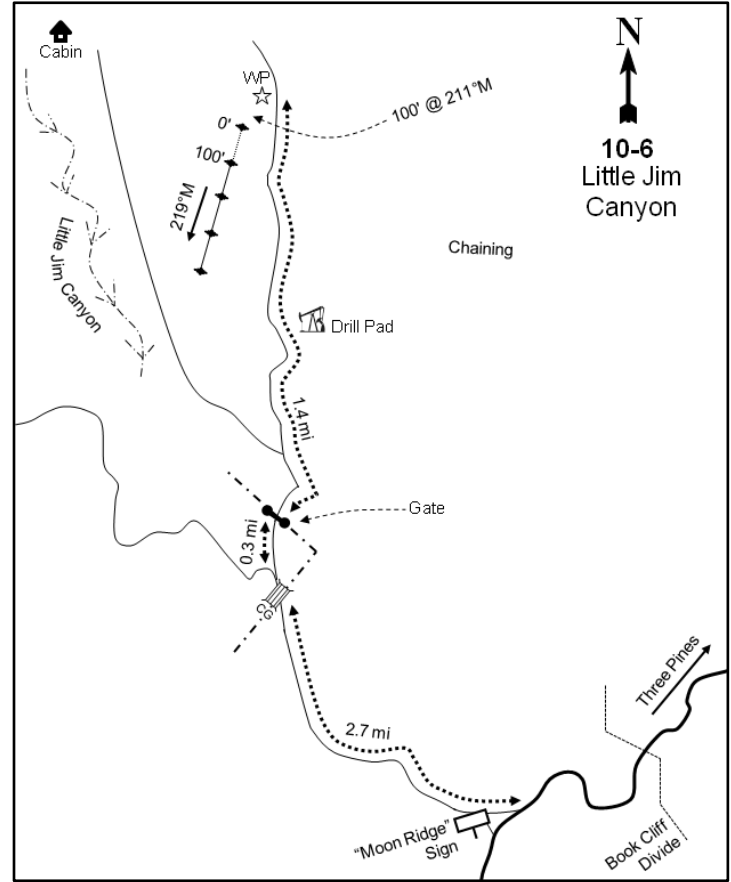
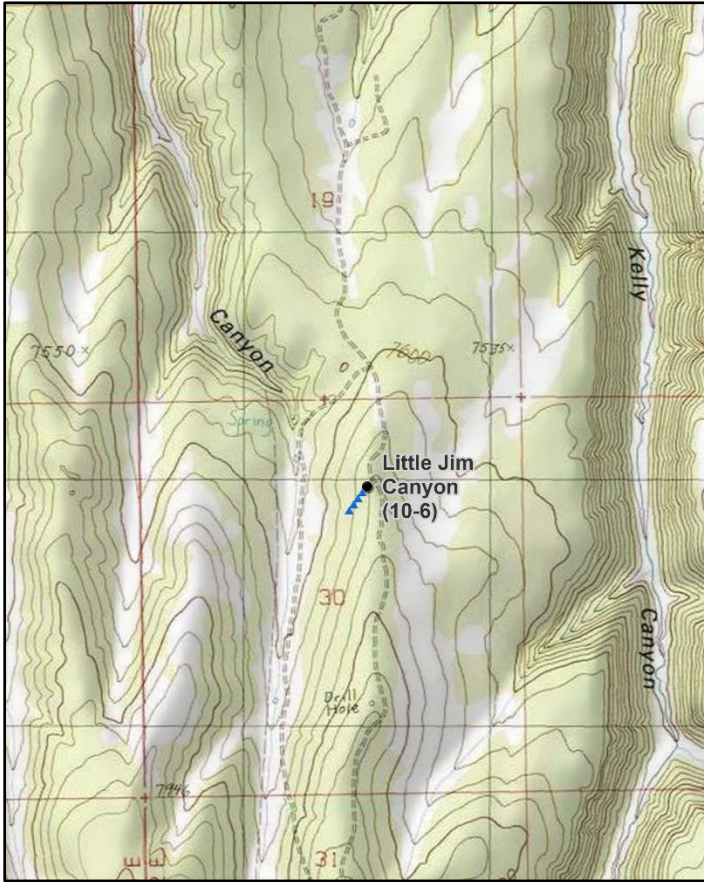
Region Boundaries
[Thick black outline symbol] Northeastern Region

Study Locations
[Blue circle symbol] 2021 WRI Study Site



Credits: Esri, HERE, Garmin, NGA, USGS, NPS

LITTLE JIM CANYON - STUDY NO. 10-6

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Tenmile Canyon North; Township 16S, Range 22E, Section 30
NAD 83 UTM ZONE 12, 626445 East 4361161 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

9099
204° magnetic
400ft
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
Standard

Directions to Site

From Three Pines, proceed southwest along the Divide road for about 10.5 miles to a major junction at Moon Ridge. Turn right and drive for 2.7 miles to a cattle guard. Just before the cattle guard and fence, turn right and travel along the fence for 0.3 miles to a gate. Stay to the right and continue down the ridges for 1.4 miles to the witness post on the left (west) side of the road. From the witness post, the 0-foot baseline stake is 100 feet into the chaining at a bearing of 211 degrees magnetic. The 0-foot stake is marked by browse tag #9099.

Site Information

Land Ownership	State
Land Administrator	SITLA
Allotment	MCCLELLAND
Elevation	7,700ft (2,347m)
Aspect	Southwest
Slope	15%
Sample Dates	06/20/1995, 06/22/2000, 08/21/2012, 07/14/2015, 08/15/2017, 07/28/2021

Table 10-06.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Mechanical - Bullhog	Little Jim Bullhog	2219	April-July 2013	669

Wildlife Habitat and Vegetation History**Table 10-06.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
American Bison	crucial	year-long	
Mule Deer	substantial	summer	
Rocky Mountain Elk	crucial	summer	
Greater Sage-Grouse	occupied	year-long	brood-rearing
Rocky Mountain Bighorn	crucial	year-long	

Table 10-06.4 - 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
1995	Mixed Mountain Brush	Phase I
2000	Mixed Mountain Brush	Phase I
2012	Mixed Mountain Brush	Phase I
2015	Mixed Mountain Brush	Phase I
2017	Mixed Mountain Brush	Phase I
2021	Mixed Mountain Brush	Phase I

Site Notes

No Notes

Soils**Table 10-06.5 - 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	7.3	38.0	37.4	24.6	6.7	8.3	96.0	0.8	06/22/2000

Site Potential

1981 - 2010 Average Annual Precipitation	17 inches
NRCS Ecological Site	Mountain Stony Loam (Shrub)
NRCS Ecological Site #	R047XC460UT
States and Transitions	No state and transition model is available for this ecological site.

The browse component on this study site has been dominated by mixed mountain brush species such as mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), alderleaf mountain mahogany (*Cercocarpus montanus*), and mountain snowberry (*Symphoricarpos oreophilus*) since study establishment in 1988 (Photos, Pre-1992 Data, Table 10-06.12, Table 10-06.13). The herbaceous understory has remained somewhat diverse and has consisted mostly of native perennial grasses. The introduced annual grass species cheatgrass (*Bromus tectorum*) has been observed in the understory, but has provided limited cover (Table 10-06.10). Forb species have remained rare (Table 10-06.7, Table 10-06.11). Twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) increased in abundance over the sample period and were becoming co-dominant with the browse component. In 2013, however, the site was treated with a bullhog that removed nearly all of the pinyon and juniper trees (Table 10-06.14). Sagebrush has steadily increased in both cover and density since the removal of pinyon and juniper. Due to the increased abundance and diversity of sagebrush and grass composition the site is considered to be improving in condition for mule deer summering habitat (Table 10-06.10, Table 10-06.10, Table 10-06.12, Table 10-06.13).

Trend Summary Tables**Table 10-06.6 - 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
1995	18.2	2.0	4.0	-	-	-
2000	24.2	0.5	3.9	-	-	-
2012	16.3	1.5	8.8	25.4	0.6	12.0
2015	17.0	2.6	0.0	27.0	2.1	-
2017	20.3	1.5	0.0	26.3	2.7	0.1
2021	19.5	2.4	0.0	29.5	2.5	-

Table 10-06.7 - 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
1995	81	139	115	95	1.6	3.2	1.9	0.9
2000	39	129	3	67	0.1	2.6	0.0	1.2
2012	6	118	4	38	0.0	2.7	0.0	0.3
2015	103	175	17	72	3.1	9.2	0.3	2.1
2017	142	217	1	55	2.1	9.6	0.1	1.8
2021	47	201	1	18	0.3	4.8	0.0	0.2

Table 10-06.8 - 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
1995	3.3	0.6	49.0	19.2	3.2	33.2
2000	7.8	1.0	54.2	25.2	3.1	31.7
2012	3.6	-	50.7	30.3	1.4	29.7
2015	6.4	-	61.1	18.3	2.1	30.4
2017	15.6	0.0	63.6	13.6	2.5	29.4
2021	8.2	0.8	56.4	21.0	2.2	25.8

Table 10-06.9 - 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	Rocky Mountain Elk	Horse	Rabbit
	Quadrat Frequency				
1995	-	3	4	-	9
2000	-	3	11	-	33
2012	-	12	9	2	5
2015	1	5	7	-	4
2017	1	10	17	2	-
2021	1	15	17	-	1
Year	Days Use Per Acre (ha)				
1995	-	-	-	-	-
2000	-	7.4 (18.2)	6.0 (14.9)	-	-
2012	-	24.8 (61.2)	19.4 (48.0)	2.3 (5.7)	-
2015	-	16.8 (41.4)	24.8 (61.2)	1.2 (2.9)	-
2017	1.5 (3.6)	22.1 (54.6)	36.2 (89.4)	0.6 (1.4)	-
2021	1.5 (3.6)	24.1 (59.6)	18.1 (44.7)	2.9 (7.2)	-

Table 10-06.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achmatherum hymenoides (Indian ricegrass)	Bromus tectorum ^{ai} (cheatgrass)	Carex (sedge)	Elymus elymoides (squirreltail)	Elymus lanceolatus (thickspike wheatgrass)	Koeleria macrantha (prairie Junegrass)	Piptatheropsis micrantha (littelseed ricegrass)	Poa fendleriana (muttongrass)	Poa pratensis ⁱ (Kentucky bluegrass)	Psathyrostachys juncea ⁱ (Russian wildrye)
year	Nested Frequency									
1995	40	81	21	58	-	-	28	3	4	6
2000	70	39	9	35	2	-	3	2	16	-
2012	82	6	14	23	-	5	-	-	-	3
2015	90	103	18	65	2	-	20	4	6	-
2017	84	142	1	122	8	3	36	0	5	-
2021	99	47	10	71	30	-	25	-	1	-
year	Average Cover (%)									
1995	1.3	1.6	0.4	0.7	-	-	0.2	0.0	0.0	0.5
2000	1.6	0.1	0.4	0.4	0.0	-	0.0	0.0	0.1	-
2012	2.2	0.0	0.2	0.3	-	0.0	-	-	-	0.0
2015	4.6	3.1	0.9	1.9	0.0	-	1.3	0.1	0.4	-
2017	4.5	2.1	0.0	2.2	0.1	0.6	2.2	0.0	0.0	-
2021	2.5	0.3	0.1	1.4	0.2	-	0.6	-	0.0	-

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

Table 10-06.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Aliciella latifolia ssp. latifolia ^a (broadleaf gilia)	Androsace septentrionalis ^{ai} (pygmyflower rockjasmine)	Antennaria (pussytoes)	Arabis (rockcress)	Chaenactis douglasii (Douglas' dustymaiden)	Chenopodium album ^a (lambsquarters)	Chenopodium fremontii ^a (Fremont's goosefoot)	Chenopodium leptophyllum ^a (narrowleaf goosefoot)	Cryptantha (cryptantha)	Delphinium nuttallianum (two-lobed larkspur)	Descurainia ^a (tansymustard)	Draba ^a (draba)	Erigeron pumilus (shaggy fleabane)	Eriogonum alatum (winged buckwheat)	Lappula occidentalis ^a (flatspine stickseed)	Lesquerella (bladderpod)	Lupinus argenteus (silvery lupine)
year	Nested Frequency																
1995	11	-	-	16	1	-	-	-	3	1	74	23	1	-	28	-	20
2000	-	-	4	9	-	-	-	-	-	-	-	-	-	-	3	6	-
2012	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	-	-	-	1	-	-	3	6	6	-	4	4	3	-	-	-	-
2017	-	-	3	-	-	-	-	-	-	-	1	-	-	3	-	10	-
2021	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
year	Average Cover (%)																
1995	0.2	-	-	0.0	0.0	-	-	-	0.0	0.0	1.5	0.1	0.0	-	0.1	-	0.1
2000	-	-	0.0	0.0	-	-	-	-	-	-	-	-	-	-	0.0	0.1	-
2012	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	-	-	-	0.1	-	-	0.0	0.0	0.1	-	0.2	0.0	0.0	-	-	-	-
2017	-	-	0.0	-	-	-	-	-	-	-	0.1	-	-	0.0	-	0.0	-
2021	-	-	-	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-

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

FORB SPECIES	Nest Frequency						
Machaeranthera grindeltooides (rayless tansyaster)	16	7	23	-	31	5	-
Melilotus officinalis ⁱ (sweetclover)	22	-	1	27	9	-	-
Packera multilobata (lobeleaf groundsel)	6	-	-	16	23	-	-
Penstemon pachyphyllus (thickleaf beardtongue)	7	-	5	37	23	-	1
Physaria newberryi (Newberry's twinpod)	11	-	-	32	-	-	-
Polygonum douglasii ^a (Douglas' knotweed)	2021	5	-	8	6	-	-
Tragopogon dubius ^{ai} (yellow salsify)	Average Cover (%)						
1995	0.6	0.0	0.1	-	0.1	0.0	-
2000	0.2	-	0.0	0.8	0.1	-	-
2012	0.0	-	-	0.2	0.1	-	-
2015	0.2	-	0.0	1.5	0.1	-	0.0
2017	0.3	-	-	1.4	-	-	-
2021	0.2	-	-	0.0	0.0	-	-

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

Table 10-06.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)																
Artemisia filifolia (sand sagebrush)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Artemisia frigida ^p (prairie sagewort)	-	0.7	-	4.3	3.3	-	0.1	1.1	-	0.2	3.3	0.9	0.1	0.2	7.8	-	-
Artemisia tridentata ssp. tridentata ^p (basin big sagebrush)	-	1.2	-	4.2	0.8	-	-	3.1	-	0.3	-	-	1.8	-	-	-	-
Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	-	0.8	-	3.8	0.5	0.1	0.4	3.6	0.2	0.9	0.1	-	1	0.1	-	-	-
Cercocarpus montanus ^p (alderleaf mountain mahogany)	0.1	0	0.2	5.1	0.5	0.1	1.2	0.9	-	-	-	-	1.1	-	-	-	-
Chrysothamnus viscidiflorus (yellow rabbitbrush)	Quadrat Cover (%)																
Ericameria nauseosa (rubber rabbitbrush)	1995	-	-	3.5	3.3	-	-	2.0	-	0.0	2.3	-	1.4	0.6	1.7	-	0.1
Ericameria nauseosa ssp. nauseosa var. hololeuca ^p (rubber rabbitbrush)	2000	-	0.0	6.8	4.2	-	0.0	1.1	-	-	1.8	0.1	0.3	0.2	1.8	0.1	-
Ericameria parryi var. parryi (Parry's rabbitbrush)	2012	-	0.8	4.6	1.8	-	0.4	0.6	-	0.2	1.8	0.0	0.2	0.7	7.0	-	-
Gutierrezia sarothrae (broom snakeweed)	2015	-	0.8	3.5	0.4	-	0.1	1.0	-	1.2	-	-	1.3	0.0	0.0	0.0	-
Juniperus osteosperma ⁱ (Utah juniper)	2017	-	0.8	4.7	0.1	0.1	0.0	1.9	0.0	0.4	0.0	-	0.9	0.0	0.0	-	-
Juniperus scopulorum ⁱ (Rocky Mountain juniper)	2021	0.0	0.2	0.0	5.2	0.8	0.5	1.2	0.3	-	-	-	0.6	0.0	0.0	-	-
Mahonia repens (creeping barberry)																	
Opuntia (pricklypear)																	
Pinus edulis ⁱ (twoneedle pinyon)																	
Pseudotsuga menziesii ⁱ (Douglas-fir)																	
Purshia tridentata ^p (antelope bitterbrush)																	

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

SHRUB SPECIES	Quercus gambelii ^p (Gambel oak)	Ribes cereum var. cereum ^p (wax currant)	Symphoricarpos oreophilus ^p (mountain snowberry)
year	Line Intercept Cover (%)		
1995	-	-	-
2000	-	-	-
2012	4.2	0.7	11.1
2015	1.5	0.1	16.1
2017	2.4	-	15.2
2021	2.3	1.2	19.3
year	Quadrat Cover (%)		
1995	1.2	1.7	6.4
2000	2.8	1.3	8.0
2012	2.7	1.3	4.6
2015	1.4	0.3	9.6
2017	3.1	0.1	9.6
2021	2.4	1.4	9.3

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

Table 10-06.13 - 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			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia frigida^p -- (prairie sagewort)									
1995	20	-	0	100	0	0	0	0	28/29
2000	320	80	25	75	0	0	0	0	12/22
2012	1440	-	0	100	0	10	0	0	13/29
2015	660	-	15	85	0	0	0	0	39/46
2017	740	-	30	70	0	0	0	0	24/34
2021	280	-	7	79	14	29	7	21	- / -
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
1995	420	-	10	86	5	0	0	0	64/78
2000	520	-	12	89	0	4	0	0	82/91
2012	620	-	7	81	13	26	29	23	60/86
2015	360	-	11	83	6	44	28	11	57/94
2017	420	20	29	67	5	5	10	5	68/99
2021	600	-	3	93	3	0	0	10	- / -
Cercocarpus montanus^p -- (alderleaf mountain mahogany)									
1995	440	-	9	86	5	14	0	0	119/115
2000	460	-	26	74	0	30	9	0	124/117
2012	300	-	20	47	33	33	33	27	113/115
2015	320	40	50	50	0	0	56	0	81/89
2017	180	-	33	67	0	33	67	0	65/72
2021	240	-	25	42	33	42	33	33	- / -

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 (%)				
Chrysothamnus viscidiflorus -- (yellow rabbitbrush)									
1995	60	-	67	33	0	67	0	0	56/62
2000	-	-	-	-	-	-	-	-	60/39
2012	-	-	-	-	-	-	-	-	22/23
2015	20	-	0	100	0	0	0	0	36/35
2017	260	-	0	100	0	0	0	0	26/35
2021	380	-	0	90	11	0	0	26	- / -
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
1995	-	-	-	-	-	-	-	-	-/-
2000	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2015	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
2021	20	-	0	100	0	0	0	0	- / -
Ericameria nauseosa -- (rubber rabbitbrush)									
1995	-	-	-	-	-	-	-	-	-/-
2000	140	-	14	86	0	0	0	0	73/80
2012	20	20	0	100	0	0	0	100	69/99
2015	60	-	0	100	0	0	0	0	73/98
2017	60	-	0	100	0	0	0	0	61/90
2021	460	-	48	26	26	0	0	22	- / -
Ericameria nauseosa ssp. nauseosa var. hololeuca^P -- (rubber rabbitbrush)									
1995	340	-	18	71	12	0	0	6	63/83
2000	200	-	10	80	10	0	10	10	82/82
2012	220	-	0	73	27	18	9	73	73/91
2015	280	20	0	100	0	43	14	0	66/79
2017	200	20	20	80	0	0	0	0	76/94
2021	280	-	21	71	7	7	7	7	- / -
Ericameria parryi var. parryi -- (Parry's rabbitbrush)									
1995	-	-	-	-	-	-	-	-	-/-
2000	-	-	-	-	-	-	-	-	-/-
2012	-	-	-	-	-	-	-	-	-/-
2015	-	-	-	-	-	-	-	-	74/96
2017	-	-	-	-	-	-	-	-	78/87
2021	-	-	-	-	-	-	-	-	-/-
Gutierrezia sarothrae -- (broom snakeweed)									
1995	-	-	-	-	-	-	-	-	-/-
2000	40	-	0	100	0	0	0	0	19/22
2012	300	-	7	93	0	0	0	0	16/26
2015	860	60	7	93	0	0	0	0	23/30
2017	820	-	7	93	0	0	0	0	19/26
2021	-	-	-	-	-	-	-	-	-/-
Juniperus osteosperma¹ -- (Utah juniper)									
1995	-	-	-	-	-	-	-	-	-/-
2000	60	-	67	33	0	0	0	0	- / -
2012	80	20	0	100	0	0	0	25	- / -
2015	20	20	100	0	0	0	0	0	- / -
2017	20	-	0	100	0	0	0	0	- / -
2021	20	-	0	100	0	0	0	0	- / -

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 (%)				
Juniperus scopulorum^t -- (Rocky Mountain juniper)									
1995	-	-	-	-	-	-	-	-	-/-
2000	40	-	0	100	0	0	0	0	-/-
2012	-	-	-	-	-	-	-	-	-/-
2015	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
Mahonia repens -- (creeping barberry)									
1995	1840	-	24	76	0	0	0	0	7/18
2000	720	-	0	100	0	0	0	0	5/11
2012	1600	-	29	71	0	0	0	0	7/9
2015	1560	-	0	100	0	0	0	0	12/22
2017	2420	-	0	100	0	0	0	0	5/11
2021	2200	-	0	100	0	0	0	0	-/-
Opuntia -- (pricklypear)									
1995	120	-	0	67	33	0	0	33	19/29
2000	240	-	0	100	0	0	0	0	9/31
2012	80	-	0	100	0	0	0	100	10/51
2015	300	-	13	87	0	0	0	0	9/32
2017	200	-	0	100	0	0	0	0	9/26
2021	280	-	14	36	50	0	0	50	-/-
Pinus edulis^t -- (twoneedle pinyon)									
1995	40	-	100	0	0	0	0	0	-/-
2000	320	-	56	44	0	0	0	0	-/-
2012	300	-	13	87	0	0	0	0	-/-
2015	20	40	100	0	0	0	0	0	-/-
2017	20	40	100	0	0	0	0	0	-/-
2021	40	80	100	0	0	0	0	0	-/-
Pseudotsuga menziesii^t -- (Douglas-fir)									
1995	-	-	-	-	-	-	-	-	-/-
2000	20	-	100	0	0	0	0	0	-/-
2012	-	-	-	-	-	-	-	-	-/-
2015	-	20	0	0	0	0	0	0	-/-
2017	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
Purshia tridentata^p -- (antelope bitterbrush)									
1995	20	-	0	100	0	0	0	0	68/111
2000	20	-	0	100	0	0	100	0	97/119
2012	-	-	-	-	-	-	-	-	54/93
2015	-	-	-	-	-	-	-	-	1/27
2017	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
Quercus gambelii^p -- (Gambel oak)									
1995	60	-	0	100	0	0	0	0	37/79
2000	1400	-	16	84	0	0	0	0	162/72
2012	820	-	24	76	0	0	0	0	94/51
2015	880	-	27	73	0	0	25	0	69/58
2017	1120	-	18	82	0	18	18	0	42/43
2021	840	-	26	62	12	17	0	12	-/-

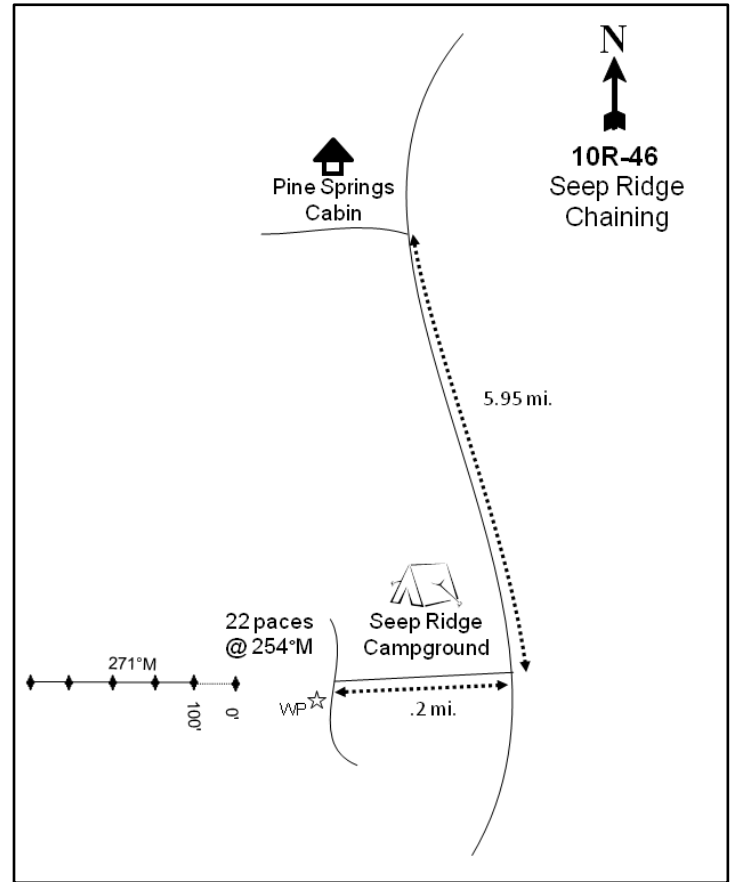
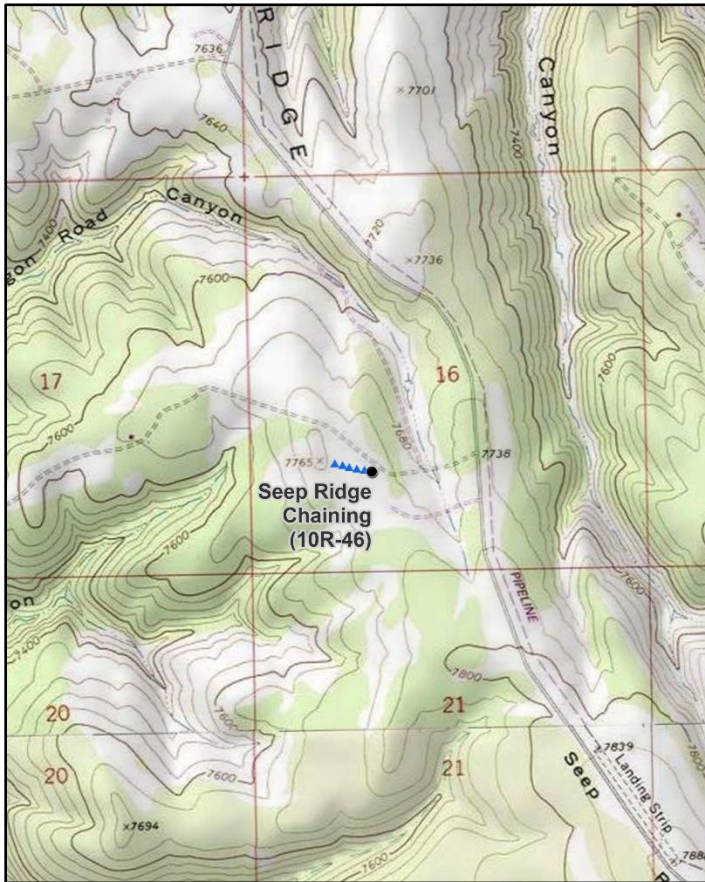
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Ribes cereum var. cereum^p -- (wax currant)									
1995	80	60	0	100	0	0	0	0	91/121
2000	100	-	0	100	0	20	0	0	85/100
2012	100	-	40	40	20	40	0	20	78/89
2015	140	20	14	86	0	14	57	0	52/67
2017	100	-	0	100	0	60	0	0	60/72
2021	60	-	33	67	0	0	0	0	- / -
Sambucus^p -- (elderberry)									
1995	-	-	-	-	-	-	-	-	- / -
2000	-	-	-	-	-	-	-	-	- / -
2012	-	-	-	-	-	-	-	-	170/130
2015	-	-	-	-	-	-	-	-	147/108
2017	-	-	-	-	-	-	-	-	- / -
2021	-	-	-	-	-	-	-	-	- / -
Symphoricarpos oreophilus^p -- (mountain snowberry)									
1995	1340	-	21	79	0	3	0	0	56/108
2000	2080	40	30	68	2	14	2	1	54/93
2012	1620	-	20	72	9	26	5	17	53/109
2015	3280	-	6	95	0	21	13	2	46/98
2017	3520	-	7	92	1	7	7	2	54/92
2021	2720	-	3	88	9	16	2	8	- / -

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

Table 10-06.14 - 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)							
1995	61	-	-	-	-	-	14.8
2000	76	-	-	-	-	-	15.4
2012	79	6	31	25	31	6	6.7
2015	20	33	67	-	-	-	3.0
2017	23	50	50	-	-	-	2.7
2021	29	25	75	-	-	-	3.8
Pinus edulis (twoneedle pinyon)							
1995	174	-	-	-	-	-	4.4
2000	231	-	-	-	-	-	5.7
2012	241	-	30	25	35	10	6.1
2015	3	33	67	-	-	-	2.3
2017	30	30	70	-	-	-	2.3
2021	21	44	56	-	-	-	2.6
Pseudotsuga menziesii (Douglas-fir)							
1995	3	-	-	-	-	-	10.0
Quercus gambelii (Gambel oak)							
1995	8	-	-	-	-	-	3.0

SEEP RIDGE CHAINING - STUDY NO. 10R-46

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Seep Canyon SW; Township 15S, Range 23E, Section 16
NAD 83 UTM ZONE 12, 641736 East 4374599 North

Transect Information

Browse Tag # (0' Stake)	279
Transect Bearing	271° 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 Pine Springs Cabin in the Book Cliffs, drive south on Seep Ridge Road for 5.95 miles, passing the Seep Ridge Campground on the right. Turn right and travel west for 0.2 miles to a fork. Proceed left at the fork and continue to the witness post on the right (west) side of the road. The 0-foot stake is 22 paces from the witness post at 254 degrees magnetic, and is marked with browse tag #279.

Site Information

Land Ownership	State
Land Administrator	SITLA
Allotment	SWEET WATER
Elevation	7,711ft (2,350m)
Aspect	Northeast
Slope	2-4%
Sample Dates	07/10/2008, 08/20/2014, 08/15/2017, 07/28/2021

Table 10R-46.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Hand Crew - Lop (No Scatter)	Seep Ridge Chaining Maintenance	3567	September-November 2016	332
Hand Crew - Lop and Scatter	Seep Ridge Maintenance Lop & Scatter (Proposed)	5517	Fall 2020	4491
Chaining - Two-Way Ely	Seep Ridge Chaining	1951	September-October 2011	322
Seeding - Aerial Before	Seep Ridge Chaining	1951	September-October 2011	322
Seeding - Dribbler	Seep Ridge Chaining	1951	September-October 2011	322
Seeding - Aerial After	Seep Ridge Chaining	1951	December 2011	322

Table 10R-46.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Seep Ridge Chaining			Aerial	Oct 2011	370
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	<i>Achnatherum hymenoides</i>	Indian Ricegrass	Emery UT	1.08	0.89
G	<i>Elymus lanceolatus</i>	Thickspike Wheatgrass	Critana	1.22	1.13
G	<i>Elymus trachycaulus</i>	Slender Wheatgrass	San Luis	1.49	1.23
G	<i>Leymus cinereus</i>	Great Basin Wildrye	Trailhead	0.68	0.66
G	<i>Nassella viridula</i>	Green Needlegrass	Lodorm	0.14	0.12
G	<i>Nassella viridula</i>	Green Needlegrass	Lodorm	0.68	0.65
G	<i>Poa secunda</i>	Canby Bluegrass	Canbar	0.20	0.10
G	<i>Poa secunda</i>	Big Bluegrass	Sherman	0.20	0.15
G	<i>Poa secunda</i>	Sandberg Bluegrass	UP Colorado Plateau	0.20	0.19
G	<i>Pseudoroegneria spicata</i>	Bluebunch Wheatgrass	P-7	1.22	1.05
F	<i>Linum perenne</i>	Blue Flax	Appar	0.54	0.39
F	<i>Medicago sativa</i>	Alfalfa	Ranger	0.81	0.74
F	<i>Medicago sativa</i>	Alfalfa	Nomad	0.68	0.61
F	<i>Onobrychis viciifolia</i>	Sainfoin	Eski	2.03	1.92
F	<i>Sanguisorba minor</i>	Small Burnet	Delar	2.03	1.91

Mix Name			Application Type	Application Date	Acres
Seep Ridge Chaining - Dribbler Mix			Dribbler	Oct 2011	370
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
S	<i>Purshia tridentata</i>	Antelope Bitterbrush	Summit UT	0.41	0.30

Mix Name			Application Type	Application Date	Acres
Seep Ridge Chaining - Browse Mix			Aerial	Dec 2011	325
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
S	<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i>	Wyoming Big Sagebrush	Sevier UT	1.00	0.16

Wildlife Habitat and Vegetation History**Table 10R-46.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
American Bison	crucial	year-long
Mule Deer	substantial	summer
Rocky Mountain Elk	crucial	summer

Table 10R-46.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2008	Pinyon-Juniper	Phase III
2014	Mountain Big Sagebrush	Phase I
2017	Mountain Big Sagebrush	Phase I
2021	Mountain Big Sagebrush	Phase I

Site Notes

No Notes

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.

Upon study establishment in 2008, this site was in Phase III of woodland succession (Table 10R-46.4). Although twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) were the dominant species in 2008, mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) still had a significant presence (Table 10R-46.12). Both grasses and forbs were diverse, but individual species had low cover (Table 10R-46.10, 10R-46.11). After treatment (Table 10R-46.1), tree cover was reduced (though not eliminated) allowing mountain big sagebrush to become the dominant species (Table 10R-46.12). Forb cover remained similar while grass cover increased; perennial grass cover decreased in 2021. However, perennial grasses still provided good cover, with squirreltail (*Elymus elymoides*) as the dominant species. Cheatgrass (*Bromus tectorum*) is present on the site as of 2021, and may be an issue in subsequent study years if cover increases significantly (Table 10R-46.10). There are a number of small trees remaining in the area which are increasing in density: these trees will require continued maintenance to reach and keep within the original project objectives.

Trend Summary Tables**Table 10R-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
2008	7.9	0.0	20.6	11.6	-	42.9
2014	7.8	0.0	3.3	12.9	-	4.7
2017	14.3	0.0	1.9	18.8	-	1.8
2021	15.8	0.0	1.6	22.1	-	2.3

Table 10R-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
2008	21	233	46	108	0.0	3.6	0.2	0.9
2014	45	280	50	121	0.5	9.7	0.4	1.5
2017	221	351	56	102	5.1	15.9	0.3	1.6
2021	11	323	1	53	0.0	10.2	0.0	0.6

Table 10R-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
2008	29.7	4.5	60.0	0.1	2.3	31.8
2014	22.5	0.2	59.6	0.0	0.9	26.1
2017	23.4	-	66.4	0.0	1.8	34.5
2021	23.0	0.9	59.3	0.6	2.2	28.0

Table 10R-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			
2008	-	7	5	41
2014	5	9	4	12
2017	7	5	1	10
2021	5	5	7	13
Days Use Per Acre (ha)				
2008	13.8 (34.1)	5.3 (13.2)	16.1 (39.7)	-
2014	4.4 (10.8)	20.8 (51.3)	5.3 (13.2)	-
2017	13.1 (32.3)	13.4 (33.1)	12.1 (29.8)	-
2021	10.9 (26.9)	5.3 (13.2)	8.1 (19.9)	-

Table 10R-46.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES											
Bouteloua gracilis (blue grama)											
Bromus tectorum ^{ai} (cheatgrass)											
Carex (sedge)											
Elymus elymoides (squirreltail)											
Elymus lanceolatus (thickspike wheatgrass)											
Hesperostipa comata (needle and thread)											
Koeleria macrantha (prairie Junegrass)											
Leymus cinereus (basin wildrye)											
Poa fendleriana (muttongrass)											
Poa pratensis ⁱ (Kentucky bluegrass)											
Poa secunda (Sandberg bluegrass)											
year	Nested Frequency										
2008	58	21	38	90	31	17	12	-	47	-	95
2014	92	45	58	129	16	4	5	0	67	-	41
2017	85	221	90	170	119	5	11	-	80	4	21
2021	60	11	75	65	181	45	-	-	15	7	135
year	Average Cover (%)										
2008	1.2	0.0	0.1	0.8	0.3	0.1	0.1	-	0.5	-	0.5
2014	3.1	0.5	0.8	3.0	0.3	0.4	0.1	0.0	1.8	-	0.3
2017	2.4	5.1	2.0	5.2	3.3	0.4	0.3	-	1.8	0.1	0.3
2021	1.4	0.0	1.4	0.9	3.1	0.8	-	-	0.5	0.1	2.0

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

Table 10R-46.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES																	
Agoseris glauca (pale agoseris)																	
Allium (onion)																	
Antennaria microphylla (littleleaf pussytoes)																	
Antennaria parvifolia (small-leaf pussytoes)																	
Arabis (rockcress)																	
Astragalus (milkvetch)																	
Astragalus convallarius (lesser rushy milkvetch)																	
Calochortus nuttallii (sego lily)																	
Camelina microcarpa ^{ai} (litlepod false flax)																	
Castilleja flava (yellow Indian paintbrush)																	
Ceratocephala testiculata ^{ai} (curvseed butterwort)																	
Chenopodium fremontii ^a (Fremont's goosefoot)																	
Comandra umbellata (bastard toadflax)																	
Cryptantha (cryptantha)																	
Descurainia pinnata ^a (western tansymustard)																	
Erigeron (fleabane)																	
Erigeron eatonii (Eaton's fleabane)																	
year	Nested Frequency																
2008	17	-	-	28	11	-	3	7	16	2	6	-	2	17	-	21	-
2014	3	4	-	18	36	3	-	-	6	-	-	6	-	3	-	3	2
2017	-	-	25	7	33	2	1	-	-	-	-	4	5	1	6	6	8
2021	2	-	-	12	2	3	-	-	-	4	-	-	11	1	1	13	2
year	Average Cover (%)																
2008	0.0	-	-	0.1	0.1	-	0.0	0.0	0.1	0.0	0.0	-	0.0	0.1	-	0.1	-
2014	0.0	0.0	-	0.1	0.4	0.0	-	-	0.0	-	-	0.0	-	0.0	-	0.0	0.0
2017	-	-	0.7	0.2	0.1	0.0	0.0	-	-	-	-	0.0	0.0	0.0	0.0	0.1	0.1
2021	0.0	-	-	0.2	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	Erigeron pumilus (shaggy fleabane)	Eriogonum alatum (winged buckwheat)	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Ipomopsis aggregata (scarlet gilia)	Lepidium ^a (pepperweed)	Lesquerella (bladderpod)	Linum perenne ⁱ (blue flax)	Microsteris gracilis ^a (slender phlox)	Nicotiana attenuata ^a (coyote tobacco)	Oenothera pallida ^a (pale evening primrose)	Onobrychis viciifolia ⁱ (sainfoin)	Packera multilobata (lobeleaf groundsel)	Penstemon caespitosus (mat penstemon)	Penstemon comarrhenus (dusty beardtongue)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)	Silene antirrhina ^a (sleepy silene)
year	Nested Frequency																
2008	-	5	13	10	-	-	-	-	-	1	-	9	0	2	14	1	17
2014	-	-	24	3	1	46	3	-	3	16	-	8	15	4	-	1	-
2017	1	17	8	-	14	3	1	14	-	-	2	2	3	8	12	12	-
2021	-	-	-	-	-	-	-	-	-	-	-	1	3	8	6	-	-
year	Average Cover (%)																
2008	-	0.1	0.0	0.1	-	-	-	-	-	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0
2014	-	-	0.2	0.0	0.0	0.2	0.1	-	0.1	0.1	-	0.0	0.2	0.0	-	0.0	-
2017	0.0	0.1	0.0	-	0.1	0.0	0.0	0.0	-	-	0.0	0.0	0.1	0.0	0.0	0.1	-
2021	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0	0.1	0.0	-	-

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

FORB SPECIES	Sisymbrium altissimum ^{ai} (tall tumblemustard)	Symphotrichum (aster)
year	Nested Frequency	
2008	-	7
2014	-	15
2017	1	-
2021	-	-
year	Average Cover (%)	
2008	-	0.1
2014	-	0.1
2017	0.0	-
2021	-	-

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

Table 10R-46.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)								
	year	Line Intercept Cover (%)							
Artemisia tridentata ssp. vaseyana ^p (mountain big sagebrush)	2008	11.5	0.1	-	8.3	-	34.6	-	-
Chrysothamnus depressus ^p (longflower rabbitbrush)	2014	12.1	-	-	2.4	0.2	2.1	0.8	-
Escobaria (foxtail cactus)	2017	17.2	0.2	-	0.9	0.5	0.4	1.4	-
Juniperus osteosperma ^t (Utah juniper)	2021	20.7	0.1	-	1.8	0.2	0.3	1.3	-
Juniperus scopulorum ^t (Rocky Mountain juniper)	year	Quadrat Cover (%)							
Pinus edulis ^t (twoneedle pinyon)	2008	7.7	0.0	0.0	5.0	-	15.6	0.2	-
Symphoricarpos oreophilus ^p (mountain snowberry)	2014	7.2	0.1	-	1.4	1.0	0.9	0.5	0.0
Tetradymia canescens (spineless horsebrush)	2017	13.2	0.2	-	0.6	1.0	0.4	0.9	0.0
	2021	15.3	0.1	-	0.9	0.1	0.6	0.5	0.0

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

Table 10R-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 (%)				
Amelanchier utahensis^p -- (Utah serviceberry)									
2008	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	57/74
2021	-	-	-	-	-	-	-	-	-/-
Artemisia tridentata ssp. vaseyana^p -- (mountain big sagebrush)									
2008	3220	200	5	17	78	34	1	40	64/79
2014	3700	300	30	66	4	39	3	7	48/67
2017	4780	3120	39	55	6	5	3	2	62/84
2021	7020	800	48	44	8	5	0	9	-/-
Chrysothamnus depressus^p -- (longflower rabbitbrush)									
2008	540	-	0	85	15	0	15	15	10/20
2014	340	20	71	24	6	59	41	53	13/24
2017	320	-	0	100	0	13	88	0	10/23
2021	400	-	10	90	0	45	25	0	-/-
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
2008	-	-	-	-	-	-	-	-	41/27
2014	-	-	-	-	-	-	-	-	43/64
2017	-	-	-	-	-	-	-	-	44/53
2021	-	-	-	-	-	-	-	-	-/-
Ericameria nauseosa -- (rubber rabbitbrush)									
2008	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	81/110
2017	-	-	-	-	-	-	-	-	60/87
2021	40	-	100	0	0	100	0	0	-/-

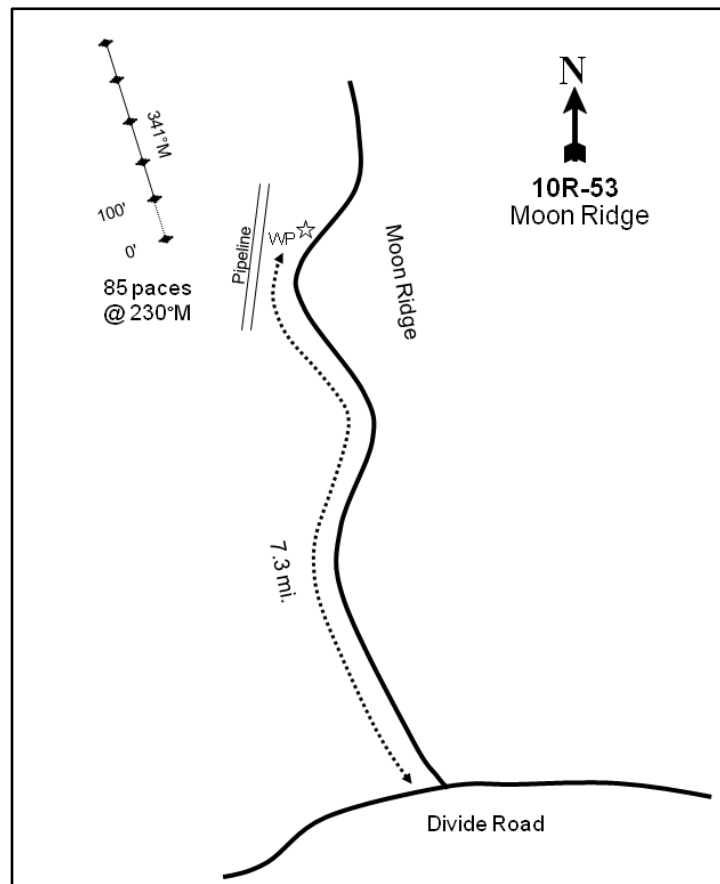
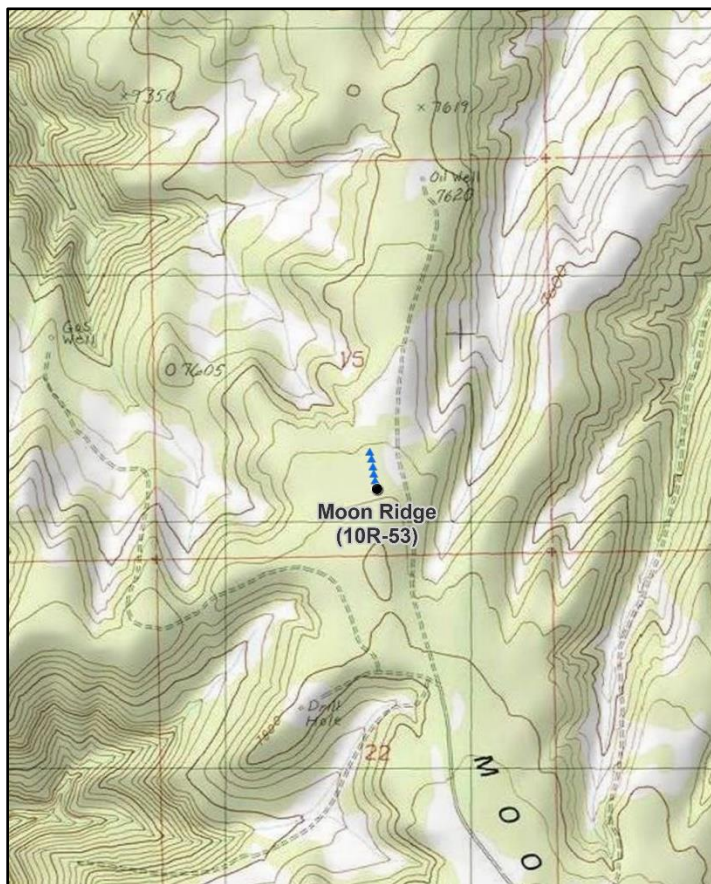
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Escobaria -- (foxtail cactus)									
2008	20	-	0	100	0	0	0	0	- / -
2014	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	- / -
2021	-	-	-	-	-	-	-	-	- / -
Juniperus osteosperma¹ -- (Utah juniper)									
2008	100	40	20	80	0	0	0	0	- / -
2014	140	20	86	14	0	0	0	14	- / -
2017	100	-	60	20	20	0	0	20	- / -
2021	40	-	50	50	0	0	0	0	- / -
Juniperus scopulorum¹ -- (Rocky Mountain juniper)									
2008	-	-	-	-	-	-	-	-	- / -
2014	20	-	0	100	0	0	0	100	- / -
2017	60	-	67	33	0	0	0	33	- / -
2021	60	-	100	0	0	0	0	0	- / -
Opuntia -- (pricklypear)									
2008	-	-	-	-	-	-	-	-	7/25
2014	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	6/37
2021	-	-	-	-	-	-	-	-	- / -
Pediocactus simpsonii -- (mountain ball cactus)									
2008	-	-	-	-	-	-	-	-	2/3
2014	-	-	-	-	-	-	-	-	- / -
2017	-	-	-	-	-	-	-	-	2/8
2021	-	-	-	-	-	-	-	-	- / -
Pinus edulis^t -- (twoneedle pinyon)									
2008	500	60	56	44	0	8	0	0	- / -
2014	220	-	100	0	0	0	0	0	- / -
2017	140	-	86	14	0	0	0	0	- / -
2021	220	-	91	9	0	0	0	9	- / -
Purshia tridentata^p -- (antelope bitterbrush)									
2008	-	-	-	-	-	-	-	-	- / -
2014	-	-	-	-	-	-	-	-	43/64
2017	-	-	-	-	-	-	-	-	45/71
2021	-	-	-	-	-	-	-	-	- / -
Symphoricarpos oreophilus^p -- (mountain snowberry)									
2008	60	-	0	100	0	0	0	0	20/29
2014	120	-	0	100	0	17	0	0	45/72
2017	80	-	0	100	0	0	0	0	55/121
2021	80	-	0	100	0	50	25	0	- / -
Tetradymia canescens -- (spineless horsebrush)									
2008	-	-	-	-	-	-	-	-	- / -
2014	20	-	0	100	0	0	0	0	16/15
2017	20	-	0	100	0	0	0	0	20/18
2021	20	-	100	0	0	0	0	0	- / -

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

Table 10R-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 & J. scopulorum (Utah and Rocky Mountain juniper)							
2014	94	-	44	56	-	-	9.8
Juniperus osteosperma (Utah juniper)							
2008	122	5	35	10	15	35	9.9
2017	47	12	82	6	-	-	7.3
2021	58	-	94	6	-	-	4.9
Juniperus scopulorum (Rocky Mountain juniper)							
2017	43	13	88	-	-	-	7.8
2021	36	13	88	-	-	-	4.8
Pinus edulis (twoneedle pinyon)							
2008	223	-	20	35	15	30	10.1
2014	188	-	65	35	-	-	3.6
2017	108	25	75	-	-	-	3.0
2021	125	25	75	-	-	-	2.6

MOON RIDGE - STUDY NO. 10R-53

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Tenmile Canyon North; Township 16S, Range 21E, Section 15
NAD 83 UTM ZONE 12, 621556 East 4363326 North

Transect Information

Browse Tag # (0' Stake)	182
Transect Bearing	341° 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

Starting at the intersection of the Divide Road and Moon Ridge Road, turn north onto Moon Ridge Road. Drive for 7.3 miles to the witness post on the left (west) side of the road. The 0-foot stake is 85 paces away at 230 degrees magnetic and is identified by browse tag #182.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	MCCLELLAND
Elevation	7,754ft (2,363m)
Aspect	Northeast
Slope	0-8%
Sample Dates	08/04/2011, 08/20/2014, 08/14/2017, 07/28/2021

Table 10R-53.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Hand Crew - Lop and Scatter	Moon Ridge Chaining Maintenance	3568	September-November 2016	692
Chaining - Two-Way Ely	Moon Ridge Chaining	2218	October-November 2013	540
Seeding - Aerial After	Moon Ridge Chaining	2218	November 2013	540
Seeding - Dribbler	Moon Ridge Chaining	2218	October-November 2013	540
Seeding - Aerial After	Moon Ridge Chaining	2218	December 2013	540

Table 10R-53.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Moon Ridge Chaining			Aerial	Nov 2013	1100
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	<i>Achnatherum hymenoides</i>	Indian Ricegrass	White River	0.45	0.43
G	<i>Achnatherum hymenoides</i>	Indian Ricegrass	Rio Grande CO	0.55	0.52
G	<i>Elymus lanceolatus</i>	Thickspike Wheatgrass	Bannock	1.18	1.03
G	<i>Elymus trachycaulus</i>	Slender Wheatgrass	First Strike	1.50	1.40
G	<i>Leymus cinereus</i>	Great Basin Wildrye	Magnar	0.82	0.55
G	<i>Nassella viridula</i>	Green Needlegrass	Lodorm	0.03	0.03
G	<i>Nassella viridula</i>	Green Needlegrass	Lodorm	0.59	0.56
G	<i>Nassella viridula</i>	Green Needlegrass	Lodorm	0.23	0.18
G	<i>Poa secunda</i>	Big Bluegrass	Sherman	0.20	0.17
G	<i>Poa secunda</i>	Canby Bluegrass	Canbar	0.20	0.17
G	<i>Poa secunda</i>	Sandberg Bluegrass	UP/Colorado Plateau	0.20	0.15
G	<i>Pseudoroegneria spicata</i>	Bluebunch Wheatgrass	Anatone	0.50	0.38
G	<i>Pseudoroegneria spicata</i>	Bluebunch Wheatgrass	Anatone	0.73	0.66
F	<i>Linum perenne</i>	Blue Flax	Appar	0.50	0.43
F	<i>Medicago sativa</i>	Alfalfa	Ladak	1.50	1.37
F	<i>Onobrychis viciifolia</i>	Sainfoin	Delaney	2.00	1.96
F	<i>Sanguisorba minor</i>	Small Burnet		2.00	1.84

Mix Name			Application Type	Application Date	Acres
Moon Ridge Chaining Dribbler			Dribbler	Nov 2013	1100
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
S	<i>Purshia tridentata</i>	Antelope Bitterbrush	Oneida, ID	0.40	0.34

Mix Name			Application Type	Application Date	Acres
Moon Ridge Chaining Sagebrush			Aerial	Dec 2013	920
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
S	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i>	Mountain Big Sagebrush	Sevier UT	0.27	0.07
S	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i>	Mountain Big Sagebrush	Summit UT	0.74	0.16

Wildlife Habitat and Vegetation History**Table 10R-53.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season	Brood/Young Rearing
American Bison	crucial	year-long	
Mule Deer	substantial	summer	
Rocky Mountain Elk	crucial	winter	
Greater Sage-Grouse	occupied	year-long	brood-rearing
Rocky Mountain Bighorn	crucial	year-long	

Table 10R-53.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2011	Pinyon-Juniper	Phase III
2014	Pinyon-Juniper	Phase I
2017	Perennial Grass	Phase I
2021	Perennial Grass/Mountain Big Sagebrush	Phase I

Site Notes

Due to the large amounts of litter and debris, point-quarter tree density data was not collected in 2014.

Site Potential

1981 - 2010 Average Annual Precipitation	16 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.

When the study was established in 2011, the site was in Phase III of woodland succession and being encroached by pinyon pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) with mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) as the only major browse species (Table 10R-53.12). The herbaceous understory was fairly abundant, but grasses and forbs were not very diverse. However, the native seed mix has resulted in the establishment of a rich and diverse understory following treatment (Table 10R-53.1, Table 10R-53.2). Native perennial grass species responded very well in particular and have become the dominant site component, with muttongrass (*Poa fendleriana*) as the primary species (Table 10R-53.10). Perennial forbs have remained moderately abundant throughout the sample period, while annual forbs have been rare (Table 10R-53.7, Table 10R-53.11). Overall, the site appears to be exhibiting an upward trending pattern of recovery with general increases in preferred browse density and perennial grass cover following treatment (Table 10R-53.7, Table 10R-53.13). There are a number of small trees remaining on the site as of 2021 which are increasing in density (Table 10R-53.14); these trees will require continued maintenance to reach and keep within the project's objectives.

Trend Summary Tables**Table 10R-53.6 - 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
2011	1.7	0.2	15.8	1.9	-	64.0
2014	0.2	-	4.4	1.0	-	7.3
2017	3.0	0.0	0.4	2.4	-	1.7
2021	5.3	0.0	0.7	4.8	-	1.0

Table 10R-53.7 - 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
2011	-	188	9	147	-	7.6	0.0	6.2
2014	-	166	37	149	-	3.3	0.2	3.5
2017	2	336	18	120	0.0	22.8	0.1	2.3
2021	1	357	47	172	0.0	16.2	0.2	5.4

Table 10R-53.8 - 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
2011	16.5	7.9	63.3	0.3	-	26.3
2014	16.4	1.3	77.3	0.1	0.0	9.9
2017	12.0	0.3	77.2	0.0	0.0	29.9
2021	13.1	2.3	70.6	0.1	0.2	28.6

Table 10R-53.9 - 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				
2011	-	-	-	-	-
2014	-	-	-	-	1
2017	5	2	12	2	2
2021	-	9	7	11	1
Days Use Per Acre (ha)					
2011	-	6.7 (16.6)	4.7 (11.6)	0.6 (1.4)	-
2014	0.7 (1.8)	3.4 (8.3)	2.0 (5.0)	-	-
2017	28.3 (69.9)	4.7 (11.6)	24.1 (59.6)	5.8 (14.3)	-
2021	8.7 (21.5)	5.3 (13.2)	11.4 (28.1)	20.9 (51.6)	-

Table 10R-53.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	Achnatherum hymenoides (Indian ricegrass)	Bromus tectorum ^{ai} (cheatgrass)	Carex (sedge)	Carex rossii (Ross' sedge)	Elymus elymoides (squirreltail)	Elymus lanceolatus (thickspike wheatgrass)	Elymus trachycaulus (slender wheatgrass)	Hesperostipa comata (needle and thread)	Koeleria macrantha (prairie Junegrass)	Leymus cinereus (basin wildrye)	Nassella viridula (green needlegrass)	Piptatheropsis micrantha (littelseed ricegrass)	Poa fendleriana (muttongrass)	Poa secunda (Sandberg bluegrass)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency														
2011	-	-	33	-	16	9	-	1	41	-	-	-	87	41	-
2014	-	-	13	-	30	4	-	-	-	-	-	-	109	22	-
2017	5	2	49	8	30	146	51	13	8	29	4	4	140	21	1
2021	18	1	71	-	26	228	98	14	-	21	0	-	49	43	6
year	Average Cover (%)														
2011	-	-	0.7	-	0.1	0.0	-	0.0	1.0	-	-	-	3.8	2.0	-
2014	-	-	0.2	-	0.7	0.0	-	-	-	-	-	-	1.9	0.4	-
2017	0.4	0.0	1.1	0.8	1.1	6.4	2.7	0.4	0.1	1.2	0.1	0.3	7.9	0.5	0.0
2021	0.7	0.0	1.6	-	0.5	7.1	3.3	0.3	-	0.9	0.0	-	1.1	0.4	0.2

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

Table 10R-53.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Agoseris glauca (pale agoseris)	Androsace septentrionalis ^a (pygmy flower rockjasmine)	Antennaria parvifolia (small-leaf pussytoes)	Arabis holboellii ^a (Holboell's rockcress)	Astragalus (milkvetch)	Astragalus convallarius (lesser rushy milkvetch)	Astragalus tenellus (looseflower milkvetch)	Chenopodium album ^a (lambsquarters)	Crepis acuminata (tapertip hawkbeard)	Erigeron eatonii (Eaton's fleabane)	Gayophytum ramosissimum ^a (pinyon groundsmoke)	Lappula occidentalis ^a (flatspine stickseed)	Linum perenne ⁱ (blue flax)	Lupinus argenteus (silvery lupine)	Machaeranthera grindelioides (rayless tansyaster)	Medicago sativa ⁱ (alfalfa)	Microsteris gracilis ^a (slender phlox)
year	Nested Frequency																
2011	9	-	46	4	4	-	2	-	1	19	-	-	-	6	-	-	-
2014	-	4	28	10	2	1	-	-	1	4	5	-	1	11	-	23	-
2017	-	-	38	15	-	-	2	-	-	9	3	-	20	2	5	9	-
2021	2	-	59	13	-	-	1	24	-	17	-	2	2	25	3	1	9
year	Average Cover (%)																
2011	0.1	-	1.5	0.0	0.1	-	0.0	-	0.0	0.2	-	-	-	0.7	-	-	-
2014	-	0.0	1.0	0.1	0.0	0.0	-	-	0.0	0.1	0.0	-	0.0	0.3	-	0.0	-
2017	-	-	0.9	0.0	-	-	0.0	-	-	0.1	0.0	-	0.5	0.0	0.0	0.0	-
2021	0.0	-	1.2	0.0	-	-	0.0	0.1	-	0.1	-	0.0	0.0	0.7	0.0	0.0	0.0

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

FORB SPECIES	Onobrychis vicifolia ⁱ (sainfoin)	Packera multiflobata (lobeleaf groundsel)	Penstemon comarrhenus (dusty beardtongue)	Penstemon watsonii (Watson's penstemon)	Phlox austromontana (mountain phlox)	Phlox longifolia (longleaf phlox)	Polygonum douglasii ^a (Douglas' knotweed)	Sanguisorba minor ⁱ (small burnet)	Sphaeralcea coccinea (scarlet globemallow)	Taraxacum officinale (common dandelion)
year	Nested Frequency									
2011	-	-	3	94	9	2	8	-	-	-
2014	2	3	6	73	3	9	22	25	-	-
2017	-	-	31	16	9	3	2	12	-	1
2021	-	7	21	94	8	2	6	3	5	-
year	Average Cover (%)									
2011	-	-	0.0	3.2	0.5	0.0	0.0	-	-	-
2014	0.0	0.0	0.0	1.8	0.0	0.0	0.1	0.1	-	-
2017	-	-	0.2	0.2	0.2	0.0	0.0	0.2	-	0.0
2021	-	0.0	0.1	2.7	0.2	0.0	0.0	0.1	0.2	-

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

Table 10R-53.12 - 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 sp. viscidiflorus var. viscidiflorus (yellow rabbitbrush)	Juniperus osteosperma ^t (Utah juniper)	Juniperus scopulorum ^t (Rocky Mountain juniper)	Opuntia fragilis (brittle pricklypear)	Pinus edulis ^t (twoneedle pinyon)	Symphoricarpos oreophilus ^p (mountain snowberry)
year	Line Intercept Cover (%)									
2011	0	1.9	0	-	-	20	1.2	-	42.8	-
2014	-	1	0	-	-	4.3	0.4	-	2.6	-
2017	-	2.3	0.1	-	-	1.2	-	-	0.5	-
2021	-	4.5	0.2	-	-	0.6	0.3	-	0.1	0.1
year	Quadrat Cover (%)									
2011	0.0	1.6	0.1	0.0	-	1.7	0.1	0.2	13.9	-
2014	-	0.2	0.0	0.1	-	3.5	0.0	-	0.9	-
2017	-	2.8	0.0	0.2	0.0	0.3	0.0	-	0.1	-
2021	-	5.1	0.0	0.2	0.0	0.6	0.0	-	0.1	0.0

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

Table 10R-53.13 - 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 (%)				
Amelanchier utahensis^P -- (Utah serviceberry)									
2011	-	-	-	-	-	-	-	-	14/27
2014	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
2021	-	-	-	-	-	-	-	-	-/-
Artemisia tridentata ssp. vaseyana^P -- (mountain big sagebrush)									
2011	280	-	29	64	7	0	0	21	61/68
2014	220	-	18	82	0	9	9	0	47/55
2017	1380	60	78	22	0	0	0	0	60/82
2021	2000	1320	59	39	2	2	0	6	-/-
Cercocarpus montanus^P -- (alderleaf mountain mahogany)									
2011	-	-	-	-	-	-	-	-	99/98
2014	20	-	0	100	0	0	0	0	52/134
2017	20	-	0	0	100	0	100	100	91/92
2021	20	-	0	100	0	0	0	0	-/-
Chrysothamnus depressus^P -- (longflower rabbitbrush)									
2011	60	20	0	100	0	0	0	0	13/20
2014	40	-	50	50	0	0	0	0	10/16
2017	140	-	14	86	0	29	57	0	8/19
2021	100	20	0	100	0	0	80	0	-/-
Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus -- (yellow rabbitbrush)									
2011	40	-	50	50	0	0	0	0	64/61
2014	40	-	0	100	0	0	0	0	38/30
2017	60	-	33	67	0	0	0	0	39/52
2021	180	-	44	56	0	0	0	0	-/-
Ericameria nauseosa -- (rubber rabbitbrush)									
2011	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	-/-
2021	20	-	0	100	0	100	0	0	-/-
Juniperus osteosperma¹ -- (Utah juniper)									
2011	160	100	63	38	0	0	0	13	-/-
2014	160	-	100	0	0	0	0	13	-/-
2017	160	20	100	0	0	0	0	0	-/-
2021	200	-	70	30	0	0	0	0	-/-
Juniperus scopulorum¹ -- (Rocky Mountain juniper)									
2011	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2017	40	40	100	0	0	0	0	0	-/-
2021	60	-	67	33	0	0	0	0	-/-
Opuntia fragilis -- (brittle pricklypear)									
2011	60	-	33	67	0	0	0	0	12/45
2014	120	-	0	100	0	0	0	0	11/27
2017	-	-	-	-	-	-	-	-	-/-
2021	40	-	0	100	0	0	0	0	-/-
Pinus edulis¹ -- (twoneedle pinyon)									
2011	500	480	36	64	0	0	0	0	-/-
2014	100	40	60	20	20	0	20	40	-/-
2017	140	40	100	0	0	0	0	14	-/-
2021	100	140	80	20	0	0	0	0	-/-

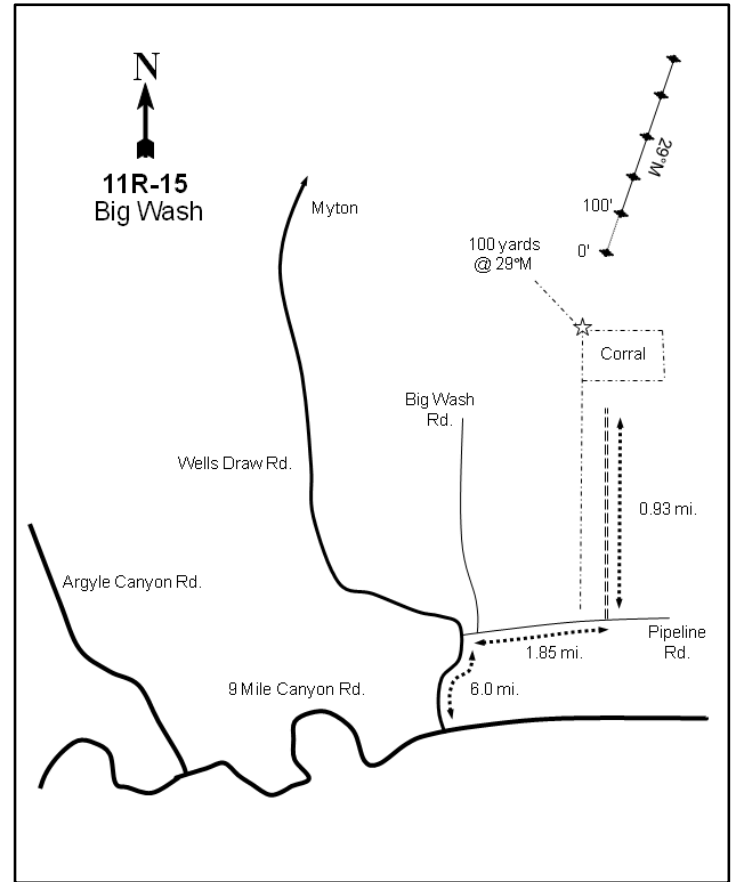
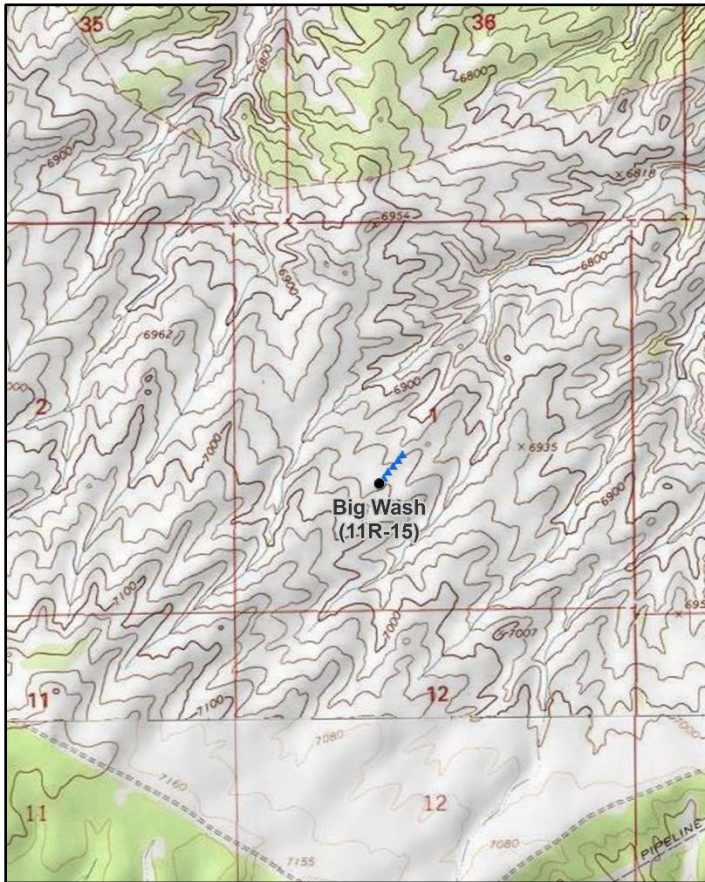
Year	Density		Age Class Distribution			Utilization		Poor Vigor (%)	Average Height Crown (cm)
	Plants Per Acre		Excluding Seedlings			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Purshia tridentata^p -- (antelope bitterbrush)									
2011	-	-	-	-	-	-	-	-	37/65
2014	-	-	-	-	-	-	-	-	34/36
2017	-	-	-	-	-	-	-	-	65/97
2021	-	-	-	-	-	-	-	-	-/-
Ribes^p -- (currant)									
2011	-	-	-	-	-	-	-	-	-/-
2014	-	-	-	-	-	-	-	-	-/-
2017	-	-	-	-	-	-	-	-	115/189
2021	-	-	-	-	-	-	-	-	-/-
Symphoricarpos oreophilus^p -- (mountain snowberry)									
2011	-	-	-	-	-	-	-	-	37/76
2014	80	-	0	100	0	0	0	0	30/64
2017	-	-	-	-	-	-	-	-	66/115
2021	20	-	0	100	0	100	0	0	-/-

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

Table 10R-53.14 - 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)							
2011	442	30	20	10	-	40	24.1
2017	138	28	72	-	-	-	3.4
2021	146	5	95	-	-	-	2.5
Juniperus scopulorum (Rocky Mountain juniper)							
2017	7	50	50	-	-	-	1.0
2021	59	-	100	-	-	-	2.0
Pinus edulis (twoneedle pinyon)							
2011	792	30	5	20	30	15	6.0
2017	150	44	44	11	-	-	2.1
2021	128	17	78	6	-	-	2.4

BIG WASH - STUDY NO. 11R-15

**Location Information**

USGS 7.5 min Map Info
GPS (0' Stake)

Gilsonite Draw SE; Township 11S, Range 15E, Section 01
NAD 83 UTM ZONE 12, 569634 East 4415145 North

Transect Information

Browse Tag # (0' Stake)	Not Available
Transect Bearing	29° 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 Nine Mile Canyon Road, turn north onto Wells Draw Road toward Myton. Drive 6 miles and turn right (east) onto Pipeline Road. Follow this road for 1.85 miles then turn left (north) onto a two-track that runs along a fence line. Drive on this road for 0.93 miles and stop just before the corral. About 100 yards from the fence corner at a bearing of 29 degrees magnetic is the start of study. The 0 and 500-foot stakes are normal posts, but stakes 100-400 are rebar.

Site Information

Land Ownership	Federal
Land Administrator	BLM
Allotment	BIG WASH
Elevation	6,898ft (2,103m)
Aspect	Northeast
Slope	8%
Sample Dates	06/27/2013, 08/04/2016, 07/21/2021

Table 11R-15.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Chaining - Chain Unknown	-	-	Historic	-
Mechanical - Bullhog	Anthro Mountain P-J Treatment	2465	January 2014	403

Wildlife Habitat and Vegetation History**Table 11R-15.3 - Wildlife Seasonal Habitat.** UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	substantial	winter
Rocky Mountain Elk	substantial	year-long
Greater Sage-Grouse	occupied	year-long & Winter
Pronghorn	substantial	year-long

Table 11R-15.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2013	Wyoming Big Sagebrush/Pinyon-Juniper	Phase II
2016	Wyoming Big Sagebrush	Phase I
2021	Wyoming Big Sagebrush	Phase I

Site Notes

In 2016 the 200, 300, 400, and 500-foot stakes were shifted slightly and placed to the east of the original transect.

Site Potential

1981 - 2010 Average Annual Precipitation	13 inches
NRCS Ecological Site	Upland Shallow Loam (Wyoming Big Sagebrush)
NRCS Ecological Site #	R047XA320UT
States and Transitions	No state and transition model is available for the above ecological site.

When the study was established in 2013, the vegetation on this site was a depleted stand of Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) with encroaching Utah juniper (*Juniperus osteosperma*) (Table 11R-15.4, Table 11R-15.6). Herbaceous understory cover was minimal prior to treatment. With the removal of juniper trees by a 2014 bullhog treatment (Table 11R-15.1), sagebrush cover and density initially exhibited a slight decrease. As expected, however, sagebrush cover and density both increased in 2021 and it became a more dominant component within the community (Table 11R-15.12, Table 11R-15.13). The perennial grasses Russian wildrye (*Psathyrostachys juncea*) and bluebunch wheatgrass (*Pseudoroegneria spicata*) have been the most abundant herbaceous species following tree removal; forbs have remained rare (Table 11R-15.10, Table 11R-15.11). As of 2021, the community remains in Phase I of woodland succession (Table 11R-15.4). Tree encroachment is considered to be a low threat due to low densities and young age classes comprising the populations (Table 11R-15.14).

Trend Summary Tables**Table 11R-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
2013	7.5	0.4	10.5	7.3	0.3	12.7
2016	2.8	0.4	0.2	5.7	0.4	0.2
2021	5.3	0.8	0.4	5.6	0.5	0.4

Table 11R-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
2013	-	136	10	34	-	4.9	0.0	0.2
2016	-	212	7	71	-	10.9	0.0	0.4
2021	-	198	-	26	-	8.8	-	0.2

Table 11R-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
2013	12.0	0.3	30.1	32.5	12.2	23.8
2016	6.2	0.2	39.1	41.2	2.1	15.2
2021	15.8	0.8	40.1	30.8	4.7	14.8

Table 11R-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	Rabbit
	Quadrat Frequency			
2013	-	-	-	9
2016	-	4	7	67
2021	2	10	10	20
Year	Days Use Per Acre (ha)			
2013	-	-	4.0 (9.9)	-
2016	8.0 (19.7)	0.7 (1.7)	14.1 (34.8)	-
2021	5.8 (14.3)	0.7 (1.7)	26.2 (64.6)	-

Table 11R-15.10 - 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)	Elymus lanceolatus (thickspike wheatgrass)	Hesperostipa comata (needle and thread)	Poa secunda (Sandberg bluegrass)	Psathyrostachys juncea ⁱ (Russian wildrye)	Pseudoroegneria spicata (bluebunch wheatgrass)
year	Nested Frequency								
2013	21	11	-	13	21	-	6	62	14
2016	12	-	5	36	9	-	8	127	34
2021	15	0	1	36	22	4	20	102	39
year	Average Cover (%)								
2013	0.5	0.2	-	0.3	0.6	-	0.0	3.0	0.3
2016	1.4	-	0.0	0.7	0.0	-	0.0	6.1	2.6
2021	0.8	0.0	0.0	0.6	0.7	0.1	0.2	4.3	2.1

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

Table 11R-15.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	Arabis (rockcross)	Arenaria (sandwort)	Astragalus (milkvetch)	Caulanthus crassicaulis ^a (thickstem wild cabbage)	Chamaesyce albomarginata (whitemargin sandmat)	Cryptantha (cryptantha)	Descurainia pinnata ^a (western tansymustard)	Eriogonum (buckwheat)	Ipomopsis congesta (ballhead ipomopsis)	Lappula occidentalis ^a (flatspine stickseed)	Schoenocrambe limifolia (flaxleaf plainsmustard)
year	Nested Frequency										
2013	-	5	-	4	9	10	1	2	14	5	-
2016	0	1	11	7	38	27	0	2	1	-	5
2021	-	6	-	-	18	7	-	6	-	-	-
year	Average Cover (%)										
2013	-	0.0	-	0.0	0.0	0.1	0.0	0.0	0.1	0.0	-
2016	0.0	0.0	0.1	0.0	0.1	0.1	0.0	0.1	0.0	-	0.0
2021	-	0.0	-	-	0.1	0.0	-	0.0	-	-	-

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

Table 11R-15.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Line Intercept Cover (%)						
	Artemisia nova ^p (black sagebrush)	Artemisia tridentata ssp. wyomingensis ^p (Wyoming big sagebrush)	Gutierrezia sarothrae (broom snakeweed)	Juniperus osteosperma ⁱ (Utah juniper)	Linanthus pungens (granite prickly phlox)	Opuntia (pricklypear)	Pinus edulis ^t (twoneedle pinyon)
year	Line Intercept Cover (%)						
2013	0.9	6.4	0.2	12.5	-	0.1	0.2
2016	0.5	5.2	0.4	0.2	-	-	-
2021	2.2	3.4	0.5	0.4	-	-	-
year	Quadrat Cover (%)						
2013	1.3	6.2	0.0	10.5	0.0	0.3	0.0
2016	0.6	2.3	0.4	0.2	-	0.0	-
2021	1.4	3.9	0.8	0.4	-	0.0	-

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

Table 11R-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			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia nova^p -- (black sagebrush)									
2013	540	-	33	56	11	0	0	4	23/50
2016	200	-	0	90	10	0	90	10	25/56
2021	540	-	11	63	26	30	0	52	- / -
Artemisia tridentata ssp. wyomingensis^p -- (Wyoming big sagebrush)									
2013	1440	-	13	40	47	33	0	49	41/80
2016	1220	200	8	43	49	2	15	49	48/84
2021	1640	-	42	24	34	4	0	44	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
2013	560	-	29	71	0	0	0	4	13/17
2016	2240	220	33	66	1	0	0	1	16/19
2021	3820	-	55	36	9	0	0	18	- / -
Juniperus osteospermaⁱ -- (Utah juniper)									
2013	180	20	33	67	0	0	0	11	- / -
2016	40	40	50	50	0	0	0	50	- / -
2021	40	-	100	0	0	0	0	0	- / -
Linanthus pungens -- (granite prickly phlox)									
2013	20	-	0	100	0	0	0	0	9/15
2016	-	-	-	-	-	-	-	-	- / -
2021	-	-	-	-	-	-	-	-	- / -
Opuntia -- (pricklypear)									
2013	80	-	0	100	0	0	0	0	11/37
2016	-	20	0	0	0	0	0	0	9/46
2021	80	-	50	50	0	0	0	0	- / -
Pinus edulis^t -- (twoneedle pinyon)									
2013	-	-	-	-	-	-	-	-	- / -
2016	-	20	0	0	0	0	0	0	- / -
2021	40	-	100	0	0	0	0	50	- / -

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

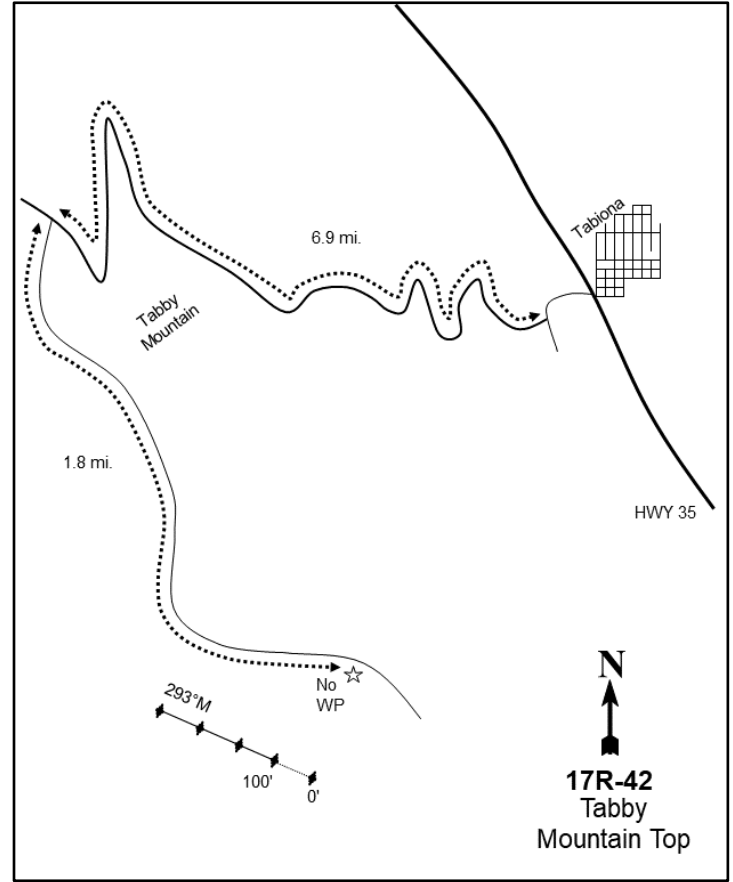
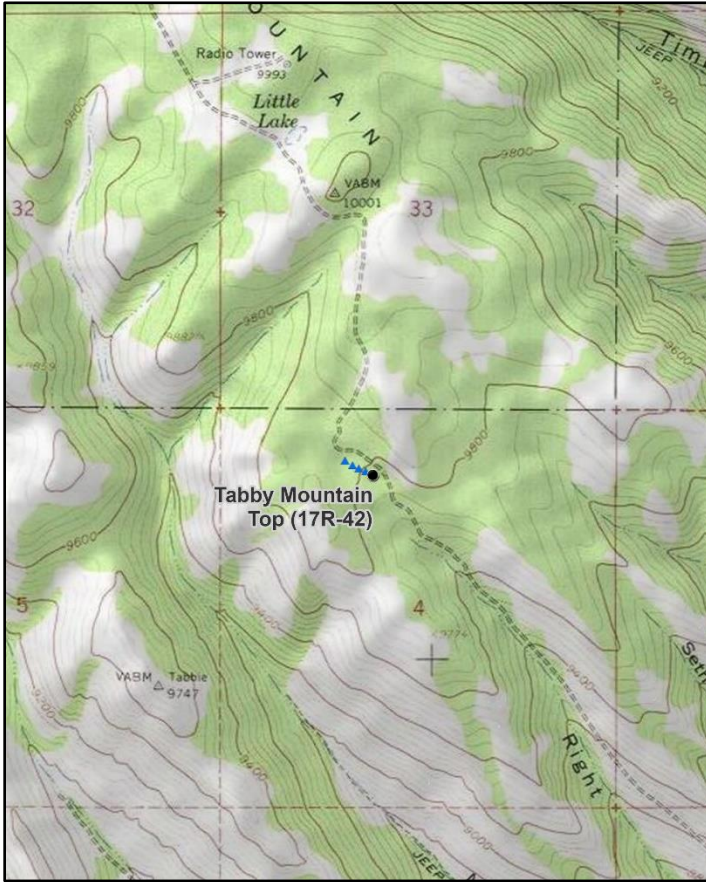
Table 11R-15.14 - Tree Characteristics. Point-quarter tree density, size class distribution, and average diameter.

Year	Density	Size Class Distribution					Average Diameter (cm)
	Trees per Acre	Seedling (%)	1-4' (%)	4-8' (%)	8-12' (%)	>12' (%)	
Juniperus osteosperma (Utah juniper)							
2013	213	-	30	40	30	-	10.8
2016	29	87	13	-	-	-	4.9
2021	25	20	80	-	-	-	3.3
Pinus edulis (twoneedle pinyon)							
2013	30	-	18	55	27	-	8.8
2016	3	100	-	-	-	-	1.0
2021	3	-	100	-	-	-	2.0

Table 11R-15.15 - Deer Desirable Components Index: Upland 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
2013	9.1	2.2	7.5	9.7	0.0	0.5	0.0	29.0	Very Poor
2016	7.1	1.3	3.7	21.7	0.0	0.9	0.0	34.7	Very Poor-Poor
2021	7.0	5.7	14.8	17.6	0.0	0.3	0.0	45.4	Poor

TABBY MOUNTAIN TOP - STUDY NO. 17R-42



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Tabby Mountain NE; Township 2S, Range 8W, Section 04
NAD 83 UTM ZONE 12, 517407 East 4465513 North

Transect Information

Browse Tag # (0' Stake)
Transect Bearing
Length
Belt Placement
Belt Marker Placement

Not Available
293° magnetic
400ft
Line 1 (11ft & 95ft), Line 2 (34ft), Line 3 (59ft), Line 4 (71ft)
No Rebar or Stakes

Directions to Site

While traveling north from the town of Tabiona on State Route 35, turn left (west) on Tabby Access Road. Continue on this road for 0.43 miles until the road intersects with 3600 North; turn right (west) and travel for 0.64 miles to Juniper Drive. Turn left onto Juniper Drive and drive to a left turn on Lewis Drive in 0.57 miles. Drive for 0.45 to East Tabby Access Road (County Road 6), and turn left (south). Travel along this access road until the summit (or near summit) of Tabby Mountain is gained, and turn left (south) just before reaching a stock pond. Travel another 1.17 miles, while passing 3800 North and another stock pond, to a right turn. Turn here (south) and travel 0.63 miles to a mixed aspen-conifer stand and a sharp left turn (east): park here. Use a GPS to navigate to stake locations. No stakes were placed for the first sampling.

Site Information

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	No data
Aspect	Northeast
Slope	4%
Sample Dates	08/10/2021

Table 17R-42.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Logging - Coppice Cut	Mill Hollow Aspen Restoration Phase II (Proposed)	5621	Fall 2021	347

Wildlife Habitat and Vegetation History

Table 17R-42.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

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

Table 17R-42.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2021	Quaking Aspen-Conifer Encroached	NA

Site Notes

No Notes

Site Potential

1981 - 2010 Average Annual Precipitation	28 inches
NRCS Ecological Site	High Mountain Stony Loam (Aspen)
NRCS Ecological Site #	F047XA531UT
States and Transitions	Current Potential State: Community Phase Undefined

When the study was established in 2021, the vegetation on this site was an encroached quaking aspen (*Populus tremuloides*) community type dominated by young subalpine fir (*Abies lasiocarpa*) and mature Engelmann spruce (*Picea engelmannii*). Browse species were limited, with gooseberry currant (*Ribes montigenum*) as the dominant species (Photos, Table 17R-42.12, Table 17R-42.13, Table 17R-42.13a). The herbaceous understory appeared to be moderately diverse with most species contributing little cover. Nevada pea (*Lathyrus lanszwertii*) was the most abundant forb and provided much of what herbaceous cover was present (Table 17R-42.11). Of the perennial grasses, Porter brome (*Bromus porteri*) and Sandberg bluegrass (*Poa secunda*) were the dominant species (Table 17R-42.10). A coppice cutting treatment is scheduled for the fall of 2021 (Table 17R-42.1). Following the reduction of more decadent aspen and conifer trees, it is expected that the open canopy will provide opportunity for much of the herbaceous understory to increase in abundance and health. Young aspen trees are expected to escape from restrictive shading and will likely rebound with more age class diversity and increased density.

Trend Summary Tables

Table 17R-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
2021	2.6	0.7	27.5	5.3	1.2	74.3

Table 17R-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
2021	-	136	21	244	-	4.8	0.1	15.3

Table 17R-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
2021	1.4	0.4	74.5	0.9	0.5	46.7

Table 17R-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	Black Bear	Cattle	Mule Deer	Rocky Mountain Elk	Shiras Moose	Rabbit
	Quadrat Frequency					
2021	-	1	10	3	-	3
Year	Days Use Per Acre (ha)					
2021	8.7 (21.5)*	5.8 (14.3)	12.1 (29.8)	7.4 (18.2)	3.4 (8.4)	-

*Pellets per acre (ha)

Table 17R-42.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES	
Bromus marginatus (mountain brome)	
Bromus porteri (Porter brome)	
Carex (sedge)	
Carex rossii (Ross' sedge)	
Elymus trachycaulus (slender wheatgrass)	
Melica bulbosa (oniongrass)	
Poa palustris (fowl bluegrass)	
Poa pratensis ⁱ (Kentucky bluegrass)	
Poa secunda (Sandberg bluegrass)	
Trisetum spicatum (spike trisetum)	
year	Nested Frequency
2021	2 62 1 24 4 3 13 30 38 9
year	Average Cover (%)
2021	0.0 1.5 0.0 0.7 0.0 0.1 0.2 0.7 1.2 0.4

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

Table 17R-42.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES	
Achillea millefolium (Common yarrow)	
Arabis (rockcress)	
Arnica cordifolia (heartleaf arnica)	
Chamerion angustifolium (fireweed)	
Clematis hirsutissima (hairy clematis)	
Collinsia parviflora ^a (maiden blue eyed Mary)	
Collomia linearis ^a (tiny trumpet)	
Descurainia californica ^a (Sierra tansymustard)	
Draba ^a (draba)	
Erigeron ursinus (Bear River fleabane)	
Fragaria virginiana (Virginia strawberry)	
Geranium richardsonii (Richardson's geranium)	
Lathyrus lanszwertii (Nevada pea)	
Lupinus argenteus (silvery lupine)	
Mertensia oblongifolia (oblongleaf bluebells)	
Osmorhiza depauperata (bluntseed sweetroot)	
Packera (ragwort)	
year	Nested Frequency
2021	54 1 51 17 5 5 5 6 5 47 67 5 93 6 4 57 9
year	Average Cover (%)
2021	1.0 0.0 1.2 0.1 0.2 0.0 0.0 0.0 0.0 1.9 1.7 0.0 5.7 0.1 0.0 0.7 0.2

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

FORB SPECIES	
Penstemon whippleanus (Whipple's penstemon)	
Polygonum douglasii ^a (Douglas' knotweed)	
Potentilla gracilis (slender cinquefoil)	
Pseudocymopterus montanus (alpine false springparsley)	
Pseudostellaria jamesiana (tuber starwort)	
Ranunculus inamoenus (graceful buttercup)	
Taraxacum officinale (common dandelion)	
Viola (violet)	
year	Nested Frequency
2021	19 4 11 0 58 1 10 29
year	Average Cover (%)
2021	0.3 0.0 0.4 0.0 1.3 0.0 0.1 0.4

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

Table 17R-42.12 - Shrub and Tree Species. Average modified Daubenmire quadrat and line intercept cover by year.

SHRUB SPECIES	Abies lasiocarpa ^t (subalpine fir)	Picea engelmannii ⁱ (Engelmann spruce)	Pinus monticola ^t (western white pine)	Populus tremuloides ^t (quaking aspen)	Ribes montigenum ^p (gooseberry currant)	Rubus idaeus (American red raspberry)	Symphoricarpos orbiculatus (coralberry)	Symphoricarpos oreophilus ^p (mountain snowberry)
year	Line Intercept Cover (%)							
2021	31.5	12.9	0.4	29.5	5	1.2	-	0.3
year	Quadrat Cover (%)							
2021	20.8	3.6	0.8	2.3	2.6	0.6	0.1	0.0

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

Table 17R-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			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Abies lasiocarpa ^t -- (subalpine fir)									
2021	5920	200	77	21	1	0	0	1	- / -
Pinus contorta ^t -- (lodgepole pine)									
2021	-	-	-	-	-	-	-	-	- / -
Picea engelmannii ⁱ -- (Engelmann spruce)									
2021	360	-	17	44	39	0	0	67	- / -
Ribes montigenum ^p -- (gooseberry currant)									
2021	1160	20	14	86	0	0	0	0	- / -
Rubus idaeus -- (American red raspberry)									
2021	700	-	9	91	0	0	6	0	- / -

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

Table 17R-42.13a - Aspen Characteristics. Characteristics of aspen populations including density, size class distribution, and vigor of plants.

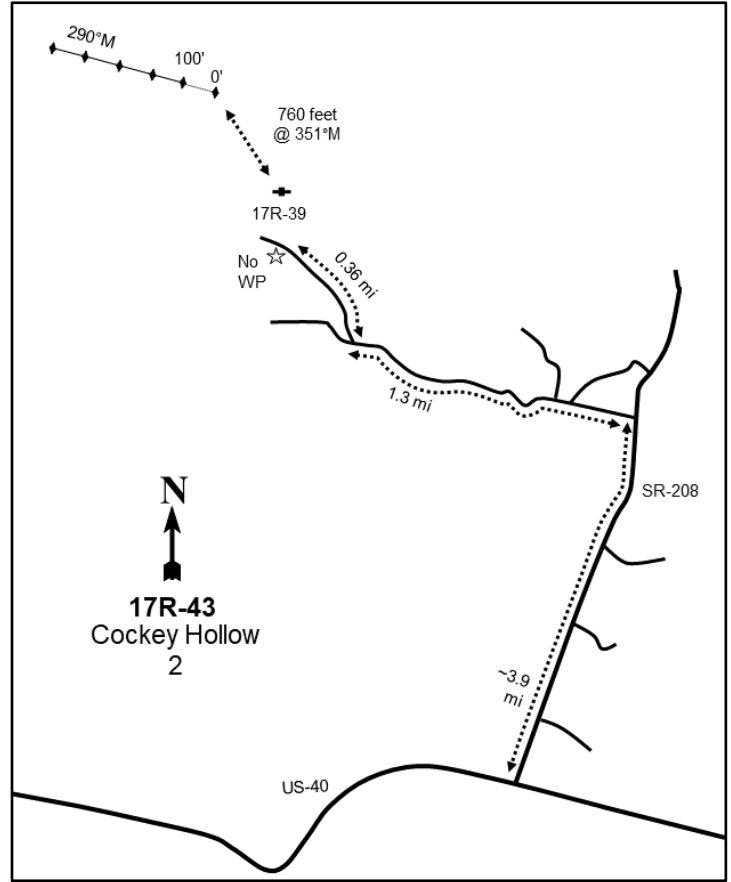
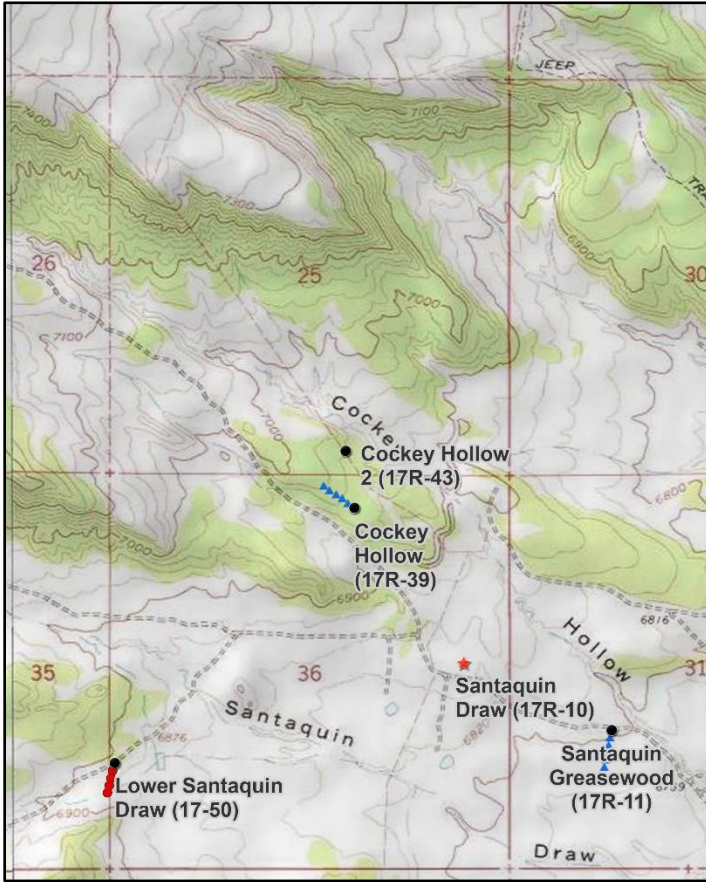
Year	Density	Size Class Distribution				Utilization		Poor Vigor (%)
	Plants per Acre	Class I (%)	Class II (%)	Class III (%)	Class IV (%)	Moderate (%)	Heavy (%)	
Populus tremuloides (quaking aspen)								
2021	1540	19	53	12	16	5	8	5

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 17R-42.14 - 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)							
2021	574	5	65	20	-	10	5.3
Pinus contorta (lodgepole pine)							
2021	9	-	-	-	-	100	30.3
Picea engelmannii (Engelmann spruce)							
2021	92	-	33	20	-	47	19.0
Populus tremuloides (quaking aspen)							
2021	268	6	39	22	-	33	6.4

COCKEY HOLLOW 2 - STUDY NO. 17R-43



Location Information

USGS 7.5 min Map Info
GPS (0' Stake)

Tabiona SW; Township 2S, Range 8W, Section 25
NAD 83 UTM ZONE 12, 522555 East 4457860 North

Transect Information

Browse Tag # (0' Stake)	606
Transect Bearing	290° 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

From the intersection of US-40 and SR-208, travel northeast on SR-208 for 3.9 miles to a road and WMA sign on the left (west) side of the road. Turn left here and travel on this road for about 1.3 miles to a fork. Bear right at the fork, drive for 0.36 miles, and park; there is no witness post. The study site is approximately 760 feet uphill from and north of the road.

Site Information

Land Ownership	State
Land Administrator	UDWR
Allotment	No data
Elevation	No data
Aspect	East
Slope	3%
Sample Dates	08/09/2021

Table 17R-43.1 Disturbance History. Recorded history of major disturbances.

Treatment/Disturbance	Name	WRI DB#	Date	Size (acres)
Seeding - Aerial Before	Cockey Hollow phase II	4433	September 2018	663
Seeding - Aerial After	Cockey Hollow phase II	4433	December 2018	663
Mechanical - Bullhog	Cockey Hollow phase II	4433	September-November 2018	663

Table 17R-43.2 Seed Mix. List of known seeded plant species and rates (if available).

Mix Name			Application Type	Application Date	Acres
Cocky Hollow			Aerial	Sep 2018	663
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
G	Achnatherum hymenoides	Indian Ricegrass	Rimrock	1.06	0.97
G	Dactylis glomerata	Orchardgrass	Paiute	0.45	0.41
G	Elymus trachycaulus	Thickspike Wheatgrass	Bannock II	1.28	1.05
G	Leymus cinereus	Great Basin Wildrye	Trailhead	1.06	0.80
G	Pascopyrum smithii	Western Wheatgrass	Arriba	1.06	0.94
G	Poa secunda	Sandberg Bluegrass	UP Colorado Plateau	0.15	0.13
G	Poa secunda	Big Bluegrass	Sherman	0.23	0.17
G	Pseudoroegneria spicata	Bluebunch Wheatgrass	Anatone	1.06	0.99
F	Gaillardia aristata	Blanket Flower		0.23	0.20
F	Linum perenne	Blue Flax	Appar	0.15	0.11
F	Onobrychis viciifolia	Sainfoin	Eski	3.02	2.77
F	Penstemon strictus	Rocky Mountain Penstemon	Bandera	0.06	0.05
F	Penstemon strictus	Rocky Mountain Penstemon	Bandera	0.38	0.31
F	Ratibida columnifera	Prairie Coneflower	Stillwater	0.23	0.20
F	Sanguisorba minor	Small Burnet	Delar	1.96	1.84

Mix Name			Application Type	Application Date	Acres
Cocky Hollow Sagebrush			Aerial	Dec 2018	663
Type	Species	Common Name	Cultivar/Source ID	Bulk lbs/acre	PLS
F	Medicago sativa	Alfalfa	Ladak DL	0.45	0.38
F	Medicago sativa ssp. falcata	Yellow Alfalfa	Don	0.53	0.52
S	Artemisia tridentata ssp. wyomingensis	Wyoming Big Sagebrush	Sevier UT	1.99	0.51

Wildlife Habitat and Vegetation History

Table 17R-43.3 - Wildlife Seasonal Habitat. UDWR wildlife habitat and seasonality.

Species	Habitat	Season
Mule Deer	crucial	winter
Rocky Mountain Elk	crucial	winter
Greater Sage-Grouse		undefined & undefined

Table 17R-43.4 - Vegetation History. The dominant vegetation type(s) and phase of woodland succession (Tausch, Miller, Roundy, & Chambers, 2009).

Year	Vegetation Type	Woodland Succession
2021	Mountain Big Sagebrush/Perennial Grass	Phase I

Site Notes

This study site was established in 2021 because the original study meant to monitor the bullhog treatment (17R-39 Cockey Hollow) did not fall within the treated area.

Site Potential

1981 - 2010 Average Annual Precipitation	14 inches
NRCS Ecological Site	Upland Loam (Mountain Big Sagebrush)
NRCS Ecological Site #	R047XC310UT
States and Transitions	No state and transition model is available for this ecological site.

This is a replacement site for Cockey Hollow (17R-39), which did not capture the bullhog treatment that occurred in 2018 (Table 17R-43.1). Due to the close proximity and similarity of Cockey Hollow 2 to Cockey Hollow, the Cockey Hollow study may be used to gain an understanding of what the vegetation community was like prior to treatment. When the study was established in 2021, the vegetation on this site existed as a mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*)-dominated community type (Table 17R-43.13) that had been treated by a bullhog in the fall of 2018. The perennial grasses western wheatgrass (*Pascopyrum smithii*) and Indian ricegrass (*Achnatherum hymenoides*) were the most abundant native species found in the herbaceous understory. Although these species were likely present prior to treatment, the abundance of these grasses found on site may be due to the seeding supplementation that occurred during the project (Table 17R-43.2). Forbs within the community were not particularly abundant, but were moderately diverse: the only species contributing any significant cover was Rocky Mountain penstemon (*Penstemon strictus*) (Table 17-43.11). Some mature trees were left on the site following treatment, but density and age class indicates that the site is in Phase I of woodland succession (17R-43.4, Table 17R-43.14).

Trend Summary Tables

Table 17R-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
2021	3.1	0.2	0.0	4.8	0.3	6.4

Table 17R-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
2021	-	225	17	127	-	7.7	0.3	3.8

Table 17R-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
2021	10.6	0.1	73.1	0.9	1.4	15.6

Table 17R-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/Pronghorn	Mule Deer	Rocky Mountain Elk	Rabbit
	Quadrat Frequency				
2021	2	7	9	15	20
Year	Days Use Per Acre (ha)				
2021	10.2 (25.1)	14.1 (34.8)	-	10.7 (26.5)	-

Table 17R-43.10 - Grass Species. Nested frequency and modified Daubenmire average cover by year.

GRASS SPECIES													
Achnatherum hymenoides (Indian ricegrass)													
Agropyron cristatum ⁱ (crested wheatgrass)													
Carex obtusata (obtuse sedge)													
Carex rossii (Ross' sedge)													
Dactylis glomerata ⁱ (orchardgrass)													
Elymus elymoides (squirreltail)													
Hesperostipa comata (needle and thread)													
Leymus cinereus (basin wildrye)													
Pascopyrum smithii (western wheatgrass)													
Poa fendleriana (muttongrass)													
Poa secunda (Sandberg bluegrass)													
Pseudoroegneria spicata (bluebunch wheatgrass)													
year	Nested Frequency												
2021	71	19	16	13	4	6	21	6	102	8	34	8	
year	Average Cover (%)												
2021	2.3	0.8	0.3	0.1	0.2	0.1	0.2	0.2	2.6	0.2	0.3	0.5	

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

Table 17R-43.11 - Forb Species. Nested frequency and modified Daubenmire average cover by year.

FORB SPECIES																	
Antennaria microphylla (littleleaf pussytoes)																	
Astragalus convallarius (lesser rushy milkvetch)																	
Astragalus utahensis (Utah milkvetch)																	
Chaetopappa ericoides (rose heath)																	
Chenopodium fremontii ^a (Fremont's goosefoot)																	
Crepis acuminata (tapertip hawksbeard)																	
Cryptantha (cryptantha)																	
Cymopterus (springparsley)																	
Ipomopsis aggregata (scarlet gilia)																	
Ipomopsis congesta (ballhead ipomopsis)																	
Lactuca serriola ^a (prickly lettuce)																	
Linum perenne ⁱ (blue flax)																	
Medicago sativa ssp. falcata ⁱ (yellow alfalfa)																	
Meibotus officinalis ⁱ (sweetclover)																	
Packera multilobata (lobeleaf groundsel)																	
Penstemon humilis (low beardtongue)																	
Penstemon pachyphyllus (thickleaf beardtongue)																	
year	Nested Frequency																
2021	4	6	4	3	10	0	6	3	1	2	0	11	2	10	13	23	5
year	Average Cover (%)																
2021	0.1	0.0	0.2	0.2	0.3	0.0	0.2	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.3	0.1	0.4

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

FORB SPECIES								
Penstemon strictus (Rocky Mountain penstemon)								
Phlox hoodii (spiny phlox)								
Ratibida columnifera (upright prairie coneflower)								
Sanguisorba minor ⁱ (small burnet)								
Schoenocrambe limifolia (flaxleaf plainsmustard)								
Sphaeralcea grossularifolia (gooseberry/leaf globemallow)								
Taraxacum officinale (common dandelion)								
Tragopogon dubius ^{a,i} (yellow salsify)								
year	Nested Frequency							
2021	41	6	3	2	15	11	0	7
year	Average Cover (%)							
2021	1.4	0.0	0.3	0.0	0.2	0.2	0.0	0.0

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

Table 17R-43.12 - 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)							
Gutierrezia sarothrae (broom snakeweed)							
Juniperus osteosperma ⁱ (Utah juniper)							
Linanthus pungens (granite prickly phlox)							
Opuntia fragilis (brittle pricklypear)							
Pinus edulis ⁱ (twoneedle pinyon)							
year	Line Intercept Cover (%)						
2021	0.2	4.6	0.2	3.2	0.1	-	3.2
year	Quadrat Cover (%)						
2021	0.2	2.9	0.2	0.0	0.0	0.0	0.0

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

Table 17R-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			Moderate (%)	Heavy (%)		
	Excluding Seedlings	Seedling	Young (%)	Mature (%)	Decadent (%)				
Artemisia nova ^p -- (black sagebrush)									
2021	320	20	25	69	6	6	6	6	- / -
Artemisia tridentata ssp. vaseyana ^p -- (mountain big sagebrush)									
2021	2500	80	46	48	6	6	0	7	- / -
Gutierrezia sarothrae -- (broom snakeweed)									
2021	160	-	0	88	13	0	0	13	- / -
Juniperus osteosperma ⁱ -- (Utah juniper)									
2021	40	20	100	0	0	0	0	0	- / -
Linanthus pungens -- (granite prickly phlox)									
2021	240	-	0	100	0	0	0	33	- / -
Opuntia fragilis -- (brittle pricklypear)									
2021	20	-	0	100	0	0	0	100	- / -
Pinus edulis ⁱ -- (twoneedle pinyon)									
2021	20	-	100	0	0	0	0	0	- / -

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

Table 17R-43.14 - 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)							
2021	22	45	36	9	-	9	11.0
Pinus edulis (twoneedle pinyon)							
2021	72	28	72	-	-	-	1.8

Table 17R-43.15 - Deer Desirable Components Index: Upland 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
2021	6.0	0.0	0.0	15.4	0.0	7.5	0.0	28.9	Very Poor

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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		