2024 Range Trend Project Report

Unit Summaries 13A, 14A, 14B, 15, 16B & 16C

Utah's Big Game Range Trend Studies

Publication Number 25-11 | Federal Aid Project W-82-R-69

Prepared by the Utah Division of Wildlife Resources

Great Basin Research Center

UTAH DNR WILDLIFE RESOURCES

Utah Big Game Range Trend
Unit Summaries
2024
Wildlife Management Units
13A, 14A, 14B, 15, 16B & 16C

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Cover Photo Credit

Woolly Locoweed (*Astragalus mollissimus*) by Jason Cox (2025)

Performance Report for Federal Aid Project W-82-R-69

Publication No. 25-11

UTAH DEPARTMENT OF NATURAL RESOURCES
Division of Wildlife Resources
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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-69

Grant Name: Utah Wildlife Habitat Research and Monitoring

Project Name: Utah Wildlife Habitat Monitoring

Need: The ability to detect changes in vegetation composition (range trend) on big game winter ranges is an important part of the Division’s 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 will be 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 BLM and USFS allotment management plans, and as one of several sources of information for revising deer and elk herd management unit plans. Range Trend data may also be gathered where habitat information is necessary for other wildlife species such as Greater sage-grouse. Study sites for all tasks will be located throughout Utah in the Great Basin, Central Basin and Range, and the Colorado Plateau Ecoregions.

Purpose: Monitor, evaluate, and report range trend at designated key areas throughout the state, and inform Division 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 re-monitored every five years, and vegetation condition and trend assessments will be made for key areas. DWR 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 and use the information in the development of management plans. Annual reports will be readily available on the Division's website, digitally stored, and in hard copies located in DWR regional offices, BLM and USFS offices, and public libraries. Special studies (habitat project monitoring and big game/livestock forage utilization studies) will give DWR biologists and public land managers additional information to address local resource management problems.

REMARKS

The work completed during the 2024 field season and reported in this publication involves the reading of interagency Range Trend studies in the DWR Southeastern Region. Most trend studies surveyed in these management units were established in the 1980s and reread at five-year intervals.

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

Bureau of Land Management: Canyon Country District
- Monticello Field Office
- Moab Field Office

Bureau of Land Management: Color Country District
- Richfield Field Office
- Henry Mountain Field Station

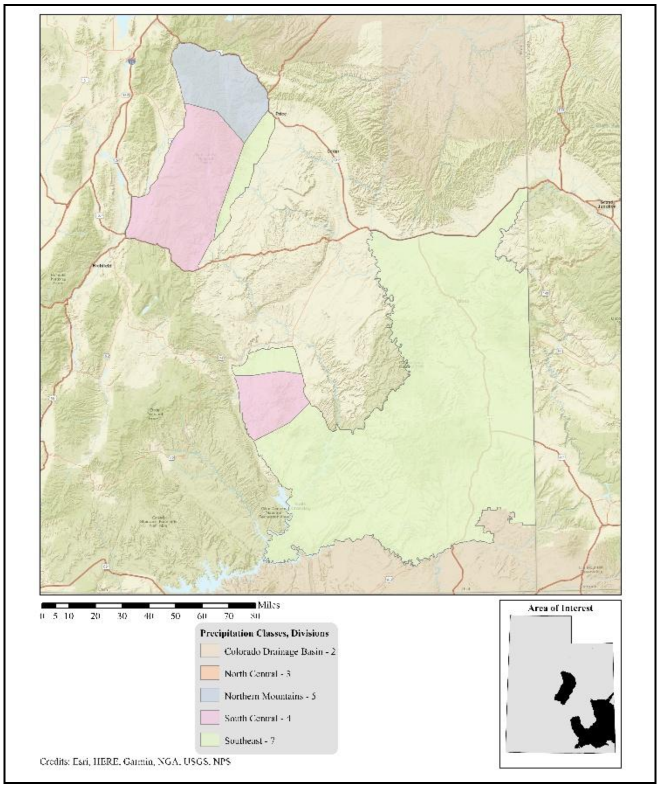
Bureau of Land Management: Green River District
- Price Field Office

United States Forest Service: Manti-La Sal National Forest
- Ferron/Price Ranger District
- Moab Ranger District
- Monticello Ranger District
- Sanpete Ranger District

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

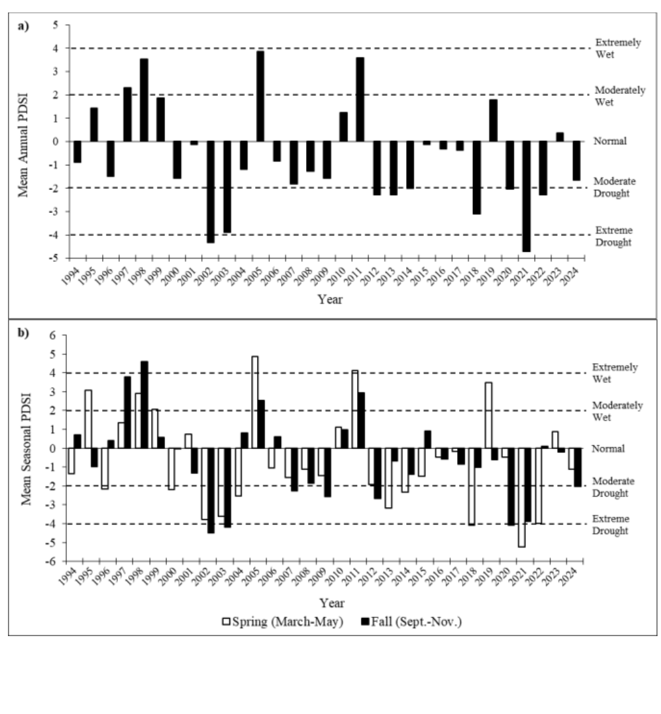
RANGE TREND UNIT SUMMARY OVERVIEW

Boundary Description and Geography: Each unit summary includes the boundary description outlining the boundary of the unit. The geography section details the major features of the unit.



Climate Data: The state of Utah is divided into seven climatic divisions for estimating the Palmer Drought Severity Index (PDSI) and the Southeastern Region occurs within three of these divisions: South Central (Division 4), Northern Mountains (Division 5), and Southeast (Division 7). The PDSI shows cumulative drought conditions based on precipitation and temperature. Long-term drought is cumulative, so the intensity of the current drought is based not only upon the prevailing conditions but also upon those of previous months (National Oceanic and Atmospheric Administration, 2025).

The PDSI is based on climate data gathered from 1895 to 2024. The data reported in this summary covers a majority of the years over which these sites have been sampled (1994-2024). The PDSI uses a scale where zero indicates normal, positive deviations indicate wet, and negative deviations indicate drought. Classification of the scale is >4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to 2.9 = Moderately Wet, 1.0 to 1.9 = Slightly Wet, 0.5 to 0.9 = Incipient Wet Spell, 0.4 to -0.4 = Normal, -0.5 to -0.9 = Incipient Dry Spell, -1.0 to -1.9 = Mild Drought, -2.0 to -2.9 = Moderate Drought, -3.0 to -3.9 = Severe Drought and <-4.0 = Extreme Drought (Time Series Data, 2024). In the figure below, graph "a" represents the mean annual PDSI for the South Central Division and graph "b" shows the mean PDSI by season, spring (March-May) and fall (Sept.-Nov.) for the same division (National Oceanic and Atmospheric Administration, 2025).



Big Game Habitat: Big game habitat is discussed within each of the unit summaries. This section is a general description of the big game habitat within the unit. Habitat maps for big game animals show the seasonal ranges for year-long, winter, transitional, and summer habitat.

Rangeland Analysis Platform (RAP): Data from the Rangeland Analysis Platform was overlaid with precipitation data to create graphs representing vegetation changes by either biomass or percent cover based on deer winter, summer, winter/spring, spring/fall, and/or year-long range habitat for each unit. A number of factors determine quality wildlife forage. Diversity of species and life forms, age class and vigor of shrubs, timing of vegetative stages of grasses and forbs, and the abundance of palatable vegetation all contribute to a quality habitat for mule deer. Site-level (Range Trend sites) data addresses species composition, age structure, and health of communities in winter habitat. However, due to the small number and/or placement of Range Trend sites, it is difficult to get a true estimation of vegetation abundance. Trend study sites are placed strategically in key areas for mule deer to assess both quantity and quality of forage, but due to the limited number of sampling sites, Range Trend cannot accurately predict the overall abundance of forage available in the entire extent of mule deer range. The RAP may aid in the estimation of forage quantity within mule deer habitat by providing values for biomass and cover for perennial, annual, and browse lifeforms that Range Trend sites cannot account for. However, RAP data does not fully address the quality of forage the way that Range Trend data does. The intent of the RAP dataset is to supplement Range Trend data and local knowledge to inform managers of general habitat trends. In addition, "[RAP] data can be used to evaluate resources in concert with site-specific information about the area under investigation, such as past land management practices, vegetation treatments, conservation efforts, or natural disturbances" (Rangeland Analysis Platform; Products, 2025, para. 5). The graphs in this report represent vegetation changes by either biomass or percent cover based on deer winter, summer, winter/spring, spring/fall, or year-long range habitat. Range Trend data is collected on a five-year interval and the intent of the RAP data is to also help illustrate the year-to-year fluctuations or changes that may occur between Range Trend samplings.

<u>Land Ownership</u>: Land ownership information was used to create maps displaying ownership and study site location for each management unit.

<u>LANDFIRE Existing Vegetation Type for Mule Deer Habitat</u>: The Existing Vegetation Type (EVT) layer represents the terrestrial ecological systems that are distributed across the landscape. According to the LANDFIRE Existing Vegetation Type website (n.d., paras. 2-4):

> A terrestrial ecological system is defined as a group of plant community types (associations) that tend to co-occur with landscapes with similar ecological processes, substrates, and/or environmental gradients. […] EVT also includes ruderal or semi-natural vegetation types within the U.S. National Vegetation Classification. […] EVT is mapped using decision tree models, field data, Landsat imagery, elevation, and biophysical gradient data.

The LANDFIRE data reported in this summary includes the major functional groups (shrubland, conifer, grassland, and others) and various subgroups of importance found on mule deer habitat within the unit boundaries. Acreage and percent of total acreage are reported for each individual vegetation type with the group percent of total for each of the major groups also reported. Agricultural, developed, riparian, and other groups are classified as "other."

<u>Treatments/Restoration Work</u>: There has been an active effort to address many of the limitations within each unit through the Watershed Restoration Initiative (WRI). This section outlines the work that has been done on the unit through WRI projects. A map of the projects that have occurred on the management unit through the WRI program and a map of the fire history from at least 2000 through 2024 is available for each unit. A total acreage amount for each type of treatment is provided in a table for each unit.

<u>Range Trend Studies</u>: Many of the Range Trend study sites were established in the 1980s and have numerous years of data associated with them. A table details the year an individual study was established,

whether it is active or suspended, and the ecological site description (if available). Another table shows the disturbance history for those sites that have had a known disturbance that occurred on the site.

Study Trend Summary: Trends were reported by grouping studies into an ecological site based on soil characteristics, elevation, precipitation, and dominant vegetation type. Trends for each individual ecological site were evaluated by analyzing directional shifts in mean densities, covers, and utilizations for shrubs and trees. Not all sites had shrubs or trees present: when this is the case, graphs are included with no data displayed. The implied trend for the herbaceous understory was evaluated by comparing mean values of nested frequencies and covers from sample year to sample year. Occupancy trends of big game species are also discussed and are evaluated by comparing mean pellet group counts of individual species from sample year to sample year.

Range Trend study sites were summarized based on their ecological site descriptions (ESD). ESDs provide a consistent means for interpreting the landscape. In addition, ESDs provide a way to identify similar ecological potentials and allow for predictable landscape responses to disturbances or management inputs based on repeating landscape patterns. Sites are classified based on abiotic and biotic features such as soil characteristics and plant community composition. The most common ESDs within big game seasonal ranges study sites are semidesert ESDs, which are lower in elevation; upland ESDs, which are mid-elevation; and mountain ESDs, which are higher elevation sites.

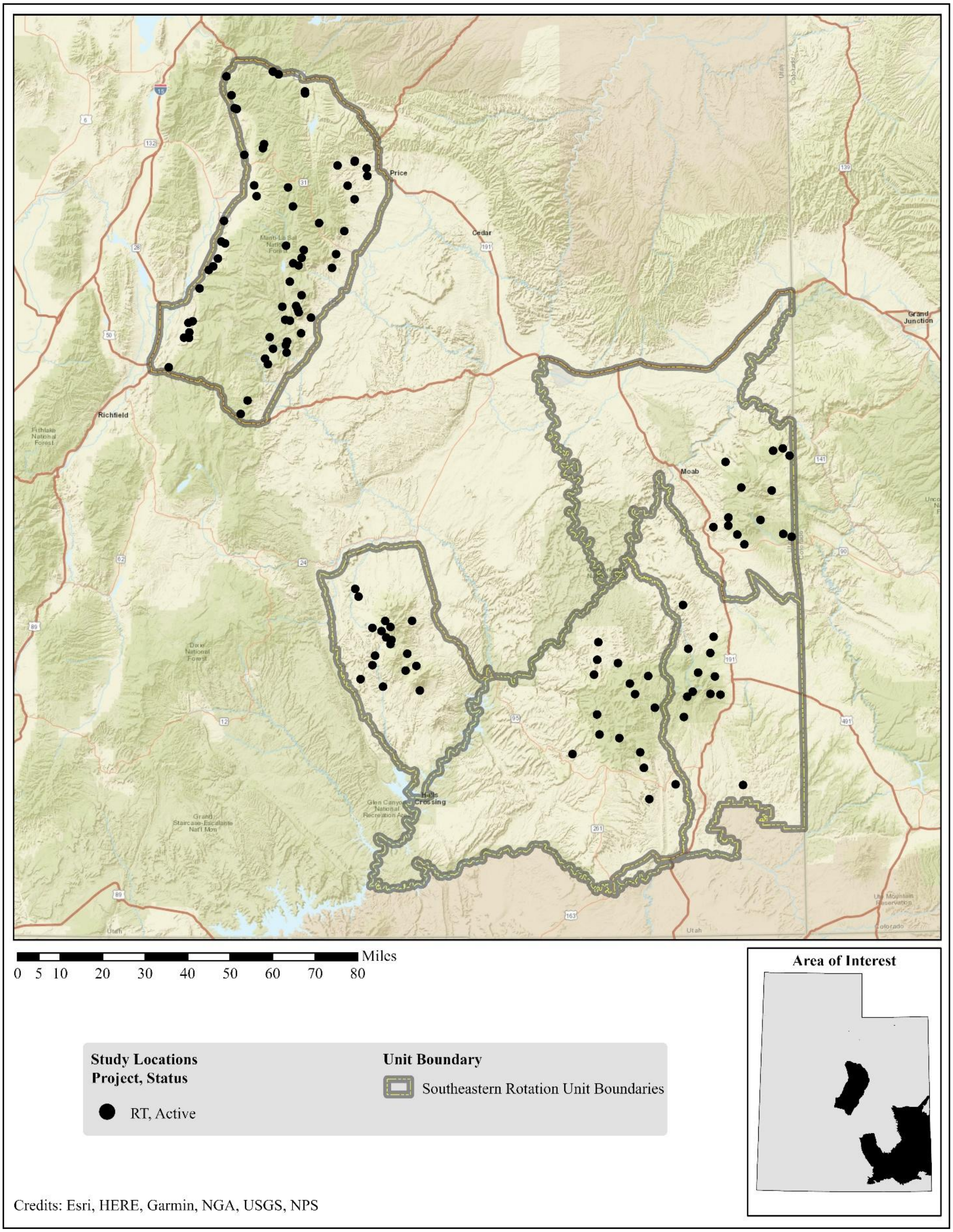
Deer Winter Range Condition Assessment: The desirable components index (DCI) for deer was created by Range Trend Program personnel as a tool to address condition and/or value of winter ranges for mule deer. This index is meant to be a companion to, and not a replacement for, the site-specific Range Trend 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, recruitment of young shrubs, 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 whether 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 soil stability, hydrologic function, and other environmental factors into account, this index should not be used to assess a site’s function and/or condition.

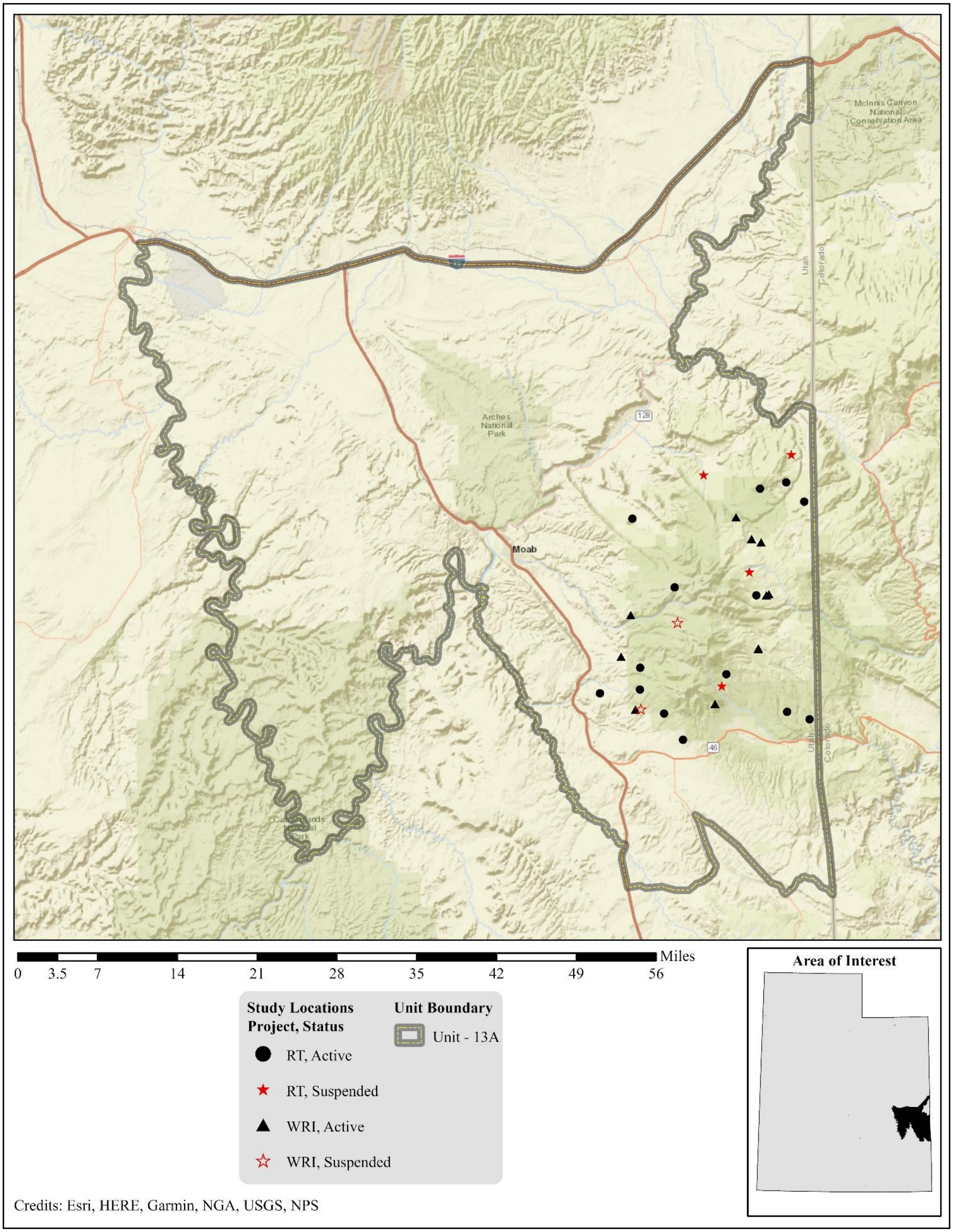
Changes in DCI over the sample years for both treated and untreated sites are included in the figures near the end of the unit summary. Care should be taken when interpreting these tables as the number of sites included in each year may vary. This could be misleading if the overall DCI seems to be improving, when really the very poor or poor sites may be excluded due to a lack of sampling in a certain year.

Discussion and Recommendations: Each of the ecological site descriptions are assessed for their overall threats based on species composition and cover. Common threats to these sites are pinyon-juniper encroachment and introduced perennial and/or annual grass species, among others. Impacts of these threats include (but are not limited to) reduced vigor of understory species, a decrease in herbaceous diversity, and/or increased fire potential. Some sites did not have any issues and were classified as “none identified.”

UNIT SUMMARIES



1. WILDLIFE MANAGEMENT UNIT 13A – LA SAL MOUNTAINS



WILDLIFE MANAGEMENT UNIT 13A – LA SAL MOUNTAINS

Boundary Description

Grand and San Juan Counties – Boundary begins at I-70 and the Green River; south along the Green River to the Colorado River; north along the Colorado River to Kane Springs Creek; southeast along Kane Springs Creek to Hatch Wash; southeast along Hatch Wash to US-191; south on US-191 to Big Indian Road; east on Big Indian Road to Lisbon Valley Road; east on Lisbon Valley Road to Island Mesa Road; east on Island Mesa Road to the Utah-Colorado state line; north on the state line to the Dolores River; northwest along the Dolores River to the Colorado River; northeast along the Colorado River to the Utah-Colorado state line; north on the state line to I-70; west on I-70 to the Green River.

Management Unit Description

Geography

The La Sal Mountains Wildlife Management Unit covers a vast and varied area including the section of the Colorado Plateau that falls between the Utah/Colorado border and the Green River. This management unit also contains the Colorado River, La Sal Mountains, Arches National Park, and the north end of Canyonlands National Park. Mount Peale, the highest point of the La Sal Mountains and the management unit, reaches 12,728ft. The lowest point of the unit is at just less than 4,000 ft. and is located along the Colorado River near Dead Horse Point State Park. Towns in this area include Moab, Castle Valley, La Sal, and Cisco.

The Colorado and Green Rivers are carved into the Colorado Plateau: these rivers and their tributaries have shaped this region. The Green and Colorado Rivers converge within Canyonlands National Park.

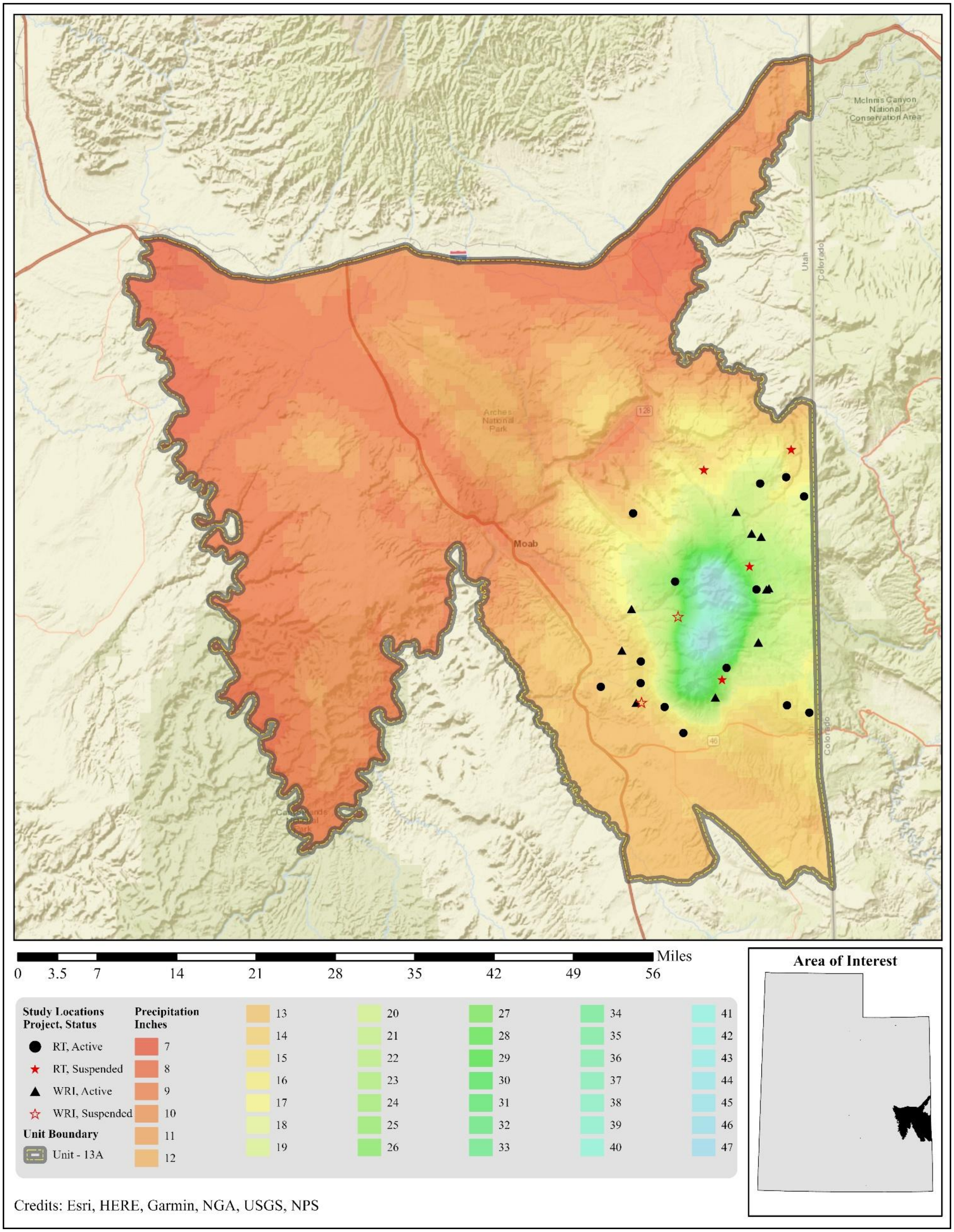
Climate Data

The 30-year (1991-2020) annual precipitation PRISM model shows precipitation on this unit ranges from 6 inches near the bottoms of the Green River and to 47 inches on Manns Peak and Mount Peale. All of the active Range Trend and Watershed Restoration Initiative (WRI) monitoring studies in this unit occur between 12 and 28 inches of precipitation (**Map 1.1**) (PRISM Climate Group, Oregon State University, 2021).

Vegetation trends are dependent upon annual and seasonal precipitation patterns. Palmer Drought Severity Index (PDSI) data for the unit was compiled from the National Oceanic and Atmospheric Administration (NOAA) Physical Sciences Division (PSD) as part of the Southeast Division (Division 7).

The mean annual PDSI of the Southeast Division, which the La Sal Mountains unit is part of, has experienced some form of drought in most years since 1994. Moreover, this climate division has been considered to be in some form of drought for nearly 52% of the time since 1994. Of the drought years, 56% are considered to be either moderate or extreme droughts. Also remarkable about this climate division is that drought is experienced over multiple years and is generally interrupted by a single wet year event. The most notable wet year occurred in 2005 and was considered to be moderately wet (**Figure 1.1a**). The mean spring (March-May) and mean fall (September-November) PDSI estimations typically follow the same trends as the average annual PDSI trends, but they can show split seasonal precipitation events that are not captured in the overall annual PDSI. These seasonal precipitation events can play a crucial role in the timing of plant growth and production for the remainder of the year (spring), or for the year ahead (fall). When a wet fall aligns with a wet spring of the following year, plant health and production for that following year can have a positive effect on forage availability. This is due to lower evaporation and transpiration rates between the months of September to May that result in higher soil moisture reserves being made available to plants for longer periods during the dry summer months. Although annual precipitation is likely the driver for plant production, the interplay of fall/spring wetness may make a drought year less impactful as a plant stressor. The ecotypes evaluated by

Range Trend are primarily found on deer transitional and winter ranges. Plant growth on these ranges is primarily affected by the seasonal precipitation that occurs during the fall and spring months (Cox, et al., 2009), and is the reason fall and spring PDSI estimations are focused on in this report (**Figure 1.1b**). The years that follow this pattern of consecutive wet fall and spring occur in 1994/95, 1996/97, 1997/98, 2004/05, and 2022/23. Range Trend sample years occur on a five-year rotation, so the PDSI years of interest should be examined by the corresponding rotation year (**Table 1.5**). The 2019 sample year occurs during a wet year, but years where drought may have affected plant condition occur in 1994, 2004, 2009, 2014, and 2024 (**Figure 1.1a, Figure 1.1b**) (National Oceanic and Atmospheric Administration, 2025).



Map 1.1: The 1991-2020 PRISM Precipitation Model for WMU 13A, La Sal Mountains (PRISM Climate Group, Oregon State University, 2021).

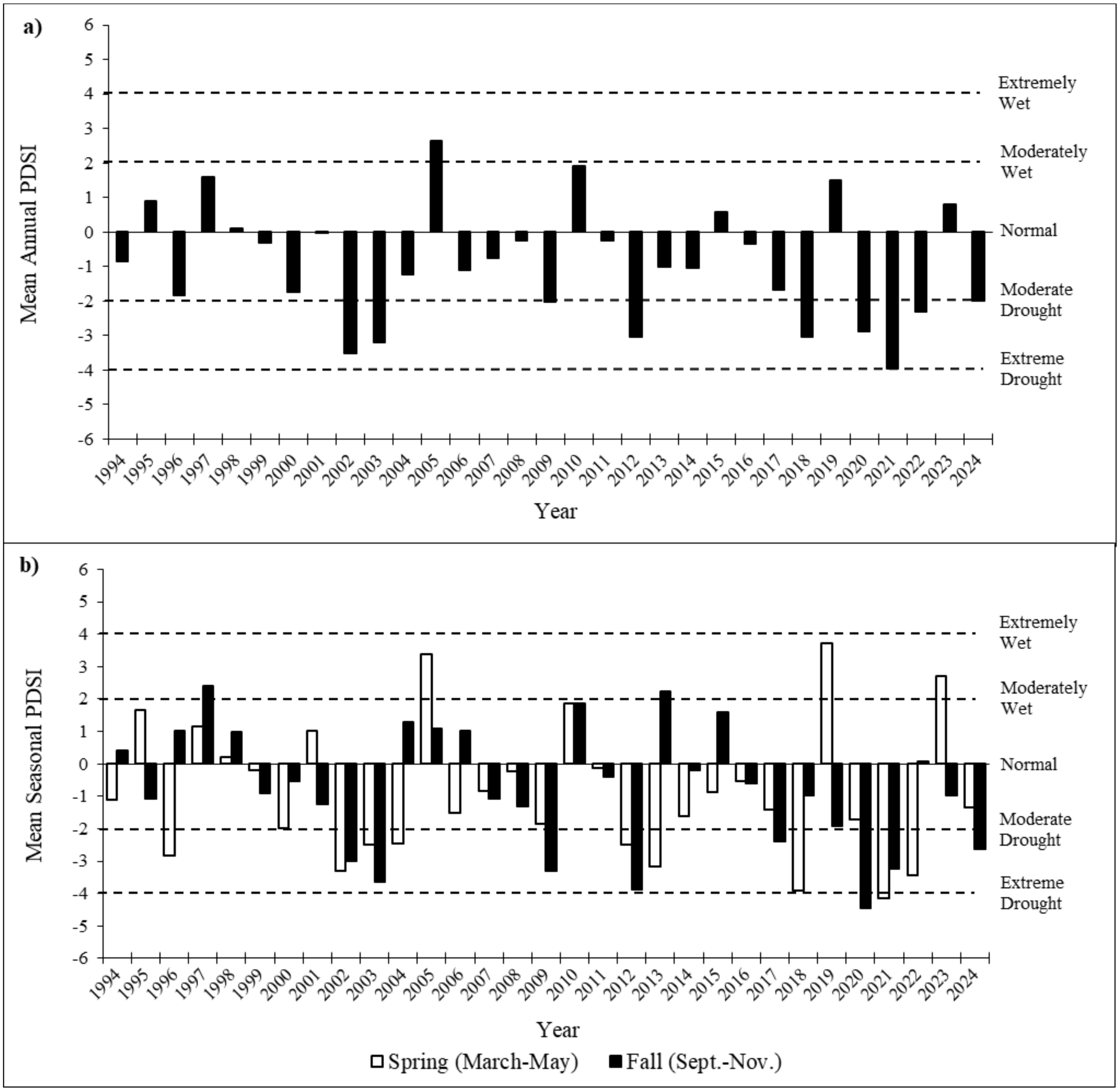


Figure 1.1: The 1994-2024 Palmer Drought Severity Index (PDSI) for the Southeast Division (Division 7). The PDSI is based on climate data gathered from 1895 to 2024. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet, and negative deviations indicate drought. Classification of the scale is ≥4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to 2.9 = Moderately Wet, 1.0 to 1.9 = Slightly Wet, 0.5 to 0.9 = Incipient Wet Spell, 0.4 to -0.4 = Normal, -0.5 to -0.9 = Incipient Dry Spell, -1.0 to -1.9 = Mild Drought, -2.0 to -2.9 = Moderate Drought, -3.0 to -3.9 = Severe Drought and ≤-4.0 = Extreme Drought. a) Mean annual PDSI. b) Mean spring (March-May) and fall (Sept.-Nov) PDSI (National Oceanic and Atmospheric Administration, 2025).

Big Game Habitat

The predominant vegetation in the northern and western portions of this unit is a desert shrub type that receives little use by deer or elk. This lower country is inhabited mostly by desert bighorn sheep and antelope, while the deer and elk ranges (**Map 1.2**, **Map 1.3**) are centered on and around the La Sal Mountains. However, the 12,000-foot talus peaks of these mountains are bare. The mountains level off at about 8,000 feet to form a plateau, then slope gently down to the desert below at about 4,000 feet; deer generally winter on the mesas at 8,000 feet or lower. South-facing slopes in steep canyons and the low desert areas also provide some additional wintering areas.

Key big game areas include the Fisher Valley-Fisher Mesa area, lower Castle Valley, upper Castle Valley and Porcupine Draw, Jimmy Keen Flat, Bald and Boren Mesas, Spanish Valley, Brumley Ridge, Black Ridge, Pack Creek, upper Muleshoe Canyon, Pole Canyon, Buck Hollow, Lisbon Valley, and North and South Beaver Mesas.

Rangeland Analysis Platform (RAP) – Biomass and Cover by Deer Habitat

Several factors determine quality wildlife forage. Diversity of species and life forms, age class and vigor of shrubs, timing of vegetative stages of grasses and forbs, and the abundance of palatable vegetation all contribute to a quality habitat for mule deer. Site-level (Range Trend sites) data addresses species composition, age structure, and health of communities in winter and transitional habitat. However, due to the small number and/or placement of Range Trend sites, it is difficult to get a true estimation of vegetation abundance. Trend study sites are strategically placed in key areas for mule deer to assess both quantity and quality of forage, but due to limited sampling size, sites cannot accurately predict the overall abundance of forage available to mule deer in the entire extent of mule deer range. The RAP (Rangeland Analysis Platform) may aid in the estimation of forage quantity within mule deer habitat by providing values for biomass and cover for perennial, annual, and browse lifeforms that Range Trend sites cannot account for. However, RAP data does not fully address the quality of forage the way that Range Trend data does. The intent of the RAP dataset is to supplement Range Trend data and local knowledge to inform managers of general habitat trends. In addition, "[RAP] data can be used to evaluate resources in concert with site-specific information about the area under investigation, such as past land management practices, vegetation treatments, conservation efforts, or natural disturbances" (Rangeland Analysis Platform; Products, 2025, para. 5). The following graphs represent vegetation changes by either biomass or percent cover based on mule deer winter, summer, or year-long range habitat. Range Trend data is collected on a five-year interval and the intent of the RAP data is to also help illustrate the year-to-year fluctuations or changes that may occur between Range Trend samplings.

The RAP data shows fluctuations of herbaceous biomass and cover on mule deer summer, winter, and year-long ranges. The highest values for herbaceous biomass of perennial lifeforms occurred in the early 1990s on ranges of all seasonality and have since decreased. Total herbaceous cover values have decreased overall on all mentioned ranges despite year-to-year variation. Annual and perennial cover and biomass have correlated with precipitation trends in many years. However, a possible lag effect of a year or so appears to occur at different times, and no apparent correlation is visible in other years. Increases and decreases in herbaceous biomass and cover generally appear to be somewhat more frequent on winter and year-long habitats than on summer range. Annual lifeforms also appear to contribute greater biomass and cover on winter and year-long range than on summer range (**Figure 1.2**, **Figure 1.3**, **Figure 1.4**, **Figure 1.5**, **Figure 1.6**, **Figure 1.7**).

Range Trend data for herbaceous cover from 1994 to present shows yearly variation in both perennial and annual lifeforms. Year-to-year fluctuations can be expected due to differences in precipitation and the timing of data collection between sample years. However, annual grasses and forbs have contributed notable cover for some upland and semidesert study sites (**Figure 1.30**, **Figure 1.31**): this broadly correlates with RAP data for herbaceous cover of annual lifeforms on mule deer winter and year-long habitat (**Figure 1.6**, **Figure 1.7**).

According to the RAP data and despite yearly fluctuations, shrub and tree cover on ranges of all seasonality have been similar when comparing 1986 data with that from 2024. Over recent years, shrub and tree cover have generally remained stable with minor variations. On summer range, however, shrub cover has decreased overall since 2018 while cover of trees has increased (**Figure 1.8**). When possible lag effects are accounted for, RAP cover data for trees and shrubs has correlated with precipitation to some degree in many years, albeit with less drastic fluctuations than those displayed by herbaceous data (**Figure 1.8**, **Figure 1.9**, **Figure 1.10**). Range Trend data for tree and shrub cover values since 2004 have exhibited yearly fluctuations depending on ecotype, and correlations with RAP data are not readily apparent (**Figure 1.11**, **Figure 1.12**, **Figure 1.13**, **Figure 1.14**, **Figure 1.15**, **Figure 1.16**, **Figure 1.17**). Some of this ambiguity may be due to low sample size on summer and year-long range and intentional placement of Range Trend studies in winter range, which therefore do not capture the full extent of tree and shrub cover for the La Sal Mountains Management Unit. It is important to note that variations in cover on Range Trend sites will not always correspond with the fluctuations estimated by the RAP. This incongruence is due to the differences in dataset types: Range Trend data is site-specific and granular while RAP data is aggregated to the unit scale for deer habitat.

RAP – Herbaceous Biomass by Deer Habitat

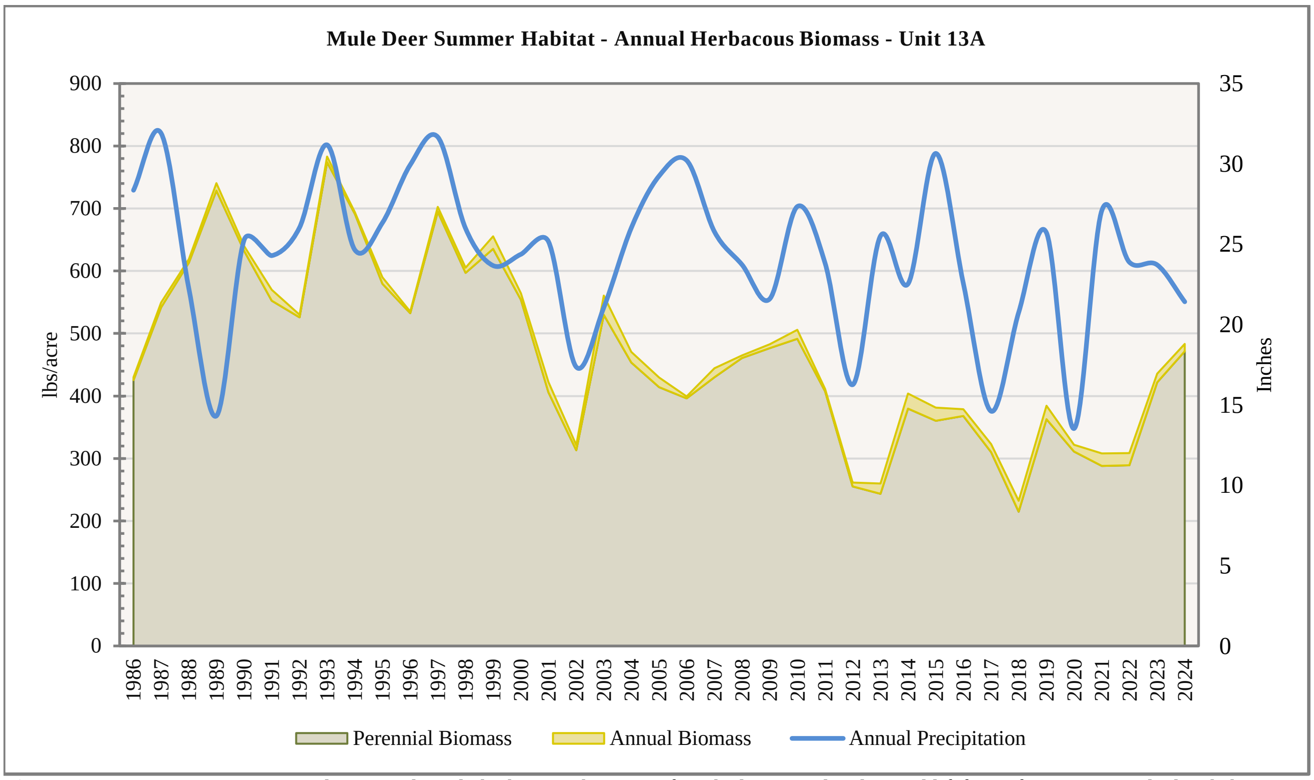


Figure 1.2: Average precipitation and estimated yearly herbaceous biomass of stacked perennial and annual lifeforms for summer mule deer habitat in WMU 13A, La Sal Mountains (Rangeland Analysis Platform, 2025).

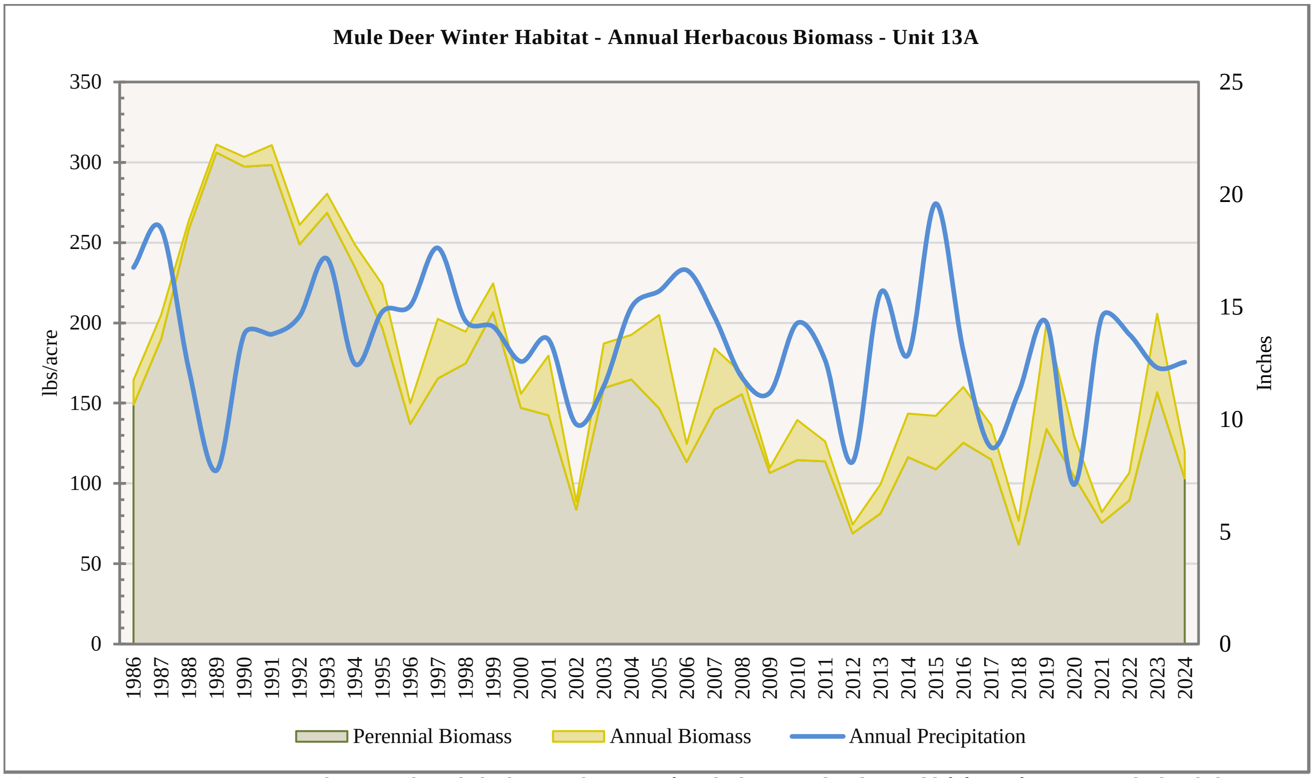


Figure 1.3: Average precipitation and estimated yearly herbaceous biomass of stacked perennial and annual lifeforms for winter mule deer habitat in WMU 13A, La Sal Mountains (Rangeland Analysis Platform, 2025).

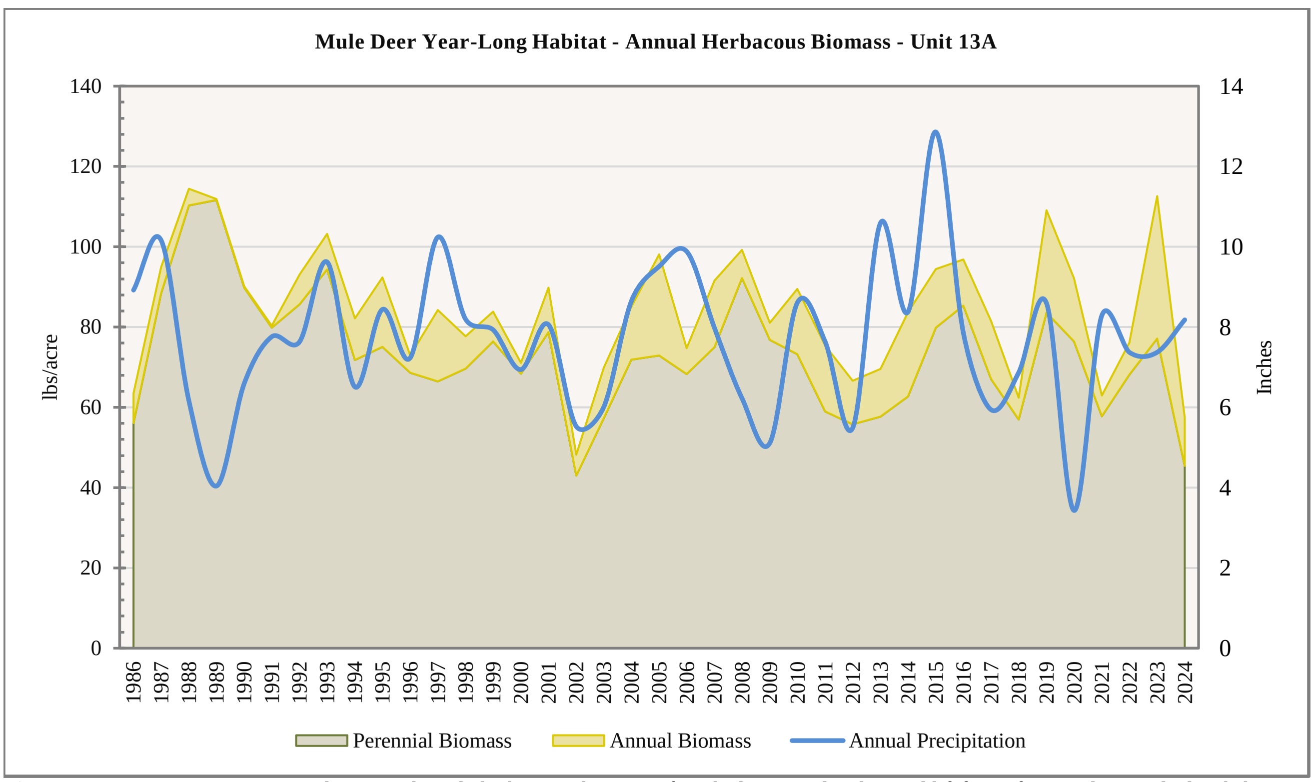


Figure 1.4: Average precipitation and estimated yearly herbaceous biomass of stacked perennial and annual lifeforms for year-long mule deer habitat in WMU 13A, La Sal Mountains (Rangeland Analysis Platform, 2025).

RAP – Herbaceous Cover by Deer Habitat

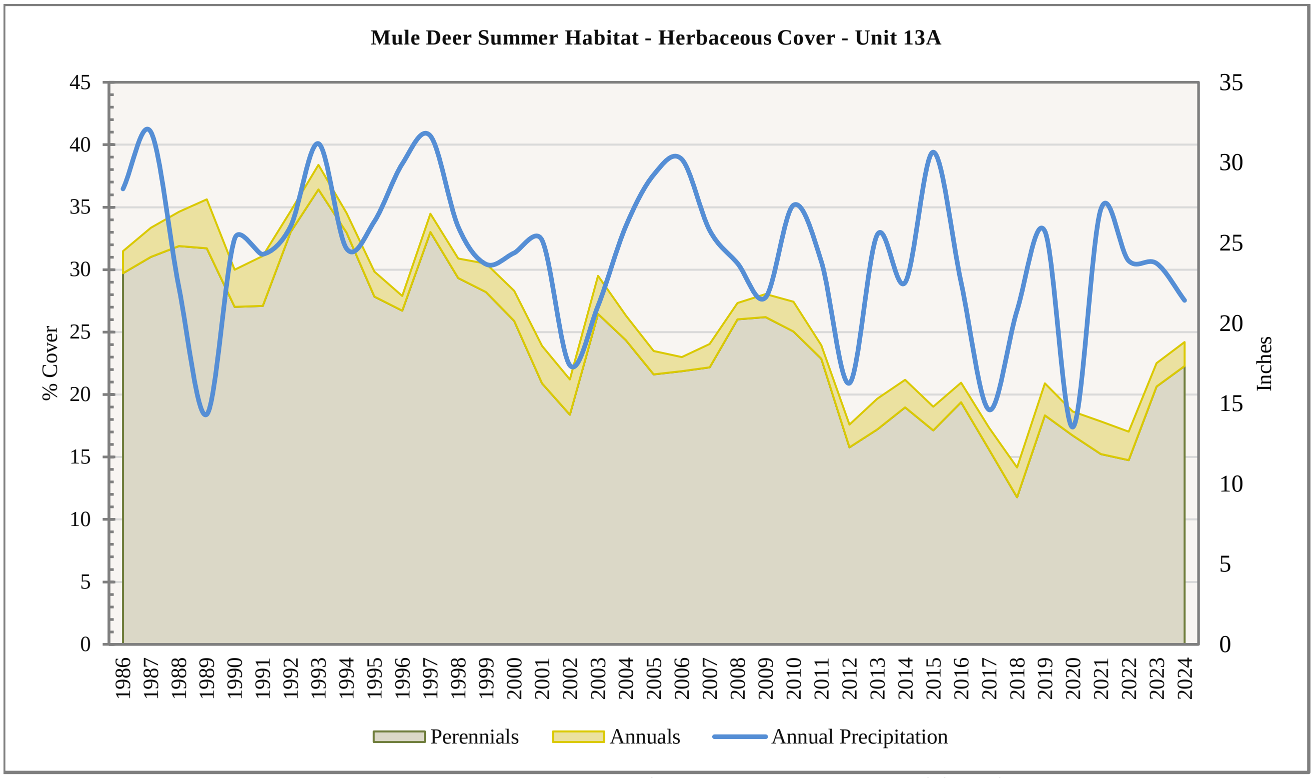


Figure 1.5: Average precipitation and estimated yearly herbaceous cover of stacked perennial and annual lifeforms for summer mule deer habitat in WMU 13A, La Sal Mountains (Rangeland Analysis Platform, 2025).

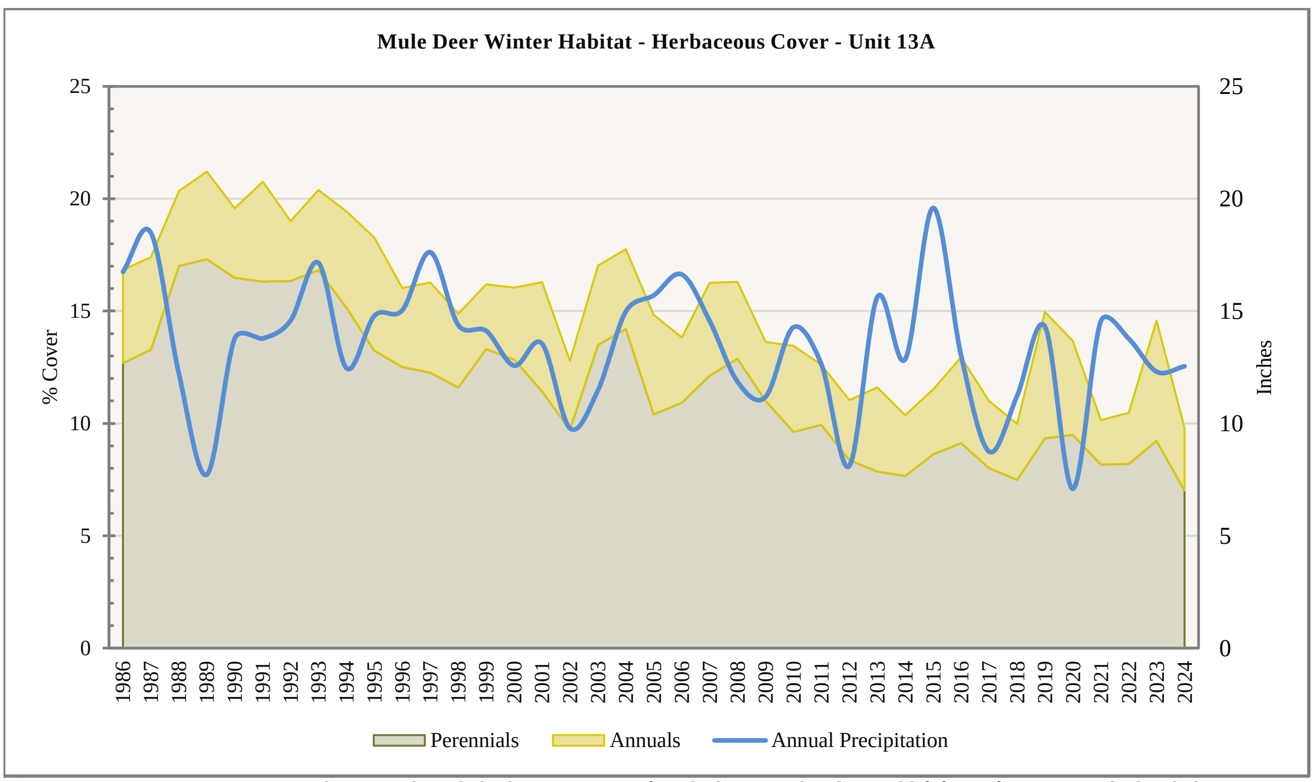


Figure 1.6: Average precipitation and estimated yearly herbaceous cover of stacked perennial and annual lifeforms for winter mule deer habitat in WMU 13A, La Sal Mountains (Rangeland Analysis Platform, 2025).

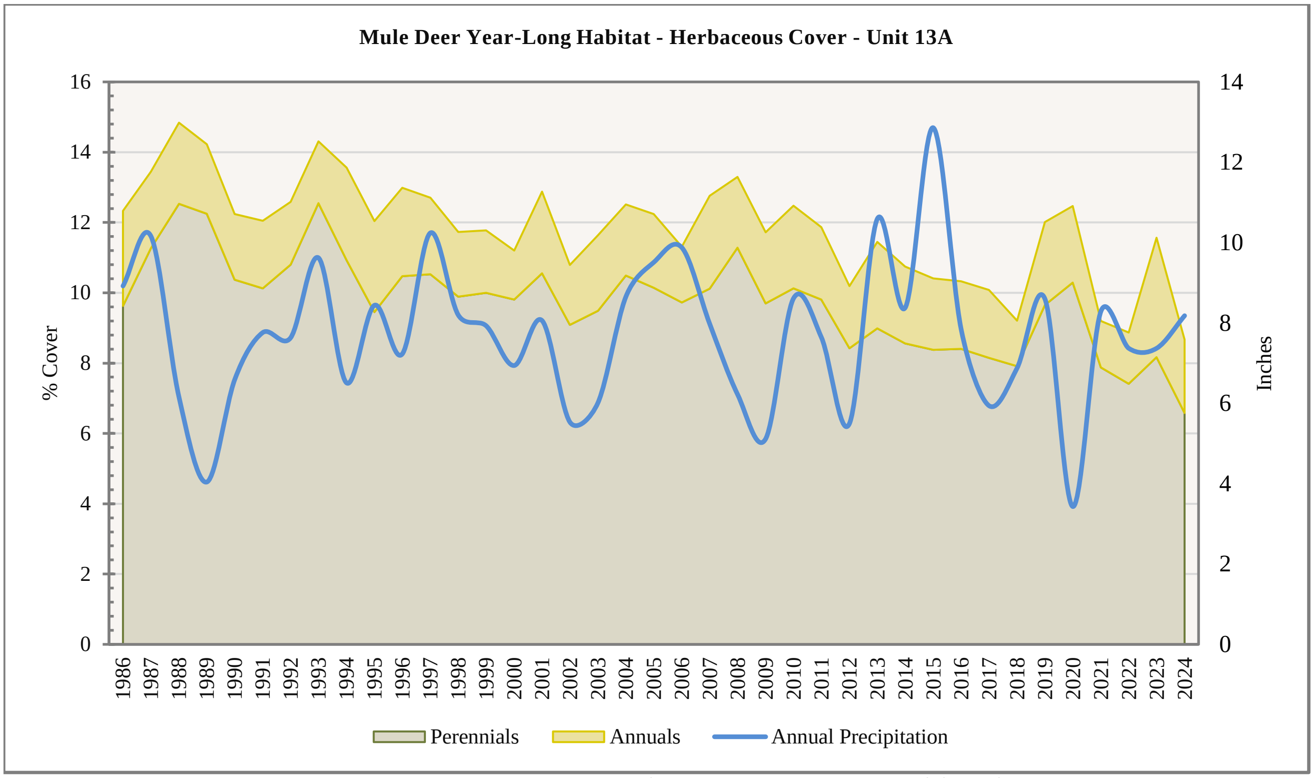


Figure 1.7: Average precipitation and estimated yearly herbaceous cover of stacked perennial and annual lifeforms for year-long mule deer habitat in WMU 13A, La Sal Mountains (Rangeland Analysis Platform, 2025).

RAP – Shrub and Tree Cover by Deer Habitat

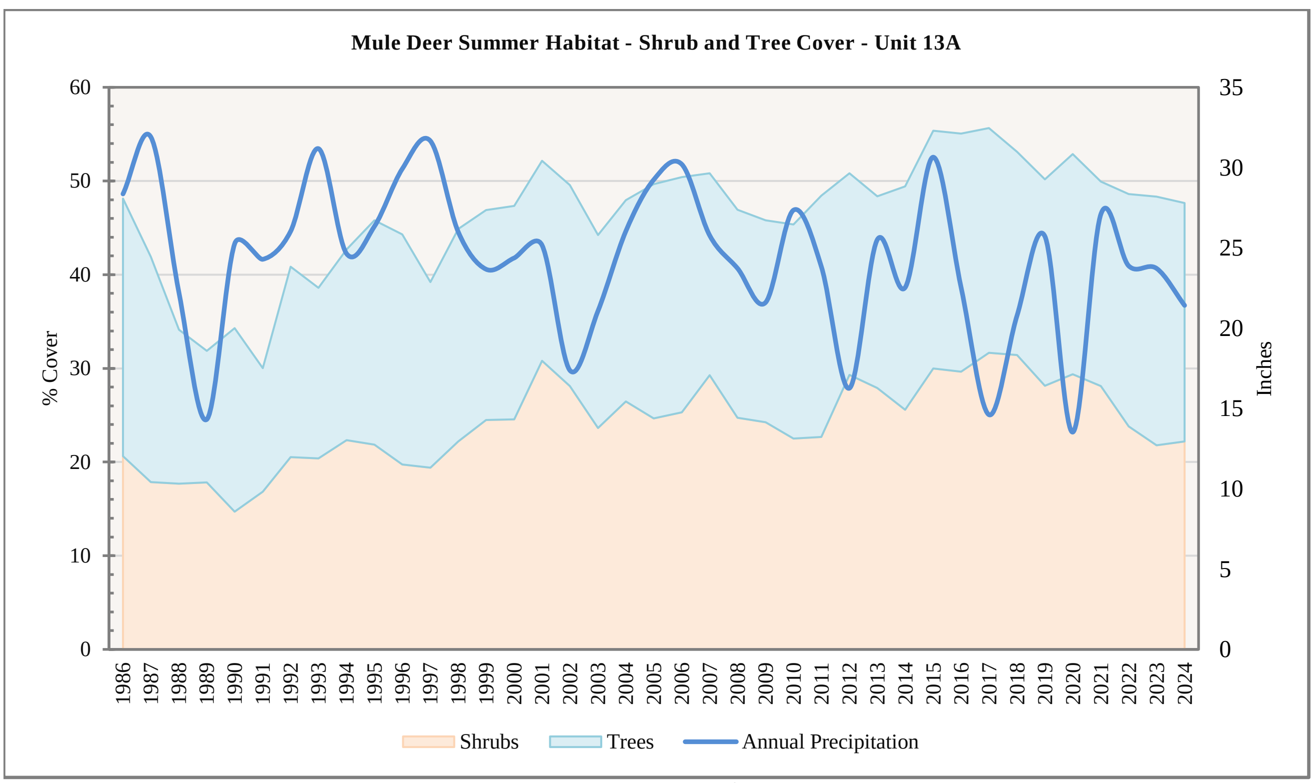


Figure 1.8: Average precipitation and estimated yearly stacked shrub and tree cover for summer mule deer habitat in WMU 13A, La Sal Mountains (Rangeland Analysis Platform, 2025).

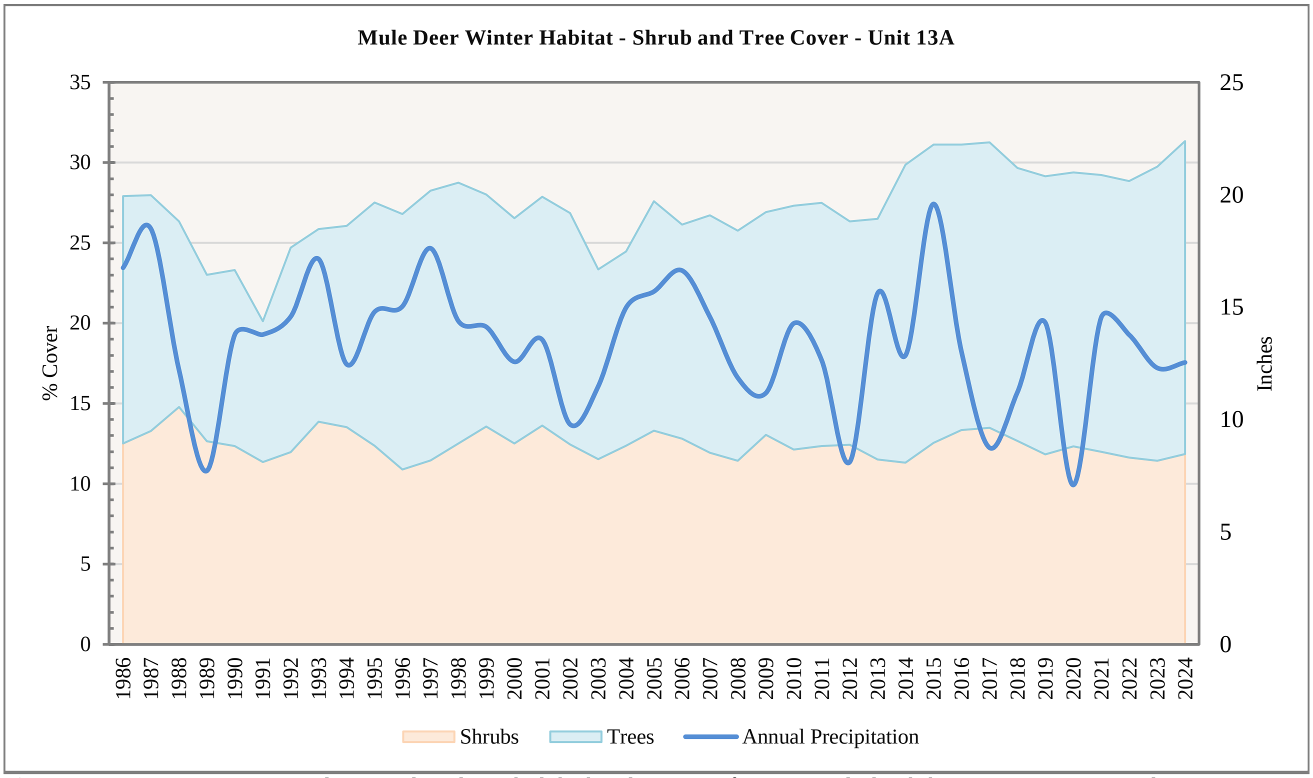


Figure 1.9: Average precipitation and estimated yearly stacked shrub and tree cover for winter mule deer habitat in WMU 13A, La Sal Mountains (Rangeland Analysis Platform, 2025).

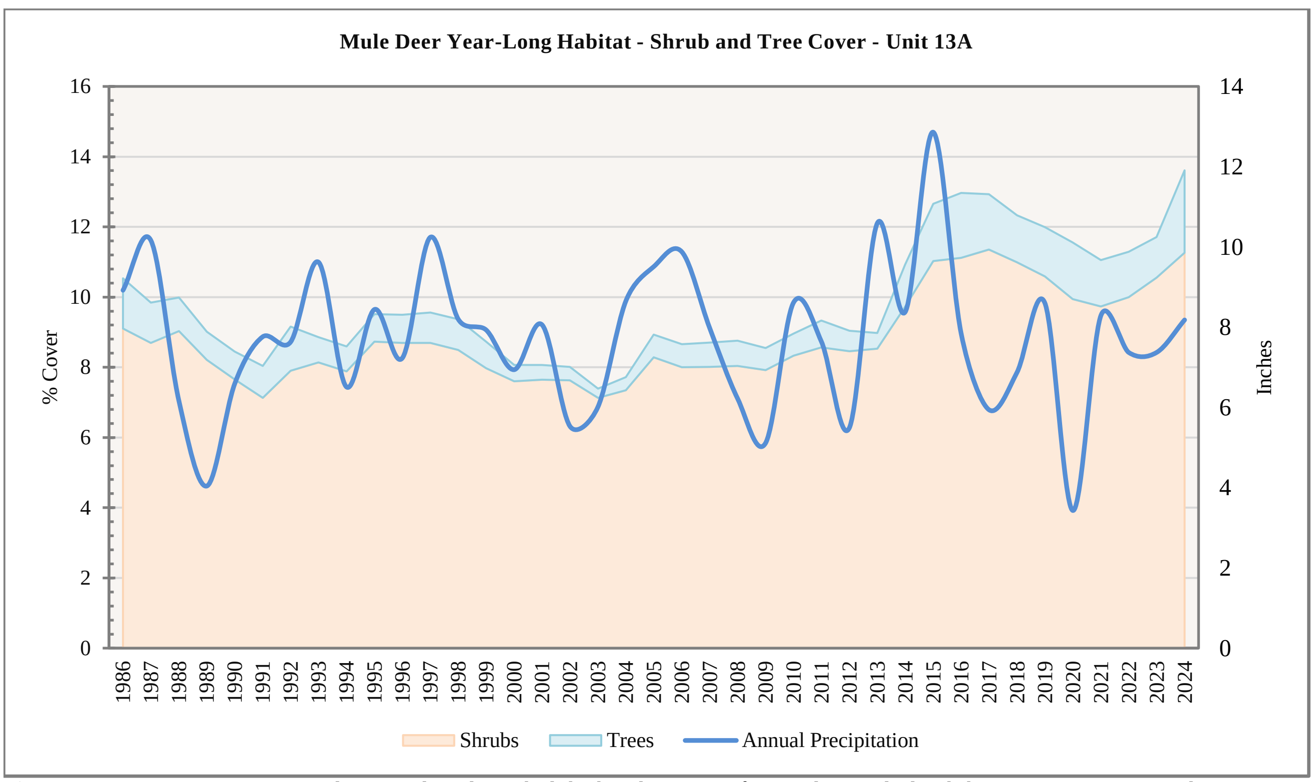
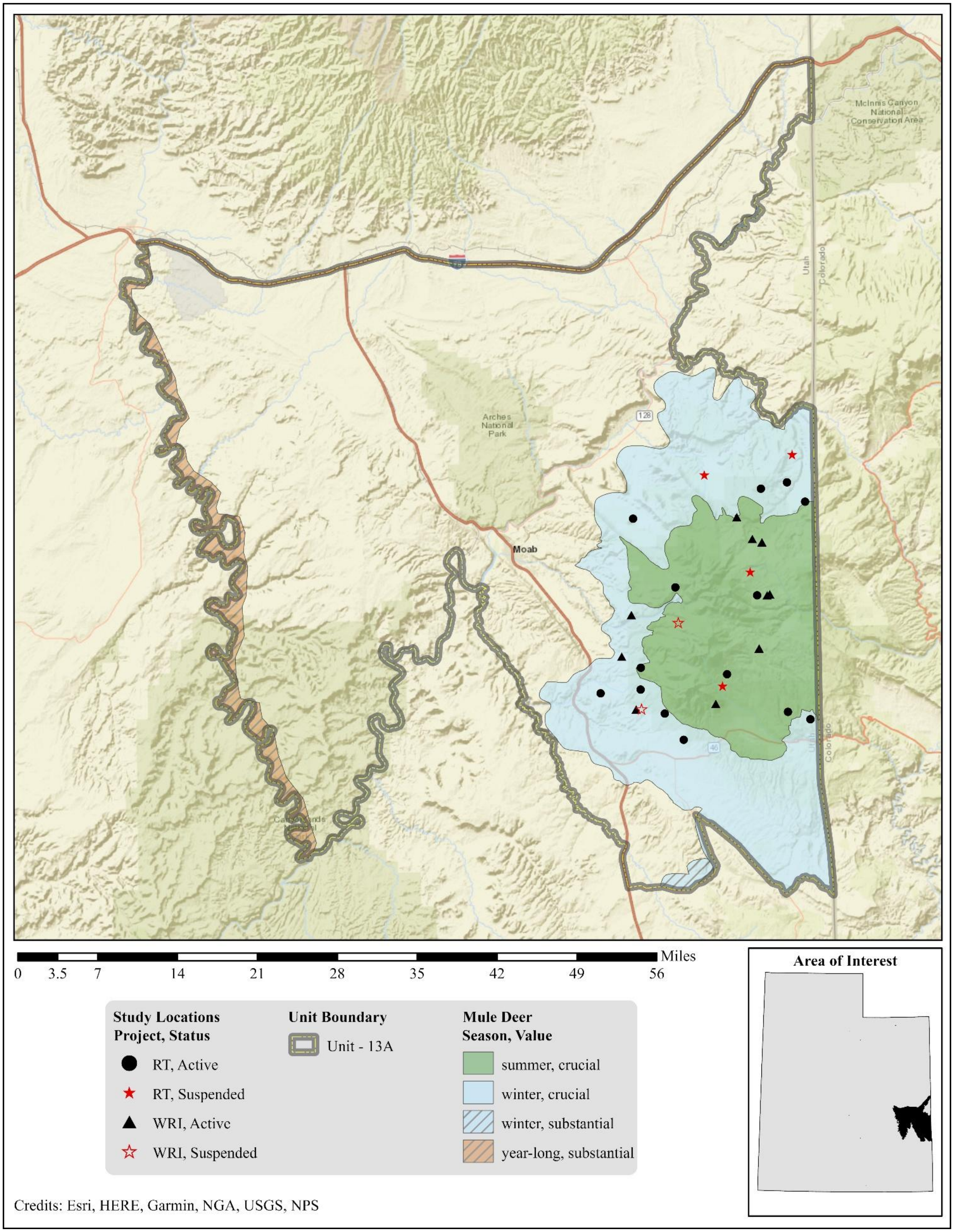
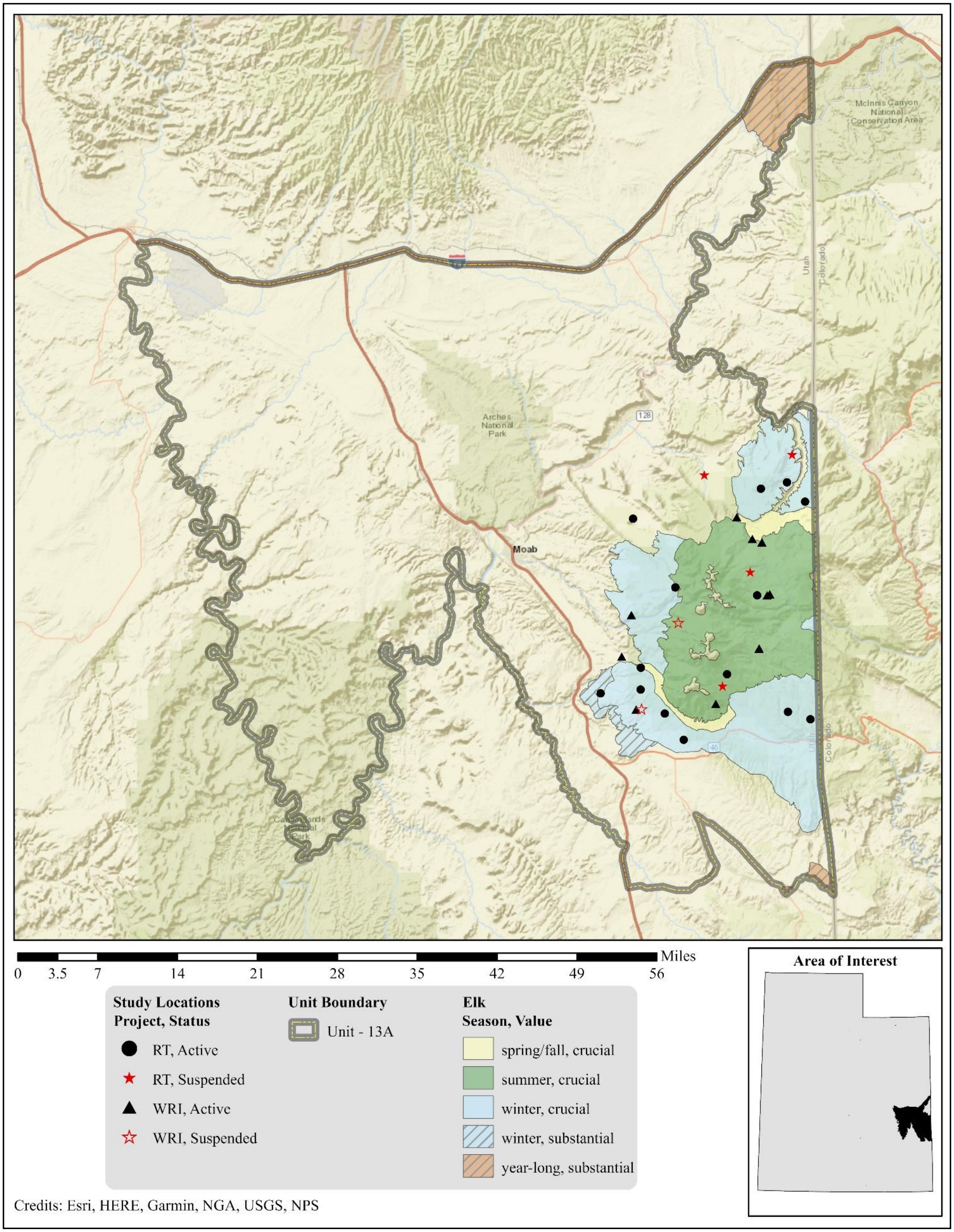


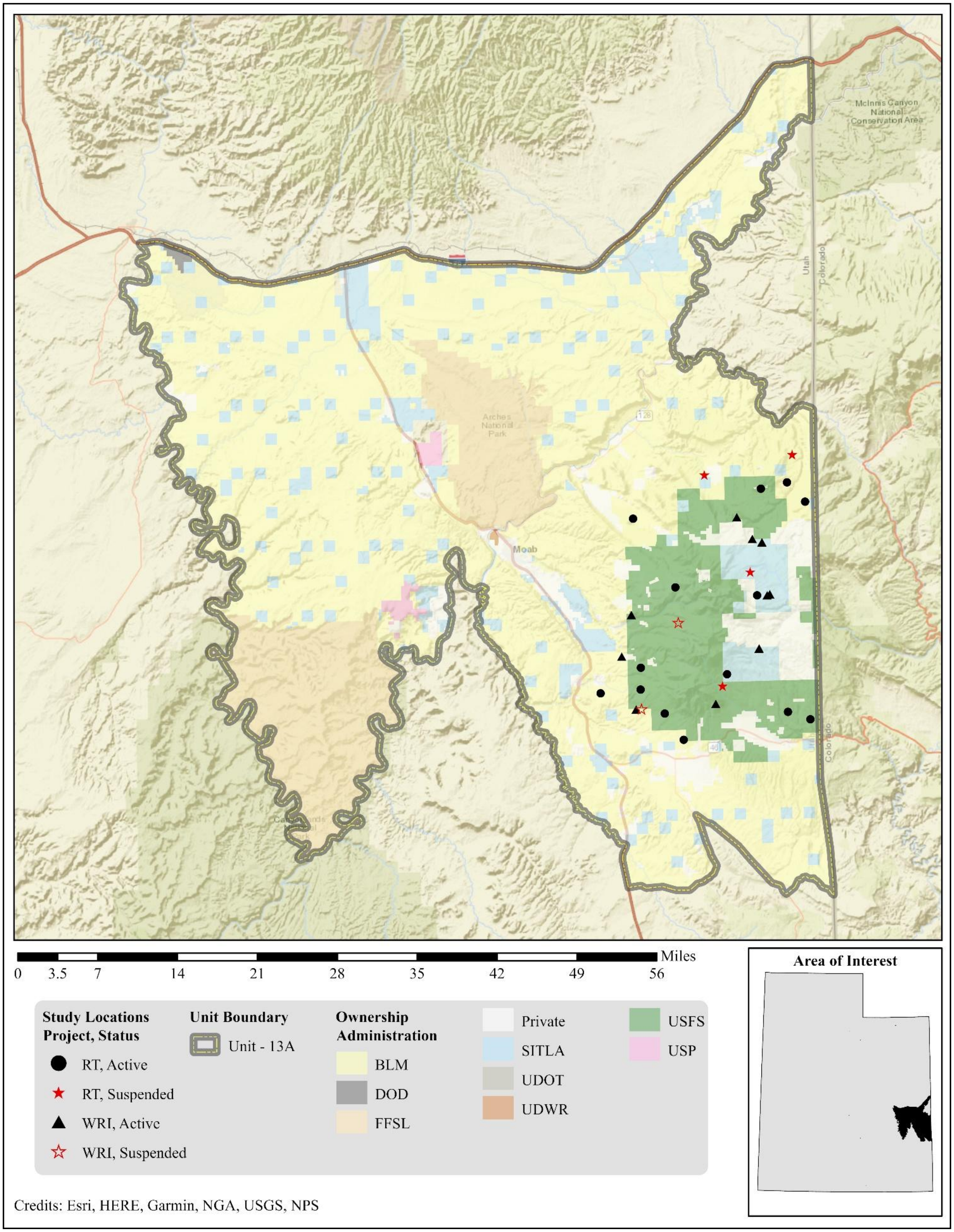
Figure 1.10: Average precipitation and estimated yearly stacked shrub and tree cover for year-long mule deer habitat in WMU 13A, La Sal Mountains (Rangeland Analysis Platform, 2025).



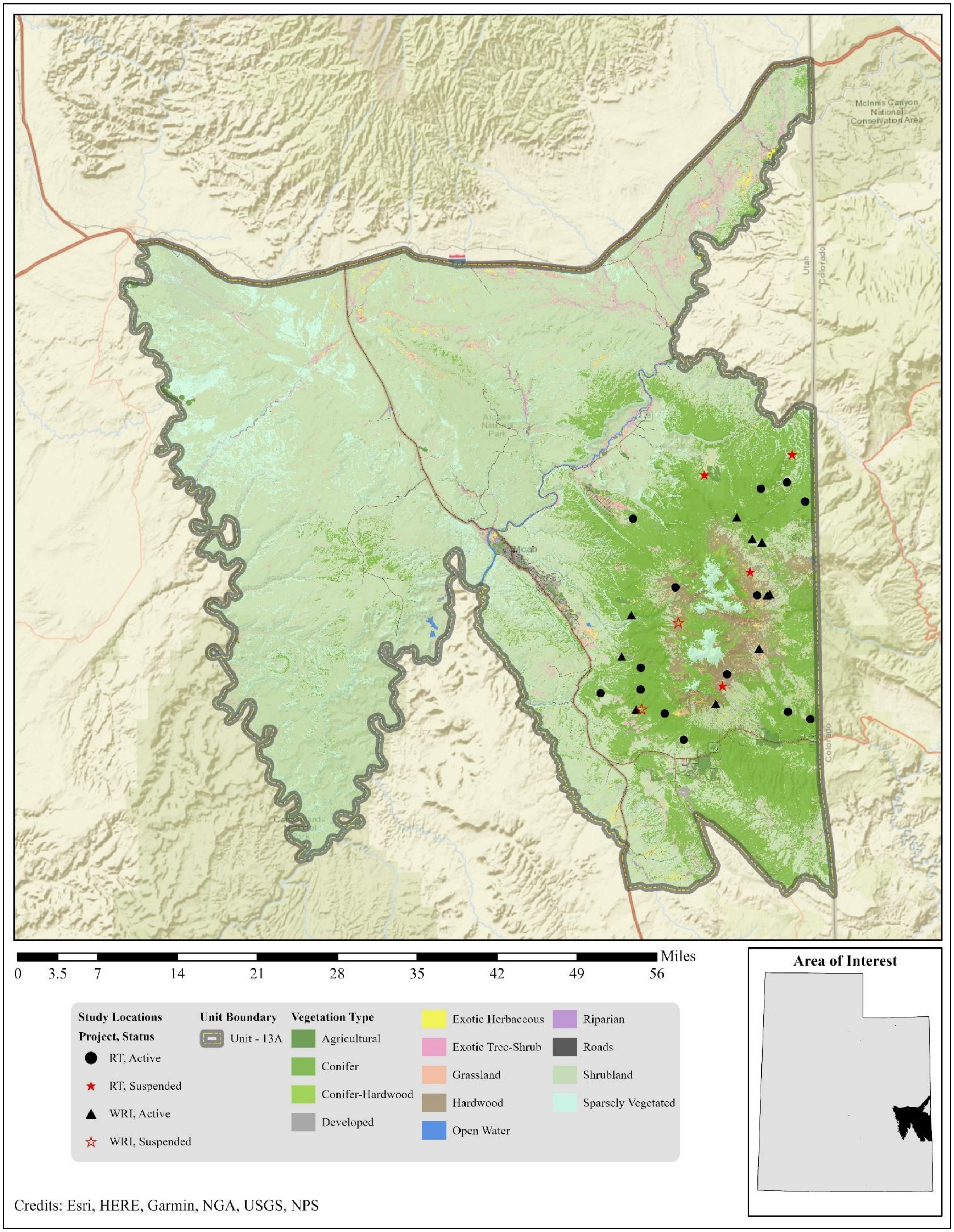
Map 1.2: Estimated mule deer habitat by season and value for WMU 13A, La Sal Mountains.



Map 1.3: Estimated elk habitat by season and value for WMU 13A, La Sal Mountains.



Map 1.4: Land ownership for WMU 13A, La Sal Mountains.



Map 1.5: LANDFIRE Existing Vegetation Type map (LC23_EVT_240, 2023) for WMU 13A, La Sal Mountains.

LANDFIRE Existing Vegetation Type for Mule Deer Habitat

According to the current LANDFIRE Existing Vegetation Type model, pinyon-juniper shrubland and woodland vegetation types comprise approximately 63.5% of the mule deer winter habitat, nearly 15% of the summer range, and almost 2% of the year-long habitat in WMU 13A (**Table 1.1**, **Table 1.2**, **Table 1.3**). These woodlands are usually located in lower elevations and may be associated with understory browse species known to be beneficial to mule deer, although abundance can vary widely. Encroachment of pinyon (*Pinus* spp.) and juniper (*Juniperus* spp.) into sagebrush (*Artemisia* spp.) shrublands has been observed in this unit. However, it is possible that some historical sagebrush types within this unit have been identified as pinyon-juniper woodland types due to their departure from the reference vegetation conditions. When pinyon and juniper encroach on existing shrublands, they can lead to decreased sagebrush and herbaceous components (Miller, Svejcar, & Rose, 2000), therefore decreasing available forage for wildlife.

The model also indicates that sagebrush steppe and shrublands make up approximately 15% of the La Sal Mountains unit's winter range for mule deer (**Table 1.2**). These biophysical sites can be found at elevations ranging from low (semidesert) to high (mountain). Sagebrush species typically dominate these biophysical sites across the elevation gradient and may provide valuable browse for deer when they are present on winter range. These sites may also be host to other preferred browse species in lesser amounts, and pinyon and juniper may be present at middle elevations. Over 41% of year-long habitat and 3.5% of winter range is comprised of the Colorado Plateau Blackbrush-Mormon-tea Shrubland type (**Table 1.2**, **Table 1.3**); sites of this vegetation type are low in elevation. Browse species that could provide valuable forage during the winter months are often present and may include species such as blackbrush (*Coleogyne ramosissima*), Mormon tea or Torrey's jointfir (*Ephedra viridis* or *E. torreyana*), and spiny hopsage (*Grayia spinosa*).

Of the mule deer summer range, the model suggests that 21% is comprised of aspen (*Populus tremuloides*) vegetation types (**Table 1.1**) that are usually found at middle-high to higher elevations. Although aspen dominates these biophysical sites, preferred browse species such as chokecherry (*Prunus virginiana*), serviceberry (*Amelanchier* spp.), and mountain snowberry (*Symphoricarpos oreophilus*) (among others) are commonly found. In addition, sites of these types typically have abundant understories that could provide forage for mule deer during the summer months. The model also indicates that over 20% of the summer habitat is comprised of the Rocky Mountain Gambel Oak-Mixed Montane Shrubland vegetation type (**Table 1.1**). This biophysical site occurs at higher elevations and is host to Gambel oak (*Quercus gambelii*) with a good herbaceous component. Other browse species such as serviceberry and sagebrush may be present in addition to oak.

A variety of other vegetation types comprise the rest of the mule deer habitat within the La Sal Mountains Management Unit (**Map 1.5**, **Table 1.1**, **Table 1.2**, **Table 1.3**), but they will not be discussed here. Descriptions for these additional vegetation types can be found on the LANDFIRE BpS Models and Descriptions Support webpage (The Nature Conservancy LANDFIRE Team, 2015).

Group	Existing Vegetation Type for Summer Mule Deer Habitat	Acres	% of Total	Group % of Total
Conifer	Southern Rocky Mountain Ponderosa Pine Woodland	33,334	18.31%	
	Colorado Plateau Pinyon-Juniper Woodland	26,631	14.63%	
	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	12,927	7.10%	
	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	5,909	3.25%	
	Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland	3,565	1.96%	
	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	1,252	0.69%	
	Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland	443	0.24%	
	Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland	236	0.13%	
	Southern Rocky Mountain Ponderosa Pine Savanna	30	0.02%	46.31%

Group	Existing Vegetation Type for Summer Mule Deer Habitat	Acres	% of Total	Group % of Total
Shrubland	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	37,170	20.41%	
	Inter-Mountain Basins Montane Sagebrush Steppe	1,780	0.98%	
	Rocky Mountain Lower Montane-Foothill Shrubland	1,375	0.76%	
	Inter-Mountain Basins Big Sagebrush Shrubland	933	0.51%	
	Colorado Plateau Mixed Low Sagebrush Shrubland	130	0.07%	
	Rocky Mountain Alpine Dwarf-Shrubland	59	0.03%	
	Inter-Mountain Basins Semi-Desert Shrub-Steppe	42	0.02%	
	Inter-Mountain Basins Mixed Salt Desert Scrub	7	0.00%	
	Colorado Plateau Pinyon-Juniper Shrubland	2	0.00%	
	Inter-Mountain Basins Greasewood Flat	<1	0.00%	22.79%
Hardwood	Rocky Mountain Aspen Forest and Woodland	34,613	19.01%	19.01%
Other	Sparsely Vegetated	10,447	5.74%	
	Riparian	3,303	1.81%	
	Agricultural	2,626	1.44%	
	Developed	379	0.21%	
	Open Water	77	0.04%	
	Quarries-Strip Mines-Gravel Pits-Well and Wind Pads	15	0.01%	9.25%
Grassland	Rocky Mountain Subalpine-Montane Mesic Meadow	1,692	0.93%	
	Southern Rocky Mountain Montane-Subalpine Grassland	1,128	0.62%	
	Inter-Mountain Basins Semi-Desert Grassland	182	0.10%	
	Rocky Mountain Alpine Turf	7	0.00%	
	Rocky Mountain Alpine Fell-Field	2	0.00%	1.65%
Exotic Herbaceous	Great Basin & Intermountain Introduced Perennial Grassland and Forbland	641	0.35%	
	Interior Western North American Temperate Ruderal Grassland	971	0.53%	
	Great Basin & Intermountain Introduced Annual Grassland	104	0.06%	
	Great Basin & Intermountain Introduced Annual and Biennial Forbland	<1	0.00%	0.94%
Exotic Tree-Shrub	Interior Western North American Temperate Ruderal Shrubland	35	0.02%	
	Great Basin & Intermountain Ruderal Shrubland	33	0.02%	0.04%
Total		**182,079**	**100%**	**100%**

Table 1.1: LANDFIRE Existing Vegetation Type (LC23_EVT_240, 2023) acreage of summer mule deer habitat for WMU 13A, La Sal Mountains.

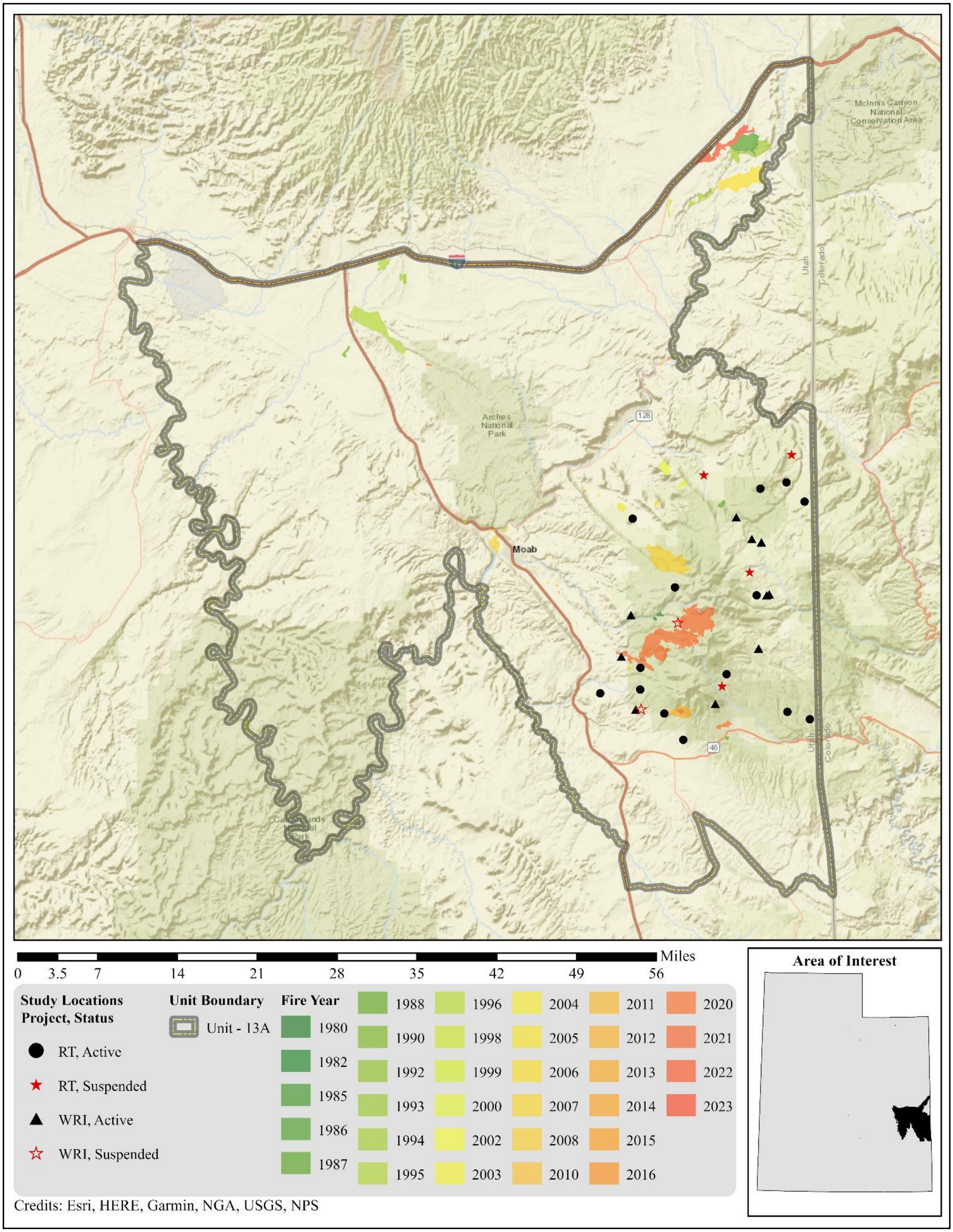
Group	Existing Vegetation Type for Winter Mule Deer Habitat	Acres	% of Total	Group % of Total
Conifer	Colorado Plateau Pinyon-Juniper Woodland	158,744	54.42%	
	Southern Rocky Mountain Ponderosa Pine Woodland	4,326	1.48%	
	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	1,603	0.55%	
	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	216	0.07%	
	Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland	2	0.00%	
	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	2	0.00%	
	Southern Rocky Mountain Ponderosa Pine Savanna	<1	0.00%	56.52%
Shrubland	Inter-Mountain Basins Big Sagebrush Shrubland	42,112	14.44%	
	Colorado Plateau Pinyon-Juniper Shrubland	26,599	9.12%	
	Colorado Plateau Blackbrush-Mormon-tea Shrubland	10,303	3.53%	
	Inter-Mountain Basins Semi-Desert Shrub-Steppe	5,269	1.81%	
	Inter-Mountain Basins Mixed Salt Desert Scrub	3,712	1.27%	
	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	3,078	1.06%	
	Rocky Mountain Lower Montane-Foothill Shrubland	2,062	0.71%	
	Inter-Mountain Basins Montane Sagebrush Steppe	1,662	0.57%	
	Colorado Plateau Mixed Low Sagebrush Shrubland	1,036	0.36%	
	Southern Colorado Plateau Sand Shrubland	405	0.14%	
	Inter-Mountain Basins Greasewood Flat	393	0.13%	
	Inter-Mountain Basins Mat Saltbush Shrubland	159	0.05%	33.18%
Other	Sparsely Vegetated	14,124	4.84%	
	Agricultural	4,652	1.59%	
	Developed	2,987	1.02%	
	Riparian	1,315	0.45%	
	Quarries-Strip Mines-Gravel Pits-Well and Wind Pads	938	0.32%	
	Open Water	132	0.05%	8.28%
Exotic Tree-Shrub	Great Basin & Intermountain Ruderal Shrubland	3,786	1.30%	
	Interior Western North American Temperate Ruderal Shrubland	34	0.01%	1.31%
Exotic Herbaceous	Great Basin & Intermountain Introduced Annual Grassland	453	0.16%	
	Great Basin & Intermountain Introduced Perennial Grassland and Forbland	353	0.12%	
	Great Basin & Intermountain Introduced Annual and Biennial Forbland	278	0.10%	
	Interior Western North American Temperate Ruderal Grassland	64	0.02%	0.39%

Group	Existing Vegetation Type for Winter Mule Deer Habitat	Acres	% of Total	Group % of Total
Grassland	Inter-Mountain Basins Semi-Desert Grassland	569	0.20%	
	Rocky Mountain Subalpine-Montane Mesic Meadow	38	0.01%	
	Southern Rocky Mountain Montane-Subalpine Grassland	30	0.01%	0.22%
Hardwood	Rocky Mountain Aspen Forest and Woodland	287	0.10%	0.10%
Total		**291,725**	**100%**	**100%**

Table 1.2: LANDFIRE Existing Vegetation Type (LC23_EVT_240, 2023) acreage of winter mule deer habitat for WMU 13A, La Sal Mountains.

Group	Existing Vegetation Type for Year-Long Mule Deer Habitat	Acres	% of Total	Group % of Total
Shrubland	Colorado Plateau Blackbrush-Mormon-tea Shrubland	18,164	41.25%	
	Inter-Mountain Basins Mixed Salt Desert Scrub	3,133	7.12%	
	Inter-Mountain Basins Mat Saltbush Shrubland	2,540	5.77%	
	Inter-Mountain Basins Greasewood Flat	468	1.06%	
	Inter-Mountain Basins Semi-Desert Shrub-Steppe	465	1.06%	
	Southern Colorado Plateau Sand Shrubland	409	0.93%	
	Colorado Plateau Mixed Low Sagebrush Shrubland	126	0.29%	
	Colorado Plateau Pinyon-Juniper Shrubland	53	0.12%	
	Rocky Mountain Lower Montane-Foothill Shrubland	50	0.11%	
	Inter-Mountain Basins Montane Sagebrush Steppe	35	0.08%	
	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	28	0.06%	
	Inter-Mountain Basins Big Sagebrush Shrubland	14	0.03%	57.88%
Other	Sparsely Vegetated	10,222	23.21%	
	Open Water	3,038	6.90%	
	Agricultural	1,364	3.10%	
	Riparian	468	1.06%	
	Quarries-Strip Mines-Gravel Pits-Well and Wind Pads	59	0.13%	
	Developed	45	0.10%	34.51%
Exotic Tree-Shrub	Great Basin & Intermountain Ruderal Shrubland	2,013	4.57%	
	Interior Western North American Temperate Ruderal Shrubland	200	0.46%	5.03%
Conifer	Colorado Plateau Pinyon-Juniper Woodland	804	1.82%	
	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	39	0.09%	
	Southern Rocky Mountain Ponderosa Pine Woodland	22	0.05%	
	Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland	7	0.02%	
	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	2	0.00%	
	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	1	0.00%	1.98%
Exotic Herbaceous	Great Basin & Intermountain Introduced Perennial Grassland and Forbland	54	0.12%	
	Great Basin & Intermountain Introduced Annual and Biennial Forbland	50	0.11%	
	Great Basin & Intermountain Introduced Annual Grassland	42	0.10%	
	Interior Western North American Temperate Ruderal Grassland	3	0.01%	0.34%
Grassland	Inter-Mountain Basins Semi-Desert Grassland	94	0.21%	
	Rocky Mountain Subalpine-Montane Mesic Meadow	17	0.04%	
	Southern Rocky Mountain Montane-Subalpine Grassland	2	0.00%	0.26%
Total		**44,031**	**100%**	**100%**

Table 1.3: LANDFIRE Existing Vegetation Type (LC23_EVT_240, 2023) acreage of year-long mule deer habitat for WMU 13A, La Sal Mountains.



Map 1.6: Land coverage of fires by year from 1980-2023 for WMU 13A, La Sal Mountains (NIFC Open Data Site: Federal Interagency Wildland Fire Maps and Data for All, 2025).

Treatments/Restoration Work

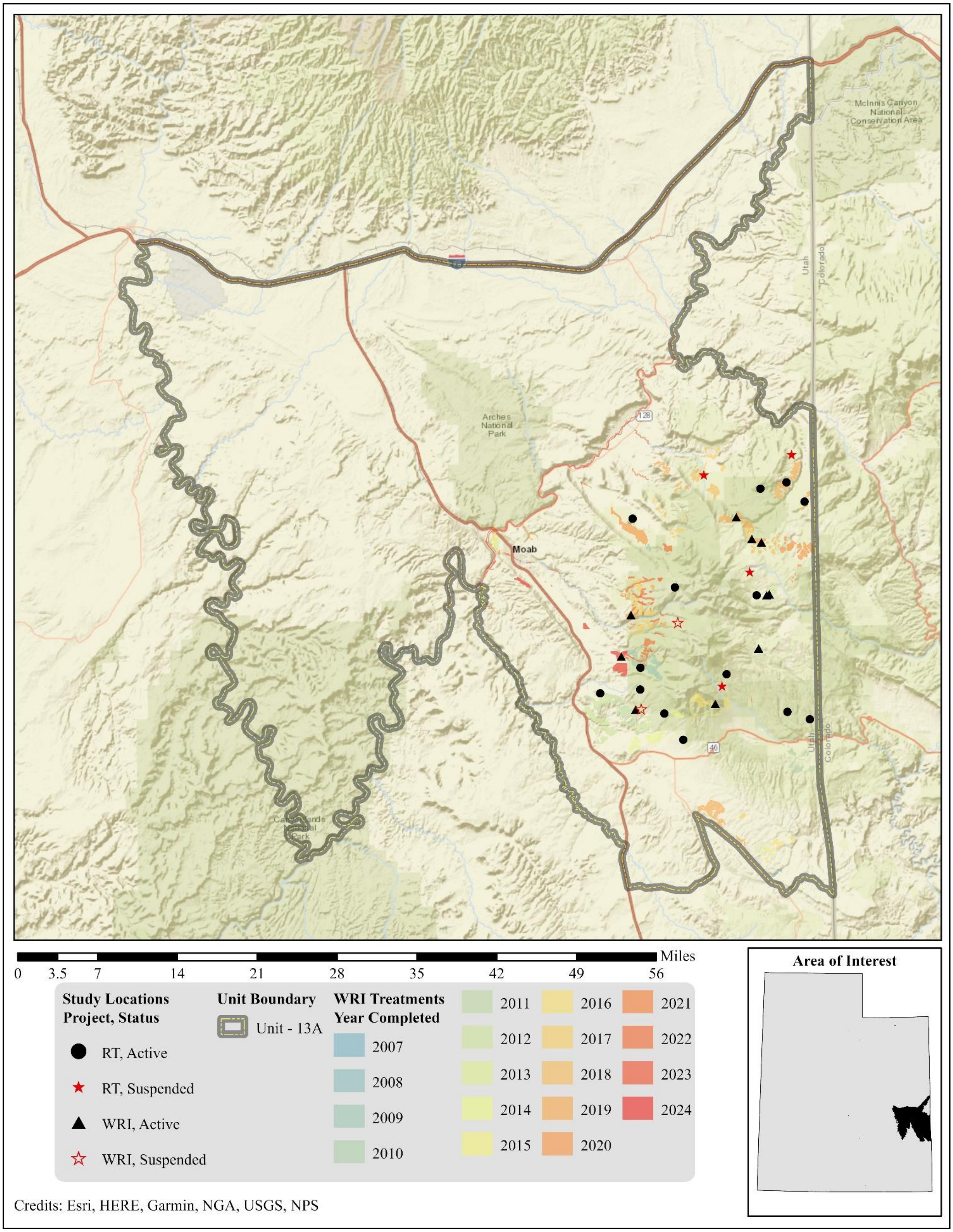
There has been an active effort to address many of the limitations on this unit through the Watershed Restoration Initiative (WRI). A total of 27,294 acres of land have been treated within the La Sal Mountains unit since the WRI was implemented in 2004. Treatments frequently overlap one another, bringing the net total of completed treatment acres to 24,468 for this unit (**Map 1.7**, **Table 1.4**). Other treatments have occurred outside of the WRI through independent agencies and landowners, but the WRI comprises most of the work done on deer winter ranges throughout the state of Utah.

Lop and scatter to remove pinyon (*Pinus* spp.) and juniper (*Juniperus* spp.) is the most common treatment type. However, mastication treatments to remove pinyon and juniper trees are also very common. Herbicide application to remove invasive species is an effective tool to manage cheatgrass (*Bromus tectorum*) and has been employed as a treatment method in unit 13A. Other management practices in this unit include (but are not limited to) seeding, prescribed fire, forestry practices, and shrub transplants (**Table 1.4**).

Type	Total Completed Acreage
Vegetation Removal/Hand Crew	**11,825**
Lop & Scatter	8,389
Lop-Pile-Burn	2,639
Cut Stump	751
Lop & Chip	39
Lop (No Scatter)	7
Bullhog	**7,157**
Full Size	6,204
Skid Steer	953
Herbicide Application	**3,424**
Spot Treatment	2,132
Aerial (Fixed-Wing)	1,292
Prescribed Fire	**2,075**
Prescribed Fire	1,896
Pile Burn	180
Seeding (Primary)	**1,971**
Broadcast (Aerial-Helicopter)	597
Broadcast (Aerial-Fixed Wing)	557
Hand Seeding	502
Ground (Mechanical Application)	274
Drill (Rangeland)	41
Planting/Transplanting	**244**
Other	161
Bareroot Stock	73
Container Stock	10
Forestry Practices	**206**
Ripping	124
Clearcutting	57
Thinning (Non-Commercial)	25
Anchor Chain	**157**
Ely (One-Way)	152
Ely (Two-Way)	4
Chain Harrow	**89**
> 15 ft. (One-Way)	89
Harrow	**53**
≤ 15 ft. (One-Way)	53
Mowing	**49**
Other	49
Seeding (Secondary/Shrub)	**21**
Hand Seeding	21
Interseeding	**18**
Interseeding	18

Type	Total Completed Acreage
Other	**6**
Road Decommissioning	4
Road/Parking Area Improvements	2
Grand Total	**27,294**
***Net Total Land Area Treated**	**24,468**

Table 1.4: WRI treatment action size (acres) of completed projects for WMU 13A, La Sal Mountains. Data accessed on 02/25/2025.
*Does not include overlapping treatments.



Map 1.7: Terrestrial WRI treatments by fiscal year completed for WMU 13A, La Sal Mountains.

Range Trend Studies

Range Trend studies have been sampled within WMU 13A on a regular basis since 1987, with studies being added or suspended as was deemed necessary (**Table 1.5**). Due to changes in sampling methodologies, only data collected following the 1992 sample year is included in this summary. Monitoring studies of Watershed Restoration Initiative (WRI) projects began in 2004. When possible, WRI monitoring studies are established prior to treatment and sampled on a regular basis following treatment. Due to the long-term nature of the studies, many of the Range Trend and WRI sites have had some sort of disturbance or treatment prior to or since study establishment (**Table 1.6**). Range Trend studies are summarized in this report by ecological site.

Study #	Study Name	Project	Status	Years Sampled	Ecological Site Description
13A-01	Two Mile Chaining	RT	Active	1987, 1994, 1999, 2004, 2009, 2014, 2019, 2024	Mountain Loam (Mountain Big Sagebrush)
13A-02	East LaSal Pass	RT	Suspended	1987, 1994, 1999	High Mountain Loam (Aspen)
13A-03	Buck Hollow	RT	Active	1987, 1994, 1999, 2004, 2009, 2014, 2019, 2024	Upland Stony Loam (Shrub)
13A-04	Slaughter Flat	RT	Active	1987, 1994, 1999, 2004, 2009, 2014, 2019, 2024	Upland Loam (Mountain Big Sagebrush)
13A-05	Amasas Back	RT	Active	1987, 1994, 1999, 2004, 2009, 2014, 2019, 2024	Upland Shallow Loam (Black Sagebrush)
13A-06	Bald Mesa	RT	Active	1987, 1994, 1999, 2004, 2009, 2014, 2019, 2024	High Mountain Loam (Mountain Big Sagebrush)
13A-07	Round Mountain	RT	Active	1987, 1994, 1999, 2004, 2009, 2014, 2019, 2024	Semidesert Stony Loam (Blackbrush)
13A-08	Black Ridge	RT	Active	1987, 1994, 1999, 2004, 2009, 2014, 2019, 2024	Upland Loam (Mountain Big Sagebrush)
13A-09	Taylor Flat	RT	Suspended	1987, 1994, 1999	High Mountain Loam (Mountain Big Sagebrush)
13A-10	Upper Fisher Valley	RT	Suspended	1987, 1994, 1999, 2004, 2009	Upland Loam (Mountain Big Sagebrush)
13A-11	North Beaver Mesa	RT	Active	1987, 1994, 1999, 2004, 2009, 2014, 2019, 2024	Upland Loam (Mountain Big Sagebrush)
13A-12	Below Polar Rim	RT	Active	1987, 1994, 1999, 2004, 2009, 2014, 2019, 2024	Upland Loam (Mountain Big Sagebrush)
13A-13	Beaver Canyon	RT	Suspended	1987, 1994	Upland Loam (Mountain Big Sagebrush)
13A-14	Lower Lackey Fan	RT	Active	1994, 1999, 2004, 2009, 2014, 2019, 2024	Upland Stony Loam (Wyoming Big Sagebrush)
13A-15	Hideout Mesa	RT	Active	1994, 1999, 2004, 2009, 2014, 2019, 2024	Mountain Loam (Mountain Big Sagebrush)
13A-16	Beaver Creek	RT	Active	2004, 2009, 2014, 2019, 2024	High Mountain Loam (Aspen)
13A-17	Bar -A	RT	Active	2004, 2009, 2014, 2019, 2024	High Mountain Loam (Thurber Fescue)
13A-18	Dolores Point	RT	Active	2019, 2024	Mountain Loam (Mountain Big Sagebrush)
13R-01	Horse Creek Burn	WRI	Suspended	2007	Not Verified
13R-02	Pack Creek	WRI	Active	2007, 2010, 2014, 2019, 2024	Semidesert Stony Loam (Blackbrush)
13R-03	Black Ridge Fuel Reduction	WRI	Active	2010, 2013, 2016, 2021	Upland Gravelly Loam (Pinyon-Utah Juniper)
13R-04	Black Ridge Fuel Reduction Reference	WRI	Suspended	2010	Not Verified
13R-05	La Sal Aspen Exclosure	WRI	Active	2011, 2014, 2019, 2024	High Mountain Loam (Aspen)
13R-06	La Sal Aspen	WRI	Active	2011, 2014, 2019, 2024	High Mountain Loam (Aspen)

Study #	Study Name	Project	Status	Years Sampled	Ecological Site Description
13R-07	Doe Canyon	WRI	Active	2013, 2018	High Mountain Loam (Aspen)
13R-08	Hop Creek Aspen	WRI	Active	2013, 2016, 2021	High Mountain Loam (Aspen)
13R-09	Hop Creek Aspen Exclosure	WRI	Active	2013, 2016, 2021	High Mountain Loam (Aspen)
13R-10	Brush Hole	WRI	Active	2016, 2022	Mountain Loam (Oak)
13R-11	Above Fisher Creek	WRI	Active	2018, 2021	Mountain Stony Loam (Shrub)
13R-12	South Mesa	WRI	Active	2018, 2021	Mountain Shallow Loam (Black Sagebrush)
13R-13	Sids Draw	WRI	Active	2019, 2022	Mountain Loam (Oak)

Table 1.5: Range Trend and WRI project studies monitoring history and ecological site potential for WMU 13A, La Sal Mountains.

Study #	Study Name	Type	Disturbance Name (If Available)	Date	Acres	WRI Project #
13A-01	Two Mile Chaining	Chain Unknown		1978	900	
		Seed Unknown		1978	900	
13A-03	Buck Hollow	Chain Unknown	Buck Hollow	1982	700	
		Seed Unknown	Buck Hollow	1982	700	
13A-04	Slaughter Flat	Chain Unknown		1974	940	
		Seed Unknown		1974	940	
13A-05	Amasas Back	Chain Unknown		1978	750	
		Seed Unknown		1978	750	
13A-08	Black Ridge	Aerial Before	Black Ridge Chaining 1967	September-December 1966	3,043	1096*
		Two-Way Ely	Black Ridge Chaining 1967	September-December 1966	3,043	1096*
		Lop and Scatter	Black Ridge Fuels Reduction and Vegetation Restoration - Phase II	2011	1,359	1730
		Aerial	Black Ridge Fuels Reduction and Vegetation Restoration - Phase II	September 2011	1,473	1730
13A-10	Upper Fisher Valley	Two-Way Unknown		1960		
		Seed Unknown		1960		
		Lop and Scatter	Moab Mule Deer Winter Range Improvement Project-Fisher Mesa Phase 1	October-November 2016	431	3790
13A-11	North Beaver Mesa	Chain Unknown		1962	1,000	
		Seed Unknown		1962	1,000	
13A-12	Below Polar Rim	Two-Way Unknown	North Beaver Mesa Seeding 1969	1969	1,540	8076*
		Seed Unknown	North Beaver Mesa Seeding 1969	1969	2,138	8076*
		Lop and Scatter	Moab Mule Deer Winter Range Habitat Improvement-Phase 3	November 2018	1,470	4514
13A-14	Lower Lackey Fan	Seed Unknown	LaSal Wray Mesa Seeding 1949	1949	4,093	6582*
		Seed Unknown	Lacky Reseeding 1953	1953	1,578	6497*
		Spike	Lacky Fan Sagebrush Treatment 1990	August 1989 - April 1990	3,064	6499*
13A-15	Hideout Mesa	Wildfire	Hideout Mesa Fire	1992		
13A-17	Bar -A	Wildfire	Bar A	2008	26	
13A-18	Dolores Point	Lop and Scatter	Moab Mule Deer Winter Range Habitat Improvement-Phase 3	November 2018	1,470	4514
13R-02	Pack Creek	Lop and Scatter	Pack Creek	2003	176	8471*
		Bullhog	Pack Creek	April 2007	127	907
		Slash Pile	Pack Creek	October 2007	127	907
		Broadcast/Harrow	Pack Creek	October 2007	127	907
			Mill Creek (Moab) Restoration 5 (Proposed)	2024-2025		6969
13R-03	Black Ridge Fuel Reduction	Aerial Before	Black Ridge Tree Chaining and Seeding	September-December 1966	3,043	1096*
		Two-Way Ely	Black Ridge Tree Chaining and Seeding	September-December 1966	3,043	1096*
		Bullhog	Black Ridge Fuels Reduction and Vegetation Restoration	September 2010-May 2011	1,803	1408
		Aerial Unknown	Black Ridge Fuels Reduction and Vegetation Restoration	Fall 2010	1,471	1408
13R-05	La Sal Aspen Exclosure	Coppice Cutting	La Sal Mountain Aspen Enhancement	September-November 2011	124	1990

Study #	Study Name	Type	Disturbance Name (If Available)	Date	Acres	WRI Project #
13R-06	La Sal Aspen	Coppice Cutting	La Sal Mountain Aspen Enhancement	September-November 2011	124	1990
13R-07	Doe Canyon	Prescribed	Lackey Basin Aspen Restoration	June 2016	665	2620
13R-08	Hop Creek Aspen	Coppice Cutting		2011-2012		
13R-09	Hop Creek Aspen Exclosure	Coppice Cutting		2011-2012		
13R-10	Brush Hole	Bullhog	Brush Hole Shrub Treatment	April-May 2017	359	3630
13R-11	Above Fisher Creek	Bullhog Bullhog	Brush Hole Shrub Treatment North End La Sal (Brush Hole Phase 3)	April-May 2017 November 2018-June 2019	1,248 747	3630 4614
13R-12	South Mesa	Bullhog	West Slope WUI Phase 4	June 2019	375	4491
13R-13	Sids Draw	Bullhog	North End La Sal (Brush Hole Phase 4)	August-October 2019	1,247	4837

Table 1.6: Range Trend and WRI studies known disturbance history for WMU 13A, La Sal Mountains. PDB = Pre-Database; LTDL = Land Treatment Digital Library (Pilliod, Welty, & Jefferies, 2019). *Numbers with an asterisk are LTDL project numbers.

Study Trend Summary (Range Trend)

Ecotypes represented by only one study site throughout most or all of the sample period are listed below, but they are not discussed in this section. However, graphs for these ecotypes have been included and referenced when a representative study site is active as of the 2024 sample year:

- Mountain (Aspen) - East LaSal Pass (13A-02) (suspended) and Beaver Creek (13A-16)
  - (**Figure 1.12**, **Figure 1.16**, **Figure 1.19**, **Figure 1.22**, **Figure 1.25**, **Figure 1.28**, **Figure 1.33**, **Figure 1.37**)
- Mountain (Thurber Fescue) - Bar-A (13A-17)
  - (**Figure 1.12**, **Figure 1.16**, **Figure 1.19**, **Figure 1.22**, **Figure 1.25**, **Figure 1.28**, **Figure 1.33**, **Figure 1.37**)
- Upland (Shrub) - Buck Hollow (13A-03)
  - (**Figure 1.13**, **Figure 1.17**, **Figure 1.20**, **Figure 1.23**, **Figure 1.26**, **Figure 1.30**, **Figure 1.35**, **Figure 1.38**)
- Upland (Black/Low Sagebrush) - Amasas Back (13A-05)
  - (**Figure 1.11**, **Figure 1.15**, **Figure 1.18**, **Figure 1.21**, **Figure 1.24**, **Figure 1.30**, **Figure 1.35**, **Figure 1.38**)
- Semidesert (Blackbrush) - Round Mountain (13A-07)
  - (**Figure 1.14**, **Figure 1.17**, **Figure 1.20**, **Figure 1.23**, **Figure 1.26**, **Figure 1.31**, **Figure 1.36**, **Figure 1.39**)

Trend summaries and/or additional data for these ecotypes are available in the corresponding site reports (Lane, Cox, & Payne, 2025).

Mountain (Big Sagebrush)

Five study sites [Two Mile Chaining (13A-01), Bald Mesa (13A-06), Taylor Flat (13A-09) (suspended), Hideout Mesa (13A-15), and Dolores Point (13A-18)] are classified as Mountain (Big Sagebrush) ecological sites. The Two Mile Chaining study is located just west of Trough Draw near the Utah-Colorado state line, while Bald Mesa can be found on top of Bald Mesa near Warner Lake. The Taylor Flat site is situated roughly one mile south of Taylor Creek on Taylor Flat. Hideout Mesa is in Dry Draw below Hideout Mesa and is roughly three-quarters of a mile west of the Utah-Colorado state line. Finally, the Dolores Point study is situated just south of Dolores Point near the Utah-Colorado border.

Consideration should be given to the varying number of study sites sampled each year (the ‘n’ value) and the relevant implications that this may have on the data. More specifically, the Taylor Flat study only contributes data for the 1994 and 1999 years, while Dolores Point has provided data since study establishment in 2019.

The Two Mile Chaining, Bald Mesa, and Hideout Mesa study sites have contributed data in all sample years since 1994.

Shrubs/Trees: According to average shrub cover data, these sites have generally remained co-dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and other preferred browse species such as mountain snowberry (*Symphoricarpos oreophilus*). However, site-level data indicates that mountain big sagebrush dominates the preferred browse component on most of these studies; trends in preferred browse cover other than sagebrush can largely be attributed to the Bald Mesa site. Total shrub cover has exhibited a slight increase overall, but it remained stable between 2019 and 2024 (**Figure 1.11**). Average preferred browse demographic data indicates that density has fluctuated from year to year, but that it has exhibited a net increase when comparing 1994 data with that from 2024. Mature plants have been the dominant age class among these preferred browse populations throughout the sample period. Recruitment of young has exhibited yearly fluctuations but has decreased overall since 2014: this can largely be attributed to the Hideout Mesa and Dolores Point studies. Decadence has also varied but has generally remained low over time (**Figure 1.21**). Average preferred browse utilization has increased, but most plants have shown signs of little to no utilization in all sample years. In 2024, 22% of preferred browse plants were moderately hedged, while 10% were heavily utilized (**Figure 1.24**).

Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) are present on these sites as of 2024, although trees are absent from the Bald Mesa study. Pinyon has contributed all of the average tree cover in most sample years, and cover has marginally increased overall. Pinyon has also been present in higher densities than juniper, and total average tree density has remained similar over time (**Figure 1.15**, **Figure 1.18**).

Herbaceous Understory: The herbaceous understories on these sites have been primarily comprised of perennial grasses and forbs. When comparing 1994 data with that from 2024, average nested frequency of all sites combined has decreased overall while cover has remained similar. Between 2019 and 2024 (during which the same study sites were sampled), however, both cover and frequency decreased. These decreases between the two most recent sample years can mainly be attributed to annual forbs on the Bald Mesa, Hideout Mesa, and Dolores Point studies. The introduced perennial grass species bulbous bluegrass (*Poa bulbosa*) has consistently been observed on the Two Mile Chaining study, but cover has decreased over the sample period. Annual grasses have remained rare over time, with cover and frequency trends driven almost entirely by the introduced species cheatgrass (*Bromus tectorum*) on the Hideout Mesa site (**Figure 1.27**, **Figure 1.32**).

Occupancy: Average pellet transect data shows that animal presence has exhibited an overall decrease and that the primary occupants have fluctuated. Cattle were the primary occupants from 1999 through 2014 largely due to the Hideout Mesa and Bald Mesa studies. Mean abundance of cattle pellet groups has ranged from 4 days use/acre in 2014 to 46 days use/acre in 2004. Elk have been the primary occupants since 2019, with pellet groups most abundant on the Dolores Point site; average elk pellet group abundance has fluctuated between 3 days use/acre in 2014 and 31.5 days use/acre in 1999. Mean abundance of deer pellet groups has been as low as 2 days use/acre in 2014 and as high as 11 days use/acre in 1999. Finally, horse pellet groups were observed in 1999 and 2009 with an average abundance of 0.3 days use/acre and 1.2 days use/acre (respectively), but they have not been observed in any other sample (**Figure 1.37**).

Upland (Big Sagebrush)

There are seven studies [Slaughter Flat (13A-04), Black Ridge (13A-08), Upper Fisher Valley (13A-10) (suspended), North Beaver Mesa (13A-11), Below Polar Rim (13A-12), Beaver Canyon (13A-13) (suspended), and Lower Lackey Fan (13A-14)] that are classified as Upland (Big Sagebrush) ecological sites. The Slaughter Flat study can be found on Slaughter Flat southwest of the La Sal Mountains. Black Ridge is situated on Black Ridge and is roughly two miles east of US-191. Upper Fisher Valley is in the northern portion of Fisher Valley, and the North Beaver Mesa study is located on the southwestern portion of North Beaver Mesa. Below Polar Rim is situated below Polar Mesa on North Beaver Mesa. The Beaver Canyon site can be found on the northern portion of North Beaver Mesa, approximately two miles north of the Below Polar Rim study. Finally, Lower Lackey Fan is located northwest of the town of La Sal and south of Lackey Basin.

When discussing the data for these study sites, it is important to note that the Upper Fisher Valley study provided data from 1994 through 2009, while Beaver Canyon only contributed data in 1994. Slaughter Flat, Black Ridge, North Beaver Mesa, Below Polar Rim, and Lower Lackey Fan have datasets that span all sample years since 1994.

Shrubs/Trees: The preferred browse components on the active study sites of this ecotype are dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*); Wyoming big sagebrush (*A. tridentata* ssp. *wyomingensis*) contributed much of the cover on Upper Fisher Valley and Beaver Canyon before study suspension. Average shrub cover has generally remained stable over the sample period with sagebrush contributing a majority of said cover. Other preferred browse species have been sampled on some study sites, but to a much lesser extent than sagebrush (**Figure 1.11**). Average preferred browse density has decreased overall since 1994. Only data since 2014 has been contributed by the same five study sites, but density trends for this span mirror the overall decrease exhibited over the entire study period. Mature individuals have comprised most of the preferred browse populations on these sites in all sample years. Decadence has remained low, as has recruitment of young. Furthermore, density of young plants has decreased since 2014 primarily due to the North Beaver Mesa study (**Figure 1.21**). Average utilization of preferred browse increased through 2004, but it has decreased in each subsequent sample year. In 2024, 32% of preferred browse plants showed signs of moderate utilization, while 15% were heavily hedged (**Figure 1.24**).

Trees sampled on these sites include twoneedle pinyon (*Pinus edulis*) and Utah and/or Rocky Mountain juniper (*Juniperus osteosperma* and/or *J. scopulorum*). Average tree cover has remained low and stable over the sample period; trees contributed cover on the Slaughter Flat, North Beaver Mesa, and Lower Lackey Fan studies in 2024 (**Figure 1.15**). Average tree density has exhibited a net increase between 2004 and 2024 but has slightly decreased since 2019. Site-level data indicates that the density decrease between the two most recent sample years can mainly be attributed to juniper on the Below Polar Rim study (**Figure 1.18**).

Herbaceous Understory: The understories of these studies are primarily comprised of perennial grasses including the introduced species crested wheatgrass (*Agropyron cristatum*) and (to a lesser extent) native species such as blue grama (*Bouteloua gracilis*). Average herbaceous cover has remained similar when comparing 1994 and 2024 data, while nested frequency has decreased. Annual forbs and grasses drove cover and frequency increases in 2019, but values for both measurements have decreased overall since 2014. Annual grasses and forbs and perennial forbs have contributed little cover in most sample years. The introduced perennial grass species bulbous bluegrass (*Poa bulbosa*) was present with low cover on the Lower Lackey Fan study in 2019, but has not been observed in any other year (**Figure 1.29**, **Figure 1.34**).

Occupancy: Pellet transect data shows that average animal presence increased slightly between 2014 and 2024 but has decreased overall since 1999. Deer were the primary occupants of these study sites in 2019, and mean pellet group abundance has ranged from 13 days use/acre in 2014 to 39.5 days use/acre in 1999. Elk have been the primary occupants in all other sample years, with average pellet group abundance being as low as 18 days use/acre in 2014 and as high as 60 days use/acre in 1999. Mean abundance of cattle pellet groups has fluctuated between 6 days use/acre in 2014 and 24 days use/acre in 1999. Finally, horses were present in 1999 and 2004 with an average pellet group abundance of 0.1 days use/acre, but pellet groups have not been observed in any other year (**Figure 1.38**).

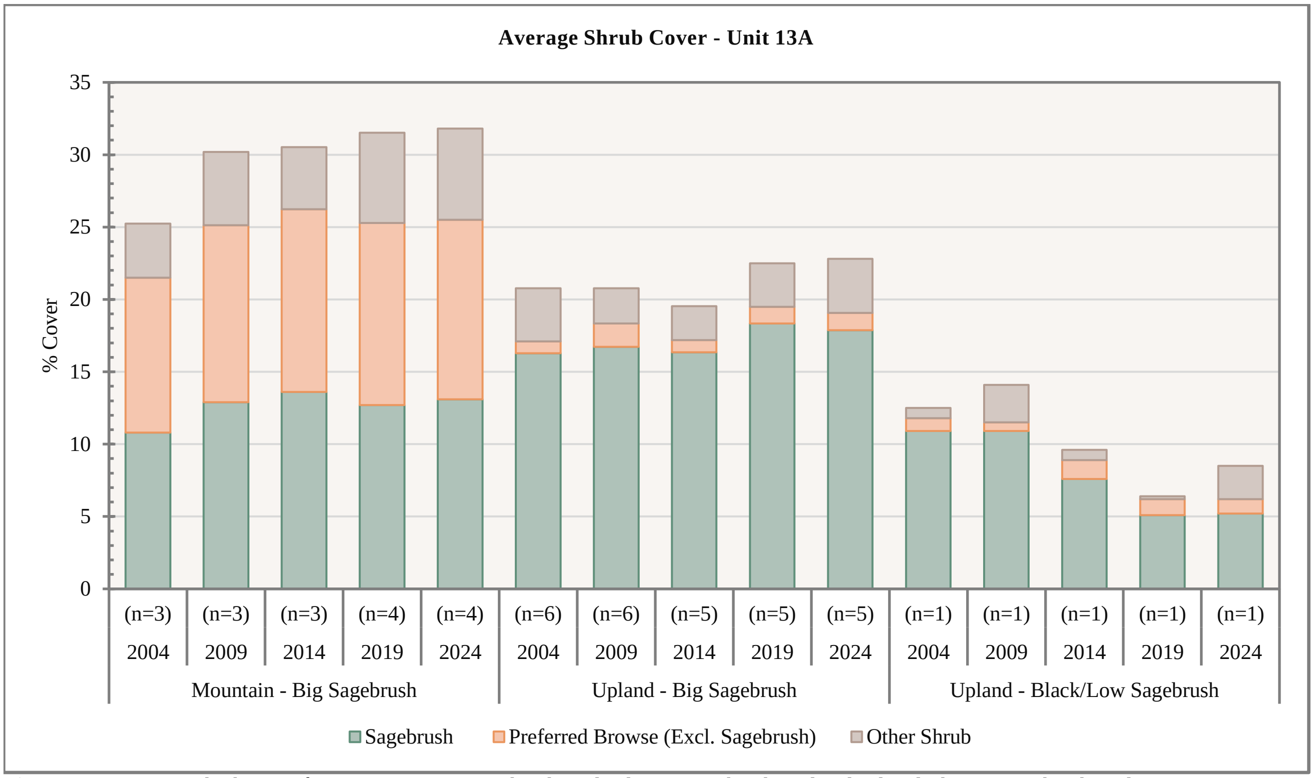


Figure 1.11: Average shrub cover for Mountain - Big Sagebrush, Upland - Big Sagebrush, and Upland - Black/Low Sagebrush study sites in WMU 13A, La Sal Mountains.

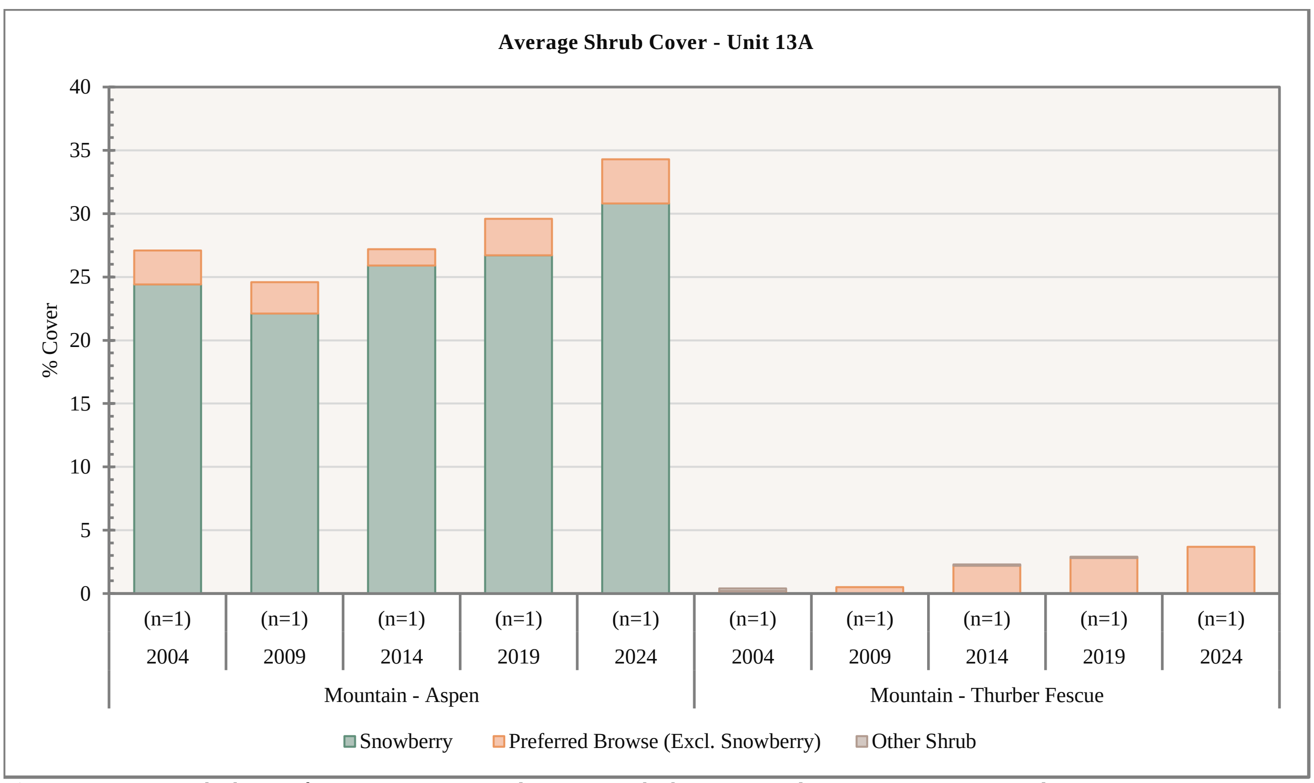


Figure 1.12: Average shrub cover for Mountain - Aspen and Mountain - Thurber Fescue study sites in WMU 13A, La Sal Mountains.

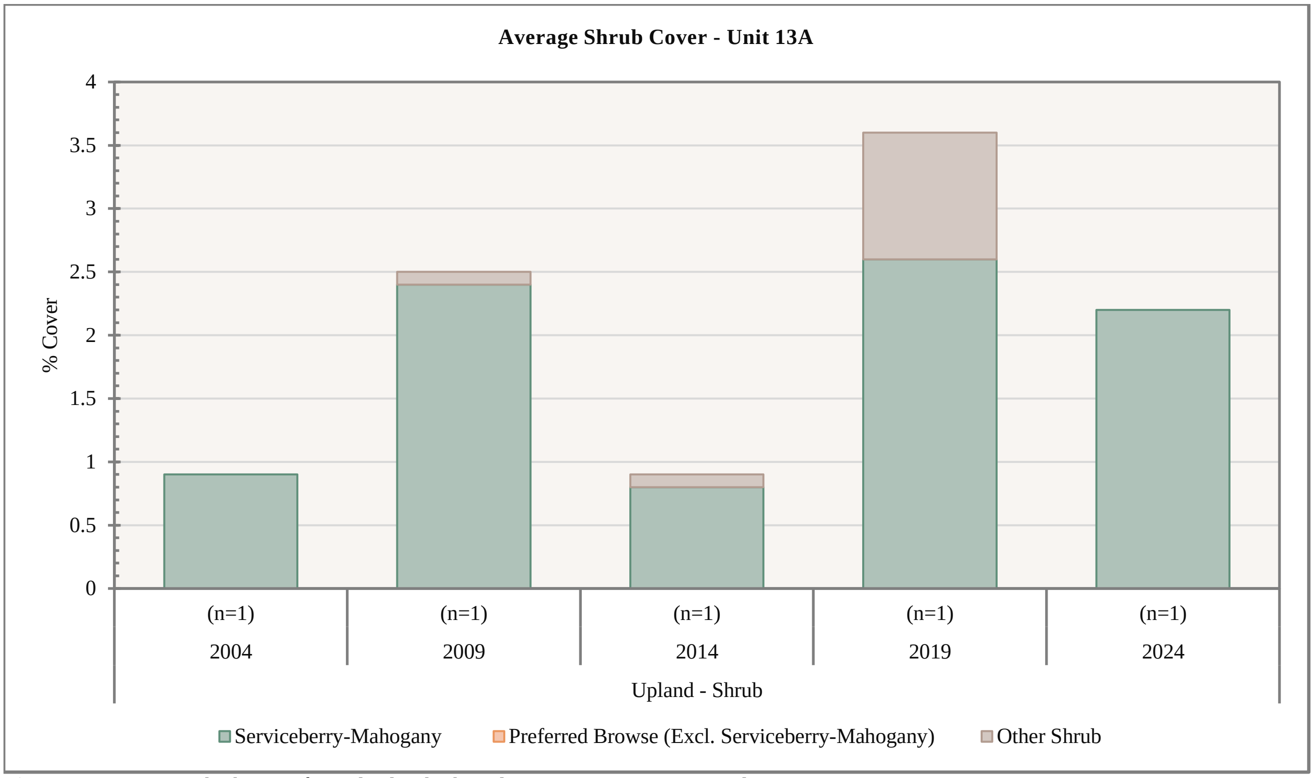


Figure 1.13: Average shrub cover for Upland - Shrub study sites in WMU 13A, La Sal Mountains.

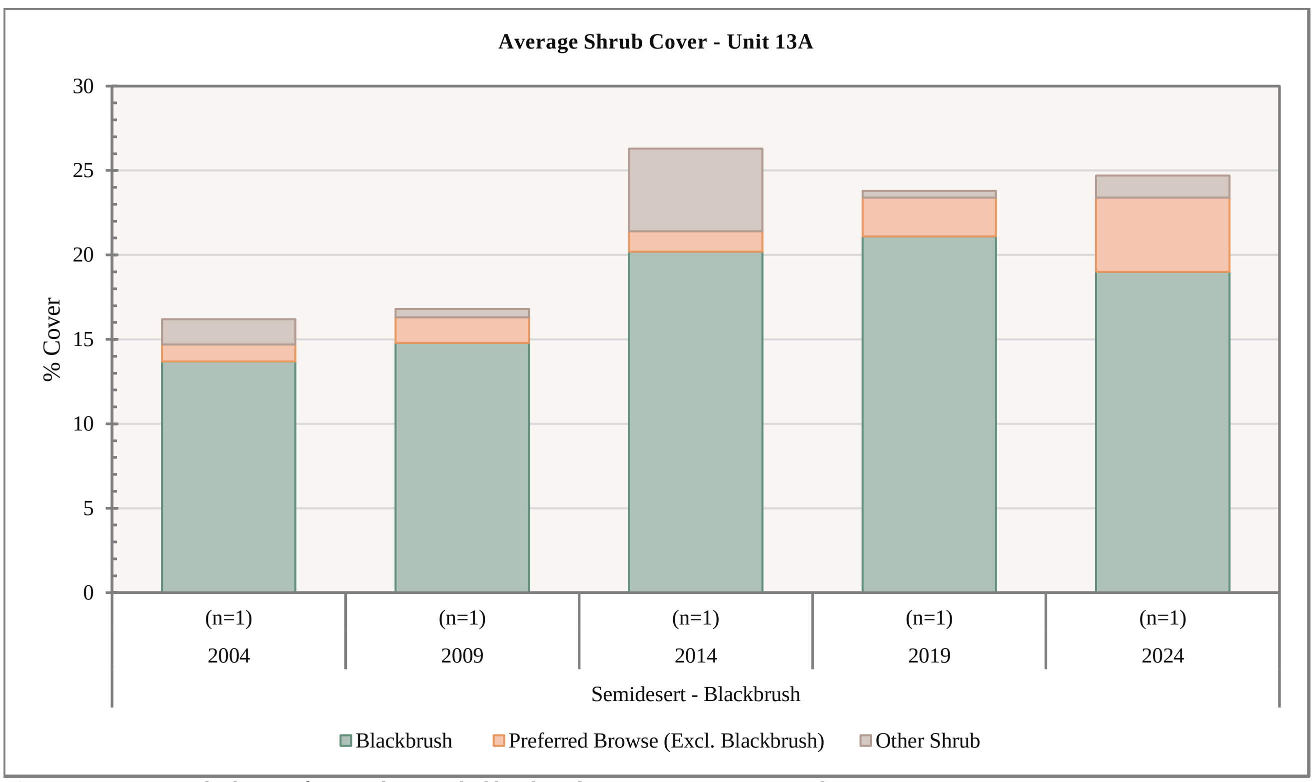


Figure 1.14: Average shrub cover for Semidesert - Blackbrush study sites in WMU 13A, La Sal Mountains.

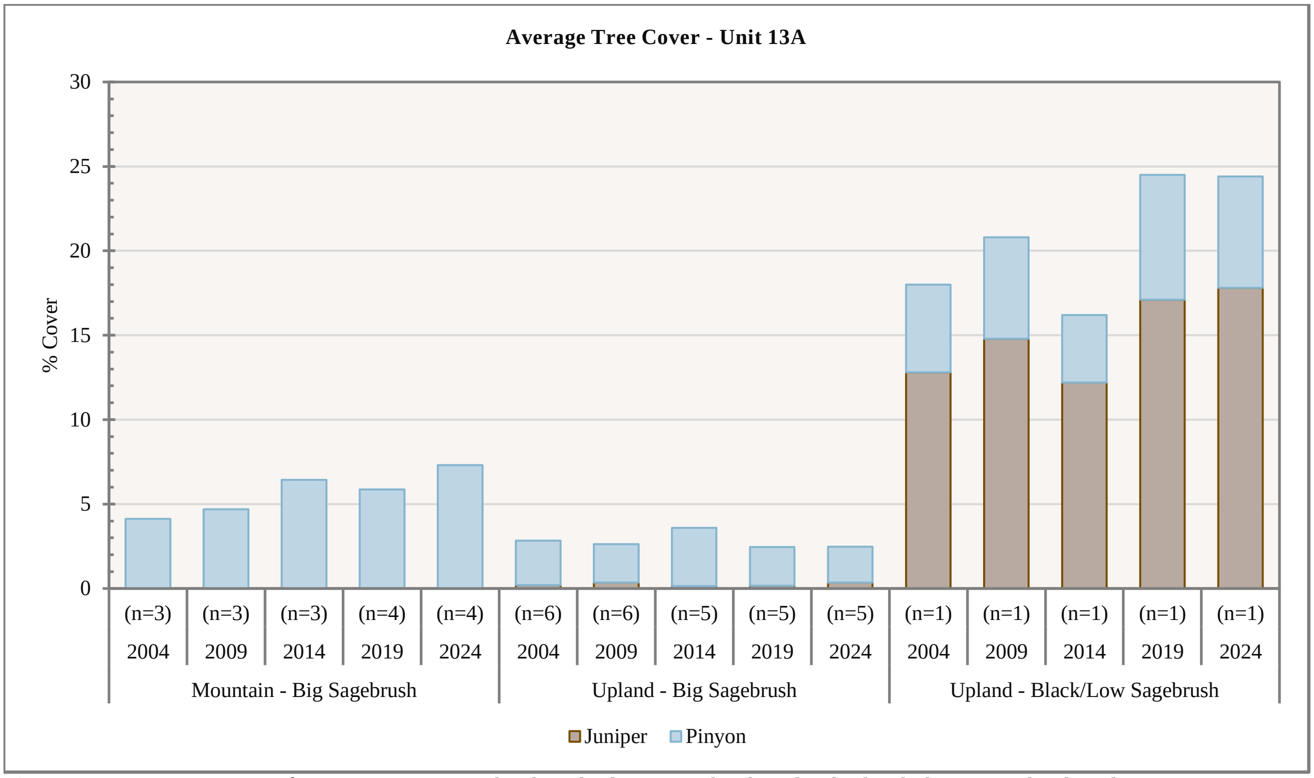


Figure 1.15: Average tree cover for Mountain - Big Sagebrush, Upland - Big Sagebrush, and Upland - Black/Low Sagebrush study sites in WMU 13A, La Sal Mountains.

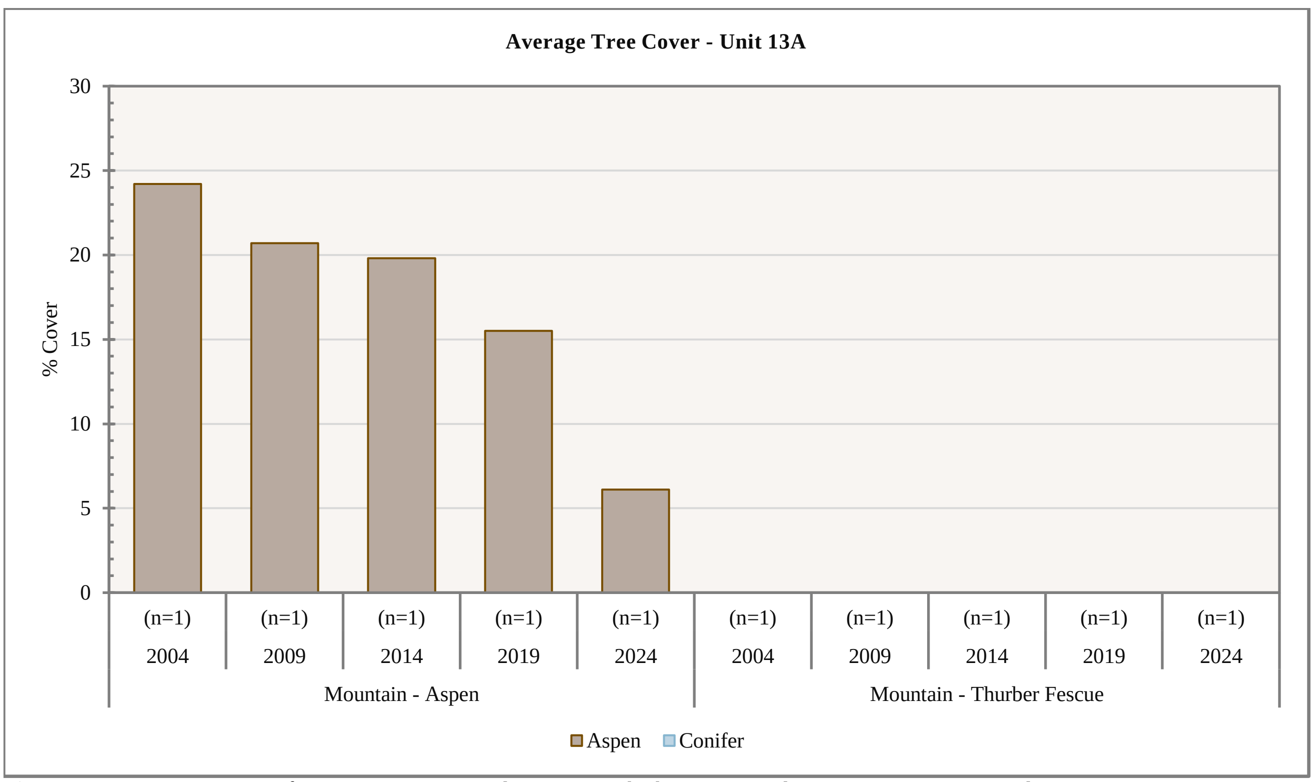


Figure 1.16: Average tree cover for Mountain - Aspen and Mountain - Thurber Fescue study sites in WMU 13A, La Sal Mountains.

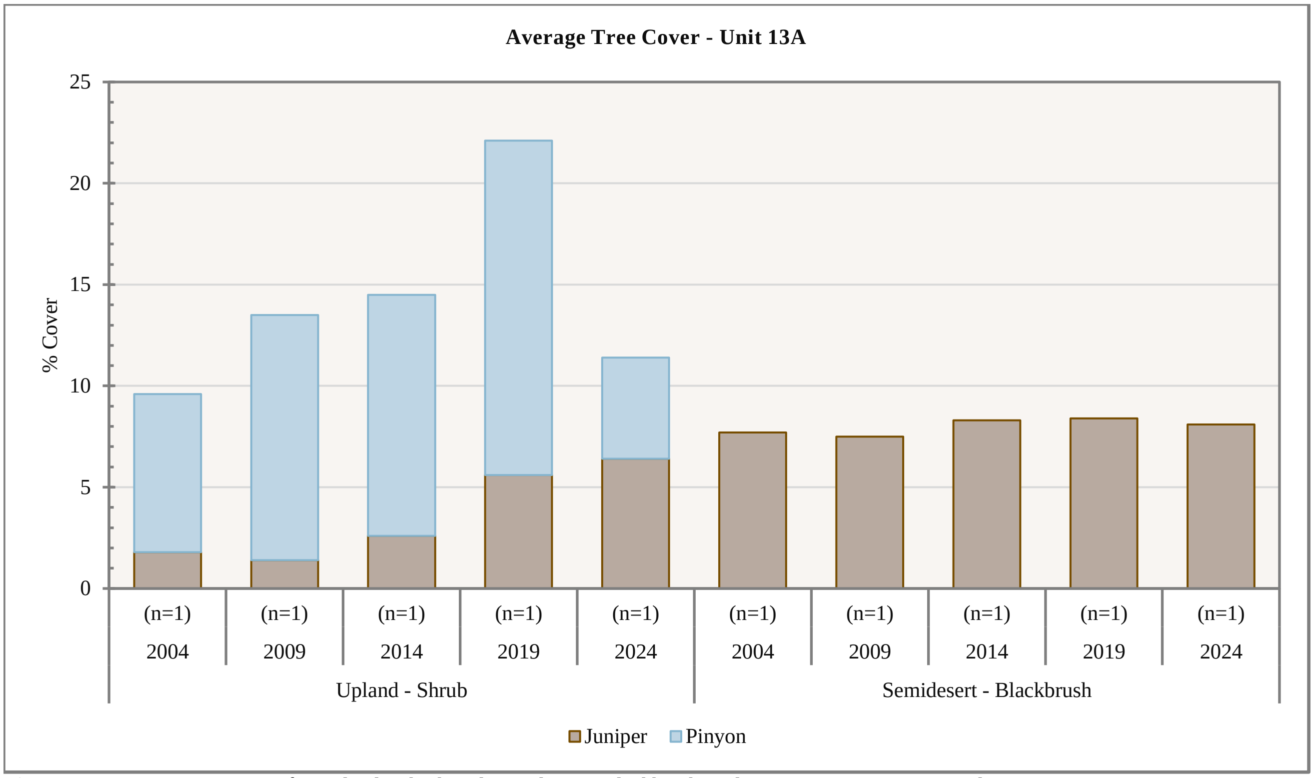


Figure 1.17: Average tree cover for Upland - Shrub and Semidesert - Blackbrush study sites in WMU 13A, La Sal Mountains.

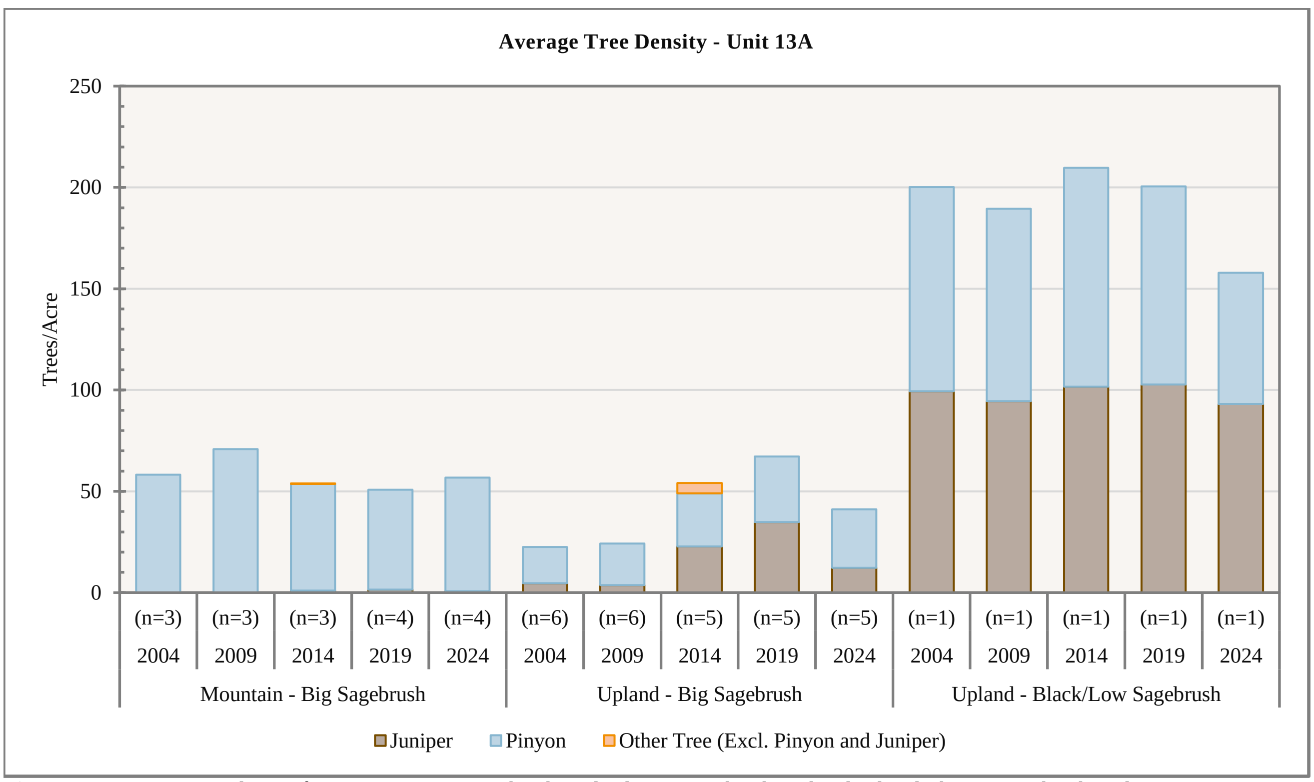


Figure 1.18: Average tree density for Mountain - Big Sagebrush, Upland - Big Sagebrush, and Upland - Black/Low Sagebrush study sites in WMU 13A, La Sal Mountains.

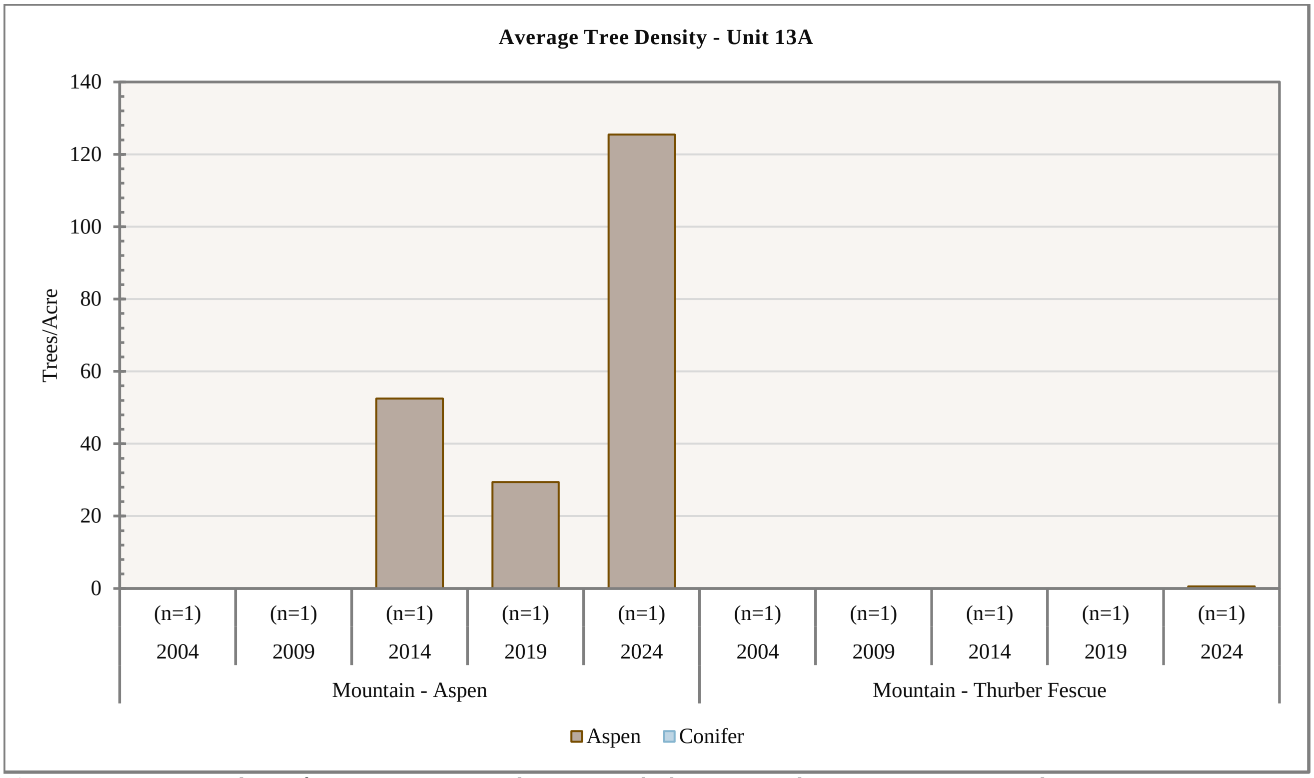


Figure 1.19: Average tree density for Mountain - Aspen and Mountain - Thurber Fescue study sites in WMU 13A, La Sal Mountains.

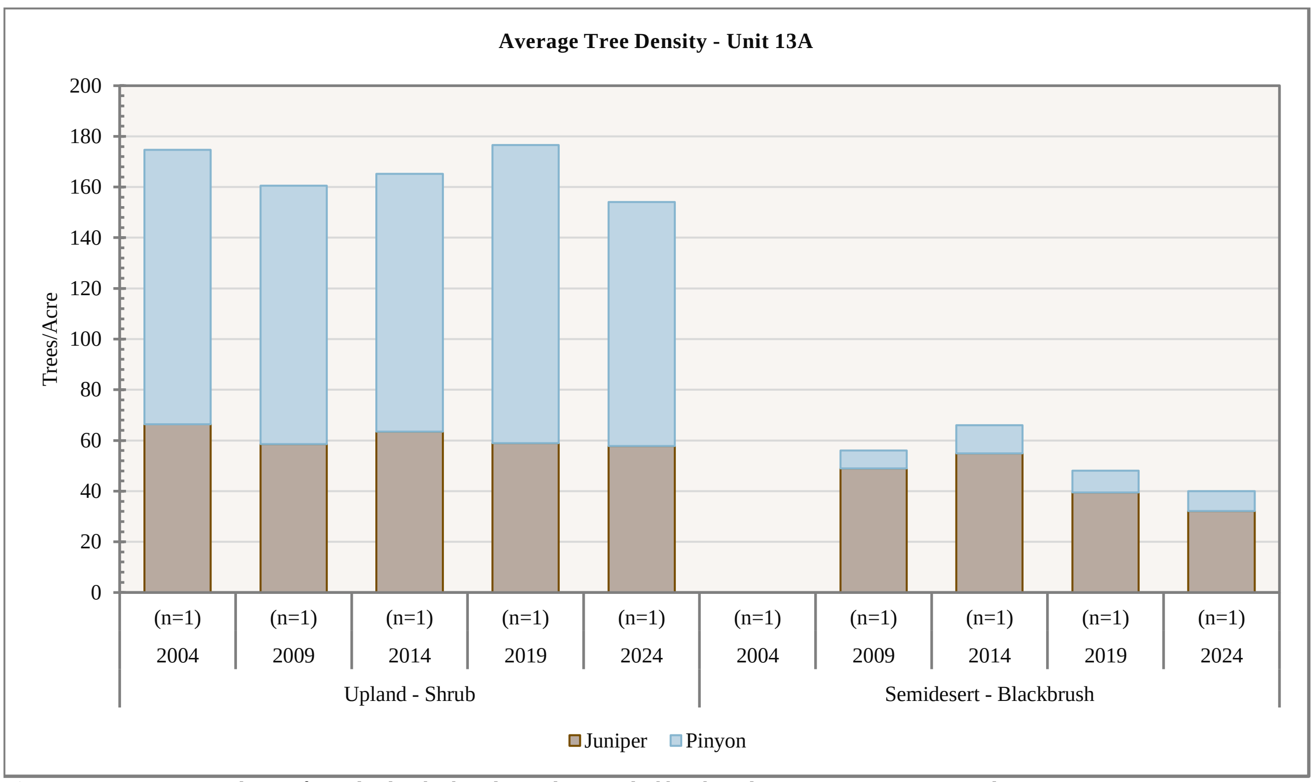


Figure 1.20: Average tree density for Upland - Shrub and Semidesert - Blackbrush study sites in WMU 13A, La Sal Mountains.

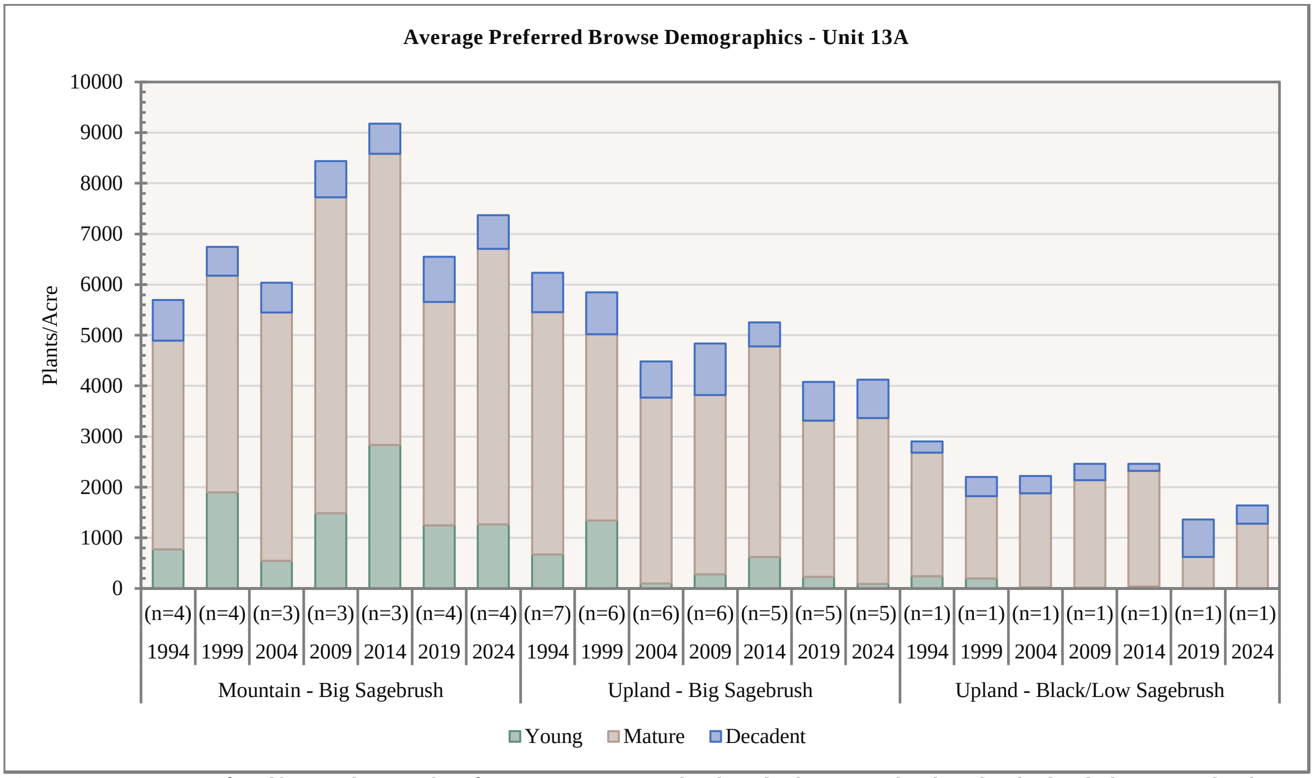


Figure 1.21: Average preferred browse demographics for Mountain - Big Sagebrush, Upland - Big Sagebrush, and Upland - Black/Low Sagebrush study sites in WMU 13A, La Sal Mountains.

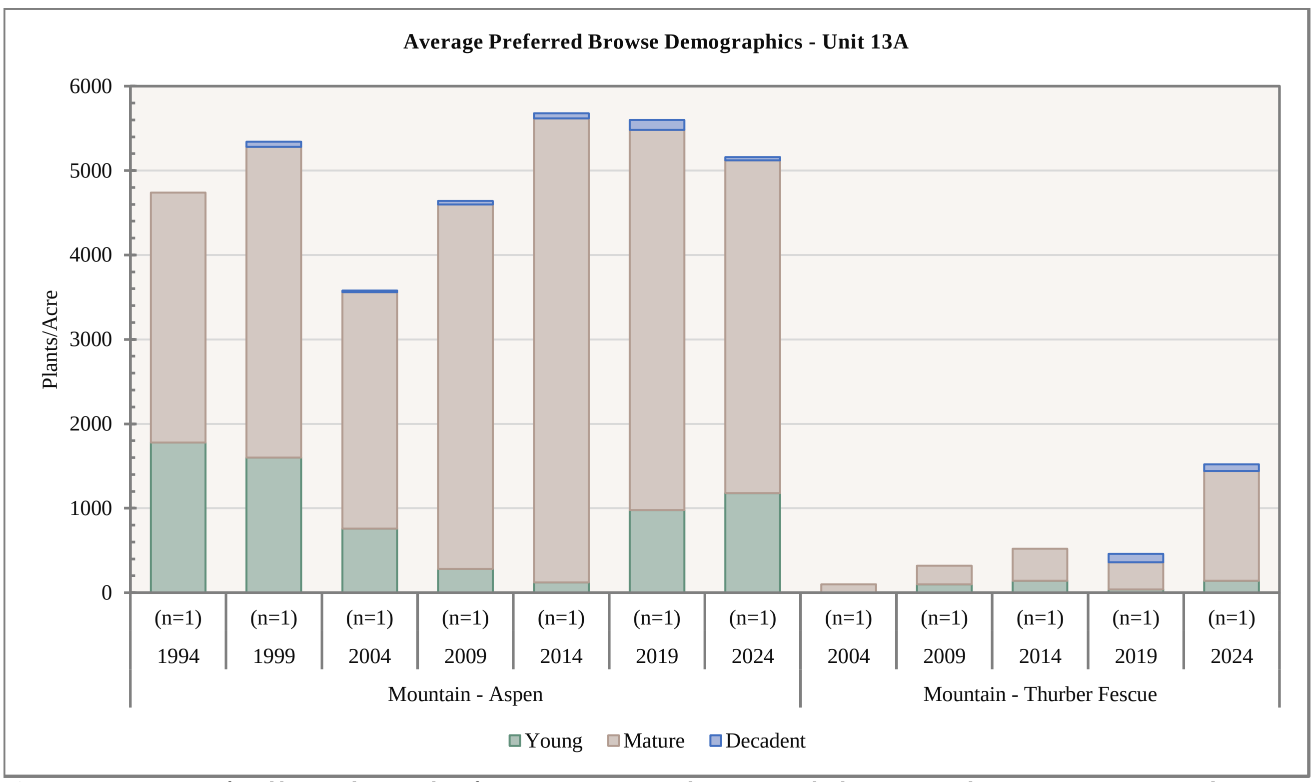


Figure 1.22: Average preferred browse demographics for Mountain - Aspen and Mountain - Thurber Fescue study sites in WMU 13A, La Sal Mountains.

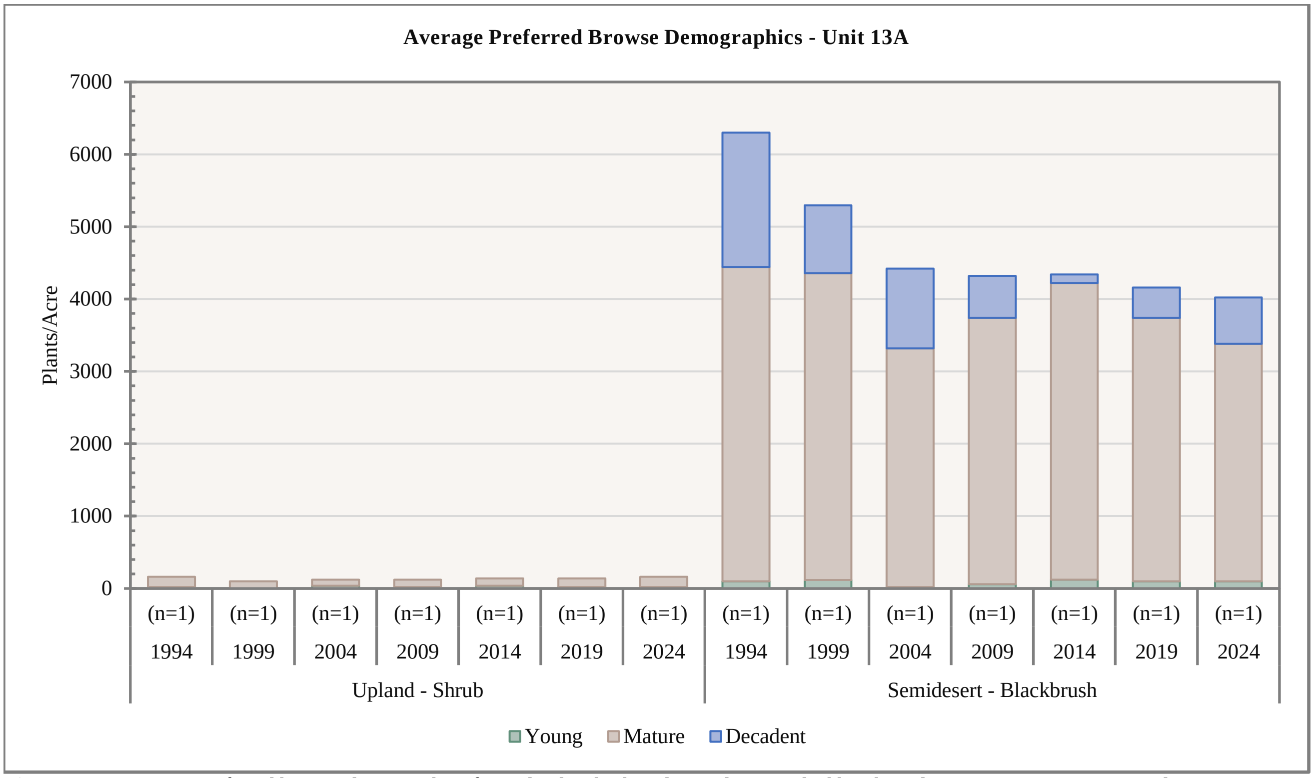


Figure 1.23: Average preferred browse demographics for Upland - Shrub and Semidesert - Blackbrush study sites in WMU 13A, La Sal Mountains.

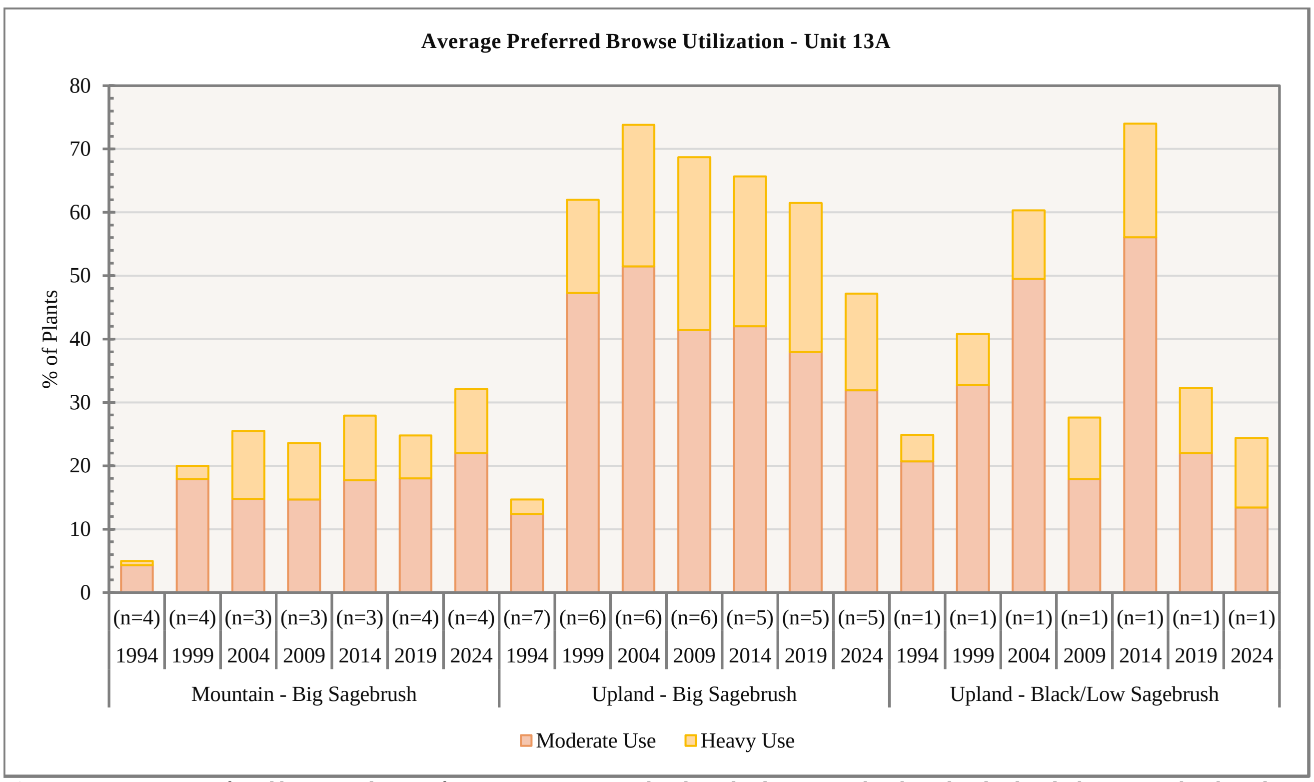


Figure 1.24: Average preferred browse utilization for Mountain - Big Sagebrush, Upland - Big Sagebrush, and Upland - Black/Low Sagebrush study sites in WMU 13A, La Sal Mountains.

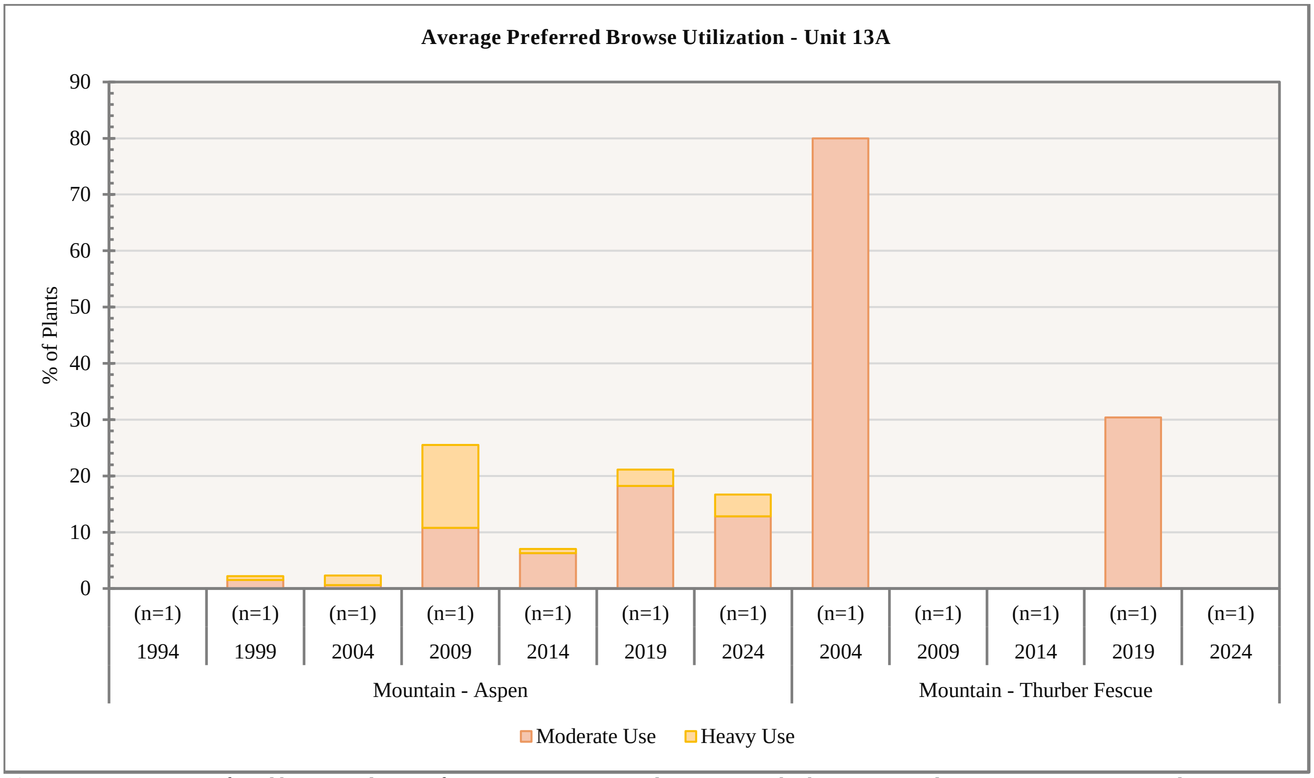


Figure 1.25: Average preferred browse utilization for Mountain - Aspen and Mountain - Thurber Fescue study sites in WMU 13A, La Sal Mountains.

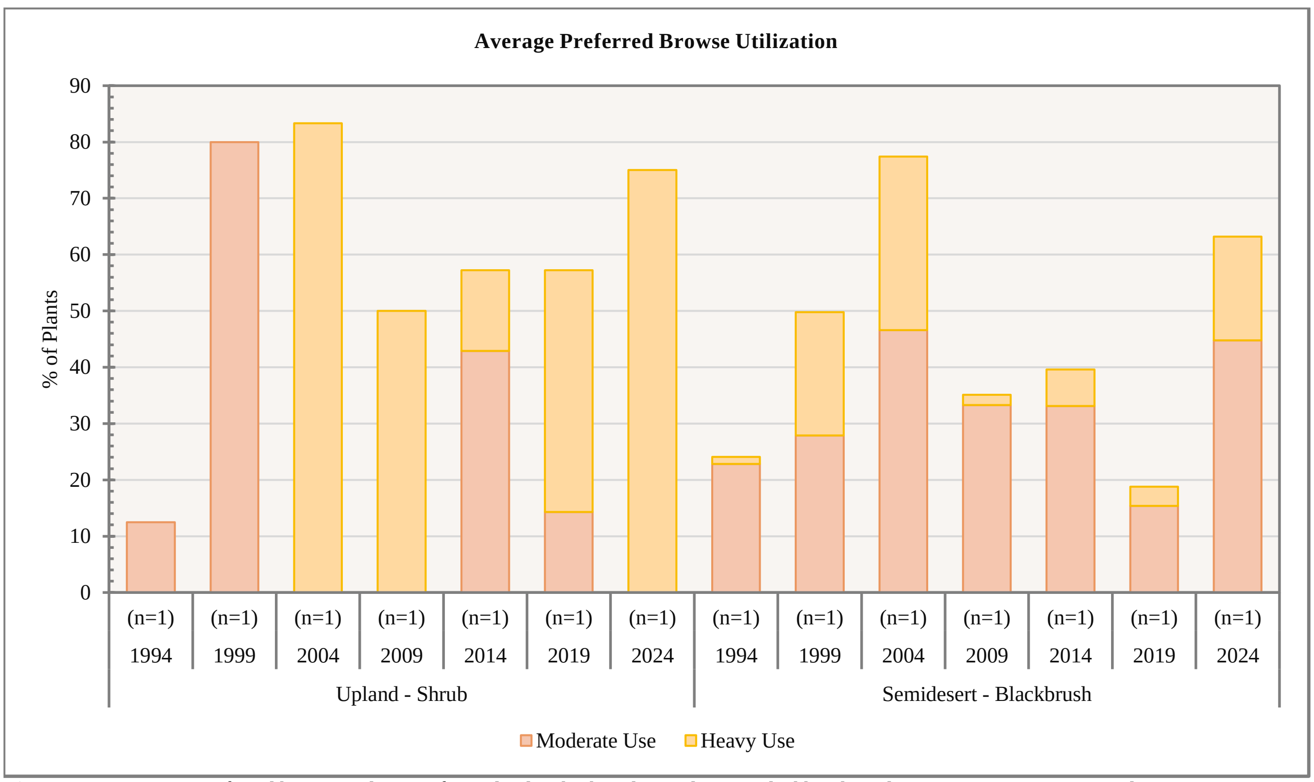


Figure 1.26: Average preferred browse utilization for Upland - Shrub and Semidesert - Blackbrush study sites in WMU 13A, La Sal Mountains.

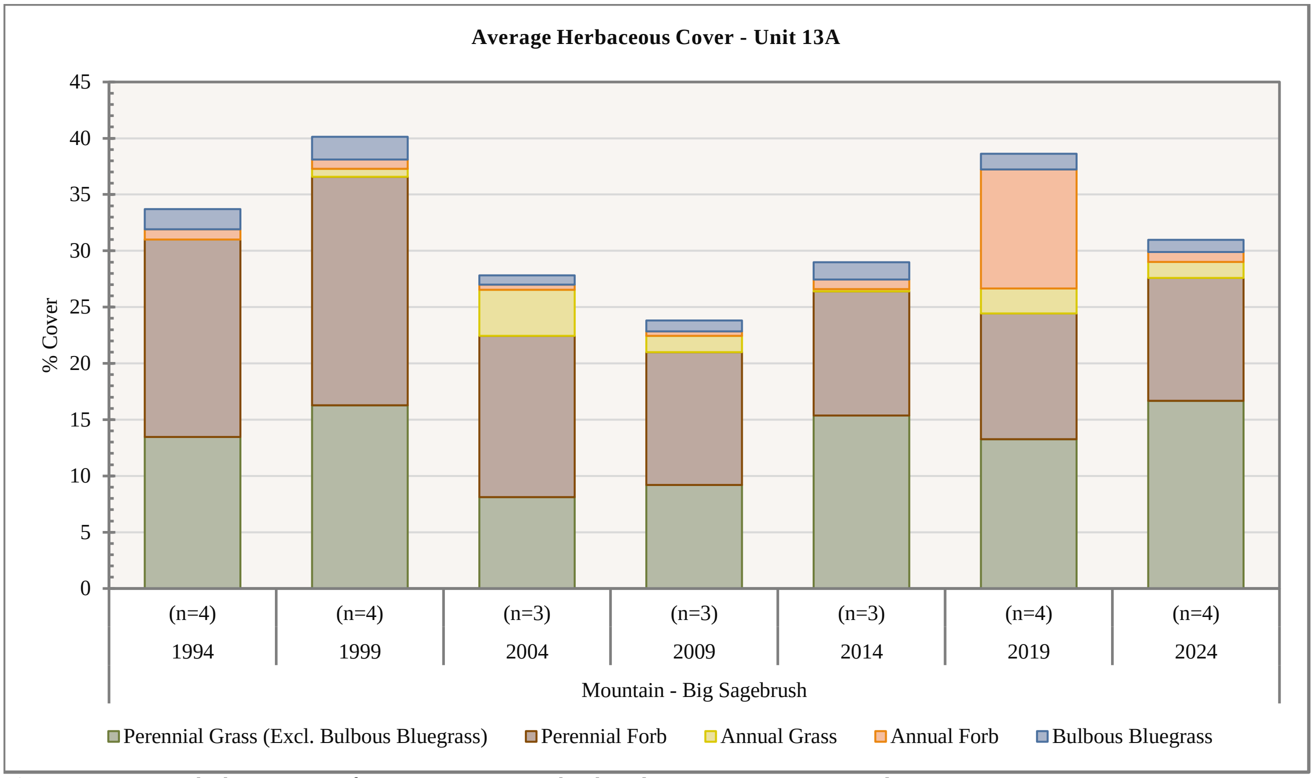


Figure 1.27: Average herbaceous cover for Mountain - Big Sagebrush study sites in WMU 13A, La Sal Mountains.

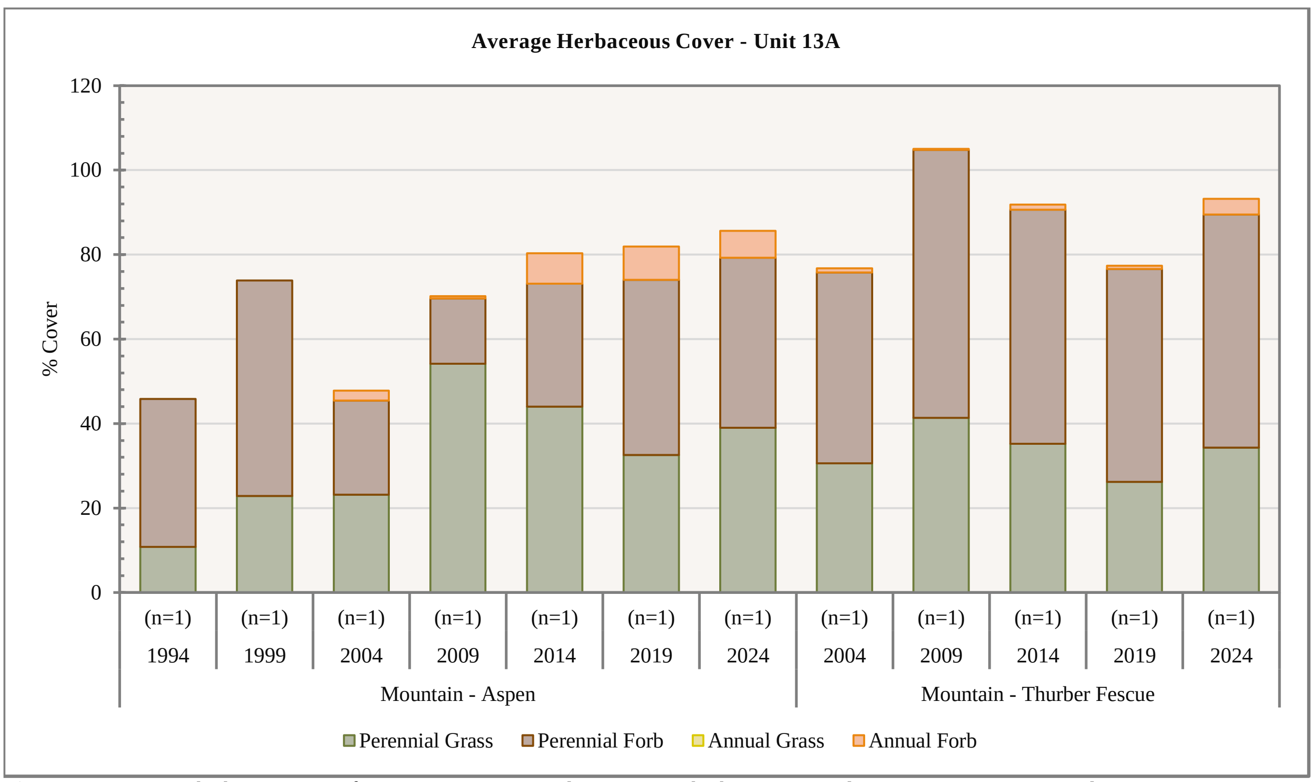


Figure 1.28: Average herbaceous cover for Mountain - Aspen and Mountain - Thurber Fescue study sites in WMU 13A, La Sal Mountains.

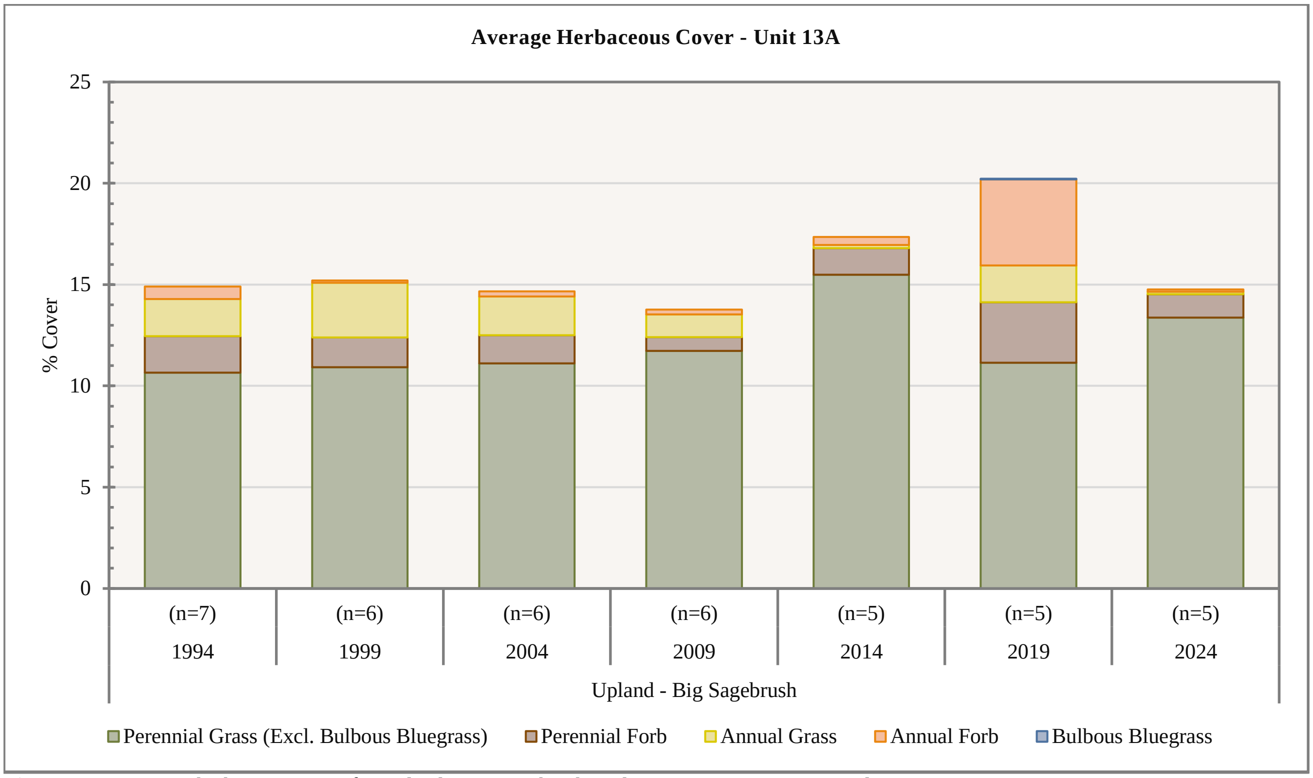


Figure 1.29: Average herbaceous cover for Upland - Big Sagebrush study sites in WMU 13A, La Sal Mountains.

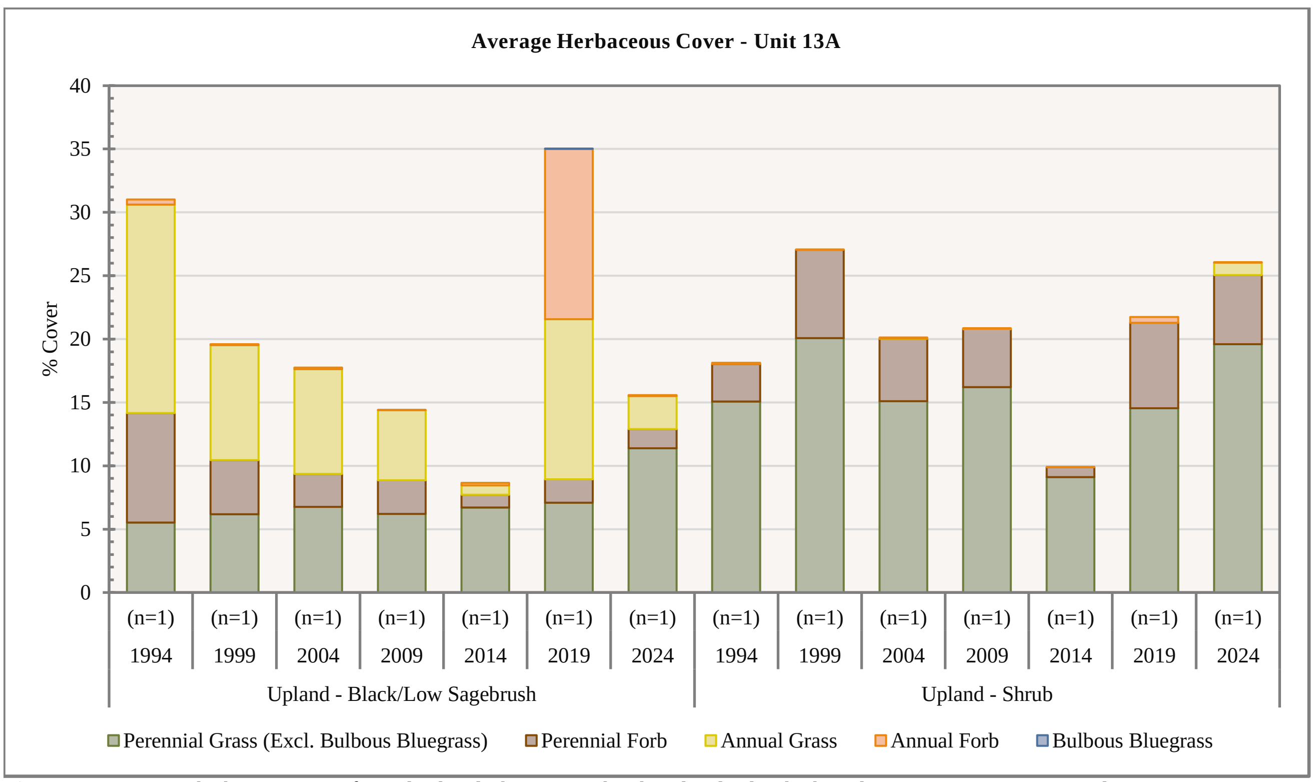


Figure 1.30: Average herbaceous cover for Upland - Black/Low Sagebrush and Upland - Shrub study sites in WMU 13A, La Sal Mountains.

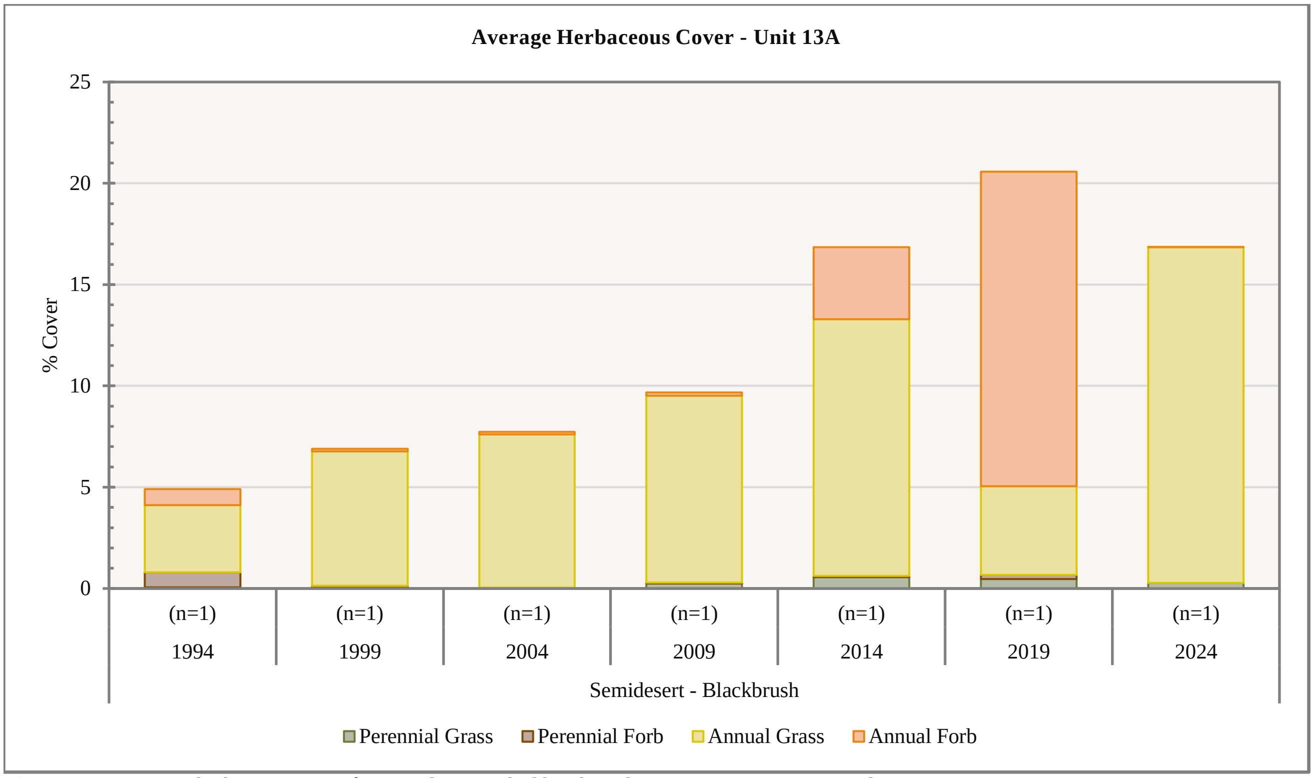


Figure 1.31: Average herbaceous cover for Semidesert - Blackbrush study sites in WMU 13A, La Sal Mountains.

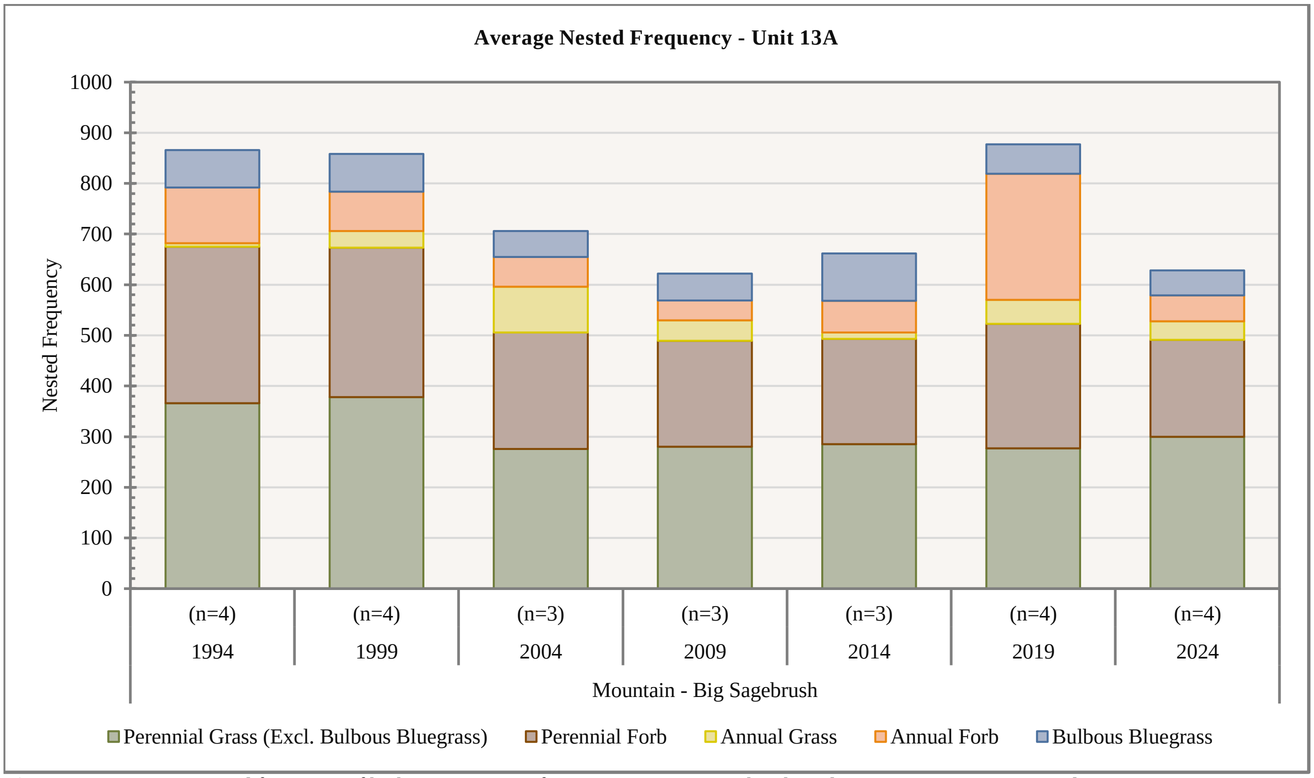


Figure 1.32: Average nested frequency of herbaceous species for Mountain - Big Sagebrush study sites in WMU 13A, La Sal Mountains.

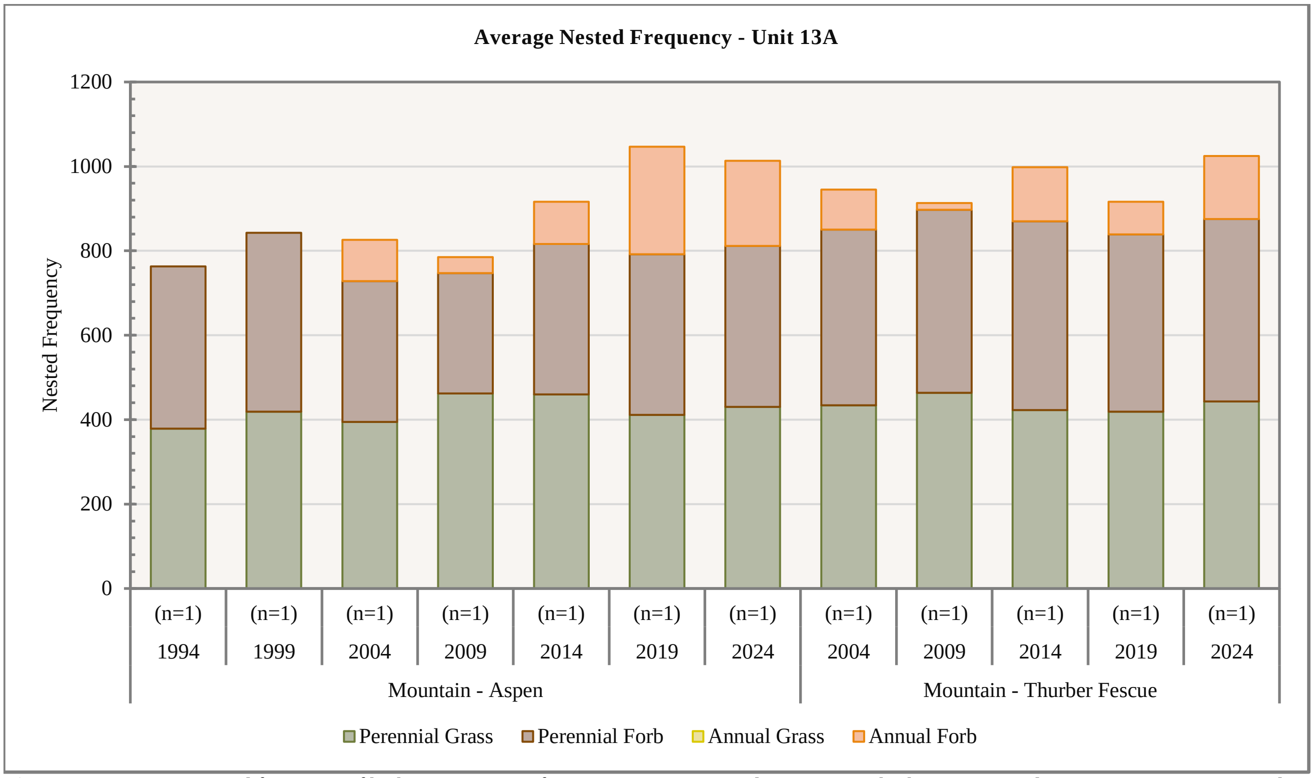


Figure 1.33: Average nested frequency of herbaceous species for Mountain - Aspen and Mountain - Thurber Fescue study sites in WMU 13A, La Sal Mountains.

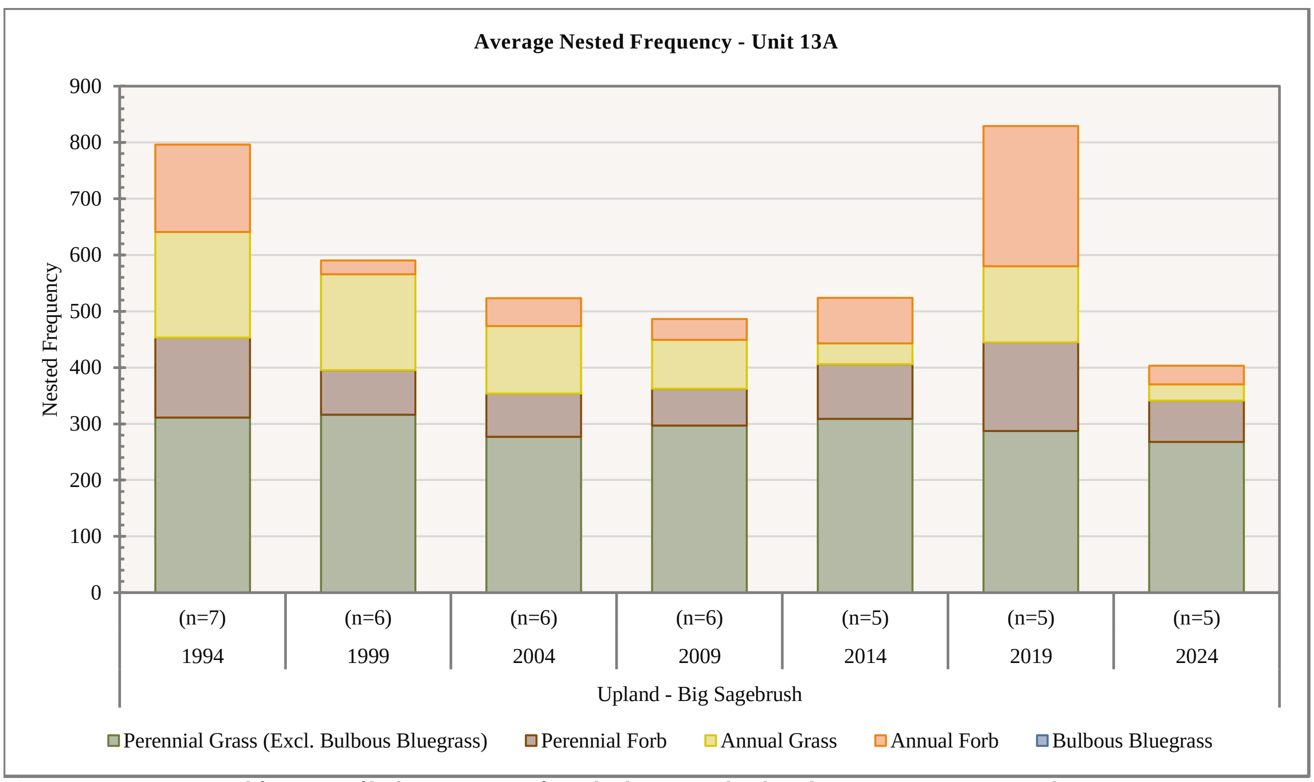


Figure 1.34: Average nested frequency of herbaceous species for Upland - Big Sagebrush study sites in WMU 13A, La Sal Mountains.

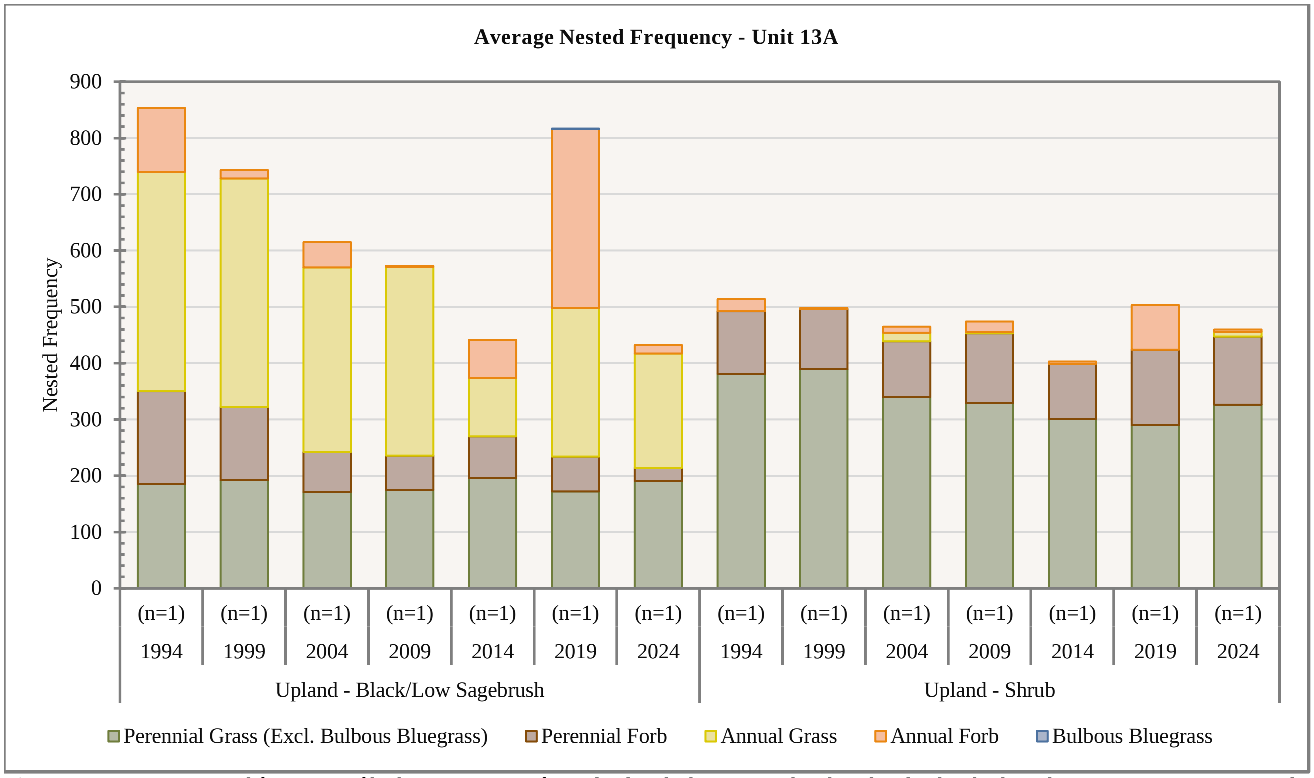


Figure 1.35: Average nested frequency of herbaceous species for Upland - Black/Low Sagebrush and Upland - Shrub study sites in WMU 13A, La Sal Mountains.

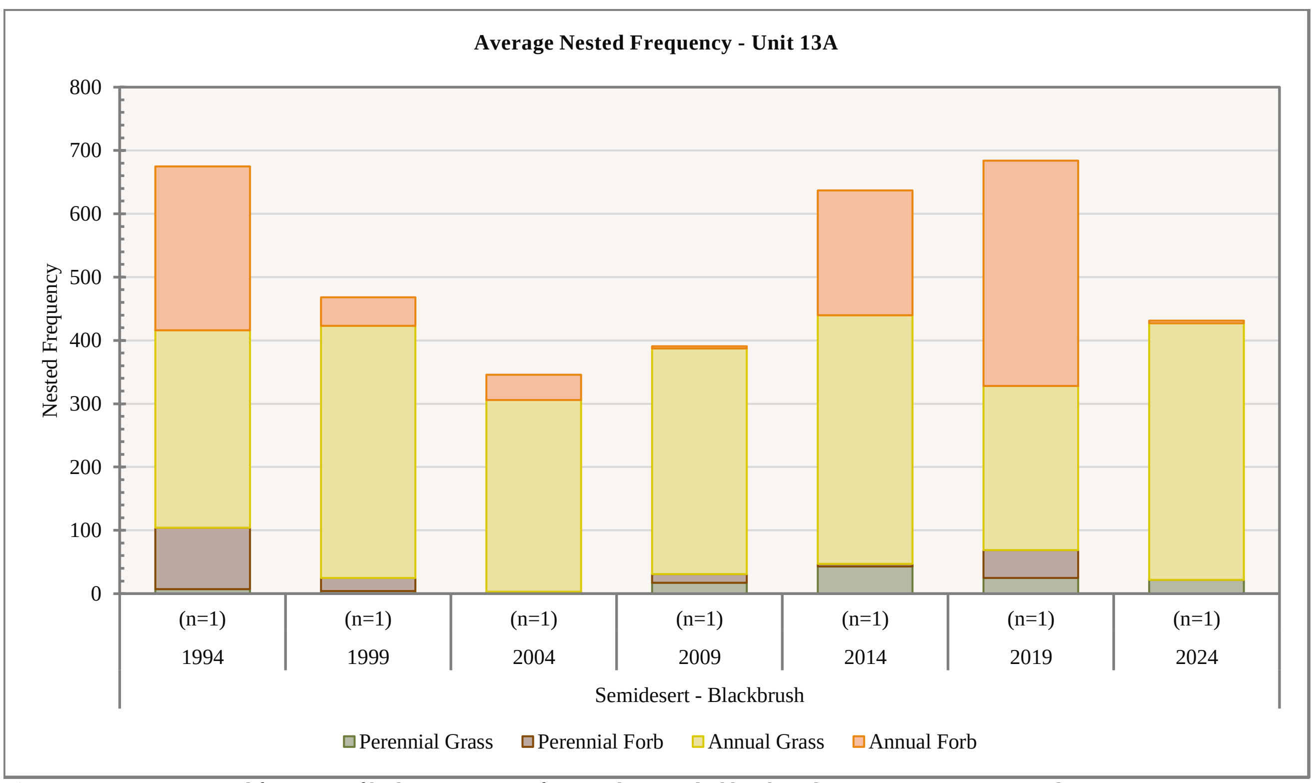


Figure 1.36: Average nested frequency of herbaceous species for Semidesert - Blackbrush study sites in WMU 13A, La Sal Mountains.

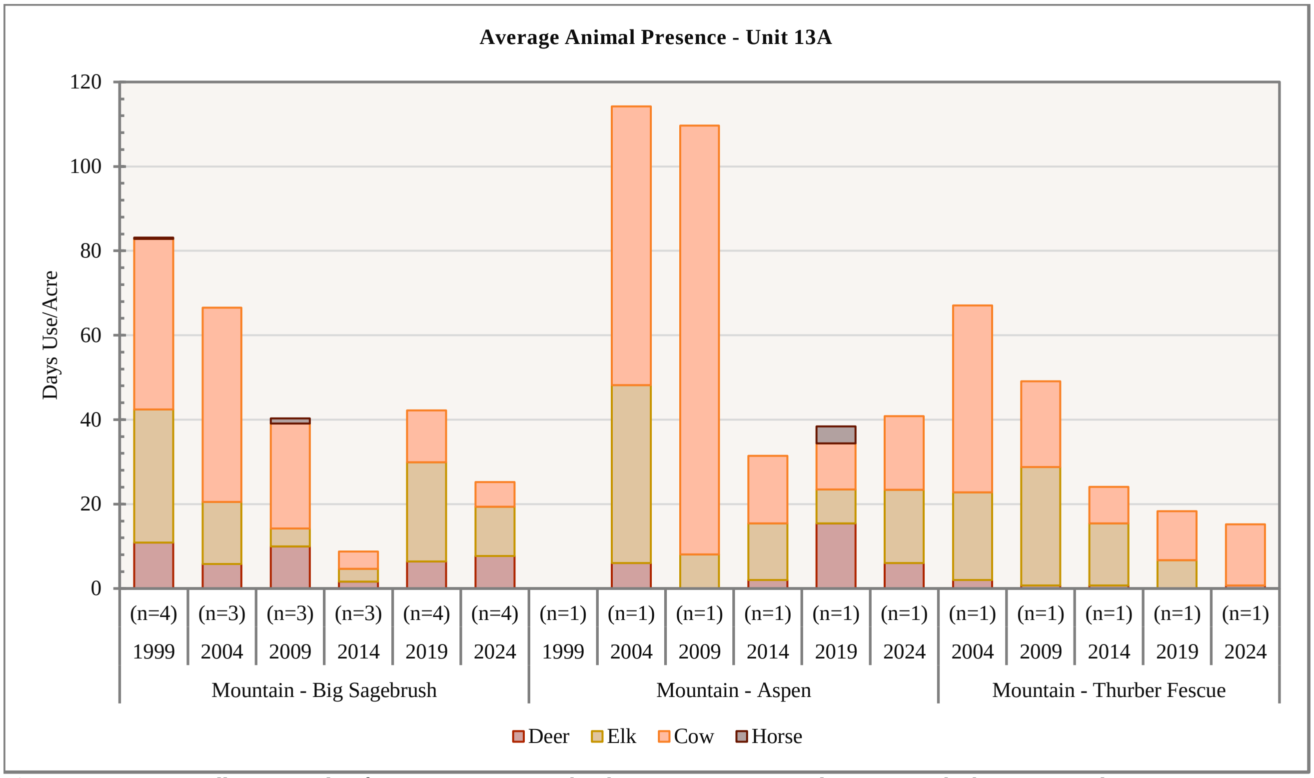


Figure 1.37: Average pellet transect data for Mountain - Big Sagebrush, Mountain - Aspen, and Mountain - Thurber Fescue study sites in WMU 13A, La Sal Mountains.

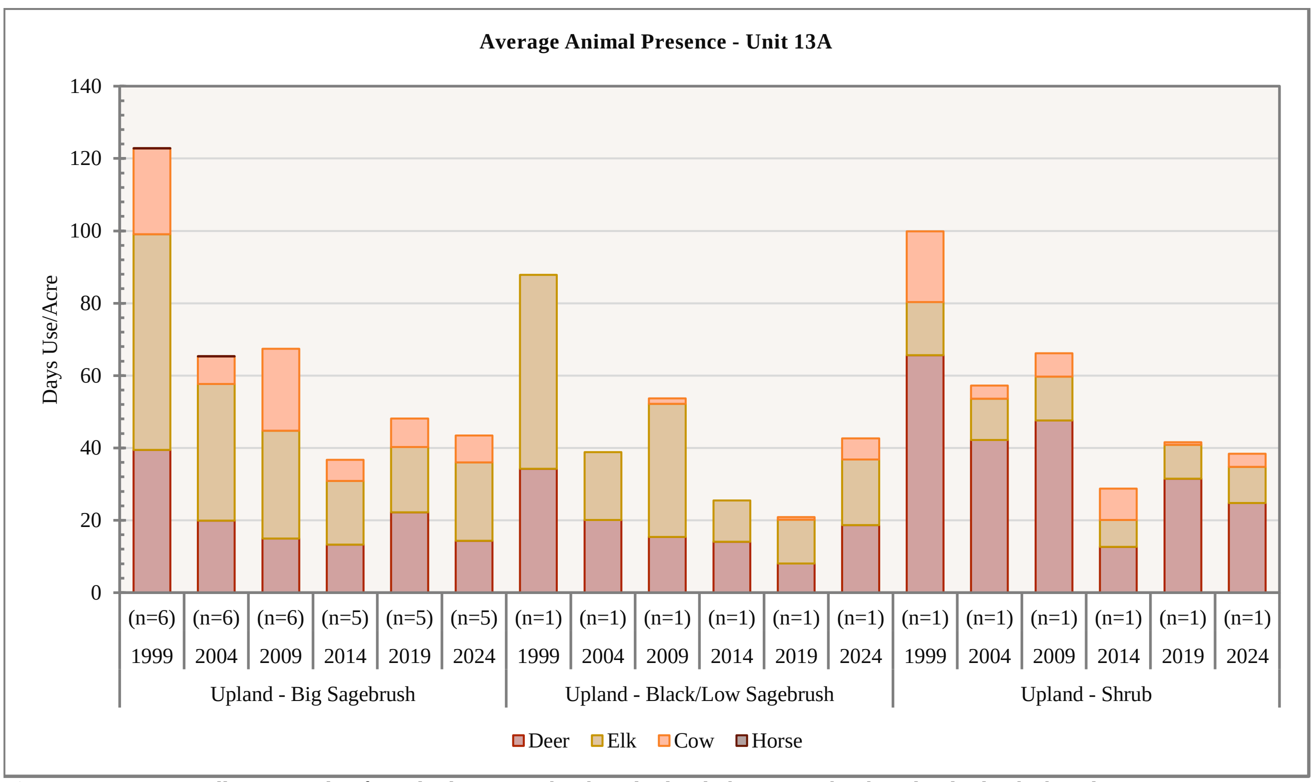


Figure 1.38: Average pellet transect data for Upland - Big Sagebrush, Upland - Black/Low Sagebrush, and Upland - Shrub study sites in WMU 13A, La Sal Mountains.

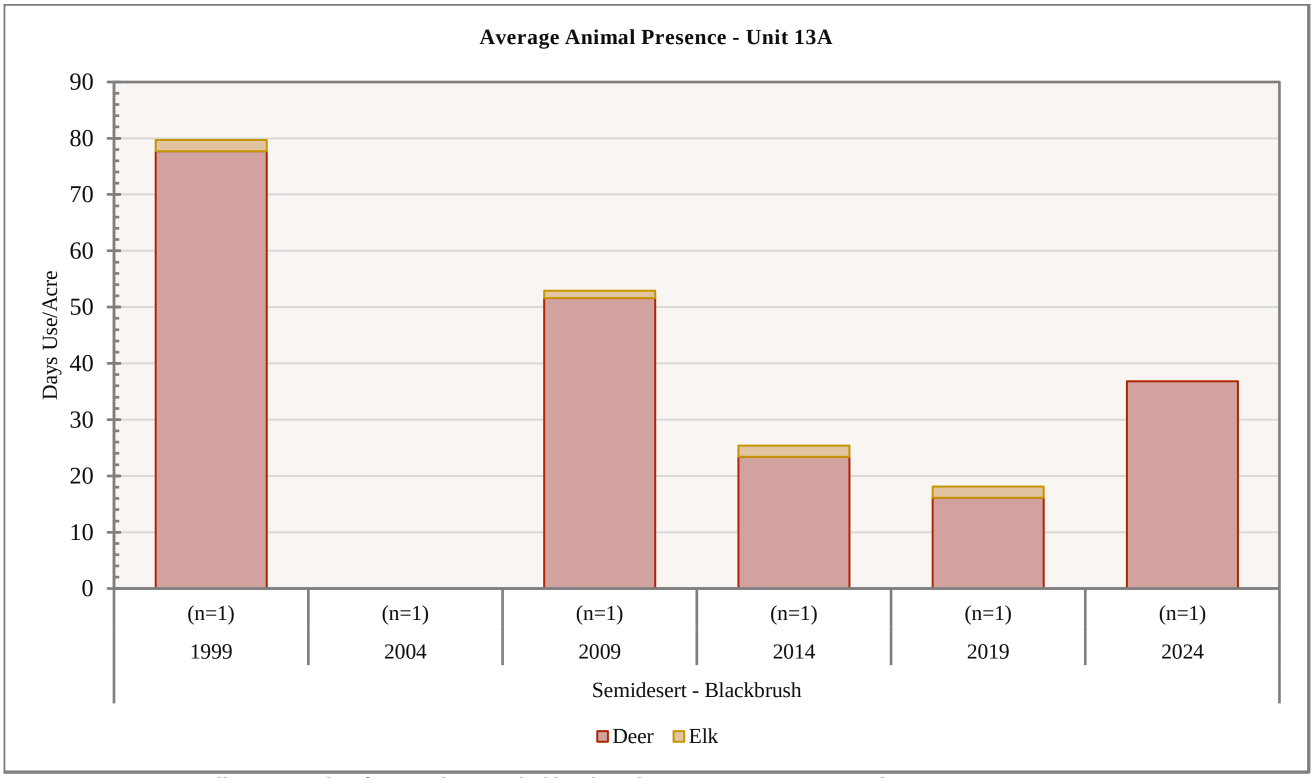


Figure 1.39: Average pellet transect data for Semidesert - Blackbrush study sites in WMU 13A, La Sal Mountains.

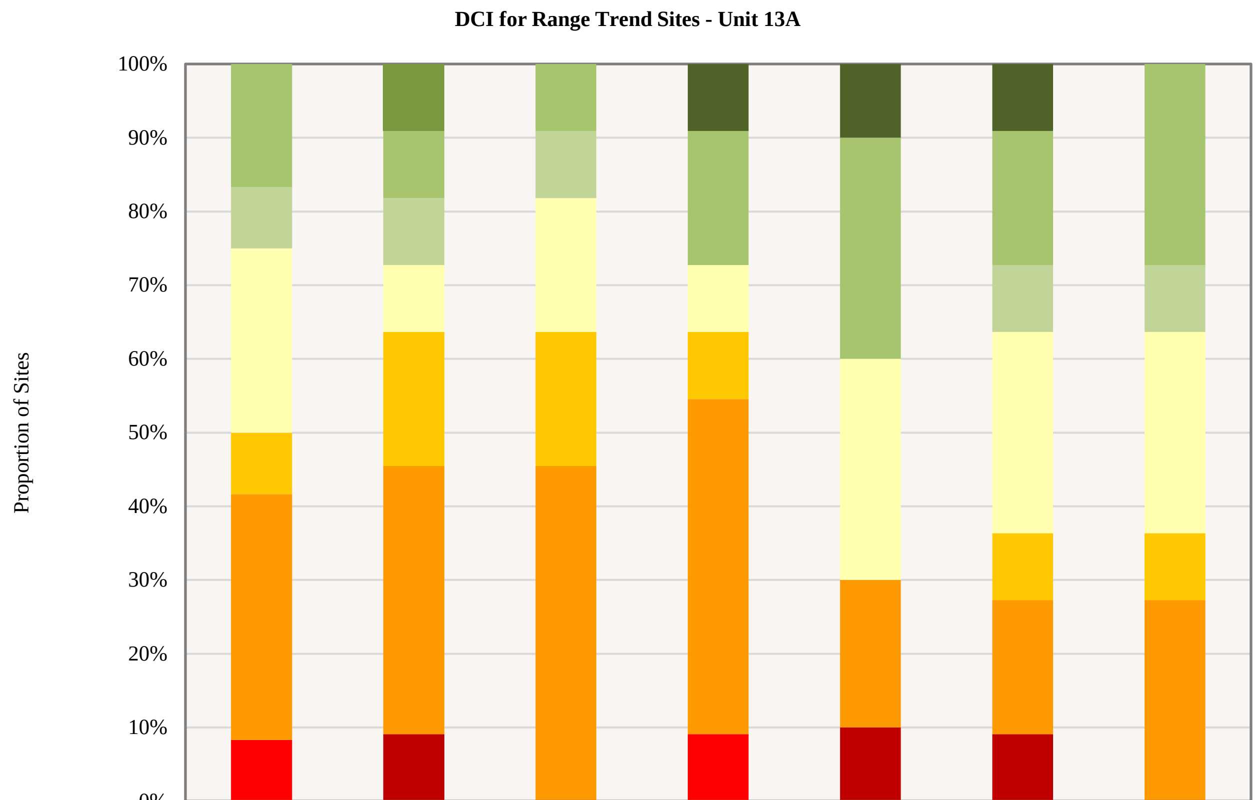
Deer Winter Range Condition Assessment

The overall condition of deer winter and transitional range (**Map 1.2**) within the La Sal Mountains Management Unit has remained similar from year to year with sites averaging between poor-fair and fair condition since 1994. North Beaver Mesa (13A-11), Below Polar Rim (13A-12), Lower Lackey Fan (13A-14), Hideout Mesa (13A-15), and Dolores Point (13A-18) are the main drivers for the unit's wintering habitat stability and quality, and deer winter range condition for these sites averages between fair and good. Two Mile Chaining (13A-01), Buck Hollow (13A-03), Slaughter Flat (13A-04), Amasas Back (13A-05), Round Mountain (13A-07), Black Ridge (13A-08), Upper Fisher Valley (13A-10) (suspended), and Beaver Canyon (13A-13) (suspended) are/have been considered to be between very poor-poor and poor-fair wintering habitat conditions consistently from year to year: these poor conditions suppress the unit's overall winter range quality. Range Trend sites in WMU 13A that tend to have higher winter habitat variability include Lower Lackey Fan and Hideout Mesa: this may suggest a higher potential for winter range improvement.

The overall deer winter range assessment in 2024 for WMU 13A is that the unit is in fair condition. However, North Beaver Mesa, Lower Lackey Fan, Hideout Mesa, and Dolores Point were considered to be in good condition due to the high cover of preferred browse and perennial grass. Lower Lackey Fan would benefit from an increase in native perennial grasses and forbs, while a reduction in annual grass on both Lower Lackey Fan and Hideout Mesa would increase habitat suitability in these areas. All sites would benefit from an increase in perennial forbs (**Figure 1.40**, **Table 1.7**).

Consideration can be given to evaluating Range Trend study sites for elk habitat health and trend. While these Range Trend study sites primarily monitor mule deer range conditions and principally target wintering areas, evaluating the condition of these winter ranges may still provide valuable insights into the overall health and suitability of elk habitats. General evaluations of elk habitat may be made using the mule deer winter range Desirable Component Index (DCI) and other vegetation data when the associated study sites intersect currently mapped elk habitat (**Map 1.3**). The DCI was created as an indicator of the general health of winter ranges for mule deer. The index incorporates shrub cover, density, and age composition as well as other key vegetation variables. Changes in DCI suggest changes in winter range capacity. However, the relationship between DCI and the changes in elk carrying capacity is difficult to quantify and is not known.

Again, the unit's wintering suitability and habitat quality for elk is likely similar to deer winter range conditions. It should be noted that the DCI graph and table associated with this section (**Figure 1.40**, **Table 1.7**) illustrates the number of Range Trend sites within mule deer winter or transitional range. As such, the number of Range Trend sites considered to be elk habitat will not coincide with those depicted in said graph and table (**Figure 1.40**, **Table 1.7**). Study sites that intersect/have intersected elk winter habitat include Two Mile Chaining, Buck Hollow, Slaughter Flat, Amasas Back, Black Ridge, North Beaver Mesa, Below Polar Rim, Beaver Canyon, Lower Lackey Fan, Hideout Mesa, and Dolores Point. The sites with elevated suitability include North Beaver Mesa, Below Polar Rim, Lower Lackey Fan, Hideout Mesa, and Dolores Point. Two Mile Chaining, Buck Hollow, Slaughter Flat, Amasas Back, and Beaver Canyon are/have remained between very poor-poor and poor-fair wintering habitat conditions consistently from year to year: these poor conditions suppress the unit's overall winter range quality for elk.



	1994	1999	2004	2009	2014	2019	2024
Excellent				1	1	1	
Good-Excellent		1					
Good	2	1	1	2	3	2	3
Fair-Good	1	1	1			1	1
Fair	3	1	2	1	3	3	3
Poor-Fair	1	2	2	1		1	1
Poor	4	4	5	5	2	2	3
Very Poor-Poor	1			1			
Very Poor		1			1	1	

Figure 1.40: Deer winter range Desirable Components Index (DCI) summary by year of Range Trend sites for WMU 13A, La Sal Mountains.

Study Number	Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
13A-01	1994	25.2	4	3.8	8.8	0	8.2	0	**50**	**P**
13A-01	1999	19.5	9.8	7.6	11.8	0	4.3	0	**53**	**P**
13A-01	2004	30	9.6	6.7	17.8	0	5.3	0	**69.4**	**F-G**
13A-01	2009	30	10.4	10.4	8.9	0	2.3	0	**62**	**F**
13A-01	2014	30	12.6	4	8.2	0	2.9	0	**57.7**	**F**
13A-01	2019	30	10.5	6.3	13.5	0	9.3	0	**69.6**	**F-G**
13A-01	2024	30	9.6	9.9	10.4	0	1.3	0	**61.2**	**F**
13A-03	1994	0	0	0	30	0	5.9	0	**35.9**	**VP-P**
13A-03	1999	0.2	0	0	30	0	10	0	**40.2**	**P**
13A-03	2004	1.4	0	0	30	0	9.9	0	**41.3**	**P**
13A-03	2009	3.6	0	0	30	0	9.2	0	**42.8**	**P**
13A-03	2014	1.2	0	0	18.2	0	1.6	0	**21**	**VP**
13A-03	2019	3.9	0	0	29.1	0	10	0	**43**	**P**
13A-03	2024	3.3	0	0	30	-0.8	10	0	**42.5**	**P**
13A-04	1994	12.6	11.9	6.4	29.5	-0.2	5.5	0	**65.7**	**F-G**
13A-04	1999	13.1	9.2	8.2	26.7	-5.5	1.5	0	**53.2**	**F**
13A-04	2004	12.1	7.6	0.9	28.5	-4.1	6.1	0	**51.1**	**P-F**
13A-04	2009	14	8	0.4	19.8	-3.6	1.3	0	**39.9**	**P**
13A-04	2014	15.9	8.5	0	30	-0.1	1.4	0	**55.7**	**F**
13A-04	2019	16.5	5.8	0.5	20	-1.5	8.5	0	**49.8**	**P-F**
13A-04	2024	20.1	11.7	1.4	20.3	-0.1	4.1	0	**57.5**	**F**
13A-05	1994	13.8	12.8	4.5	11	-12.3	10	0	**39.8**	**P**
13A-05	1999	10.2	9.5	5.4	12.4	-6.8	8.5	0	**39.2**	**P**
13A-05	2004	14.8	10.6	0.4	13.5	-6.2	5.2	0	**38.3**	**P**
13A-05	2009	14.4	11.1	0.4	12.4	-4.2	5.3	0	**39.4**	**P**
13A-05	2014	11.1	13.2	1.3	13.4	-0.5	2	0	**40.5**	**P**
13A-05	2019	7.8	3.6	0	14.2	-9.5	3.7	0	**19.8**	**VP**
13A-05	2024	7.8	8.5	0	22.8	-1.9	3.1	0	**40.3**	**P**
13A-07	1994	18.3	4.8	0.8	0.1	-2.5	1.5	0	**23**	**P**
13A-07	1999	15.6	11.5	0.9	0.1	-5	0.2	0	**23.3**	**P-F**
13A-07	2004	15	9.4	0.2	0.1	-5.7	0	0	**19**	**P**
13A-07	2009	16.7	11.9	0.7	0.5	-6.9	0.1	0	**23**	**P**
13A-07	2014	21.7	14.6	1.5	1.1	-9.5	0.1	0	**29.5**	**F**
13A-07	2019	24	12.4	1.2	0.9	-3.3	0.4	0	**35.6**	**F**
13A-07	2024	24.5	10.5	1.1	0.5	-12.4	0	0	**24.2**	**P-F**
13A-08	1994	18.1	7.8	3.1	11.3	-1.3	0	0	**39**	**P**
13A-08	1999	14.7	11	1.8	6.4	-1.5	0	0	**32.4**	**VP**
13A-08	2004	23.1	8.3	0.7	10.2	-2.4	0	0	**39.9**	**P**
13A-08	2009	17.5	4.6	0.6	11.1	-0.3	0	0	**33.5**	**VP-P**
13A-08	2014	17.5	11.5	1.9	12.5	-0.1	0	0	**43.3**	**P**
13A-08	2019	21.1	6	0	12	-1.8	2.3	0	**39.6**	**P**
13A-08	2024	19.6	6.7	0	16.3	-0.2	0	0	**42.4**	**P**
13A-10*	1994	19.7	12.2	5.8	14.5	-0.8	1.8	0	**53.2**	**F**
13A-10*	1999	17	13	2.8	16.5	-0.7	1.5	0	**50.1**	**P-F**
13A-10*	2004	24.1	8.2	0.3	17.1	-0.8	1.1	0	**50**	**P-F**
13A-10*	2009	23.4	6.6	0	16.1	-0.4	1.1	0	**46.8**	**P**
13A-11	1994	30	11.1	8.9	18.9	-1.2	9	0	**76.7**	**G**
13A-11	1999	24.5	9.5	11.4	27.9	-0.4	8.3	0	**81.2**	**G-E**
13A-11	2004	27.1	11.4	1.1	25.9	-0.2	5.7	0	**71**	**G**
13A-11	2009	30	12.5	6.1	30	-0.1	4.3	0	**82.8**	**E**
13A-11	2014	26.2	12	9.2	30	-0.1	9.1	0	**86.4**	**E**
13A-11	2019	27.3	10.5	5.2	30	0	10	0	**83**	**E**
13A-11	2024	21.1	9.7	1.1	30	0	4.2	0	**66.1**	**F-G**
13A-12	1994	13.8	14.1	0.7	30	-0.6	4.2	0	**62.2**	**F**
13A-12	1999	15.1	12.2	15	30	-1.4	6.2	0	**77.1**	**G**
13A-12	2004	23.6	11.4	0.1	19.6	-0.1	2.4	0	**57**	**F**
13A-12	2009	26.6	11.5	3.5	30	-0.4	0.9	0	**72.1**	**G**
13A-12	2014	25.5	13.6	3.7	30	-0.2	2	0	**74.6**	**G**
13A-12	2019	25.8	9.9	1.6	30	-1.5	4.8	0	**70.6**	**G**

Study Number	Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
13A-12	2024	23.9	8.2	0.7	28.9	0	1.2	0	**62.9**	**F**
13A-13*	1994	12.6	5.3	0.5	29.8	-3.1	3.2	0	**48.3**	**P-F**
13A-14	1994	15.2	8.9	15	15.1	-2.4	1.5	0		**F**
13A-14	1999	12.6	6.2	9	20.2	-2.6	0.1	0	**45.5**	**P**
13A-14	2004	17.3	8.1	2.6	30	-0.9	1.3	0	**58.4**	**F**
13A-14	2009	22.2	1.4	1.2	25	-0.3	0.4	0	**49.9**	**P-F**
13A-14	2014	21.5	12.1	8.6	28.4	-0.1	0.5	0	**71**	**G**
13A-14	2019	30	11	2.3	10.6	-2	1.9	0	**53.8**	**F**
13A-14	2024	30	11.9	8.7	15.3	-0.1	2.1	0	**67.9**	**G**
13A-15	1994	15	10.7	12.1	25.4	0	9.9	0	**73.1**	**G**
13A-15	1999	13.7	11.4	15	25	-2.1	7.6	0	**70.6**	**F-G**
13A-15	2004	23.3	11.9	3.9	9.2	-9.2	7.6	0	**46.7**	**P**
13A-15	2009	28.7	12.1	13.5	12.2	-3.3	9.9	0	**73.1**	**G**
13A-15	2014	30	12.3	13.3	17.8	-0.4	10	0	**83**	**G**
13A-15	2019	23.6	6.9	6.4	21	-6.5	8.7	0	**60.1**	**F**
13A-15	2024	24.9	12.6	10.3	30	-4.2	7.5	0	**81.1**	**G**
13A-18	2019	24.8	11.5	10.6	30	-0.2	10	0	**86.7**	**G**
13A-18	2024	23.4	11.1	5.2	30	0	8.3	0	**78**	**G**

Table 1.7: Deer winter range Desirable Components Index (DCI) information by site number of Range Trend studies for WMU 13A, La Sal Mountains. VP = Very Poor, P = Poor, F = Fair, G = Good, E = Excellent. *Studies with an asterisk have been suspended.

Study #	Study Name	Limiting Factor and/or Threat	Level of Impact	Potential Impact
13A-01	Two Mile Chaining	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Medium	Reduced understory shrub and herbaceous vigor
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
13A-03	Buck Hollow	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Medium	Reduced understory shrub and herbaceous vigor
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
13A-04	Slaughter Flat	Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
13A-05	Amasas Back	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Medium	Reduced understory shrub and herbaceous vigor
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
13A-06	Bald Mesa	Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
		Noxious Weeds	Low	Reduced diversity of desirable grass and forb species
		Tourism/Recreation	Low	Loss of habitat, reduced shrub and herbaceous vigor
13A-07	Round Mountain	Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
13A-08	Black Ridge	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
13A-11	North Beaver Mesa	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Medium	Reduced understory shrub and herbaceous vigor
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
13A-12	Below Polar Mesa	Animal Use – Elk	High	Reduced shrub vigor/diversity of desirable grass and forb species
		Animal Use – Cattle	Medium	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
13A-14	Lower Lackey Fan	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
13A-15	Hideout Mesa	Annual Grass	Medium	Increased fire potential and reduced herbaceous diversity
		Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
13A-16	Beaver Creek	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
13A-17	Bar-A	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
13A-18	Dolores Point	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor

Study #	Study Name	Limiting Factor and/or Threat	Level of Impact	Potential Impact
13R-02	Pack Creek	Annual Grass	Medium	Increased fire potential and reduced herbaceous diversity
		Energy Development	Low	Fragmentation and degradation/loss of habitat
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
13R-03	Black Ridge Fuel Reduction	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
13R-05	La Sal Aspen Exclosure	Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
13R-06	La Sal Aspen	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
13R-07	Doe Canyon	Conifer Encroachment	Medium	Reduced understory shrub, aspen stand, and herbaceous vigor
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
13R-08	Hop Creek Aspen	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Noxious Weeds	Low	Reduced diversity of desirable grass and forb species
13R-09	Hop Creek Aspen Exclosure	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
13R-10	Brush Hole	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
13R-11	Above Fisher Creek	PJ Encroachment	Medium	Reduced understory shrub and herbaceous vigor
13R-12	South Mesa	Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
13R-13	Sids Draw	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species

Table 1.8: Assessment of the potential limiting factors and/or threats and level of threat to study sites for WMU 13A, La Sal Mountains. All assessments are based off the most current sample date for each study site. Criteria for evaluating limiting factors is available in **Appendix A - Threat Assessment**.

Discussion and Recommendations

Deer winter and/or transitional range condition on the La Sal Mountains Management Unit averages as fair unit wide as of 2024. North Beaver Mesa, Lower Lackey Fan, Hideout Mesa, and Dolores Point are considered to be in good condition as of the most recent sample year due to high cover of preferred browse and perennial grasses. In contrast, the Buck Hollow, Amasas Back, Round Mountain, and Black Ridge studies are classified as being in poor or poor-fair condition as of 2024. Factors contributing to the poor conditions of these studies vary between reduced preferred browse cover, a lack of perennial forbs, annual grass presence (in the case of the Round Mountain study), and undiversified age class structures among the preferred browse communities (**Figure 1.40**, **Table 1.7**).

Of positive note within this unit is that ample preferred browse communities have persisted on many Range Trend sites that are considered to be/may serve as mule deer winter or transitional range (Two Mile Chaining, Slaughter Flat, Round Mountain, Black Ridge, North Beaver Mesa, Below Polar Rim, Lower Lackey Fan, Hideout Mesa, and Dolores Point). More specifically, the browse components on these sites have not exhibited decreases in cover or density that would cause the associated plant communities to shift into different (and possibly degraded) ecological states. An additional highlight in the La Sal Mountains unit is that in 2024, cheatgrass (*Bromus tectorum*) contributed little to no cover on all study sites except Round Mountain and (to a lesser extent) Hideout Mesa. Of further positive note is that quaking aspen (*Populus tremuloides*) has begun to regenerate or has regenerated on study sites that monitor aspen improvement projects, including La Sal Aspen Exclosure, La Sal Aspen, Doe Canyon, Hop Creek Aspen, and Hop Creek Aspen Exclosure. Furthermore, data and/or repeat photography for many of these sites demonstrate age class diversification within the aspen stands in the years following treatment. The United States Forest Service (USFS) has planned for additional aspen restoration projects on the Manti-La Sal National Forest. In addition, approximately 1,800 acres of aspen are responding to the 2021 Pack Creek wildfire (**Map 1.6**) with "dense, vigorous sprouting" (B. Smith, personal communication, February 25, 2025).

Other restoration projects have occurred across the unit, and improvements in habitat quality (aspen regeneration, pinyon-juniper reduction, browse diversification, etc.) have been observed following treatment on many Range Trend and Watershed Restoration Initiative (WRI) sites. Habitat treatment projects have also been and continue to be implemented in areas not monitored by the Range Trend program; nearly 27,294 treatment acres have been completed through the WRI as of February 2025 (**Map 1.7**, **Table 1.4**). Introduced perennial grasses – including species such as intermediate wheatgrass (*Thinopyrum intermedium*), smooth brome (*Bromus inermis*), crested wheatgrass (*Agropyron cristatum*), Kentucky bluegrass (*Poa pratensis*), bulbous bluegrass (*P. bulbosa*), and Russian wildrye (*Psathyrostachys juncea*) – may be a concern in some areas of the La Sal Mountains Management Unit. More than 50% of perennial grass cover in 2024 was provided by introduced species on the Two Mile Chaining, Buck Hollow, Slaughter Flat, Amasas Back, Black Ridge, North Beaver Mesa, Lower Lackey Fan, Hideout Mesa, Beaver Creek, and Bar-A study sites (**Table 1.8**). While they provide forage, introduced perennial grasses may outcompete other more desirable and or/native species for resources (Mack, et al., 2000; Oftinowski, Kenkel, & Catling, 2007). Furthermore, crested wheatgrass in particular can outcompete establishing, young shrubs (Gunnell, Monaco, Call, & Ransom, 2010). Competition for resources may be occurring on the Buck Hollow study, on which introduced perennial grasses such as smooth brome, crested wheatgrass, and intermediate wheatgrass have been a dominant vegetation component since 1994. Density and cover of preferred browse species on this site have remained low over time despite seedlings and young plants being observed in density strips in some years (Lane, Cox, & Payne, Utah Big Game Range Trend Studies 2024, Wildlife Management Units 13A, 14A, 14B, 15, 16B & 16C, 2025). Although it is probable that several factors contribute to the persistently limited presence of preferred browse, increases in density and cover may be negatively affected by these perennial grass species.

Although a number of treatments aimed at aspen regeneration have occurred in this unit (**Map 1.7**, **Table 1.4**), the condition of aspen stands in some areas may still be a concern. Of the 25 active Range Trend or WRI sites in 13A, only six have quaking aspen as a dominant vegetation component. Furthermore, only one of these six studies (Beaver Creek) has not undergone an aspen regeneration treatment, and as such, Range Trend data addressing untreated aspen stands is lacking as of 2024. However, the LANDFIRE Vegetation Departure model indicates that nearly 85% of the Aspen Forest and Woodland and Aspen-Mixed Conifer Forest vegetation types within the La Sal Mountains unit are between 30 and 60% departed from reference conditions. More specifically, approximately 29,463 acres of Aspen Forest and Woodland and 3,543 acres of Aspen-Mixed Conifer Forest fall within the 30 to 60% departure scale (LC23_VDep_240, 2023). Satellite imagery shows that some of these departed aspen systems are experiencing conifer encroachment. Aspen communities in later successional stages may be the result of decades-long fire management and policy, which have allowed for fir (*Abies* spp.) and spruce (*Picea* spp.) to accumulate over time. Although healthy aspen communities are present on portions of land managed by the USFS, conifer encroachment is of particular concern in some stands at higher elevations and in north-facing areas. In select, more isolated aspen stands below approximately 9,000 feet, dead trees remain standing with little aspen suckering or recruitment of young occurring. In these lower elevation stands, this lack of age class diversification and regeneration can be attributed to factors such as ungulate browsing, competition with mountain snowberry (*Symphoricarpos oreophilus*), and a lack of disturbance (B. Smith, personal communication, February 25, 2025). Furthermore, the 2015-2025 Wildlife Action Plan (which considers aspen-conifer to be a key habitat) mentions that aspen cover throughout the state has generally decreased due to conifer encroachment resulting from fire suppression and higher levels of ungulate browsing on young aspen plants in disturbed areas (Utah Division of Wildlife Resources, 2015).

Infilling and/or encroachment of twoneedle pinyon (*Pinus edulis*) and juniper (*Juniperus* spp.) is occurring on many lower-elevation study sites in this unit, posing a low-level threat on most of the affected sites. However, the threat of tree encroachment is considered to be medium on Two Mile Chaining, Buck Hollow, Amasas Back, and North Beaver Mesa (**Table 1.8**): these sites are in Phase II or Phase I transitioning to Phase II of woodland succession. Presence of pinyon and juniper can result in reduced understory shrub and herbaceous health as infilling/encroachment advances (Miller, Svejcar, & Rose, 2000).

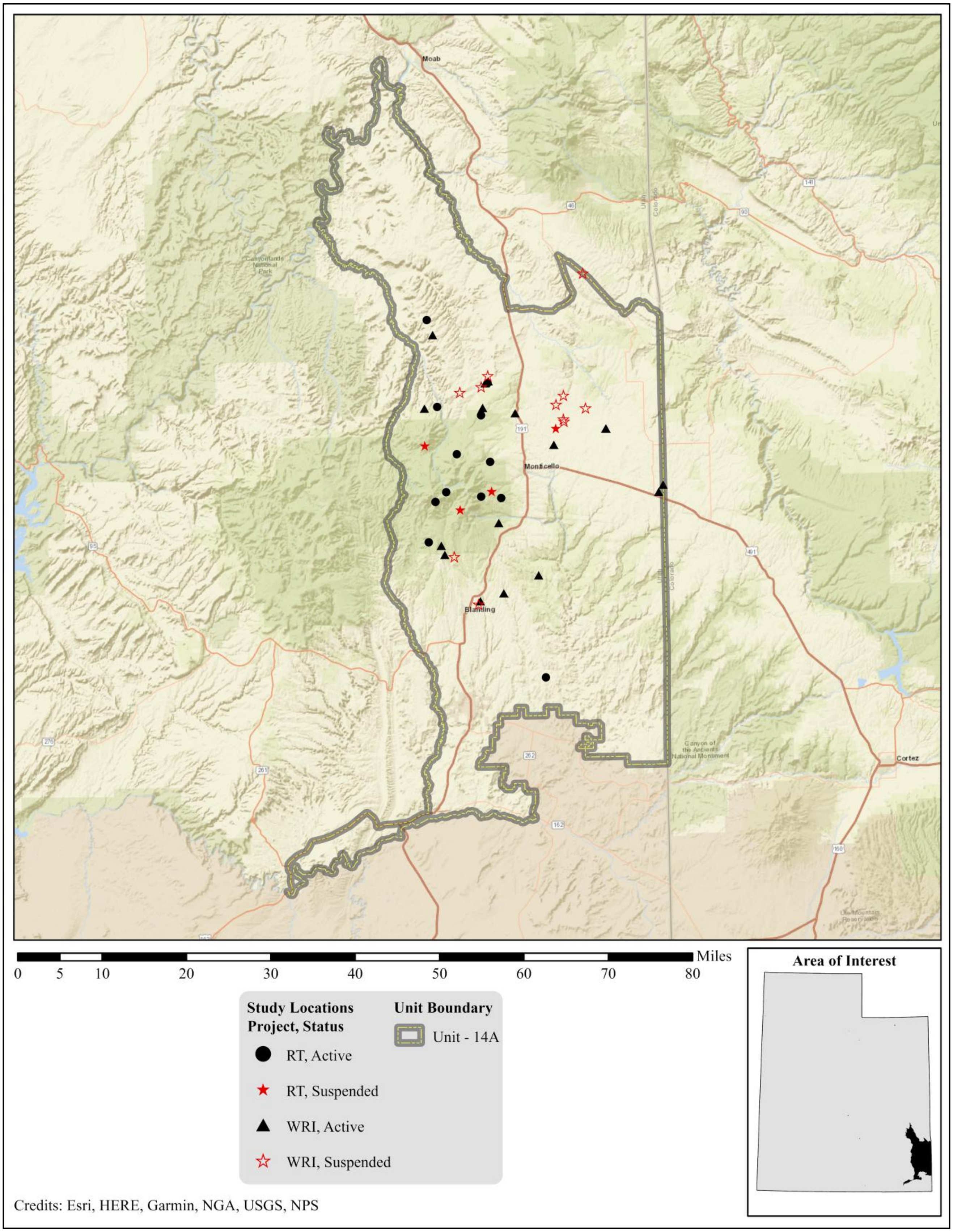
There may also be potential for human development within select areas of the La Sal Mountains unit. Islands of privately-owned land are scattered along the west side of the mountain range in both mule deer winter and summer range, and part of the town of Castle Valley overlaps crucial winter range. Human expansion is by nature dynamic in location, extent, and timeframe. Furthermore, the extent of development is likely limited as much of the land on the La Sal Mountains is managed by state or federal entities (**Map 1.4**). However, satellite imagery over time makes evident the occurrence of development such as building construction in select areas of the unit. Development in areas that overlap wildlife habitat can have direct deleterious effects to both habitat and wildlife through habitat fragmentation, human-wildlife interactions, and increased potential for invasive plant production, among others.

Recreation in general benefits members of the public and provides opportunities for economic growth, but higher levels can become unsustainable for wildlife if not properly managed. Arches National Park falls within the boundaries of unit 13A and receives a significant number of visitors each year, with over 1,480,000 recorded in 2023 alone (National Park Service, 2024). The park does not overlap currently mapped mule deer habitat. However, it is reasonable to hypothesize that travelers may visit the larger vicinity, including areas that may be important to wildlife. Furthermore, the La Sal Mountains themselves offer numerous opportunities for recreational activities, including more than 300 trail miles (Manti-La Sal National Forest Moab Ranger District). The La Sal Loop – Moab Front Recreation Area and Warner Lake are considered to be wildlife-viewing areas by the USFS and receive medium-heavy and heavy use, respectively (U.S. Department of Agriculture, Forest Service, 2025). Monitoring, objectives, and guidelines issued by the USFS likely help mitigate many of the negative outcomes that might result from recreational use; the exact effects of recreation in the La Sal Mountains are unknown to the authors of this report. However, deleterious effects on wildlife and habitat are always a possibility. Single negative incidents may not greatly affect local wildlife populations, but continued interactions may have greater impacts that could be exacerbated by other simultaneous stressors (Utah Division of Wildlife Resources, 2015).

Other threats to wildlife habitat are occurring in localized portions of this unit, but they will not be discussed in this section. These additional threats are specified by study site in the previous table (**Table 1.8**).

A number of recommendations for the La Sal Mountains unit should be considered for the benefit of both wildlife and habitat. A portion of this unit has already been treated for pinyon-juniper encroachment (**Table 1.4**, **Table 1.6**), and treatments have generally been effective. When and where appropriate, however, efforts to address infilling or encroachment of pinyon and juniper in both previously treated and untreated areas should be continued or implemented. According to aerial imagery and site data (Lane, Cox, & Payne, 2025), specific opportunities for tree removal may exist in the larger areas around the Amasas Back and Buck Hollow studies in the southwestern portion of the unit; in the general vicinity of the North Beaver Mesa study in the north; and in the areas surrounding the Dolores Point site (which was previously treated) in the northeastern portion of the management unit. If reseeding is necessary to restore herbaceous species, care should be taken in species selection and preference given to native species whenever possible. In higher elevations, aspen stands should (continue to) be monitored. Conifer-encroached aspen stands with little recruitment of young may benefit from treatments that promote rejuvenation and regeneration. Continued cooperation with federal land management agencies, state entities, and private landowners is encouraged to implement habitat improvement projects where possible and appropriate. Finally, monitoring of Range Trend studies and areas where rehabilitation projects have occurred should continue. Periodic monitoring of these areas not only assesses the quality of big game habitat but may also aid in the identification of threats as they appear over time.

2. WILDLIFE MANAGEMENT UNIT 14A – ABAJO MOUNTAINS



WILDLIFE MANAGEMENT UNIT 14A – ABAJO MOUNTAINS

Boundary Description

Grand and San Juan Counties – Boundary begins at the junction of the Colorado River and Kane Springs Creek; south along Kane Springs Creek to Hatch Wash ; south along Hatch Wash to US Highway 191; south on US Highway 191 to County Road 113 (Big Indian Road); east and then north on County Road 113 to County Road 313 (Lisbon Valley Road); southeast on County Road 313 to Island Mesa Road; east on Island Mesa Road to the Utah-Colorado state line; south on the state line to the Navajo Nation boundary; west on the Navajo Nation boundary to US Highway 163; northeast along US Highway 163 to US Highway 191; east on US Highway 191 to Cottonwood Wash in Bluff, UT; north on Cottonwood Wash (Cottonwood Canyon) to Allen Canyon; north along Allen Canyon (transitioning to Chippean Canyon) to Mule Canyon; north along Mule Canyon to The Causeway; north along Trough Canyon to North Cottonwood Creek; north along North Cottonwood Creek (transitioning to Cottonwood Creek) to Indian Creek; north along Indian Creek to the Colorado River; north on the Colorado River to Kane Springs Creek.

Management Unit Description

Geography

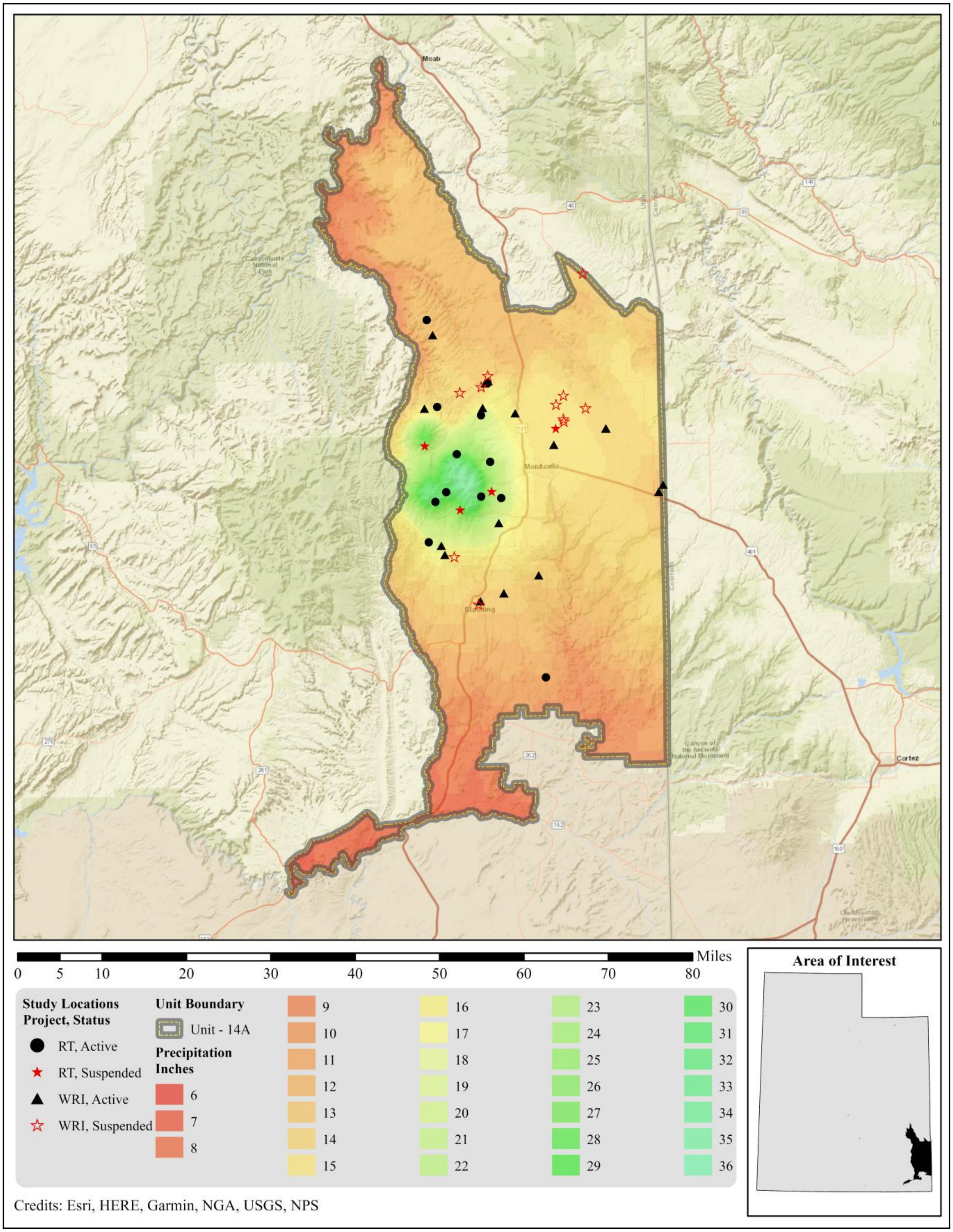
The Abajo Mountains subunit (14A) covers a large portion of the eastern side of San Juan County in southeastern Utah and is a climactically and topographically diverse area. The elevation ranges from 4,300 feet near the town of Bluff to 11,360 feet on Abajo Peak. The Abajo Mountains, located in the western-central part of the unit, contain the unit's summer range (**Map 2.2**, **Map 2.3**): these mountains typically have steep slopes and rugged canyons that have well-developed vegetation communities except for the rocky peaks above timberline. The highest meadow slopes have been terraced to slow destructive erosion caused by historic overgrazing. From the base of the mountain, gentle slopes extend out into the flat mesas and rough desert canyon lands that constitute the majority of the unit's land area. Major drainages include Indian Creek and Hatch Wash, which flow north to the Colorado River; and Cottonwood, Johnson, Recapture, Verdure, and Montezuma Creeks, which flow east and south to the San Juan River. Municipalities within this subunit include Monticello, Blanding, Bluff, and Montezuma Creek.

Climate Data

The 30-year (1991-2020) annual precipitation PRISM model shows precipitation ranges from 6 inches in the far southwest portion of the unit near Mexican Hat and the bottoms of the San Juan River to 36 inches on Horsehead and Abajo Peaks. All of the active Range Trend and WRI monitoring studies on this unit occur within 10-31 inches of precipitation (**Map 2.1**) (PRISM Climate Group, Oregon State University, 2021).

Vegetation trends are dependent upon annual and seasonal precipitation patterns. Palmer Drought Severity Index (PDSI) data for the unit was compiled from the National Oceanic and Atmospheric Administration (NOAA) Physical Sciences Division (PSD) as part of the Southeast Division (Division 7).

The mean annual PDSI of the Southeast Division, which the Abajo Mountains unit is part of, has experienced some form of drought in most years since 1994. Moreover, this climate division has been considered to be in some form of drought nearly 52% of the time since 1994. Of the drought years, 56% are considered to be either moderate or extreme droughts. Also remarkable about this climate division is that drought is experienced over multiple, consecutive years and is generally interrupted by a single wet year event. The most notable wet year occurred in 2005 and was considered to be moderately wet (**Figure 2.1a**). The mean spring (March-May) and mean fall (September-November) PDSI estimations typically follow the same trends as the average annual PDSI trends, but they can show split seasonal precipitation events that are not captured in the overall annual PDSI. These seasonal precipitation events can play a crucial role in the timing of plant growth and production for the remainder of the year (spring), or for the year ahead (fall). When a wet fall aligns with a wet spring of the following year, plant health and production for that following year can have a positive effect on forage availability. This is due to lower evaporation and transpiration rates between the months of September to May that result in higher soil moisture reserves being made available to plants for longer periods during the dry summer months. Although annual precipitation is likely the driver for plant production, the interplay of fall/spring wetness may make a drought year less impactful as a plant stressor. The ecotypes evaluated by Range Trend are primarily found on deer transitional and winter ranges. Plant growth on these ranges is primarily affected by the seasonal precipitation that occurs during the fall and spring months (Cox, et al., 2009), and is the reason fall and spring PDSI estimations are focused on in this report (**Figure 2.1b**). The years that follow this pattern of consecutive wet fall and spring occur in 1994/95, 1996/97, 1997/98, 2004/05, and 2022/23. Range Trend sample years occur on a five-year rotation, so the PDSI years of interest should be examined by the corresponding rotation year (**Table 2.5**). The 2019 sample year occurs during a wet year, but years where drought may have affected plant condition occur in 1994, 2004, 2009, 2014, and 2024 (**Figure 2.1a, Figure 2.1b**) (National Oceanic and Atmospheric Administration, 2025).



Map 2.1: The 1991-2020 PRISM Precipitation Model for WMU 14A, Abajo Mountains (PRISM Climate Group, Oregon State University, 2021).

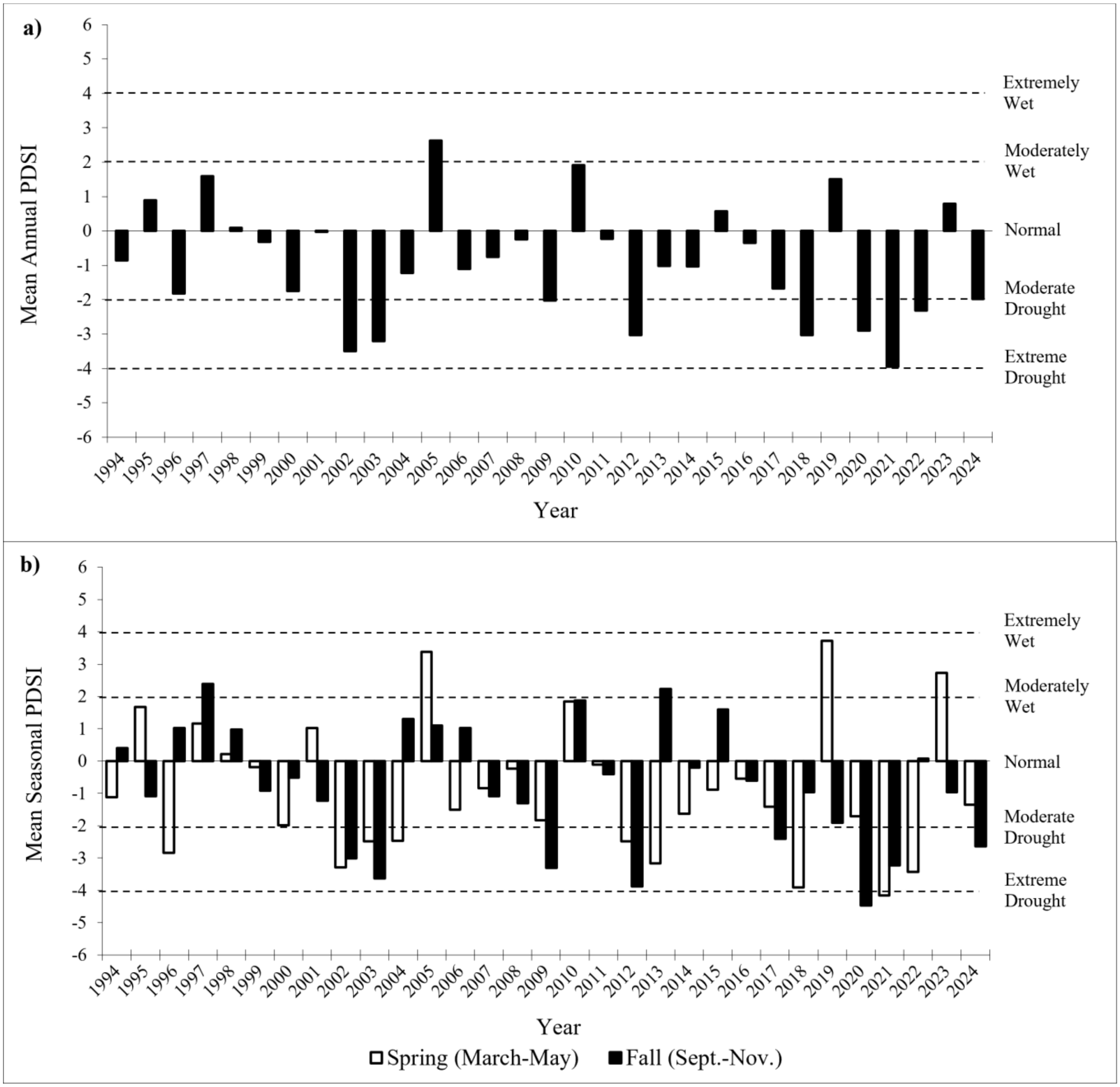


Figure 2.1: The 1994-2024 Palmer Drought Severity Index (PDSI) for the Southeast Division (Division 7). The PDSI is based on climate data gathered from 1895 to 2024. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet, and negative deviations indicate drought. Classification of the scale is $\geq$4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to 2.9 = Moderately Wet, 1.0 to 1.9 = Slightly Wet, 0.5 to 0.9 = Incipient Wet Spell, 0.4 to -0.4 = Normal, -0.5 to -0.9 = Incipient Dry Spell, -1.0 to -1.9 = Mild Drought, -2.0 to -2.9 = Moderate Drought, -3.0 to -3.9 = Severe Drought and $\leq$-4.0 = Extreme Drought. a) Mean annual PDSI. b) Mean spring (March-May) and fall (Sept.-Nov.) PDSI (National Oceanic and Atmospheric Administration, 2025).

Big Game Habitat

The normal deer winter range in the Abajo Mountains (**Map 2.2**) is found on various mesas at middle elevations. The upper elevation limit of most deer use during most winters is approximately 7,000 feet. However, during mild winters the range may remain open up to approximately 8,000 feet in elevation. The desert shrub community type (semidesert ecological sites) is found at low elevations along the northern boundary: deer use this community only in the most severe winters. The sagebrush-grass and pinyon-juniper vegetation communities (upland ecological sites) can be found side-by-side on the mesa tops of the normal winter range that are very important to wintering deer; the sagebrush-grass community type provides quality forage while pinyon-juniper communities provide important thermal cover. The pinyon-juniper-mountain brush community mountain ecological site is the most productive, but it is usually excluded from use by deep snow during the harsher winters.

The summer range (**Map 2.2**) is centered on and extends down the ridges of Abajo Peak to about 8,000 feet in elevation. Subalpine forest, aspen, and grass-shrub communities (high mountain ecological sites) are prevalent at higher elevations. Interspersed oak brush, sagebrush-grass, and forest communities (mountain ecological sites) provide the necessary cover and forage required for fawning and calving. The lower limits of the summer range on the north and east sides of the mountain are closer in elevation to approximately 7,500 feet and are dominated by mixed mountain brush communities (Giunta & Musclow, 1981). Oak brush is the dominant vegetation type at the lower reaches of the summer range.

Extensive areas of pinyon-juniper were chained and seeded in the 1960s. Although cover requirements for wildlife were not considered at the time (chained areas were large and usually square with no regard for cover or edge effect), they still provided many benefits (forage, for example) to the big game populations in the area.

The most crucial wintering areas for mule deer include Alkali Flat and Harts Draw. Other key areas are Shay Mesa, Indian Creek, Shay Mesa, Deerneck Mesa, East Canyon, Horsehead Point, Montezuma Canyon, Lime Ridge, and Dodge Point.

Rangeland Analysis Platform (RAP) – Biomass and Cover by Deer Habitat

Several factors determine quality wildlife forage. Diversity of species and life forms, age class and vigor of shrubs, timing of vegetative stages of grasses and forbs, and the abundance of palatable vegetation all contribute to a quality habitat for mule deer. Site-level (Range Trend sites) data addresses species composition, age structure, and health of communities in winter and transitional habitats. However, due to the small number and/or placement of Range Trend sites, it is difficult to get a true estimation of vegetation abundance. Trend study sites are strategically placed in key areas for mule deer to assess both quantity and quality of forage, but due to limited sampling, these sites cannot accurately predict the overall abundance of forage available to mule deer in the entire extent of mule deer range. The Rangeland Analysis Platform (RAP) may aid in the estimation of forage quantity within mule deer habitat by providing values for biomass and cover for perennial, annual, and browse lifeforms that Range Trend sites cannot account for. However, RAP data does not fully address the quality of forage the way that Range Trend data does. The intent of the RAP dataset is to supplement Range Trend data and local knowledge to inform managers of general habitat trends. Additionally, "[RAP] data can be used to evaluate resources in concert with site-specific information about the area under investigation, such as past land management practices, vegetation treatments, conservation efforts, or natural disturbances" (Rangeland Analysis Platform; Products, 2025, para. 5). The following graphs represent vegetation changes by either biomass or percent cover based on deer winter, summer, or spring/fall range habitat. Range Trend data is collected on a five-year interval and the intent of the RAP data is to also help illustrate the year-to-year fluctuations or changes that may occur between Range Trend samplings.

The RAP data illustrates fluctuations in herbaceous cover and biomass on mule deer summer, winter, and spring/fall range. The highest values for biomass and cover occurred in the early 1990s and have since decreased on ranges of all seasonality. These trends are particularly apparent on summer range: biomass of perennial and annual lifeforms decreased from approximately 621 pounds/acre in 1993 to roughly 302 pounds/acre in 2024. Cover of perennial and annual lifeforms on summer range also decreased from 30% in 1993 to nearly 16% in 2024. This decrease may be partially driven by precipitation, which was nearly 28 inches in 1993. However, similar precipitation has been observed since 1993 (26 inches in 2005 and 2019) without particularly notable increases in cover and biomass, which suggests other factors also play into herbaceous trends on summer range in this unit. Annual and perennial cover and biomass have loosely followed precipitation trends on winter and spring/fall range in many years, although lag effects of a year or so have occurred at other times. RAP data also shows that annual lifeforms have generally provided more cover on winter and spring/fall range than on summer habitat (**Figure 2.2**, **Figure 2.3**, **Figure 2.4**, **Figure 2.5**, **Figure 2.6**, **Figure 2.7**). This correlates with herbaceous cover on Range Trend sites: annual grasses and forbs have provided more cover on semidesert and upland study sites than on those of a mountain ecotype (**Figure 2.29**, **Figure 2.30**, **Figure 2.31**, **Figure 2.32**). However, it is important to note that Range Trend sites are summarized by ecological potential in this report and not seasonality of mule deer range. As such, incongruences between Range Trend data and that reported by the RAP are probable.

The RAP data for tree and shrub cover shows fluctuations from year to year. When comparing 1986 data with that from 2024, shrub cover has remained similar on summer and spring/fall ranges and has decreased on mule deer winter range. Tree cover on summer range has remained similar over the same period, but it has increased on winter and spring/fall ranges. Values for both correlate with precipitation in some years (or a possible lag effect has occurred), but more loosely so than herbaceous cover and biomass (**Figure 2.8**, **Figure 2.9**, **Figure 2.10**). Range Trend data for mountain study sites displays general increases in shrub cover since 2004. Total average shrub cover has decreased on semidesert study sites when comparing 2004 data with that from 2024 and has remained similar on upland sites (**Figure 2.11**, **Figure 2.12**, **Figure 2.13**, **Figure 2.14**). Tree cover has fluctuated depending on ecotype according to Range Trend data (**Figure 2.15**, **Figure 2.16**, **Figure 2.17**). When making comparisons between RAP and Range Trend data, it is important to take the caveats mentioned in the previous section into consideration.

RAP – Herbaceous Biomass by Deer Habitat

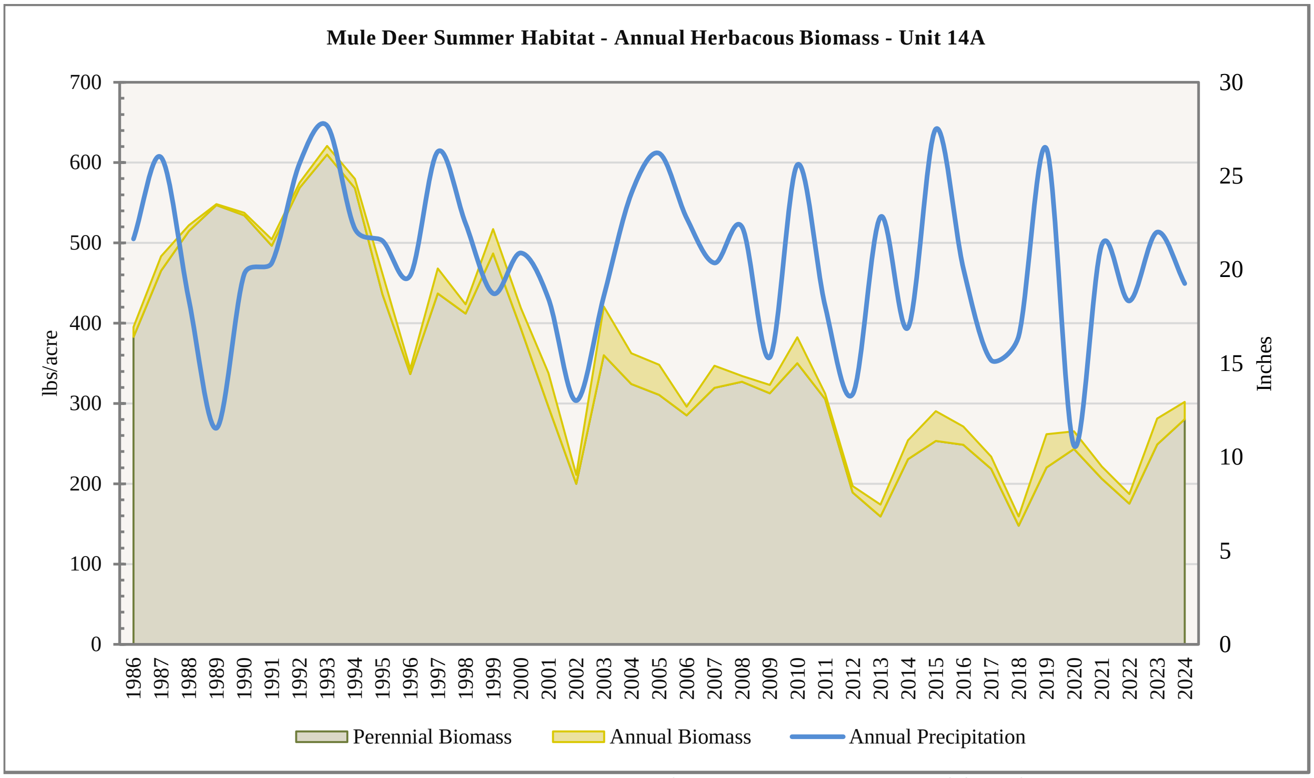


Figure 2.2: Average precipitation and estimated yearly herbaceous biomass of stacked perennial and annual lifeforms for summer mule deer habitat in WMU 14A, Abajo Mountains (Rangeland Analysis Platform, 2025).

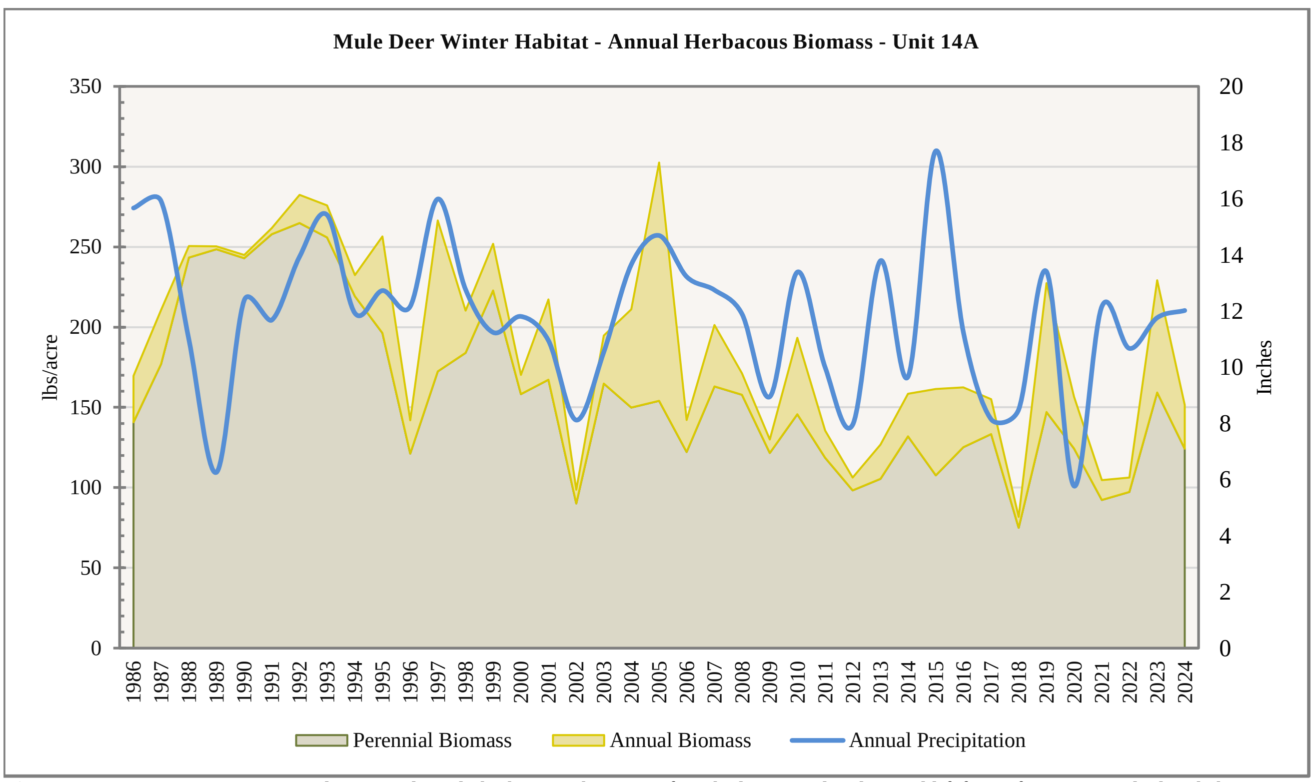


Figure 2.3: Average precipitation and estimated yearly herbaceous biomass of stacked perennial and annual lifeforms for winter mule deer habitat in WMU 14A, Abajo Mountains (Rangeland Analysis Platform, 2025).

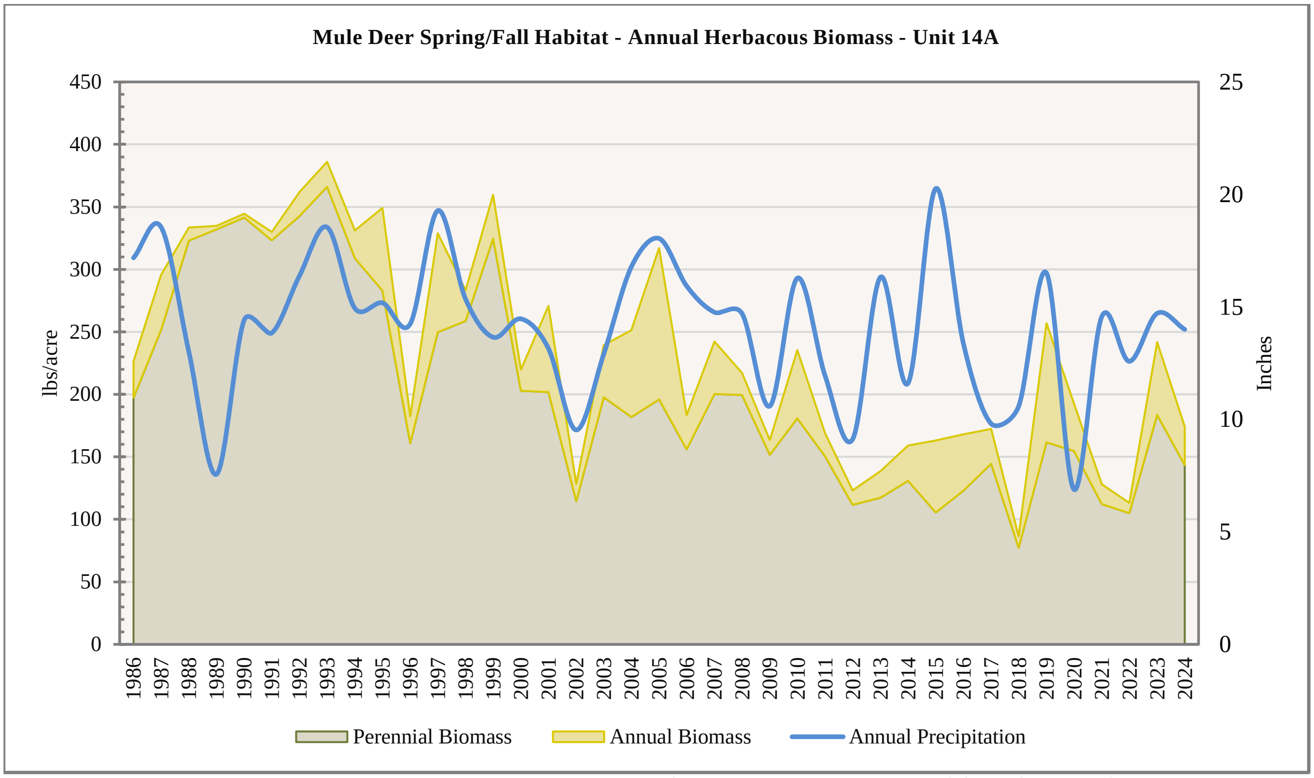


Figure 2.4: Average precipitation and estimated yearly herbaceous biomass of stacked perennial and annual lifeforms for spring/fall mule deer habitat in WMU 14A, Abajo Mountains (Rangeland Analysis Platform, 2025).

RAP – Herbaceous Cover by Deer Habitat

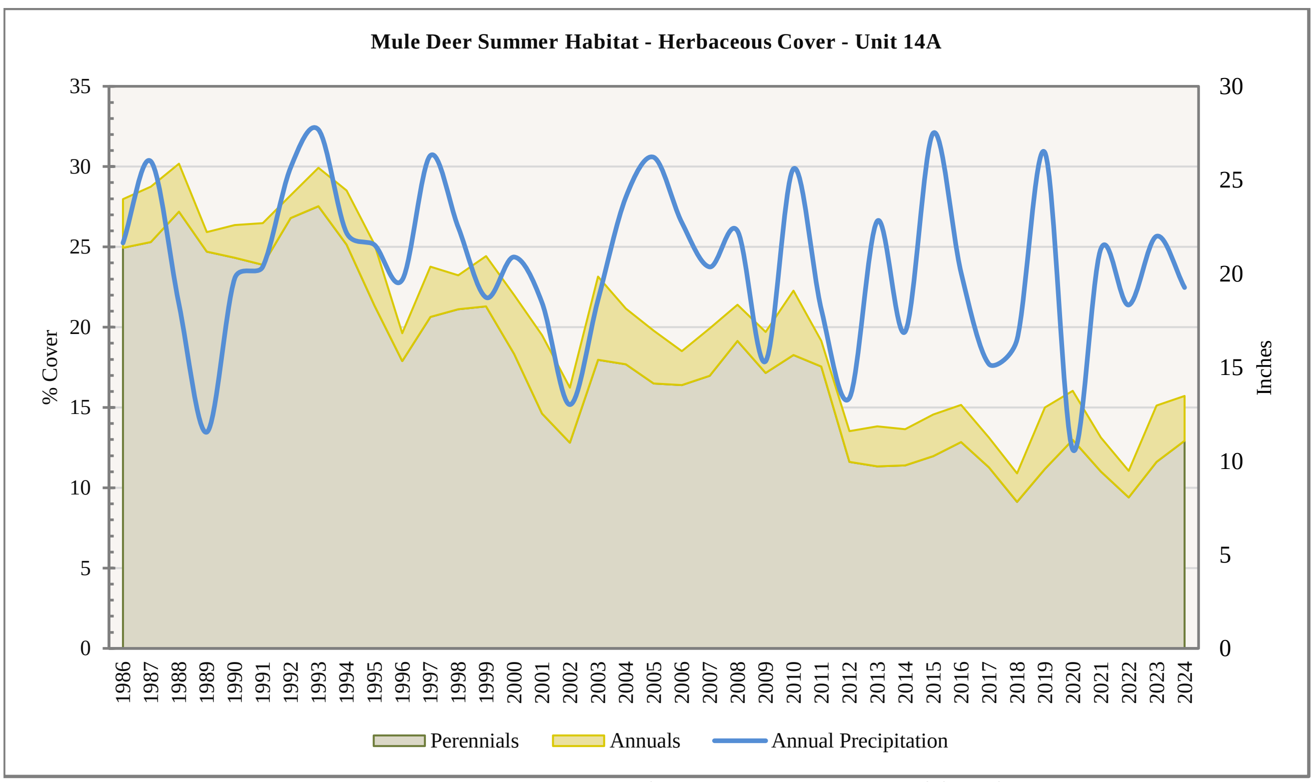


Figure 2.5: Average precipitation and estimated yearly herbaceous cover of stacked perennial and annual lifeforms for summer mule deer habitat in WMU 14A, Abajo Mountains (Rangeland Analysis Platform, 2025).

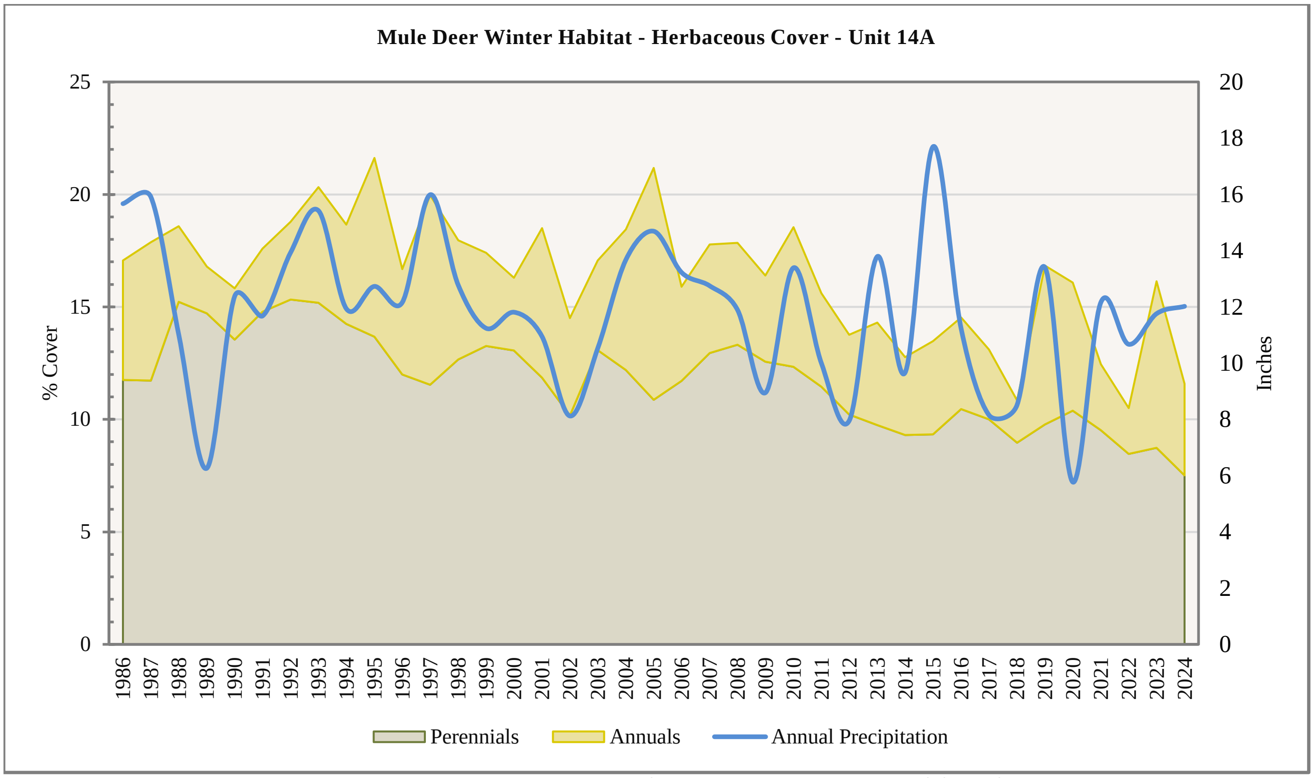


Figure 2.6: Average precipitation and estimated yearly herbaceous cover of stacked perennial and annual lifeforms for winter mule deer habitat in WMU 14A, Abajo Mountains (Rangeland Analysis Platform, 2025).

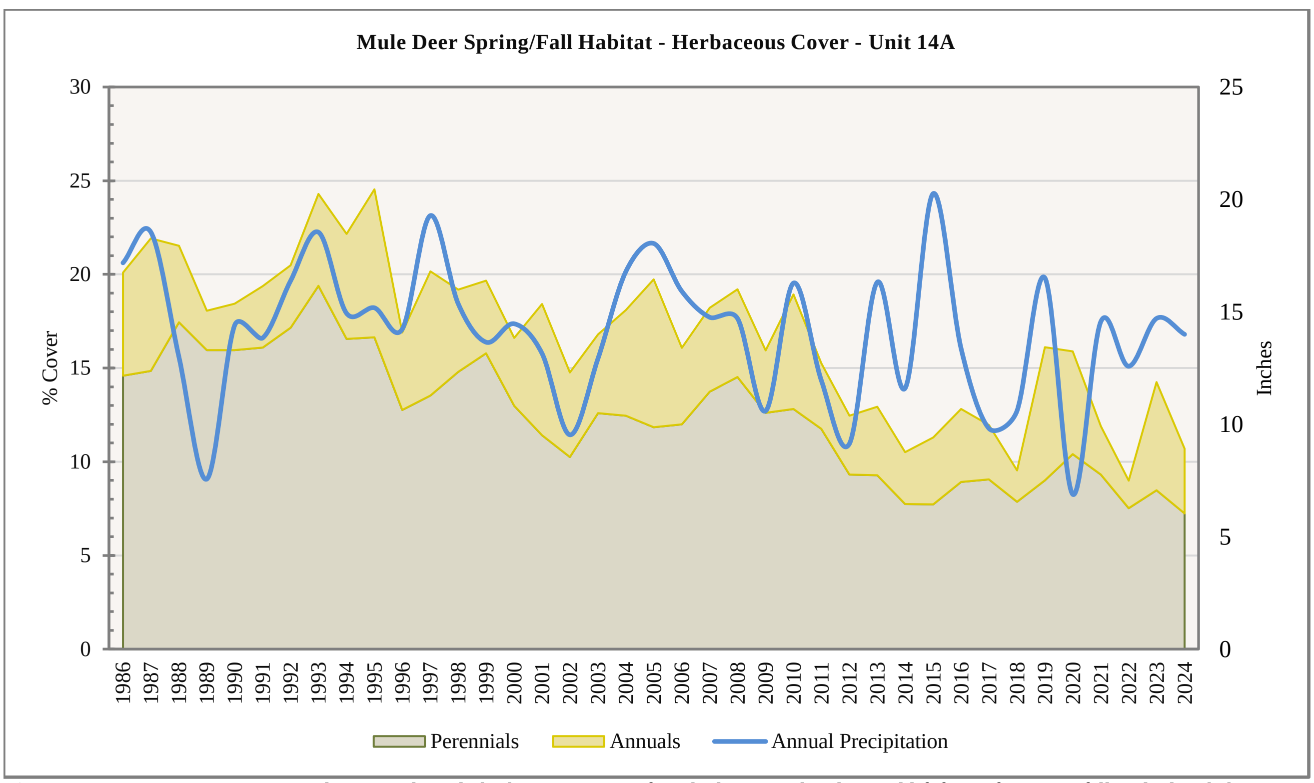


Figure 2.7: Average precipitation and estimated yearly herbaceous cover of stacked perennial and annual lifeforms for spring/fall mule deer habitat in WMU 14A, Abajo Mountains (Rangeland Analysis Platform, 2025).

RAP – Shrub and Tree Cover by Deer Habitat

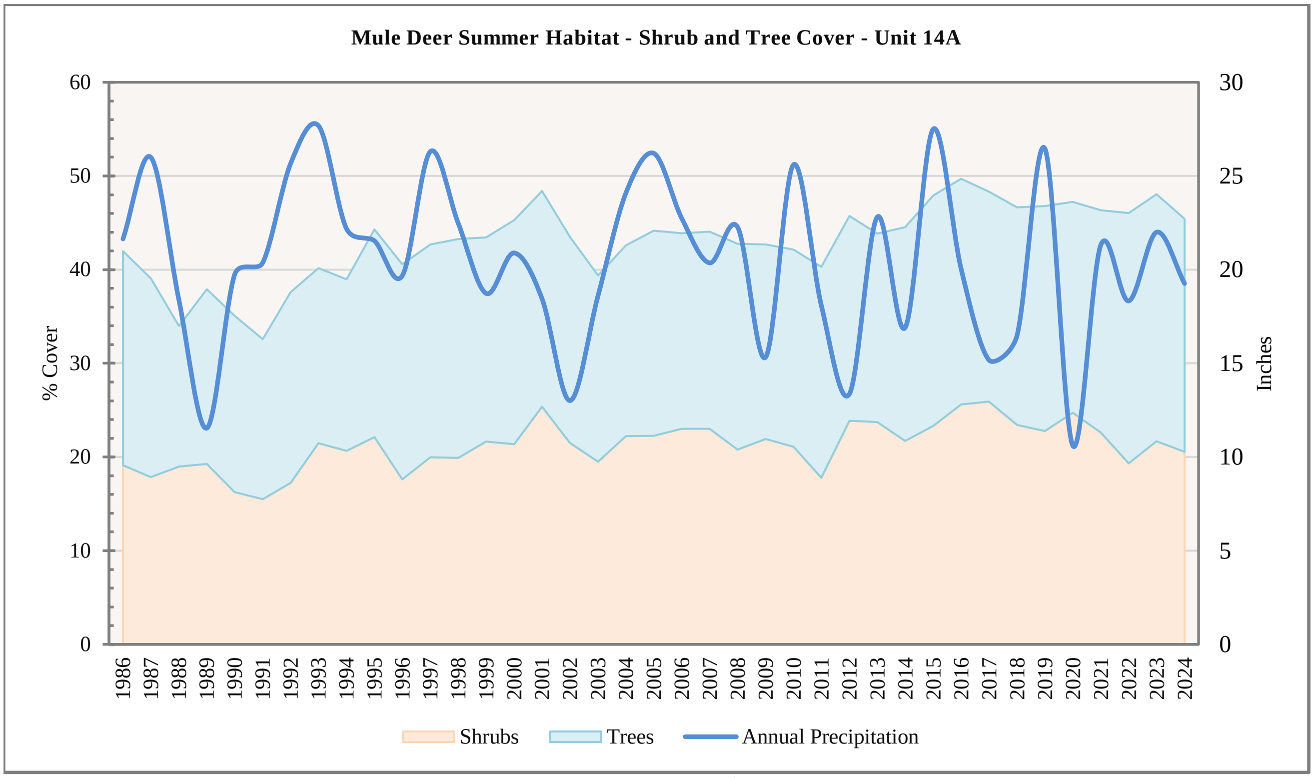


Figure 2.8: Average precipitation and estimated yearly stacked shrub and tree cover for summer mule deer habitat in WMU 14A, Abajo Mountains (Rangeland Analysis Platform, 2025).

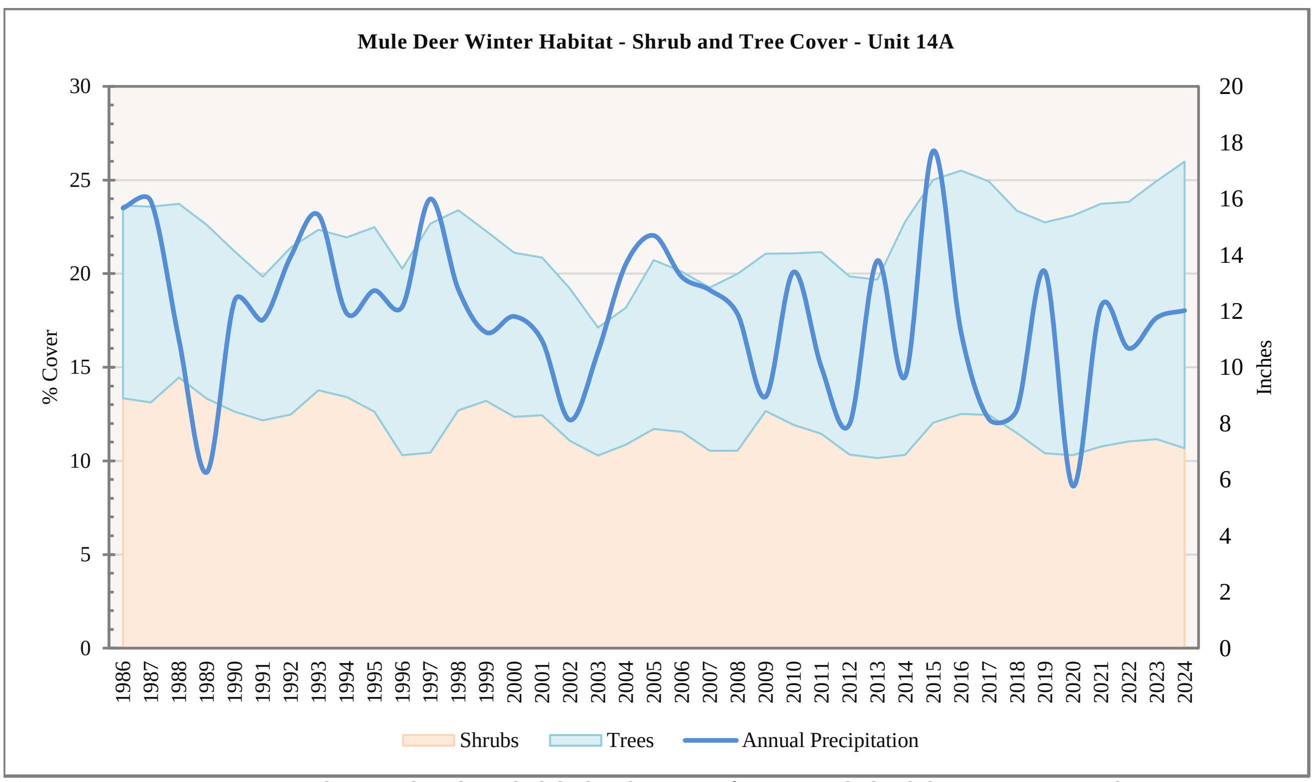


Figure 2.9: Average precipitation and estimated yearly stacked shrub and tree cover for winter mule deer habitat in WMU 14A, Abajo Mountains (Rangeland Analysis Platform, 2025).

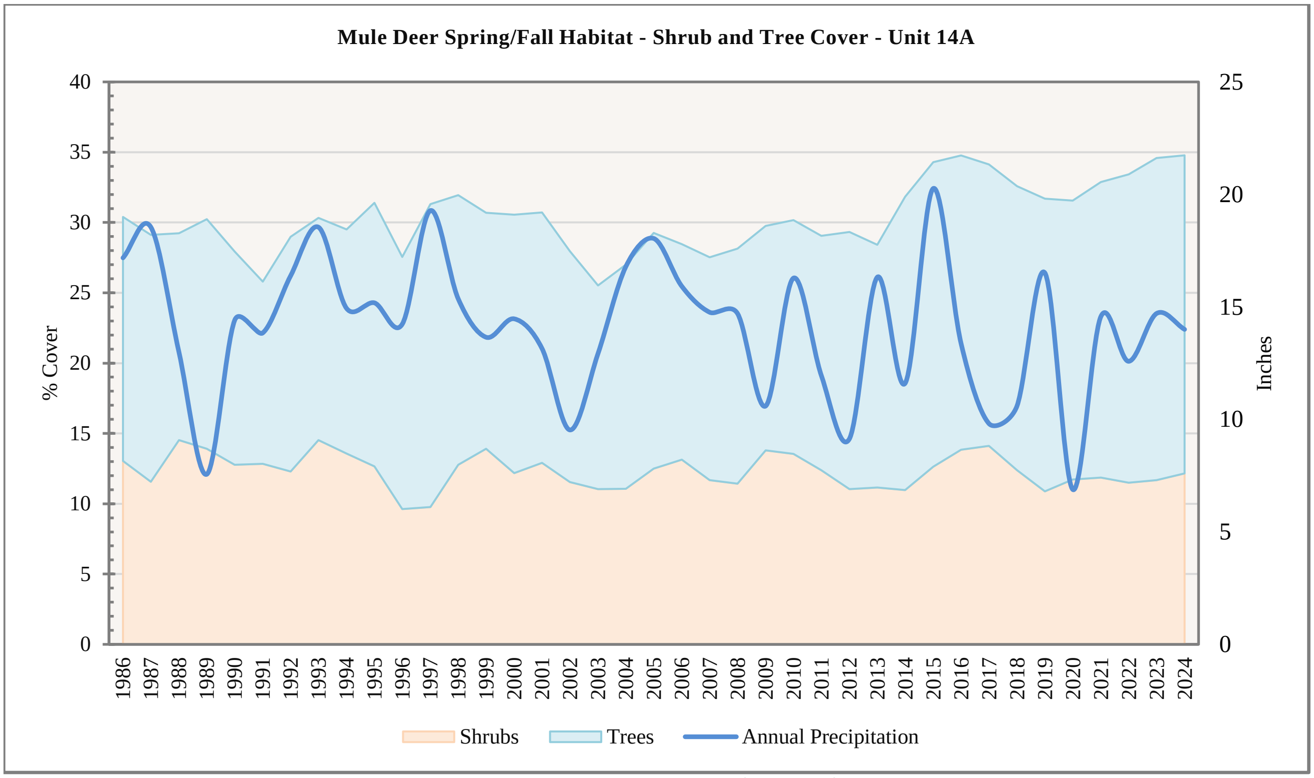
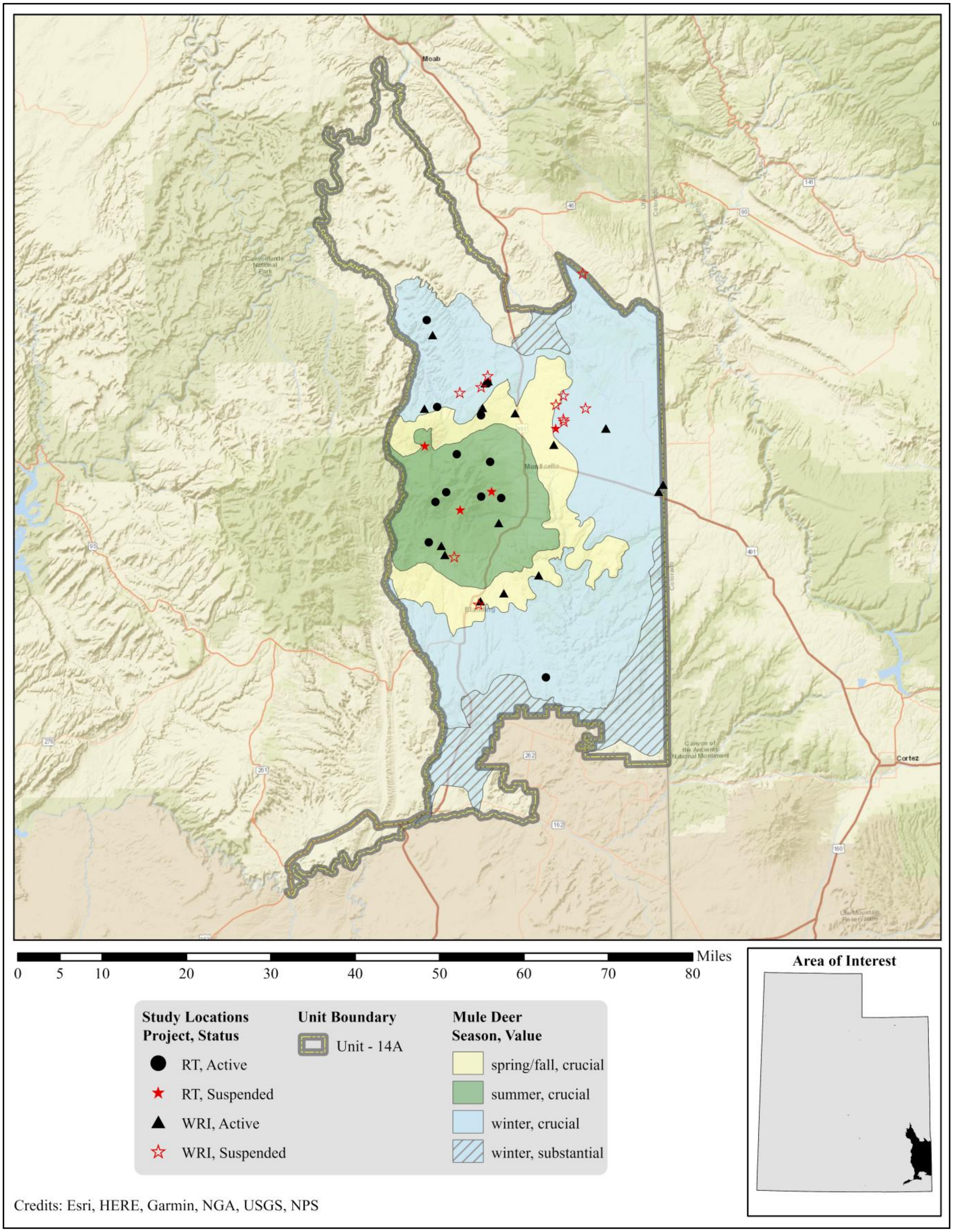
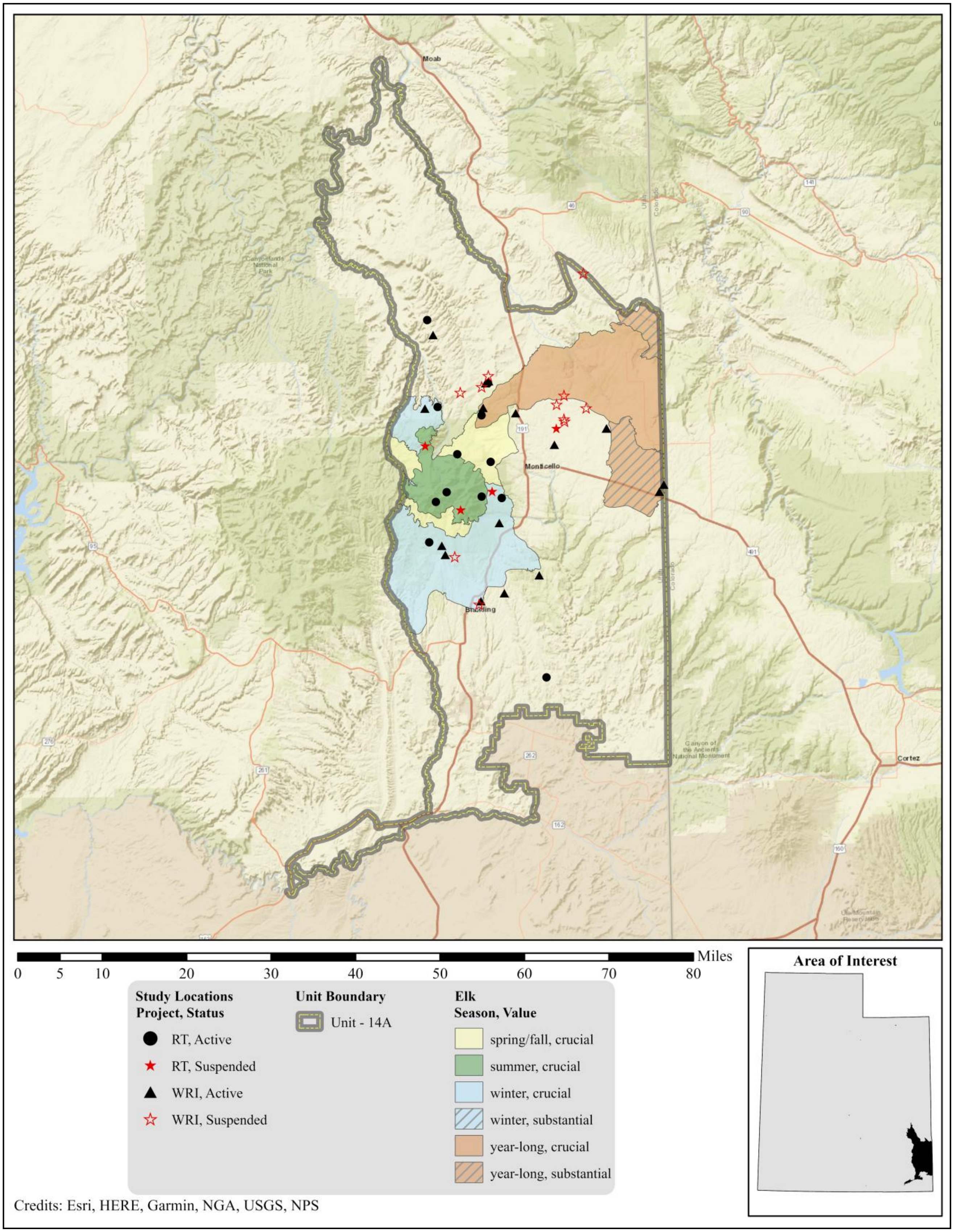


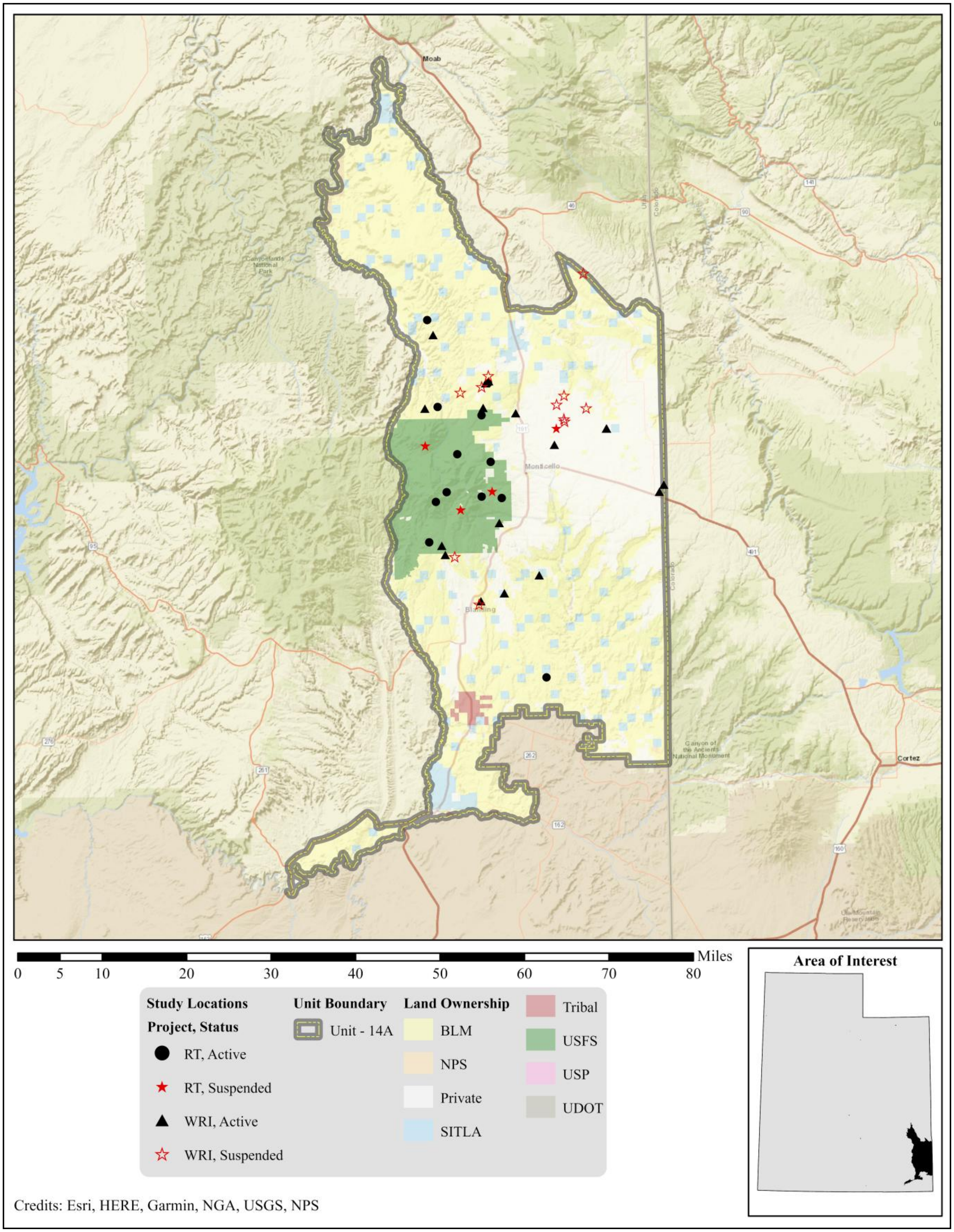
Figure 2.10: Average precipitation and estimated yearly stacked shrub and tree cover for spring/fall mule deer habitat in WMU 14A, Abajo Mountains (Rangeland Analysis Platform, 2025).



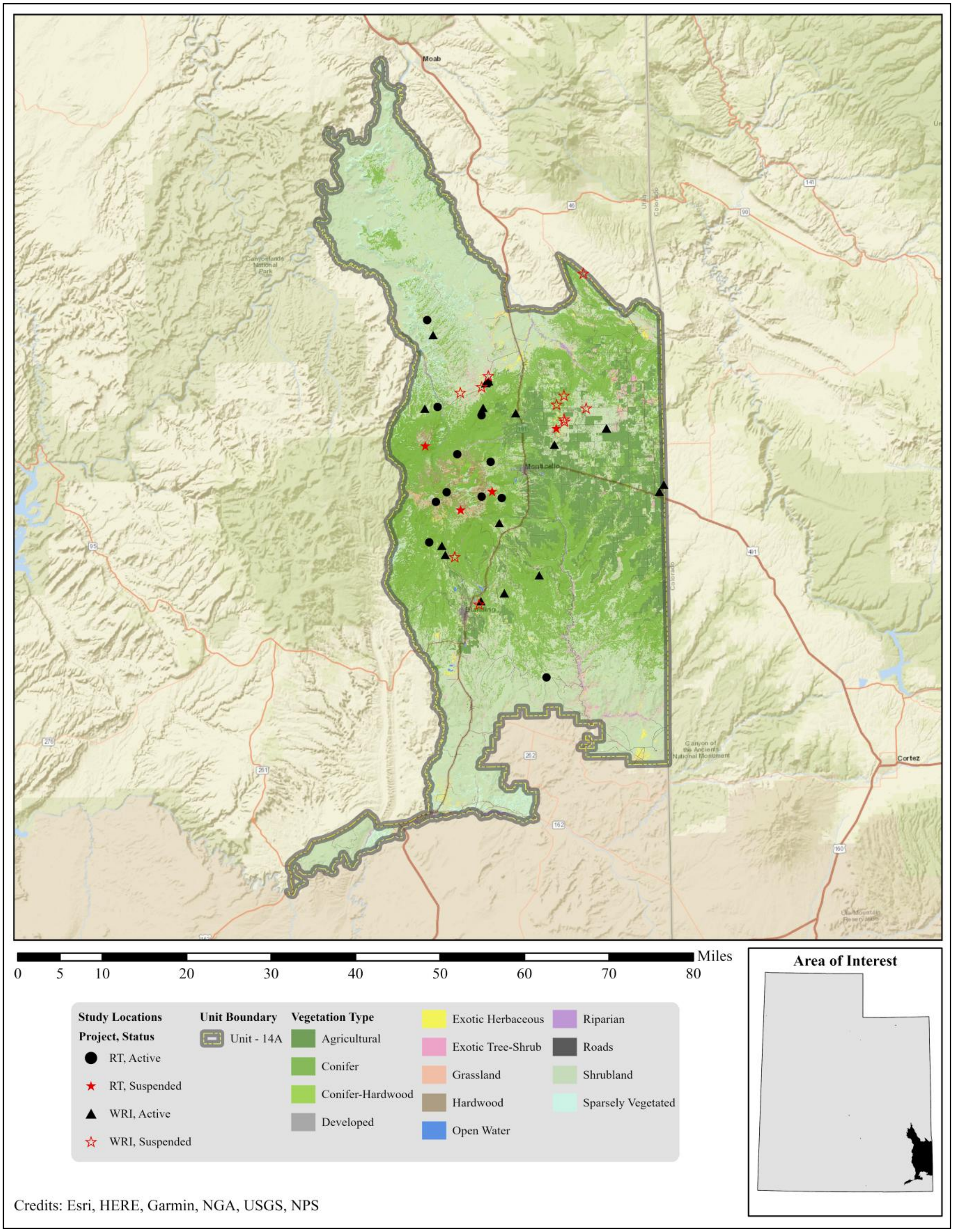
Map 2.2: Estimated mule deer habitat by season and value for WMU 14A, Abajo Mountains.



Map 2.3: Estimated elk habitat by season and value for WMU 14A, Abajo Mountains.



Map 2.4: Land ownership for WMU 14A, Abajo Mountains.



Map 2.5: LANDFIRE Existing Vegetation Type map (LC23_EVT_240, 2023) for WMU 14A, Abajo Mountains.

LANDFIRE Existing Vegetation Type for Mule Deer Habitat

The current LANDFIRE Existing Vegetation Type model shows that just over 44% of mule deer winter range; nearly 32% of summer habitat; and almost 59% of spring/fall range in the Abajo Mountains Management Unit is comprised of biophysical sites (also referred to here as vegetation types) that are dominated by pinyon (*Pinus* spp.) and juniper (*Juniperus* spp.) (**Table 2.1**, **Table 2.2**, **Table 2.3**). These sites are often located in lower to middle elevations and may be associated with understory browse species known to be beneficial to mule deer, although abundance may vary widely. When pinyon and juniper encroach on existing shrublands, they have been shown to lead to decreased sagebrush and herbaceous components (Miller, Svejcar, & Rose, 2000), thereby decreasing available forage for wildlife.

The model also suggests that sagebrush vegetation types make up nearly 17% of the unit's winter range and almost 10% of the spring/fall habitat (**Table 2.2**, **Table 2.3**). These biophysical sites can be found at elevations ranging from low (semidesert) to middle or middle-high (upland or montane). Sagebrush species (*Artemisia* spp.) are the dominant vegetation component on these sites across the elevation gradient and may provide browse for wintering deer. Other preferred browse species may also be present on sites of these vegetation types, and pinyon-juniper may be present at middle elevations. Just over 8% of winter habitat is also comprised of the Colorado Plateau Blackbrush-Mormon-tea Shrubland type (**Table 2.2**), which is typically located in lower elevations. Browse species that could provide valuable forage during the winter months are often present and may include species such as blackbrush (*Coleogyne ramosissima*), Mormon tea or Torrey's jointfir (*Ephedra viridis* or *E. torreyana*), and spiny hopsage (*Grayia spinosa*).

Twenty percent of the mule deer summer range is comprised of the Southern Rocky Mountain Ponderosa Pine Woodland vegetation type according to the model (**Table 2.1**). On the Abajo Mountains unit, this biophysical site occurs at elevations ranging from middle to high. Ponderosa pine (*Pinus ponderosa*) dominates the tree component on sites of this type. Shrubs are usually present in the understory and may include species that could provide valuable summer/transitional browse for deer such as Gambel oak (*Quercus gambelii*), serviceberry (*Amelanchier* spp.), mountain snowberry (*Symphoricarpos oreophilus*), and chokecherry (*Prunus virginiana*), among others.

According to the model, over 9% of summer range is also made up of the Rocky Mountain Gambel Oak-Mixed Montane Shrubland vegetation type (**Table 2.1**). This biophysical site occurs at middle to higher elevations and is host to Gambel oak with a good herbaceous component. Other browse species such as serviceberry and sagebrush may be present in addition to oak. The model also suggests that nearly 8% of summer range is comprised of aspen (*Populus tremuloides*) biophysical sites (**Table 2.1**) that are usually found at middle-high to higher elevations. Although aspen dominates these biophysical sites, preferred browse species such as chokecherry, serviceberry, and mountain snowberry are commonly present. In addition, sites of these types typically have abundant understories that could provide forage for mule deer during the summer months. These aspen sites can be impacted by conifer encroachment, ungulate browsing, insects, disease, and landslides, among other threats.

Several other vegetation types comprise the rest of the mule deer habitat within the Abajo Mountains management unit (**Map 2.5**, **Table 2.1**, **Table 2.2**, **Table 2.3**), but they will not be discussed here. Descriptions for these additional vegetation types can be found on the LANDFIRE BpS Models and Descriptions Support webpage (The Nature Conservancy LANDFIRE Team, 2015).

Group	Existing Vegetation Type for Summer Mule Deer Habitat	Acres	% of Total	Group % of Total
Conifer	Colorado Plateau Pinyon-Juniper Woodland	56,309	30.95%	
	Southern Rocky Mountain Ponderosa Pine Woodland	36,564	20.10%	
	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	6,038	3.32%	
	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	4,710	2.59%	
	Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland	1,937	1.06%	
	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	320	0.18%	
	Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland	234	0.13%	
	Southern Rocky Mountain Ponderosa Pine Savanna	18	0.01%	
	Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland	4	0.00%	58.34%
Other	Agricultural	19,429	10.68%	
	Developed	4,162	2.29%	
	Sparsely Vegetated	3,210	1.76%	
	Riparian	2,484	1.37%	
	Open Water	189	0.10%	
	Quarries-Strip Mines-Gravel Pits-Well and Wind Pads	161	0.09%	16.29%
Shrubland	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	16,856	9.27%	
	Inter-Mountain Basins Big Sagebrush Shrubland	4,762	2.62%	
	Inter-Mountain Basins Montane Sagebrush Steppe	2,668	1.47%	
	Colorado Plateau Pinyon-Juniper Shrubland	1,392	0.77%	
	Rocky Mountain Lower Montane-Foothill Shrubland	1,105	0.61%	
	Inter-Mountain Basins Semi-Desert Shrub-Steppe	818	0.45%	
	Colorado Plateau Mixed Low Sagebrush Shrubland	378	0.21%	
	Inter-Mountain Basins Mixed Salt Desert Scrub	162	0.09%	
	Inter-Mountain Basins Greasewood Flat	5	0.00%	
	Inter-Mountain Basins Mat Saltbush Shrubland	4	0.00%	
	Rocky Mountain Alpine Dwarf-Shrubland	4	0.00%	
	Colorado Plateau Blackbrush-Mormon-tea Shrubland	<1	0.00%	
	Southern Colorado Plateau Sand Shrubland	<1	0.00%	15.48%
Hardwood	Rocky Mountain Aspen Forest and Woodland	12,238	6.73%	6.73%
Grassland	Southern Rocky Mountain Montane-Subalpine Grassland	2,029	1.12%	
	Rocky Mountain Subalpine-Montane Mesic Meadow	1,665	0.92%	
	Inter-Mountain Basins Semi-Desert Grassland	149	0.08%	2.11%
Exotic Herbaceous	Great Basin & Intermountain Introduced Perennial Grassland and Forbland	436	0.24%	
	Interior Western North American Temperate Ruderal Grassland	587	0.32%	
	Great Basin & Intermountain Introduced Annual Grassland	134	0.07%	
	Great Basin & Intermountain Introduced Annual and Biennial Forbland	9	0.01%	0.64%
Exotic Tree-Shrub	Great Basin & Intermountain Ruderal Shrubland	595	0.33%	
	Interior Western North American Temperate Ruderal Shrubland	160	0.09%	0.42%
Total		**181,927**	**100%**	**100%**

Table 2.1: LANDFIRE Existing Vegetation Type (LC23_EVT_240, 2023) acreage of summer mule deer habitat for WMU 14A, Abajo Mountains.

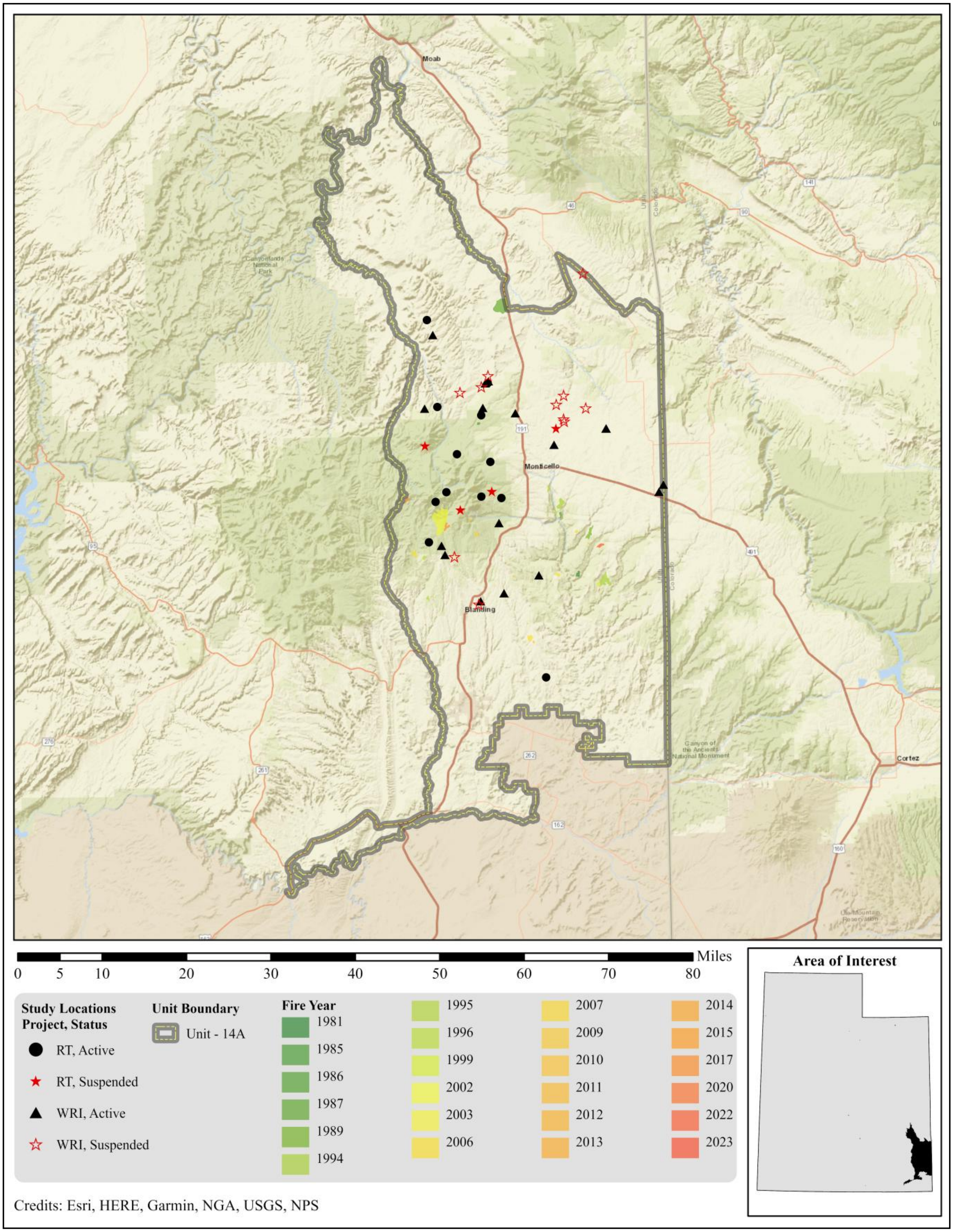
Group	Existing Vegetation Type for Winter Mule Deer Habitat	Acres	% of Total	Group % of Total
Shrubland	Inter-Mountain Basins Big Sagebrush Shrubland	109,009	15.99%	
	Colorado Plateau Pinyon-Juniper Shrubland	98,696	14.48%	
	Colorado Plateau Blackbrush-Mormon-tea Shrubland	55,103	8.08%	
	Inter-Mountain Basins Mixed Salt Desert Scrub	22,548	3.31%	
	Inter-Mountain Basins Semi-Desert Shrub-Steppe	16,992	2.49%	
	Inter-Mountain Basins Montane Sagebrush Steppe	5,432	0.80%	
	Inter-Mountain Basins Mat Saltbush Shrubland	3,873	0.57%	
	Southern Colorado Plateau Sand Shrubland	3,732	0.55%	
	Inter-Mountain Basins Greasewood Flat	2,881	0.42%	
	Rocky Mountain Lower Montane-Foothill Shrubland	1,760	0.26%	
	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	1,654	0.24%	
	Colorado Plateau Mixed Low Sagebrush Shrubland	1,369	0.20%	47.38%
Conifer	Colorado Plateau Pinyon-Juniper Woodland	201,451	29.55%	
	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	80	0.01%	
	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	13	0.00%	
	Southern Rocky Mountain Ponderosa Pine Woodland	14	0.00%	29.56%
Other	Agricultural	87,314	12.81%	
	Sparsely Vegetated	21,469	3.15%	
	Developed	13,085	1.92%	
	Riparian	5,008	0.73%	
	Quarries-Strip Mines-Gravel Pits-Well and Wind Pads	421	0.06%	
	Open Water	344	0.05%	18.72%

Group	Existing Vegetation Type for Winter Mule Deer Habitat	Acres	% of Total	Group % of Total
Exotic	Great Basin & Intermountain Ruderal Shrubland	15,950	2.34%	
Tree-Shrub	Interior Western North American Temperate Ruderal Shrubland	3,832	0.56%	2.90%
Exotic	Great Basin & Intermountain Introduced Annual and Biennial Forbland	2,507	0.37%	
Herbaceous	Great Basin & Intermountain Introduced Annual Grassland	2,383	0.35%	
	Great Basin & Intermountain Introduced Perennial Grassland and Forbland	1,781	0.26%	
	Interior Western North American Temperate Ruderal Grassland	724	0.11%	1.08
Grassland	Inter-Mountain Basins Semi-Desert Grassland	2,286	0.33%	
	Rocky Mountain Subalpine-Montane Mesic Meadow	19	0.00%	
	Southern Rocky Mountain Montane-Subalpine Grassland	42	0.01%	0.34%
Hardwood	Rocky Mountain Aspen Forest and Woodland	9	0.00%	0.00%
Total		**681,778**	**100%**	**100%**

Table 2.2: LANDFIRE Existing Vegetation Type (LC23_EVT_240, 2023) acreage of winter mule deer habitat for WMU 14A, Abajo Mountains.

Group	Existing Vegetation Type for Spring/Fall Mule Deer Habitat	Acres	% of Total	Group % of Total
Conifer	Colorado Plateau Pinyon-Juniper Woodland	89,485	56.14%	
	Southern Rocky Mountain Ponderosa Pine Woodland	2,307	1.45%	
	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	1,031	0.65%	
	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	171	0.11%	
	Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland	12	0.01%	
	Southern Rocky Mountain Ponderosa Pine Savanna	7	0.00%	
	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	2	0.00%	
	Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland	<1	0.00%	58.35%
Other	Agricultural	32,663	20.49%	
	Developed	5,120	3.21%	
	Sparsely Vegetated	1,674	1.05%	
	Riparian	1,022	0.64%	
	Quarries-Strip Mines-Gravel Pits-Well and Wind Pads	199	0.13%	
	Open Water	181	0.11%	25.63%
Shrubland	Inter-Mountain Basins Big Sagebrush Shrubland	12,205	7.66%	
	Colorado Plateau Pinyon-Juniper Shrubland	4,394	2.76%	
	Inter-Mountain Basins Montane Sagebrush Steppe	2,682	1.68%	
	Inter-Mountain Basins Semi-Desert Shrub-Steppe	1,253	0.79%	
	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	873	0.55%	
	Rocky Mountain Lower Montane-Foothill Shrubland	519	0.33%	
	Colorado Plateau Mixed Low Sagebrush Shrubland	420	0.26%	
	Inter-Mountain Basins Mixed Salt Desert Scrub	234	0.15%	
	Inter-Mountain Basins Greasewood Flat	61	0.04%	
	Inter-Mountain Basins Mat Saltbush Shrubland	9	0.01%	
	Colorado Plateau Blackbrush-Mormon-tea Shrubland	5	0.00%	
	Southern Colorado Plateau Sand Shrubland	3	0.00%	14.21%
Exotic	Great Basin & Intermountain Ruderal Shrubland	1,270	0.80%	
Tree-Shrub	Interior Western North American Temperate Ruderal Shrubland	392	0.25%	1.04%
Exotic	Great Basin & Intermountain Introduced Perennial Grassland and Forbland	401	0.25%	
Herbaceous	Great Basin & Intermountain Introduced Annual Grassland	193	0.12%	
	Interior Western North American Temperate Ruderal Grassland	102	0.06%	
	Great Basin & Intermountain Introduced Annual and Biennial Forbland	97	0.06%	0.50%
Grassland	Inter-Mountain Basins Semi-Desert Grassland	226	0.14%	
	Rocky Mountain Subalpine-Montane Mesic Meadow	20	0.01%	
	Southern Rocky Mountain Montane-Subalpine Grassland	10	0.01%	0.16%
Hardwood	Rocky Mountain Aspen Forest and Woodland	160	0.10%	0.10%
Total		**159,402**	**100%**	**100%**

Table 2.3: LANDFIRE Existing Vegetation Type (LC23_EVT_240, 2023) acreage of spring/fall mule deer habitat for WMU 14A, Abajo Mountains.



Map 2.6: Land coverage of fires by year from 1981-2023 for WMU 14A, Abajo Mountains (NIFC Open Data Site: Federal Interagency Wildland Fire Maps and Data for All, 2025).

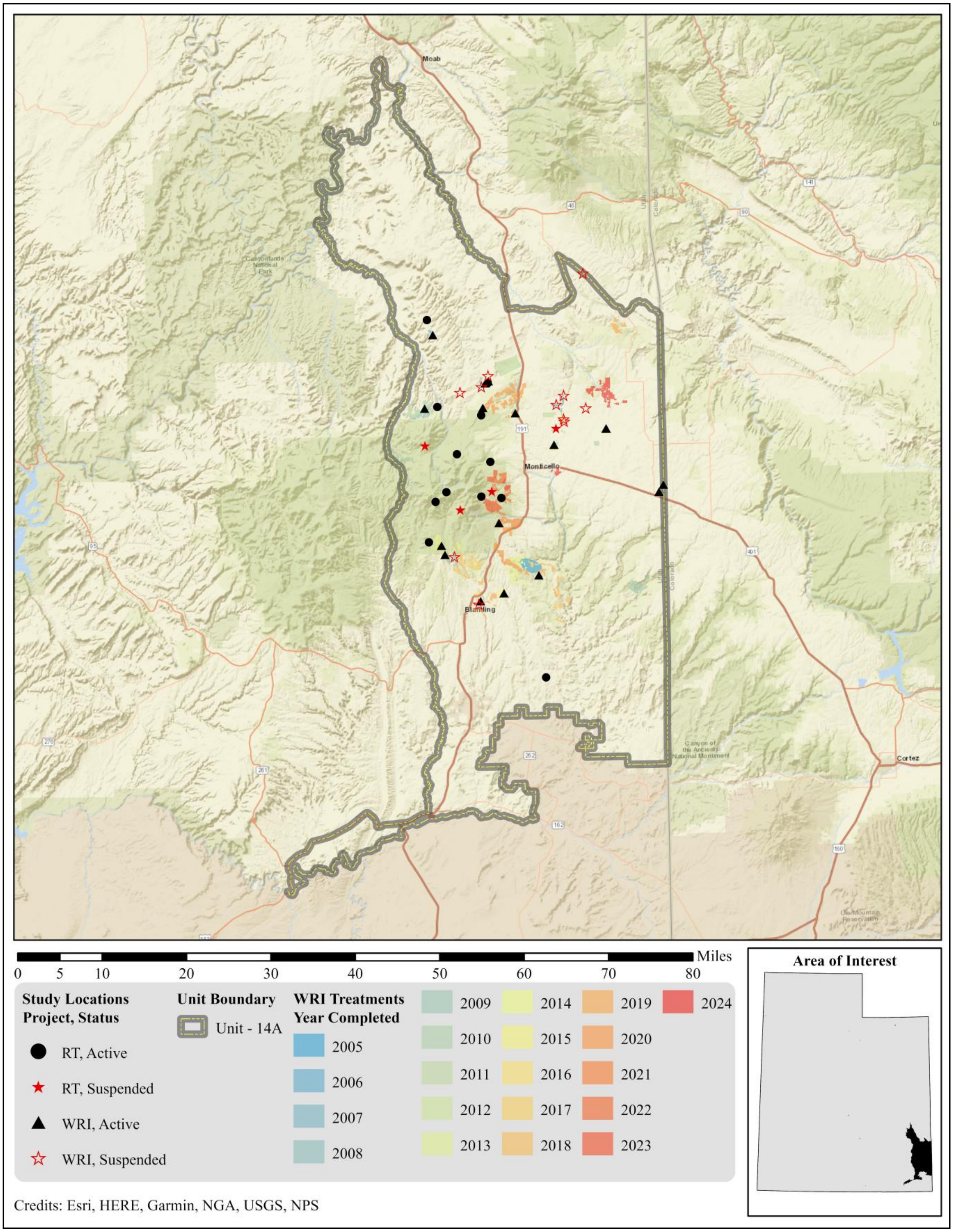
Treatments/Restoration Work

There has been an active effort to address many of the limitations on this unit through the Watershed Restoration Initiative (WRI). A total of 29,917 acres of land have been treated within the Abajo Mountains unit since the WRI was implemented in 2004 (**Map 2.7**) Treatments frequently overlap one another bringing the net total of completed treatment acres to 27,190 for this unit (**Table 2.4**). Other treatments have occurred outside of the WRI through independent agencies and landowners, but the WRI comprises most of the work done on deer winter ranges throughout the state of Utah.

The most common management practice in this unit is vegetation removal by hand crew (lop and scatter, lop-pile-burn, etc.) targeting pinyon (*Pinus* spp.) and juniper (*Juniperus* spp.) trees. Additional techniques to remove pinyon and juniper often include bullhog treatments. Other management practices including (but not limited to) aerating, prescribed fire, and seeding species to augment the herbaceous understory have all been used across the unit (**Table 2.4**).

Type	Total Completed Acreage
Vegetation Removal/Hand Crew	**9,496**
Lop & Scatter	5,563
Lop-Pile-Burn	3,904
Cut Stump	24
Lop & Chip	4
Bullhog	**8,697**
Full Size	6,898
Skid Steer	1,799
Aerator	**3,248**
Double Drum (Two-Way)	2,619
Single Drum (One-Way)	629
Prescribed Fire	**2,330**
Prescribed Fire	2,330
Harrow	**2,205**
≤ 15 ft. (One-Way)	2,205
Disc	**2,083**
Off-Set (One-Way)	1,863
Plow (One-Way)	220
Seeding (Primary)	**1,431**
Drill (Rangeland)	826
Ground (Mechanical Application)	438
Hand Seeding	87
Drill (Truax)	56
Broadcast (Aerial-Helicopter)	24
Forestry Practices	**252**
Thinning (Commercial)	252
Herbicide Application	**115**
Spot Treatment	115
Planting/Transplanting	**60**
Other	59
Bareroot Stock	<1
Grand Total	**29,917**
***Net Total Land Area Treated**	**27,190**

Table 2.4: WRI treatment action size (acres) for completed projects for WMU 14A, Abajo Mountains. Data accessed on 02/25/2025.
*Does not include overlapping treatments.



Map 2.7: Terrestrial WRI treatments by fiscal year completed for WMU 14A, Abajo Mountains.

Range Trend Studies

Range Trend studies have been sampled within WMU 14A on a regular basis since 1986, with studies being added or suspended as was deemed necessary (**Table 2.5**). Due to changes in sampling methodologies, only data collected following the 1992 sample year is included in this summary. Monitoring studies of WRI projects began in 2004. When possible, WRI monitoring studies are established prior to treatment and sampled on a regular basis following treatment. Due to the long-term nature of the studies, many of the Range Trend and WRI studies have had some sort of disturbance or treatment prior to or since study establishment (**Table 2.6**). Range Trend studies are summarized in this report by ecological site.

Study #	Study Name	Project	Status	Years Sampled	Ecological Site Description
14A-01	Alkali Point	RT	Active	1986, 1994, 1999, 2004, 2009, 2012, 2014, 2019, 2024	Semidesert Loam (Wyoming Big Sagebrush)
14A-02	Brushy Basin	RT	Active	1986, 1994, 1999, 2004, 2009, 2014, 2019, 2024	Mountain Stony Loam (Mountain Big Sagebrush)
14A-03	Gold Queen Basin	RT	Suspended	1986, 1994, 1999, 2004	Mountain Loam (Ponderosa Pine)
14A-04	Camp Jackson Reservoir	RT	Suspended	1986, 1994, 1999	Mountain Loam (Oak)
14A-05	Jackson Ridge	RT	Active	1986, 1994, 1999, 2004, 2009, 2014, 2019, 2024	High Mountain Stony Loam (Aspen)
14A-06	Harts Draw Reservoir	RT	Active	1986, 1994, 1999, 2004, 2009, 2014, 2019, 2024	Mountain Loam (Oak)
14A-07	Shay Mountain	RT	Suspended	1986, 1994	Mountain Loam (Ponderosa Pine)
14A-08	Peters Point	RT	Active	1986, 1994, 1999, 2004, 2009, 2014, 2019, 2024	Upland Loam (Mountain Big Sagebrush)
14A-09	Harts Draw	RT	Active	1986, 1994, 1999, 2004, 2009, 2014, 2019, 2024	Upland Loam (Mountain Big Sagebrush)
14A-10	Harts Point	RT	Active	1986, 1994, 1999, 2004, 2009, 2014, 2019, 2024	Upland Loam (Mountain Big Sagebrush)
14A-11	Shay Mesa	RT	Active	1986, 1994, 1999, 2004, 2009, 2011, 2014, 2019, 2024	Upland Loam (Mountain Big Sagebrush)
14A-12	Shingle Mill	RT	Active	1994, 1999, 2004, 2009, 2014, 2019, 2024	Mountain Stony Loam (Shrub)
14A-35	Dickson Gulch	RT	Active	2009, 2014, 2019, 2024	High Mountain Loam (Aspen)
14A-40	Clay Draw	RT	Active	2019, 2024	Mountain Stony Loam (Shrub)
14A-41	Duckett Ridge	RT	Active	2019, 2024	High Mountain Loam (Thurber Fescue)
14R-02	Jerry Hines CRP	RT	Suspended	2001	Upland Loam (Mountain Big Sagebrush)
14R-05	Turner Water Canyon (Hart Draw)	WRI	Suspended	2004	Not Verified
14R-06	Dugout (Hart Draw)	WRI	Active	2004, 2008, 2013, 2018, 2023	Upland Loam (Mountain Big Sagebrush)
14R-07	Adams CE Harrow	WRI	Active	2004, 2007, 2012, 2017, 2023	Upland Shallow Loam (Black Sagebrush)
14R-08	Adams CE Control	WRI	Active	2004, 2007, 2012, 2017, 2023	Upland Shallow Loam (Black Sagebrush)
14R-09	Hart Draw Flat 1	WRI	Active	2005, 2008, 2013, 2018, 2023	Upland Loam (Mountain Big Sagebrush)
14R-10	Hart Draw Flat 2	WRI	Active	2005, 2008, 2013, 2018, 2023	Upland Loam (Mountain Big Sagebrush)
14R-11	Harts Windmill	WRI	Suspended	2005, 2008, 2013, 2018	Upland Loam (Mountain Big Sagebrush)

Study #	Study Name	Project	Status	Years Sampled	Ecological Site Description
14R-12	Bell Draw Drill	WRI	Suspended	2006	Not Verified
14R-13	Bell Draw Dixie	WRI	Suspended	2006, 2009, 2010	Not Verified
14R-14	SITLA Dixie	WRI	Suspended	2006, 2009, 2010	Upland Loam (Big Sagebrush)
14R-15	SITLA Dixie 2	WRI	Suspended	2006, 2012, 2017	Upland Loam (Big Sagebrush)
14R-16	Harvey John Mesa	WRI	Suspended	2006, 2010, 2014	Not Verified
14R-17	Stateline South	WRI	Active	2006, 2012, 2017, 2023	Upland Shallow Loam (Black Sagebrush)
14R-18	Stateline North	WRI	Active	2006, 2009, 2013, 2017, 2023	Upland Loam (Big Sagebrush)
14R-19	Peter's Canyon	WRI	Active	2007, 2010, 2014, 2018, 2023	Upland Loam (Mountain Big Sagebrush)
14R-20	Johnson Creek	WRI	Active	2007, 2010, 2014, 2019, 2024	Upland Loam (Mountain Big Sagebrush)
14R-21	Shay Mesa Bullhog	WRI	Active	2008, 2011, 2014, 2018, 2023	Upland Loam (Mountain Big Sagebrush)
14R-22	Harts Draw Reference	WRI	Suspended	2009	Not Verified
14R-23	Gunnison Sage Grouse Reference	WRI	Suspended	2009	Not Verified
14R-24	Lisbon Valley GIP	WRI	Suspended	2008	Not Verified
14R-25	Peters Point BLM	WRI	Active	2011, 2014, 2018, 2023	Upland Loam (Mountain Big Sagebrush)
14R-27	Seep Creek	WRI	Active	2012, 2015, 2019, 2024	Upland Loam (Mountain Big Sagebrush)
14R-28	Johnson Creek 2	WRI	Active	2012, 2015, 2019, 2024	Mountain Loam (Oak)
14R-35	Blanding East	WRI	Suspended	2014	Upland Loam (Pinyon/Utah Juniper)
14R-36	Mustang Mesa	WRI	Active	2014, 2017, 2023	Upland Loam (Big Sagebrush)
14R-43	Long Canyon Point	WRI	Active	2018, 2023	Upland Loam (Mountain Big Sagebrush)
14R-44	Lems Draw	WRI	Active	2018, 2022	Upland Shallow Loam (Black Sagebrush
14R-45	Long Canyon	WRI	Active	2019, 2023	Mountain Loam (Oak)

Table 2.5: Range Trend and WRI project studies monitoring history and ecological site potential for WMU 14A, Abajo Mountains.

Study #	Study Name	Type	Disturbance Name (If Available)	Date	Acres	WRI Project #
14A-02	Brushy Basin	Chain Unknown		1971	1,400	
		Seed Unknown		1971	1,400	
		Bullhog	Brushy Basin Habitat Improvement Project Phase II	Fall 2012-Winter 2014	573	2275
14A-06	Harts Draw Reservoir	Seed Unknown		Historic		
14A-08	Peters Point	Chain Unknown		1962		
		Seed Unknown		1962		
14A-09	Harts Draw	Broadcast Before	Hart Draw Sagebrush Restoration (year 1)	December 2005	629	246
		Single Drum	Hart Draw Sagebrush Restoration (year 1)	December 2005	629	246
		Aerial After	Hart Draw Sagebrush Restoration (year 1)	December 2005	629	246
14A-11	Shay Mesa	Chain Unknown		Mid-1960s		
		Seed Unknown		Mid-1960s		
		Bullhog	Shay Mesa Phase II	May-June 2009	545	1091
14A-12	Shingle Mill	Bullhog	La Sal/Abajo Rx and Mx FY22	August 2021-June 2022	560	5527
14R-06	Dugout (Hart Draw)	Broadcast Before	Hart Draw Sagebrush Restoration (year 1)	December 2005	628	246
		Single Drum	Hart Draw Sagebrush Restoration (year 1)	December 2005	628	246
		Aerial After	Hart Draw Sagebrush Restoration (year 1)	December 2005	628	246
14R-07	Adams CE Harrow	Broadcast Before		August-December 2001	320	PDB
		Two-Way Dixie		August-December 2001	320	PDB

Study #	Study Name	Type	Disturbance Name (If Available)	Date	Acres	WRI Project #
14R-09	Hart Draw Flat 1	Broadcast Before	Hart Draw Sagebrush Restoration (year 1)	December 2005	628	246
		Single Drum	Hart Draw Sagebrush Restoration (year 1)	December 2005	628	246
		Aerial After	Hart Draw Sagebrush Restoration (year 1)	December 2005	628	246
		Rangeland Drill	Hart Draw Phase 1 Cont.	September-October 2008	263	1231
		Aerial	Hart Draw Phase 1 Cont.	October 2008	263	1231
14R-10	Hart Draw Flat 2	Broadcast Before	Hart Draw Sagebrush Restoration (year 1)	December 2005	628	246
		Single Drum	Hart Draw Sagebrush Restoration (year 1)	December 2005	628	246
		Aerial After	Hart Draw Sagebrush Restoration (year 1)	December 2005	628	246
		Aerial	Hart Draw Phase 1 Cont.	October 2008	263	1231
14R-11	Harts Windmill	Broadcast Before	Hart Draw Sagebrush Restoration (year 1)	December 2005	628	246
		Single Drum	Hart Draw Sagebrush Restoration (year 1)	December 2005	628	246
		Aerial After	Hart Draw Sagebrush Restoration (year 1)	December 2005	628	246
		Rangeland Drill	Hart Draw Phase 1 Cont.	September-October 2008	263	1231
		Aerial	Hart Draw Phase 1 Cont.	October 2008	263	1231
14R-12	Bell Draw Drill	Disc Unknown	Bell Draw	Fall 2006	219	295
		Rangeland Drill	Bell Draw	Fall 2006	219	295
14R-13	Bell Draw Dixie	Broadcast Before	Bell Draw	Fall 2006	102	295
		One-Way Dixie	Bell Draw	Fall 2006	102	295
14R-14	SITLA Dixie	Broadcast Before	Gunnison Sage-grouse Sagebrush Treatments phase 1	Fall 2006	275	334
		One-Way Dixie	Gunnison Sage-grouse Sagebrush Treatments phase 1	Fall 2006	275	334
		One-Way Chain	Gunnison Sage-grouse Sagebrush Treatments Follow-up	September 2014	220	2855
		Broadcast	Gunnison Sage-grouse Sagebrush Treatments Follow-up	September 2014	220	2855
14R-15	SITLA Dixie 2	Broadcast Before	Gunnison Sage-grouse Sagebrush Treatments phase 1	Fall 2006	275	334
		One-Way Dixie	Gunnison Sage-grouse Sagebrush Treatments phase 1	Fall 2006	275	334
		One-Way Chain	Gunnison Sage-grouse Sagebrush Treatments Follow-up	September 2014	220	2855
		Broadcast	Gunnison Sage-grouse Sagebrush Treatments Follow-up	September 2014	220	2855
14R-16	Harvey John Mesa	Broadcast Before	Harvey John Kratcher Mesa	October-November 2006	270	526
		One-Way Dixie	Harvey John Kratcher Mesa	October-November 2006	270	526
14R-17	Stateline South	Broadcast Before	Gunnison Sage-grouse Sagebrush Treatments phase 1	November-December 2006	240	334
		One-Way Dixie	Gunnison Sage-grouse Sagebrush Treatments phase 1	November-December 2006	240	334
14R-18	Stateline North	Broadcast Before	Gunnison Sage-grouse Sagebrush Treatments phase 1	November-December 2006	240	334
		One-Way Dixie	Gunnison Sage-grouse Sagebrush Treatments phase 1	November-December 2006	240	334
14R-19	Peter's Canyon	Bullhog	Peter's Canyon	December 2006	151	906
		Prescribed	Peter's Canyon	October 2007	151	906
		Broadcast/Harrow	Peter's Canyon	December 2007	151	906
14R-20	Johnson Creek	Lop and Scatter	Johnson Creek	October 2007-May 2008	300	905
		Broadcast/Harrow	Johnson Creek	October 2007-May 2008	300	905
		Slash Pile	Johnson Creek	October 2007-May 2008	261	905
14R-21	Shay Mesa Bullhog	Chain Unknown		1959		
		Seed Unknown		1959		
		Aerial Before	Shay Mesa Phase II	December 2008-March 2009	212	1091
		Bullhog	Shay Mesa Phase II	April-September 2009	545	1091
14R-24	Lisbon Valley GIP	Aerial Before	Lisbon Rim Seeding	October-November 1966	1,520	6702*
		Two-Way Unknown	Lisbon Rim Seeding	October-November 1966	1,520	6702*
14R-25	Peters Point BLM	Bullhog	Peters Point - Phase I	October 2011-May 2012	1,253	1944
		Lop and Scatter	Peter's Point Maintenance	November 2019	2,097	4627

Study #	Study Name	Type	Disturbance Name (If Available)	Date	Acres	WRI Project #
14R-27	Seep Creek	Plateau	Seep Creek Sagebrush and Wet Meadow Enhancement	November 2012	130	2325
		Disc Unknown	Seep Creek Sagebrush and Wet Meadow Enhancement	November 2012	130	2325
		Rangeland Drill	Seep Creek Sagebrush and Wet Meadow Enhancement	November 2012	130	2325
		Transplant	Seep Creek Sagebrush and Wet Meadow Enhancement	March 2013	130	2325
		Rangeland Drill	Seep Creek Sagebrush and Wet Meadow Enhancement	September 2013	130	2325
		Transplant	Seep Creek Sagebrush and Wet Meadow Enhancement	April 2014	130	2325
14R-28	Johnson Creek 2	Bullhog	Johnson Creek Hazard Fuel Project	October 2013-June 2014	266	2265
14R-36	Mustang Mesa	Chain Unknown		1960s		
		Aerial Before	Mustang Mesa Lop and Scatter	October 2014	418	3050
		Lop and Scatter	Mustang Mesa Lop and Scatter	October-November 2014	418	3050
14R-43	Long Canyon Point	Chain Unknown		1972		
		Aerial Unknown		1972		
		Aerial Before	Devil's Canyon	October 2018	450	4476
		Bullhog	Devil's Canyon	November 2018-January 2019	258	4476
		Aerial After	Devil's Canyon	March 2019	450	4476
14R-44	Lems Draw	Lop and Scatter	Blanding East Phase III	November 2018	233	4323
14R-45	Long Canyon	Bullhog	Shingle Mill Phase 1	Fall 2019 and October-November 2020	312	4860

Table 2.6: Range Trend and WRI studies known disturbance history for WMU 14A, Abajo Mountains. PDB = Pre-Database; LTDL = Land Treatment Digital Library (Pilliod, Welty, & Jefferies, 2019). *Numbers with an asterisk are LTDL project numbers.

Study Trend Summary (Range Trend)

Ecotypes represented by only one study site throughout most or all of the sample period are listed below but are not discussed in this section. However, graphs for these ecotypes have been included and referenced when a representative study site is active as of the 2024 sample year:

- Mountain (Oak) - Camp Jackson Reservoir (14A-04) (suspended) and Harts Draw Reservoir (14A-06)
  - (**Figure 2.14**, **Figure 2.16**, **Figure 2.19**, **Figure 2.24**, **Figure 2.28**, **Figure 2.30**, **Figure 2.34**, **Figure 2.38**)
- Mountain (Big Sagebrush) - Brushy Basin (14A-02)
  - (**Figure 2.11**, **Figure 2.15**, **Figure 2.18**, **Figure 2.21**, **Figure 2.25**, **Figure 2.30**, **Figure 2.34**, **Figure 2.38**)
- Mountain (Thurber Fescue) - Duckett Ridge (14A-41)
  - (**Figure 2.13**, **Figure 2.17**, **Figure 2.20**, **Figure 2.23**, **Figure 2.27**, **Figure 2.30**, **Figure 2.34**, **Figure 2.38**)
- Mountain (Ponderosa Pine) - Gold Queen Basin (14A-03) (suspended) and Shay Mountain (14A-07) (suspended)
- Semidesert (Big Sagebrush) - Alkali Point (14A-01)
  - (**Figure 2.11**, **Figure 2.15**, **Figure 2.18**, **Figure 2.21**, **Figure 2.25**, **Figure 2.32**, **Figure 2.36**, **Figure 2.40**)

Trend summaries and/or additional data for these ecotypes are available in the corresponding site reports (Lane, Cox, & Payne, 2025).

Mountain (Shrub)

There are two studies [Shingle Mill (14A-12) and Clay Draw (14A-40)] that are classified as Mountain (Shrub) ecological sites. The Shingle Mill study is located south of the city of Monticello and in the hills just above Shingle Mill Draw. The Clay Draw site is situated east of Monticello and roughly one mile south of Clay Draw.

Consideration should be given to the varying number of study sites sampled each year (the ‘n’ value) and the relevant implications that this may have on the data. More specifically, data for 1994 through the 2014 year was solely contributed by the Shingle Mill site, while both the Shingle Mill and Clay Draw studies have provided data since 2019.

Shrubs/Trees: These study sites are dominated by a mixture of preferred browse species such as mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), mountain snowberry (*Symphoricarpos oreophilus*), and wild crab apple (*Peraphyllum ramosissimum*), among others. Total shrub cover has increased overall, with the increase between 2014 and 2019 partially driven by the establishment of the Clay Draw study (**Figure 2.12**). Average preferred browse density increased through the 2009 study year and has since decreased, but density remains high as of 2024. Mature plants have been the dominant age class in these browse populations throughout the sample period, and decadence has exhibited an overall decrease. Recruitment of young plants has slightly increased overall, with the trend between the two most recent sample years being driven by increases on both study sites (**Figure 2.22**). More than 50% of preferred browse plants sampled in density strips through the 2019 sample year showed signs of little to no utilization. Utilization increased in 2024, however, when 31% of plants were moderately browsed and 39% were heavily hedged (**Figure 2.26**).

Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) have been observed on both study sites. Average tree cover increased through 2019, but it then decreased in 2024 due to a 2021-2022 bullhog treatment on the Shingle Mill study (**Table 2.6**). Average tree density increased between 2014 and 2019 primarily due to the establishment of Clay Draw but decreased in 2024 (also due to the bullhog on Shingle Mill). Tree density has increased overall; it should be noted that trees were present on the Shingle Mill study in 2004 and 2009 despite no density being recorded in those years (**Figure 2.16**, **Figure 2.19**).

Herbaceous Understory: The herbaceous understories of these study sites have been dominated by mostly native perennial grasses and forbs. Total average cover and frequency of the herbaceous understories have fluctuated from year to year. However, both average cover and frequency slightly decreased between 2019 and 2024, largely due to perennial forbs. The introduced annual grass species cheatgrass (*Bromus tectorum*) and/or field brome (*B. arvensis*) have been observed on both study sites since 2019, but in very low amounts. Annual forbs have remained rare (**Figure 2.29**, **Figure 2.33**).

Occupancy: According to average pellet group data, animal presence on these sites has increased overall and deer have been the primary occupants. Mean abundance of deer pellet groups has ranged from 37 days use/acre in 2014 to 80 days use/acre in 2024. Elk pellet groups have had an average abundance as low as 0.7 days use/acre in 2024 and as high as 19 days use/acre in 2004. Finally, mean abundance of cattle pellet groups has fluctuated between 0 days use/acre in 2014 and 9 days use/acre in 1999 (**Figure 2.37**).

Mountain (Aspen)

There are two studies [Jackson Ridge (14A-05) and Dickson Gulch (14A-35)] that are classified as Mountain (Aspen) ecological sites. The Jackson Ridge site can be found on Jackson Ridge in the Abajo Mountains, while the Dickson Gulch study is situated just north of Dickson Gulch.

When discussing these study sites, it is important to note that data between 1994 and 2004 was solely provided by the Jackson Ridge study, while both sites have contributed data since 2009.

Shrubs/Trees: Mountain snowberry (*Symphoricarpos oreophilus*) and/or Gambel oak (*Quercus gambelii*) have been the dominant shrub species on these sites throughout the study period. Total average shrub cover has increased over time with the notable increase between 2004 and 2009 due to the establishment of the Dickson Gulch study. Total average shrub cover noticeably increased again in 2024, which can be entirely attributed to mountain snowberry on Dickson Gulch (**Figure 2.13**). Average preferred browse demographic data shows that density has generally increased over time, a trend largely driven by the Dickson Gulch study. Mature plants have comprised most of the browse populations on these sites in most sample years. Decadence in these browse populations has remained low, but recruitment of young plants has decreased each sample year since 2009 (**Figure 2.20**). Average utilization of preferred browse has also remained low throughout the study period. In 2024, only 2% of preferred browse plants were moderately utilized and less than 1% were heavily hedged (**Figure 2.27**).

Quaking aspen (*Populus tremuloides*) is the dominant tree species on these sites; conifers such as Engelmann spruce (*Picea engelmannii*) and fir (*Abies* sp.) have also been present on the Jackson Ridge study. Average tree cover increased between 2004 and 2014, but it has decreased in each subsequent sample year. This decreasing tree cover trend can be attributed to aspen primarily on the Dickson Gulch study, although aspen cover has also decreased on Jackson Ridge to a lesser extent (**Figure 2.17**). Average tree density has fluctuated each year. More specifically, density notably increased between 2009 and 2014, decreased in 2019, and increased again between 2019 and 2014: this trend was mainly driven by quaking aspen on the Dickson Gulch site (**Figure 2.20**).

<u>Herbaceous Understory</u>: Average cover of the herbaceous understories on these sites has decreased each year since 2014, but it has exhibited an overall increase when comparing 1994 data with that from 2024. Average nested frequency has generally decreased over the sample period. The herbaceous understories of both study sites have been primarily comprised of perennial grasses and forbs – common species as of 2024 include Kentucky bluegrass (*Poa pratensis*), Common yarrow (*Achillea millefolium*), and Nevada pea (*Lathyrus lanszwertii*), among others. Annual forbs have remained rare in comparison with perennial herbaceous species, and annual grasses have not been observed in any sample year (**Figure 2.29**, **Figure 2.33**).

<u>Occupancy</u>: Average animal presence has fluctuated from year to year but has slightly increased when comparing 1999 with 2024 data. However, presence has remained stable when comparing 2009 data (when the Dickson Gulch study was established) with that from 2024. Elk were the primary occupants of these study sites between 1999 and 2009, and average pellet group abundance has ranged from 0 days use/acre in 2024 to 13 days use/acre in 2004. Cattle have been the primary occupants since 2014, with a mean pellet group abundance as low as 0 days use/acre in 1999 and as high as 15 days use/acre in 2019. Finally, average abundance of deer pellet groups has fluctuated between 1 days use/acre in 1999 and 7 days use/acre in 2019 (**Figure 2.37**).

Upland (Big Sagebrush)

There are five study sites [Peters Point (14A-08), Harts Draw (14A-09), Harts Point (14A-10), Shay Mesa (14A-11), and Jerry Hines CRP (14R-02) (suspended)] that are classified as Upland (Big Sagebrush) ecological sites. The Peters Point study site is located north of Monticello on Peters Point. The Harts Draw site is situated just south of SR-211 near the mouth of Hart Draw, while the Harts Point study can be found west of the Harts Draw site on Harts Point. The Shay Mesa site is located on Shay Mesa and roughly 0.8 miles southwest of Newspaper Rock. The Jerry Hines CRP study site is situated northeast of Monticello and just east of Seep Creek.

Consideration should be given to the varying number of study sites sampled each year (the ‘n’ value) and the relevant implications that this may have on the data. More specifically, the Jerry Hines CRP study only contributed data in 1999, while the other four sites have provided data spanning all sample years.

<u>Shrubs/Trees</u>: Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) dominates the preferred browse components of these study sites. However, no shrubs were observed on Jerry Hines CRP when the study was last sampled in 1999. A majority of the total average shrub cover on sites of this ecotype has been contributed by sagebrush in all sample years. Total average shrub cover decreased from 2004 to 2014 but has since increased. Furthermore, site-level data reveals that the increase in total cover between 2019 and 2024 can

primarily be attributed to sagebrush on all active sites, and shrubs other than preferred browse species on the Harts Draw study (**Figure 2.11**). Average preferred browse density has decreased, with the greatest overall decreases between 1994 and 2024 observed on the Harts Draw and Harts Point studies. According to average demographic data, however, this overall density decrease is largely driven by a decrease in the number of decadent plants. Mature individuals have comprised a majority of the preferred browse populations on these sites in all sample years, and density of mature plants has actually increased when comparing 1994 with 2024 data. Recruitment of young plants has decreased overall and has remained relatively low over time (**Figure 2.21**). Average preferred browse utilization has increased over the study period and has remained high since 2014. More specifically, 31% of preferred browse plants showed signs of moderate utilization and 46% were heavily hedged in 2024 (**Figure 2.25**).

Twoneedle pinyon (*Pinus edulis*) and/or Utah juniper (*Juniperus osteosperma*) have been observed on all active study sites. Tree cover and density initially decreased between 2004 and 2009 (due to a bullhog project on Shay Mesa) but have remained similar in subsequent years. Furthermore, site-level data indicate that tree cover trends since 2009 can largely be attributed to juniper on the Peters Point study, while density trends over the same period have mainly been driven by both Peters Point and Shay Mesa (**Figure 2.15**, **Figure 2.18**).

<u>Herbaceous Understory</u>: Total average herbaceous cover and frequency have fluctuated from year to year. However, average herbaceous cover has remained similar overall, while frequency has decreased when comparing 1994 with 2024 data. Perennial grasses have been the primary herbaceous component on these sites in most sample years. Furthermore, perennial grasses have remained comprised of mainly native species on most sites. The exception to this is the Peters Point study, on which the introduced species crested wheatgrass (*Agropyron cristatum*) has provided most of the perennial grass cover. Annual grasses – particularly the introduced species cheatgrass (*Bromus tectorum*) – have been present throughout the sample period in low to moderate abundance. Annual forbs are present with low cover and frequency as of 2024. Annual forbs were the dominant vegetation component in 2019, however, primarily due to native species on the Harts Draw, Harts Point, and Shay Mesa studies. Perennial forbs have generally remained rare (**Figure 2.31**, **Figure 2.35**).

<u>Occupancy</u>: Pellet transect data shows that the average occupancy of these sites has increased overall between 1999 and 2024 despite yearly fluctuations. Deer have been the primary occupants in all sample years, and average pellet group abundance has fluctuated between 13 days use/acre in 2014 and 41 days use/acre in 2019. Mean elk pellet group abundance has been as low as 0.5 days use/acre in 1999 and as high as 9 days use/acre in 2024. Cattle have also been present on these sites with an average pellet group abundance ranging from 2 days use/acre in 2014 to 13 days use/acre in 2019. Finally, horses were present in 2009 with a mean pellet group abundance of 0.3 days use/acre, but pellet groups have not been sampled in any other year (**Figure 2.39**).

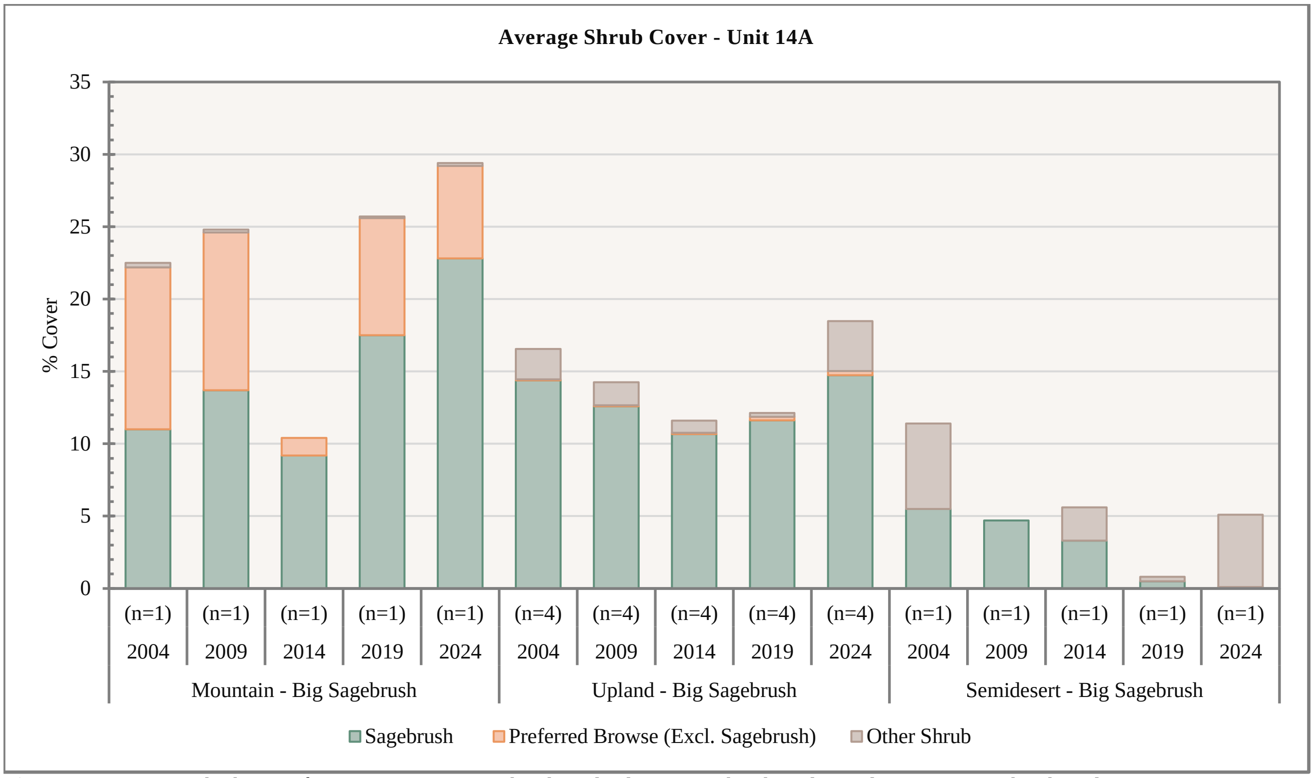


Figure 2.11: Average shrub cover for Mountain - Big Sagebrush, Upland - Big Sagebrush, and Semidesert - Big Sagebrush study sites in WMU 14A, Abajo Mountains.

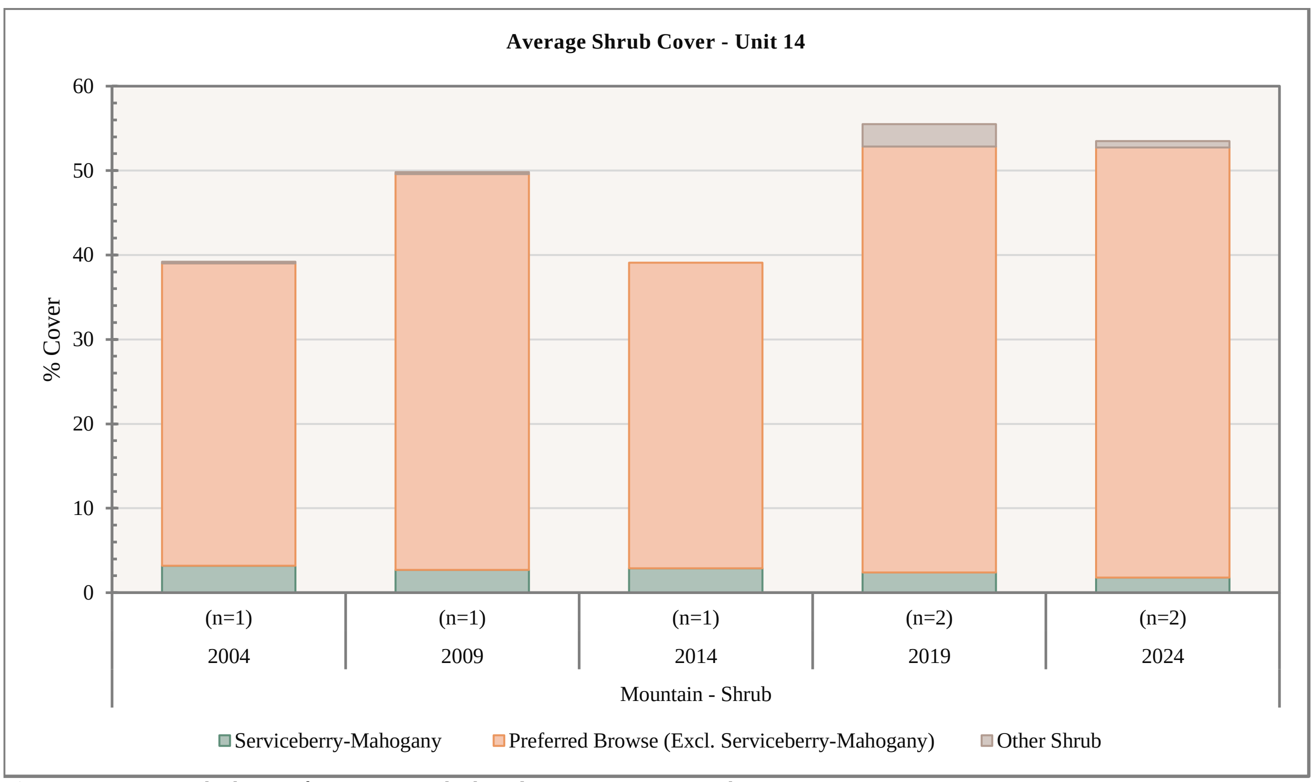


Figure 2.12: Average shrub cover for Mountain - Shrub study sites in WMU 14A, Abajo Mountains.

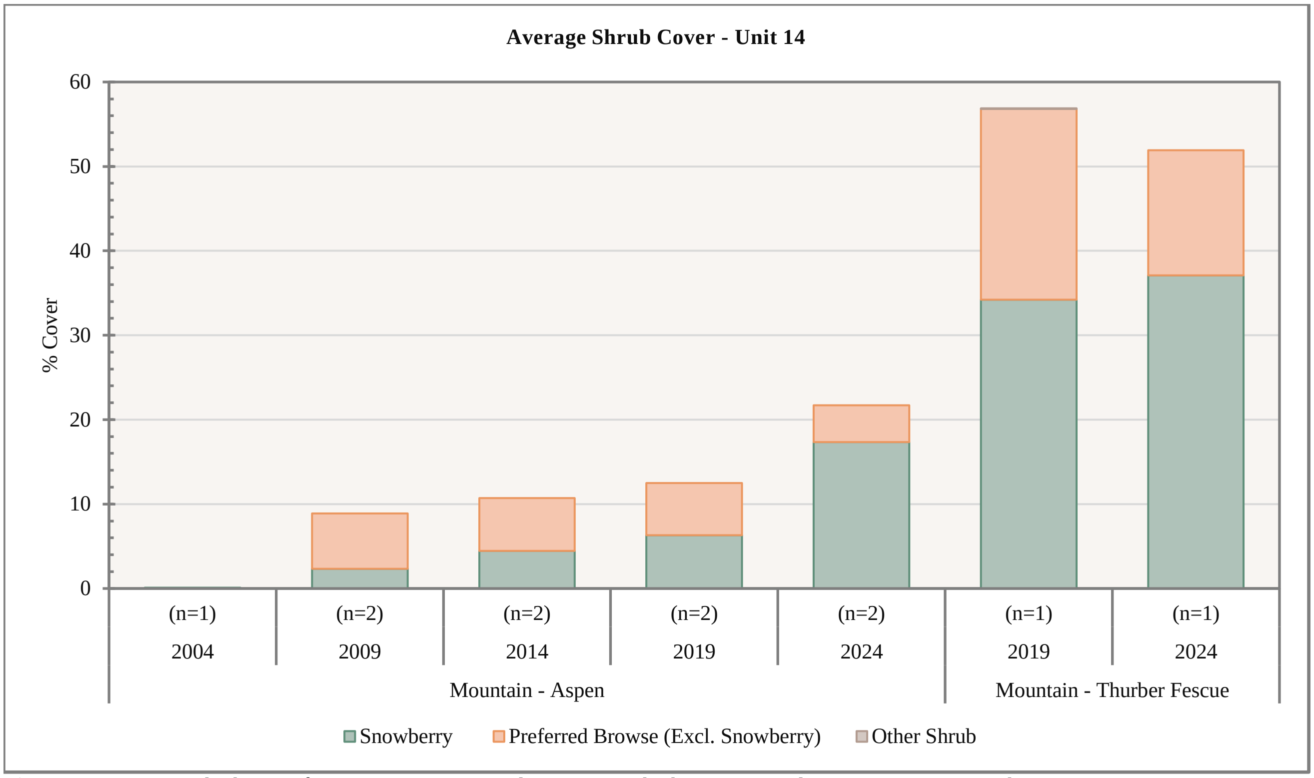


Figure 2.13: Average shrub cover for Mountain - Aspen and Mountain - Thurber Fescue study sites in WMU 14A, Abajo Mountains.

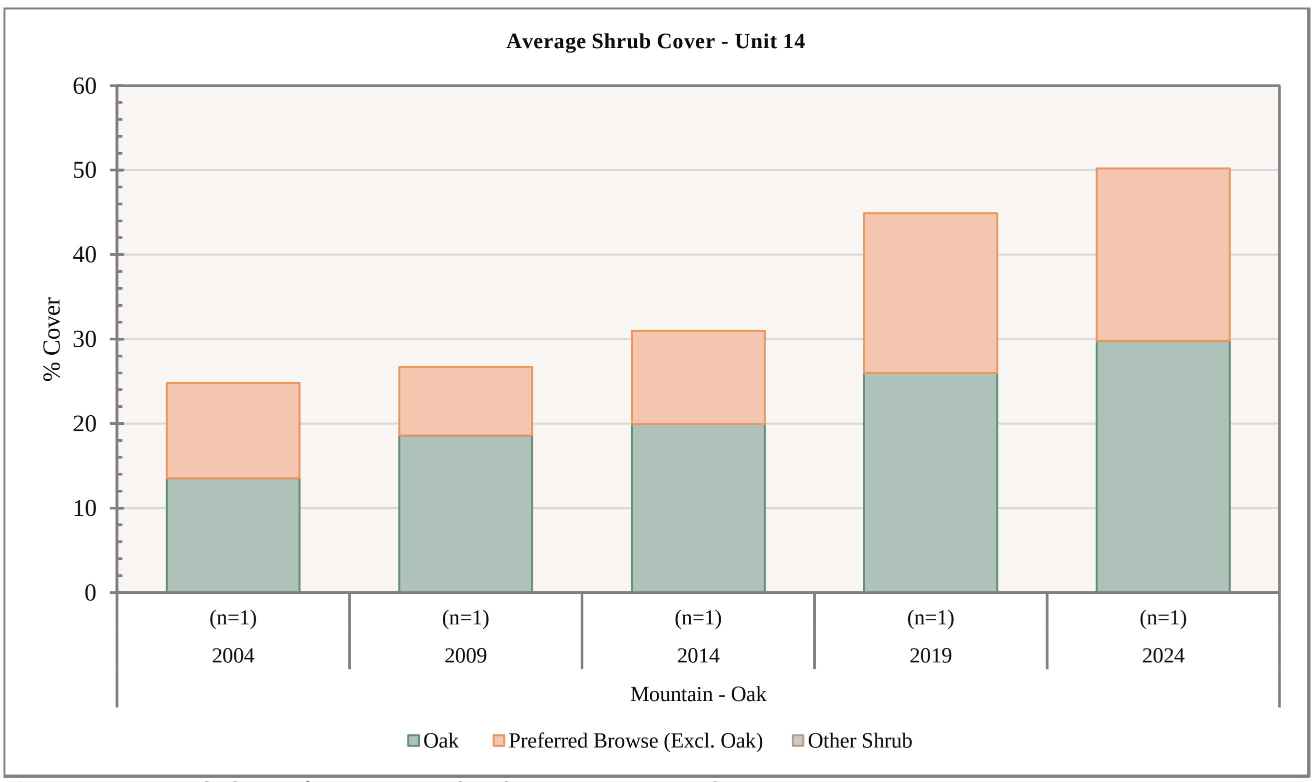


Figure 2.14: Average shrub cover for Mountain - Oak study sites in WMU 14A, Abajo Mountains.

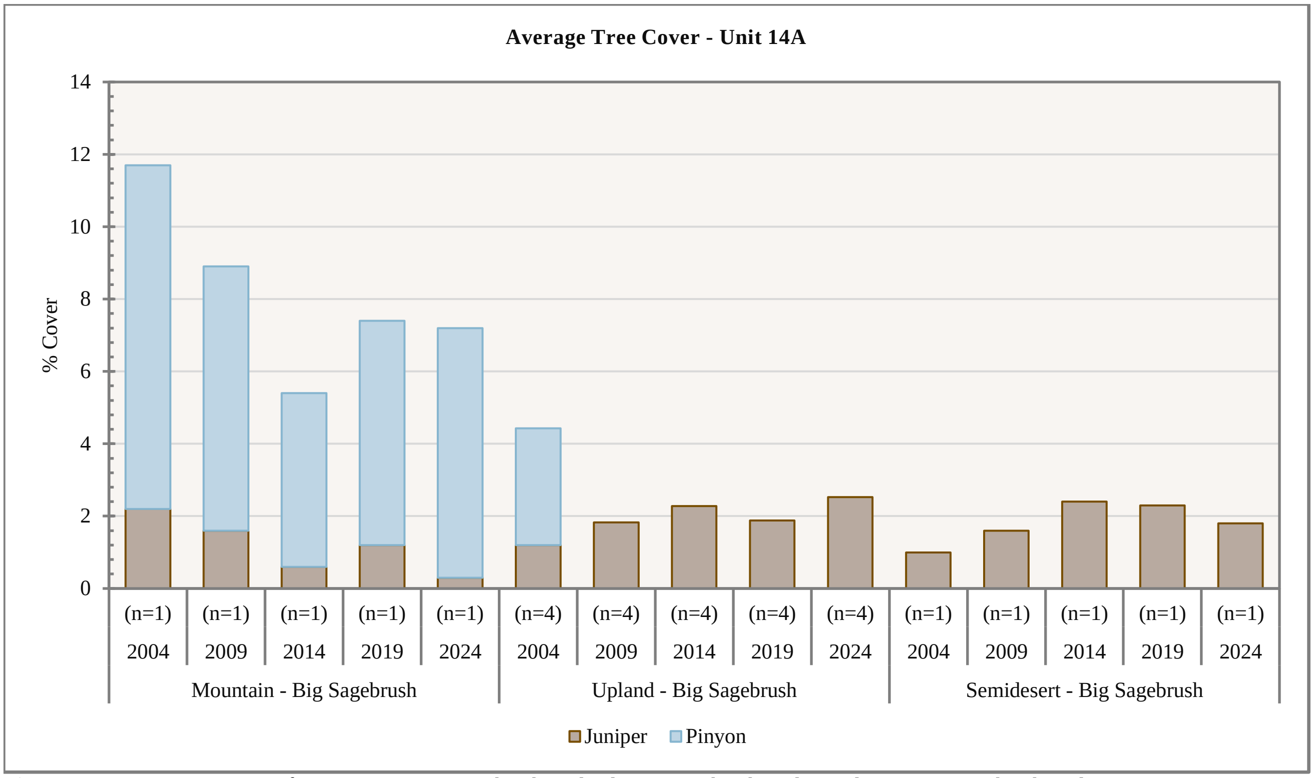


Figure 2.15: Average tree cover for Mountain - Big Sagebrush, Upland - Big Sagebrush, and Semidesert - Big Sagebrush study sites in WMU 14A, Abajo Mountains.

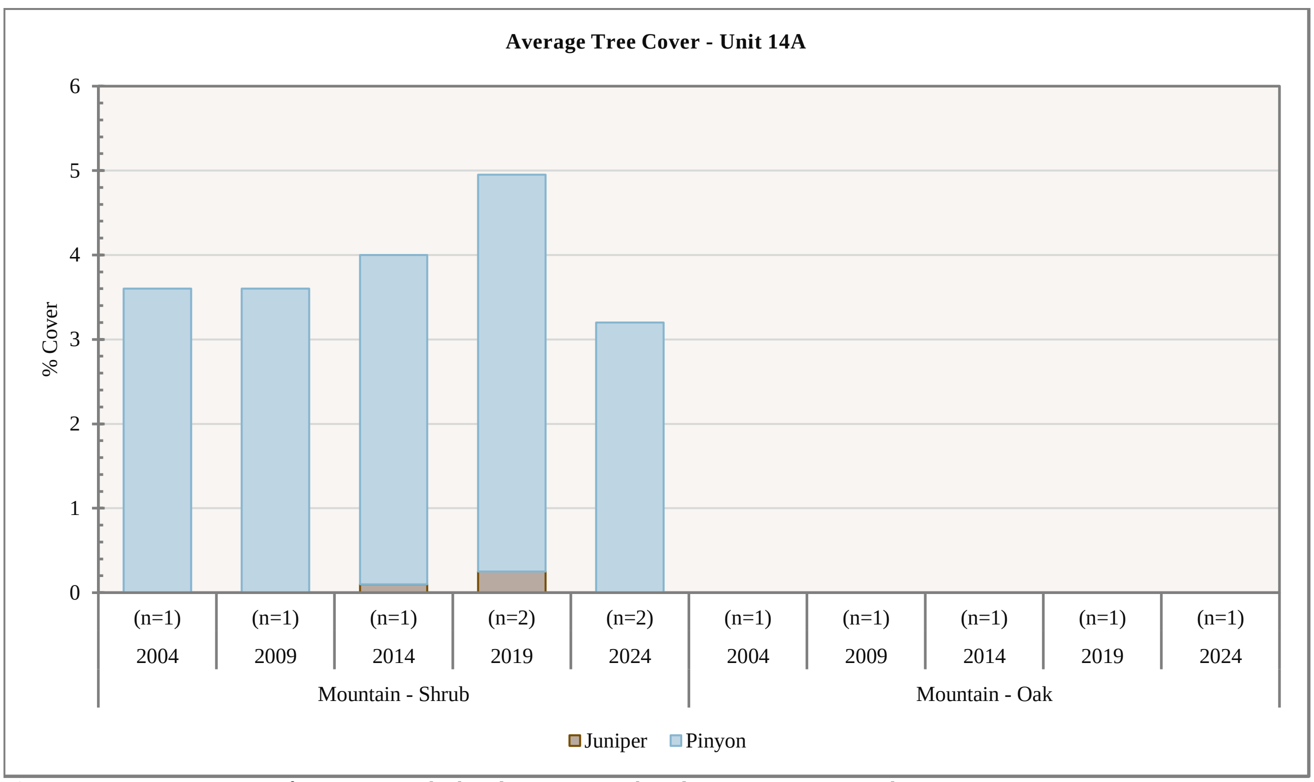


Figure 2.16: Average tree cover for Mountain - Shrub and Mountain - Oak study sites in WMU 14A, Abajo Mountains.

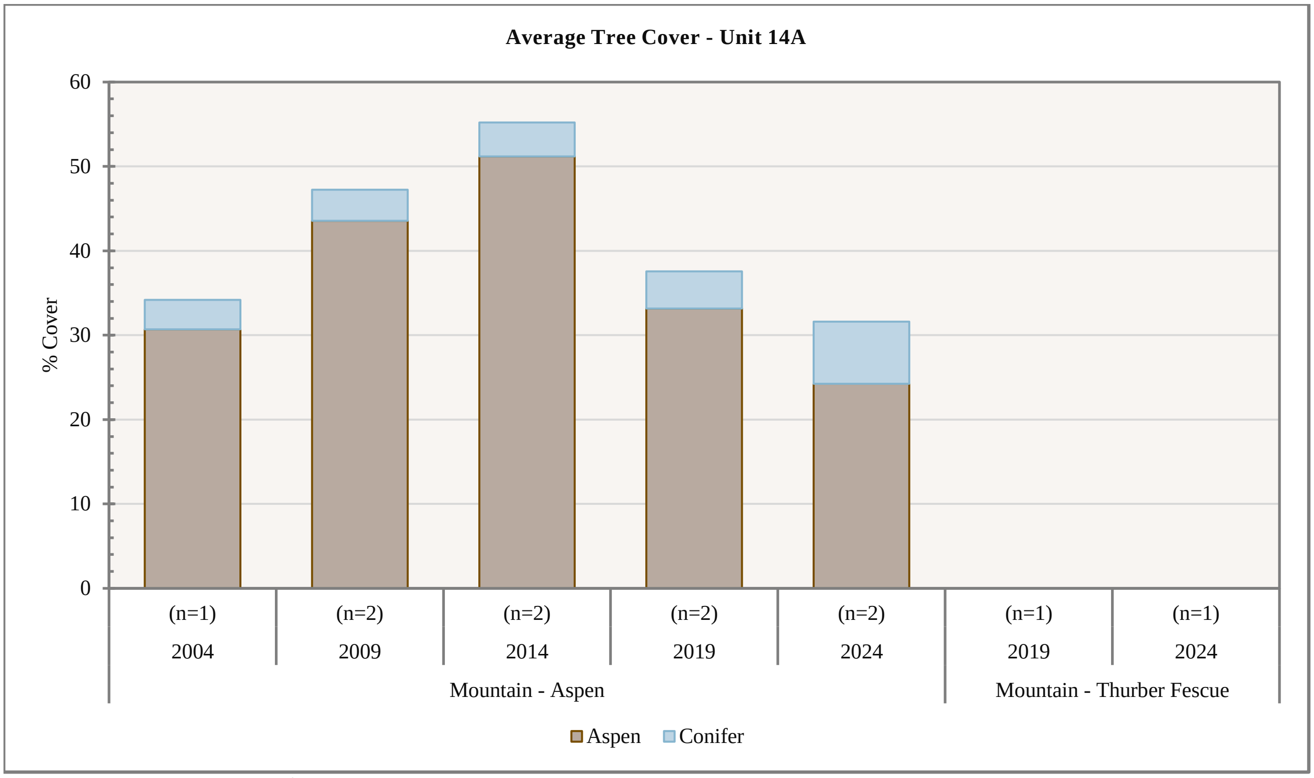


Figure 2.17: Average tree cover for Mountain - Aspen and Mountain - Thurber Fescue study sites in WMU 14A, Abajo Mountains.

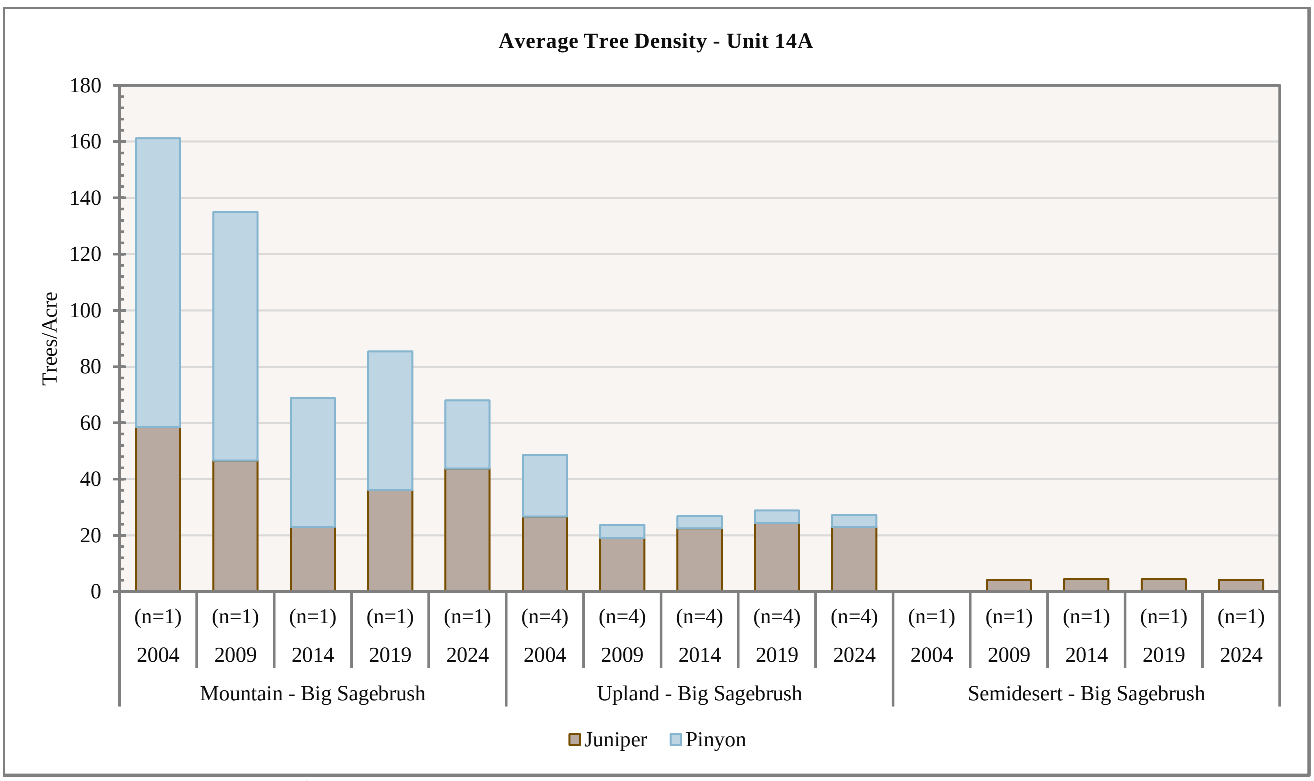


Figure 2.18: Average tree density for Mountain - Big Sagebrush, Upland - Big Sagebrush, and Semidesert - Big Sagebrush study sites in WMU 14A, Abajo Mountains.

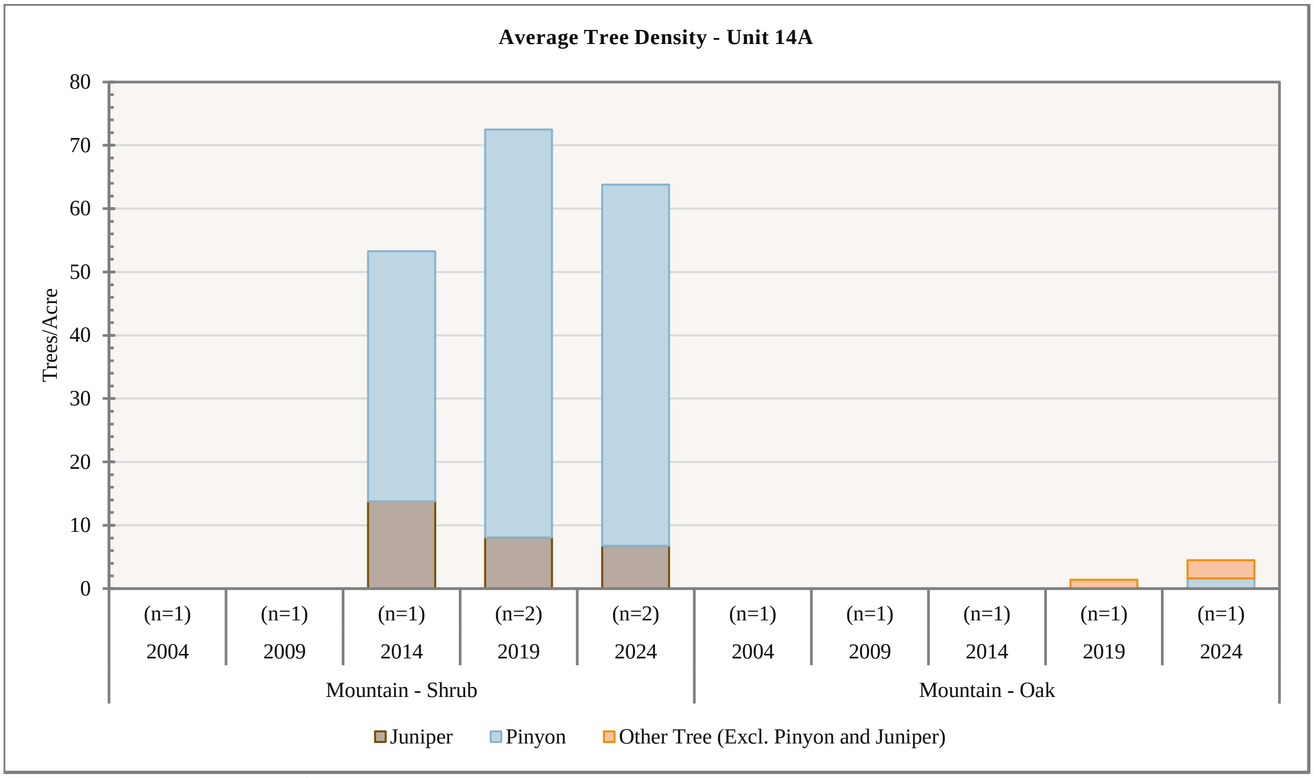


Figure 2.19: Average tree density for Mountain - Shrub and Mountain - Oak study sites in WMU 14A, Abajo Mountains.

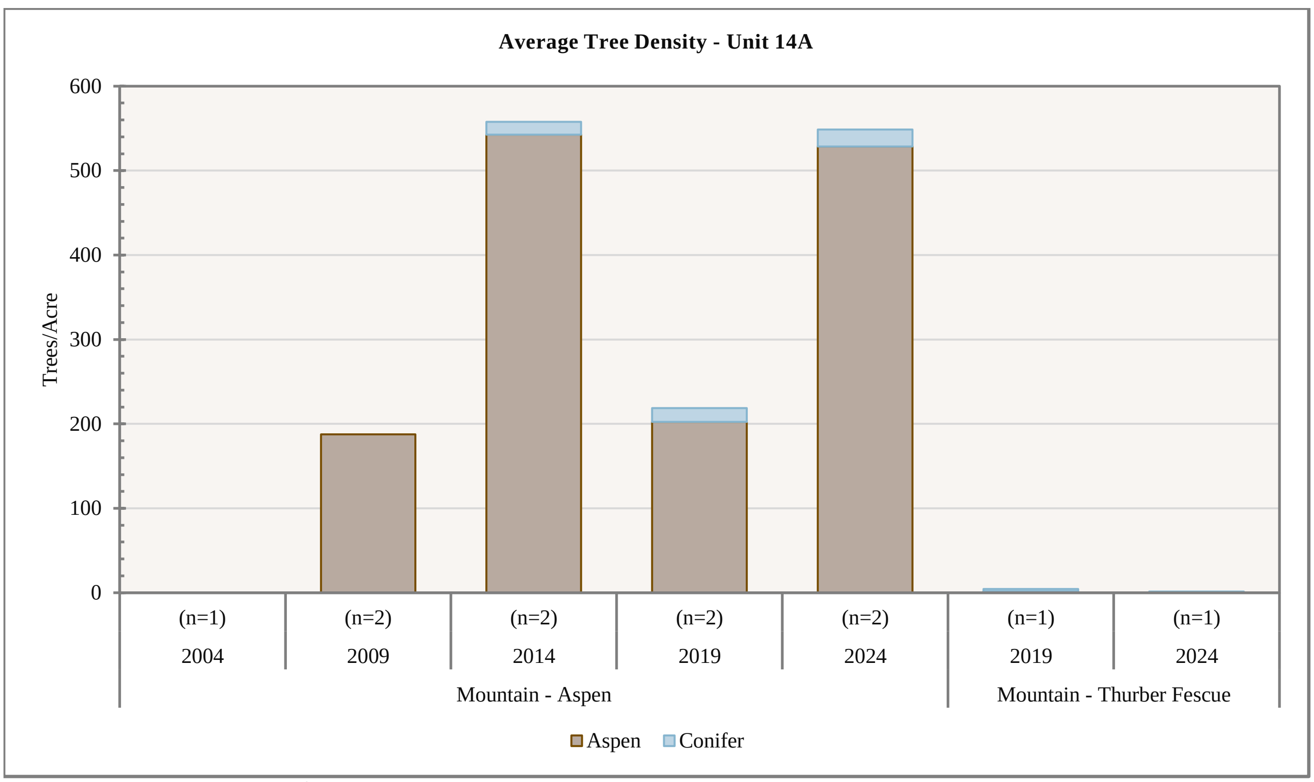


Figure 2.20: Average tree density for Mountain - Aspen and Mountain - Thurber Fescue study sites in WMU 14A, Abajo Mountains.

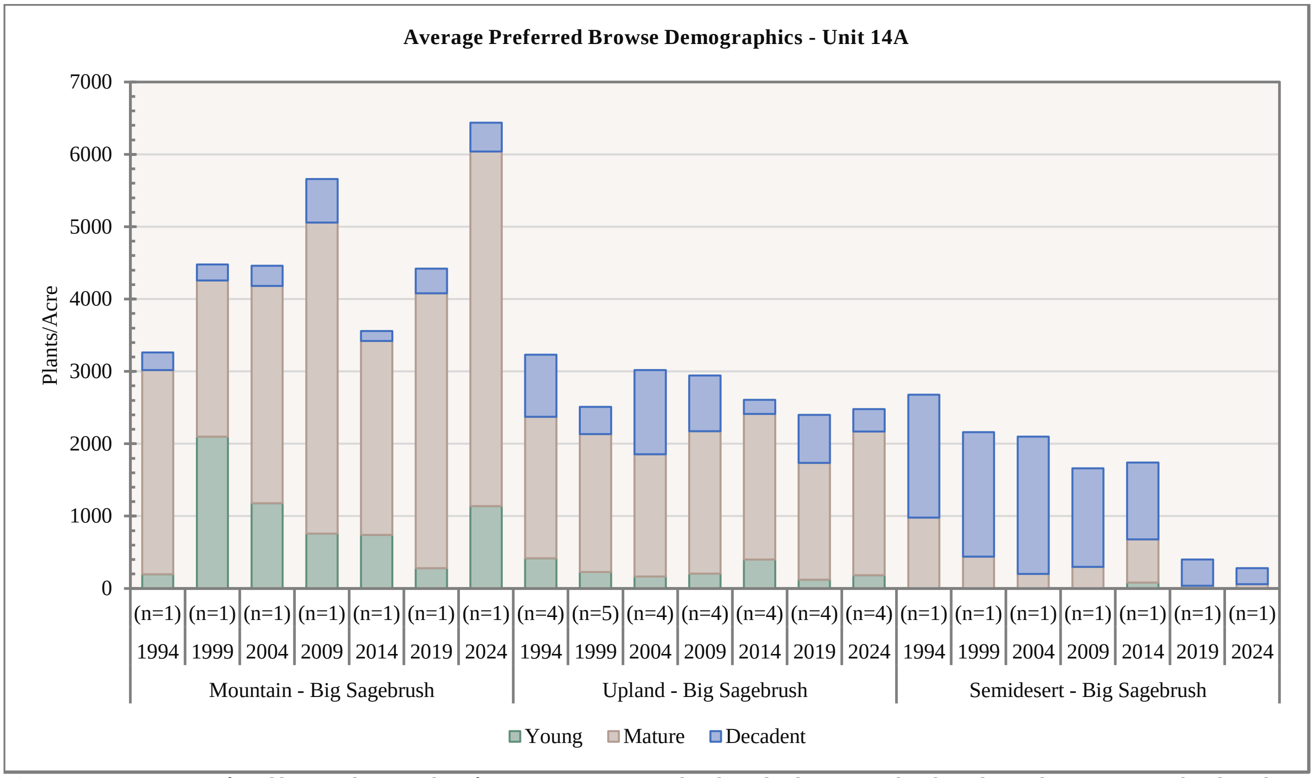


Figure 2.21: Average preferred browse demographics for Mountain - Big Sagebrush, Upland - Big Sagebrush, and Semidesert - Big Sagebrush study sites in WMU 14A, Abajo Mountains.

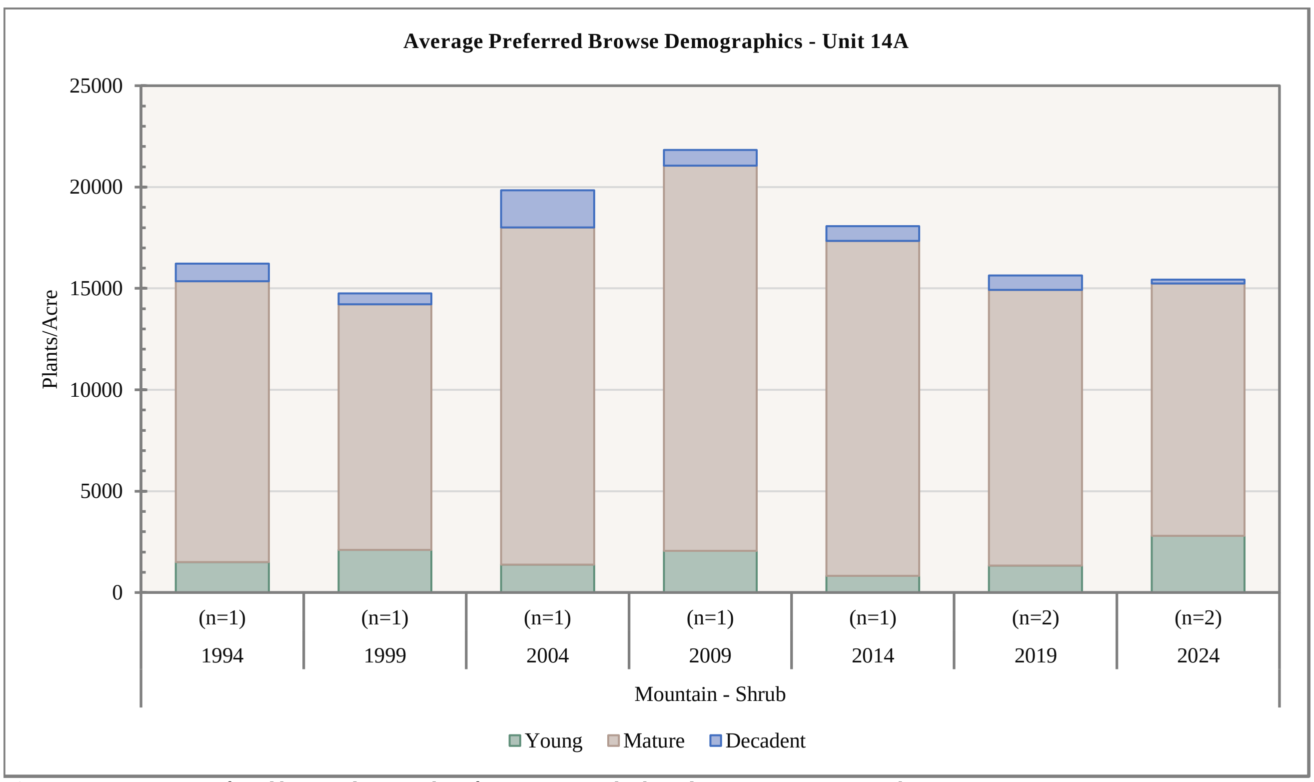


Figure 2.22: Average preferred browse demographics for Mountain - Shrub study sites in WMU 14A, Abajo Mountains.

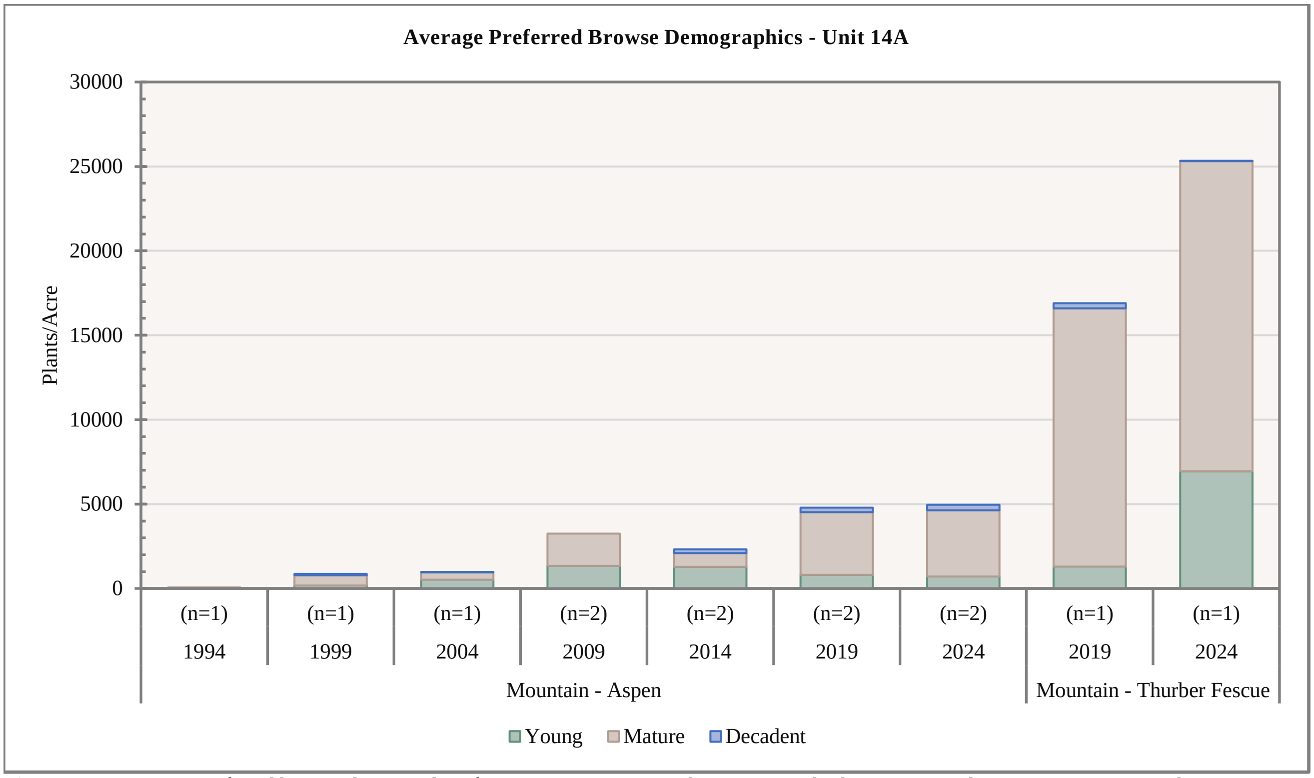


Figure 2.23: Average preferred browse demographics for Mountain - Aspen and Mountain - Thurber Fescue study sites in WMU 14A, Abajo Mountains.

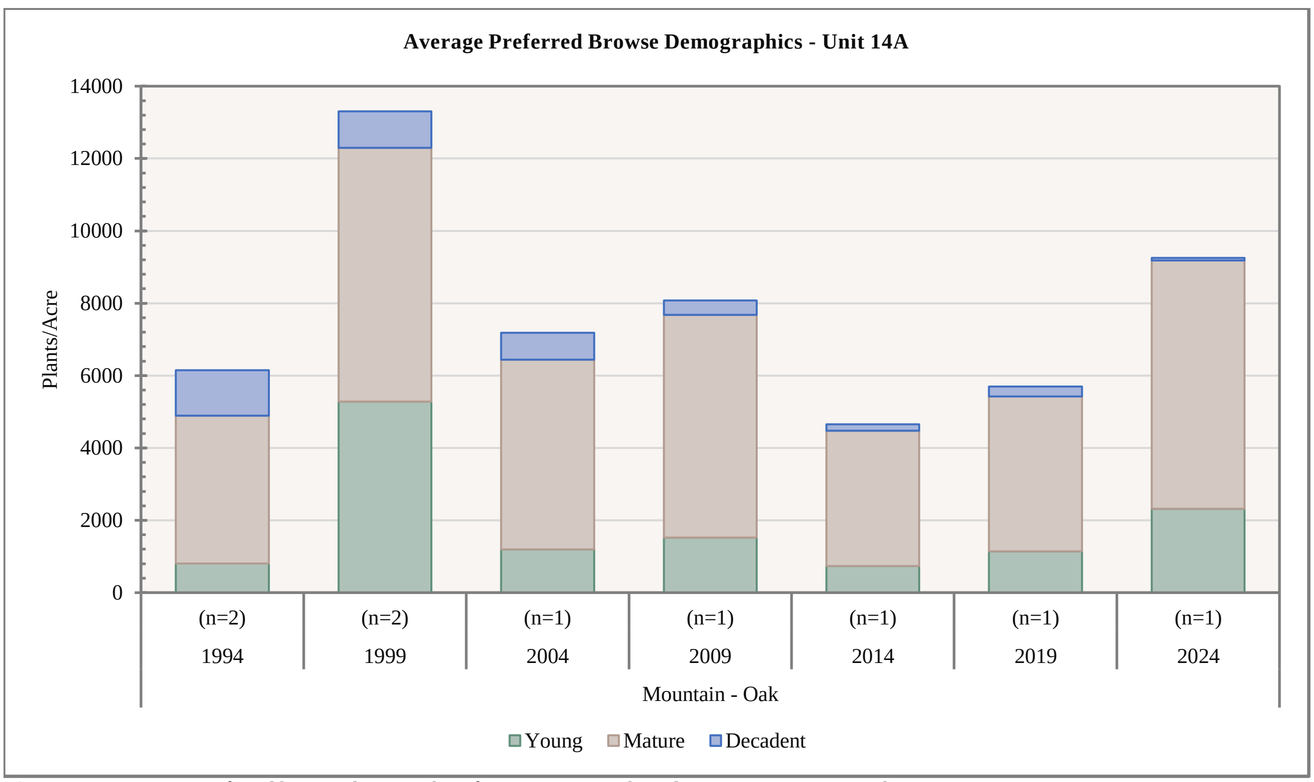


Figure 2.24: Average preferred browse demographics for Mountain - Oak study sites in WMU 14A, Abajo Mountains.

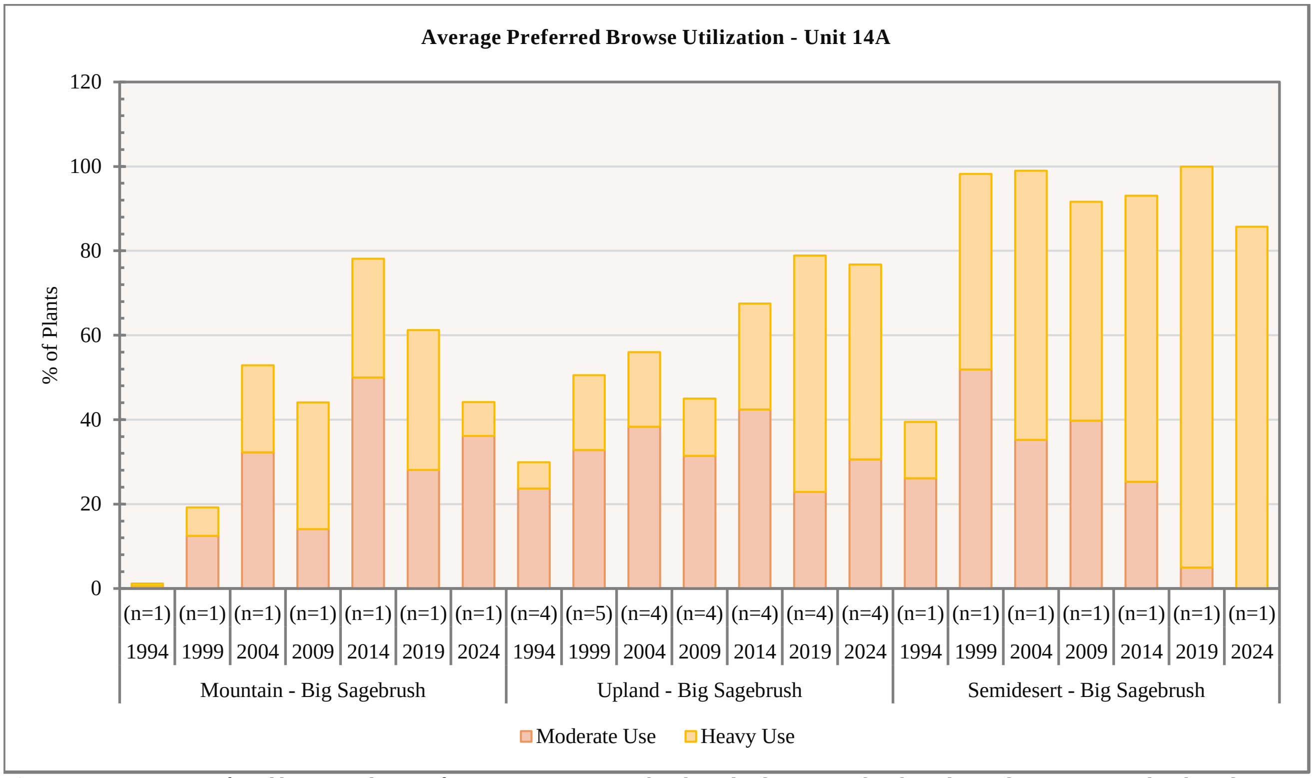


Figure 2.25: Average preferred browse utilization for Mountain - Big Sagebrush, Upland - Big Sagebrush, and Semidesert - Big Sagebrush study sites in WMU 14A, Abajo Mountains.

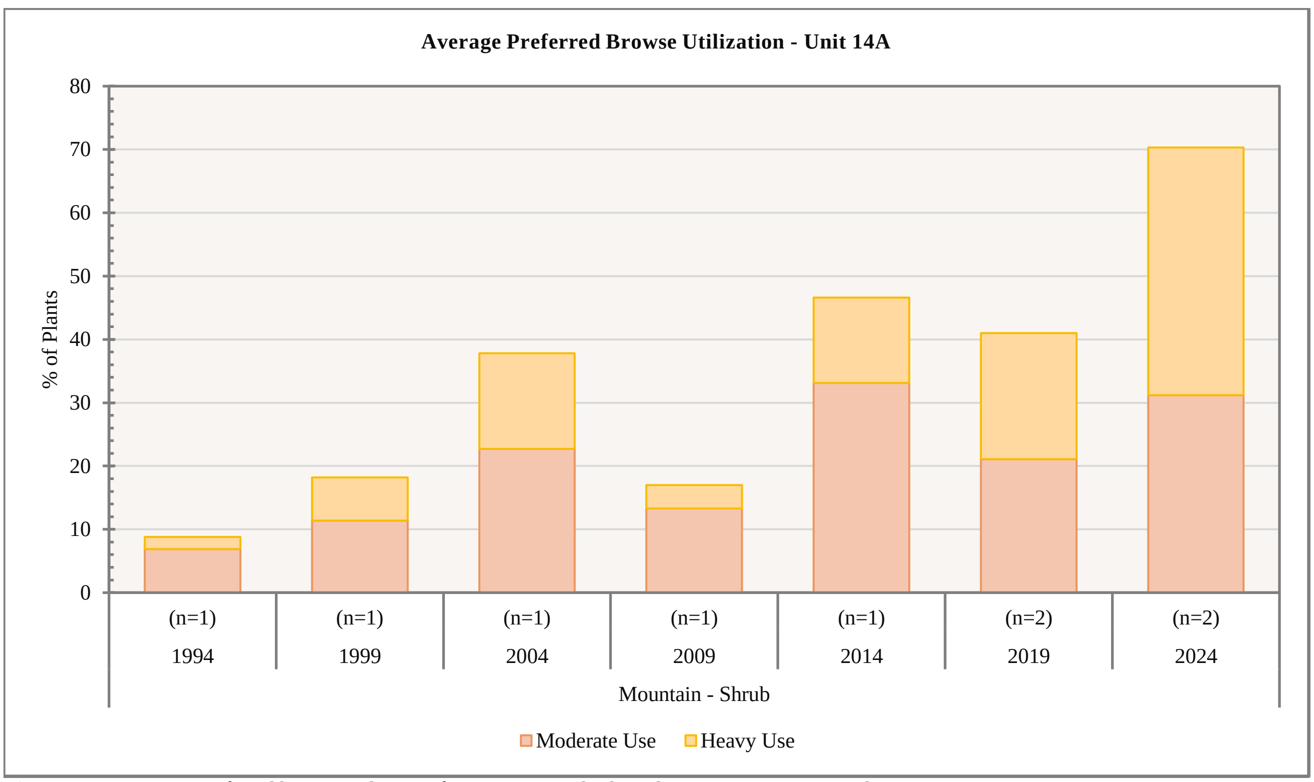


Figure 2.26: Average preferred browse utilization for Mountain - Shrub study sites in WMU 14A, Abajo Mountains.

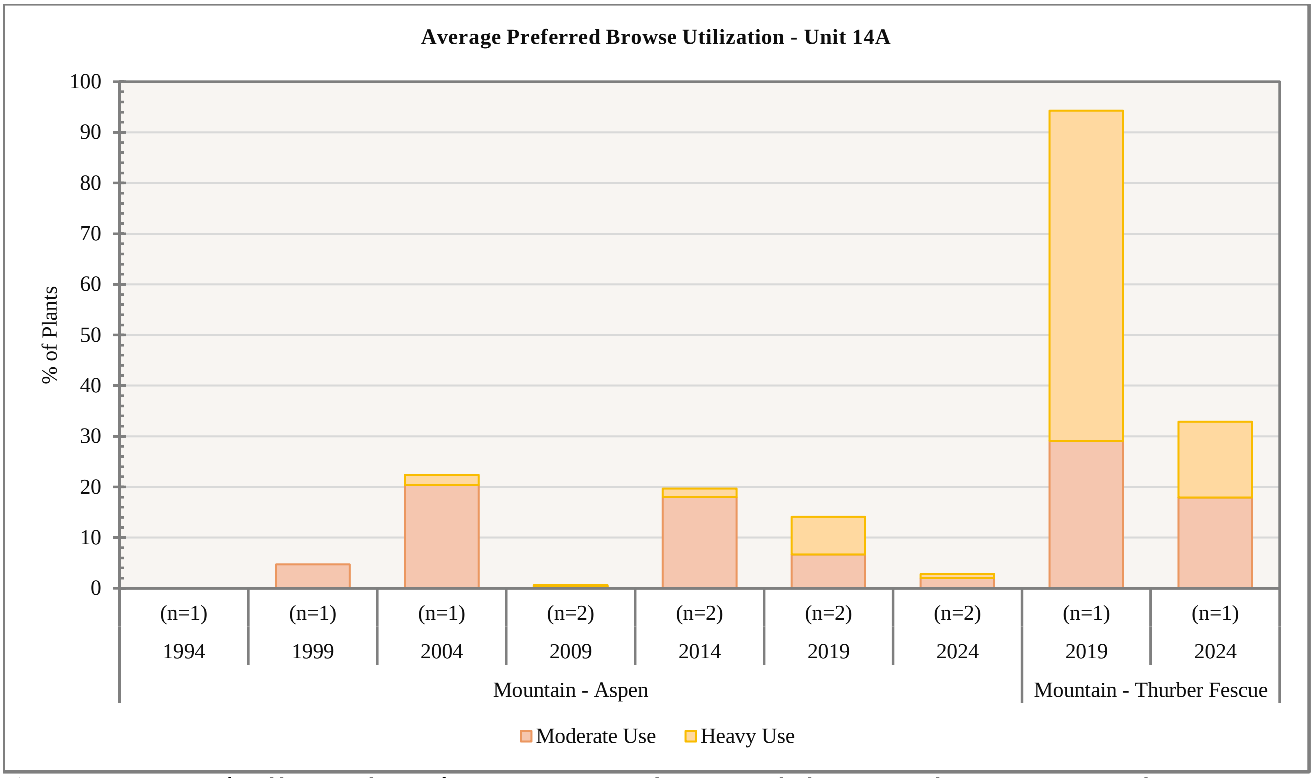


Figure 2.27: Average preferred browse utilization for Mountain - Aspen and Mountain - Thurber Fescue study sites in WMU 14A, Abajo Mountains.

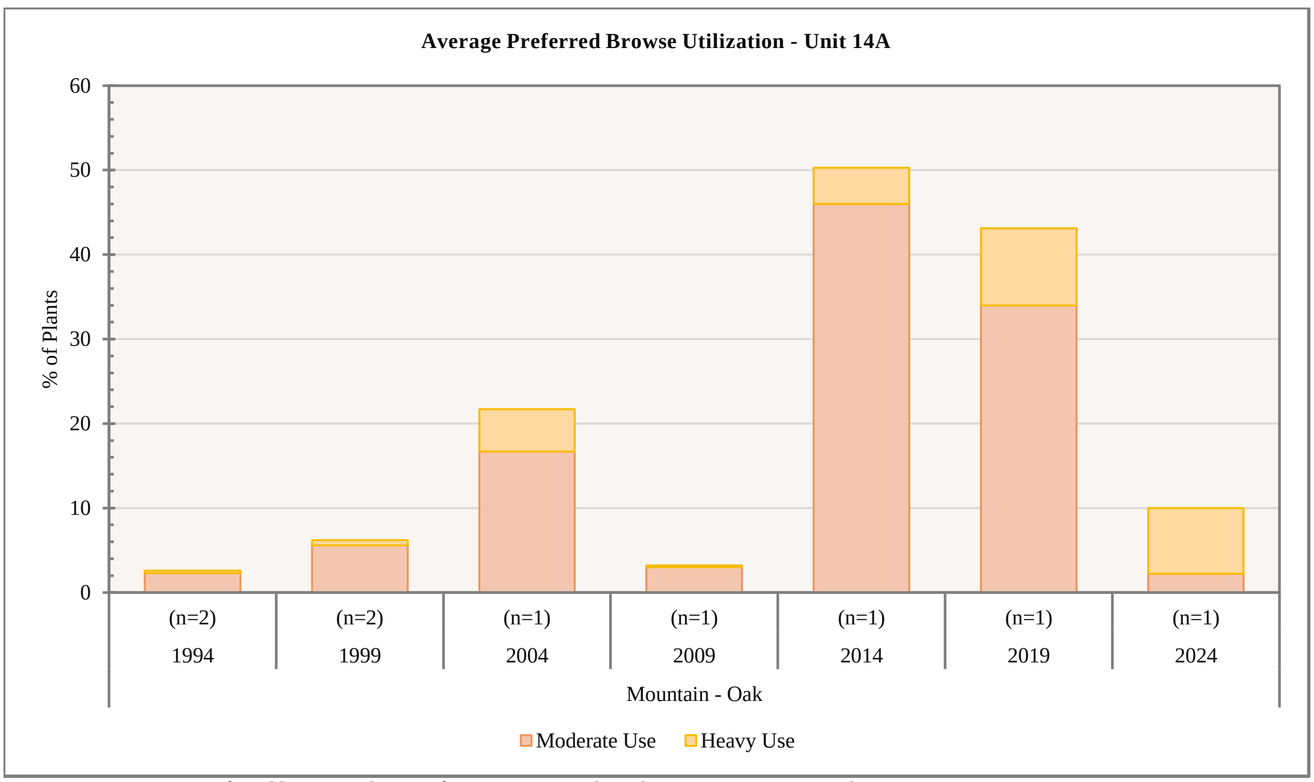


Figure 2.28: Average preferred browse utilization for Mountain - Oak study sites in WMU 14A, Abajo Mountains.

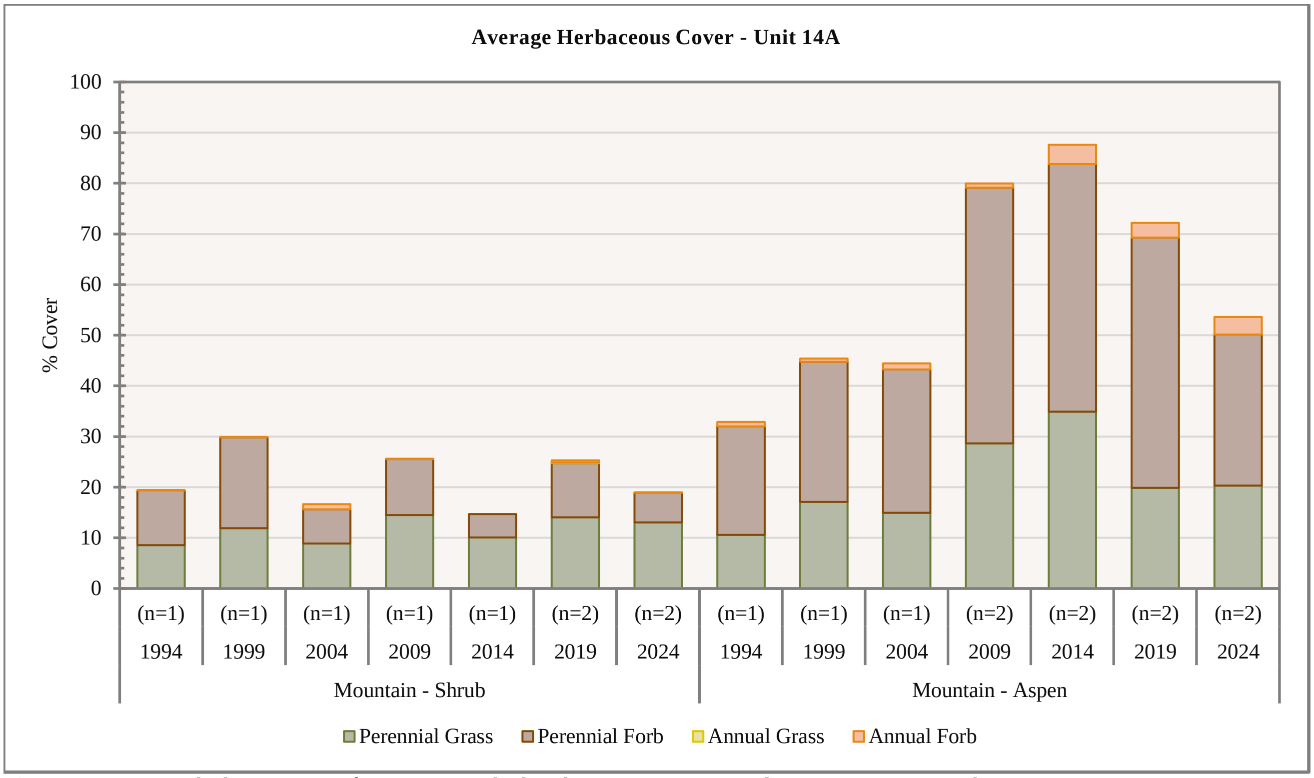


Figure 2.29: Average herbaceous cover for Mountain - Shrub and Mountain - Aspen study sites in WMU 14A, Abajo Mountains.

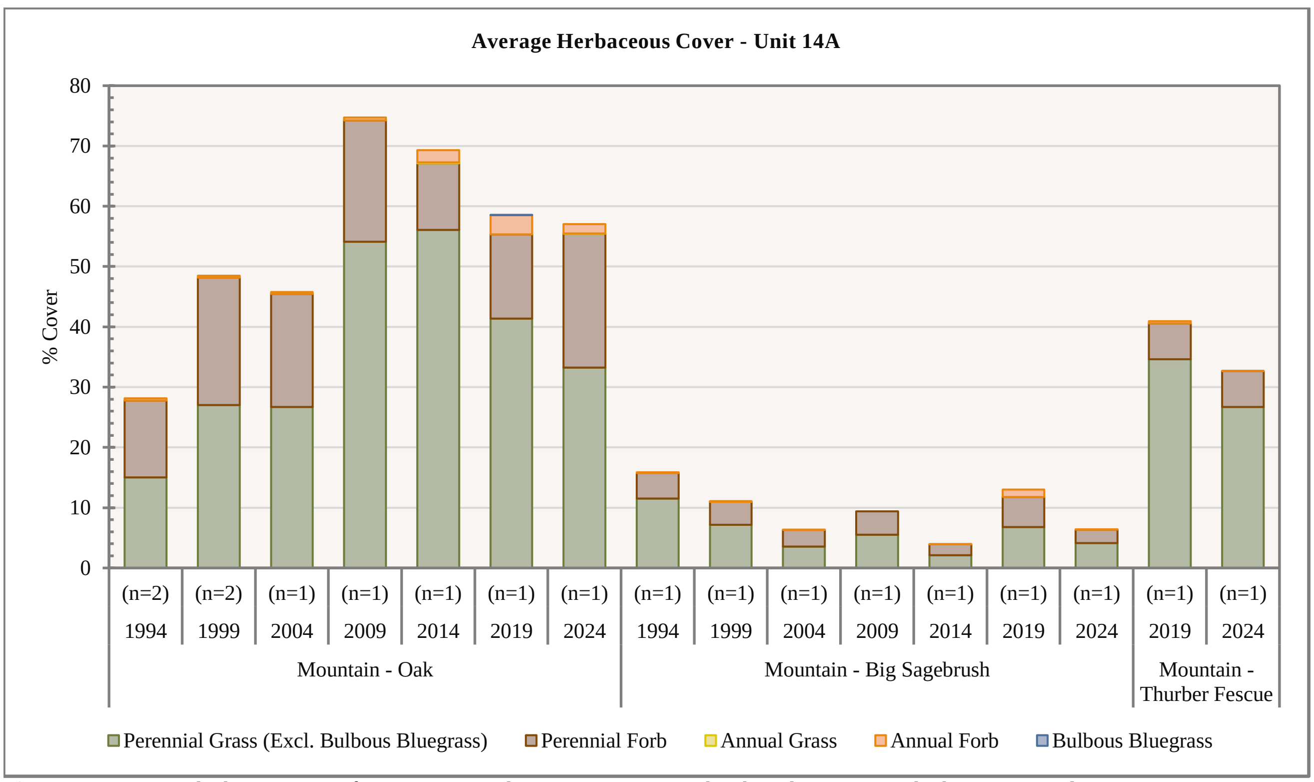


Figure 2.30: Average herbaceous cover for Mountain - Oak, Mountain - Big Sagebrush, and Mountain - Thurber Fescue study sites in WMU 14A, Abajo Mountains.

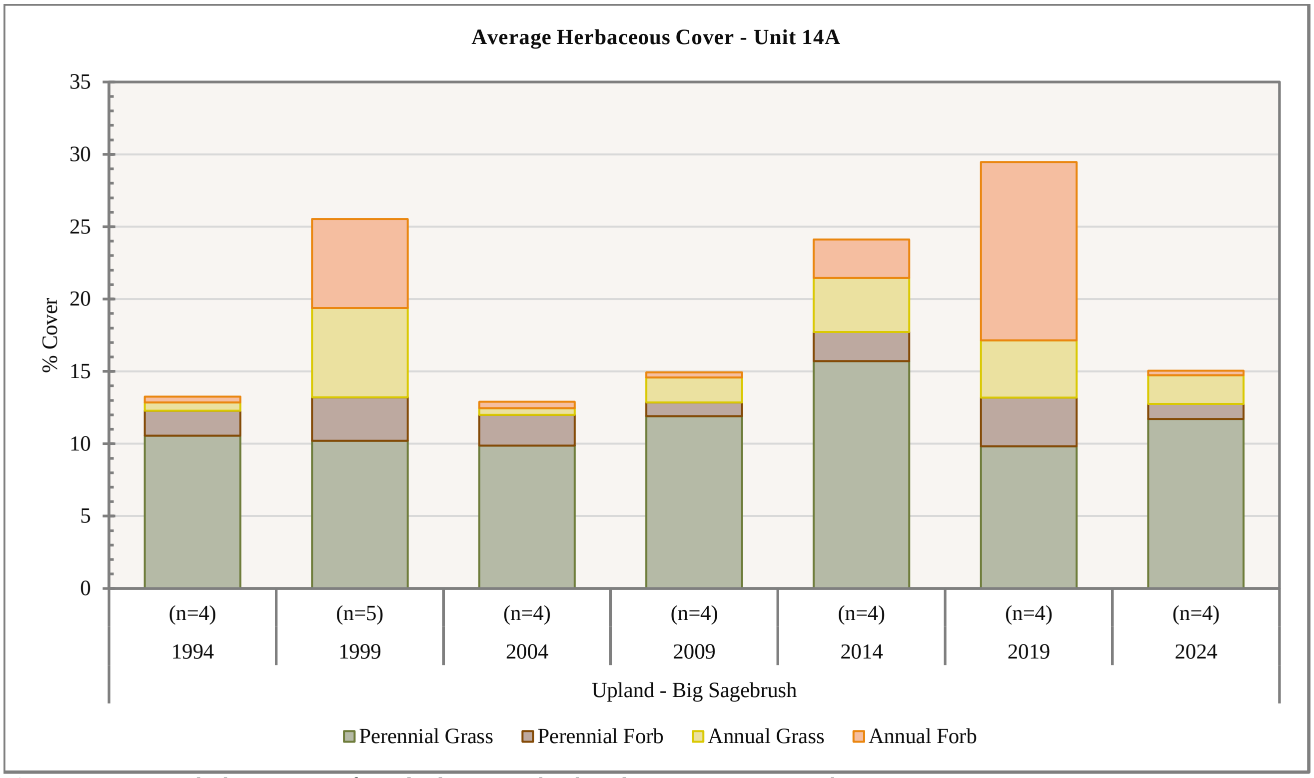


Figure 2.31: Average herbaceous cover for Upland - Big Sagebrush study sites in WMU 14A, Abajo Mountains.

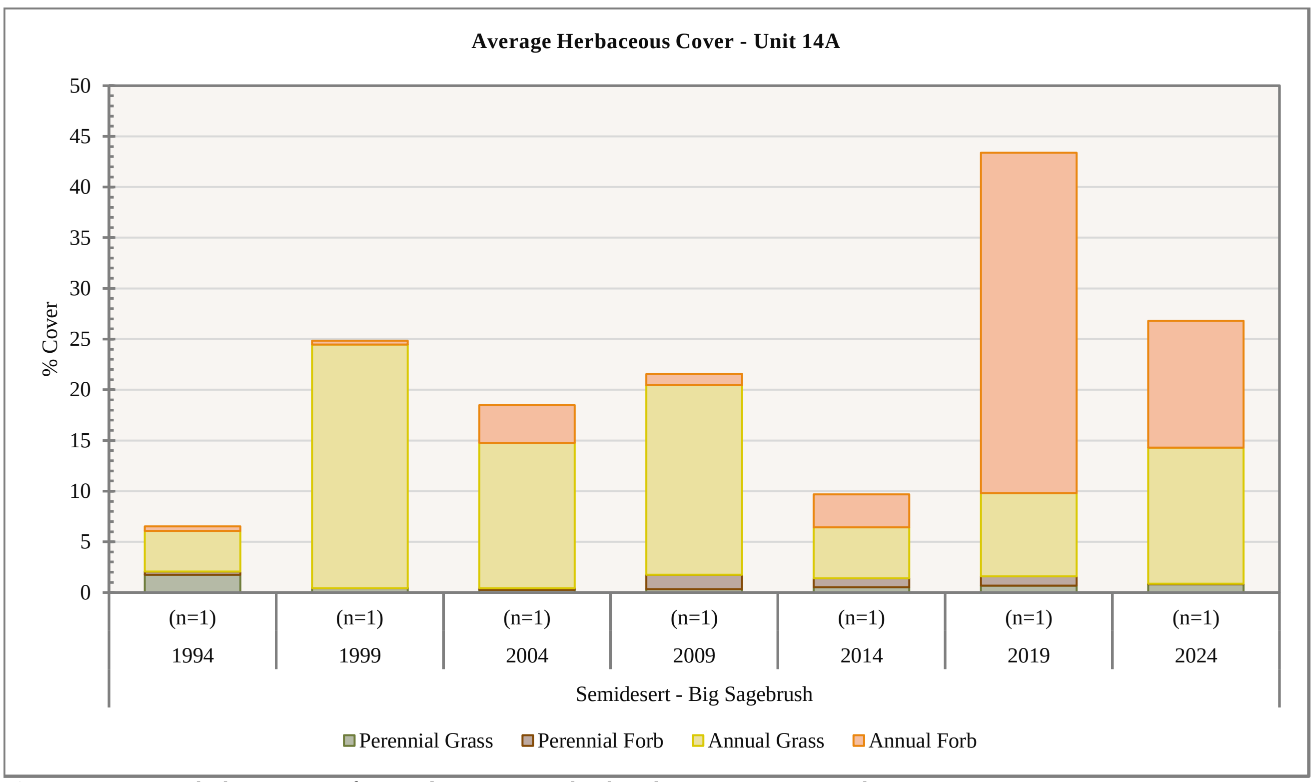


Figure 2.32: Average herbaceous cover for Semidesert - Big Sagebrush study sites in WMU 14A, Abajo Mountains.

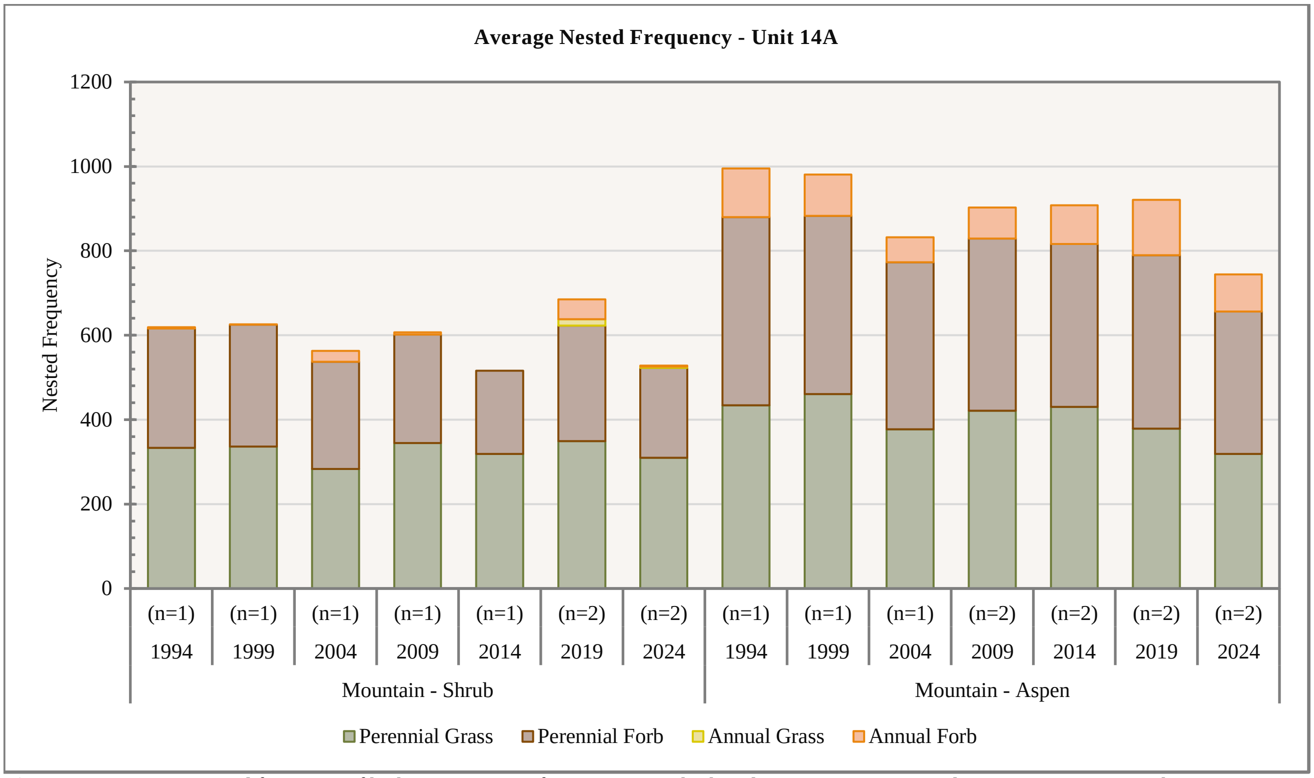


Figure 2.33: Average nested frequency of herbaceous species for Mountain - Shrub and Mountain - Aspen study sites in WMU 14A, Abajo Mountains.

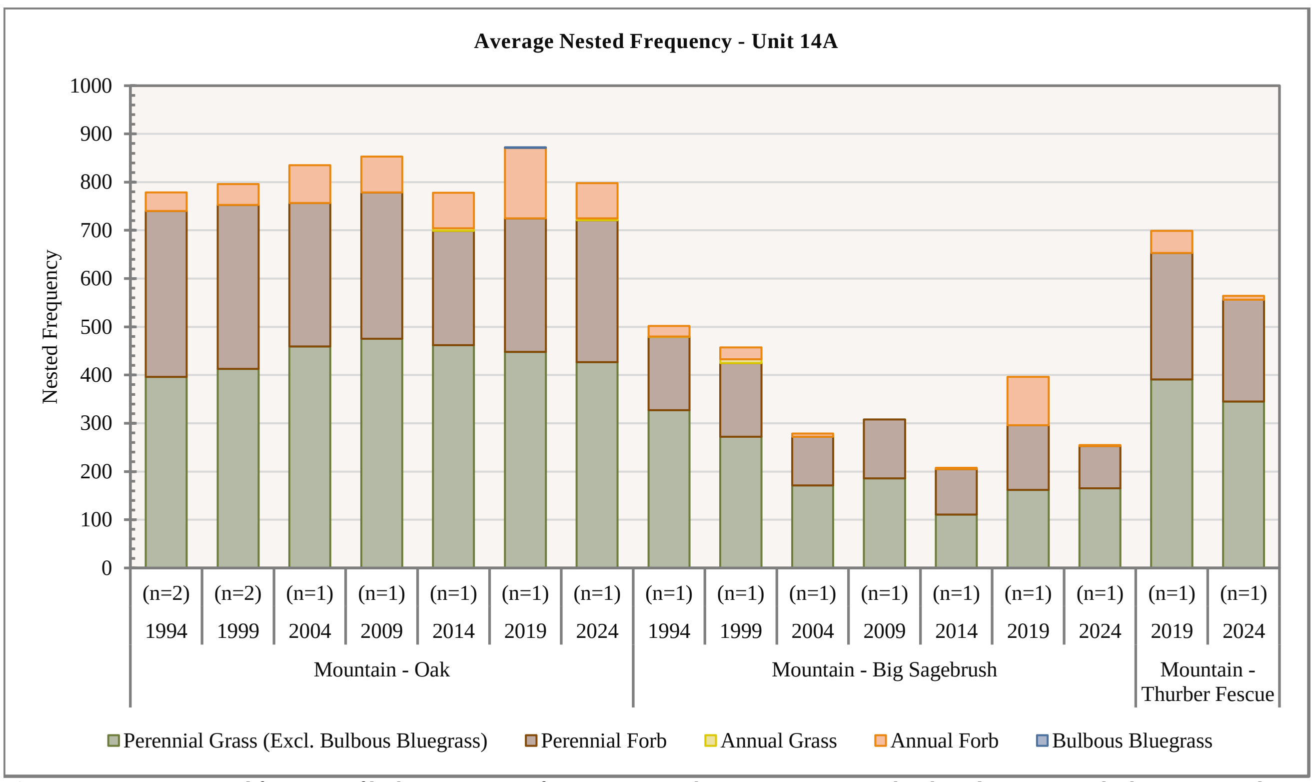


Figure 2.34: Average nested frequency of herbaceous species for Mountain - Oak, Mountain - Big Sagebrush, and Mountain - Thurber Fescue study sites in WMU 14A, Abajo Mountains.

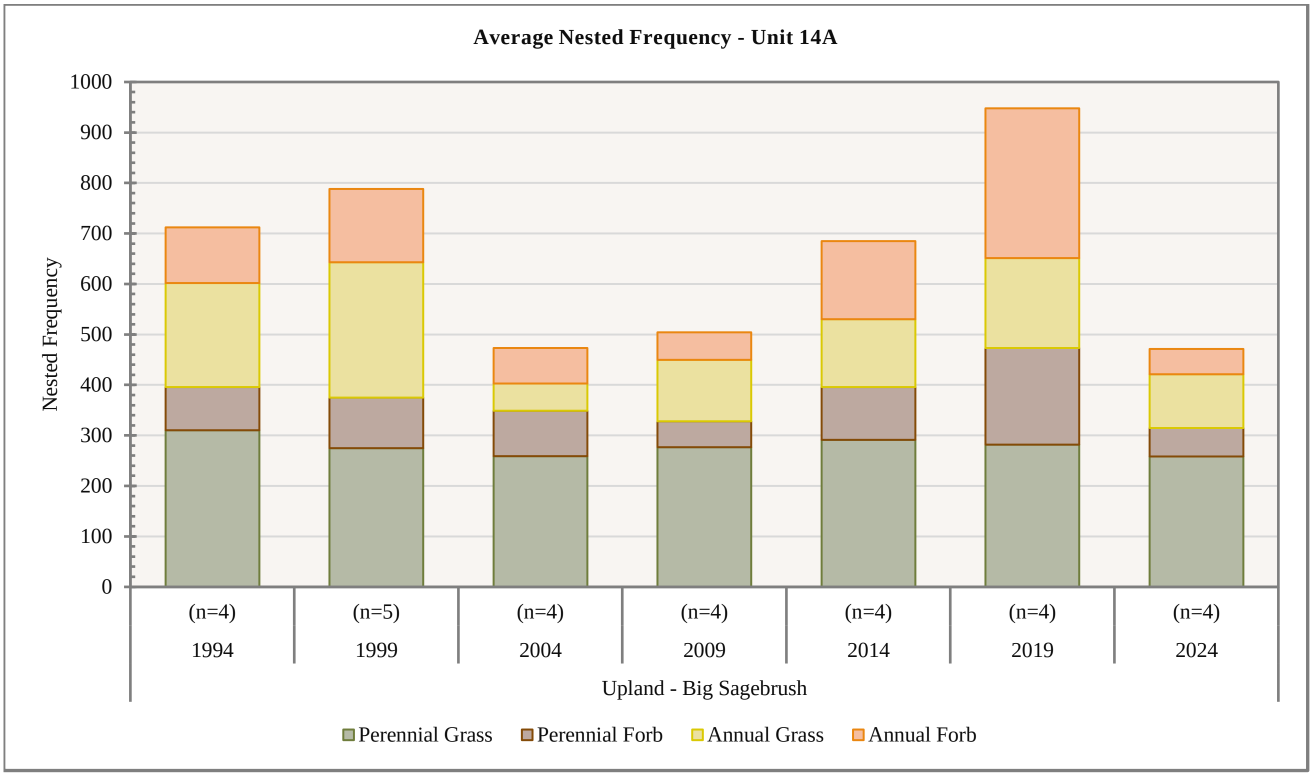


Figure 2.35: Average nested frequency of herbaceous species for Upland - Big Sagebrush study sites in WMU 14A, Abajo Mountains.

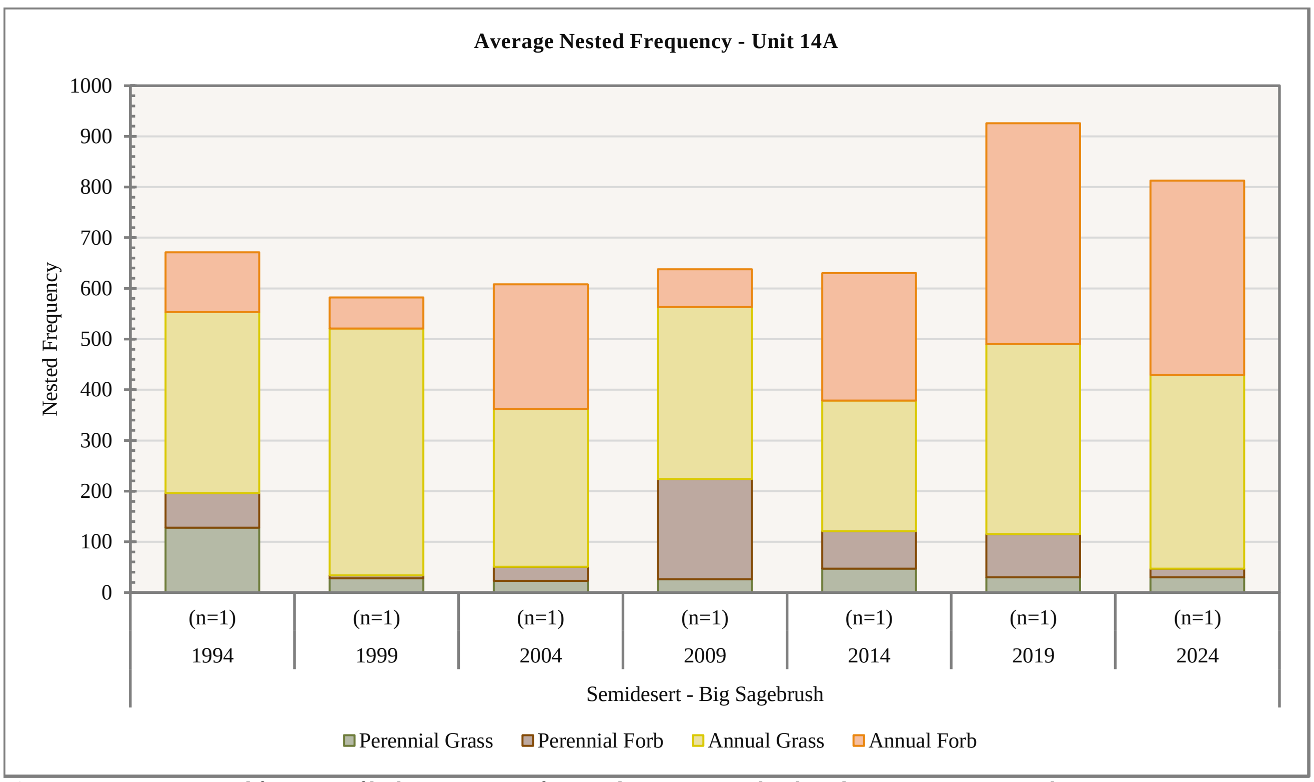


Figure 2.36: Average nested frequency of herbaceous species for Semidesert - Big Sagebrush study sites in WMU 14A, Abajo Mountains.

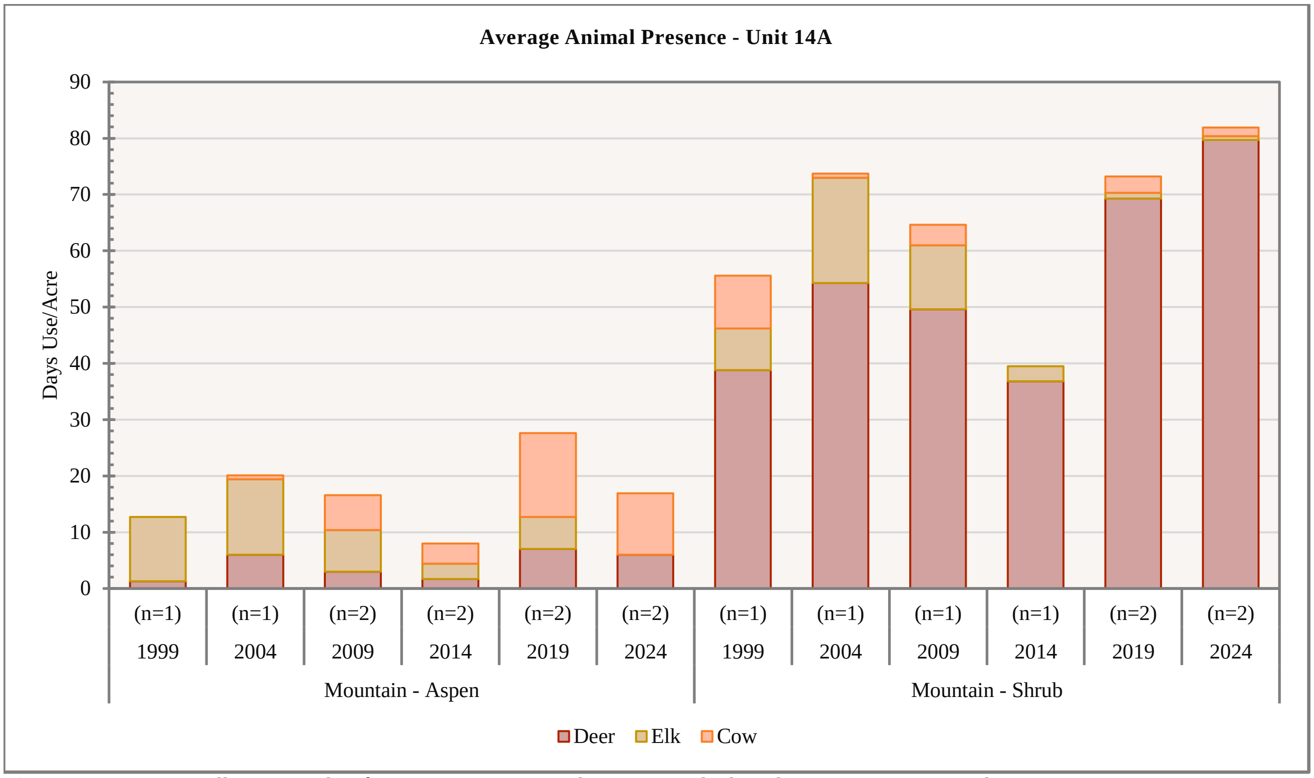


Figure 2.37: Average pellet transect data for Mountain - Aspen and Mountain - Shrub study sites in WMU 14A, Abajo Mountains.

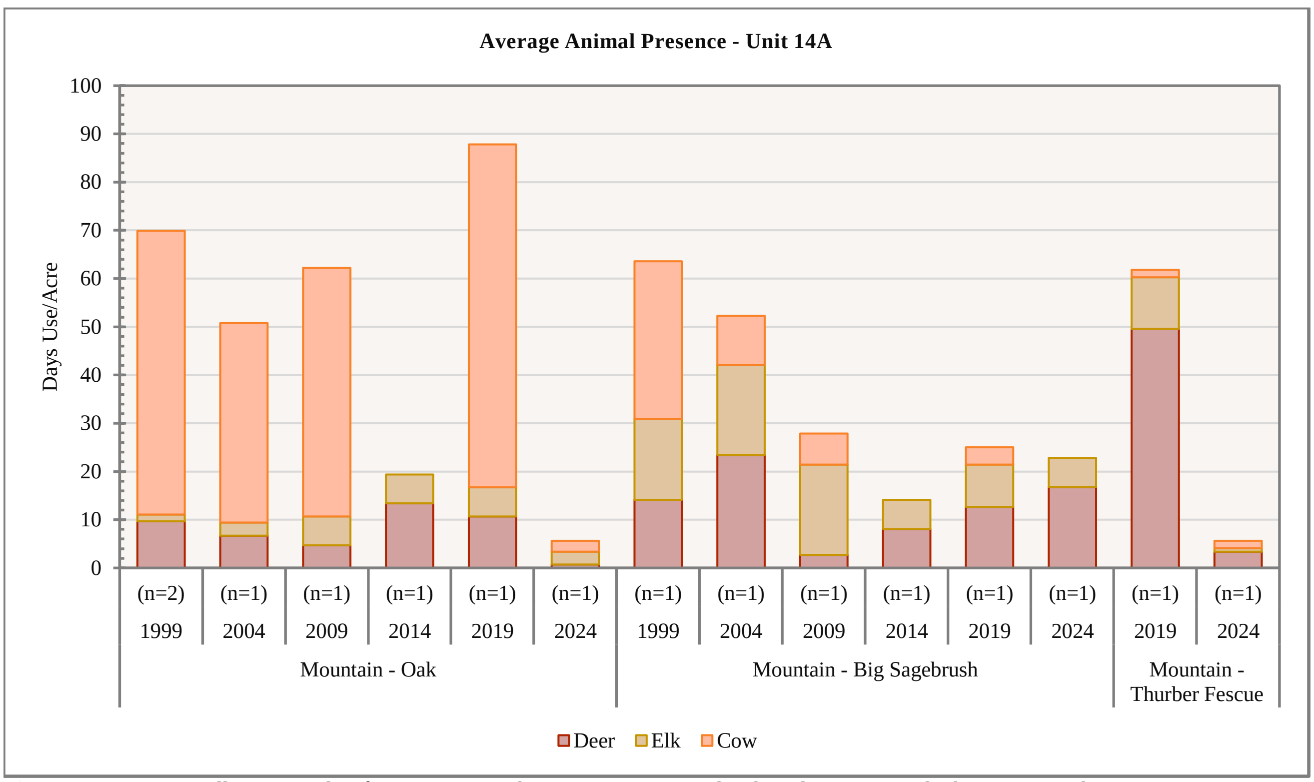


Figure 2.38: Average pellet transect data for Mountain - Oak, Mountain - Big Sagebrush, and Mountain - Thurber Fescue study sites in WMU 14A, Abajo Mountains.

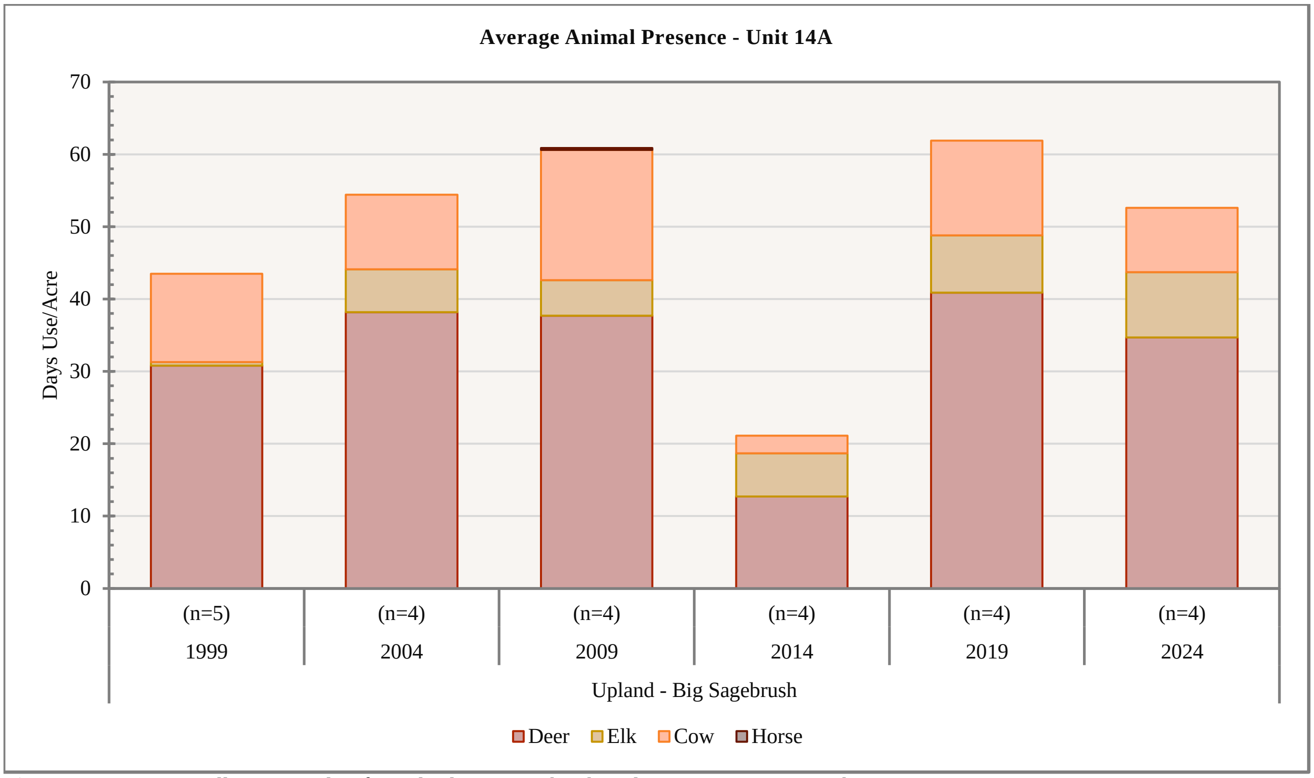


Figure 2.39: Average pellet transect data for Upland - Big Sagebrush study sites in WMU 14A, Abajo Mountains.

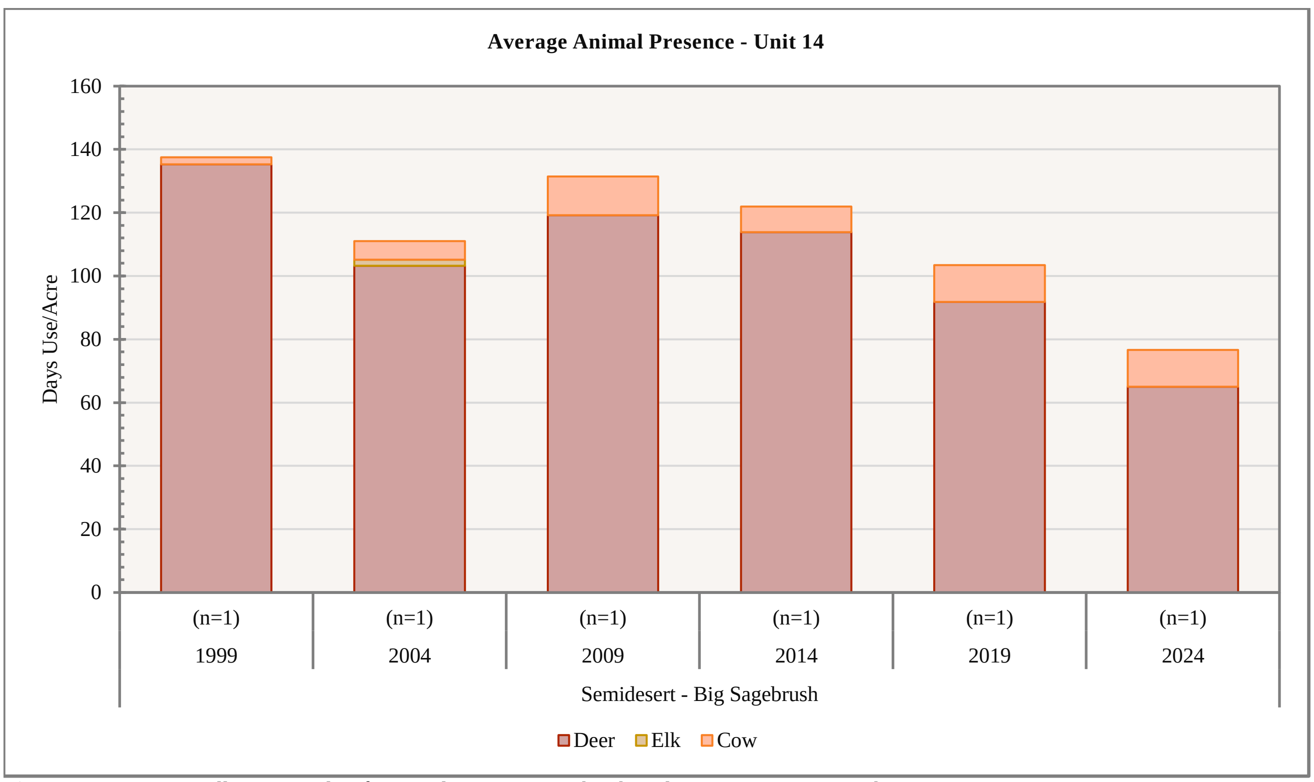


Figure 2.40: Average pellet transect data for Semidesert - Big Sagebrush study sites in WMU 14A, Abajo Mountains.

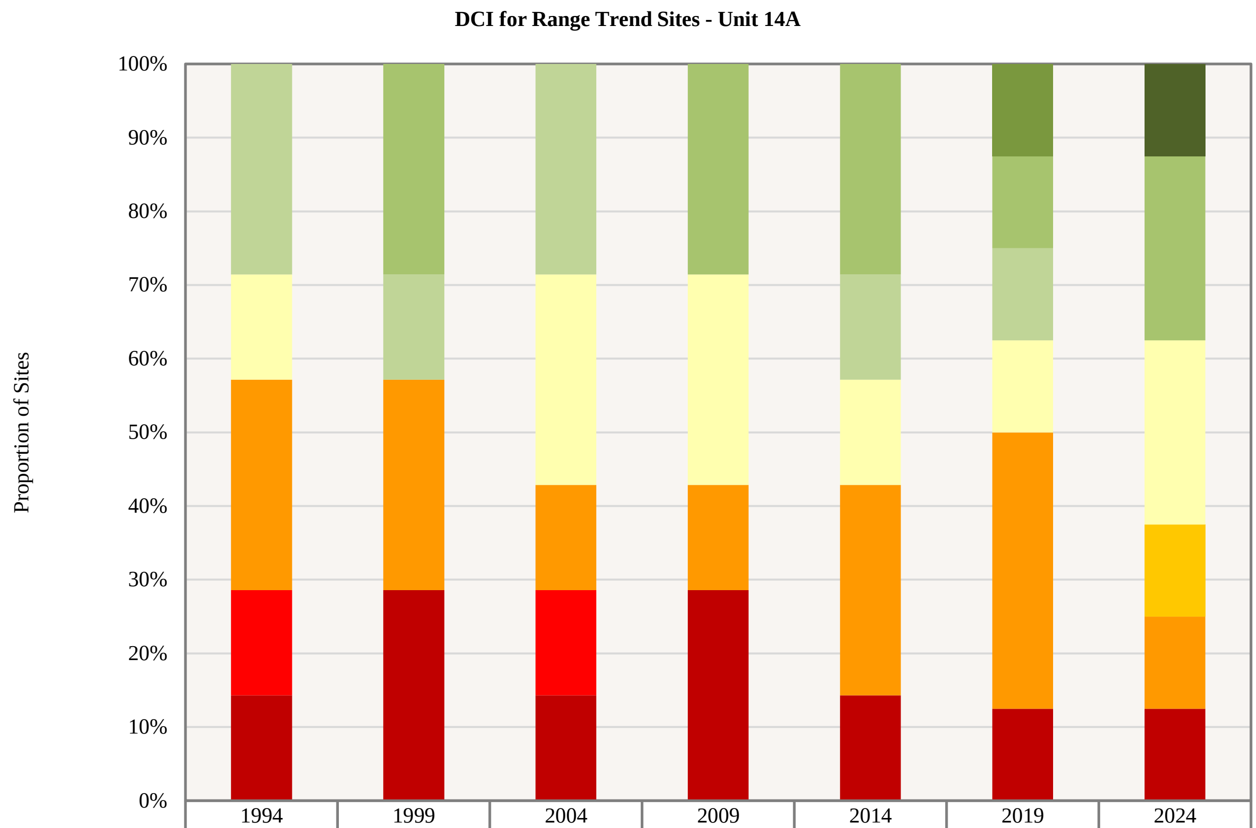
Deer Winter Range Condition Assessment

The overall condition of deer winter and transitional range (**Map 2.2**) within the Abajo Mountains Management Unit has improved since 1994. More specifically, average unit conditions improved from poor in 1994 to fair in 2024. Alkali Point (14A-01) is the only Range Trend site that has been consistently considered to be in very poor condition, which can be attributed to a lack of preferred browse and perennial forbs and the consistent presence of annual grass. One factor beneficial to the overall winter range health on all Range Trend sites in this unit is a general lack of annual grass. However, most sites could benefit by increasing preferred browse and perennial forb cover while diversifying these components in their respective communities. It is probable that these sites represent their surrounding areas. As such, Range Trend sites likely point to areas of needed habitat rehabilitation topics of concern, namely the need for increased preferred browse on Alkali Point, Harts Draw (14A-09), and Shay Mesa (14A-11) and increases in perennial forbs as a whole. Brushy Basin (14A-02), Peters Point (14A-08), and Shingle Mill (14A-12) have averaged conditions ranked between fair and good, and these sites are the drivers for unit-wide conditions. Brushy Basin and Shay Mesa tend to have higher variability in deer winter habitat and may have the highest degree of potential winter range improvement: the immediate area may benefit and respond the most to improvement projects. Areas of improvement may include a reduction in pinyon (*Pinus* spp.) and juniper (*Juniperus* spp.) tree cover, and/or cheatgrass (*Bromus tectorum*). Increases in preferred browse cover and native perennial grass and forbs would also improve habitat health.

The overall deer winter range assessment in 2024 was that WMU 14A is in fair condition. Factors negatively contributing to fair conditions are the lack of preferred shrub cover and recruitment on Alkali Point, Peters Point, Harts Draw, and Shay Mesa. Most sites would benefit from increases in native perennial grass and forb cover, while Alkali Point, Harts Point, and Shay Mesa have notable cheatgrass grass populations and a reduction of cover and abundance would benefit the respective habitat areas (**Figure 2.41**, **Table 2.7**).

While these Range Trend study sites primarily monitor mule deer range conditions and principally target wintering areas, evaluating the condition of these winter ranges may still provide valuable insights into the overall health and suitability of elk habitats. General evaluations of elk habitat may be made using the mule deer winter range Desirable Component Index (DCI) and other vegetation data when the associated study sites intersect currently mapped elk habitat (**Map 2.3**). The DCI was created as an indicator of the general health of winter ranges for mule deer. The index incorporates shrub cover, density, and age composition as well as other key vegetation variables. Changes in DCI suggest changes in winter range capacity. However, the relationship between DCI and the changes in elk carrying capacity is difficult to quantify and is not known.

Again, the unit's wintering suitability and quality for elk is likely similar to deer winter range conditions. It should be noted that the DCI graph and table associated with this section (**Figure 2.41**, **Table 2.7**) illustrate the number of Range Trend sites within mule deer winter or transitional range. As such, the number of Range Trend sites considered to be elk habitat will not coincide with those depicted in said graph and table (**Figure 2.41**, **Table 2.7**). Study sites that intersect/have intersected elk winter, transitional, or year-long habitat include Brushy Basin, Gold Queen Basin (14A-03) (suspended), Harts Draw Reservoir (14A-06), Peters Point, Shay Mesa, Shingle Mill, and Clay Draw (14A-40). The overall condition of elk winter range within the Abajo Mountains Management Unit has improved since 1994. More specifically, average unit conditions improved from poor-fair in 1994 to good in 2024. The sites with elevated suitability include Gold Queen Basin, Harts Draw Reservoir, Shingle Mill, and Clay Draw. As of 2024, Brushy Basin and Shay Mesa are considered to have fair and poor respective wintering habitat conditions. Habitat improvements for these two sites could be accomplished by increasing cover for native perennial grasses and forbs. Shay Mesa would also benefit from increases in preferred browse cover and recruitment (**Figure 2.41**, **Table 2.7**).



	1994	1999	2004	2009	2014	2019	2024
Excellent							1
Good-Excellent						1	
Good		2		2	2	1	2
Fair-Good	2	1	2		1	1	
Fair	1		2	2	1	1	2
Poor-Fair							1
Poor	2	2	1	1	2	3	1
Very Poor-Poor	1		1				
Very Poor	1	2	1	2	1	1	1

Figure 2.41: Deer winter range Desirable Components Index (DCI) summary by year of Range Trend sites for WMU 14A, Abajo Mountains.

Study Number	Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
14A-01	1994	14	-4	0	3.5	-3	0.7	0	**11.2**	**VP-P**
14A-01	1999	10.8	-0.9	0	0.8	-18	0	0	**-7.3**	**VP**
14A-01	2004	6.9	-8.9	0	0.5	-10.8	0.3	0	**-12**	**VP**
14A-01	2009	5.9	0	0	0.6	-14	2.8	0	**-4.7**	**VP**
14A-01	2012	4.9	0	0	1.3	-12.3	0.8	0	**-5.3**	**VP**
14A-01	2014	4.1	0	0	1	-3.8	1.8	0	**3.1**	**VP**
14A-01	2019	0.6	0	0	1.4	-6.1	1.9	0	**-2.2**	**VP**
14A-01	2024	0.1	0	0	1.6	-10.1	0.2	0	**-8.2**	**VP**
14A-02	1994	16.6	12.1	1.7	23.1	0	8.5	0	**62**	**F**
14A-02	1999	19.9	14.2	14.7	14.3	0	7.7	0	**70.8**	**F-G**
14A-02	2004	29.8	13.8	13.7	7.1	0	5.5	0	**69.9**	**F-G**
14A-02	2009	30	12.5	12.2	11	0	7.8	0	**73.5**	**G**
14A-02	2014	13.3	13.9	9.1	4.3	0	3.6	0	**44.2**	**P**
14A-02	2019	30	12.8	3.7	13.6	0	10	0	**70.1**	**F-G**
14A-02	2024	30	12.7	5.4	8.3	0	4.5	0	**60.9**	**F**
14A-08	1994	9.8	8.8	11.5	26.9	0	10	0	**67**	**F-G**
14A-08	1999	14.1	12.6	6.5	30	-0.1	7.4	0	**70.5**	**G**
14A-08	2004	17.3	9.5	7	19.1	0	3.5	0	**56.4**	**F**
14A-08	2009	19.9	9.8	8.1	18.7	0	5.2	0	**61.7**	**F**
14A-08	2014	16	13.1	13.4	20.9	0	4.7	0	**68.1**	**G**
14A-08	2019	14.7	7.3	4	22.5	0	5.1	0	**53.6**	**F**
14A-08	2024	18	11	3.7	20.4	0	4.7	0	**57.8**	**F**
14A-09	1994	14.6	1.1	1.1	21.1	-0.5	0.9	0	**38.3**	**P**
14A-09	1999	11.8	5.2	0.3	15	-9.9	1.4	0	**23.8**	**VP**
14A-09	2004	10.3	-5.1	1	29.3	-0.4	0.4	0	**35.5**	**VP-P**
14A-09	2009	10.3	3.9	2.5	30	-2.4	0.7	0	**45**	**P**
14A-09	2014	9.6	10.7	1.1	30	-0.3	5.7	0	**56.8**	**F**
14A-09	2019	8.9	0	0.7	26.9	-0.3	9.5	0	**45.7**	**P**
14A-09	2024	10.6	8.9	0	22.7	0	0.1	0	**42.3**	**P**
14A-10	1994	15.1	7	3.1	22.2	-0.8	0.7	0	**47.3**	**P**
14A-10	1999	14.5	11.7	5.8	12.1	-5.6	4.9	0	**43.4**	**P**
14A-10	2004	27.4	2.6	1.4	16	-0.9	10	0	**56.5**	**F**
14A-10	2009	25.9	5.7	0	23.4	-1.3	0.1	0	**53.8**	**F**
14A-10	2014	19.3	12.1	2.8	20.9	-9.6	2	0	**47.5**	**P**
14A-10	2019	23.3	4.6	0.7	14.1	-8.1	3	0	**37.6**	**P**
14A-10	2024	29	10.2	0.4	15.5	-5.6	0.2	0	**49.7**	**P-F**
14A-11	1994	4.5	0	0	14.4	-0.4	2.1	0	**20.6**	**VP**
14A-11	1999	7.1	13.2	4.1	16.5	-4.2	3.3	0	**40**	**P**
14A-11	2004	17.4	7	2	14.7	0	1.4	0	**42.5**	**P**
14A-11	2009	7.3	5.5	0.8	13.6	-1.4	1.5	0	**27.3**	**VP**
14A-11	2011	10	12.4	8.3	30	-2.6	6.7	0	**64.8**	**F-G**
14A-11	2014	8.9	14.3	8.4	30	-1.3	3.6	0	**63.9**	**F-G**
14A-11	2019	12.5	10.8	2.1	15.2	-3.5	9.3	0	**46.4**	**P**
14A-11	2024	17.6	13.5	3	30	-0.3	3.4	0	**67.2**	**G**
14A-12	1994	30	9.9	3.6	17.2	0	10	0	**70.7**	**F-G**
14A-12	1999	30	13.5	7.9	23.9	0	10	0	**85.3**	**G**
14A-12	2004	30	9.8	3.3	17.8	0	10	0	**70.9**	**F-G**
14A-12	2009	30	12.9	6.1	29	0	10	0	**88**	**G**
14A-12	2014	30	13	2.6	20.2	0	9.2	0	**75**	**G**
14A-12	2019	30	13	3.6	27.3	0	10	0	**83.9**	**G**
14A-12	2024	30	14.9	8.1	21.1	0	10	0	**84.1**	**G**
14A-40	2019	30	13.8	6.4	29	-0.2	10	0	**89**	**G-E**
14A-40	2024	30	14.3	7.9	30	0	10	0	**92.2**	**E**

Table 2.7: Deer winter range Desirable Components Index (DCI) information by site number of Range Trend studies for WMU 14A, Abajo Mountains. VP = Very Poor, P = Poor, F = Fair, G = Good, E = Excellent. *Studies with an asterisk have been suspended.

Study #	Study Name	Limiting Factor and/or Threat	Level of Impact	Potential Impact
14A-01	Alkali Point	Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		Animal Use – Deer	Medium	Reduced/less vigorous browse component
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
		Drought		Lowered resilience and resistance to disturbance
14A-02	Brushy Basin	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
14A-05	Jackson Ridge	Conifer Encroachment	Medium	Reduced understory shrub, aspen stand, and herbaceous vigor
		Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
		Woodcutting	Low	Fragmentation and degradation/lass of habitat
14A-06	Harts Draw Reservoir	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
		Tourism/Recreation	Low	Loss of habitat, reduced shrub and herbaceous vigor
14A-08	Peters Point	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Medium	Reduced understory shrub and herbaceous vigor
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		Tourism/Recreation	Low	Loss of habitat, reduced shrub and herbaceous vigor
14A-09	Harts Draw	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
14A-10	Harts Point	Animal Use – Deer	High	Reduced/less vigorous browse component
		Annual Grass	Medium	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
		Drought		Lowered resilience and resistance to disturbance
14A-11	Shay Mesa	Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
14A-12	Shingle Mill	Animal Use – Deer	Medium	Reduced/less vigorous browse component
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
14A-35	Dickson Gulch	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
14A-40	Clay Draw	Animal Use – Deer	High	Reduced/less vigorous browse component
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
14A-41	Duckett Ridge	Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species
14R-06	Dugout (Hart Draw)	Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
14R-07	Adams CE Harrow	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Animal Use – Cattle	Medium	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
14R-08	Adams CE Control	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Animal Use – Cattle	Medium	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
14R-09	Hart Draw Flat 1	Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Medium	Increased fire potential and reduced herbaceous diversity
14R-10	Hart Draw Flat 2	Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
14R-17	Stateline South	Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
14R-18	Stateline North	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
14R-19	Peter's Canyon	Animal Use – Cattle	Medium	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Medium	Reduced understory shrub and herbaceous vigor
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
14R-20	Johnson Creek	Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
14R-21	Shay Mesa Bullhog	Animal Use – Elk	High	Reduced shrub vigor/diversity of desirable grass and forb species
		Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor

Study #	Study Name	Limiting Factor and/or Threat	Level of Impact	Potential Impact
14R-25	Peters Point BLM	PJ Encroachment	Medium	Reduced understory shrub and herbaceous vigor
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
14R-27	Seep Creek	Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		Noxious Weeds	High	Reduced diversity of desirable grass and forb species
		Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
14R-28	Johnson Creek 2	Annual Grass	Medium	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
14R-36	Mustang Mesa	Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
14R-43	Long Canyon Point	Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
14R-44	Lems Draw	PJ Encroachment	Medium	Reduced understory shrub and herbaceous vigor
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		Drought		Lowered resilience and resistance to disturbance
14R-45	Long Canyon	Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor

Table 2.8: Assessment of the potential limiting factors and/or threats and level of threat to study sites for WMU 14A, Abajo Mountains. All assessments are based off the most current sample date for each study site. Criteria for evaluating limiting factors is available in **Appendix A - Threat Assessment**.

Discussion and Recommendations

Sites on deer winter and transitional range within the Abajo Mountains Management Unit average as being in fair condition as of the 2024 sample year. Negative factors contributing to these conditions include reduced perennial grass and forb cover, undiversified age class structures in the preferred browse communities, and reduced preferred browse cover. In contrast, the absence or low amounts of annual grasses present on most sites positively influences the condition of deer winter and transitional range in this unit (**Figure 2.41**, **Table 2.7**).

A positive aspect of the Abajo Mountains unit is that in the central to northern portions of the unit, the browse communities have persisted with normal vigor on a number of Range Trend sites that are considered to be/may serve as mule deer winter or transitional range (Brushy Basin, Peters Point, Harts Draw, Shay Mesa, and Clay Draw). More specifically, the preferred browse communities on these sites have not exhibited changes in cover or density that would cause the associated vegetation communities to shift into different (and possibly degraded) ecological states. Furthermore, many study sites in higher elevations have maintained productive vegetation components that may provide valuable forage for summering wildlife. An additional highlight within the unit is that – except for the Alkali Point and Harts Point studies – the introduced annual grass species cheatgrass (*Bromus tectorum*) contributed little to no cover on most study sites in 2024. Finally, several habitat restoration projects have occurred throughout the unit. As a result, improvements in habitat quality (pinyon-juniper reduction, augmentation of the herbaceous understory, browse diversification, etc.) have been observed following treatment on some study sites monitored by the Range Trend Project. Additional habitat treatments have been and continue to be implemented within the Abajo Mountains Management Unit but are not all monitored by Range Trend study sites; over 29,917 treatment acres have been completed through the Watershed Restoration Initiative (WRI) as of February 2025 (**Table 2.4**).

Increased decadence and death within the Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) communities on Alkali Flat is one threat to big game habitat in unit 14A. On the Alkali Flat study site, cover and density of sagebrush have decreased over time. A particularly notable decrease in sagebrush density occurred between 2014 and 2019: this was likely driven by drought conditions in 2018 and further compounded by moderate to extreme droughts in 2020-2022 (**Figure 2.1a**). Furthermore, cheatgrass has been very abundant in the understory of this study in most sample years since 1994, and weedy annual forbs were present with considerable cover in 2019 and 2024. Few sagebrush seedlings were observed on this site in the most recent sample year (Lane, Cox, & Payne, 2025), and any potential establishment of young shrubs (or desirable herbaceous species) could be impeded by the presence of these introduced annuals (Mack, et al., 2000). In addition, cheatgrass has increased over time on the Harts Point study and contributed moderate cover in 2024. High amounts of cheatgrass can increase fuel loads and exacerbate the risk of wildfire (Balch, D'Antonio, & Gómez-Dans, 2013).

An additional (and known) concern within this unit is the condition of quaking aspen (*Populus tremuloides*) stands. One affected area includes Dickson Gulch and the larger vicinity in Gold Queen Basin, where satellite imagery reveals numerous pockets of downed trees. The occurrence of dead and downed aspen in the Dickson Gulch area is directly corroborated by data from the Dickson Gulch study site. Although point-quarter and other density measurements show an increase in the number of aspen plants over time, the age class has shifted with little recruitment of seedlings/suckers in 2024. Line intercept cover of aspen has also decreased significantly over the past decade, from 64.4% in 2014 to 15.7% in 2024 (Lane, Cox, & Payne, 2025). Repeat photography gives a more comprehensive picture of aspen stand health over time, with numerous dead and downed trees readily apparent during the most recent sample year. However, on-site observations for 2024 also note that crews in the vicinity were cutting dead trees, and various habitat projects have been proposed for the larger area through the WRI (Spurr, et al., 2025).

The LANDFIRE Vegetation Departure model also indicates that 90% of the modeled Aspen Forest and Woodland and Aspen-Mixed Conifer Forest vegetation types in this unit are between 40% and 60% departed from their respective reference states. More specifically, approximately 11,126 acres of Aspen Forest and Woodland and 1,926 acres of Aspen-Mixed Conifer Forest fall within the 40% to 60% departure scale (LC23_VDep_240, 2023). Some specific areas within this 40 to 60 percent departure level include those in the larger vicinity of Prairie Dog Knoll and Robertson Pasture in the northern portion of the unit. Satellite imagery over various seasons for select portions of these areas shows that some aspen stands appear to be conifer encroached. Range Trend data does not address specific and detailed conditions of the areas mentioned. However, photographs for the Duckett Ridge study show conifers scattered in the aspen stands that surround the site. In addition, data for the Jackson Ridge site indicates that Engelmann spruce (*Picea engelmannii*) and fir (*Abies* spp.) are present as of 2024 (Lane, Cox, & Payne, 2025), and repeat photography shows infilling of young trees over time. Conifer encroachment can be associated with the decline of aspen stands (Kitchen, et al., 2019).

Human developments may also pose a threat to wildlife habitat. Dryland farms are scattered throughout the areas surrounding Blanding and Monticello and are periodically disturbed as part of regular farm operations. Much of the area immediately east of Monticello is comprised of multiple parcels of privately-owned property. A few islands of private property also occur in the higher elevations managed by the United States Forest Service (USFS) to the west (**Map 2.4**). In addition, numerous gas wells are scattered throughout the unit at generally lower elevations. Plans for and the extent of further development in these areas (a majority of which overlap currently mapped mule deer habitat of varying seasonality) are not known to the authors of this report. However, there is always the potential for unintended consequences for wildlife if/when further developments occur, including (but not limited to) a loss of preferred browse and herbaceous forage, habitat fragmentation, and habitat degradation through the introduction of non-native species.

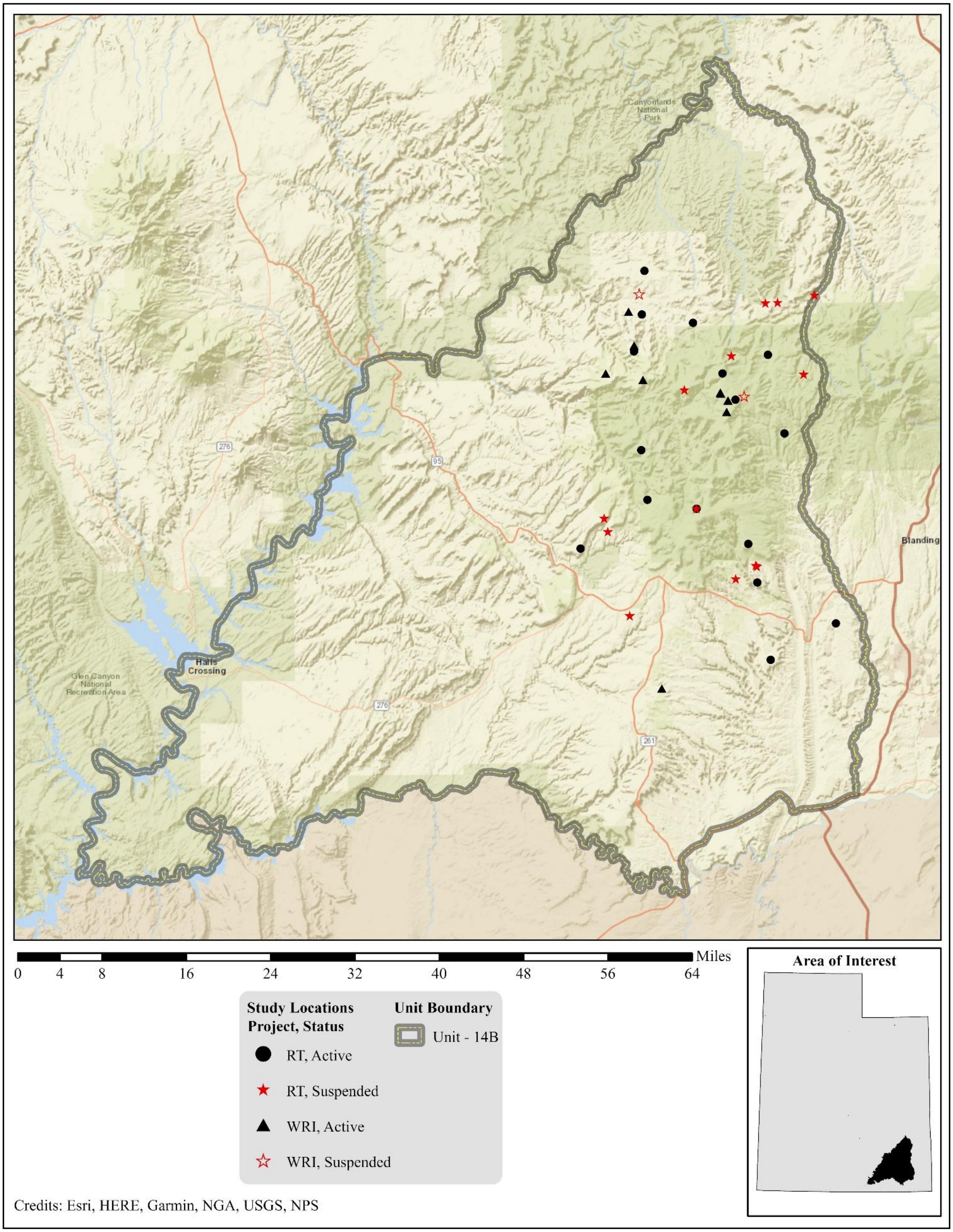
A uranium mill is also located in this unit off Highway 191 south of Blanding in an area that overlaps crucial winter habitat for mule deer. Although the largest direct impacts on the loss and fragmentation of deer habitat likely occurred during construction of this mill, noise pollution caused by operational activities may still have an impact on local wildlife. The actual impact on animals around this location is unknown. However, human-caused noise can negatively affect wildlife in general in terms of foraging, wildlife presence, body condition, and reproductive success (Shannon, et al., 2016).

Utah Roadkill Reports data indicates that highway mortality may pose an additional (and known) threat to wildlife (particularly mule deer) in portions of this unit. Roadkill pick-up reports for mule deer between 2019 and February of 2025 appear to be concentrated along Highway 191 from the intersection of SR-211 and US-191 south to the northern edges of the city of Blanding. The data also shows multiple reports over the same period along US-491 east from Monticello to the Utah-Colorado border, but there are very few reports in other parts of the unit. One should keep in mind that collisions occurring at high enough speeds to result in animal mortality are likely more common on main roads that receive the most use: this could explain the relative lack of reports on less-traveled routes in other parts of the unit (Utah Division of Wildlife Resources, 2025). However, efforts have been made to mitigate highway mortality. More specifically, five underpass crossings are located on US-191 between Monticello and Blanding, and mesh exclusionary fencing has been installed along the same highway between mile markers 59 and 66.

Other threats to wildlife habitat are occurring in localized portions of this unit, but they will not be discussed in this section. These additional threats are specified by study site in the previous table (**Table 2.8**).

There are a few suggestions to consider for maintaining or improving big game habitat within the Abajo Mountains Management Unit. Broadly speaking and when necessary, habitat improvement projects should continue to be implemented. Pinyon and juniper removal projects have taken place in this unit (**Table 2.4**) and have generally been effective. However, efforts to address infilling or encroachment of pinyon and juniper in both previously treated and untreated areas should be continued or implemented when and where appropriate. The northerly portion of Alkali Ridge is one such area that may benefit from tree-removal treatments. If and when projects do take place, care should be taken in method selection (lop and scatter, bullhog, chaining, etc.) to ensure that annual grass loads are not unintentionally amplified. Annual grass treatments (herbicide application, changes in grazing management, etc.) may also be advisable in areas around the Alkali Flat study and along Dry Hole Road. If reseeding is necessary to restore herbaceous species, care should be taken in species selection and preference should be given to native species whenever possible. If and where feasible, efforts to restore preferred browse communities in the larger Alkali Flat area may also be worth considering. Although current Range Trend data cannot determine unit-wide extent and effects of conifer encroachment into aspen stands at higher elevations, further investigation, and (if deemed necessary) implementation of conifer-removal projects may be prudent. Finally, monitoring of both Range Trend studies and areas where rehabilitation projects have occurred should continue. Periodic monitoring of these areas not only assesses the quality of big game habitat, but it may also aid in the identification of threats as they appear over time.

3. WILDLIFE MANAGEMENT UNIT 14B – ELK RIDGE



WILDLIFE MANAGEMENT UNIT 14B – ELK RIDGE

Boundary Description

San Juan County – Boundary begins at the junction of highway US-163 and South Cottonwood Creek (near the town of Bluff); north along South Cottonwood Creek to Allen Canyon; north along Allen Canyon to Chippean Canyon; north along Chippean Canyon to Deep Canyon; north along Deep Canyon to Mule Canyon; north along Mule Canyon to the Causeway; north from the Causeway to Trough Canyon; north along Trough Canyon to North Cottonwood Creek; north along North Cottonwood Creek to Indian Creek; north along Indian Creek to the Colorado River; south on the Colorado River to the San Juan River; east on the San Juan River to US-163; east on US-163 to South Cottonwood Creek.

Management Unit Description

Geography

The Elk Ridge subunit (14B) is in the western half of San Juan County west of the Abajo Mountains. The dominant topographic feature is Elk Ridge, a long, flat, sedimentary plateau. Horse Mountain, found at the north end of Elk Ridge, is the highest point in the subunit at approximately 9,300 feet of elevation. Elk Ridge itself is relatively level and ranges from 8,700 feet at the north end to 8,400 feet at the south end. Surrounding the steep slopes below Elk Ridge are numerous flats, which provide most of the winter range in the unit. These flats have elevations of 5,000 to 6,000 feet and are dissected by numerous deep slickrock canyons, which end at the San Juan and Colorado Rivers at about 4,000 feet of elevation. The most prominent drainages are South Cottonwood Wash, Butler Wash, and Comb Wash, which drain into the San Juan River; and Beef Basin Wash, Dark Canyon, White Canyon, and North Cottonwood Wash, which drain into the Colorado River. Two small communities, Bluff and Mexican Hat, are located near the unit's southern boundary. The unit boundaries encompass Natural Bridges National Monument and part of Canyonlands National Park.

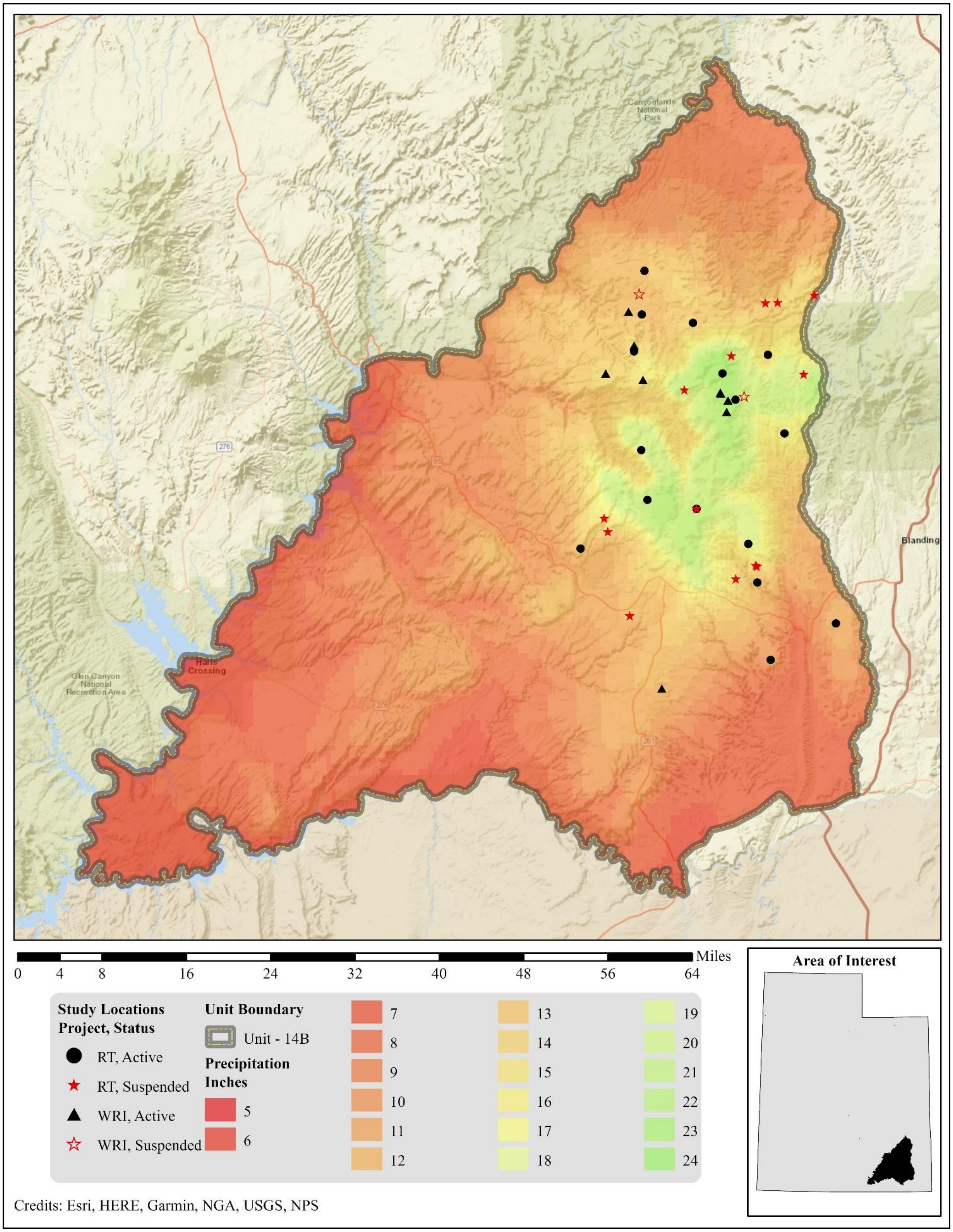
Climate Data

The 30-year (1991-2020) annual precipitation PRISM model shows precipitation ranges on the unit from 5 inches in the southwest portion of the unit along the Colorado River near Halls Crossing to 23 and 24 inches along North Elk Ridge and The Causeway, respectively. All of the active Range Trend and WRI monitoring studies on the unit occur within 9-23 inches of precipitation (**Map 3.1**) (PRISM Climate Group, Oregon State University, 2021).

Vegetation trends are dependent upon annual and seasonal precipitation patterns. Palmer Drought Severity Index (PDSI) data for the unit was compiled from the National Oceanic and Atmospheric Administration (NOAA) Physical Sciences Division (PSD) as part of the Southeast Division (Division 7).

The mean annual PDSI of the Southeast Division, which the Elk Ridge Management Unit is part of, has experienced some form of drought most years since 1994. Moreover, this climate division has been considered to be in some form of drought nearly 52% of the time since 1994. Of the drought years, 56% are considered to be either moderate or extreme droughts. Also remarkable about this climate division is that drought is experienced over multiple sequential years and is generally interrupted by a single wet year event. The most notable wet year occurred in 2005 and was considered to be moderately wet (**Figure 3.1a).** The mean spring (March-May) and mean fall (September-November) PDSI estimations typically follow the same trends as the average annual PDSI trends, but can show split seasonal precipitation events that are not captured in the overall annual PDSI. These seasonal precipitation events can play a crucial role in the timing of plant growth and production for the remainder of the year (spring), or for the year ahead (fall). When a wet fall aligns with a wet spring of the following year, plant health and production for that following year can have a positive effect on forage availability. This is due to lower evaporation and transpiration rates between the months of

September to May that result in higher soil moisture reserves being made available to plants for longer periods during the dry summer months. Although annual precipitation is likely the driver for plant production, the interplay of fall/spring wetness may make a drought year less impactful as a plant stressor. The ecotypes evaluated by Range Trend are primarily found on deer transitional and winter ranges. Plant growth on these ranges is primarily affected by the seasonal precipitation that occurs during the fall and spring months (Cox, et al., 2009), and is the reason fall and spring PDSI estimations are focused on in this report (**Figure 3.1b)** The years that follow this pattern of consecutive wet fall and spring occur in 1994/95, 1996/97, 1997/98, 2004/05, and 2022/23. Range Trend sample years occur on a five-year rotation, so the PDSI years of interest should be examined by the corresponding rotation year (**Table 3.5**). The 2019 sample year occurs during a wet year, but years where drought may have affected plant condition occur in 1994, 2004, 2009, 2014, and 2024 (**Figure 3.1a, Figure 3.1b**) (Committee Members, 2022).



Map 3.1: The 1991-2020 PRISM Precipitation Model for WMU 14B, Elk Ridge (PRISM Climate Group, Oregon State University, 2021).

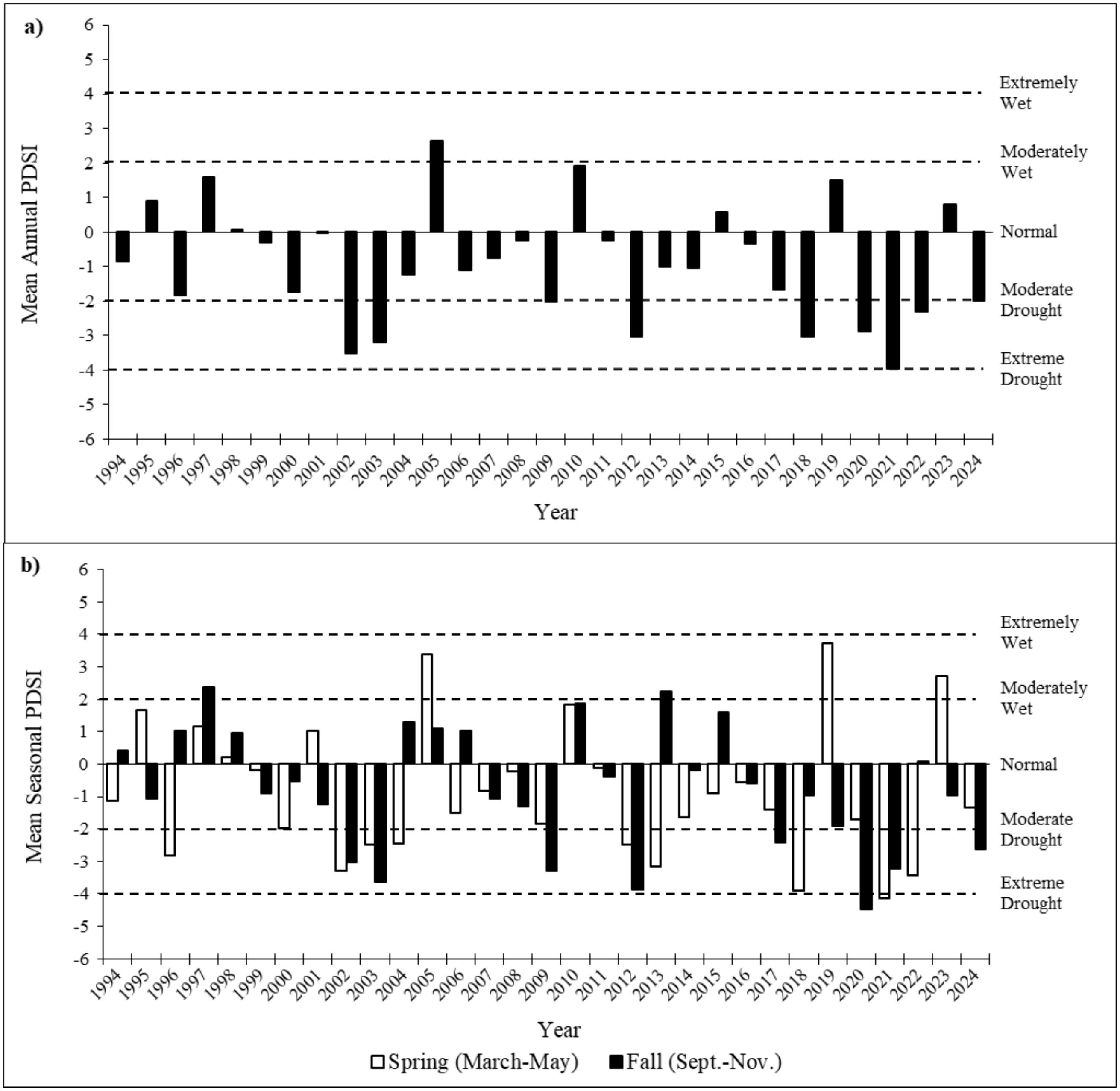


Figure 3.1: The 1994-2024 Palmer Drought Severity Index (PDSI) for the Southeast Division (Division 7). The PDSI is based on climate data gathered from 1895 to 2024. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet, and negative deviations indicate drought. Classification of the scale is $\geq$4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to 2.9 = Moderately Wet, 1.0 to 1.9 = Slightly Wet, 0.5 to 0.9 = Incipient Wet Spell, 0.4 to -0.4 = Normal, -0.5 to -0.9 = Incipient Dry Spell, -1.0 to -1.9 = Mild Drought, -2.0 to -2.9 = Moderate Drought, -3.0 to -3.9 = Severe Drought and $\leq$-4.0 = Extreme Drought. a) Mean annual PDSI. b) Mean spring (March-May) and fall (Sept.-Nov.) PDSI (National Oceanic and Atmospheric Administration, 2025).

Big Game Habitat

The primary winter range in this unit is found between 5,000 and 7,000 feet on the slopes and throughout the large flats surrounding Elk Ridge.

The sagebrush-grass vegetation community type (upland and semidesert ecological sites), dominated by *Artemisia* spp. shrubs, blue grama (*Bouteloua gracilis*), and needle and thread (*Hesperostipa comata*), is found in Beef Basin and on Black Mesa, two important crucial winter ranges. The pinyon-juniper community (upland ecological sites) is the most prominent community type and occupies the majority of the deer winter range (**Table 3.2**): this type is relatively unproductive but provides good thermal and escape cover for deer that use the adjacent, more productive types. The pinyon-juniper with mountain brush communities (upland and mountain ecological sites), like the mountain brush community, can be found in the upper elevations of the winter range; this type provides quality deer forage in normal winters, but can be inaccessible to deer during severe winters. The pinyon-juniper-sagebrush community type (upland ecological sites) is fairly open, interspersed throughout larger tracts of pinyon-juniper woodland, and is important to wintering deer in both normal and severe winters.

Chaining projects are located throughout the unit and were mostly done in the 1960s (**Table 3.6**) to improve range for livestock, but they have benefited big game as well. Most of the treated and seeded areas are within pinyon-juniper communities. Herbicide and seeding treatments have been done in several areas to open sagebrush understories, make them more productive, and increase their vigor.

Key areas for mule deer winter range on Elk Ridge include Beef Basin, Salt Creek Mesa, Dark Canyon Plateau, Deer Flat and Woodenshoe Canyon, Baullies, and Black Mesa.

Rangeland Analysis Platform (RAP) – Biomass and Cover by Deer Habitat

Numerous factors determine quality wildlife forage. Diversity of species and life forms, age class and vigor of shrubs, timing of vegetative stages of grasses and forbs, and the abundance of palatable vegetation all contribute to a quality habitat for mule deer. Site-level (Range Trend sites) data addresses species composition, age structure, and health of communities in winter and transitional habitat. However, due to the small number and/or placement of Range Trend sites, it is difficult to get a true estimation of vegetation abundance. Trend study sites are placed strategically in key areas for mule deer to assess both quantity and quality of forage, but due to limited sampling, these sites cannot accurately predict the overall abundance of forage available to mule deer in the entire extent of mule deer range. The Rangeland Analysis Platform (RAP) may aid in the estimation of forage quantity within mule deer habitat by providing values for biomass and cover for perennial, annual, and browse lifeforms that Range Trend sites cannot account for. However, RAP data does not fully address the quality of forage the way that Range Trend data does. The intent of the RAP dataset is to supplement Range Trend data and local knowledge to inform managers of general habitat trends. Additionally, "[RAP] data can be used to evaluate resources in concert with site-specific information about the area under investigation, such as past land management practices, vegetation treatments, conservation efforts, or natural disturbances" (Rangeland Analysis Platform; Products, 2025, para. 5). The following graphs represent vegetation changes by either biomass or percent cover based on deer winter, summer, or spring/fall range habitat. Range Trend data is collected on a five-year interval and the intent of the RAP data is to also help illustrate the year-to-year fluctuations or changes that may occur between Range Trend samplings.

The RAP data illustrates yearly fluctuations in herbaceous cover and biomass on mule deer winter, summer, and spring/fall ranges. Herbaceous cover and biomass peaked in the early 1990s and have since decreased on ranges of all seasonality. Annual and perennial cover and biomass have followed precipitation trends in many years, although lag effects of a year or so have occurred at other times. Annual herbaceous lifeforms have generally provided more cover on winter and spring/fall ranges than on summer range (**Figure 3.2**, **Figure 3.3**, **Figure 3.4**, **Figure 3.5**, **Figure 3.6**, **Figure 3.7**). Range Trend data shows that herbaceous cover has exhibited variations from year to year. On Mountain (Big Sagebrush) and Semidesert (Big Sagebrush) study sites, total average herbaceous cover has increased when comparing 2004 data with that from 2024. On other mountain studies and Upland (Big Sagebrush) sites, average herbaceous cover has largely remained stable over the sample period despite yearly fluctuations. In addition, annual grasses and forbs have generally provided more cover on upland and semidesert study sites than on those of a mountain potential (**Figure 3.24**, **Figure 3.25**).

The RAP data for tree and shrub cover shows fluctuations from year to year. Trees have generally provided more cover than shrubs on ranges of all seasonality in most years including 2024. When possible lag effects are accounted for, cover data for trees and shrubs has correlated with precipitation in many years, but more loosely so than herbaceous cover and biomass. On all mentioned habitats, RAP data shows that shrub cover has remained similar and tree cover has increased overall when comparing 1986 data with that from 2024 (**Figure 3.8**, **Figure 3.9**, **Figure 3.10**). However, some recent trends for mule deer summer range can be elucidated by looking solely at a subset of more contemporary (within the last 5-10 years) data. For example, shrub cover increased substantially between 2015 and 2016. However, shrub cover has decreased to 21.1% in 2024 despite yearly variations. Tree cover marginally decreased between 2015 and 2016 and fluctuated in subsequent sample years (**Figure 3.8**).

Range Trend data shows that trends in shrub and tree cover vary depending on ecotype. On study sites of a mountain potential, shrub cover has remained stable or increased overall since 2004. Shrub cover has increased overall over the same period on upland sites, and it has fluctuated on semidesert study sites (**Figure 3.11**, **Figure 3.12**, **Figure 3.13**). Trees have provided no cover on Mountain (Big Sagebrush) studies, but cover has increased overall since 2004 on Mountain (Ponderosa Pine) and Mountain (Oak) sites. Finally, tree cover has exhibited a total decrease between 2004 and 2024 on upland and semidesert study sites (**Figure 3.14**, **Figure 3.15**, **Figure 3.16**). When comparing Range Trend with RAP data, one should consider the variation in number of Range Trend study sites sampled each year (the 'n' value) and the implications it may have for the associated data. In addition, it is important to note that variations in cover on Range Trend sites will not always correspond with the fluctuations estimated by the RAP. This incongruence is due to the differences in dataset types: Range Trend data is site-specific and granular while RAP data is aggregated to the unit scale for deer habitat.

RAP – Herbaceous Biomass by Deer Habitat

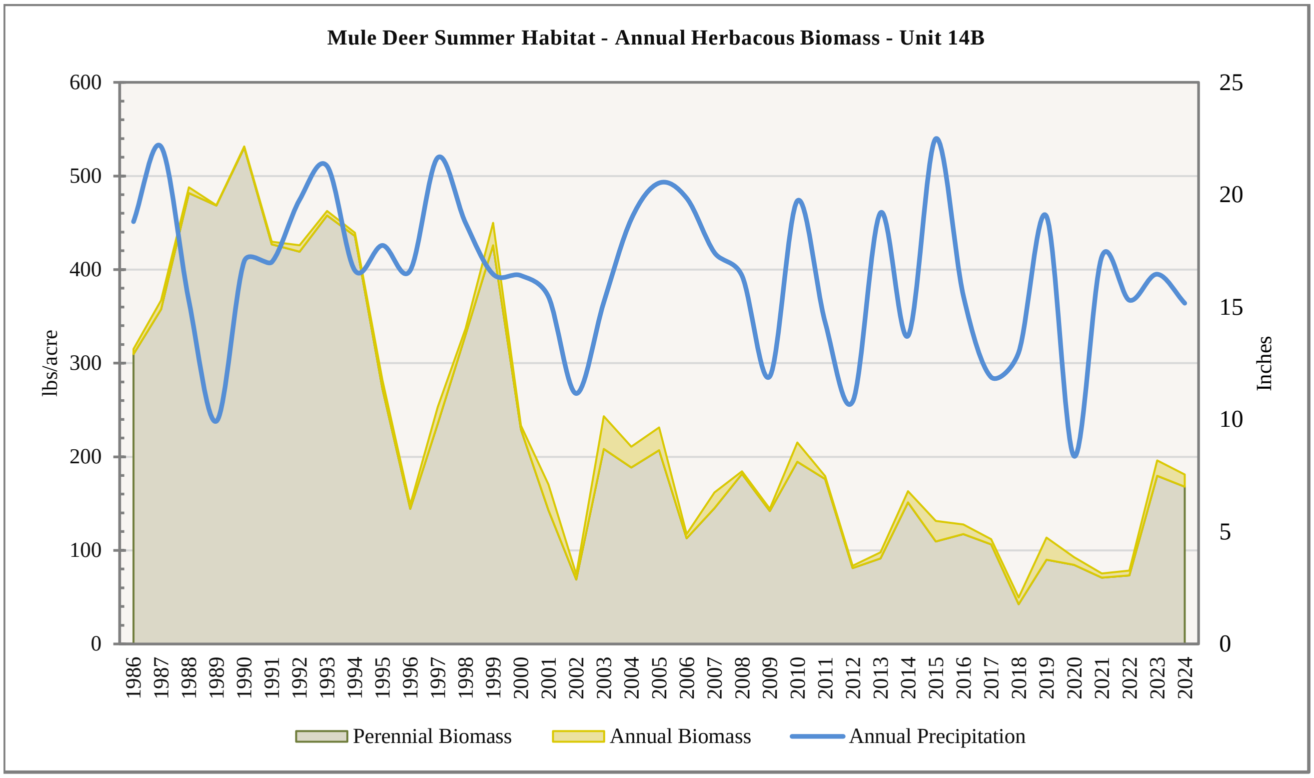


Figure 3.2: Average precipitation and estimated yearly herbaceous biomass of stacked perennial and annual lifeforms for summer mule deer habitat in WMU 14B, Elk Ridge (Rangeland Analysis Platform, 2025).

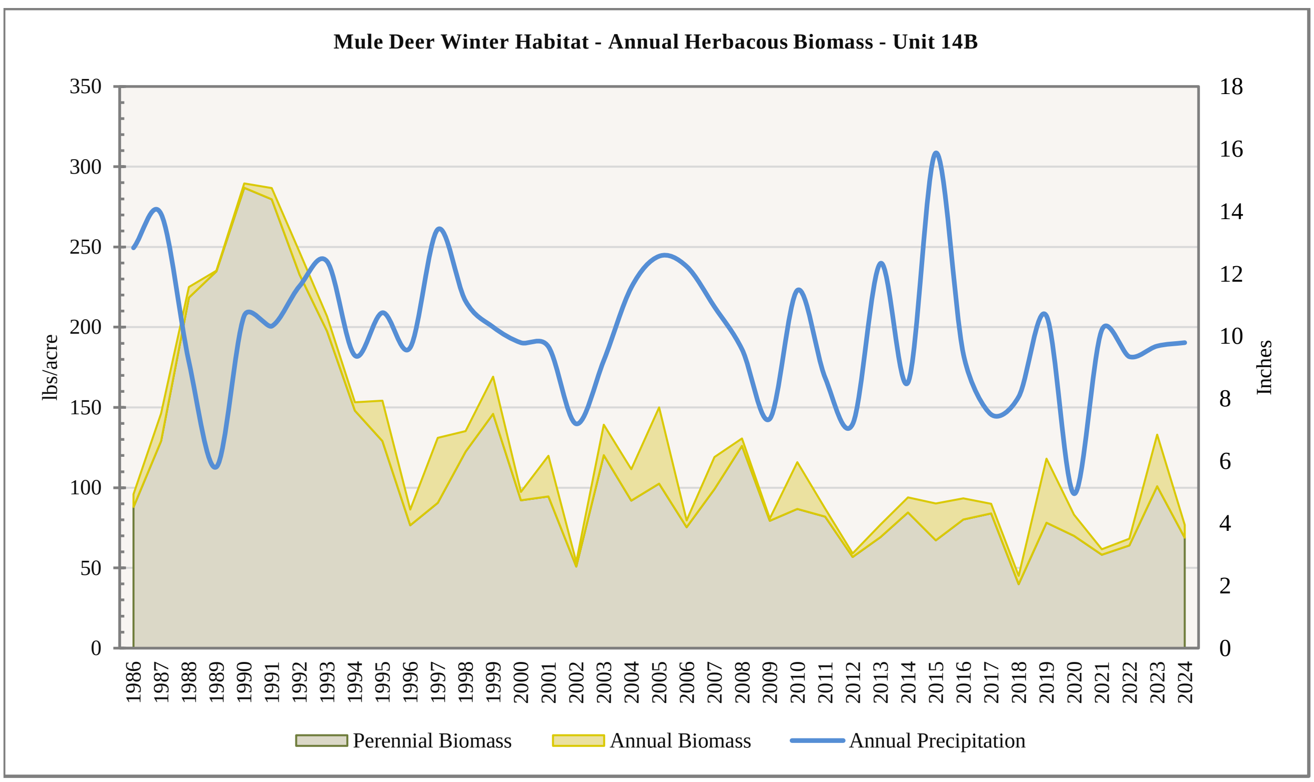


Figure 3.3: Average precipitation and estimated yearly herbaceous biomass of stacked perennial and annual lifeforms for winter mule deer habitat in WMU 14B, Elk Ridge (Rangeland Analysis Platform, 2025).

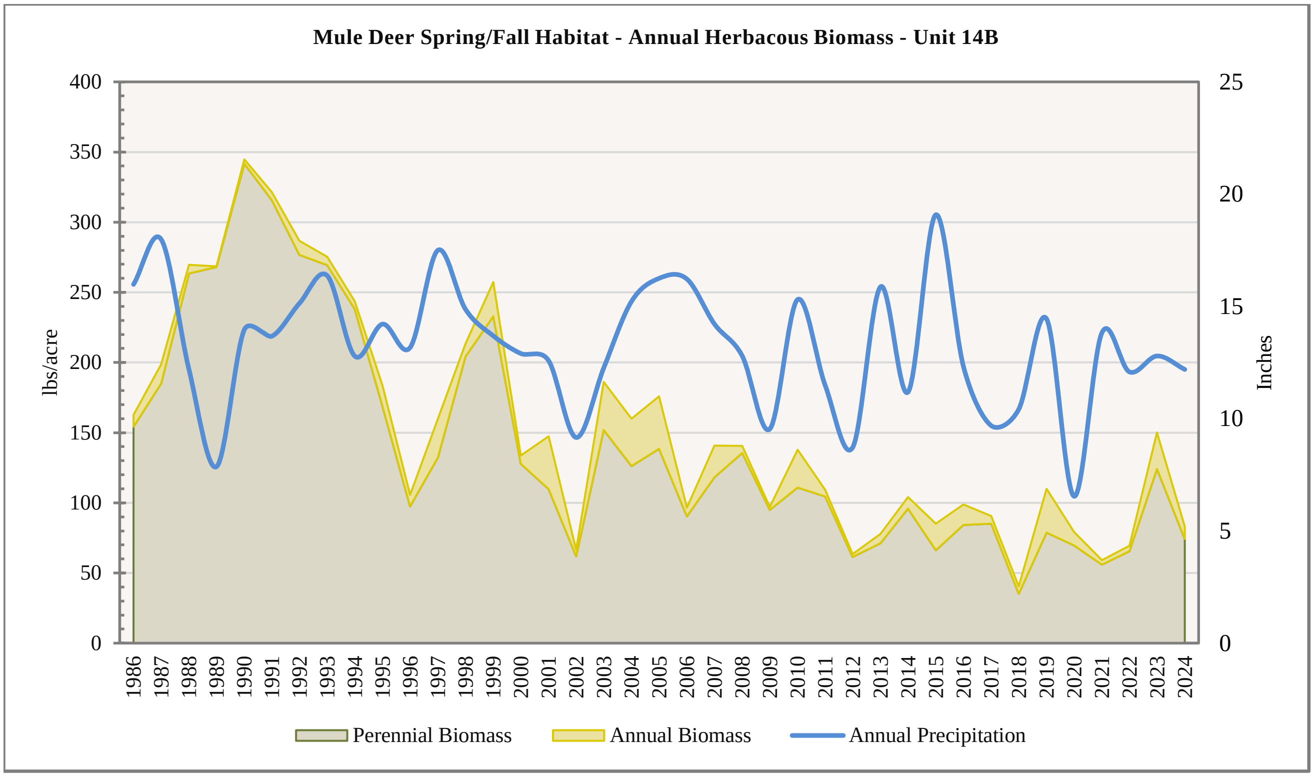


Figure 3.4: Average precipitation and estimated yearly herbaceous biomass of stacked perennial and annual lifeforms for spring/fall mule deer habitat in WMU 14B, Elk Ridge (Rangeland Analysis Platform, 2025).

RAP – Herbaceous Cover by Deer Habitat

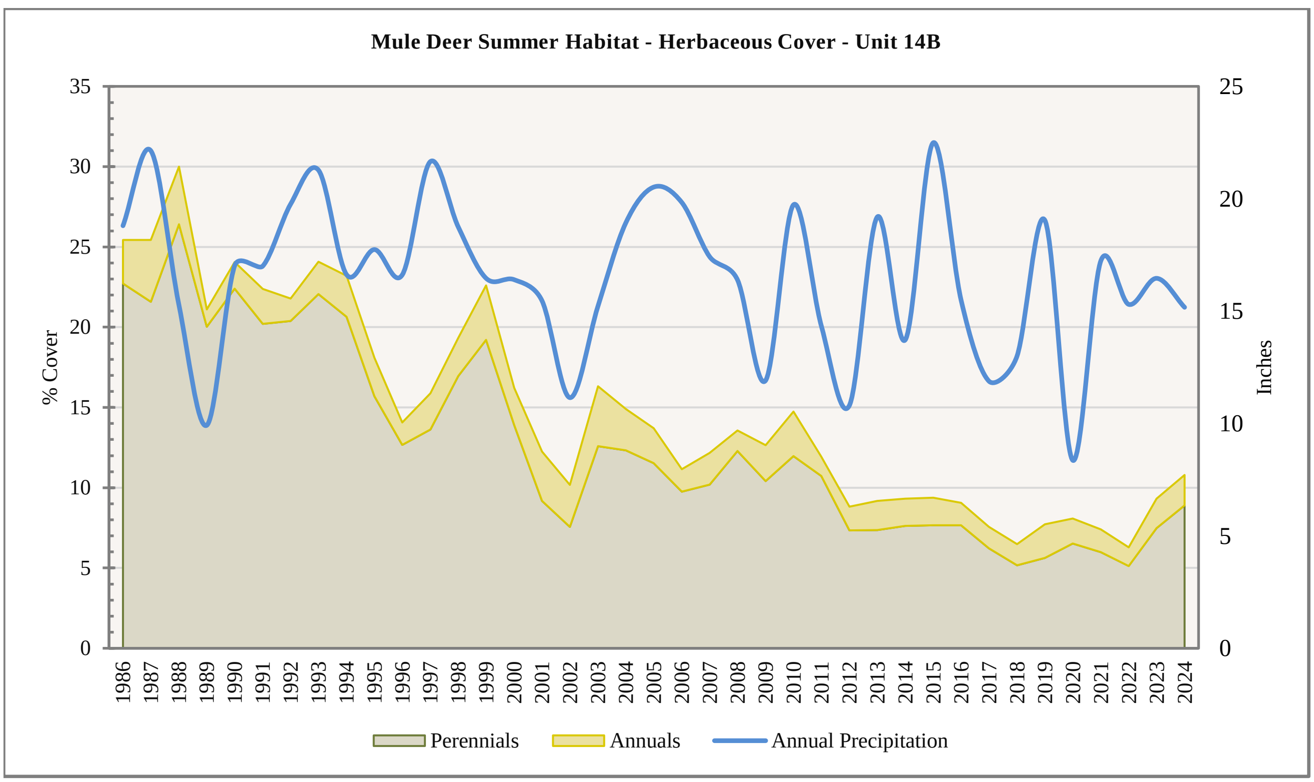


Figure 3.5: Average precipitation and estimated yearly herbaceous cover of stacked perennial and annual lifeforms for summer mule deer habitat in WMU 14B, Elk Ridge (Rangeland Analysis Platform, 2025).

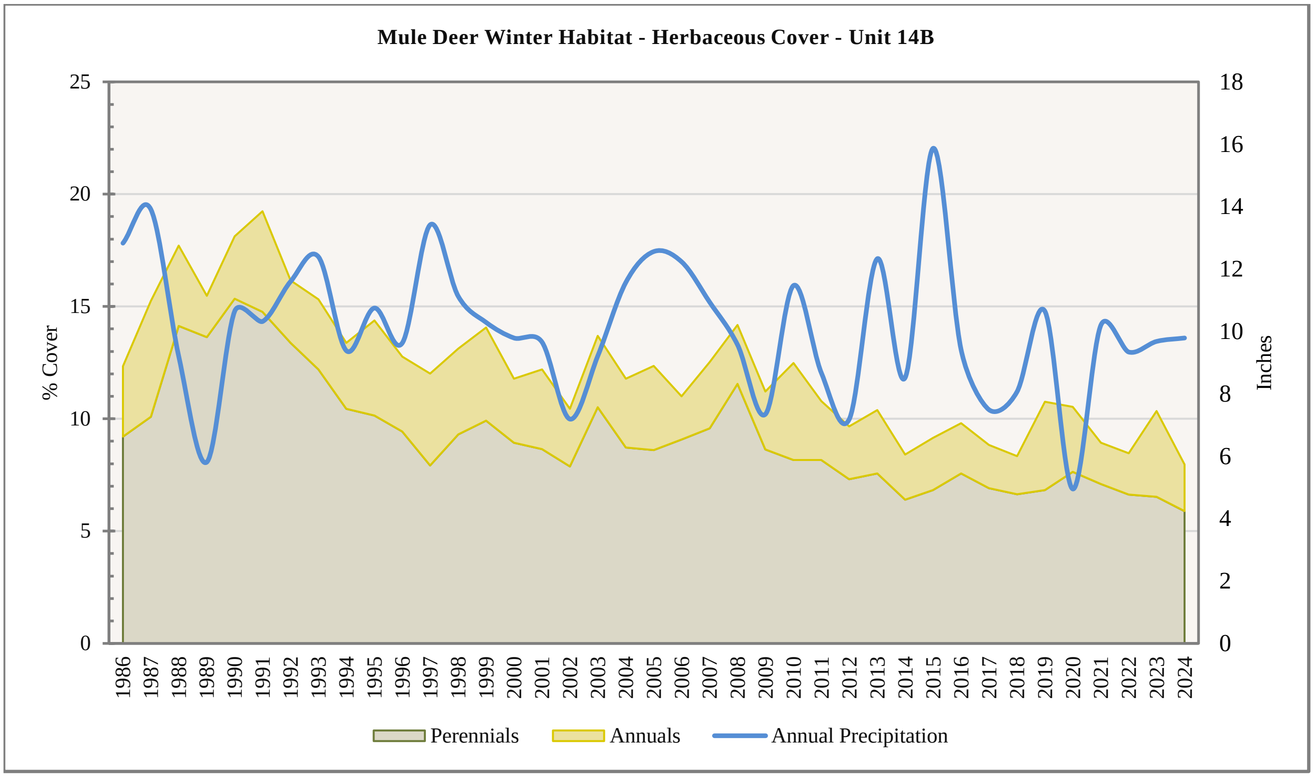


Figure 3.6: Average precipitation and estimated yearly herbaceous cover of stacked perennial and annual lifeforms for winter mule deer habitat in WMU 14B, Elk Ridge (Rangeland Analysis Platform, 2025).

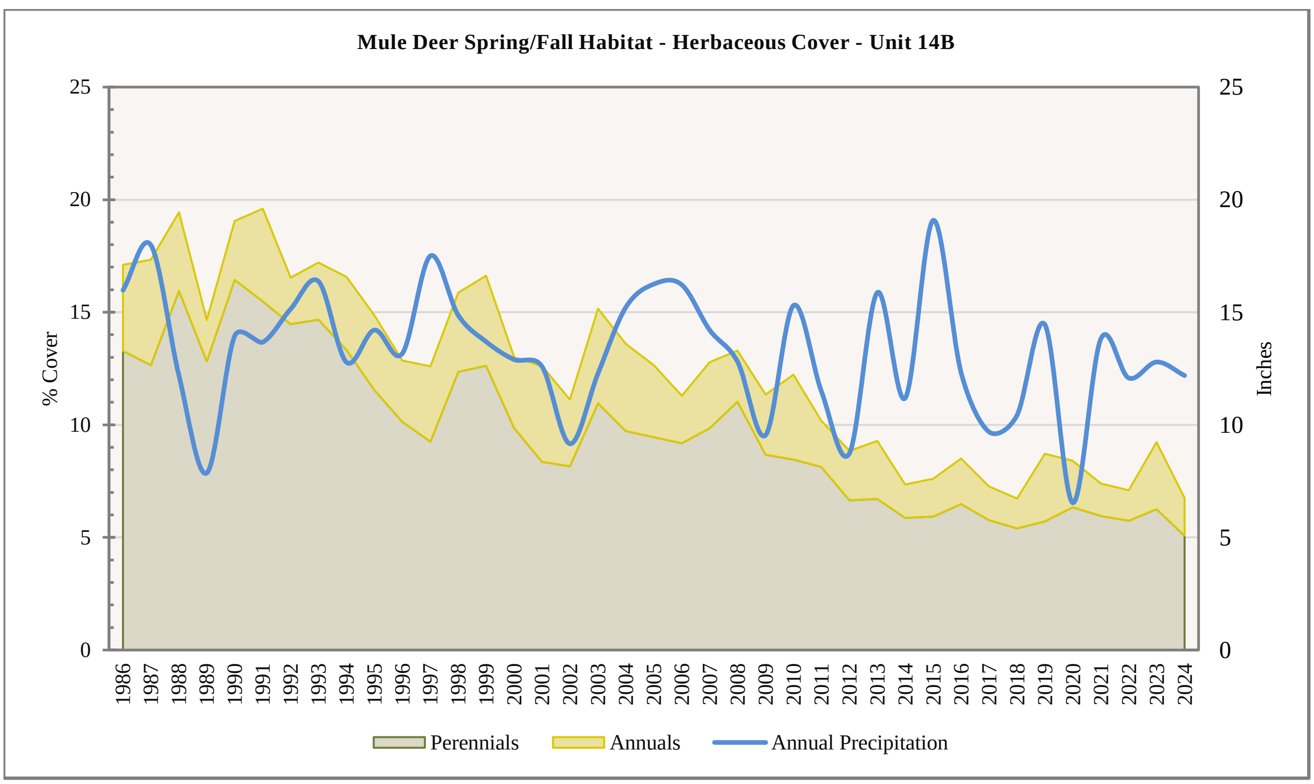


Figure 3.7: Average precipitation and estimated yearly herbaceous cover of stacked perennial and annual lifeforms for spring/fall mule deer habitat in WMU 14B, Elk Ridge (Rangeland Analysis Platform, 2025).

RAP – Shrub and Tree Cover by Deer Habitat

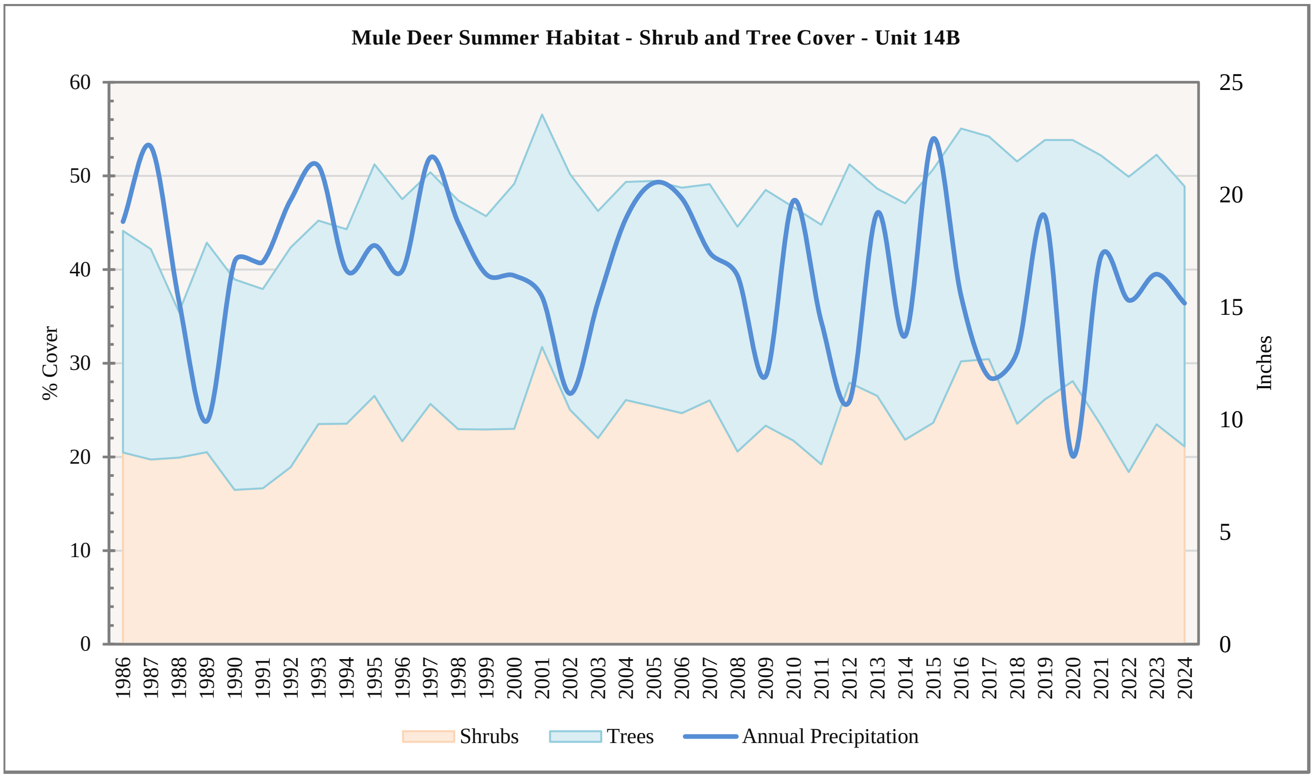


Figure 3.8: Average precipitation and estimated yearly stacked shrub and tree cover for summer mule deer habitat in WMU 14B, Elk Ridge (Rangeland Analysis Platform, 2025).

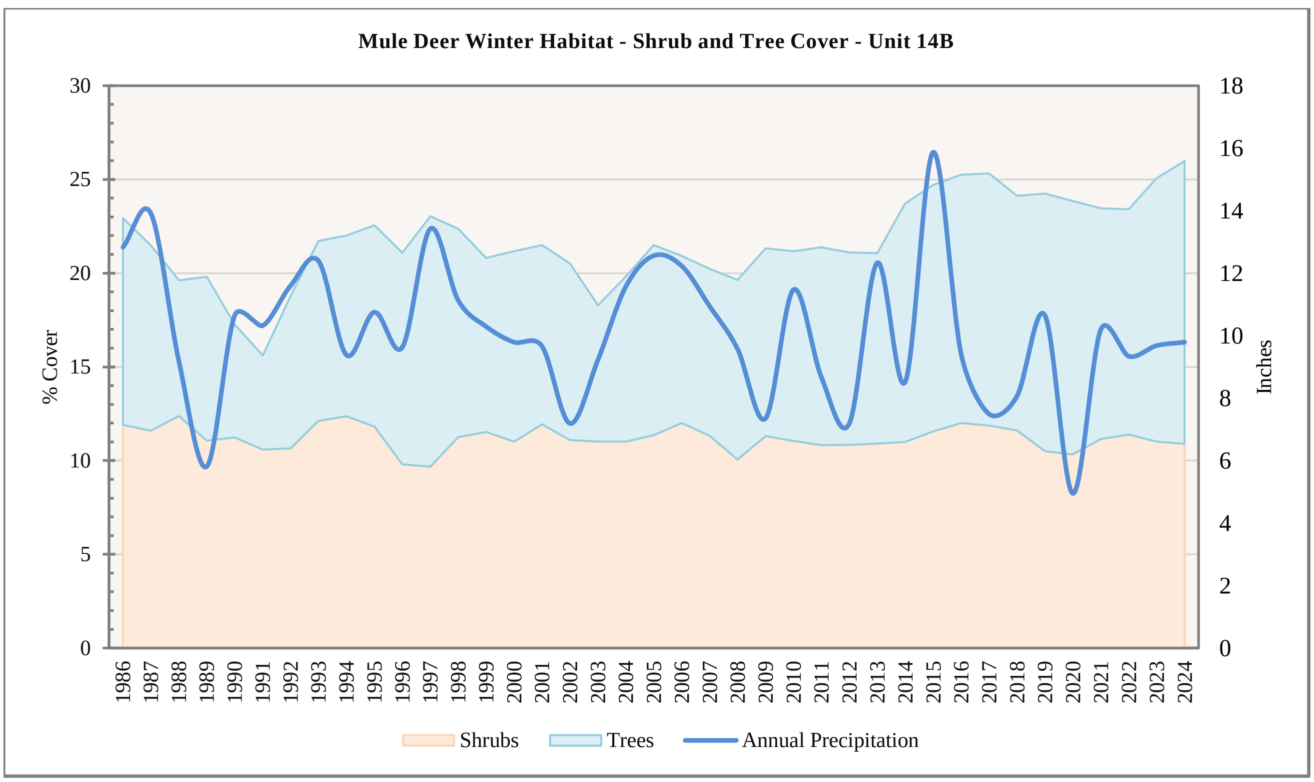


Figure 3.9: Average precipitation and estimated yearly stacked shrub and tree cover for winter mule deer habitat in WMU 14B, Elk Ridge (Rangeland Analysis Platform, 2025).

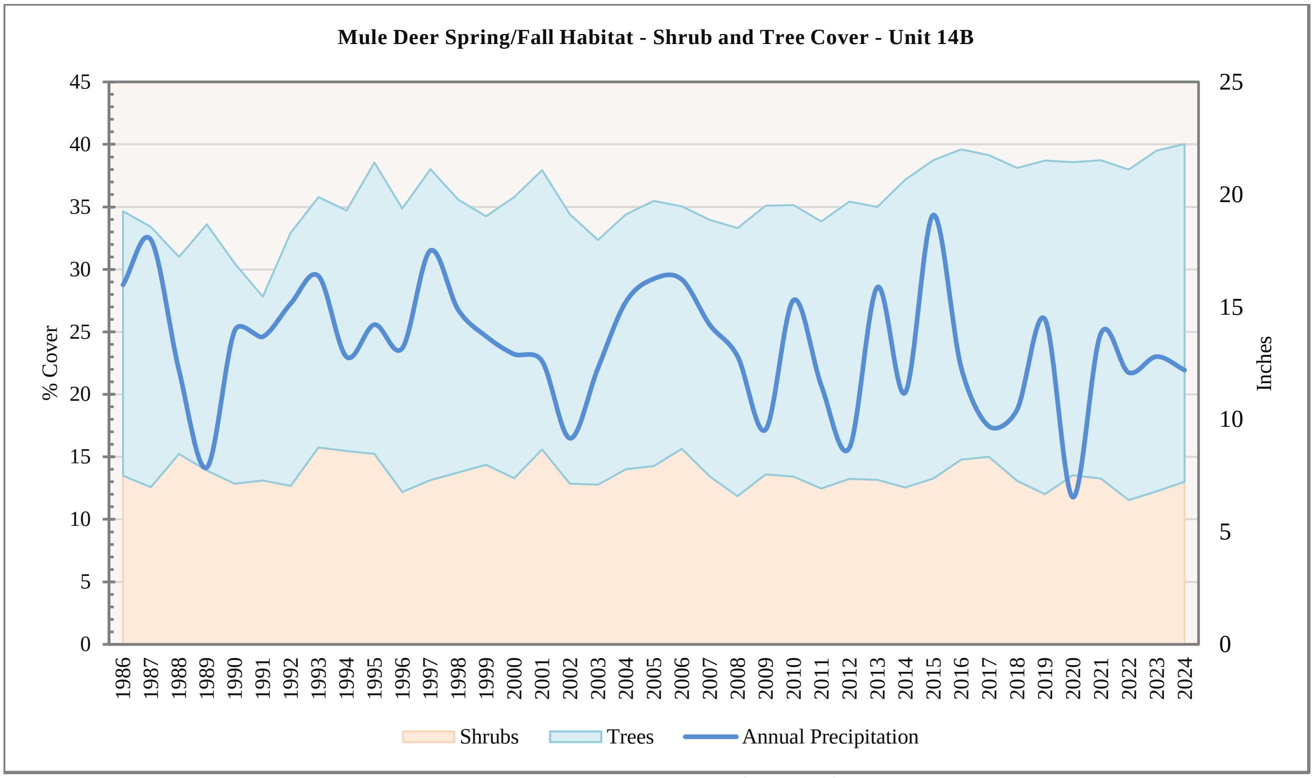
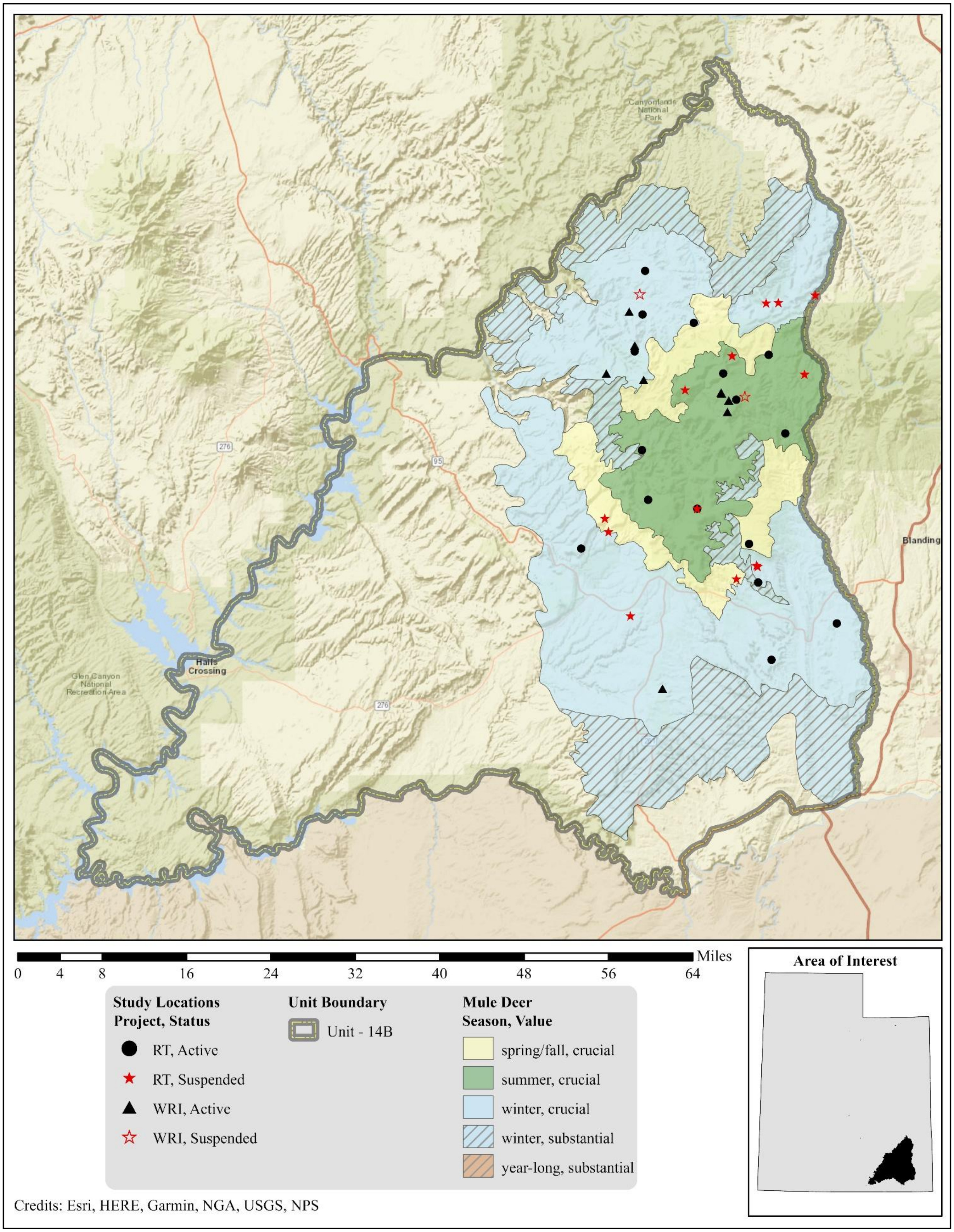
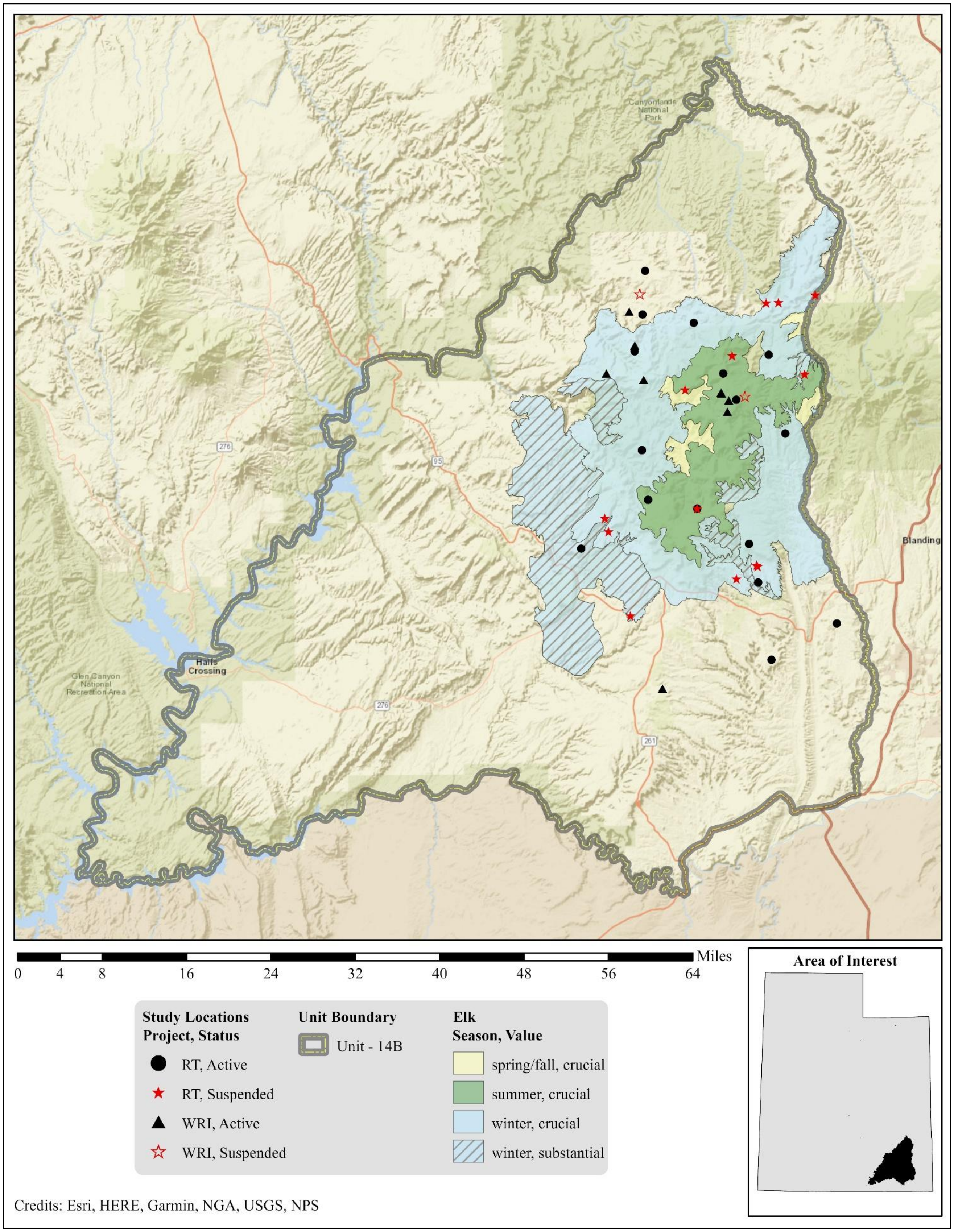


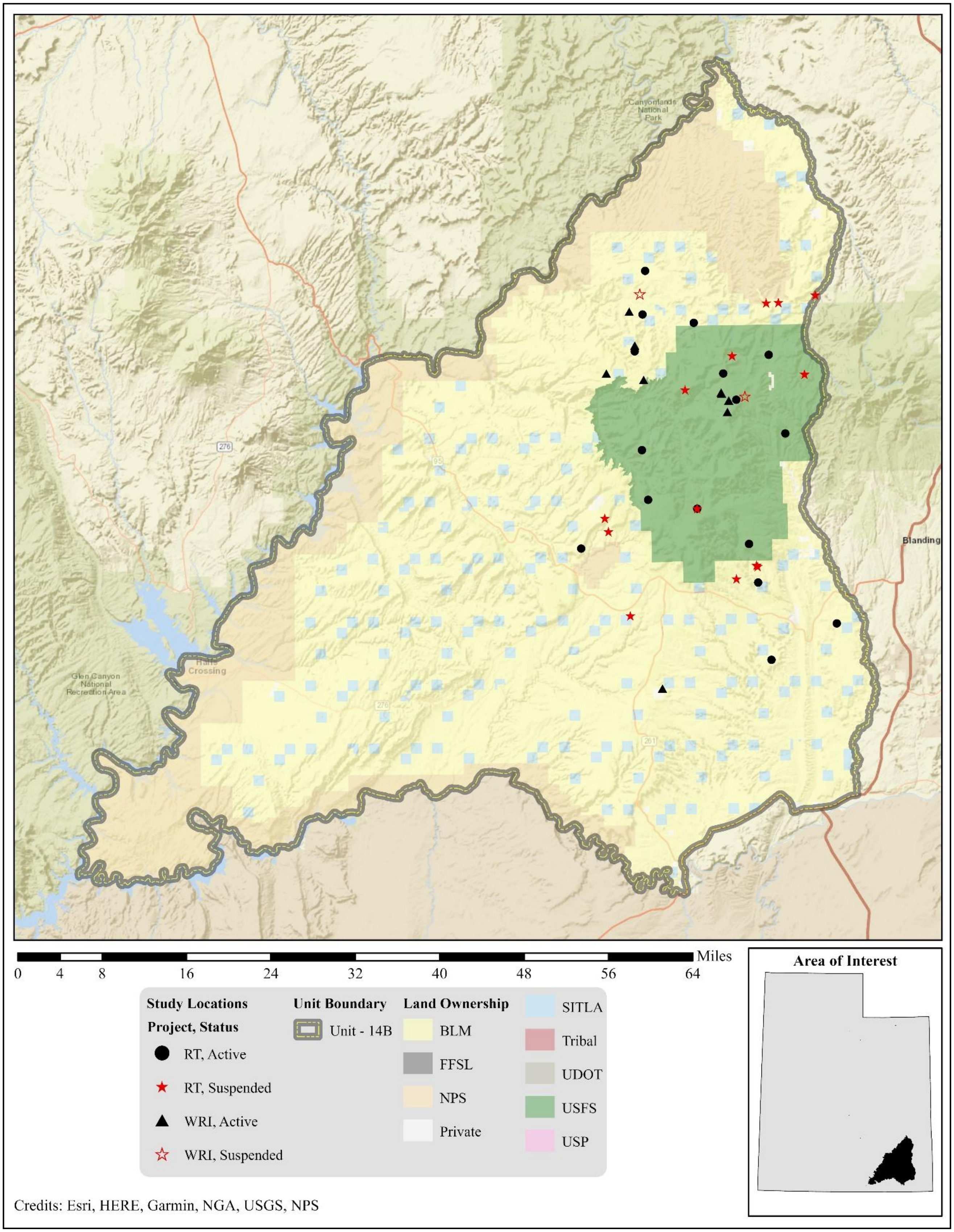
Figure 3.10: Average precipitation and estimated yearly stacked shrub and tree cover for spring/fall mule deer habitat in WMU 14B, Elk Ridge (Rangeland Analysis Platform, 2025).



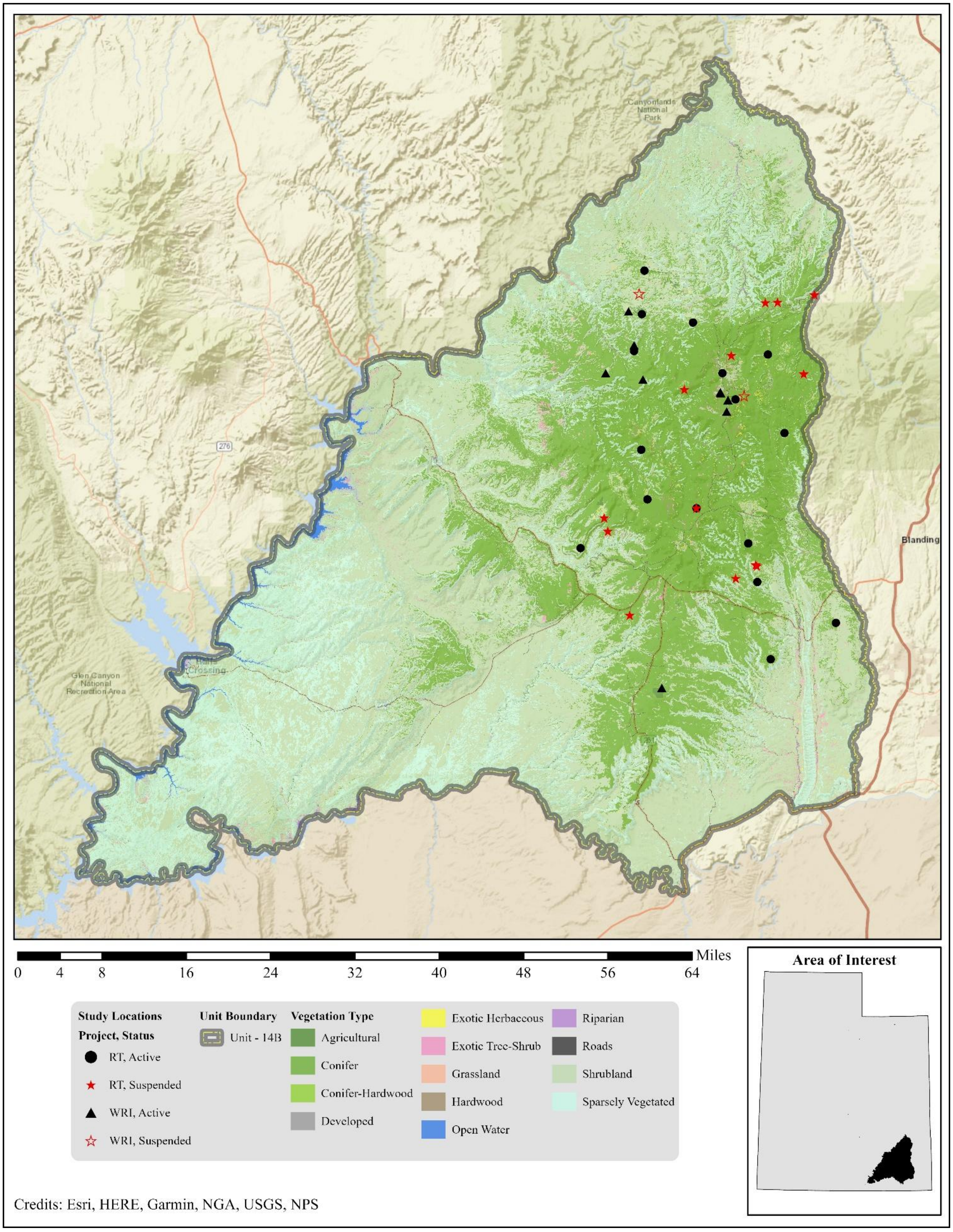
Map 3.2: Estimated mule deer habitat by season and value for WMU 14B, Elk Ridge.



Map 3.3: Estimated elk habitat by season and value for WMU 14B, Elk Ridge.



Map 3.4: Land ownership for WMU 14B, Elk Ridge.



Map 3.5: LANDFIRE Existing Vegetation Type map (LC23_EVT_240, 2023) for WMU 14B, Elk Ridge.

LANDFIRE Existing Vegetation Type for Mule Deer Habitat

According to the current LANDFIRE Existing Vegetation Type model, 61% of winter range for mule deer; nearly 45% of summer habitat; and 77% of spring/fall range is made up of biophysical sites (also referred to here as vegetation types) that are dominated by pinyon (*Pinus* spp.) and juniper (*Juniperus* spp.) (**Table 3.1**, **Table 3.2**, **Table 3.3**). Prevalence can show large variation, but these lower to mid-elevation sites can be associated with understory browse species known to be beneficial to mule deer. Encroachment of pinyon and juniper into sagebrush (*Artemisia* spp.) shrublands has been observed in this unit; it is possible that some historical sagebrush types within this unit have been identified as pinyon-juniper woodland types due to their departure from the reference vegetation conditions. Pinyon and juniper trees can provide thermal cover for big game. However, when these trees encroach on existing shrublands, they can lead to decreased sagebrush and herbaceous components (Miller, Svejcar, & Rose, 2000), therefore decreasing available forage for wildlife.

The model also suggests that over 11% of the winter range is comprised of the Colorado Plateau Blackbrush-Mormon Tea Shrubland type (**Table 3.1**), which is located at low elevations. Species such as blackbrush (*Coleogyne ramosissima*), spiny hopsage (*Grayia spinosa*), and Mormon tea (*Ephedra viridis*) or Torrey's jointfir (*E. torreyana*) may be found on sites of this type and could provide valuable browse for wintering mule deer. Should sites of this vegetation type burn, they can be particularly susceptible to annual grass invasion that may significantly alter fire regimes. Nearly 15% of the unit's winter range is occupied by sparsely vegetated areas according to the model (**Table 3.1**): this vegetation class may have less value for deer when compared with other, more productive sites.

Of the summer range, the model states that just over 29% is made up of the Southern Rocky Mountain Ponderosa Pine Woodland biophysical site (**Table 3.2**). This vegetation class occurs at middle to higher elevations on the Elk Ridge unit. Ponderosa pine (*Pinus ponderosa*) dominates the tree component on sites of this type. Shrubs are usually present in the understory and may include species that could provide valuable summer browse for deer such as Gambel oak (*Quercus gambelii*), serviceberry (*Amelanchier* spp.), mountain snowberry (*Symphoricarpos oreophilus*), and chokecherry (*Prunus virginiana*), among others. The model also indicates that nearly 7% of summer range is made up of the Rocky Mountain Gambel Oak-Mixed Montane Shrubland vegetation class (**Table 3.2**), which is found at middle to higher elevations in this unit. This vegetation class is host to Gambel oak with a good herbaceous component. Other browse species such as serviceberry and sagebrush may be present in addition to oak.

Numerous other vegetation classes comprise the rest of the mule deer habitat within the Elk Ridge Management Unit (**Map 3.5**, **Table 3.1**, **Table 3.2**, **Table 3.3**), but they will not be discussed here. Descriptions for these additional vegetation classes can be found on the LANDFIRE BpS Models and Descriptions Support webpage (The Nature Conservancy LANDFIRE Team, 2015).

Group	Existing Vegetation Type for Summer Mule Deer Habitat	Acres	% of Total	Group % of Total
Conifer	Colorado Plateau Pinyon-Juniper Woodland	69,437	44.61%	
	Southern Rocky Mountain Ponderosa Pine Woodland	45,208	29.05%	
	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	10,737	6.90%	
	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	1,480	0.95%	
	Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland	18	0.01%	
	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	13	0.01%	
	Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland	2	0.00%	81.53%
Shrubland	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	10,315	6.63%	
	Inter-Mountain Basins Montane Sagebrush Steppe	1,595	1.02%	
	Rocky Mountain Lower Montane-Foothill Shrubland	1,436	0.92%	
	Inter-Mountain Basins Big Sagebrush Shrubland	252	0.16%	
	Inter-Mountain Basins Mixed Salt Desert Scrub	195	0.13%	
	Inter-Mountain Basins Semi-Desert Shrub-Steppe	123	0.08%	
	Colorado Plateau Pinyon-Juniper Shrubland	99	0.06%	
	Colorado Plateau Mixed Low Sagebrush Shrubland	52	0.03%	
	Inter-Mountain Basins Mat Saltbush Shrubland	1	0.00%	9.04%

Group	Existing Vegetation Type for Summer Mule Deer Habitat	Acres	% of Total	Group % of Total
Other	Sparsely Vegetated	6,601	4.24%	
	Riparian	1,183	0.76%	
	Developed	889	0.57%	
	Agricultural	473	0.30%	
	Open Water	6	0.00%	5.88%
Hardwood	Rocky Mountain Aspen Forest and Woodland	3,757	2.41%	2.41%
Exotic Herbaceous	Interior Western North American Temperate Ruderal Grassland	543	0.35%	
	Great Basin & Intermountain Introduced Annual Grassland	449	0.29%	
	Great Basin & Intermountain Introduced Perennial Grassland and Forbland	313	0.20%	
	Great Basin & Intermountain Introduced Annual and Biennial Forbland	2	0.00%	0.84%
Grassland	Inter-Mountain Basins Semi-Desert Grassland	173	0.11%	
	Rocky Mountain Subalpine-Montane Mesic Meadow	55	0.04%	
	Southern Rocky Mountain Montane-Subalpine Grassland	94	0.06%	0.21%
Exotic Tree-Shrub	Great Basin & Intermountain Ruderal Shrubland	135	0.09%	
	Interior Western North American Temperate Ruderal Shrubland	3	0.00%	0.09%
Total		**155,641**	**100%**	**100%**

Table 3.1: LANDFIRE Existing Vegetation Type (LC23_EVT_240, 2023) acreage of summer mule deer habitat for WMU 14B, Elk Ridge.

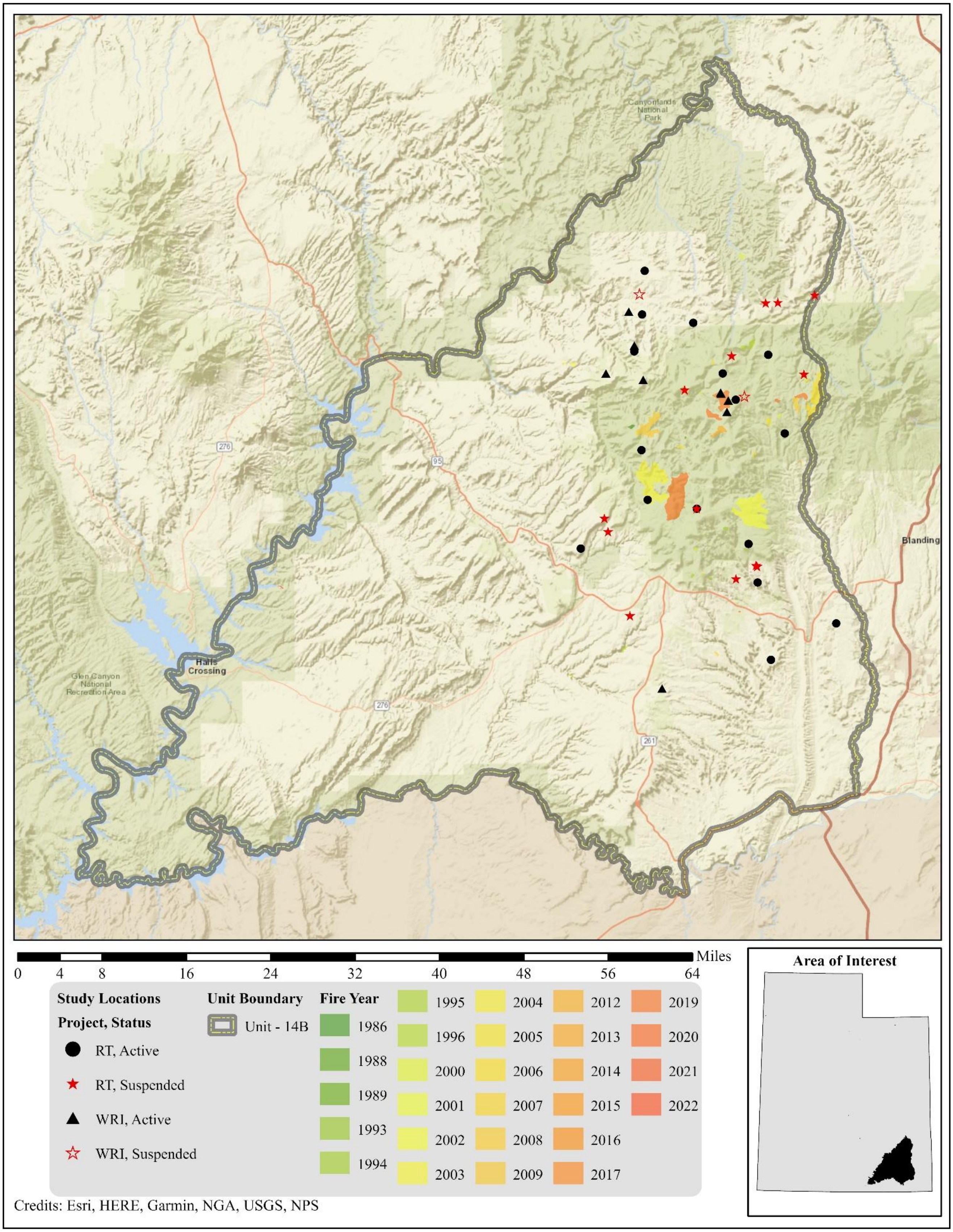
Group	Existing Vegetation Type for Winter Mule Deer Habitat	Acres	% of Total	Group % of Total
Shrubland	Colorado Plateau Pinyon-Juniper Shrubland	165,885	22.82%	
	Colorado Plateau Blackbrush-Mormon-tea Shrubland	81,830	11.26%	
	Inter-Mountain Basins Big Sagebrush Shrubland	32,931	4.53%	
	Inter-Mountain Basins Mixed Salt Desert Scrub	10,796	1.49%	
	Inter-Mountain Basins Semi-Desert Shrub-Steppe	8,578	1.18%	
	Southern Colorado Plateau Sand Shrubland	6,947	0.96%	
	Rocky Mountain Lower Montane-Foothill Shrubland	5,154	0.71%	
	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	3,002	0.41%	
	Inter-Mountain Basins Greasewood Flat	1,848	0.25%	
	Inter-Mountain Basins Montane Sagebrush Steppe	1,047	0.14%	
	Inter-Mountain Basins Mat Saltbush Shrubland	761	0.10%	
	Colorado Plateau Mixed Low Sagebrush Shrubland	728	0.10%	43.95%
Conifer	Colorado Plateau Pinyon-Juniper Woodland	278,258	38.28%	
	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	1,318	0.18%	
	Southern Rocky Mountain Ponderosa Pine Woodland	595	0.08%	
	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	253	0.03%	38.58%
Other	Sparsely Vegetated	106,557	14.66%	
	Agricultural	4,241	0.58%	
	Developed	4,070	0.56%	
	Riparian	2,032	0.28%	
	Open Water	91	0.01%	
	Quarries-Strip Mines-Gravel Pits-Well and Wind Pads	6	0.00%	16.09%
Exotic Tree-Shrub	Great Basin & Intermountain Ruderal Shrubland	7,420	1.02%	
	Interior Western North American Temperate Ruderal Shrubland	107	0.02%	1.04%
Exotic Herbaceous	Great Basin & Intermountain Introduced Annual Grassland	535	0.07%	
	Great Basin & Intermountain Introduced Annual and Biennial Forbland	526	0.07%	
	Great Basin & Intermountain Introduced Perennial Grassland and Forbland	291	0.04%	
	Interior Western North American Temperate Ruderal Grassland	22	0.00%	0.19%
Grassland	Inter-Mountain Basins Semi-Desert Grassland	1,102	0.15%	
	Rocky Mountain Subalpine-Montane Mesic Meadow	4	0.00%	
	Southern Rocky Mountain Montane-Subalpine Grassland	3	0.00%	0.15%
Hardwood	Rocky Mountain Aspen Forest and Woodland	16	0.00%	0.00%
Total		**726,953**	**100%**	**100%**

Table 3.2: LANDFIRE Existing Vegetation Type (LC23_EVT_240, 2023) acreage of winter mule deer habitat for WMU 14B, Elk Ridge.

Group	Existing Vegetation Type for Spring/Fall Mule Deer Habitat	Acres	% of Total	Group % of Total
Conifer	Colorado Plateau Pinyon-Juniper Woodland	78,019	75.21%	
	Southern Rocky Mountain Ponderosa Pine Woodland	2,590	2.50%	
	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	1,738	1.68%	
	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	223	0.22%	
	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	<1	0.00%	79.60%

Group	Existing Vegetation Type for Spring/Fall Mule Deer Habitat	Acres	% of Total	Group % of Total
Shrubland	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	3,179	3.06%	
	Inter-Mountain Basins Big Sagebrush Shrubland	3,154	3.04%	
	Colorado Plateau Pinyon-Juniper Shrubland	1,859	1.79%	
	Rocky Mountain Lower Montane-Foothill Shrubland	1,590	1.53%	
	Inter-Mountain Basins Montane Sagebrush Steppe	862	0.83%	
	Inter-Mountain Basins Semi-Desert Shrub-Steppe	612	0.59%	
	Inter-Mountain Basins Mixed Salt Desert Scrub	536	0.52%	
	Colorado Plateau Mixed Low Sagebrush Shrubland	54	0.05%	
	Inter-Mountain Basins Mat Saltbush Shrubland	14	0.01%	
	Inter-Mountain Basins Greasewood Flat	2	0.00%	
	Colorado Plateau Blackbrush-Mormon-tea Shrubland	2	0.00%	
	Southern Colorado Plateau Sand Shrubland	2	0.00%	11.44%
Other	Sparsely Vegetated	6,951	6.70%	
	Developed	537	0.52%	
	Agricultural	430	0.41%	
	Riparian	341	0.33%	
	Open Water	2	0.00%	7.96%
Exotic Tree-Shrub	Great Basin & Intermountain Ruderal Shrubland	641	0.62%	
	Interior Western North American Temperate Ruderal Shrubland	3	0.00%	0.62%
Exotic Herbaceous	Great Basin & Intermountain Introduced Perennial Grassland and Forbland	182	0.18%	
	Great Basin & Intermountain Introduced Annual Grassland	49	0.05%	
	Interior Western North American Temperate Ruderal Grassland	8	0.01%	
	Great Basin & Intermountain Introduced Annual and Biennial Forbland	3	0.00%	0.23%
Grassland	Inter-Mountain Basins Semi-Desert Grassland	70	0.07%	
	Rocky Mountain Subalpine-Montane Mesic Meadow	30	0.03%	
	Southern Rocky Mountain Montane-Subalpine Grassland	18	0.02%	0.11%
Hardwood	Rocky Mountain Aspen Forest and Woodland	26	0.02%	0.02%
Total		**103,730**	**100%**	**100%**

Table 3.3: LANDFIRE Existing Vegetation Type (LC23_EVT_240, 2023) acreage of spring/fall mule deer habitat for WMU 14B, Elk Ridge.



Map 3.6: Land coverage of fires by year from 1986-2022 for WMU 14B, Elk Ridge (NIFC Open Data Site: Federal Interagency Wildland Fire Maps and Data for All, 2025).

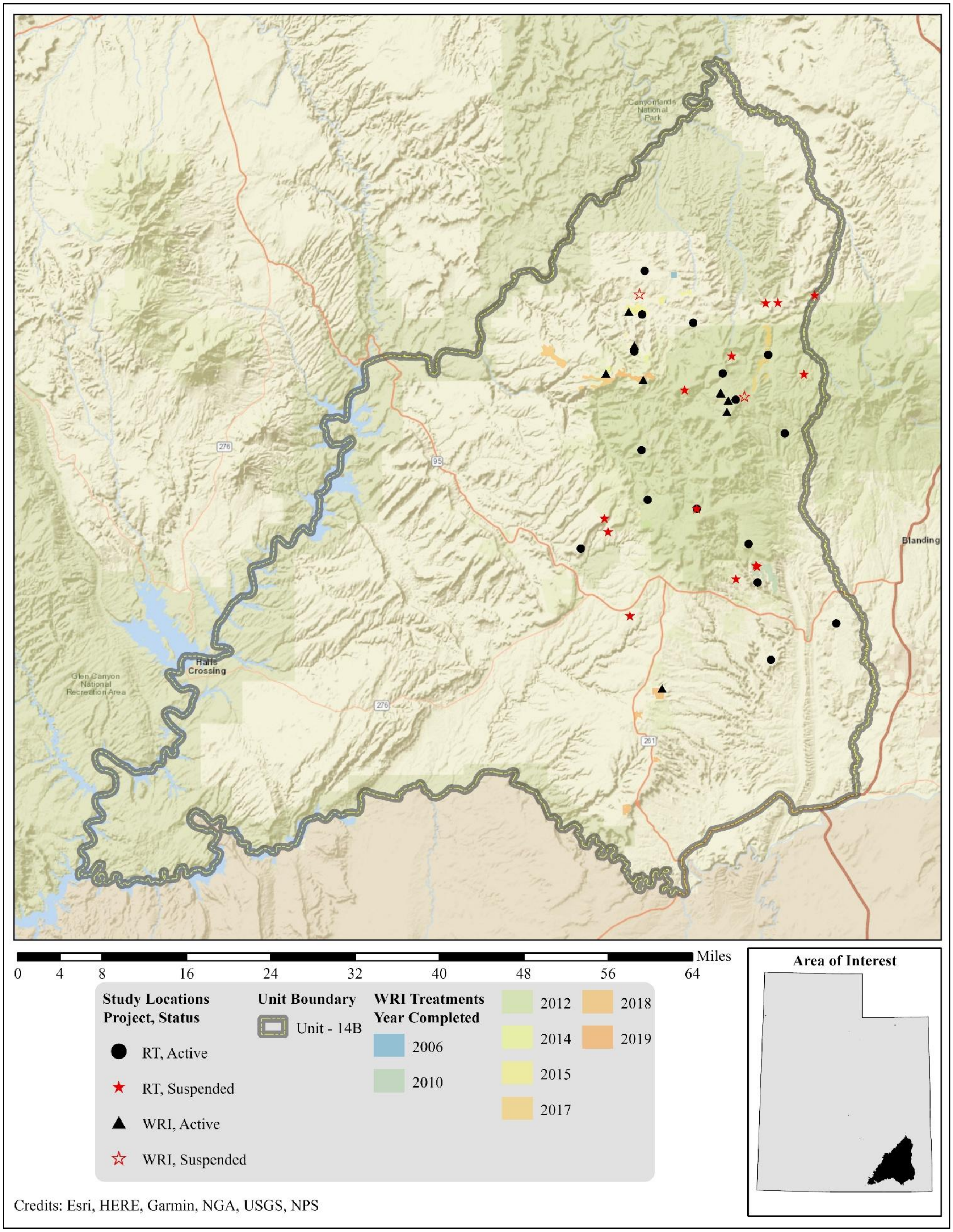
Treatments/Restoration Work

There has been an active effort to address many of the limitations on this unit through the Watershed Restoration Initiative (WRI). A total of 9,612 acres of land have been treated within the Elk Ridge Management Unit since the WRI was implemented in 2004 (**Map 3.7**) Treatments frequently overlap one another bringing the net total of completed treatment acres to 9,153 for this unit (**Table 3.4**). Other treatments have occurred outside of the WRI through independent agencies and landowners, but the WRI comprises most of the work done on deer winter ranges throughout the state of Utah.

The most common management practice in this unit is vegetation removal by mastication (bullhog) to remove pinyon and juniper trees. Additional techniques to remove pinyon (*Pinus* spp.) and juniper (*Juniperus* spp.) often include lop and scatter treatments. Other management practices including (but not limited to) seeding species to augment the herbaceous understory and prescribed fire are all used across the unit (**Table 3.4**).

Type	Total Completed Acreage
Bullhog	**5,991**
Full Size	5,400
Skid Steer	591
Seeding (Primary)	**1,336**
Drill (Rangeland)	699
Broadcast (Aerial-Fixed Wing)	636
Herbicide Application	**959**
Aerial (Fixed-Wing)	959
Vegetation Removal/Hand Crew	**537**
Lop & Scatter	533
Lop (No Scatter)	4
Prescribed Fire	**318**
Prescribed Fire	318
Forestry Practices	**270**
Thinning (Non-Commercial)	270
Seeding (Secondary/Shrub)	**184**
Broadcast (Aerial-Fixed Wing)	184
Planting/Transplanting	**17**
Other	17
Grand Total	**9,612**
***Net Total Land Area Treated**	**9,153**

Table 3.4: WRI treatment action size (acres) for completed projects for WMU 14B, Elk Ridge. Data accessed on 02/25/2025.
*Does not include overlapping treatments.



Map 3.7: Terrestrial WRI treatments by fiscal year completed for WMU 14B, Elk Ridge.

Range Trend Studies

Range Trend studies have been sampled within WMU 14B on a regular basis since 1986, with studies being added or suspended as was deemed necessary (**Table 3.5**). Due to changes in sampling methodologies, only data collected following the 1992 sample year is included in this summary. Monitoring studies of WRI projects began in 2004. When possible, WRI monitoring studies are established prior to treatment and sampled on a regular basis following treatment. Due to the long-term nature of the studies, many of the Range Trend and WRI studies have had some sort of disturbance or treatment prior to or since study establishment (**Table 3.6**). Range Trend studies are summarized in this report by ecological site.

Study #	Study Name	Project	Status	Years Sampled	Ecological Site Description
14B-13	Black Mesa	RT	Active	1986, 1992, 1994, 1999, 2004, 2009, 2014, 2019, 2024	Semidesert Sandy Loam (Wyoming Big Sagebrush)
14B-14	Texas Flat	RT	Suspended	1986, 1992, 1994, 1999, 2004, 2009	Upland Loam (Mountain Big Sagebrush)
14B-15	Harmony Flat	RT	Suspended	1986, 1992, 1999, 2004	Semidesert Sandy Loam (Wyoming Big Sagebrush)
14B-16	Lower Lost Park	RT	Suspended	1986, 1992, 1999, 2004, 2009	Upland Loam (Mountain Big Sagebrush)
14B-17	Deer Flat	RT	Suspended	1986, 1992, 1999	Upland Loam (Mountain Big Sagebrush)
14B-18	Kigalia Point	RT	Suspended	1986, 1992, 1999, 2004	Mountain Loam (Ponderosa Pine)
14B-19	Woodenshoe	RT	Active	1986, 1992, 1999, 2004, 2009, 2014, 2019, 2024	Mountain Loam (Ponderosa Pine)
14B-20	Gooseberry	RT	Active	1986, 1992, 1999, 2004, 2009, 2014, 2020, 2024	Mountain Loam (Ponderosa Pine)
14B-21	North Long Point	RT	Suspended	1986, 1992, 1999	Mountain Loam (Ponderosa Pine)
14B-22	Wild Cow Point	RT	Active	1986, 1992, 1999, 2004, 2009, 2014, 2019, 2024	Upland Loam (Mountain Big Sagebrush)
14B-23	South Plain	RT	Active	1986, 1992, 1999, 2004, 2009, 2012, 2014, 2019, 2024	Upland Loam (Mountain Big Sagebrush)
14B-24	Ruin Park	RT	Active	1986, 1992, 1999, 2004, 2009, 2014, 2019, 2024	Semidesert Sandy Loam (Wyoming Big Sagebrush)
14B-25	Davis Pocket	RT	Suspended	1986, 1992	Mountain Loam (Oak)
14B-26	The Wilderness	RT	Suspended	1986, 1992, 1999	Mountain Loam (Ponderosa Pine)
14B-27	Mormon Pasture Point	RT	Active	1986, 1992, 1999, 2004, 2009, 2014, 2019, 2024	Mountain Loam (Oak)
14B-28	North Cottonwood	RT	Suspended	1986, 1999	Upland Shallow Loam (Pinyon-Utah Juniper)
14B-29	Salt Creek Mesa	RT	Suspended	1992, 1999, 2004, 2009, 2014, 2019	Upland Shallow Loam (Pinyon-Utah Juniper)
14B-30	Milk Ranch Point	RT	Active	1992, 1999, 2004, 2009, 2014, 2019, 2024	Mountain Loam (Oak)
14B-31	Chippean Ridge	RT	Active	1992, 1999, 2004, 2009, 2014, 2019, 2024	Mountain Loam (Oak)
14B-32	Lower Deer Flat	RT	Active	1994, 1999, 2004, 2009, 2014, 2019, 2024	Upland Loam (Mountain Big Sagebrush)
14B-34	Big Flat	RT	Active	2004, 2009, 2014, 2019, 2024	Mountain Loam (Mountain Big Sagebrush)
14B-36	Dry Mesa	RT	Active	2009, 2014, 2024	Upland Loam (Mountain Big Sagebrush)
14B-37	Kigalia Point II	RT	Active	2009, 2014, 2019, 2024	Mountain Loam (Ponderosa Pine)
14B-38	Arch Canyon	RT	Active	2014, 2019, 2024	Upland Loam (Big Sagebrush)
14B-39	Beef Basin Wash	RT	Active	2019, 2024	Upland Loam (Wyoming Big Sagebrush)

Study #	Study Name	Project	Status	Years Sampled	Ecological Site Description
14B-42	Lower Ballies	RT	Active	2024	Semidesert Sandy Loam (Wyoming Big Sagebrush)
14R-01	Cathedral Butte	RT	Suspended	2001, 2004	Upland Shallow Loam (Pinyon-Utah Juniper)
14R-03	Little Baullies 1	RT	Suspended	1998	Upland Loam (Big Sagebrush)
14R-04	Little Baullies 2	RT	Suspended	1998	Upland Loam (Big Sagebrush)
14R-29	South Plain 2	WRI	Active	2012, 2017, 2022	Upland Sand (Mountain Big Sagebrush)
14R-30	North Plain	WRI	Suspended	2012	Semidesert Sandy Loam (Wyoming Big Sagebrush)
14R-31	Dark Canyon	WRI	Active	2012, 2015, 2019	Upland Loam (Mountain Big Sagebrush)
14R-33	Sego Spring 1	WRI	Active	2014, 2020	High Mountain Loam (Aspen)
14R-34	Sego Spring 2	WRI	Active	2014, 2020	High Mountain Loam (Aspen)
14R-37	Lower Wild Cow Point	WRI	Active	2014, 2017, 2022	Upland Loam (Mountain Big Sagebrush)
14R-38	Sweet Alice Spring	WRI	Active	2017, 2020	Upland Sand (Mountain Big Sagebrush)
14R-39	Duck Lake	WRI	Active	2017, 2020	High Mountain Loam (Aspen)
14R-40	Gooseberry North	WRI	Active	2017, 2020	High Mountain Loam (Aspen)
14R-41	Round Mountain	WRI	Suspended	2017	High Mountain Loam (Aspen)
14R-42	Brushy Flat	WRI	Active	2018, 2022	Upland Loam (Mountain Big Sagebrush)

Table 3.5: Range Trend and WRI project studies monitoring history and ecological site potential for WMU 14B, Elk Ridge.

Study #	Study Name	Type	Disturbance Name (If Available)	Date	Acres	WRI Project #
14B-13	Black Mesa	Wildfire		Before 1986		
14B-14	Texas Flat	Railing	Texas Flat Reseeding	September-December 1955	1,462	3860*
		Rangeland Drill	Texas Flat Reseeding	September-December 1955	1,462	3860*
		Tebuthiuron	Texas Flat Seeding Maintenance	October 1986	360	11568*
14B-16	Lower Lost Park	Chain Unknown		1969		
		Seed Unknown		1969		
		Herbicide Unknown		October 1986		
14B-17	Deer Flat	Chain Unknown	Deer Flat Revegetation	October 1950	1,900	3199*
		Aerial	Deer Flat Revegetation	October 1950	1,900	3199*
		Tebuthiuron	Deer Flat Brush Control 1984	1984	2,700	3197*
14B-19	Woodenshoe	Wildfire	Woodenshoe	2003	2,710	
14B-20	Gooseberry	Selective		1963		
		Selective		1998-1999		
14B-22	Wild Cow Point	Chain Unknown		Early 1960s		
		Seed Unknown		Early 1960s		
14B-23	South Plain	Plateau	Beef Basin Phase I	Late November 2014	272	2939
		Aerial After	Beef Basin Phase I	January 2015	272	2939
		Transplant	Beef Basin Phase II	May 2016	10	3307
14B-27	Mormon Pasture Point	Chain Unknown		Early 1970s	900	
		Seed Unknown		Early 1970s	900	
		Tordon		1985	200	
		Bullhog	Mormon Pasture Mountain Wildlife Habitat Improvement Phase I	November 2016	463	3774
14B-29	Salt Creek Mesa	Aerial Before	Salt Creek Mesa Chain and Seed Treatment	1968	1,600	LTDL
		Chain Unknown	Salt Creek Mesa Chain and Seed Treatment	1968	1,600	LTDL
		Prescribed	Salt Creek Prescribed Burn and Seed Treatment 2002	April 2002-September 2004	1,886	10046*
14B-30	Milk Ranch Point	Plow		1953		
		Seed Unknown		1953		
14B-32	Lower Deer Flat	Chain Unknown	Deer Flat Revegetation	October 1950	1,900	3199*
		Aerial	Deer Flat Revegetation	October 1950	1,900	3199*
		Spike	Deer Flat Brush Control 1984	1984	2,700	3197*
14B-36	Dry Mesa	Chain Unknown		Historic		
		Seed Unknown		Historic		

Study #	Study Name	Type	Disturbance Name (If Available)	Date	Acres	WRI Project #
14B-37	Kigalia Point II	Seed Unknown		Historic		
		Selective		1960s		
		Prescribed		1998		
14B-38	Arch Canyon	Chain Unknown	Little Baullies Reseeding	August-September 1960	1,983	6711*
		Aerial	Little Baullies Reseeding	August-September 1960	1,983	6711*
14R-01	Cathedral Butte	Aerial Before	Salt Creek Mesa Chain and Seed Treatment	1968	1,600	LTDL
		Chain Unknown	Salt Creek Mesa Chain and Seed Treatment	1968	1,600	LTDL
		Prescribed	Salt Creek Prescribed Burn and Seed Treatment 2002	April 2002-September 2004	1,886	10046*
14R-03	Little Baullies 1	Aerial	Little Baullie Mesa Fuels Reduction and Vegetative Restoration (1404)	October 2009	1,633	1404
		Bullhog	Little Baullie Mesa Fuels Reduction and Vegetative Restoration (1404)	October-December 2009, May-June 2010	1,633	1404
14R-04	Little Baullies 2	Aerial	Little Baullie Mesa Fuels Reduction and Vegetative Restoration (1404)	October 2009	1,633	1404
		Bullhog	Little Baullie Mesa Fuels Reduction and Vegetative Restoration (1404)	October-December 2009, May-June 2010	1,633	1404
14R-29	South Plain 2	Plateau	Beef Basin Phase I	November 2014	272	2939
		Drill	Beef Basin Phase I	October-November 2014	254	2939
		Aerial	Beef Basin Phase I	January 2015	272	2939
14R-31	Dark Canyon	Bullhog	Dark Canyon Phase I (formerly Beef Basin Phase 1)	June-October 2013	285	2177
14R-33	Sego Spring 1	Exclosure	North Elk Ridge Aspen Restoration Phase II	Fall 2016	84	3773
		Prescribed	La Sal/Abajo Prescribed Fire FY20	Summer 2019	21,732	4882
14R-34	Sego Spring 2	Prescribed	La Sal/Abajo Prescribed Fire FY20	Summer 2019	21,732	4882
14R-37	Lower Wild Cow Point	Bullhog	Dark Canyon Plateau Phase II	May 2015	238	2938
14R-38	Sweet Alice Spring	Bullhog	Dark Canyon Plateau Phase 4	July 2018-June 2019	1,042	4018
		Bullhog	Dark Canyon Plateau Phase 5	November 2018-January 2019	913	4163
14R-39	Duck Lake	Selective	North Elk Ridge Aspen Restoration Phase II	June 2016-June 2017	84	3773
		Prescribed	La Sal/Abajo Prescribed Fire FY20	Summer 2019	21,732	4882
14R-40	Gooseberry North	Selective	North Elk Ridge Aspen Restoration Phase II	June 2016-June 2017	84	3773
		Prescribed	La Sal/Abajo Prescribed Fire FY20	Summer 2019	21,732	4882
14R-41	Round Mountain	Prescribed	Abajo Mountains Prescribed Fire FY2026-FY2028 (Proposed)	2025-2027	12,193	7515
14R-42	Brushy Flat	Farmland		Historic		
		Rangeland Drill	Cedar Mesa "Buck Pasture" Seeding	November-December 2018	546	4423

Table 3.6: Range Trend and WRI studies known disturbance history for WMU 14B, Elk Ridge. PDB = Pre-Database; LTDL = Land Treatment Digital Library (Pilliod, Welty, & Jefferies, 2019). *Numbers with an asterisk are LTDL project numbers.

Study Trend Summary (Range Trend)

Ecotypes represented by only one study site throughout most or all of the sample period are listed below, but they are not discussed in this section. However, graphs for these ecotypes have been included and referenced when a representative study site is active as of the 2024 sample year:

- Mountain (Big Sagebrush) - Big Flat (14B-34)
  - (**Figure 3.11**, **Figure 3.14**, **Figure 3.17**, **Figure 3.20**, **Figure 3.22**, **Figure 3.24**, **Figure 3.26**, **Figure 3.28**)
- Upland (Pinyon-Juniper) - North Cottonwood (14B-28) (suspended), Salt Creek Mesa (14B-29) (suspended), Cathedral Butte (14R-01) (suspended)

Trend summaries and/or additional data for these ecotypes are available in the corresponding site reports (Lane, Cox, & Payne, Utah Big Game Range Trend Studies 2024, Wildlife Management Units 13A, 14A, 14B, 15, 16B & 16C, 2025).

Mountain (Oak)

There are four studies [Davis Pocket (14B-25) (suspended), Mormon Pasture Point (14B-27), Milk Ranch Point (14B-30), and Chippean Ridge (14B-31)] that are classified as Mountain (Oak) ecological sites. The Davis Pocket site can be found in Davis Pocket on the lower slopes of Horse Mountain. Mormon Pasture Point is situated just north of Mormon Pasture Mountain on North Elk Ridge, while the Milk Ranch Point study is located on Milk Ranch Point on South Elk Ridge. Finally, the Chippean Ridge study site is located on Chippean Ridge.

When discussing the data for these study sites, it is important to note that the Davis Pocket study only provides data for the 1994 study year, whereas the remaining studies contribute data spanning all sample years.

<u>Shrubs/Trees</u>: Although Gambel oak (*Quercus gambelii*) has been present on these sites, preferred browse species other than oak have contributed a majority of the average shrub cover since 2004: this trend is primarily driven by Utah serviceberry (*Amelanchier utahensis*) on the Chippean Ridge and Milk Ranch Point studies. Total preferred browse cover has exhibited minor fluctuations from year to year, but it has remained stable when comparing 2004 data with that from 2024 (**Figure 3.12**). Average preferred browse density has decreased since 1994; however, the significant decrease between 1994 and 1999 can be entirely attributed to the suspension of the Davis Pocket study. Average preferred browse density has generally remained stable since 1999, and mature plants have been the dominant demographic over the same period. Recruitment of young individuals into the preferred browse populations was notable in 1994 (again due to the Davis Pocket study) but has been low in other sample years. Decadence has remained low throughout the study period (**Figure 3.21**). A majority of the preferred browse populations on these sites have shown signs of little to no utilization in most sample years including 2024 (**Figure 3.23**).

Twoneedle pinyon (*Pinus edulis*) and juniper (*Juniperus osteosperma* and/or *J. scopulorum*) are present on these study sites with pinyon contributing much of the cover and density. Average tree cover has exhibited a minor increase since 2004, but it has remained under 10% throughout the study period. Tree density has also increased over time (**Figure 3.15**, **Figure 3.18**).

<u>Herbaceous Understory</u>: Total average cover and frequency of the herbaceous understories on these sites have exhibited yearly fluctuations. However, cover has remained similar overall when comparing 1994 data with that from 2024, while frequency has slightly decreased. Perennial grasses have been the dominant herbaceous component of these studies in all years, with most of the cover contributed by introduced species such as intermediate wheatgrass (*Thinopyrum intermedium*), smooth brome (*Bromus inermis*), and/or crested wheatgrass (*Agropyron cristatum*). The introduced species bulbous bluegrass (*Poa bulbosa*) has also been observed on the Chippean Ridge and Milk Ranch Point studies, but with lower cover and abundance than other

perennial grasses. Perennial forbs have also contributed notable cover throughout the study period, a trend in part driven by arrowleaf balsamroot (*Balsamorhiza sagittata*) on the Milk Ranch Point site. Annual grasses and forbs have generally remained rare (**Figure 3.24**, **Figure 3.26**).

Occupancy: Average animal presence on these sites has decreased overall between 1999 and 2024, and elk have been the primary occupants in all sample years. Mean abundance of elk pellet groups has fluctuated between 7 days use/acre in 2014 and 16 days use/acre in 1999 and 2009. Deer pellet groups have had an average abundance as low as 2 days use/acre in 2014 and as high as 8 days use/acre in 1999. Mean abundance of cattle pellet groups has ranged from 1.5 days use/acre in 2024 to 15 days use/acre in 1999. Finally, horse pellet groups were observed in 2019 with an average abundance of 0.2 days use/acre, but they have not been present in any other sample year (**Figure 3.28**).

Mountain (Ponderosa Pine)

There are six studies [Kigalia Point (14B-18) (suspended), Woodenshoe (14B-19), Gooseberry (14B-20), North Long Point (14B-21) (suspended), The Wilderness (14B-26) (suspended), and Kigalia Point II (14B-37)] that are classified as Mountain (Ponderosa Pine) ecological sites. The Kigalia Point study is located on the southern portion of Kigalia Point on South Elk Ridge, and the Woodenshoe site can be found just east of the Woodenshoe Buttes. The Gooseberry site is less than one mile northeast of the Gooseberry Guard Station on North Elk Ridge. The North Long Point study site is on the edge of North Long Point above Poison Canyon. The Wilderness is situated on Starvation Point, which is above Vega Creek and east of Maverick Point. Finally, the Kigalia Point II study is located just adjacent to the Kigalia Point study on the southern portion of Kigalia Point.

Consideration should be given to the varying number of study sites sampled each year (the ‘n’ value) and the relevant implications that this may have on the data. More specifically, The Wilderness and North Long Point only contributed data for 1994 and 1999, while the Kigalia Point study provided data from 1994 through 2004. The Woodenshoe and Gooseberry study sites have provided data spanning all sample years. Finally, the Kigalia Point II study has contributed data since 2009.

Shrubs/Trees: The dominant shrub species on most of these sites have been a mixture of preferred browse species such as mountain snowberry (*Symphoricarpos oreophilus*), Gambel oak (*Quercus gambelii*), and/or mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), among others. Total shrub cover has increased over time. More specifically, the increase in preferred browse cover between 2019 and 2024 can largely be attributed to mountain snowberry on the Woodenshoe study (**Figure 3.13**). Total preferred browse density has decreased over time when comparing 1994 data with that from 2024; the decrease between 1994 and 1999 is largely due to mountain snowberry on Kigalia Point (likely due to a 1998 prescribed burn). However, only density trends since 2009 have been consistently driven by the same three study sites (Woodenshoe, Gooseberry, and Kigalia Point II). Between 2009 and 2024, average preferred browse density has slightly increased primarily due to mountain snowberry on the Gooseberry study. Mature individuals have comprised a majority of the preferred browse populations on these sites in all years except 1994, when young plants were the dominant demographic. Recruitment of young has been comparatively low in years other than 1994, and decadence has remained low throughout the sample period (**Figure 3.21**). Forty percent of preferred browse plants were moderately to heavily hedged in 1994 according to average preferred browse utilization data. However, less than 4% of plants were moderately to heavily utilized in 2024, and over 90% have exhibited signs of no to light utilization since 1999 (**Figure 3.23**).

Ponderosa pine (*Pinus ponderosa*) is the dominant tree species on studies of this ecotype, with other species such as quaking aspen (*Populus tremuloides*) present to a lesser extent. Tree cover has exhibited yearly fluctuations but has remained stable when comparing 2009 data with that from 2024 (**Figure 3.16**). Average density has increased both overall and in each sample year since 2014. More specifically, the increase in tree density between 2019 and 2024 was primarily driven by ponderosa on the Gooseberry study (**Figure 3.19**).

Herbaceous Understory: Average cover and abundance of the herbaceous understories on these sites have exhibited yearly fluctuations, but they have remained largely stable when comparing 1994 data with that from 2024. However, values for both measurements have decreased overall since 2009. Mainly native perennial grasses dominate study sites of this ecotype as of 2024: the exception to this is the Kigalia Point II study, on which smooth brome (*Bromus inermis*) has consistently provided the most perennial grass cover. The introduced perennial grass species bulbous bluegrass (*Poa bulbosa*) has been observed since 2009, but with very low cover and abundance. Perennial forbs have been a notable herbaceous component throughout the study period. Annual grasses and forbs have remained rare in comparison with their perennial counterparts (**Figure 3.24**, **Figure 3.26**).

Occupancy: Cattle have been the primary occupants of these study sites in all sample years except 2024, when deer pellet groups were the most abundant. Average abundance of cattle pellet groups has ranged from 5 days use/acre in 2024 to 14 days use/acre in 2019. Deer pellet groups have had an average abundance as low as less than 6 days use/acre in 2009 and as high as 10 days use/acre. Finally, mean elk pellet group abundance has fluctuated between less than 2 days use/acre in 2014 and 11 days use/acre in 2019 (**Figure 3.28**).

Upland (Big Sagebrush)

There are 11 study sites [Texas Flat (14B-14) (suspended), Lower Lost Park (14B-16) (suspended), Deer Flat (14B-17) (suspended), Wild Cow Point (14B-22), South Plain (14B-23), Lower Deer Flat (14B-32), Dry Mesa (14B-36), Arch Canyon (14B-38), Beef Basin Wash (14B-39), Little Baullies 1 (14R-03) (suspended), and Little Baullies 2 (14R-04) (suspended)] that are classified as Upland (Big Sagebrush) ecological sites. The Texas Flat study is located on Texas Flat on South Elk Ridge, and Lower Lost Park can be found on Lower Lost Parks east of and above Deer Canyon. The Deer Flat study is situated on the edge of Deer Flat. The Wild Cow Point site is between Fable Valley and Sweet Alice Canyon on Wild Cow Point. South Plain can be found in the southern portion of Beef Basin near the mouth of Sweet Alice Canyon, and the Lower Deer Flat study is located between Hideout Canyon and Deer Canyon on the lower portion of Deer Flat. The Dry Mesa study site is located on Dry Mesa above Dark Canyon, while Arch Canyon is situated on the edge of Little Baullie Mesa above Arch Canyon. The Beef Basin Wash study site can be found approximately two and a half miles southeast of House Park Butte in Beef Basin Wash. Finally, the Little Baullies 1 and 2 studies are located on the northern portion of Little Baullies Mesa.

It is important to note that the number of study sites sampled (the ‘n’ value) has shifted from year to year and consider the implications that this may have on data discussed in the following sections. More specifically, the Little Baullies 1 and 2 studies only provided data in 1999, while Texas Flat and Lower Lost Park contributed data from 1994 through 2009. The Deer Flat study provides data for the 1994 and 1999 sample years, and the Dry Mesa site was sampled in 2009, 2014, and 2024. Arch Canyon and Beef Basin have contributed data since 2014 and 2019, respectively. Finally, the Wild Cow Point, South Plain, and Lower Deer Flat studies have provided data spanning all sample years since 1994.

Shrubs/Trees: The preferred browse components of most of these study sites are/have been dominated by mountain or Wyoming big sagebrush (*Artemisia tridentata* ssp. *vaseyana* or *A. tridentata* ssp. *wyomingensis*), although additional browse species are also present on many sites. Total average shrub cover has increased overall since 2004. However, this increase in cover is mainly due to preferred browse species other than sagebrush; sagebrush cover has remained similar over time. Furthermore, the increase in other preferred browse cover between 2019 and 2024 can largely be attributed to an increase in saltbush (*Atriplex canescens* and *A. confertifolia*) cover on the Beef Basin Wash site and the inclusion of the Dry Mesa study, which was not read in 2019 (**Figure 3.11**). Average preferred browse density has decreased overall since 1994 due to both actual decreases and the activation and suspension of different study sites. When comparing 2014 and 2024 data, site-level analysis indicates that preferred browse density has remained similar or has increased on most studies. The exception to this stability or increase in density, however, is the Wild Cow Point study: in 2014, preferred browse density was 3,460 plants/acre but was 2,800 plants/acre in 2024. Mature plants have comprised a majority of the preferred browse populations on these sites throughout the study period. In contrast, recruitment of young and decadence have remained low in most sample years (**Figure 3.20**). Average preferred browse utilization has fluctuated from year to year. Over 50% of preferred browse plants were moderately to heavily hedged in 1994, 2004, 2014, and 2019. However, most plants exhibited signs of little to no utilization in other sample years (**Figure 3.22**).

Twoneedle pinyon (*Pinus edulis*) and/or Utah juniper (*Juniperus osteosperma*) have been observed on many study sites of this ecotype. Average tree cover has decreased overall since 2004, but it has remained fairly stable since 2009. Furthermore, this initial decrease in tree cover between 2004 and 2009 can be largely attributed to pinyon on the Wild Cow Point study (**Figure 3.14**). Tree density has also decreased. Between 2014 and 2024, site-level data reveals this trend was mainly driven by decreases in pinyon density on some sites and the establishment of the Beef Basin Wash study, on which trees have been rare (**Figure 3.17**).

<u>Herbaceous Understory</u>: Total average herbaceous cover and frequency have fluctuated from year to year. Cover has remained stable when comparing 1994 data with that from 2024, but nested frequency has decreased. However, both values increased significantly in 2019: this was primarily due to an increase in annual forbs on most of the study sites sampled that year. Perennial grasses have been the primary herbaceous component on these sites throughout the study period. Native perennial grass species such as blue grama (*Bouteloua gracilis*) and sand dropseed (*Sporobolus cryptandrus*) have dominated the understories of many study sites. However, the introduced species smooth brome (*Bromus inermis*) and/or crested wheatgrass (*Agropyron cristatum*) contribute most of the perennial grass cover on the Dry Mesa, Lower Deer Flat, and Wild Cow Point studies as of 2024. Perennial forbs and annual grasses and forbs have been comparatively rare in most sample years (**Figure 3.25**, **Figure 3.27**).

<u>Occupancy</u>: Pellet transect data shows that average occupancy of these sites has decreased overall despite yearly fluctuations. Deer have been the primary occupants throughout the study period, with a mean pellet group abundance ranging from 5 days use/acre in 2014 to 40 days use/acre in 1999. Average abundance of cattle pellet groups has been as low as 2 days use/acre in 2014 and as high as 22 days use/acre in 1999. Elk have also been present on these sites with mean abundance of pellet groups fluctuating between 0.3 days use/acre in 1999 and 9 days use/acre in 2009. Finally, horse pellet groups were observed with low abundance in 1999, but have not been recorded in any other sample year (**Figure 3.29**).

Semidesert (Big Sagebrush)

There are four study sites [Black Mesa (14B-13), Harmony Flat (14B-15) (suspended), Ruin Park (14B-24), and Lower Ballies (14B-42)] that are classified as Semidesert (Big Sagebrush) ecological sites. The Black Mesa study is located east of Black Mesa Butte on Black Mesa, and the Harmony Flat site can be found southeast of Natural Bridges National Monument on Harmony Flat. The Ruin Park study site is in the northern portion of Beef Basin in Ruin Park. The Lower Ballies study is situated on the southern portion of Baullies Mesa, west of Comb Ridge.

One should consider the varying number of study sites sampled each year (the ‘n’ value) and the relevant implications that this may have on the data. The Harmony Flat study provided data from 1994 through 2004, and Lower Ballies only contributes data for the 2024 sample year. However, the Black Mesa and Ruin Park studies have provided data spanning all sample years since 1994.

<u>Shrubs/Trees</u>: Composition of the shrub component on these sites has fluctuated over time between big sagebrush (*Artemisia tridentata*) and other shrubs excluding preferred browse. Preferred browse species other than sagebrush are not found in any significant abundance and contribute low cover on sites where they are present as of 2024. Average cover of sagebrush has decreased over time. The initial decrease in sagebrush cover between 2004 and 2009 was driven by the suspension of the Harmony Flat study, and sagebrush cover trends after 2009 can largely be attributed to the Black Mesa site. In addition, the increase in the cover of shrubs other than preferred browse species in 2024 was almost entirely due to broom snakeweed (*Gutierrezia sarothrae*) on Black Mesa (**Figure 3.11**). Average preferred browse density has notably decreased since 1994.

Mature individuals were the dominant demographic in 2024, although decadent plants have been the primary demographic in some years. Recruitment of young has decreased over time and young plants were only observed on the Ruin Park study during the most recent sample year (**Figure 3.20**). Average utilization of preferred browse has exhibited yearly fluctuations, but it has generally remained high. In 2024, 35% of preferred browse plants sampled in density strips were moderately hedged, and an additional 35% were heavily browsed (**Figure 3.22**).

Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) provided cover in 2004, but trees have contributed no cover in subsequent years. This trend can be entirely attributed to the Harmony Flat study and its suspension following the 2004 sample year, as line intercept cover for trees has not been observed on other sites (**Figure 3.14**). Tree density exhibited a notable decrease between 2004 and 2009, again due to the suspension of the Harmony Flat site. Juniper has been recorded in density data on the other three studies in the years following the suspension of Harmony Flat, but in low amounts (**Figure 3.17**).

<u>Herbaceous Understory</u>: Total average herbaceous cover and frequency have fluctuated from year to year but have increased overall. Perennial grasses have been the primary component of the herbaceous understories according to average cover and frequency data. However, site-level data indicates that this trend is in large part driven by needle and thread (*Hesperostipa comata*) on the Ruin Park study. Annual grasses have contributed notable cover and/or frequency in many sample years, particularly 1999, 2019, and 2024. These annual grass flushes can mainly be attributed to the introduced species cheatgrass (*Bromus tectorum*) on the Black Mesa study and, in 2024, on Lower Ballies as well. Annual forbs were present with notable cover and abundance in 2019 on both Ruin Park and Black Mesa. However, both annual forbs and their perennial counterparts have otherwise remained rare throughout the study period (**Figure 3.25**, **Figure 3.27**).

<u>Occupancy</u>: Pellet transect data shows that average occupancy of these sites has decreased overall despite yearly fluctuations; the decrease between 2019 and 2024 is largely due to deer on the Black Mesa study. Deer have been the primary occupants of these study sites throughout the sample period, with a mean pellet group abundance fluctuating between 6 days use/acre in 2014 and 51 days use/acre in 2009. Average cattle pellet group abundance has ranged from 1 days use/acre in 2014 to 27 days use/acre in 1999. Finally, elk have also been present with a mean pellet group abundance as low as 0 days use/acre in 2014 and 2024 and as high as 5 days use/acre in 2009 (**Figure 3.29**).

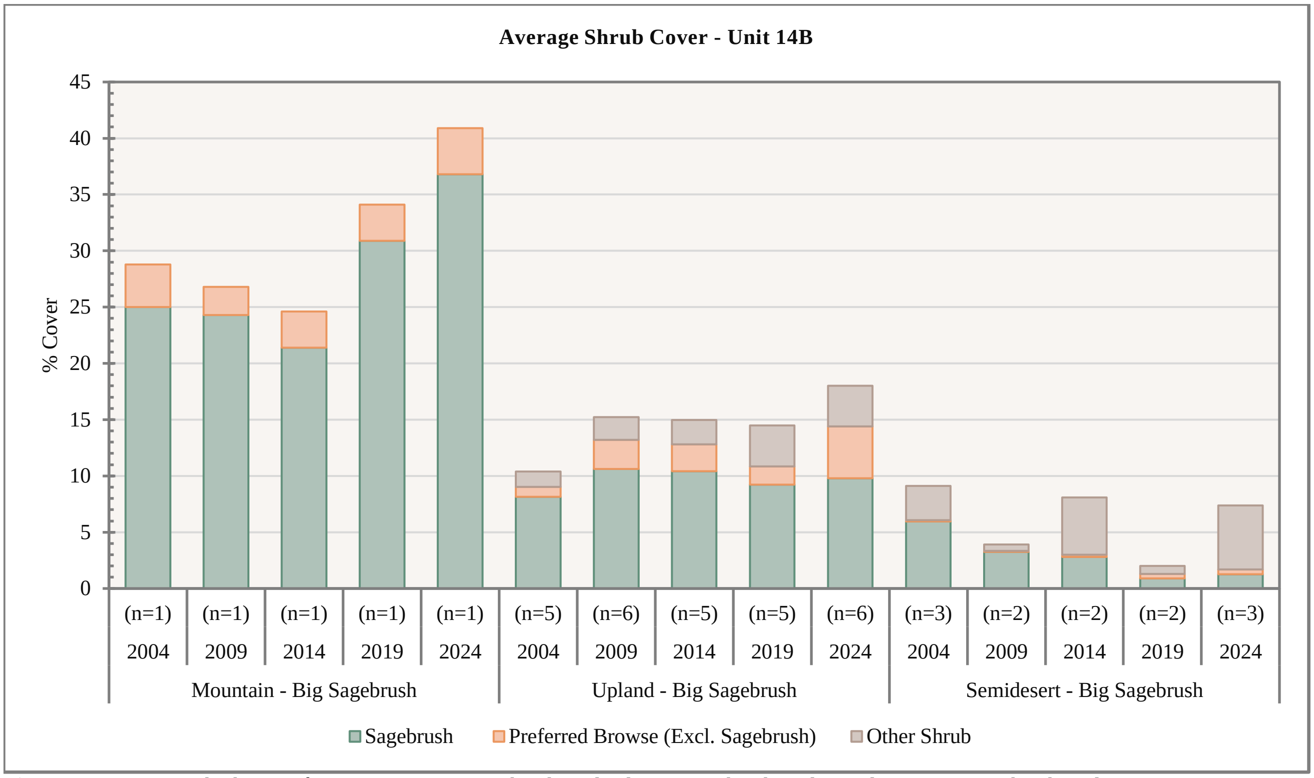


Figure 3.11: Average shrub cover for Mountain - Big Sagebrush, Upland - Big Sagebrush, and Semidesert - Big Sagebrush study sites in WMU 14B, Elk Ridge.

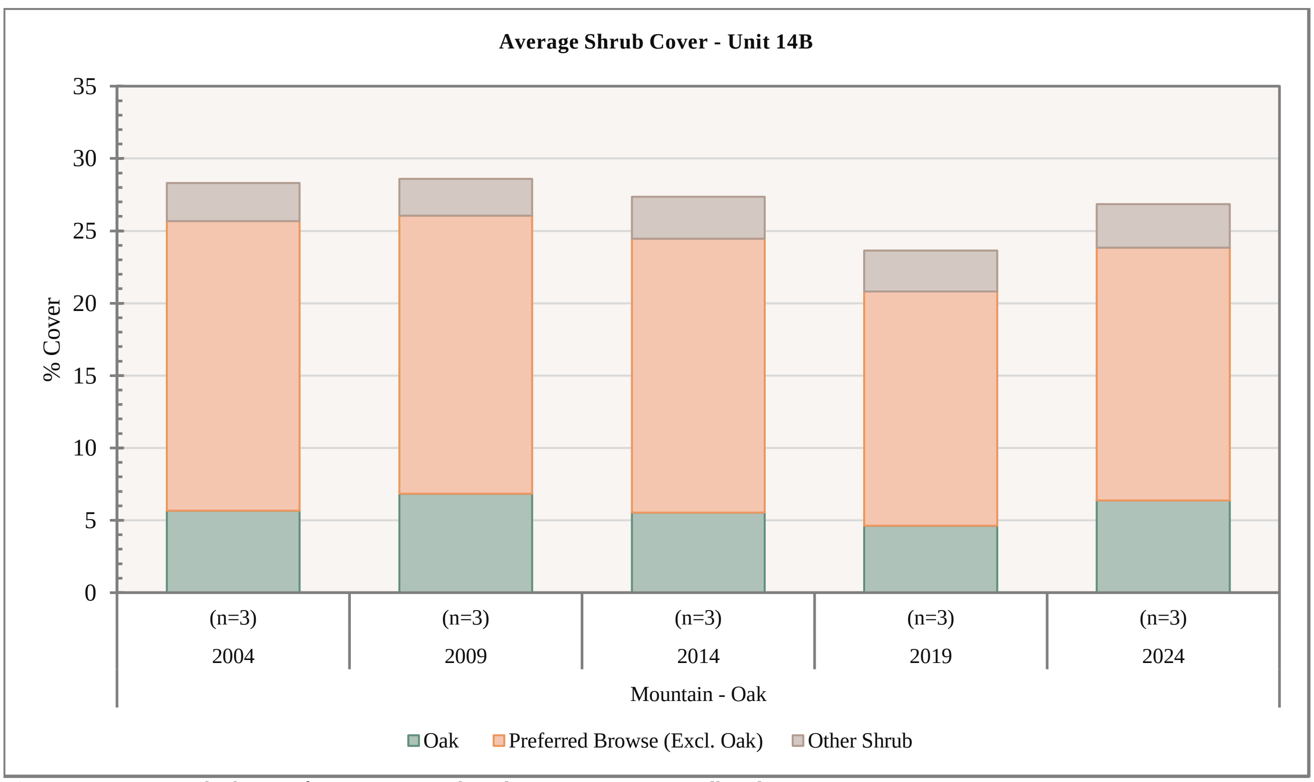


Figure 3.12: Average shrub cover for Mountain - Oak study sites in WMU 14B, Elk Ridge.

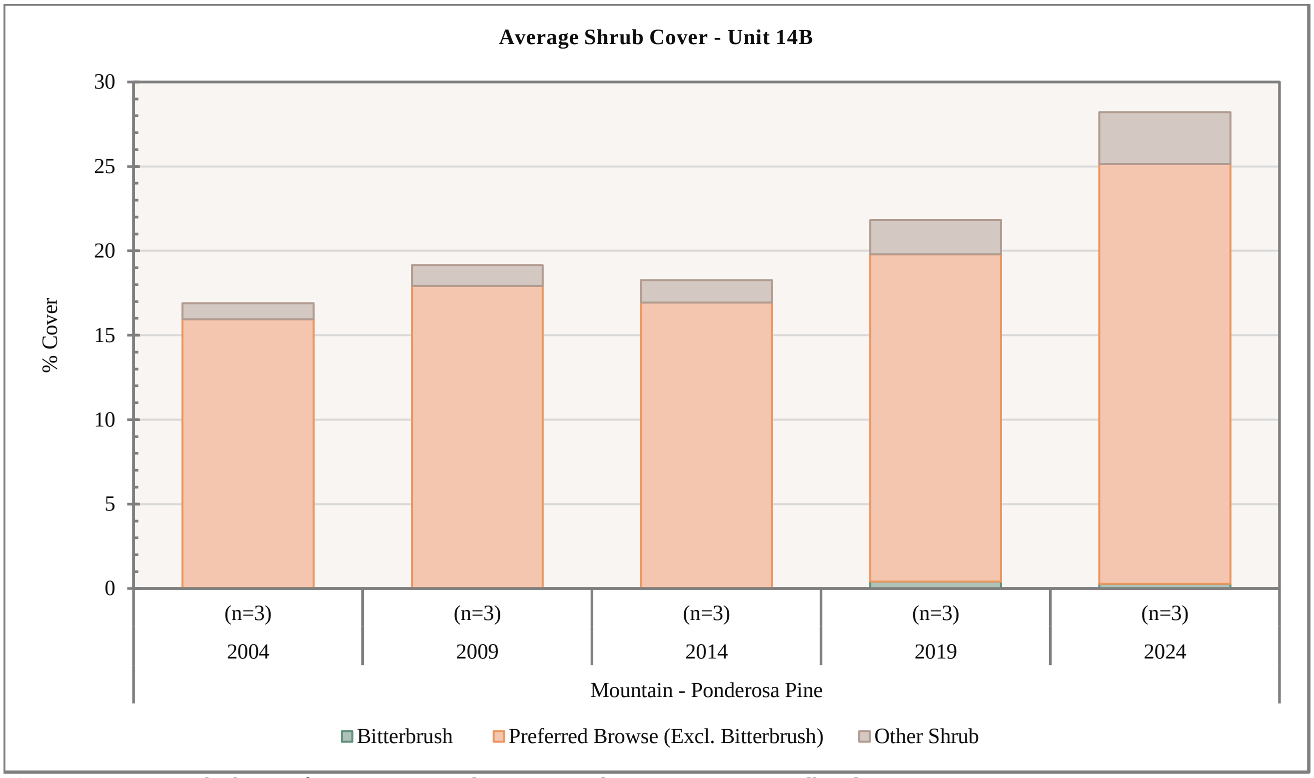


Figure 3.13: Average shrub cover for Mountain - Ponderosa Pine study sites in WMU 14B, Elk Ridge.

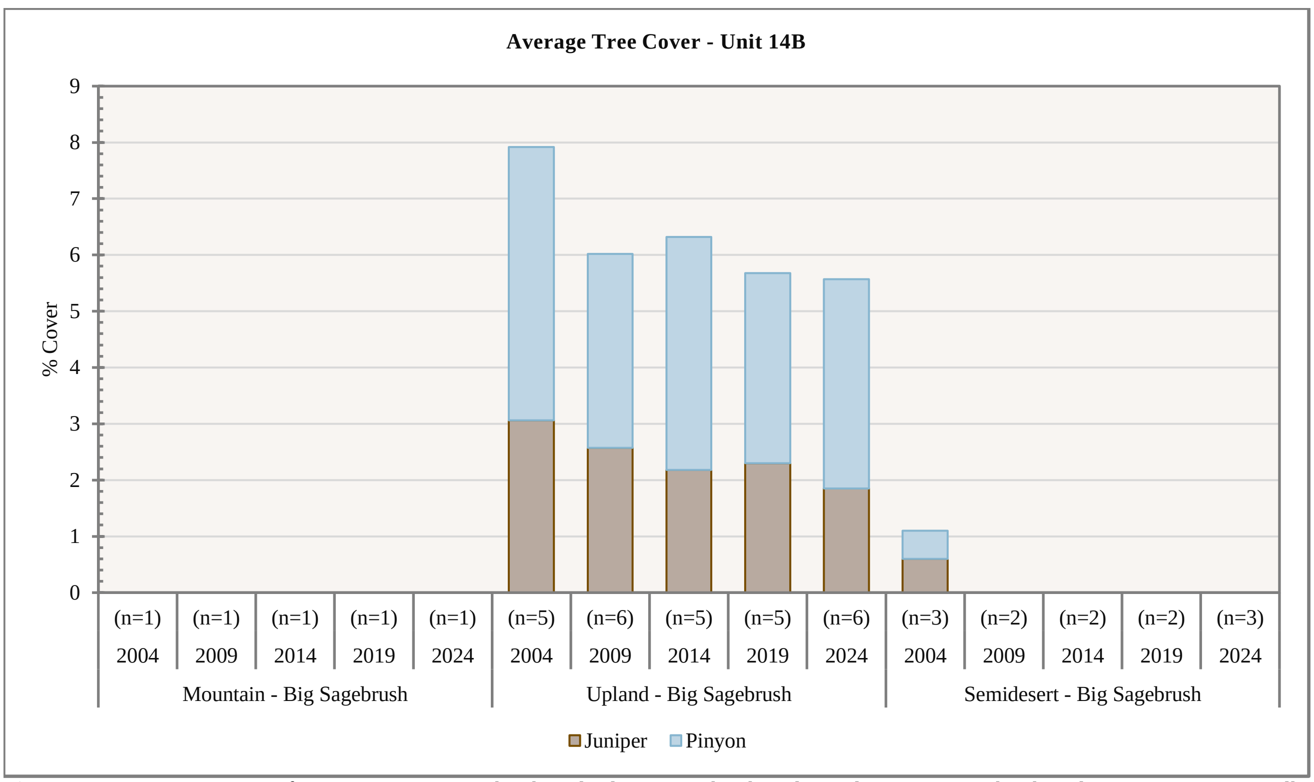


Figure 3.14: Average tree cover for Mountain - Big Sagebrush, Upland - Big Sagebrush, and Semidesert - Big Sagebrush study sites in WMU 14B, Elk Ridge.

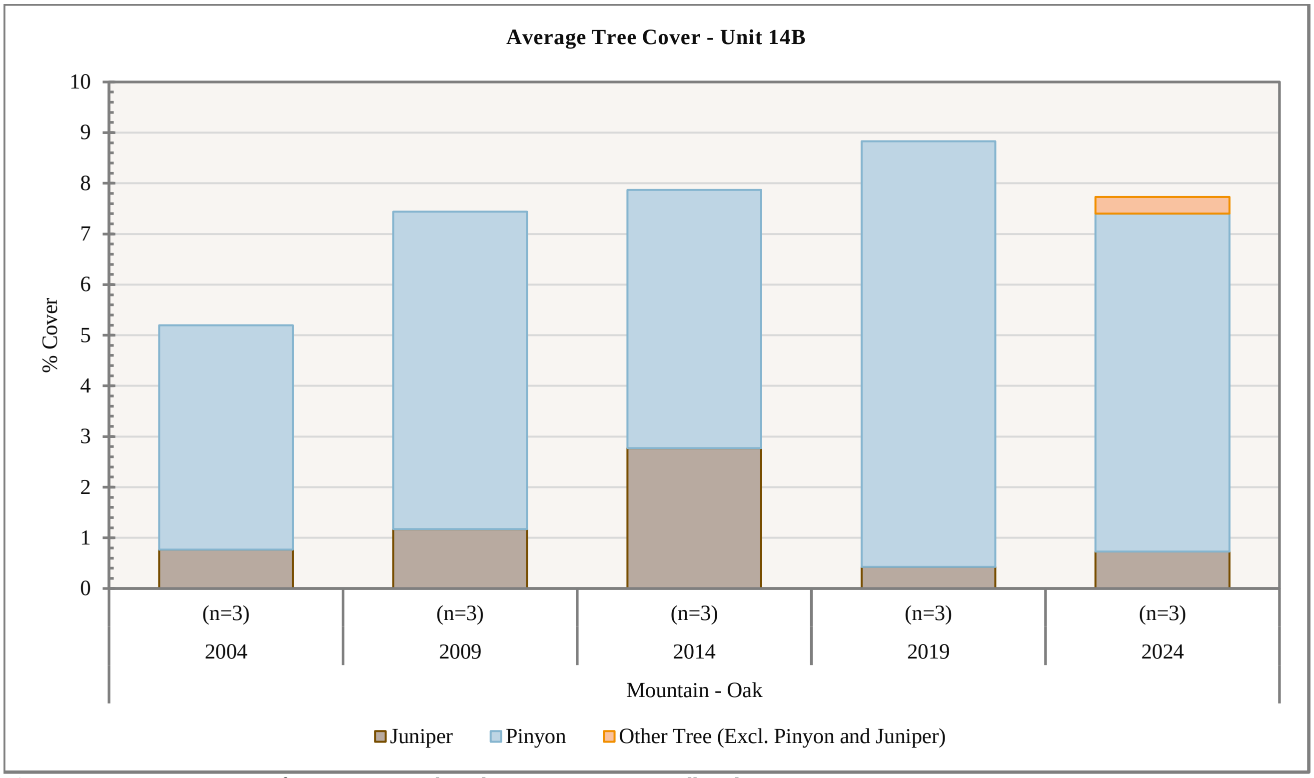


Figure 3.15 Average tree cover for Mountain - Oak study sites in WMU 14B, Elk Ridge.

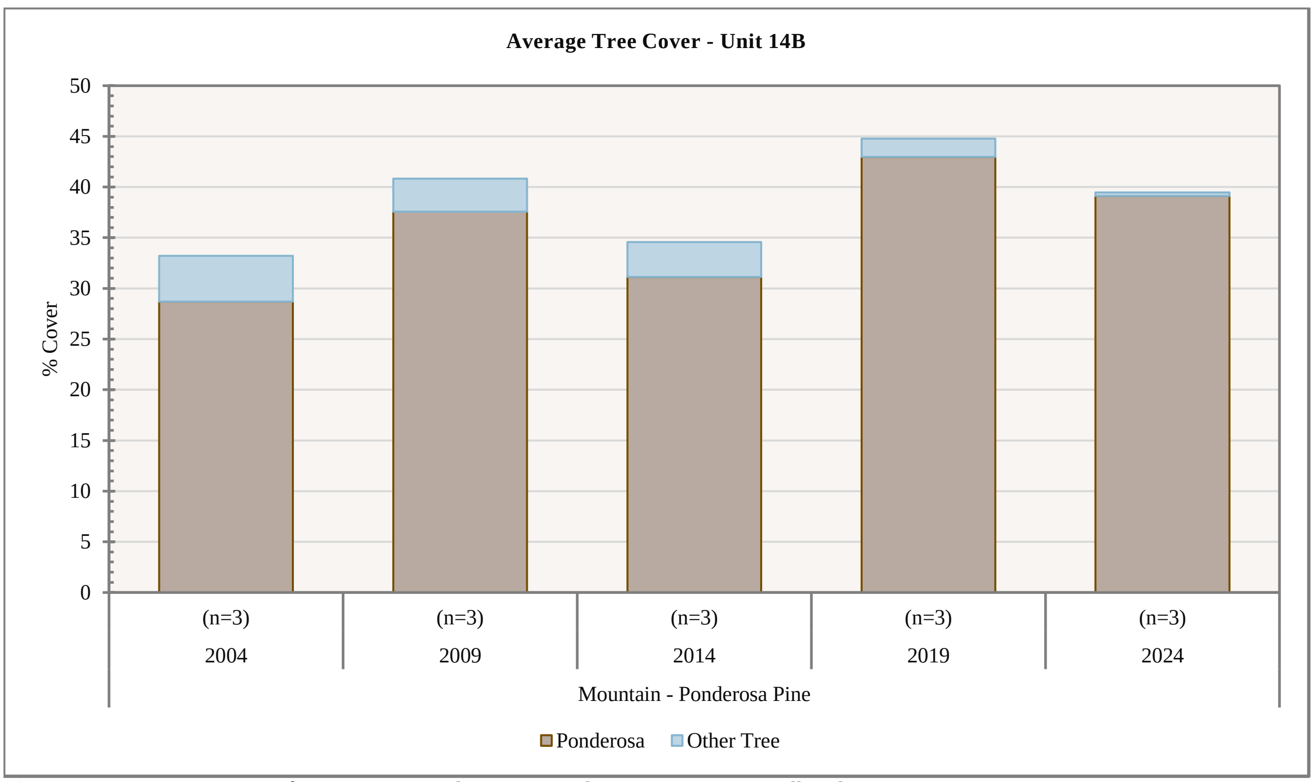


Figure 3.16: Average tree cover for Mountain - Ponderosa Pine study sites in WMU 14B, Elk Ridge.

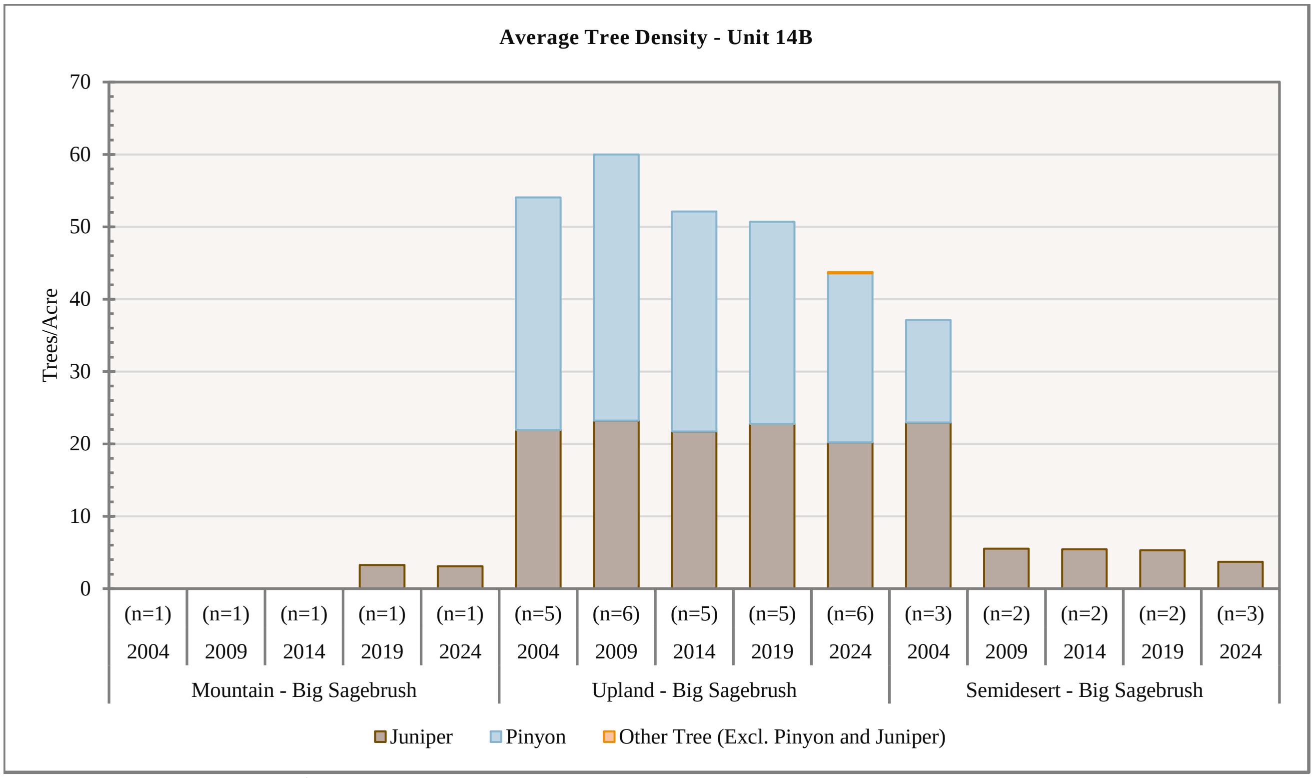


Figure 3.17: Average tree density for Mountain - Big Sagebrush, Upland - Big Sagebrush, and Semidesert - Big Sagebrush study sites in WMU 14B, Elk Ridge.

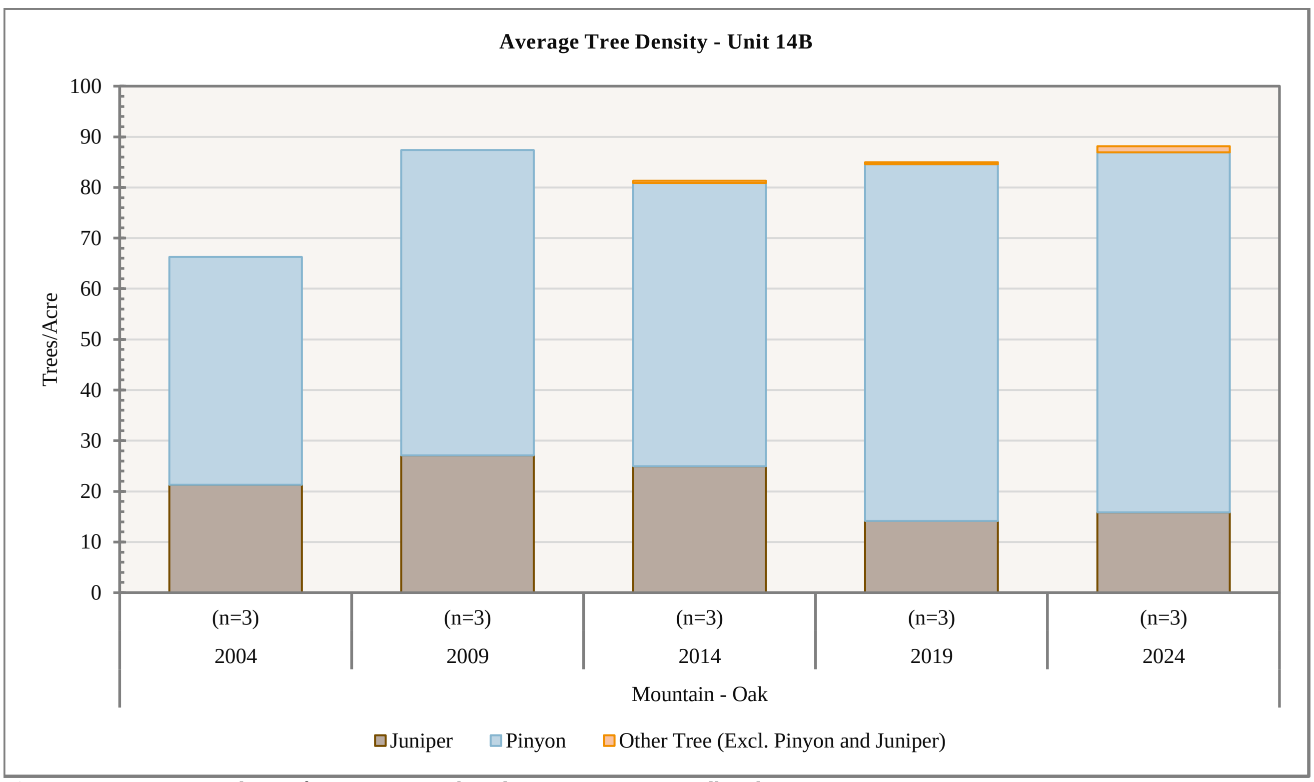


Figure 3.18: Average tree density for Mountain - Oak study sites in WMU 14B, Elk Ridge.

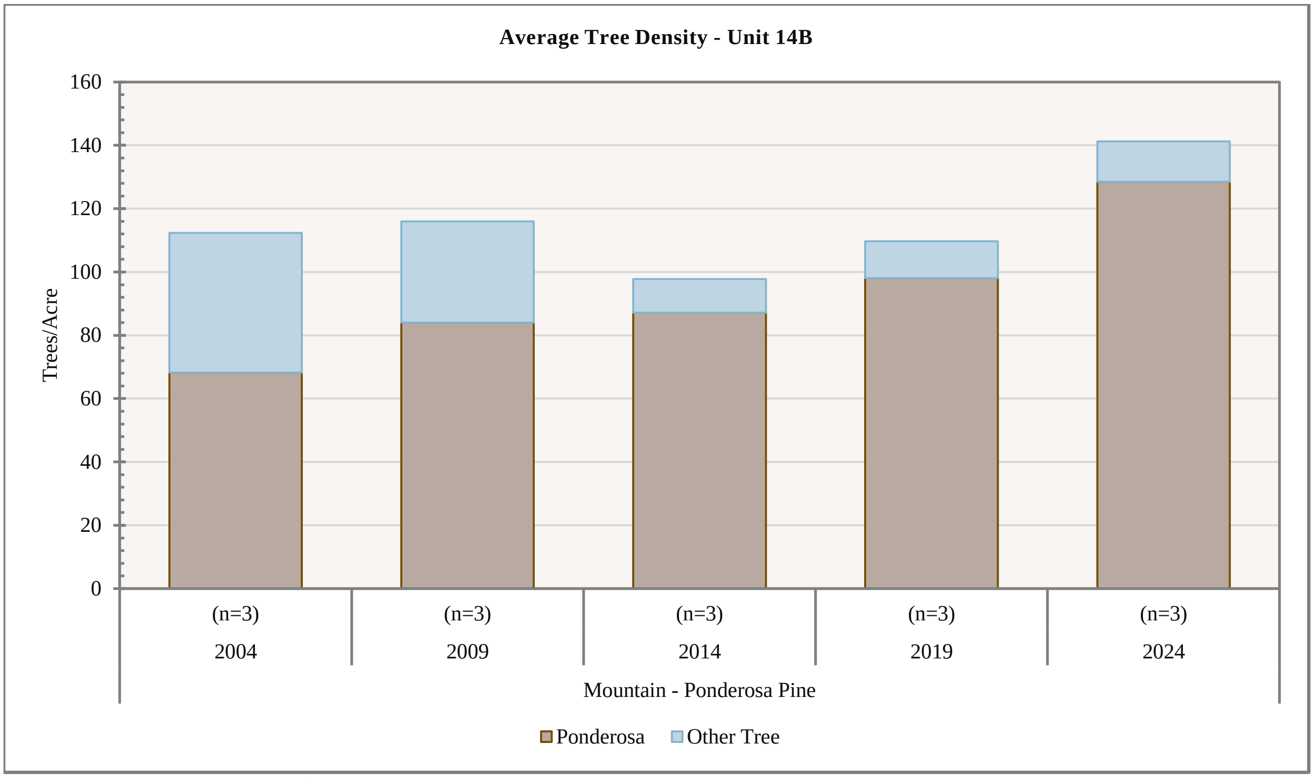


Figure 3.19: Average tree density for Mountain - Ponderosa Pine study sites in WMU 14B, Elk Ridge.

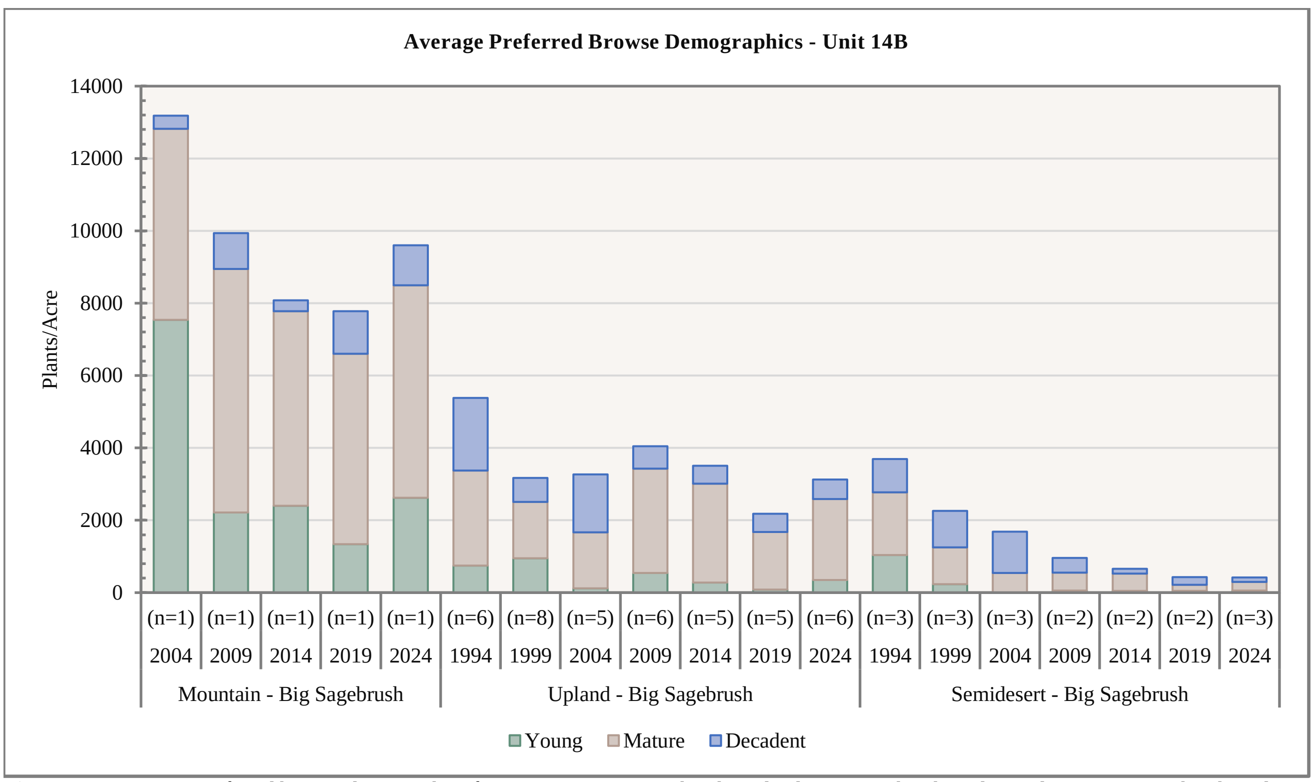


Figure 3.20: Average preferred browse demographics for Mountain - Big Sagebrush, Upland - Big Sagebrush, and Semidesert - Big Sagebrush study sites in WMU 14B, Elk Ridge.

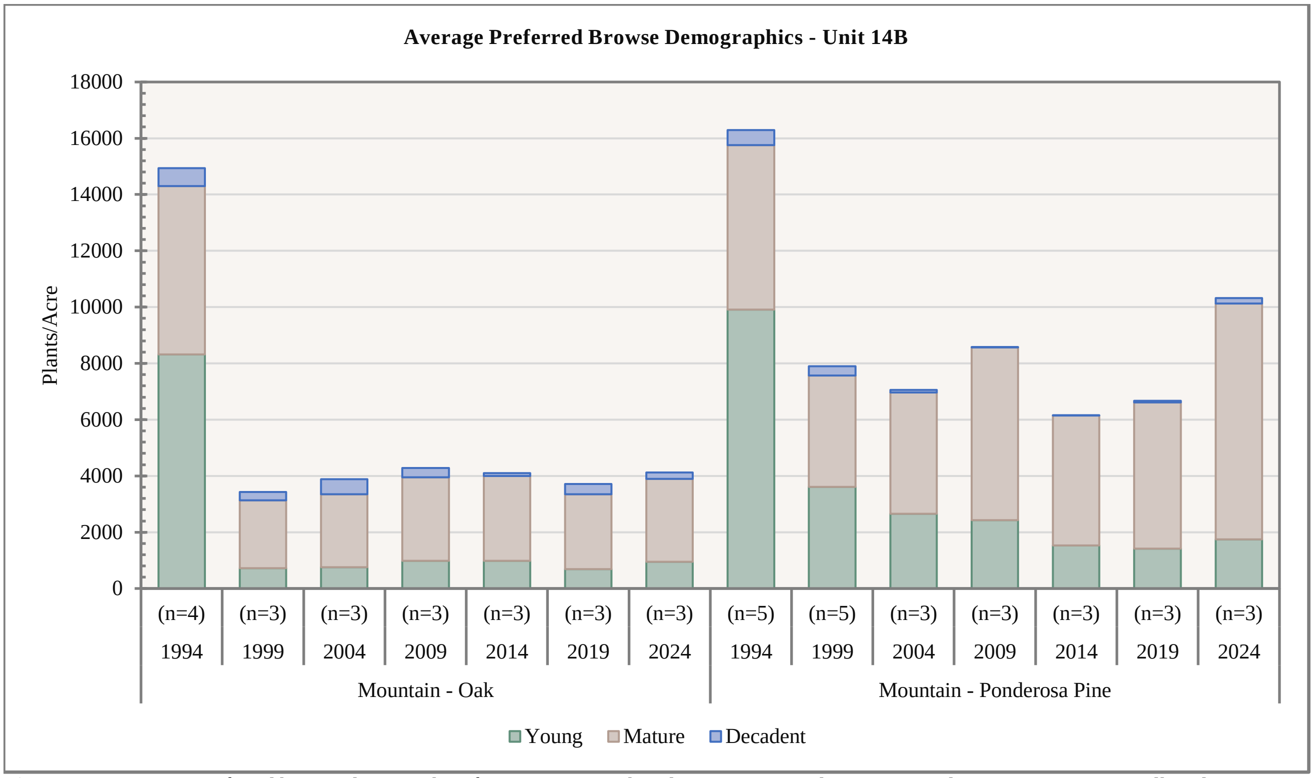


Figure 3.21: Average preferred browse demographics for Mountain - Oak and Mountain - Ponderosa Pine study sites in WMU 14B, Elk Ridge.

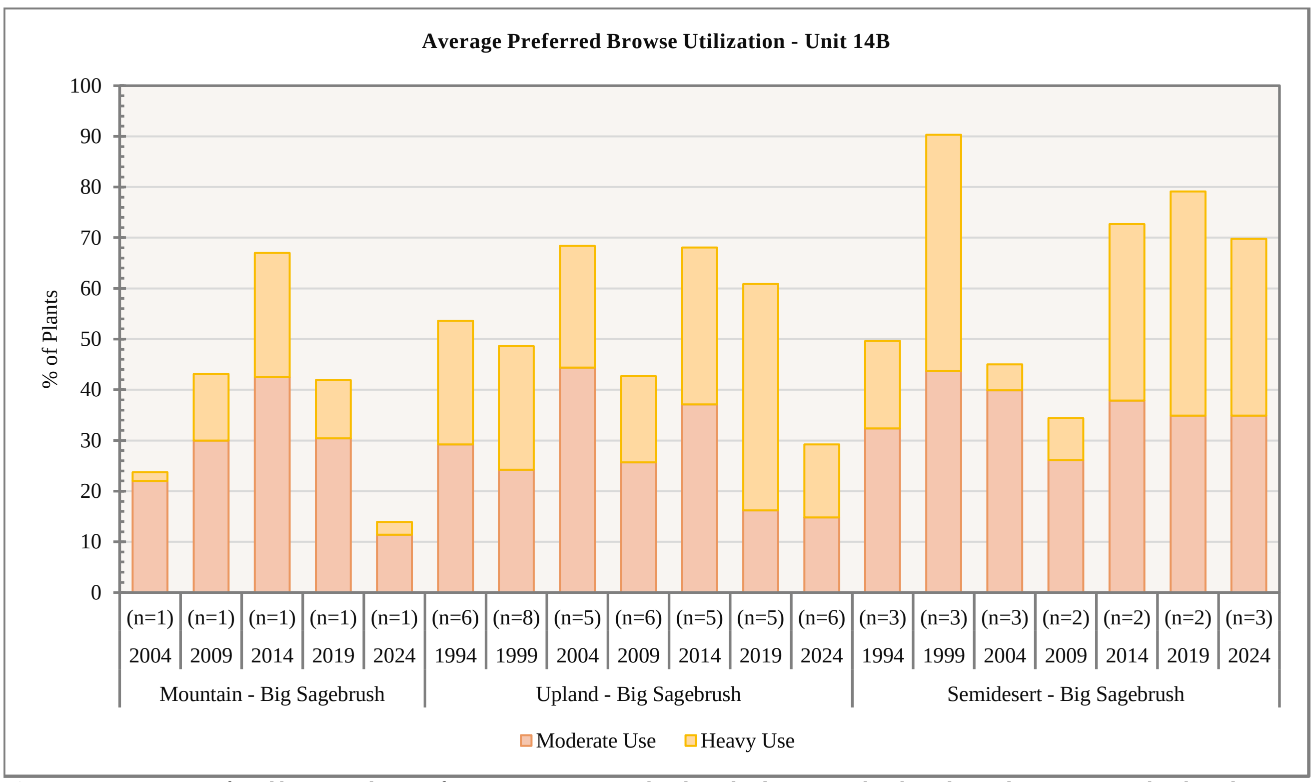


Figure 3.22: Average preferred browse utilization for Mountain - Big Sagebrush, Upland - Big Sagebrush, and Semidesert - Big Sagebrush study sites in WMU 14B, Elk Ridge.

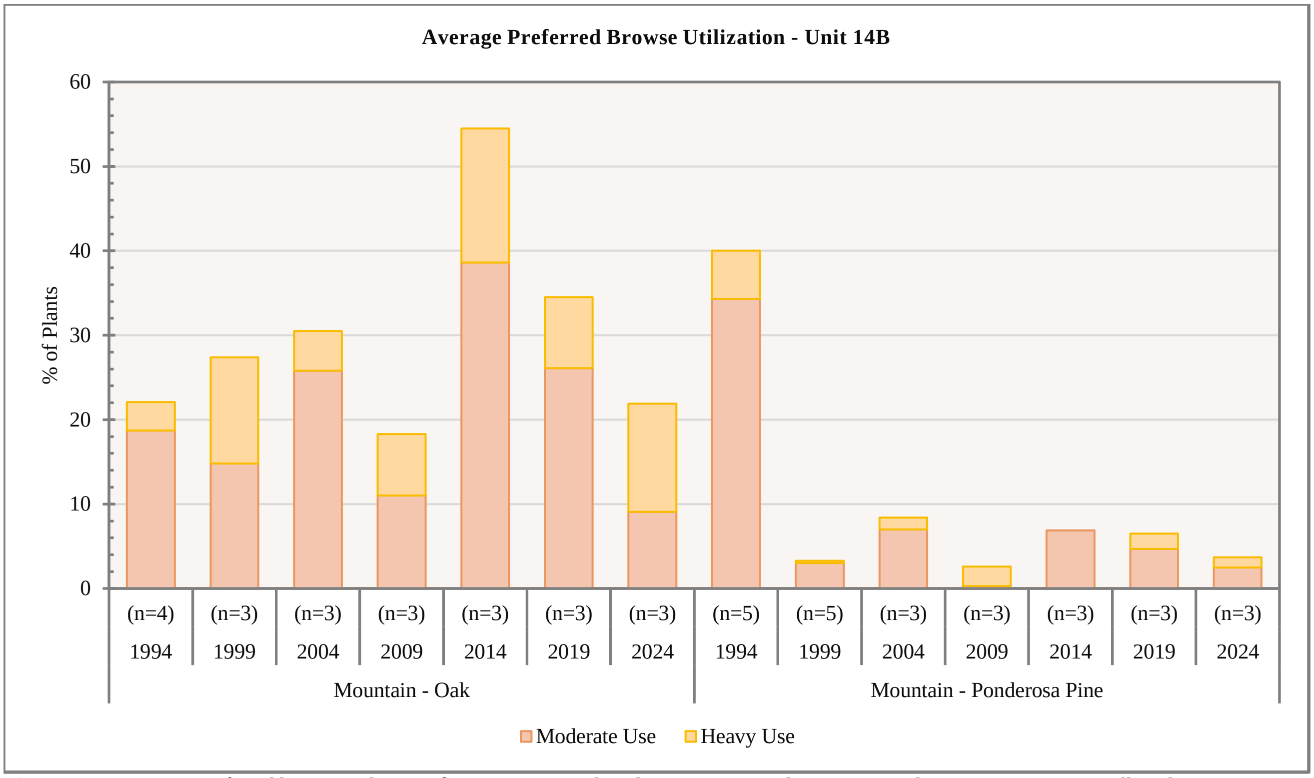


Figure 3.23: Average preferred browse utilization for Mountain - Oak and Mountain - Ponderosa Pine study sites in WMU 14B, Elk Ridge.

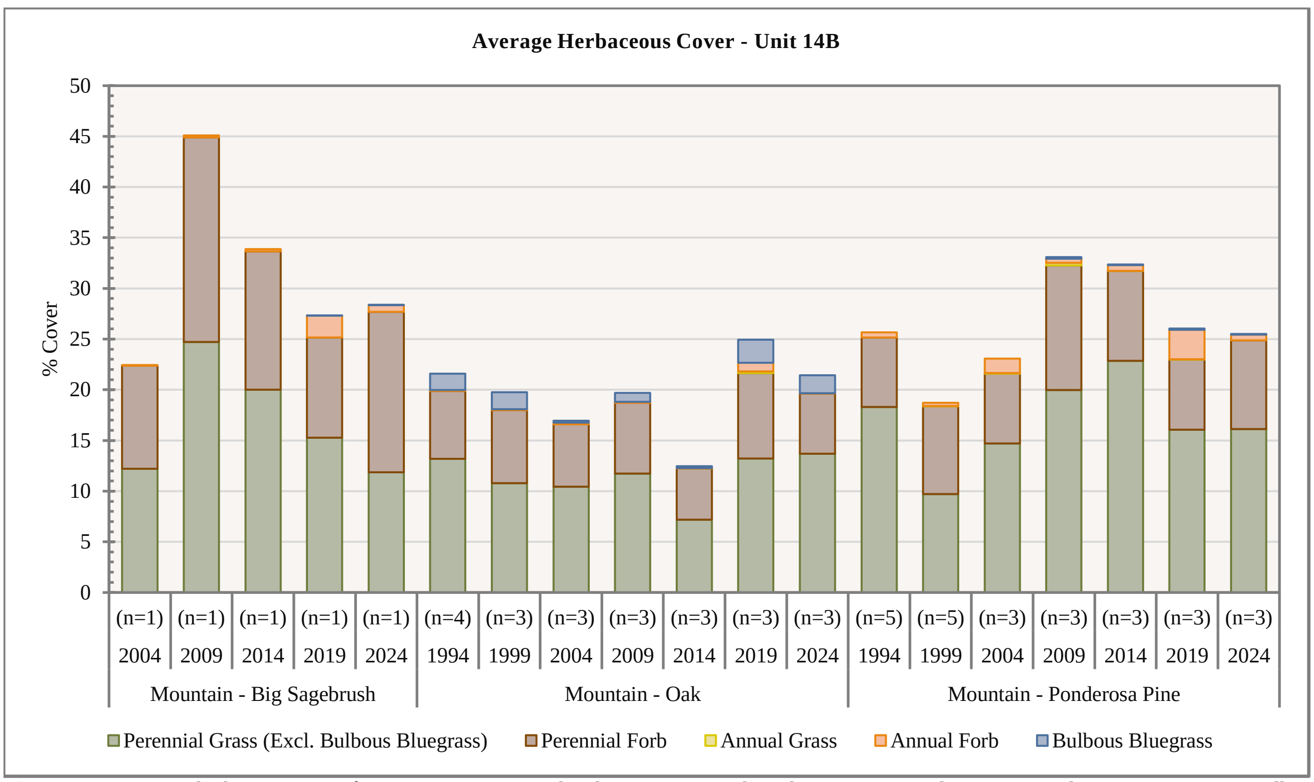


Figure 3.24: Average herbaceous cover for Mountain - Big Sagebrush, Mountain - Oak, and Mountain - Ponderosa Pine study sites in WMU 14B, Elk Ridge.

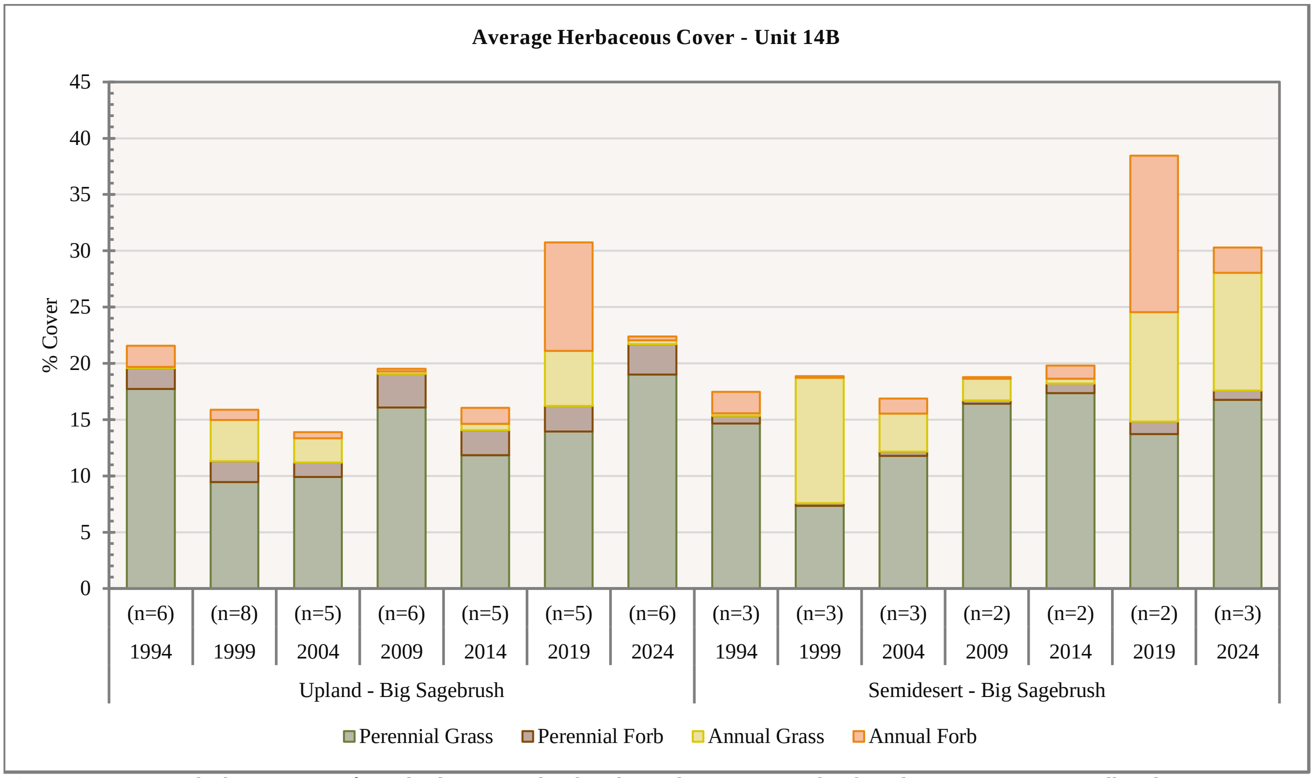


Figure 3.25: Average herbaceous cover for Upland - Big Sagebrush and Semidesert - Big Sagebrush study sites in WMU 14B, Elk Ridge.

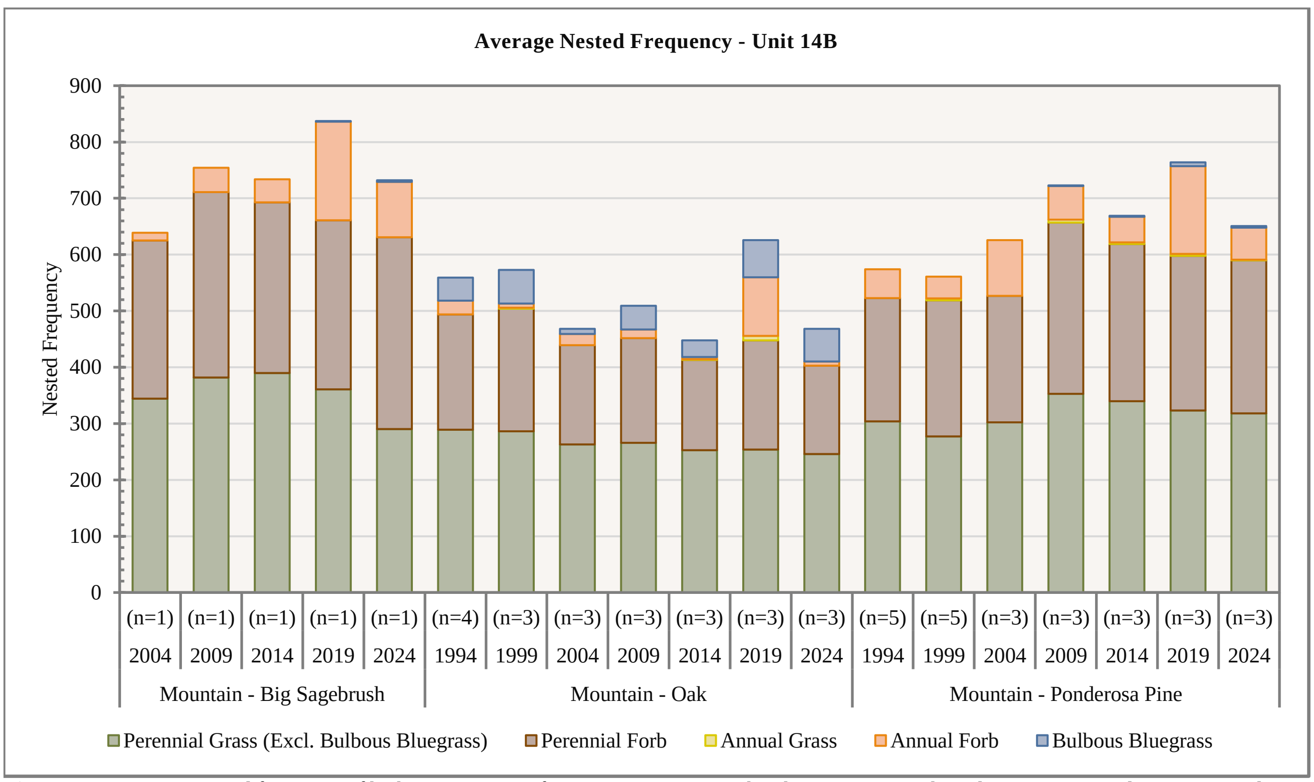


Figure 3.26: Average nested frequency of herbaceous species for Mountain - Big Sagebrush, Mountain - Oak, and Mountain - Ponderosa Pine study sites in WMU 14B, Elk Ridge.

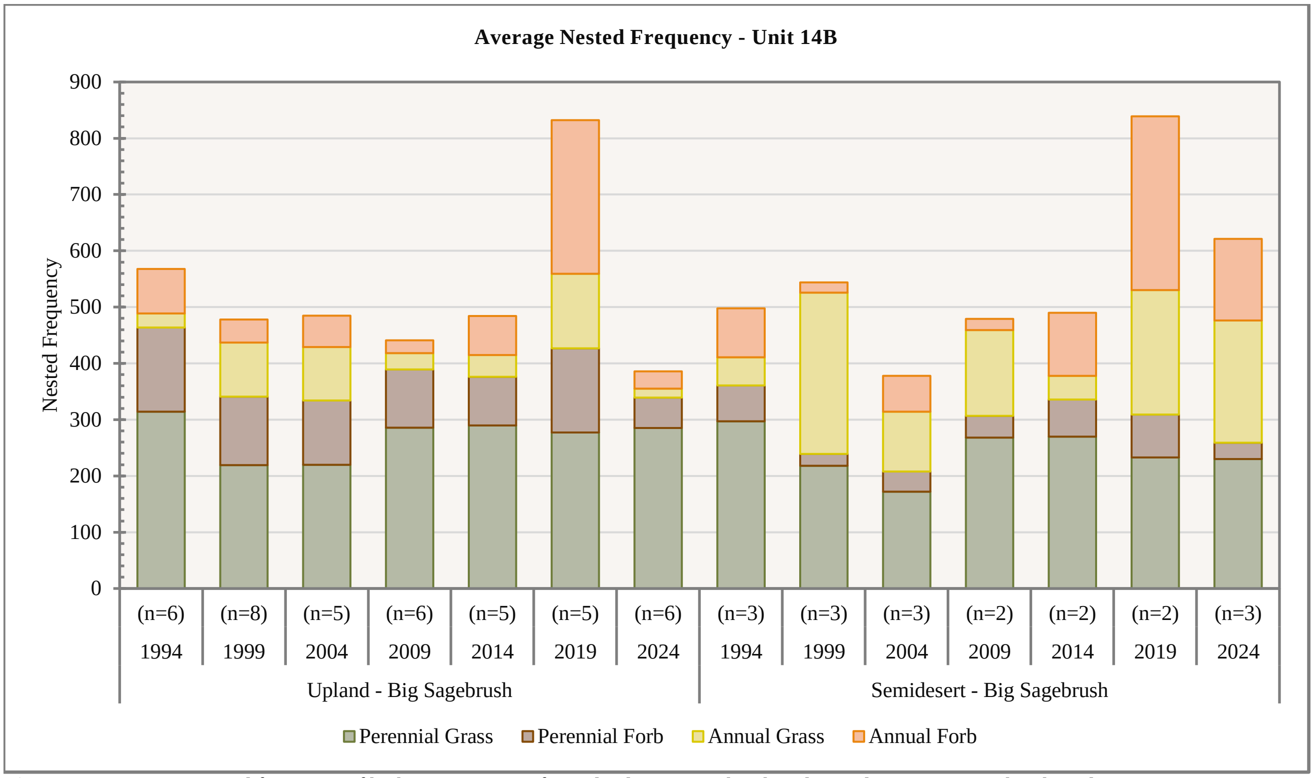


Figure 3.27: Average nested frequency of herbaceous species for Upland - Big Sagebrush and Semidesert - Big Sagebrush study sites in WMU 14B, Elk Ridge.

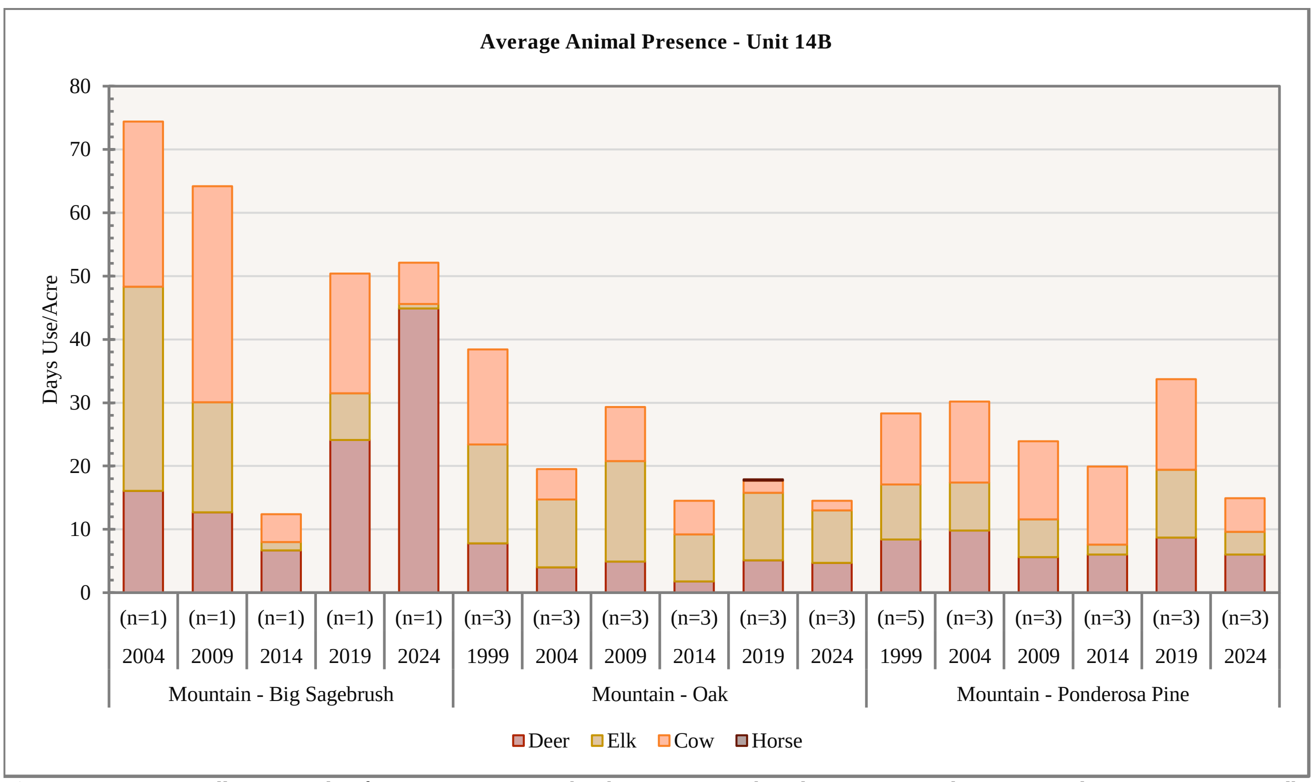


Figure 3.28: Average pellet transect data for Mountain - Big Sagebrush, Mountain - Oak, and Mountain - Ponderosa Pine study sites in WMU 14B, Elk Ridge.

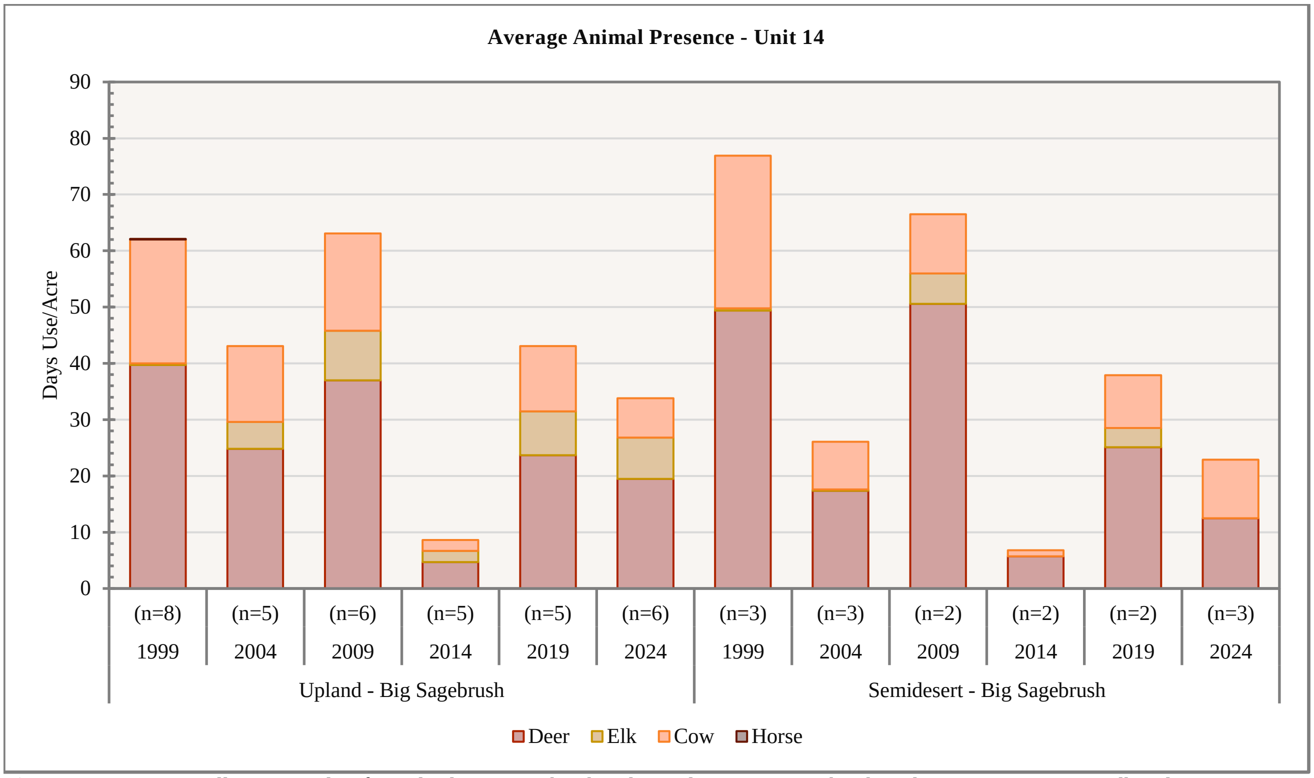


Figure 3.29: Average pellet transect data for Upland - Big Sagebrush and Semidesert - Big Sagebrush study sites in WMU 14B, Elk Ridge.

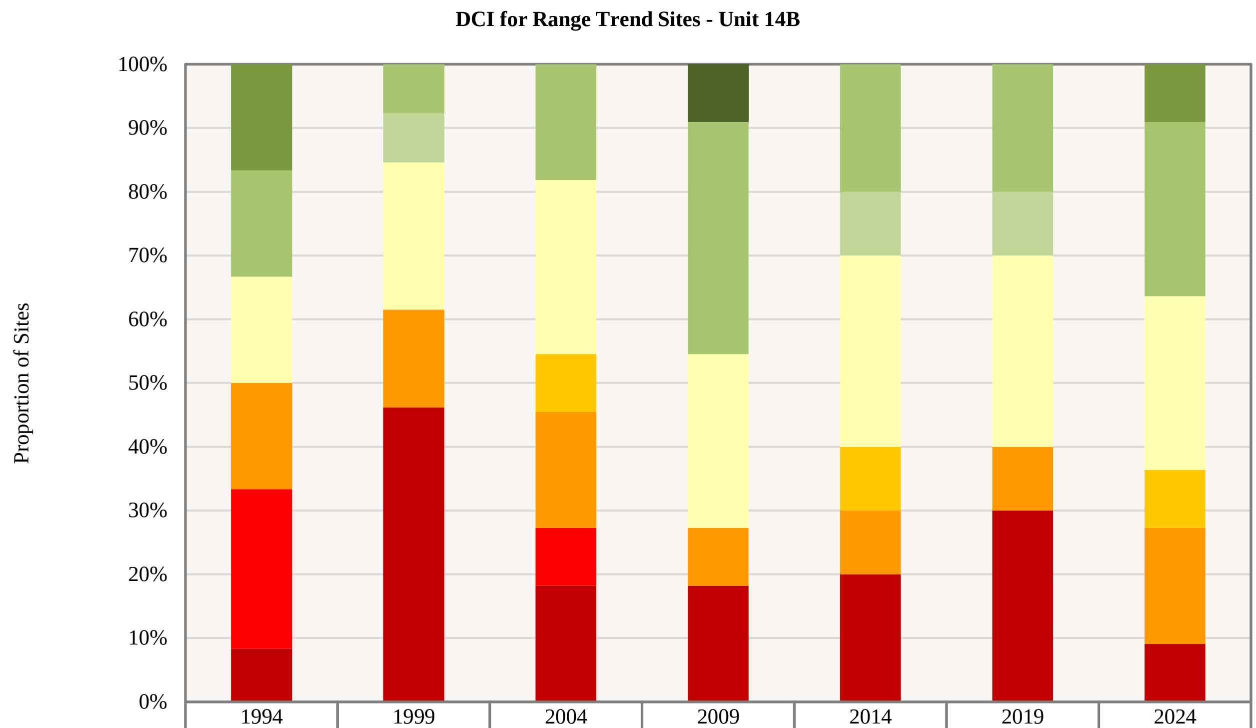
Deer Winter Range Condition Assessment

The overall condition of deer winter and transitional range on the Elk Ridge Management Unit (**Map 3.2**) has slightly improved from poor-fair conditions in 1994 to fair conditions in 2024. Mormon Pasture Point (14B-27), Dry Mesa (14B-36), and Beef Basin Wash (14B-39) are the main drivers for the unit's wintering habitat suitability and quality, and average between poor-fair and fair-good condition for deer winter range. Lower Lost Park (14B-16) (suspended), Deer Flat (14B-17) (suspended), South Plain (14B-23), North Cottonwood (14B-28) (suspended), Salt Creek Mesa (14B-29) (suspended), Arch Canyon (14B-38), and Lower Ballies (14B-42) are/have been considered to have very poor and poor (respective) wintering habitat condition consistently from year to year: these poor conditions suppress the unit's overall quality of winter habitat. Range Trend sites in WMU 14B that tend to have higher winter habitat variability include Black Mesa (14B-13), Texas Flat (14B-14) (suspended), Harmony Flat (14B-15) (suspended), Wild Cow Point (14B-22), and Arch Canyon (14B-38). This variability may suggest a higher potential for winter range improvement, but it may also suggest some instability in each community's resistance and resilience to state transitions. All of these sites appear to exhibit declining winter habitat condition overall but may experience the most improvement if treatments were applied in these areas.

The overall deer winter range assessment in 2024 for WMU 14B was that the unit is in fair condition with most sites ranging between fair and good-excellent condition. However, Black Mesa, Wild Cow Point, Arch Canyon, and Lower Ballies remain between very poor and poor-fair condition due to low amounts of preferred browse and lack of perennial grass and forbs. Black Mesa and Lower Ballies have particularly high amounts of cheatgrass (*Bromus tectorum*). Furthermore, caution should be used when implementing landscape-scale treatments for habitat improvement in the Black Mesa and Lower Ballies areas due to their respective communities' low productivity or resilience to change in the long term (**Figure 3.30**, **Table 3.7**).

Range Trend studies are also conducted by DWR to evaluate elk habitat health and trend. While these Range Trend study sites primarily monitor mule deer range conditions and principally target wintering areas, evaluating the condition of these winter ranges may still provide valuable insights into the overall health and suitability of elk habitats (**Map 3.3**). General evaluations of elk habitat may be made using the mule deer winter range Desirable Component Index (DCI) and other vegetation data when the associated study sites intersect currently mapped elk habitat. The DCI was created as an indicator of the general health of winter ranges for mule deer; the index incorporates shrub cover, density, and age composition as well as other key vegetation variables. Changes in DCI suggest changes in winter range capacity. However, the relationship between DCI and the changes in elk carrying capacity is difficult to quantify and is not known.

Again, the unit's wintering suitability and quality for elk is likely similar to deer winter range conditions. It should be noted that the DCI graph and table associated with this section (**Figure 3.30**, **Table 3.7**) illustrates the number of Range Trend sites within mule deer winter or transitional range. As such, the number of Range Trend sites considered to be elk habitat will not coincide with those depicted in said graph and table (**Figure 3.30**, **Table 3.7**). Study sites that intersect/have intersected elk winter habitat include Texas Flat, Harmony Flat, Lower Lost Park, Deer Flat, Wild Cow Point, Mormon Pasture Point, North Cottonwood, Salt Creek Mesa, Milk Ranch Point (14B-30), Chippean Ridge (14B-31), Lower Deer Flat (14B-32), Dry Mesa, Arch Canyon, and Beef Basin Wash. The overall condition of elk winter range within the Elk Ridge Management Unit has improved since 1994. Average unit conditions improved from poor-fair in 1994 to fair-good in 2024. The sites with elevated suitability – between fair-good and good-excellent – include Mormon Pasture Point, Milk Ranch Point, Chippean Ridge, Lower Deer Flat, Dry Mesa, and Beef Basin Wash. As of 2024, Wild Cow Point, Lower Deer Flat, and Arch Canyon are between poor and fair wintering habitat conditions for elk. Habitat improvements for these three sites can be accomplished by increasing cover for preferred browse and perennial forbs. Arch Canyon would benefit from increases in native perennial grass cover and recruitment of young browse plants (**Figure 3.30**, **Table 3.7**). These are also areas where reductions in pinyon and juniper tree cover would improve habitat conditions.



	1994	1999	2004	2009	2014	2019	2024
Excellent				1			
Good-Excellent	2						1
Good	2	1	2	4	2	2	3
Fair-Good		1			1	1	
Fair	2	3	3	3	3	3	3
Poor-Fair			1		1		1
Poor	2	2	2	1	1	1	2
Very Poor-Poor	3		1				
Very Poor	1	6	2	2	2	3	1

Figure 3.30: Deer winter range Desirable Components Index (DCI) summary by year of Range Trend sites for WMU 14B, Elk Ridge.

Study Number	Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
14B-13	1992	9.8	-2.1	9.7	18.8	-0.1	3.3	0	**39.4**	**F**
14B-13	1994	15.2	3.3	13.1	17.7	-0.5	0.6	0	**49.4**	**G**
14B-13	1999	5.9	0	0	7.6	-9.2	0.3	0	**4.6**	**VP**
14B-13	2004	6.3	0	0	24.1	-7.5	1.5	0	**24.4**	**P-F**
14B-13	2009	8.1	-0.4	0.7	21.8	-2.4	1	0	**28.8**	**F**
14B-13	2014	7	7.7	3.8	16.2	-0.7	0.8	0	**34.8**	**F**
14B-13	2019	2.4	0	0	2.2	-14	1.7	0	**-7.7**	**VP**
14B-13	2024	3.5	0	0	22.9	-8.2	2.1	0	**20.3**	**P**
14B-14*	1992	0.5	0	0	30	0	10	-2	**38.5**	**P**
14B-14*	1994	3	0	0	30	0	3.6	0	**36.6**	**VP-P**
14B-14*	1999	1.4	0	0	30	0	10	0	**41.4**	**P**
14B-14*	2004	7.1	3.5	2	25	0	6	0	**43.6**	**P**
14B-14*	2009	10.8	10.2	13.8	30	0	4.9	0	**69.7**	**G**
14B-15*	1992	11	14.2	15	14.2	0	0.3	0	**54.7**	**G**
14B-15*	1999	14.7	6	4.7	17	0	0.1	0	**42.5**	**F**
14B-15*	2004	16.1	-6.7	0	1	-0.1	0.4	0	**10.7**	**VP-P**

Study Number	Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
14B-16*	1992	22.3	-5.4	0.7	3.3	-0.2	7.2	-2	**25.9**	**VP**
14B-16*	1999	18.7	1.2	0.2	3.7	-1.6	6.6	0	**28.8**	**VP**
14B-16*	2004	13.6	2.3	0	1.3	-0.6	2.8	0	**19.4**	**VP**
14B-16*	2009	19.4	2.4	0.8	0.3	0	7	0	**29.9**	**VP**
14B-17*	1992	1.9	0	0	30	0	3	0	**34.9**	**VP-P**
14B-17*	1999	4.1	0	0	30	0	6	0	**40.1**	**P**
14B-22	1992	23.6	10	12.4	30	0	5.9	0	**81.9**	**G-E**
14B-22	1999	17.8	10.5	4.2	30	0	3.8	0	**66.3**	**F-G**
14B-22	2004	16.4	3.9	1.2	19.6	0	2.3	0	**43.4**	**P**
14B-22	2009	19	9.6	1.9	30	0	1.3	0	**61.8**	**F**
14B-22	2014	14.9	4.3	0.4	25.5	0	0.6	0	**45.7**	**P**
14B-22	2019	13	7	1.9	28.9	-0.1	3.7	0	**54.4**	**F**
14B-22	2024	12.6	4.3	2.2	30	0	0.9	0	**50**	**P-F**
14B-23	1992	6.8	-4.7	10.1	30	-0.1	0.5	0	**42.6**	**P**
14B-23	1999	3.4	0	0	7.2	-19.7	0.4	0	**-8.7**	**VP**
14B-23	2004	2.9	0	0	21.6	-7.2	0.4	0	**17.7**	**VP**
14B-23	2009	2.3	0	0	30	-0.9	0.7	0	**32.1**	**VP**
14B-23	2012	3.9	0	0	30	-0.9	0.6	0	**33.6**	**VP-P**
14B-23	2014	2.1	0	0	30	-2.1	2.8	0	**32.8**	**VP**
14B-23	2019	3.9	0	0	23.3	-15.7	1.7	0	**13.2**	**VP**
14B-23	2024	7.8	9.1	11.3	30	-1.5	0.2	0	**56.9**	**F**
14B-24	1992	5.8	0	0	30	0	3.2	0	**39**	**F**
14B-24	1999	2.4	0	0	19.5	-15.8	1.1	0	**7.2**	**VP**
14B-24	2004	0.4	0	0	30	0	0.4	0	**30.8**	**F**
14B-24	2009	0.3	0	0	30	-0.5	0.2	0	**30**	**F**
14B-24	2014	0.5	0	0	30	0	2.5	0	**33**	**F**
14B-24	2019	0.9	0	0	30	-0.6	2.7	0	**33**	**F**
14B-24	2024	1.1	0	0	30	0	1.5	0	**32.6**	**F**
14B-27	1992	5.5	0	0	30	0	7	0	**42.5**	**P**
14B-27	1999	7.1	12.6	10.4	30	0	4.5	0	**64.6**	**F**
14B-27	2004	20.4	13.9	12	30	0	7.5	0	**83.8**	**G**
14B-27	2009	18.2	12.9	11.7	30	0	10	0	**82.8**	**G**
14B-27	2014	15.5	14.7	15	16	0	7.2	0	**68.4**	**F-G**
14B-27	2019	5.5	14.8	13.7	30	0	10	0	**74**	**G**
14B-27	2024	13	14.7	14.6	30	0	6.9	0	**79.2**	**G**
14B-28*	1999	1.6	0	0	1.7	-0.2	4.1	0	**7.2**	**VP**
14B-29*	1992	2.2	0	0	30	0	2.6	0	**34.8**	**VP-P**
14B-29*	1999	4.5	0	0	20.2	0	4.3	0	**29**	**VP**
14B-29*	2004	7.4	15	15	8.7	0	6.7	0	**52.8**	**F**
14B-29*	2009	7.9	15	0	11.4	0	10	0	**44.3**	**P**
14B-29*	2014	7.4	0	0	14.6	0	4.8	0	**26.8**	**VP**
14B-29*	2019	18.7	14.6	0	10.4	0	4.1	0	**47.8**	**P**
14B-30	1992	30	13.6	15	19.9	0	10	0	**88.5**	**G-E**
14B-30	1999	29	13.4	11.9	14.8	0	10	0	**79.1**	**G**
14B-30	2004	30	12.6	14.5	15.7	0	10	0	**82.8**	**G**
14B-30	2009	30	13.4	15	15.6	0	10	0	**84**	**G**
14B-30	2014	30	14.7	10.4	8.6	0	10	0	**73.7**	**G**
14B-30	2019	30	12.9	10.4	16.2	0	10	0	**79.5**	**G**
14B-30	2024	30	12.6	12.1	14.6	0	10	0	**79.3**	**G**
14B-32	1994	15.9	9.5	4.1	25.4	-0.2	2	0	**56.7**	**F**
14B-32	1999	15.1	8.6	10.7	26.9	-0.6	1.7	0	**62.4**	**F**
14B-32	2004	17	3.2	3.5	30	-0.2	1.3	0	**54.8**	**F**
14B-32	2009	23.3	11.3	2.6	30	0	2.6	0	**69.8**	**G**
14B-32	2014	17.4	10.6	1.7	19.9	0	0.7	0	**50.3**	**P-F**
14B-32	2019	19	10.3	0	30	0	5.6	0	**64.9**	**F-G**
14B-32	2024	19.1	8.6	0	30	0	0.2	0	**57.9**	**F**
14B-36	2009	22.4	14.2	12.9	30	0	10	0	**89.5**	**E**
14B-36	2014	17.2	14	8.5	27.7	0	10	0	**77.4**	**G**
14B-36	2024	20.6	11.9	7.8	30	0	10	0	**80.3**	**G-E**

Study Number	Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
14B-38	2014	26.5	10.9	1.2	12.9	0	0.7	0	**52.2**	**F**
14B-38	2019	18	3.9	0	3.9	-0.3	5.7	0	**31.2**	**VP**
14B-38	2024	21.9	7.4	0.3	13.8	0	1.1	0	**44.5**	**P**
14B-39	2019	13.9	6.1	1.7	30	-2.2	5.9	0	**55.4**	**F**
14B-39	2024	23.5	10.8	12.6	30	0	0	0	**76.9**	**G**
14B-42	2024	1.8	0	0	14	-15.3	1.3	0	**1.8**	**VP**

Table 3.7: Deer winter range Desirable Components Index (DCI) information by site number of Range Trend studies for WMU 14B, Elk Ridge. VP = Very Poor, P = Poor, F = Fair, G = Good, E = Excellent. *Studies with an asterisk have been suspended.

Study #	Study Name	Limiting Factor and/or Threat	Level of Impact	Potential Impact
14B-13	Black Mesa	Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
		Drought		Lowered resilience and resistance to disturbance
14B-19	Woodenshoe	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
14B-20	Gooseberry	Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
14B-22	Wild Cow Point	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Medium	Reduced understory shrub and herbaceous vigor
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		Drought		Lowered resilience and resistance to disturbance
14B-23	South Plain	Animal Use – Cattle	Medium	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
		Drought		Lowered resilience and resistance to disturbance
14B-24	Ruin Park	Animal Use – Cattle	Medium	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
14B-27	Mormon Pasture Point	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
14B-30	Milk Ranch Point	Introduced Perennial Grass	Moderate	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
14B-31	Chippean Ridge	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
14B-32	Lower Deer Flat	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Animal Use – Cattle	Medium	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
14B-34	Big Flat	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
14B-36	Dry Mesa	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
14B-37	Kigalia Point II	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
14B-38	Arch Canyon	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
14B-39	Beef Basin Wash	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
14B-42	Lower Ballies	Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
		Drought		Lowered resilience and resistance to disturbance
14R-29	South Plain 2	Animal Use – Cattle	Medium	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
14R-31	Dark Canyon	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Medium	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
14R-33	Sego Spring 1	Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		Animal Use – Deer	High	Reduced/less vigorous browse component
		Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
14R-34	Sego Spring 2	Animal Use – Elk	High	Reduced shrub vigor/diversity of desirable grass and forb species
		Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species

Study #	Study Name	Limiting Factor and/or Threat	Level of Impact	Potential Impact
14R-37	Lower Wild Cow Point	PJ Encroachment Annual Grass	Medium Low	Reduced understory shrub and herbaceous vigor Increased fire potential and reduced herbaceous diversity
14R-38	Sweet Alice Spring	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
14R-39	Duck Lake	Introduced Perennial Grass PJ Encroachment	Medium Low	Reduced diversity of desirable grass and forb species Reduced understory shrub and herbaceous vigor
14R-40	Gooseberry North	Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species
14R-42	Brushy Flat	Annual Grass Introduced Perennial Grass Agriculture Noxious Weeds	High High Low Low	Increased fire potential and reduced herbaceous diversity Reduced diversity of desirable grass and forb species Fragmentation and degradation/loss of habitat Reduced diversity of desirable grass and forb species

Table 3.8: Assessment of the potential limiting factors and/or threats and level of threat to study sites for WMU 14B, Elk Ridge. All assessments are based off the most current sample date for each study site. Criteria for evaluating limiting factors is available in **Appendix A - Threat Assessment**.

Discussion and Recommendations

Deer winter range within the Elk Ridge Management Unit averages as being in fair condition as of the 2024 sample year. The presence of notable perennial grass communities on all studies positively influences the condition of winter range in this unit.

Severe droughts are defined as having a minimum of five consecutive years of below average soil moisture (The Nature Conservancy LANDFIRE Team, 2015). Though this area of the state experiences prolonged droughts, consecutive years of drought are typically interrupted by a single wet year. However, wet years have remained below "moderately wet" since 2005 (**Figure 3.1a**). Extended droughts have posed, and may still pose, a substantial threat to the sagebrush (*Artemisia* spp.) rangelands within this unit. Large drought-related die-offs of sagebrush on Ruin Park, Black Mesa, the South Plain and South Plain 2 study sites, and other key areas have reduced the quality of mule deer winter range. Future droughts could contribute to continued decreases of sagebrush, thereby inhibiting recovery. Furthermore, a lack of preferred browse cover and recruitment of young negatively contribute to these conditions. Shrub thinning is a typical response to severe drought either regionally or locally; shrub thinning for this unit appears to be local. Another indicator that a severe drought has occurred locally is the transition of some of these shrubland communities to early successional classes typically dominated by grasses (The Nature Conservancy LANDFIRE Team, 2015). Since local drought effects have been identified, Ruin Park, Beef Basin Wash, and the South Plain sites have had increases in fourwing saltbush (*Atriplex canescens*) and/or winterfat (*Krascheninnikovia lanata*). The South Plain sites and Black Mesa all have substantial populations of annual and perennial grasses, and the establishment of cheatgrass (*Bromus tectorum*) is also typical of post-disturbance episodes (The Nature Conservancy LANDFIRE Team, 2015). Cheatgrass is present in elevated amounts on the Black Mesa study as of 2024 (Lane, Cox, & Payne, 2025). Overall, these shrubland sites appear to be experiencing post-replacement recovery following local drought disturbances. These sites are either in mid to early development stages following drought that are identified by the presence of the indicator species needle and thread (*Hesperostipa comata*), which is present in the majority of these studies' understories (The Nature Conservancy LANDFIRE Team, 2015).

Introduced perennial grasses – including species such as intermediate wheatgrass (*Thinopyrum intermedium*), smooth brome (*Bromus inermis*), crested wheatgrass (*Agropyron cristatum*), Kentucky bluegrass (*Poa pratensis*), and bulbous bluegrass (*P. bulbosa*) – may be a concern in some areas of the Elk Ridge Management Unit. More than 40% of perennial grass cover in 2024 was provided by introduced species on the Dry Mesa, Lower Deer Flat, Milk Ranch, Mormon Pasture Point, and Wild Cow Point study sites. While they provide forage, introduced perennial grasses may outcompete other more desirable and/or native species for resources (Mack, et al., 2000; Oftinowski, Kenkel, & Catling, 2007). Furthermore, crested wheatgrass in particular can outcompete establishing, young shrubs (Gunnell, Monaco, Call, & Ransom, 2010). Crested wheatgrass and other introduced grasses are used in seed mixes due to their ability to stabilize disturbed soils and compete with cheatgrass. However, introduced species like crested wheatgrass are quite competitive with other native grasses, forbs, and shrubs and have the potential to suppress species diversity. Regardless, these seeded species have contributed to the overall recovery of wildlife habitat. Native perennial grasses –

including species such as needle and thread, sand dropseed (*Sporobolus cryptandrus*), and blue grama (*Bouteloua gracilis*) – are also common on this unit, but most abundant on Ruin Park and South Plain. In general, perennial grass on this unit does well and is a major contributor to the health of deer winter range.

Most communities sampled by Range Trend have little to no cheatgrass invasion occurring. However, in areas where notable cheatgrass invasion has been observed (Black Mesa and South Plain), cheatgrass levels are decreasing. Where there are decreases in cheatgrass cover and abundance, it may speak to the respective area's resilience to disturbance. However, the newly sampled site Lower Ballies had a notable population of cheatgrass established. Though cheatgrass presence appears to be low overall on this unit, it should be noted that the presence of annual grasses can increase fine fuel loads, exacerbate the risk of wildfire, and may even result in altered fire regimes (Balch, D'Antonio, & Gómez-Dans, 2013). This in turn can perpetuate and expand the removal of valuable reestablishing or extant browse communities. Should the affected sites burn, they may be at risk for the release of even greater amounts of cheatgrass and the increased fire frequency associated with annual grasses (Balch, D'Antonio, & Gómez-Dans, 2013; Bradley, 2018).

Some of the most notable or common community types on the Elk Ridge unit are those that are dominated by twoneedle pinyon (*Pinus edulis*) and juniper (*Juniperus* spp.). According to the LANDFIRE Existing Vegetation Type model, Colorado Plateau Pinyon-Juniper Woodlands and Shrublands comprise an estimated 717,597 acres (36%) of the total vegetation acreage for the unit. The Colorado Plateau Pinyon-Juniper Woodland type has an estimated 444,867 acres (91%) that are between 40% and 60% departed from reference state. Furthermore, an estimated 179,324 acres (78%) of Colorado Pinyon Juniper Shrubland are between 40% and 60% departed from reference state. Much of these ecotypes' departure is due to the loss of shrub species. These two ecological systems share ecological characteristics where fire regimes and climatic events (drought) determine community structure; however, soils (rock mesa tops) are a major contributor to vegetation structure for the shrubland community type. Where these two community types share shrub and understory components, lumping pinyon and juniper communities should be considered (The Nature Conservancy LANDFIRE Team, 2015). The process of infilling by pinyon and juniper can lead to the loss of these shrubs and other understory components. Maintaining early seral stages of these woodlands likely has more value to wildlife than later seral states due to a more abundant herbaceous understory in the former stages (Miller, Svejcar, & Rose, 2000). Neighboring vegetation classes encroached by pinyon and juniper may have been misidentified as Pinyon-Juniper Woodlands due to remote sensing not reliably distinguishing between late successional Basin Big Sagebrush (and like) systems and early successional classes of Pinyon-Juniper Woodlands (The Nature Conservancy LANDFIRE Team, 2015). This is important to note, as Basin Big Sagebrush, Montane Sagebrush Steppe, and Mountain Shrub biophysical systems all experience pinyon-juniper encroachment and are considered to be Key Habitat by Utah's Wildlife Action Plan (Utah Division of Wildlife Resources, 2015). Therefore, shrublands with the potential to be misidentified as Pinyon-Juniper Woodlands may be overlooked or under prioritized for needed landscape-scale treatments. Regardless of the possibility of misidentification between ecological systems, resetting these systems to an early successional structure and composition would likely be beneficial to wildlife. Identified Range Trend sites with pinyon and juniper presence are found in areas in Little Baullies, Arch Canyon, Texas and Harmony Flats, Salt Creek Mesa, Wild Cow Point, Mormon Pasture, and Chippean Ridge; these areas all have varying degrees of pinyon-juniper infilling.

Drought is a concern on the Elk Ridge Management Unit as it may pose a threat to the condition of the unit's wildlife habitat. The majority of browse leader growth in 2024 was observed to be between 3-6 centimeters; leader growth or overall plant stature can be influenced by precipitation. Palmer Drought Severity Index (PDSI) data for the Southeastern Division (in which unit 14B is located) shows that most years between 2020-2024 were considered to be years of moderate to extreme drought (**Figure 3.1a**). Possible holdover effects from these drought years were observed on some sites in 2024, including partial crown death on some shrubs. However, deer winter range Desirable Components Index (DCI) scores show a slight improvement between 2019 and 2024, despite the number of drought years since the last time this unit was sampled (**Figure 3.30**, **Table 3.7**). As a historical indicator for drought, DCI scores at site level show large or persistent decreases in preferred browse recruitment and decadence scores beginning in either 1999 or 2004: these were the most negatively influential factors on Black Mesa, Harmony Flat, and Wild Cow Point. Ruin Park shows similar trends for browse recruitment and decadence that began between the 1986 and 1992 samplings (Davis, 1999). The Dry Mesa study is currently showing a similar trend in these two metrics as of 2024, which may be an indicator of community transition due to drought. However, there are other confounding factors that may be leading to decreases in preferred browse recruitment on the Dry Mesa site like elevated levels of introduced perennial grass (**Figure 3.30**, **Table 3.8**). It should be noted that because Range Trend study sites are not monitored every year, densities of seedlings and young plants and observations about inflorescence production are not available for the 2020-2023 period. However, it is possible that most of the seedlings and/or young plants that may have established on the previously mentioned studies were unable to survive during these unsampled drought periods.

Increased human presence may pose an additional threat to wildlife and wildlife habitat in the Elk Ridge Management Unit. Of all possible scenarios for human-wildlife interaction, human recreation is the most likely cause of interaction with wildlife. Recreation in general benefits members of the public and provides opportunities for economic growth. If not properly managed, however, recreation may become unsustainable for wildlife. As such, the potential for and occurrence of increased human presence through recreation and the effects on wildlife and wildlife habitat should be noted by wildlife and land managers for this unit. Although some areas of the unit are likely to experience more use than others, a few areas deserve some mention. Portions of Canyonlands National Park and Glen Canyon National Recreation area are located within unit boundaries, and Bears Ears and Natural Bridges National Monuments are also contained within the Elk Ridge unit. A portion of the Manti-La Sal National Forest is also located within this unit's boundary, which contains 11 Wilderness Study Areas (WSAs). The largest of these study areas are the Grand Gulch and Dark Canyon Instant Study Area Complexes. Excluding the Mancos WSA, all other recreation areas intersect with deer summer or winter ranges (**Map 3.2**) to some degree. Despite Elk Ridge's connection to Canyonlands National Park and other recreational areas, much of the unit remains isolated and inaccessible to general motorists due to geographic features and unimproved road systems. Therefore, high traffic is likely kept to the periphery of the unit. Any vehicle-wildlife interactions on the unit's interior are likely at lower speeds and with local and backcountry traffic, keeping wildlife mortality to a minimum in this area. Wildlife and motorist interactions appear to have a minimal impact on highway mortality in this unit for highways 95, 276 and 163 as illustrated by Wildlife Tracker reports between 2005 and 2024 (Wildlife Tracker, 2025). As such, highway mortality is not considered a limiting factor or a concern for this subunit.

In addition, off-highway vehicle (OHV) use remains a popular form of recreation throughout the state of Utah: there were over 227,000 in-state OHV registrations issued as of January of 2025 (Utah State Legislature, 2025). OHV routes traverse vast areas of the Elk Ridge Management Unit, with nearly 1,700 miles of trails designated as OHV limited areas (Bureau of Land Management, 2025). Education on proper OHV use required by state law and guidelines issued by federal land management agencies likely help mitigate some of the negative outcomes that might otherwise result from OHV recreation. However, deleterious effects on wildlife and wildlife habitat are always a possibility. Threat levels vary between and do not affect all locations equally, but auditory disturbances to wildlife, physical damage to habitat, and the introduction of non-native plant species can all result from improperly managed OHV recreation.

Aspen Forest and Woodland and Aspen-Mixed Conifer Forest health are areas of focus on mule deer summer range. However, a small portion of the total vegetation acreage is comprised of these two forest types (approximately 3,966 acres or 0.2%) according to the LANDFIRE Existing Vegetation Type model. Approximately 80% of all aspen community types in the Elk Ridge Management Unit are found to be between 40% and 60% departed from their respective reference states. Aspen-Mixed Conifer Forest biophysical sites comprise a very small portion of the total aspen community type in this subunit, and the Aspen Forest and Woodland is the primary community type (LC23_VDep_240, 2023). There are a number of studies sampled by Range Trend that have quaking aspen (*Populus tremuloides*) as a component of their respective communities. Duck Lake, Sego Spring, and Sego Spring 2 are all identified as aspen ecological types. LANDFIRE departure from reference is estimated to be between 40% and 58% departure for the Sego Springs sites, and 48% to 58% departure for the Duck Lake site. Although Gooseberry, Gooseberry North, and Kigalia Point II all have a notable component of the Aspen Forest and Woodland type, these areas are identified by

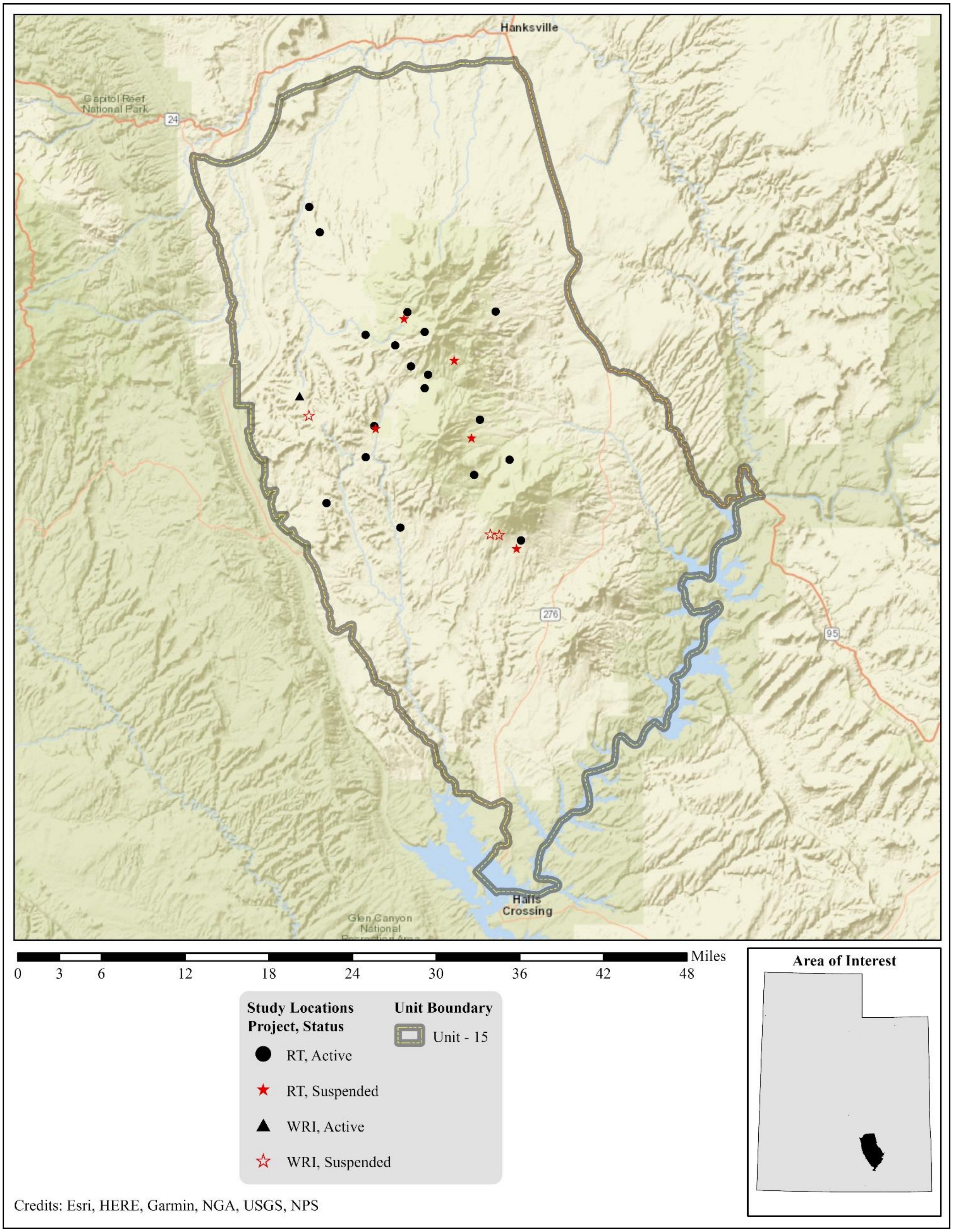
Range Trend as ponderosa (*Pinus ponderosa*) ecotypes. Furthermore, LANDFIRE identifies these areas as Mountain Ponderosa Pine Woodlands. The aspen components contained in these woodlands that are between 58% and 74% departed from reference conditions (LC23_VDep_240, 2023). Of all the Range Trend sites that sample aspen in these woodlands, the majority of quaking aspen stands are considered to be young with a mixture of herbivory pressures. However, Gooseberry and Kigalia Point II have fairly aged aspen stands (Lane, Payne, & Cox, 2021; Lane, Cox, & Payne, 2025). Range Trend sites where aspen regeneration is occurring have all been related to prescribed fire or logging disturbances; many of these areas border or overlap Mountain Ponderosa Pine Woodlands. Though several areas have experienced wildfire or prescribed burns, only a few Watershed Restoration Initiative (WRI) study areas sample burned ponderosa ecotypes. Gooseberry North and Sego Spring 2 were burned in the Duck Lake and Poison Canyon Wildfires (**Table 3.6**). These two studies show conflicting responses to the burn, although Sego Spring 2 was sampled only a year following the Poison Canyon fire and likely did not have enough time to show a recovery response. However, Gooseberry North displayed increases in some preferred shrub, quaking aspen, and ponderosa pine densities (Lane, Cox, & Payne, Utah Big Game Range Trend Studies 2024, Wildlife Management Units 13A, 14A, 14B, 15, 16B & 16C, 2025). LANDFIRE estimates that nearly 87% (14,912 acres) of vegetation acreage for Mountain Ponderosa Pine Woodlands falls between 40 and 60% of departure from the defined reference state (LC23_VDep_240, 2023). The understory for this woodland type is often shrubby; black sagebrush (*Artemisia nova*), big sagebrush (*A. tridentata*), mountain mahogany (*Cercocarpus montanus*), antelope bitterbrush (*Purshia tridentata*), and serviceberry (*Amelanchier* spp.) are a few species identified by LANDFIRE as being common on sites of this ecological type (The Nature Conservancy LANDFIRE Team, 2015). Improving ponderosa pine understories on this subunit will likely have great effects benefiting deer summer and winter range.

The introduced perennial grass species bulbous bluegrass (*Poa bulbosa*) is present on six of the 16 sites found within this unit. Chippean Ridge has a well-established bulbous bluegrass presence, but most of the areas where bulbous bluegrass has been sampled have low amounts of cover and nested frequency (Lane, Cox, & Payne, 2025). However, the presence of this introduced grass is a concern. Once established, bulbous bluegrass populations persist and invade native plant communities (Kulmatiski, 2006): this introduced perennial species can form dense mats that may compete with other more desirable herbaceous species, seedlings, and young shrubs, potentially limiting the establishment of new plants into the population (Mack, et al., 2000).

Other threats to wildlife habitat are occurring in localized portions of this unit, but they will not be discussed in this section. These additional threats are specified by study site in the previous table (**Table 3.8**).

There are a few suggestions to consider for maintaining or improving big game habitat within the Elk Ridge Management Unit. Broadly speaking and when necessary, habitat improvement projects should continue to be implemented. More specifically, some portions of this unit have been treated for tree encroachment (**Table 3.4**). When and where appropriate, efforts to address infilling or encroachment of pinyon and juniper in both previously treated and untreated areas should be continued or implemented. Care should be taken in method selection (lop and scatter, bullhog, chaining, etc.) to ensure that annual grass loads are not unintentionally amplified. Although annual grasses are generally not considered a high-level threat within this unit, they are present in the understories of a few study sites; proactive monitoring of annual grass loads is advisable. Treatments to control annual grass loads may be prudent following future disturbances, as annual grasses (particularly cheatgrass) often behave opportunistically and increase when resources are released. In heavily visited areas where it is not already present, strategically placed signage on proper wildlife etiquette and responsible recreation may prove beneficial. Finally, continued monitoring of Range Trend studies and areas where rehabilitation projects have occurred will prove valuable. Periodic monitoring of these areas not only assesses the quality of big game habitat but may also aid in the identification of threats as they appear over time. Data collected in the future will indicate whether the severities of current limiting factors are increasing and may provide guidance on what actions are needed to mitigate identified potential threats to habitat and wildlife.

4. WILDLIFE MANAGEMENT UNIT 15 – HENRY MOUNTAINS



WILDLIFE MANAGEMENT UNIT 15 – HENRY MOUNTAINS

Boundary Description

Garfield, Kane, and Wayne Counties - Boundary begins on SR-95 at a point two miles south of Hanksville; south on SR-95 to Lake Powell; south along the center line of the Colorado River (Garfield/San Juan County and Kane/San Juan County lines) to Bullfrog Bay; SR-276 at Bullfrog; north on SR-276 to Burr Trail (County Road 0598); north on the Burr Trail; north along the Capitol Reef National Park boundary; back to Notom-Bullfrog Road (near The Narrows) and north to a point two miles south of SR-24; east along a line that is two miles south of SR-24 to SR-95. Unit boundaries exclude Capitol Reef National Park.

Management Unit Description

Geography

The Henry Mountains lie between the Waterpocket Fold on the west, the canyon of the Colorado River and Lake Powell to the southeast, and the Fremont and Dirty Devil Rivers to the north and northeast. The mountain peaks are the result of vertical intrusions of igneous rocks that have penetrated from a broad basin into the sedimentary strata (Stokes, 1986). The majority of the mountains rise gently upwards to these peaks, which are (from north to south): Mt. Ellen (11,507 feet), Mt. Pennell (11,431 feet), Mt. Hillers (10,738 feet), Mt. Holmes (7,990 feet), and Mt. Ellsworth (8,217 feet). From the base of the peaks, gentle slopes extend out into the flat mesas and rough desert canyon lands that constitute most of the unit's land area. Towns in this area include Hanksville, Notom, and Ticaboo.

The Glen Canyon Dam on the Colorado River in Arizona created Lake Powell, which stretches northeast into Utah and makes up the southeastern border of the Henry Mountains unit. The south-flowing stream systems that drain the Henry Mountains run into Lake Powell while the streams to the north flow into the Fremont River and to the east into the Dirty Devil River.

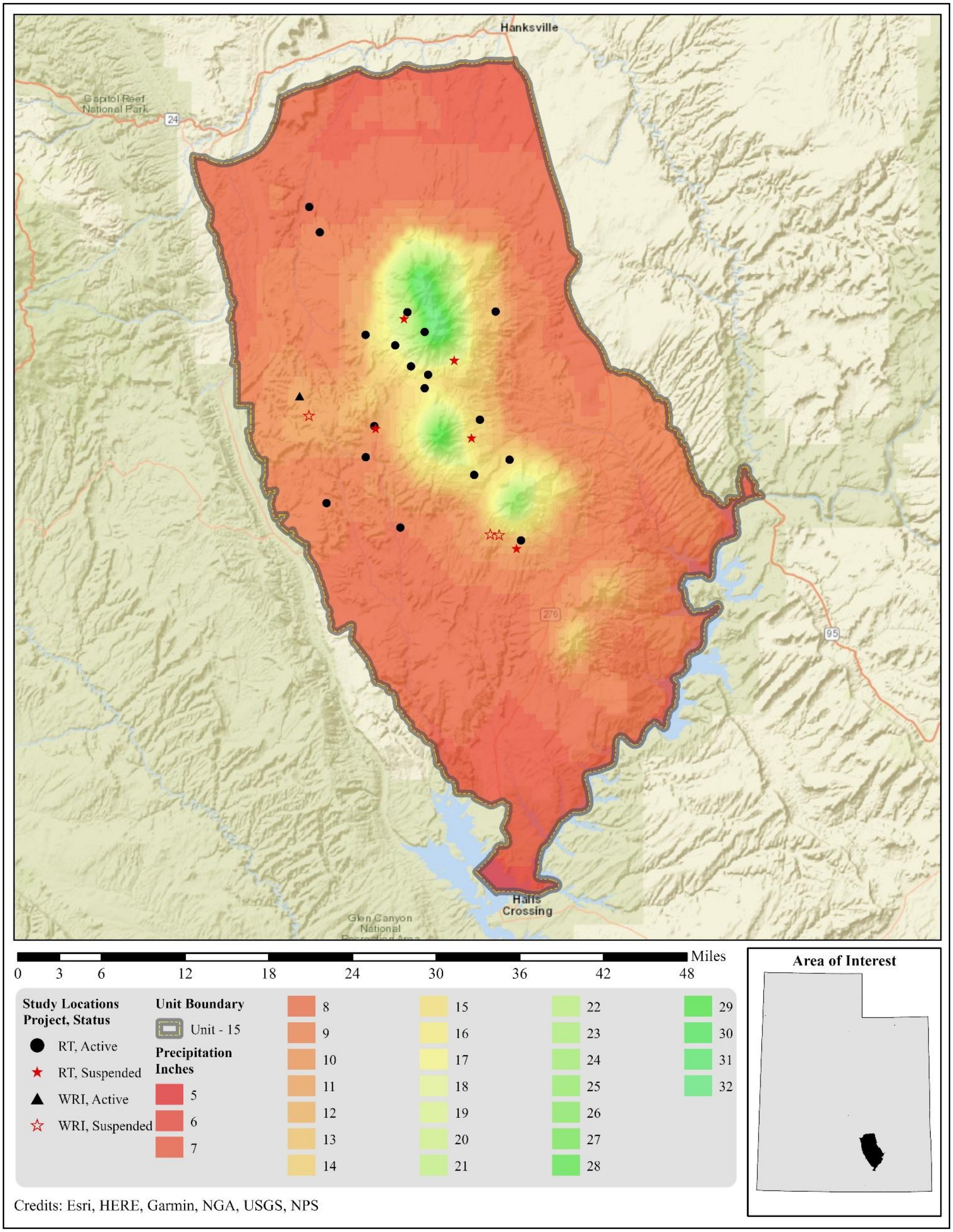
Climate Data

The 30-year (1991-2020) annual precipitation PRISM model shows precipitation on this unit ranges from 5 inches near Stanton Canyon at the southernmost portion of the unit to 32 inches along the summit ridge of Mount Ellen. All of the active Range Trend and WRI monitoring studies in this unit occur within 7-28 inches of precipitation (**Map 4.1**) (PRISM Climate Group, Oregon State University, 2021).

Vegetation trends are dependent upon annual and seasonal precipitation patterns. Palmer Drought Severity Index (PDSI) data for the unit was compiled from the National Oceanic and Atmospheric Administration (NOAA) Physical Sciences Division (PSD) as part of the South Central Division (Division 4) and Southeast Division (Division 7).

The mean annual PDSI of the South Central Division has displayed mild to extreme drought for 16 out of the past 31 years. The most recent annual PDSI score with an extreme drought ranking was in 2021. Wet years were relatively consistent in the 1990s, with four moderately to extremely wet years occurring between 1993 and 1999. However, these "wet" rankings have become less common since 2000. Annual PDSI data shows an apparently cyclical pattern over the past 20 years, with one very to extremely wet year occurring amid longer periods of drought. The most recent moderately wet years were 2005 and 2011, with 2020-2022 being years of moderate to extreme drought. Overall, 26% of the 1994-2024 period consisted of slightly to very wet years, while 52% was considered to be years of mild to extreme drought; the remaining 22% of this period was comprised of normal, incipiently wet, or incipiently dry years. Mean spring (March-May) and fall (September-November) PDSI values show similar patterns to the one demonstrated by mean annual data. During the last five years, fall PDSI rankings have been slightly wetter than the spring rankings for most years (**Figure 4.1a**, **Figure 4.1b**).

The mean annual PDSI of the Southeast Division, which the Henry Mountains unit is part of, has experienced some form of drought in most years since 1994. Moreover, this climate division has been considered to be in some form of drought for nearly 52% of the time since 1994. Of the drought years, 56% are considered to be either moderate or extreme droughts. Also remarkable about this climate division is that drought is experienced over multiple years and is generally interrupted by a single wet year event. The most notable wet year occurred in 2005, which was considered moderately wet (**Figure 4.2a**). The mean spring (March-May) and mean fall (Sept.-Nov.) PDSI estimations typically follow the same trends as the average annual PDSI trends, but they can show split seasonal precipitation events that are not captured in the overall annual PDSI. These seasonal precipitation events can play a crucial role in the timing of plant growth and production for the remainder of the year (spring), or for the year ahead (fall). When a wet fall aligns with a wet spring of the following year, plant health and production for that following year can have a positive effect on forage availability. This is due to lower evaporation and transpiration rates between the months of September to May that result in higher soil moisture reserves being made available to plants for longer periods during the dry summer months. Although annual precipitation is likely the driver for plant production, the interplay of fall/spring wetness may make a drought year less impactful as a plant stressor. The ecotypes evaluated by Range Trend are primarily found on deer transitional and winter ranges. Plant growth on these ranges is primarily affected by the seasonal precipitation that occurs during the fall and spring months (Cox, et al., 2009), and is the reason fall and spring PDSI estimations are focused on in this report (**Figure 4.2b**). The years that follow this pattern of consecutive wet fall and spring occur in 1994/95, 1996/97, 1997/98, 2004/05, and 2022/23. Range Trend sample years occur on a five-year rotation, so the PDSI years of interest should be examined by the corresponding rotation year (**Table 4.5**). The 2019 sample year occurs during a wet year, but years where drought may have affected plant condition occur in 1994, 2004, 2009, 2014, and 2024 (**Figure 4.2a, Figure 4.2b**) (National Oceanic and Atmospheric Administration, 2025).



Map 4.1: The 1991-2020 PRISM Precipitation Model for WMU 15, Henry Mountains (PRISM Climate Group, Oregon State University, 2021).

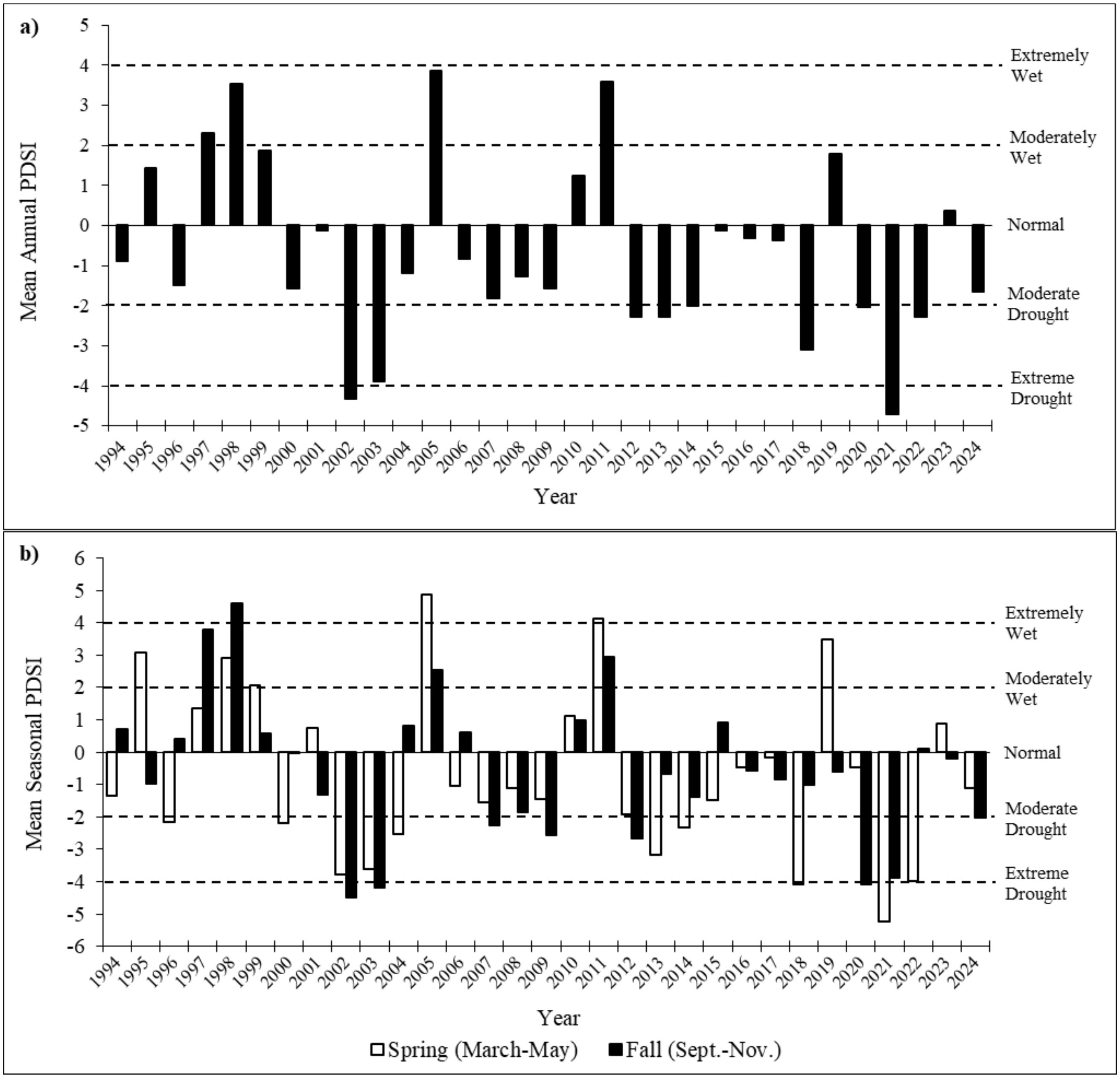


Figure 4.1: The 1994-2024 Palmer Drought Severity Index (PDSI) for the South Central Division (Division 4). The PDSI is based on climate data gathered from 1895 to 2024. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet, and negative deviations indicate drought. Classification of the scale is ≥4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to 2.9 = Moderately Wet, 1.0 to 1.9 = Slightly Wet, 0.5 to 0.9 = Incipient Wet Spell, 0.4 to -0.4 = Normal, -0.5 to -0.9 = Incipient Dry Spell, -1.0 to -1.9 = Mild Drought, -2.0 to -2.9 = Moderate Drought, -3.0 to -3.9 = Severe Drought and ≤-4.0 = Extreme Drought. a) Mean annual PDSI. b) Mean spring (March-May) and fall (Sept.-Nov.) PDSI (National Oceanic and Atmospheric Administration, 2025).

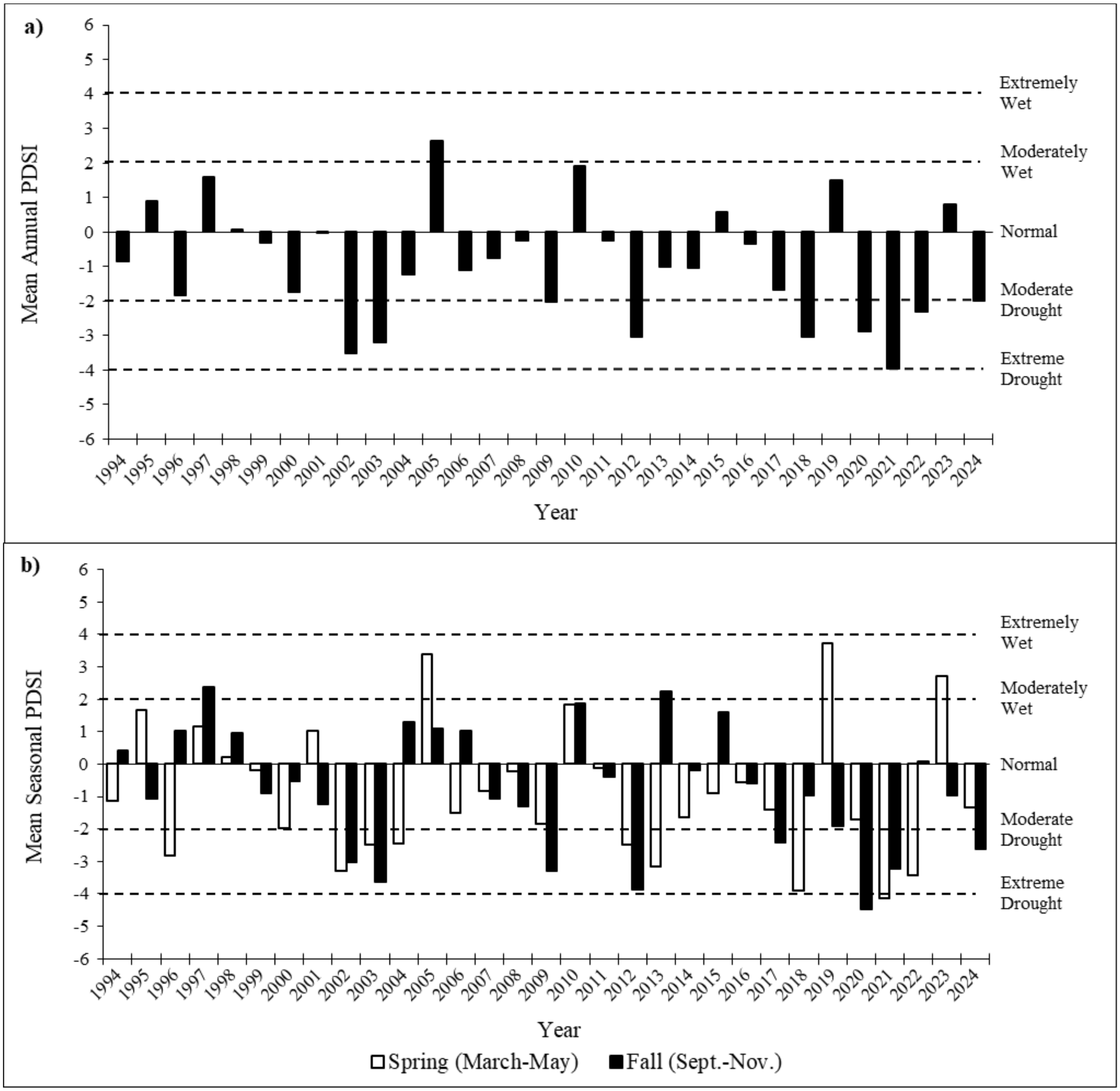


Figure 4.2: The 1994-2024 Palmer Drought Severity Index (PDSI) for the Southeast Division (Division 7). The PDSI is based on climate data gathered from 1895 to 2024. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet, and negative deviations indicate drought. Classification of the scale is ≥4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to 2.9 = Moderately Wet, 1.0 to 1.9 = Slightly Wet, 0.5 to 0.9 = Incipient Wet Spell, 0.4 to -0.4 = Normal, -0.5 to -0.9 = Incipient Dry Spell, -1.0 to -1.9 = Mild Drought, -2.0 to -2.9 = Moderate Drought, -3.0 to -3.9 = Severe Drought and ≤-4.0 = Extreme Drought. a) Mean annual PDSI. b) Mean spring (March-May) and fall (Sept.-Nov.) PDSI (National Oceanic and Atmospheric Administration, 2025).

Big Game Habitat

The key areas in this unit are associated primarily with pinyon-juniper chaining and revegetation treatments, but exceptions include other areas that are frequently used by bison and mule deer. The following areas are considered to be crucial deer winter habitat: Crescent Creek, Cave Flat, Quaking Aspen Spring, Dugout Creek, and Coyote Creek. The Bullfrog Creek and Airplane Spring areas are considered substantial winter deer habitat. The Mud Spring area is crucial year-round habitat for both bison and deer. The Steven’s Mesa and Swap Mesa areas sample desert shrub communities that are crucial year-long habitat for bison and crucial winter habitat for deer. Finally, the Birch Spring and Nasty Flat areas are considered to be crucial year-long bison habitat and crucial deer summer habitat. As American bison are both state and nationally recognized as a species of concern, by extension habitat health and suitability for the Henry Mountain unit is a focus for improvement (Utah Division of Wildlife Resources, 2015; Committee Members, 2022).

Rangeland Analysis Platform (RAP) – Biomass and Cover by Deer Habitat

Numerous factors determine quality wildlife forage. Diversity of species and life forms, age class and vigor of shrubs, timing of vegetative stages of grasses and forbs, and the abundance of palatable vegetation all contribute to a quality habitat for mule deer. Site-level (Range Trend sites) data addresses species composition, age structure, and health of communities in winter and transitional habitats. However, due to the small number and/or placement of Range Trend sites, it is difficult to get a true estimation of vegetation abundance. Trend study sites are strategically placed in key areas for mule deer to assess both quantity and quality of forage, but due to limited sampling, these sites cannot accurately predict the overall abundance of forage available to mule deer in the entire extent of mule deer range. The Rangeland Analysis Platform (RAP) may aid in the estimation of forage quantity within mule deer habitat by providing values for biomass and cover for perennial, annual, and browse lifeforms that Range Trend sites cannot account for. However, RAP data does not fully address the quality of forage the way that Range Trend data does. The intent of the RAP dataset is to supplement Range Trend data and local knowledge to inform managers of general habitat trends. In addition, "[RAP] data can be used to evaluate resources in concert with site-specific information about the area under investigation, such as past land management practices, vegetation treatments, conservation efforts, or natural disturbances" (Rangeland Analysis Platform; Products, 2025, para. 5). The following graphs represent vegetation changes by either biomass or percent cover based on deer winter, summer, or year-long range habitat. Range Trend data is collected on a five-year interval and the intent of the RAP data is to also help illustrate the year-to-year fluctuations or changes that may occur between Range Trend samplings.

The RAP data illustrates fluctuations in herbaceous cover and biomass on mule deer winter, summer, and year-long range. Years showing the highest values for herbaceous biomass and cover vary between ranges of different seasonality, but peaks have generally occurred in the early 1990s, the mid-2000s, early 2010s, and early 2020s. Annual and perennial cover and biomass have tightly correlated with precipitation trends in many years. However, possible lag effects of a year or so have occurred at other times, such as those displayed in herbaceous cover on mule deer summer range between 1999 and 2000 and again between 2000 and 2001 (**Figure 4.6**). Annual lifeforms have provided more biomass and cover on winter and year-long habitats than on summer range. In contrast, RAP data indicates that perennial lifeforms have generally provided higher cover on summer range than on winter and year-long habitat (**Figure 4.3**, **Figure 4.4**, **Figure 4.5**, **Figure 4.6**, **Figure 4.7**, **Figure 4.8**).

The Range Trend data for most ecotypes displays overall increases in perennial herbaceous cover since 2009 (or later depending on year of study establishment) despite year-to-year variability. However, perennial herbaceous cover has decreased overall over the same period on sites of the Mountain (Aspen) and Upland (Cliffrose) ecotypes. In addition, Range Trend data shows that annual forbs and grasses have generally contributed more cover on upland and semidesert sites than on mountain study sites (**Figure 4.33**, **Figure 4.34**, **Figure 4.35**). This trend in Range Trend cover data broadly correlates with the higher relative biomass and cover of annual lifeforms seen in the RAP data on winter and year-long range compared to summer range. However, it is important to note that Range Trend sites are summarized by ecological potential in this report and not seasonality of mule deer range. As such, incongruences between Range Trend data and that reported by the RAP are probable.

The RAP data for combined tree and shrub cover on deer ranges of all seasonality shows fluctuations over time (**Figure 1.8**, **Figure 1.10**, **Figure 4.11**). Tree cover on winter range has doubled since 2004, while shrub cover has remained similar. These trends can also be seen in data for summer and year-long ranges, albeit with smaller increases in overall tree cover. Trees and shrubs have generally displayed less drastic peaks and troughs in cover data than those exhibited by herbaceous data. However, a notable decrease in both shrub and tree cover on summer range occurred between 2002 and 2004 following decreased precipitation in 2002.

Furthermore, the Palmer Drought Severity Index (PDSI) data for the South Central and Southeast Divisions (which unit 15 is a part of) indicate that 2002 and 2003 were moderate to extreme drought years (**Figure 4.1a**, **Figure 4.2a**). As such, it is reasonable to infer that the decreases in shrub and tree cover between 2002 and 2004 were likely driven in part by drought.

Range Trend cover trends for tree and shrub cover data are not consistent across and vary depending on ecotype (**Figure 4.12**, **Figure 4.13**, **Figure 4.14**, **Figure 4.15**, **Figure 4.16**, **Figure 4.17**, **Figure 4.18**, **Figure 4.19**, **Figure 4.20**). One specific trend, however, is that tree cover on Mountain (Big Sagebrush) sites has increased since 2009 (the decrease between 2004 and 2009 was due to a tree-removing treatment) (**Figure 4.18**). This trend broadly correlates with the increases in tree cover in summer range RAP data discussed above (**Figure 4.9**). However, any comparisons made between RAP and Range Trend data should take into consideration the caveats mentioned in the previous paragraph.

RAP – Herbaceous Biomass by Deer Habitat

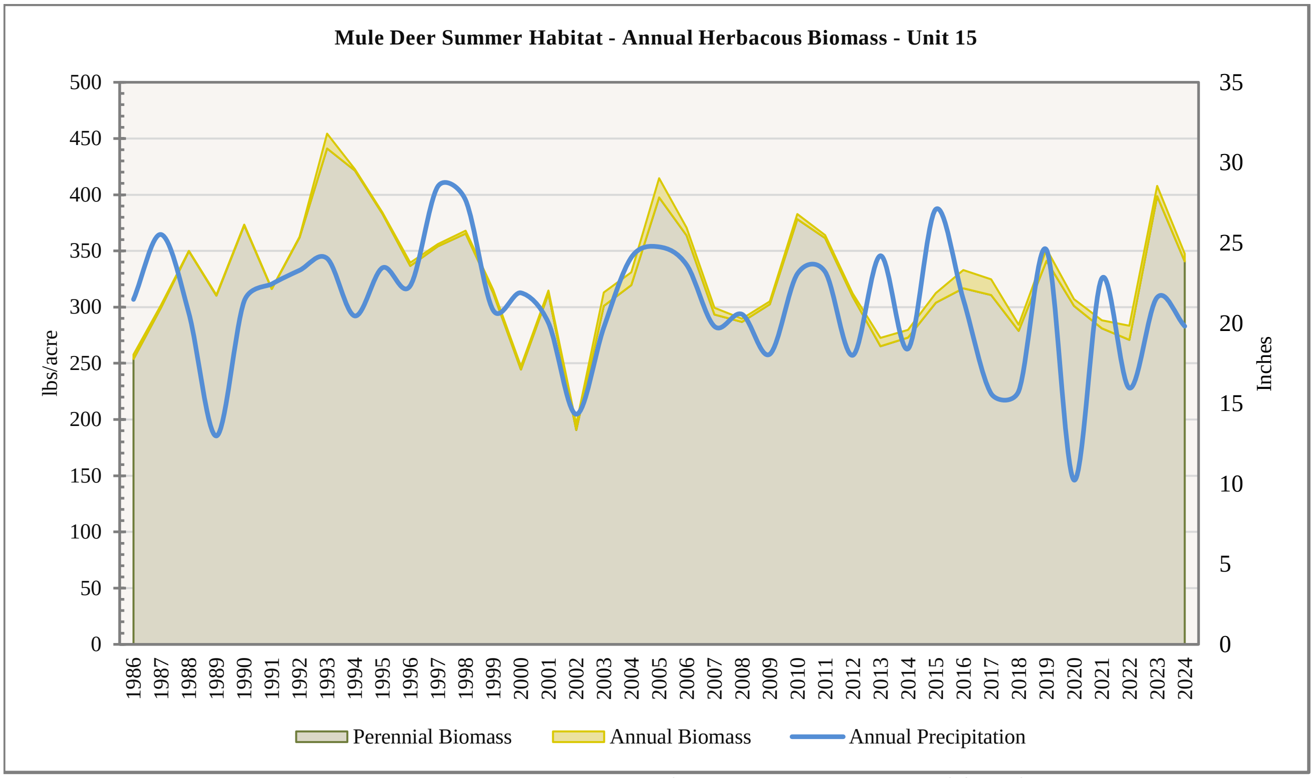


Figure 4.3: Average precipitation and estimated yearly herbaceous biomass of stacked perennial and annual lifeforms for summer mule deer habitat in WMU 15, Henry Mountains (Rangeland Analysis Platform, 2025).

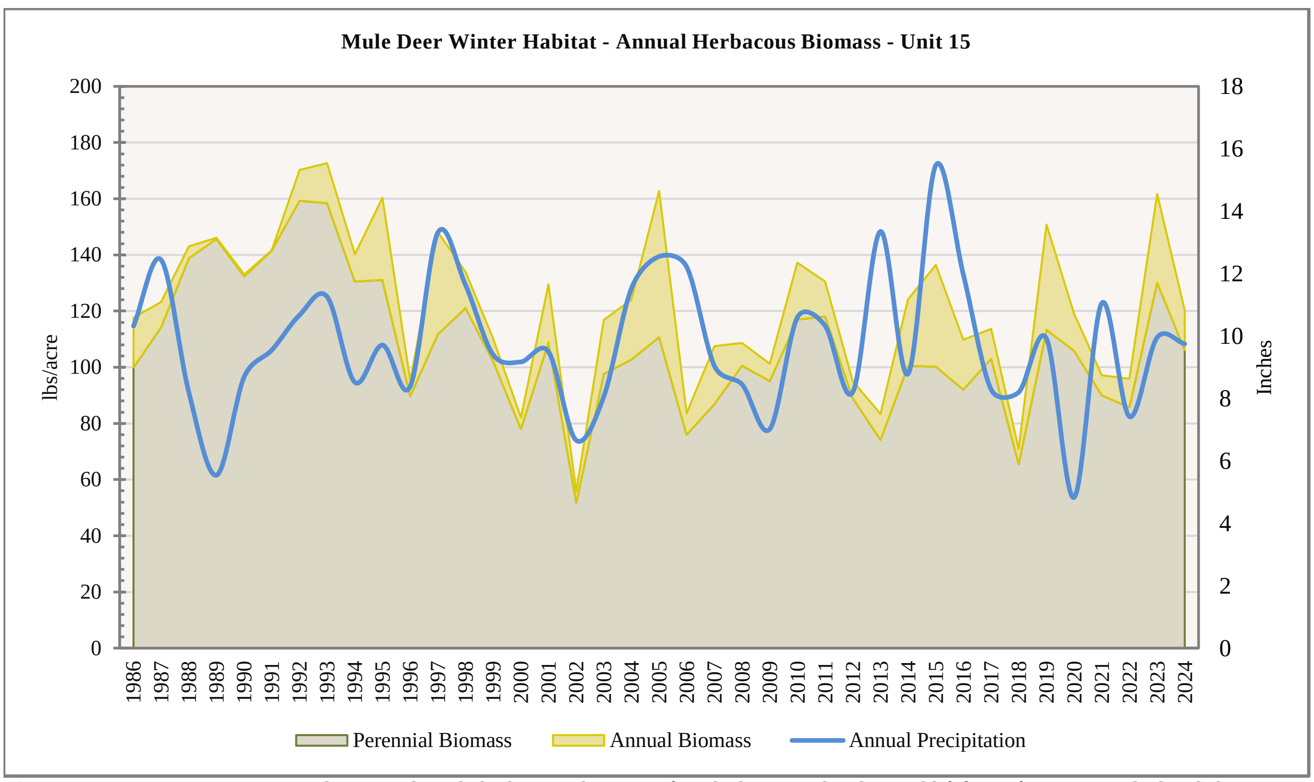


Figure 4.4: Average precipitation and estimated yearly herbaceous biomass of stacked perennial and annual lifeforms for winter mule deer habitat in WMU 15, Henry Mountains (Rangeland Analysis Platform, 2025).

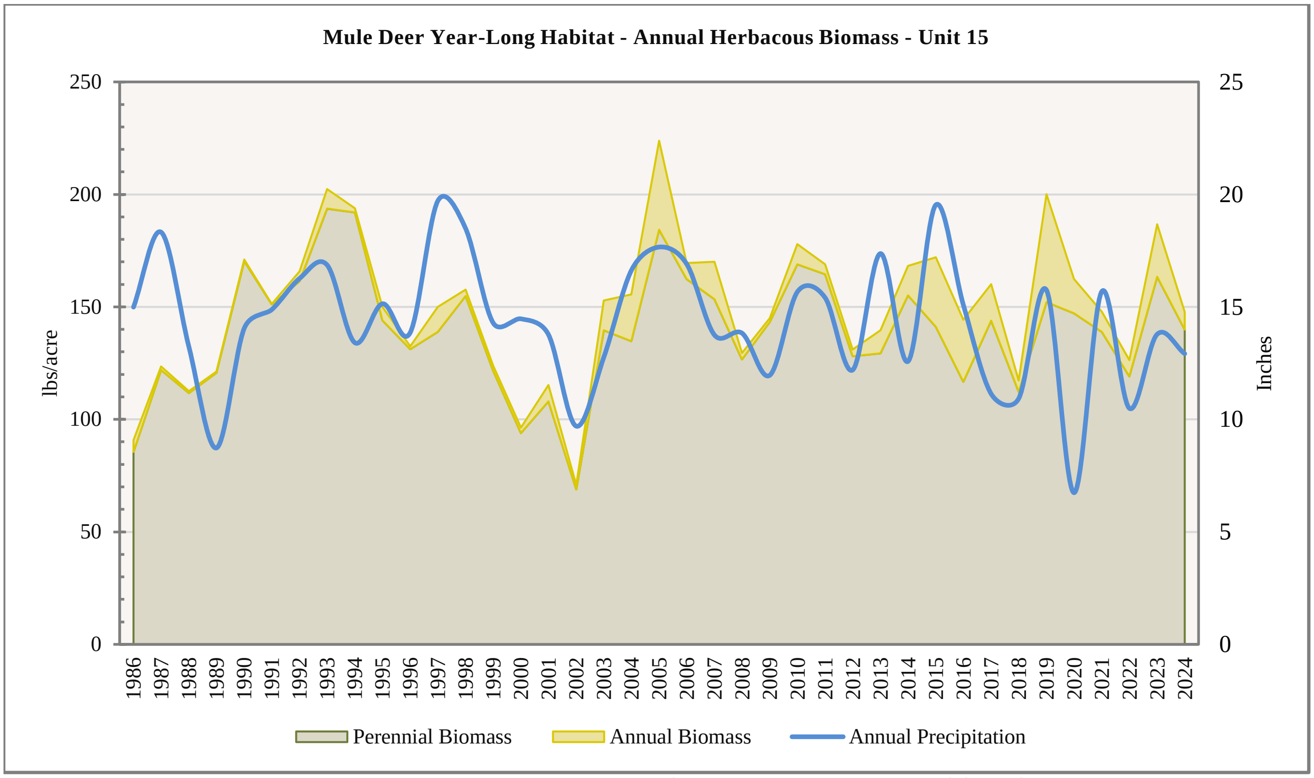


Figure 4.5: Average precipitation and estimated yearly herbaceous biomass of stacked perennial and annual lifeforms for year-long mule deer habitat in WMU 15, Henry Mountains (Rangeland Analysis Platform, 2025).

RAP – Herbaceous Cover by Deer Habitat

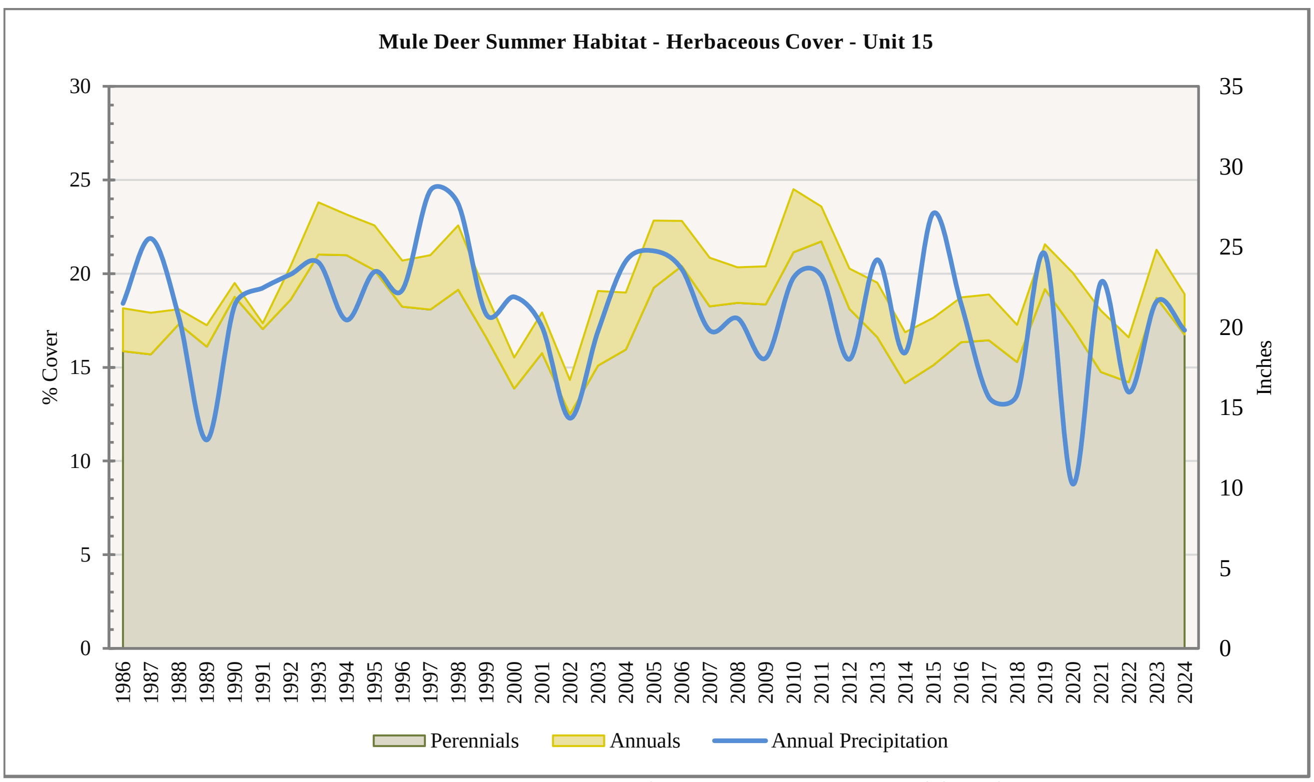


Figure 4.6: Average precipitation and estimated yearly herbaceous cover of stacked perennial and annual lifeforms for summer mule deer habitat in WMU 15, Henry Mountains (Rangeland Analysis Platform, 2025).

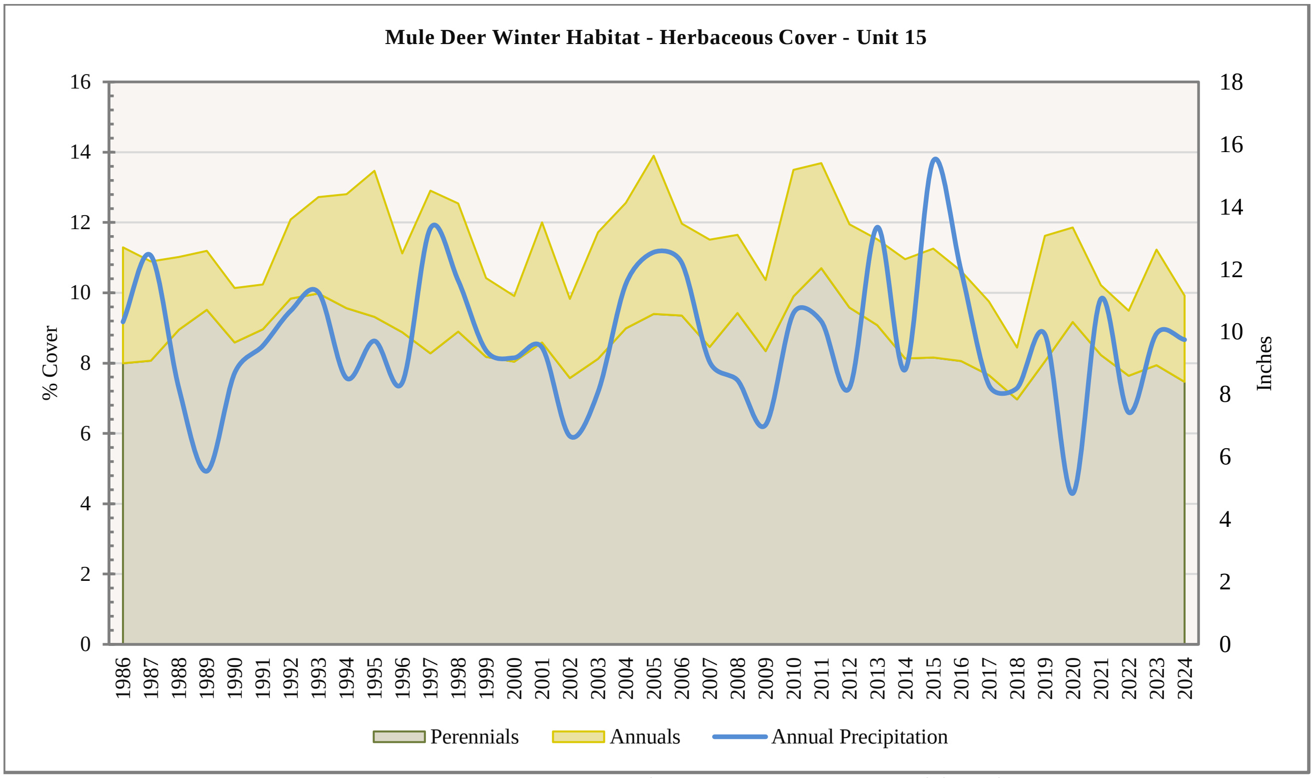


Figure 4.7: Average precipitation and estimated yearly herbaceous cover of stacked perennial and annual lifeforms for winter mule deer habitat in WMU 15, Henry Mountains (Rangeland Analysis Platform, 2025) .

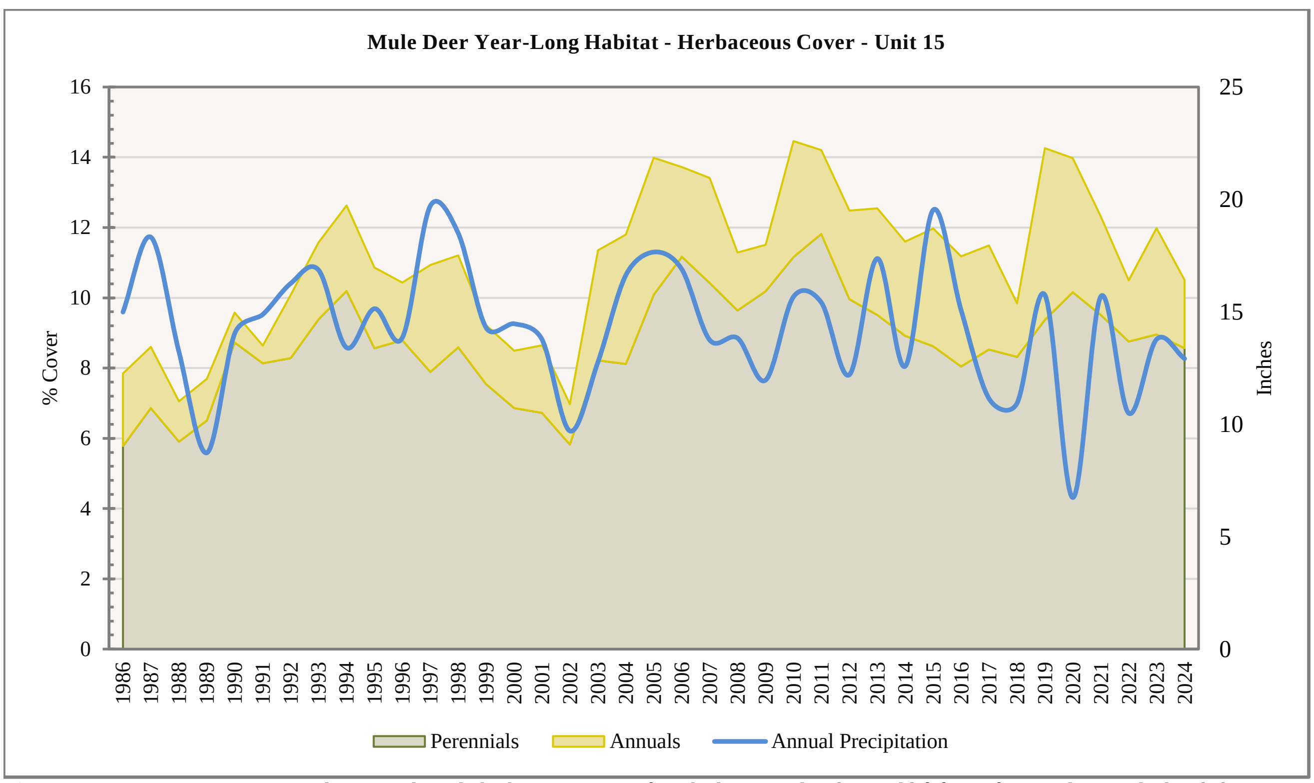


Figure 4.8: Average precipitation and estimated yearly herbaceous cover of stacked perennial and annual lifeforms for year-long mule deer habitat in WMU 15, Henry Mountains (Rangeland Analysis Platform, 2025) .

RAP – Shrub and Tree Cover by Deer Habitat

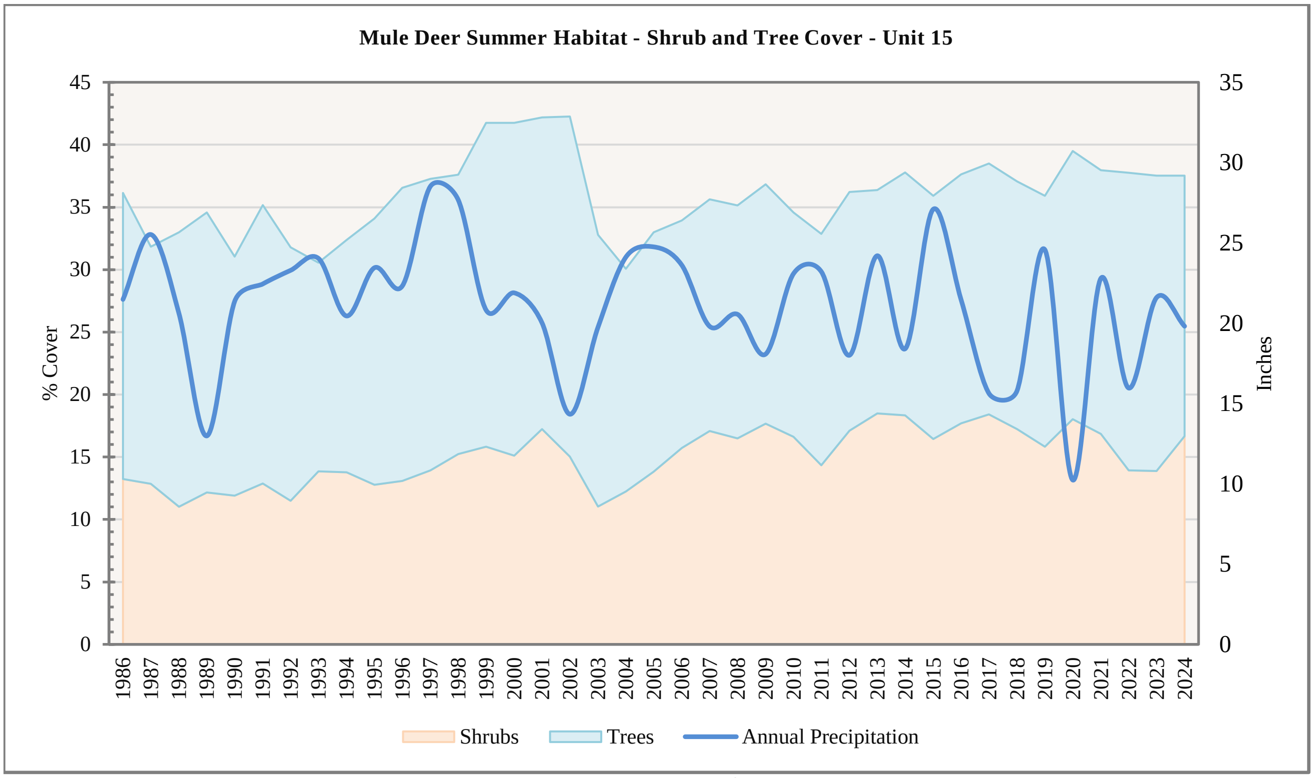


Figure 4.9: Average precipitation and estimated yearly stacked shrub and tree cover for summer mule deer habitat in WMU 15, Henry Mountains (Rangeland Analysis Platform, 2025).

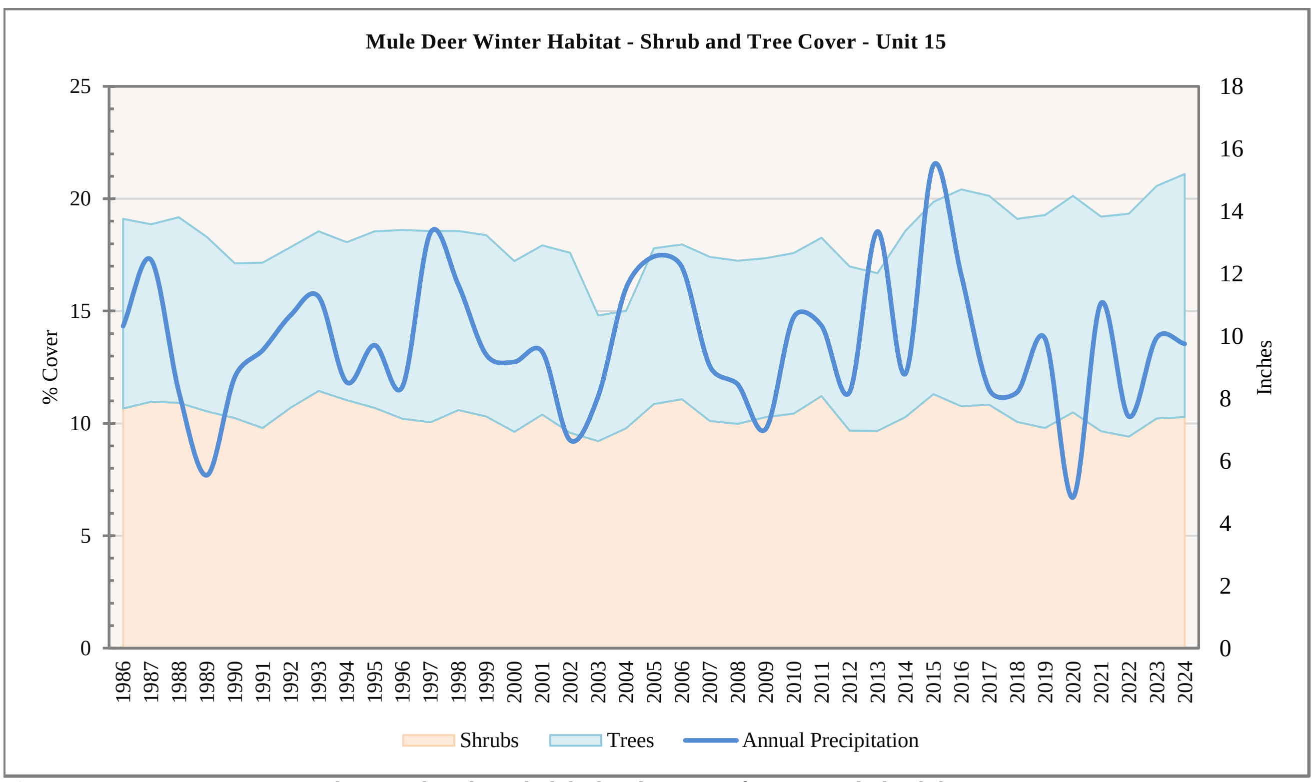


Figure 4.10: Average precipitation and estimated yearly stacked shrub and tree cover for winter mule deer habitat in WMU 15, Henry Mountains (Rangeland Analysis Platform, 2025).

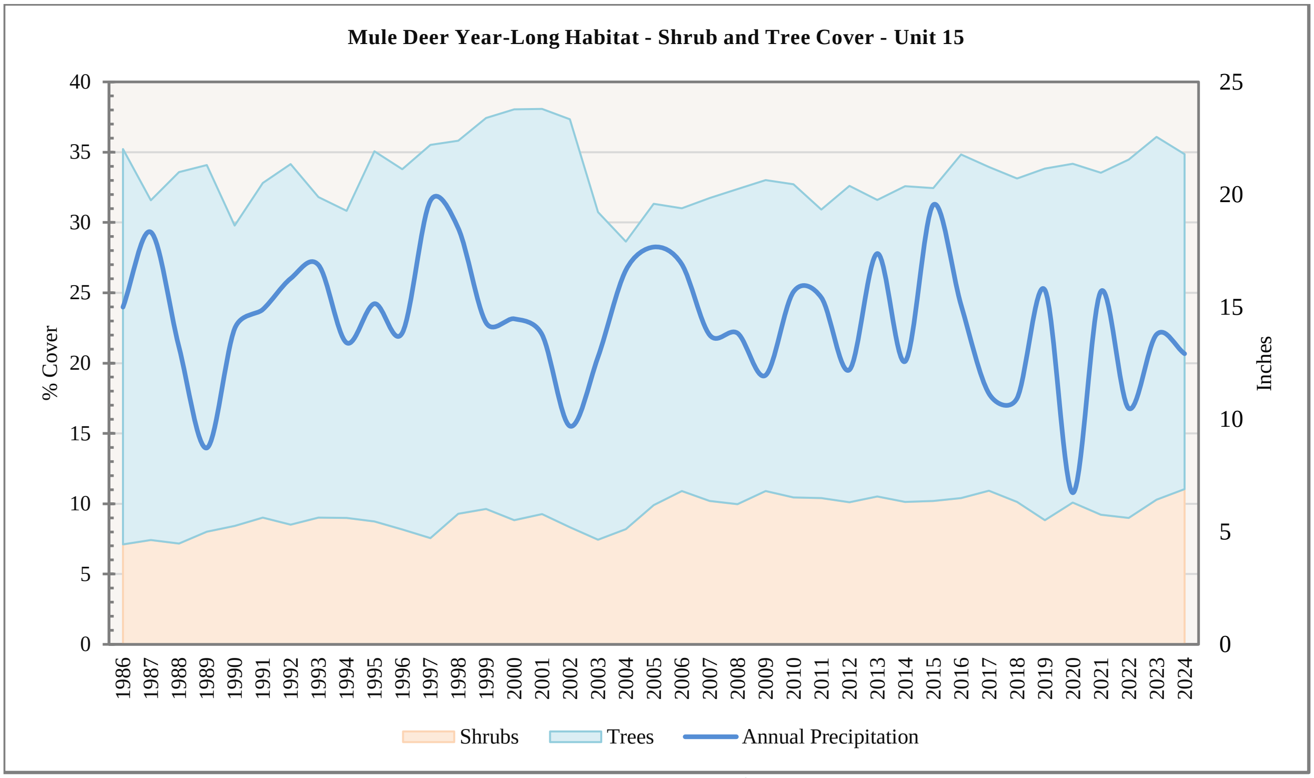
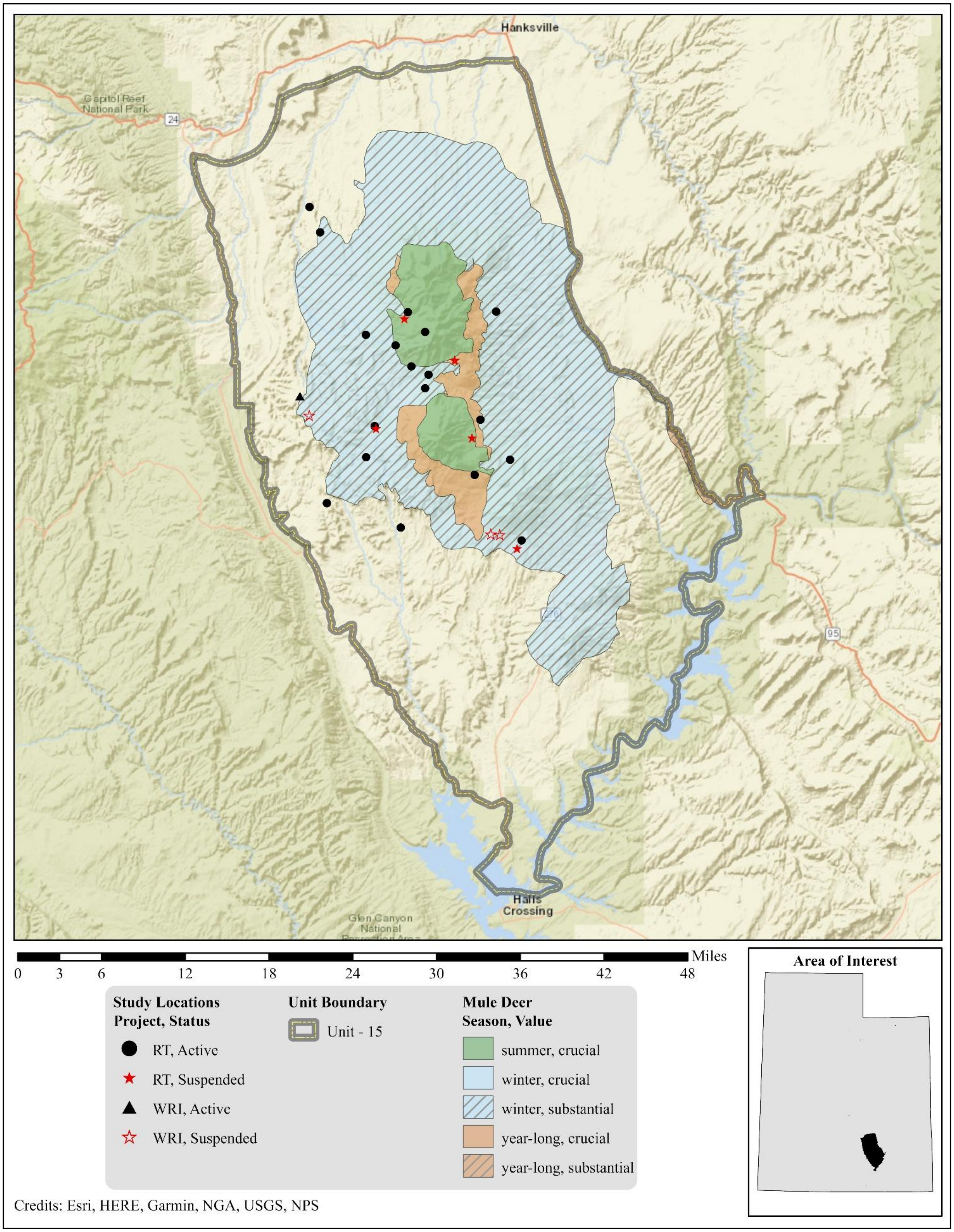
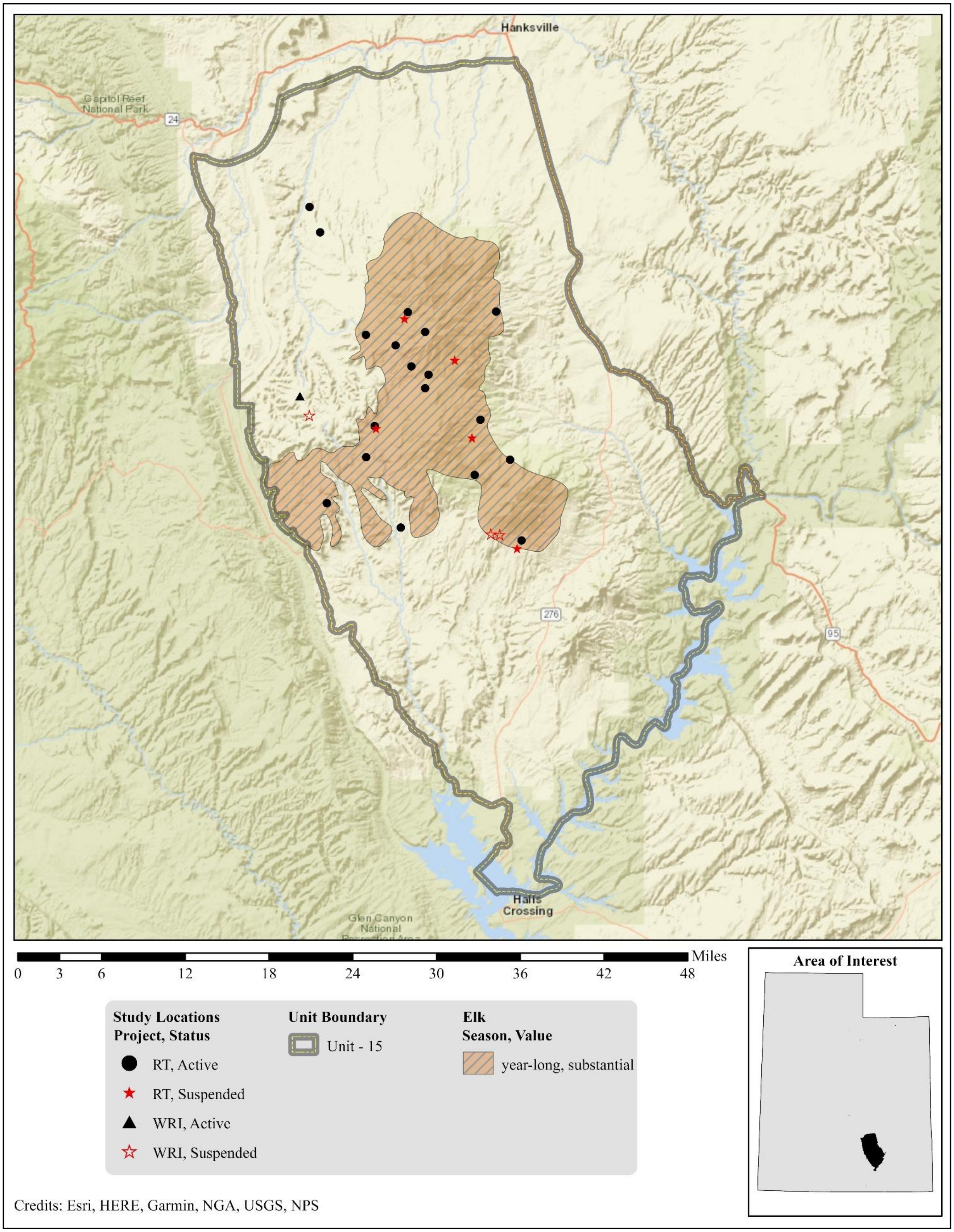


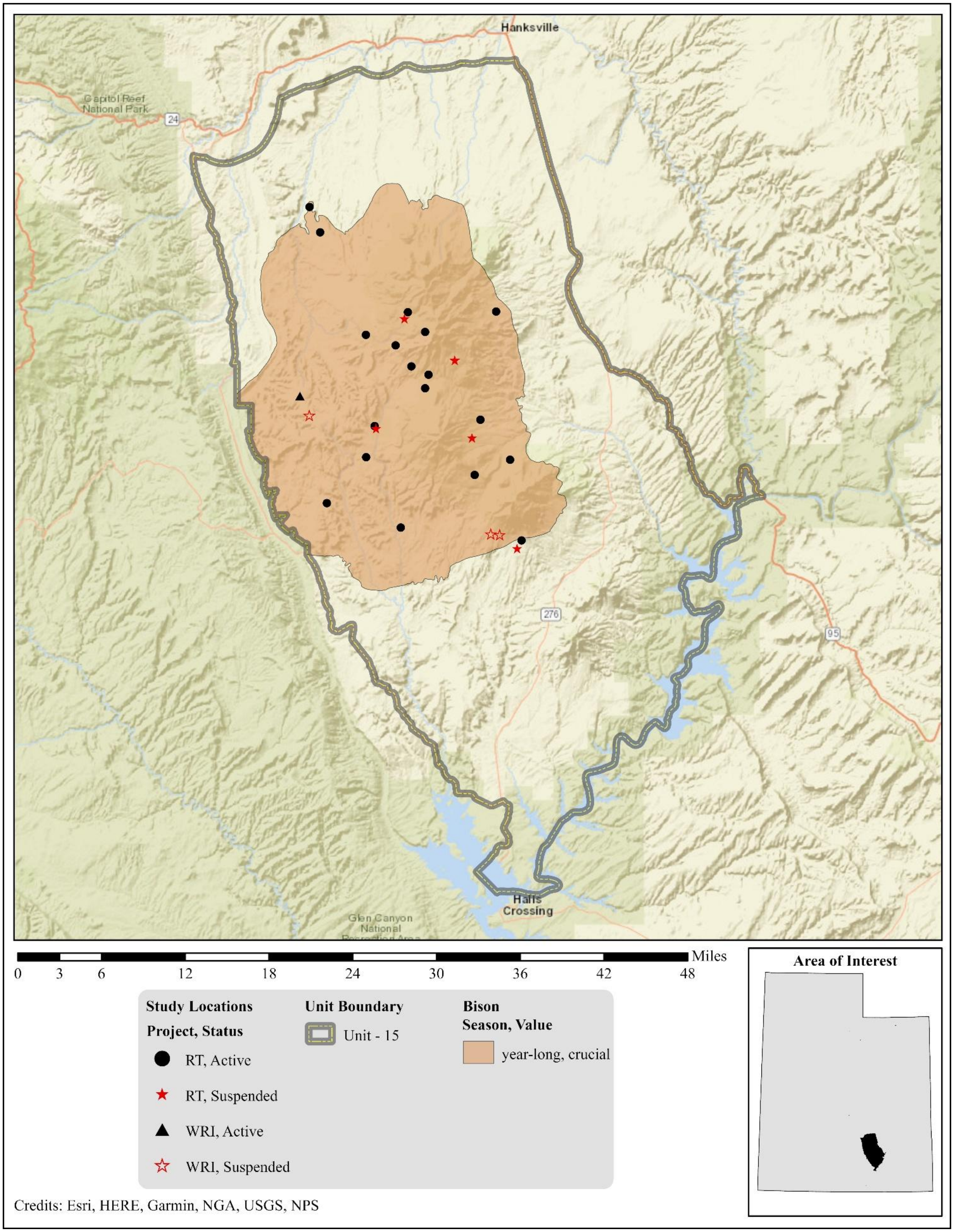
Figure 4.11: Average precipitation and estimated yearly stacked shrub and tree cover for year-long mule deer habitat in WMU 15, Henry Mountains (Rangeland Analysis Platform, 2025).



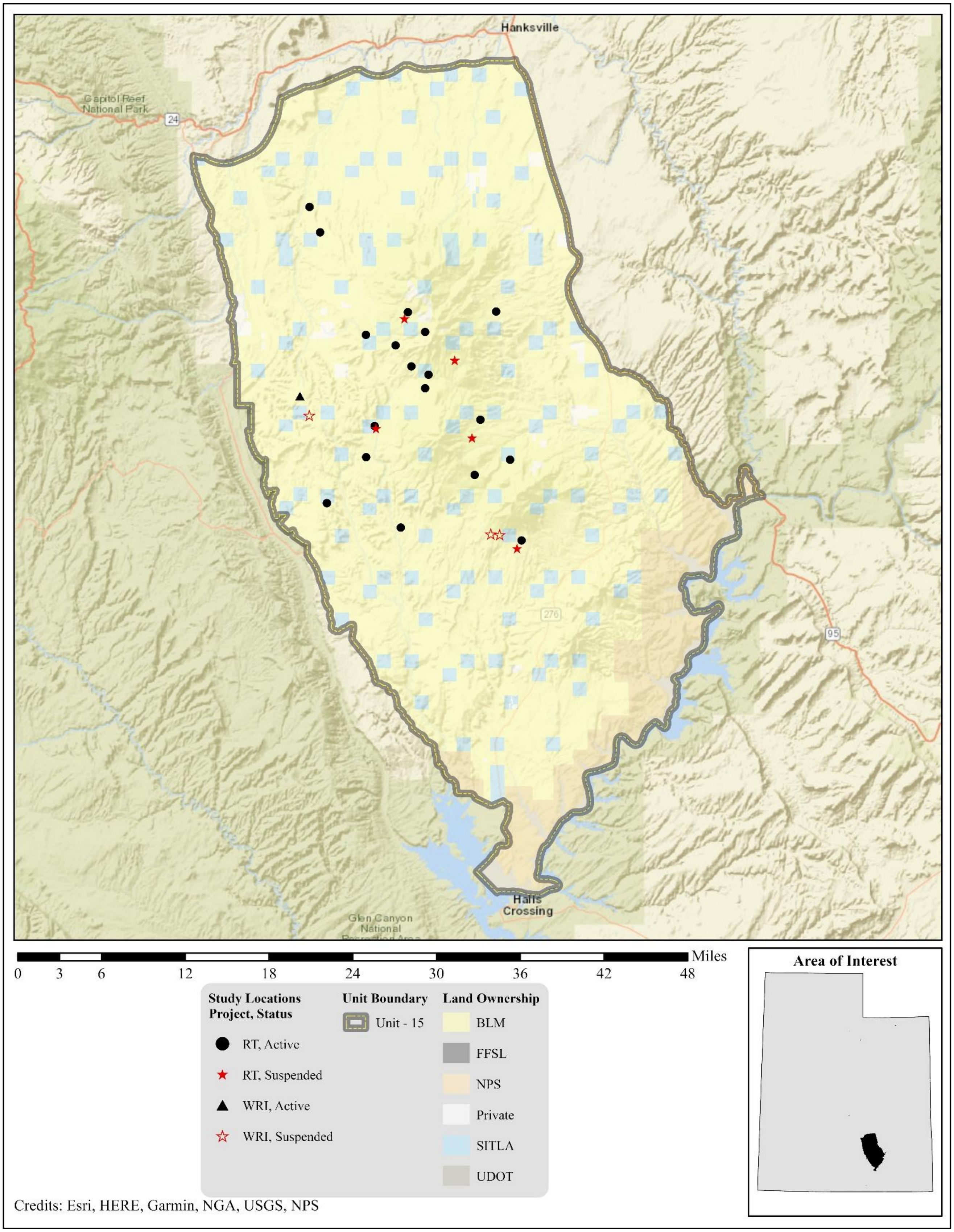
Map 4.2: Estimated mule deer habitat by season and value for WMU 15, Henry Mountains.



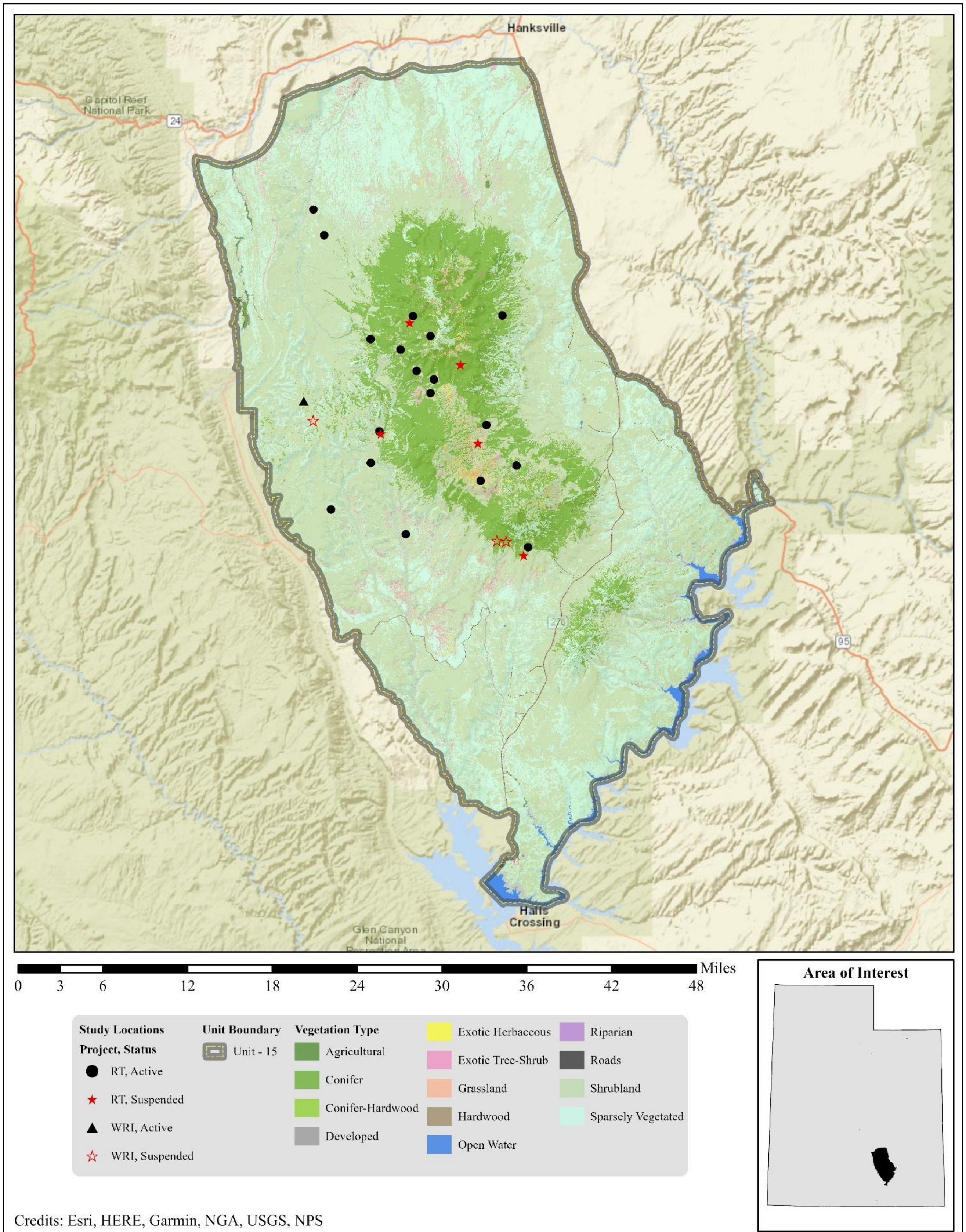
Map 4.3: Estimated elk habitat by season and value for WMU 15, Henry Mountains.



Map 4.4: Estimated bison habitat by season and value for WMU 15, Henry Mountains.



Map 4.5: Land ownership for WMU 15, Henry Mountains.



Map 4.6: LANDFIRE Existing Vegetation Type map (LC23_EVT_240, 2023) for WMU 15, Henry Mountains.

LANDFIRE Existing Vegetation Type for Mule Deer Habitat

Pinyon-juniper biophysical sites (also referred to here as vegetation types) make up approximately 24% of the mule deer summer range; nearly 37% of the winter habitat; and just over 64% of the year-long range in the Henry Mountains Management Unit according to the current LANDFIRE Existing Vegetation Type model (The Nature Conservancy LANDFIRE Team, 2015) (**Table 4.1**, **Table 4.2**, **Table 4.3**). These lower to mid-elevation sites can be associated with understory browse species known to be beneficial to mule deer, although abundance may vary widely. Pinyon (*Pinus* spp.) and juniper (*Juniperus* spp.) woodlands may provide valuable escape and thermal cover for wildlife. When these trees encroach on existing shrublands, however, they can lead to decreased sagebrush and herbaceous components (Miller, Svejcar, & Rose, 2000), therefore decreasing available forage for wildlife. The model also indicates that almost 18% of the winter range is comprised of the Colorado Plateau Blackbrush-Mormon-tea Shrubland vegetation type (**Table 4.2**); sites of this type are low in elevation. Browse species that could provide valuable forage during the winter months are often present and may include species such as blackbrush (*Coleogyne ramosissima*), Mormon tea or Torrey's jointfir (*Ephedra viridis* or *E. torreyana*), and spiny hopsage (*Grayia spinosa*).

Six percent of winter habitat is made up of the Inter-Mountain Basins Mat Saltbush Shrubland type. This type is dominated by mat and Gardner's saltbush (*Atriplex corrugata* and *A. gardneri*), although shadscale and fourwing saltbush (*A. confertifolia* and *A. canescens*) may also be present to a lesser extent. Inter-Mountain Basins Mixed Salt Desert Scrub biophysical sites comprise an additional 6% of winter habitat and 3.5% of year-long range (**Table 4.2**, **Table 4.3**). Sites of this vegetation type may host preferred browse and other shrub species such as winterfat (*Krascheninnikovia lanata*), spiny hopsage, and shadscale and fourwing saltbush, among others. Both biophysical sites are located at lower elevations. According to the Biophysical Site Descriptions, the herbaceous understory is rare on sites of the Mat Saltbush Shrubland type, and abundance varies on the Mixed Salt Desert Scrub biophysical sites.

Just over 15% of the summer range for mule deer in the Henry Mountains unit is made up of the Southern Rocky Mountain Ponderosa Pine Woodland vegetation type (**Table 4.1**). This vegetation type occurs at middle to higher elevations on the Henry Mountains unit. Ponderosa pine (*Pinus ponderosa*) dominates the tree component on sites of this type. Shrubs are usually present in the understory and may include species that could provide valuable summer/transitional browse for deer such as Gambel oak (*Quercus gambelii*), serviceberry (*Amelanchier* spp.), mountain snowberry (*Symphoricarpos oreophilus*), and chokecherry (*Prunus virginiana*), among others. According to the model, aspen (*Populus tremuloides*) biophysical sites can be found in the higher elevation drainages and slopes of the Henry Mountains. Although aspen dominates these biophysical sites, preferred browse species such as chokecherry, serviceberry, and mountain snowberry (among others) are commonly found. In addition, sites of these types typically have abundant understories that could provide forage for mule deer during the summer months. However, the model indicates that these aspen sites comprise only 5% of the summer range in this unit. Approximately 20% of the unit's mule deer winter habitat; almost 7% of the summer range; and 6% of the year-long habitat is made up of biophysical sites that may have little to no value for mule deer. These biophysical sites include developed land, sparsely vegetated areas, open water, agricultural land, and energy developments (**Table 4.1**, **Table 4.2**, **Table 4.3**).

The rest of the mule deer habitat within the Henry Mountains Management Unit is comprised of a number of other vegetation types (**Map 4.6**, **Table 4.1**, **Table 4.2**, **Table 4.3**), but those will not be discussed here. Descriptions for these additional vegetation types are available on the LANDFIRE BpS Models and Descriptions Support webpage (The Nature Conservancy LANDFIRE Team, 2015).

Group	Existing Vegetation Type for Summer Mule Deer Habitat	Acres	% of Total	Group % of Total
Conifer	Colorado Plateau Pinyon-Juniper Woodland	9,206	24.04%	
	Southern Rocky Mountain Ponderosa Pine Woodland	5,812	15.18%	
	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	2,328	6.08%	
	Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland	2,205	5.76%	
	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	1,969	5.14%	
	Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland	859	2.24%	
	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	497	1.30%	
	Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland	195	0.51%	
	Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland	93	0.24%	60.48%
Shrubland	Inter-Mountain Basins Montane Sagebrush Steppe	3,365	8.79%	
	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	3,269	8.54%	
	Inter-Mountain Basins Semi-Desert Shrub-Steppe	1,263	3.30%	
	Rocky Mountain Alpine Dwarf-Shrubland	318	0.83%	
	Inter-Mountain Basins Mixed Salt Desert Scrub	259	0.68%	
	Rocky Mountain Lower Montane-Foothill Shrubland	170	0.44%	
	Colorado Plateau Mixed Low Sagebrush Shrubland	124	0.32%	
	Inter-Mountain Basins Big Sagebrush Shrubland	6	0.01%	22.91%
Other	Sparsely Vegetated	2,405	6.28%	
	Agricultural	199	0.52%	
	Riparian	49	0.13%	
	Developed	2	0.01%	6.93%
Grassland	Rocky Mountain Subalpine-Montane Mesic Meadow	783	2.04%	
	Southern Rocky Mountain Montane-Subalpine Grassland	462	1.21%	
	Inter-Mountain Basins Semi-Desert Grassland	76	0.20%	
	Rocky Mountain Alpine Turf	31	0.08%	
	Rocky Mountain Alpine Fell-Field	3	0.01%	3.54%
Hardwood	Rocky Mountain Aspen Forest and Woodland	1,151	3.00%	3.00%
Exotic Herbaceous	Great Basin & Intermountain Introduced Annual and Biennial Forbland	710	1.85%	
	Great Basin & Intermountain Introduced Perennial Grassland and Forbland	320	0.84%	
	Great Basin & Intermountain Introduced Annual Grassland	2	0.01%	2.70%
Exotic Tree-Shrub	Great Basin & Intermountain Ruderal Shrubland	165	0.43%	
	Interior Western North American Temperate Ruderal Shrubland	1	0.00%	0.44%
Total		**38,296**	**100%**	**100%**

Table 4.1: LANDFIRE Existing Vegetation Type (LC23_EVT_240, 2023) acreage of summer mule deer habitat for WMU 15, Henry Mountains.

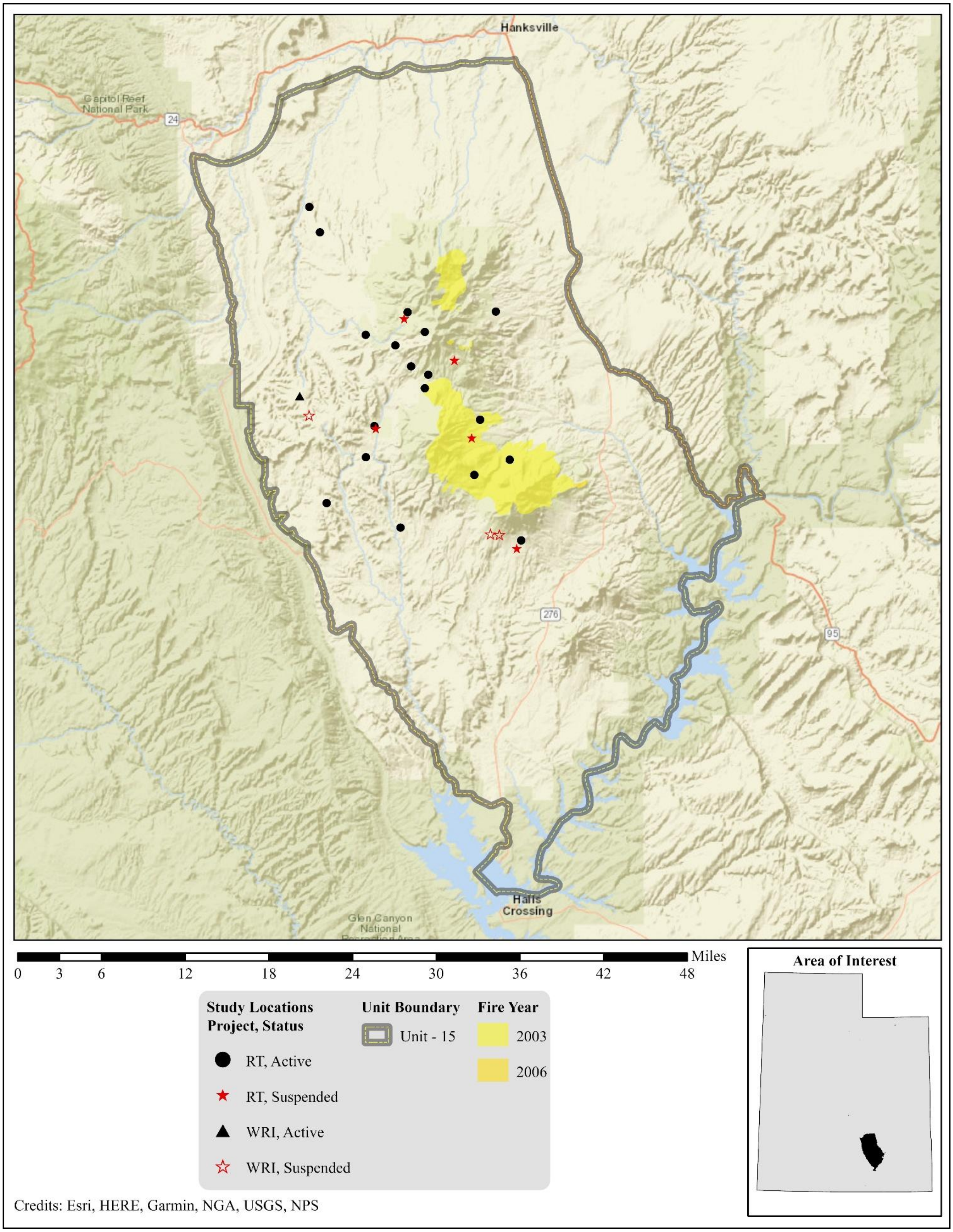
Group	Existing Vegetation Type for Winter Mule Deer Habitat	Acres	% of Total	Group % of Total
Shrubland	Colorado Plateau Blackbrush-Mormon-tea Shrubland	53,086	17.77%	
	Colorado Plateau Pinyon-Juniper Shrubland	38,262	12.8%	
	Inter-Mountain Basins Mat Saltbush Shrubland	17,994	6.02%	
	Inter-Mountain Basins Mixed Salt Desert Scrub	17,221	5.76%	
	Inter-Mountain Basins Semi-Desert Shrub-Steppe	11,382	3.81%	
	Inter-Mountain Basins Big Sagebrush Shrubland	9,840	3.29%	
	Southern Colorado Plateau Sand Shrubland	3,784	1.27%	
	Colorado Plateau Mixed Low Sagebrush Shrubland	2,977	1.00%	
	Inter-Mountain Basins Montane Sagebrush Steppe	2,299	0.77%	
	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	1,888	0.63%	
	Rocky Mountain Lower Montane-Foothill Shrubland	1,373	0.46%	
	Inter-Mountain Basins Greasewood Flat	665	0.22%	
	Rocky Mountain Alpine Dwarf-Shrubland	5	0.00%	53.81%
Conifer	Colorado Plateau Pinyon-Juniper Woodland	70,998	23.76%	
	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	671	0.22%	
	Southern Rocky Mountain Ponderosa Pine Woodland	473	0.16%	
	Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland	468	0.16%	
	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	193	0.06%	
	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	149	0.05%	
	Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland	88	0.03%	
	Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland	53	0.02%	
	Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland	1	0.00%	24.46%
Other	Sparsely Vegetated	58,653	19.63%	
	Developed	1,489	0.50%	
	Agricultural	345	0.12%	
	Riparian	143	0.05%	
	Open Water	29	0.01%	
	Quarries-Strip Mines-Gravel Pits-Well and Wind Pads	2	0.00%	20.30%

Group	Existing Vegetation Type for Winter Mule Deer Habitat	Acres	% of Total	Group % of Total
Exotic Tree-Shrub	Great Basin & Intermountain Ruderal Shrubland	2,808	0.94%	
	Interior Western North American Temperate Ruderal Shrubland	39	0.01%	0.95%
Exotic Herbaceous	Great Basin & Intermountain Introduced Annual and Biennial Forbland	325	0.11%	
	Great Basin & Intermountain Introduced Perennial Grassland and Forbland	223	0.07%	
	Great Basin & Intermountain Introduced Annual Grassland	89	0.03%	
	Interior Western North American Temperate Ruderal Grassland	8	0.00%	0.22%
Grassland	Inter-Mountain Basins Semi-Desert Grassland	380	0.13%	
	Rocky Mountain Subalpine-Montane Mesic Meadow	157	0.05%	
	Southern Rocky Mountain Montane-Subalpine Grassland	39	0.01%	0.19%
Hardwood	Rocky Mountain Aspen Forest and Woodland	164	0.05%	0.05%
Total		**298,764**	**100%**	**100%**

Table 4.2: LANDFIRE Existing Vegetation Type (LC23_EVT_240, 2023) acreage of winter mule deer habitat for WMU 15, Henry Mountains.

Group	Existing Vegetation Type for Year-Long Mule Deer Habitat	Acres	% of Total	Group % of Total
Conifer	Colorado Plateau Pinyon-Juniper Woodland	15,975	60.90%	
	Southern Rocky Mountain Ponderosa Pine Woodland	810	3.09%	
	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	120	0.46%	
	Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland	59	0.22%	
	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	65	0.25%	
	Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland	11	0.04%	
	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	1	0.00%	64.96%
Shrubland	Inter-Mountain Basins Semi-Desert Shrub-Steppe	1,480	5.64%	
	Inter-Mountain Basins Mixed Salt Desert Scrub	915	3.49%	
	Colorado Plateau Blackbrush-Mormon-tea Shrubland	783	2.98%	
	Inter-Mountain Basins Montane Sagebrush Steppe	722	2.75%	
	Colorado Plateau Pinyon-Juniper Shrubland	654	2.49%	
	Inter-Mountain Basins Big Sagebrush Shrubland	559	2.13%	
	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	466	1.78%	
	Colorado Plateau Mixed Low Sagebrush Shrubland	276	1.05%	
	Inter-Mountain Basins Mat Saltbush Shrubland	187	0.71%	
	Rocky Mountain Lower Montane-Foothill Shrubland	142	0.54%	
	Southern Colorado Plateau Sand Shrubland	39	0.15%	
	Inter-Mountain Basins Greasewood Flat	1	0.00%	23.73%
Other	Sparsely Vegetated	1,483	5.65%	
	Developed	127	0.48%	
	Agricultural	20	0.08%	
	Riparian	16	0.06%	
	Open Water	2	0.01%	6.28%
Exotic Tree-Shrub	Great Basin & Intermountain Ruderal Shrubland	681	2.60%	
	Interior Western North American Temperate Ruderal Shrubland	22	0.08%	2.68%
Exotic Herbaceous	Great Basin & Intermountain Introduced Perennial Grassland and Forbland	280	1.07%	
	Great Basin & Intermountain Introduced Annual and Biennial Forbland	6	0.02%	
	Great Basin & Intermountain Introduced Annual Grassland	3	0.01%	
	Interior Western North American Temperate Ruderal Grassland	1	0.00%	1.10%
Grassland	Rocky Mountain Subalpine-Montane Mesic Meadow	89	0.34%	
	Inter-Mountain Basins Semi-Desert Grassland	66	0.25%	
	Southern Rocky Mountain Montane-Subalpine Grassland	17	0.06%	0.65%
Hardwood	Rocky Mountain Aspen Forest and Woodland	157	0.60%	0.60%
Total		**26,231**	**100%**	**100%**

Table 4.3: LANDFIRE Existing Vegetation Type (LC23_EVT_240, 2023) acreage of year-long mule deer habitat for WMU 15, Henry Mountains.



Map 4.7: Land coverage of fires by year from 2003-2006 for WMU 15, Henry Mountains (NIFC Open Data Site: Federal Interagency Wildland Fire Maps and Data for All, 2025).

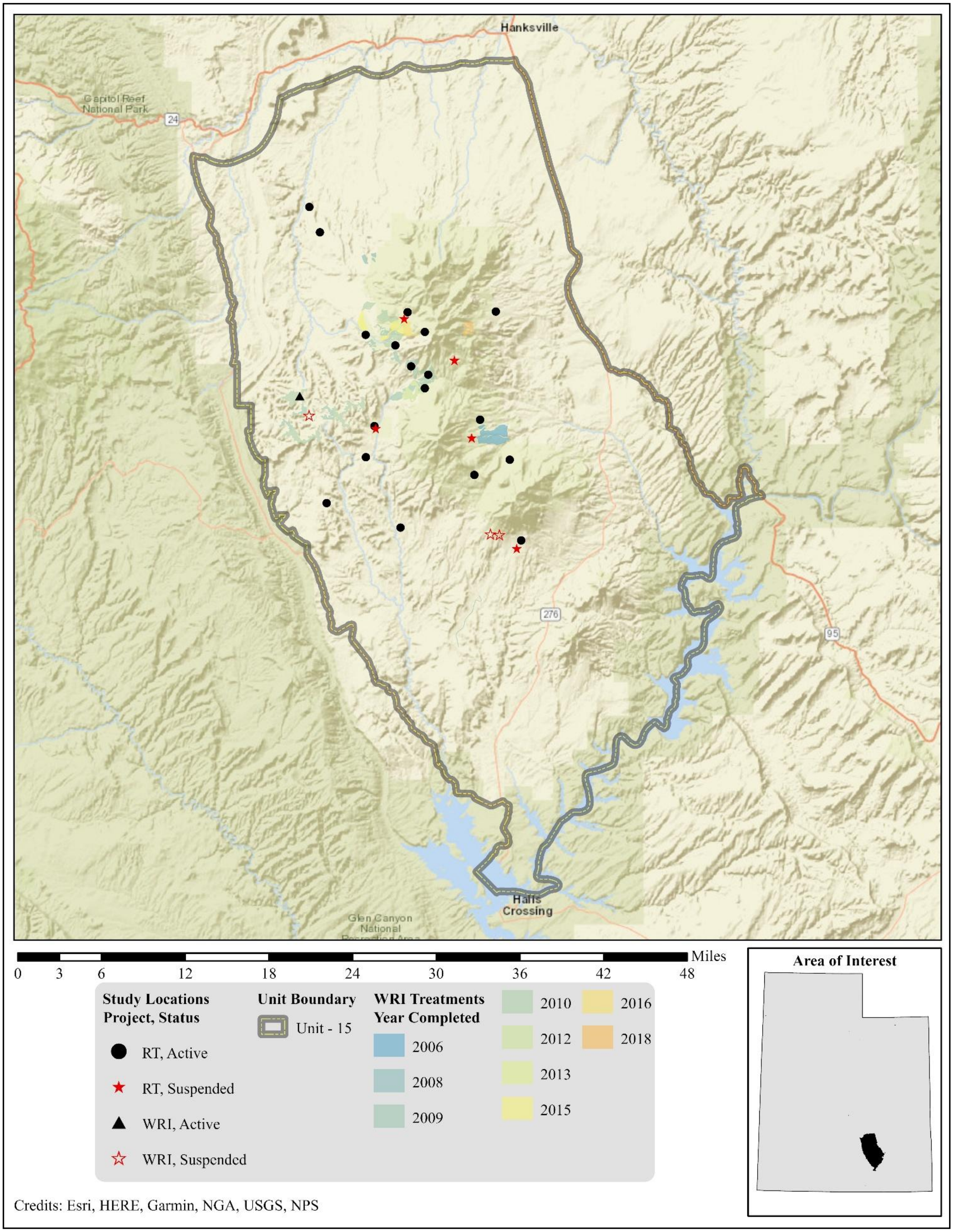
Treatments/Restoration Work

There has been an active effort to address many of the limitations on this unit through the Watershed Restoration Initiative (WRI). A total of 8,908 acres of land have been treated within the Henry Mountains unit since the WRI was implemented in 2004. Treatments frequently overlap one another, bringing the net total of completed treatment acres for this unit to 8,258 (**Map 4.8**, **Table 4.4**). Other treatments have occurred outside of the WRI through independent agencies and landowners, but the WRI comprises most of the work done on deer winter ranges throughout the state of Utah.

Manual vegetation removal (lop and scatter, etc.) to treat pinyon (*Pinus* spp.) and juniper (*Juniperus* spp.) trees is the most common management practice by acreage in this unit. Harrow treatments are also common, as are bullhog and chaining for tree removal. Other management practices include (but are not limited to) seeding to augment herbaceous components and anchor chaining (**Table 4.4**).

Type	Total Completed Acreage
Vegetation Removal/Hand Crew	**5,722**
Lop & Scatter	5,717
Lop-Pile-Burn	5
Harrow	**1,331**
≤ 15 ft. (Two-Way)	1,325
≤ 15 ft. (One-Way)	5
Bullhog	**791**
Skid Steer	791
Chain Harrow	**516**
≤ 15 ft. (One-Way)	516
Seeding (Primary)	**471**
Ground (Mechanical Application)	411
Broadcast (Aerial-Fixed Wing)	60
Anchor Chain	**72**
Ely (Two-Way)	72
Other	**5**
Road Decommissioning	5
Grand Total	**8,908**
***Net Total Land Area Treated**	**8,258**

Table 4.4: WRI treatment action size (acres) of completed projects for WMU 15, Henry Mountains. Data accessed on 02/25/2025.
*Does not include overlapping treatments.



Map 4.8: Terrestrial WRI treatments by fiscal year completed for WMU 15, Henry Mountains.

Range Trend Studies

Range Trend studies have been sampled within WMU 15 on a regular basis since 1987, with studies being added or suspended as was deemed necessary (**Table 4.5**). Due to changes in sampling methodologies, only data collected following the 1992 sample year is included in this summary. Monitoring studies of Watershed Restoration Initiative (WRI) projects began in 2004. When possible, WRI monitoring studies are established prior to treatment and sampled on a regular basis following treatment. Due to the long-term nature of the studies, many of the Range Trend and WRI studies have had some sort of disturbance or treatment prior to or since study establishment (**Table 4.6**). Range Trend studies are summarized in this report by ecological site.

Study #	Study Name	Project	Status	Years Sampled	Ecological Site Description
15-01	Eagle Bench	RT	Active	1987, 1994, 1999, 2004, 2009, 2014, 2019, 2024	Semidesert Gravelly Loam (Wyoming Big Sagebrush)
15-02	Nasty Flat	RT	Active	1987, 1994, 1999, 2004, 2009, 2014, 2019, 2024	High Mountain Stony Loam (Aspen)
15-03	Dugout	RT	Suspended	1987, 1994, 1999	Mountain Loam (Shrub)
15-04	South Creek Chaining	RT	Active	1987, 1994, 1999, 2004, 2009, 2014, 2019, 2024	Mountain Stony Loam (Mountain Big Sagebrush)
15-05	Bates Knob	RT	Active	1987, 1994, 1999, 2004, 2009, 2014, 2019, 2024	Mountain Loam (Mountain Big Sagebrush)
15-06	Box Springs Chaining	RT	Active	1987, 1994, 1999, 2004, 2009, 2014, 2019, 2024	Mountain Loam (Mountain Big Sagebrush)
15-07	Airplane Spring	RT	Active	1987, 1994, 1999, 2004, 2009, 2014, 2019, 2024	Upland Stony Loam (Black Sagebrush)
15-08	Garden Basin	RT	Suspended	1987, 1994, 1999	Mountain Loam (Shrub)
15-09	Cave Flat Chaining	RT	Suspended	1987, 1994, 1999, 2009	Upland Shallow Loam (Cliffrose)
15-10	Cave Flat	RT	Active	1987, 1994, 1999, 2011, 2014, 2019, 2024	Semidesert Sandy Loam (Wyoming Big Sagebrush)
15-11	Above Coyote Bench	RT	Suspended	1987, 1994, 1999	Mountain Loam (Shrub)
15-12	Quaking Aspen Spring	RT	Active	1987, 1994, 1999, 2004, 2009, 2014, 2019, 2024	Upland Stony Loam (Black Sagebrush)
15-13	Sidehill Spring	RT	Active	1987, 1994, 1999, 2004, 2009, 2014, 2019, 2024	Mountain Loam (Mountain Big Sagebrush)
15-14	Dugout Creek	RT	Active	2004, 2009, 2014, 2019, 2024	Mountain Loam (Mountain Big Sagebrush)
15-15	Steven’s Mesa	RT	Active	2004, 2009, 2014, 2024	Semidesert Sandy Loam (Fourwing Saltbush)
15-16	Coyote Spring	RT	Active	2009, 2014, 2019, 2024	Mountain Stony Loam (Mountain Big Sagebrush)
15-17	Swap Mesa	RT	Active	2009, 2014, 2019, 2024	Semidesert Sandy Loam (Fourwing Saltbush)
15-18	Cave Flat Chaining 2	RT	Active	2014, 2019, 2024	Upland Shallow Loam (Cliffrose)
15-19	Copper Creek	RT	Suspended	2014	Semidesert Sandy Loam (Blackbrush)
15-20	Sage Flat	RT	Active	2019, 2024	Upland Stony Loam (Mountain Big Sagebrush)
15-21	Bullfrog Benches	RT	Active	2019, 2024	Desert Loam (Shadscale)
15-22	Johns Knoll	RT	Active	2019, 2024	Upland Stony Loam (Wyoming Big Sagebrush)
15-23	Steven's Mesa Point	RT	Active	2019, 2024	Desert Loam (Shadscale)
15R-01	Tarantula Mesa Reference	WRI	Suspended	2009	Not Verified
15R-02	Tarantula Mesa Lop and Scatter	WRI	Active	2009, 2012, 2019	Semidesert Sandy Loam (Wyoming Big Sagebrush)
15R-03	Indian Springs	WRI	Suspended	2010	Not Verified

Study #	Study Name	Project	Status	Years Sampled	Ecological Site Description
15R-04	Indian Springs Reference	WRI	Suspended	2010	Not Verified

Table 4.5: Range Trend and WRI project studies monitoring history and ecological site potential for WMU 15, Henry Mountains.

Study #	Study Name	Type	Disturbance Name (If Available)	Date	Acres	WRI Project #
15-01	Eagle Bench	Two-Way Unknown	Eagle Bench Seeding	August-October 1966	1,627	3713*
		Aerial After	Eagle Bench Seeding	August-October 1966	1,627	3713*
		Lop and Scatter	Henry Mountain Fuel Reduction	April-May 2002	1,529	3237*
15-04	South Creek Chaining	Chain Unknown	South Creek Pinyon-Juniper Project	May 1968-June 1969	607	76595*
		Dribbler	South Creek Pinyon-Juniper Project	Fall 1968-Spring 1969	607	LTDL
		Aerial After	South Creek Pinyon-Juniper Project	May 1969	607	10841*
		Lop and Scatter	Henry Mountains PJ Thinning	September 1999-July 2002	3,363	5238*
		Lop and Scatter	Dugout Flat Lop and Scatter Phase II	September-October 2010	1,396	1335
		Lop and Scatter	Color Country and Paria River District Maintenance (Proposed)	2025	5,007	7315
15-05	Bates Knob	Two-Way Unknown	South Creek Seeding 1968	Fall 1968-Spring 1969	607	10841*
		Dribbler	South Creek Seeding 1968	Fall 1968-Spring 1969	607	10841*
		Aerial After	South Creek Seeding 1968	May 1969	607	10841*
		Lop and Scatter	Airplane Springs Fuels Project	June-July 2008	1,464	1123
15-06	Box Springs Chaining	Seed Unknown	Box Springs Chain and Seed	August 1984-March 1985	294	1398*
		Chain Unknown	Box Springs Chain and Seed	August 1984-March 1985	294	1398*
		Dribbler	Box Springs Chain and Seed	August 1984-March 1985	294	1398*
		Lop and Scatter	Bullfrog Creek Chaining Maint. Phase I	June-November 2008	164	339
15-07	Airplane Spring	Aerial Before	West Horn Seeding 1968	October 1968-June 1969	1,632	12601*
		Two-Way Unknown	West Horn Seeding 1968	November 1968-June 1969	1,632	12601*
		Lop and Scatter	Airplane Springs Fuels Project	June-July 2008	1,464	1123
		Lop and Scatter	Color Country and Paria River District Maintenance (Proposed)	2025	5,007	7315
15-09	Cave Flat Chaining	Chain Unknown		Fall 1983		
		Seed Unknown		Fall 1983		
15-11	Above Coyote Bench	Wildfire	Bulldog Fire	July 2003	31,753	
		Aerial After	Bulldog Fire Rehabilitation-Non WSA	November 2003	8,527	LTDL
15-12	Quaking Aspen Spring	Chain Unknown		Historic		
		Seed Unknown		Historic		
		Wildfire	Bulldog	2003	31,754	
		One-Way Unknown	Bulldog Fire Rehabilitation-Non WSA	October 2003-April 2004	4,600	1702*
		Dribbler	Henry Mountains Dribbler	2003	900	
		Aerial	Henry Mountains Low Elevation Seeding	November 2003	7,676	
15-13	Sidehill Spring	Wildfire	Bulldog	2003	31,754	
		One-Way Unknown	Bulldog Fire Rehab 2003	November 2003-April 2004	4,600	1702*
		Aerial	BLM Bulldog Fire (Non-WSA)	November 2003	8,098	1702*
15-16	Coyote Spring	Wildfire	Bulldog	2003	31,728	
		One-Way Unknown	Bulldog Fire Rehab 2003	October 2003-April 2004	4,600	1702*
		Aerial	Bulldog Fire Rehab 2003	November 2003	8,098	1702*
15-17	Swap Mesa	Wildfire		Historic		
15-18	Cave Flat Chaining 2	Chain Unknown		Fall 1983		
		Seed Unknown		Fall 1983		
15-20	Sage Flat	Aerial Before	Nasty Flat Chaining	August 1984	685	7938*
		Two-Way Ely	Nasty Flat Chaining	August 1984	685	7938*
		Lop and Scatter	Color Country and Paria River District Maintenance (Proposed)	2025	5,007	7315
15R-02	Tarantula Mesa Lop and Scatter	Aerial Before	Tarantula Seeding #2	April 1966	1,500	
		Two-Way Unknown	Tarantula Seeding #2	October 1965-March 1966	1,500	
		Lop and Scatter	Tarantula Mesa Lop and Scatter Phase II	August-September 2009	1,784	1336

Table 4.6: Range Trend and WRI studies known disturbance history for WMU 15, Henry Mountains. PDB = Pre-Database; LTDL = Land Treatment Digital Library (Pilliod, Welty, & Jefferies, 2019). *Numbers with an asterisk are LTDL project numbers.

Study Trend Summary (Range Trend)

Ecotypes represented by only one study site throughout most or all of the sample period or entirely by sites that are suspended are listed below but are not discussed in this section. However, graphs for these ecotypes have been included and referenced when a representative study site is active as of the 2024 sample year:

- Mountain (Aspen) - Nasty Flat (15-02)
  - (**Figure 4.13**, **Figure 4.19**, **Figure 4.22**, **Figure 4.26**, **Figure 4.30**, **Figure 4.33**, **Figure 4.36**, **Figure 4.39**)
- Mountain (Shrub) - Dugout (15-03) (suspended), Garden Basin (15-08) (suspended), Above Coyote Bench (15-11) (suspended)
- Upland (Cliffrose) - Cave Flat Chaining (15-09) (suspended) and Cave Flat Chaining 2 (15-18)
  - (**Figure 4.15**, **Figure 4.20**, **Figure 4.23**, **Figure 4.27**, **Figure 4.31**, **Figure 4.34**, **Figure 4.37**, **Figure 4.40**)
- Semidesert (Blackbrush) - Copper Creek (15-19) (suspended)

Trend summaries and/or additional data for these ecotypes are available in the corresponding site reports (Lane, Cox, & Payne, Utah Big Game Range Trend Studies 2024, Wildlife Management Units 13A, 14A, 14B, 15, 16B & 16C, 2025).

Mountain (Big Sagebrush)

There are six studies [South Creek Chaining (15-04), Bates Knob (15-05), Box Springs Chaining (15-06), Sidehill Spring (15-13), Dugout Creek (15-14), and Coyote Spring (15-16)] that are classified as Mountain (Big Sagebrush) ecological sites. The South Creek Chaining study can be found just south of South Creek on the lower slopes of South Creek Ridge. Bates Knob is situated on the lower southern-facing slopes of South Creek Ridge between Sweetwater Creek and North Fork Bullfrog Creek. The Box Springs Chaining site is located just north of Box Spring and Pennellen Pass, and the Sidehill Spring study is situated east of Sidehill Spring and just southwest of Bulldog Peak. The Dugout Creek study site can be found south of Corral Point near Dugout Creek. Finally, Coyote Spring is located north of the Coyote Benches near Coyote Creek.

Consideration should be given to the varying number of study sites sampled each year (the 'n' value) and the relevant implications that this may have on the data and associated discussions. More specifically, the Dugout Creek study has provided data since 2004, and Coyote Spring has contributed data since 2009. South Creek, Bates Knob, Box Springs Chaining, and Sidehill Spring have provided data in all sample years since 1994.

<u>Shrubs/Trees</u>: Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) is the dominant preferred browse species on nearly all of these study sites as of 2024. However, fourwing saltbush (*Atriplex canescens*) is the dominant browse species on the Coyote Spring study, on which preferred browse is rare in general. Other preferred browse such as black sagebrush (*Artemisia nova*), antelope bitterbrush (*Purshia tridentata*), and/or other species are present on some study sites, but they contribute less cover than mountain big sagebrush. Total average shrub cover on these sites has increased over time, mainly due to mountain big sagebrush. Sagebrush has exhibited notable net increases in cover particularly on the Dugout Creek, Sidehill Spring, and Bates Knob studies (**Figure 4.12**). Average preferred browse density has increased overall since 2009. More specifically, the decrease in preferred browse density between 2009 and 2014 can primarily be attributed to a decrease in young plants on the South Creek Chaining and Dugout Creek studies. Mature plants have been the dominant demographic on these sites in most sample years, including 2024. Recruitment of young (aside from 2009) and decadence among these preferred browse populations have remained low over the study period (**Figure 4.25**). Browse utilization has displayed yearly fluctuations, but it has decreased since 2014. In 2024, 20% of preferred browse plants sampled in density strips displayed signs of moderate utilization while 34% were heavily used (**Figure 4.29**).

Twoneedle pinyon (*Pinus edulis*) and Rocky Mountain and/or Utah juniper (*Juniperus scopulorum* and/or *J. osteosperma*) are present on all study sites of this ecotype as of 2024; limber pine (*P. flexilis*) is also present on the Dugout Creek study. Both tree cover and density exhibited an initial decrease between 2004 and 2009: these trends can largely be attributed to lop and scatter projects on the Bates Knob and Box Springs Chaining studies. Tree cover and density have increased since 2009, however, indicating that infilling or encroachment is actively occurring on sites of this ecotype (**Figure 4.18**, **Figure 4.21**).

Herbaceous Understory: The herbaceous understories of these study sites have remained dominated by perennial grasses, many of which are introduced species such as crested wheatgrass (*Agropyron cristatum*) and/or intermediate wheatgrass (*Thinopyrum intermedium*). Total average herbaceous cover has exhibited yearly fluctuations but has remained generally stable since 2014. Average nested frequency has also varied between sample years and exhibited a noticeable decrease between 2019 and 2024, primarily due to a decrease in the abundance of annual forbs. Perennial forbs have contributed little cover in comparison with perennial grasses. Annual grasses provided moderate cover in 1999 due to the introduced species cheatgrass (*Bromus tectorum*) on the Sidehill Spring study, but both cover and frequency have remained very low since 2009 (**Figure 4.33**, **Figure 4.36**).

Occupancy: Average pellet transect data shows an overall decreasing trend in animal presence and indicates that primary occupancy has fluctuated. Cattle and/or bison were the primary occupants between 1999 and 2014, and average pellet group abundance has ranged from 13 days use/acre in 2024 to 47 days use/acre in 1999. Deer were the primary occupants in 2019 and 2024, and mean pellet group abundance has been as low as 10 days use/acre in 1999 and as high as 31 days use/acre in 2009. Finally, elk were present in 2009, 2014, and 2024 with an average pellet group abundance of 1 days use/acre, but pellet groups were not sampled in other years (**Figure 4.39**).

Upland (Big Sagebrush)

Two studies [Sage Flat (15-20) and Johns Knoll (15-22)] are classified as Upland (Big Sagebrush) ecological sites. The Sage Flat study site is located in Sage Flat, just south of South Creek. The Johns Knoll study can be found west of Johns Knoll and Star Spring.

Shrubs/Trees: Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) is the dominant preferred browse species on these studies, with lesser amounts of blackbrush (*Coleogyne ramosissima*) also present on the Johns Knoll site. Total average shrub cover has remained stable between 2019 and 2024, with sagebrush contributing most of the cover (**Figure 4.12**). Average preferred browse density decreased between 2019 and 2024, primarily due to a decrease in decadent individuals. Mature plants have been the dominant preferred browse demographic throughout the study period, and recruitment of young has remained low (**Figure 4.25**). Utilization of preferred browse was high in 2019, but has since decreased. In 2024, 14% of preferred browse plants were moderately browsed and 27% were heavily hedged (**Figure 4.29**).

Utah juniper (*Juniperus osteosperma*) has been present on these study sites in both 2019 and 2024 but has not contributed any cover. Density has remained very low and stable over time (**Figure 4.18**, **Figure 4.21**).

Herbaceous Understory: The herbaceous understories on these sites were co-dominated by perennial grasses and annual grasses and forbs in 2019. However, both cover and frequency of annual grasses and forbs decreased in 2024, leaving perennial grasses as the dominant herbaceous component. Perennial grasses have consisted of mainly native species such as blue grama (*Bouteloua gracilis*) and James' galleta (*Pleuraphis jamesii*), but the introduced species crested wheatgrass (*Agropyron cristatum*) has also contributed cover on the Sage Flat study. The introduced annual grass species cheatgrass (*Bromus tectorum*) has been present on both study sites (particularly Sage Flat in 2019), but with low cover as of 2024. Perennial forbs have provided little cover throughout the study period (**Figure 4.34**, **Figure 4.37**).

Occupancy: Average pellet transect data indicates that occupancy of these sites has decreased slightly between 2019 and 2024: this can be attributed to the Sage Flat study, as animal presence increased on Johns Knoll.

Deer were the primary occupants in both study years, with a mean pellet group abundance of 33 days use/acre in 2019 and 26 days use/acre in 2024. Cattle and/or bison pellet groups have also been observed, with an average abundance of 5 days use/acre in 2019 and 10 days use/acre in 2024 (**Figure 4.40**).

Upland (Black/Low Sagebrush)

There are two studies [Airplane Spring (15-07) and Quaking Aspen Spring (15-12)] classified as Upland (Black/Low Sagebrush) ecological sites. The Airplane Spring study is located northwest of The Horn and just northeast of Airplane Spring. The Quaking Aspen Spring site is situated north of Cass Creek Peak and Quaking Aspen Spring.

Shrubs/Trees: Sagebrush (*Artemisia* spp.) dominates the preferred browse components of these study sites. Black sagebrush (*A. nova*) dominates the Airplane Spring study, while mountain big sagebrush (*A. tridentata* ssp. *vaseyana*) contributes much of the cover on Quaking Aspen Spring. Other preferred browse species including (but not limited to) Utah serviceberry (*Amelanchier utahensis*) and alderleaf mountain mahogany (*Cercocarpus montanus*) are also present on these sites, but to a lesser extent than sagebrush. Total average shrub cover has increased each sample year, a trend largely driven by increases in sagebrush cover over time (**Figure 4.14**). Average preferred browse density has decreased overall when comparing 1994 data with that from 2024. However, site-level data indicates that the initial significant decrease in preferred browse density driving the overall trend can be attributed to the 2003 Bulldog wildfire on the Quaking Aspen Spring study (**Table 4.6**); density has increased overall between 2004 and 2024. Mature individuals have been the dominant demographic in all sample years. Both decadence and recruitment of young have remained comparatively low throughout the study period, but the number of decadent and young plants did exhibit a notable decrease following the wildfire (**Figure 4.27**). Average utilization of preferred browse has increased overall, but it has decreased each sample year since 2014. In 2024, 20% of plants were moderately browsed, while 26% showed signs of heavy utilization (**Figure 4.31**).

Tree cover and/or density have been sampled on these sites in all sample years; a mixture of both twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) has been observed. Both cover and density decreased between 2004 and 2009 due to the lop and scatter project on the Airplane Spring study and wildfire on Quaking Aspen Spring. Cover has remained low in subsequent years. However, density has increased each year since 2009. Site-level data indicates that although this increasing density trend is mainly driven by the Airplane Spring study, infilling is also occurring (to a much lesser extent) on Quaking Aspen Spring (**Figure 4.20**, **Figure 4.23**).

Herbaceous Understory: The herbaceous understories of these study sites have mainly been comprised of perennial grasses, particularly the introduced species crested wheatgrass (*Agropyron cristatum*). Total average nested frequency of herbaceous species has fluctuated from year to year, but it has remained similar when comparing 1994 data with that from 2024. Average herbaceous cover has increased, however, mainly due to perennial grasses. The introduced annual grass species cheatgrass (*Bromus tectorum*) has been observed on both study sites in most sample years, but with generally low cover and abundance. Perennial and annual forbs have consistently provided less cover than perennial grasses (**Figure 4.34**, **Figure 4.37**).

Occupancy: Pellet transect data shows that total animal presence decreased between 2019 and 2024 but has increased overall; primary occupancy has fluctuated over time. Cattle and/or bison were the primary occupants in 1999 and 2004, and average pellet group abundance has fluctuated between 3 days use/acre in 2024 and 19 days use/acre in 2009. Deer have been the primary occupants of these study sites since 2009, with a mean pellet group abundance as low as 7 days use/acre in 2004 and as high as 53 days use/acre in 2019. Finally, elk pellet groups were sampled with an average abundance of less than 1 days use/acre in 2009, 2014, and 2024, but were not observed in any other sample year (**Figure 4.40**).

Semidesert (Big Sagebrush)

Two sites [Eagle Bench (15-01) and Cave Flat (15-10)] are classified as Semidesert (Big Sagebrush) ecological sites. The Eagle Bench study is located on the east side of the Henry Mountains north of Crescent Creek and Lecleed Spring. The Cave Flat site is found on Cave Flat, approximately 0.8 miles south of Cave Flat Reservoir.

Shrubs/Trees: Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) dominates the preferred browse components on these study sites, although other species have been present to a much lesser extent. Sagebrush drives the average shrub cover trend of these sites, which has exhibited an overall decrease. Furthermore, site-level data indicates that the decrease in sagebrush cover between 2014 and 2024 can largely be attributed to the Cave Flat study, on which cover decreased from 28% to 14% over the past 10 years (**Figure 4.12**). Preferred browse density has decreased overall between 1994 and 2024 according to average preferred browse demographics. Mature individuals have comprised most of the populations on these sites throughout the study period. Recruitment of young plants has consistently been low and has decreased over time. In contrast, decadence within these populations has increased overall (**Figure 4.25**). Average preferred browse utilization has exhibited fluctuations, but it has decreased each sample year since 2009. In 2024, 20% of preferred browse plants were moderately hedged, while 34% were heavily utilized (**Figure 4.29**).

Utah juniper (*Juniperus osteosperma*) and/or twoneedle pinyon (*Pinus edulis*) are the tree species present on these study sites. Cover has remained stable and very low since 2009, a trend entirely driven by the Cave Flat study; no cover was recorded in 2004 as Cave Flat was not sampled that year (**Figure 4.18**). Average tree density has increased over time, largely due to infilling on the Eagle Bench site (**Figure 4.21**).

Herbaceous Understory: The herbaceous understories of these studies have been primarily comprised of native perennial grass species such as blue grama (*Bouteloua gracilis*), James' galleta (*Pleuraphis jamesii*), and squirreltail (*Elymus elymoides*), among others. Total average herbaceous cover has increased overall. Average nested frequency has fluctuated from year to year, but abundance of perennial grasses has remained similar over time. Total frequency exhibited a notable decrease between 2019 and 2024, but this was mainly due to a decrease in perennial forbs and annual grasses and forbs. The introduced annual grass species cheatgrass (*Bromus tectorum*) has been observed in many sample years, but with generally low cover and abundance. Annual and perennial forbs have provided little cover in most sample years (**Figure 4.35**, **Figure 4.38**).

Occupancy: Average pellet transect data shows an initial increase in animal presence between 2004 and 2009, but presence has decreased in each subsequent sample year. Cattle and/or bison were the primary occupants of these sites in 1999, and mean pellet group abundance has fluctuated between less than 1 days use/acre in 2009 and 2014 and 24 days use/acre in 1999. Deer have been the primary occupants in all other sample years, with an average pellet group abundance as low as 2 days use/acre in 1999 and as high as 51 days use acre in 2014. Finally, mean abundance of elk pellet groups was 0.3 days use/acre in 1999, but elk pellet groups have not been observed in any other year (**Figure 4.41**).

Semidesert (Fourwing Saltbush)

There are two studies [Steven's Mesa (15-15) and Swap Mesa (15-17)] that are classified as Semidesert (Fourwing Saltbush) ecological sites. The Steven's Mesa study is found on the northern portion of Stevens Mesa, and the Swap Mesa site is located southwest of the Henry Mountains on the eastern portion of Swap Mesa.

It is important to note the variation in the number of study sites sampled from year to year (the 'n' value) and consider the implications that this may have on the data and associated discussions. The Steven's Mesa study provided data between 2004 and 2014 and in 2024. Swap Mesa has contributed data for all sample years since 2009.

Shrubs/Trees: Fourwing saltbush (*Atriplex canescens*) is the dominant browse species on these study sites, although it has contributed little cover throughout the sample period. Total average shrub cover has exhibited yearly fluctuations (due to both actual variation in cover and the difference in the number of studies sampled each year), but it has decreased overall. Shrubs other than preferred browse species such as broom snakeweed (*Gutierrezia sarothrae*) and/or yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus* var. *stenophyllus*) have provided much of the cover in most sample years (**Figure 4.16**). Like cover, average preferred browse density has decreased overall despite yearly variation. Total density remains stable when comparing 2014 and 2024 data, but population demographics have shifted over time. More specifically, mature plants comprised a majority of the preferred browse populations on these sites in 2004, 2019, and 2024. Decadent individuals were the most abundant demographic in 2009, while recruitment of young was highest in 2014 (but has since decreased) (**Figure 4.28**). On average, more than 50% of preferred browse plants on these study sites exhibited signs of little to no utilization between 2004 and 2019. In 2024, however, 39% of individuals were moderately hedged, and 46% showed signs of heavy utilization (**Figure 4.32**).

Twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) were sampled with low density in 2014, but trees have not been observed in cover or density measurements for any other study year (**Figure 4.24**). As such, no tree cover graph is included for this ecotype.

Herbaceous Understory: The herbaceous understories of these studies have fluctuated in cover, abundance, and composition from year to year. Both cover and frequency increased between 2004 and 2019, but they notably decreased in 2024. This decrease between the two most recent sample years can be attributed to a decrease in annual forbs on the Swap Mesa study and the fact that the Steven's Mesa site was not sampled in 2019. When comparing 2009 with 2024 data (years in which both sites were sampled), cover and frequency have increased overall. Annual forbs were the dominant herbaceous component in 2004 and 2019, with mainly native species providing much of the cover in most years. In contrast, native perennial grasses such as James' galleta (*Pleuraphis jamesii*) dominated the understories in 2009, 2014, and 2024. A flush of annual grasses occurred in 2019 due to the native sixweeks fescue (*Vulpia octiflora*) and, to a lesser extent, the introduced species cheatgrass (*Bromus tectorum*). However, annual grasses have remained rare in other sample years. Perennial forbs have increased overall, with globemallow (*Sphaeralcea* spp.) providing much of the cover in 2024 (**Figure 4.35**, **Figure 4.38**).

Occupancy: Average pellet transect data shows that despite an overall increase between 2004 and 2024, animal presence has generally decreased since 2009. Cattle and/or bison have been the primary occupants of these study sites in all years, with mean pellet group abundance ranging from 2 days use/acre in 2004 to 29 days use/acre in 2019. Deer were present in 2009 and 2019 with a mean abundance of 0.7 days use/acre and 4 days use/acre (respectively), but pellet groups have not been observed in any other sample year (**Figure 4.41**).

Desert (Shadscale)

Two studies [Bullfrog Benches (15-21) and Steven's Mesa Point (15-23)] are classified as Desert (Shadscale) ecological sites. The Bullfrog Benches study is located southwest of the Henry Mountains on the Bullfrog Benches. The Steven's Mesa Point study can be found north of the Henry Mountains on the northernmost portion of Stevens Mesa.

Shrubs/Trees: Preferred browse cover on these study sites is mainly contributed by shadscale saltbush (*Atriplex confertifolia*). Total average shrub cover increased between sample years but remains less than 10% as of 2024. This increase in total shrub cover can largely be attributed to shadscale saltbush and shrubs other than preferred browse species on the Steven's Mesa Point study. Average density of preferred browse species has increased over time. This density trend is also driven by Steven's Mesa Point, as preferred browse density decreased between 2019 and 2024 on the Bullfrog Benches site. Decadent plants were the primary demographic on these studies in 2019. However, decadence decreased on both study sites in 2024, leaving mature individuals as the dominant demographic. Recruitment of young has also decreased over time (**Figure 4.17**, **Figure 4.28**). Average preferred browse utilization was low in 2019 and has since decreased further; less than 1% of preferred browse plants were moderately hedged and no plants were heavily utilized in 2024 (**Figure 4.32**).

Trees have remained absent from these sites throughout the study period and will not be discussed in this section. As such, tree cover and density graphs are not included in this report for this ecotype.

Herbaceous Understory: Cover and abundance of the herbaceous understories of these study sites decreased between 2019 and 2024, mainly due to decreases in annual forbs on both study sites. The introduced annual forb prickly Russian thistle (*Salsola tragus*) still contributed a majority of the herbaceous cover on Bullfrog Benches during the most recent sample year, but James' galleta (*Pleuraphis jamesii*) dominated the understory of Steven's Mesa Point in 2024. Perennial forbs and annual grasses have remained rare in both sample years in comparison with their annual/perennial counterparts (**Figure 4.35**, **Figure 4.38**).

Occupancy: Average pellet transect data indicates that animal presence has decreased between 2019 and 2024. Cattle and/or bison have been the primary occupants of these sites in both sample years, with a mean abundance of 32 days use/acre in 2019 and 6 days use/acre in 2024 (**Figure 4.41**).

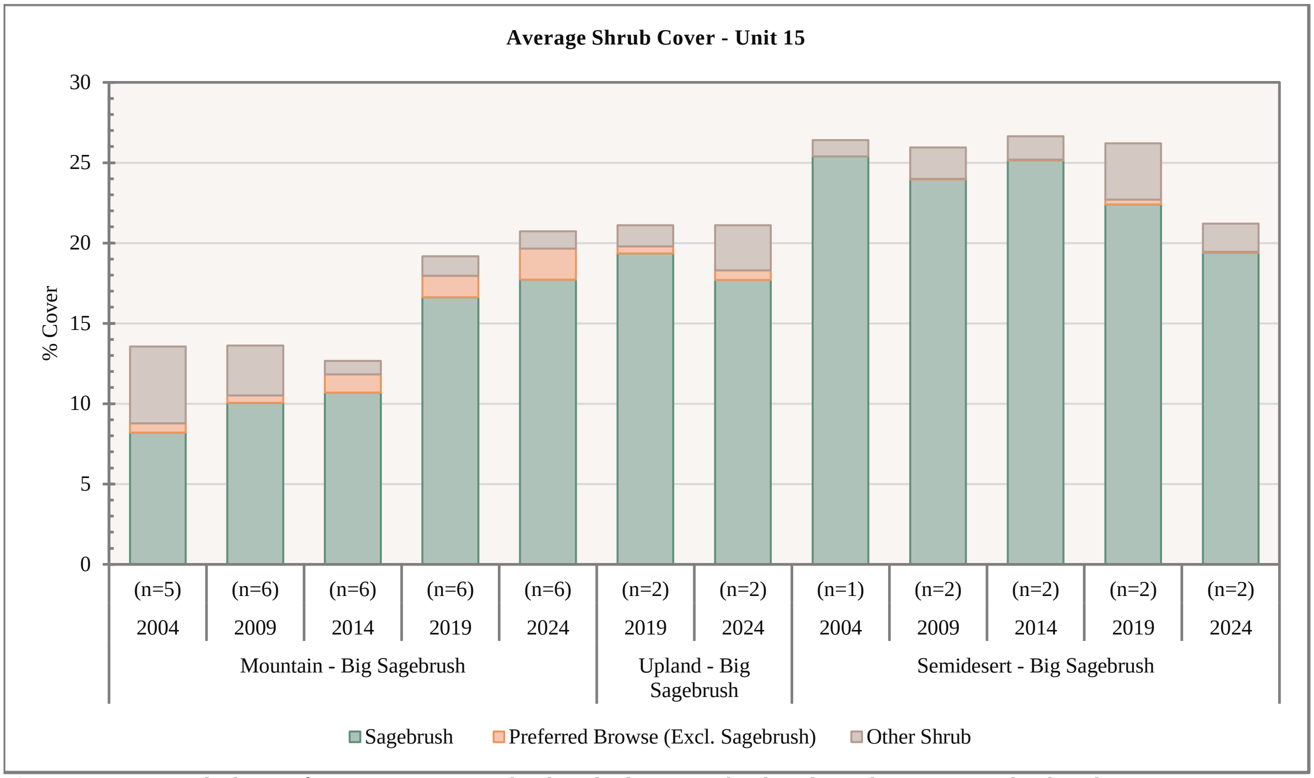


Figure 4.12: Average shrub cover for Mountain - Big Sagebrush, Upland - Big Sagebrush, and Semidesert - Big Sagebrush study sites in WMU 15, Henry Mountains.

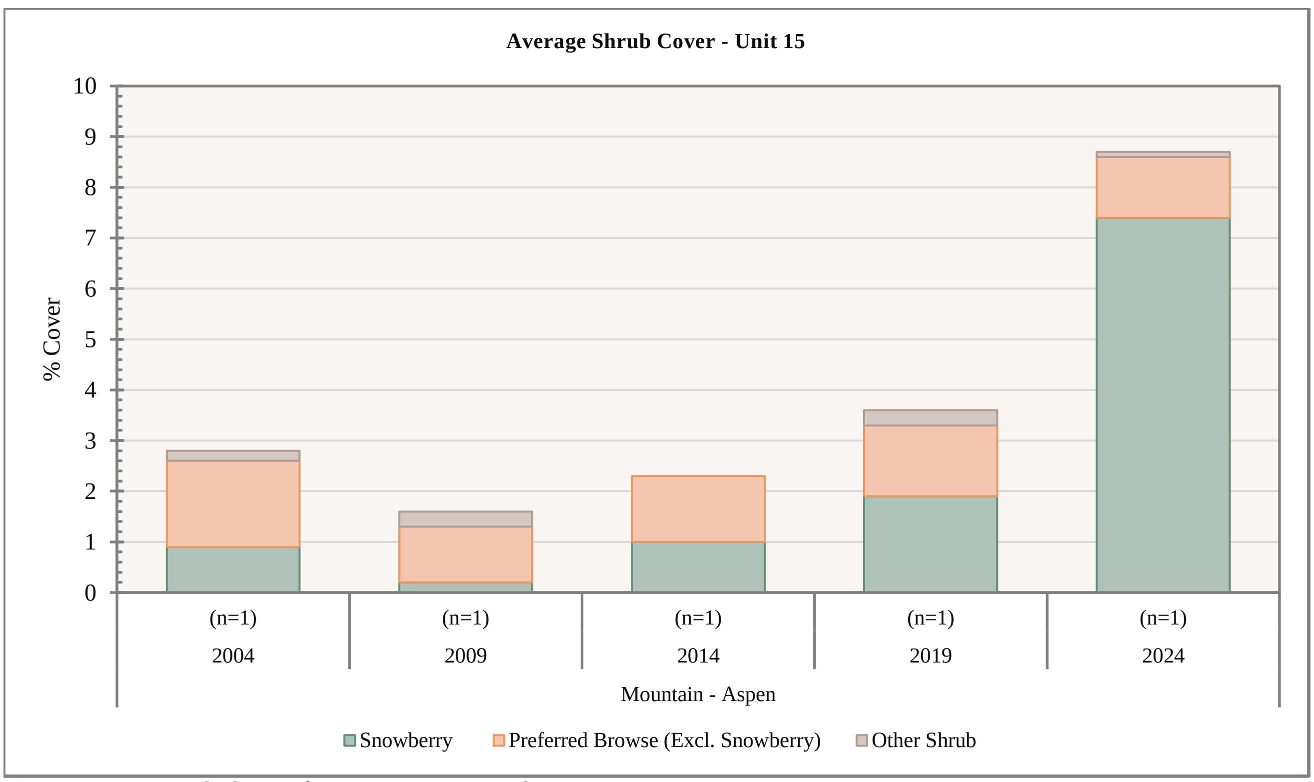


Figure 4.13: Average shrub cover for Mountain - Aspen study sites in WMU 15, Henry Mountains.

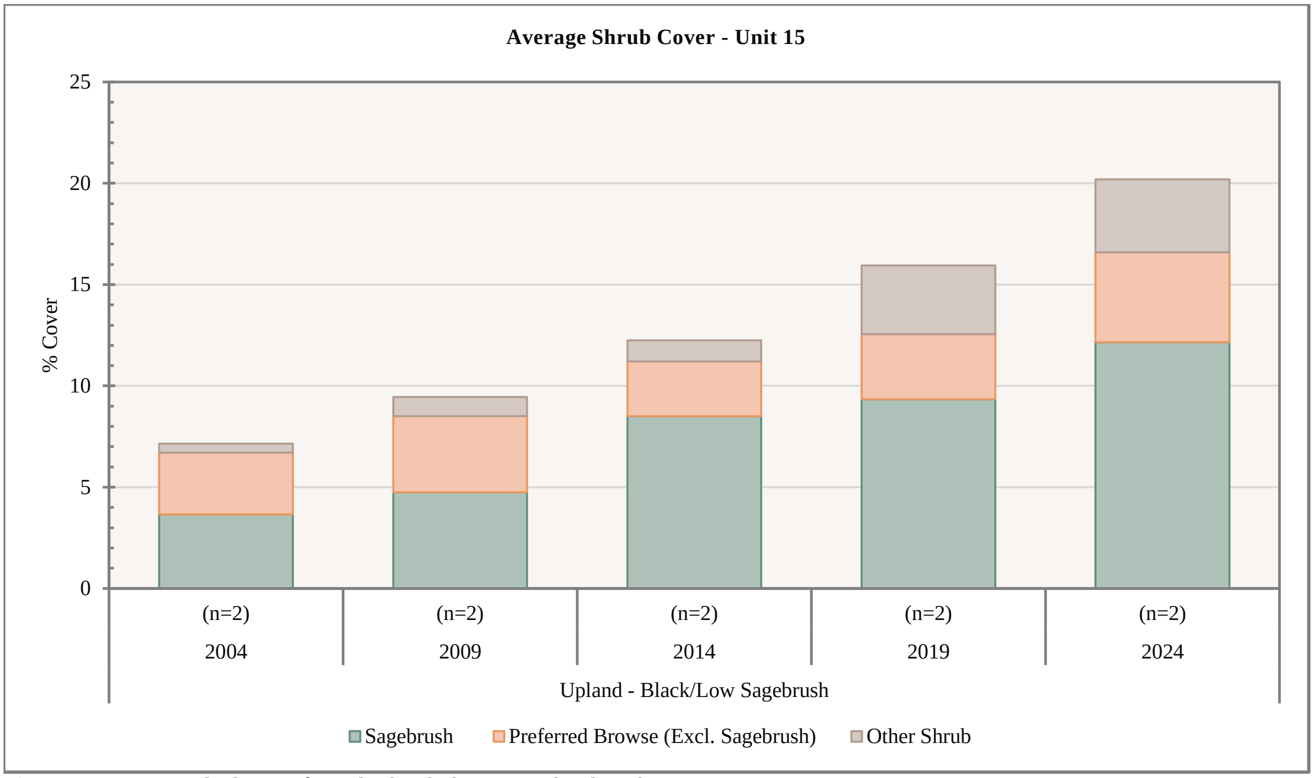


Figure 4.14: Average shrub cover for Upland - Black/Low Sagebrush study sites in WMU 15, Henry Mountains.

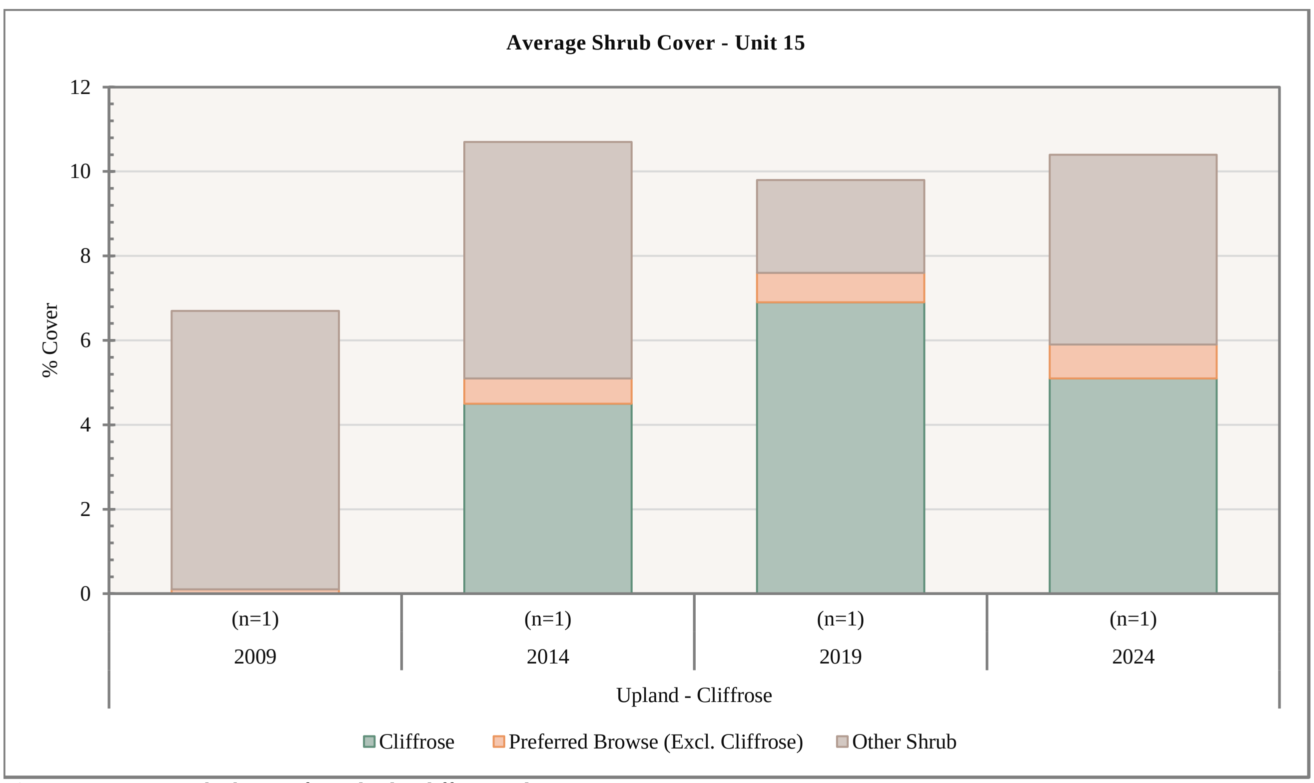


Figure 4.15: Average shrub cover for Upland - Cliffrose study sites in WMU 15, Henry Mountains.

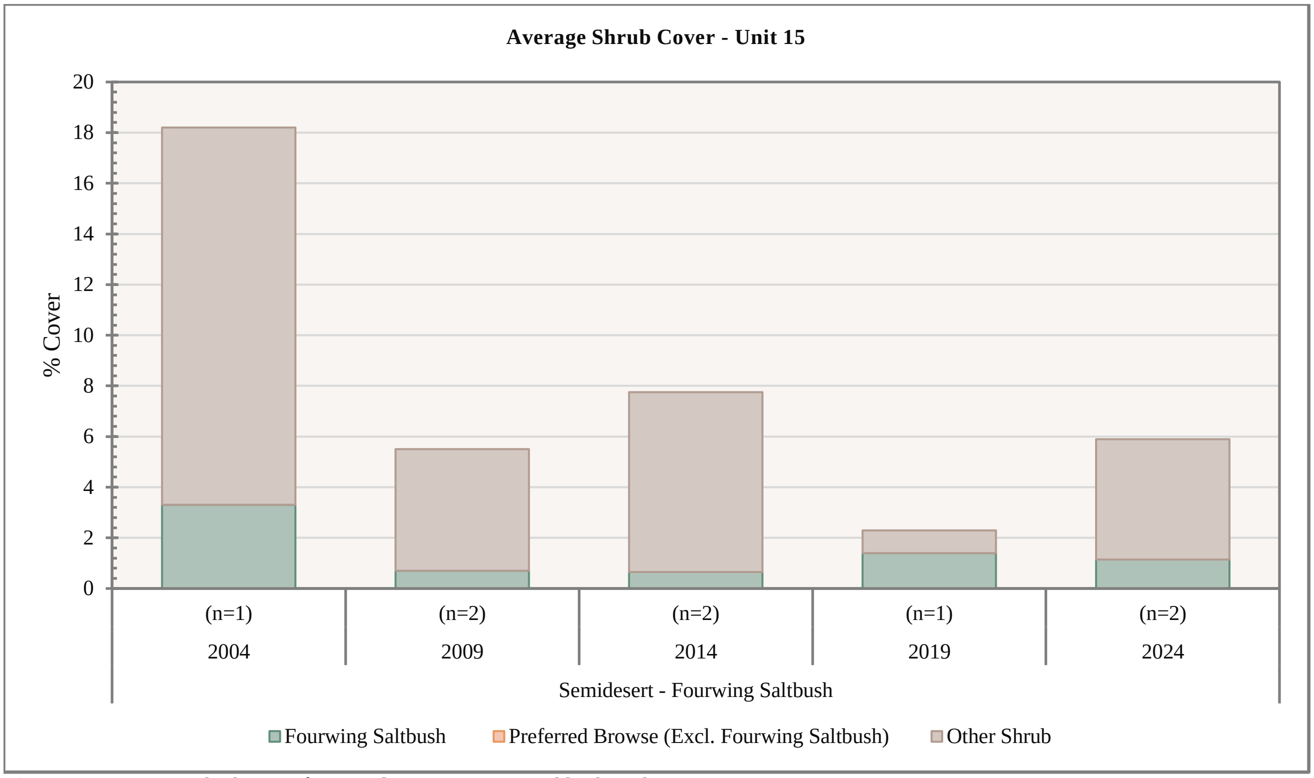


Figure 4.16: Average shrub cover for Semidesert - Fourwing Saltbush study sites in WMU 15, Henry Mountains.

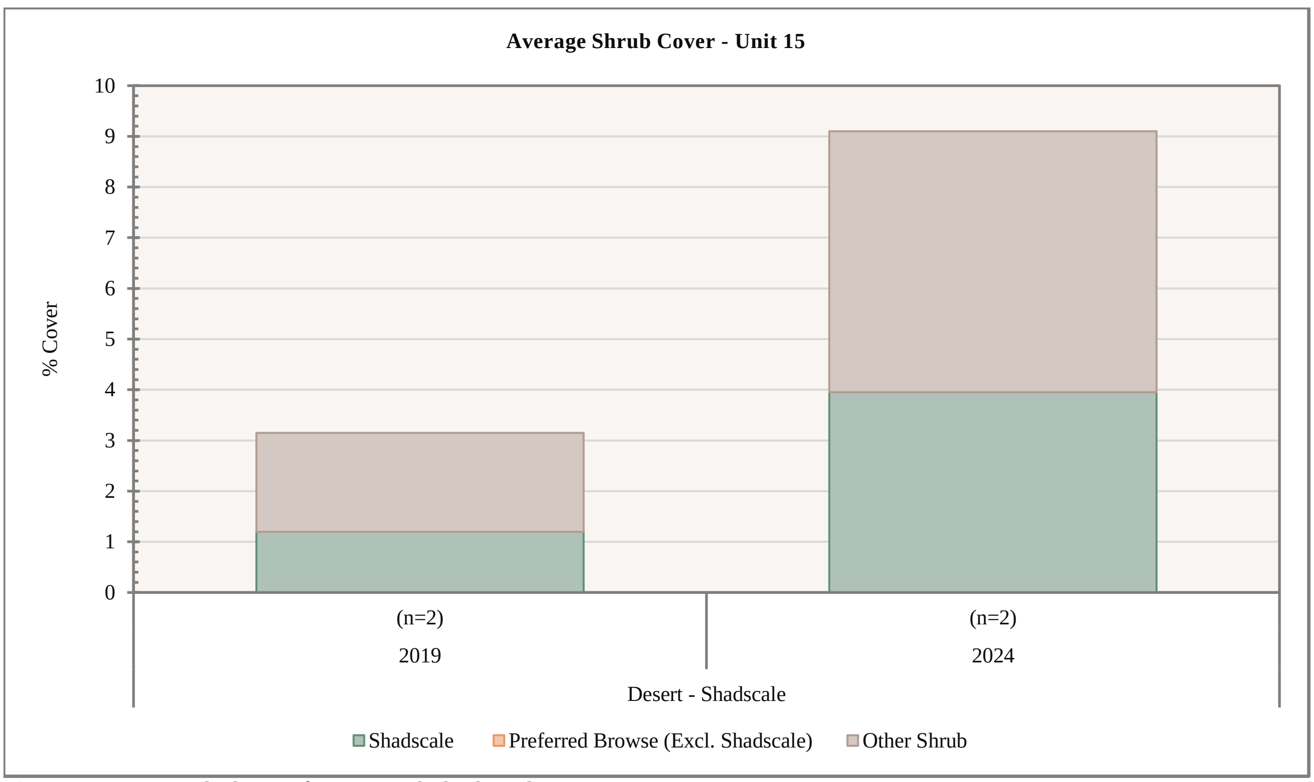


Figure 4.17: Average shrub cover for Desert - Shadscale study sites in WMU 15, Henry Mountains.

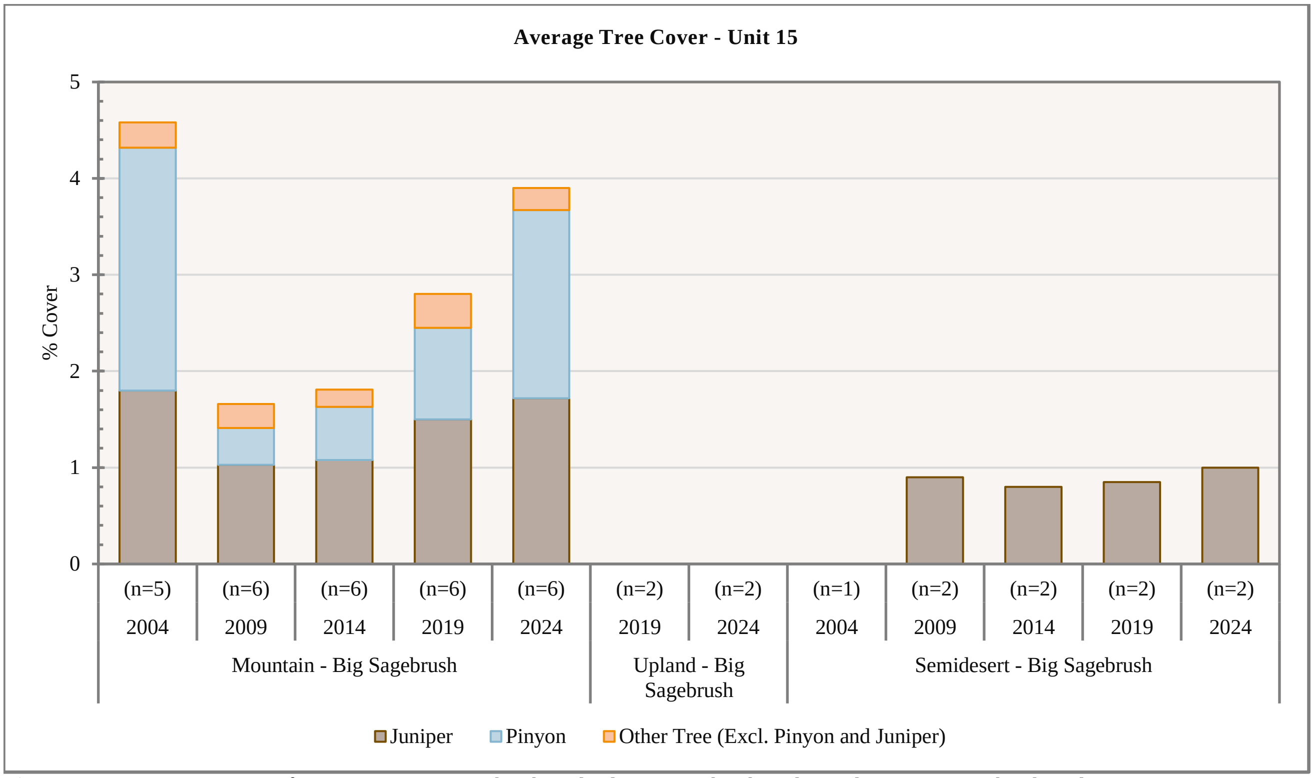


Figure 4.18: Average tree cover for Mountain - Big Sagebrush, Upland - Big Sagebrush, and Semidesert - Big Sagebrush study sites in WMU 15, Henry Mountains.

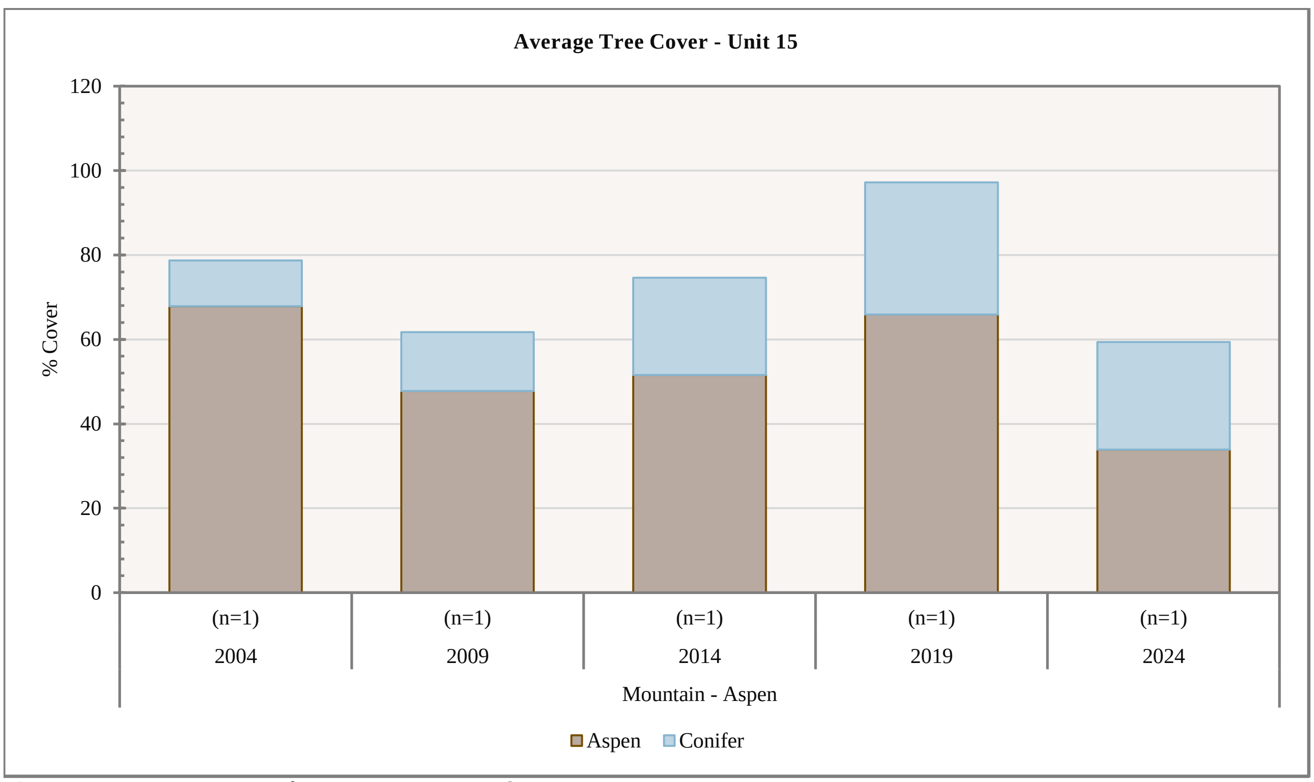


Figure 4.19: Average tree cover for Mountain - Aspen study sites in WMU 15, Henry Mountains.

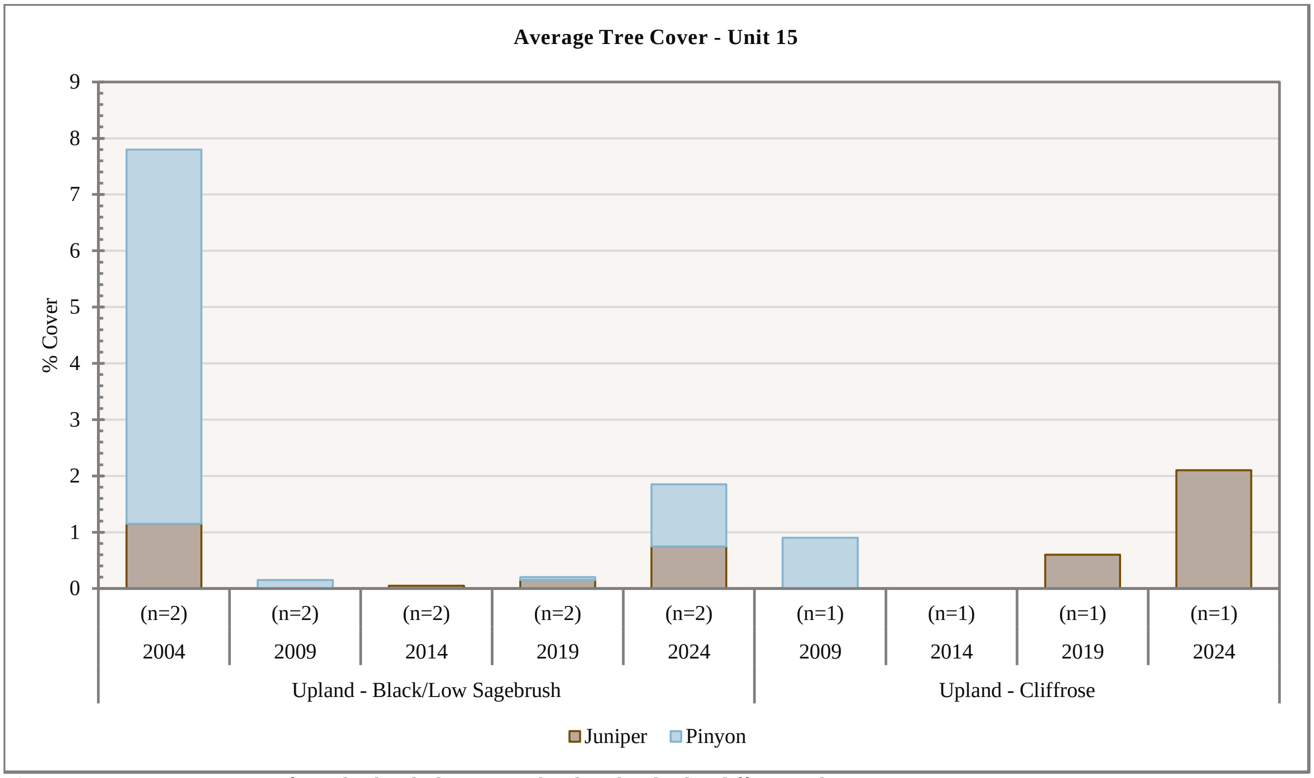


Figure 4.20: Average tree cover for Upland - Black/Low Sagebrush and Upland - Cliffrose study sites in WMU 15, Henry Mountains.

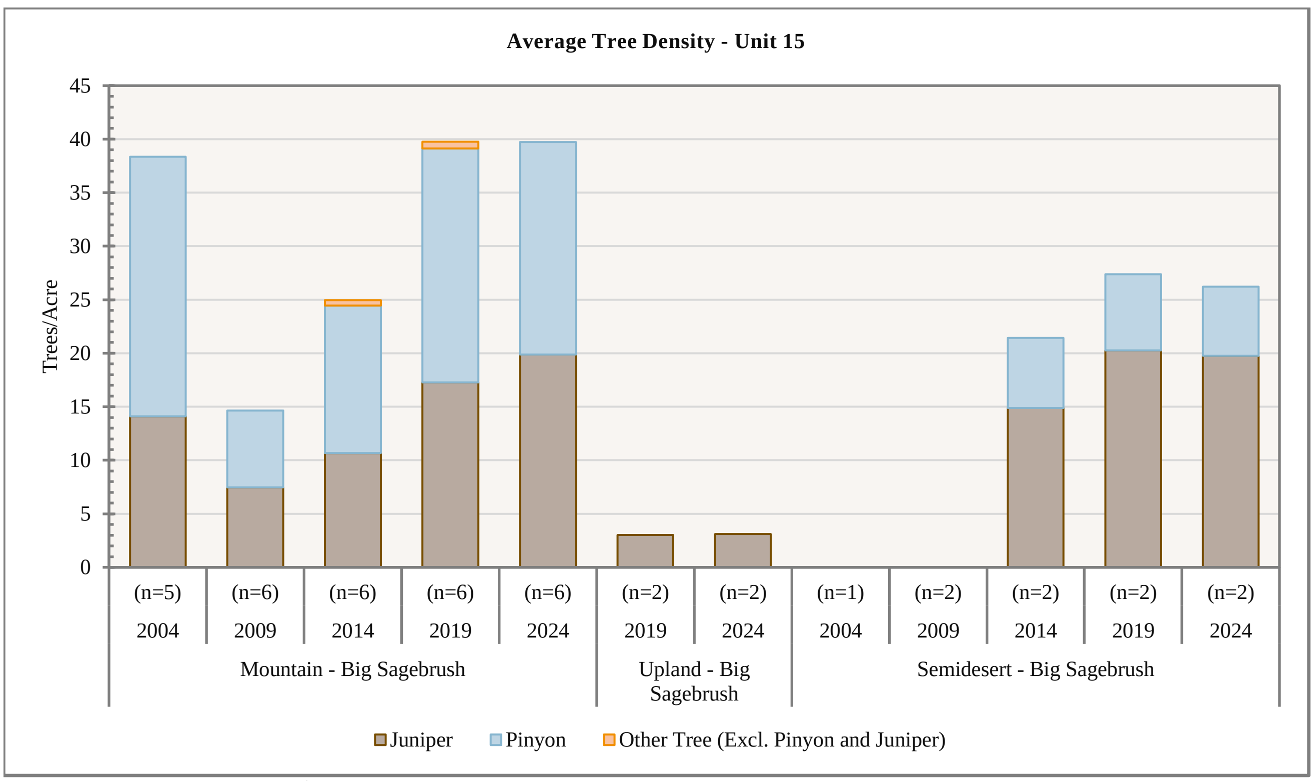


Figure 4.21: Average tree density for Mountain - Big Sagebrush, Upland - Big Sagebrush, and Semidesert - Big Sagebrush study sites in WMU 15, Henry Mountains.

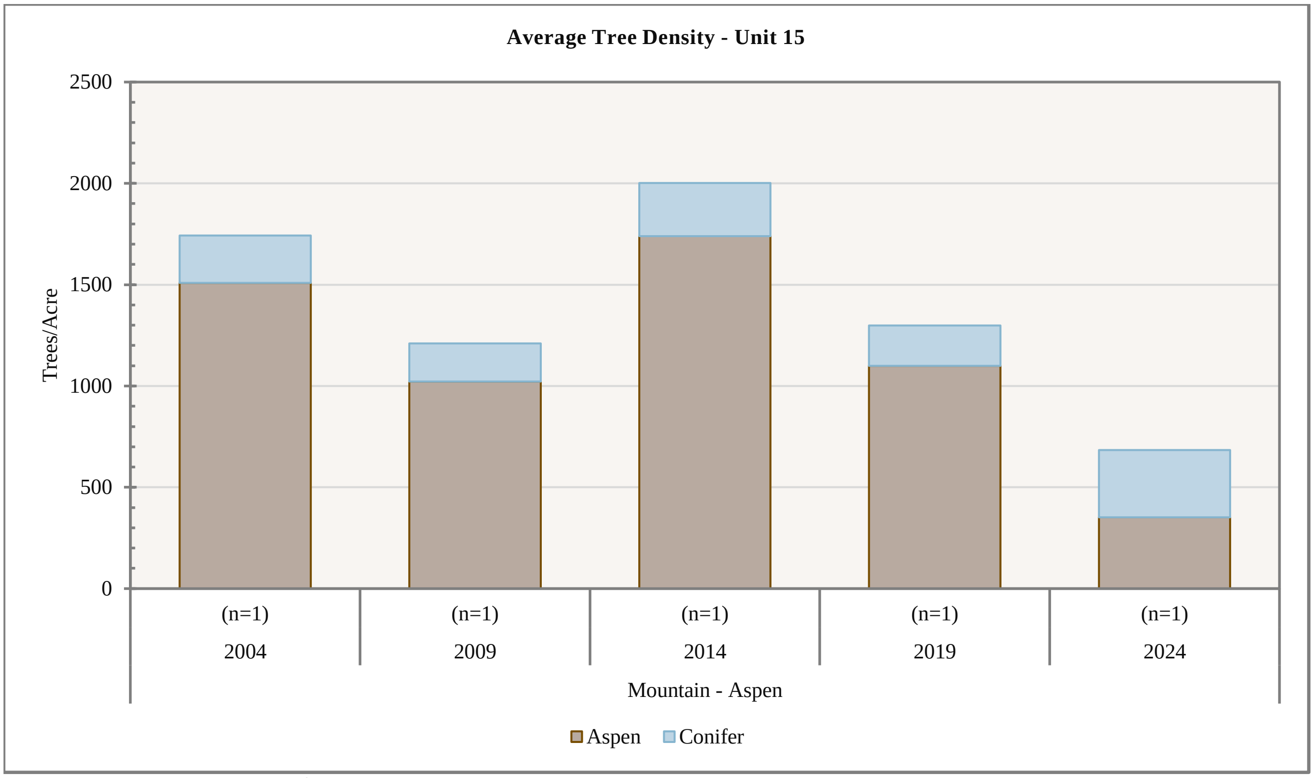


Figure 4.22: Average tree density for Mountain - Aspen study sites in WMU 15, Henry Mountains.

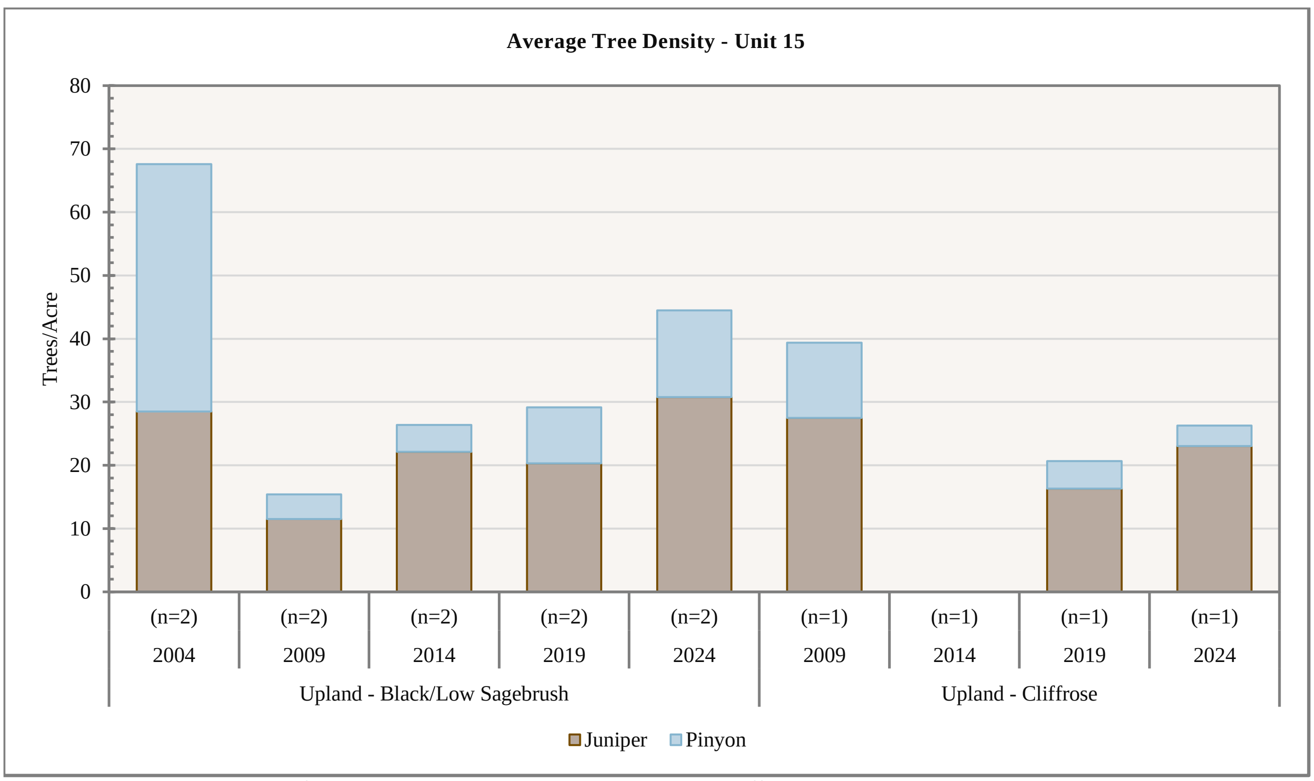


Figure 4.23: Average tree density for Upland - Black/Low Sagebrush and Upland - Cliffrose study sites in WMU 15, Henry Mountains.

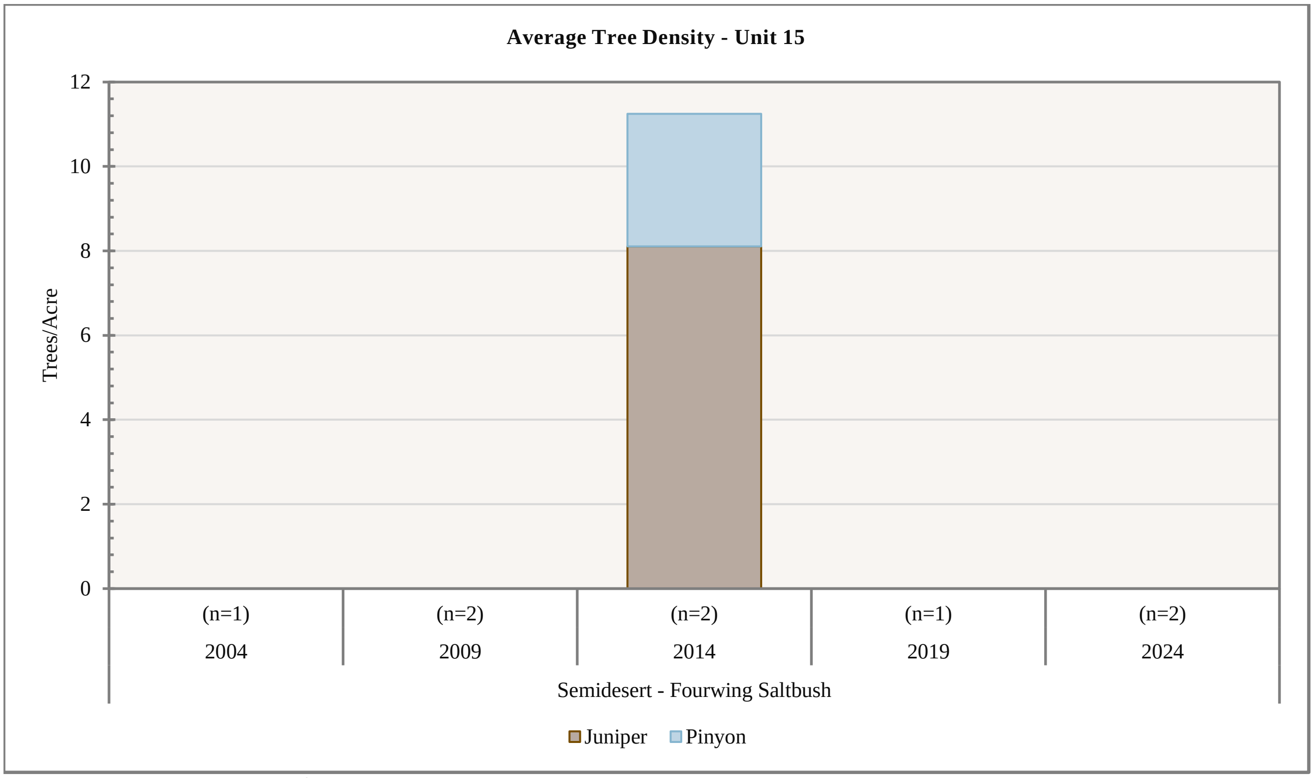


Figure 4.24: Average tree density for Semidesert - Fourwing Saltbush study sites in WMU 15, Henry Mountains.

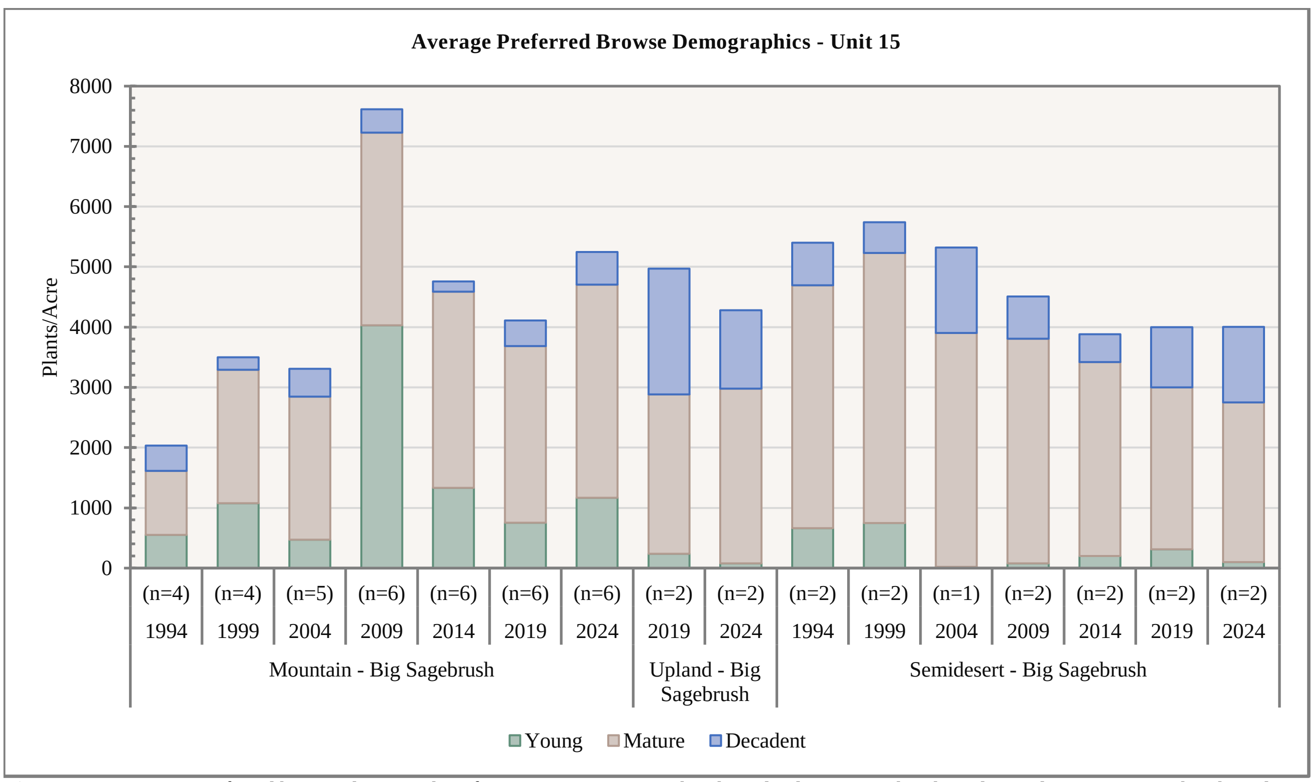


Figure 4.25: Average preferred browse demographics for Mountain - Big Sagebrush, Upland - Big Sagebrush, and Semidesert - Big Sagebrush study sites in WMU 15, Henry Mountains.

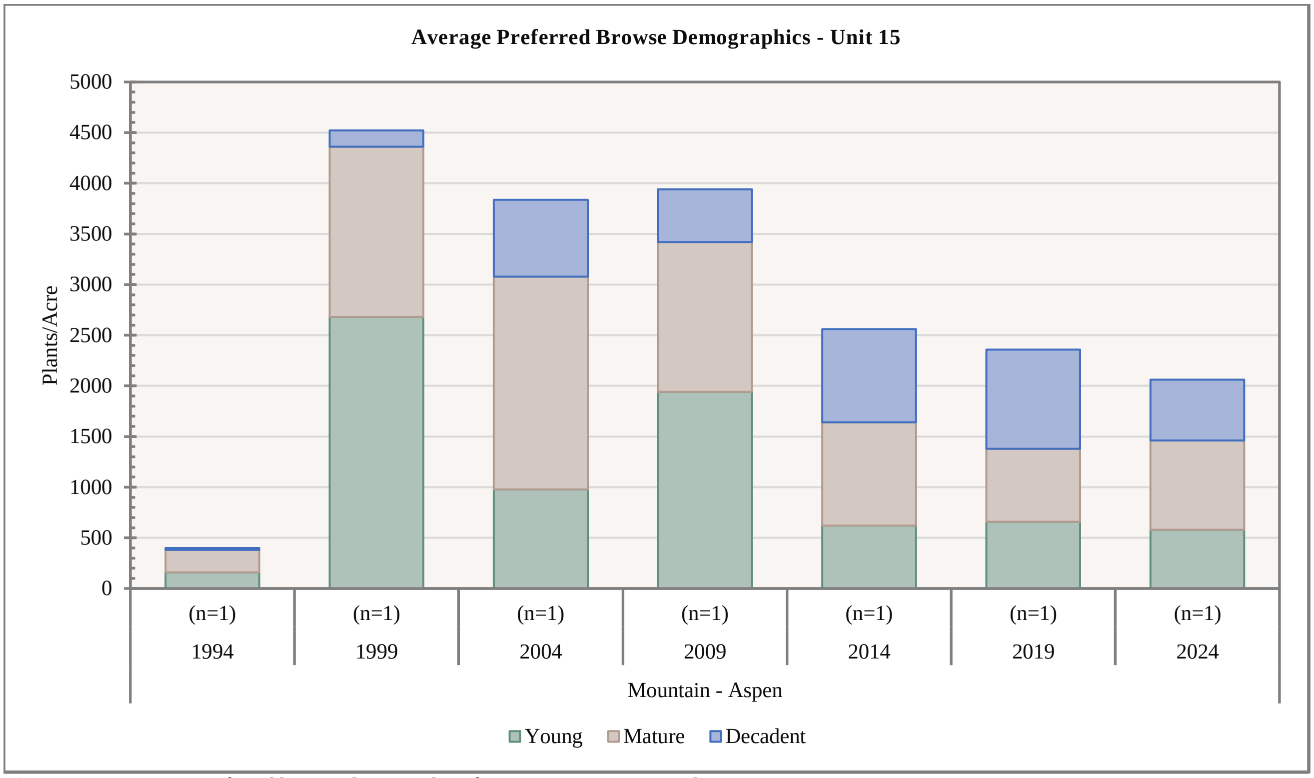


Figure 4.26: Average preferred browse demographics for Mountain - Aspen study sites in WMU 15, Henry Mountains.

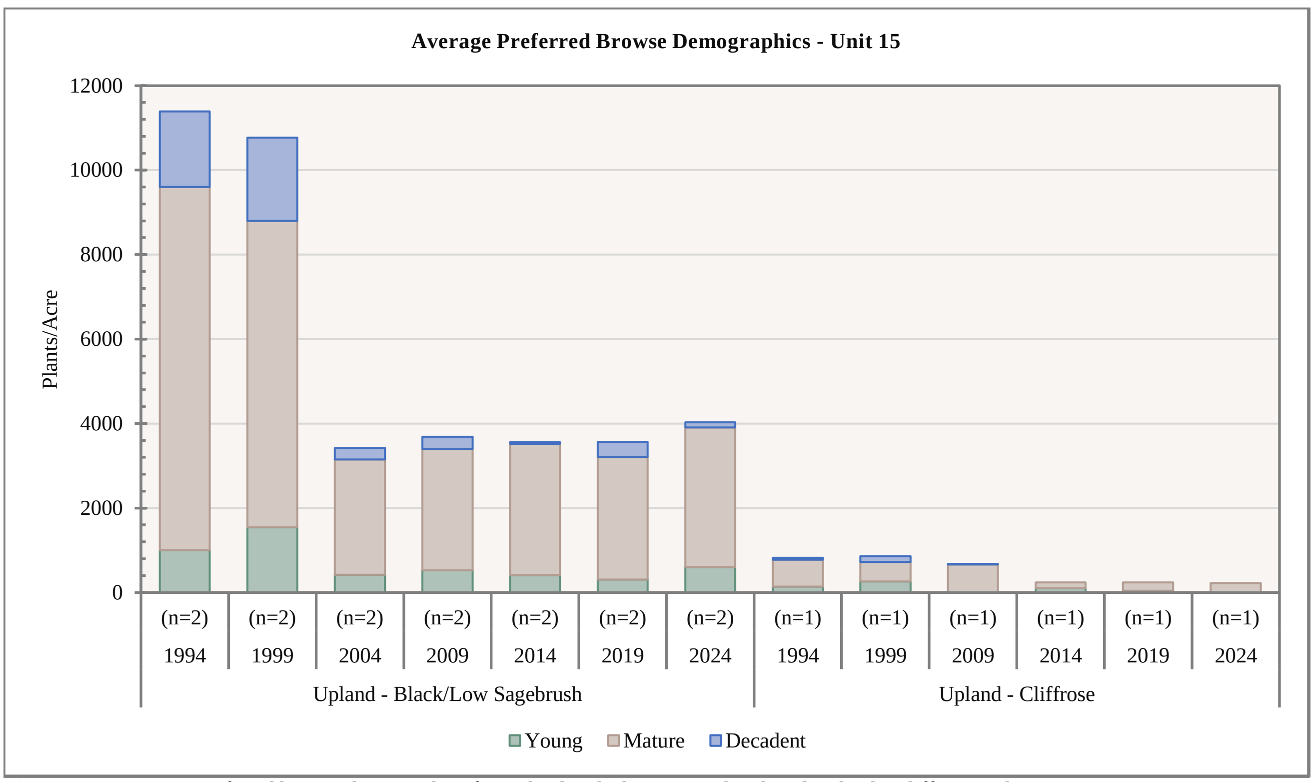


Figure 4.27: Average preferred browse demographics for Upland - Black/Low Sagebrush and Upland - Cliffrose study sites in WMU 15, Henry Mountains.

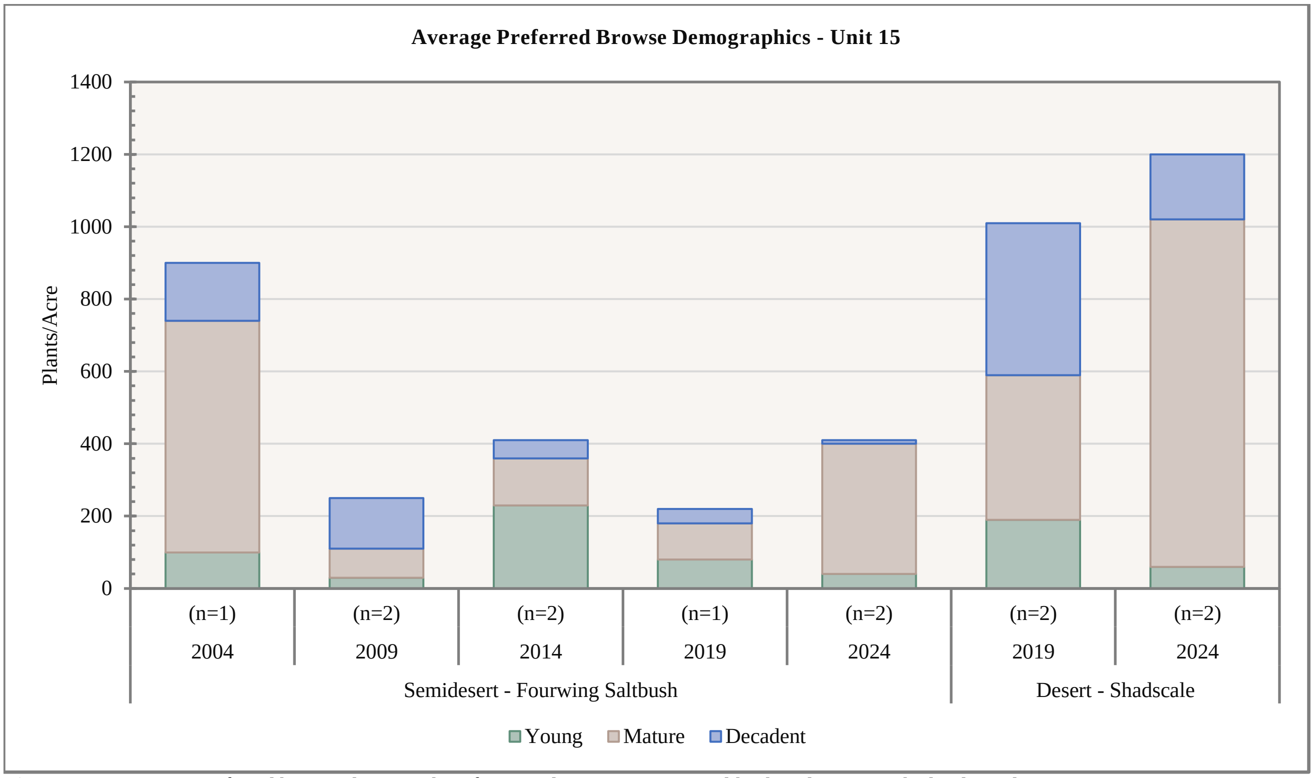


Figure 4.28: Average preferred browse demographics for Semidesert - Fourwing Saltbush and Desert - Shadscale study sites in WMU 15, Henry Mountains.

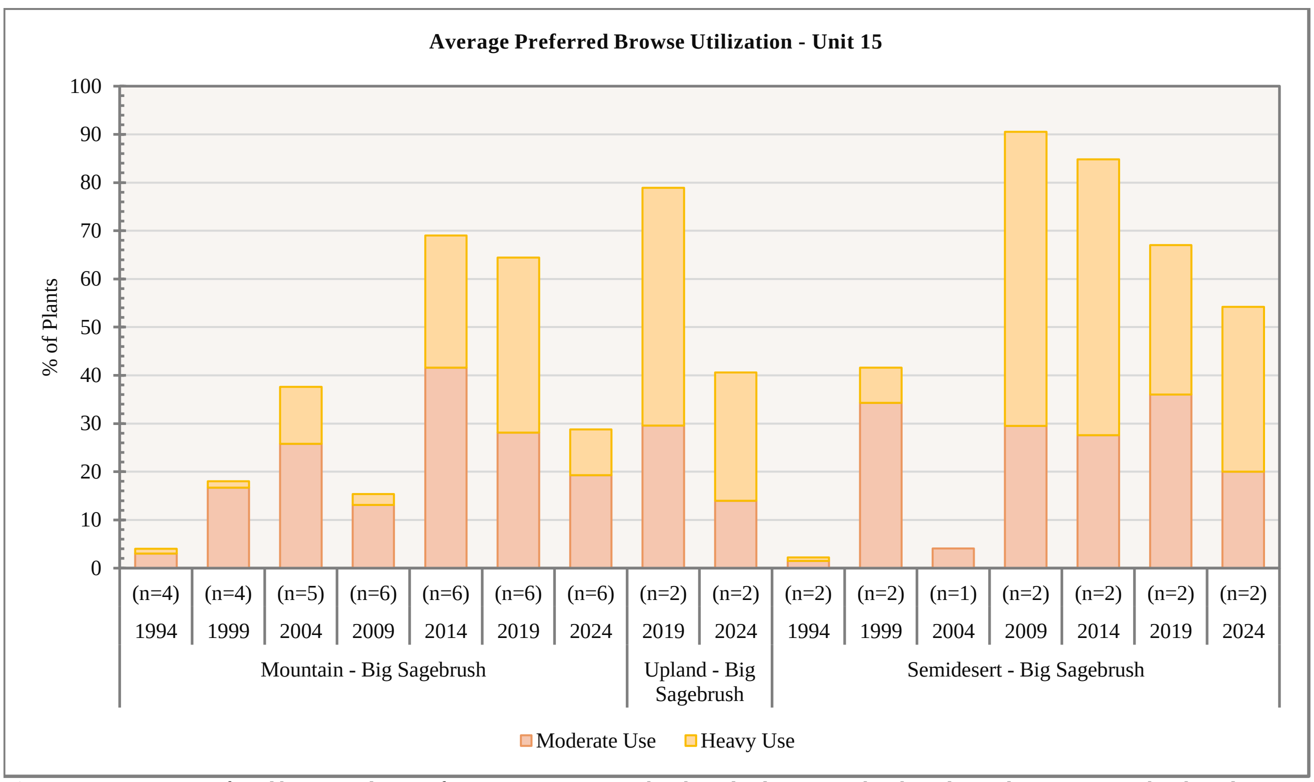


Figure 4.29: Average preferred browse utilization for Mountain - Big Sagebrush, Upland - Big Sagebrush, and Semidesert - Big Sagebrush study sites in WMU 15, Henry Mountains.

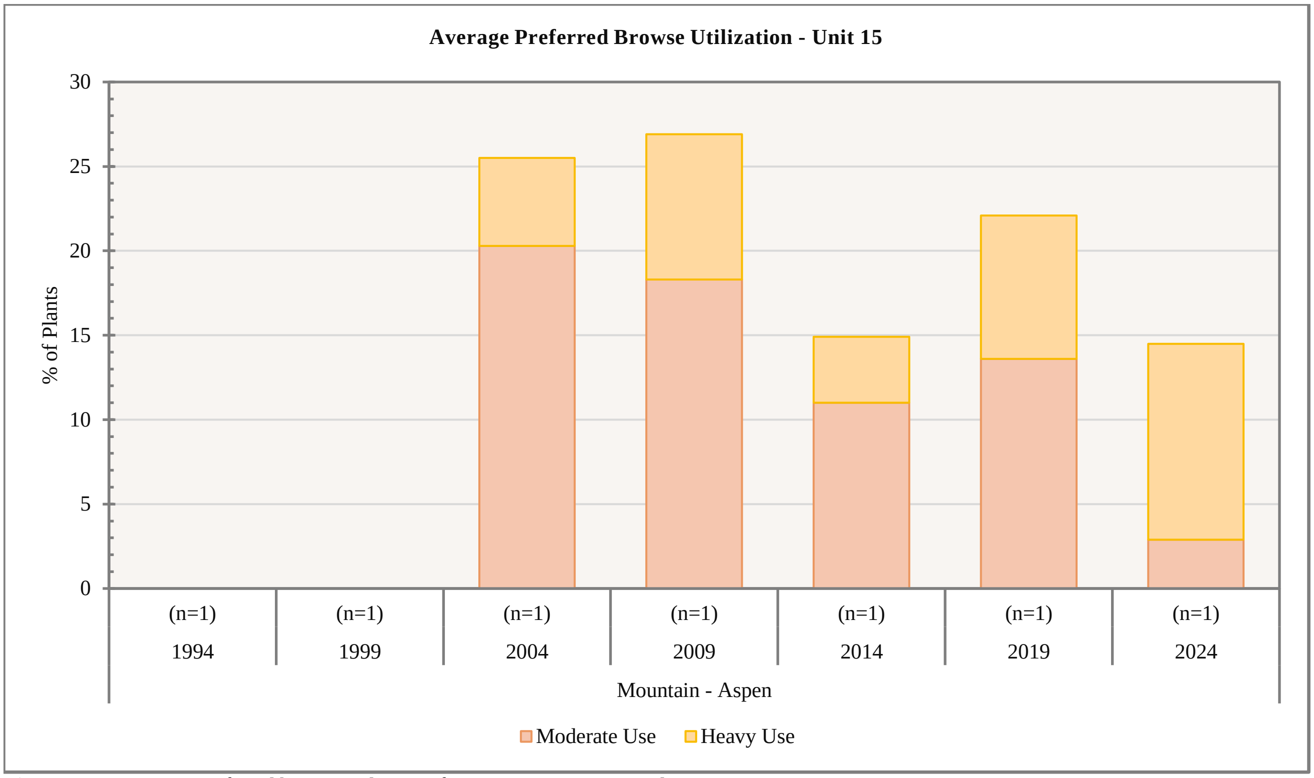


Figure 4.30: Average preferred browse utilization for Mountain - Aspen study sites in WMU 15, Henry Mountains.

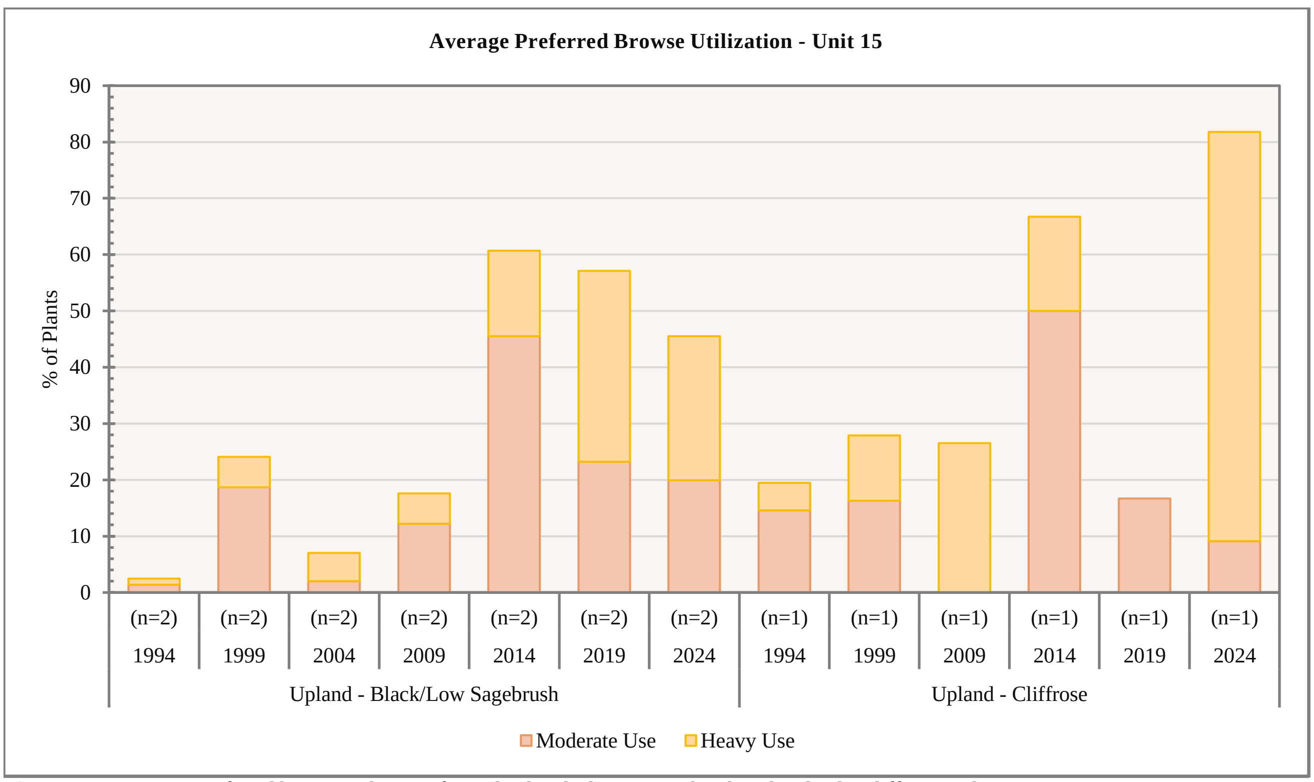


Figure 4.31: Average preferred browse utilization for Upland - Black/Low Sagebrush and Upland - Cliffrose study sites in WMU 15, Henry Mountains.

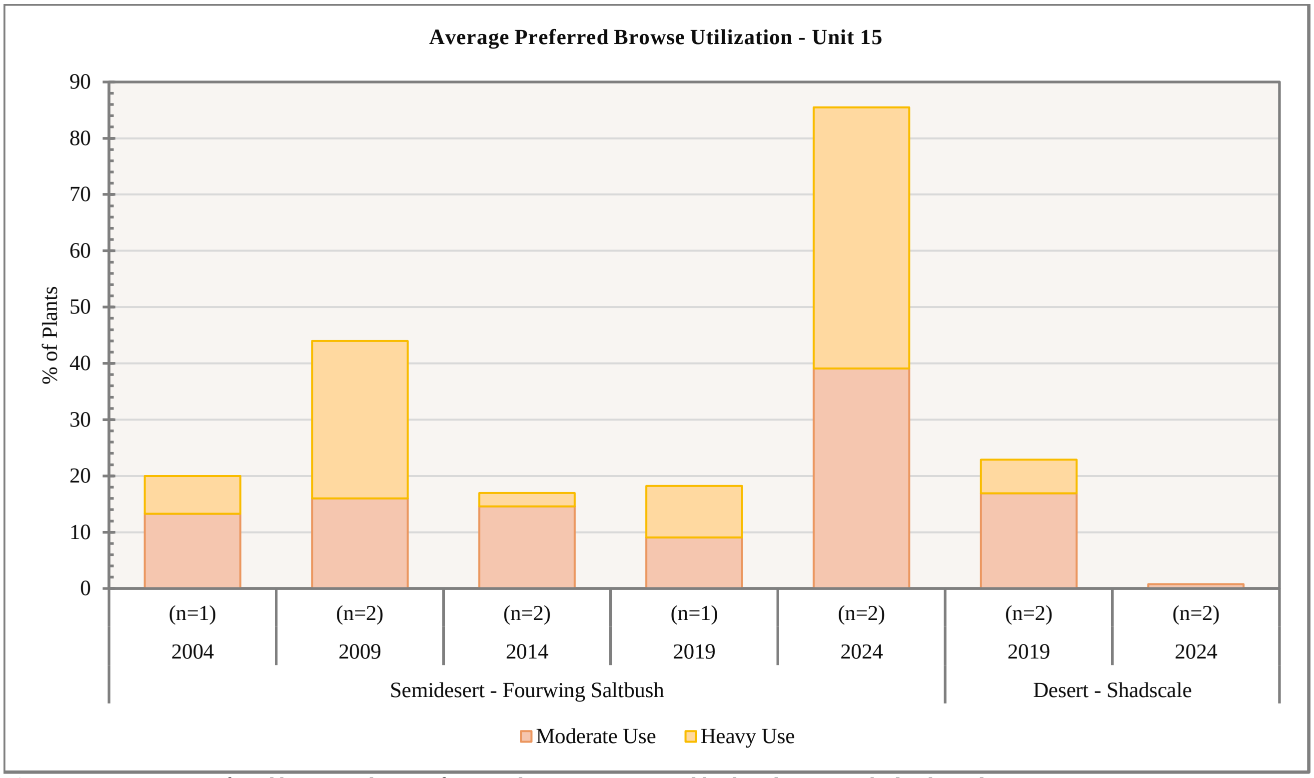


Figure 4.32: Average preferred browse utilization for Semidesert - Fourwing Saltbush and Desert - Shadscale study sites in WMU 15, Henry Mountains.

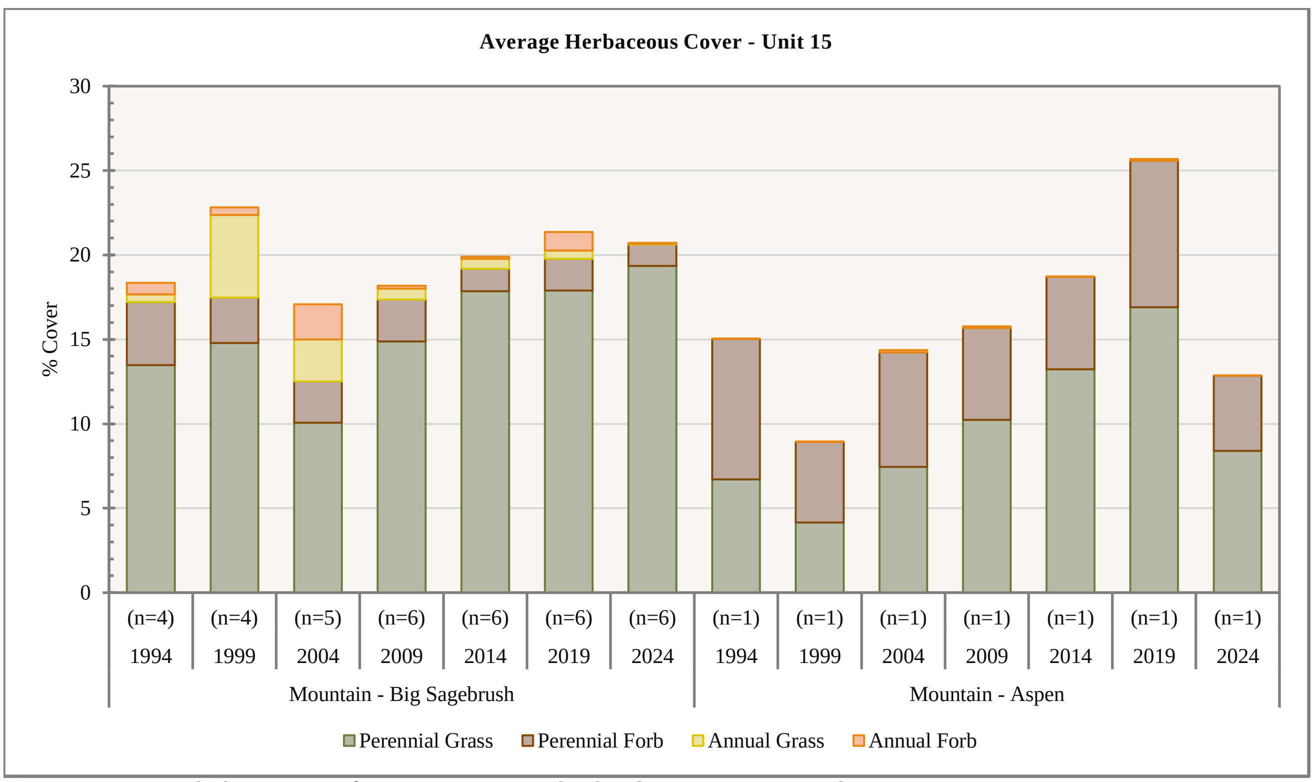


Figure 4.33: Average herbaceous cover for Mountain - Big Sagebrush and Mountain - Aspen study sites in WMU 15, Henry Mountains.

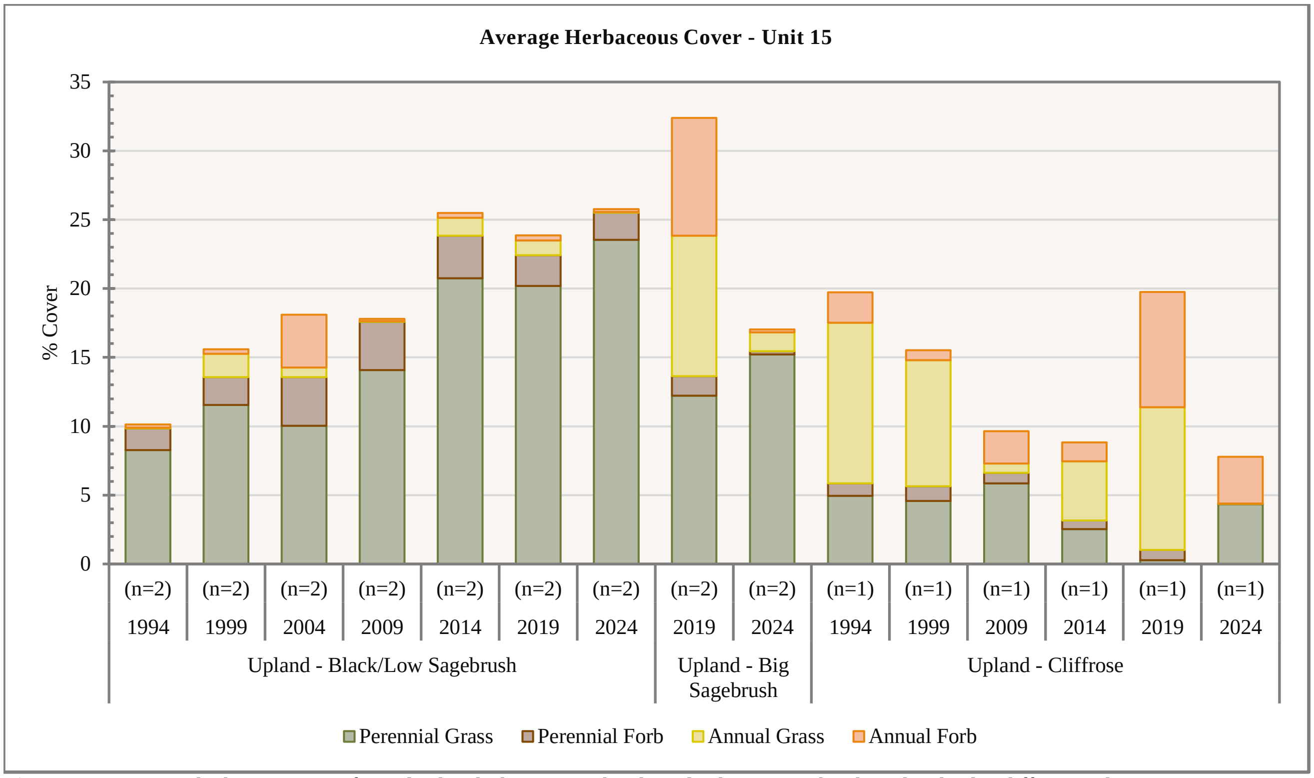


Figure 4.34: Average herbaceous cover for Upland - Black/Low Sagebrush, Upland - Big Sagebrush, and Upland - Cliffrose study sites in WMU 15, Henry Mountains.

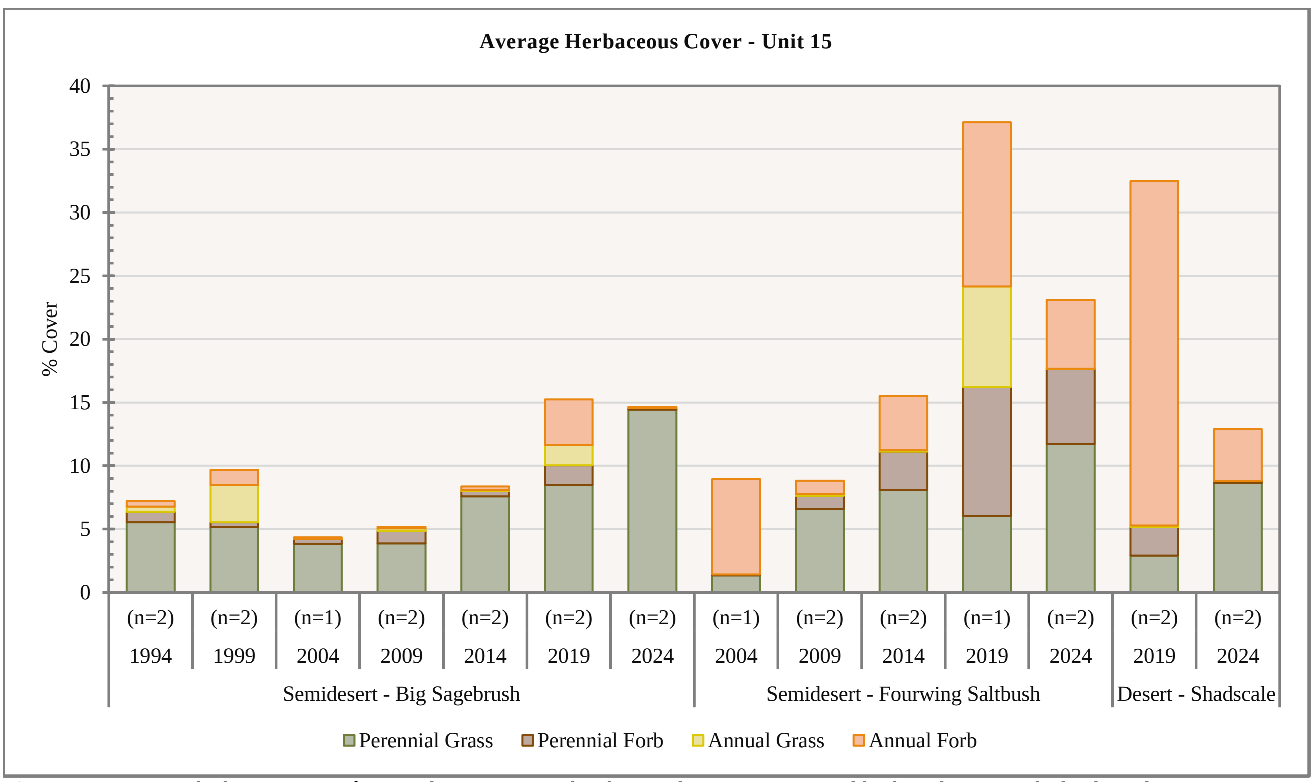


Figure 4.35: Average herbaceous cover for Semidesert - Big Sagebrush, Semidesert - Fourwing Saltbush, and Desert - Shadscale study sites in WMU 15, Henry Mountains.

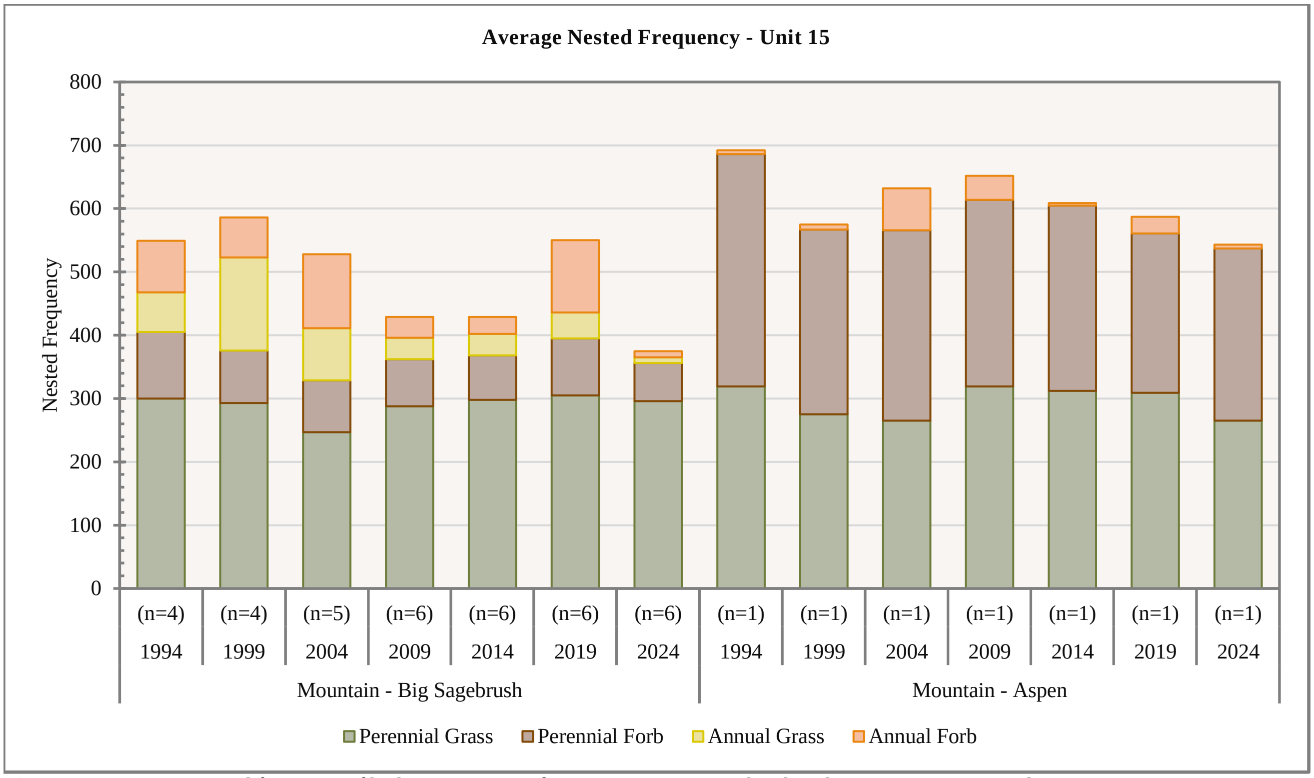


Figure 4.36: Average nested frequency of herbaceous species for Mountain - Big Sagebrush and Mountain - Aspen study sites in WMU 15, Henry Mountains.

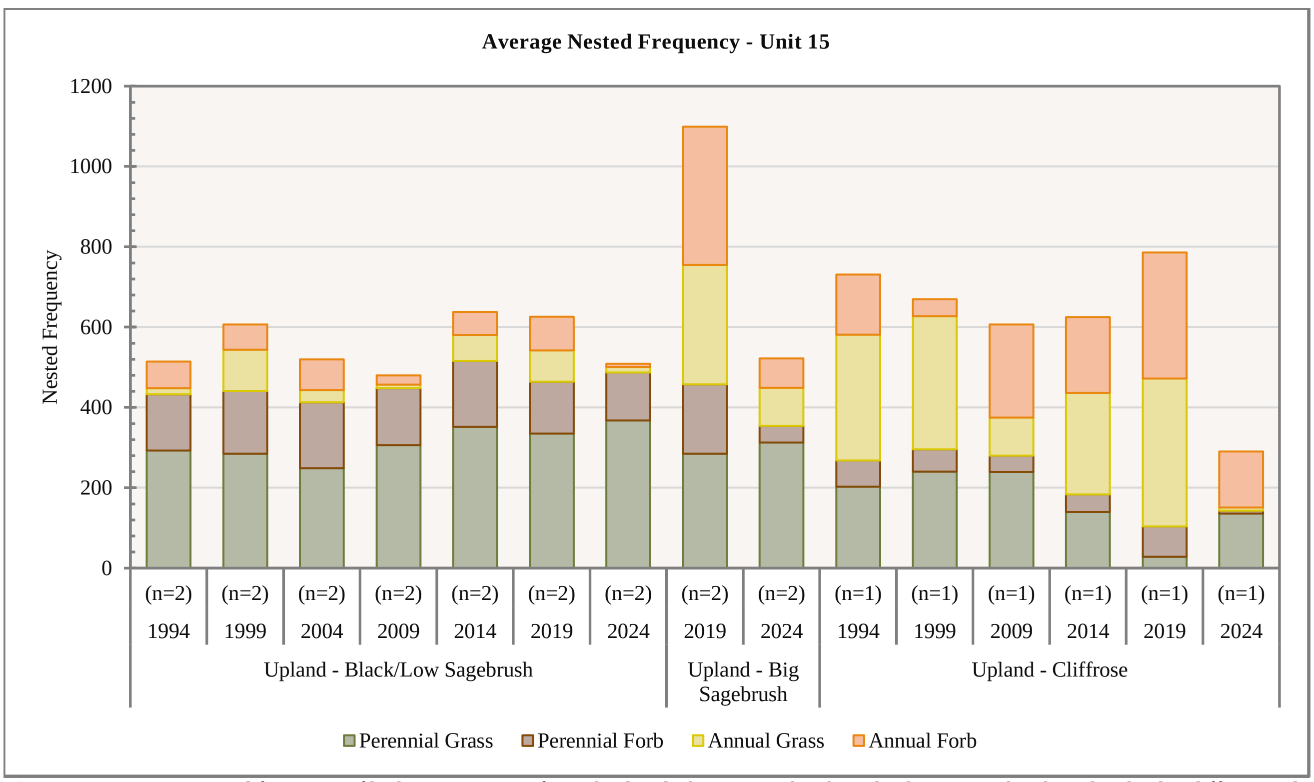


Figure 4.37: Average nested frequency of herbaceous species for Upland - Black/Low Sagebrush, Upland - Big Sagebrush, and Upland - Cliffrose study sites in WMU 15, Henry Mountains.

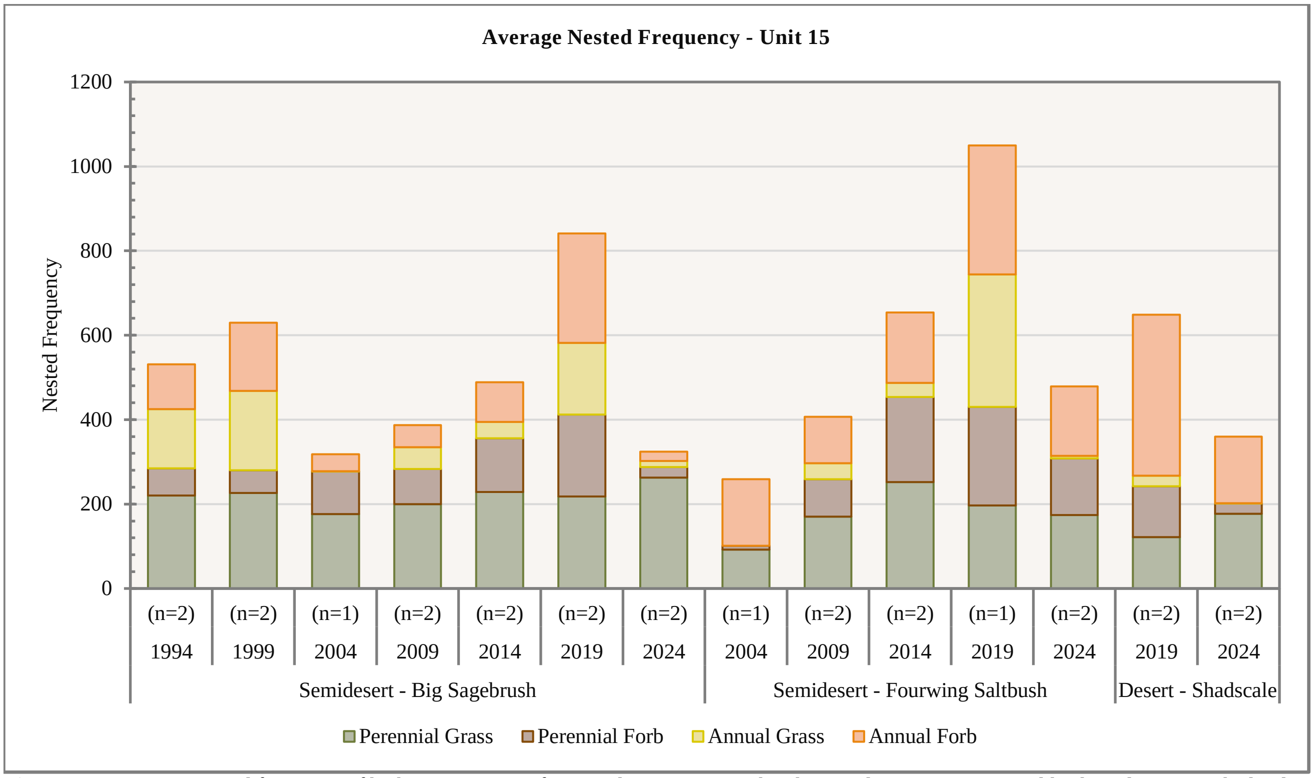


Figure 4.38: Average nested frequency of herbaceous species for Semidesert - Big Sagebrush, Semidesert - Fourwing Saltbush, and Desert - Shadscale study sites in WMU 15, Henry Mountains.

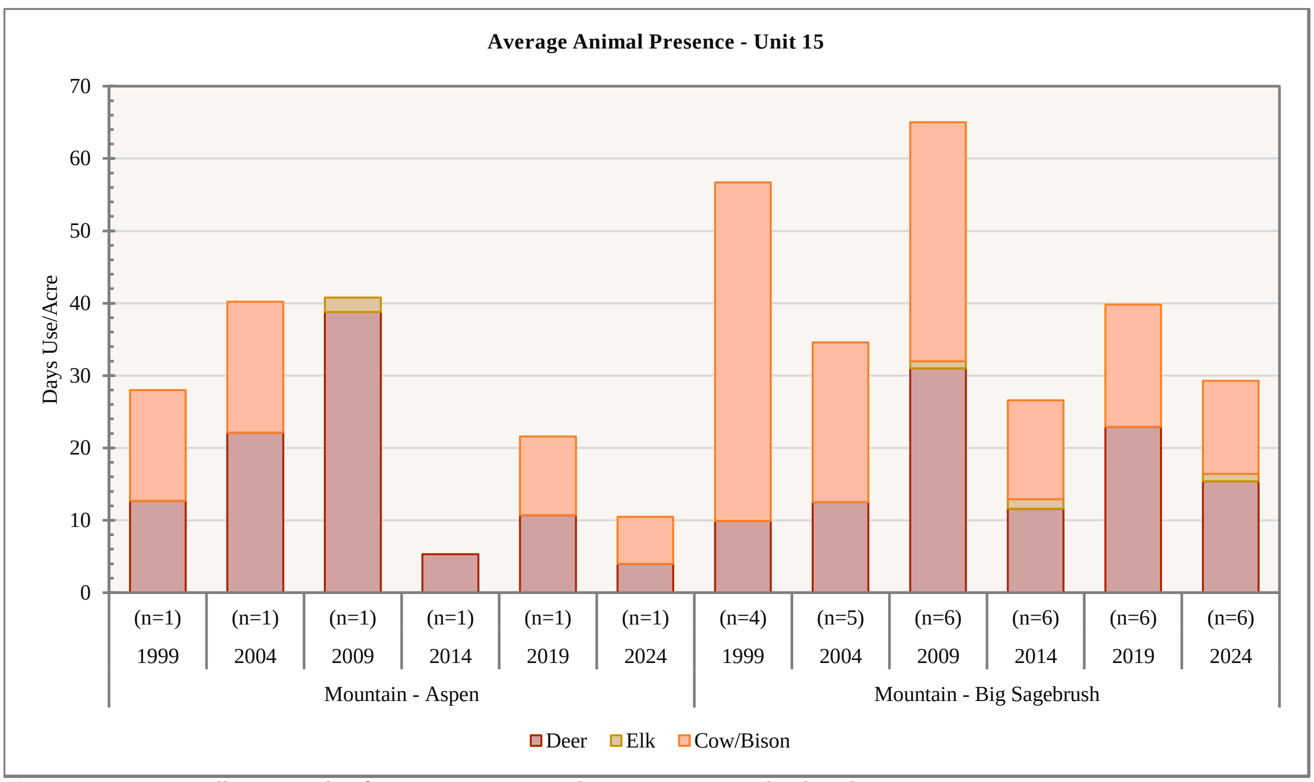


Figure 4.39: Average pellet transect data for Mountain - Aspen and Mountain - Big Sagebrush study sites in WMU 15, Henry Mountains.

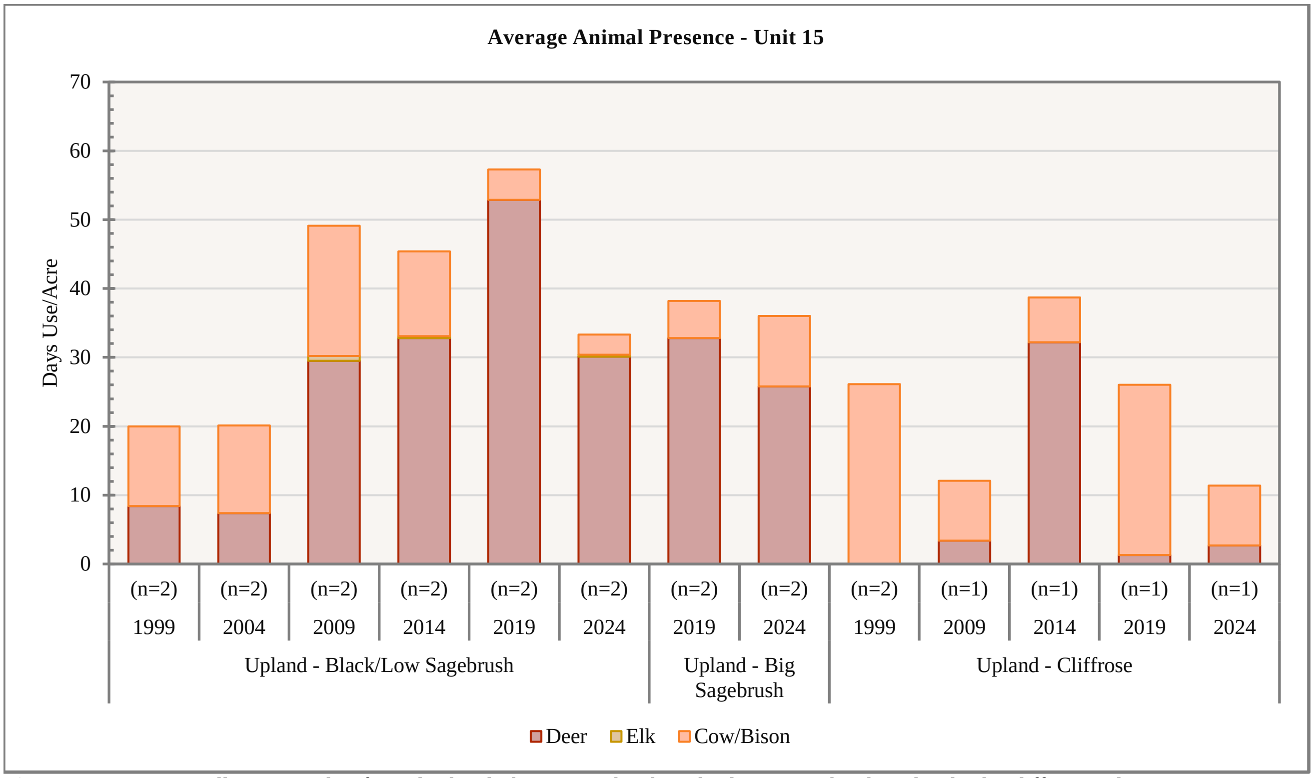


Figure 4.40: Average pellet transect data for Upland - Black/Low Sagebrush, Upland - Big Sagebrush, and Upland - Cliffrose study sites in WMU 15, Henry Mountains.

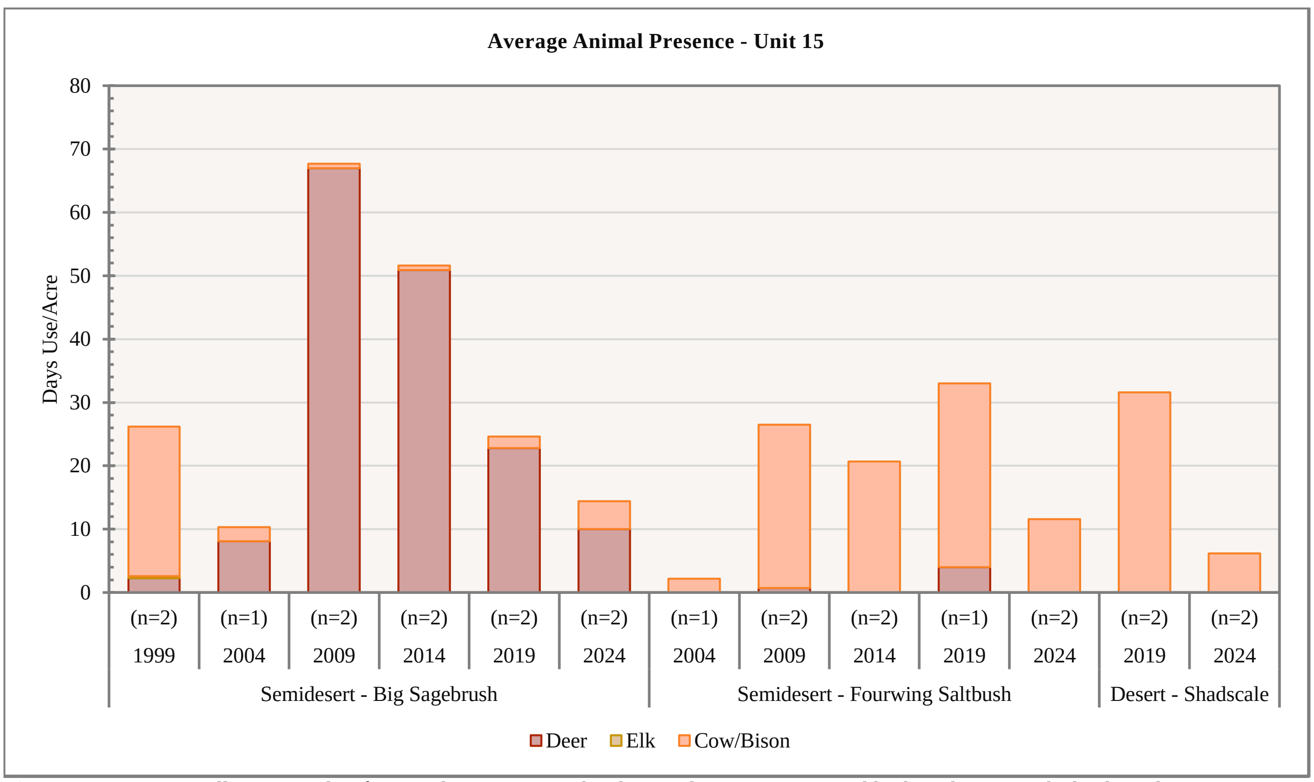


Figure 4.41: Average pellet transect data for Semidesert - Big Sagebrush, Semidesert - Fourwing Saltbush, and Desert - Shadscale study sites in WMU 15, Henry Mountains.

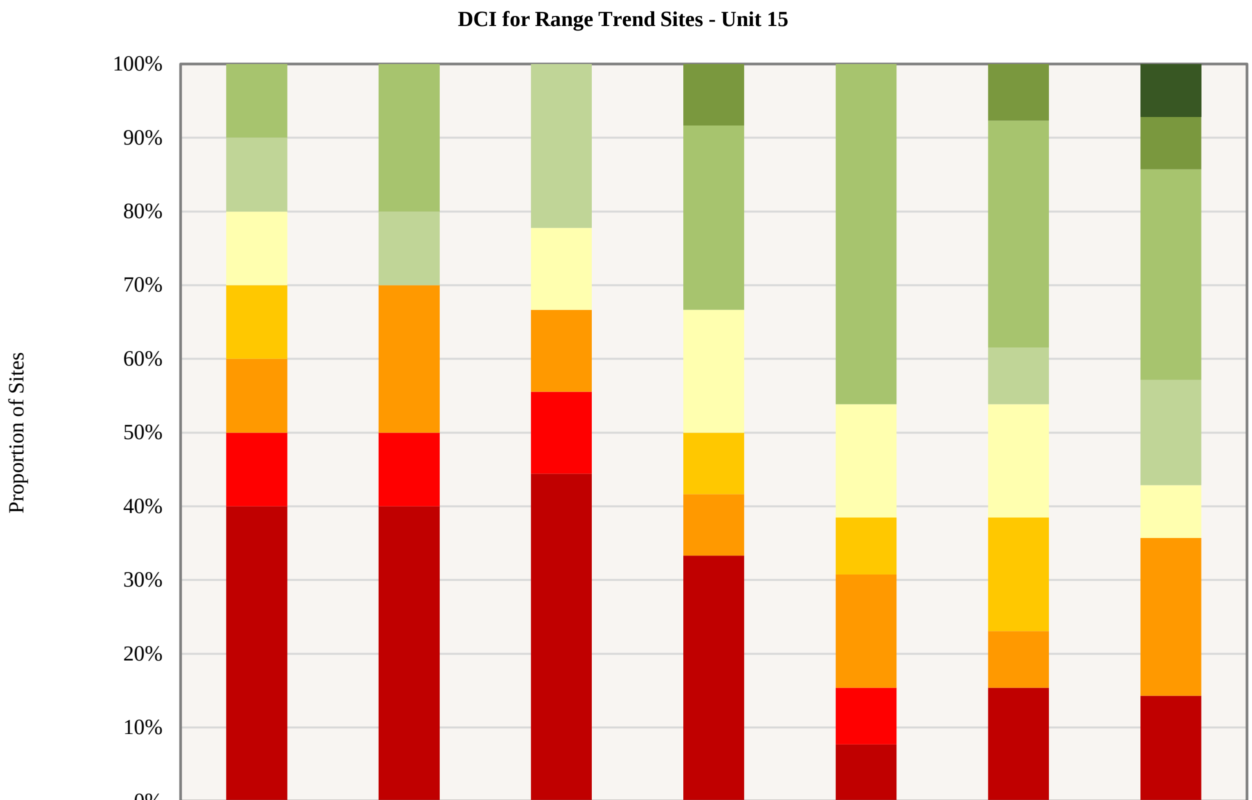
Deer Winter Range Condition Assessment

The overall condition of deer winter range (**Map 4.2**) on the Henry Mountains Management Unit has improved from poor averaged conditions between 1994 and 2004 to fair conditions between 2014 and 2024. This improvement in conditions is primarily driven not by the addition of sample sites, but by improving conditions on long-standing sampling areas, namely Bates Knob (15-05), Box Springs Chaining (15-06), Airplane Spring (15-07), Cave Flat (15-10), Quaking Aspen Spring (15-12), and Sidehill Spring (15-13). The main drivers for the unit's wintering habitat stability and quality, and for the overall deer winter range condition averages between fair and good include Eagle Bench (15-01), South Creek Chaining (15-04), Airplane Spring, Cave Flat, Sage Flat (15-20), and Copper Creek (15-19). The Bates Knob, Box Springs Chaining, Garden Basin (15-08) (suspended), Cave Flat Chaining (15-09) (suspended), Quaking Aspen Spring, Steven's Mesa (15-15), Coyote Spring (15-16), Cave Flat Chaining 2 (15-18), and Johns Knoll (15-22) studies are/have been considered to have very poor and poor wintering habitat conditions consistently from year to year: these poor conditions suppress the unit's overall quality of winter habitat. Range Trend sites in WMU 15 that tend to have higher winter habitat variability include South Creek Chaining, Bates Knob, Quaking Aspen Spring, Sidehill Spring, Dugout Creek (15-14), and Sage Flat. This may suggest a higher potential for winter range improvement, but it may also suggest some instability in each community's resistance and resilience to state transitions. However, all of these sites except for Dugout Creek appear to exhibit overall improvement in winter habitat and may experience the most success out of all study sites if treatments were applied in these areas.

The overall deer winter range assessment in 2024 for WMU 15 is that the unit is in fair condition with most sites ranging between fair and excellent conditions. However, Dugout Creek, Steven's Mesa, Coyote Spring, Cave Flat Chaining 2, and Johns Knoll remain between very poor and poor conditions due to either a lack of preferred browse cover or perennial forbs and the presence of annual grass. Specific factors limiting habitat quality on Dougout Creek include a lack of perennial grass cover and a diversified age class structure for preferred browse (**Figure 4.42**, **Table 4.7**).

While these Range Trend study sites primarily monitor mule deer range conditions and principally target wintering areas, evaluating the condition of these winter ranges may still provide valuable insights into the overall health and suitability of elk and bison habitats (**Map 4.3**, **Map 4.4**) that both share in similar habitat requirements (Committee Members, 2022). General evaluations of elk habitat may be made using the mule deer winter range Desirable Component Index (DCI) and other vegetation data when the associated study sites intersect currently mapped elk habitat. The DCI was created as an indicator of the general health of winter ranges for mule deer. The index incorporates shrub cover, density, and age composition as well as other key vegetation variables. Changes in DCI suggest changes in winter range capacity. However, the relationship between DCI and the changes in elk carrying capacity is difficult to quantify and is not known.

Again, the unit's wintering suitability and quality for elk and bison is likely similar to deer winter range conditions. It should be noted that the DCI graph and table associated with this section (**Figure 4.42**, **Table 4.7**) illustrates the number of Range Trend sites within mule deer winter range. As such, the number of Range Trend sites considered to be elk or bison habitat will not coincide with those depicted in said graph and table (**Figure 4.42**, **Table 4.7**). Studies that intersect/have intersected elk year-long habitat include Eagle Bench, Nasty Flat (15-02), Dugout (15-03) (suspended), South Creek Chaining, Bates Knob, Box Springs Chaining, Airplane Spring, Garden Basin, Cave Flat Chaining, Cave Flat, Above Coyote Bench (15-11) (suspended), Quaking Aspen Spring, Sidehill Spring, Dugout Creek, Coyote Spring, Swap Mesa (15-17), Cave Flat Chaining 2, Sage Flat, and Johns Knoll. The sites with elevated suitability include Eagle Bench, South Creek Chaining, Airplane Spring, Cave Flat, and Sage Flat. In contrast, Bates Knob, Box Springs Chaining, Garden Basin, Cave Flat Chaining, Quaking Aspen Spring, Coyote Spring, Cave Flat Chaining 2, and Johns Knoll are considered to have very poor and poor wintering habitat conditions consistently from year to year.



	1994	1999	2004	2009	2014	2019	2024
Excellent							1
Good-Excellent				1		1	1
Good	1	2		3	6	4	4
Fair-Good	1	1	2			1	2
Fair	1		1	2	2	2	1
Poor-Fair	1			1	1	2	
Poor	1	2	1	1	2	1	3
Very Poor-Poor	1	1	1		1		
Very Poor	4	4	4	4	1	2	2

Figure 4.42: Deer winter range Desirable Components Index (DCI) summary by year of Range Trend sites for WMU 15, Henry Mountains.

Study Number	Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
15-01	1994	20	14	3.5	6.9	0	3.2	0	**47.6**	**G**
15-01	1999	26.7	12.4	3.8	8.4	0	1.5	0	**52.8**	**G**
15-01	2004	30	7.1	0.2	7.7	0	0.7	0	**45.7**	**F-G**
15-01	2009	30	10.2	0.5	6.6	0	2.1	0	**49.4**	**G**
15-01	2014	28.2	11	2.9	18.7	-0.1	1.3	0	**62**	**G**
15-01	2019	27.6	5.8	1.8	21.5	-0.3	1.8	0	**58.2**	**G**
15-01	2024	30	5.8	0.4	23.4	0	0.5	0	**60.1**	**G**
15-04	1994	1.6	0	0	30	-0.2	10	0	**41.4**	**VP-P**
15-04	1999	5	0	0	30	-0.5	10	0	**44.5**	**P**
15-04	2004	12.3	14.9	9.3	22.6	-0.3	5.2	0	**64**	**F**
15-04	2009	22.4	14.9	15	30	-0.2	8.9	0	**91**	**G-E**
15-04	2014	17.6	14.7	15	28	-0.1	4.1	0	**79.3**	**G**
15-04	2019	22	13.8	12.4	30	-0.6	8.7	0	**86.3**	**G**
15-04	2024	22.6	13.9	15	30	0	8.2	0	**89.7**	**G-E**
15-05	1994	2.2	0	0	20.8	-0.5	4.6	0	**27.1**	**VP**
15-05	1999	4.5	0	0	23.9	-1.7	3.4	0	**30.1**	**VP**
15-05	2004	10	13.7	5.4	11.8	0	5	0	**45.9**	**P**
15-05	2009	15.6	14.6	8	16.2	0	2.2	0	**56.6**	**P-F**
15-05	2014	17	14.2	10.9	22.2	0	0.7	0	**65**	**F**
15-05	2019	30	12.3	1.9	18.2	0	1.7	0	**64.1**	**F**
15-05	2024	30	12.2	4.2	22.2	0	1.3	0	**69.9**	**F-G**
15-06	1994	0.5	0	0	30	0	0.9	0	**31.4**	**VP**
15-06	1999	2.4	0	0	30	0	0.5	0	**32.9**	**VP**
15-06	2004	4	0	0	30	0	0	0	**34**	**VP**
15-06	2009	4.7	0	0	30	0	0.1	0	**34.8**	**VP**
15-06	2014	8.8	15	0	30	0	0	0	**53.8**	**P-F**
15-06	2019	13.9	15	0	30	0	0.4	0	**59.3**	**F**
15-06	2024	11.7	11.3	13.2	30	0	0	0	**66.2**	**F**
15-07	1994	9.5	11.9	7.1	26	0	3.4	0	**57.9**	**F**
15-07	1999	11.8	12.5	15	30	0	2.8	0	**72.1**	**G**
15-07	2004	17.5	13.3	3.5	29.9	0	1.6	0	**65.8**	**F-G**
15-07	2009	20.7	11.3	5.5	22.7	0	1.2	0	**61.4**	**F**
15-07	2014	23.4	14.6	5.1	30	-0.6	1.3	0	**73.8**	**G**
15-07	2019	22.6	11	4.9	30	-1.2	1.2	0	**68.5**	**G**
15-07	2024	30	14.5	7.3	30	0	1.2	0	**83**	**E**
15-08*	1994	6.1	0	0	0.1	0	0.5	0	**6.7**	**VP**
15-08*	1999	5.1	0	0	0.2	0	0.7	0	**6**	**VP**
15-09*	1994	0.1	0	0	9.9	-8.7	1.8	0	**3.1**	**VP**
15-09*	1999	0.1	0	0	9.1	-6.9	2.1	0	**4.4**	**VP**
15-09*	2009	0.1	0	0	11.7	-0.5	1.5	0	**12.8**	**VP**
15-10	1994	15.8	5.9	8.4	15.2	-0.6	0.1	0	**44.8**	**F-G**
15-10	1999	16	12.1	9.6	12.3	-4.4	0	0	**45.6**	**F-G**
15-10	2011	28	10.3	1.2	8.9	-0.3	1.8	0	**49.9**	**G**
15-10	2014	30	11.9	1	11.6	-0.1	0.3	0	**54.7**	**G**
15-10	2019	29.3	9.8	6.2	12.4	-2.1	4.5	0	**60.1**	**G**
15-10	2024	17.5	5	3.1	30	0	0.1	0	**55.7**	**G**
15-12	1994	25.8	9.2	3.1	7.1	-0.1	3	0	**48.1**	**P-F**
15-12	1999	25.2	9.1	3.7	6.3	-2.6	5.3	0	**47**	**P**
15-12	2004	0	0	0	10.2	-1	10	0	**19.2**	**VP**
15-12	2009	1.8	0	0	30	0	10	0	**41.8**	**P**
15-12	2014	5.8	0	0	30	-1.3	10	0	**44.5**	**P**
15-12	2019	10	12.9	5.4	30	-0.4	7.7	0	**65.6**	**F-G**
15-12	2024	11.6	13.4	4.6	30	0	6.8	0	**66.4**	**F-G**

Study Number	Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
15-13	1994	24.3	6.3	7.5	3.1	-0.6	10	0	**50.6**	**P**
15-13	1999	24	11.4	6.8	4.3	-12.6	7.3	0	**41.2**	**VP-P**
15-13	2004	0.6	0	0	17.3	-1.6	9.6	0	**25.9**	**VP**
15-13	2009	7.3	15	4.9	25.2	-1.6	6.8	0	**57.6**	**F**
15-13	2014	14.3	14.7	15	30	-1.2	1.7	0	**74.5**	**G**
15-13	2019	26.3	14.6	15	30	-0.4	4.5	0	**90**	**G-E**
15-13	2024	30	13.7	8	30	0	2.1	0	**83.8**	**G**
15-14	2004	28.1	5.8	1.5	7.8	-7.3	4.5	0	**40.4**	**VP-P**
15-14	2009	28.8	11	15	18.4	-1.1	9	0	**81.1**	**G**
15-14	2014	30	12.3	2.4	17.9	-1.1	5.7	0	**67.2**	**F**
15-14	2019	30	8.2	2	9.5	-1	5	0	**53.7**	**P-F**
15-14	2024	30	7.4	1.8	6.1	-0.1	2.2	0	**47.4**	**P**
15-15	2004	4.1	0	0	2.7	0	0.2	0	**7**	**VP**
15-15	2009	0.1	0	0	5.1	0	0.4	0	**5.6**	**VP**
15-15	2014	1	0	0	7.3	0	2	0	**10.3**	**VP-P**
15-15	2024	2.3	0	0	10.7	0	10	0	**23**	**P**
15-16	2009	0.3	0	0	30	0	2.8	0	**33.1**	**VP**
15-16	2014	0.4	0	0	30	-0.2	3.6	0	**33.8**	**VP**
15-16	2019	1.2	0	0	30	-0.1	2.3	0	**33.4**	**VP**
15-16	2024	1.9	0	0	30	0	1.4	0	**33.3**	**VP**
15-18	2014	7.6	13.5	15	5.1	-3.2	1.2	0	**39.2**	**P**
15-18	2019	11.2	15	9.1	0.5	-7.8	1.5	0	**29.5**	**VP**
15-18	2024	8.7	15	0	8.7	0	0	0	**32.4**	**VP**
15-19*	2014	30	13.5	7.8	3.7	-0.5	0.3	0	**54.8**	**G**
15-20	2019	21.3	4.5	1.9	26	-10.9	4	0	**46.8**	**P**
15-20	2024	25.6	10.4	1.8	30	0	0.7	0	**68.5**	**G**
15-22	2019	28	0.3	2.4	22.9	-4.4	1.7	0	**50.9**	**P-F**
15-22	2024	19.8	1.6	0.2	24.6	-2	0.2	0	**44.4**	**P**

Table 4.7: Deer winter range Desirable Components Index (DCI) information by site number of Range Trend studies for WMU 15, Henry Mountains. VP = Very Poor, P = Poor, F = Fair, G = Good, E = Excellent. *Studies with an asterisk have been suspended.

Study #	Study Name	Limiting Factor and/or Threat	Level of Impact	Potential Impact
15-01	Eagle Bench	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
15-02	Nasty Flat	Conifer Encroachment	Medium	Reduced understory shrub, aspen stand, and herbaceous vigor
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
15-04	South Creek Chaining	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
15-05	Bates Knob	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Animal Use – Cattle/Bison	Medium	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
15-06	Box Springs Chaining	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
15-07	Airplane Spring	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
15-10	Cave Flat	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
15-12	Quaking Aspen Spring	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
15-13	Sidehill Spring	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
15-14	Dugout Creek	PJ Encroachment	Medium	Reduced understory shrub and herbaceous vigor
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
15-15	Steven's Mesa	Animal Use – Cattle/Bison	Medium	Reduced diversity of desirable grass and forb species

Study #	Study Name	Limiting Factor and/or Threat	Level of Impact	Potential Impact
15-16	Coyote Spring	Introduced Perennial Grass Annual Grass PJ Encroachment	High Low Low	Reduced diversity of desirable grass and forb species Increased fire potential and reduced herbaceous diversity Reduced understory shrub and herbaceous vigor
15-17	Swap Mesa	Animal Use – Bison Annual Grass PJ Encroachment	High Low Low	Reduced diversity of desirable grass and forb species Increased fire potential and reduced herbaceous diversity Reduced understory shrub and herbaceous vigor
15-18	Cave Flat Chaining 2	Animal Use – Cattle/Bison Annual Grass PJ Encroachment	High Low Low	Reduced diversity of desirable grass and forb species Increased fire potential and reduced herbaceous diversity Reduced understory shrub and herbaceous vigor
15-20	Sage Flat	Introduced Perennial Grass Annual Grass PJ Encroachment	Medium Low Low	Reduced diversity of desirable grass and forb species Increased fire potential and reduced herbaceous diversity Reduced understory shrub and herbaceous vigor
15-21	Bullfrog Benches	Annual Grass Drought	Low	Increased fire potential and reduced herbaceous diversity Lowered resilience and resistance to disturbance
15-22	Johns Knoll	Annual Grass PJ Encroachment Drought	Low Low	Increased fire potential and reduced herbaceous diversity Reduced understory shrub and herbaceous vigor Lowered resilience and resistance to disturbance
15-23	Steven's Mesa Point	Animal Use – Cattle/Bison Annual Grass	High Low	Reduced diversity of desirable grass and forb species Increased fire potential and reduced herbaceous diversity
15R-02	Tarantula Mesa Lop and Scatter	Introduced Perennial Grass PJ Encroachment	High Low	Reduced diversity of desirable grass and forb species Reduced understory shrub and herbaceous vigor

Table 4.8: Assessment of the potential limiting factors and/or threats and level of threat to study sites for WMU 15, Henry Mountains. All assessments are based off the most current sample date for each study site. Criteria for evaluating limiting factors is available in **Appendix A - Threat Assessment**.

Discussion and Recommendations

Deer winter range on the Henry Mountains unit has generally improved from poor to fair; in 2024, the unit averaged fair for wintering conditions, and the last three sample years have remained the same. Most sites are considered to be between fair and excellent condition. However, Dugout Creek, Steven's Mesa, Coyote Spring, Cave Flat Chaining 2, and Johns Knoll are either in very poor or poor condition and lower the overall unit average when evaluated together. Excluding Dugout Creek, the shared factor contributing to the poor conditions on these sites is the lack of preferred browse, although Johns Knoll has a moderate amount of preferred browse. Most of these sites are lacking perennial forb components, while only a small number of areas have cheatgrass invading their understories to varying degrees. Dugout Creek, Steven's Mesa, and Cave Flat Chaining 2 do not have a strong perennial grass presence in their respective understories. Eagle Bench, Airplane Spring, and Cave Flat are all sites that contribute to the overall stability and habitat quality of this unit. Shared factors among these sites that lead to good quality include high cover of preferred browse and minimal cheatgrass cover. The biggest improvements in habitat quality have occurred on South Creek Chaining and Sidehill Spring. South Creek Chaining has experienced active recruitment of sagebrush in the past that has led to increased cover in the most recent sample year. Sidehill Spring has had similar, but more gradual improvements (**Figure 4.42**, **Table 4.7**).

Many studies on this unit have robust browse components that have persisted or have not decreased in abundance. The preferred shrub components on Eagle Bench, Airplane Spring, Cave Flat, Sage Flat, and John's Knoll have not exhibited decreases in cover or density to a degree that would cause the associated plant communities to shift into a different (and possibly degraded) ecological state. In addition, studies like Box Springs Chaining, Quaking Aspen Spring, and Sidehill Spring have all increased in cover since the Bulldog fire in 2003. Improvements in habitat quality on this unit are concentrated on deer winter range and aimed at reducing twoneedle pinyon (*Pinus edulis*) and juniper (*Juniperus* spp.) encroachment. The Sage Flat, Airplane Spring, Bates Knob, and Airplane Spring study sites have all been observed following treatment with most sites showing some form of deer habitat improvement. Habitat treatment projects have also been and continue to be implemented in the area, many of which overlap Watershed Restoration Initiative (WRI) projects that have already been completed. Furthermore, a net total of 8,257 treatment acres have been completed on the Henry Mountains unit through the WRI as of February 2025 (**Map 4.8**, **Table 4.4**). Many WRI treatments are focused on Montane Sagebrush Steppe and Basin Big Sagebrush Shrubland ecotypes as defined by LANDFIRE (The Nature Conservancy LANDFIRE Team, 2015): these two systems have many threats identified by the Utah Wildlife Action Plan. However, fire and/or fire suppression, invasion of non-native species (e.g. cheatgrass), climate change/severe weather (e.g. drought), and/or improper grazing practices may have the most impact on these two community types in the Henry Mountains (Utah Division of Wildlife Resources, 2015). Approximately 7,480 acres (60%) of the Basin Big Sagebrush Shrubland are between 40% and 60% departed from reference, and an estimated 5,012 acres (73%) of Montane Sagebrush Steppe are between 40% and 60% departed from the natural reference state.

Most communities sampled by Range Trend have little to no cheatgrass (*Bromus tectorum*) occurring. However, in areas where notable cheatgrass presence has been observed (Sidehill Spring, Sage Flat, and Cave Flat), cheatgrass levels are decreasing. These decreases in cheatgrass cover and abundance may speak to the area's resilience to disturbance. Although cheatgrass is decreasing on this unit, it should be noted that the presence of annual grasses can increase fine fuel loads, exacerbate the risk of wildfire, and may even result in altered fire regimes (Balch, D'Antonio, & Gómez-Dans, 2013). This in turn can perpetuate and expand the removal of valuable reestablishing or extant browse communities. Should the affected sites burn, they may be at risk for the release of even greater amounts of cheatgrass and the increased fire frequency associated with annual grasses (Balch, D'Antonio, & Gómez-Dans, 2013; Bradley, 2018).

Native perennial grasses play an important role in overall deer habitat health in this unit. Most sites have an array of native grasses, but these communities are mostly dominated by the native species James' galleta (*Pleuraphis jamesii*). However, Dugout Creek is more diverse in perennial grass composition with muttongrass (*Poa fendleriana*), slender wheatgrass (*Elymus trachycaulus*), and squirreltail (*E. elymoides*) as the main species providing cover. There are a small number of studies that are dominated by introduced perennial grasses. South Creek Chaining, Bates Knob, and Quaking Aspen Spring all have high crested wheatgrass (*Agropyron cristatum*) cover, and introduced perennial grasses are a high-level threat on these sites (**Table 4.8**). The presence of introduced perennial grasses can have an impact on native forb and grass establishment (Mack, et al., 2000). In contrast, Steven's Mesa and Cave Flat Chaining 2 are lacking in perennial grass cover (Lane, Cox, & Payne, 2025).

Two notable wildfires have burned in the Henry Mountains unit; both of which occurred in 2003. The Lonesome Beaver wildfire burned 4,171 acres (6% of mule summer range and 0.2% of mule deer winter range) in or on the Horseshoe Basin, Dandelion Flat, and Wickiup Ridge. The Bulldog wildfire burned 31,728 acres (60% of mule deer summer range and nearly 7% of mule deer winter range) that spanned between the east side of Mount Pennell to Mount Hillers. Fire can act as an agent of negative change in some situations depending on where and how it occurs, and it is likely that localized detrimental effects occurred on portions of the Henry range burned by the Bullfrog and Lonesome Beaver fires. However, fire can also serve as a catalyst for habitat improvement in other circumstances, and these wildfires appear to have acted as such in some ways. Sidehill Spring and Quaking Aspen Spring are studies that sample mountain big and black sagebrush (*Artemisia tridentata* ssp. *vaseyana* and *A. nova*) ecological type communities – both sites have sample years that are pre- and post-Bullfrog fire. The Coyote Spring study samples an area near the Coyote Creek drainage that is considered to be a perennial grass ecological type community; the Coyote Spring study was established following the Bullfrog fire. All three of these study areas have shown an increase in preferred browse density and cover following the burn. However, the most notable increase in preferred browse has occurred on Sidehill Spring. Mountain big sagebrush on this site was reduced from nearly 6,000 plants per acre in 1999 to 520 plants per acre in 2004 following the fire. However, sagebrush increased to nearly 7,400 plants per acre in 2024; sagebrush cover follows a similar recovery trajectory. Perennial grasses have also increased since the Bullfrog fire, but these perennial grass communities are dominated by the introduced species crested wheatgrass. Crested wheatgrass and other introduced grasses are used in seed mixes due to their ability to stabilize disturbed soils and compete with cheatgrass. However, introduced species like crested wheatgrass are quite competitive with other native grasses, forbs, shrubs and have the potential to suppress species diversity (Mack, et al., 2000). Regardless, these seeded species have contributed to the overall recovery of wildlife habitat in the Henry Mountains unit.

Improvements of mule deer range have occurred on both Sidehill Spring and Quaking Aspen Spring since the Bullfrog wildfire. The Coyote Spring, Quaking Aspen Spring, Sidehill Spring and Above Coyote Bench studies were in various phases of woodland succession prior to the wildfire. Many conifer trees were removed by the fire, and communities transitioned to Phase I of woodland succession or were no longer invaded following the burn. Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) infilling is active and young trees are now being captured in density on these sites (Lane, Cox, & Payne, Utah Big Game Range Trend Studies 2024, Wildlife Management Units 13A, 14A, 14B, 15, 16B & 16C, 2025). Habitat and wildfire rehabilitation efforts following the Bullfrog wildfire were performed by seeding both inside and outside of wilderness study areas on the Henry Mountains; areas inside wilderness study areas were aerially seeded without chaining. Juran et al. (2008) studied the success of these seedings with and without chaining following the Bullfrog wildfire. This study found that seeding without chaining was a successful strategy in areas where disturbance is limited by WSA regulations, although success was mainly driven by precipitation.

Several habitat rehabilitation projects have been completed within deer winter and year-long ranges in the Henry Mountains unit. These treatments have been concentrated in areas where pinyon and juniper have infilled with most areas being treated by lop-and-scatter (**Map 4.8**, **Table 4.4**). Proposed and current WRI land treatments are planned to be implemented in areas that have already been treated for the continued thinning of pinyon and juniper trees. Nearly a third of the Range Trend sites in this unit have had habitat treatments (**Table 4.6**), and the bulk of the treated studies are found near Pennellen Pass, Head of Bullfrog, and Sage Flat.

Aspen Forest and Woodland and Aspen-Mixed Conifer Forest health are areas of focus on both mule deer summer and winter ranges. A notable portion of deer summer range includes these two forest types (**Table 4.1**). Approximately 77% of all aspen community types in the Henry Mountains unit are found to be between 40% and 60% departed from their respective reference states. More specifically, approximately 1,183 acres of Aspen Forest and Woodland and 706 acres of Aspen-Mixed Conifer Forest fall within the 40% to 60% departure scale (LC23_VDep_240, 2023). Nasty Flat samples an Aspen Forest and Woodland type that is considered to be between 40% to 70% departed from reference state and is fairly representative of overall aspen community health in the unit when compared to LANDFIRE. Many of these areas border mountain sagebrush habitat, so improving these two adjoining ecotypes together will likely have great effects benefiting deer summer and winter range in these areas.

There are also a number of concerns or threats that may impact mule deer habitat on the Henry Mountains unit ranging from human influences to biotic and abiotic factors.

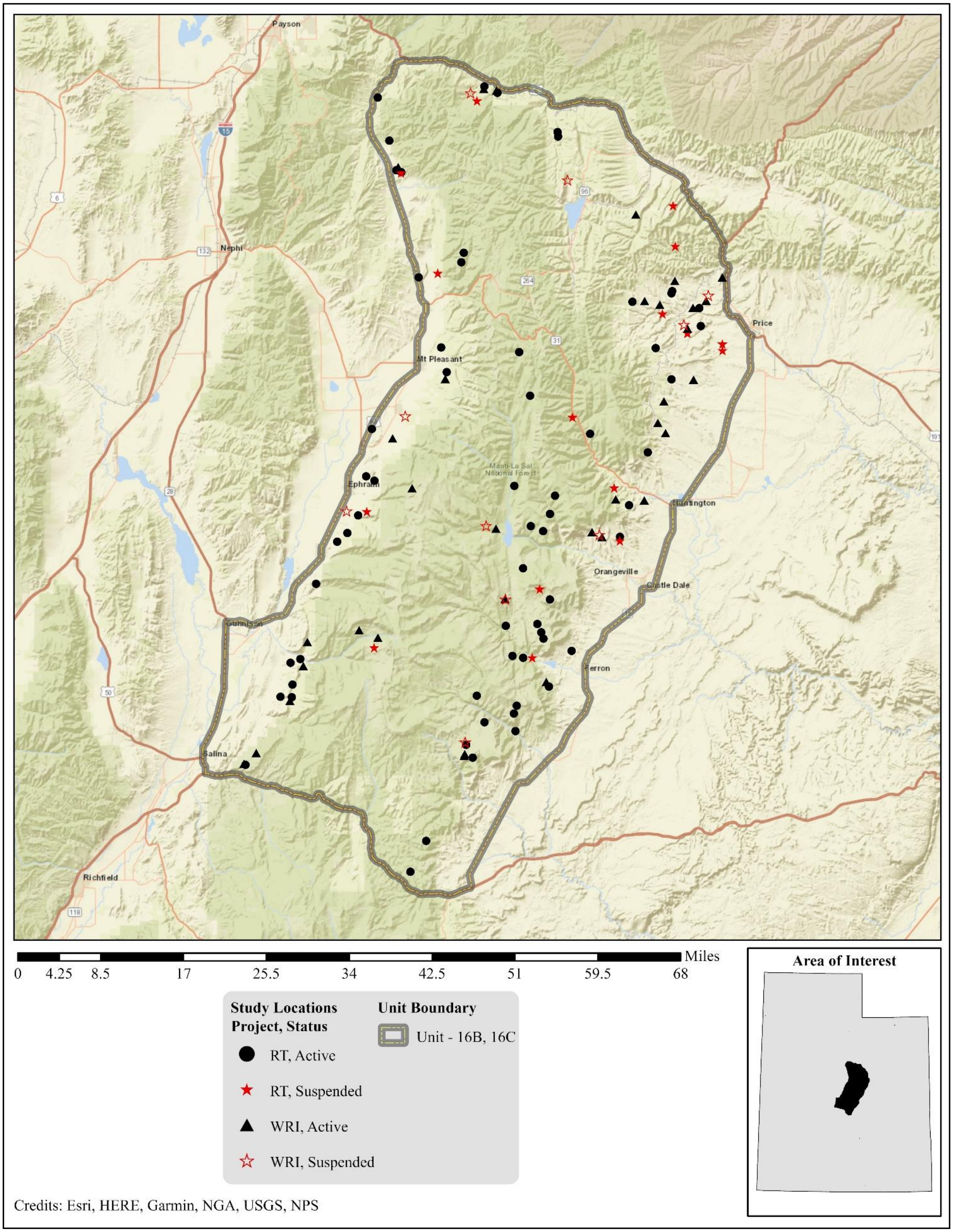
Drought has played a role in community health for several areas on the Henry Mountains unit; Bullfrog Benches and Steven's Mesa have had the most notable community changes. Both areas have estimated average precipitation values between 6 and 7 inches per year, so any precipitation lower than the average can have notable effects on vegetation health, especially if the drought is prolonged. The Palmer Drought Severity Index indicates a prolonged drought that began in 2012 and culminated in 2018 with an extreme drought occurring in the spring (**Figure 4.1a**, **Figure 4.1b**, **Figure 4.2a**, **Figure 4.2b**). Following the drought in 2018, Bullfrog Benches and Steven's Mesa were dominated by annual forbs. In the time since the drought, however, these sites have had increases in both perennial grasses and preferred shrub cover. Steven's Mesa not only had increases in preferred shrub cover, but shadscale saltbush (*Atriplex confertifolia*) density notably increased between 2019 and 2024 (Lane, Cox, & Payne, 2025).

Human influences that may affect wildlife habitat in this unit come from energy resource development. Oil and gas development appears to be evenly distributed across the unit; however, wells are rare and infrequent. There are an estimated 11 wells of varying age found in the area designated as crucial mule deer winter range. In addition to oil and gas extraction, solar zones have been identified on the north and east sides of the unit that overlap with substantial deer winter range. Much of this area along highways 24 and 95 has been evaluated for peak solar production and may be considered valuable for future solar energy development; however, much of this corridor falls just outside of mule deer winter range. Another area of interest evaluated for renewable energy is found on Steven's Mesa. This area experiences good southwest winds and has potential for wind energy development. In addition, there appears to be some interest in mineral extraction (uranium and vanadium) in the South Henry Mountains Mining District, which is historically known for mining gold and other heavy metals. However, much of the Henry Mountains unit is governed by Wilderness Area regulations: when this is taken into consideration, energy development does not pose a current threat to overall big game habitat. Regardless, these resources remain, and smaller localized energy developments may occur in areas that are not governed by wilderness and wilderness study area regulations.

Other threats to wildlife habitat are occurring in localized portions of this unit, but they will not be discussed in this section. These additional threats are specified by study site in the previous table (**Table 4.8**).

A number of recommendations should be taken into consideration when trying to mitigate or slow the effects of big game habitat loss in the Henry Mountains Management Unit. A considerable portion of this unit has already been treated for tree encroachment (**Table 4.4**). However, restoration efforts in historic sagebrush and shrubland habitats should continue where active infilling or encroachment of pinyon and juniper in both previously treated and untreated areas is occurring. Habitat projects in general should also continue to help restore and maintain historic and current sagebrush stands. When these projects do take place, care should be taken in method selection (lop and scatter, bullhog, chaining, etc.) to ensure that annual grass loads are not unintentionally amplified. In addition, range monitoring should proactively continue in areas where annual grass levels are high, and appropriate actions (herbicide application, changes in grazing management, etc.) should be taken if outbreaks occur in the future. If reseeding is necessary to restore herbaceous species, care should be taken in species selection and preference should be given to native species whenever possible. Finally, both Range Trend studies and areas where rehabilitation projects have occurred should continue to be monitored. Data collected in the future will indicate whether the severity of current limiting factors is increasing and may provide guidance on what actions are needed to mitigate these identified potential threats to habitat and wildlife.

5. WILDLIFE MANAGEMENT UNIT 16B, 16C – MANTI CENTRAL MOUNTAINS



WILDLIFE MANAGEMENT UNIT 16B, 16C – MANTI CENTRAL MOUNTAINS

Boundary Description

16B: Utah, Sanpete, Emery, and Carbon Counties – Boundary begins at SR-10 and SR-31 in Huntington; north on SR-10 to Highway US-6; northwest on US-6 to Highway US-89; south on US-89 to SR-31; southeast on SR-31 to Huntington.

16C: Sanpete, Emery, and Sevier Counties – Boundary begins at the junction of SR-10 and SR-31 at Huntington; south on SR-10 to Interstate 70; west on I-70 to Highway US-89 at Salina; north on US-89 to SR-31 at Fairview; southeast on SR-31 to SR-10 at Huntington.

Management Unit Description

Geography

Unit 16B covers the east and west sides of the Wasatch Plateau; Skyline Drive to Soldier Summit roughly divides the eastern and western halves of the unit. This unit was previously called the Northeast Manti Deer Herd Unit 30. In the spring of 1998, this unit was incorporated into the much larger Wildlife Management Unit 16.

Unit 16C was previously called Deer Herd Unit 31- Southeast Manti. The unit was enlarged in the spring of 1998 to include both the east and west sides of the Wasatch Plateau and renamed Wildlife Management Unit 16C. Unit 16C is a subunit of the very large management unit 16, which encompasses areas in Utah, Carbon, Juab, Sevier, and Sanpete Counties. WMU 16C covers the southern portion of the Wasatch Plateau; as with unit 16B, this subunit's western and eastern halves are roughly divided by Skyline Drive. The upper limits of the winter range on 16C generally follow the rim of the plateau and the 9,000-foot level of the south and west exposures of the large canyons and mountain slopes. Many of the plateaus drop steeply to the valley floor below to the very lowest portion of the herd unit that supports a low desert shrub type on unproductive shale hills. This lowest-elevation acreage is not considered part of the winter range.

Climate Data

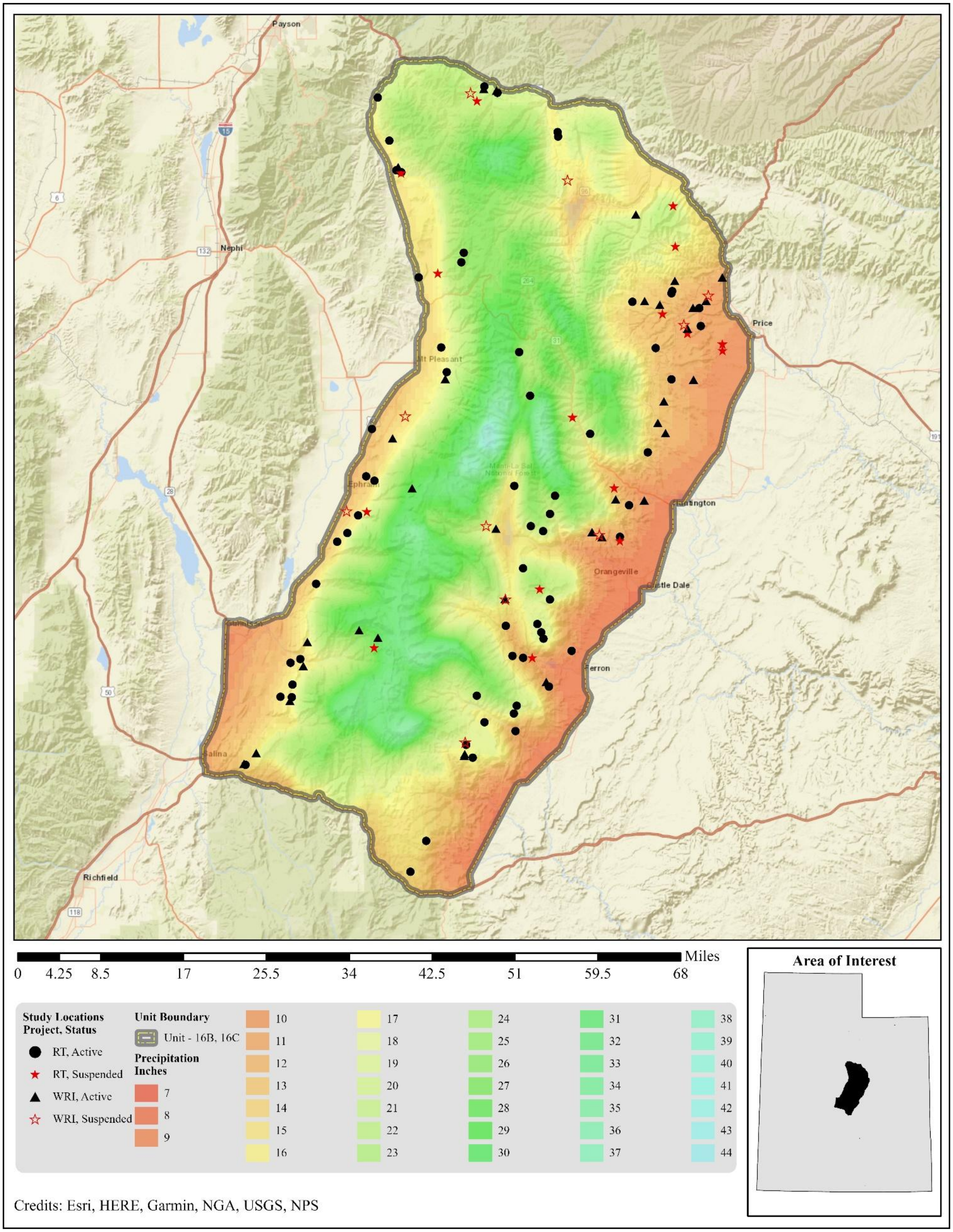
The 30-year (1991-2020) annual precipitation PRISM model shows that precipitation on this unit ranges from 7 inches along the western border near Castle Dale to 44 inches on Lowry Top on the Wasatch Plateau. All of the active Range Trend and Watershed Restoration Initiative (WRI) monitoring studies on the unit occur within 8-29 inches of precipitation (**Map 5.1**) (PRISM Climate Group, Oregon State University, 2021).

Vegetation trends are dependent upon annual and seasonal precipitation patterns. Palmer Drought Severity Index (PDSI) data for the unit was compiled from the National Oceanic and Atmospheric Administration (NOAA) Physical Sciences Division (PSD) as part of the South Central (Division 4), Northern Mountains (Division 5), and Southeast Divisions (Division 7).

The mean annual PDSI of the South Central Division has displayed mild to extreme drought for 16 out of the past 31 years. The most recent annual PDSI score with an extreme drought ranking was 2021. Wet years were relatively consistent in the 1990s, with four moderately to extremely wet years occurring between 1993 and 1999. However, these "wet" rankings have become less common since 2000. Annual PDSI data shows an apparently cyclical pattern over the past 20 years, with one very to extremely wet year occurring amid longer periods of drought. The most recent moderately wet years were 2005 and 2011, with 2020-2022 being years of moderate to extreme drought. Overall, 26% of the 1994-2024 period consisted of slightly to very wet years, while 52% was considered to be years of mild to extreme drought; the remaining 22% of this period was comprised of normal, incipiently wet, or incipiently dry years. Mean spring (March-May) and fall (September-November) PDSI values show similar patterns to the one demonstrated by mean annual data. During the last five years, fall PDSI rankings have been slightly wetter than the spring rankings for most years (**Figure 5.1a**, **Figure 5.1b**).

Twelve of the past 31 years in the Northern Mountains Division have had mean annual PDSI rankings of mild to extreme drought; the last year with an extreme drought ranking was 2021. Seven of the 31 years have ranged between slightly and extremely wet. Of those seven years, two have been slightly wet while the remaining years have been considered to be between moderately and extremely wet; 2011 was the most recent moderately wet year. Like the other divisions, however, these wet PDSI rankings have typically presented as periods of one or two years among longer periods of drought. When characterized as percentages of the 1994-2024 period, 39% were years of mild to extreme drought; 22% were slightly to extremely wet years; and the remaining 39% were normal, incipiently dry, or incipiently wet years (**Figure 5.2a)** The mean spring (March-May) and mean fall (Sept.-Nov.) PDSI estimations typically follow the same trends as the average annual PDSI trends, but can show split seasonal precipitation events that are not captured in the overall annual PDSI. The spring season was the main driver in overall wetness during the most recent wet year in 2011 (**Figure 5.2b**).

The mean annual PDSI of the Southeast Division has experienced some form of drought in most years since 1994. Moreover, this climate division has been considered to be in droughts of varying severity for nearly 52% of the time since 1994. Of the drought years, 56% are considered to be either moderate or extreme droughts. Also remarkable about this climate division is that drought is experienced over multiple years and is generally interrupted by a single wet year event. The most notable wet year occurred in 2005, which was considered to be moderately wet (**Figure 5.3a**).The mean spring (March-May) and mean fall (Sept.-Nov.) PDSI estimations typically follow the same trends as the average annual PDSI trends, but can show split seasonal precipitation events that are not captured in the overall annual PDSI. These seasonal precipitation events can play a crucial role in the timing of plant growth and production for the remainder of the year (spring), or for the year ahead (fall). When a wet fall aligns with a wet spring of the following year, plant health and production for that following year can have a positive effect on forage availability. This is due to lower evaporation and transpiration rates between the months of September to May that result in higher soil moisture reserves being made available to plants for longer periods during the dry summer months. Although annual precipitation is likely the driver for plant production, the interplay of fall/spring wetness may make a drought year less impactful as a plant stressor. The ecotypes evaluated by Range Trend are primarily found on deer transitional and winter ranges. Plant growth on these ranges is primarily affected by the seasonal precipitation that occurs during the fall and spring months (Cox, et al., 2009), and is the reason fall and spring PDSI estimations are focused on in this report (**Figure 5.3b**). The years that follow this pattern of consecutive wet fall and spring occur in 1994/95, 1996/97, 1997/98, 2004/05, and 2022/23. Range Trend sample years occur on a five-year rotation, so the PDSI years of interest should be examined by the corresponding rotation year (**Table 5.7**). The 2019 sample year occurs during a wet year, but years where drought may have affected plant condition occur in 1994, 2004, 2009, 2014, and 2024 (**Figure 5.3a**, **Figure 5.3b**) (National Oceanic and Atmospheric Administration, 2025).



Map 5.1: The 1991-2020 PRISM Precipitation Model for WMU 16B, 16C, Manti Central Mountains (PRISM Climate Group, Oregon State University, 2021).

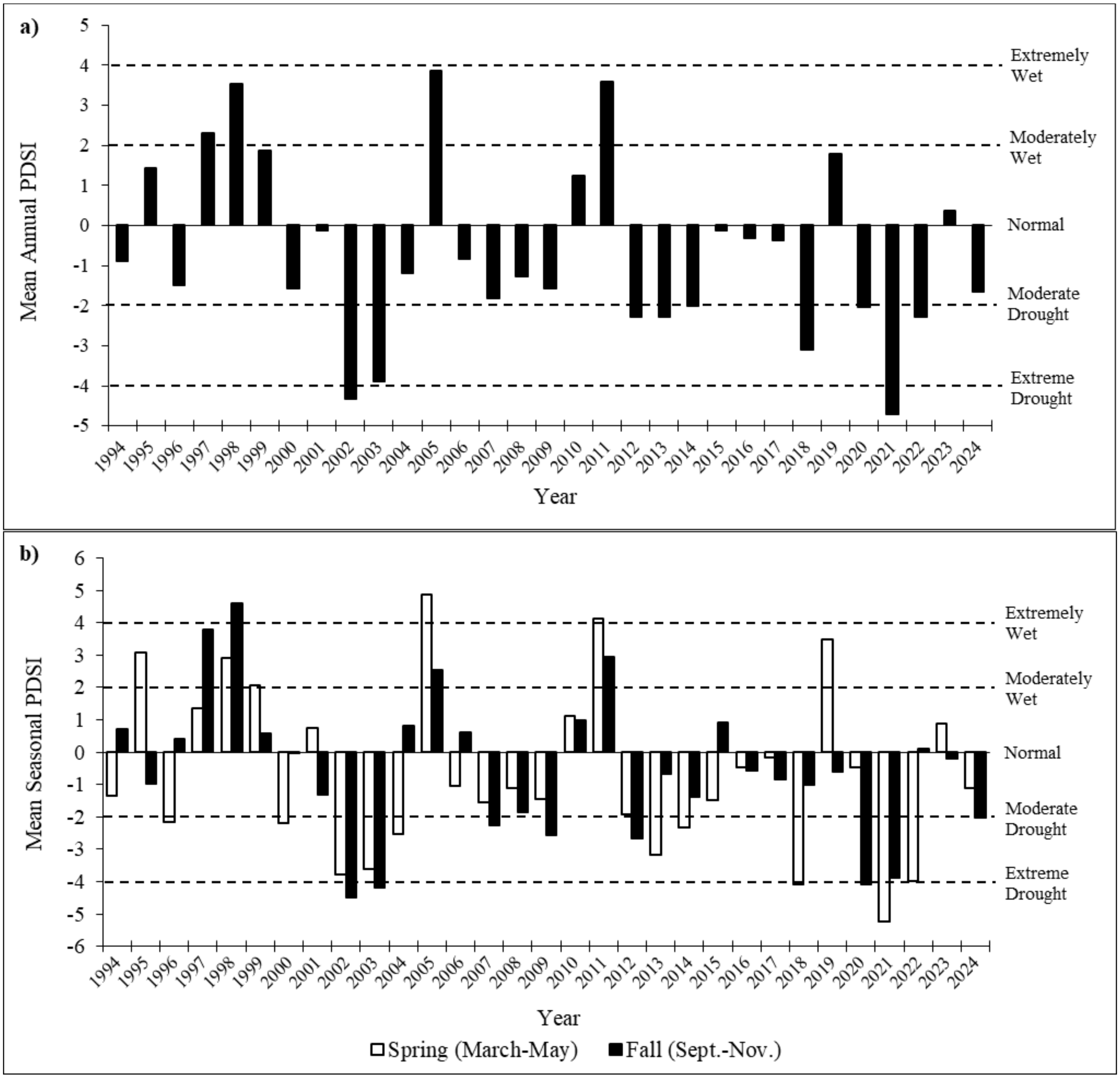


Figure 5.1: The 1994-2024 Palmer Drought Severity Index (PDSI) for the South Central Division (Division 4). The PDSI is based on climate data gathered from 1895 to 2024. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet, and negative deviations indicate drought. Classification of the scale is $\geq$4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to 2.9 = Moderately Wet, 1.0 to 1.9 = Slightly Wet, 0.5 to 0.9 = Incipient Wet Spell, 0.4 to -0.4 = Normal, -0.5 to -0.9 = Incipient Dry Spell, -1.0 to -1.9 = Mild Drought, -2.0 to -2.9 = Moderate Drought, -3.0 to -3.9 = Severe Drought and $\leq$-4.0 = Extreme Drought. a) Mean annual PDSI. b) Mean spring (March-May) and fall (Sept.-Nov.) PDSI (National Oceanic and Atmospheric Administration, 2025).

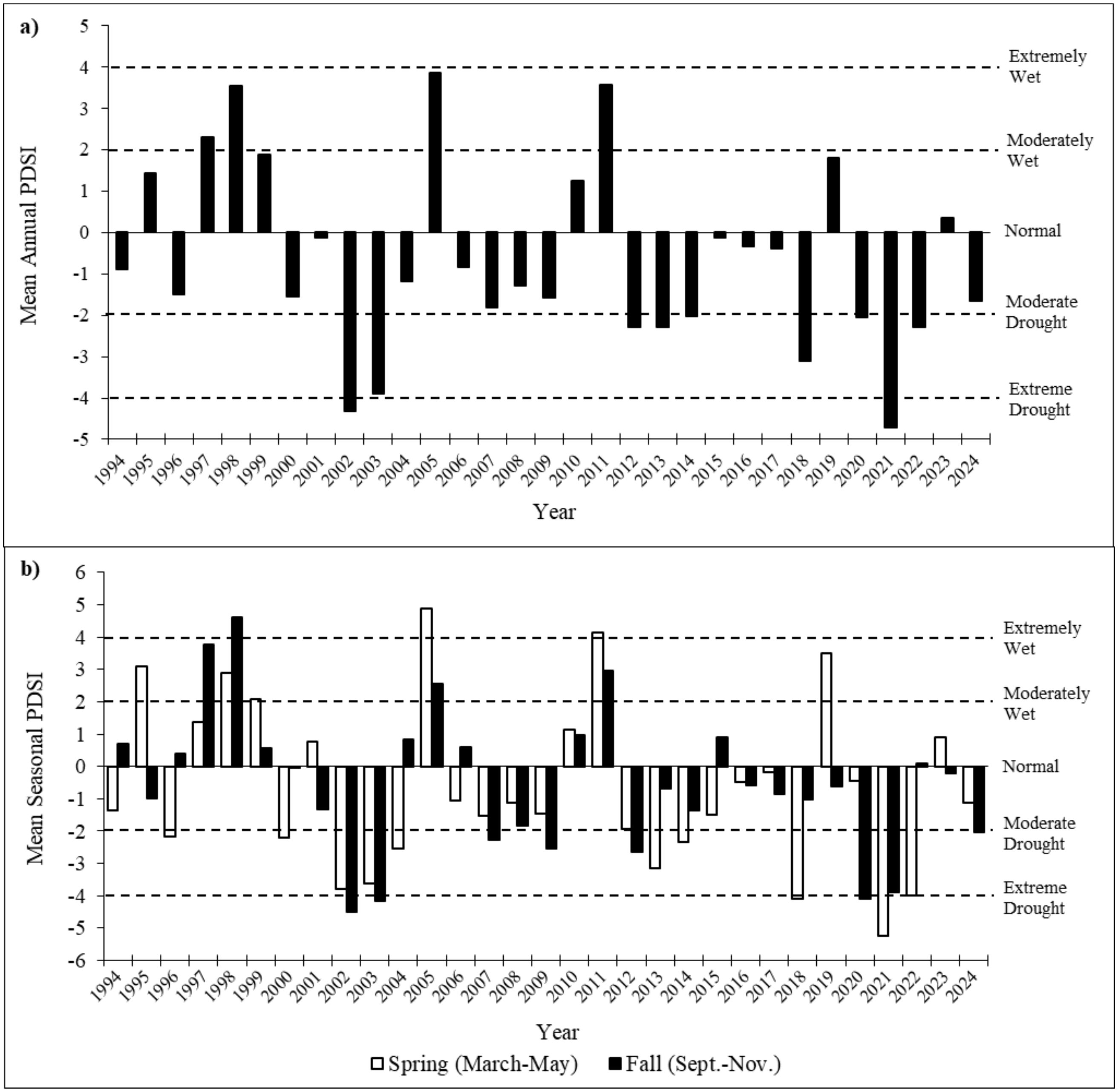


Figure 5.2: The 1994-2024 Palmer Drought Severity Index (PDSI) for the Northern Mountains Division (Division 5). The PDSI is based on climate data gathered from 1895 to 2024. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet, and negative deviations indicate drought. Classification of the scale is ≥4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to 2.9 = Moderately Wet, 1.0 to 1.9 = Slightly Wet, 0.5 to 0.9 = Incipient Wet Spell, 0.4 to -0.4 = Normal, -0.5 to -0.9 = Incipient Dry Spell, -1.0 to -1.9 = Mild Drought, -2.0 to -2.9 = Moderate Drought, -3.0 to -3.9 = Severe Drought and ≤-4.0 = Extreme Drought. a) Mean annual PDSI. b) Mean spring (March-May) and fall (Sept.-Nov.) PDSI (National Oceanic and Atmospheric Administration, 2025).

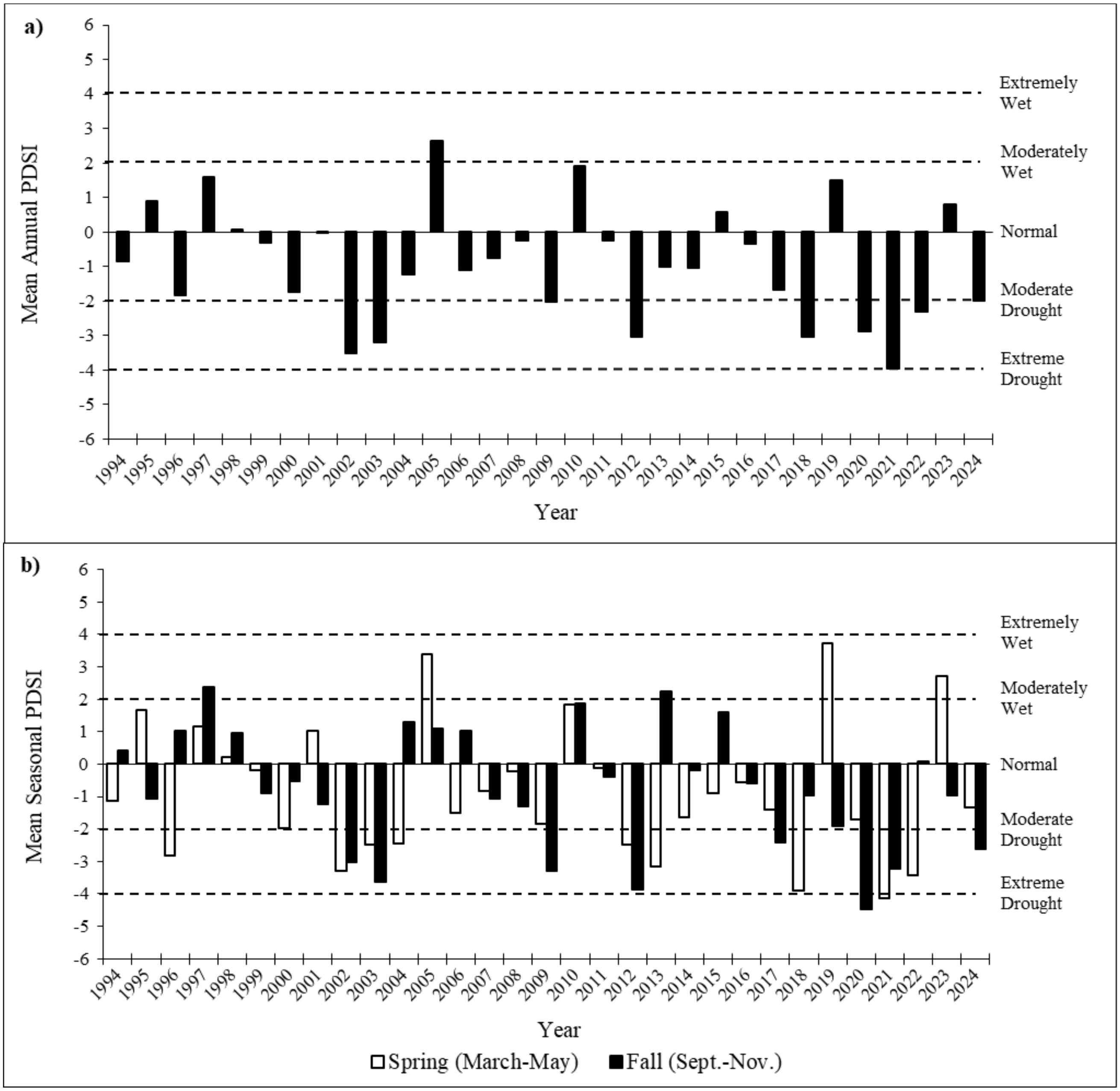


Figure 5.3: The 1994-2024 Palmer Drought Severity Index (PDSI) for the Southeast Division (Division 7). The PDSI is based on climate data gathered from 1895 to 2024. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet, and negative deviations indicate drought. Classification of the scale is ≥4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to 2.9 = Moderately Wet, 1.0 to 1.9 = Slightly Wet, 0.5 to 0.9 = Incipient Wet Spell, 0.4 to -0.4 = Normal, -0.5 to -0.9 = Incipient Dry Spell, -1.0 to -1.9 = Mild Drought, -2.0 to -2.9 = Moderate Drought, -3.0 to -3.9 = Severe Drought and ≤-4.0 = Extreme Drought. a) Mean annual PDSI. b) Mean spring (March-May) and fall (Sept.-Nov.) PDSI (National Oceanic and Atmospheric Administration, 2025).

Big Game Habitat

Central Mountains Manti North

Most of the winter range in subunit 16B lies on the eastern side of the Wasatch Plateau, which rises straight up from the valley floor to ridges with heights of over 9,500 feet. The winter range is a narrow strip of land along the base of the plateau below the 8,000-foot contour: it runs from Price Canyon south to Huntington Canyon. Other important winter ranges include a large section of land along the Price River in the Colton area; below Scofield Reservoir; and in the mouths of several side canyons in Huntington Canyon. Elk winter ranges are found on south-facing grassy points at high elevations on the Wasatch Plateau.

Key wintering areas for deer include Wildcat Canyon and the Gordon Creek basin; Consumers Bench; Porphyry Bench; North Spring; Rocky Hollow; Dairy Fork; several areas in Huntington Canyon; Gentry Mountain; Spring Canyon drainages; and the foothills along US-89 and US-6. Preferred elk wintering areas include Miles Point; Reynolds Point on Trail Mountain; Telephone Bench; Thistle; and canyons and tributaries of Eccles Canyon. The winter range is made up of several habitat types, including pinyon-juniper, sagebrush-grass, mountain brush, grassland, seedings, and other miscellaneous vegetation types.

Central Mountains Manti South

The key deer wintering areas in subunit 16C include the lower end of Muddy Creek and Ferron Creek; Black Dragon; Arapien Valley; Link Canyon; Saleratus Creek; Cottonwood Canyon; and Huntington Canyon. Elk winter higher on Trail Mountain; North and South Horn Mountain; Sage Flat; and on the foothills along US-89 from Salina to Mount Pleasant: deer also use these areas during mild winters. Elk utilize the mountain mahogany and sagebrush on the lower points of the plateau, such as North and South Horn Mountain and Trail Mountain. Much of this key winter range is located on Forest Service lands.

Pinyon-juniper benches become more limited in the southern portion of the unit and there are mostly low desert shrub foothills associated with Muddy Creek. Overall, the pinyon-juniper vegetation type comprises a fair amount of the winter range at low elevations, but it is not considered to be critical to the Range Trend monitoring program. However, chained and seeded portions of this type provide important wintering areas and are monitored for trends; chaining treatments are sampled in the foothills from Huntington Canyon to south of Dry Wash, and other key areas at Middle and Dry Mountains (**Table 5.8**). The big sagebrush-grass vegetation type is found on many key areas on the Northeast Manti Central Mountains unit, but also on high-elevation elk winter range on Trail, East, and Horn Mountains. Big sagebrush-grass is limited on crucial deer winter range, but key areas are located on Black Dragon and Muddy Creek.

Rangeland Analysis Platform (RAP) – Biomass and Cover by Deer Habitat

Several factors determine quality wildlife forage. Diversity of species and life forms, age class and vigor of shrubs, timing of vegetative stages of grasses and forbs, and the abundance of palatable vegetation all contribute to a quality habitat for mule deer. Site-level (Range Trend sites) data addresses species composition, age structure, and health of communities in winter and transitional habitat. However, due to the small number and/or placement of Range Trend sites, it is difficult to get a true estimation of vegetation abundance. Trend study sites are strategically placed in key areas for mule deer to assess both quantity and quality of forage, but due to limited sampling size, sites cannot accurately predict the overall abundance of forage available to mule deer in the entire extent of mule deer range. The Rangeland Analysis Platform (RAP) may aid in the estimation of forage quantity within mule deer habitat by providing values for biomass and cover for perennial, annual, and browse lifeforms that Range Trend sites cannot account for. However, RAP data does not fully address the quality of forage the way that Range Trend data does. The intent of the RAP dataset is to supplement Range Trend data and local knowledge to inform managers of general habitat trends. In addition, "[RAP] data can be used to evaluate resources in concert with site-specific information about the area under investigation, such as past land management practices, vegetation treatments, conservation efforts, or natural disturbances" (Rangeland Analysis Platform; Products, 2025, para. 5). The following graphs represent vegetation changes by either biomass or percent cover based on deer winter, summer, or year-long range habitat. Range Trend data is collected on a five-year interval and the intent of the RAP data is to also help illustrate the year-to-year fluctuations or changes that may occur between Range Trend samplings.

According to the RAP data, herbaceous biomass and cover have exhibited yearly fluctuations on summer, winter, winter/spring, spring/fall, and year-long mule deer ranges. When comparing 1986 data to that from 2024, herbaceous biomass and cover have generally increased or remained stable overall on summer and spring/fall habitat. Average biomass and cover have also increased on year-long range between 1986 and 2024, but this was largely due to annual lifeforms. On winter range, biomass has remained similar over the same period, but cover has slightly decreased; both biomass and cover exhibited net decreases on winter/spring habitat. Large flushes of annuals have occurred during many years of good precipitation and have been particularly pronounced on year-long and winter range. Annual and perennial cover and biomass have followed precipitation trends in numerous years on ranges of all seasonality, although lag effects of one to two years or so have occurred at other times (**Figure 5.4**, **Figure 5.5**, **Figure 5.6**, **Figure 5.7**, **Figure 5.8**, **Figure 5.9**, **Figure 5.10**, **Figure 5.11**, **Figure 5.12**, **Figure 5.13**). Range Trend data from 1999 to present shows fluctuations in herbaceous cover depending on ecotype. Although annual grasses and forbs have been present on sites across the elevation gradient, they have generally had larger flushes on sites of upland and semidesert ecotypes than on those of mountain ecotypes. However, it is important to note the different number of studies sampled from year to year (the 'n' value) in some ecotypes and consider the implications that this may have on the data. Furthermore, Range Trend sites are summarized by ecological potential in this report and not seasonality of mule deer range (**Figure 5.48**, **Figure 5.49**, **Figure 5.51**, **Figure 5.53**). As such, incongruences between Range Trend data and that reported by the RAP are probable.

The RAP data for tree and shrub cover shows fluctuation over time on all five range types, but total values are generally similar or have only slightly increased or decreased when comparing 1986 and 2024 data. Cover data for both lifeforms has correlated with precipitation (or a lag effect has occurred) in many sample years, but to a lesser degree and with generally less drastic peaks and troughs than herbaceous data (**Figure 5.14**, **Figure 5.15**, **Figure 5.16**, **Figure 1.10**, **Figure 5.18**). Range Trend data shows fluctuations in shrub and tree cover depending on ecotype (**Figure 5.19**, **Figure 5.20**, **Figure 5.21**, **Figure 5.22**, **Figure 5.23**, **Figure 5.24**, **Figure 5.25**, **Figure 5.26**, **Figure 5.27**, **Figure 5.28**, **Figure 5.29**, **Figure 5.30**): these fluctuations are discussed in the associated Study Trend Summary sections. Again, however, it is important to consider the caveats discussed above when making comparisons between RAP and Range Trend data. Range Trend data is site-specific and granular while RAP data is aggregated to the unit scale for deer habitat.

RAP – Herbaceous Biomass by Deer Habitat

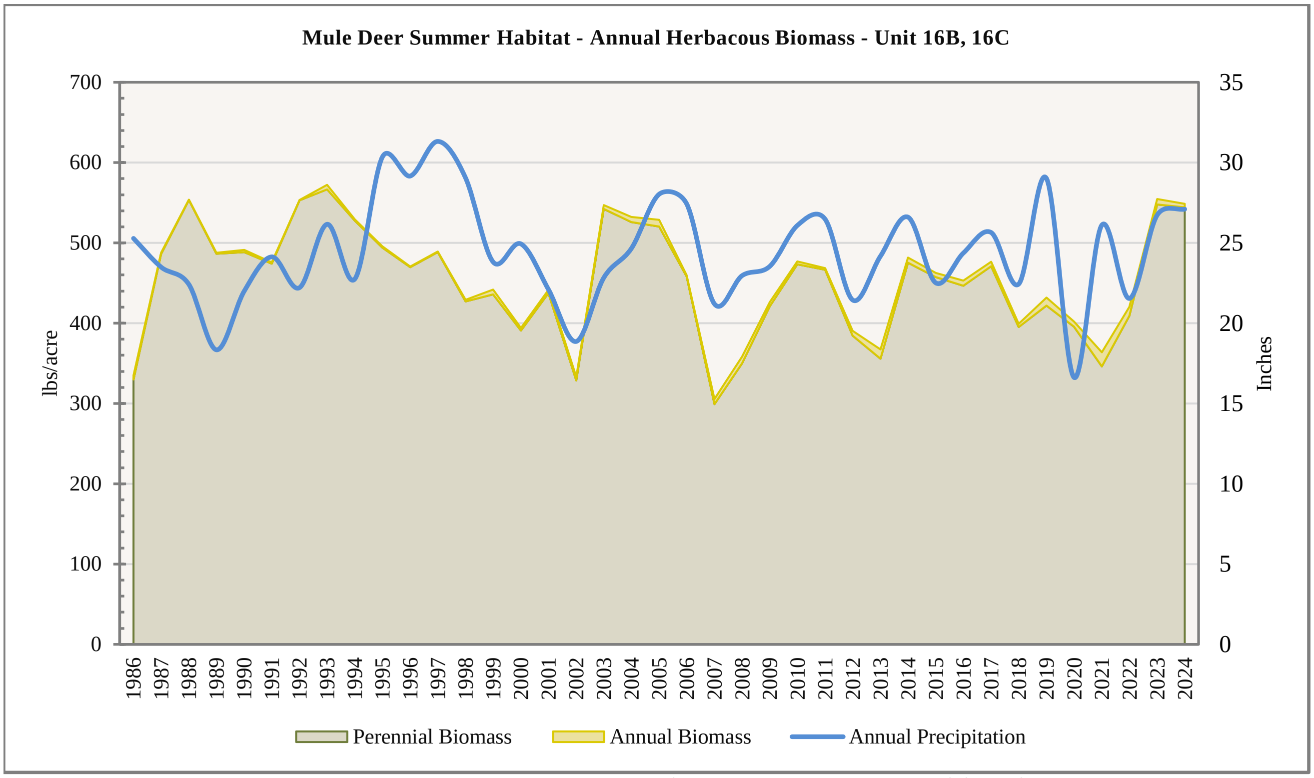


Figure 5.4: Average precipitation and estimated yearly herbaceous biomass of stacked perennial and annual lifeforms for summer mule deer habitat in WMU 16B, 16C, Manti Central Mountains (Rangeland Analysis Platform, 2025).

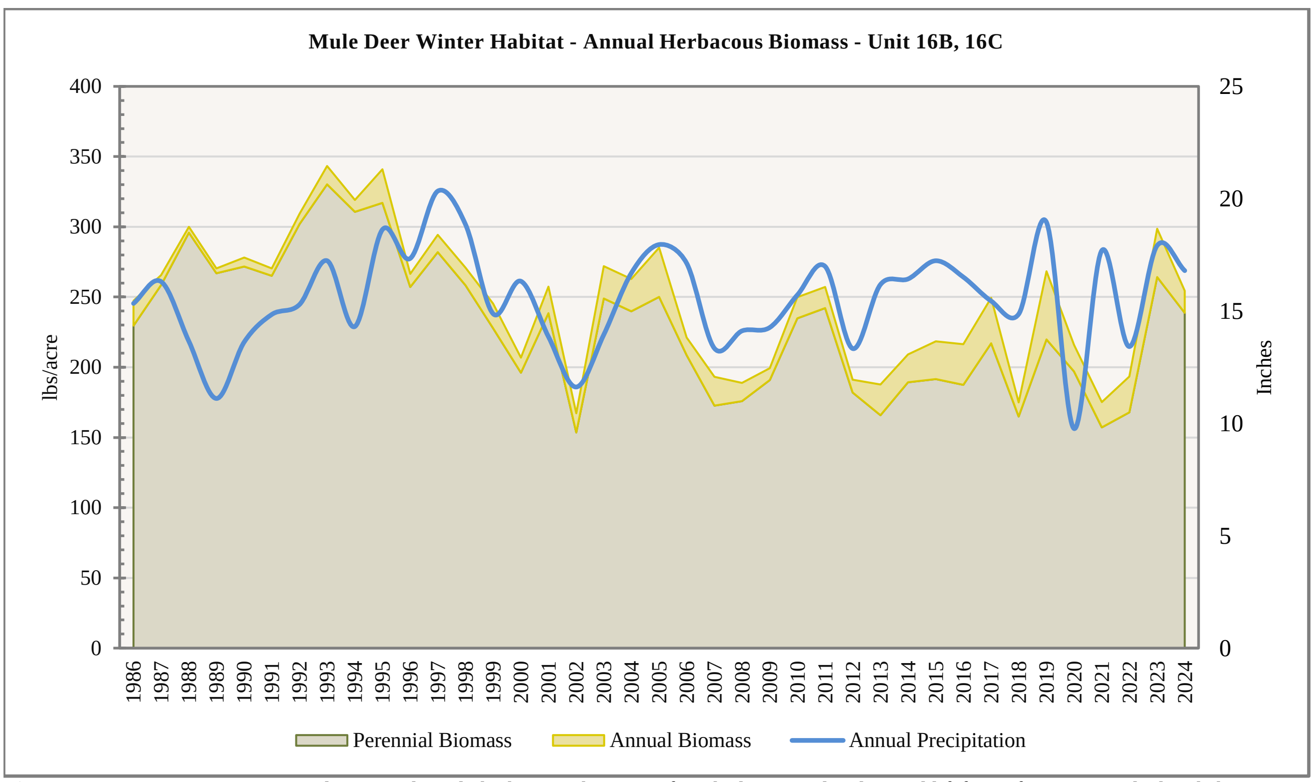


Figure 5.5: Average precipitation and estimated yearly herbaceous biomass of stacked perennial and annual lifeforms for winter mule deer habitat in WMU 16B, 16C, Manti Central Mountains (Rangeland Analysis Platform, 2025).

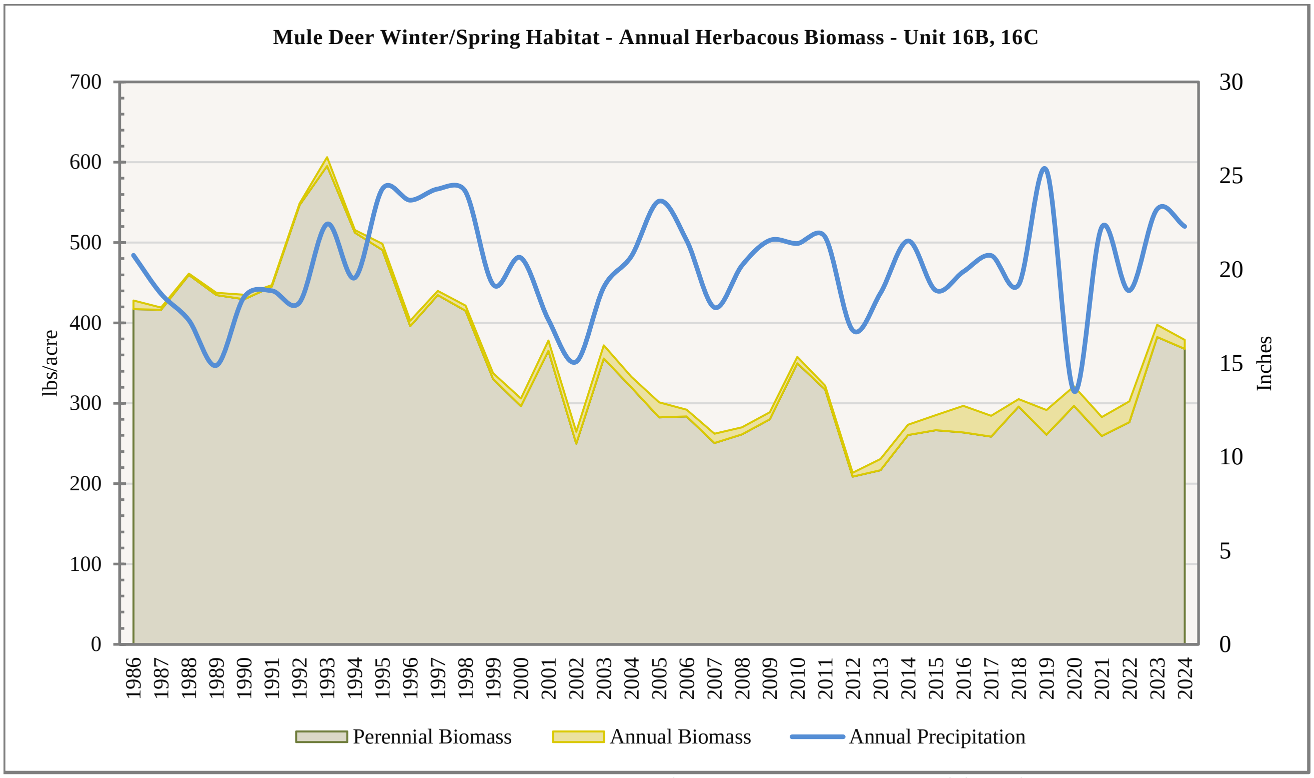


Figure 5.6: Average precipitation and estimated yearly herbaceous biomass of stacked perennial and annual lifeforms for winter/spring mule deer habitat in WMU 16B, 16C, Manti Central Mountains (Rangeland Analysis Platform, 2025).

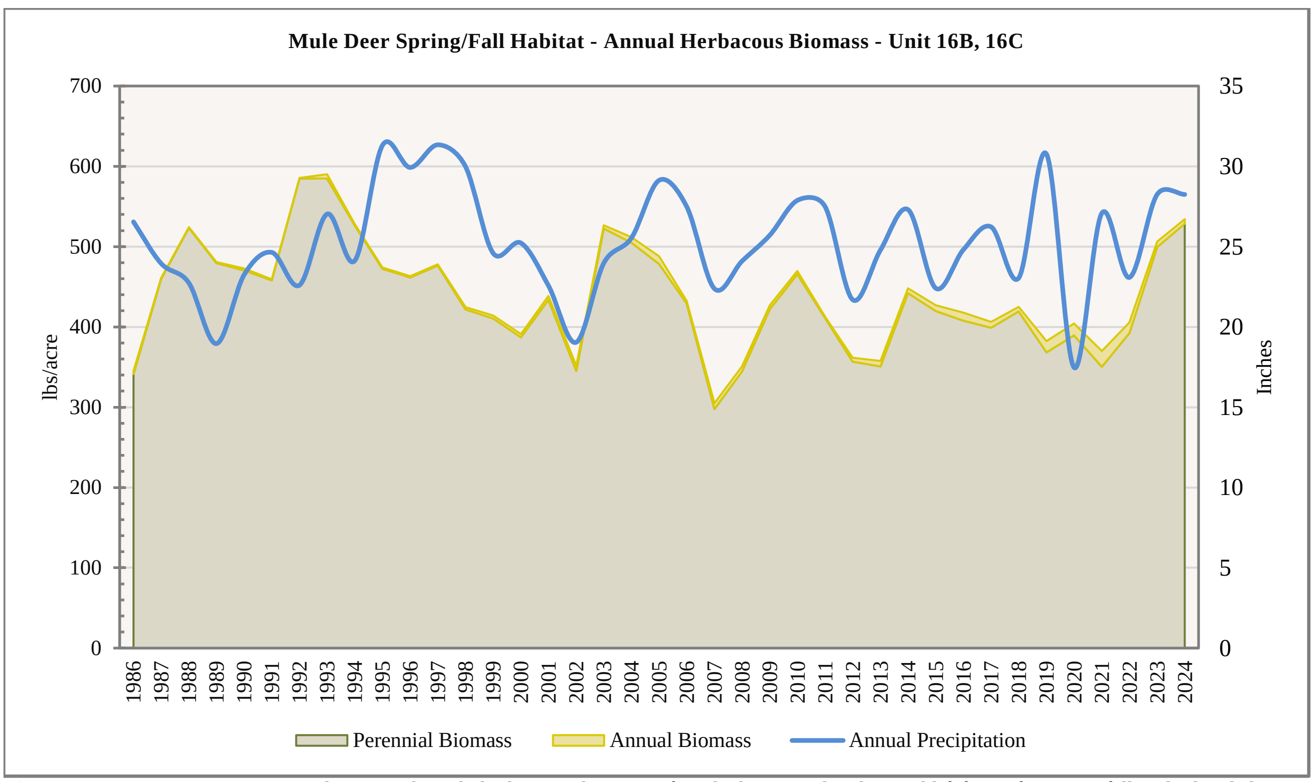


Figure 5.7: Average precipitation and estimated yearly herbaceous biomass of stacked perennial and annual lifeforms for spring/fall mule deer habitat in WMU 16B, 16C, Manti Central Mountains (Rangeland Analysis Platform, 2025).

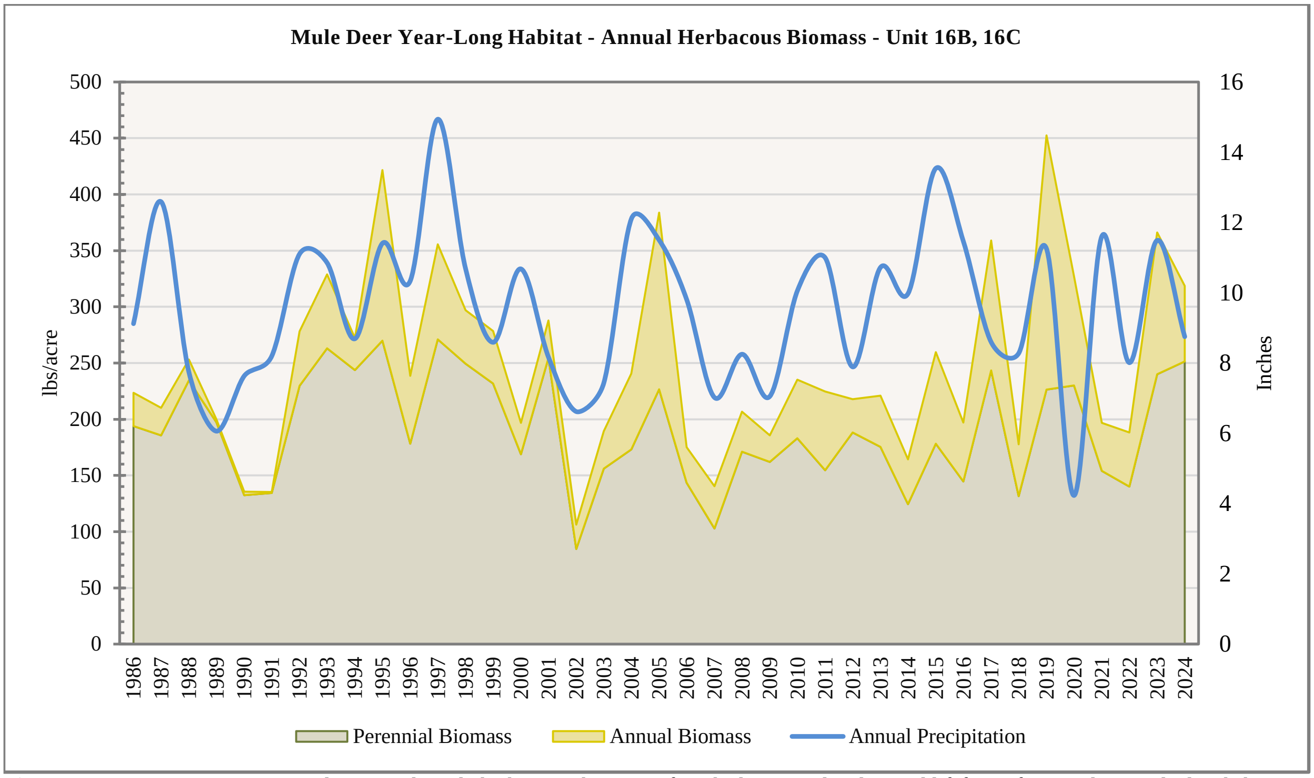


Figure 5.8: Average precipitation and estimated yearly herbaceous biomass of stacked perennial and annual lifeforms for year-long mule deer habitat in WMU 16B, 16C, Manti Central Mountains (Rangeland Analysis Platform, 2025).

RAP – Herbaceous Cover by Deer Habitat

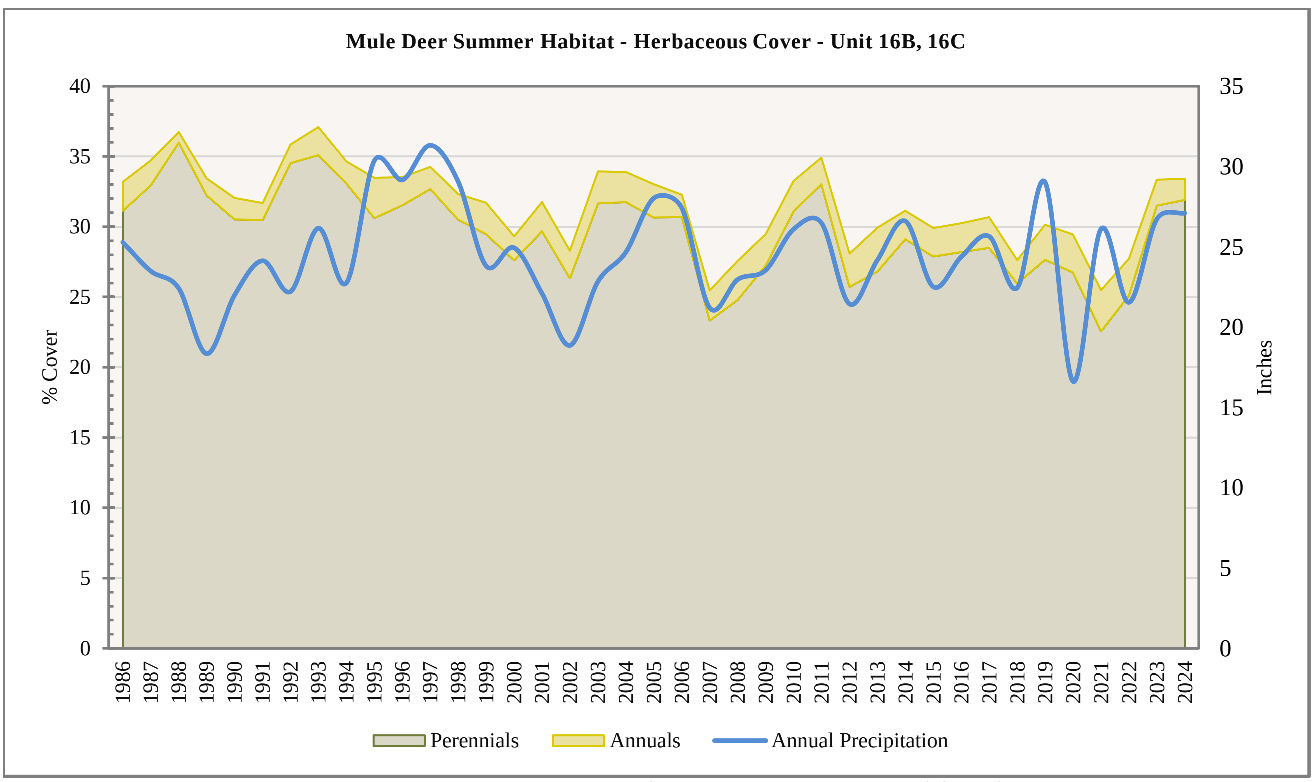


Figure 5.9: Average precipitation and estimated yearly herbaceous cover of stacked perennial and annual lifeforms for summer mule deer habitat in WMU 16B, 16C, Manti Central Mountains (Rangeland Analysis Platform, 2025).

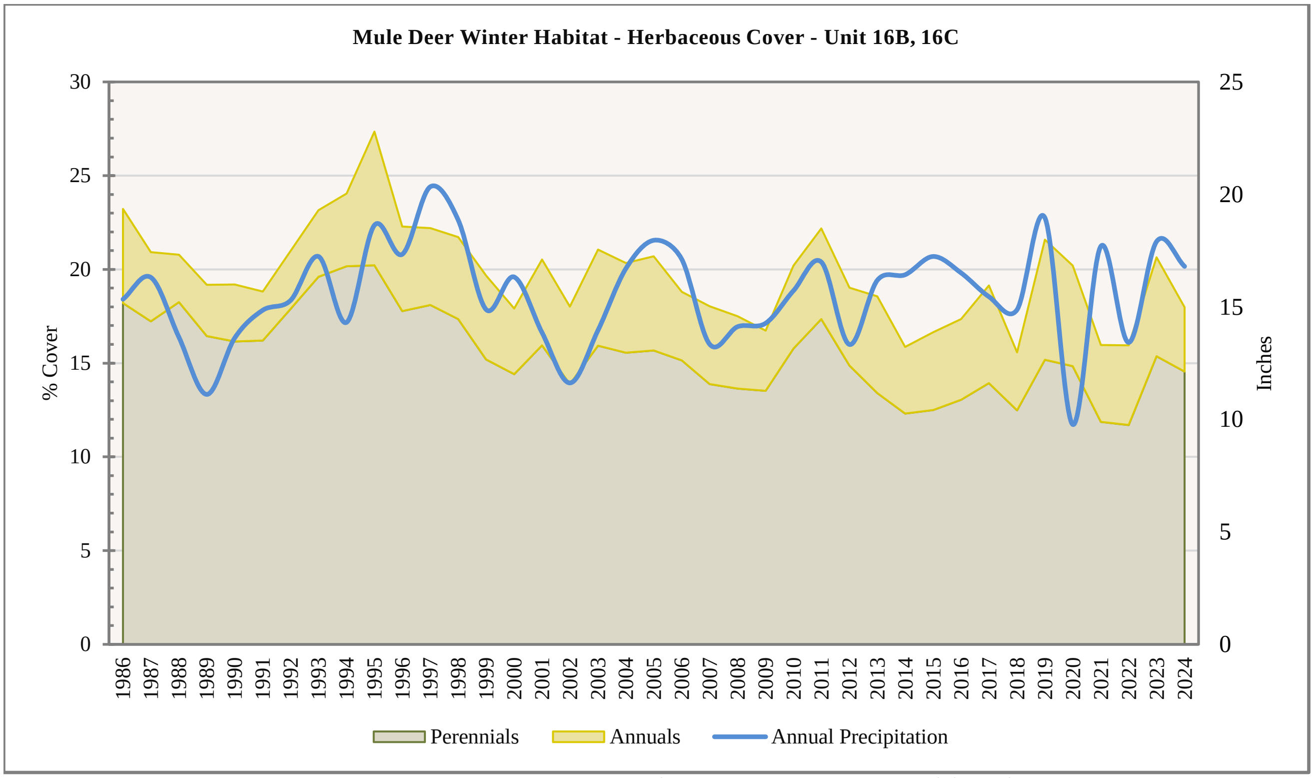


Figure 5.10: Average precipitation and estimated yearly herbaceous cover of stacked perennial and annual lifeforms for winter mule deer habitat in WMU 16B, 16C, Manti Central Mountains (Rangeland Analysis Platform, 2025).

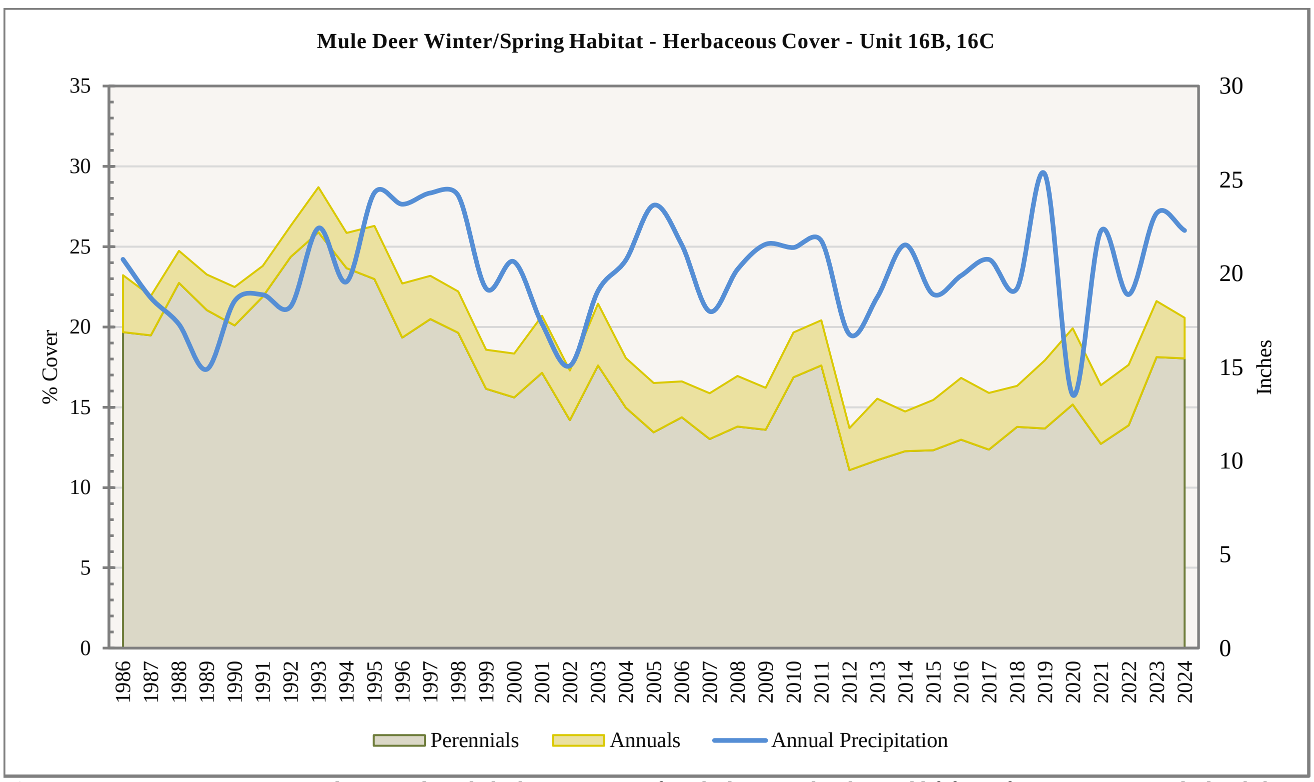


Figure 5.11: Average precipitation and estimated yearly herbaceous cover of stacked perennial and annual lifeforms for winter/spring mule deer habitat in WMU 16B, 16C, Manti Central Mountains (Rangeland Analysis Platform, 2025).

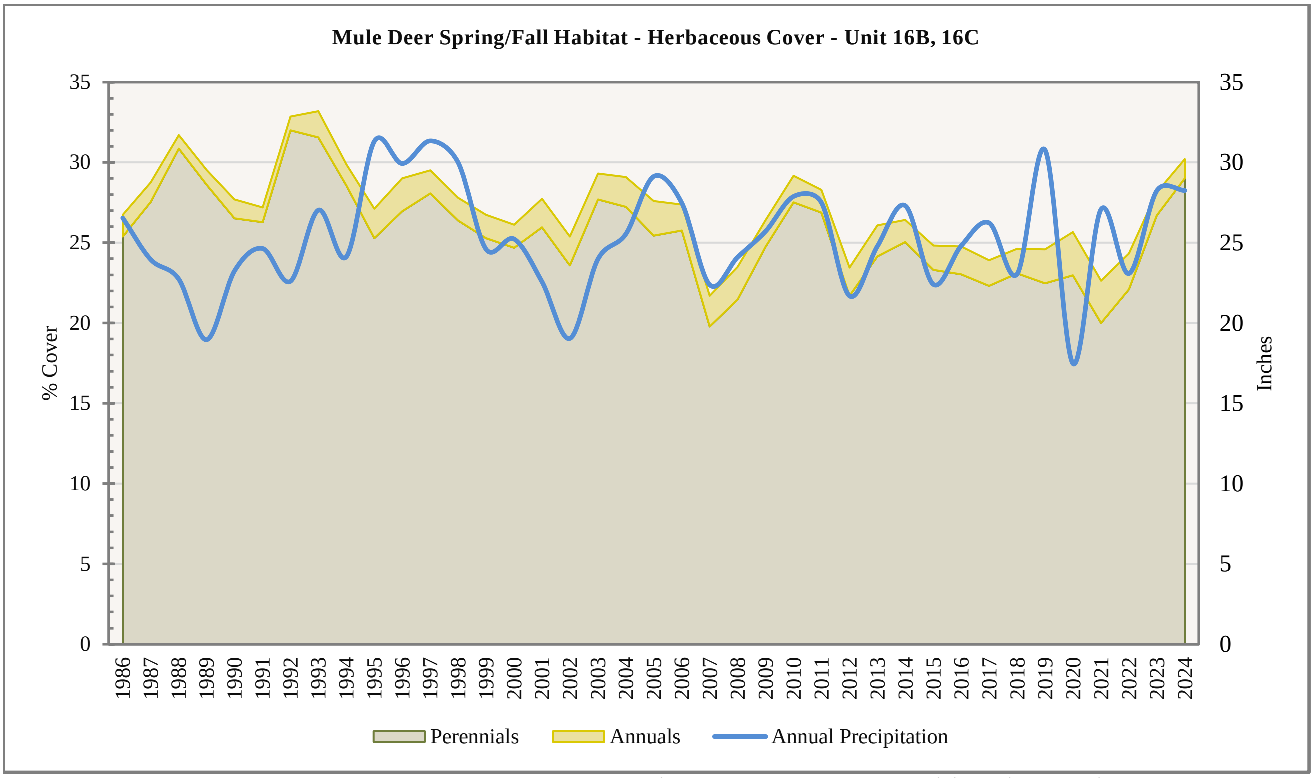


Figure 5.12: Average precipitation and estimated yearly herbaceous cover of stacked perennial and annual lifeforms for spring/fall mule deer habitat in WMU 16B, 16C, Manti Central Mountains (Rangeland Analysis Platform, 2025).

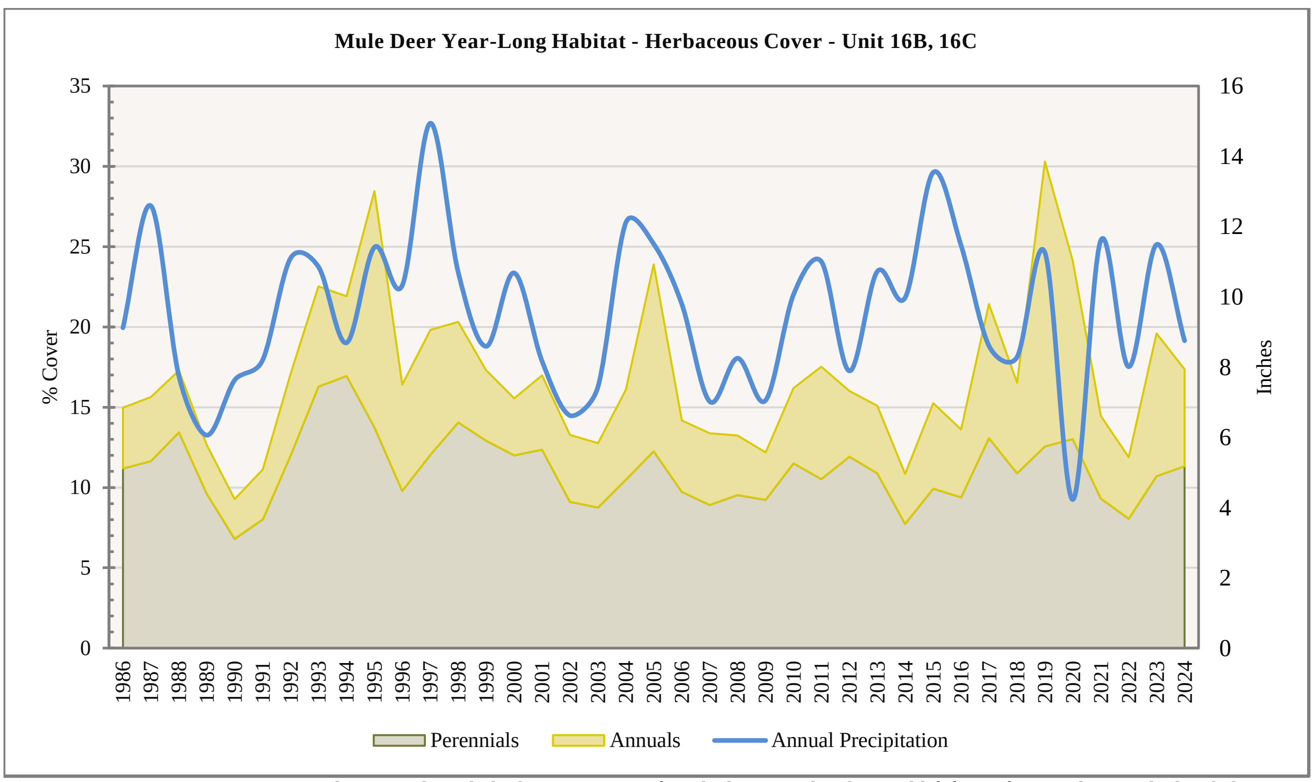


Figure 5.13: Average precipitation and estimated yearly herbaceous cover of stacked perennial and annual lifeforms for year-long mule deer habitat in WMU 16B, 16C, Manti Central Mountains (Rangeland Analysis Platform, 2025).

RAP – Shrub and Tree Cover by Deer Habitat

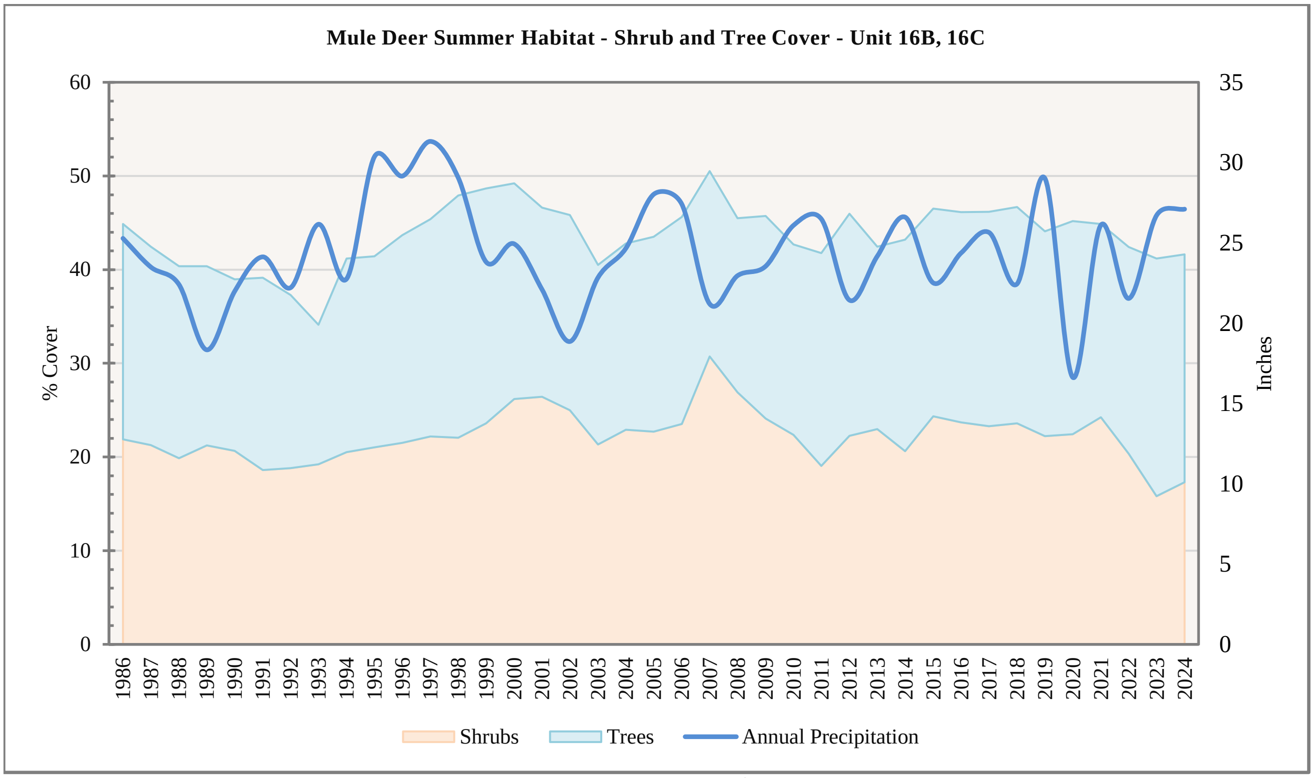


Figure 5.14: Average precipitation and estimated yearly stacked shrub and tree cover for summer mule deer habitat in WMU 16B, 16C, Manti Central Mountains (Rangeland Analysis Platform, 2025).

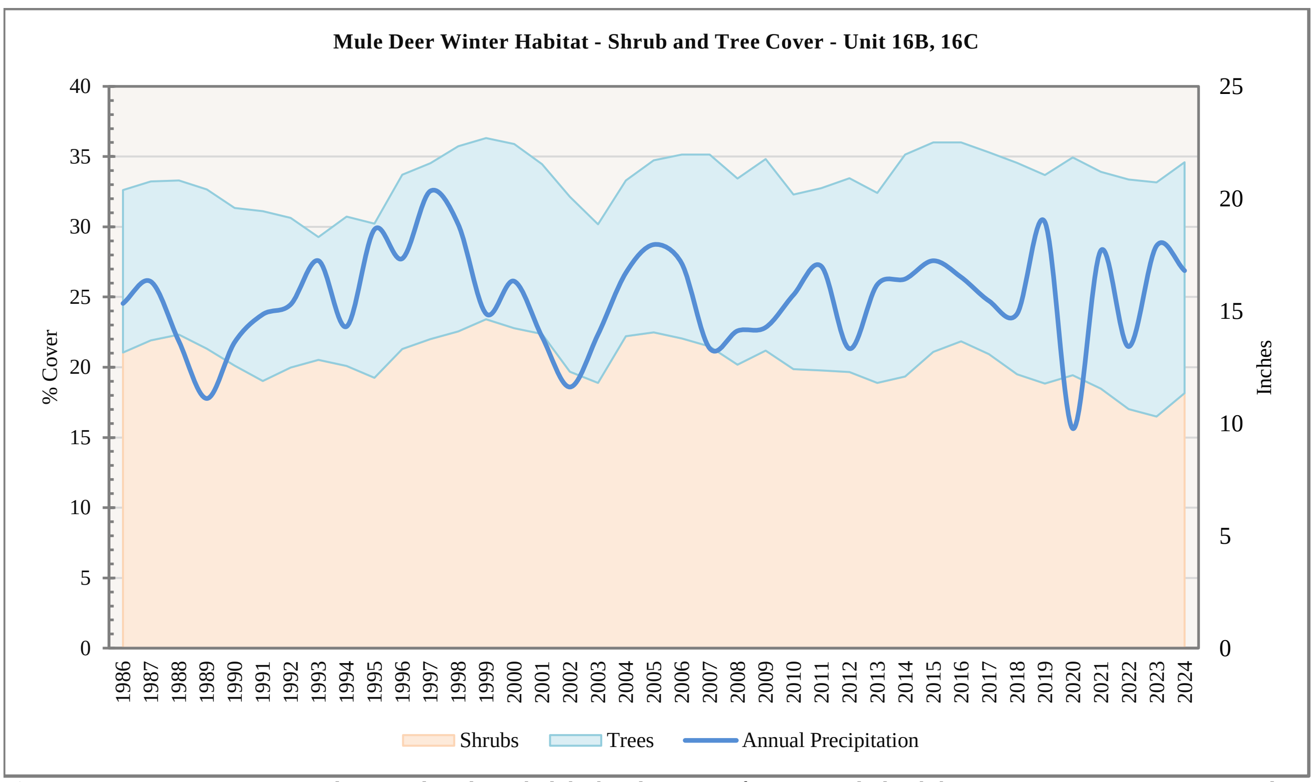


Figure 5.15: Average precipitation and estimated yearly stacked shrub and tree cover for winter mule deer habitat in WMU 16B, 16C, Manti Central Mountains (Rangeland Analysis Platform, 2025).

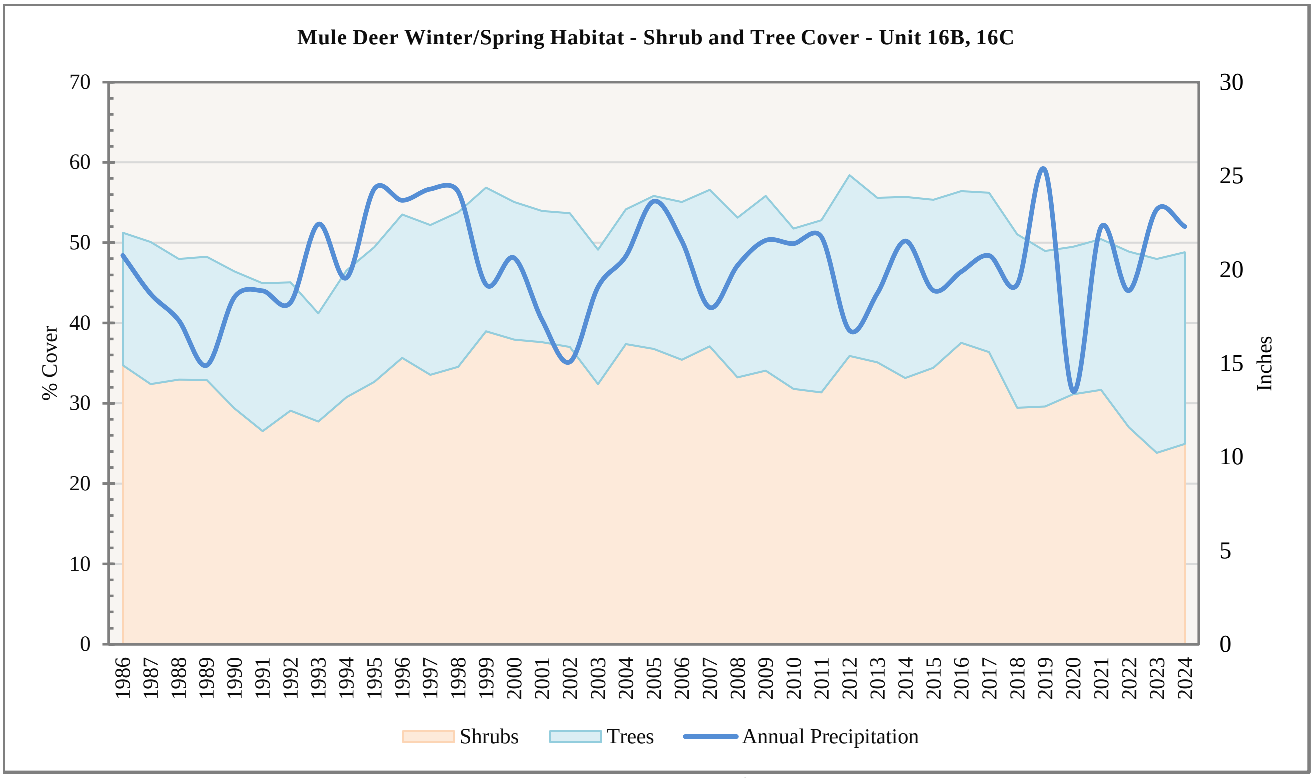


Figure 5.16: Average precipitation and estimated yearly stacked shrub and tree cover for winter/spring mule deer habitat in WMU 16B, 16C, Manti Central Mountains (Rangeland Analysis Platform, 2025).

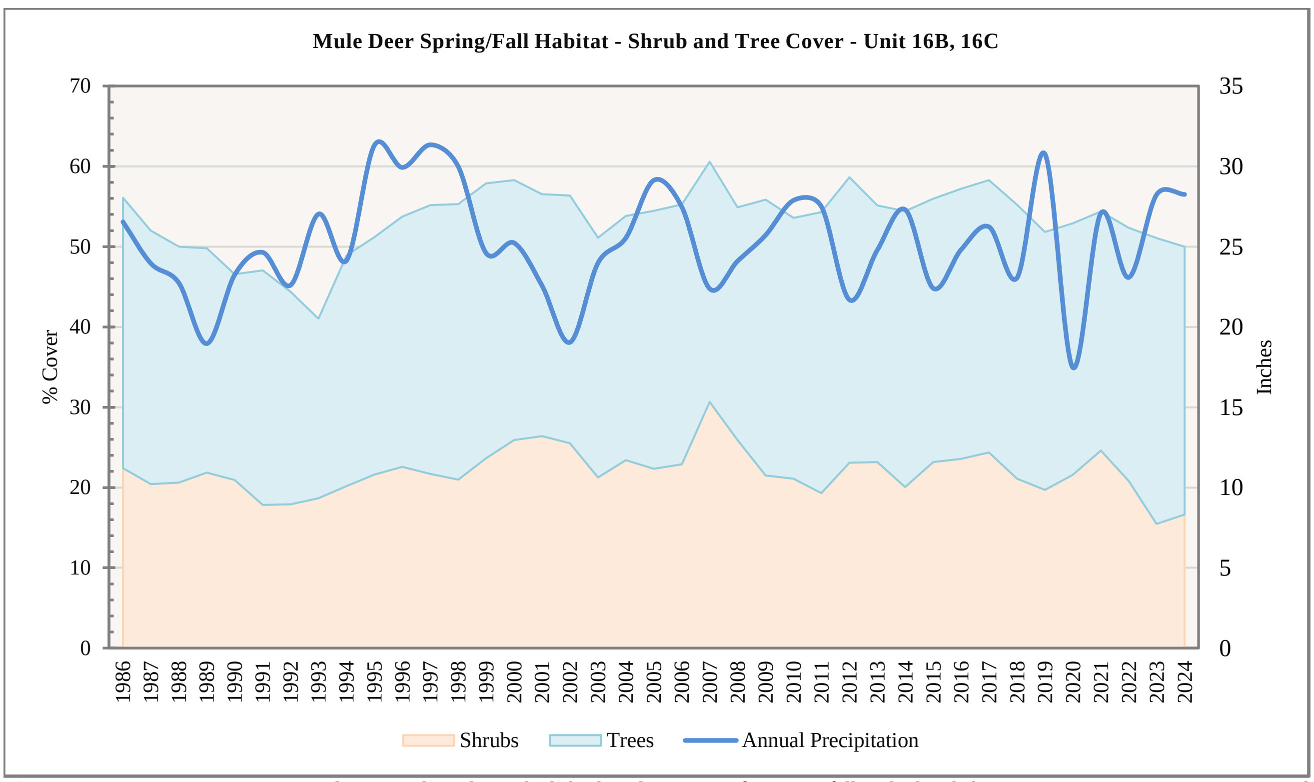


Figure 5.17: Average precipitation and estimated yearly stacked shrub and tree cover for spring/fall mule deer habitat in WMU 16B, 16C, Manti Central Mountains (Rangeland Analysis Platform, 2025).

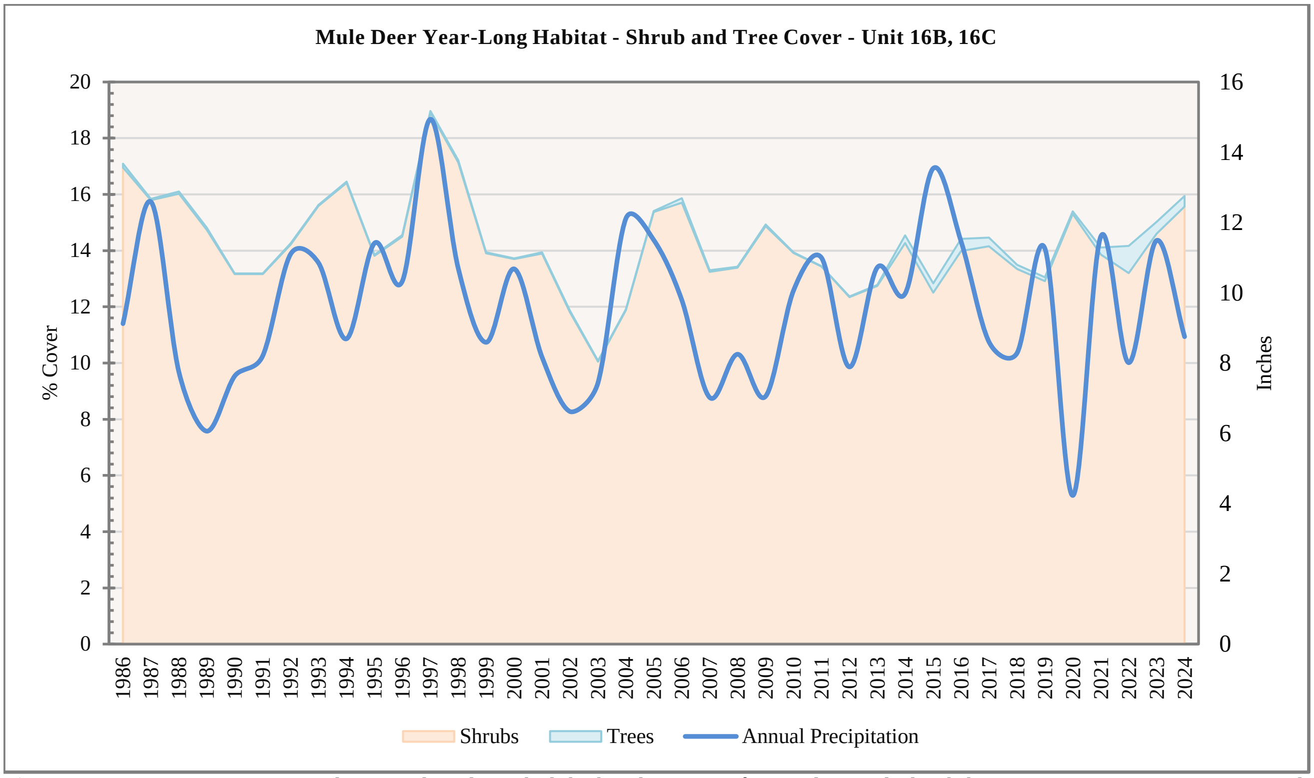
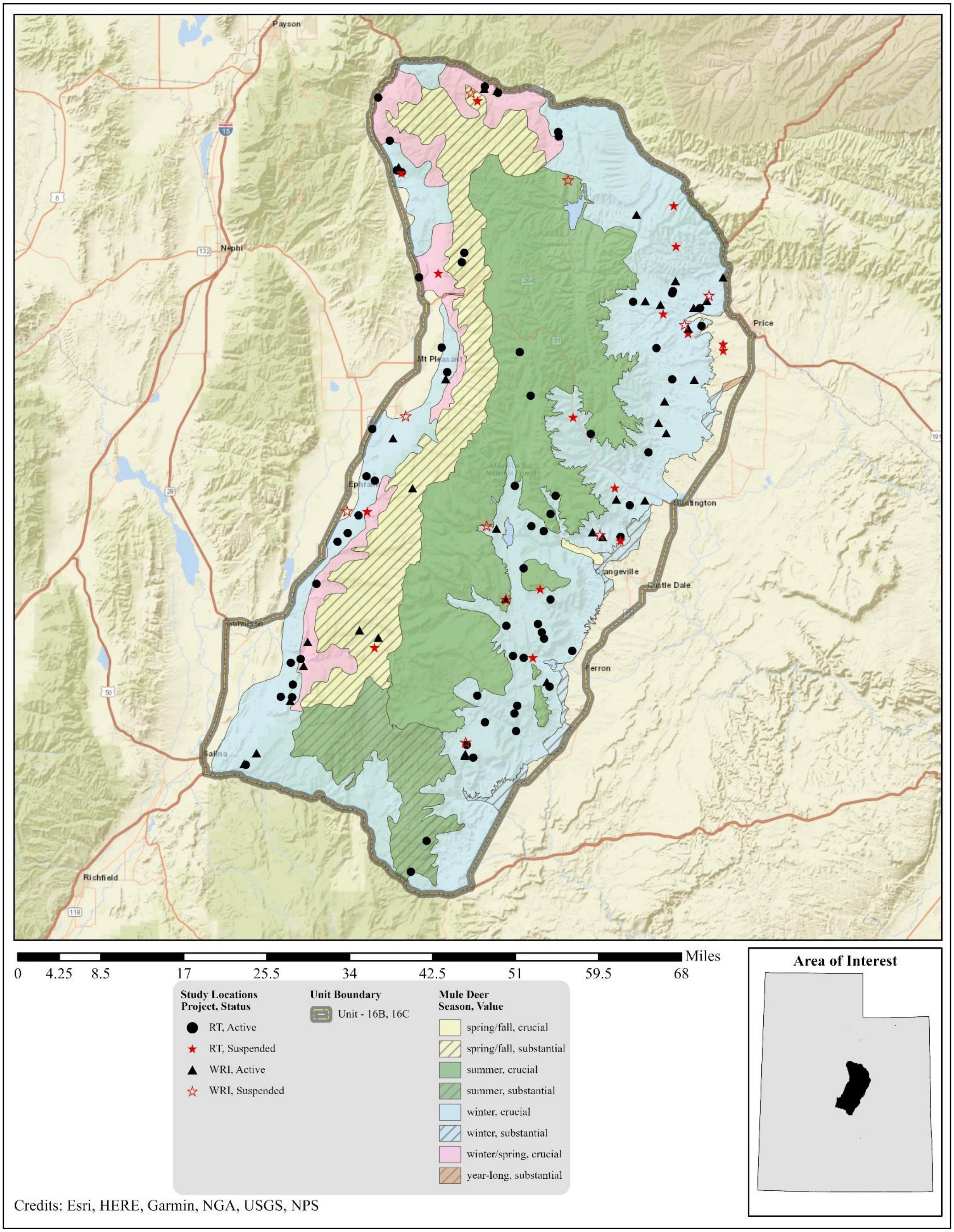
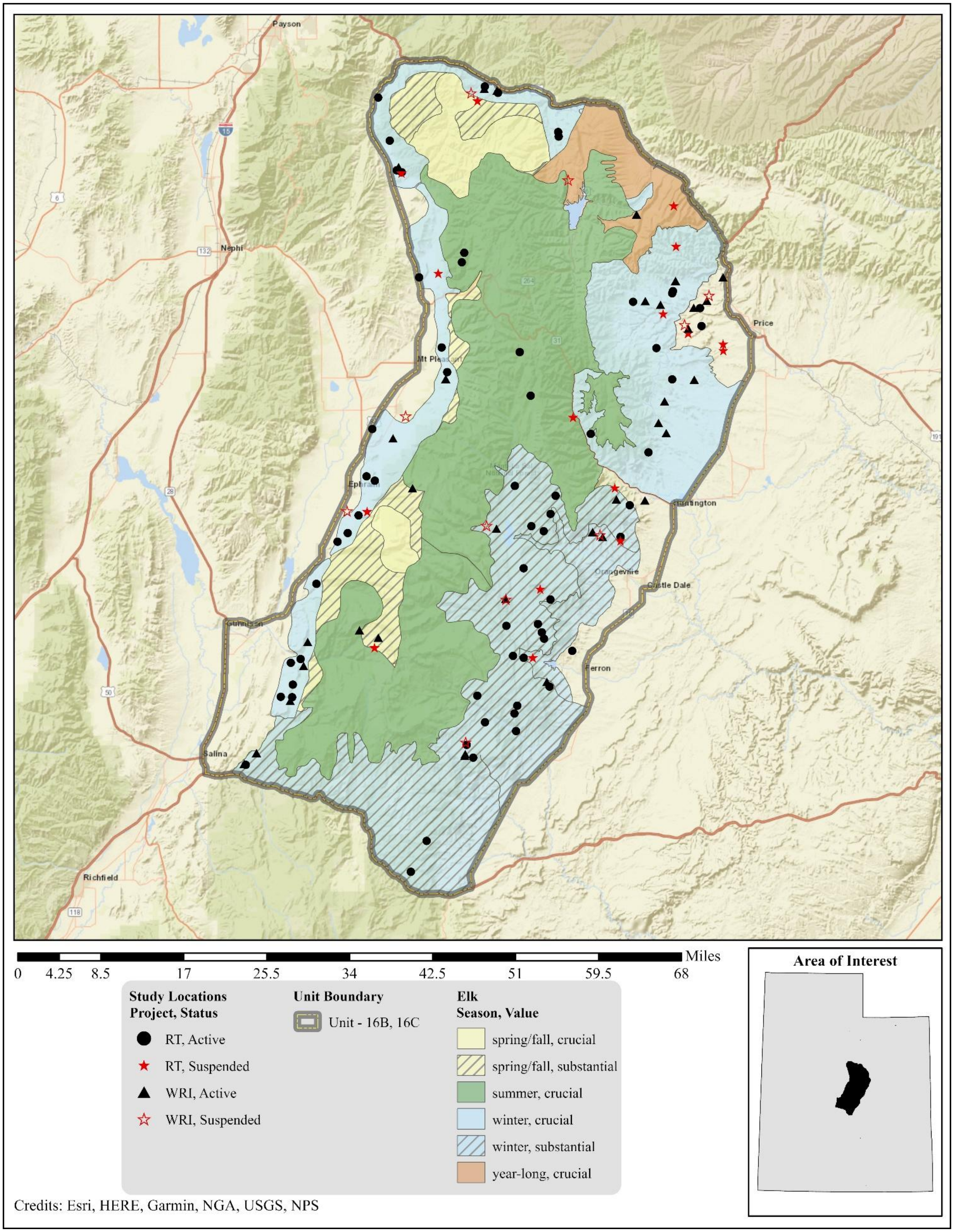


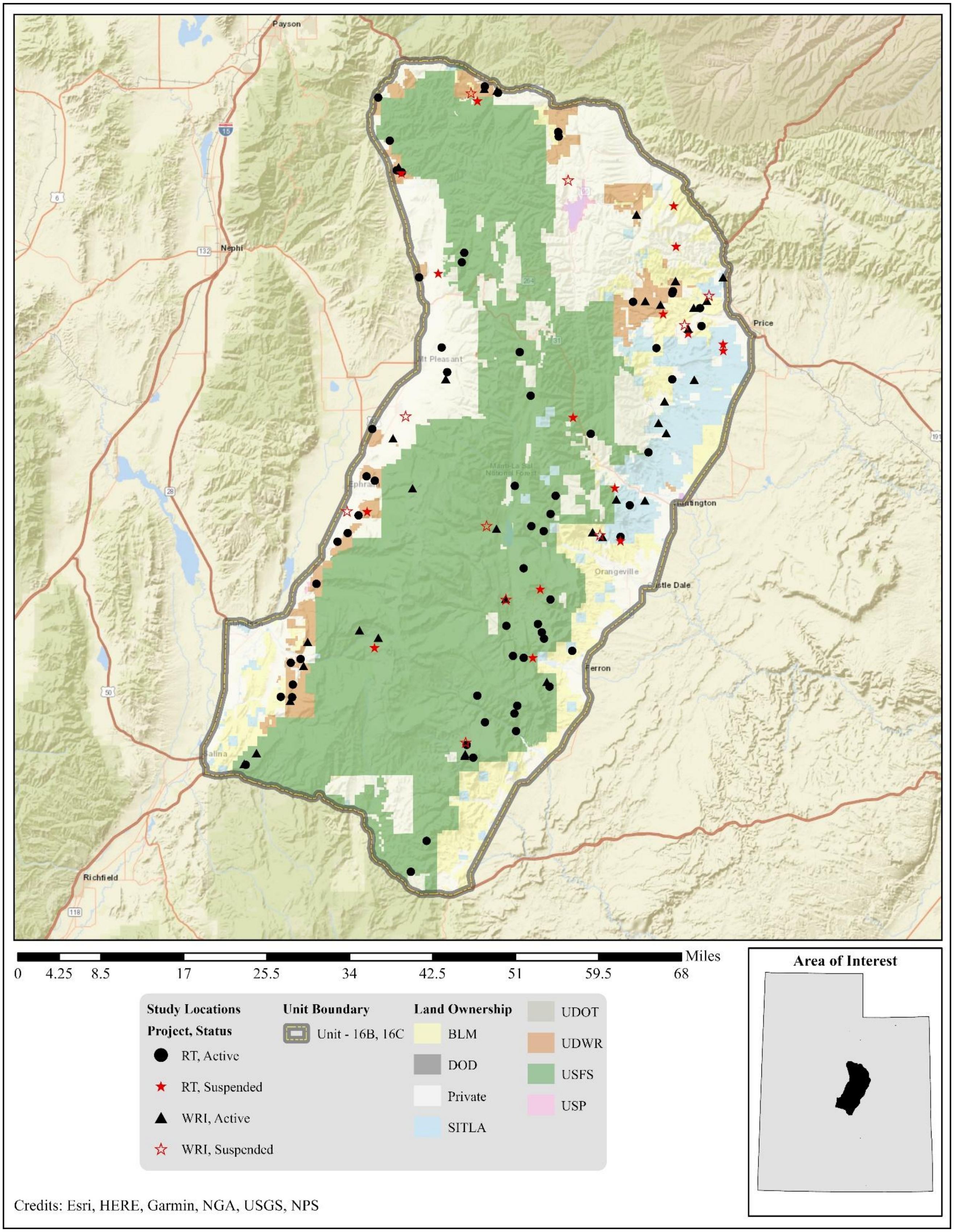
Figure 5.18: Average precipitation and estimated yearly stacked shrub and tree cover for year-long mule deer habitat in WMU 16B, 16C, Manti Central Mountains (Rangeland Analysis Platform, 2025).



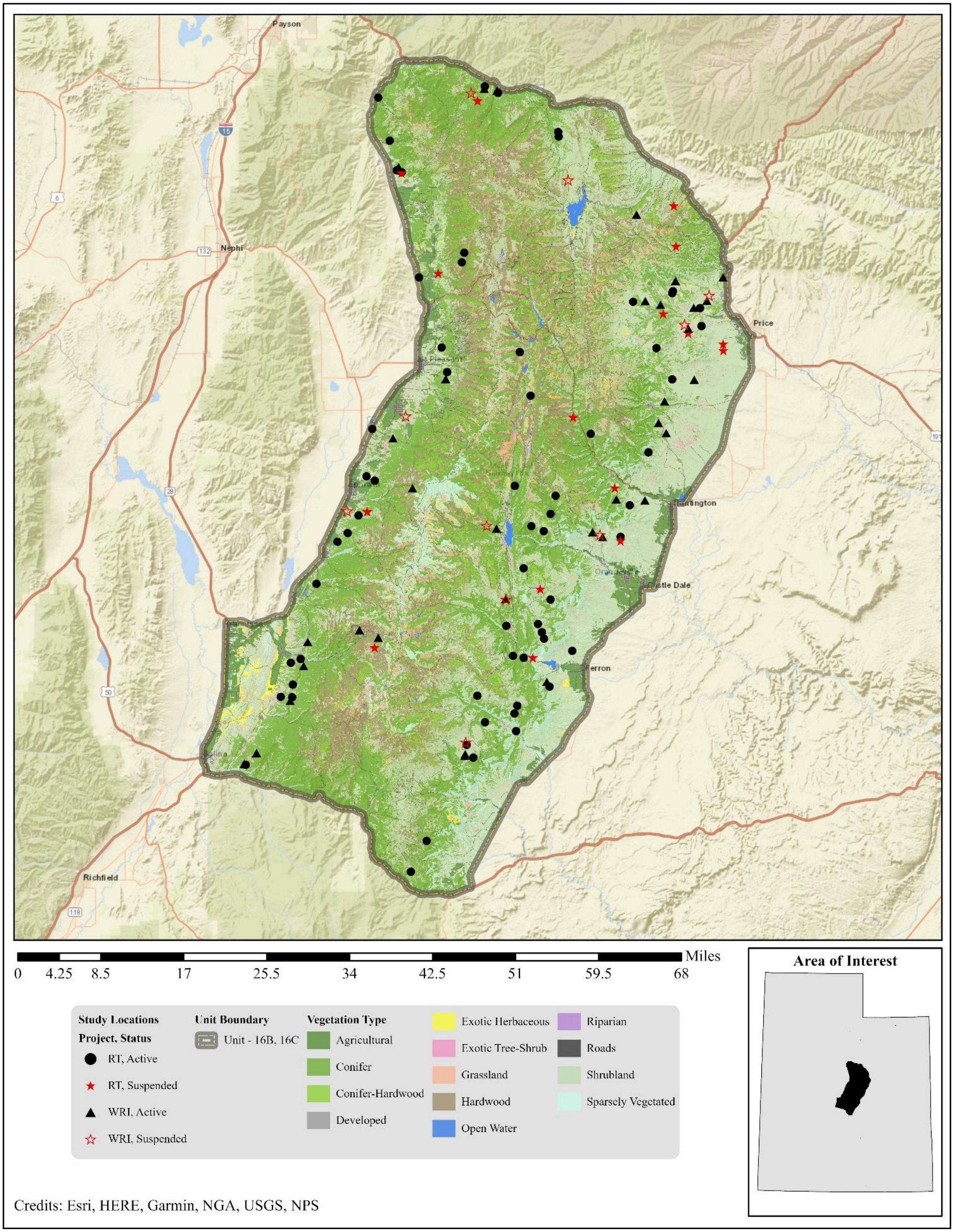
Map 5.2: Estimated mule deer habitat by season and value for WMU 16B, 16C, Manti Central Mountains.



Map 5.3: Estimated elk habitat by season and value for WMU 16B, 16C, Manti Central Mountains.



Map 5.4: Land ownership for WMU 16B, 16C, Manti Central Mountains.



Map 5.5: LANDFIRE Existing Vegetation Type map (LC23_EVT_240, 2023) for WMU 16B, 16C, Manti Central Mountains.

LANDFIRE Existing Vegetation Type for Mule Deer Habitat

The current LANDFIRE Existing Vegetation Type model shows that 27% of mule deer winter range; nearly 4% of summer range; 36.5% of winter/spring habitat; and nearly 4% of spring/fall range in Unit 16B, 16C is comprised of biophysical sites (also referred to here as vegetation types or ecological sites) that are dominated by pinyon (*Pinus* spp.) and juniper (*Juniperus* spp.) (**Table 5.1**, **Table 5.2**, **Table 5.3**, **Table 5.4**). These lower to mid-elevation sites can be associated with understory browse species known to be beneficial to mule deer, although abundance may vary. Encroachment of pinyon and juniper into sagebrush shrublands has been observed. As such, it is possible that some historical sagebrush types within this unit have been identified as pinyon-juniper woodland types due to their departure from the reference vegetation conditions. When pinyon and juniper encroach on existing shrublands, they can lead to decreased sagebrush and herbaceous components (Miller, Svejcar, & Rose, 2000), therefore decreasing available forage for wildlife.

Sagebrush (*Artemisia* spp.) ecological sites comprise 27% of the unit's mule deer winter habitat; almost 9% of winter/spring range; nearly 10% of spring/fall habitat; and 7% of year-long range (**Table 5.2**, **Table 5.3**, **Table 5.4**, **Table 5.5**). These sites are found at elevations ranging from low (semidesert) to high (mountain), and pinyon-juniper can be present at lower elevations. Other preferred browse species may be present: these may include (but are not limited to) saltbush (*Atriplex* spp.) and spiny hopsage (*Grayia spinosa*) at lower elevations; and antelope bitterbrush (*Purshia tridentata*), mountain snowberry (*Symphoricarpos oreophilus*), and serviceberry (*Amelanchier* spp.) at higher elevations. These shrub species could be beneficial as browse for mule deer during the winter, spring, and fall seasons.

The model also indicates that nearly 31% of mule deer summer range and 38% of spring/fall habitat is comprised of aspen (*Populus tremuloides*) vegetation types that are located at middle to higher elevations. Although aspen dominates these biophysical sites, preferred browse species such as chokecherry (*Prunus virginiana*), serviceberry, and mountain snowberry (among others) are commonly found. In addition, sites of these types typically have abundant understories that could provide valuable forage for deer during the summer and transitional months. Approximately 20.5% of the summer habitat and nearly 10% of winter/spring range is also made up of sagebrush biophysical sites (**Table 5.1**, **Table 5.4**). Sagebrush is usually the dominant vegetation component on sites of these types. However, the Inter-Mountain Basins Montane Sagebrush Steppe biophysical site in particular can be host to abundant and diverse grasses and forbs that are important components for summering mule deer.

A number of other vegetation types comprise the rest of the mule deer habitat within the Manti Central Mountains management unit (**Map 5.5**, **Table 5.1**, **Table 5.2**, **Table 5.3**, **Table 5.4**, **Table 5.5**), but will not be discussed here. Descriptions for these additional vegetation types are available on the LANDFIRE BpS Models and Descriptions Support webpage (The Nature Conservancy LANDFIRE Team, 2015).

Group	Existing Vegetation Type for Summer Mule Deer Habitat	Acres	% of Total	Group % of Total
Conifer	Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland	46,841	9.10%	
	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	42,958	8.35%	
	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	20,635	4.01%	
	Colorado Plateau Pinyon-Juniper Woodland	19,783	3.84%	
	Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland	13,101	2.55%	
	Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland	11,484	2.23%	
	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	9,492	1.84%	
	Southern Rocky Mountain Ponderosa Pine Woodland	4,502	0.87%	
	Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland	2,406	0.47%	
	Rocky Mountain Foothill Limber Pine-Juniper Woodland	3	0.00%	33.26%

Group	Existing Vegetation Type for Summer Mule Deer Habitat	Acres	% of Total	Group % of Total
Shrubland	Inter-Mountain Basins Montane Sagebrush Steppe	105,022	20.40%	
	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	17,951	3.49%	
	Inter-Mountain Basins Semi-Desert Shrub-Steppe	6,290	1.22%	
	Rocky Mountain Lower Montane-Foothill Shrubland	4,413	0.86%	
	Rocky Mountain Alpine Dwarf-Shrubland	3,399	0.66%	
	Colorado Plateau Mixed Low Sagebrush Shrubland	412	0.08%	
	Inter-Mountain Basins Mixed Salt Desert Scrub	356	0.07%	
	Inter-Mountain Basins Big Sagebrush Shrubland	208	0.04%	
	Inter-Mountain Basins Mat Saltbush Shrubland	2	0.00%	26.82%
Hardwood	Rocky Mountain Aspen Forest and Woodland	112,390	21.83%	
	Rocky Mountain Bigtooth Maple Ravine Woodland	2,236	0.43%	22.27%
Other	Sparsely Vegetated	30,021	5.83%	
	Developed	12,369	2.40%	
	Riparian	5,383	1.05%	
	Open Water	1,495	0.29%	
	Agricultural	111	0.02%	
	Quarries-Strip Mines-Gravel Pits-Well and Wind Pads	1	0.00%	9.59%
Grassland	Rocky Mountain Subalpine-Montane Mesic Meadow	17,196	3.34%	
	Southern Rocky Mountain Montane-Subalpine Grassland	14,413	2.80%	
	Inter-Mountain Basins Semi-Desert Grassland	2,508	0.49%	
	Rocky Mountain Alpine Turf	319	0.06%	
	Rocky Mountain Alpine Fell-Field	201	0.04%	6.73%
Exotic Herbaceous	Interior Western North American Temperate Ruderal Grassland	3,382	0.66%	
	Great Basin & Intermountain Introduced Perennial Grassland and Forbland	1,821	0.35%	
	Great Basin & Intermountain Introduced Annual Grassland	869	0.17%	
	Great Basin & Intermountain Introduced Annual and Biennial Forbland	20	0.00%	1.18%
Exotic Tree-Shrub	Interior Western North American Temperate Ruderal Shrubland	588	0.11%	
	Great Basin & Intermountain Ruderal Shrubland	183	0.04%	0.15%
Total		**514,762**	**100%**	**100%**

Table 5.1: LANDFIRE Existing Vegetation Type (LC23_EVT_240, 2023) acreage of summer mule deer habitat for WMU 16B, 16C, Manti Central Mountains.

Group	Existing Vegetation Type for Winter Mule Deer Habitat	Acres	% of Total	Group % of Total
Shrubland	Inter-Mountain Basins Montane Sagebrush Steppe	91,289	13.81%	
	Inter-Mountain Basins Big Sagebrush Shrubland	52,760	7.98%	
	Inter-Mountain Basins Mixed Salt Desert Scrub	37,447	5.67%	
	Inter-Mountain Basins Semi-Desert Shrub-Steppe	30,511	4.62%	
	Colorado Plateau Mixed Low Sagebrush Shrubland	26,714	4.04%	
	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	26,159	3.96%	
	Rocky Mountain Lower Montane-Foothill Shrubland	11,757	1.78%	
	Inter-Mountain Basins Mat Saltbush Shrubland	11,219	1.70%	
	Great Basin Xeric Mixed Sagebrush Shrubland	7,979	1.21%	
	Colorado Plateau Pinyon-Juniper Shrubland	1,936	0.29%	
	Inter-Mountain Basins Greasewood Flat	1,306	0.20%	
	Great Basin Semi-Desert Chaparral	65	0.01%	
	Inter-Mountain Basins Big Sagebrush Steppe	22	0.00%	
	Southern Colorado Plateau Sand Shrubland	<1	0.00%	45.26%
Conifer	Colorado Plateau Pinyon-Juniper Woodland	176,644	26.73%	
	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	18,710	2.83%	
	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	9,478	1.43%	
	Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland	8,078	1.22%	
	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	5,557	0.84%	
	Southern Rocky Mountain Ponderosa Pine Woodland	5,243	0.79%	
	Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland	2,119	0.32%	
	Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland	1,598	0.24%	
	Great Basin Pinyon-Juniper Woodland	1,482	0.22%	
	Rocky Mountain Foothill Limber Pine-Juniper Woodland	1,456	0.22%	
	Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland	42	0.01%	34.86%
Other	Sparsely Vegetated	52,737	7.98%	
	Developed	15,904	2.41%	
	Agricultural	13,156	1.99%	
	Riparian	2,374	0.36%	
	Quarries-Strip Mines-Gravel Pits-Well and Wind Pads	784	0.12%	
	Open Water	316	0.05%	12.90%

Group	Existing Vegetation Type for Winter Mule Deer Habitat	Acres	% of Total	Group % of Total
Hardwood	Rocky Mountain Aspen Forest and Woodland	17,025	2.58%	
	Rocky Mountain Bigtooth Maple Ravine Woodland	2,112	0.32%	2.90%
Exotic Tree-Shrub	Great Basin & Intermountain Ruderal Shrubland	11,481	1.74%	
	Interior Western North American Temperate Ruderal Shrubland	1,533	0.23%	1.97%
Grassland	Inter-Mountain Basins Semi-Desert Grassland	3,083	0.47%	
	Rocky Mountain Subalpine-Montane Mesic Meadow	2,068	0.31%	
	Southern Rocky Mountain Montane-Subalpine Grassland	1,837	0.28%	1.06%
Exotic Herbaceous	Great Basin & Intermountain Introduced Perennial Grassland and Forbland	2,662	0.40%	
	Interior Western North American Temperate Ruderal Grassland	1,589	0.24%	
	Great Basin & Intermountain Introduced Annual Grassland	1,399	0.21%	
	Great Basin & Intermountain Introduced Annual and Biennial Forbland	1,304	0.20%	1.05%
Total		**660,935**	**100%**	**100%**

Table 5.2: LANDFIRE Existing Vegetation Type (LC23_EVT_240, 2023) acreage of winter mule deer habitat for WMU 16B, 16C, Manti Central Mountains.

Group	Existing Vegetation Type for Winter/Spring Mule Deer Habitat	Acres	% of Total	Group % of Total
Conifer	Colorado Plateau Pinyon-Juniper Woodland	36,909	36.54%	
	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	4,219	4.18%	
	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	2,151	2.13%	
	Rocky Mountain Foothill Limber Pine-Juniper Woodland	1,904	1.88%	
	Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland	1,293	1.28%	
	Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland	916	0.91%	
	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	752	0.74%	
	Southern Rocky Mountain Ponderosa Pine Woodland	236	0.23%	
	Great Basin Pinyon-Juniper Woodland	27	0.03%	
	Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland	24	0.02%	
	Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland	6	0.01%	47.95%
Shrubland	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	21,843	21.62%	
	Inter-Mountain Basins Montane Sagebrush Steppe	5,721	5.66%	
	Inter-Mountain Basins Big Sagebrush Shrubland	2,592	2.57%	
	Inter-Mountain Basins Semi-Desert Shrub-Steppe	2,293	2.27%	
	Inter-Mountain Basins Mixed Salt Desert Scrub	484	0.48%	
	Great Basin Xeric Mixed Sagebrush Shrubland	318	0.31%	
	Rocky Mountain Lower Montane-Foothill Shrubland	209	0.21%	
	Colorado Plateau Mixed Low Sagebrush Shrubland	136	0.13%	33.26%
Hardwood	Rocky Mountain Bigtooth Maple Ravine Woodland	4,304	4.26%	
	Rocky Mountain Aspen Forest and Woodland	3,630	3.59%	7.85%
Other	Agricultural	2,968	2.94%	
	Developed	2,645	2.62%	
	Sparsely Vegetated	1,359	1.35%	
	Riparian	683	0.68%	
	Open Water	24	0.02%	7.60%
Exotic Tree-Shrub	Great Basin & Intermountain Ruderal Shrubland	852	0.84%	
	Interior Western North American Temperate Ruderal Shrubland	779	0.77%	1.61%
Exotic Herbaceous	Interior Western North American Temperate Ruderal Grassland	690	0.68%	
	Great Basin & Intermountain Introduced Perennial Grassland and Forbland	303	0.30%	
	Great Basin & Intermountain Introduced Annual Grassland	106	0.11%	
	Great Basin & Intermountain Introduced Annual and Biennial Forbland	33	0.03%	1.12%
Grassland	Rocky Mountain Subalpine-Montane Mesic Meadow	453	0.45%	
	Southern Rocky Mountain Montane-Subalpine Grassland	163	0.16%	0.61%
Total		**101,023**	**100%**	**100%**

Table 5.3: LANDFIRE Existing Vegetation Type (LC23_EVT_240, 2023) acreage of winter/spring mule deer habitat for WMU 16B, 16C, Manti Central Mountains.

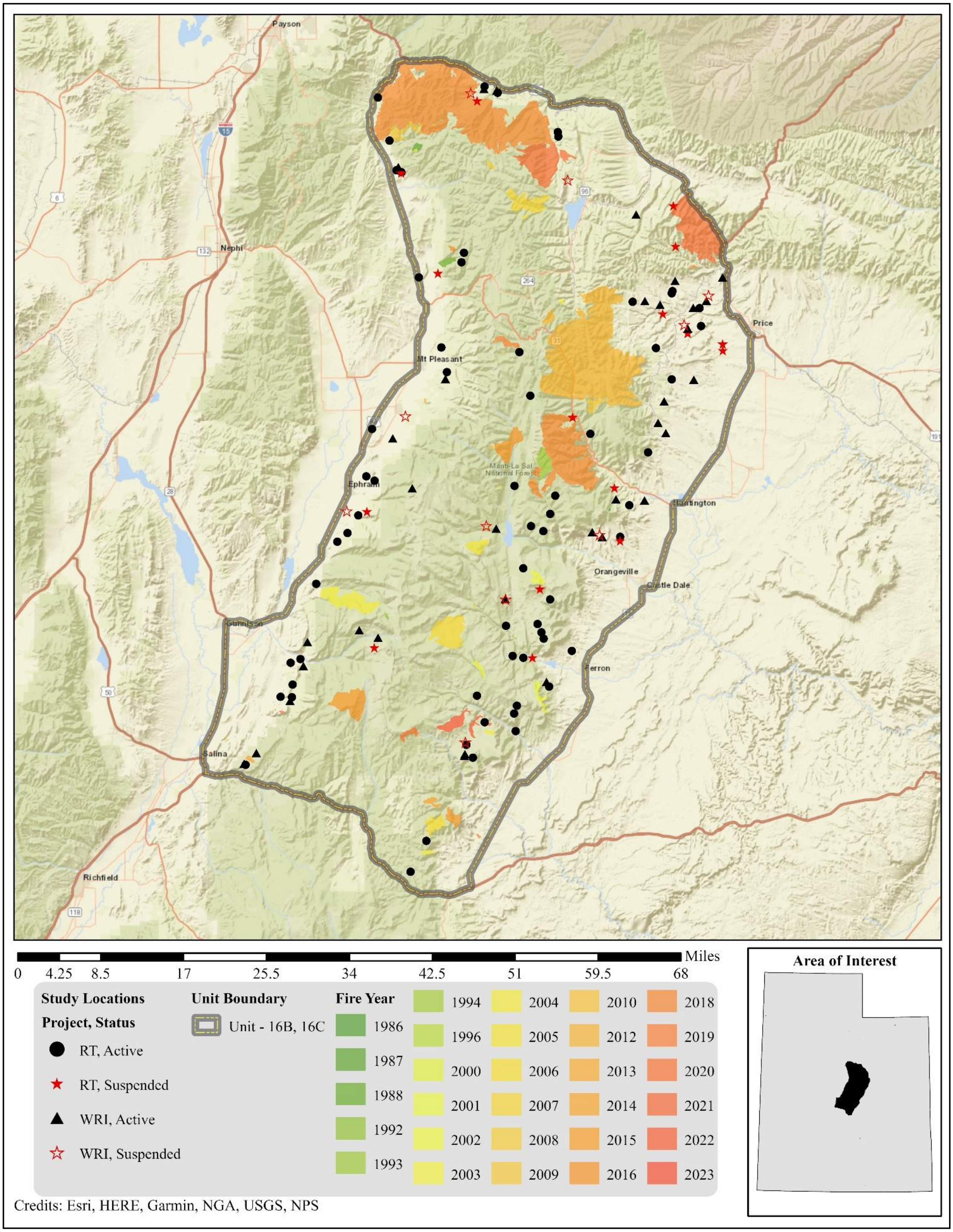
Group	Existing Vegetation Type for Spring/Fall Mule Deer Habitat	Acres	% of Total	Group % of Total
Conifer	Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland	24,282	11.31%	
	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	15,575	7.25%	
	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	13,010	6.06%	
	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	10,606	4.94%	
	Colorado Plateau Pinyon-Juniper Woodland	7,876	3.67%	
	Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland	4,676	2.18%	
	Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland	3,315	1.54%	
	Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland	1,831	0.85%	
	Southern Rocky Mountain Ponderosa Pine Woodland	834	0.39%	
	Rocky Mountain Foothill Limber Pine-Juniper Woodland	338	0.16%	38.34%
Hardwood	Rocky Mountain Aspen Forest and Woodland	57,618	26.83%	
	Rocky Mountain Bigtooth Maple Ravine Woodland	3,978	1.85%	28.68%
Shrubland	Inter-Mountain Basins Montane Sagebrush Steppe	20,452	9.52%	
	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	17,040	7.93%	
	Rocky Mountain Lower Montane-Foothill Shrubland	2,578	1.20%	
	Rocky Mountain Alpine Dwarf-Shrubland	1,067	0.50%	
	Inter-Mountain Basins Semi-Desert Shrub-Steppe	806	0.38%	
	Colorado Plateau Mixed Low Sagebrush Shrubland	439	0.20%	
	Inter-Mountain Basins Big Sagebrush Shrubland	372	0.17%	
	Inter-Mountain Basins Mixed Salt Desert Scrub	333	0.16%	
	Inter-Mountain Basins Mat Saltbush Shrubland	91	0.04%	
	Colorado Plateau Pinyon-Juniper Shrubland	58	0.03%	
	Inter-Mountain Basins Greasewood Flat	7	0.00%	
	Great Basin Xeric Mixed Sagebrush Shrubland	1	0.00%	20.13%
Other	Sparsely Vegetated	9,551	4.45%	
	Developed	4,306	2.00%	
	Riparian	1,189	0.55%	
	Agricultural	368	0.17%	
	Open Water	115	0.05%	7.23%
Grassland	Rocky Mountain Subalpine-Montane Mesic Meadow	5,628	2.62%	
	Southern Rocky Mountain Montane-Subalpine Grassland	3,232	1.50%	
	Rocky Mountain Alpine Fell-Field	67	0.03%	
	Rocky Mountain Alpine Turf	66	0.03%	
	Inter-Mountain Basins Semi-Desert Grassland	2	0.00%	4.19%
Exotic Herbaceous	Interior Western North American Temperate Ruderal Grassland	1,001	0.47%	
	Great Basin & Intermountain Introduced Perennial Grassland and Forbland	894	0.42%	
	Great Basin & Intermountain Introduced Annual Grassland	681	0.32%	
	Great Basin & Intermountain Introduced Annual and Biennial Forbland	6	0.00%	1.20%
Exotic Tree-Shrub	Interior Western North American Temperate Ruderal Shrubland	339	0.16%	
	Great Basin & Intermountain Ruderal Shrubland	158	0.07%	0.23%
Total		**214,784**	**100%**	**100%**

Table 5.4: LANDFIRE Existing Vegetation Type (LC23_EVT_240, 2023) acreage of spring/fall mule deer habitat for WMU 16B, 16C, Manti Central Mountains.

Group	Existing Vegetation Type for Year-Long Mule Deer Habitat	Acres	% of Total	Group % of Total
Shrubland	Inter-Mountain Basins Mat Saltbush Shrubland	487	43.55%	
	Inter-Mountain Basins Greasewood Flat	268	24.00%	
	Inter-Mountain Basins Mixed Salt Desert Scrub	209	18.68%	
	Colorado Plateau Mixed Low Sagebrush Shrubland	48	4.28%	
	Inter-Mountain Basins Big Sagebrush Shrubland	33	2.94%	
	Inter-Mountain Basins Semi-Desert Shrub-Steppe	7	0.66%	
	Colorado Plateau Pinyon-Juniper Shrubland	4	0.40%	
	Rocky Mountain Lower Montane-Foothill Shrubland	<1	0.04%	94.55%
Other	Developed	27	2.45%	
	Agricultural	11	0.96%	
	Riparian	2	0.22%	
	Sparsely Vegetated	2	0.16%	
	Open Water	<1	0.02%	3.80%

Group	Existing Vegetation Type for Year-Long Mule Deer Habitat	Acres	% of Total	Group % of Total
Exotic Tree-Shrub	Great Basin & Intermountain Ruderal Shrubland	18	1.57%	1.57%
Grassland	Inter-Mountain Basins Semi-Desert Grassland	<1	0.04%	0.04%
Exotic Herbaceous	Great Basin & Intermountain Introduced Annual Grassland	<1	0.02%	0.02%
Conifer	Colorado Plateau Pinyon-Juniper Woodland	<1	0.02%	0.02%
Total		**1,118**	**100%**	**100%**

Table 5.5: LANDFIRE Existing Vegetation Type (LC23_EVT_240, 2023) acreage of year-long mule deer habitat for WMU 16B, 16C, Manti Central Mountains.



Map 5.6: Land coverage of fires by year from 1986-2023 for WMU 16B, 16C, Manti Central Mountains (NIFC Open Data Site: Federal Interagency Wildland Fire Maps and Data for All, 2025).

Treatments/Restoration Work

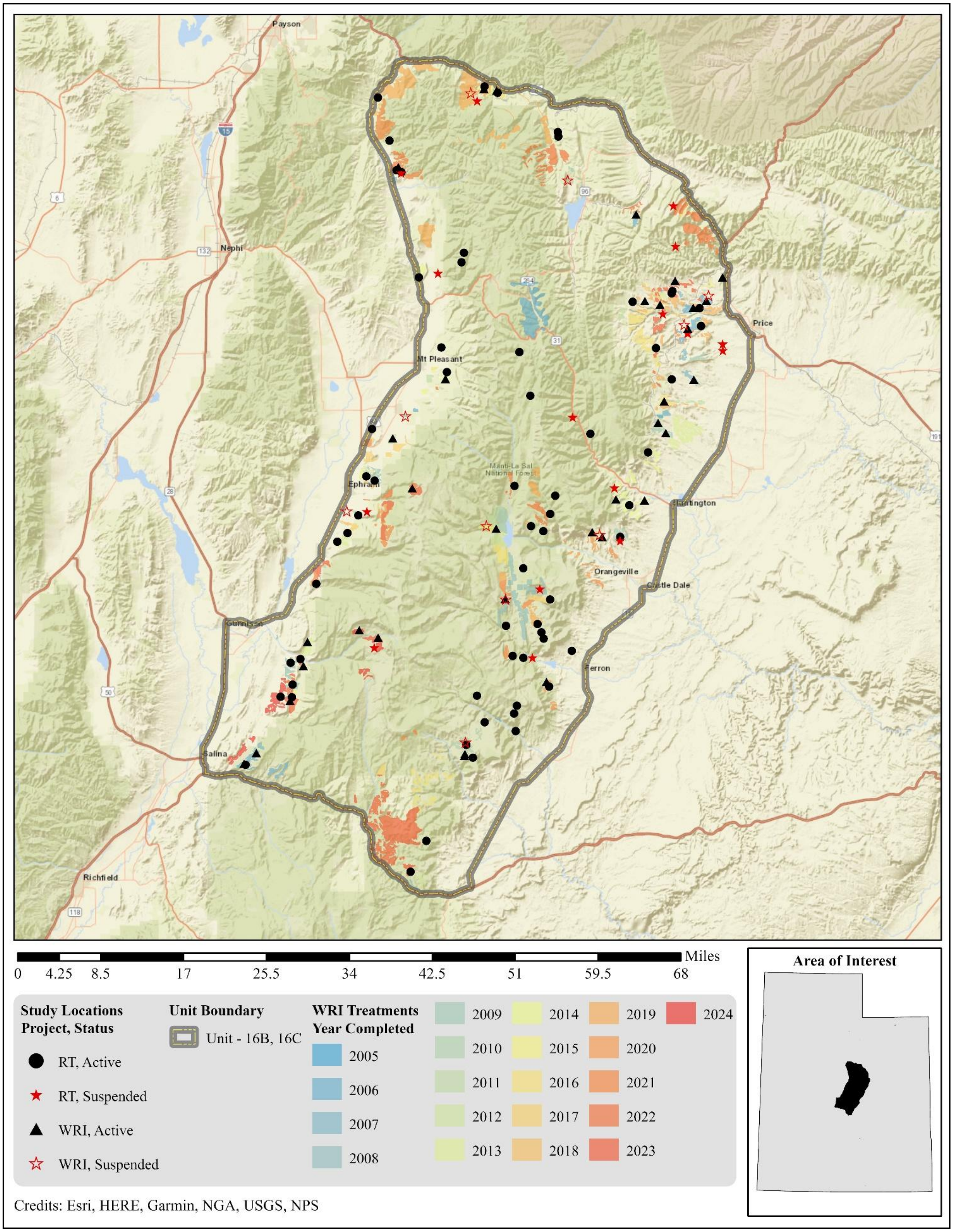
There has been an active effort to address many of the limitations on this unit through the Watershed Restoration Initiative (WRI). A total of 103,220 acres of land have been treated within the Manti Central Mountains unit since the WRI was implemented in 2004 (**Map 5.7**). Treatments frequently overlap one another, bringing the net total of completed treatment acres to 94,633 for this unit (**Table 5.6**). Other treatments have occurred outside of the WRI through independent agencies and landowners, but the WRI comprises most of the work done on deer winter ranges throughout the state of Utah.

Vegetation removal by hand crew (through methods such as lop and scatter) to remove pinyon (*Pinus* spp.) and juniper (*Juniperus* spp.) is the most common management practice by acreage in this unit, with bullhog treatments also being frequently used to remove trees. Seeding plants to augment the herbaceous understory is also common and often occurs with other treatment types. Other management practices include (but are not limited to) herbicide application to control undesirable vegetation, prescribed fire, and anchor chaining (**Table 5.6**).

Type	Total Completed Acreage
Vegetation Removal/Hand Crew	**26,741**
Lop & Scatter	19,801
Lop (No Scatter)	3,959
Lop-Pile-Burn	2,959
Lop & Chip	21
Bullhog	**22,432**
Skid Steer	15,074
Full Size	7,359
Seeding (Primary)	**20,854**
Broadcast (Aerial-Fixed Wing)	13,053
Broadcast (Aerial-Helicopter)	7,318
Ground (Mechanical Application)	398
Drill (Rangeland)	83
Hand Seeding	1
Herbicide Application	**8,524**
Ground	5,725
Aerial (Helicopter)	1,447
Spot Treatment	1,183
Aerial (Fixed-Wing)	169
Prescribed Fire	**8,122**
Prescribed Fire	7,707
Pile Burn	415
Anchor Chain	**4,155**
Ely (One-Way)	3,197
Ely (Two-Way)	957
Harrow	**2,901**
> 15 ft. (Two-Way)	1,274
≤ 15 ft. (One-Way)	933
≤ 15 ft. (Two-Way)	694
Aerator	**2,320**
Double Drum (One-Way)	2,320
Chain Harrow	**1,860**
> 15 ft. (Two-Way)	1,750
≤ 15 ft. (Two-Way)	83
≤ 15 ft. (One-Way)	27
Disc	**1,591**
Plow (Two-Way)	1,398
Off-Set (One-Way)	183
Plow (One-Way)	10
Roller Chopper	**1,150**
One-Way	1,150
Mowing	**876**
Brush Hog	846
Other	31
Bulldozing	**520**
Tree Push	469
Other	51

Type	Total Completed Acreage
Forestry Practices	**442**
Thinning (Non-Commercial)	442
Skid-Steer Mounted Tree Cutter	**388**
Hydraulic Brush Saw	388
Interseeding	**268**
Interseeding	268
Planting/Transplanting	**57**
Container Stock	31
Other	26
Other	**18**
Road Decommissioning	18
Grand Total	**103,220**
***Net Total Land Area Treated**	**94,633**

Table 5.6: WRI treatment action size (acres) of completed projects for WMU 16B, 16C, Manti Central Mountains. Data accessed on 02/25/2025.
*Does not include overlapping treatments.



Map 5.7: Terrestrial WRI treatments by fiscal year completed for WMU 16B, 16C, Manti Central Mountains.

Range Trend Studies

Range Trend studies have been sampled within WMU 16B, 16C on a regular basis since 1985, with studies being added or suspended as was deemed necessary **(Table 5.7**). Due to changes in sampling methodologies, only data collected following the 1992 sample year is included in this summary. Monitoring studies of Watershed Restoration Initiative (WRI) projects began in 2004. When possible, WRI monitoring studies are established prior to treatment and sampled on a regular basis following treatment. Due to the long-term nature of the studies, many of the Range Trend and WRI studies have had some sort of disturbance or treatment prior to or since study establishment (**Table 5.8**). Range Trend studies are summarized in this report by ecological site.

Study #	Study Name	Project	Status	Years Sampled	Ecological Site Description
16B-01	Long Ridge South	RT	Suspended	1989, 1997, 2002, 2007	Mountain Stony Loam (Mountain Big Sagebrush)
16B-02	Long Ridge North	RT	Active	1989, 1997, 2002, 2007, 2014, 2019, 2024	Mountain Stony Loam (Mountain Big Sagebrush)
16B-03	Rocky Hollow	RT	Active	1989, 1997, 2002, 2007, 2014, 2019, 2024	Mountain Loam (Mountain Big Sagebrush)
16B-04	Dry Creek Chaining	RT	Active	1989, 1997, 2002, 2007, 2014, 2019, 2024	Mountain Stony Loam (Shrub)
16B-05	Jackson Unit	RT	Active	1989, 1997, 2002, 2007, 2014, 2019, 2024	Mountain Gravelly Loam (Mountain Big Sagebrush)
16B-06	Mill Fork	RT	Active	1989, 1997, 2002, 2007, 2014, 2019, 2024	Mountain Stony Loam (Mountain Big Sagebrush)
16B-07	East Dairy Fork	RT	Suspended	1989, 1997, 2002	Mountain Stony Loam (Shrub)
16B-08	Starvation Mahogany	RT	Active	1989, 1999, 2002, 2007, 2014, 2019, 2024	Mountain Shallow Loam (Curlleaf Mountain Mahogany)
16B-09	Starvation Mountain Brush	RT	Active	1989, 1999, 2002, 2007, 2014, 2019, 2024	Mountain Stony Loam (Shrub)
16B-10	Dairy Fork Burn	RT	Active	1989, 1997, 2002, 2007, 2014, 2019, 2024	Mountain Loam (Mountain Big Sagebrush)
16B-11	Hilltop	RT	Active	1989, 1997, 2002, 2007, 2014, 2019, 2024	Upland Loam (Mountain Big Sagebrush-Indian Ricegrass)
16B-12	Oak Creek	RT	Suspended	1989, 1997, 2002	Mountain Loam (Oak)
16B-13	Oak Creek Ridge Aspen	RT	Active	1989, 1997, 2002, 2007, 2014, 2019, 2024	High Mountain Loam (Aspen)
16B-14	Oak Creek Ridge Seeding	RT	Active	1989, 1997, 2002, 2007, 2014, 2019, 2024	High Mountain Clay (Slender Wheatgrass)
16B-15	Ford Ridge	RT	Suspended	1988, 1994, 1999	Mountain Loam (Mountain Big Sagebrush)
16B-16	Hardscrabble	RT	Suspended	1988, 1994, 1999	Mountain Loam (Black Sagebrush)
16B-17	Slackpile	RT	Active	1988, 1994, 1999, 2004, 2009, 2014, 2019, 2024	Upland Loam (Mountain Big Sagebrush-Indian Ricegrass)
16B-18	Porphyry Bench	RT	Active	1988, 1994, 1999, 2004, 2009, 2014, 2019, 2024	Semidesert Loam (Wyoming Big Sagebrush)
16B-19	North Spring Bench	RT	Active	1988, 1994, 1999, 2004, 2009, 2014, 2019, 2024	Upland Loam (Mountain Big Sagebrush-Indian Ricegrass)
16B-20	Telephone Bench	RT	Active	1988, 1994, 1999, 2004, 2009, 2014, 2019, 2024	Upland Shallow Loam (Black Sagebrush)
16B-21	Huntington Canyon	RT	Active	1988, 1994, 1999, 2004, 2009, 2014, 2019, 2024	Mountain Very Steep Stony Loam (Mountain Big Sagebrush)
16B-22	Poison Spring Bench	RT	Active	1988, 1994, 1999, 2004, 2009, 2014, 2019, 2024	Upland Shallow Loam (Black Sagebrush)
16B-23	Consumer Bench	RT	Active	1994, 1999, 2004, 2009, 2012, 2014, 2019, 2024	Semidesert Loam (Wyoming Big Sagebrush)
16B-24	Wire Grass Bench	RT	Active	1994, 1999, 2004, 2009, 2014, 2019, 2024	Upland Loam (Mountain Big Sagebrush-Indian Ricegrass)

Study #	Study Name	Project	Status	Years Sampled	Ecological Site Description
16C-01	Manti Face Chaining	RT	Active	1989, 1997, 2002, 2007, 2014, 2019, 2024	Upland Gravelly Loam (Black Sagebrush)
16C-02	Willow Creek	RT	Active	1989, 1997, 2002, 2007, 2014, 2019, 2024	Mountain Loam (Shrub)
16C-03	North Manti Face	RT	Active	1989, 1997, 2002, 2007, 2014, 2019, 2024	Mountain Loam (Mountain Big Sagebrush)
16C-04	Bald Mountain	RT	Suspended	1989, 1997, 2002	Mountain Loam (Mountain Big Sagebrush)
16C-05	Cane Valley	RT	Active	1989, 1997, 2002, 2007, 2014, 2019, 2024	Upland Stony Loam (Mountain Big Sagebrush)
16C-06	Black Hill	RT	Active	1989, 1997, 2002, 2007, 2014, 2015, 2019, 2024	Upland Shallow Loam (Black Sagebrush)
16C-07	Mayfield Mountain Face	RT	Active	1989, 1997, 2002, 2007, 2014, 2019, 2024	Upland Loam (Black Sagebrush)
16C-08	Pole Canyon Chaining	RT	Active	1989, 1997, 2002, 2007, 2014, 2019, 2024	Upland Loam (Mountain Big Sagebrush-Indian Ricegrass)
16C-09	Pole Canyon Oak	RT	Active	1989, 1997, 2002, 2007, 2014, 2019, 2024	Mountain Stony Loam (Oak)
16C-10	Julius Pasture	RT	Suspended	1989, 1997	High Mountain Loam (Aspen)
16C-11	Above South Hollow	RT	Active	1989, 1997, 2002, 2007, 2014, 2019, 2024	Mountain Loam (Shrub)
16C-12	Manti Dump	RT	Active	1989, 1997, 2002, 2007, 2014, 2019, 2024	Upland Loam (Wyoming Big Sagebrush)
16C-13	West Huntington Canyon	RT	Suspended	1988, 1994, 1999, 2004, 2009, 2014	Mountain Loam (Black Sagebrush)
16C-14	Red Point	RT	Active	1988, 1994, 1999, 2004, 2009, 2014, 2019, 2024	Upland Shallow Loam (Birchleaf Mountain Mahogany)
16C-15	Howard FS Chaining	RT	Suspended	1988, 1994, 1999, 2004, 2009, 2014	Upland Shallow Loam (Pinyon-Utah Juniper)
16C-16	Church Mine Road	RT	Suspended	1988, 1994	Upland Shallow Loam (Birchleaf Mountain Mahogany)
16C-17	Middle Mountain	RT	Active	1988, 1994, 1999, 2004, 2009, 2014, 2019, 2024	Upland Shallow Loam (Birchleaf Mountain Mahogany)
16C-18	East Mountain	RT	Active	1988, 1994, 1999, 2004, 2009, 2014, 2019, 2024	High Mountain Loam (Mountain Big Sagebrush)
16C-19	Trail Mountain Exclosure	RT	Active	1988, 1994, 1999, 2004, 2009, 2014, 2019, 2024	Mountain Loam (Shrub)
16C-20	Miles Point	RT	Active	1988, 1994, 1999, 2004, 2009, 2014, 2019, 2024	Mountain Loam (Mountain Big Sagebrush)
16C-21	North Horn Cap	RT	Suspended	1988, 1994, 1999, 2004	Mountain Stony Loam (Shrub)
16C-22	North Horn Rock Canyon	RT	Active	1988, 1994, 1999, 2004, 2009, 2014, 2019, 2024	Mountain Shallow Loam (Black Sagebrush)
16C-23	Black Dragon	RT	Active	1988, 1994, 1999, 2004, 2009, 2014, 2019, 2024	Upland Loam (Mountain Big Sagebrush-Indian Ricegrass)
16C-24	South Horn Exclosure	RT	Active	1988, 1994, 1999, 2004, 2009, 2014, 2019, 2024	Mountain Loam (Shrub)
16C-25	South Horn 1/4 Corner	RT	Active	1988, 1994, 1999, 2004, 2009, 2014, 2019, 2024	Mountain Loam (Mountain Big Sagebrush)
16C-26	Dry Mountain	RT	Active	1988, 1994, 1999, 2004, 2009, 2014, 2019, 2024	Upland Loam (Mountain Big Sagebrush-Indian Ricegrass)
16C-27	Birch Creek Chaining	RT	Active	1988, 1994, 1999, 2004, 2009, 2014, 2019, 2024	Upland Loam (Mountain Big Sagebrush-Indian Ricegrass)
16C-28	South of Dry Wash	RT	Active	1988, 1994, 1999, 2004, 2009, 2014, 2019, 2024	Upland Shallow Loam (Birchleaf Mountain Mahogany)
16C-29	Scab Hollow	RT	Active	1988, 1994, 1999, 2004, 2009, 2014, 2019, 2024	Mountain Stony Loam (Curlleaf Mountain Mahogany)

Study #	Study Name	Project	Status	Years Sampled	Ecological Site Description
16C-30	Upper Hole Trail	RT	Active	1988, 1994, 1999, 2004, 2009, 2014, 2019, 2024	Mountain Stony Loam (Curlleaf Mountain Mahogany)
16C-31	Box Canyon Knolls	RT	Active	1988, 1994, 1999, 2004, 2009, 2014, 2019, 2024	Mountain Shallow Loam (Black Sagebrush)
16C-32	Muddy Creek	RT	Active	1988, 1994, 1999, 2004, 2009, 2014, 2019, 2024	Semidesert Clay (Shadscale)
16C-33	Little Nelson Mountain	RT	Suspended	1994, 1999, 2004, 2009	Semidesert Loam (Wyoming Big Sagebrush)
16C-34	South Sage Flat	RT	Active	1994, 1999, 2004, 2009, 2014, 2019, 2024	Mountain Shallow Loam (Black Sagebrush)
16C-35	Wildcat Knolls	RT	Active	1994, 1999, 2004, 2009, 2014, 2019, 2024	Mountain Shallow Loam (Black Sagebrush)
16C-36	Danish Bench	RT	Active	1994, 1999, 2004, 2009, 2014, 2019, 2024	Upland Shallow Loam (Birchleaf Mountain Mahogany)
16C-37	Joes Valley Overlook	RT	Active	1994, 1999, 2004, 2009, 2014, 2019, 2024	Mountain Loam (Shrub)
16C-38	Pleasant Creek	RT	Active	1989, 1997, 2002, 2007, 2014, 2019, 2024	Mountain Loam (Mountain Big Sagebrush)
16C-39	Cove Creek	RT	Active	1989, 1997, 2002, 2007, 2014, 2019, 2024	Upland Loam (Bonneville Big Sagebrush)
16C-40	Cedar Mountain	RT	Active	1985, 1991, 1999, 2004, 2009, 2014, 2019, 2024	Upland Stony Loam (Mountain Big Sagebrush)
16C-41	Trough Hollow	RT	Active	1985, 1991, 1999, 2004, 2009, 2014, 2019, 2024	Mountain Loam (Mountain Big Sagebrush)
16C-42	Box Canyon Sage-Grouse	RT	Active	2004, 2009, 2014, 2019, 2024	Mountain Loam (Mountain Big Sagebrush)
16C-43	Olson Draw Sage-Grouse	RT	Active	2004, 2009, 2014, 2019, 2024	Mountain Loam (Mountain Big Sagebrush)
16C-44	North Horn	RT	Active	2005, 2009, 2014, 2019, 2024	Mountain Shallow Loam (Birchleaf Mountain Mahogany)
16C-45	Olsen Canyon	RT	Active	2007, 2014, 2019, 2024	Upland Gravelly Loam (Wyoming Big Sagebrush)
16C-46	Indian Hollow	RT	Active	2014, 2019, 2024	Semidesert Shallow Loam (Black Sagebrush)
16C-47	White Hill	RT	Active	2019, 2024	Upland Loam (Mountain Big Sagebrush-Indian Ricegrass)
16C-51	Old Woman Plateau	RT	Active	2019, 2024	Mountain Shallow Loam (Mountain Big Sagebrush)
16C-52	Rolfson Reservoir	RT	Active	2024	High Mountain Loam (Mountain Big Sagebrush)
16R-01	Price Pipeline South	RT	Suspended	1997, 2004	Semidesert Loam (Wyoming Big Sagebrush)
16R-02	Price Pipeline Native South	RT	Suspended	1997, 2004	Semidesert Loam (Wyoming Big Sagebrush)
16R-03	Price Pipeline Native North	RT	Suspended	1997, 2004	Semidesert Loam (Wyoming Big Sagebrush)
16R-04	Price Pipeline North	RT	Suspended	1997, 2004	Semidesert Loam (Wyoming Big Sagebrush)
16R-05	Scad Hollow	RT	Suspended	1998, 2004, 2009, 2014, 2019	High Mountain Loam (Silver Sagebrush)
16R-06	North Slackpile	RT	Active	1998, 2004, 2009, 2014, 2019, 2024	Upland Loam (Mountain Big Sagebrush-Indian Ricegrass)
16R-10	Gordon Creek Burn	RT	Suspended	1999, 2001, 2004, 2009	Upland Loam (Wyoming Big Sagebrush)
16R-11	Lower Cedar Bench	WRI	Active	2004, 2007, 2012, 2016, 2021	Upland Loam (Wyoming Big Sagebrush)
16R-12	Upper Cedar Bench	WRI	Active	2004, 2007, 2012, 2016, 2021	Upland Loam (Mountain Big Sagebrush-Indian Ricegrass)

Study #	Study Name	Project	Status	Years Sampled	Ecological Site Description
16R-13	Upper Porphyry	WRI	Active	2004, 2007, 2009, 2010, 2012, 2017, 2024	Semidesert Loam (Wyoming Big Sagebrush)
16R-14	Consumer Bench North	WRI	Active	2005, 2008, 2012, 2017, 2023	Semidesert Loam (Wyoming Big Sagebrush)
16R-15	Consumer Bench 2	WRI	Active	2005, 2008, 2012, 2017, 2023	Semidesert Loam (Wyoming Big Sagebrush)
16R-16	Wildcat Push	WRI	Active	2005, 2010, 2014, 2018, 2023	Upland Loam (Mountain Big Sagebrush-Indian Ricegrass)
16R-17	Cedar Mountain Brush Saw	WRI	Active	2005, 2008, 2013, 2018, 2023	Upland Stony Loam (Black Sagebrush)
16R-18	Cedar Mountain Dixie	WRI	Active	2005, 2008, 2013, 2018, 2023	Upland Loam (Black Sagebrush)
16R-19	Lower Fish Creek WMA	WRI	Active	2005, 2010, 2015, 2019, 2024	Mountain Loam (Mountain Big Sagebrush)
16R-20	Howerton's	WRI	Suspended	2005, 2007, 2013	Upland Loam (Mountain Big Sagebrush)
16R-21	Stump Flat	WRI	Active	2006, 2010, 2014, 2018, 2023	Upland Loam (Black Sagebrush)
16R-23	North Spring	WRI	Active	2006, 2010, 2014, 2018, 2024	Semidesert Loam (Wyoming Big Sagebrush)
16R-24	12 Mile Dixie	WRI	Active	2006, 2010, 2013, 2017, 2022	Upland Loam (Wyoming Big Sagebrush)
16R-25	Black Dragon Bullhog	WRI	Active	2006, 2009, 2012, 2018, 2023	Mountain Loam (Shrub)
16R-29	Wildcat Disking Reference	WRI	Suspended	2008	Not Verified
16R-30	Mill Fork Chaining	WRI	Active	2007, 2010, 2014, 2019, 2024	Mountain Loam (Mountain Big Sagebrush)
16R-31	Mohrland Roller Chopper 1	WRI	Active	2008, 2011, 2014, 2018, 2023	Upland Gravelly Loam (Black Sagebrush)
16R-32	Mohrland Roller Chopper 2	WRI	Active	2008, 2011, 2014, 2018, 2023	Upland Loam (Black Sagebrush)
16R-33	Scofield Dixie	WRI	Suspended	2008, 2011, 2015	High Mountain Loam (Mountain Big Sagebrush)
16R-34	Wildcat Dixie Harrow	WRI	Active	2008, 2009, 2010, 2013, 2017, 2022	Mountain Loam (Mountain Big Sagebrush)
16R-35	Upper Porphyry Reference	WRI	Suspended	2009	Not Verified
16R-36	Consumer Bench Reference	WRI	Suspended	2009	Not Verified
16R-37	Wildcat Disking	WRI	Active	2009, 2010, 2013, 2017, 2022	Mountain Loam (Mountain Big Sagebrush)
16R-38	Black Dragon Reference	WRI	Suspended	2009	Not Verified
16R-42	Canal Canyon	WRI	Active	2011, 2014, 2018, 2023	Upland Loam (Bonneville Big Sagebrush)
16R-43	Swasey Mountain Brush Bullhog	WRI	Suspended	2011	Not Verified
16R-44	Swasey Bullhog	WRI	Active	2011, 2015, 2019, 2024	Mountain Stony Loam (Mountain Big Sagebrush)
16R-45	Grimes Wash	WRI	Suspended	2011, 2017	Upland Stony Loam (Pinyon-Utah Juniper)
16R-46	Dairy Fork 1	WRI	Suspended	2012, 2015	Mountain Loam (Oak)
16R-47	Dairy Fork 2	WRI	Active	2012, 2015, 2019, 2024	Mountain Stony Loam (Mountain Big Sagebrush)
16R-48	North Hollow	WRI	Active	2012, 2015, 2018, 2023	Mountain Stony Loam (Oak)
16R-49	Stump Flat 2	WRI	Active	2013, 2016, 2021	Semidesert Shallow Loam (Black Sagebrush)
16R-50	Bear Ranch	WRI	Active	2013, 2017, 2022	Mountain Gravelly Loam (Oak)
16R-52	Helper Benches	WRI	Active	2014, 2017, 2022	Semidesert Stony Loam (Wyoming Big Sagebrush)

Study #	Study Name	Project	Status	Years Sampled	Ecological Site Description
16R-53	Grimes Wash 2	WRI	Active	2014, 2017, 2022	Upland Stony Loam (Wyoming Big Sagebrush)
16R-54	Hiawatha Miller Creek	WRI	Active	2015, 2018, 2023	Upland Loam (Mountain Big Sagebrush-Indian Ricegrass)
16R-55	Grimes Wash 3	WRI	Active	2017, 2021	Upland Stony Loam (Pinyon-Utah Juniper)
16R-56	Dry Wash	WRI	Active	2019, 2022	Upland Shallow Loam (Birchleaf Mountain Mahogany)
16R-57	New Canyon Reservoir	WRI	Active	2021	High Mountain Stony Loam (Aspen)
16R-58	Rocky Hollow Ridge	WRI	Active	2021, 2022, 2023	Mountain Stony Loam (Mountain Big Sagebrush)
16R-59	Wildwest	WRI	Active	2022	High Mountain Loam (Aspen)
16R-60	Pole Canyon	WRI	Active	2022	Mountain Gravelly Loam (Oak)
16R-61	Spring Hill	WRI	Active	2023	High Mountain Loam (Aspen)

Table 5.7: Range Trend and WRI project studies monitoring history and ecological site potential for WMU 16B, 16C, Manti Central Mountains.

Study #	Study Name	Type	Disturbance Name (If Available)	Date	Acres	WRI Project #
16B-03	Rocky Hollow	Plateau	Thistle Creek Watershed and Fire Rehab Project	September 2020	670	5177
		Aerial Before	Thistle Creek Watershed Restoration Phase 2	October 2021	730	5558
		Bullhog	Thistle Creek Watershed Restoration Phase 2	November 2021	819	5558
16B-04	Dry Creek Chaining	Chain Unknown		Historic		
		Seed Unknown		Historic		
		Bullhog	Dry Canyon Wildlife Improvement and Fuels Reduction Project Phase I	Between July 2010 and June 2012	496	1701
16B-05	Jackson Unit	Chain Unknown		1972		
		Seed Unknown		1972		
		Bullhog	Birdseye WMA Bullhog Project	September 2016-December 2017	229	3605
16B-06	Mill Fork	Dribbler	Mill Fork Wildlife Habitat Improvement Project	November 2007	350	716
		Aerial Before	Mill Fork Wildlife Habitat Improvement Project	October 2007	462	716
		Two-Way Ely/Smooth	Mill Fork Wildlife Habitat Improvement Project	October-November 2007	350	716
		Lop and Scatter	Mill Fork Wildlife Habitat Improvement Project (Phase 2)	August-November 2015	553	3019
16B-09	Starvation Mountain Brush	Bullhog		2002		
		Transplant	Soldier Creek Mule Deer and Watershed Restoration Project FY 25 (Proposed)	2025	3,582	6909
16B-10	Dairy Fork Burn	Chain Unknown		1988		
		Wildfire		1988		
		Disc Unknown		1988		
		Seed Unknown		1988		
16B-11	Hilltop	Chain Unknown		1978	250	
		Seed Unknown		1978	250	
		Bullhog	Hilltop Conservation Easement Bullhog Phase 2	July 2014-June 2015	269	3047
16B-14	Oak Creek Ridge Seeding	Herbicide Unknown		1988		
		Seed Unknown		1988		
16B-18	Porphyry Bench	Double Drum	Price West Benches Year 1--Porphyry Bench	November 2004, April-May 2005	1,104	229
		Broadcast Before	Price West Benches Year 1--Porphyry Bench	November 2004, April-May 2005	1,104	229
		Aerial After	Price West Benches Year 1--Porphyry Bench	December 2004	1,104	229
		One-Way	Porphyry Bench Sagebrush Planting	November 2016	20	3616
		Broadcast After	Porphyry Bench Sagebrush Planting	November 2016	20	3616
16B-20	Telephone Bench	Lop and Scatter	North Springs PJ Removal Phase II	March-October 2018	4,484	3583

Study #	Study Name	Type	Disturbance Name (If Available)	Date	Acres	WRI Project #
16B-22	Poison Spring Bench	Chain Unknown		Late 1960s		
		Seed Unknown		Late 1960s		
		Lop and Scatter	Burma Rd. Pinyon/Juniper Removal	October-December 2013	1,312	2556
		Seed Unknown	Burma Rd. Pinyon/Juniper Removal	December 2013	293	2556
16B-23	Consumer Bench	Double Drum	Price West Benches Year 2	October-December 2005	2,658	228
		Broadcast Before	Price West Benches Year 2	October-December 2005	2,658	228
		Aerial After	Price West Benches Year 2	March 2006	2,658	228
		Lop and Scatter	Miller Creek Watershed Restoration	November 2018	242	4207
16C-01	Manti Face Chaining	Chain Unknown		Historic		
		Seed Unknown		Historic		
		Lop and Scatter	Manti Face Lop and Scatter	September-December 2012	853	1707
16C-02	Willow Creek	Chain Unknown	Bald Mountain	1969	700	
		Seed Unknown	Bald Mountain	1969	700	
		Lop and Scatter	Bald Mountain WMA Lop and Scatter	2014-2015	400	
16C-03	North Manti Face	Lop and Scatter	Manti Face Lop and Scatter	July 2010-June 2012	853	1707
16C-05	Cane Valley	Two-Way Unknown		1982		
		Aerial Unknown		1982		
		Lop and Scatter	Black Hills WMA Lop and Scatter	October 2007	878	710
		Lop and Scatter	Dedicated Hunter Project	June 2018		
		Lop and Scatter	Dedicated Hunter Project	July 2019		
16C-06	Black Hill	Chain Unknown		1982		
		Seed Unknown		1982		
		Lop and Scatter	Black Hills WMA Lop and Scatter	October 2007	878	710
		Transplant	Ephraim Mule Deer and Watershed Restoration Project FY25 (Proposed)	2025	51	6934
16C-07	Mayfield Mountain Face	Chain Unknown		Historic		
		Seed Unknown		Historic		
		Lop and Scatter	Twelve Mile WMA Habitat Improvement	July-October 2007	1,294	273
16C-08	Pole Canyon Chaining	Aerial After	Pole Canyon Seeding	September 1967	2,058	8938*
		Two-Way Unknown	Pole Canyon Seeding	September-October 1967	2,058	8938*
		Lop and Scatter	Mayfield Fuels Reduction 2001	January 2001-June 2002	3,623	7296*
		Lop and Scatter	Sanpitch Mountains Collaborative Phase I	September 2019-June 2024	3,733	5942
16C-09	Pole Canyon Oak	Chain Unknown		1970s		
		Two-Way Ely/Smooth	Twelve Mile WMA Habitat Improvement - Year 2	October-November 2008	540	1059
		Aerial Before	Twelve Mile WMA Habitat Improvement - Year 2	October-November 2008	618	1059
		Dribbler	Twelve Mile WMA Habitat Improvement - Year 2	October-November 2008	540	1059
		Garlon 3A/Tordon/ Aquafact	12 Mile Habitat Improvement Project	September 2013-April 2015	302	2242
16C-11	Above South Hollow	Chain Unknown		Prior to 1960		
		Seed Unknown		Prior to 1960		
		Aerial Before	Twelve Mile WMA Habitat Improvement - Year 2	October-November 2008	618	1059
		Dribbler	Twelve Mile WMA Habitat Improvement - Year 2	October-November 2008	540	1059
		Two-Way Ely/Smooth	Twelve Mile WMA Habitat Improvement - Year 2	October-November 2008	540	1059
		Lop and Scatter	Twelve Mile Watershed Restoration Project FY 23	July 2022-June 2023	629	5916
16C-12	Manti Dump	Chain Unknown	East Manti Dump	1961		
		Seed Unknown	East Manti Dump	1961		
		Lop and Scatter	6-Mile Habitat Improvement	June-August 2009	787	1051
		Bullhog	Six Mile WMA In-House Bullhog Project - Phase 1	2019	446	4809
		Dribbler Unknown	Six Mile WMA In-House Bullhog Project - Phase 1	2019	1,065	4809
16C-13	West Huntington Canyon	Wildfire		Historic		

Study #	Study Name	Type	Disturbance Name (If Available)	Date	Acres	WRI Project #
16C-14	Red Point	Two-Way Unknown	West Huntington Chain and Seed	September-December 1969	1,033	12602*
		Aerial After	West Huntington Chain and Seed	December 1969	1,033	12602*
		Aerial After	West Huntington Chain and Seed	March 1973	1,033	12602*
		Lop and Scatter	Burma Rd. Pinyon/Juniper Removal	October-December 2013	1,312	2556
16C-15	Howard FS Chaining	Two-Way Unknown		September-December 1961	445	12603*
		Aerial Before		September-December 1961	445	12603*
16C-16	Church Mine Road	Chain Unknown		November-December 1969	1,319	12835*
		Broadcast		November-December 1969	1,319	12835*
		Lop and Scatter	Danish Bench Lop and Scatter	Spring 2009	589	1390
16C-17	Middle Mountain	Chain Unknown		Historic	200	
		Bullhog		Spring 2009		
16C-18	East Mountain	Herbicide Unknown		Late 1960s		
16C-19	Trail Mountain Exclosure	Contour Trench		1960s		
		Seed Unknown		1960s		
16C-21	North Horn Cap	Bullhog	Black Dragon	March 2006-June 2008	4,358	514
16C-22	North Horn Rock Canyon	Bullhog	Swasey Wildlife Habitat Improvement and Hazardous Fuels Reduction Project Phase VII	August 2016-June 2017	620	3638
16C-23	Black Dragon	Contour Trench		1965		
		Seed Unknown		1965		
16C-24	South Horn Exclosure	Bullhog	South Horn Wildlife Habitat Improvement Project	June 2017-April 2018	608	4036
		Bullhog	West Emery County Watershed Restoration	August 2023	593	6597
		Bullhog	Manti-La Sal Healthy Forest Restoration (Proposed)	2024-2025	1,215	5568
16C-25	South Horn 1/4 Corner	Bullhog	South Horn Wildlife Habitat Improvement Project	February 2017	1,215	
		Bullhog	Manti-La Sal Healthy Forest Restoration (Proposed)	2024-2025	1,215	5568
16C-26	Dry Mountain	Chain Unknown		1967		
		Seed Unknown		1967		
		Lop and Scatter		1999		
		Bullhog		Between 2004 and 2009		
16C-27	Birch Creek Chaining	Chain Unknown		1972		
		Contour Trench		1972		
		Seed Unknown		1972		
		Lop and Scatter		Fall 2004		
16C-28	South of Dry Wash	Chain Unknown		1972	35	
		Seed Unknown		1972	35	
		Bullhog		Between 2015 and 2018		
		Lop and Scatter	Swasey/Dry Wash/Grimes Wildlife Habitat Improvement and Hazardous Fuels Reduction	October 2020	610	5202
16C-31	Box Canyon Knolls	Prescribed	West Emery County Watershed Restoration (Proposed)	2024-2025	5,934	6597
16C-32	Muddy Creek	Broadcast	Muddy Creek Seeding	February 2006	60	95
16C-34	South Sage Flat	Seed Unknown		Historic		
16C-36	Danish Bench	Chain Unknown		November-December 1969	1,319	12835*
		Broadcast		November-December 1969	1,319	12835*
		Lop and Scatter	Danish Bench Lop and Scatter	Spring 2009	586	1390
		Lop and Scatter		Between 2014 and 2019		
16C-37	Joes Valley Overlook	Seed Unknown		Historic		
		Contour Trench		Historic		
16C-38	Pleasant Creek	Two-Way Ely	Bear Mountain CWMU Habitat Enhancement	October-December 2013	232	2602
		Aerial Before	Bear Mountain CWMU Habitat Enhancement	October-December 2013	232	2602
		Dribbler	Bear Mountain CWMU Habitat Enhancement	October-December 2013	232	2602
		Aerial After	Bear Mountain CWMU Habitat Enhancement	February 2014	232	2602

Study #	Study Name	Type	Disturbance Name (If Available)	Date	Acres	WRI Project #
16C-40	Cedar Mountain	Seed Unknown		1979-1980		
		Chain Unknown		1979-1980		
		One-Way Dixie	Fishlake NF PJ Maintenance-Sagebrush Enhancement - Year 1	June-December 2005	4,445	216
		Brush Saw		2005-2008		
		Bullhog		2009-2014		
16C-41	Trough Hollow	Lop (No Scatter)	Salina Creek Ecosystem Restoration Project Phase 3	July 2021-August 2022	2,734	5446
16C-42	Box Canyon Sage-Grouse	Two-Way Ely	GH Olsen Chaining	September 1967	800	9198*
		Aerial Before	GH Olsen Chaining	September 1967	800	9198*
		One-Way Dixie	Wildcat Knolls Habitat Improvement	September-November 2008	435	1161
		Broadcast Before	Wildcat Knolls Habitat Improvement	September-November 2008	810	1161
		Rangeland Drill	Wildcat Sagebrush Restoration Project Phase II	August-September 2009	466	1392
16C-44	North Horn	Contour Trench		Historic		
16C-45	Olsen Canyon	Seed Unknown		Historic		
		Chain Unknown		Historic		
		Lop and Scatter	Twelve Mile Wma Habitat Improvement	July 2007-October 2008	1,254	273
16R-03	Price Pipeline Native North	Broadcast Before	Price West Benches (Year1) Porphyry Bench	November 2004, April-May 2005	1,104	229
		Double Drum	Price West Benches (Year1) Porphyry Bench	November 2004, April-May 2005	1,104	229
		Aerial After	Price West Benches (Year1) Porphyry Bench	December 2004	1,104	229
16R-04	Price Pipeline North	Broadcast Before	Price West Benches (Year1) Porphyry Bench	November 2004, April-May 2005	1,104	229
		Double Drum	Price West Benches (Year1) Porphyry Bench	November 2004, April-May 2005	1,104	229
16R-06	North Slackpile	Roller Chopper	Gordon Creek Roller Chopper	October 2006	199	513
16R-10	Gordon Creek Burn	Broadcast Before		March 1999	160	
		One-Way Dixie		March 1999	160	
		Prescribed		March 1999	160	
16R-11	Lower Cedar Bench	Broadcast Before	Cedar Bench	Spring 2005		PDB
		Push	Cedar Bench	Spring 2005		PDB
		Lop and Scatter	North Springs PJ Removal Phase II	March-October 2018	4,484	3583
16R-12	Upper Cedar Bench	Broadcast Before	Cedar Bench	Spring 2005		PDB
		Push	Cedar Bench	Spring 2005		PDB
16R-13	Upper Porphyry	Broadcast Before	Price West Benches (Year1) Porphyry Bench	November 2004, April-May 2005	1,104	229
		Double Drum	Price West Benches (Year1) Porphyry Bench	November 2004, April-May 2005	1,104	229
		Aerial After	Price West Benches (Year1) Porphyry Bench	December 2004	1,104	229
16R-14	Consumer Bench North	Broadcast Before	Price West Benches (Year2)(Consumers)(airport)	November 2004-March 2005	2,658	228
		Double Drum	Price West Benches (Year2)(Consumers)(airport)	November 2004-March 2005	2,658	228
		Aerial After	Price West Benches (Year2)(Consumers)(airport)	March 2005	2,658	228
16R-15	Consumer Bench 2	Broadcast Before	Price West Benches (Year2)(Consumers)(airport)	November 2004-March 2005	2,658	228
		Double Drum	Price West Benches (Year2)(Consumers)(airport)	November 2004-March 2005	2,658	228
		Aerial After	Price West Benches (Year2)(Consumers)(airport)	March 2005	2,658	228
16R-16	Wildcat Push	Aerial Before	Wildcat Canyon P-J Removal	October 2007	140	32
		Roller Chopper	Wildcat Canyon P-J Removal	October-November 2007	140	32
		Dribbler	Wildcat Canyon P-J Removal	October-November 2007	140	32
16R-17	Cedar Mountain Brush Saw	Chain Unknown		1970s		
		Brush Saw	Fishlake NF PJ Maintenance-Sagebrush Enhancement - Year 2	June-December 2005	2,469	465
		Bullhog		Between 2008 and 2013		

Study #	Study Name	Type	Disturbance Name (If Available)	Date	Acres	WRI Project #
16R-18	Cedar Mountain Dixie	Chain Unknown		1970s		
		Seed Unknown		1970s		
		One-Way Dixie	Fishlake NF PJ Maintenance-Sagebrush Enhancement - Year 1	June-December 2005	4,445	216
		Broadcast	Fishlake NF PJ Maintenance-Sagebrush Enhancement - Year 1	Fall 2005	1,600	216
		Brush Saw		2011		
16R-19	Lower Fish Creek WMA	2,4-D/Tordon	Lower Fish Creek Sage-Grouse Habitat Improvement	June 2006	418	17
16R-20	Howerton's	Disc Unknown	Spring City Plateau Demonstration Project	October 2005	152	169
		Rangeland Drill	Spring City Plateau Demonstration Project	October 2005	152	169
		Plateau	Spring City Plateau Demonstration Project	November 2005	152	169
		Plateau	Spring City Plateau Project - Year 2	September 2008	50	1092
		Rangeland Drill	Spring City Plateau Project - Year 2	October 2008	25	1092
		Broadcast	Spring City Plateau Project - Year 2	January 2009	25	1092
16R-21	Stump Flat	Two-Way Unknown	West Huntington Chain and Seed	September-December 1969	1,158	12602*
		Aerial After	West Huntington Chain and Seed	December 1969	1,158	12602*
		Aerial After	West Huntington Chain and Seed	March 1973	1,158	12602*
		Roller Chopper	Stump Flat Pinyon/Juniper Habitat Restoration	September-October 2006	67	431
		Lop and Scatter	Burma Rd. Pinyon/Juniper Removal	October-December 2013	1,312	2556
16R-23	North Spring	Broadcast Before	Price West Benches Phase 3 - North Springs	October 2006	340	430
		One-Way Dixie	Price West Benches Phase 3 - North Springs	October 2006	680	430
16R-24	12 Mile Dixie	Farmland		Historic		
		Roundup/ Paramount	Twelve Mile WMA Habitat Improvement	November 2006	40	273
		Roundup	Twelve Mile WMA Habitat Improvement	May 2007	40	273
		Roundup	Twelve Mile WMA Habitat Improvement	October 2007	40	273
		Truax Drill	Twelve Mile WMA Habitat Improvement	October 2007	45	273
		Broadcast	Twelve Mile WMA Habitat Improvement	January 2008	40	273
16R-25	Black Dragon Bullhog	Bullhog	Black Dragon	August 2006-June 2008	4,358	514
16R-30	Mill Fork Chaining	Aerial Before	Mill Fork Wildlife Habitat Improvement	October 2007	462	716
		Two-Way Ely	Mill Fork Wildlife Habitat Improvement	October-November 2007	350	716
		Dribbler	Mill Fork Wildlife Habitat Improvement	November 2007	350	716
		Lop and Scatter	Mill Fork Wildlife Habitat Improvement Project (Phase 2)	August-November 2015	553	3019
16R-31	Mohrland Roller Chopper 1	Aerial Before	Poison Spring Bench Seeding	1970-1971	4,995	8924*
		Two-Way Unknown	Poison Spring Bench Seeding	1970-1971	4995	8924*
		Aerial Before	Mohrland PJ Removal	October 2008	743	1083
		Roller Chopper	Mohrland PJ Removal	October-December 2008	743	1083
		Dribbler	Mohrland PJ Removal	October-December 2008	743	1083
16R-32	Mohrland Roller Chopper 2	Aerial Before	Poison Spring Bench Seeding	1970-1971	4,995	8924*
		Two-Way Unknown	Poison Spring Bench Seeding	1970-1971	4,995	8924*
		Aerial Before	Mohrland PJ Removal	October 2008	743	1083
		Roller Chopper	Mohrland PJ Removal	October-December 2008	743	1083
		Dribbler	Mohrland PJ Removal	October-December 2008	743	1083
16R-33	Scofield Dixie	Broadcast Before	Scofield Sage Grouse Habitat Restoration	November 2008	150	1085
		Two-Way Dixie	Scofield Sage Grouse Habitat Restoration	November 2008	150	1085
		Harrow Unknown		2014-2015		

Study #	Study Name	Type	Disturbance Name (If Available)	Date	Acres	WRI Project #
16R-34	Wildcat Dixie Harrow	One-Way Dixie	Wildcat Knolls Habitat Improvement	September-November 2008	435	1161
		Broadcast	Wildcat Knolls Habitat Improvement	September-November 2008	810	1161
		Rangeland Drill	Wildcat Sagebrush Restoration Project Phase II	August-September 2009	90	1392
		Two-Way	Wildcat Sagebrush Restoration Project Phase II	August-September 2009	90	1392
16R-37	Wildcat Disking	Broadcast Before	Wildcat Knolls Habitat Improvement	September-November 2008	810	1161
		Two-Way	Wildcat Knolls Habitat Improvement	September-November 2008	375	1161
		Rangeland Drill	Wildcat Sagebrush Restoration Project Phase II	September 2009	466	1392
16R-42	Canal Canyon	Aerial Before	Canal Canyon Project	October 2011	314	1921
		Two-Way Ely	Canal Canyon Project	October 2011	314	1921
		Dribbler	Canal Canyon Project	October 2011	314	1921
		Aerial After	Canal Canyon Project	January 2012	314	1921
		Plateau	Canal Canyon Project	Fall 2012	314	1921
16R-43	Swasey Mountain Brush Bullhog	Bullhog	Swasey Wildlife Improvement and Hazardous Fuels Phase IV	August 2013-June 2015	519	2627
16R-44	Swasey Bullhog	Bullhog	Swasey Wildlife Improvement and Hazardous Fuels Phase IV	August 2013-June 2015	519	2627
16R-45	Grimes Wash	Aerial Before	Grimes Wash Phase 2	October 2017	111	4041
		Bullhog	Grimes Wash Phase 2	October-November 2017	111	4041
		Aerial After	Grimes Wash Phase	January 2018	111	4041
16R-46	Dairy Fork 1	Bullhog	Dairy Fork Habitat Improvement Phase 2	July 2013-June 2014	447	2214
16R-47	Dairy Fork 2	Aerial Before	Dairy Fork Habitat Improvement Phase 2	November 2013	460	2214
		Two-Way Ely	Dairy Fork Habitat Improvement Phase 2	November 2013	460	2214
		Dribbler	Dairy Fork Habitat Improvement Phase 2	November 2013	460	2214
		Aerial After	Dairy Fork Habitat Improvement Phase 2	February 2014	460	2214
		Transplant	Bitterbrush Hand Planting	July 2015		
16R-48	North Hollow	Aerial Before	Mayfield Seeding	October-November 1966	957	8178*
		Two-Way Unknown	Mayfield Seeding	October 1966-January 1967	1600	8178*
		Aerial Before	North Hollow WMA and LS Conservation Easement Habitat Improvement	November 2012	447	2276
		Two-Way Ely/Smooth	North Hollow WMA and LS Conservation Easement Habitat Improvement	November 2012	321	2276
		Dribbler	North Hollow WMA and LS Conservation Easement Habitat Improvement	November 2012	447	2276
		Aerial After	North Hollow WMA and LS Conservation Easement Habitat Improvement	January 2013	447	2276
		Plateau	North Hollow WMA and LS Conservation Easement Habitat Improvement	December 2012-March 2013	447	2276
16R-49	Stump Flat 2	Aerial Before	Stump Flat Pinyon/Juniper Removal Project	October 2013	460	2693
		Bullhog	Stump Flat Pinyon/Juniper Removal Project	October 2013	460	2693
		Aerial After	Stump Flat Pinyon/Juniper Removal Project	December 2013	460	2693
16R-50	Bear Ranch	Aerial Before	Bear Mountain CWMU Habitat Enhancement	October 2013	232	2602
		Two-Way Ely	Bear Mountain CWMU Habitat Enhancement	October-December 2013	232	2602
		Dribbler	Bear Mountain CWMU Habitat Enhancement	October-December 2013	232	2602
		Aerial After	Bear Mountain CWMU Habitat Enhancement	February 2014	232	2602

Study #	Study Name	Type	Disturbance Name (If Available)	Date	Acres	WRI Project #
16R-52	Helper Benches	Aerial Before	Helper Benches Pinyon/Juniper Removal	October 2014	241	3006
		Two-Way Ely	Helper Benches Pinyon/Juniper Removal	October 2014	241	3006
16R-53	Grimes Wash 2	Aerial Before	Grimes Wash PJ Removal	October 2011	272	1946
		Two-Way Ely	Grimes Wash PJ Removal	October 2011	148	1946
		Aerial After	Grimes Wash PJ Removal	December 2011	272	1946
16R-54	Hiawatha Miller Creek	Aerial Before	Hiawatha/Miller Creek Phase 2	December 2015-March 2016	486	3365
		Lop and Scatter	Hiawatha/Miller Creek Phase 2	December 2015-March 2016	486	3365
16R-55	Grimes Wash 3	Broadcast Before	Grimes Wash BLM Stewardship P/J Removal	October-November 2013	181	2866
		Aerial Before	Grimes Wash Phase 2	October 2017	111	4041
		Bullhog	Grimes Wash Phase 2	October-November 2017	111	4041
		Aerial After	Grimes Wash Phase 2	January 2018	111	4041
16R-56	Dry Wash	Aerial Before	Dry Wash Units 4, 5, 9	October 2019	117	4907
		Lop and Scatter	Dry Wash Units 4, 5, 9	October-November 2019	117	4907
16R-57	New Canyon Reservoir	Selective	Ephraim Watershed Restoration Phase 3 (Proposed)	October 2021-August 2022	85	5552
16R-58	Rocky Hollow Ridge	Aerial Before	Thistle Creek Watershed Restoration Phase 2	Fall 2021	743	5558
		Bullhog	Thistle Creek Watershed Restoration Phase 2	Winter 2021-2022	743	5558
16R-59	Wildwest	Lop-Pile-Burn	South Manti Big Game Summer Range Restoration (Proposed)	August 2022-June 2024	16,748	5658
16R-60	Pole Canyon	Aerial Before	Twelve Mile Watershed Restoration Project	November 2022	759	5916
		Bullhog	Twelve Mile Watershed Restoration Project	November-December 2022	759	5916
16R-61	Spring Hill	Selective	Twelve Mile Watershed Restoration Project FY 24	September 2023-June 2024	287	6536

Table 5.8: Range Trend and WRI studies known disturbance history for WMU 16B, 16C, Manti Central Mountains. PDB = Pre-Database; LTDL = Land Treatment Digital Library (Pilliod, Welty, & Jefferies, 2019). *Numbers with an asterisk are LTDL project numbers.

Study Trend Summary (Range Trend)

Ecotypes represented by only one study site throughout most or all of the sample period or entirely by sites that are suspended are listed below but are not discussed in this section. However, graphs for these ecotypes have been included and referenced when a representative study site is active as of the 2024 sample year:

- Mountain (Oak) - Oak Creek (16B-12) (suspended) and Pole Canyon Oak (16C-09)
    - (**Figure 5.23**, **Figure 5.29**, **Figure 5.34**, **Figure 5.39**, **Figure 5.45**, **Figure 5.48**, **Figure 5.54**, **Figure 5.59**)
- Mountain (Aspen) - Oak Creek Ridge Aspen (16B-13) and Julius Pasture (16C-10) (suspended)
    - (**Figure 5.24**, **Figure 5.30**, **Figure 5.35**, **Figure 5.40**, **Figure 5.46**, **Figure 5.50**, **Figure 5.56**, **Figure 5.61**)
- Mountain (Silver Sagebrush) - Scad Hollow (16R-05) (suspended)
- Mountain (Slender Wheatgrass) - Oak Creek Ridge Seeding (16B-14)
    - (**Figure 5.30**, **Figure 5.35**, **Figure 5.40**, **Figure 5.46**, **Figure 5.50**, **Figure 5.56**, **Figure 5.61**)
- Upland (Pinyon-Juniper) - Howard FS Chaining (16C-15) (suspended)
- Semidesert (Black/Low Sagebrush) - Indian Hollow (16C-46)
    - (**Figure 5.20**, **Figure 5.27**, **Figure 5.32**, **Figure 5.37**, **Figure 5.43**, **Figure 5.53**, **Figure 5.58**, **Figure 5.63**)
- Semidesert (Shadscale) - Muddy Creek (16C-32)
    - (**Figure 5.25**, **Figure 5.27**, **Figure 5.32**, **Figure 5.41**, **Figure 5.47**, **Figure 5.53**, **Figure 5.58**, **Figure 5.63**)

Trend summaries and/or additional data for these ecotypes are available in the corresponding site reports (Lane, Cox, & Payne, 2025).

Mountain (Big Sagebrush)

Nineteen studies [Long Ridge South (16B-01) (suspended), Long Ridge North (16B-02), Rocky Hollow (16B-03), Jackson Unit (16B-05), Mill Fork (16B-06), Dairy Fork Burn (16B-10), Ford Ridge (16B-15) (suspended), Huntington Canyon (16B-21), North Manti Face (16C-03), Bald Mountain (16C-04) (suspended), East Mountain (16C-18), Miles Point (16C-20), South Horn ¼ Corner (16C-25), Pleasant Creek (16C-38), Trough Hollow (16C-41), Box Canyon Sage-Grouse (16C-42), Olson Draw Sage-Grouse (16C-43), Old Woman Plateau (16C-51), and Rolfson Reservoir (16C-52)] are classified as Mountain (Big Sagebrush) ecological sites.

The Long Ridge North study is located north of the community of Indianola on Long Ridge, while the Long Ridge South site is situated just west of Long Ridge North. The Rocky Hollow study is located just north of the Long Ridge study in Rocky Hollow, and Jackson Unit can be found south of Birdseye and about 0.4 miles east of US-89. The Mill Fork site is south of US-6 on the north slopes of Davis Hill. Dairy Fork Burn is located south of US-6 between Sky High and Davis Hill. The Ford Ridge site can be found south of US-6 on the slopes above Ford Creek, and the Huntington Canyon study is situated above Huntington Canyon on the southwestern-facing slopes of Gentry Mountain. North Manti Face is on the northern portion of the face of Manti Mountain. The Bald Mountain site is located on the west-facing slopes below the peak of Bald Mountain. The East Mountain study is situated on East Mountain above Cottonwood Creek, and Miles Point is located on Trail Mountain above Cottonwood Creek. The South Horn ¼ Corner site is on South Horn Mountain between the South Horn Exclosure and Olson Draw Sage-Grouse study sites. Pleasant Creek is situated on the east bench near the town of Mt. Pleasant, and the Trough Hollow study is located northeast of I-70 and Moroni Peak. The Box Canyon Sage-Grouse study site is situated on a flat east of Duncan Mountain. Olson Draw Sage-Grouse can be found on the sagebrush flats of South Horn Mountain, and the Old Woman Plateau study is located on a flat west of the Saleratus Benches on Old Woman Plateau. Finally, the Rolfson Reservoir site is situated south of SR-31 near the mouth of Rolfson Canyon and just north of Rolfson Reservoir.

Consideration should be given to the variation in the number of study sites sampled each year (the ‘n’ value) and the relevant implications that this may have on the data and associated discussions. More specifically, the Ford Ridge study was only sampled in 1994 and 1999, while the Bald Mountain site provides data from 1999 through 2004. Long Ridge South contributed data between 1999 and 2009, while Box Canyon Sage-Grouse and Olson Draw Sage-Grouse have been sampled since 2004. Old Woman Plateau has provided data since study establishment in 2019. Rolfson Reservoir was established in 2024 and only contributes data for that year. The Long Ridge North, North Manti Face, Rocky Hollow, Jackson Unit, Mill Fork, Dairy Fork Burn, Pleasant Creek, and Trough Hollow study sites have provided data each sample year since 1999. Finally, East Mountain, Miles Point, Huntington Canyon, and South Horn ¼ Corner have contributed data in all sample years since 1994.

<u>Shrubs/Trees</u>: Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) is the dominant browse species on all study sites except for Huntington Canyon, Pleasant Creek, Jackson Unit, and Long Ridge South (on which there are a variety of other dominant species). Average cover of sagebrush has displayed no net increase (**Figure 5.19**). Average preferred browse demographic data shows that the communities on these sites are primarily composed of mature individuals and that densities have remained relatively stable. Decadence has remained low over the course of the sample period and has generally decreased over time. Recruitment of young sagebrush has generally increased and was considered to be high in 2024. Much of the increase is likely driven by increases on East Mountain, Rocky Hollow, and Box-Cayon Sage Grouse (**Figure 5.36**). Overall utilization of preferred browse has generally increased over time when the 1994 sample year is taken into consideration; however, a more accurate representation of the trend would be to consider the data beginning with the 1999 sample year. Since 1999, overall utilization has decreased, although this could be attributed to the lack of utilization on Rolfson Reservoir (**Figure 5.42**).

Tree cover for these sites is provided by Utah juniper (*Juniperus osteosperma*), Rocky Mountain juniper (*J. scopulorum*), and trees other than twoneedle pinyon (*Pinus edulis*) and juniper. Average tree juniper cover has decreased since 2009, which is in part due to the data being averaged across different numbers of sites each year. However, site-level data shows that tree cover has also decreased on most study sites between 2009 and 2024. The exceptions to this are the Huntington Canyon and North Manti Face studies, on which tree cover has slightly increased overall (**Figure 5.26**). The density of trees has also decreased since 2009. As with cover, the decreasing trend can be attributed to varying sample numbers from year to year and actual decreases on some sites (**Figure 5.31**).

Herbaceous Understory: The herbaceous understories of these sites are mostly abundant and moderately diverse. The higher-elevation sites display more diversity in the forb and grass components; introduced perennial grasses dominate the Rolfson Reservoir, Box Canyon Sage-Grouse, and Dairy Fork Burn studies. Total average cover increased between 1999 and 2019 primarily due to perennial grasses, but it then decreased in 2024 due to a decrease in annual forbs. Nested frequency appears to have remained relatively stable overall since 1999 with some fluctuation from year to year. This yearly variability is primarily due to larger shifts in the annual grass and forb communities. Again, the differing number of studies sampled from year to year may affect the portrayal of the overall trend (**Figure 5.49**, **Figure 5.55**).

Occupancy: Since 2004, average pellet transect data shows that animal presence on these sites has generally decreased and that deer and elk are the primary occupants. Mean abundance of deer pellet groups has varied from 50 days use/acre in 2004 to 32 days use/acre in 2009. Mean abundance of elk pellet groups has ranged between 15 days use/acre in 2014 and 41 days use/acre in 2004. Cattle presence has fluctuated between 1 days use/acre in 2014 and nearly 14 days use/acre in 2019. Horse pellet groups have been absent to low; mean abundance was under 1 days use/acre in 2004 and 2009 (**Figure 5.60**).

Mountain (Shrub)

There are 10 studies [Dry Creek Chaining (16B-04), East Dairy Fork (16B-07) (suspended), Starvation Mountain Brush (16B-09), Willow Creek (16C-02), Above South Hollow (16C-11), Trail Mountain Exclosure (16C-19), North Horn Cap (16C-21) (suspended), South Horn Exclosure (16C-24), Joes Valley Overlook (16C-37), and North Horn (16C-44)] that are classified as Mountain (Shrub) ecological sites. Dry Creek Chaining can be found north of Dry Creek and approximately one- and one-half miles east of US-89. The East Dairy Fork site is located south of US-6 near the head of East Dairy Fork, while Starvation Mountain Brush is situated on Starvation Mountain. The Above South Hollow site can be found on Mayfield Mountain above South Hollow. Trail Mountain Exclosure is located on Trail Mountain and roughly two miles east of Joes Valley Reservoir, and North Horn Cap is just south of The Cap of North Horn Mountain. The South Horn Exclosure study can be found on South Horn Mountain, and Joes Valley Overlook is situated on the southern portion of Trail Mountain above Straight Canyon. Finally, the North Horn study site is located on North Horn Mountain north of The Cap.

When discussing the data for these study sites, it is important to note the differing number of study sites sampled from year to year (the ‘n’ value) and consider the implications that this may have on the data and associated discussions. More specifically, the North Horn Cap study provided data between 1994 and 1999, while East Dairy Fork was only sampled in 2004. The North Horn site has contributed data since 2004. The Willow Creek, Dry Creek Chaining, Starvation Mountain Brush, and Above South Hollow studies have provided data since 1999. Finally, Trail Mountain Exclosure, South Horn Exclosure, and Joes Valley Overlook have datasets that span all sample years since 1994.

Shrubs/Trees: The shrub components on these study sites are generally dominated by a mixture of preferred browse species including mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), alderleaf mountain mahogany (*Cercocarpus montanus*), mountain snowberry (*Symphoricarpos oreophilus*), and Utah serviceberry (*Amelanchier utahensis*), among others. Total average shrub cover has decreased overall. However, this decreasing trend was driven by an initial decrease between 2004 and 2009. Furthermore, site-level data indicates that this initial decrease can mainly be attributed to the data being averaged across four additional study sites (Willow Creek, Dry Creek Chaining, Starvation Mountain Brush, and Above South Hollow) in 2009. When comparing 2009 with 2024 data, total average shrub cover has slightly increased due to preferred browse other than serviceberry-mahogany (**Figure 5.21**). Average preferred browse density has slightly decreased overall since 1994. The same study sites have only been sampled each year since 2004, however, and preferred browse has slightly increased over that time. Mature plants have been the dominant demographic throughout the study period. In addition, decadence and recruitment of young have remained low over time (**Figure 5.38**). Average preferred browse utilization has fluctuated from year to year, but it has decreased each sample year since 2014. In 2024, 16% of preferred browse plants were moderately hedged, and 14% showed signs of heavy utilization (**Figure 5.44**).

Trees sampled on these study sites include twoneedle pinyon (*Pinus edulis*), Utah juniper (*Juniperus osteosperma*), and/or Rocky Mountain juniper (*J. scopulorum*), among others. Both tree cover and density increased in 2009 with the inclusion of four additional studies. However, cover and density have decreased in the years since 2009 following tree reduction projects on select sites (**Figure 5.28**, **Figure 5.33**).

<u>Herbaceous Understory</u>: The herbaceous understories of these sites are robust and abundant with native and introduced perennial grasses as the dominant component. Average cover of the herbaceous understory has exhibited a notable increase over time, a trend primarily driven by perennial grasses. Average nested frequency has also increased overall. Perennial and annual forbs have been present with low to moderate abundance and cover throughout the sample period. Annual grasses have remained rare (**Figure 5.48, Figure 5.54**).

<u>Occupancy</u>: According to pellet transect data, average animal presence decreased notably between 2009 and 2014 but has since increased. Deer and/or sheep were the primary occupants of these sites in 2004, and mean pellet group abundance has ranged from 10 days use/acre in 2014 to 46 days use/acre in 2004. Elk have been the primary occupants in all other sample years, and average pellet group abundance has fluctuated between 22 days use/acre in 2019 and 52 days use/acre in 1999. Finally, cattle pellet groups have had an average abundance as low as 2.5 days use/acre in 2019 and as high as 14 days use/acre in 2009 (**Figure 5.59**).

Mountain (Curlleaf Mountain Mahogany)

Three studies [Starvation Mahogany (16B-08), Scab Hollow (16C-29), and Upper Hole Trail (16C-30)] are classified as Mountain (Curlleaf Mountain Mahogany) ecological sites. The Starvation Mahogany study is located on Starvation Mountain, and the Scab Hollow site can be found above Muddy Creek in Scab Hollow. The Upper Hole Trail study site is situated between Sage Flat and South Sage Flat.

When discussing the data in this section, one should note that the Scab Hollow and Upper Hole Trail sites have provided data for all sample years since 1994, while Starvation Mahogany has contributed data since 1999.

<u>Shrubs/Trees</u>: These study sites are dominated by a mixture of preferred browse species such as curl-leaf mountain mahogany (*Cercocarpus ledifolius*), mountain snowberry (*Symphoricarpos oreophilus*), alderleaf mountain mahogany (*C. montanus*), and/or Utah serviceberry (*Amelanchier utahensis*), among others. Total average shrub cover has increased overall, primarily due to preferred browse species other than curl-leaf mountain mahogany (**Figure 5.22**). Average preferred browse density has remained similar over time with mature plants as the dominant demographic in all sample years. Both decadence within and recruitment of young individuals into the browse communities have remained low in comparison with the density of mature plants (**Figure 5.39**). Average utilization of preferred browse has remained low throughout the sample period despite yearly fluctuations. Only 7% of preferred browse plants were moderately hedged and 5% were heavily browsed in 2024 (**Figure 5.45**).

Twoneedle pinyon (*Pinus edulis*) and Rocky Mountain and/or Utah juniper (*Juniperus scopulorum* and/or *J. osteosperma*) have been observed on these study sites. Average tree cover has remained low and stable since 2004 (**Figure 5.29**). Average tree density has increased overall but is low as of 2024 (**Figure 5.34**).

<u>Herbaceous Understory</u>: The herbaceous understories of these study sites have remained dominated by mainly native perennial grass species such as saline wildrye (*Leymus salinus*), bluebunch wheatgrass

(*Pseudoroegneria spicata*), and/or western wheatgrass (*Pascopyrum smithii*), among others. Total average herbaceous cover has increased overall when comparing 1994 with 2024 data, while average nested frequency has remained stable. The introduced perennial grass species bulbous bluegrass (*Poa bulbosa*) has been observed on the Starvation Mahogany study since 2019, but with very low cover and abundance. Perennial forbs have been present with moderate cover and frequency throughout the sample period and have been primarily comprised of native species. Annual forbs and grasses have remained rare in most years (**Figure 5.48**, **Figure 5.54**).

Occupancy: Average pellet transect data shows that animal presence increased through 2009, but that it has notably decreased since that time. Elk were the primary occupants of these study sites from 1999 through 2019, and mean elk pellet group abundance has ranged from 6 days use/acre in 2024 to 71 days use/acre in 2009. Cattle were the main occupants in 2024, with an average pellet group abundance as low as 3 days use/acre in 2014 and as high as 12 days use/acre in 1999. Finally, average deer pellet group abundance has fluctuated between 5 days use/acre in 2014 and 25 days use/acre in 2004 (**Figure 5.59**).

Mountain (Black/Low Sagebrush)

There are six studies [Hardscrabble (16B-16) (suspended), West Huntington Canyon (16C-13) (suspended), North Horn Rock Canyon (16C-22), Box Canyon Knolls (16C-31), South Sage Flat (16C-34), and Wildcat Knolls (16C-35)] that are classified as Mountain (Black/Low Sagebrush) ecological sites. The Hardscrabble site is located on the south-facing slopes above Spring Canyon, and West Huntington Canyon can be found in Huntington Canyon near the mouth of Crandall Canyon. The North Horn Rock Canyon site is situated on a bench south of North Horn Mountain and north of Rock Canyon. The Box Canyon Knolls study can be found on a plateau top west of White Mountain and south of Flagstaff Peak. South Sage Flat is located above Muddy Creek on South Sage Flat. Finally, the Wildcat Knolls study site is just south of Wildcat Knolls.

Consideration should be given to the varying number of study sites sampled each year (the 'n' value) and the relevant implications that this may have on the data. More specifically, the Hardscrabble study only provided data for the 1994 and 1999 sample years, while West Huntington Canyon contributed data between 1994 and 2014. North Horn Rock Canyon, Box Canyon Knolls, South Sage Flat, and Wildcat Knolls provide data for all sample years since 1994.

Shrubs/Trees: The dominant preferred browse species on these Upland (Big Sagebrush) ecological sites have been either black sagebrush (*Artemisia nova*) or mountain big sagebrush (*A. tridentata* ssp. *vaseyana*). Lesser amounts of other browse are also present depending on the site; these other preferred browse species include prairie sagewort (*A. frigida*), Utah serviceberry (*Amelanchier utahensis*), and/or antelope bitterbrush (*Purshia tridentata*). Average cover of preferred browse has generally increased and was at a high in 2019. The increase in cover between 2014 and 2019 can largely be attributed to the suspension of the West Huntington Canyon study, which had the least amount of preferred browse cover of the five sites sampled in 2014 (**Figure 5.20**). Preferred browse demographic data shows that the communities on these sites are primarily composed of mature individuals and that decadence has decreased overall since 1999. There has generally been an increase in density since 1999; however, overall average density has decreased since 2009 (**Figure 5.37**). Utilization of preferred browse has increased over time, and use has mostly been considered to be moderate. However, the proportion of heavy utilization has increased since 2014 and may indicate an increase in demand for forage (**Figure 5.43**). It should be noted that there are differences in the number of studies sampled starting in 2019 (the 'n' values), which make it difficult to determine trends.

Trees are rare on these sites. Any trends in cover and density are driven by the North Horn Rock Canyon and West Huntington Canyon study sites; however, the West Huntington Canyon site has been suspended since 2014. The North Horn Rock Canyon study was treated by bullhog in 2016 and is responsible for the decrease in both cover and density following the 2014 sample year (**Figure 5.27**, **Figure 5.32**).

Herbaceous Understory: The herbaceous understories of these sites share similar conditions. Perennial grasses are the dominant life form in these herbaceous communities. Perennial grasses have fluctuated in nested frequency from year to year, but they have mostly been stable overall. Average cover of perennial grasses has fluctuated more drastically than nested frequency; however, there has been a slight decrease in average cover. The varying number of studies sampled from year to year may have implications on data interpretation and may not fully portray the overall trend. Average nested frequency of perennial forbs has exhibited some fluctuations over the study period, but there has been no net change in nested frequency. Average perennial forb cover has had no net increase over time. Most of the sites are dominated by native species except for the North Horn Rock Canyon site, which had cheatgrass (*Bromus tectorum*) establish in 2019 (**Figure 5.49**, **Figure 5.55**).

Occupancy: Average pellet transect data shows fluctuations, yet an overall decreasing trend in animal presence. Elk are the primary occupants of these sites, and presence has varied from a low of 30 days use/acre in 2014 to a high of 88 days use/acre in 1998. Mule deer pellet group abundance has varied from a low of 3 days use/acre in 2009 to a high of 16 days use/acre in 2004. Cattle presence on these sites has fluctuated, ranging in mean abundance from 4 days use/acre in 2014 to over 17 days use/acre in 2019 (**Figure 5.60**).

Upland (Big Sagebrush)

Sixteen studies [Hilltop (16B-11), Slackpile (16B-17), North Spring Bench (16B-19), Wire Grass Bench (16B-24), Cane Valley (16C-05), Pole Canyon Chaining (16C-08), Manti Dump (16C-12), Black Dragon (16C-23), Dry Mountain (16C-26), Birch Creek Chaining (16C-27), Cove Creek (16C-39), Cedar Mountain (16C-40), Olsen Canyon (16C-45), White Hill (16C-47), North Slackpile (16R-06), and Gordon Creek Burn (16R-10) (suspended)] are classified as Upland (Big Sagebrush) ecological sites. Hilltop can be found north of the town of Fairview and just east of US-89. The Slackpile study site is located south of Wildcat Canyon on the Gordon Creek WMA, while the North Spring Bench study is situated south of North Spring Canyon on North Spring Bench. The Wire Grass Bench site can be found west of the city of Price on Wiregrass Bench. The Cane Valley site is situated east of Ephraim in Cane Valley. Pole Canyon Chaining is just south of Mayfield Mountain. The Manti Dump study site is located just north of Sixmile Canyon on the Six-Mile WMA, while Black Dragon is situated above Ferron Canyon and west of Black Dragon Creek. The Dry Mountain site is above Slide Hollow on Dry Mountain. Birch Creek Chaining can be found east of Millsite Reservoir on the lower slopes of Little Nelson Mountain, while Cove Creek is located just north of Cove Creek in Sanpete Valley. The Cedar Mountain study is situated east of the town of Salina on Cedar Mountain. The Olsen Canyon site is located near the mouth of Olsen Canyon on the Twelve-Mile WMA, and the White Hill study site is situated north of Pigeon Hollow on the White Hill WMA. North Slackpile can be found south of Wildcat Canyon and east of Cedar Bench. Finally, the Gordon Creek Burn study site is located just north of South Fork Gordon Creek on the Gordon Creek WMA.

When discussing the data for these study sites, it is important to note the variation in the number of sites sampled each year (the ‘n’ value) and consider the implications that this may have on the data and associated discussions. The Gordon Creek Burn study provided data between 1999 and 2009, and Olsen Canyon has been sampled since 2009. The White Hill site has provided data since study establishment in 2019. Cane Valley, North Slackpile, Pole Canyon Chaining, Hilltop, Manti Dump, Cove Creek, and Cedar Mountain have contributed data since 1999. Finally, the Slackpile, North Spring Bench, Black Dragon, Wire Grass Bench, Dry Mountain, and Birch Creek Chaining studies have datasets spanning all sample years since 1994.

Shrubs/Trees: The primary browse species present on most of these Upland (Big Sagebrush) ecological sites are mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), but a few sites have Wyoming big sagebrush (*A. tridentata* ssp. *wyomingensis*). Additional preferred browse species are present and include Utah serviceberry (*Amelanchier utahensis*), antelope bitterbrush (*Purshia tridentata*), and black sagebrush (*Artemisia nova*). Since 2009, average sagebrush cover has increased slightly; average cover of other preferred browse species decreased between 2009 and 2014. This decrease is likely the result of site suspension of Gordon Creek Burn (**Figure 5.19**). Preferred browse demographic data shows that the communities are primarily comprised of mature individuals with decadence remaining stable in the overall population. Recruitment of young plants to the overall preferred browse communities has been highly variable. Recruitment was at its lowest in 2004, which correlates with a climate period of extreme drought. Overall preferred browse density has generally had no net increase since 1999 (**Figure 5.36**). Preferred browse utilization has fluctuated from year to year, but there was a notable increase in 2014 and 2019. Overall utilization for this potential has been widespread and heavy (**Figure 5.42**).

Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) have been sampled on these sites, but juniper has been the driver for average tree cover and density trends. Average juniper cover increased between 2009 and 2019. However, cover had a notable decrease between 2019 and 2024 associated with bullhog and lop and scatter treatments on the respective Manti Dump and Pole Canyon Chaining studies (**Figure 5.26**). Average tree density follows a similar trend to cover and is primarily driven by the removal of juniper. More specifically, the decrease in density between 2014 and 2019 is due to a bullhog treatment on the Hilltop study. Overall density of pinyon has remained stable from year to year (**Figure 5.31**).

Herbaceous Understory: The herbaceous understories for sites of this potential are primarily composed of a mixture of native and non-native perennial grasses. There has been a steady increase in perennial grass cover since 1999. Annual grasses and forbs are not a dominant component; however, there was a notable increase in these lifeforms in 2019 that correlates with a wet spring of the same year. Average nested frequency for most herbaceous components has remained stable since 1999, but annual grasses have had the most variability. Overall nested frequency correlates closely to climatic conditions. The most notable decrease in overall average nested frequency occurred in 2004 when there was a prolonged drought that lasted a few years. In contrast, a notable increase in overall nested frequency occurred in 2019 after a wet spring (**Figure 5.1b, Figure 5.2b, Figure 5.3b, Figure 5.51**, **Figure 5.57).**

Occupancy: Since 2004, average pellet transect data displays fluctuations in animal presence and indicates that deer are the primary occupants of these sites. The mean abundance of deer pellet groups has been as low as 24 days use/acre in 2014 and as high as 67 days use/acre in 2009. Mean abundance of elk pellet groups has ranged between 10 days use/acre in 2024 and 24 days use/acre in 2004. Cattle pellet groups have had a mean abundance ranging from 4 days use/acre in 2014 to 8 days use/acre in 1999 (**Figure 5.62**).

Upland (Shrub)

There are four studies [Red Point (16C-14), Middle Mountain (16C-17), South of Dry Wash (16C-28), and Danish Bench (16C-36)] that are considered to be Upland (Shrub) ecological sites. The Red Point study is located west of the town of Huntington and north of Red Point. The Middle Mountain site is situated north of Joes Valley Reservoir on Middle Mountain, and the South of Dry Wash study site can be found south of Dry Wash and northeast of Nelson Mountain. Finally, Danish Bench is north of the towns of Orangeville and Castle Dale on Danish Bench.

Shrubs/Trees: The preferred browse components on these studies are dominated by different species including black sagebrush (*Artemisia nova*), alderleaf mountain mahogany (*Cercocarpus montanus*), and/or Mormon tea (*Ephedra viridis*), among others. Total average shrub cover has exhibited yearly fluctuations but has remained similar when 2004 and 2024 data are compared. Average cover data also shows that a majority of the shrub cover on these sites has been contributed by preferred browse species other than Utah serviceberry (*Amelanchier utahensis*) or mountain mahogany (*Cercocarpus* spp.) (**Figure 5.21**). Average preferred browse density has increased over the sample period, a trend mainly driven by sagebrush species (*Artemisia* spp.) and longflower rabbitbrush (*Chrysothamnus depressus*) on the Middle Mountain study. The preferred browse populations on these sites have mainly been comprised of mature individuals, and decadence has remained low. The recruitment of young plants has increased overall, but it has also remained low in comparison with density of mature individuals (**Figure 5.38**). Average utilization of preferred browse species has increased over time, and more than 50% of preferred browse plants were moderately to heavily hedged in 2014 and 2024. In 2024 specifically, 23% of plants showed signs of moderate use, and 44% were heavily browsed (**Figure 5.44**).

Twoneedle pinyon (*Pinus edulis*), Utah juniper (*Juniperus osteosperma*), and/or Rocky Mountain juniper (*J. scopulorum*) have been observed on these study sites. Total average tree cover has decreased each sample year due to various tree-reduction projects; the decrease in tree cover between the two most recent years can be attributed to a 2020 lop and scatter project on the South of Dry Wash study (**Figure 5.28**). Average tree density has also decreased, with juniper being more abundant than pinyon in 2024 (**Figure 5.33**).

Herbaceous Understory: Perennial grasses comprise much of the herbaceous understories on these sites. The introduced species crested wheatgrass (*Agropyron cristatum*) provides much of the perennial grass cover on the Danish Bench and Red Point studies, while native species contribute the same on South of Dry Wash and Middle Mountain. Total average herbaceous cover and nested frequency have varied from year to year, but they have remained similar when comparing 1994 with 2024 data. Perennial forbs have been observed in all years with low cover and abundance. Annual forbs have also been sampled with low abundance and cover in most years: the exception to this is 2019, when average annual forb cover was nearly 8%. The introduced annual grass species cheatgrass (*Bromus tectorum*) has been present in past sample years with very low cover and abundance, but was not observed in 2024 (**Figure 5.51**, **Figure 5.57**).

Occupancy: Average animal presence has fluctuated from year to year, decreasing between 1994 and 2014 and increasing since that time. Mule deer and/or domestic sheep were the primary occupants of these study sites in 2014, and average pellet group abundance has been as low as 12 days use/acre in 2019 and as high as 41 days use/acre in 1999. Elk have been the primary occupants in all other sample years, with a mean pellet group abundance ranging from 8 days use/acre in 2014 to 45 days use/acre in 1999. Finally, average abundance of cattle pellet groups has fluctuated between 0.4 days use/acre in 2009 and 4 days use/acre in 2014 (**Figure 5.62**).

Upland (Black/Low Sagebrush)

Five study sites [Telephone Bench (16B-20), Poison Spring Bench (16B-22), Manti Face Chaining (16C-01), Black Hill (16C-06), and Mayfield Mountain Face (16C-07)] are classified as Upland (Black/Low Sagebrush) ecological sites. The Telephone Bench study is found on the western portion of Telephone Bench, while Manti Face Chaining is situated on the lower slopes of Manti Mountain face. The Black Hill study is located just northeast of the city of Ephraim on Black Hill. The Mayfield Mountain Face study site is situated south of the town of Mayfield on the face of Mayfield Mountain.

Consideration should be given to the varying number of study sites sampled each year (the 'n' value) and the relevant implications that this may have on the data. More specifically, Telephone Bench and Poison Spring Bench have contributed data for all sample years since 1994. The Manti Face Chaining, Black Hill, and Mayfield Mountain Face studies have provided data since 1999.

Shrubs/Trees: The primary browse species present on these Upland (Black/Low Sagebrush) ecological sites is black sagebrush (*Artemisia nova*), though Black Hill and Manti Face Chaining sites have contributed little to browse cover and density. Additional preferred browse species are present in small quantities and include fourwing saltbush (*Atriplex canescens*), alderleaf mountain mahogany (*Cercocarpus montanus*), and antelope bitterbrush (*Purshia tridentata*), among others. Since 2009, average cover of sagebrush has slightly increased (**Figure 5.20**). Preferred browse demographic data shows that these communities are primarily comprised of mature individuals with a moderate but generally increasing amount of decadence. There was a notable, temporary increase of young in 2009. Overall preferred browse density has increased since 1999 (**Figure 5.37**). Utilization of preferred browse has generally increased over time and has been considered to be mostly moderate. However, the proportion of heavy utilization has increased since 2014 and may indicate an increase in forage demand (**Figure 5.43**).

Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) have been sampled on these sites, but juniper has been the driver for average tree cover and density trends. Average juniper cover decreased between 2009 and 2014 due to tree reduction treatments, but cover has steadily increased in subsequent years (**Figure 5.27**). Average tree density follows a similar trend to cover and has primarily been provided by juniper, but some pinyons have been sampled in smaller amounts. Again, the decreasing trend in tree density between 2009 and 2014 can be accounted for by some of the tree-reducing treatments. However, juniper density has continued to increase, while average pinyon density has remained stable (**Figure 5.32**).

Herbaceous Understory: Perennial grasses have been the dominant herbaceous component in all years, although perennial forbs have also been increasing in dominance. Annual grasses have also increased since 1999. Average cover for all vegetation types has generally exhibited an increasing trend since 1999 with perennial grasses having the greatest increase. The most notable increase in average cover for all vegetation types (excluding perennial grasses) occurred in 2019, which may be related to the wet winter and spring of that year (**Figure 5.1b**, **Figure 5.2b**, **Figure 5.3b**, **Figure 5.51**, **Figure 5.57**).

Occupancy: Beginning in 2004, average pellet transect data has displayed fluctuations in animal presence and indicates that deer are the primary occupants of these sites. The mean abundance of deer pellet groups has been as low as 27 days use/acre in 2014 and as high as 86 days use/acre in 2009. Elk pellet groups have slightly decreased over time and mean abundance has ranged between 10 days use/acre in 2024 and 23 days use/acre in 2009. Cow pellet groups were observed in each sample year and considered to be low in abundance. Cattle presence has decreased over time, with average abundance ranging from 5 days use/acre in 2004 to less than 1 days use/acre in 2024 (**Figure 5.62**).

Semidesert (Big Sagebrush)

There are seven study sites [Porphyry Bench (16B-18), Consumer Bench (16B-23), Little Nelson Mountain (16C-33) (suspended), Price Pipeline South (16R-01) (suspended), Price Pipeline Native South (16R-02) (suspended), Price Pipeline Native North (16R-03) (suspended), and Price Pipeline North (16R-04) (suspended)] that are classified as Semidesert (Big Sagebrush) ecological sites. The Porphyry Bench study is situated above Pinnacle Canyon on the eastern portion of Porphyry Bench, while the Consumer Bench study is located just south of Garley Canyon on Consumer Bench. The Little Nelson Mountain site can be found west of Millsite Reservoir and just north of Little Nelson Mountain. The Price Pipeline South and Price Pipeline Native South studies are located just adjacent to a pipeline and east of Pinnacle Bench. Finally, the Price Pipeline Native North and Price Pipeline North studies are situated north of Pinnacle Canyon on Porphyry Bench.

Consideration should be given to the varying number of study sites sampled each year (the ‘n’ value) and the relevant implications that this may have on the data and associated discussions. The Price Pipeline South, Price Pipeline Native South, Price Pipeline Native North, and Price Pipeline North studies only contributed data in 1999 and 2004; Little Nelson Mountain provided data between 1994 and 2009. Finally, the Porphyry Bench and Consumer Bench studies have contributed data in all sample years since 1994.

Shrubs/Trees: The primary browse species present on these Semidesert (Big Sagebrush) ecological sites has been Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) since 2009. Additional preferred browse species have also been present on some sites and include Utah serviceberry (*Amelanchier utahensis*), forage kochia (*Bassia prostrata*), and winterfat (*Krascheninnikovia lanata*). Average cover of sagebrush decreased when the Little Nelson Mountain study was suspended after the 2009 sample year. Although not captured in this trend (sample years 1994-1999), Consumer Bench and Porphyry Bench both had a substantial population of sagebrush that decreased notably in cover over the course of the sample period. When this trend began in 2004, sagebrush cover was sampled at a much lower level on the Consumer and Porphyry Bench sites; any cover (<1%) of sagebrush sampled in 2019 and 2024 was from the remnant populations on these studies (**Figure 5.19**). Despite very low cover values for sagebrush on the Consumer and Porphyry Bench studies, preferred browse demographic data show a flush of young, preferred browse (forage kochia and winterfat) that are being recruited into the mature population as of 2024. Forage kochia and winterfat densities have increased substantially between 2014 and 2024 on the Consumer Bench and Porphyry Bench sites (**Figure 5.36**). Preferred browse utilization has fluctuated from year to year primarily due to changing ‘n’ values. Overall utilization has decreased from 31% in 2014 to 10% in 2024 with much of the utilization of these plants considered to be heavy (**Figure 5.42**).

Few Utah juniper (*Juniperus osteosperma*) and pinyon (*Pinus* spp.) trees have observed on sites of this potential; the Consumer Bench study is the main driver for tree trends. Tree cover has not been sampled and tree presence is only represented in density (**Figure 5.26**). Average tree density is primarily provided by juniper, but some pinyon has been observed. The decreasing trend in tree density between 2014 and 2019 was driven by a 2018 lop and scatter treatment on Consumer Bench (**Figure 5.31**).

Herbaceous Understory: Since 2009 (due to comparability in 'n' values), perennial grasses have been the dominant component in all years except for 2019, when annual grass and forbs were a co-dominant understory type. Average nested frequency for perennial grasses has decreased. Meanwhile, annual grasses have increased in abundance, but annual grasses have had the most variability. Average cover for all vegetation types has generally exhibited an increasing trend since 2009, though this trend is more pronounced when considering the 2014 to 2024 sample years. Most notable is the increase in average cover for all vegetation types (excluding perennial grasses) that occurred in 2019, which may be related to the wet winter and spring of that year (**Figure 5.1b**, **Figure 5.2b**, **Figure 5.3b**, **Figure 5.53**, **Figure 5.58**).

Occupancy: Average pellet transect data displays fluctuations in animal presence, which is related to the varying 'n' values from year to year. Deer are the primary occupants of these sites. The mean abundance of deer pellet groups has been as low as 17 days use/acre in 2004 and as high as 137 days use/acre in 2009. Pellet transect data for elk has ranged between 0 days use/acre in 2024 to 22 days use/acre in 1999. Cow pellet groups have had a mean abundance ranging from 2 days use/acre in 2009 to 10 days use/acre in 2019. Finally, horse pellet groups were sampled in 2004, but data showed an average abundance of less than 1 days use/acre for that year (**Figure 5.63**).

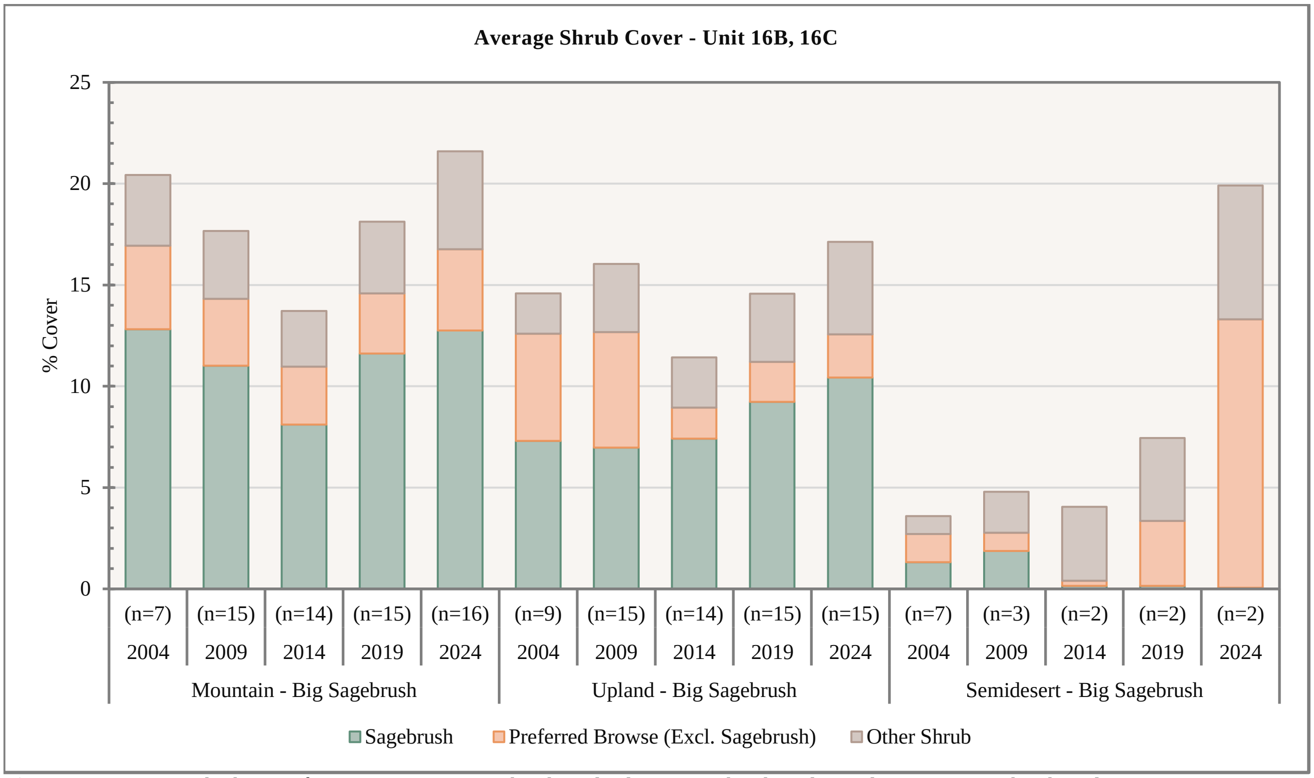


Figure 5.19: Average shrub cover for Mountain - Big Sagebrush, Upland - Big Sagebrush, and Semidesert - Big Sagebrush study sites in WMU 16B, 16C, Manti Central Mountains.

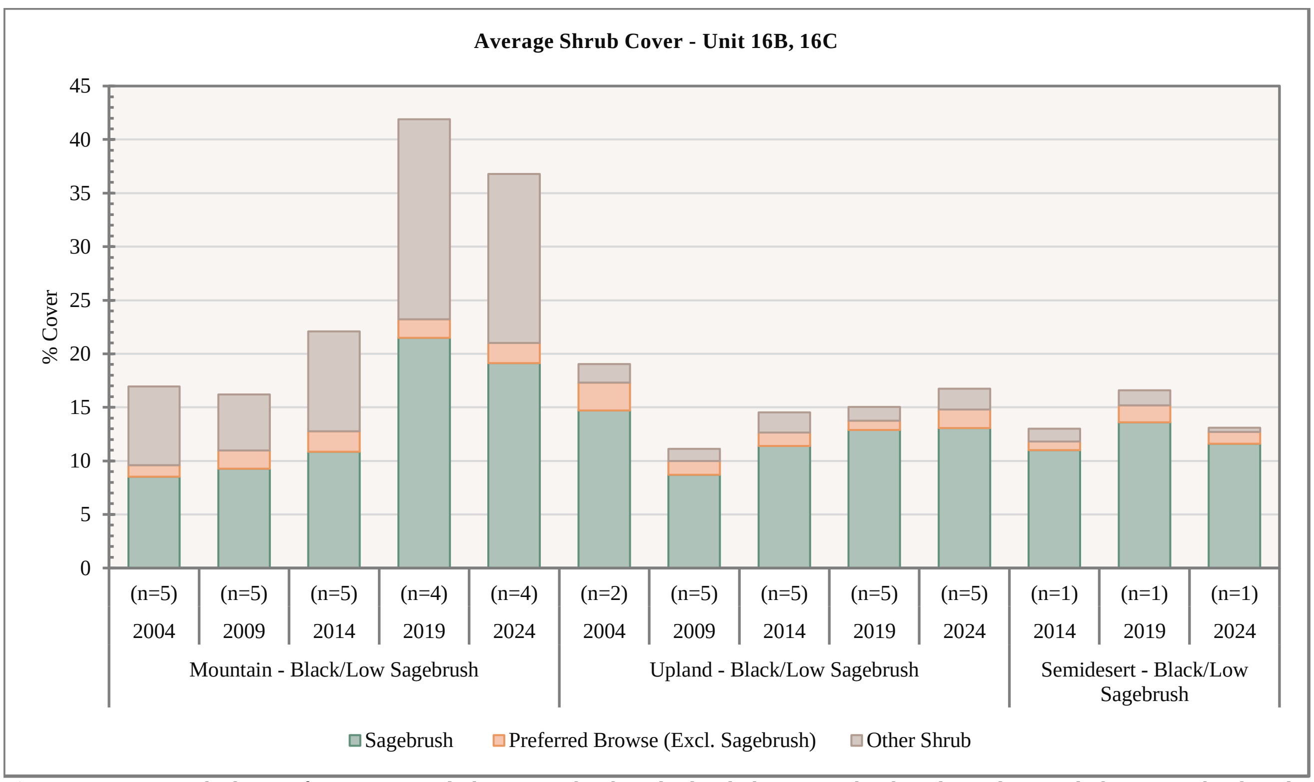


Figure 5.20: Average shrub cover for Mountain - Black/Low Sagebrush, Upland - Black/Low Sagebrush, and Semidesert - Black/Low Sagebrush study sites in WMU 16B, 16C, Manti Central Mountains.

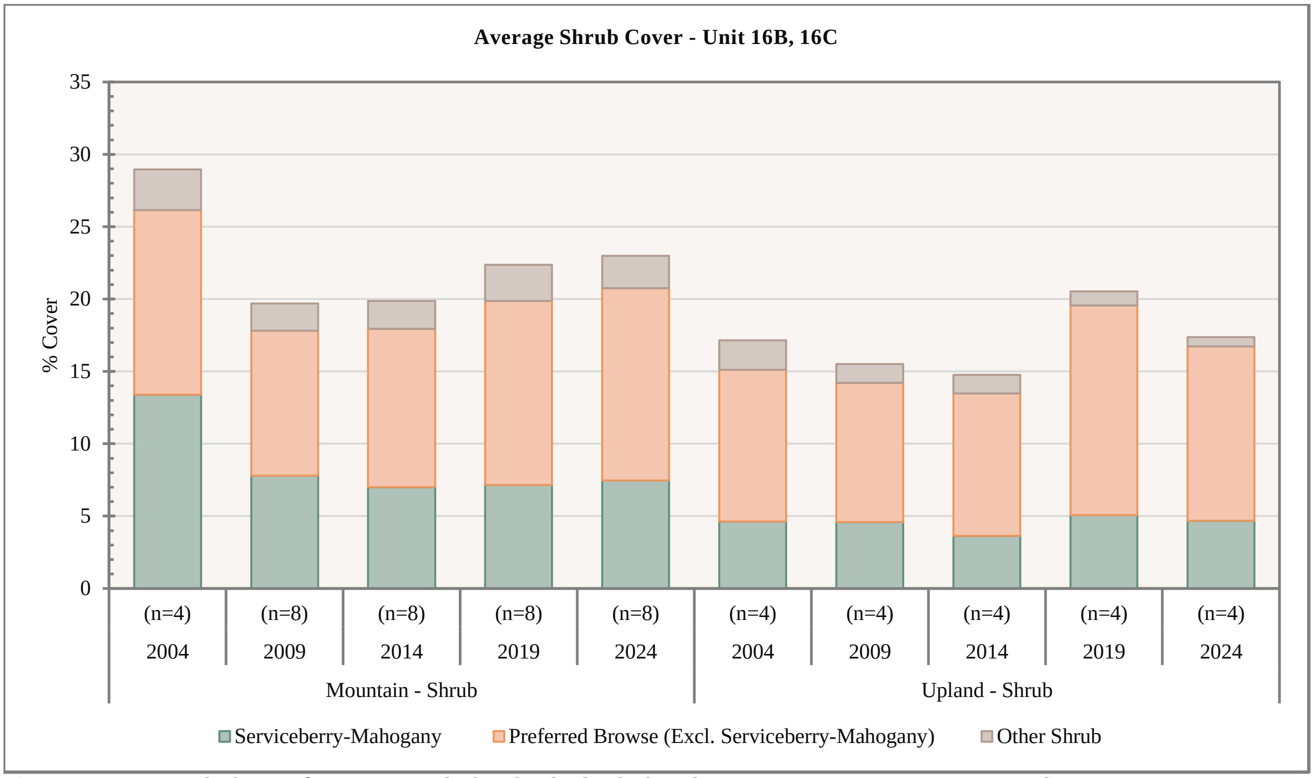


Figure 5.21: Average shrub cover for Mountain - Shrub and Upland - Shrub study sites in WMU 16B, 16C, Manti Central Mountains.

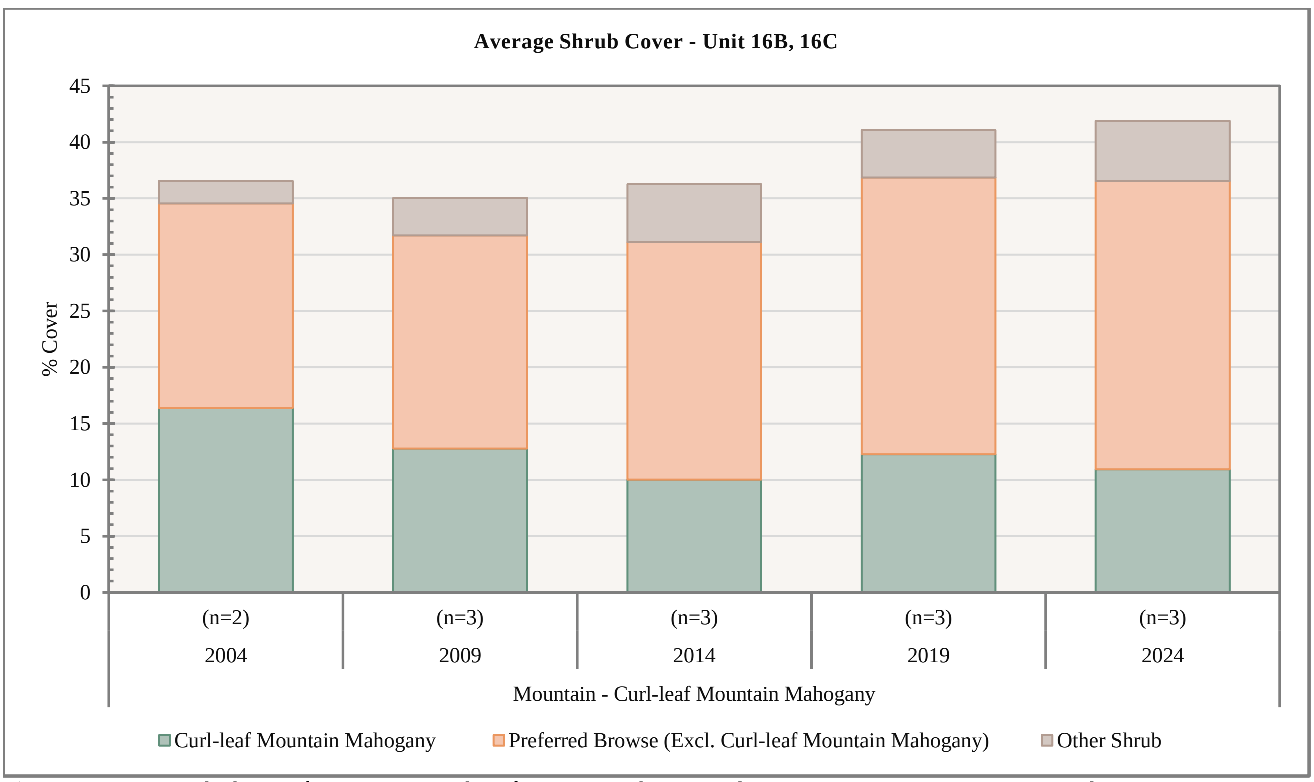


Figure 5.22: Average shrub cover for Mountain - Curl-Leaf Mountain Mahogany study sites in WMU 16B, 16C, Manti Central Mountains.

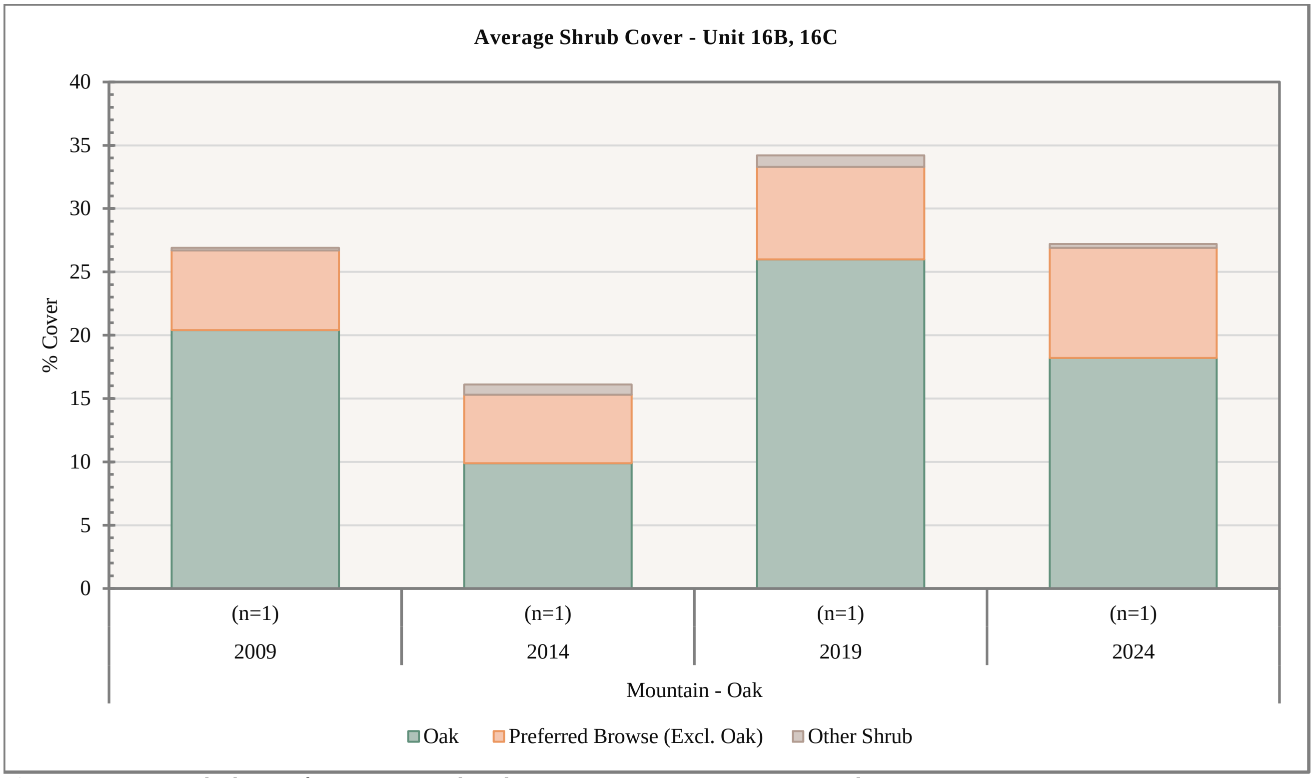


Figure 5.23: Average shrub cover for Mountain - Oak study sites in WMU 16B, 16C, Manti Central Mountains.

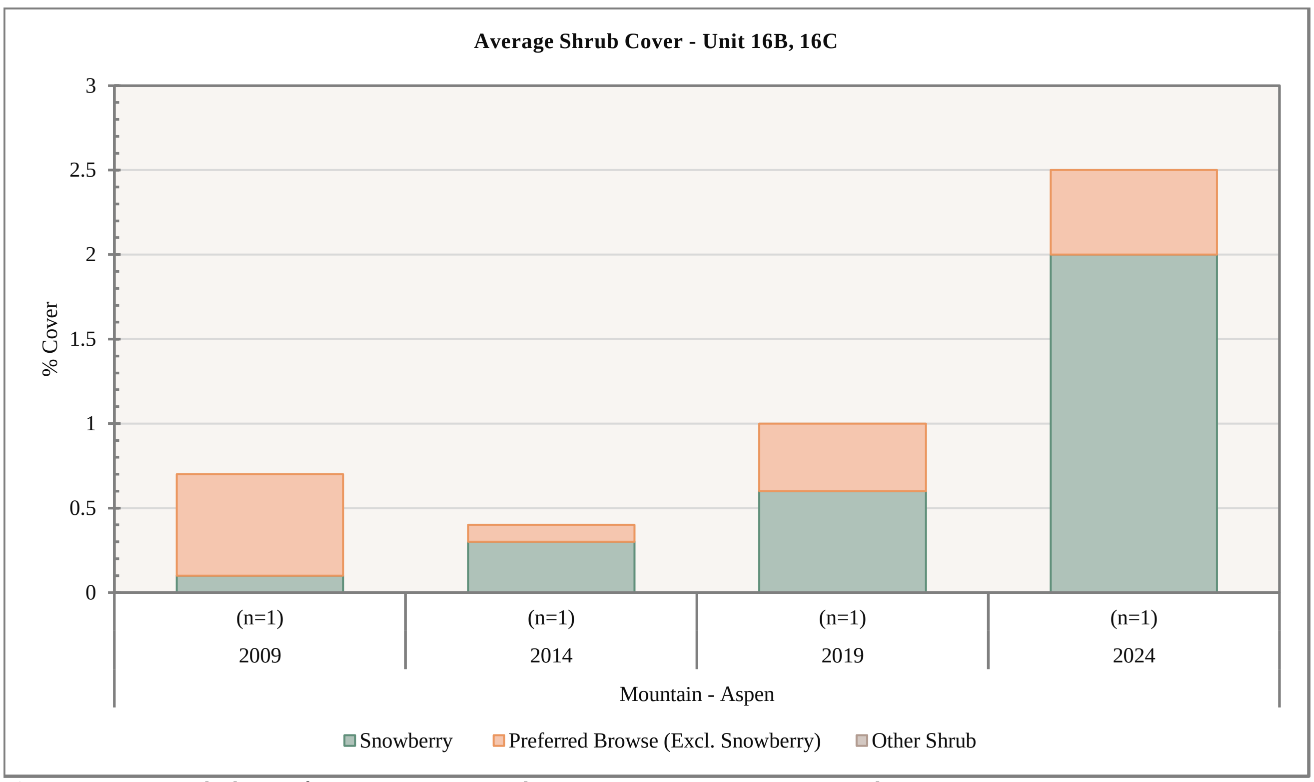


Figure 5.24: Average shrub cover for Mountain - Aspen study sites in WMU 16B, 16C, Manti Central Mountains.

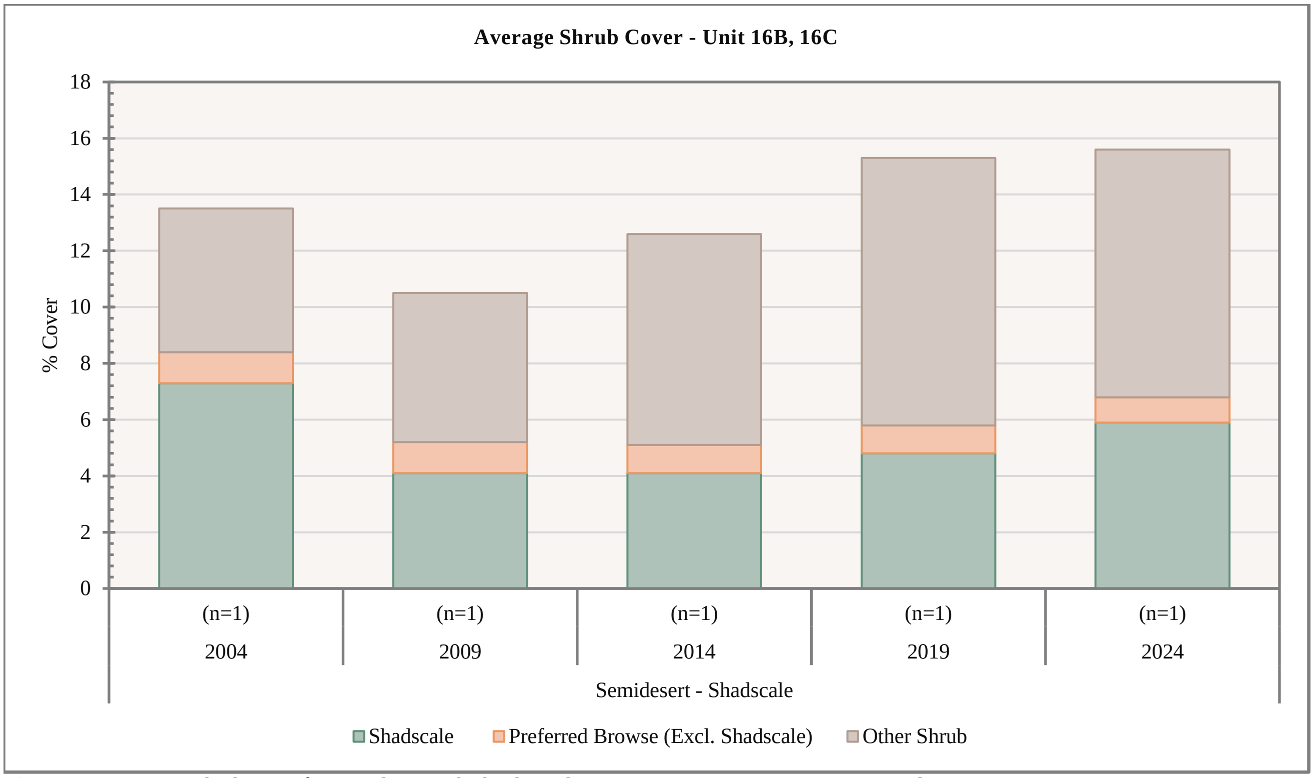


Figure 5.25: Average shrub cover for Semidesert - Shadscale study sites in WMU 16B, 16C, Manti Central Mountains.

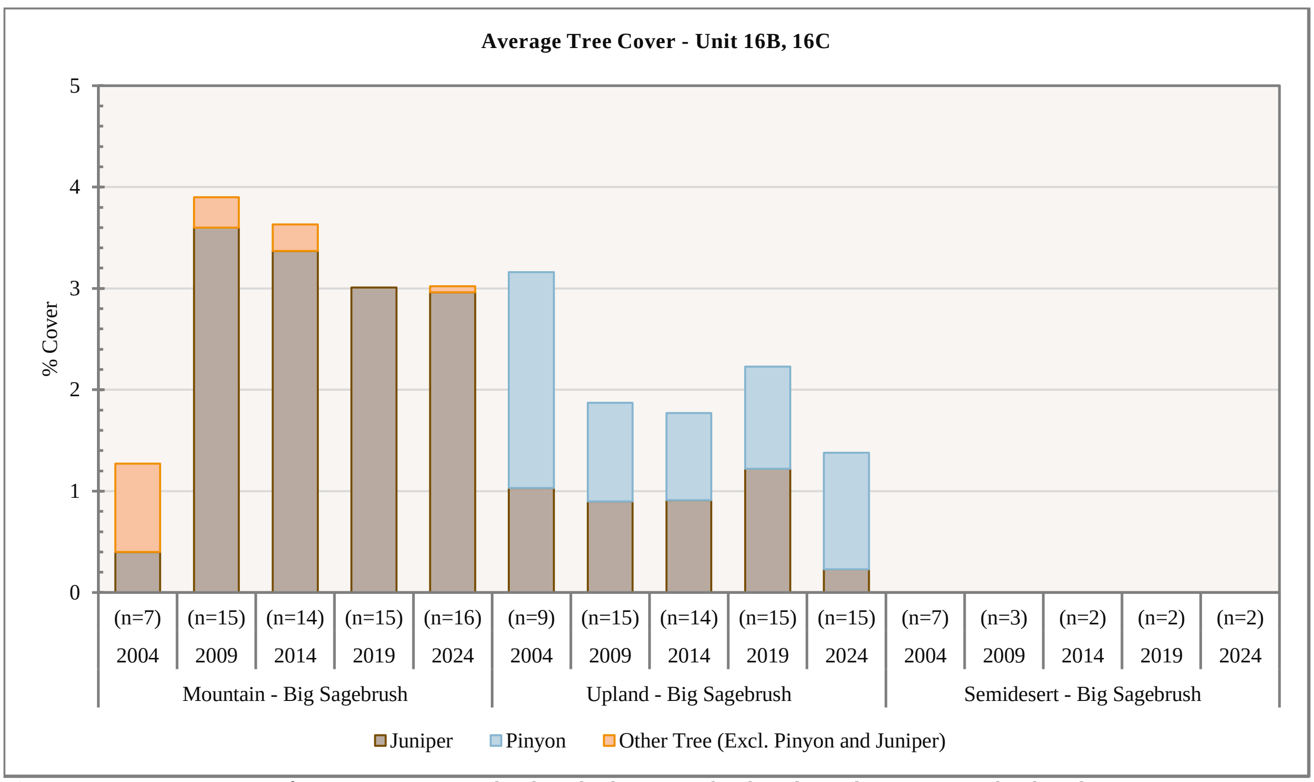


Figure 5.26: Average tree cover for Mountain - Big Sagebrush, Upland - Big Sagebrush, and Semidesert - Big Sagebrush study sites in WMU 16B, 16C, Manti Central Mountains.

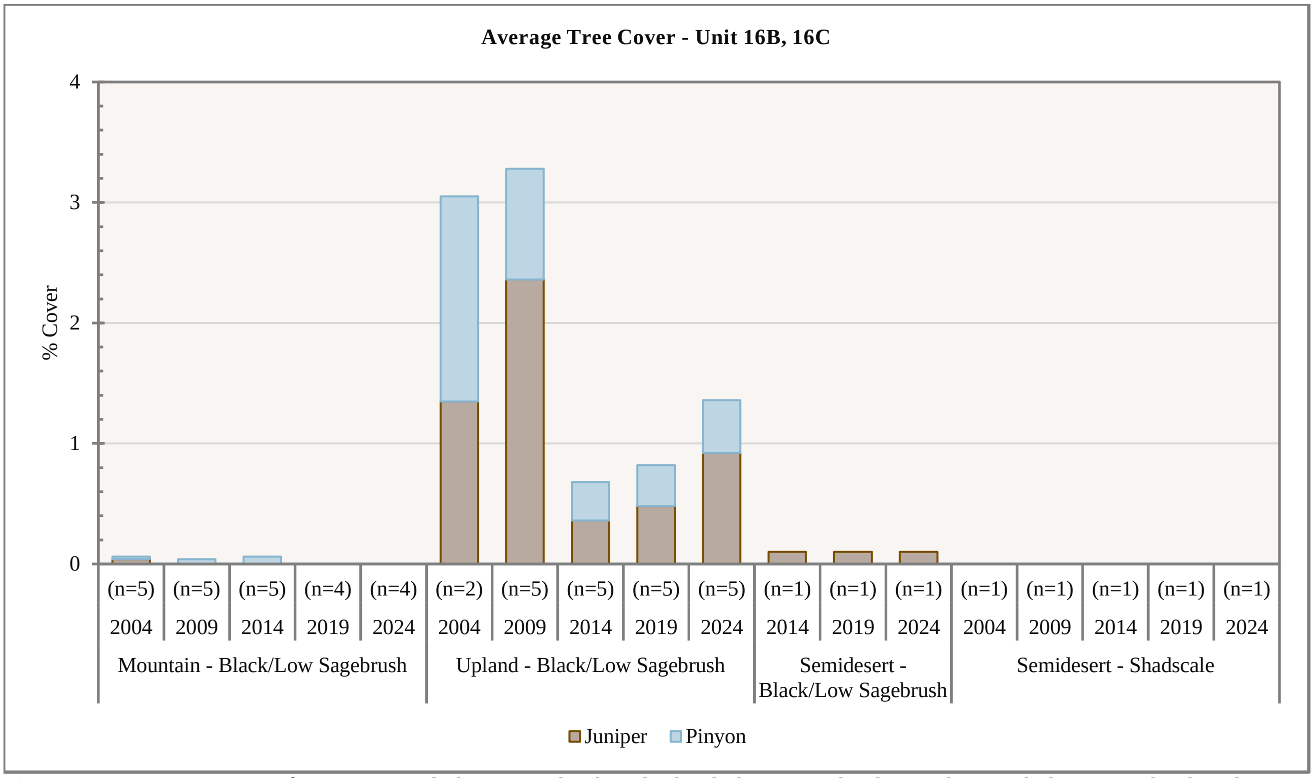


Figure 5.27: Average tree cover for Mountain - Black/Low Sagebrush, Upland - Black/Low Sagebrush, Semidesert - Black/Low Sagebrush, and Semidesert - Shadscale study sites in WMU 16B, 16C, Manti Central Mountains.

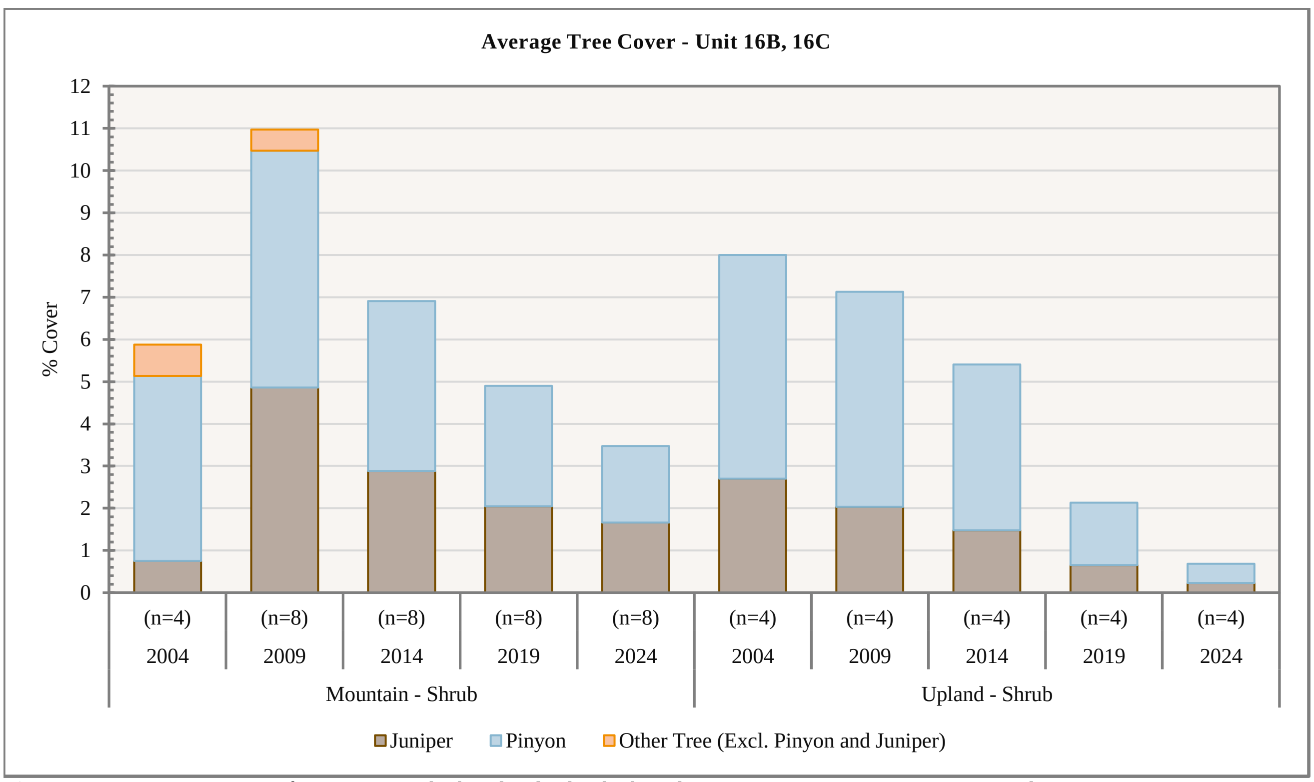


Figure 5.28: Average tree cover for Mountain - Shrub and Upland - Shrub study sites in WMU 16B, 16C, Manti Central Mountains.

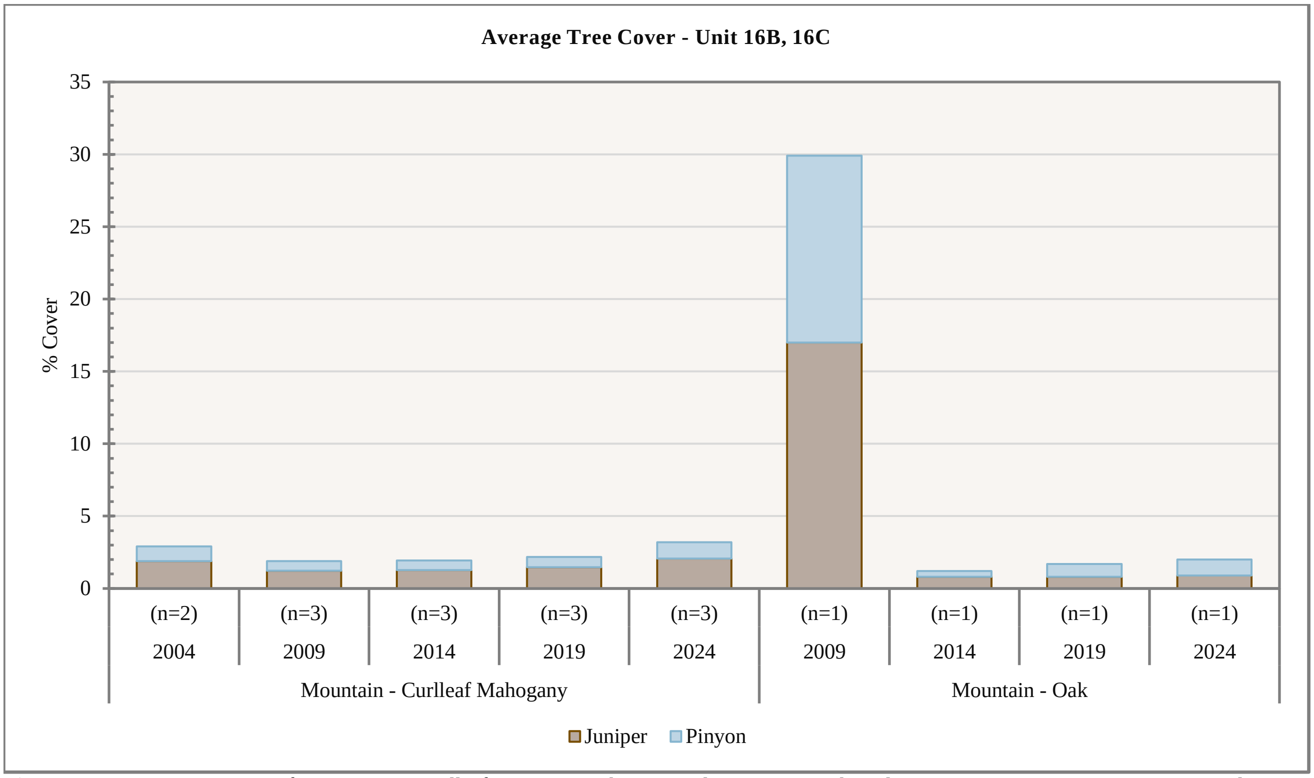


Figure 5.29: Average tree cover for Mountain - Curlleaf Mountain Mahogany and Mountain - Oak study sites in WMU 16B, 16C, Manti Central Mountains.

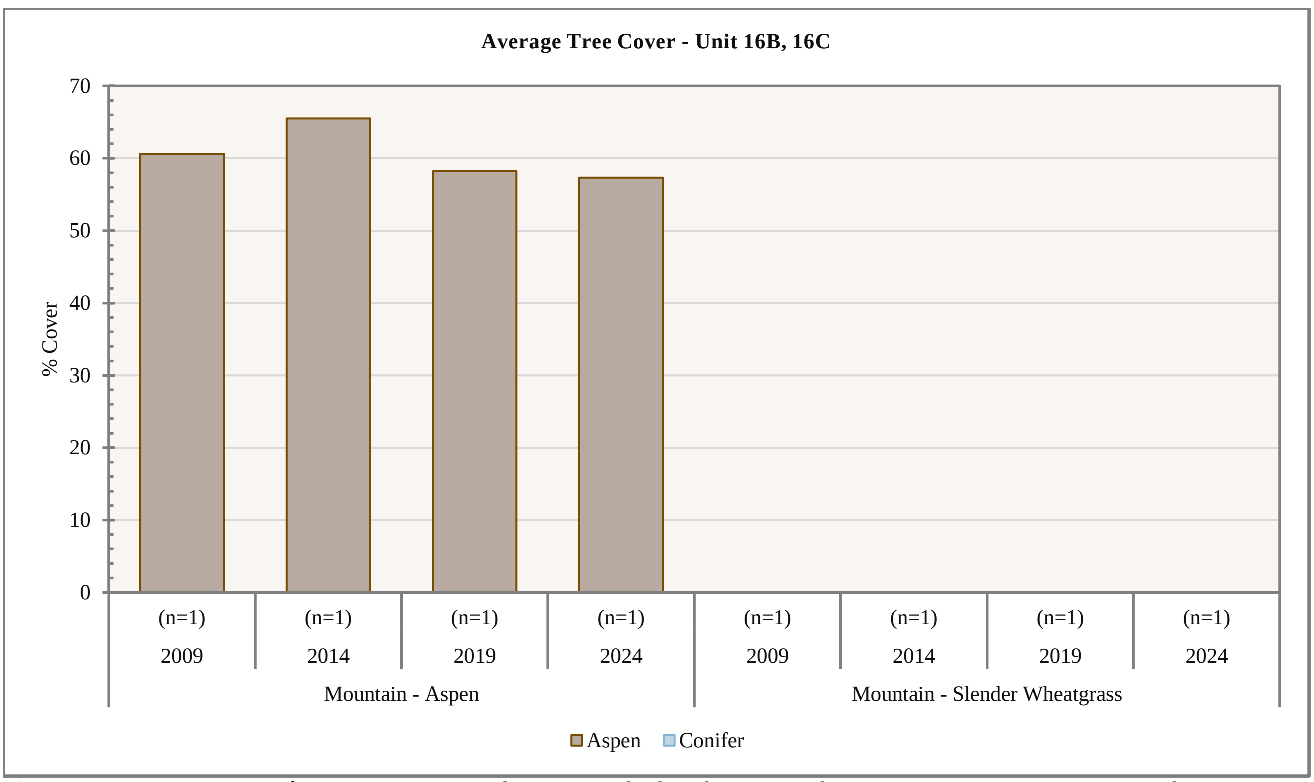


Figure 5.30: Average tree cover for Mountain - Aspen and Mountain - Slender Wheatgrass study sites in WMU 16B, 16C, Manti Central Mountains.

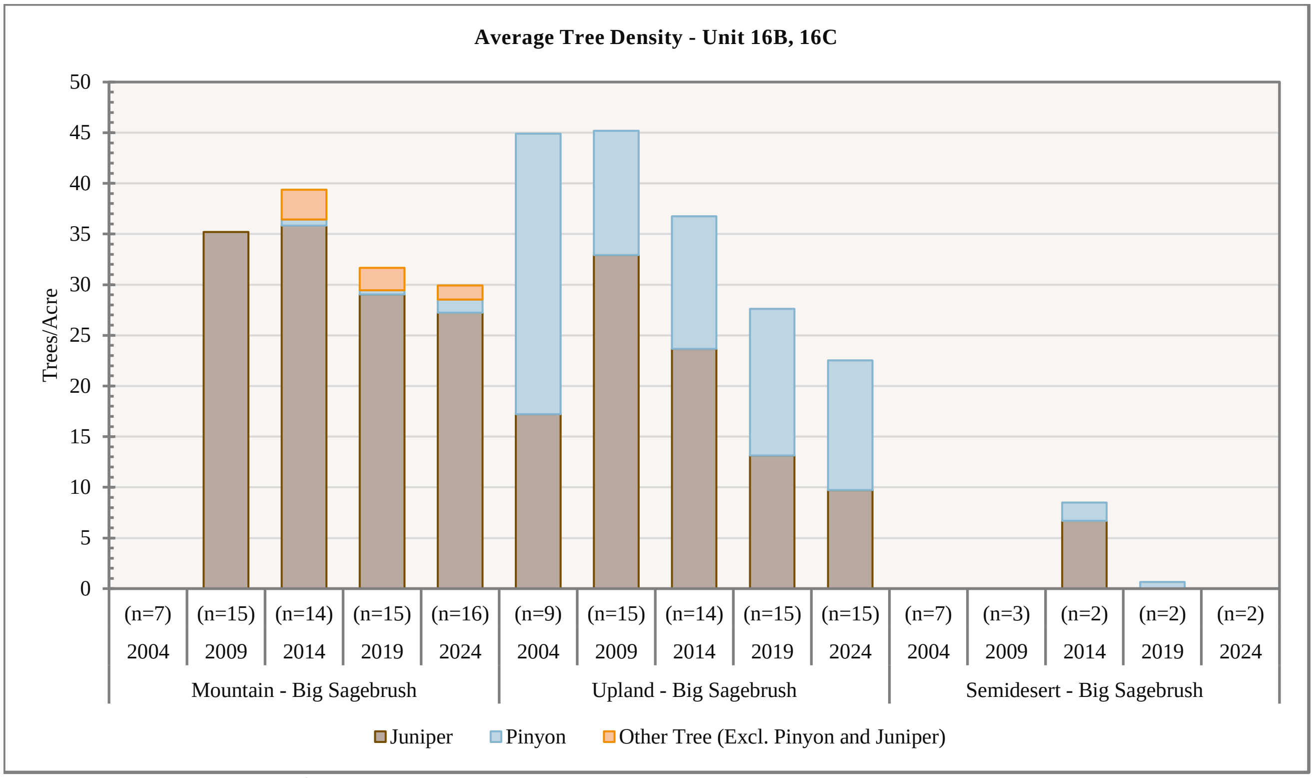


Figure 5.31: Average tree density for Mountain - Big Sagebrush, Upland - Big Sagebrush, and Semidesert - Big Sagebrush study sites in WMU 16B, 16C, Manti Central Mountains.

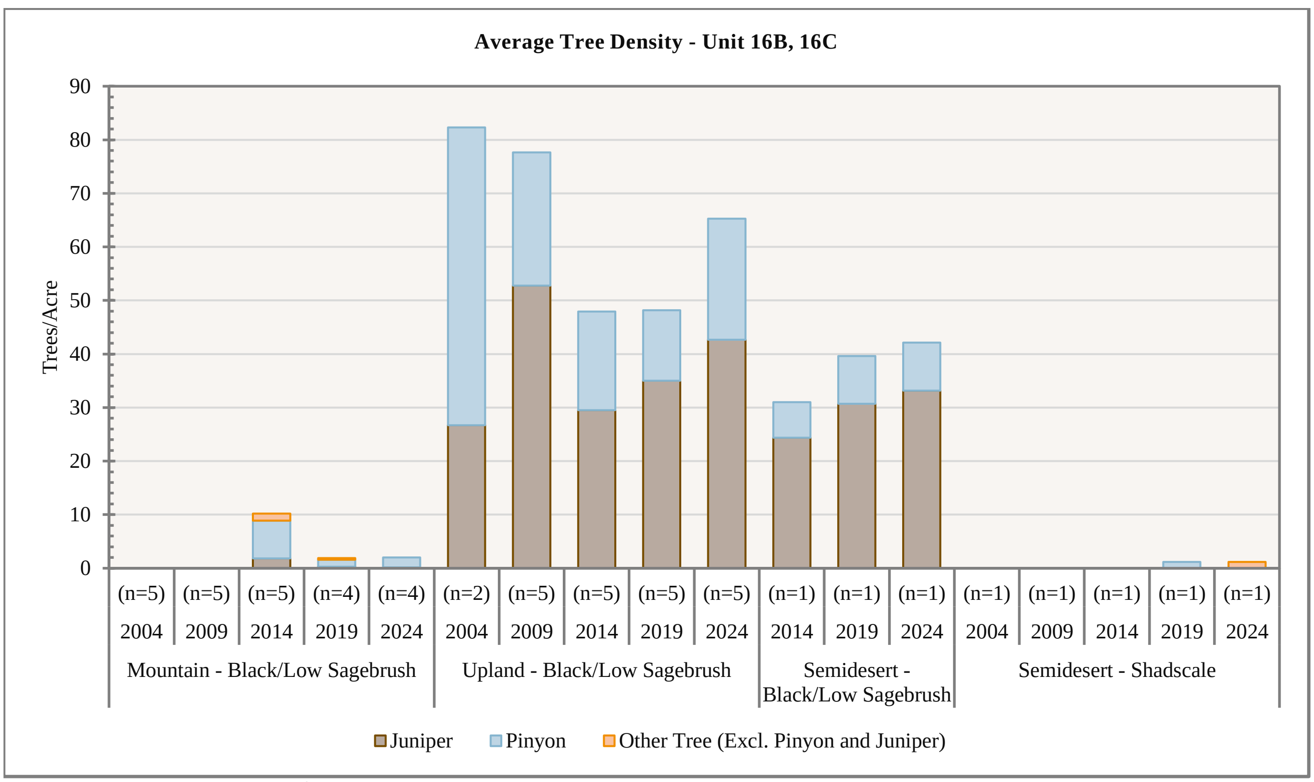


Figure 5.32: Average tree density for Mountain - Black/Low Sagebrush, Upland - Black/Low Sagebrush, Semidesert - Black/Low Sagebrush, and Semidesert - Shadscale study sites in WMU 16B, 16C, Manti Central Mountains.

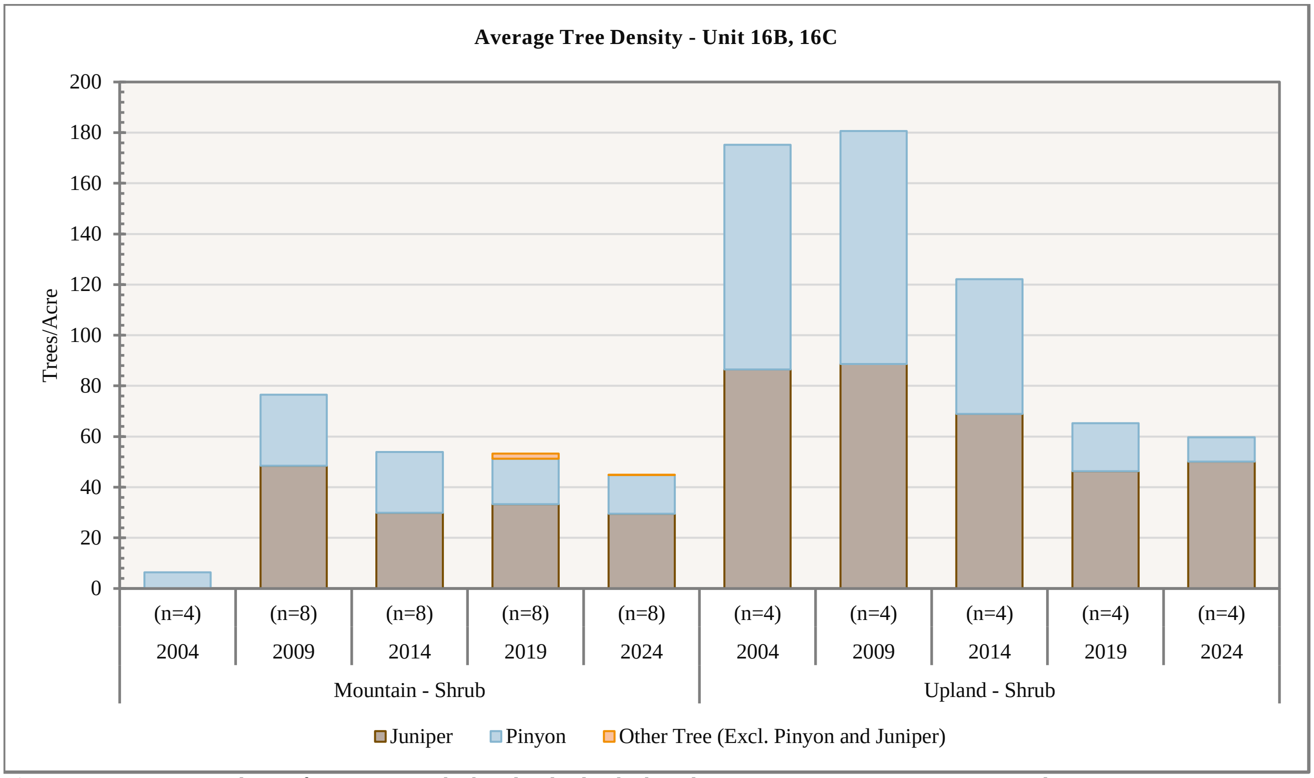


Figure 5.33: Average tree density for Mountain - Shrub and Upland - Shrub study sites in WMU 16B, 16C, Manti Central Mountains.

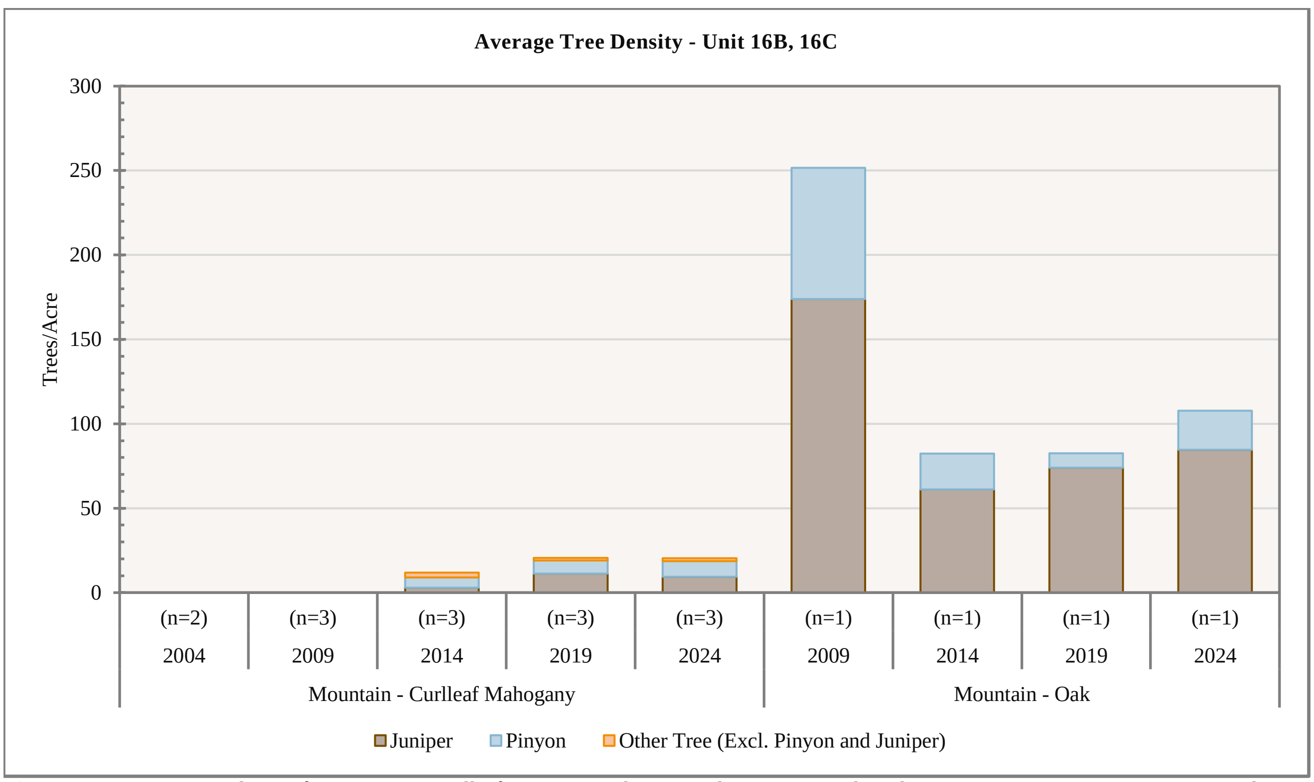


Figure 5.34: Average tree density for Mountain - Curlleaf Mountain Mahogany and Mountain - Oak study sites in WMU 16B, 16C, Manti Central Mountains.

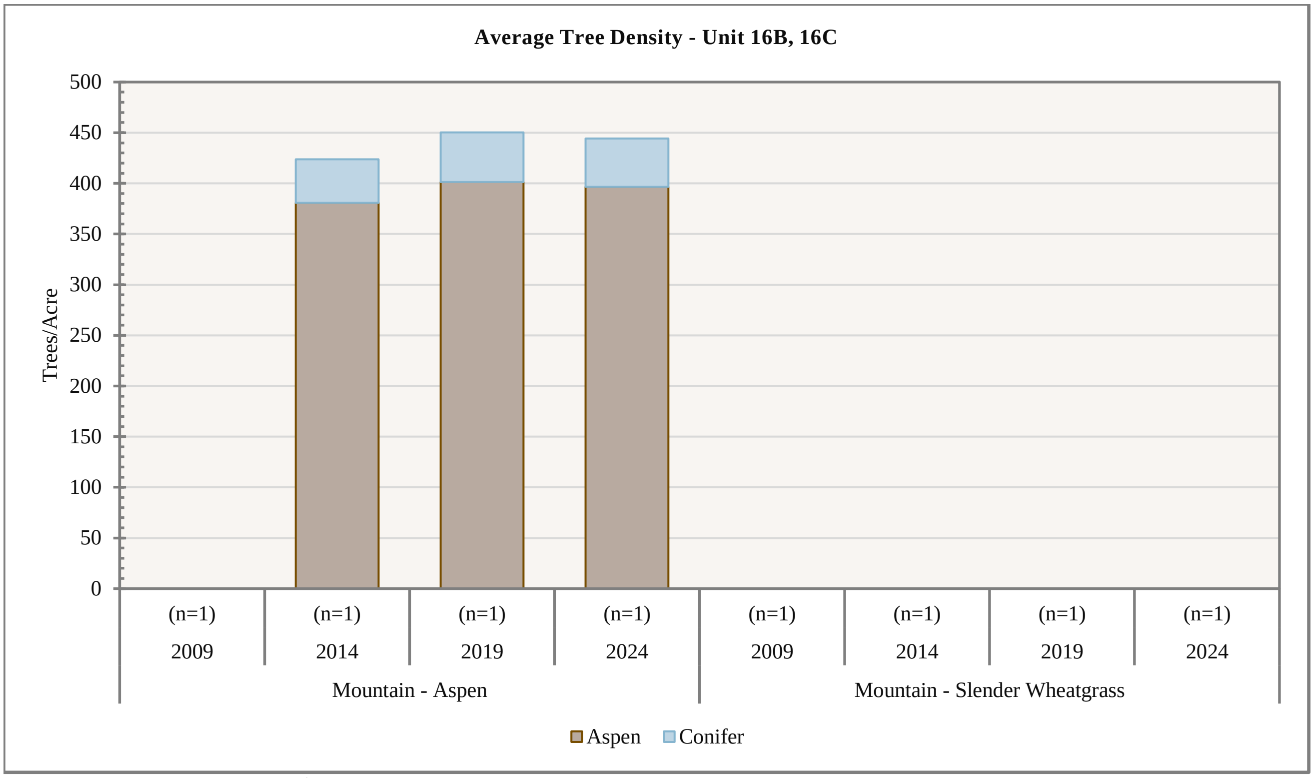


Figure 5.35: Average tree density for Mountain - Aspen and Mountain - Slender Wheatgrass study sites in WMU 16B, 16C, Manti Central Mountains.

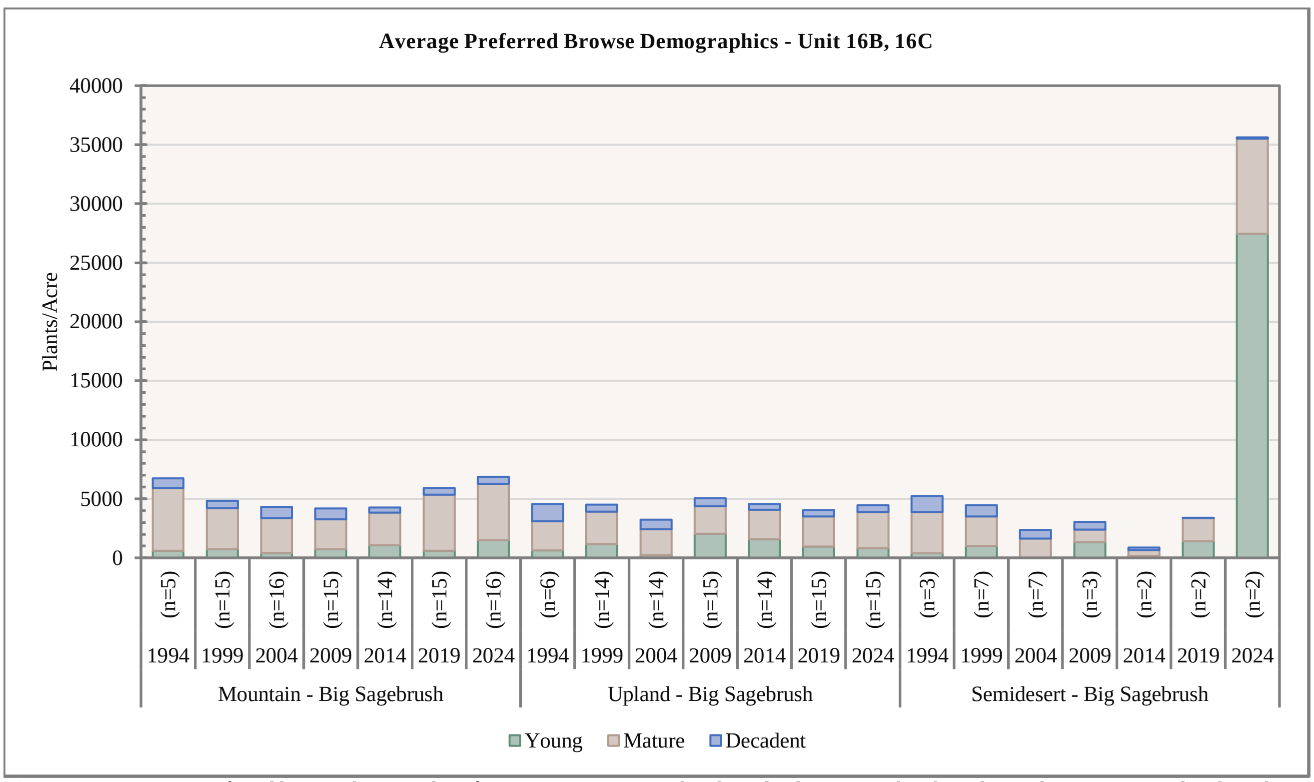


Figure 5.36: Average preferred browse demographics for Mountain - Big Sagebrush, Upland - Big Sagebrush, and Semidesert - Big Sagebrush study sites in WMU 16B, 16C, Manti Central Mountains.

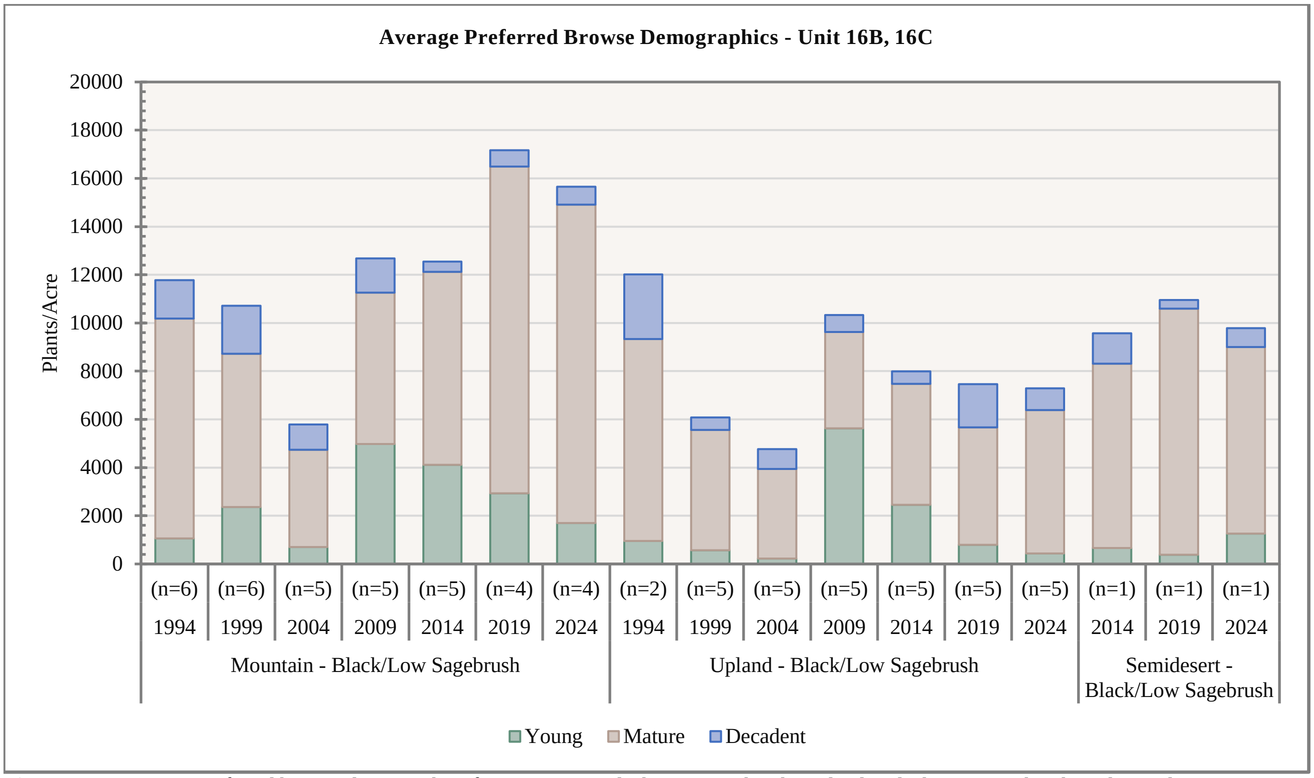


Figure 5.37: Average preferred browse demographics for Mountain - Black/Low Sagebrush, Upland - Black/Low Sagebrush, and Semidesert - Black/Low Sagebrush study sites in WMU 16B, 16C, Manti Central Mountains.

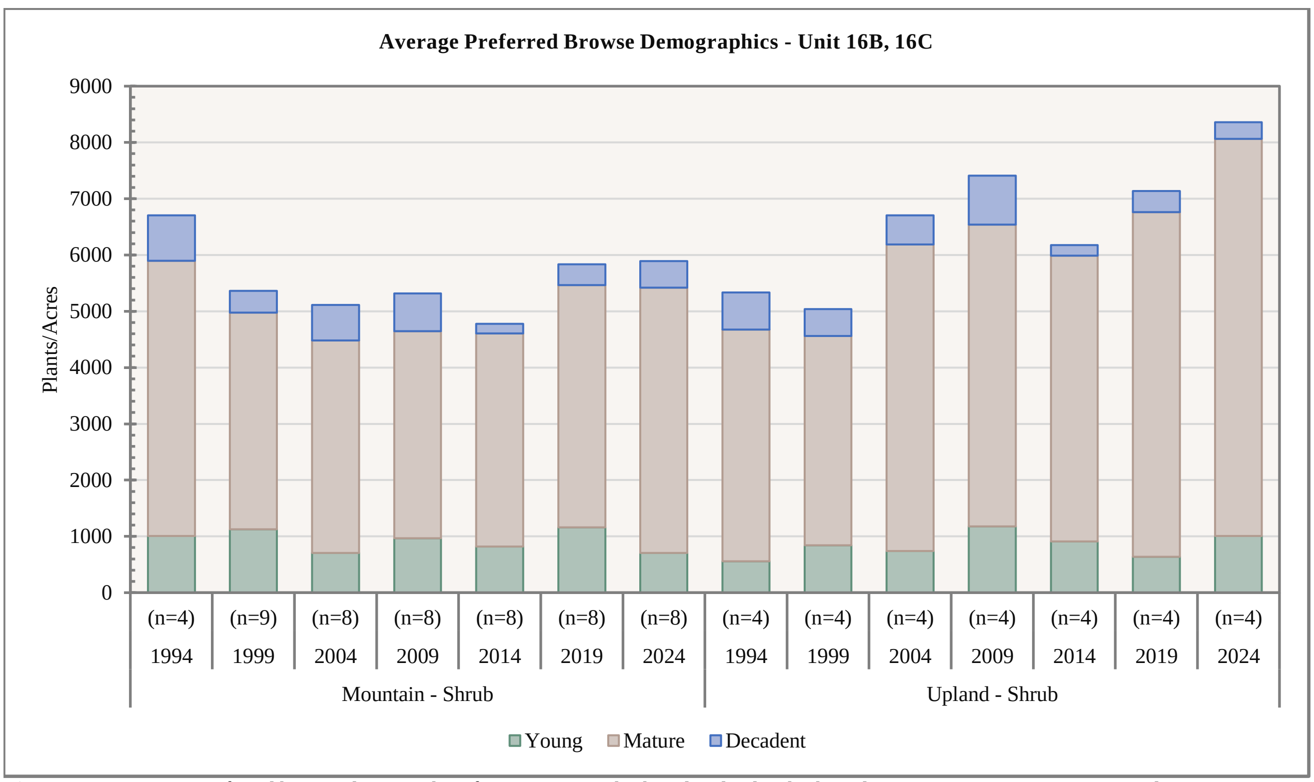


Figure 5.38: Average preferred browse demographics for Mountain - Shrub and Upland - Shrub study sites in 16B, 16C, Manti Central Mountains.

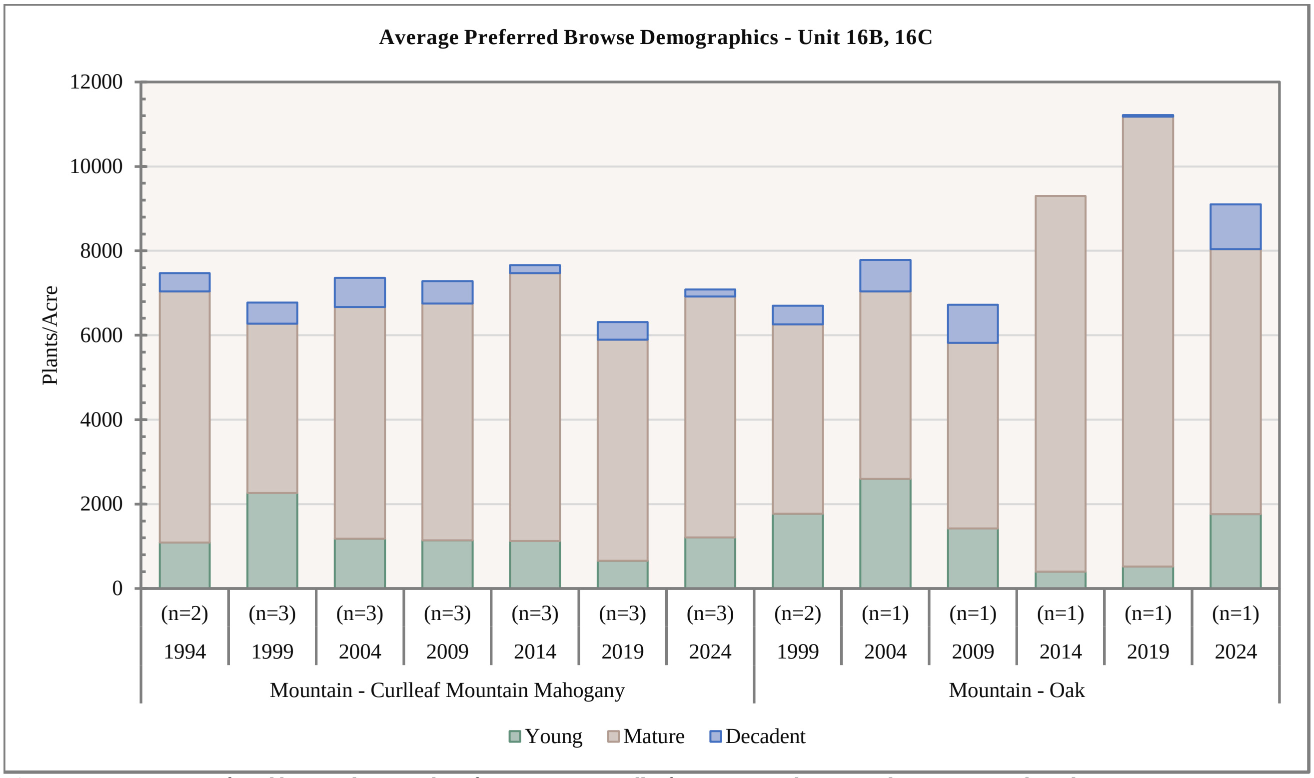


Figure 5.39: Average preferred browse demographics for Mountain - Curlleaf Mountain Mahogany and Mountain - Oak study sites in 16B, 16C, Manti Central Mountains.

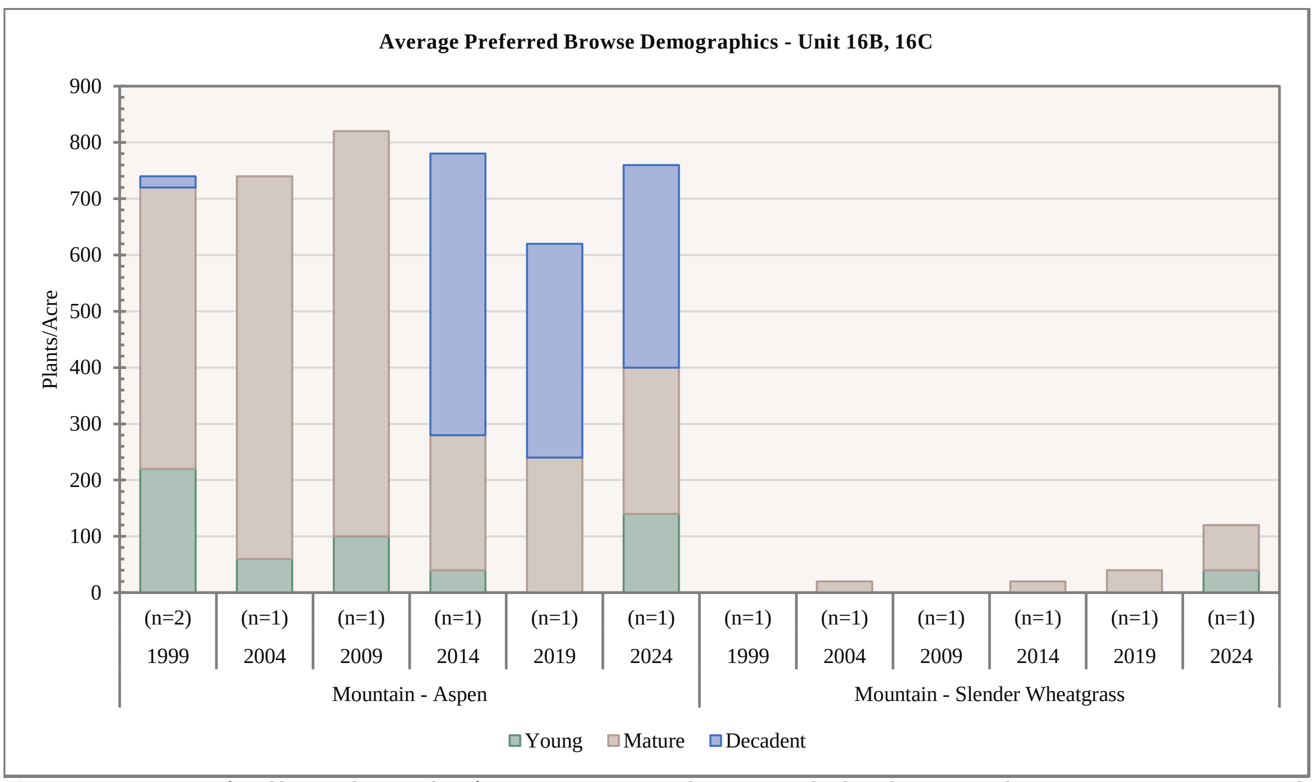


Figure 5.40: Average preferred browse demographics for Mountain - Aspen and Mountain - Slender Wheatgrass study sites in 16B, 16C, Manti Central Mountains.

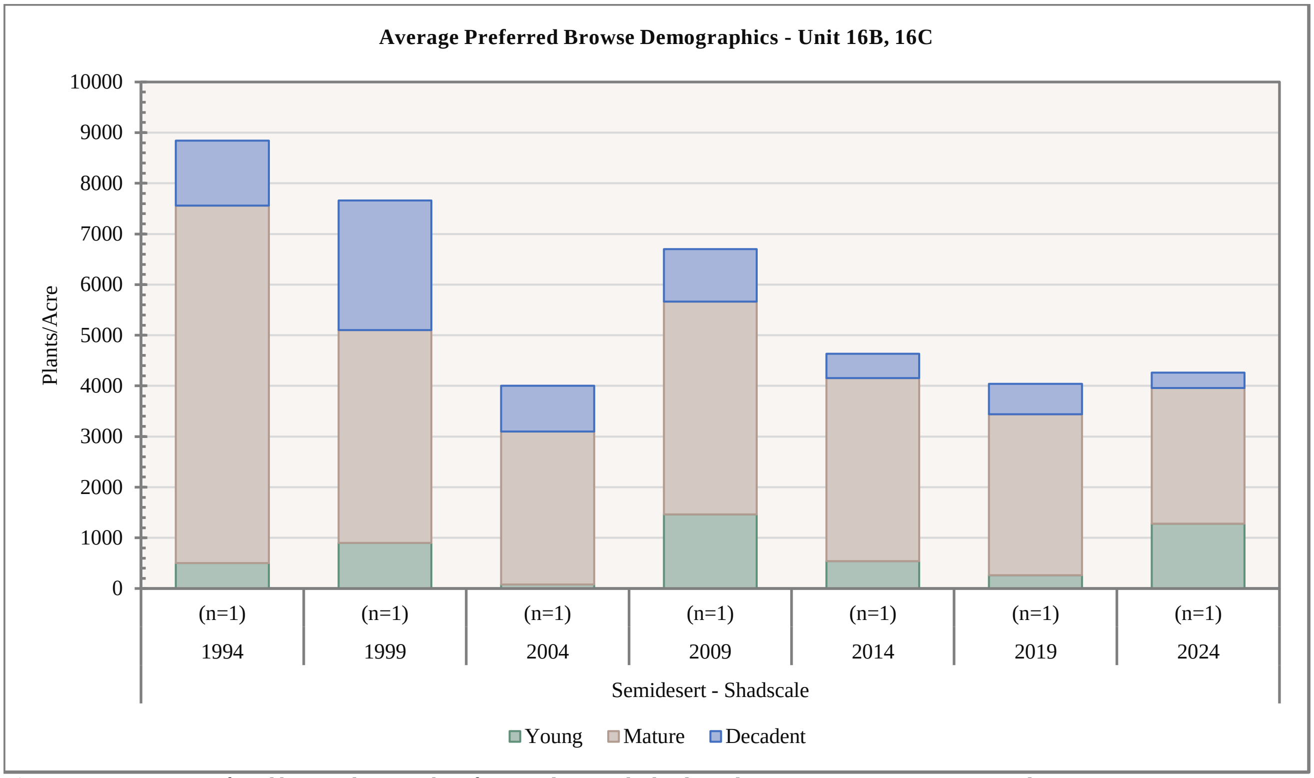


Figure 5.41: Average preferred browse demographics for Semidesert - Shadscale study sites in 16B, 16C, Manti Central Mountains.

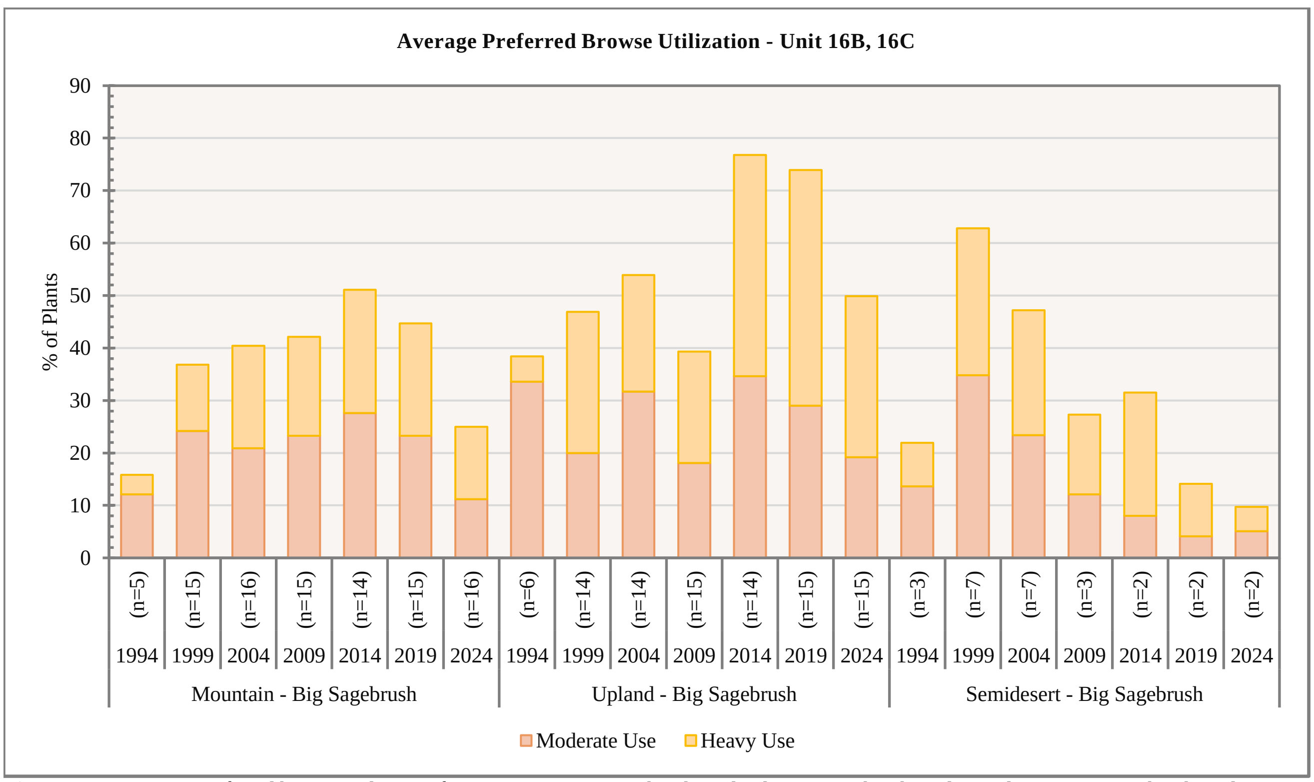


Figure 5.42: Average preferred browse utilization for Mountain - Big Sagebrush, Upland - Big Sagebrush, and Semidesert - Big Sagebrush study sites in WMU 16B, 16C, Manti Central Mountains.

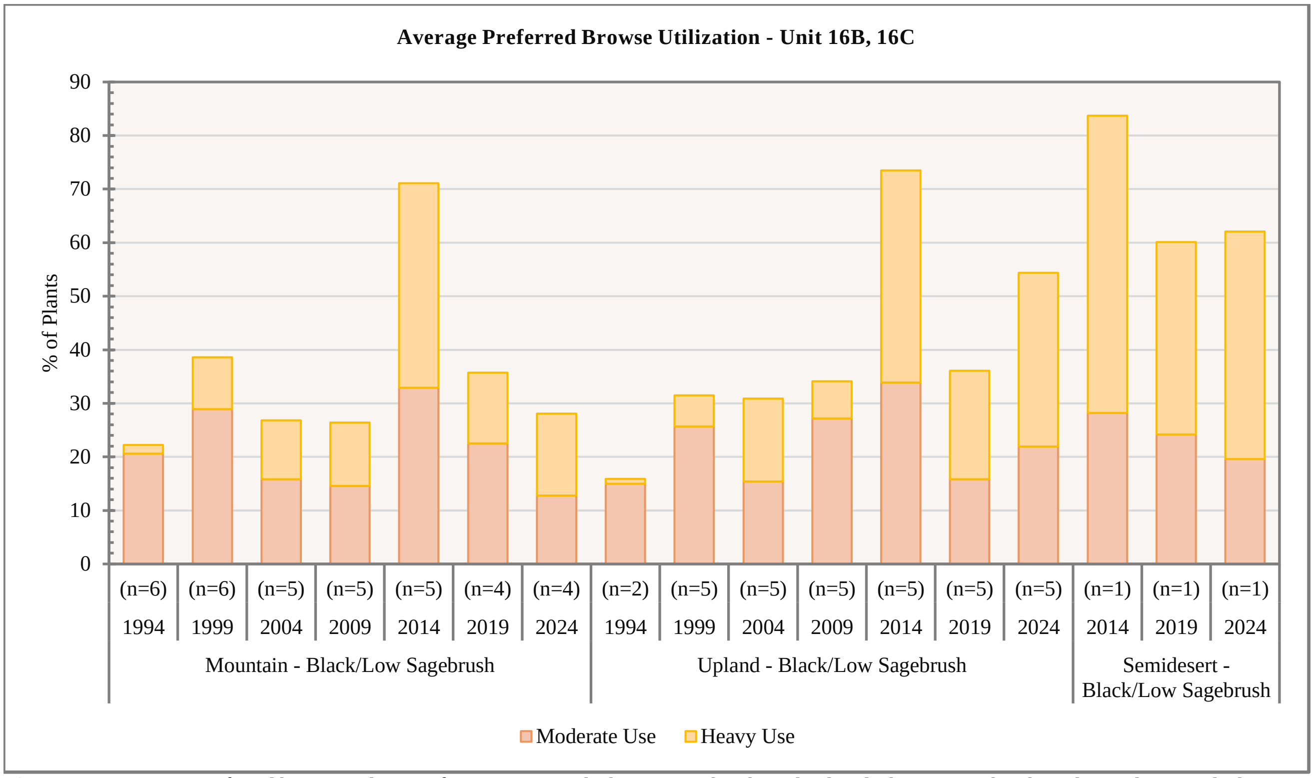


Figure 5.43: Average preferred browse utilization for Mountain - Black/Low Sagebrush, Upland - Black/Low Sagebrush, and Semidesert - Black/Low Sagebrush study sites in WMU 16B, 16C, Manti Central Mountains.

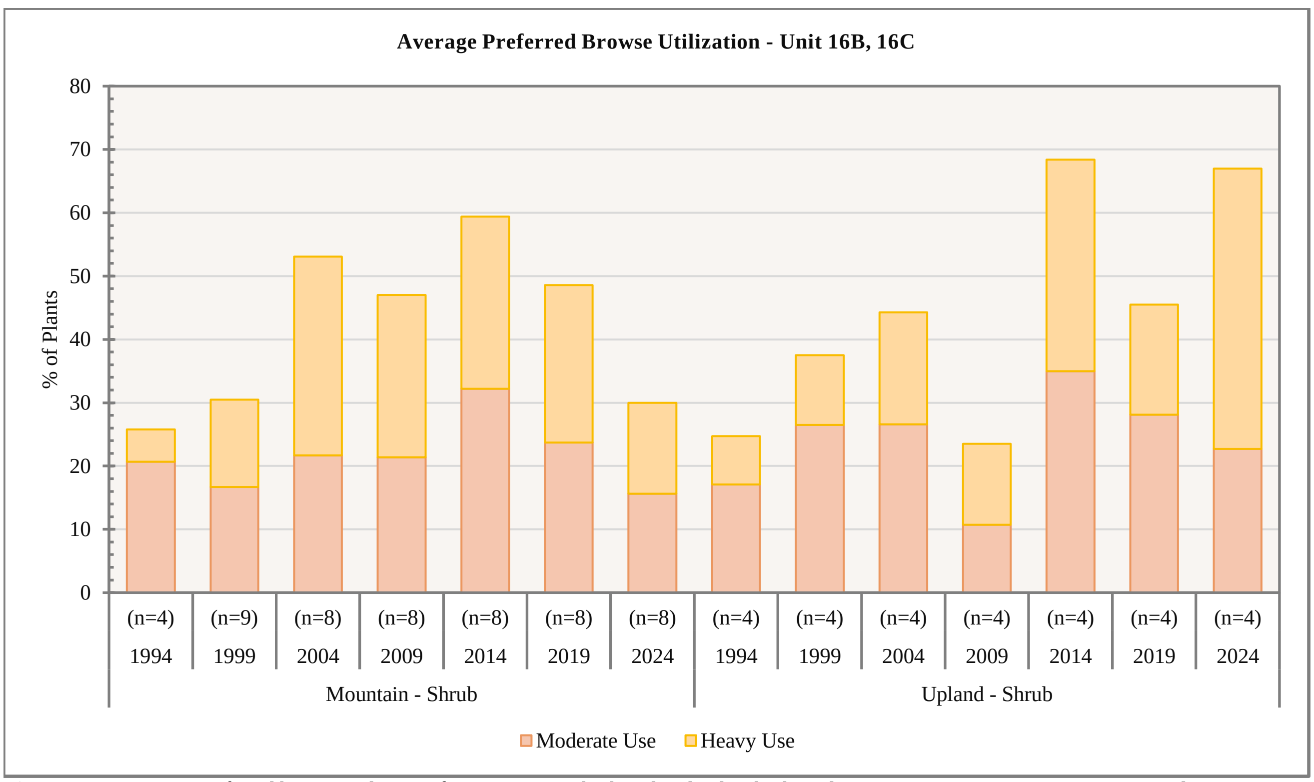


Figure 5.44: Average preferred browse utilization for Mountain - Shrub and Upland - Shrub study sites in WMU 16B, 16C, Manti Central Mountains.

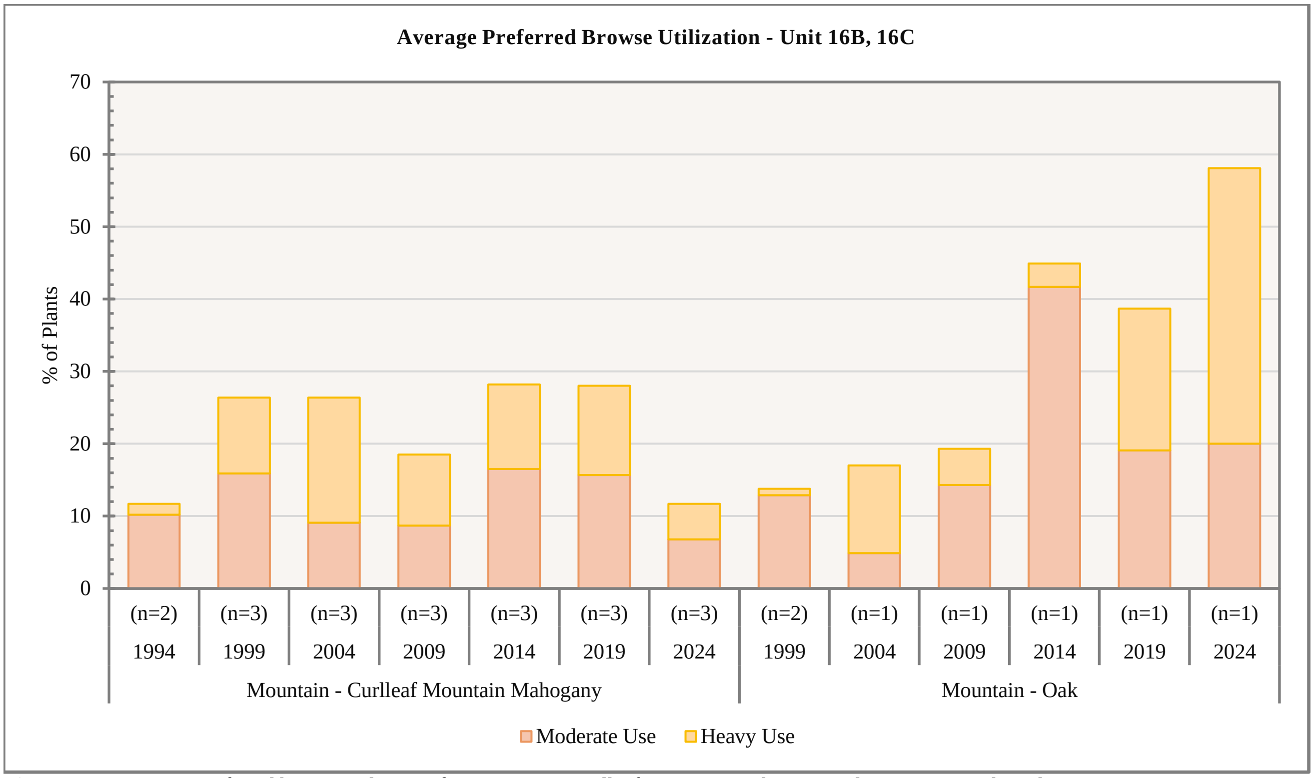


Figure 5.45: Average preferred browse utilization for Mountain - Curlleaf Mountain Mahogany and Mountain - Oak study sites in WMU 16B, 16C, Manti Central Mountains.

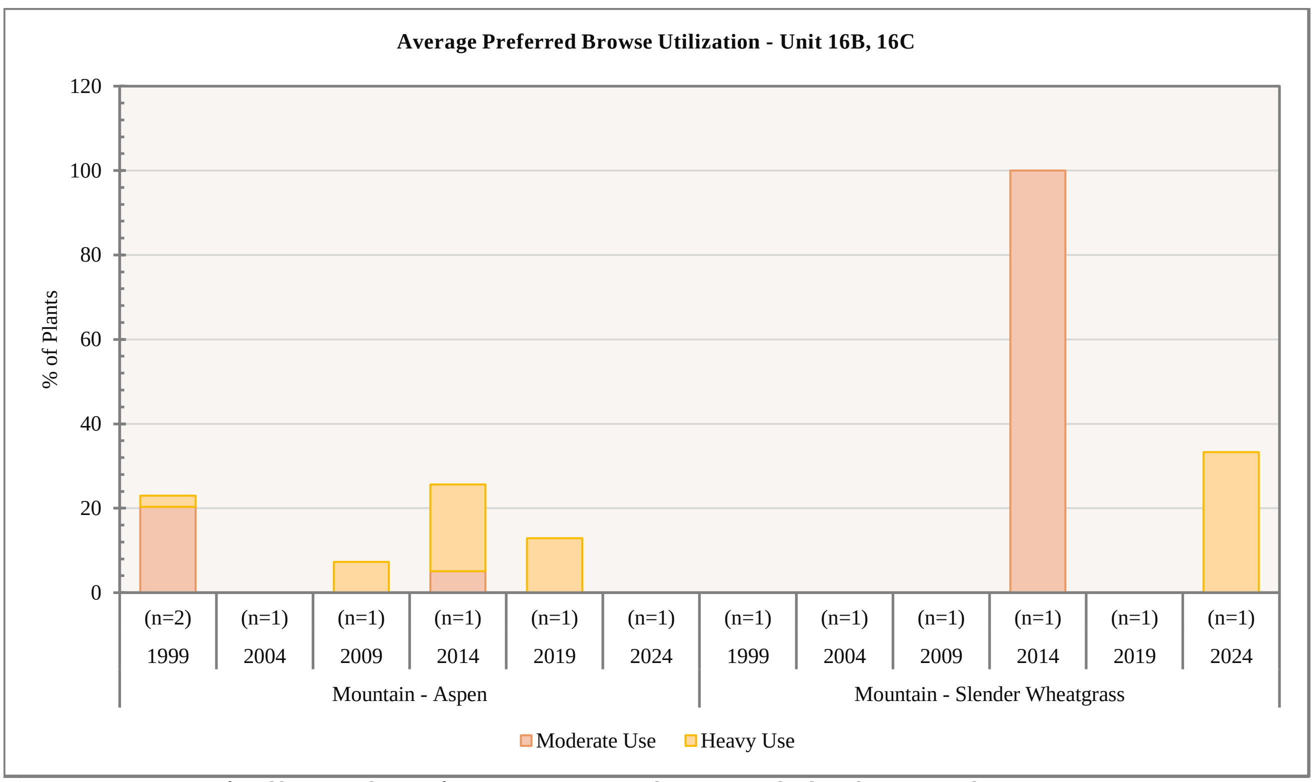


Figure 5.46: Average preferred browse utilization for Mountain - Aspen and Mountain - Slender Wheatgrass study sites in WMU 16B, 16C, Manti Central Mountains.

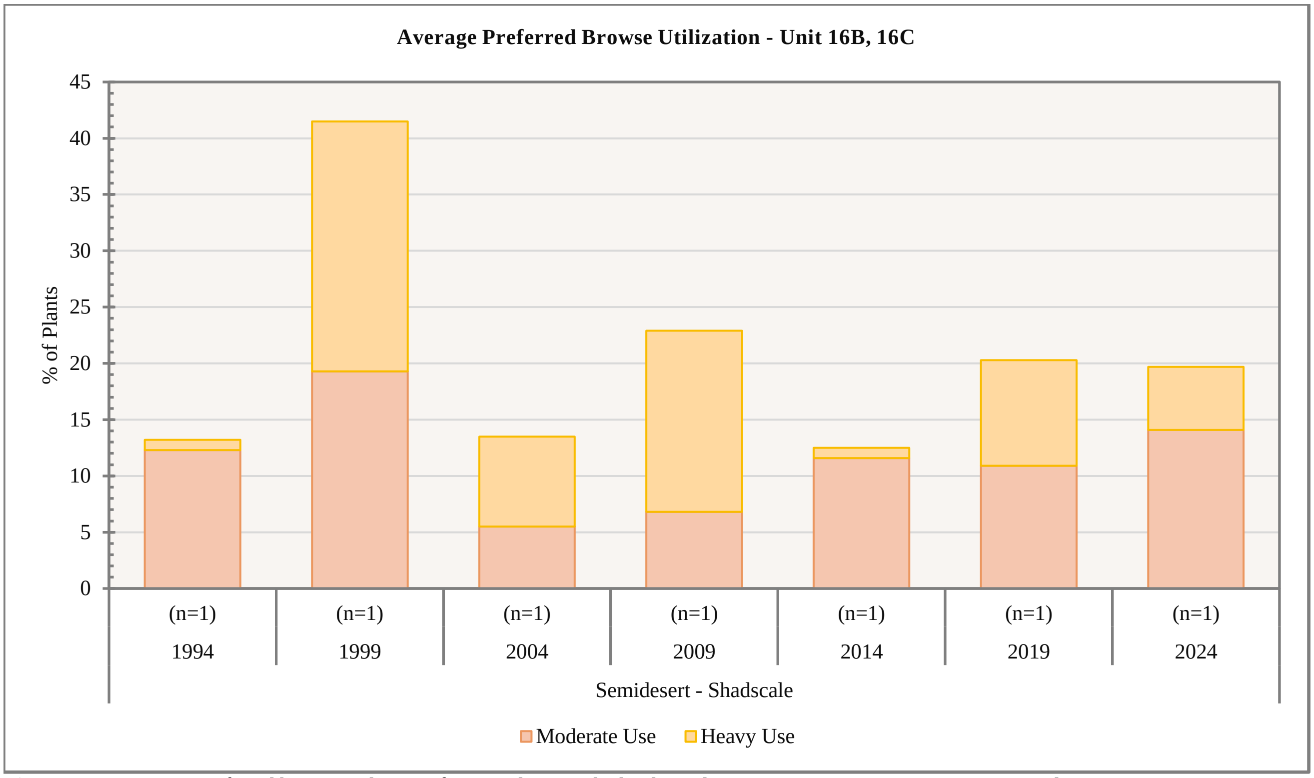


Figure 5.47: Average preferred browse utilization for Semidesert - Shadscale study sites in WMU 16B, 16C, Manti Central Mountains.

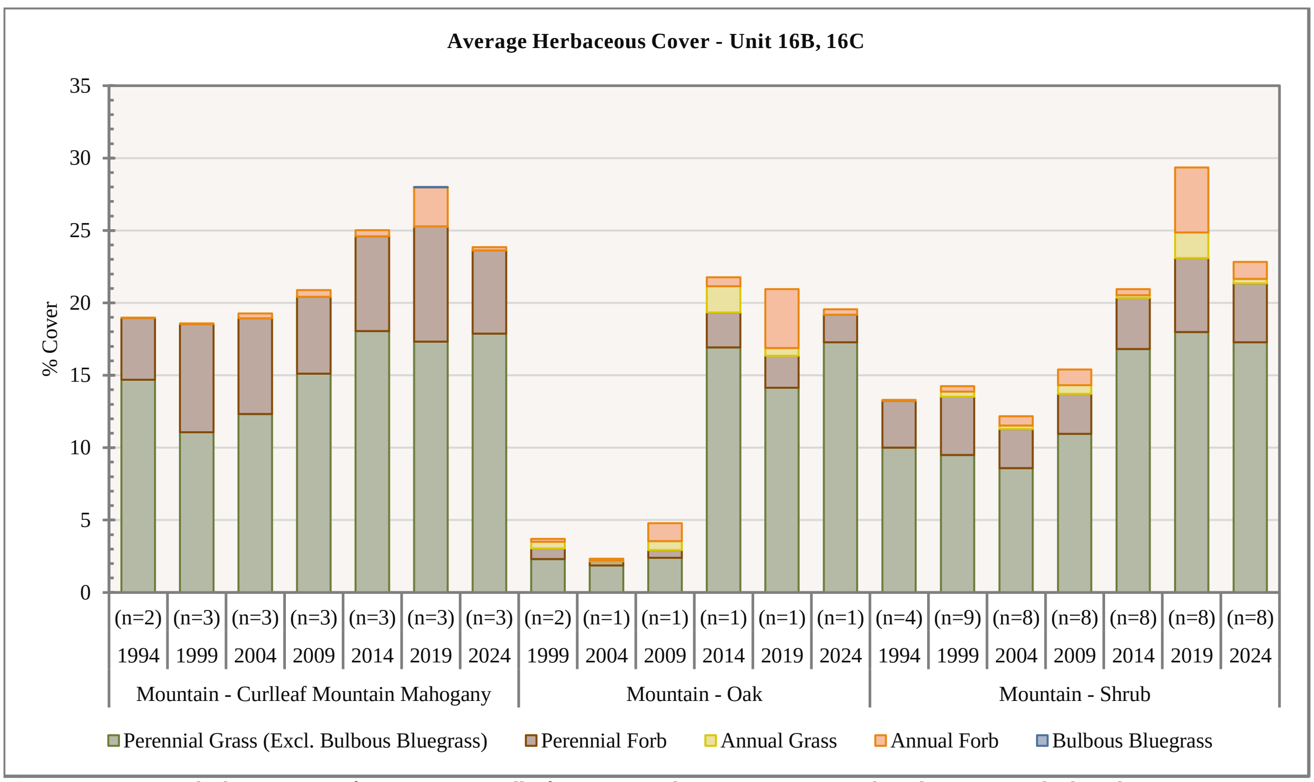


Figure 5.48: Average herbaceous cover for Mountain - Curlleaf Mountain Mahogany, Mountain - Oak, and Mountain - Shrub study sites in WMU 16B, 16C, Manti Central Mountains.

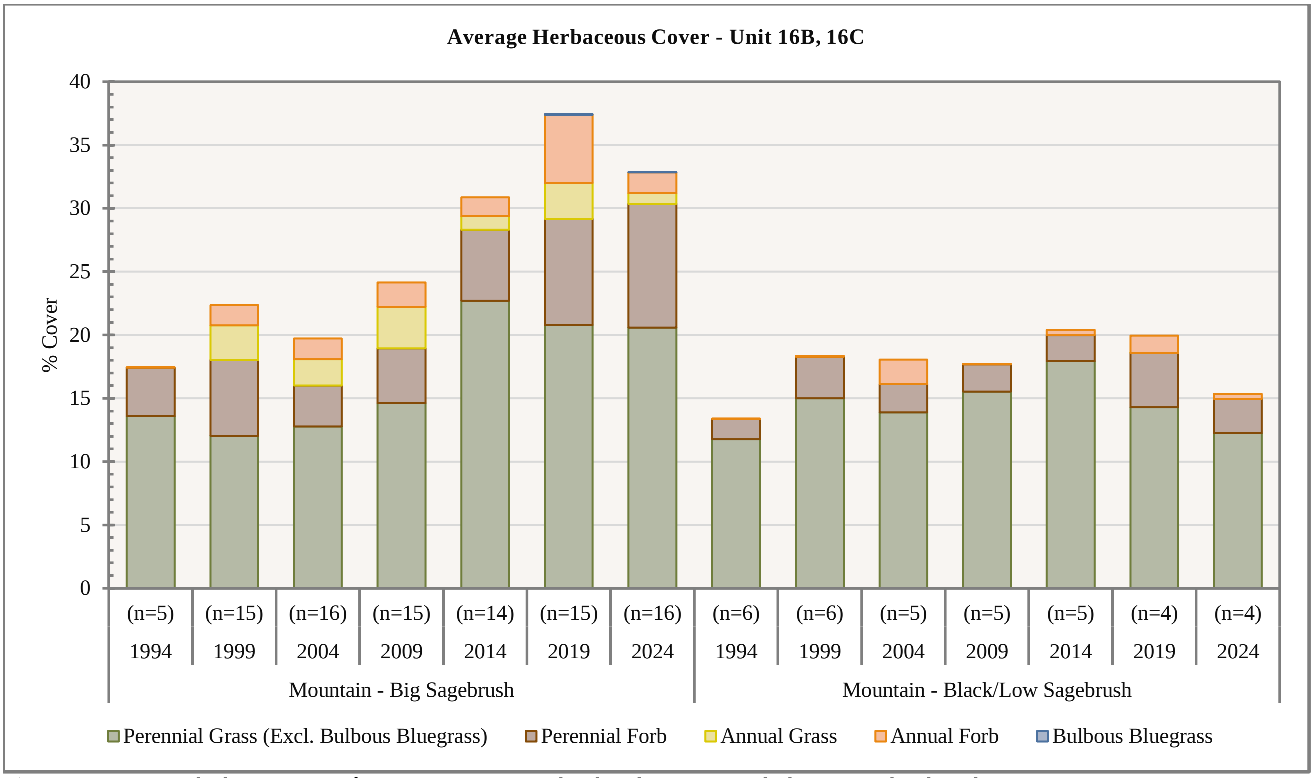


Figure 5.49: Average herbaceous cover for Mountain - Big Sagebrush and Mountain - Black/Low Sagebrush study sites in WMU 16B, 16C, Manti Central Mountains.

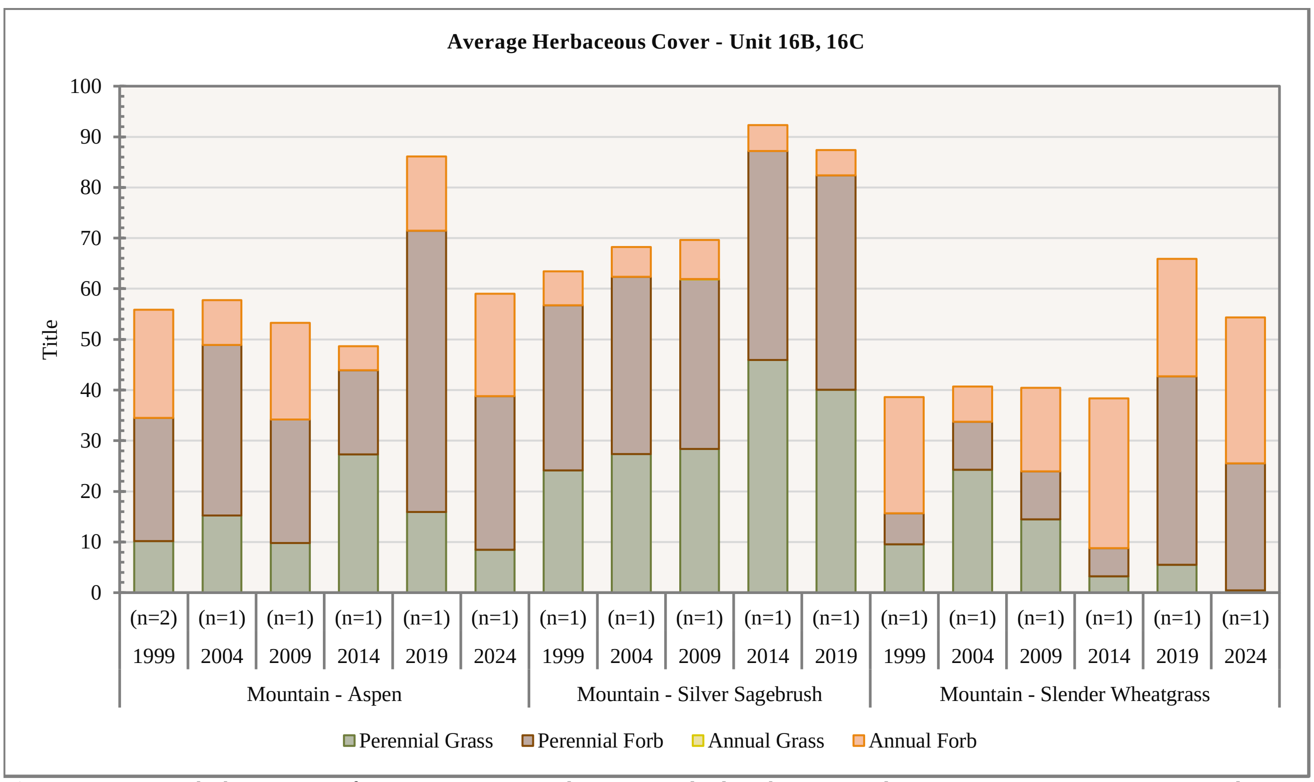


Figure 5.50: Average herbaceous cover for Mountain - Aspen and Mountain - Slender Wheatgrass study sites in WMU 16B, 16C, Manti Central Mountains.

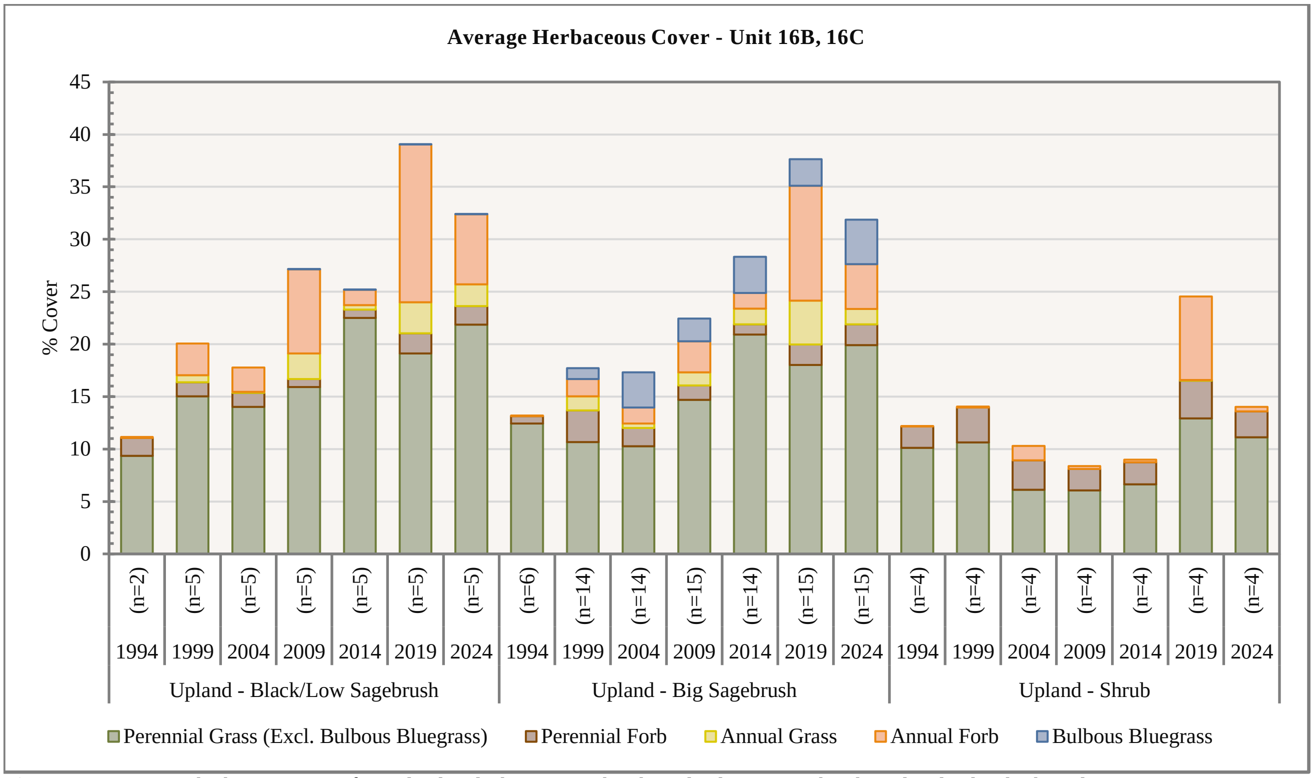


Figure 5.51: Average herbaceous cover for Upland - Black/Low Sagebrush, Upland - Big Sagebrush, and Upland - Shrub study sites in WMU 16B, 16C, Manti Central Mountains.

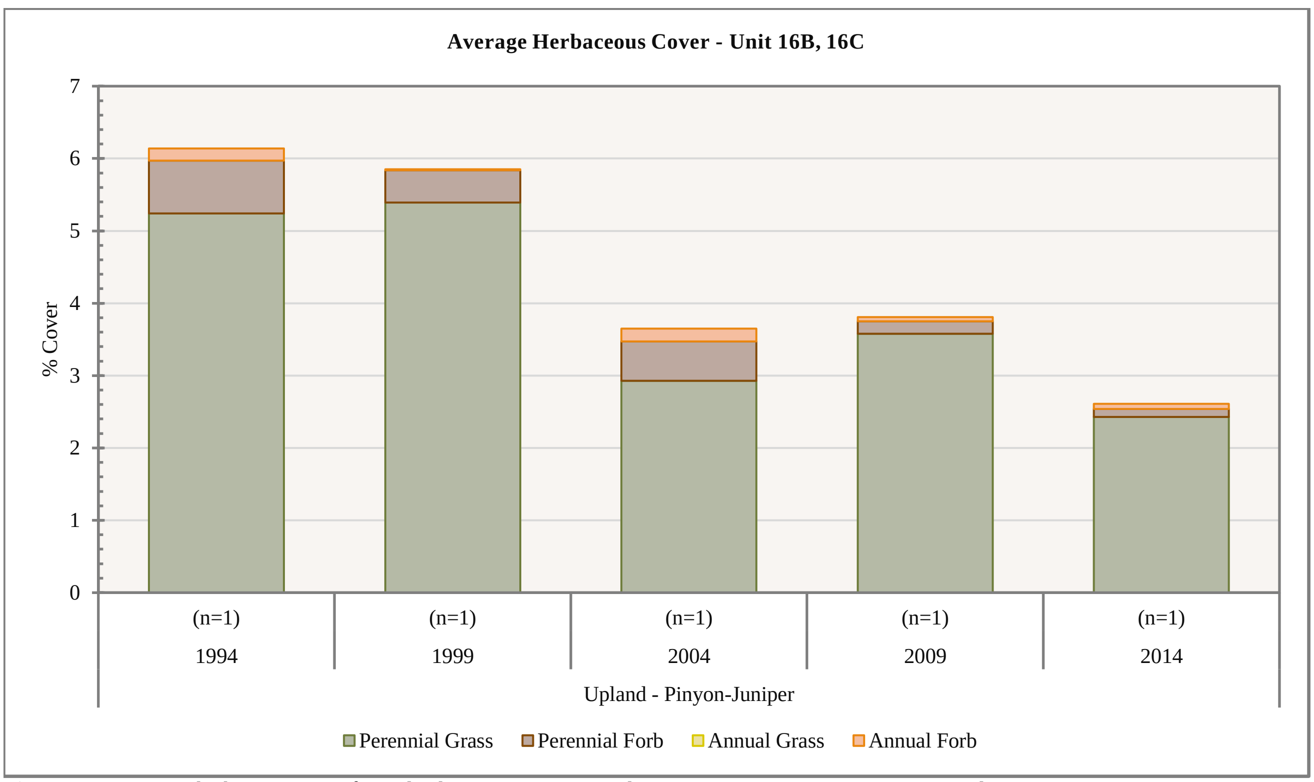


Figure 5.52: Average herbaceous cover for Upland - Pinyon-Juniper study sites in WMU 16B, 16C, Manti Central Mountains.

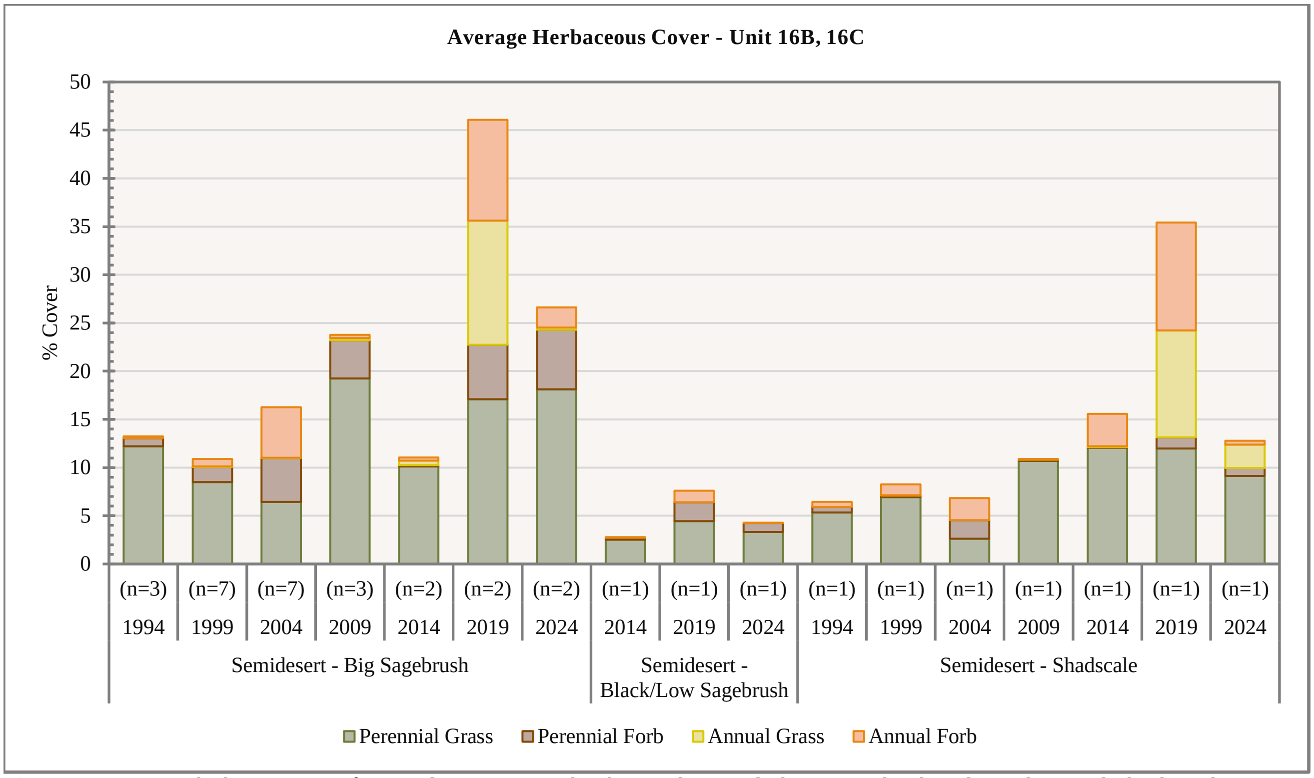


Figure 5.53: Average herbaceous cover for Semidesert - Big Sagebrush, Semidesert - Black/Low Sagebrush, and Semidesert - Shadscale study sites in WMU 16B, 16C, Manti Central Mountains.

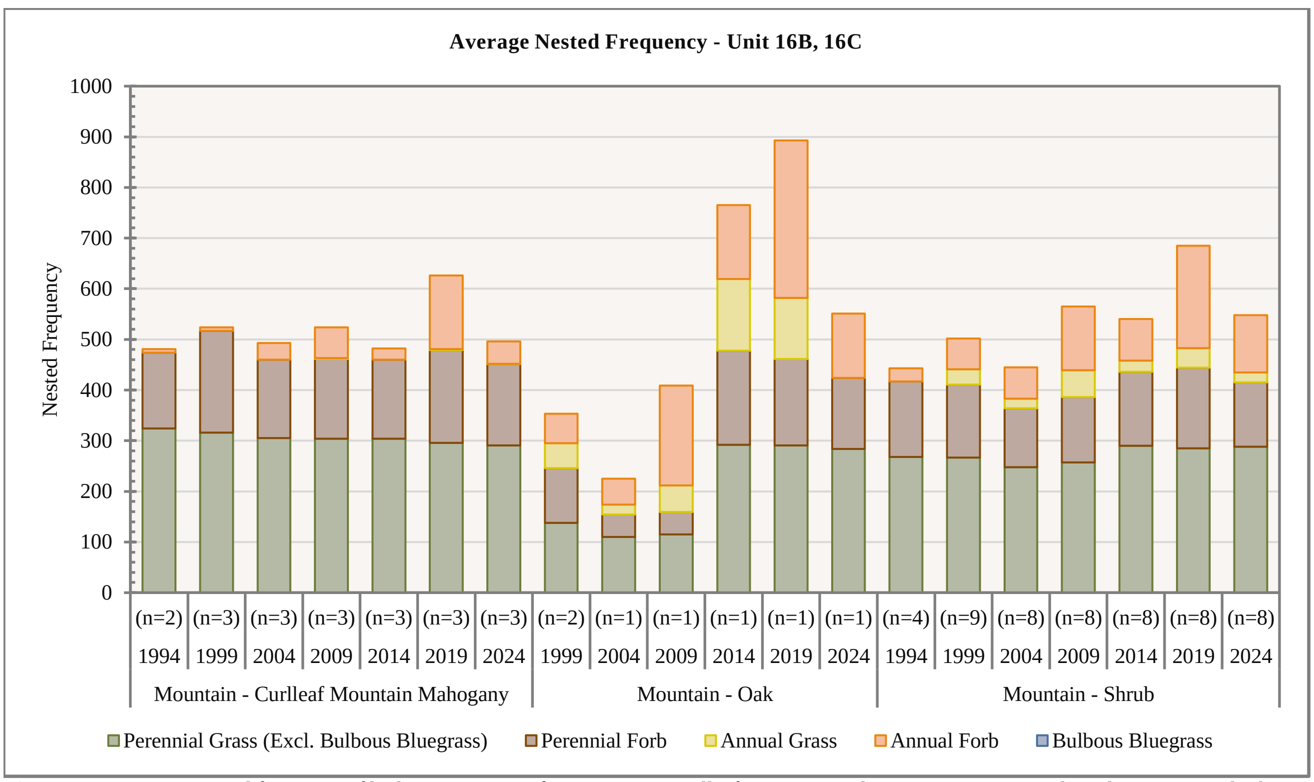


Figure 5.54: Average nested frequency of herbaceous species for Mountain - Curlleaf Mountain Mahogany, Mountain - Oak, and Mountain - Shrub study sites in WMU 16B, 16C, Manti Central Mountains.

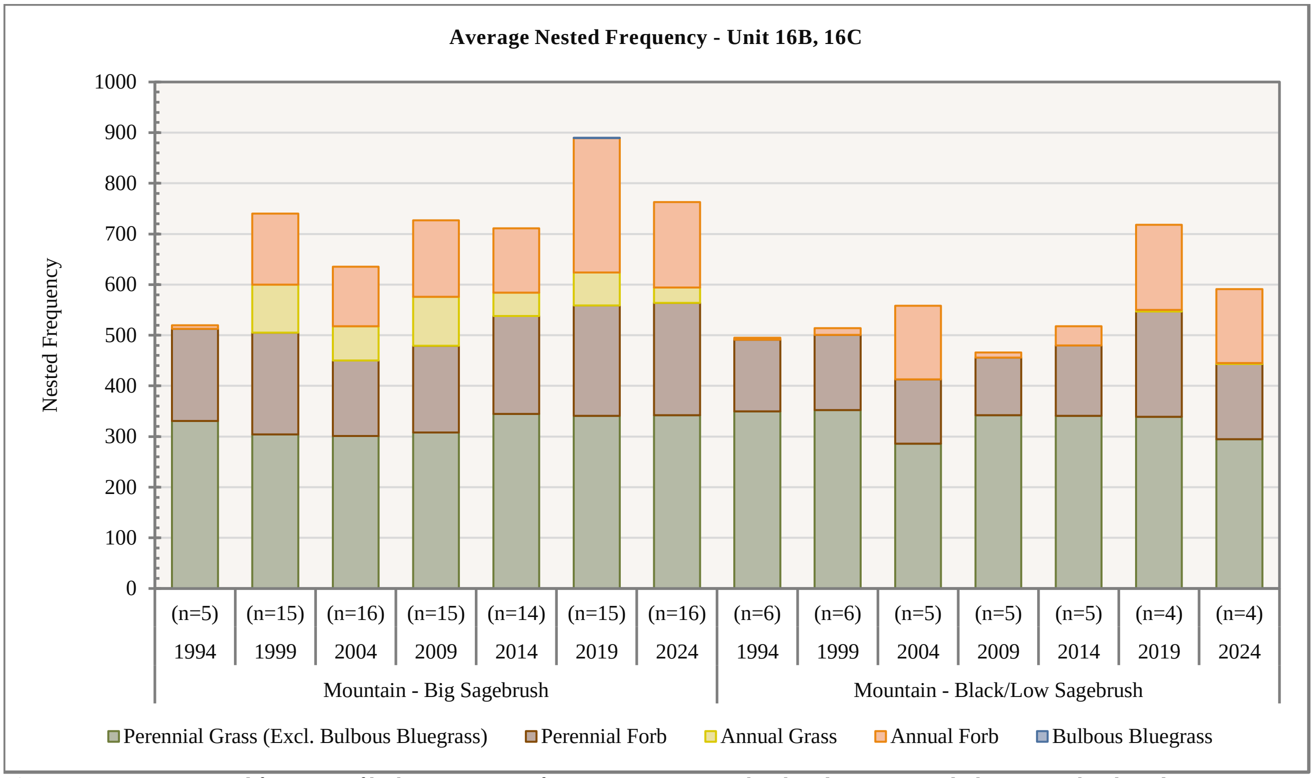


Figure 5.55: Average nested frequency of herbaceous species for Mountain - Big Sagebrush and Mountain - Black/Low Sagebrush study sites in WMU 16B, 16C, Manti Central Mountains.

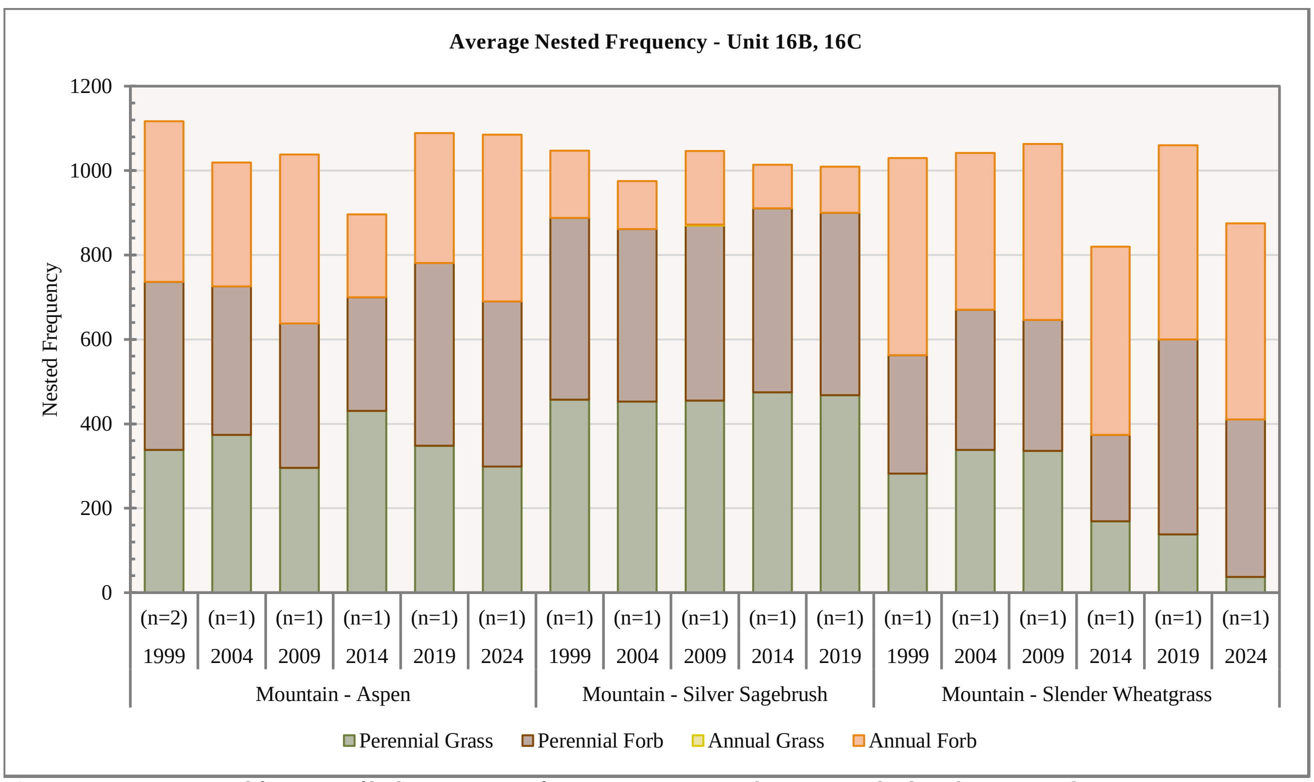


Figure 5.56: Average nested frequency of herbaceous species for Mountain - Aspen and Mountain - Slender Wheatgrass study sites in WMU 16B, 16C, Manti Central Mountains.

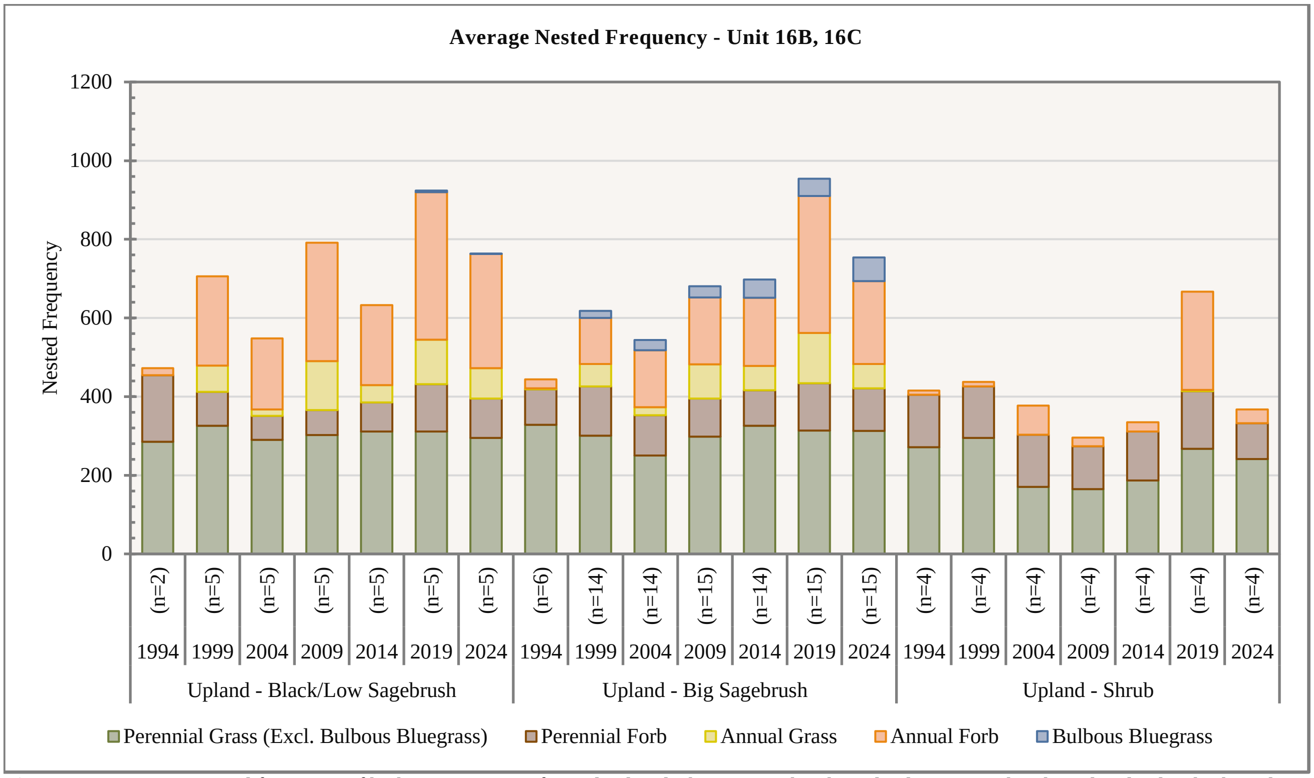


Figure 5.57: Average nested frequency of herbaceous species for Upland - Black/Low Sagebrush, Upland - Big Sagebrush, and Upland - Shrub study sites in WMU 16B, 16C, Manti Central Mountains.

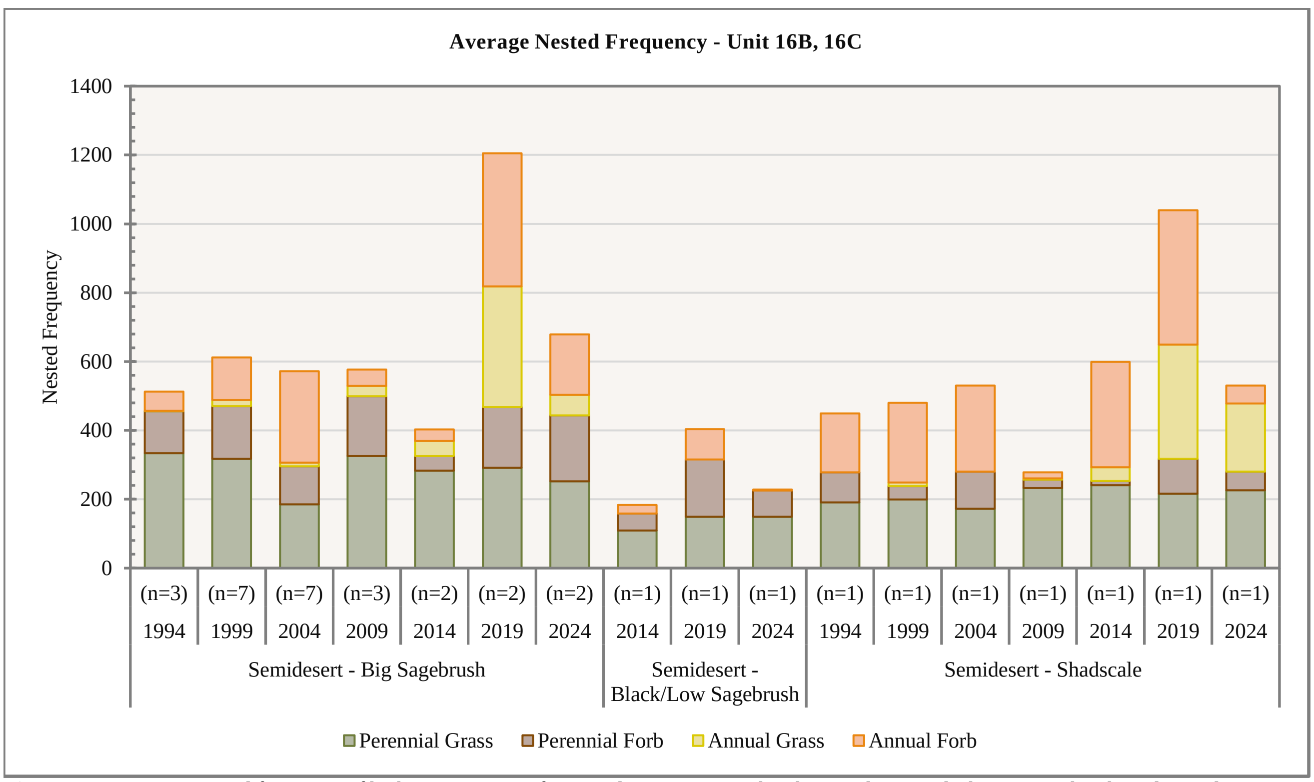


Figure 5.58: Average nested frequency of herbaceous species for Semidesert - Big Sagebrush, Semidesert - Black/Low Sagebrush, and Semidesert - Shadscale study sites in WMU 16B, 16C, Manti Central Mountains.

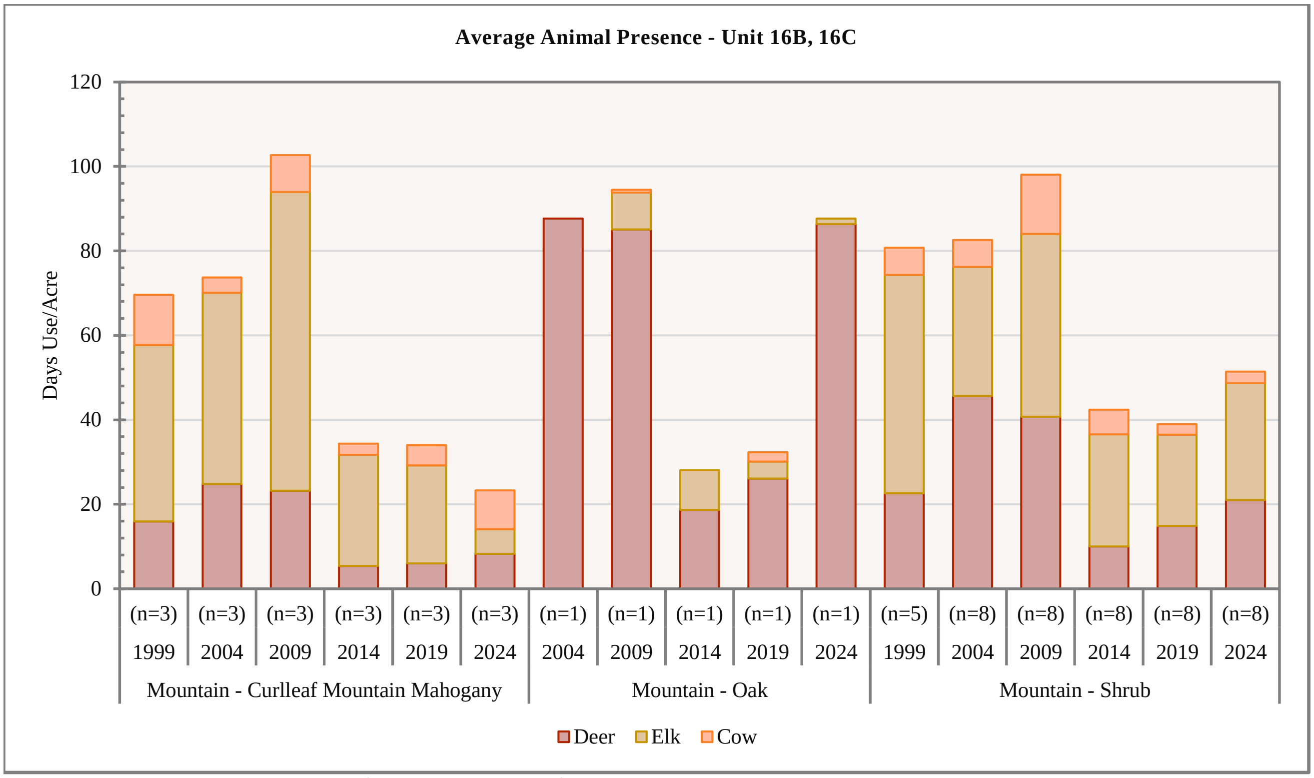


Figure 5.59: Average pellet transect data for Mountain - Curlleaf Mountain Mahogany, Mountain - Oak, and Mountain - Shrub study sites in WMU 16B, 16C, Manti Central Mountains. *Mountain - Shrub deer pellets include deer and sheep pellet groups.

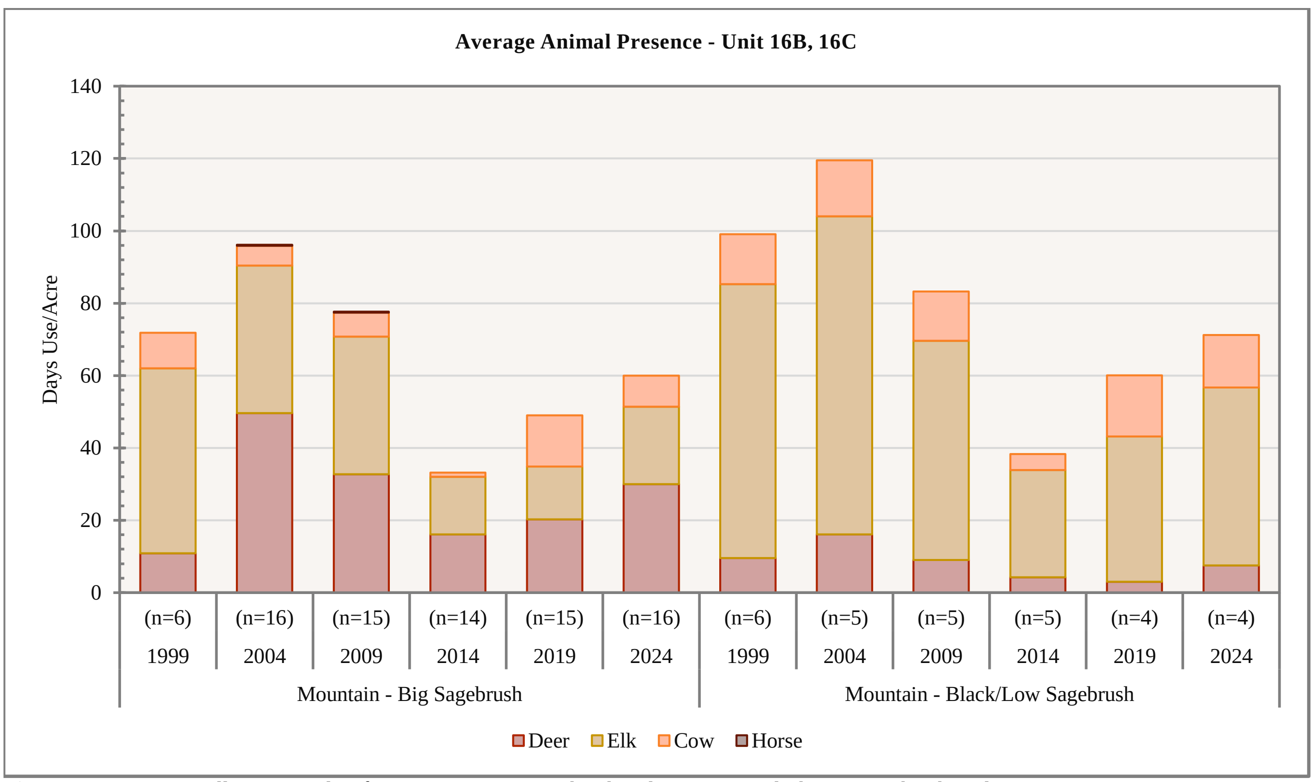


Figure 5.60: Average pellet transect data for Mountain - Big Sagebrush and Mountain - Black/Low Sagebrush study sites in WMU 16B, 16C, Manti Central Mountains.

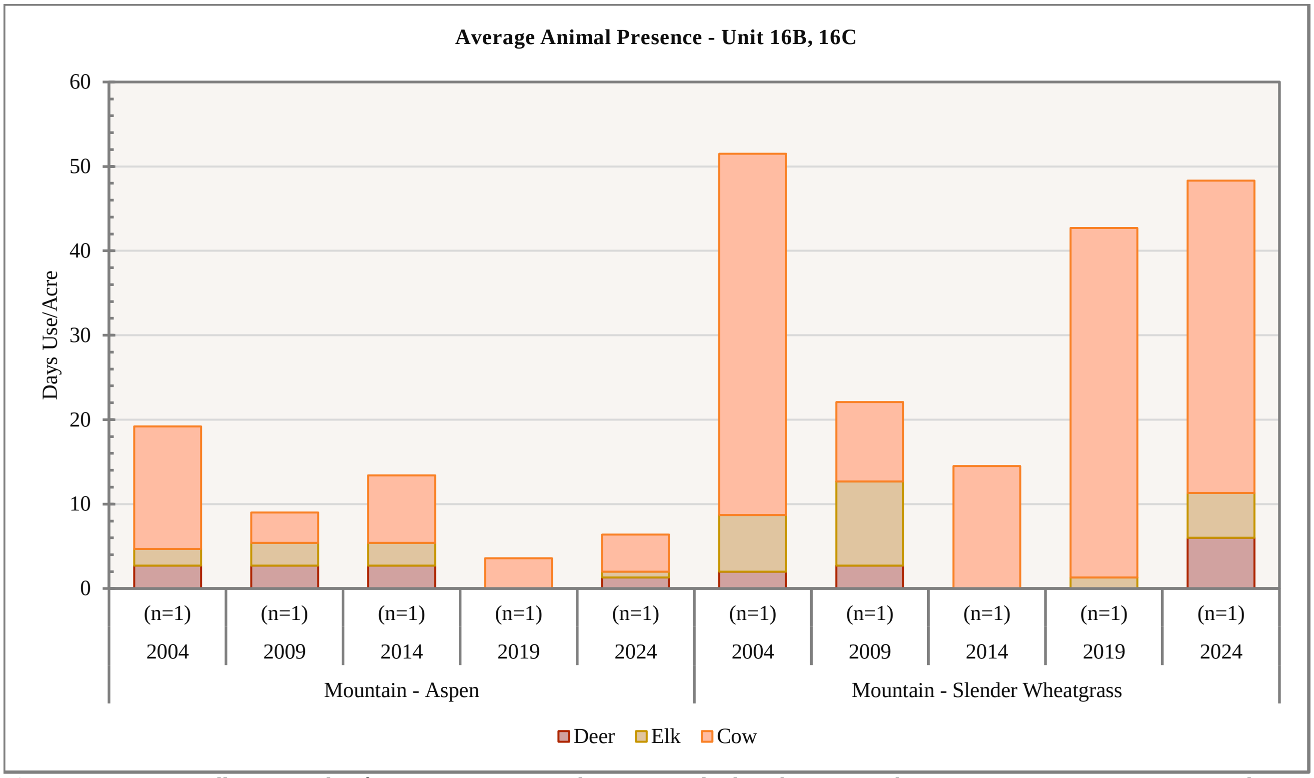


Figure 5.61: Average pellet transect data for Mountain - Aspen and Mountain - Slender Wheatgrass study sites in WMU 16B, 16C, Manti Central Mountains.

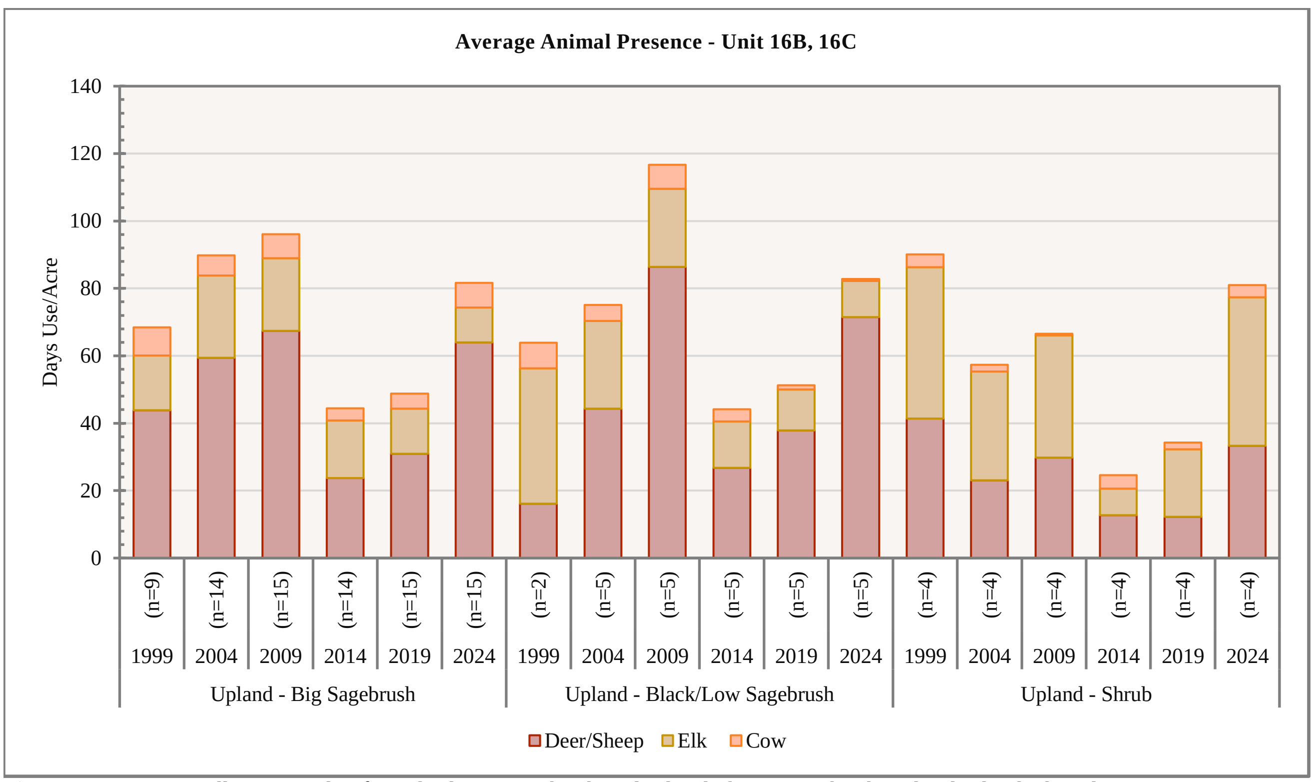


Figure 5.62: Average pellet transect data for Upland - Big Sagebrush, Upland - Black/Low Sagebrush, and Upland - Shrub study sites in WMU 16B, 16C, Manti Central Mountains.

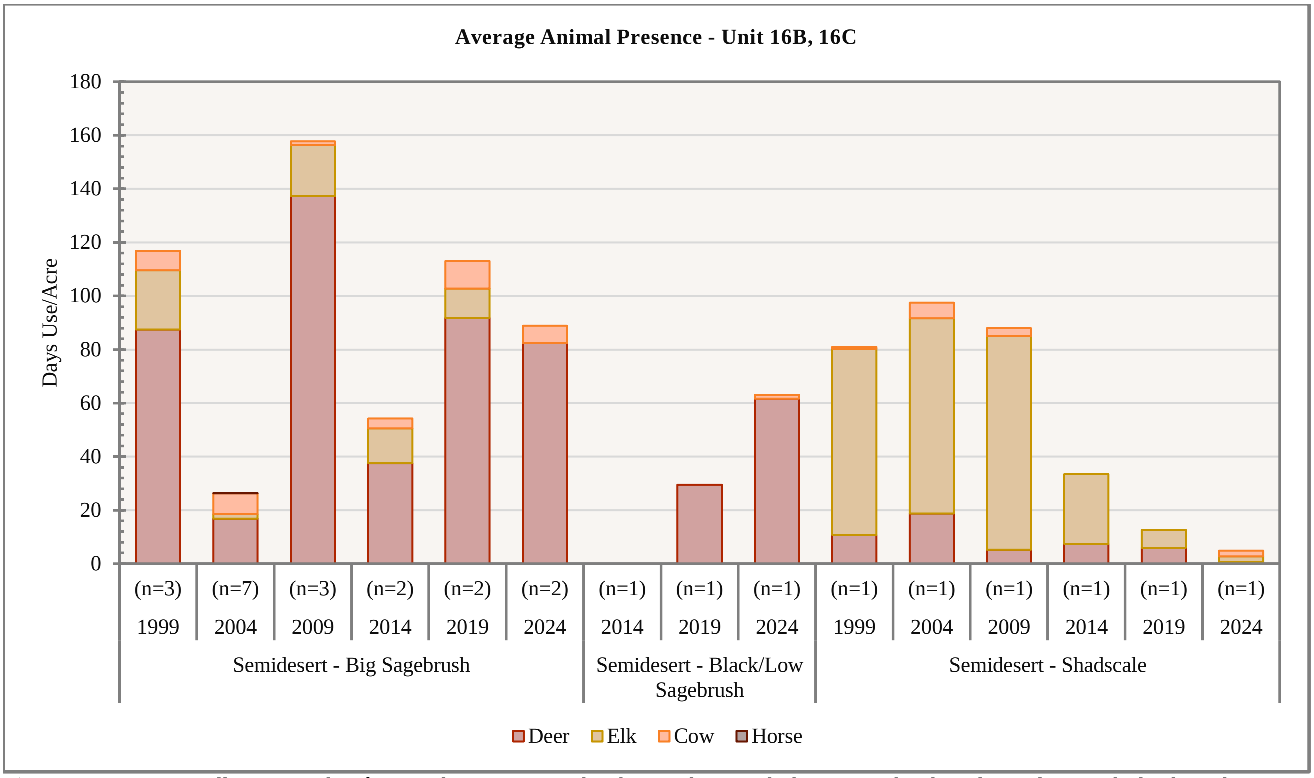


Figure 5.63: Average pellet transect data for Semidesert - Big Sagebrush, Semidesert - Black/Low Sagebrush, and Semidesert - Shadscale study sites in WMU 16B, 16C, Manti Central Mountains. *Semidesert - Big Sagebrush deer pellets include deer and sheep pellet groups.

Deer Winter Range Condition Assessment

On average, the condition of deer winter and transitional range (**Map 5.2**) within the Manti Central Mountains Management Unit has slightly improved from poor in 1994 to fair in 2024. There was a notable decrease in average habitat suitability that corresponds with the drought years of 2002 through 2004 (**Figure 5.1a**, **Figure 5.2a**, **Figure 5.3a**). However, deer habitat quality has since improved with average condition being considered fair beginning in 2019 and remains in a similar condition as of 2024.

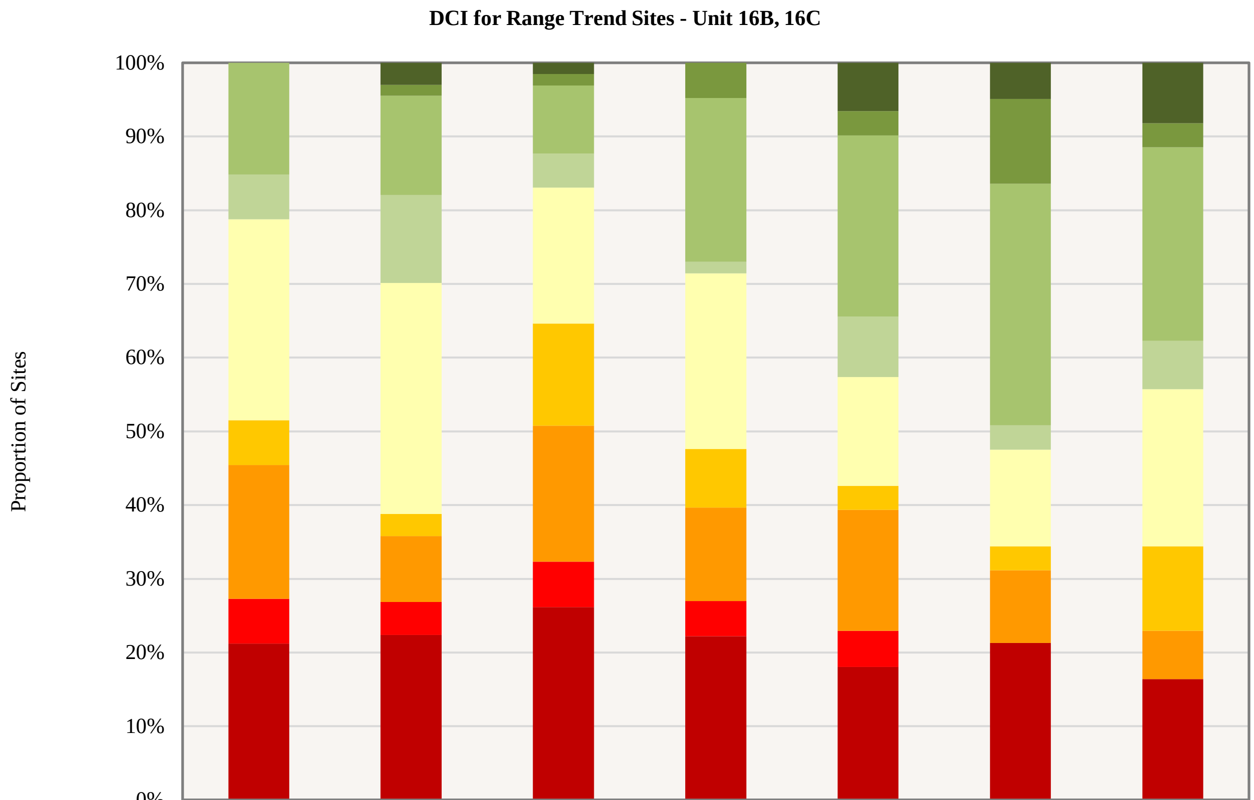
Unit suitability can be attributed to many sites; there are 31 sites with Desirable Component Indices of fair or better. However, of these studies, there are some more notable sites that affect the unit's overall stability and suitability. These sites include Starvation Mahogany (16B-08), Starvation Mountain Brush (16B-09), Wire Grass Bench (16B-24), Middle Mountain (16C-17), Trail Mountain Exclosure (16C-19), Upper Hole Trail (16C-30), Wild Cat Knolls (16C-35), Joes Valley Overlook (16C-37), Trough Hollow (16C-41), Box Canyon Sage-Grouse (16C-42), North Horn (16C-44), and North Slackpile (16R-06), which have been consistently considered to be between fair and good-excellent conditions.

On this combined unit, 38 Range Trend sites have lower averaged winter range quality and/or have higher variability in quality from year to year. Long Ridge South (16B-01) (suspended), Rocky Hollow (16B-03), Jackson Unit (16B-05), Dairy Fork Burn (16B-10), Hilltop (16B-11), Slackpile (16B-17), North Spring Bench (16B-19), Manti Face Chaining (16C-01), Willow Creek (16C-02), Cane Valley (16C-05), Black Hill (16C-06), Julius Pasture (16C-10) (suspended), Above South Hollow (16C-11), Howard FS Chaining (16C-15) (suspended), Danish Bench, (16C-36), Cove Creek (16C-39), and Olsen Canyon (16C-45) are all considered/have been considered to be in poor condition, when averaged, or have higher variability. Reasons for these poor winter range conditions vary between high amounts of annual grass, few perennial forbs, lack of recruitment within the preferred browse community, and/or a lack of preferred browse cover. If any of these areas are to be considered for habitat rehabilitation, individual habitat concerns should be evaluated on a site-by-site basis. Dry Creek Chaining, Box Canyon Knoll, Mill Fork, North Slackpile, Porphyry Bench, and Red Point are all sites that have had habitat improvement projects that have occurred. Although specific components of habitat have improved, most of these sites have not experienced net improvements in habitat desirable component scores. However, Dry Creek Chaining and Mill Fork have had the largest improvement in conditional change; improvement has been driven by an increase in perennial grasses and forbs. Cove Creek, Huntington Canyon, Oak Creek Ridge Aspen, Scab Hollow, Slackpile, and Wire Grass Bench have the highest degree of conditional change without having land treatments in their histories. Slackpile and Wire Grass Bench are two sites that have experienced the largest degree of positive change driven by increases in preferred browse recruitment. As such, these sites may make good candidates for additional habitat improvements. Low variability in conditional change may be indicative of community resistance and resilience to ecological state transitions and may suggest that sites could be resistant to improvement inputs, so caution and planning are likely necessary to avoid treatment failure. However, it may also mean that these communities have not had major disturbances in their sample histories.

The overall deer winter range assessment in 2024 for WMU 16BC is that the combined unit remains in fair condition. Of the 61 sites sampled in 2024, 23 (or 37%) were evaluated to be between good and excellent wintering habitat conditions with most of those being in good condition. Concerning ranked proportionality, most sites are considered to be in good condition (16 sites or 26%); the number of sites ranked to be in fair condition (13 sites or 21%) is the next highest category in unit habitat condition (**Figure 5.64**, **Table 5.9**).

While these Range Trend study sites primarily monitor mule deer range conditions and principally target mule deer wintering and transitional areas, evaluating the condition of these ranges may still provide valuable insights into the overall health and suitability of elk habitats. General evaluations of elk habitat may be made using the mule deer winter range Desirable Component Index (DCI) and other vegetation data when the associated study sites intersect currently mapped elk habitat (13 sites or 21%). The DCI was created as an indicator of the general health of winter ranges for mule deer. The index incorporates shrub cover, density, and age composition as well as other key vegetation variables. Changes in DCI suggest changes in winter range capacity. However, the relationship between DCI and the changes in elk carrying capacity is difficult to quantify and is not known.

Again, the unit's wintering suitability and quality for elk is likely similar to deer winter range conditions. It should be noted that the DCI graph and table associated with this section (**Figure 5.64**, **Table 5.9**) illustrates the number of Range Trend sites within mule deer winter range. As such, the number of Range Trend sites considered to be elk habitat will not coincide with those depicted in said graph and table (**Figure 5.64**, **Table 5.9**). Sites that intersect/have intersected elk winter habitat include Long Ridge North (16B-02), Rocky Hollow, Dry Creek Chaining (16B-04), Jackson Unit, Mill Fork (16B-06), Starvation Mahogany, Starvation Mountain Brush, Dairy Fork Burn, Hilltop (16B-11), Slackpile, North Spring Bench, Telephone Bench (16B-20), Huntington Canyon (16B-21), Poison Spring Bench (16B-22), Wire Grass Bench, North Manti Face (16C-03), Cane Valley, Mayfield Mountain Face (16C-07), Pole Canyon Oak (16C-09), Above South Hollow, Middle Mountain, East Mountain (16C-18), North Horn Rock Canyon (16C-22), South Horn Exclosure (16C-24), South Horn ¼ Corner (16C-25), Upper Hole Trail, Box Canyon Knolls (16C-31), and Muddy Creek (16C-32). The overall condition of elk winter range within the Manti Central Mountains Management Unit has improved since 1994. Average unit conditions improved from poor in 1994 to fair in 2024. The sites with elevated suitability – between fair-good and good-excellent – include Starvation Mahogany, Starvation Mountain Brush, Telephone Bench, Wire Grass Bench, Middle Mountain, East Mountain, Upper Hole Trail, Wildcat Knolls, Joes Valley Overlook, Box Canyon Sage-Grouse, North Horn, and North Slackpile. As of 2024, Long Ridge North, Rocky Hollow, Dry Creek Chaining, Jackson Unit, Mill Fork, Hilltop, North Spring Bench, Huntington Canyon, Poison Spring Bench, North Manti Face, Cane Valley, Mayfield Mountain Face, Pole Canyon Oak, Above South Hollow, East Mountain, North Horn Rock Canyon, South Horn Exclosure, South Horn ¼ Corner, Box Canyon Knolls, Muddy Creek, South Sage Flat (16C-34), Danish Bench, Pleasant Creek (16C-38), Cove Creek, Olson Draw Sage-Grouse (16C-43), Olsen Canyon, and White Hill (16C-47) are between very poor and fair wintering habitat conditions for elk. Due to the number of sites that are considered to have lower elk habitat suitability, a discussion on specific condition factors contributing to suppressed habitat health is difficult. However, factors contributing to overall elevated habitat health include increased cover for preferred browse, native perennial grasses, and forbs; increased preferred browse recruitment; decreased preferred browse decadence; and decreased annual grass cover, namely cheatgrass (*Bromus tectorum*) (**Figure 5.64**, **Table 5.9**). There are many areas where reductions in twoneedle pinyon (*Pinus edulis*) and juniper (*Juniperus* spp.) tree cover would improve habitat conditions.



	1994	1999	2004	2009	2014	2019	2024
Excellent		2	1		4	3	5
Good-Excellent		1	1	3	2	7	2
Good	5	9	6	14	15	20	16
Fair-Good	2	8	3	1	5	2	4
Fair	9	21	12	15	9	8	13
Poor-Fair	2	2	9	5	2	2	7
Poor	6	6	12	8	10	6	4
Very Poor-Poor	2	3	4	3	3		
Very Poor	7	15	17	14	11	13	10

Figure 5.64: Deer winter range Desirable Components Index (DCI) summary by year of Range Trend sites for WMU 16B, 16C, Manti Central Mountains.

Study Number	Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
16B-01*	1997	14.3	5.5	3.9	11.4	-17.8	6.1	-2	**21.4**	**VP**
16B-01*	2002	10.1	10.9	0.4	17.9	-18.7	2.1	0	**22.7**	**VP**
16B-01*	2007	8.3	4.9	5.9	11.8	-20	5.4	0	**16.3**	**VP**
16B-02	1997	13.1	4.1	2.6	28.9	-0.4	10	0	**58.3**	**F**
16B-02	2002	14	6.2	6.8	30	-0.1	7.9	0	**64.8**	**F**
16B-02	2007	16.2	2	4.4	30	-0.8	10	0	**61.8**	**F**
16B-02	2014	10.2	10.8	8.7	30	-0.5	9	0	**68.2**	**F-G**
16B-02	2019	9.3	8.5	14.2	30	-6.3	10	0	**65.7**	**F**
16B-02	2024	13.6	11	5	30	-1.8	10	-2	**65.8**	**F**
16B-03	1997	14.4	6.2	4.1	17.5	-9.8	10	0	**42.4**	**P**
16B-03	2002	18.6	6	2.5	13.6	-5.5	5.7	0	**40.9**	**VP-P**
16B-03	2007	19.7	3.7	1.4	17.5	-7.6	6.5	0	**41.2**	**VP-P**
16B-03	2014	13.2	3.6	3.5	21.5	-9.7	10	0	**42.1**	**P**
16B-03	2019	14.1	4.5	3.3	18	-20	10	0	**29.9**	**VP**
16B-03	2024	19.6	14.5	15	15.8	-8.1	10	0	**66.8**	**F**
16B-04	1997	13.7	14.6	5.4	10.7	-1.2	7.8	0	**51**	**P**
16B-04	2002	12.6	7.8	2	6.9	-1.4	5.2	0	**33.1**	**VP**
16B-04	2007	18.1	9.8	10.4	8	-1.4	5.9	0	**50.8**	**P**
16B-04	2014	16.5	14.6	8.3	9.7	-0.8	4.7	0	**53**	**P**
16B-04	2019	28.7	14.8	5.1	19.9	-8	10	0	**70.5**	**F-G**
16B-04	2024	26.2	12.5	8.1	17.3	-1.5	10	0	**72.6**	**G**
16B-05	1997	0.2	0	0	29.1	-0.6	2.9	0	**31.6**	**VP**
16B-05	2002	0.2	0	0	28.2	-0.3	0.1	0	**28.2**	**VP**
16B-05	2007	0.5	0	0	30	-0.2	0.5	0	**30.8**	**VP**
16B-05	2014	0.1	0	0	30	-0.1	0.2	0	**30.2**	**VP**
16B-05	2019	0	0	0	30	0	0.6	0	**30.6**	**VP**
16B-05	2024	0.3	0	0	30	0	1.6	0	**31.9**	**VP**
16B-06	1997	30	10.8	0.5	2	0	7.4	0	**50.7**	**P**
16B-06	2002	30	2.3	0.1	1.8	0	4.9	0	**39.1**	**VP-P**
16B-06	2007	30	-1.3	0.8	2.3	0	7.4	0	**39.2**	**VP-P**
16B-06	2014	15.2	13.3	15	30	0	10	-2	**81.5**	**G**
16B-06	2019	16	12.8	14.6	30	0	9.3	-2	**80.7**	**G**
16B-06	2024	22.9	12.6	8.9	30	0	6.6	-2	**79**	**G**
16B-07*	1997	29.6	14.5	8.8	5.7	0	10	-2	**66.6**	**F**
16B-08	1999	23.2	13.1	15	15.7	0	10	0	**77**	**G**
16B-08	2002	24.7	11.6	6.8	22.3	0	10	0	**75.4**	**G**
16B-08	2007	30	12.6	11.1	27.8	0	10	0	**91.5**	**G-E**
16B-08	2014	30	14.7	7.5	30	0	10	0	**92.2**	**E**
16B-08	2019	30	14.1	5.6	30	0	10	0	**89.7**	**G-E**
16B-08	2024	30	13.8	12.2	30	0	10	0	**96**	**E**
16B-09	1999	30	12	9	11.7	-0.2	7.7	0	**70.2**	**F-G**
16B-09	2002	30	8.9	5.1	20.4	0	5	0	**69.4**	**F-G**
16B-09	2007	27.6	12.4	8.5	30	-0.6	4.8	0	**82.7**	**G**
16B-09	2014	30	14	2.9	30	0	3	0	**79.9**	**G**
16B-09	2019	30	11.8	3.6	30	-0.1	6.1	0	**81.4**	**G**
16B-09	2024	30	12.2	3.1	30	0	1.6	0	**76.9**	**G**
16B-10	1997	0.5	0	0	30	-0.7	5.7	-2	**33.5**	**VP**
16B-10	2002	2.3	0	0	30	-0.2	0.6	-2	**30.7**	**VP**
16B-10	2007	6	0	0	30	-0.1	8.4	-2	**42.3**	**P**
16B-10	2014	3.3	0	0	30	0	4.2	-2	**35.5**	**VP**
16B-10	2019	2.9	0	0	30	0	3.2	-4	**32.1**	**VP**
16B-10	2024	2.1	0	0	30	0	5.6	-2	**35.7**	**VP**
16B-11	1997	1.7	0	0	30	-0.3	0.9	-4	**28.3**	**VP**
16B-11	2002	0.9	0	0	30	0	0.4	0	**31.3**	**VP**
16B-11	2007	1.4	0	0	30	-1.3	1.3	-2	**29.4**	**VP**
16B-11	2014	0.9	0	0	30	-0.1	1.4	-2	**30.2**	**VP**
16B-11	2019	1.5	0	0	30	-2.6	2.1	-4	**27**	**VP**
16B-11	2024	2.7	0	0	30	-0.1	2.1	-4	**30.7**	**VP**

Study Number	Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
16B-12*	1997	29.1	13.9	10.7	3.9	-0.1	1.5	0	**59**	**F**
16B-13	1997	0.8	0	0	11.9	0	10	0	**22.7**	**VP**
16B-13	2002	0.7	0	0	30	0	10	-2	**38.7**	**VP-P**
16B-13	2007	30	14.9	2	19.5	0	10	-2	**74.4**	**G**
16B-13	2014	30	-13.4	2.4	30	0	10	-2	**57**	**P-F**
16B-13	2019	30	-14.4	0	30	0	10	-2	**53.6**	**P-F**
16B-13	2024	30	-7.5	8.7	16.9	0	10	-4	**54.1**	**P-F**
16B-14	1997	0	0	0	19.1	0	10	-2	**27.1**	**VP**
16B-14	2002	0	0	0	30	0	10	-2	**38**	**VP**
16B-14	2007	0	0	0	29	0	10	-2	**37**	**VP**
16B-14	2014	0	0	0	6.5	0	10	-2	**14.5**	**VP**
16B-14	2019	0	0	0	11	0	10	-2	**19**	**VP**
16B-14	2024	0	0	0	0.8	0	10	-2	**8.8**	**VP**
16B-15*	1994	17.4	14.5	5.7	30	0	7.3	0	**74.9**	**G**
16B-15*	1999	18.5	11.1	5	13.5	0	9.3	0	**57.4**	**F**
16B-16*	1994	7.9	1.4	1.8	30	0	0.6	0	**41.7**	**VP-P**
16B-16*	1999	9	6.7	10.3	30	0	6.4	0	**62.4**	**F**
16B-17	1994	7.2	2.7	2.5	29.2	0	2.6	0	**44.2**	**P**
16B-17	1999	9.9	4.4	4.1	23.2	0	4.4	0	**46**	**P**
16B-17	2004	1	0	0	8.4	0	10	-2	**17.4**	**VP**
16B-17	2009	2.4	0	0	17.9	0	5.1	0	**25.4**	**VP**
16B-17	2014	3.9	0	0	30	0	1.2	0	**35.1**	**VP-P**
16B-17	2019	8.6	13	8.2	30	-0.1	10	0	**69.7**	**G**
16B-17	2024	13	13.8	15	30	0	7.9	0	**79.7**	**G-E**
16B-18	1994	13.4	7.4	1.7	24.4	0	2.4	0	**49.3**	**G**
16B-18	1999	14.8	6.6	5.2	28.6	0	4.1	0	**59.3**	**G**
16B-18	2004	1.8	0	0	2.7	0	10	0	**14.5**	**P**
16B-18	2009	0.9	0	0	30	0	10	0	**40.9**	**F**
16B-18	2014	0.3	0	0	19.8	0	0.1	0	**20.2**	**P**
16B-18	2019	7.7	15	15	24.5	-9.9	10	0	**62.3**	**G**
16B-18	2024	29.4	14.8	15	15.8	-0.2	10	0	**84.8**	**E**
16B-19	1994	15.8	-3.5	1.3	15.7	0	0.1	0	**29.4**	**VP**
16B-19	1999	17	5.8	11.7	23.3	-0.7	0.9	0	**58**	**F**
16B-19	2004	2.3	0	0	12.3	-0.1	3.7	0	**18.2**	**VP**
16B-19	2009	2.4	0	0	26	-0.9	3.5	0	**31**	**VP**
16B-19	2014	0.6	0	0	30	-0.7	0.8	0	**30.7**	**VP**
16B-19	2019	0	0	0	30	-10.3	8.1	0	**27.8**	**VP**
16B-19	2024	0	0	0	30	-1.7	10	0	**38.3**	**P**
16B-20	1994	11.5	4.5	4	30	0	5.4	0	**55.4**	**F**
16B-20	1999	15.7	12.2	6.3	30	0	9	0	**73.2**	**G**
16B-20	2004	8.5	7.4	3.6	30	0	10	0	**59.5**	**F**
16B-20	2009	13	14.4	15	30	0	5.8	0	**78.2**	**G-E**
16B-20	2014	26.6	14.7	15	30	0	3.7	0	**90**	**E**
16B-20	2019	30	7	3.9	30	-0.6	10	0	**80.3**	**G-E**
16B-20	2024	30	11.8	1.8	30	-0.3	10	0	**83.3**	**E**
16B-21	1994	3.8	0	0	24.8	0	7	0	**35.6**	**VP**
16B-21	1999	7.9	10.5	4.5	25.7	0	10	0	**58.6**	**F**
16B-21	2004	9.7	8.3	10.4	24.4	0	2.9	0	**55.7**	**P-F**
16B-21	2009	12	5	11.8	25.6	0	3.7	0	**58.1**	**F**
16B-21	2014	10.1	10	15	30	0	10	0	**75.1**	**G**
16B-21	2019	11.1	12.4	3.4	30	0	10	0	**66.9**	**F**
16B-21	2024	11.8	8.3	1.2	30	0	10	0	**61.3**	**F**
16B-22	1994	26.6	10.6	4.2	4.7	0	1.5	0	**47.6**	**P**
16B-22	1999	28.9	12.8	2.3	6	0	1.1	0	**51.1**	**P-F**
16B-22	2004	30	10.2	1.2	0.3	0	0.7	0	**42.4**	**P**
16B-22	2009	30	9.6	1.8	1.1	0	0.9	0	**43.4**	**P**
16B-22	2014	30	8.5	2.4	0.5	0	2	0	**43.4**	**P**
16B-22	2019	30	7.6	2.4	2.1	0	5.3	0	**47.4**	**P**
16B-22	2024	30	11.2	4.1	2.6	0	3	0	**50.9**	**P-F**

Study Number	Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
16B-23	1994	11.4	6.5	8.7	28.6	0	2.2	0	**57.4**	**G**
16B-23	1999	12.8	6.8	8.7	30	0	4	0	**62.3**	**G**
16B-23	2004	1.5	0	0	10.9	-0.1	10	0	**22.3**	**P**
16B-23	2009	1.4	0	0	30	-0.2	8.9	0	**40.1**	**F**
16B-23	2012	1.7	0	0	27.7	0	1.6	0	**31**	**F**
16B-23	2014	0.8	0	0	20.7	-0.7	0.4	0	**21.2**	**P**
16B-23	2019	1.9	0	0	30	-9.5	6.2	0	**28.6**	**F**
16B-23	2024	7.2	0	0	30	-0.1	1.2	0	**38.3**	**F**
16B-24	1994	6.8	0.3	4.8	30	0	4.1	0	**46**	**P**
16B-24	1999	12.1	6.4	8.8	30	-0.2	6.3	0	**63.4**	**F-G**
16B-24	2004	6.7	0	6.4	30	0	7.5	0	**50.6**	**P-F**
16B-24	2009	8.6	8.6	15	30	0	5.3	0	**67.5**	**G**
16B-24	2014	9.7	10.9	15	30	0	4.5	0	**70.1**	**G**
16B-24	2019	11.8	10.8	15	30	-0.2	9.8	0	**77.2**	**G**
16B-24	2024	17.3	12.7	15	30	0	10	0	**85**	**E**
16C-01	1997	0.1	0	0	30	-0.7	1.2	-2	**28.6**	**VP**
16C-01	2002	0.2	0	0	30	0	0.1	-2	**28.3**	**VP**
16C-01	2007	0.5	0	0	30	-3	0.1	-2	**25.6**	**VP**
16C-01	2014	1	0	0	30	0	1	-2	**30**	**VP**
16C-01	2019	2.5	0	0	30	-0.9	1.9	-2	**31.5**	**VP**
16C-01	2024	1.5	0	0	30	0	1.3	-2	**30.8**	**VP**
16C-02	1997	11.2	15	5.4	29.2	-1	3.3	-2	**61.1**	**F**
16C-02	2002	6.9	0	0	30	0	0.8	-2	**35.7**	**VP**
16C-02	2007	7.6	13.6	0.9	28	-1.3	0.7	-2	**47.5**	**P**
16C-02	2014	6.3	0	0	30	-0.1	2.2	0	**38.4**	**VP-P**
16C-02	2019	5.7	0	0	30	-2.2	1.7	-2	**33.2**	**VP**
16C-02	2024	8.4	12.4	1.7	30	-0.3	1.9	-2	**52.1**	**P**
16C-03	1997	6.2	6.3	5	23.9	-0.2	10	0	**51.2**	**P**
16C-03	2002	6.2	0	0	24.2	0	6.7	0	**37.1**	**VP**
16C-03	2007	3.9	0	0	16.2	-0.9	5.3	0	**24.5**	**VP**
16C-03	2014	4.3	0	0	24.4	-0.2	10	0	**38.5**	**VP-P**
16C-03	2019	5.9	0	0	30	-0.8	10	0	**45.1**	**P**
16C-03	2024	5.3	0	0	30	-0.1	8.3	0	**43.5**	**P**
16C-04*	1997	24.1	10.1	9.6	12	0	2.8	-2	**56.6**	**P-F**
16C-04*	2002	22	9.1	7.7	10.9	0	2.2	0	**51.9**	**P**
16C-05	1997	0.1	0	0	29.7	-0.1	8	-2	**35.7**	**VP-P**
16C-05	2002	0.1	0	0	30	0	6.9	0	**37**	**VP-P**
16C-05	2007	0	0	0	30	-1.8	7.9	0	**36.1**	**VP-P**
16C-05	2014	1.2	0	0	30	-0.2	6.9	0	**37.9**	**P**
16C-05	2019	2.2	0	0	30	-0.1	7.6	-2	**37.7**	**P**
16C-05	2024	4	0	0	30	0	9.3	0	**43.3**	**P**
16C-06	1997	1.1	0	0	30	-1.5	1	0	**30.6**	**VP**
16C-06	2002	1.2	0	0	30	-0.3	0	0	**30.9**	**VP**
16C-06	2007	1.5	0	0	30	-4.4	0.1	0	**27.2**	**VP**
16C-06	2014	1.8	0	0	30	-0.5	0.3	0	**31.6**	**VP**
16C-06	2015	1.9	0	0	30	-0.6	0.1	0	**31.4**	**VP**
16C-06	2019	1.3	0	0	30	-6.6	0.4	0	**25.1**	**VP**
16C-06	2024	2.5	0	0	30	-7.1	0.4	0	**25.8**	**VP**
16C-07	1997	12.2	11.3	7.6	30	-0.3	0.6	0	**61.4**	**F**
16C-07	2002	11.4	10.9	0.4	22	0	0	0	**44.7**	**P**
16C-07	2007	12.8	9.2	13.7	25.8	-1.8	0.2	0	**59.9**	**F**
16C-07	2014	17.4	12.4	15	30	-1	0.5	0	**74.3**	**G**
16C-07	2019	17.5	11.4	13.6	30	-3	1.5	0	**71**	**G**
16C-07	2024	14.1	8.5	1.6	30	-0.4	1	0	**54.8**	**F**

Study Number	Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
16C-08	1997	4.3	0	0	11.9	-0.4	1.3	0	**17.1**	**VP**
16C-08	2002	1.7	0	0	1.1	0	0.3	0	**3.1**	**VP**
16C-08	2007	3.8	0	0	21.5	-1.9	0.4	0	**23.8**	**VP**
16C-08	2014	1.4	0	0	30	-4.1	0.3	0	**27.6**	**VP**
16C-08	2019	1.3	0	0	30	-3.4	0.2	0	**28.1**	**VP**
16C-08	2024	2.2	0	0	30	-1	0	0	**31.2**	**VP**
16C-09	1997	25.7	12.6	14.1	5.4	-0.6	1.3	0	**58.5**	**F**
16C-09	2002	17.3	9.7	11.4	3.7	0	0.6	0	**42.7**	**P**
16C-09	2007	29.3	10.9	10.2	4.8	-0.5	1	0	**55.7**	**P-F**
16C-09	2014	17.9	15	1.6	30	-1.4	4.8	-2	**65.9**	**F**
16C-09	2019	30	14.8	2.4	28.3	-0.4	4.4	-2	**77.5**	**G**
16C-09	2024	30	12.2	7.7	30	0	3.8	-2	**81.7**	**G**
16C-10*	1997	0	0	0	28.9	0	10	0	**38.9**	**VP-P**
16C-11	1997	4.7	0	0	30	0	1.9	0	**36.6**	**VP**
16C-11	2002	3.4	0	0	13.7	0	0.1	0	**17.2**	**VP**
16C-11	2007	4.3	0	0	25.5	-0.1	0.1	0	**29.8**	**VP**
16C-11	2014	0.8	0	0	30	0	2.5	-4	**29.3**	**VP**
16C-11	2019	2.3	0	0	30	-0.4	3	-2	**32.9**	**VP**
16C-11	2024	2.4	0	0	30	0	1.9	0	**34.3**	**VP**
16C-12	1997	15.3	5.2	2.8	29.2	-0.3	0	0	**52.2**	**F**
16C-12	2002	11.4	4.4	0.4	27.8	0	0	0	**44**	**P**
16C-12	2007	11.3	-2.1	0.5	30	-0.5	0	0	**39.2**	**P**
16C-12	2014	7.6	8.7	1.1	30	-0.1	0.1	0	**47.4**	**P**
16C-12	2019	9.1	3.7	1.9	30	-0.6	0.7	0	**44.8**	**P**
16C-12	2024	8.5	6.2	5.1	30	-0.7	0.9	0	**50**	**P-F**
16C-13*	1994	5.6	0	0	27.8	0	3.5	0	**36.9**	**VP**
16C-13*	1999	11.1	12.5	5.9	30	0	7.7	0	**67.2**	**F**
16C-13*	2004	9.6	10.4	1.6	30	0	1.8	0	**53.4**	**P-F**
16C-13*	2009	10.7	10.4	2.9	30	0	3	0	**57**	**P-F**
16C-13*	2014	7.6	11.3	0.7	30	0	2.3	0	**51.9**	**P**
16C-14	1994	2.3	0	0	19	0	2.4	0	**23.7**	**VP**
16C-14	1999	7.5	14.8	7.9	23.7	0	1	0	**54.9**	**F**
16C-14	2004	13.5	13.6	11.6	4.6	0	1.4	0	**44.7**	**P**
16C-14	2009	12.1	13.9	9.7	3.8	0	0.4	0	**39.9**	**P**
16C-14	2014	14.9	14.3	15	8.7	0	0.5	0	**53.4**	**F**
16C-14	2019	21.6	13.1	5.8	30	-0.2	2.1	0	**72.4**	**G**
16C-14	2024	14.2	8	13.1	25.2	0	0.2	0	**60.7**	**F**
16C-15*	1994	6.5	9.8	4.8	10.5	0	1.5	0	**33.1**	**VP-P**
16C-15*	1999	6.7	5.4	5.7	10.8	0	0.9	0	**29.5**	**VP**
16C-15*	2004	7	6.3	3.2	5.9	0	1.1	0	**23.5**	**VP**
16C-15*	2009	7.8	7.1	1	7.2	0	0.3	0	**23.4**	**VP**
16C-15*	2014	4	0	0	4.9	0	0.2	0	**9.1**	**VP**
16C-17	1994	12.9	10.5	5.8	28.8	0	8.2	0	**66.2**	**F-G**
16C-17	1999	23.9	12.7	8.4	29.5	0	10	0	**84.5**	**E**
16C-17	2004	30	12.3	9	29.7	0	10	0	**91**	**E**
16C-17	2009	27.1	12.2	8.5	23.8	0	10	0	**81.6**	**G-E**
16C-17	2014	29.5	14.5	6.2	25.3	0	10	0	**85.5**	**E**
16C-17	2019	30	13.6	5	27.6	0	10	0	**86.2**	**E**
16C-17	2024	30	14.1	6	24.3	0	10	0	**84.4**	**E**
16C-18	1994	17.6	8.8	4.2	18.2	0	10	0	**58.8**	**F**
16C-18	1999	19.7	6.5	4.1	20.6	0	10	0	**60.9**	**F**
16C-18	2004	17.8	2.9	5.7	23.2	0	10	0	**59.6**	**F**
16C-18	2009	21.6	4.5	6.1	16.1	0	10	0	**58.3**	**F**
16C-18	2014	19.5	9.4	9.7	25.3	0	10	0	**73.9**	**G**
16C-18	2019	26.9	11.1	3.1	21.1	-0.1	10	0	**72.1**	**G**
16C-18	2024	22.3	7.3	3.7	22.7	0	10	0	**66**	**F**

Study Number	Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
16C-19	1994	26.7	9.9	10.6	20.3	0	10	0	**77.5**	**G**
16C-19	1999	29.1	12.3	11.2	20.4	0	10	0	**83**	**G**
16C-19	2004	30	11.7	9.4	20	0	10	0	**81.1**	**G**
16C-19	2009	28.4	11.5	12.2	17.1	0	10	0	**79.2**	**G**
16C-19	2014	30	13.7	6.4	22.6	0	10	0	**82.7**	**G**
16C-19	2019	30	11.7	7.2	30	0	10	0	**88.9**	**G-E**
16C-19	2024	30	11.2	3.7	27.8	0	10	0	**82.7**	**G**
16C-20	1994	19.5	9.8	2.7	30	0	0.1	0	**62.1**	**F**
16C-20	1999	22.6	11.3	4.8	30	0	2.3	0	**71**	**F-G**
16C-20	2004	14.8	2.5	1.6	30	0	0.8	0	**49.7**	**P**
16C-20	2009	22.9	7.6	4.1	30	0	0.6	0	**65.2**	**F**
16C-20	2014	14.6	12.4	3.7	30	0	2.2	0	**62.9**	**F**
16C-20	2019	17.6	6.3	2.1	30	0	6.1	0	**62.1**	**F**
16C-20	2024	13.6	8.7	1.3	30	0	1.9	0	**55.5**	**P-F**
16C-22	1994	19	7.8	0.6	14.8	0	1.1	0	**43.3**	**P**
16C-22	1999	17.3	6.3	1.4	22.7	0	3.4	0	**51.1**	**P**
16C-22	2004	22.3	5.3	2.1	22.1	0	2.8	0	**54.6**	**P-F**
16C-22	2009	22.8	6	6.2	19.5	0	1.3	0	**55.8**	**P-F**
16C-22	2014	21.1	12.7	15	19.2	0	3.2	0	**71.2**	**F-G**
16C-22	2019	30	9.9	2.6	18.5	0	3.7	0	**64.7**	**F**
16C-22	2024	30	11.2	2	17.9	0	2.3	0	**63.4**	**F**
16C-23	1994	7.4	10.2	14	25.9	0	0.8	0	**58.3**	**F**
16C-23	1999	9.8	10.4	15	19.8	0	0.9	0	**55.9**	**F**
16C-23	2004	15.9	12.9	1.7	21.4	0	3.2	0	**55.1**	**F**
16C-23	2009	15.9	9.9	15	14.9	0	1.1	0	**56.8**	**F**
16C-23	2014	18.5	11.9	15	30	0	0.7	0	**76.1**	**G**
16C-23	2019	20.6	11.4	15	30	0	4.6	0	**81.6**	**G-E**
16C-23	2024	24.3	10.9	1.5	29.1	0	2.7	0	**68.5**	**G**
16C-24	1994	16.8	6.3	0.6	6.7	0	4.2	0	**34.6**	**VP**
16C-24	1999	25.7	11.7	8.4	10	0	6.3	0	**62.1**	**F**
16C-24	2004	30	11.1	8.5	3.7	0	4	0	**57.3**	**F**
16C-24	2009	30	8.6	6.6	9.1	0	2.8	0	**57.1**	**F**
16C-24	2014	30	12.1	8.4	7.8	0	5.5	0	**63.8**	**F**
16C-24	2019	17.5	7	11.8	9	0	7.1	0	**52.4**	**P**
16C-24	2024	17.1	11.9	9.1	8	0	7.7	0	**53.8**	**P-F**
16C-25	1994	12.7	2.7	2.5	17	0	9.8	0	**44.7**	**P**
16C-25	1999	13.1	11.8	9.1	24.2	0	10	0	**68.2**	**F-G**
16C-25	2004	15.6	8.7	7.1	20.6	0	10	0	**62**	**F**
16C-25	2009	14.9	10.6	15	20.1	0	10	0	**70.6**	**F-G**
16C-25	2014	18.5	12.8	15	30	0	10	0	**86.3**	**G**
16C-25	2019	24	12.7	5.9	30	0	10	0	**82.6**	**G**
16C-25	2024	21	11.3	4	23.9	0	10	0	**70.2**	**F-G**
16C-26	1994	30	5.5	1.1	9.6	0	0.6	0	**46.8**	**P**
16C-26	1999	30	9.4	4.4	8.7	0	5.6	0	**58.1**	**F**
16C-26	2004	30	4.1	1.4	6.5	0	1.7	0	**43.7**	**P**
16C-26	2009	30	7.8	1.1	10.6	0	1.2	0	**50.7**	**P-F**
16C-26	2014	30	12.2	3.5	12.7	0	2.6	0	**61**	**F**
16C-26	2019	30	11.1	4.3	19.7	0	4.8	0	**69.9**	**G**
16C-26	2024	30	10.5	0.6	15.3	0	2.2	0	**58.6**	**F**
16C-27	1994	9.7	11.7	11.7	23.6	0	0.2	0	**56.9**	**F**
16C-27	1999	13.8	11.2	7.4	27.2	0	0	0	**59.6**	**F**
16C-27	2004	21.8	7.5	4.8	16.2	0	0.1	0	**50.4**	**P-F**
16C-27	2009	19	11.3	11	21.6	0	0	0	**62.9**	**F**
16C-27	2014	19.9	12.4	7	24.3	0	0	0	**63.6**	**F-G**
16C-27	2019	27.8	12.8	3.8	30	0	0.1	0	**74.5**	**G**
16C-27	2024	27	8.6	2.2	25.4	0	0.1	0	**63.3**	**F-G**

Study Number	Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
16C-28	1994	21	10.1	5.9	18.3	0	3.1	0	**58.4**	**F**
16C-28	1999	23.4	11.3	13.6	17.2	0	0.9	0	**66.4**	**F-G**
16C-28	2004	27.6	12.6	11.6	6.9	0	0.5	0	**59.2**	**F**
16C-28	2009	24.4	7.7	8.1	13.5	0	1.4	0	**55.1**	**F**
16C-28	2014	15.7	12.7	13	9.7	0	0.7	0	**51.8**	**P-F**
16C-28	2019	21.2	11.9	8.8	23.7	0	2.9	0	**68.5**	**G**
16C-28	2024	19.3	13.9	7.9	22.2	0	1.3	0	**64.6**	**F-G**
16C-29	1994	5	0	0	30	0	1.2	0	**36.2**	**VP**
16C-29	1999	8.5	14.8	15	30	0	10	0	**78.3**	**G**
16C-29	2004	23.7	12	15	30	0	1.7	0	**82.4**	**G**
16C-29	2009	24.8	14.9	6.6	30	0	1.6	0	**77.9**	**G**
16C-29	2014	19.5	13.1	3.4	30	0	3.7	0	**69.7**	**F-G**
16C-29	2019	20.7	13	5.6	30	0	5.3	0	**74.6**	**G**
16C-29	2024	13.6	10.4	0.1	30	0	6.3	0	**60.4**	**F**
16C-30	1994	29.7	13.7	5.9	17.1	0	10	0	**76.4**	**G**
16C-30	1999	30	12.9	12.8	14.5	0	10	0	**80.2**	**G**
16C-30	2004	30	13.6	7.1	17.4	0	10	0	**78.1**	**G**
16C-30	2009	30	14.3	5.8	16	0	10	0	**76.1**	**G**
16C-30	2014	30	13.4	8.8	16.3	0	10	0	**78.5**	**G**
16C-30	2019	30	12.6	6.8	9.6	0	10	0	**69**	**F-G**
16C-30	2024	30	14.5	6.1	17.1	0	10	0	**77.7**	**G**
16C-31	1994	9.4	13.3	14.7	28.9	0	3.5	0	**69.8**	**F-G**
16C-31	1999	14	10.2	13.4	21.8	0	6.1	0	**65.5**	**F**
16C-31	2004	6	0	0	12.9	0	8.3	0	**27.2**	**VP**
16C-31	2009	8.3	12.9	15	16.9	0	9.9	0	**63**	**F**
16C-31	2014	18	14.9	15	17.3	0	4.4	0	**69.6**	**F-G**
16C-31	2019	30	15	9.7	16.5	0	10	0	**81.2**	**G**
16C-31	2024	24.6	14.4	4.9	13	0	6.2	0	**63.1**	**F**
16C-32	1994	10.1	10.5	2.9	10.7	0	1.1	0	**35.3**	**F**
16C-32	1999	9.3	3.9	5.1	13.8	0	0.4	0	**32.5**	**F**
16C-32	2004	8.7	7.8	1	5.2	0	3.9	0	**26.6**	**P-F**
16C-32	2009	5.5	10.1	10.6	21.3	0	0.3	0	**47.8**	**G**
16C-32	2014	5.4	11.8	5.8	24.1	-0.1	0.1	0	**47.1**	**G**
16C-32	2019	6.1	10.5	3.4	24	-8.3	2.3	0	**38**	**F**
16C-32	2024	7	13.1	15	18.3	-1.8	1.6	0	**53.2**	**G**
16C-33*	1994	6.1	5.6	2.9	20.3	0	0.4	0	**35.3**	**F**
16C-33*	1999	11.4	7.4	12.5	30	-0.3	5.9	0	**66.9**	**G-E**
16C-33*	2004	10	7	0	14.2	0	7.7	0	**38.9**	**F**
16C-33*	2009	7.7	11.4	15	20.8	-0.3	1	0	**55.6**	**G**
16C-34	1994	16.1	11	5.1	14.8	0	6.4	0	**53.4**	**P-F**
16C-34	1999	20	9.8	9.9	20.7	0	8.2	0	**68.6**	**F-G**
16C-34	2004	8.5	7.9	3	30	0	4.2	0	**53.6**	**P-F**
16C-34	2009	9.3	8.6	7.5	21.6	0	4.1	0	**51.1**	**P**
16C-34	2014	14.5	13.7	15	30	0	5.3	0	**78.5**	**G**
16C-34	2019	22.6	14.4	11.2	27.1	0	8.9	0	**84.2**	**G**
16C-34	2024	17.3	13.5	5.5	30	0	4.7	0	**71**	**F-G**
16C-35	1994	17	11.8	0.3	22.1	0	4	0	**55.2**	**P-F**
16C-35	1999	20.6	11	13.1	30	0	7.8	0	**82.5**	**G**
16C-35	2004	14.6	13.1	4.2	26.5	0	5.1	0	**63.5**	**F**
16C-35	2009	18.8	13.6	15	30	0	3.2	0	**80.6**	**G**
16C-35	2014	19.6	13.8	6	30	0	5.3	0	**74.7**	**G**
16C-35	2019	30	14.1	7.3	30	0	9.4	0	**90.8**	**G-E**
16C-35	2024	30	14.5	8.2	30	0	8.6	0	**91.3**	**G-E**

Study Number	Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
16C-36	1994	5.7	0	0	14.7	0	2.9	0	**23.3**	**VP**
16C-36	1999	5.9	0	0	14.6	0	2.6	0	**23.1**	**VP**
16C-36	2004	7.7	11.4	6.8	7.6	0	7.5	0	**41**	**P**
16C-36	2009	11.9	0.1	6.2	7.2	0	1.4	0	**26.8**	**VP**
16C-36	2014	11	13.7	2	9.4	0	2.7	0	**38.8**	**P**
16C-36	2019	17.2	13	0.5	18.2	0	3.2	0	**52.1**	**F**
16C-36	2024	15.7	12.6	3.1	17.2	0	0.8	0	**49.4**	**P-F**
16C-37	1994	15.3	10.8	1.6	24.6	0	5	0	**57.3**	**F**
16C-37	1999	18.4	10.8	6	24.3	0	10	0	**69.5**	**F-G**
16C-37	2004	27.8	9.7	5.6	19	0	8.6	0	**70.7**	**F-G**
16C-37	2009	22.6	11.1	11.4	20.5	0	10	0	**75.6**	**G**
16C-37	2014	30	14.6	13.4	30	0	10	0	**98**	**E**
16C-37	2019	30	13.2	13.4	29	0	10	0	**95.6**	**E**
16C-37	2024	30	12.3	4.5	25.7	0	10	0	**82.5**	**G**
16C-38	1997	22.1	12.5	8.8	28	-1.2	10	-6	**74.2**	**G**
16C-38	2002	24.1	13.3	4.9	24.2	0	10	-4	**72.5**	**G**
16C-38	2007	21.9	7.1	6.3	19.2	-2.4	10	-2	**60.1**	**F**
16C-38	2014	8.9	13.8	6.3	25.7	-0.5	10	-4	**60.2**	**F**
16C-38	2019	18.1	12	1.6	24	-0.4	10	-6	**59.3**	**F**
16C-38	2024	24.8	13.6	4.6	27.5	0	10	-2	**78.5**	**G**
16C-39	1997	22.6	12.6	5.4	6.1	-11.9	1.5	-4	**32.3**	**VP**
16C-39	2002	30	12.7	5.5	19.5	-3.6	0.2	-2	**62.3**	**F**
16C-39	2007	30	11	4.3	6.5	-6.3	0.5	-2	**44**	**P**
16C-39	2014	30	8.4	11.1	5.4	-10.4	0.1	-2	**42.6**	**P**
16C-39	2019	30	1.5	3.3	6	-20	0.2	-2	**19**	**VP**
16C-39	2024	30	10.3	15	14.6	-5.9	0.7	-2	**62.7**	**F**
16C-40	1999	0	0	0	25	0	1.4	-2	**24.4**	**VP**
16C-40	2004	0	0	0	28.4	0	0.9	0	**29.3**	**VP**
16C-40	2009	0.3	0	0	30	0	2.1	0	**32.4**	**VP**
16C-40	2014	0	0	0	30	0	4.7	-4	**30.7**	**VP**
16C-40	2019	0	0	0	30	0	0.9	-2	**28.9**	**VP**
16C-40	2024	0.1	0	0	30	0	0.3	-2	**28.4**	**VP**
16C-41	1999	30	11.3	11.7	30	0	9.7	0	**92.7**	**E**
16C-41	2004	30	10.6	5.9	28.8	0	7.9	0	**83.2**	**G**
16C-41	2009	30	12	5.8	30	0	9.1	0	**86.9**	**G**
16C-41	2014	30	11.8	6.5	30	0	10	0	**88.3**	**G-E**
16C-41	2019	30	9.3	6.5	30	0	10	0	**85.8**	**G**
16C-41	2024	30	10.7	5.1	30	0	10	0	**85.8**	**G**
16C-42	2004	20.9	8.1	5	30	0	7.9	0	**71.9**	**F-G**
16C-42	2009	12.1	9.4	15	30	0	10	0	**76.5**	**G**
16C-42	2014	9.6	9.2	8.6	30	0	7.3	0	**64.7**	**F**
16C-42	2019	14.2	11.4	15	30	0	9.2	0	**79.8**	**G**
16C-42	2024	19.8	13.4	5.6	30	0	10	0	**78.8**	**G**
16C-43	2004	20.8	0.7	1.2	23.6	0	10	0	**56.3**	**P-F**
16C-43	2009	15.6	3.8	9.2	27.5	0	5.9	0	**62**	**F**
16C-43	2014	19.3	9.6	15	30	0	10	0	**83.9**	**G**
16C-43	2019	21.1	7	10.2	30	0	10	0	**78.3**	**G**
16C-43	2024	24.3	10.2	4.9	30	0	10	0	**79.4**	**G**
16C-44	2005	30	13.4	15	23.2	0	8.4	0	**90**	**G-E**
16C-44	2009	30	9.7	6	26.8	0	5.4	0	**77.9**	**G**
16C-44	2014	28.7	13.9	12.1	27.2	0	8.9	0	**90.8**	**G-E**
16C-44	2019	30	14.1	15	30	0	10	0	**99.1**	**E**
16C-44	2024	30	13.5	11.3	15.7	0	8.7	0	**79.2**	**G**
16C-45	2007	12.3	9.8	1.8	30	-0.6	1	0	**54.3**	**F**
16C-45	2014	11.6	8	4.1	30	-0.2	2.6	0	**56.1**	**F**
16C-45	2019	8.3	5	5	30	-1.9	2.1	0	**48.5**	**P-F**
16C-45	2024	9.8	6.8	2.1	30	0	1.8	0	**50.5**	**P-F**

Study Number	Year	Preferred Browse Cover	Preferred Browse Decadence	Preferred Browse Young	Perennial Grass Cover	Annual Grass Cover	Perennial Forb Cover	Noxious Weeds	Total Score	Ranking
16C-46	2014	14.6	10.7	2.2	5	0	0.4	0	**32.9**	**F**
16C-46	2019	18.8	13.6	2	8.9	0	3.9	0	**47.2**	**G**
16C-46	2024	15.7	11.8	4.3	6.7	0	1.8	0	**40.3**	**F**
16C-47	2019	18.9	8.2	11.4	7.8	-7.3	0.1	0	**39.1**	**P**
16C-47	2024	18.1	5.9	2.4	10.9	-7	0	0	**30.3**	**VP**
16C-51	2019	30	14.5	3.6	30	0	10	0	**88.1**	**G-E**
16C-51	2024	30	13.6	6.2	25.5	0	6.3	0	**81.6**	**G**
16R-03*	1997	11.2	0.5	1.1	14	0	0.3	0	**27.1**	**F**
16R-03*	2004	2.1	0	0	21.2	0	3.3	0	**26.6**	**P-F**
16R-04*	1997	0	0	0	5	0	6.4	0	**11.4**	**VP-P**
16R-04*	2004	0	0	0	30	0	7.4	0	**37.4**	**F**
16R-06	1998	17.2	9.3	12.9	23.8	0	1.3	0	**64.5**	**F-G**
16R-06	2004	3.5	0	0	28.8	0	6.1	0	**38.4**	**P**
16R-06	2009	7.3	13.7	15	30	0	5	0	**71**	**G**
16R-06	2014	7.4	13.9	15	30	0	1.1	0	**67.4**	**G**
16R-06	2019	21.9	14.7	15	25.9	0	3.5	0	**81**	**G-E**
16R-06	2024	28.3	12.7	3.4	25.1	0	2.3	0	**71.8**	**G**
16R-10*	1999	3.9	0	0	6.3	-0.4	10	0	**19.8**	**VP**
16R-10*	2001	30	14.9	0.3	4.8	-0.8	10	0	**59.2**	**F**
16R-10*	2004	30	15	0	7.4	-0.7	0.4	0	**52.1**	**F**
16R-10*	2009	30	15	0	6.8	-0.6	0	0	**51.2**	**P-F**

Table 5.9: Deer winter range Desirable Components Index (DCI) information by site number of Range Trend studies for WMU 16B, 16C, Manti Central Mountains. VP = Very Poor, P = Poor, F = Fair, G = Good, E = Excellent. *Studies with an asterisk have been suspended.

Study #	Study Name	Limiting Factor and/or Threat	Level of Impact	Potential Impact
16B-02	Long Ridge North	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		Energy Development	Low	Fragmentation and degradation/loss of habitat
		Noxious Weeds	Low	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16B-03	Rocky Hollow	Animal Use – Deer	High	Reduced/less vigorous browse component
		Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16B-04	Dry Creek Chaining	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Medium	Reduced understory shrub and herbaceous vigor
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
16B-05	Jackson Unit	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		PJ Encroachment	High	Reduced understory shrub and herbaceous vigor
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
16B-06	Mill Fork	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		Noxious Weeds	Low	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16B-08	Starvation Mahogany	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16B-09	Starvation Mountain Brush	Energy Development	High	Fragmentation and degradation/loss of habitat
		Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16B-10	Dairy Fork Burn	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		Noxious Weeds	Low	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16B-11	Hilltop	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		Noxious Weeds	Low	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16B-13	Oak Creek Ridge Aspen	Noxious Weeds	High	Reduced diversity of desirable grass and forb species
		Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
		Conifer Encroachment	Low	Reduced understory shrub, aspen stand, and herbaceous vigor

Study #	Study Name	Limiting Factor and/or Threat	Level of Impact	Potential Impact
16B-14	Oak Creek Ridge Seeding	Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		Noxious Weeds	Medium	Reduced diversity of desirable grass and forb species
16B-17	Slackpile	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		Noxious Weeds	Low	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16B-18	Porphyry Bench	Animal Use – Deer	High	Reduced/less vigorous browse component
		Energy Development	High	Fragmentation and degradation/loss of habitat
		Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
t		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
16B-19	North Spring Bench	Energy Development	High	Fragmentation and degradation/loss of habitat
		PJ Encroachment	Medium	Reduced understory shrub and herbaceous vigor
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
16B-20	Telephone Bench	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16B-21	Huntington Canyon	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16B-22	Poison Spring Bench	Animal Use – Deer	High	Reduced/less vigorous browse component
		Energy Development	High	Fragmentation and degradation/loss of habitat
		Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16B-23	Consumer Bench	Energy Development	High	Fragmentation and degradation/loss of habitat
		Animal Use – Cattle	Medium	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16B-24	Wire Grass Bench	Animal Use – Deer	High	Reduced/less vigorous browse component
		Energy Development	High	Fragmentation and degradation/loss of habitat
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16C-01	Manti Face Chaining	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		Noxious Weeds	Low	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16C-02	Willow Creek	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		Noxious Weeds	Low	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16C-03	North Manti Face	Animal Use – Deer	High	Reduced/less vigorous browse component
		PJ Encroachment	Medium	Reduced understory shrub and herbaceous vigor
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		Tourism/Recreation	Low	Loss of habitat, reduced shrub and herbaceous vigor
16C-05	Cane Valley	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		Noxious Weeds	Low	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
		Tourism/Recreation	Low	Loss of habitat, reduced shrub and herbaceous vigor
16C-06	Black Hill	Animal Use – Deer/Sheep	High	Reduced/less vigorous browse component
		Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16C-07	Mayfield Mountain Face	Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
		Tourism/Recreation	Low	Loss of habitat, reduced shrub and herbaceous vigor
16C-08	Pole Canyon Chaining	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Animal Use – Cattle	Medium	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16C-09	Pole Canyon Oak	Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		Noxious Weeds	Low	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16C-11	Above South Hollow	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		Noxious Weeds	Low	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor

Study #	Study Name	Limiting Factor and/or Threat	Level of Impact	Potential Impact
16C-12	Manti Dump	Energy Development	High	Fragmentation and degradation/loss of habitat
		Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16C-14	Red Point	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Animal Use – Elk	Medium	Reduced shrub vigor/diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16C-17	Middle Mountain	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16C-18	East Mountain	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16C-19	Trail Mountain Exclosure	Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16C-20	Miles Point	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16C-22	North Horn Rock Canyon	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16C-23	Black Dragon	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
		Drought		Lowered resilience and resistance to disturbance
16C-24	South Horn Exclosure	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16C-25	South Horn ¼ Corner	None Identified		
16C-26	Dry Mountain	Animal Use – Deer	Medium	Reduced/less vigorous browse component
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16C-27	Birch Creek Chaining	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16C-28	South of Dry Wash	Animal Use – Elk	High	Reduced shrub vigor/diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16C-29	Scab Hollow	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16C-30	Upper Hole Trail	Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16C-31	Box Canyon Knolls	Animal Use – Elk	High	Reduced shrub vigor/diversity of desirable grass and forb species
16C-32	Muddy Creek	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16C-34	South Sage Flat	Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		Animal Use – Elk	High	Reduced shrub vigor/diversity of desirable grass and forb species
		Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
16C-35	Wildcat Knolls	Animal Use – Cattle	Medium	Reduced diversity of desirable grass and forb species
		Animal Use – Elk	Medium	Reduced shrub vigor/diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16C-36	Danish Bench	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16C-37	Joes Valley Overlook	Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16C-38	Pleasant Creek	Energy Development	High	Fragmentation and degradation/loss of habitat
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species
		Noxious Weeds	Low	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16C-39	Cove Creek	Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Noxious Weeds	Medium	Reduced diversity of desirable grass and forb species
		Animal Use – Cattle	Medium	Reduced diversity of desirable grass and forb species
16C-40	Cedar Mountain	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		Noxious Weeds	Low	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor

Study #	Study Name	Limiting Factor and/or Threat	Level of Impact	Potential Impact
16C-41	Trough Hollow	Introduced Perennial Grass PJ Encroachment	Low Low	Reduced diversity of desirable grass and forb species Reduced understory shrub and herbaceous vigor
16C-42	Box Canyon Sage-Grouse	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
16C-43	Olson Draw Sage-Grouse	None Identified		
16C-44	North Horn	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16C-45	Olsen Canyon	Introduced Perennial Grass Annual Grass PJ Encroachment	High Low Low	Reduced diversity of desirable grass and forb species Increased fire potential and reduced herbaceous diversity Reduced understory shrub and herbaceous vigor
16C-46	Indian Hollow	Animal Use – Deer PJ Encroachment	Medium Low	Reduced/less vigorous browse component Reduced understory shrub and herbaceous vigor
16C-47	White Hill	Annual Grass Animal Use – Deer Introduced Perennial Grass PJ Encroachment Tourism/Recreation	High Medium Medium Low Low	Increased fire potential and reduced herbaceous diversity Reduced/less vigorous browse component Reduced diversity of desirable grass and forb species Reduced understory shrub and herbaceous vigor Loss of habitat, reduced shrub and herbaceous vigor
16C-51	Old Woman Plateau	Animal Use – Cattle Introduced Perennial Grass	High Medium	Reduced diversity of desirable grass and forb species Reduced diversity of desirable grass and forb species
16C-52	Rolfson Reservoir	Introduced Perennial Grass Noxious Weeds	Medium Low	Reduced diversity of desirable grass and forb species Reduced diversity of desirable grass and forb species
16R-06	North Slackpile	Animal Use – Deer Annual Grass Introduced Perennial Grass PJ Encroachment	High Low Low Low	Reduced/less vigorous browse component Increased fire potential and reduced herbaceous diversity Reduced diversity of desirable grass and forb species Reduced understory shrub and herbaceous vigor
16R-11	Lower Cedar Bench	Animal Use – Deer Annual Grass PJ Encroachment	Medium Low Low	Reduced/less vigorous browse component Increased fire potential and reduced herbaceous diversity Reduced understory shrub and herbaceous vigor
16R-12	Upper Cedar Bench	Annual Grass PJ Encroachment	Low Low	Increased fire potential and reduced herbaceous diversity Reduced understory shrub and herbaceous vigor
16R-13	Upper Porphyry	Animal Use – Cattle Energy Development Introduced Perennial Grass Annual Grass	High High High Low	Reduced diversity of desirable grass and forb species Fragmentation and degradation/loss of habitat Reduced diversity of desirable grass and forb species Increased fire potential and reduced herbaceous diversity
16R-14	Consumer Bench North	Energy Development Annual Grass Introduced Perennial Grass PJ Encroachment Drought	High Low Low Low 	Fragmentation and degradation/loss of habitat Increased fire potential and reduced herbaceous diversity Reduced diversity of desirable grass and forb species Reduced understory shrub and herbaceous vigor Lowered resilience and resistance to disturbance
16R-15	Consumer Bench 2	Animal Use – Cattle Energy Development Annual Grass Introduced Perennial Grass PJ Encroachment Drought	High High Low Low Low 	Reduced diversity of desirable grass and forb species Fragmentation and degradation/loss of habitat Increased fire potential and reduced herbaceous diversity Reduced diversity of desirable grass and forb species Reduced understory shrub and herbaceous vigor Lowered resilience and resistance to disturbance
16R-16	Wildcat Push	Introduced Perennial Grass Annual Grass PJ Encroachment	Medium Low Low	Reduced diversity of desirable grass and forb species Increased fire potential and reduced herbaceous diversity Reduced understory shrub and herbaceous vigor
16R-17	Cedar Mountain Brush Saw	Introduced Perennial Grass Annual Grass Noxious Weeds PJ Encroachment	High Low Low Low	Reduced diversity of desirable grass and forb species Increased fire potential and reduced herbaceous diversity Reduced diversity of desirable grass and forb species Reduced understory shrub and herbaceous vigor
16R-18	Cedar Mountain Dixie	Introduced Perennial Grass Annual Grass PJ Encroachment	High Low Low	Reduced diversity of desirable grass and forb species Increased fire potential and reduced herbaceous diversity Reduced understory shrub and herbaceous vigor
16R-19	Lower Fish Creek WMA	Introduced Perennial Grass Animal Use – Cattle	High Medium	Reduced diversity of desirable grass and forb species Reduced diversity of desirable grass and forb species
16R-21	Stump Flat	Animal Use – Cattle Energy Development Introduced Perennial Grass PJ Encroachment	High High High Low	Reduced diversity of desirable grass and forb species Fragmentation and degradation/loss of habitat Reduced diversity of desirable grass and forb species Reduced understory shrub and herbaceous vigor
16R-23	North Spring	Energy Development Annual Grass Introduced Perennial Grass PJ Encroachment	High Low Low Low	Fragmentation and degradation/loss of habitat Increased fire potential and reduced herbaceous diversity Reduced diversity of desirable grass and forb species Reduced understory shrub and herbaceous vigor

Study #	Study Name	Limiting Factor and/or Threat	Level of Impact	Potential Impact
16R-24	12 Mile Dixie	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Noxious Weeds	Medium	Reduced diversity of desirable grass and forb species
16R-25	Black Dragon Bullhog	Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16R-30	Mill Fork Chaining	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		Noxious Weeds	Low	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16R-31	Mohrland Roller Chopper 1	Energy Development	High	Fragmentation and degradation/loss of habitat
		Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16R-32	Mohrland Roller Chopper 2	Energy Development	High	Fragmentation and degradation/loss of habitat
		Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16R-34	Wildcat Dixie Harrow	None Identified		
16R-37	Wildcat Disking	Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
16R-42	Canal Canyon	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Animal Use – Deer	Medium	Reduced/less vigorous browse component
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16R-44	Swasey Bullhog	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16R-47	Dairy Fork 2	Noxious Weeds	Medium	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16R-48	North Hollow	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16R-49	Stump Flat 2	Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		Energy Development	High	Fragmentation and degradation/loss of habitat
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16R-50	Bear Ranch	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		Noxious Weeds	Low	Reduced diversity of desirable grass and forb species
		Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16R-52	Helper Benches	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16R-53	Grimes Wash 2	Energy Development	High	Fragmentation and degradation/loss of habitat
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16R-54	Hiawatha Miller Creek	Energy Development	High	Fragmentation and degradation/loss of habitat
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		Noxious Weeds	Low	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16R-55	Grimes Wash 3	Energy Development	High	Fragmentation and degradation/loss of habitat
		Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16R-56	Dry Wash	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16R-57	New Canyon Reservoir	Conifer Encroachment	High	Reduced understory shrub, aspen stand, and herbaceous vigor
		Noxious Weeds	Low	Reduced diversity of desirable grass and forb species
16R-58	Rocky Hollow Ridge	Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		Energy Development	Low	Fragmentation and degradation/loss of habitat
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
16R-59	Wildwest	Conifer Encroachment	High	Reduced understory shrub, aspen stand, and herbaceous vigor

Study #	Study Name	Limiting Factor and/or Threat	Level of Impact	Potential Impact
16R-60	Pole Canyon	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		PJ Encroachment	High	Reduced understory shrub and herbaceous vigor
16R-61	Spring Hill	Conifer Encroachment	High	Reduced understory shrub, aspen stand, and herbaceous vigor

Table 5.10: Assessment of the potential limiting factors and/or threats and level of threat to study sites for WMU 16B, 16C, Manti Central Mountains. All assessments are based off the most current sample date for each study site. Criteria for evaluating limiting factors is available in **Appendix A - Threat Assessment**.

Discussion and Recommendations

Average unit-wide conditions of deer winter and/or transitional range within the Manti Central Mountains management unit are considered fair as of 2024. Starvation Mahogany, Starvation Mountain Brush, Wire Grass Bench, Middle Mountain, Trail Mountain Exclosure, Upper Hole Trail, Wild Cat Knolls, Joes Valley Overlook, Trough Hollow, Box Canyon Sage-Grouse, North Horn, and North Slackpile are considered to be in good to excellent condition as of the most recent sampling. Factors influencing this good to excellent condition vary from site to site but generally include substantial preferred browse cover and recruitment of young; little decadence within the browse communities; and/or ample perennial grass and forb cover. As of 2024, however, the Jackson Unit, Dairy Fork Burn, Hilltop, Oak Creek Ridge Seeding, North Spring Bench, Manti Face Chaining, Willow Creek, North Manti Face, Cane Valley, Black Hill, Pole Canyon Chaining, Above South Hollow, Cedar Mountain, and White Hill studies are considered to be in very poor to poor condition (**Table 5.9**). Reasons for these poor range conditions vary between high amounts of annual grass, few perennial forbs, lack of recruitment within the preferred browse communities, and/or a lack of preferred browse cover.

Of positive note within the Manti Central Mountains management unit is that in 2024, introduced annual grasses (*Bromus* spp.) were not observed or contributed less than 3% cover on 58 of the 62 Range Trend sites. Annual grasses provided more than 5% cover on only four sites (Rocky Hollow, Black Hill, Cove Creek, and White Hill), with only Rocky Hollow having greater than 10% annual grass cover in 2024. The herbaceous understories in general on several study sites are an additional highlight of this unit. In the lower elevation areas near Price, many sites (Slackpile, North Spring Bench, Telephone Bench, Consumer Bench, and Wire Grass Bench) had abundant and primarily native perennial grass components during the most recent sample year. Furthermore, mainly native perennial forbs and/or grasses were diverse and/or provided notable cover on many higher elevation studies throughout the unit (Long Ridge North, North Manti Face, Starvation Mahogany, Pole Canyon Oak, Oak Creek Ridge Aspen, Oak Creek Ridge Seeding, Huntington Canyon, Middle Mountain, East Mountain, Trail Mountain Exclosure, Miles Point, South Horn ¼ Corner, Upper Hole Trail, Wildcat Knolls, Joes Valley Overlook, Pleasant Creek, Trough Hollow, Box Canyon Sage-Grouse, Olson Draw Sage-Grouse, and Rolfson Reservoir).

Another positive aspect in this unit is that browse communities on many study sites at higher elevations in the vicinity of Joes Valley Reservoir; in the southeastern portion of the unit; and north of Fairview contribute notable cover as of 2024 (Long Ridge North, Rocky Hollow, Dry Creek Chaining, Mill Fork, Starvation Mahogany, Starvation Mountain Brush, Huntington Canyon, Middle Mountain, East Mountain, Trail Mountain Exclosure, Miles Point, North Horn Rock Canyon, Black Dragon, South Horn Exclosure, South Horn ¼ Corner, Dry Mountain, Birch Creek Chaining, Upper Hole Trail, Box Canyon Knolls, South Sage Flat, Wildcat Knolls, Joes Valley Overlook, Trough Hollow, Box Canyon Sage-Grouse, Olson Draw Sage-Grouse, North Horn, Old Woman Plateau, and Rolfson Reservoir). These browse components have also remained stable between the two most recent sample years (except Rolfson Reservoir, which only has data for 2024). More specifically, the browse populations on these sites have not shown decreases in cover or density to a degree that would cause the plant communities to transition to different – and possibly degraded – states. Furthermore, the Rocky Hollow, Porphyry Bench, Cove Creek, and Box Canyon Sage-Grouse studies have browse populations that exhibited particularly notable increases in cover and/or density between 2019 and 2024 (Lane, Cox, & Payne, 2025).

Additional positive aspects include the improvements in habitat quality (browse diversification, augmentation of the herbaceous understory, pinyon-juniper reduction, etc.) that have been observed following treatment on many Range Trend and Watershed Restoration Initiative (WRI) sites. Habitat treatment projects have also been and continue to be implemented in areas not monitored by the Range Trend program. As of February 2025, an estimated 103,220 acres have been treated in the Manti Central Mountains management unit through the WRI (**Map 5.7**, **Table 5.6**).

Condition of preferred browse in localized areas throughout the unit may be a concern. According to current habitat maps, crucial mule deer winter range in the western half of the Manti Central Mountains unit is restricted to a thin band in Spanish Fork Canyon, the valley surrounding Indianola, and a generally slender strip that stretches from the foothills north of Mt. Pleasant down to Salina. Bands of transitional and yearlong range are located in the elevations immediately above or adjacent to crucial winter habitat (**Map 5.2**). Browse populations on many study sites within these ranges are limited in cover and density, including Dairy Fork Burn, Manti Face Chaining, Willow Creek, North Manti Face, Cane Valley, Black Hill, Pole Canyon Chaining, Above South Hollow, Manti Dump, Cedar Mountain, and Olsen Canyon. With the exception of the Dairy Fork Burn study, utilization of browse components on these sites by wildlife has been heavy in many sample years. Because preferred browse populations in these areas are of limited size, they can be negatively impacted by concentrated wildlife browsing. Furthermore, introduced perennial grasses pose a high-level threat on all of the mentioned sites except North Manti Face (**Table 5.10**). Although they provide forage, introduced perennial grasses may outcompete establishing native plant species (Mack, et al., 2000; Gunnell, Monaco, Call, & Ransom, 2010). Recruitment of young browse plants varies from site to site. On several studies (Dairy Fork Burn, Willow Creek, Cane Valley, Black Hill, Pole Canyon Chaining, Manti Dump, and Olsen Canyon) with introduced perennial grasses designated as a high-level threat, however, less than 20% of the preferred browse populations were comprised of young individuals in 2024. Limited recruitment of young plants on these sites is undoubtedly multifactorial, but establishment of young shrubs is likely at least partially impeded by the presence of introduced perennial grass species. Limited recruitment of new plants into the communities combined with sustained moderate to heavy utilization by wildlife in future years could lead to the eventual loss of preferred browse and by extension, its associated forage value.

The condition of big sagebrush (*Artemisia tridentata*) populations on some lower elevation sites around Price has generally deteriorated over time. On the Porphyry Bench, North Spring Bench, and Consumer Bench studies, sagebrush density and quadrat cover exhibited an initial decrease between 1999 and 2004 and have continued to decrease in subsequent sample years (Lane, Cox, & Payne, 2025). Palmer Drought Severity Index (PDSI) data indicates that the area around Price experienced moderate to extreme drought conditions in 2002-2003, 2012-2014, 2018, and 2020-2022 (**Figure 5.1a**, **Figure 5.2a**, **Figure 5.3a**). Extended periods of drought may result in reduced vigor and abundance of shrub and herbaceous species and lower resistance of ecosystems to disturbance (Shafer, Bartlein, & Thompson, 2001; Schlaepfer, Lauenroth, & Bradford, 2014; Karban & Pezzola, 2017). The decrease in sagebrush cover and density between 1999 and 2004 can likely be attributed to the 2002-2003 drought. Furthermore, it is probable that the sagebrush populations in these and other localized areas have been further affected by the additional drought years. This is particularly evident on the Consumer Bench North and Consumer Bench 2 sites, on which sagebrush decreased notably in both cover and density between 2017 and 2023 (Cox, Lane, & Payne, 2024). In addition, the percentage of decadent sagebrush individuals on these sites increased between the two most recent sample years. Sagebrush populations on other Range Trend sites in the vicinity (Slackpile, North Slackpile, Telephone Bench, and Wire Grass Bench) have not decreased as markedly those on the previously mentioned studies and have generally exhibited better recovery following the 2002-2003 drought (Lane, Cox, & Payne, 2025). According to the 1991-2020 PRISM Precipitation Model (**Map 5.1**), this disparity correlates with average precipitation gradients: sagebrush populations in better condition as of 2024 are modeled as receiving more precipitation than those that have displayed lower resilience to drought.

Current and historic habitat restoration work has been successful in reducing the impact of tree encroachment (**Map 5.7**, **Table 5.6**, **Table 5.8**). However, infilling and/or encroachment of twoneedle pinyon (*Pinus edulis*) and juniper (*Juniperus* spp.) is still an ongoing concern in areas of the Manti-Central Mountains unit. Based on when the sites were last surveyed, pinyon-juniper trees are present on 77 of the 96 Range Trend and WRI sites. More specifically, pinyon-juniper encroachment/infilling is considered to be a low-level threat on 72 of these sites. Trees pose a medium-level threat on three studies (Dry Creek Chaining, North Spring Bench, and North Manti Face); and a high-level threat on only two sites (Jackson Unit and Pole Canyon), one of which has been treated since it was last read (**Table 5.10**). Although the threat posed by trees on most study sites is low, one should consider that threat levels are assigned only for the immediate area where a site is located and cannot be used to extrapolate extent of pinyon-juniper woodland expansion across the entire unit. According to the LANDFIRE Existing Vegetation Type model, pinyon-juniper vegetation types account for 19,783 acres of mule deer summer range; 180,062 acres of winter range; 36,936 acres of winter/spring habitat; 7,934 acres of spring/fall range; and nearly five acres of year-long range in the 16B, 16C unit as a whole (**Map 5.5**, **Table 5.1**, **Table 5.2**, **Table 5.3**, **Table 5.4**, **Table 5.5**). These existing woodlands play a role as a source for pinyon-juniper expansion. Numerous tree-removal projects have taken place in this unit through the WRI (**Table 5.6**, **Table 5.8**), but extant trees remain in many areas. Pinyon-juniper encroachment/infilling poses a low-level threat (medium on North Manti Face) on all Range Trend sites south of Fairview except Cove Creek: maintenance projects to remove trees could be appropriate in future years as infilling progresses. Two of the study sites with a medium-high level threat from tree encroachment (Dry Creek Chaining and Jackson Unit) are in the northwestern portion of Unit 16B, 16C (**Table 5.8**). Satellite imagery makes evident the removal of trees by fire in localized areas, and a number of recent habitat restoration projects have occurred in this portion of the unit (**Map 5.6**, **Map 5.7**). However, the larger area north of Fairview would likely continue to benefit from additional work targeting pinyon and juniper trees.

The health of the Aspen Forest and Woodland and Aspen-Mixed Conifer Forest vegetation types is a known area of interest on mule deer ranges: a notable portion of deer summer range in this unit includes these two forest types. Nearly 97% of all aspen community types in the Manti Central Mountains unit are found to be between 30% and 60% departed from their respective reference states. More specifically, approximately 183,541 acres of Aspen Forest and Woodland and 78,207 acres of Aspen-Mixed Conifer Forest fall within the 30% to 60% departure scale. The New Canyon Reservoir, Wildwest, and Spring Hill study sites sample aspen ecotypes that are between 30% and 60% departed from reference state (LC23_VDep_240, 2023). All three study sites were established to monitor treatment projects that have since taken/are scheduled to take place, but were conifer-encroached aspen stands when they were last surveyed. Several projects (some of considerable size) to remove conifer have been or will be implemented (**Table 5.8**). However, the pre-treatment conditions of these study sites are likely representative of untreated aspen communities across the unit.

Human activities that may impact wildlife are also occurring in the Manti Central Mountains Management Unit. Gas wells are numerous and primarily located in the eastern portion of the unit, with the greatest concentration occurring in the larger area around Price (Utah Geological Survey, n.d. -b.). According to current habitat maps, many of these gas wells fall within the boundaries of mule deer winter range. Three active coal mines are also located in this management unit, and production is expected to begin at one additional mine in 2026. All of these mines are underground, but at least three active and planned mining operations are/will be served by trucks and/or rail (Wolverine Fuels, 2024). Furthermore, all of these coal mines overlap elk and deer habitats of varying seasonality. The largest direct impacts on the loss and fragmentation of big game habitat likely occurred during construction of the mines and associated coal haul roads. However, there is still potential for vehicle- or train-animal collisions with mining-related traffic. In addition, noise pollution caused by operational activities may have an impact on local wildlife. The actual impact on animals around these locations is unknown to the authors of this report, but human-caused noise can negatively affect wildlife in general in terms of foraging, wildlife presence, body condition, and reproductive success (Shannon, et al., 2016). Multiple inactive mines are also scattered across the Wasatch Plateau, and two coal permit areas are under temporary cessation. In addition, almost the entire eastern half of the unit is part of the Wasatch Plateau Coalfield (Utah Geological Survey, n.d. -a.), which had an estimated 7.3% of recoverable resources still remaining in 2023 (Utah Geological Survey, 2023). With these remaining energy resources, there may be the potential for further localized extraction in the future.

Human expansion through new construction also poses a threat in some areas of unit 16B, 16C. In the lower elevations on the western side of the unit lie numerous smaller communities including Fairview, Mt. Pleasant, Ephraim, Manti, Gunnison, and Salina, among others. Price, Huntington, Orangeville, and additional towns/municipalities are located on the eastern perimeter of the Manti-Central Mountains unit. Many of these communities on both the eastern and western sides overlap or are adjacent to currently mapped winter habitat for mule deer and elk. In addition, cabins and smaller communities can be found at higher-elevation big game range of varying seasonality. Human development is by nature dynamic in location, extent, and time frame. Expansion of smaller communities (such as most of those on the perimeters of the unit) likely happens on a more limited scale than construction in more densely populated (sub)urban areas. Opportunities for development at higher elevations may also be limited, as much of the land is federally managed as part of the Manti-La Sal National Forest (**Map 5.4**). However, satellite imagery over time does show that localized construction of new buildings and roadways has occurred in some areas at both higher and lower elevations over the last 5-10 years. Naturally, there is the potential for further human development in this unit, which can have direct deleterious effects to habitat and wildlife through habitat fragmentation, human-wildlife interactions on roadways, and increased potential for invasive plant introduction, among others.

Recreation benefits members of the public and provides opportunities for economic and social growth. If not properly managed, however, recreation may become unsustainable and can result in degradation of habitat. Four state parks are located within the boundaries of this unit and are immediately adjacent to or fall within the boundaries of mapped big game range: Huntington State Park, Millsite State Park, Palisade State Park, and Scofield State Park. The average number of visitors per fiscal year (FY) has increased for all parks between FY 2015 and FY 2024. However, Palisade State Park (which is located within crucial winter habitat for mule deer) experienced the largest increase. Between FY 2015 and FY 2019, Palisade State Park averaged nearly 130,600 visitors per year: this increased to just over 215,80 yearly visitors between FY 2020 and FY 2024 (Utah State Parks, 2025). Multiple recreational opportunities are also available on land managed by the United States Forest Service (USFS), with numerous trails and roads traversing the Manti-La Sal National Forest (U.S. Department of Agriculture, Forest Service, 2023). The USFS not only monitors and manages land and resources within its jurisdiction accordingly (Forest Plan Revision Team, 2023), but also has guidelines readily available to inform the public of proper outdoor ethics and wildlife safety (U.S. Department of Agriculture, Forest Service, n.d. -a.; U.S. Department of Agriculture, Forest Service, n.d. -b.; U.S. Department of Agriculture, Forest Service, n.d. -c.). However, human recreation can result in disturbances of animals within the area through human-wildlife interactions; even lower impact recreational activities such as hiking may influence the presence in and timing of use of an area by various wildlife species including elk (Anderson, Waller, & Thornton, 2023). Single interactions may not greatly affect local wildlife populations. However, continued incidents may have greater impacts that could be exacerbated by other simultaneous stressors (Utah Division of Wildlife Resources, 2015). As such, the potential for increased human recreation and the effects on wildlife and wildlife habitat are possible concerns within this unit.

Off-highway vehicle (OHV) use remains a popular form of recreation statewide; there were over 227,000 OHVs registered in the state of Utah as of January 2025 (Utah State Legislature, 2025). In the Manti-Central Mountains unit, the Arapeen OHV Trail system boasts over 600 trail miles and is particularly popular; multiple large-scale events for off-road vehicles are held on the Arapeen Trail throughout the summer months (Sanpete County Travel, 2025). Education on proper OHV use required by state law and guidelines issued by federal land management agencies likely help mitigate some of the negative outcomes that might otherwise result from OHV recreation. However, harmful effects on wildlife and wildlife habitat are always a possibility. Level of impact varies between and does not affect all locations equally, but auditory disturbances to wildlife, physical damage to habitat, and the introduction of non-native plant species can all result from improperly managed OHV recreation.

Utah Roadkill Reports data indicates that highway mortality may pose an additional threat to wildlife (particularly mule deer) in portions of this unit. Roadkill pick-up reports for mule deer between 2019 and February of 2025 appear to be concentrated along US-89 from Thistle to Salina; along I-70 from Salina to the intersection with SR-10; on SR-10 from I-70 to Price; and along US-6 from Price to the intersection with US-89. The data also shows multiple reports over the same period on SR-29 from the intersection with SR-10 to the intersection with North Cottonwood Canyon Road; on SR-31 from Huntington to approximately mile marker 39; along SR-96 from US-6 to mile marker 3; and scattered at various points on SR-31 and SR-264.

Very few pick-up reports occur in other parts of the unit. One should keep in mind that collisions occurring at high enough speeds to result in animal mortality are likely more common on main roads that receive the most use: this could explain the relative lack of reports of less-traveled routes in other parts of the unit (Utah Division of Wildlife Resources, 2025). However, efforts have been made to mitigate highway mortality of big game and other species. Multiple wildlife exclusionary fences have been constructed along major roadways on the perimeters of the unit. In addition, seven wildlife crossings have been installed on US-6 between Price and the intersection with US-89; and six are located along Quitchupah/Convulsion Road in the southeastern part of the unit.

Other threats to wildlife are occurring in localized portions of this unit, but they will not be discussed in this section. These additional threats are specified by study site in the previous table (**Table 5.10**).

There are several recommendations to mitigate or slow the effects of habitat loss in the Manti-Central Mountains Management Unit. Efforts to restore preferred browse communities when and where feasible would likely prove beneficial for big game. A possible area of opportunity for browse improvement on the western side of the unit is the band of mule deer winter range extending from Mt. Pleasant to Salina. On the eastern side, potential areas of focus for browse restoration include the lower elevation communities around Price down to Huntington that have been particularly affected by dry climatic conditions. A considerable portion of this unit has already been treated for pinyon-juniper encroachment; over 53,000 acres have been bullhogged, chained, or treated by hand crews (**Table 5.6**). When and where appropriate, however, efforts to address infilling or encroachment of pinyon and juniper in both previously treated and untreated areas should be continued or implemented. If reseeding is necessary to restore herbaceous species, care should be taken in species selection and preference should be given to native species whenever possible. There has also been restoration work within aspen communities in higher elevations: this should continue to alleviate the threat of fir and spruce infilling. Timely removal of conifer from aspen systems is essential before community vigor is lost through decadence and low recruitment; conifer removal ensures that early seral vegetation classes will return to provide suitable and abundant habitat for wildlife. Finally, both Range Trend studies and areas where rehabilitation projects have occurred should continue to be monitored. Data collected in the future will indicate whether the severity of current limiting factors is increasing and may provide guidance on what actions are needed to mitigate these identified potential threats to habitat and wildlife.

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APPENDIX A - THREAT ASSESSMENT

Agriculture:

Low: Site located in former agricultural field, has potential to revert back to agricultural land.
High: Site is converted back to agricultural land.

Potential Impact: Fragmentation and degradation/loss of habitat.

Animal Use:

Categories determined using calculations based on pellet group data compared to ESD annual production values. Threat level is based on most recent sample year only.

NOTE: 'Low' risk can be assumed with any animal on site without being explicitly stated.
Medium: 75-99% of total production is used.
High: 100% of total production is used.

Potential Impact: Reduced diversity of desirable grass and forb species.

Annual Grass:

Species: *Bromus tectorum, B. rubens, B. arvensis, B. briziformis, Taeniatherum caput-medusae, Eremopyrum triticeum, Secale cereale*

Low: If present, automatically a threat. Present in any sample year and/or cover 0-3% in the most recent sample year.
Medium: 3-7% cover in most recent sample year.
High: >7% cover in the most recent sample year.

Potential impact: Increased fire potential and reduced herbaceous diversity.

Conifer Encroachment (Aspen):

Species: All conifer species

Low: Conifer present or near site. Present -<1%.
Medium: Conifer >1% but not codominant.
High: Conifers codominant.

Potential Impact: Reduced understory shrub, aspen stand, and herbaceous vigor.

<u>Drought:</u>

NOTE: The "limiting factor or threat" of drought or long-term drought can assigned can be assumed for the whole State without being explicitly stated. However, to state that a site is limited or threatened is only assigned when visible changes are occurring, and annual and seasonal Palmer Drought Stress indexes for the specified division have been considered to be in moderate drought or drier for multiple years.

Shrub poor vigor above 40% or above, Decadence above 40%, and PDSI is negative (-2) or lower for multiple years (does not have to include the most recent or consecutive years if holdover effects are observed).*

*Select sites may be classified as being limited by drought even when the stated thresholds are not met. These thresholds give general guidance to aid in the identification of drought, but are not all-inclusive and do not exclusively delineate drought conditions.

Potential Impact: Lowered resilience and resistance to disturbance.

<u>Energy Development:</u>

Low: Must meet one of the following:

a.) Site located in a known oil and/or gas reserve (ex: sites near Price, Book Cliffs, etc.).
b.) Site is in the vicinity of a wind or solar farm <u>AND</u> could reasonably be developed in the future (ex: Milford Flat).
c.) Site is adjacent to powerline.
d.) Site is adjacent to pipeline.

Medium: Site located in a known oil and/or gas reserve with road developments/improvements occurring in the area.

NOTE: No 'medium' option applicable for powerlines, pipelines, or wind or solar farms.

High: Must meet one of the following:

a.) Oil and gas developments are active within one mile of the study site.
b.) Site is in immediate vicinity of/adjacent to solar or wind farm.
c.) Powerline is actually on site.
d.) Pipeline is actually on site.

Potential Impact: Fragmentation and degradation/loss of habitat.

Introduced Perennial Grasses:

Species: *Thinopyrum intermedium, Bromus inermis, Agropyron cristatum, Poa pratensis, Psathyrostachys juncea, Poa bulbosa*

Low: 1% of actual cover has to be contributed by a single species AND ratio to total perennial grass cover has to be up to 20%.
Medium: 20-50% of total perennial grass cover is contributed by introduced species.
High: >50% of total perennial grass cover is contributed by introduced species.

Potential Impact: Reduced diversity of desirable grass and forb species.

Noxious Weeds:

Low: If present, automatically a threat. Present in any sample year and/or cover 0-3% in the most recent sample year.
Medium: 1-5% cover in the most recent sample year.
High: >5% cover in the most recent sample year.

Potential Impact: Reduced diversity of desirable grass and forb species.

PJ Encroachment:

Species: *Juniperus osteosperma, J. scopulorum, Pinus edulis, P. monophylla*

Low: Phase I.
Medium: Phase I transitioning to Phase II or Phase II.
High: Phase II transitioning to Phase III or Phase III.

Potential Impact: Reduced understory shrub and herbaceous vigor.

Urban Development:

Low: On private or SITLA property that may be developed in the future AND near a community (ex: house or building nearby).
Medium: Development occurring nearby including road improvements and new roads.
High: Development occurring within one mile of the study site.

Potential Impact: Fragmentation and loss of habitat.

Tourism/Recreation:

Ski areas, golf courses, county parks, campgrounds, mountain bike trails, trailheads, ATV trails

Low: Minimal evidence of recreation occurring (ex: recent ATV or bike tracks, recent camping, general recreational activity, clay pigeon and bullet shells).

Moderate: In the process of becoming a high-activity area (ex: fire ring, beginnings of a trail).

High: High-activity area/area developed for recreation (ex: definite trails, tent pads).

Potential Impact: Loss of habitat, reduced shrub and herbaceous vigor.

Woodcutting (excluding intentional habitat treatments):

Firewood, fenceposts

Low: Evidence that woodcutting is occurring in the vicinity.

NOTE: No ‘medium’ option applicable.

High: Off-road truck traffic for access, large amounts of tree debris, intensive woodcutting occurring.

Potential Impact: Fragmentation and degradation/loss of habitat.