2025 Range Trend Project Report

Unit Summaries
8, 9, 10, 11, 13B, 17B&C

Utah's Big Game Range Trend Studies



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Great Basin Research Center
Prepared by the Utah Division of Wildlife Resources

UTAH DNR WILDLIFE RESOURCES

Utah Big Game Range Trend
Unit Summaries
2025
Wildlife Management Units
8, 9, 10, 11, 13B, 17B&C

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PROGRAM NARRATIVE

State: UTAH

Project Number: W-82-R-70

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 2025 field season and reported in this publication involves the reading of interagency Range Trend studies in the DWR Northeastern Region and portions of the 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: Green River District
- Price Field Office
- Vernal Field Office

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

United States Forest Service: Ashley National Forest
- Duchesne - Roosevelt Ranger District
- Flaming Gorge Ranger District
- Vernal Ranger District

United States Forest Service: Uinta-Wasatch-Cache National Forest
- Mountain View Ranger District

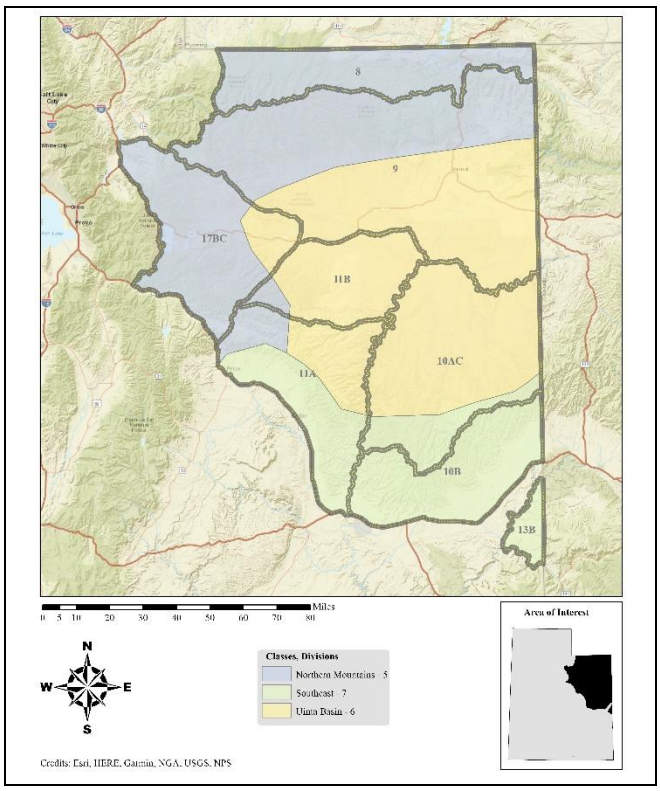
United States National Park Service
- Dinosaur National Monument

Ute Indian Tribe, Uintah and Ouray Reservation
- Fort Duchesne, Utah

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.

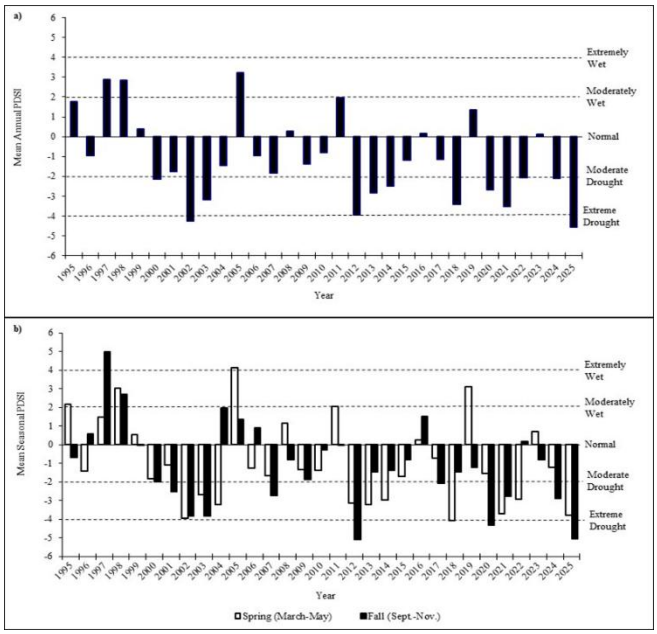


Climate Data: The state of Utah is divided into seven climatic divisions for estimating the Palmer Drought Severity Index (PDSI) and the Southeastern Region occurs within three of these divisions: Northern Mountains (Division 5), Uinta Basin (Division 6), and Southeast (Division 7). The PDSI shows cumulative 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, 2026).

The PDSI is based on climate data gathered from 1895 to 2025. The data reported in this summary covers a majority of the years over which these sites have been sampled (1995-2025). 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. In the figure below, graph "a" represents the mean annual PDSI for the Uinta Basin 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, 2026).

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. The graphs in this report represent vegetation changes by 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 inclusion of the RAP data in this report is to also help illustrate the year-to-year fluctuations or changes that may occur between Range Trend samplings. Also displayed by the graphs in this report is the change in satellite imaging resolution from 30m to 10m used to calculate cover: this change occurs in 2018 and is denoted by a dashed line. Calculated cover estimations in 2018 and beyond use 10m resolution, so caution should be used when comparing years before 2018 to years after, as sequential comparisons are not at the same scale.

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

LANDFIRE Existing Vegetation Type for Mule Deer Habitat: The Existing Vegetation Type (EVT-ES) 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-ES also includes ruderal or semi-natural vegetation types within the U.S. National Vegetation Classification. […] EVT-ES 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.”

Treatments/Restoration Work: 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 2025 is available for each unit. A total acreage amount for each type of treatment is provided in a table for each unit.

Range Trend Studies: 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.

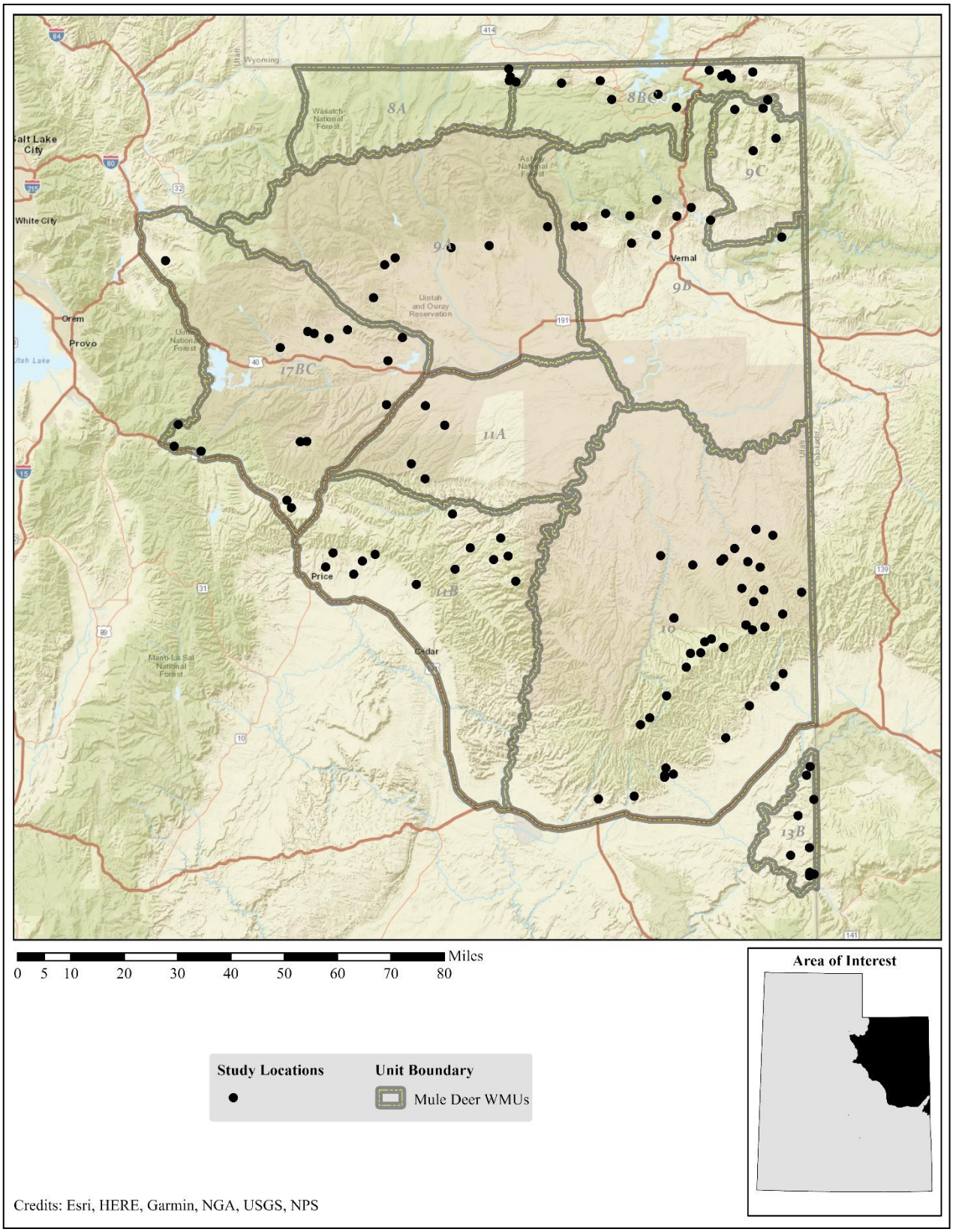
Deer Winter Range Condition Assessment: The desirable components index (DCI) for deer was created by Range Trend Program personnel as a tool to address condition and/or value of winter ranges for mule deer. This index is meant to be a companion to, and not a replacement for, the site-specific Range Trend 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.

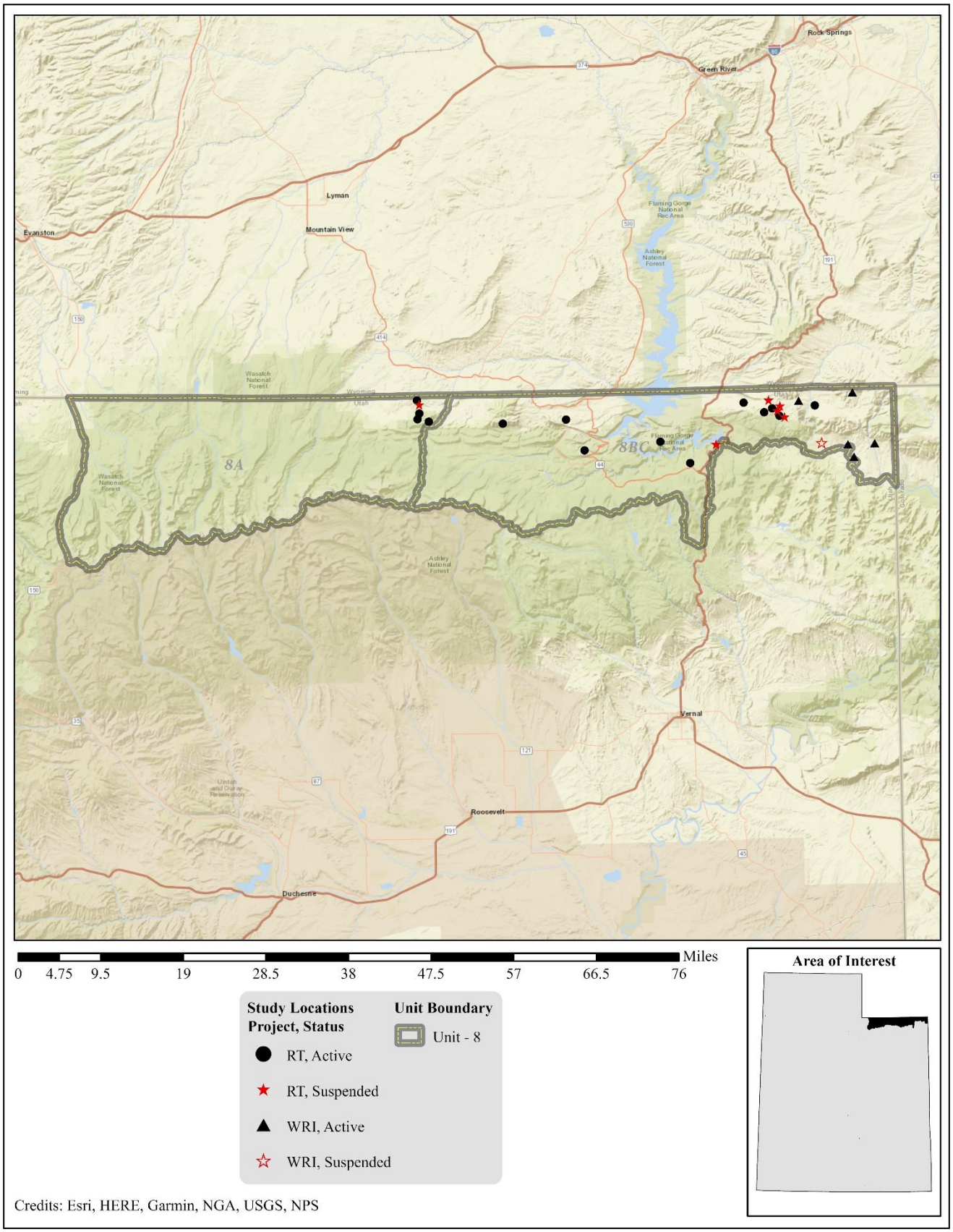
Changes in DCI over the sample years for both treated and untreated sites are included in the figures near the end of the unit summary. Care should be taken when interpreting these tables as the number of sites included in each year may vary. This could be misleading if the overall DCI seems to be improving, 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 8 – NORTH SLOPE



WILDLIFE MANAGEMENT UNIT 8 – NORTH SLOPE

Boundary Description

Summit and Daggett Counties – Boundary begins at SR-150 and the Summit-Duchesne County line at Hayden Pass (summit of the Uinta Mountains); north on SR-150 to the Utah-Wyoming state line; east on this state line to the Utah-Colorado state line; south on this state line to the Green River; west along this river to Flaming Gorge Reservoir; west along the south shoreline of this reservoir to Cart Creek; south along this creek to US-191; south on US-191 to the Uintah-Daggett County line (summit of the Uinta Mountains); west along the summit of the Uinta Mountains to SR-150 at Hayden Pass.

Management Unit Description

Geography

The North Slope Wildlife Management Unit is located along the north slope of the Uinta Mountains in Summit and Daggett Counties. This unit contains Flaming Gorge National Recreation Area, portions of Wasatch-Cache and Ashley National Forests, and a portion of the High Uintas Wilderness Area. Elevation of Unit 8 ranges from 5,400 feet in the bottomlands of the Green River to over 13,000 feet in the Uinta Mountains. Several major drainages are located within the unit including Green River, Bear River, Black's Fork, Smith's Fork, Henry's Fork, and Burnt Fork. Towns in this area include Manila and Dutch John.

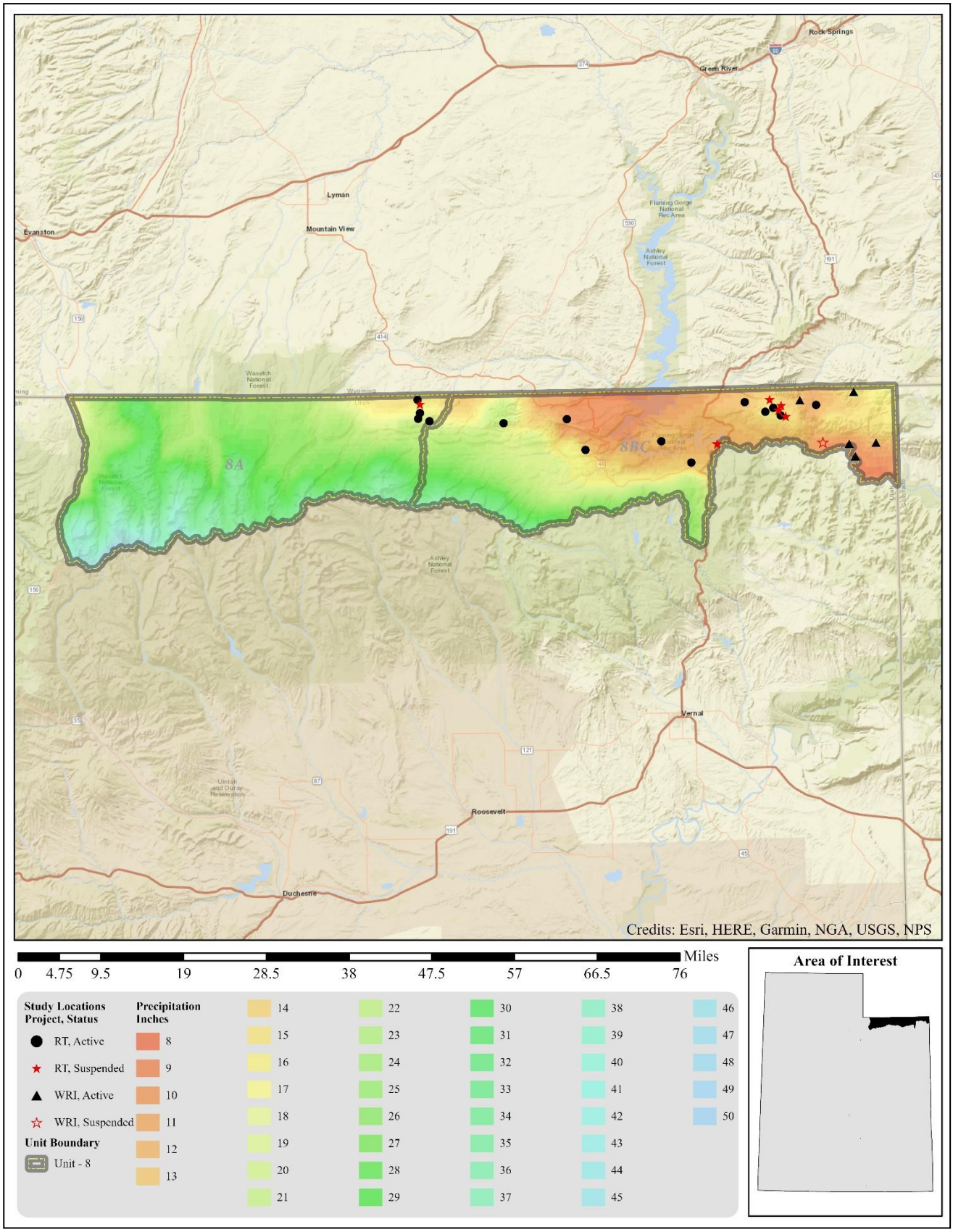
Climate Data

The 30 year (1981-2010) annual precipitation PRISM model shows that precipitation ranges on the unit from 8 inches along the Green River near the Utah-Colorado border to 50 inches on the peaks of the Uinta Mountains. All of the Range Trend and WRI monitoring studies on the unit occur within 7-18 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 Northern Mountains division (Division 5).

The mean annual PDSI of the Northern Mountains division, which the North Slope unit is part of, has experienced some form of drought or dry spell in most years since 1995. Moreover, this climate division has been considered to be in some form of drought for nearly 42% of the time since 1995. Of the drought years, 77% are considered to be either moderate or extreme droughts. Also remarkable about this climate division is that a moderately wet year has not been experienced since 2011, and the last 14 years of drought or dry conditions have been interrupted by two single wet year events. The most notable wet year occurred in 1998 and was a part of a series of wet year events that occurred between 1995 to 1999 (**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 1995/96, 1996/97, 1997/98, 1998/99, 2004/05, 2005/06, and 2010/11. 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 1995, 2005, and 2010 sample years occur during a wet year, but years where drought may have affected plant condition occur in 2000, 2015, 2020, and 2025 (**Figure 1.1a**, **Figure 1.1b**) (National Oceanic and Atmospheric Administration, 2026).



Map 1.1: The 1991-2020 PRISM Precipitation Model for WMU 8, North Slope (PRISM Climate Group, Oregon State University, 2021).

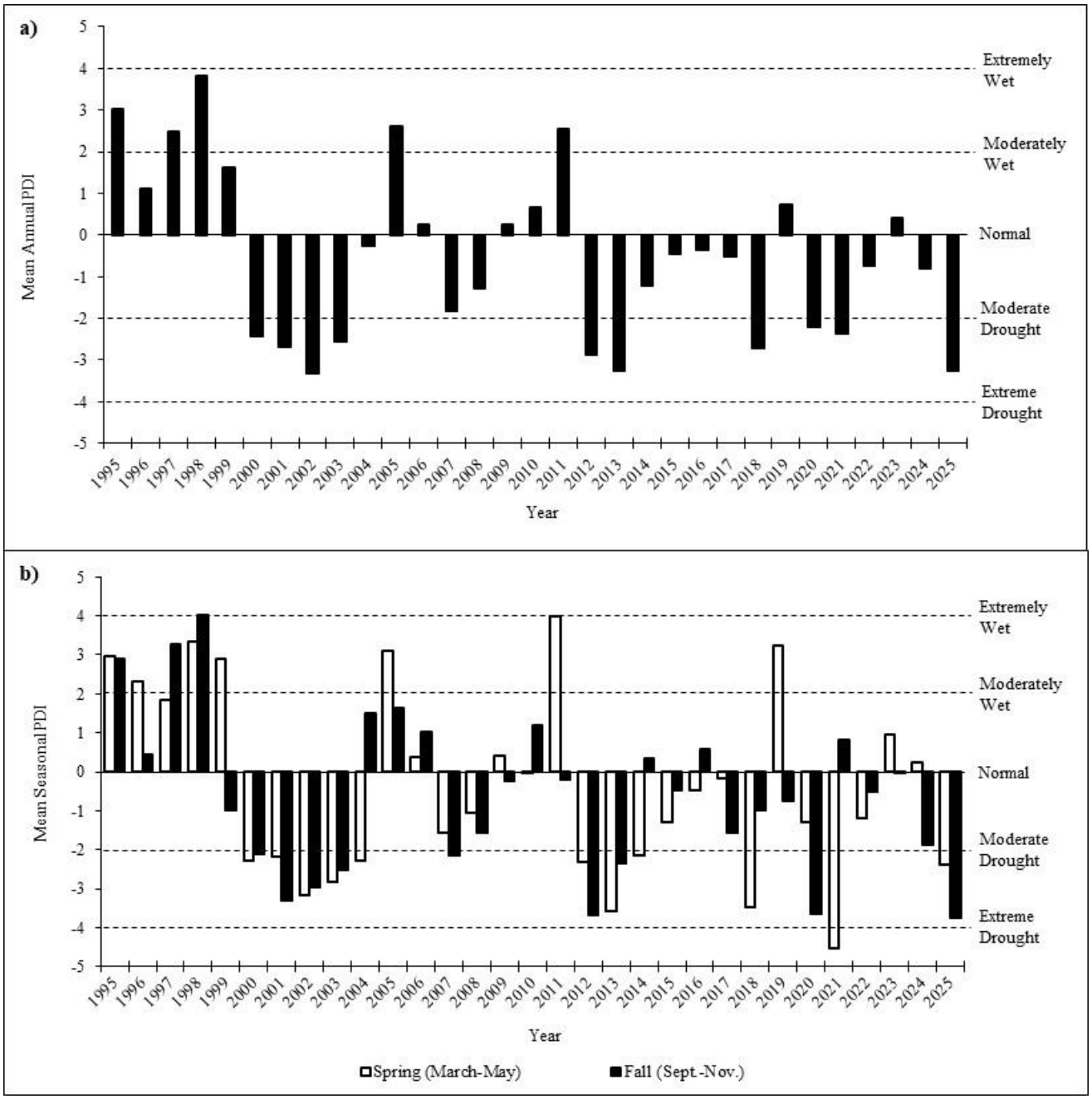


Figure 1.1: The 1995-2025 Palmer Drought Severity Index (PDSI) for the Northern Mountains division (Division 5). The PDSI is based on climate data gathered from 1895 to 2025. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet, and negative deviations indicate drought. Classification 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, 2026).

Big Game Habitat

Several important deer winter concentration areas were identified within the unit by the 1974 range inventory. They include the Dowd Mountains, Bear Mountains, Goslin Mountains, Dutch John Flat, Little Hole, Red Creek Flat, Taylor Flat, Death Valley, and Digger Basin (Olson, 1975). Collared data from the 2024/25 winter season suggests that these areas are still likely considered key areas for wintering big game with the additions of China/Big Meadows, South Valley, Greendale, Boars Tusk, Cedar Springs [suspended site (08B-01)], and Willow Creek in Brown's Park for mule deer; and Pigeon Basin and Clay Basin as key areas for pronghorn. The key areas for elk winter range are found on the alderleaf mountain mahogany (*Cercocarpus montanus*) slopes of Phil Pico Mountain, Bald Range, Widdop Mountain, and Jessen Butte.

Rangeland Analysis Platform (RAP) – Cover by Mule 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 cover values 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. The following graphs represent vegetation changes by 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 inclusion of the RAP data in this report is also to help illustrate the year-to-year fluctuations or changes that may occur between Range Trend samplings. Also displayed in the following graphs is the change in satellite imaging resolution from 30m to 10m used to calculate cover: this change occurs in 2018 and is denoted by a dashed line. Calculated cover estimations in 2018 and beyond use 10m resolution, so caution should be followed when comparing years before 2018 to years after, as sequential comparisons are not at the same scale.

Herbaceous cover, as indicated by RAP data, fluctuates annually across mule deer summer, winter, and year-long ranges. Overall, total herbaceous cover values have increased in all areas except on winter range. Annual and perennial cover often correlate with precipitation trends, although a temporary lag effect of about one year is occasionally observed. A more significant influence on the increase of annual and perennial cover on the year-long range appears to be the 2002 Mustang Ridge Fire, which burned approximately 17,000 acres near Dutch John, Utah. Spikes in herbaceous cover are generally more frequent on winter and year-long habitats than on summer range, while the winter range specifically experienced an overall decrease in cover. Furthermore, annual plant lifeforms have consistently contributed greater cover on the winter and year-long ranges compared to the summer habitat (**Figure 1.2**, **Figure 1.3**, **Figure 1.4**).

Range Trend data spanning from 1995 to the present indicates yearly variations in perennial lifeforms, though perennial cover generally increased across both mountain and upland sites. These year-to-year fluctuations are expected due to variations in precipitation levels and the timing of data collection between sampling years. A specific trend noted was a substantial increase in annual forb cover within the Mountain (Big Sagebrush) sites, accompanied by a decrease in perennial grasses and forbs. Semidesert sites experienced a similar dynamic: increases in annual grasses and forbs occurred, yet a substantial decrease in overall percent cover for herbaceous life forms was recorded in 2020 (**Figure 1.18**, **Figure 1.19**). Ultimately, annual grasses and forbs have contributed notable cover for the semidesert study areas, a finding that broadly correlates with Rangeland Analysis Platform (RAP) data regarding herbaceous cover on mule deer winter and year-long habitats (**Figure 1.2**, **Figure 1.3**, **Figure 1.4**).

According to RAP data, overall shrub and tree cover on mule deer ranges of all seasonalities have remained similar between 1986 and 2025 despite expected yearly fluctuations. However, more recent data from 2012 to 2025 indicates a general increase in both shrub and tree cover across all three deer habitat ranges (**Figure 1.5**, **Figure 1.6**, **Figure 1.7**). When accounting for possible lagged effects, the RAP cover data for trees and shrubs correlates with precipitation in many years, though these fluctuations are less drastic than those seen in herbaceous data. As with the herbaceous lifeforms, trees and shrubs had a notable decrease in cover in year-long deer habitat. This dramatic decrease in cover is, again, likely due to the Mustang wildfire that occurred near Dutch John. Despite this, the overall trend for tree and shrub cover is an increase over time.

Range Trend data offers a slightly different perspective. Tree cover values on Mountain (Big Sagebrush) and Mountain (Browse) sites have shown yearly fluctuations since 2010; however, the scale for percent cover on these sites is small, and the drivers for these fluctuations are not readily apparent. Total shrub cover has increased over time for Mountain (Big Sagebrush sites), while sagebrush cover for Upland and Semidesert (Big Sagebrush) sites has remained stable (**Figure 1.8**, **Figure 1.9**, **Figure 1.10**, **Figure 1.11**).

It is important to note that variations in cover observed on Range Trend sites will not always correspond with the fluctuations estimated by the RAP. This incongruence is primarily due to the differences in dataset types: Range Trend data is site-specific and highly granular, while RAP data is aggregated to the broader unit scale for the entire deer habitat.

RAP – Herbaceous Cover by Mule Deer Habitat

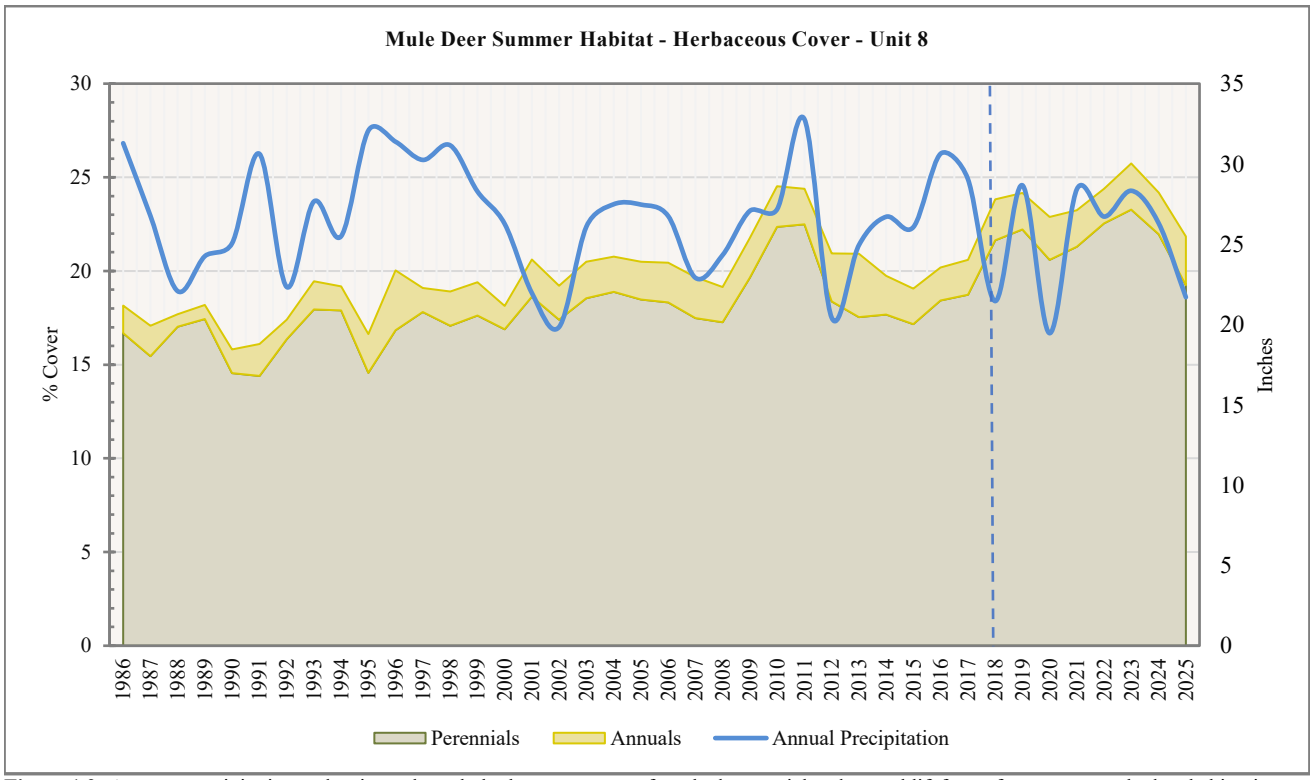


Figure 1.2: Average precipitation and estimated yearly herbaceous cover of stacked perennial and annual lifeforms for summer mule deer habitat in WMU 8, North Slope (Rangeland Analysis Platform, 2026).
*Dashed line indicates shift in depicted datasets from RAP 30m (1986-2017) to RAP 10m (2018-2025) (USDA Agricultural Research Service, 2026).

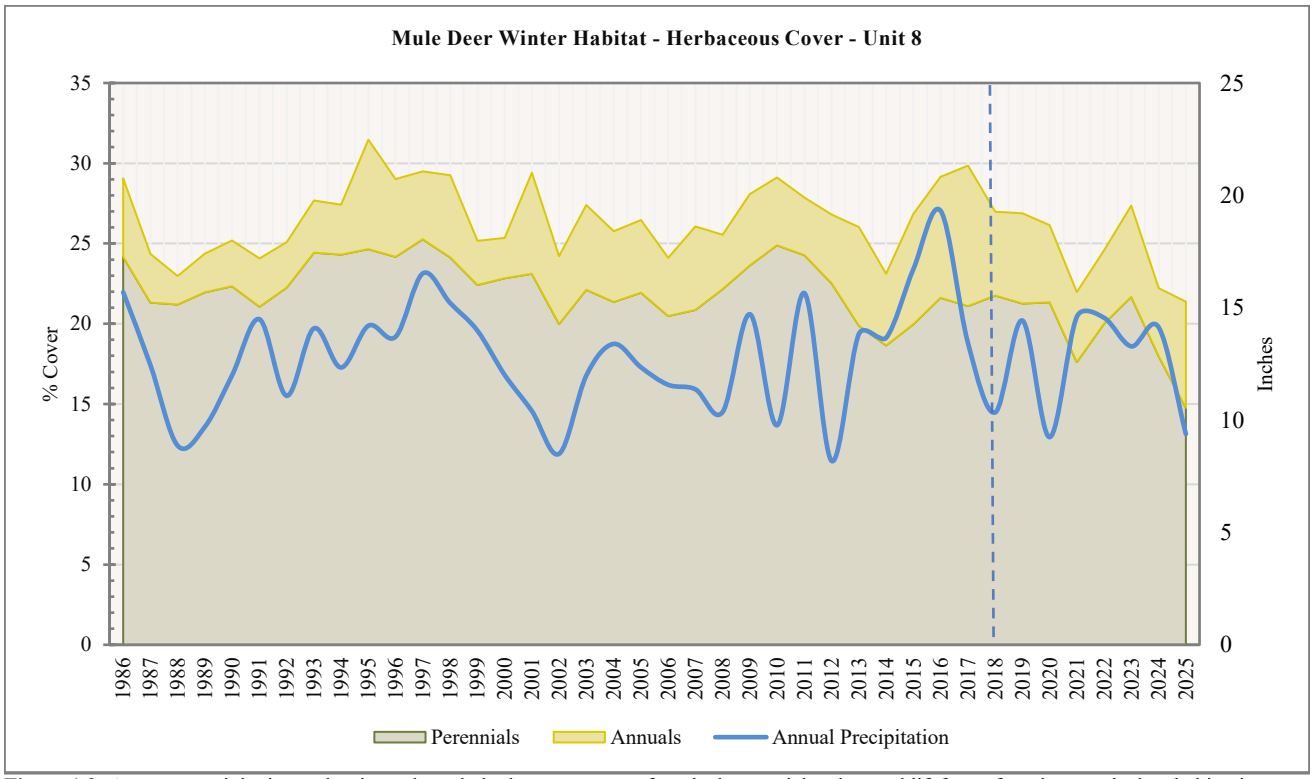


Figure 1.3: Average precipitation and estimated yearly herbaceous cover of stacked perennial and annual lifeforms for winter mule deer habitat in WMU 8, North Slope (Rangeland Analysis Platform, 2026).
*Dashed line indicates shift in depicted datasets from RAP 30m (1986-2017) to RAP 10m (2018-2025) (USDA Agricultural Research Service, 2026).

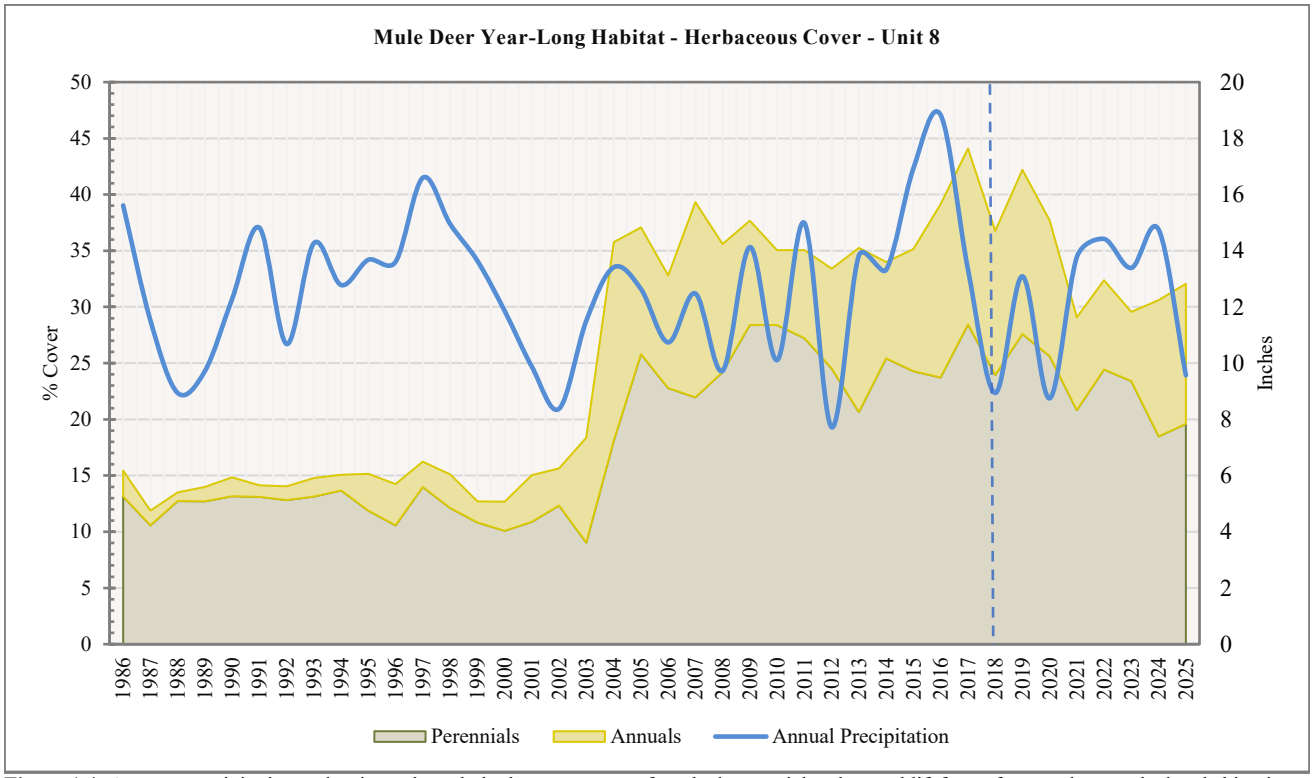


Figure 1.4: Average precipitation and estimated yearly herbaceous cover of stacked perennial and annual lifeforms for year-long mule deer habitat in WMU 8, North Slope (Rangeland Analysis Platform, 2026).
*Dashed line indicates shift in depicted datasets from RAP 30m (1986-2017) to RAP 10m (2018-2025) (USDA Agricultural Research Service, 2026).

RAP – Shrub and Tree Cover by Mule Deer Habitat

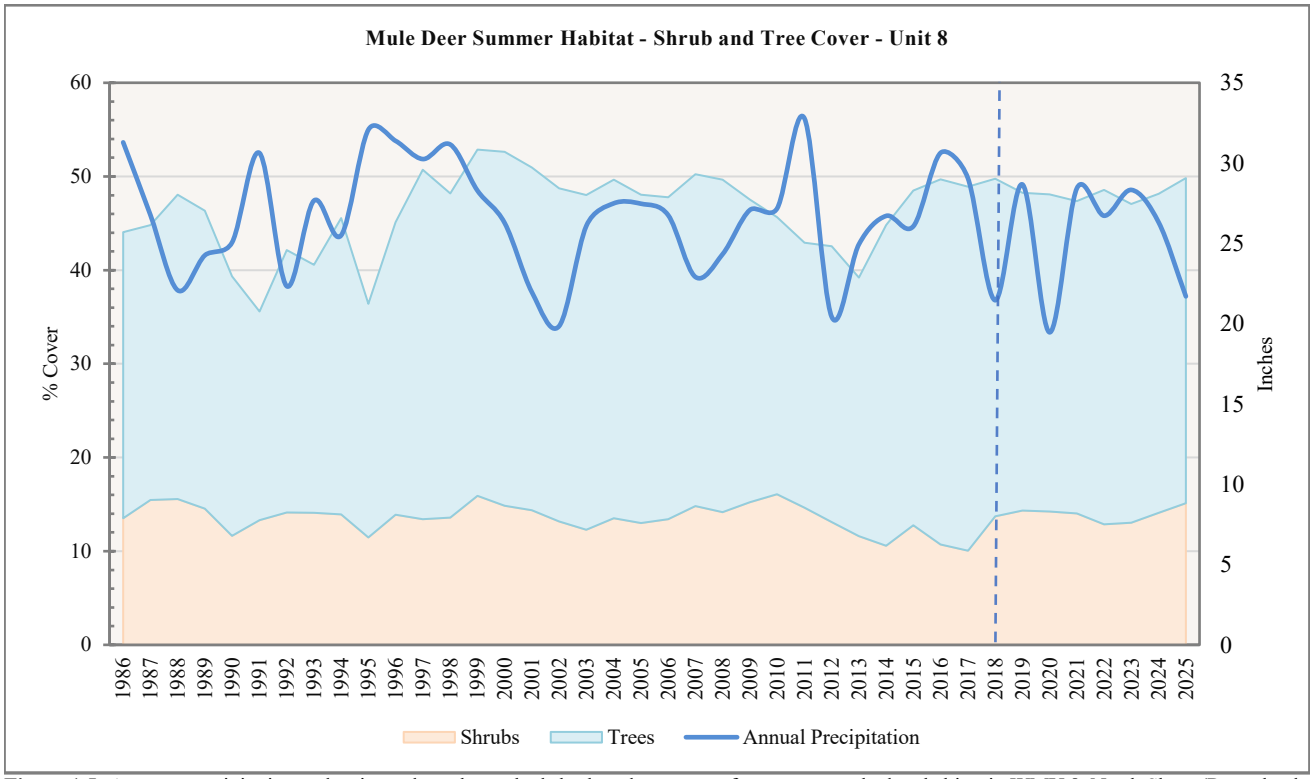


Figure 1.5: Average precipitation and estimated yearly stacked shrub and tree cover for summer mule deer habitat in WMU 8, North Slope (Rangeland Analysis Platform, 2026).
*Dashed line indicates shift in depicted datasets from RAP 30m (1986-2017) to RAP 10m (2018-2025) (USDA Agricultural Research Service, 2026).

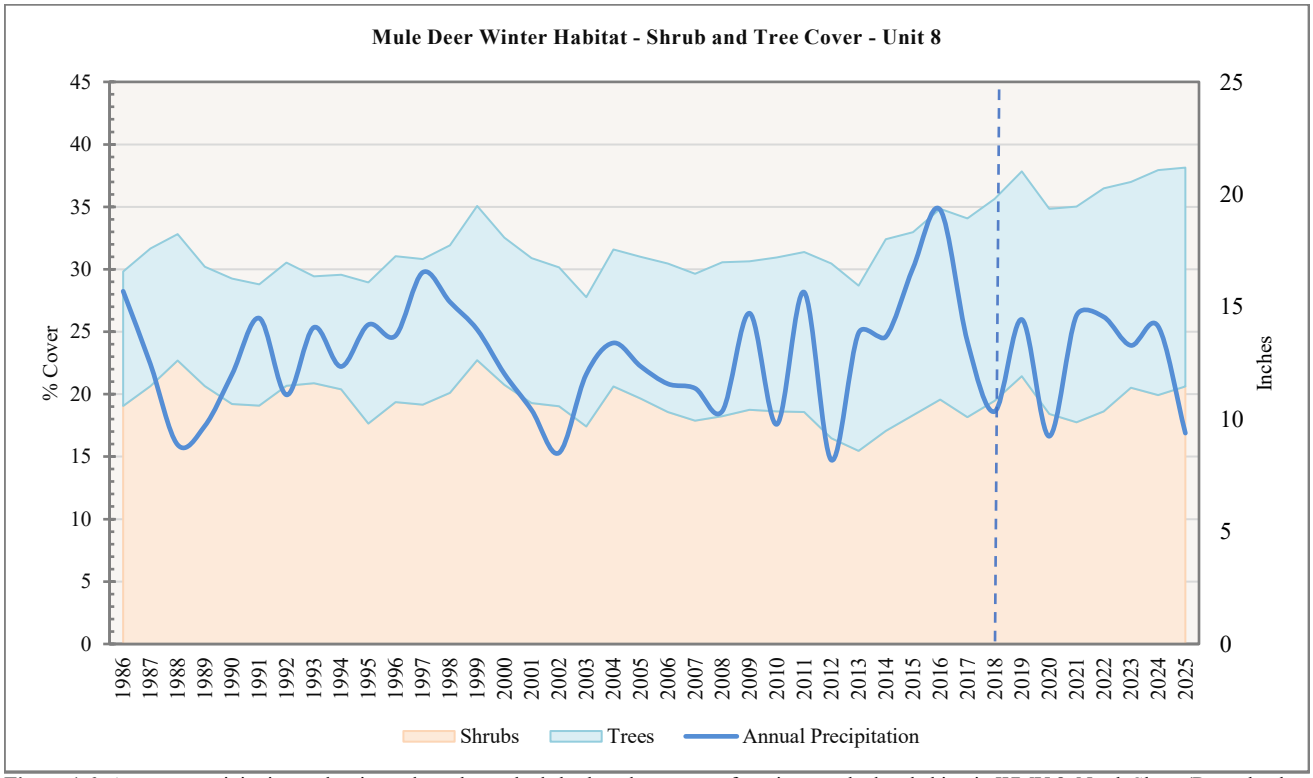


Figure 1.6: Average precipitation and estimated yearly stacked shrub and tree cover for winter mule deer habitat in WMU 8, North Slope (Rangeland Analysis Platform, 2026).
*Dashed line indicates shift in depicted datasets from RAP 30m (1986-2017) to RAP 10m (2018-2025) (USDA Agricultural Research Service, 2026).

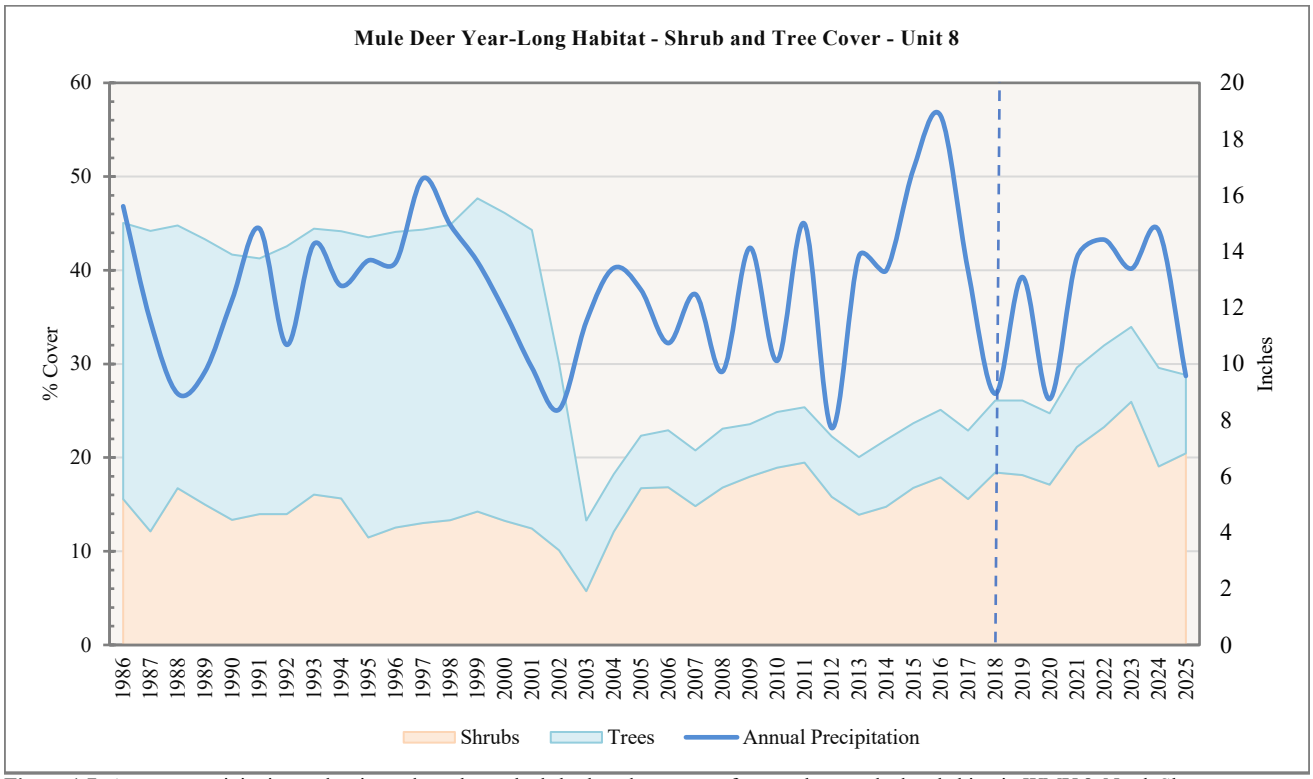
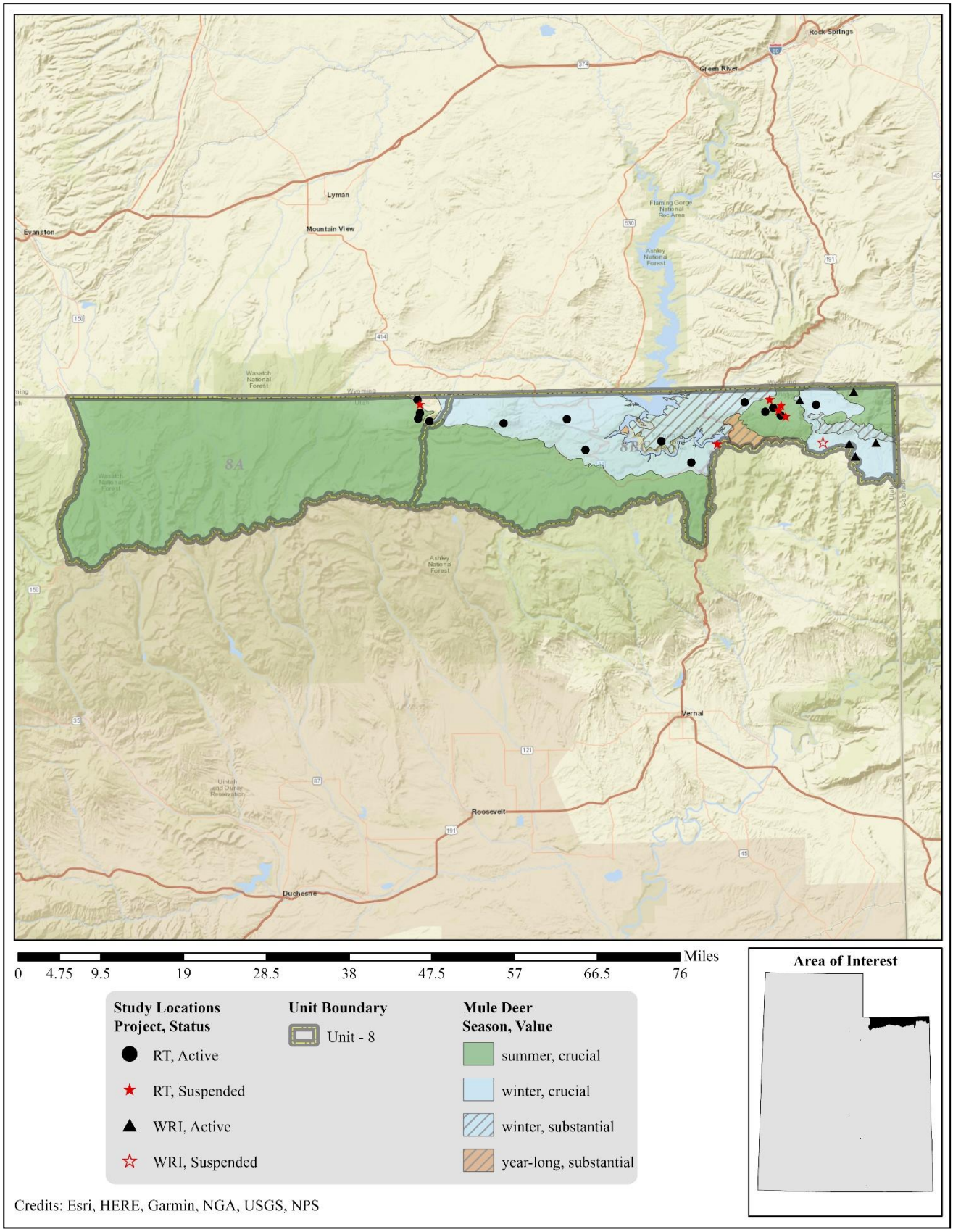
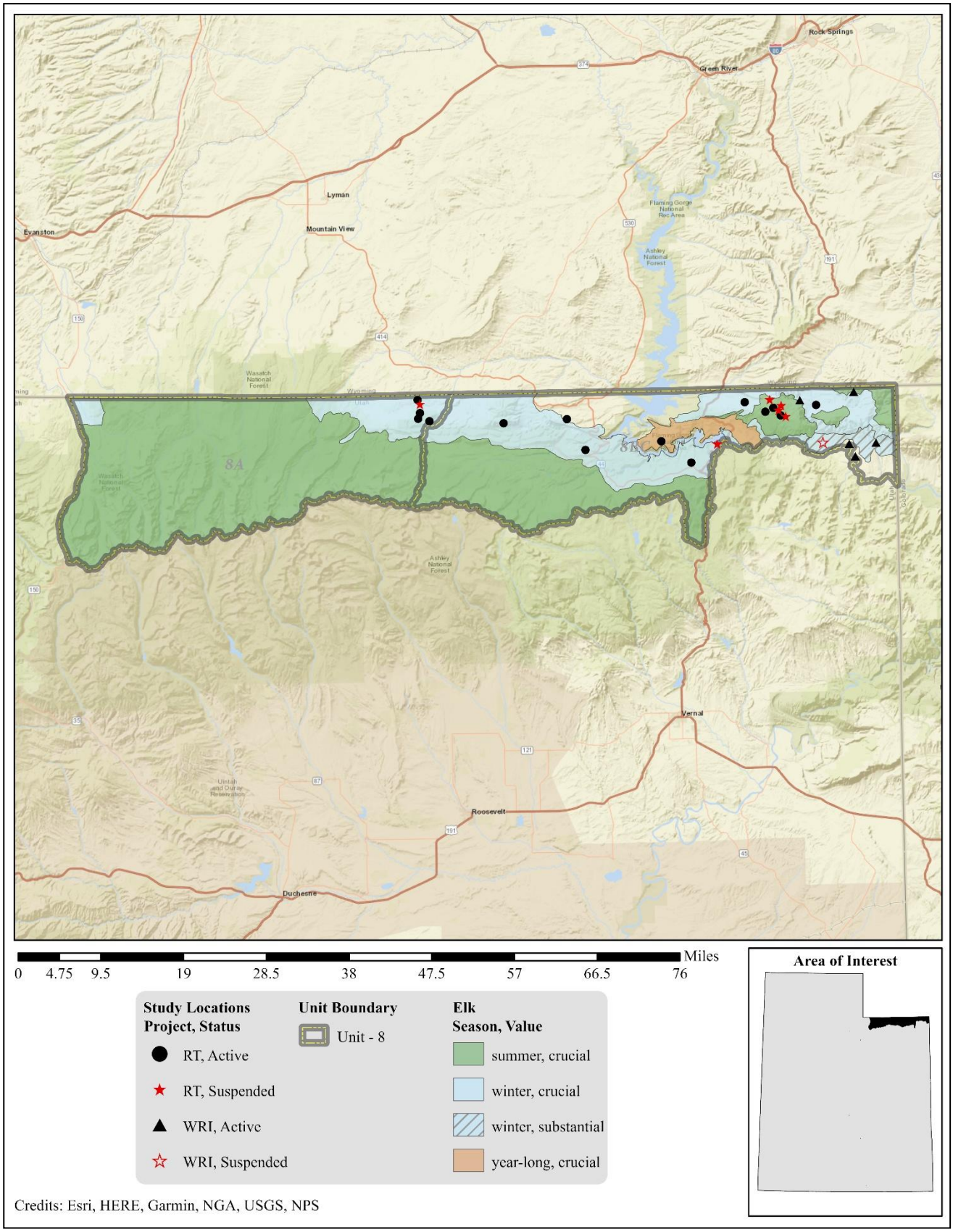


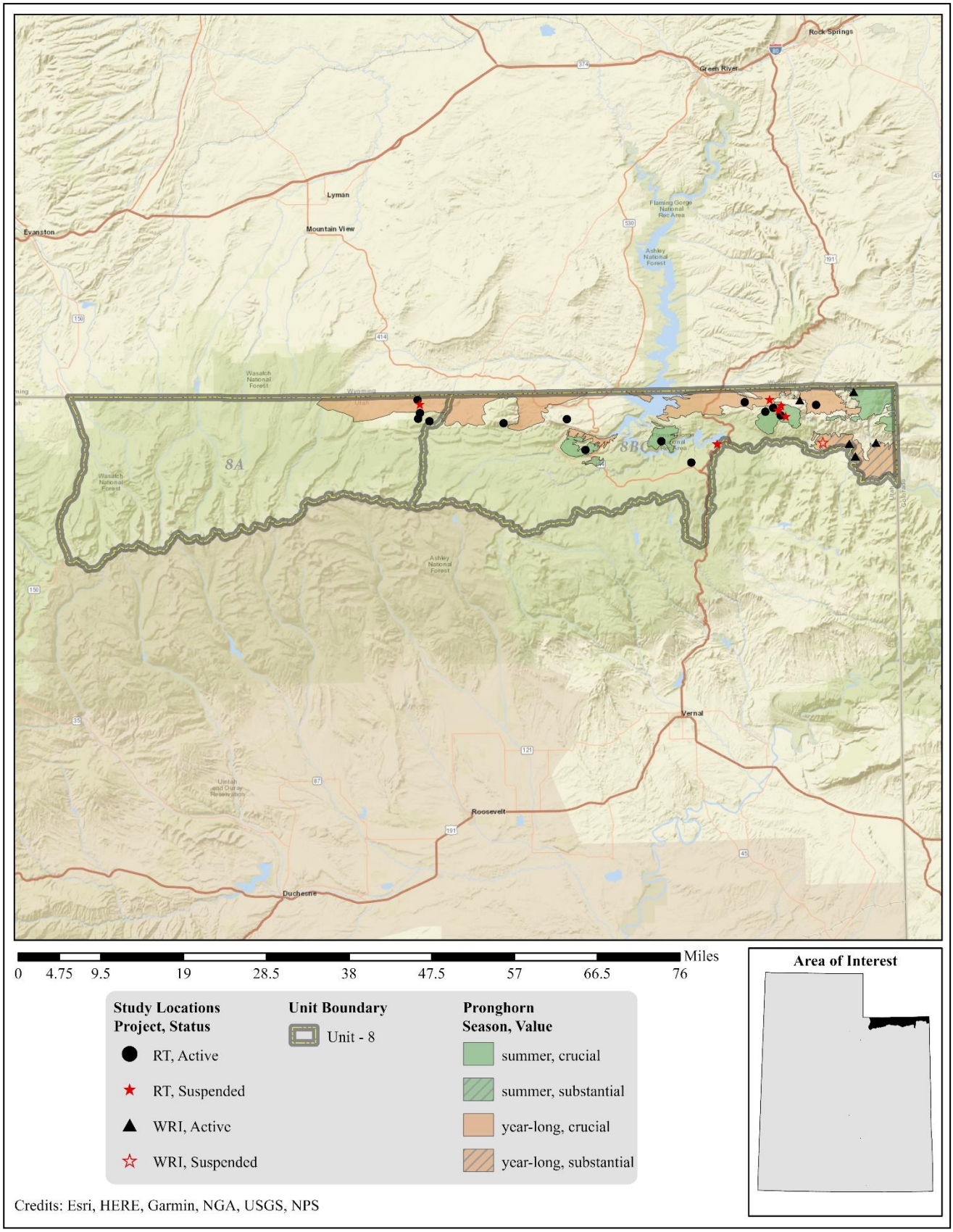
Figure 1.7: Average precipitation and estimated yearly stacked shrub and tree cover for year-long mule deer habitat in WMU 8, North Slope (Rangeland Analysis Platform, 2026).
*Dashed line indicates shift in depicted datasets from RAP 30m (1986-2017) to RAP 10m (2018-2025) (USDA Agricultural Research Service, 2026).



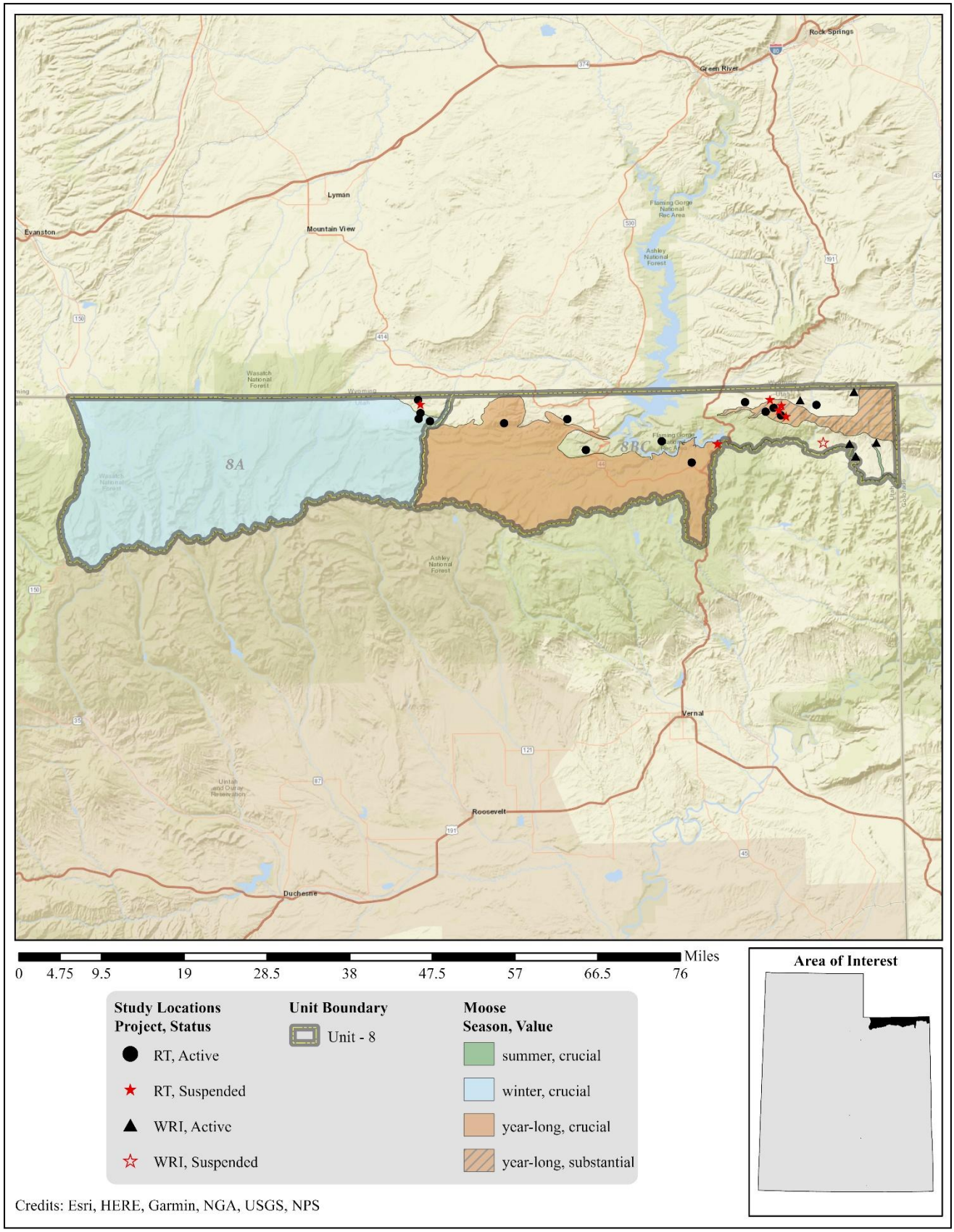
Map 1.2: Estimated mule deer habitat by season and value for WMU 8, North Slope.



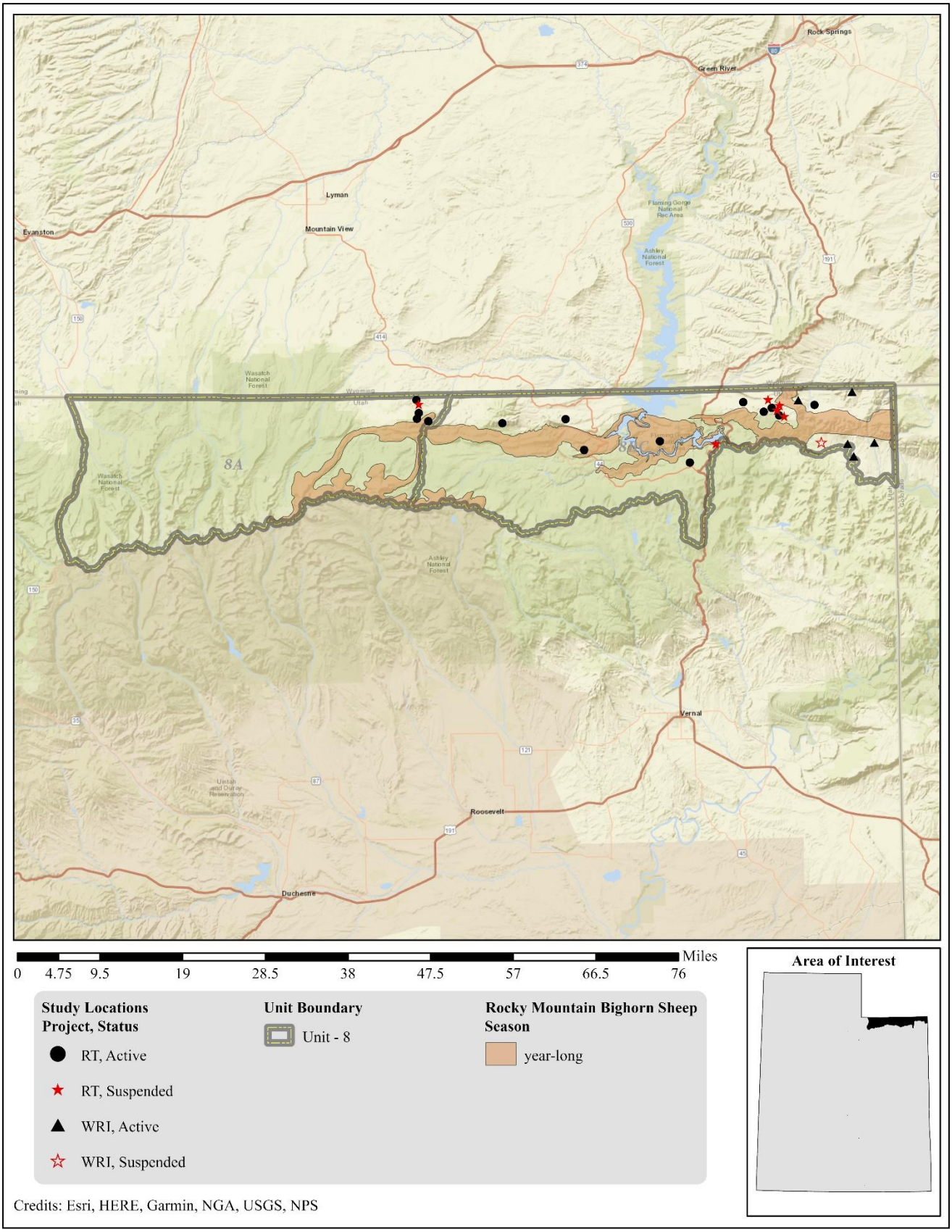
Map 1.3: Estimated elk habitat by season and value for WMU 8, North Slope.



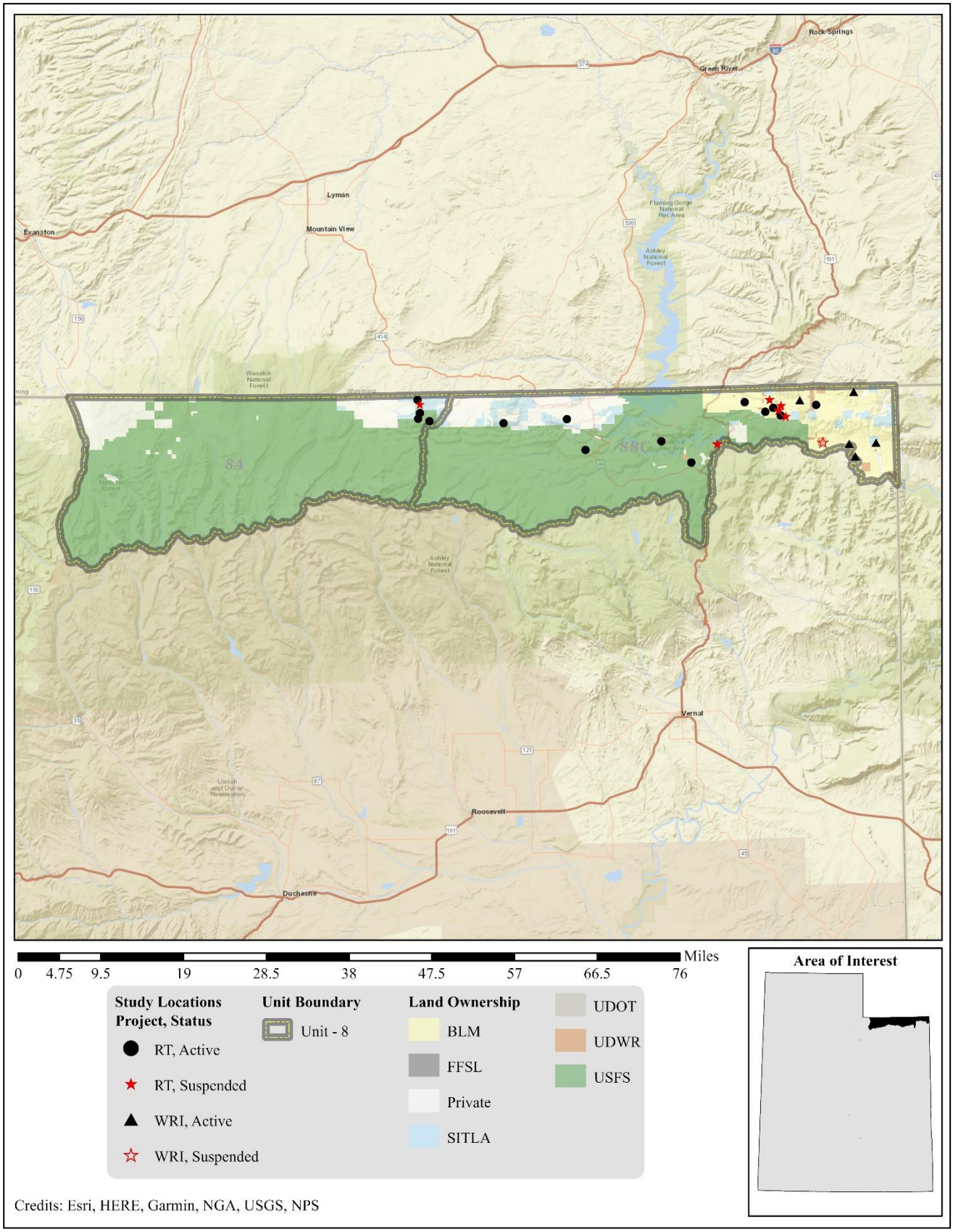
Map 1.4: Estimated pronghorn habitat by season and value for WMU 8, North Slope.



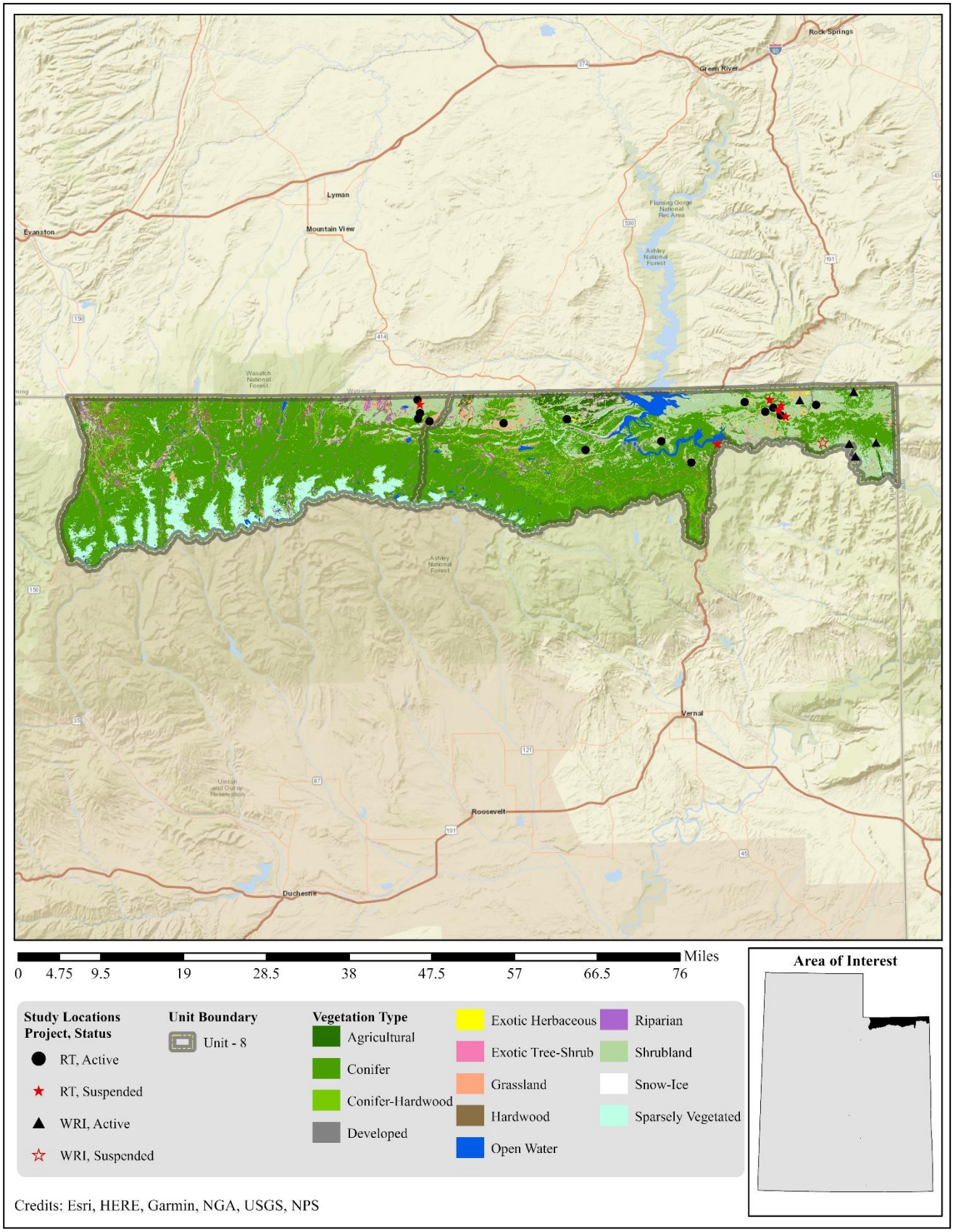
Map 1.5: Estimated moose habitat by season and value for WMU 8, North Slope.



Map 1.6: Estimated Rocky Mountain bighorn sheep habitat by season and value for WMU 8, North Slope.



Map 1.7: Land ownership for WMU 8, North Slope.



Map 1.8: LANDFIRE Existing Vegetation Type map (LC24_EVT_250, 2024) for WMU 8, North Slope.

LANDFIRE Existing Vegetation Type for Mule Deer Habitat

The current LANDFIRE Existing Vegetation Type model shows that just over 10% of mule deer summer habitat in the North Slope unit is comprised of biophysical sites (also referred to here as vegetation types or classes) that have quaking aspen (*Populus tremuloides*) as a dominant component (**Error! Reference source not found.**); various conifer species may also be dominant in the Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland vegetation type. Although they are tree-dominated, these aspen biophysical sites may also have diverse herbaceous components that could provide valuable forage for summering mule deer. Over 12% of the unit's summer range is occupied by sparsely vegetated areas according to the model: this vegetation class may have less value for mule deer when compared with other, more productive sites.

The model also indicates that sagebrush steppe and shrublands make up approximately 7% of the North Slope unit's summer range for mule deer; 33% of the winter range; and 37% of year-long habitat (**Error! Reference source not found.**, **Error! Reference source not found.**, **Error! Reference source not found.**). These biophysical sites can be found at elevations ranging from low (semidesert) to high (mountain). Sagebrush (*Artemisia* spp.) 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 lower to middle elevations.

The Colorado Plateau Pinyon-Juniper Woodland biophysical site is modeled to comprise 31% of mule deer winter range in this unit; 19% of the year-long range; and 2% of the summer range. Pinyon (*Pinus* spp.) and juniper (*Juniperus* spp.) dominate this vegetation type, which occurs at low to middle elevations. Prevalence can show large variation, but sites of this type can be associated with understory browse species known to be valuable to wintering mule deer.

A variety of other vegetation types comprise the rest of the mule deer habitat within the North Slope Management Unit (**Map 1.8**, **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	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	150,404	26.33%	
	Rocky Mountain Lodgepole Pine Forest	132,885	23.27%	
	Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland	32,253	5.65%	
	Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland	23,567	4.13%	
	Colorado Plateau Pinyon-Juniper Woodland	11,643	2.04%	
	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	10,774	1.89%	
	Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland	9,102	1.59%	
	Southern Rocky Mountain Ponderosa Pine Woodland	6,903	1.21%	
	Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland	3,401	0.60%	
	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	2,748	0.48%	
	Rocky Mountain Foothill Limber Pine-Juniper Woodland	1,088	0.19%	
	Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland	12	0.00%	67.37%
Other	Sparsely Vegetated	70,509	12.35%	
	Riparian	17,500	3.06%	
	Developed	4,905	0.86%	
	Open Water	4,234	0.74%	
	Snow-Ice	55	0.01%	
	Agricultural	28	0.00%	
	Quarries-Strip Mines-Gravel Pits-Well and Wind Pads	1	0.00%	17.02%
Shrubland	Inter-Mountain Basins Montane Sagebrush Steppe	39,468	6.91%	
	Rocky Mountain Lower Montane-Foothill Shrubland	2,180	0.38%	
	Inter-Mountain Basins Big Sagebrush Shrubland	1,956	0.34%	
	Rocky Mountain Alpine Dwarf-Shrubland	1,749	0.31%	
	Wyoming Basins Dwarf Sagebrush Shrubland and Steppe	1,553	0.27%	
	Inter-Mountain Basins Big Sagebrush Steppe	1,222	0.21%	
	Inter-Mountain Basins Semi-Desert Shrub-Steppe	704	0.12%	
	Inter-Mountain Basins Curl-leaf Mountain Mahogany Shrubland	671	0.12%	
	Inter-Mountain Basins Mixed Salt Desert Scrub	55	0.01%	
	Inter-Mountain Basins Greasewood Flat	6	0.00%	
	Inter-Mountain Basins Mat Saltbush Shrubland	3	0.00%	
	Colorado Plateau Mixed Low Sagebrush Shrubland	2	0.00%	
Hardwood	Rocky Mountain Aspen Forest and Woodland	26,273	4.60%	4.60%
Grassland	Rocky Mountain Subalpine-Montane Mesic Meadow	4,023	0.70%	
	Southern Rocky Mountain Montane-Subalpine Grassland	3,527	0.62%	
	Inter-Mountain Basins Semi-Desert Grassland	2,376	0.42%	
	Rocky Mountain Alpine Turf	1,555	0.27%	
	Rocky Mountain Alpine Fell-Field	715	0.13%	2.14%
Exotic Herbaceous	Great Basin & Intermountain Introduced Perennial Grassland and Forbland	499	0.09%	
	Interior Western North American Temperate Ruderal Grassland	402	0.07%	
	Great Basin & Intermountain Introduced Annual Grassland	45	0.01%	
	Great Basin & Intermountain Introduced Annual and Biennial Forbland	28	0.00%	0.17%
Exotic Tree-Shrub	Great Basin & Intermountain Ruderal Shrubland	55	0.01%	
	Interior Western North American Temperate Ruderal Shrubland	55	0.01%	0.02%
Total		**571,134**	**100%**	**100%**

Table 1.1: LANDFIRE Existing Vegetation Type (LC24_EVT_250, 2024) acreage of summer mule deer habitat for WMU 8, North Slope.

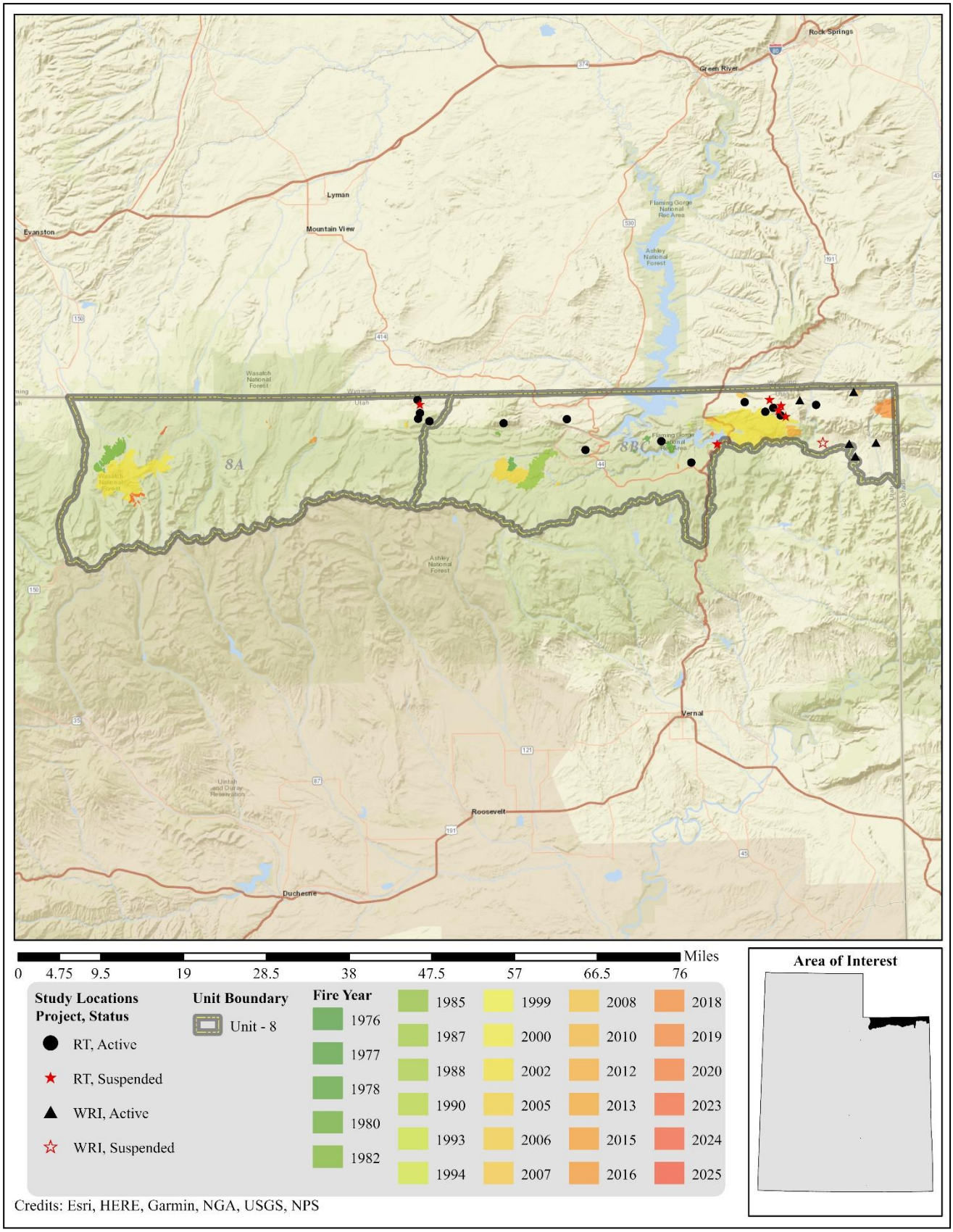
Group	Existing Vegetation Type for Winter Mule Deer Habitat	Acres	% of Total	Group % of Total
Conifer	Colorado Plateau Pinyon-Juniper Woodland	56,280	31.19%	
	Southern Rocky Mountain Ponderosa Pine Woodland	5,452	3.02%	
	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	3,141	1.74%	
	Rocky Mountain Foothill Limber Pine-Juniper Woodland	2,959	1.64%	
	Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland	1,759	0.97%	
	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	1,737	0.96%	
	Rocky Mountain Lodgepole Pine Forest	1,291	0.72%	
	Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland	1,243	0.69%	
	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	1,116	0.62%	
	Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland	1,052	0.58%	
	Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland	19	0.01%	42.14%

Group	Existing Vegetation Type for Winter Mule Deer Habitat	Acres	% of Total	Group % of Total
Shrubland	Inter-Mountain Basins Big Sagebrush Shrubland	23,672	13.12%	
	Inter-Mountain Basins Montane Sagebrush Steppe	20,941	11.60%	
	Inter-Mountain Basins Big Sagebrush Steppe	10,332	5.73%	
	Inter-Mountain Basins Semi-Desert Shrub-Steppe	4,917	2.72%	
	Wyoming Basins Dwarf Sagebrush Shrubland and Steppe	4,900	2.72%	
	Inter-Mountain Basins Mixed Salt Desert Scrub	2,681	1.49%	
	Rocky Mountain Lower Montane-Foothill Shrubland	2,232	1.24%	
	Inter-Mountain Basins Mat Saltbush Shrubland	1,239	0.69%	
	Inter-Mountain Basins Greasewood Flat	592	0.33%	
	Inter-Mountain Basins Curl-leaf Mountain Mahogany Shrubland	355	0.20%	
	Colorado Plateau Mixed Low Sagebrush Shrubland	340	0.19%	40.01%
Other	Agricultural	8,929	4.95%	
	Sparsely Vegetated	5,146	2.85%	
	Developed	3,228	1.79%	
	Riparian	2,886	1.60%	
	Open Water	332	0.18%	
	Quarries-Strip Mines-Gravel Pits-Well and Wind Pads	18	0.01%	11.38%
Grassland	Inter-Mountain Basins Semi-Desert Grassland	1,603	0.89%	
	Rocky Mountain Subalpine-Montane Mesic Meadow	1,588	0.88%	
	Southern Rocky Mountain Montane-Subalpine Grassland	2,844	1.58%	3.34%
Exotic Tree-Shrub	Great Basin & Intermountain Ruderal Shrubland	1,724	0.96%	
	Interior Western North American Temperate Ruderal Shrubland	209	0.12%	1.07%
Exotic Herbaceous	Great Basin & Intermountain Introduced Annual and Biennial Forbland	337	0.19%	
	Great Basin & Intermountain Introduced Annual Grassland	469	0.26%	
	Great Basin & Intermountain Introduced Perennial Grassland and Forbland	333	0.18%	
	Interior Western North American Temperate Ruderal Grassland	753	0.42%	
Hardwood	Rocky Mountain Aspen Forest and Woodland	1,805	1.00%	1.00%
Total		**180,456**	**100%**	**100%**

Table 1.2: LANDFIRE Existing Vegetation Type (LC24_EVT_250, 2024) acreage of winter mule deer habitat for WMU 8, North Slope.

Group	Existing Vegetation Type for Year-Long Mule Deer Habitat	Acres	% of Total	Group % of Total
Shrubland	Inter-Mountain Basins Semi-Desert Shrub-Steppe	2,185	29.75%	
	Inter-Mountain Basins Big Sagebrush Shrubland	1,973	26.86%	
	Inter-Mountain Basins Montane Sagebrush Steppe	546	7.44%	
	Colorado Plateau Mixed Low Sagebrush Shrubland	153	2.08%	
	Rocky Mountain Lower Montane-Foothill Shrubland	91	1.24%	
	Inter-Mountain Basins Big Sagebrush Steppe	46	0.62%	
	Inter-Mountain Basins Mixed Salt Desert Scrub	14	0.19%	
	Wyoming Basins Dwarf Sagebrush Shrubland and Steppe	9	0.13%	
	Inter-Mountain Basins Curl-leaf Mountain Mahogany Shrubland	3	0.04%	
	Inter-Mountain Basins Greasewood Flat	2	0.02%	68.37%
Conifer	Colorado Plateau Pinyon-Juniper Woodland	1,387	18.89%	
	Rocky Mountain Foothill Limber Pine-Juniper Woodland	2	0.03%	
	Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland	1	0.01%	
	Southern Rocky Mountain Ponderosa Pine Woodland	<1	0.01%	18.94%
Exotic Tree-Shrub	Great Basin & Intermountain Ruderal Shrubland	427	5.82%	
	Interior Western North American Temperate Ruderal Shrubland	40	0.55%	6.37%
Other	Developed	259	3.52%	
	Sparsely Vegetated	23	0.32%	
	Riparian	15	0.20%	
	Open Water	4	0.06%	4.10%
Exotic Herbaceous	Great Basin & Intermountain Introduced Annual Grassland	72	0.98%	
	Great Basin & Intermountain Introduced Perennial Grassland and Forbland	31	0.42%	
	Great Basin & Intermountain Introduced Annual and Biennial Forbland	18	0.24%	
	Interior Western North American Temperate Ruderal Grassland	4	0.06%	1.70%
Grassland	Inter-Mountain Basins Semi-Desert Grassland	30	0.41%	
	Rocky Mountain Subalpine-Montane Mesic Meadow	6	0.08%	
	Southern Rocky Mountain Montane-Subalpine Grassland	1	0.02%	0.51%
Hardwood	Rocky Mountain Aspen Forest and Woodland	1	0.02%	
Total		**7,343**	**100%**	**100%**

Table 1.3: LANDFIRE Existing Vegetation Type (LC24_EVT_250, 2024) acreage of year-long mule deer habitat for WMU 8, North Slope.



Map 1.9: Land coverage of fires by year from 1976-2025 for WMU 8, North Slope (NIFC Open Data Site: Federal Interagency Wildland Fire Maps and Data for All, 2025; Geosciences and Environmental Change Science Center (GECSC) Outgoing Datasets, 2023).

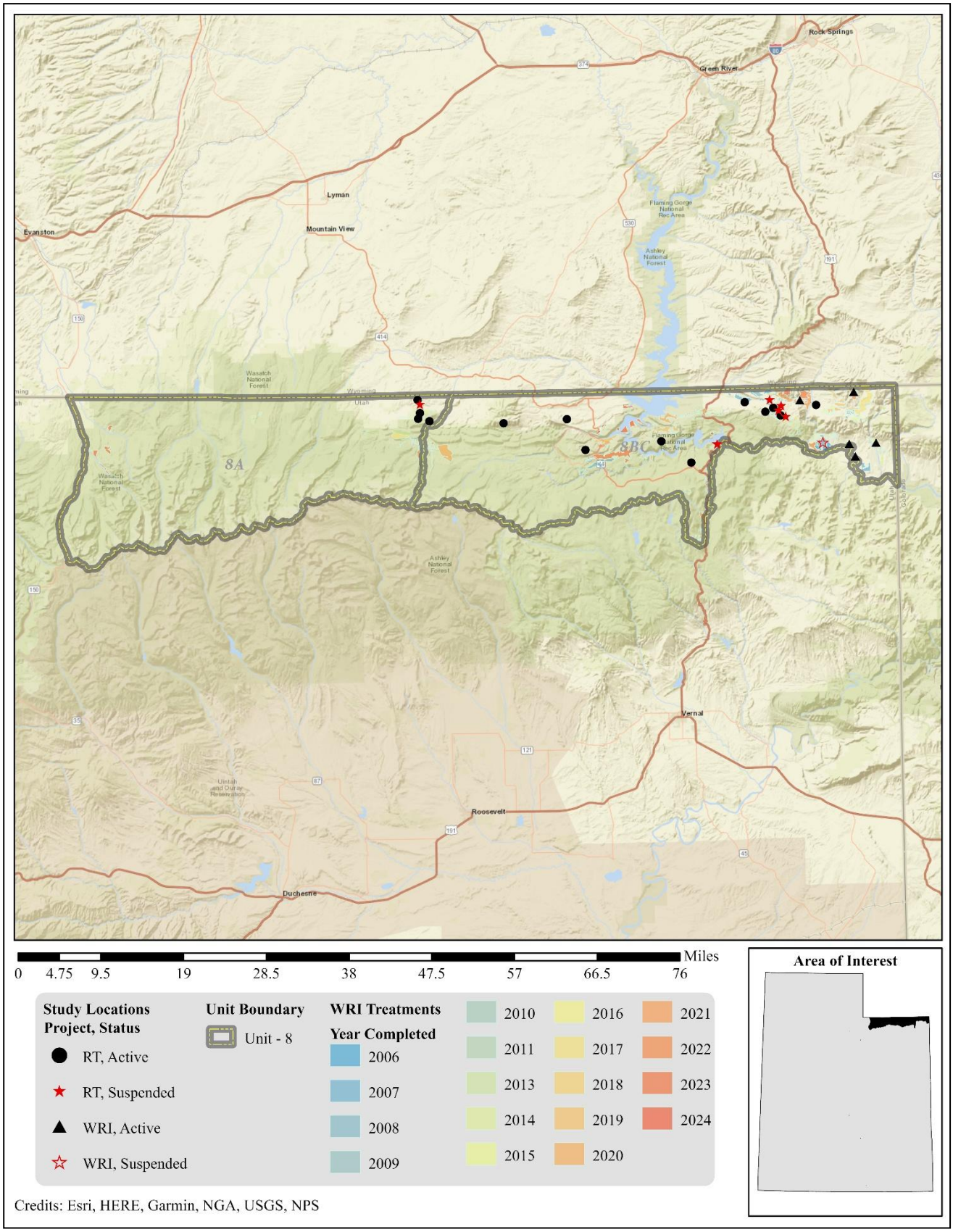
Treatments/Restoration Work

There has been an active effort to address many of the limitations on this unit through the Watershed Restoration Initiative (WRI). A total of 40,401 acres of land has been treated within the North Slope unit since the WRI was implemented in 2004. Treatments frequently overlap one another, bringing the net total of completed treatment acres to 33,299 for this unit (**Map 1.10**, **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 by acreage in this unit. However, mastication treatments to remove pinyon and juniper trees are also common, as are herbicide treatments to control undesirable vegetation. Other management practices in this unit include (but are not limited to) forestry practices, prescribed fire, and seedings to augment the herbaceous understory and shrub populations (**Table 1.4**).

Type	Total Completed Acreage
Vegetation Removal/Hand Crew	**25,280**
Lop & Scatter	24,224
Lop-Pile-Burn	1,006
Herbicide Application	**7,496**
Aerial (Helicopter)	5,029
Spot Treatment	2,338
Aerial (Fixed-Wing)	129
Bullhog	**3,496**
Full Size	2,967
Skid Steer	528
Forestry Practices	**1,512**
Thinning (Commercial)	1,266
Thinning (Non-Commercial)	246
Prescribed Fire	**1,444**
Pile Burn	821
Prescribed Fire	623
Seeding (Primary)	**714**
Drill (Rangeland)	647
Broadcast (Aerial-Fixed Wing)	67
Seeding (Secondary/Shrub)	**178**
Broadcast (Aerial-Helicopter)	178
Harrow	**146**
≤ 15 ft. (One-Way)	146
Aerator	**132**
Double Drum (One-Way)	132
Excavating/Extraction	**3**
Grapple/Opposable Thumb	3
Grand Total	**40,401**
***Net Total Land Area Treated**	**33,299**

Table 1.4: WRI treatment action size (acres) of completed projects for WMU 8, North Slope. Data accessed on 01/26/2026.
*Does not include overlapping treatments.



Map 1.10: Terrestrial WRI treatments by fiscal year completed for WMU 8, North Slope.

Range Trend Studies

Range Trend studies have been sampled within subunit 8A on a regular basis since 1988 and within subunits 8B and 8C since 1982, 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
08A-01	Widdop Mtn. South Slope	RT	Active	1988, 1995, 2000, 2005, 2010, 2015, 2021, 2025	Mountain Stony Loam (Browse)
08A-02	Widdop Mtn. North Slope	RT	Active	1988, 1995, 2000, 2005, 2010, 2015, 2020, 2025	Mountain Stony Loam (Browse)
08A-03	Bald Range South	RT	Suspended	1988, 1995, 2000	Mountain Stony Loam (Browse)
08A-04	Bald Range	RT	Active	1988, 1995, 2000, 2005, 2010, 2015, 2020, 2025	Mountain Stony Loam (Browse)
08A-05	Telephone Hollow	RT	Active	1988, 1995, 2000, 2005, 2010, 2015, 2021, 2025	Mountain Stony Loam (Browse)
08B-01	Cedar Springs	RT	Suspended	1982, 1988, 1995, 2000	Upland Loam (Mountain Big Sagebrush)
08B-04	Greendale	RT	Active	1982, 1988, 1995, 2000, 2005, 2010, 2015, 2020, 2025	Mountain Loam (Mountain Big Sagebrush)
08B-05	Bennett Ranch	RT	Active	1982, 1988, 1995, 2000, 2005, 2010, 2015, 2020, 2025	Upland Loam (Mountain Big Sagebrush)
08B-06	Death Valley	RT	Active	1982, 1988, 1995, 2000, 2005, 2010, 2015, 2020, 2025	Mountain Shallow Loam (Birchleaf Mountain Mahogany)
08B-08	Phil Pico Mountain	RT	Active	1988, 1995, 2000, 2005, 2010, 2015, 2020, 2025	Mountain Very Steep Stony Loam (Browse)
08C-02	Goslin Mountain	RT	Active	1982, 1988, 1995, 2000, 2005, 2010, 2015, 2020, 2025	Mountain Loam (Mountain Big Sagebrush)
08C-03	Bear Top Mountain	RT	Active	1982, 1988, 1995, 2000, 2005, 2010, 2015, 2020, 2025	Mountain Loam (Mountain Big Sagebrush)
08C-07	Antelope Flat	RT	Active	1988, 1995, 2000, 2005, 2010, 2015, 2020, 2025	Semidesert Loam (Wyoming Big Sagebrush)
08C-09	West Goslin	RT	Active	1995, 2000, 2005, 2010, 2015, 2020, 2025	Mountain Loam (Mountain Big Sagebrush)
08C-10	Sagebrush Ridge	RT	Suspended	1995, 2000	Mountain Loam (Mountain Big Sagebrush)
08C-11	Triangle Meadow	RT	Suspended	1995, 2000	Semiwet (Fresh Meadow)
08C-12	Big Meadow	RT	Active	1995, 2000, 2010, 2015, 2020, 2025	Semiwet (Fresh Meadow)
08C-13	Lower Big Meadow	RT	Suspended	1995, 2000	Semiwet (Fresh Meadow)
08C-14	Clay Basin Bench	RT	Active	2000, 2005, 2010, 2015, 2020, 2025	Semidesert Loam (Wyoming Big Sagebrush)
08C-15	Ford Spring	RT	Suspended	1996	Semiwet (Fresh Meadow)
08R-01	Brown's Park db Drum	WRI	Active	2005, 2008, 2012, 2016, 2022	Semidesert - Alkali Flat (Black Greasewood)
08R-02	Teepee Mountain Bullhog	WRI	Active	2007, 2010, 2013, 2018, 2023	Upland Stony Loam (Bonneville Big Sagebrush)

Study #	Study Name	Project	Status	Years Sampled	Ecological Site Description
08R-03	Goslin Mountain Bullhog	WRI	Active	2008, 2010, 2013, 2017, 2022	Upland Loam (Mountain Big Sagebrush)
08R-04	Bake Oven	WRI	Active	2012, 2016, 2022	Semidesert - Alkali Flat (Black Greasewood)
08R-05	Birch Creek	WRI	Active	2014, 2017, 2022	Upland Loam (Mountain Big Sagebrush)
08R-06	Red Creek	WRI	Suspended	2016, 2019	Semidesert Loam (Wyoming Big Sagebrush)

Table 1.5: Range Trend and WRI project studies monitoring history and ecological site potential for WMU 8, North Slope.

Study #	Study Name	Type	Disturbance Name (If Available)	Date	Acres	WRI Project #
08A-02	Widdop Mtn. North Slope	Lop and Scatter	Telephone Hollow Lop and Scatter	September 2014	303	2536
08A-05	Telephone Hollow	Lop and Scatter	Telephone Hollow Lop and Scatter	September 2014	303	2536
08B-06	Death Valley	Lop and Scatter	West Northwest D1 Wildlife Habitat Project – Sheep Creek Geological Loop (Phase 4, 5, and 6) (Proposed)	Fall 2026	2,039	7582
08C-02	Goslin Mountain	Lop and Scatter	Goslin Mountain Phase 2 Lop and Scatter	May 2008	1,221	691
08C-03	Bear Top Mountain	Prescribed Fire		1998		
08C-07	Antelope Flat	Lop and Scatter	Goslin Mountain P/J Encroachment Removal	August 2006	1,677	297
08C-09	West Goslin	Wildfire	Mustang	2002	21,638	
08C-11	Triangle Meadow	Lop and Scatter	Goslin Mountain PJ Encroachment Removal	August 2006	1,677	297
08C-14	Clay Basin Bench	Utility Pipeline		2013		
08R-01	Brown's Park db Drum	2,4-D/Tordon Broadcast Before Double Drum/Seed	Brown's Park Brown's Park Brown's Park	June 2005 2005 2005	141 141 141	26 26 26
08R-02	Teepee Mountain Bullhog	Bullhog Lop and Scatter Spot Spray	Teepee Mountain Bullhog Project Diamond Mountain Weed Inventory/Treatment	June-August 2007 2019 May-June 2022	535 6,576	692 5656
08R-03	Goslin Mountain Bullhog	Aerial Before Bullhog Wildfire Plateau Herbicide Unknown	Goslin Bullhog Phase II Goslin Bullhog Phase II Richard Mountain Herbicide Treatments – Richard Mtn. and Little Davenport Richard Mountain Fire Weed/Herbicide Treatment	October 2008 March-May 2009 August 2020 September 2020 Fall 2022	2,595 2,595 7,632 8,513 1,318	1090 1090 5107 5905
08R-04	Bake Oven	Arsenal Truax Drill Two-Way Chain Aerial After	Bake Oven Sagebrush Restoration Bake Oven Sagebrush Restoration Bake Oven Sagebrush Restoration Bake Oven Sagebrush Restoration	September 2013 September 2013 January 2014 January 2014	150 150 150 150	2268 2268 2268 2268
08R-05	Birch Creek	Aerial Before Bullhog Aerial After	Birch Creek Pinyon and Juniper Removal Birch Creek Pinyon and Juniper Removal Birch Creek Pinyon and Juniper Removal	November 2014 December 2014 January 2015	276 276 276	2913 2913 2913
08R-06	Red Creek	Lop and Scatter	Red Creek Flat Phase 2 Lop and Scatter	May 2007	503	359

Table 1.6: Range Trend and WRI studies known disturbance history for WMU 8, North Slope. 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 periods 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 2025 sample year:

- Semiwet (Fresh Meadow) - Triangle Meadow (08C-11) (suspended), Big Meadow (08C-12), Lower Big Meadow (08C-13) (suspended), and Ford Spring (08C-15) (suspended)
    - (**Figure 1.15**, **Figure 1.17**, **Figure 1.18**, **Figure 1.20**, **Figure 1.22**)
- Upland (Big Sagebrush) - Cedar Springs (08B-01) (suspended) and Bennett Ranch (08B-05)

- (**Figure 1.5**, **Figure 1.11**, **Figure 1.13**, **Figure 1.14**, **Figure 1.16**, **Figure 1.19**, **Figure 1.21**, **Figure 1.23**)

Trend summaries and/or additional data for these ecotypes are available in the corresponding site reports (Lane, Payne, & Cox, 2026).

Mountain (Big Sagebrush)

Five study sites [Greendale (08B-04), Goslin Mountain (08C-02), Bear Top Mountain (08C-03), West Goslin (08C-09), and Sagebrush Ridge (08C-10) (suspended)] are classified as Mountain (Big Sagebrush) ecological sites. The Bear Top Mountain and Greendale studies are located within the Flaming Gorge National Recreation Area, north and south (respectively) of the Green River. The Goslin Mountain and West Goslin study sites are both found on the south face of Goslin Mountain. Finally, the Sagebrush Ridge study is also located on the southern face of Goslin Mountain and approximately one mile northeast of the Goslin Mountain site.

When discussing the data for these study sites, it is important to note that the Sagebrush Ridge study only contributed data in 1995 and 2000 while Greendale, Goslin Mountain, Bear Top Mountain, and West Goslin have provided data spanning all reported sample years.

Shrubs/Trees: The primary browse species on these sites has been mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), although other browse species have also been present in smaller amounts. Line-intercept cover of sagebrush has increased from year to year and is good overall as of 2025 with 21% cover (**Figure 1.8**). Density of sagebrush has increased overall since 1995, with density having a more notable increase between 2020 and 2025. The recruitment of young plants remained relatively consistent between 1995 and 2015 and was low, but density of young increased in 2020 and 2025. Furthermore, increased young density in 2020 led to a doubling in density of mature plants in 2025. Density of decadent plants has remained similar from year to year. With some variability in density, mature plants have been the most dominant age group throughout the study years (**Figure 1.14**). Average preferred browse utilization appears to have a cyclic pattern. Utilization of sagebrush was low in 2000 and was at its highest in 2015. Moderate utilization was estimated to be just over 40% in 2010 and 2015 while heavy utilization was estimated at 21% and 25% for the same respective years. Total utilization of sagebrush reached 28% of the population in 2025 (**Figure 1.16**).

The increase in average cover and density of conifers is mostly due to the Greendale study site and driven by a population of ponderosa pine (*Pinus ponderosa*). Most of the sites do have some woodland encroachment occurring, but not in any considerable amount and are considered to be in either early Phase I or Phase I of woodland succession as of the most recent sample year (**Figure 1.10**, **Figure 1.12**).

Herbaceous Understory: The herbaceous understories on these sites have generally increased over the sample years and have been mainly dominated by perennial grass. The exception to this is the Bear Top Mountain study, which was dominated by the introduced annual grass cheatgrass (*Bromus tectorum*) from 2010 to 2020, but cheatgrass cover decreased substantially in 2025. Overall cover of annual grass has varied over time from less than 1% in 2005 to 5% in 2010 and 6% in 2015, but it decreased to over 2% in 2020 and back to less than 1% in 2025. Cover for bulbous bluegrass (*Poa bulbosa*) on the Goslin Mountain study has generally exhibited a slight, steady increase, but there were marked increases in 2020 and 2025. Covers of perennial and annual forbs have fluctuated, but they have displayed a steady increase since 2000 (**Figure 1.18, Figure 1.20**).

Occupancy: Pellet transect data indicates that elk presence has generally decreased on these sites while deer presence has varied from year to year; cattle pellet groups have also varied over time. Combined presence appears to be strongly cyclic or a bimodal pattern driven by deer presence, and it may indicate oscillations in resource availability. Deer pellet groups have had a mean abundance ranging from 11 days use/acre in 2015 to 46 days use/acre in 2005. Average abundance of elk pellet groups has been as low as 6 days use/acre in 2015 and 2020 and as high as 22 days use/acre in 2005. Mean abundance of cattle pellet groups has fluctuated between 0 days use/acre in 2015 and 15 days use/acre in 2020. Finally, moose pellet groups were present in

2000 with an average abundance of 0.1 days use/acre, but they have not been observed in any other sample year (**Figure 1.22**).

Mountain (Browse)

There are seven studies [Widdop Mtn. South Slope (08A-01), Widdop Mtn. North Slope (08A-02), Bald Range South (08A-03) (suspended), Bald Range (08A-04), Telephone Hollow (08A-05), Death Hollow (08B-06), and Phil Pico Mountain (08B-08)] that are classified as Mountain (Browse) ecological sites. Widdop Mtn. South Slope is located on the south slope of Widdop Mountain, and the Widdop Mtn. North Slope and Telephone Hollow studies are located on the northern slope. The Bald Range and Bald Range South study sites are found on Bald Range, north of Widdop Mountain. Death Valley occurs southwest of Flaming Gorge Reservoir on the north slope of Windy Ridge. Finally, the Phil Pico Mountain study is found on the south slope of Phil Pico Mountain.

When discussing the data for these study sites, it is important to note that the Widdop Mtn. South Slope, Widdop Mtn. North Slope, Bald Range, Telephone Hollow, Death Valley, and Phil Pico Mountain study sites have datasets that span all reported sample years since 1995. In contrast, the Bald Range South site only provided data for the 1995 sample year.

Shrubs/Trees: These sites have remained dominated by a mixture of browse species, namely alderleaf mountain mahogany (*Cercocarpus montanus*), mountain snowberry (*Symphoricarpos oreophilus*), and Utah serviceberry (*Amelanchier utahensis*); other preferred browse species have been present but have contributed less cover. Overall, the mean cover of combined serviceberry and mahogany has steadily increased over the study years, from 15% in 2005, to 21% in 2025. Other preferred browse has been present in much lower amounts. Average combined cover of preferred browse excluding serviceberry and mahogany has ranged between 5% in 2005 and 6.5% in 2025 (**Figure 1.9**). The average density of preferred browse has exhibited an overall increasing trend over the study years. The population has maintained a moderate amount of recruitment of young plants, although recruitment has decreased each year since 2010. The number of decadent plants has remained low. Mature plants make up a majority of the preferred browse populations with density increasing over time and reaching a high in 2025 (**Figure 1.15**). Overall utilization has increased over time with a more pronounced utilization trend developing between 2010 and 2025. Heavy utilization has increased over the same time period and is responsible for the shape of the utilization trend. Overall, heavy utilization has varied and is characterized as cyclic or bimodal pattern which could be related to resource variations. Over 40% of plants sampled in density strips received heavy use in 2005, 2020, and 2025, and 17% of plants in 1995 and 13% in 2010 were heavily utilized. Moderate utilization has displayed an inverse relationship with heavy use and with a similar magnitude of change (**Figure 1.17**).

Overall tree encroachment is minimal as of 2025. However, cover and density measurements for limber pine (*Pinus flexilis*) have been observed each sample year on Telephone Hollow: this site had a notable change in cover and density between 2010 and 2015. However, scale is important and when it is taken into consideration cover and density of trees have remained very low for this ecotype. Potential for encroachment remains on Death Valley, although density of young Utah juniper (*Juniperus osteosperma*) trees has not changed since 2000 (**Figure 1.10**, **Figure 1.12**).

Herbaceous Understory: In general, herbaceous cover has displayed an increase over the sample years with the dominant component being perennial grass. A notable increase in total cover corresponds with the removal of sampled sites. Perennial forbs have also exhibited an increase overall and contributed 4.5% cover in 2025. The cover provided by annual forbs has remained consistent over time, and has been less than 1% in all sample years; annual grasses not been sampled on these sites (**Figure 1.18**, **Figure 1.20**).

Occupancy: Pellet transect data indicates that these sites have largely been occupied by elk, and to a lesser extent, deer. Moose presences have been noted each sample year, but presence has decreased over time. Cattle presence appears to be low across these sites. Total average animal presence has fluctuated, but it has shown an overall decreasing trend since 2000. The mean abundance of elk pellet groups has ranged from 26 days

use/acre in 2015 to 46 days use/acre in 2005. Deer pellet groups have had a mean abundance fluctuating between 7 days use/acre in 2005 and 29 days use/acre in 2020. Finally, the mean abundance of cattle pellet groups has ranged from 2 to 4 days use/acre for all sample years (**Figure 1.22**).

Semidesert (Big Sagebrush)

There are two studies [Antelope Flat (08C-07) and Clay Basin Bench (08C-14)] that are classified as Upland (Big Sagebrush) ecological sites. The Antelope Flat study site is found in the eastern portion of Antelope Flat near Goslin Mountain. The Clay Basin Bench study is located south of the Utah-Wyoming border in central Clay Basin.

When discussing the data for these study sites, it is important to consider that data for the 1995 sample year was only provided by the Antelope Flat study, but both sites contributed data for the rest of the reported sample period.

Shrubs/Trees: Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) has been the primary browse species on the Antelope Flat and Clay Basin Bench study sites. Sagebrush cover has displayed a slight but generally increasing trend in cover between 2005 and 2025. Other preferred browse species have also been present on these sites and displayed a notable increase in cover in 2020 and 2025. These other shrubs include broom snakeweed (*Gutierrezia sarothrae*) and pricklypear cactus (*Opuntia sp*.) on Clay Basin Bench, and yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *viscidiflorus* var. *viscidiflorus*) on the Antelope Flat site. These specific species contribute the most cover in the shrub understory on their respective sites in 2025 (**Figure 1.11**). Recruitment of young to the sagebrush population was elevated between 2010 and 2020 but was at its lowest in 2025, and decadence of sagebrush has remained similar since 2005. The overall preferred browse populations have gradually decreased in density, while the individual demographics of the population have fluctuated over the study years. However, these populations have mainly been a mixture of mature and decadent individuals (**Figure 1.13**). The average amount of preferred browse receiving moderate use has exhibited an overall decrease since 2000. However, overall utilization had a notable increase in 2025, with 17% of plants sampled in density strips receiving moderate use and 74% with heavy use. Heavy use of preferred browse has fluctuated greatly over the sample period (**Figure 1.16**).

Pinyon-juniper encroachment it is not occurring as of 2025 on these representative sites and will therefore not be discussed in this section (**Figure 1.11**, **Figure 1.13**).

Herbaceous Understory: The herbaceous understories for these study sites have been plentiful and dominated by perennial grasses, mainly needle and thread (*Hesperostipa comata*) and Sandberg bluegrass (*Poa secunda*). Although cover has fluctuated slightly in recent sample years, perennial grass has shown an overall increasing trend. Covers of both annual grass and annual forbs have fluctuated over time; annual grass cover reached its highest value in 2015 at 17%, but it decreased to less than 3% in 2025. Abundances of annual grasses and forbs have increased overall as perennial grass has decreased (**Figure 1.19**, **Figure 1.21**).

Occupancy: Average pellet transect data shows that occupancy on these sites has generally decreased. Elk presence has decreased over time despite some variability. Mean abundance of pellet groups for deer/antelope has ranged from 0 days use/acre in 2020 to 81 days use/acre in 2010. Mean abundance of cattle pellet groups has fluctuated between 10 days use/acre in 2015 and 81 days use/acre in 2020. Cattle presence has been consistent from year to year and considered to be low to moderate (**Figure 1.23**).

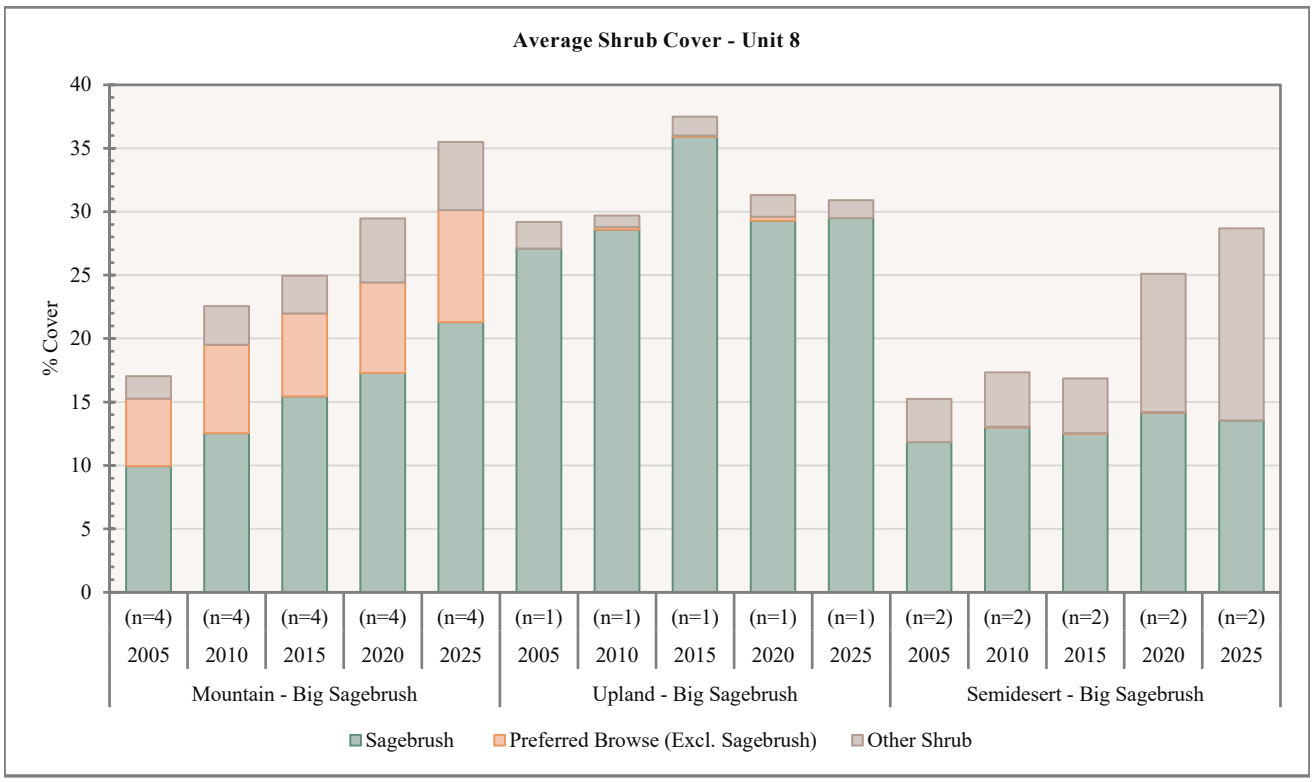


Figure 1.8: Average shrub cover for Mountain - Big Sagebrush, Upland - Big Sagebrush, and Semidesert - Big Sagebrush study sites in WMU 8, North Slope.

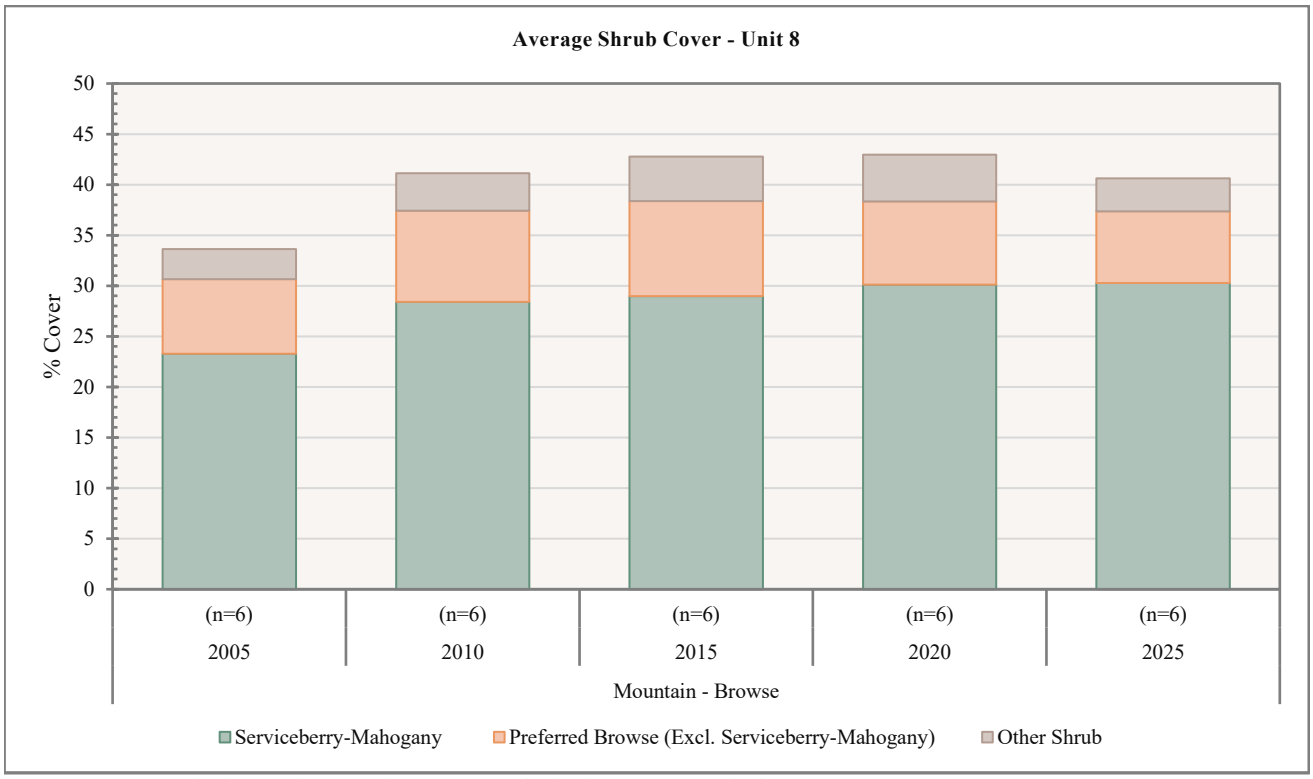


Figure 1.9: Average shrub cover for Mountain - Browse study sites in WMU 8, North Slope.

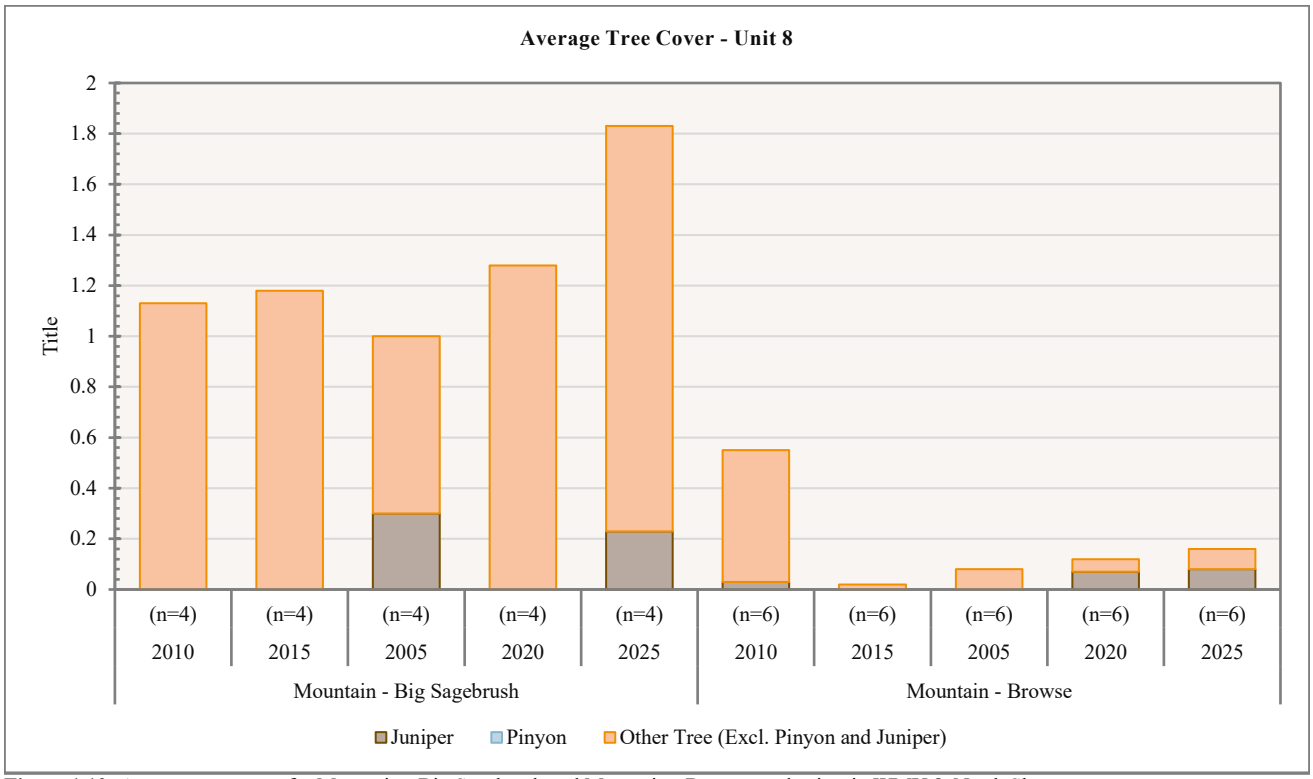


Figure 1.10: Average tree cover for Mountain - Big Sagebrush and Mountain - Browse study sites in WMU 8, North Slope.

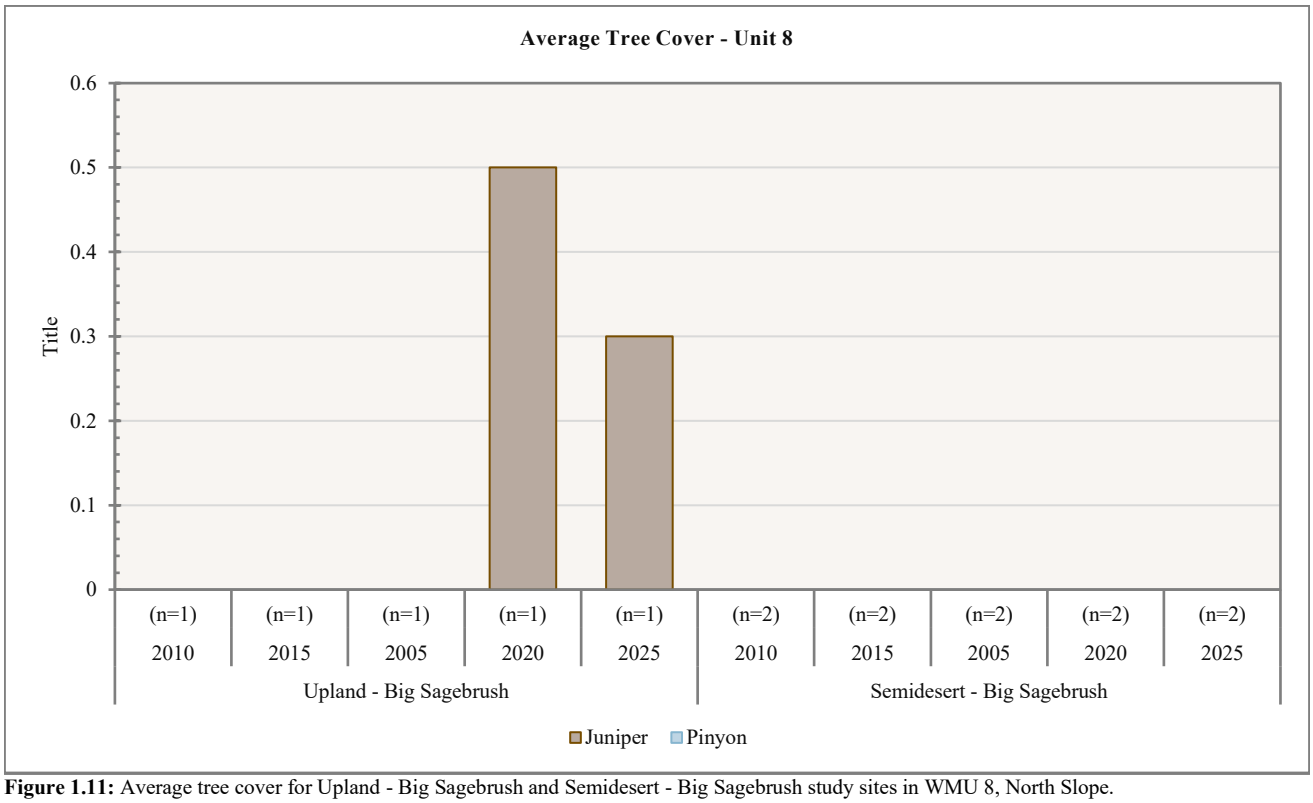


Figure 1.11: Average tree cover for Upland - Big Sagebrush and Semidesert - Big Sagebrush study sites in WMU 8, North Slope.

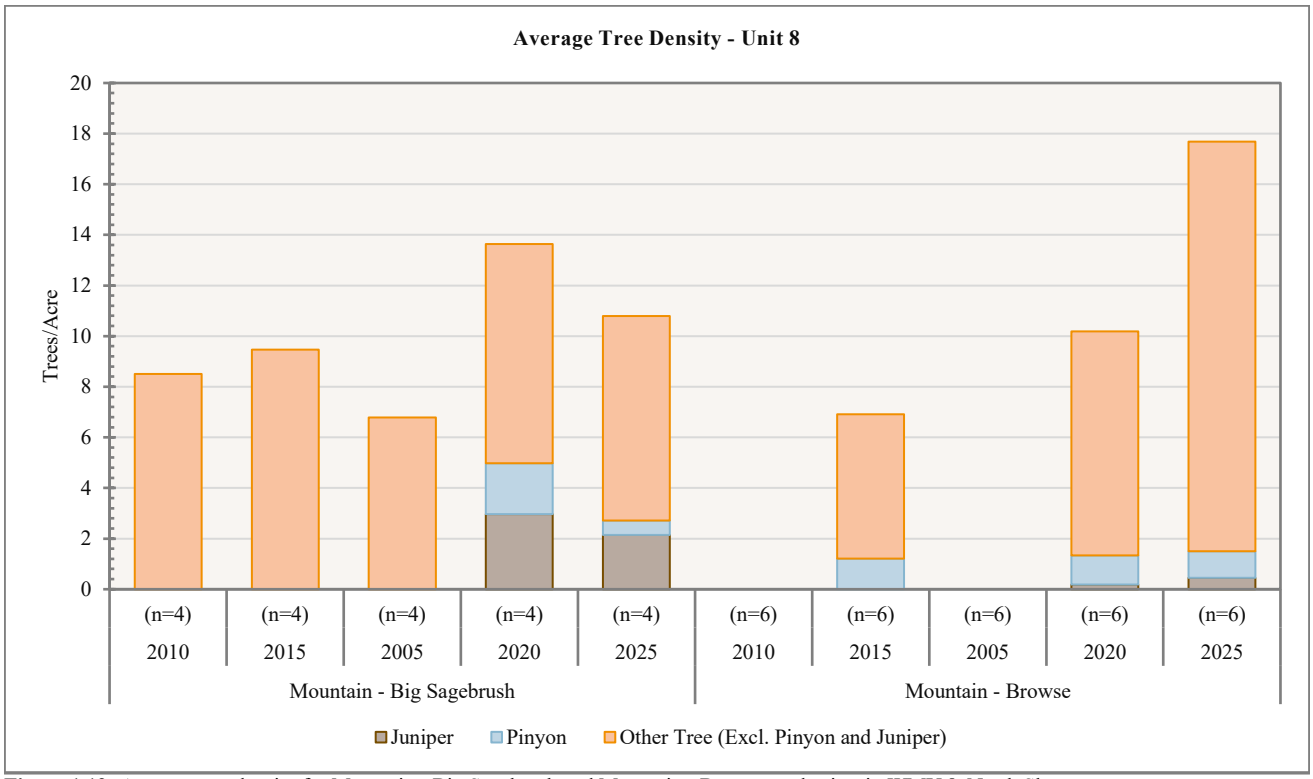


Figure 1.12: Average tree density for Mountain - Big Sagebrush and Mountain - Browse study sites in WMU 8, North Slope.

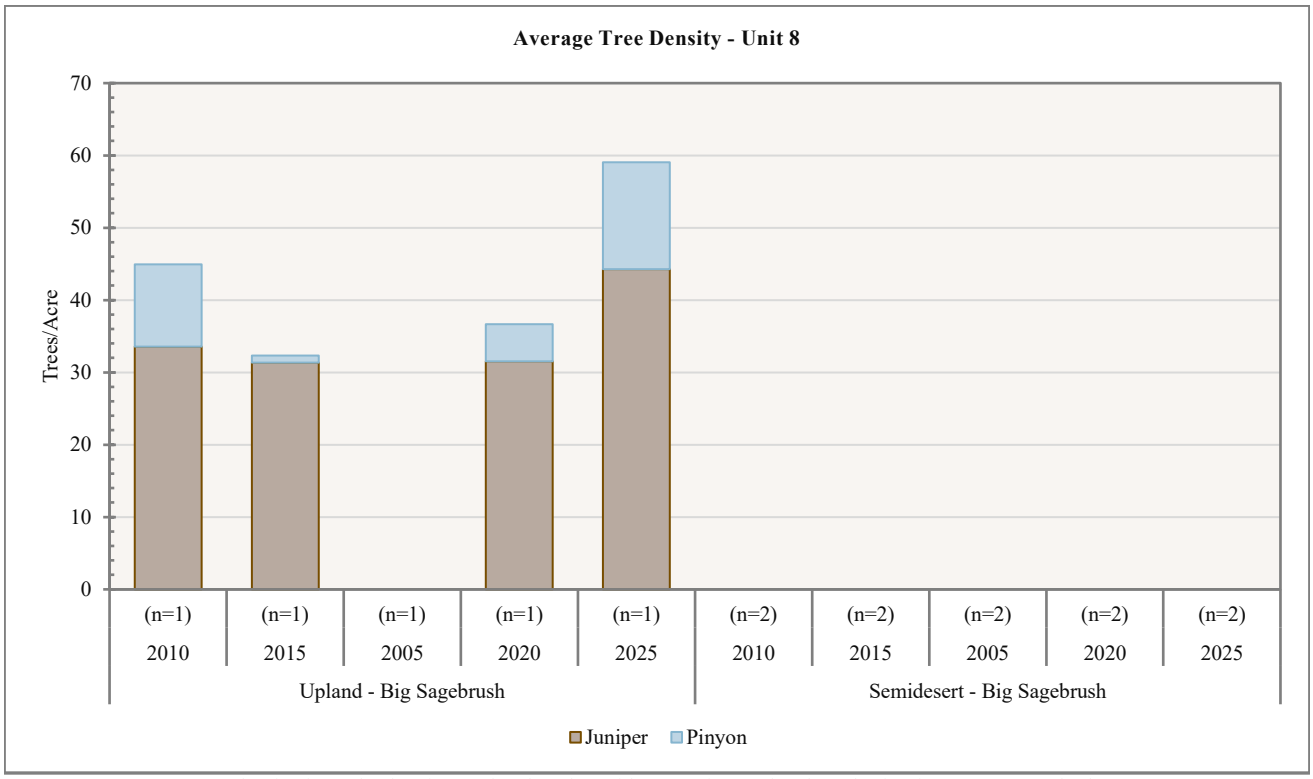


Figure 1.13: Average tree density for Upland - Big Sagebrush and Semidesert - Big Sagebrush study sites in WMU 8, North Slope.

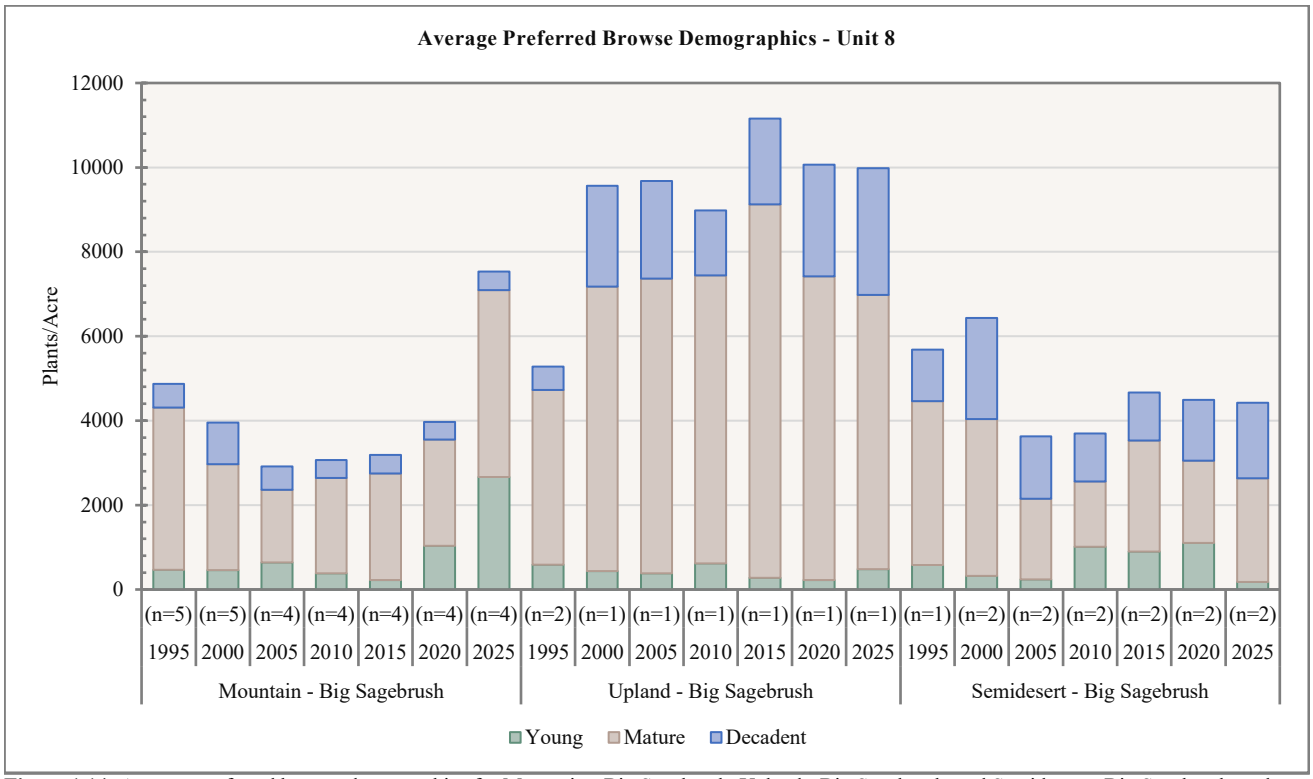


Figure 1.14: Average preferred browse demographics for Mountain - Big Sagebrush, Upland - Big Sagebrush, and Semidesert - Big Sagebrush study sites in WMU 8, North Slope.

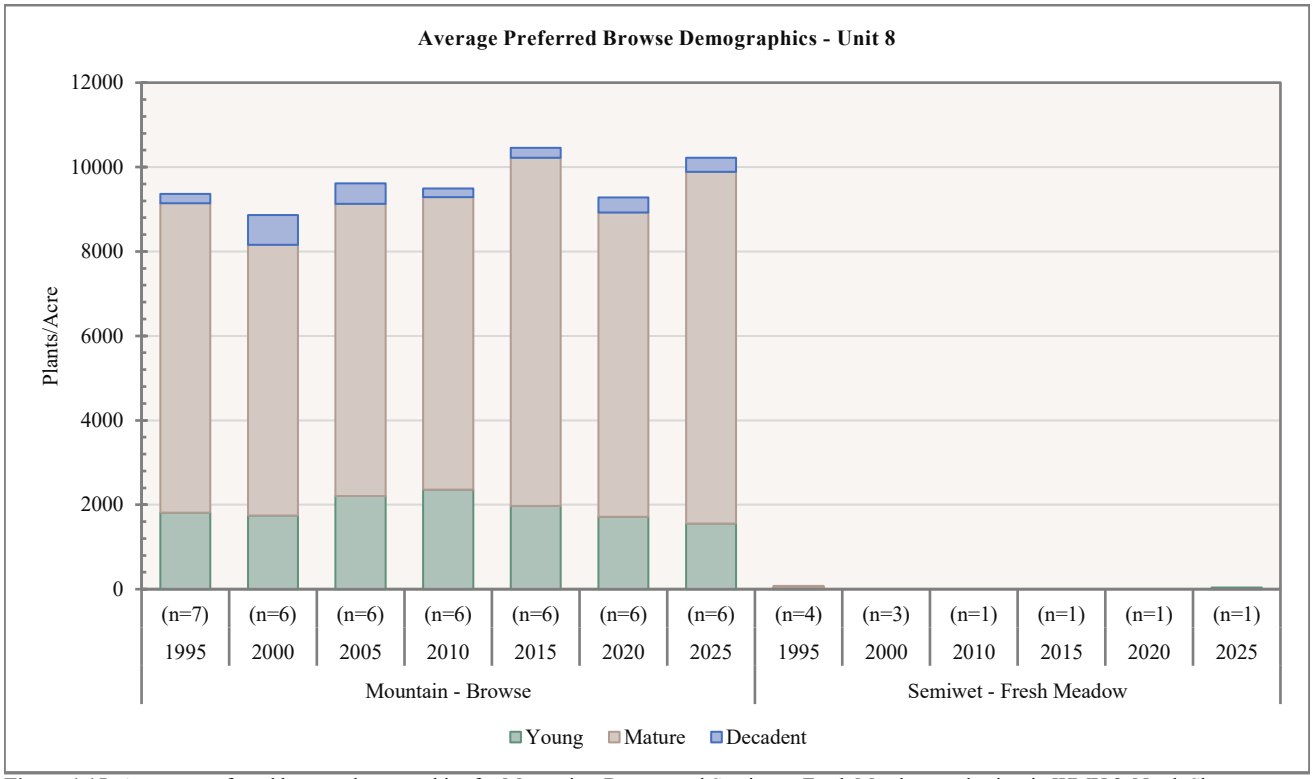


Figure 1.15: Average preferred browse demographics for Mountain - Browse and Semiwet - Fresh Meadow study sites in WMU 8, North Slope.

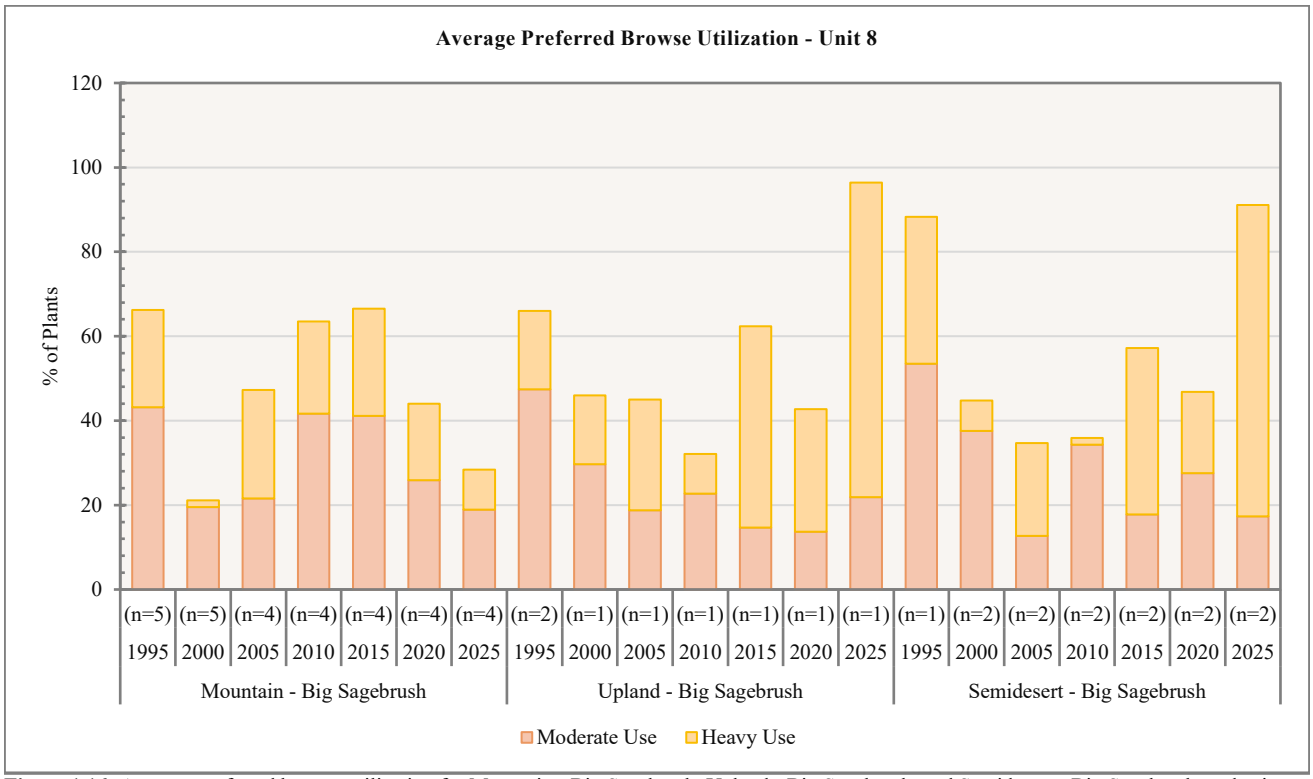


Figure 1.16: Average preferred browse utilization for Mountain - Big Sagebrush, Upland - Big Sagebrush, and Semidesert - Big Sagebrush study sites in WMU 8, North Slope.

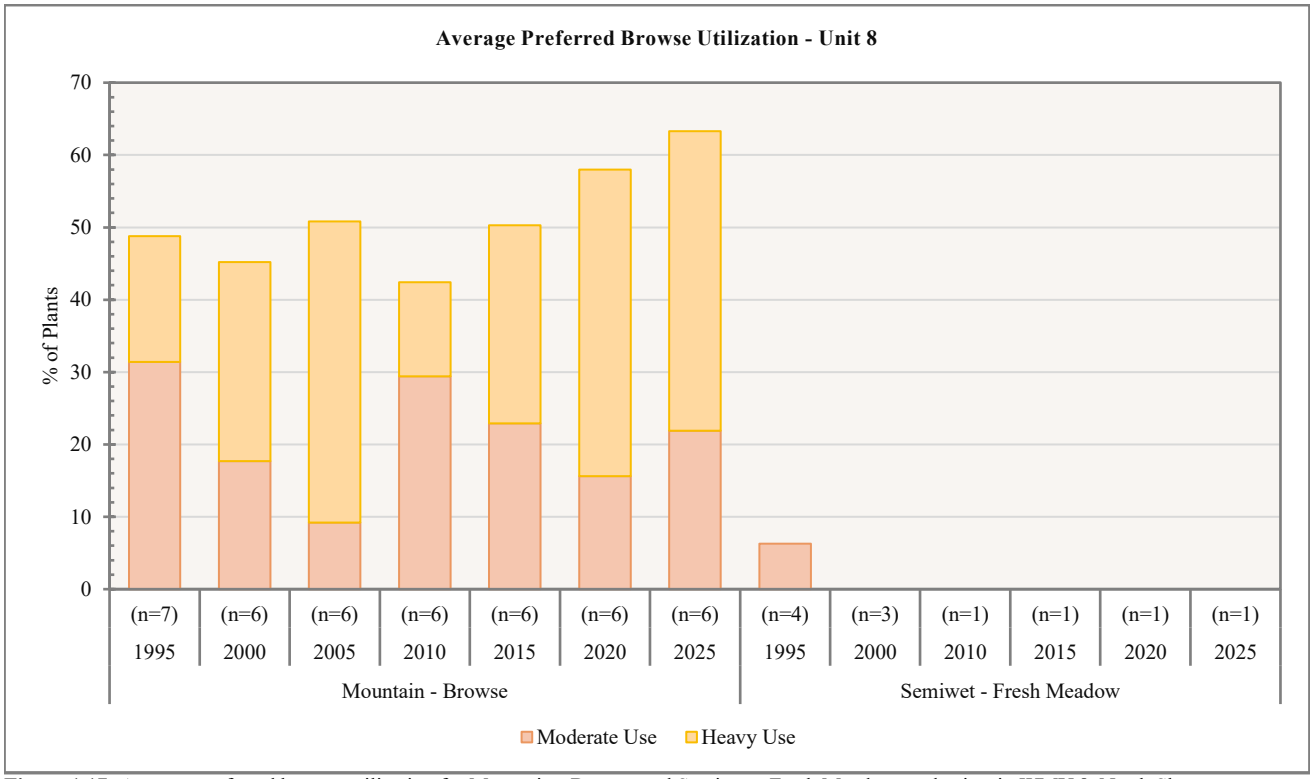


Figure 1.17: Average preferred browse utilization for Mountain - Browse and Semiwet - Fresh Meadow study sites in WMU 8, North Slope.

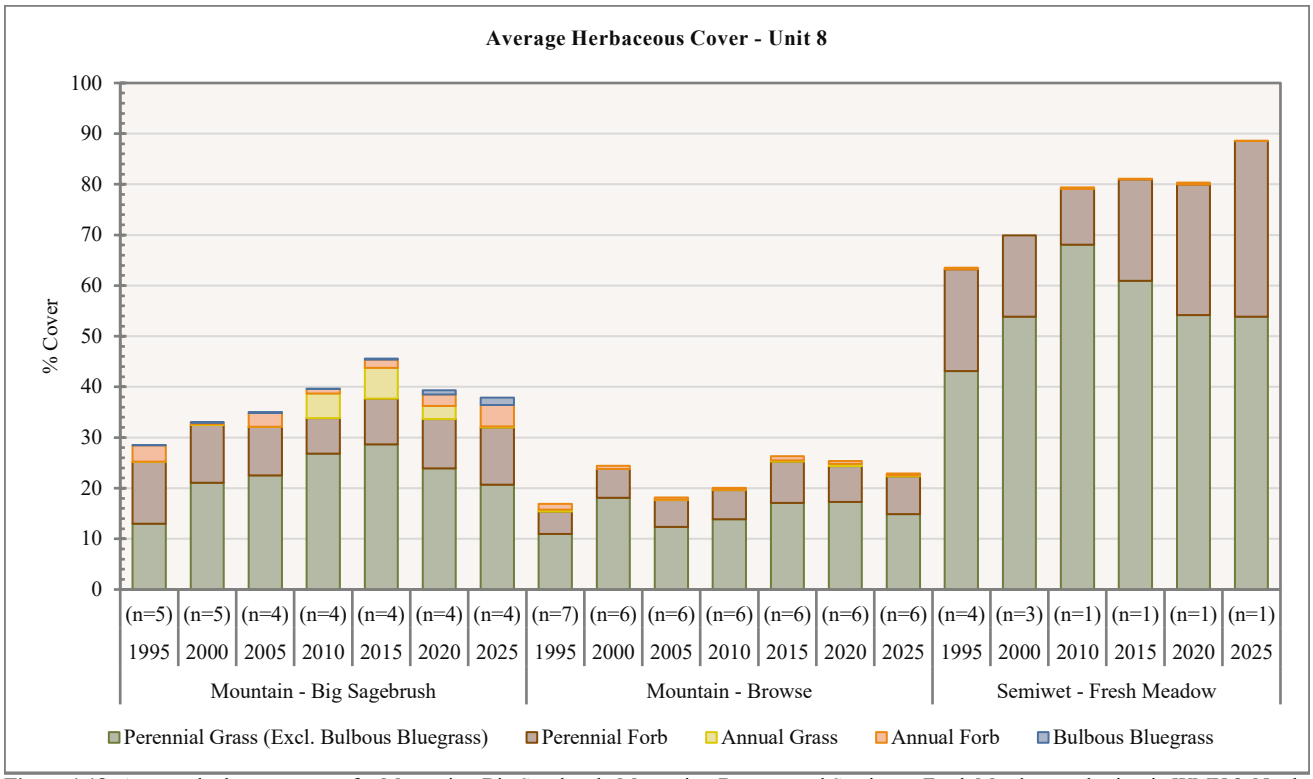


Figure 1.18: Average herbaceous cover for Mountain - Big Sagebrush, Mountain - Browse, and Semiwet - Fresh Meadow study sites in WMU 8, North Slope.

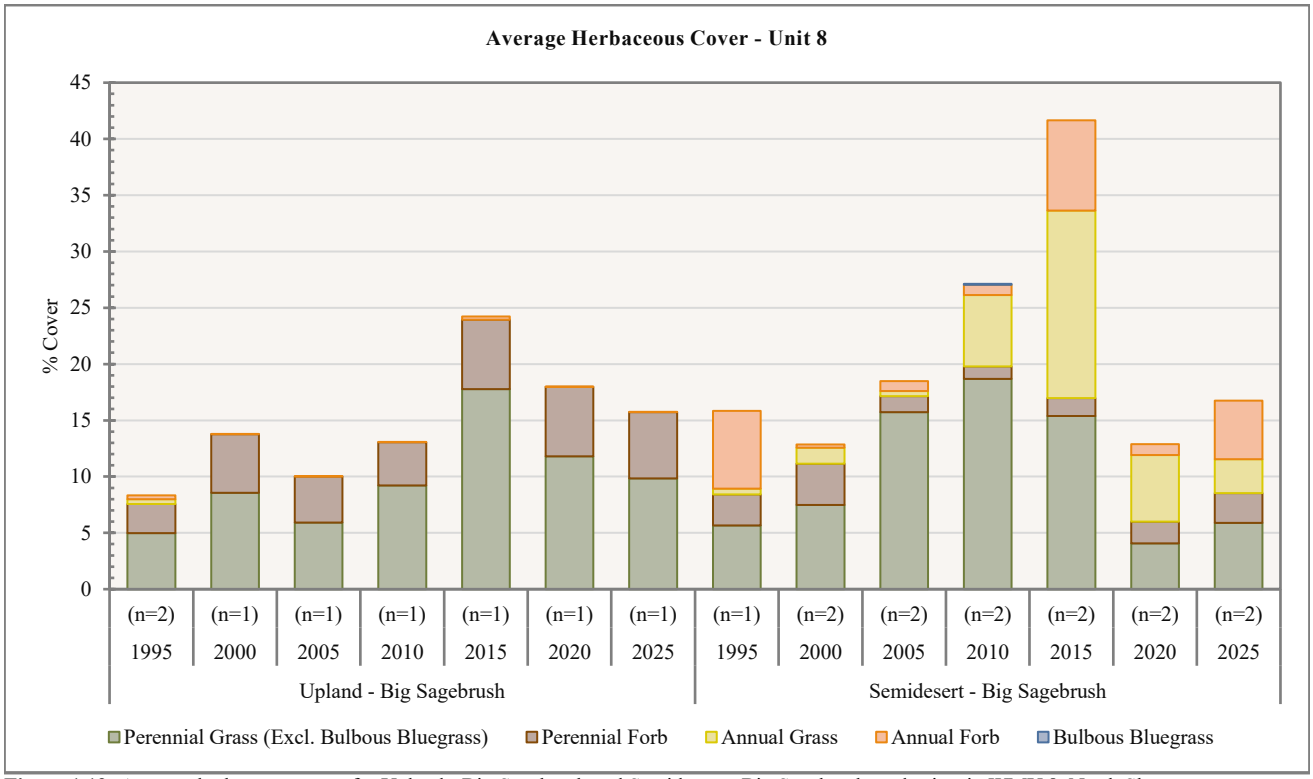


Figure 1.19: Average herbaceous cover for Upland - Big Sagebrush and Semidesert - Big Sagebrush study sites in WMU 8, North Slope.

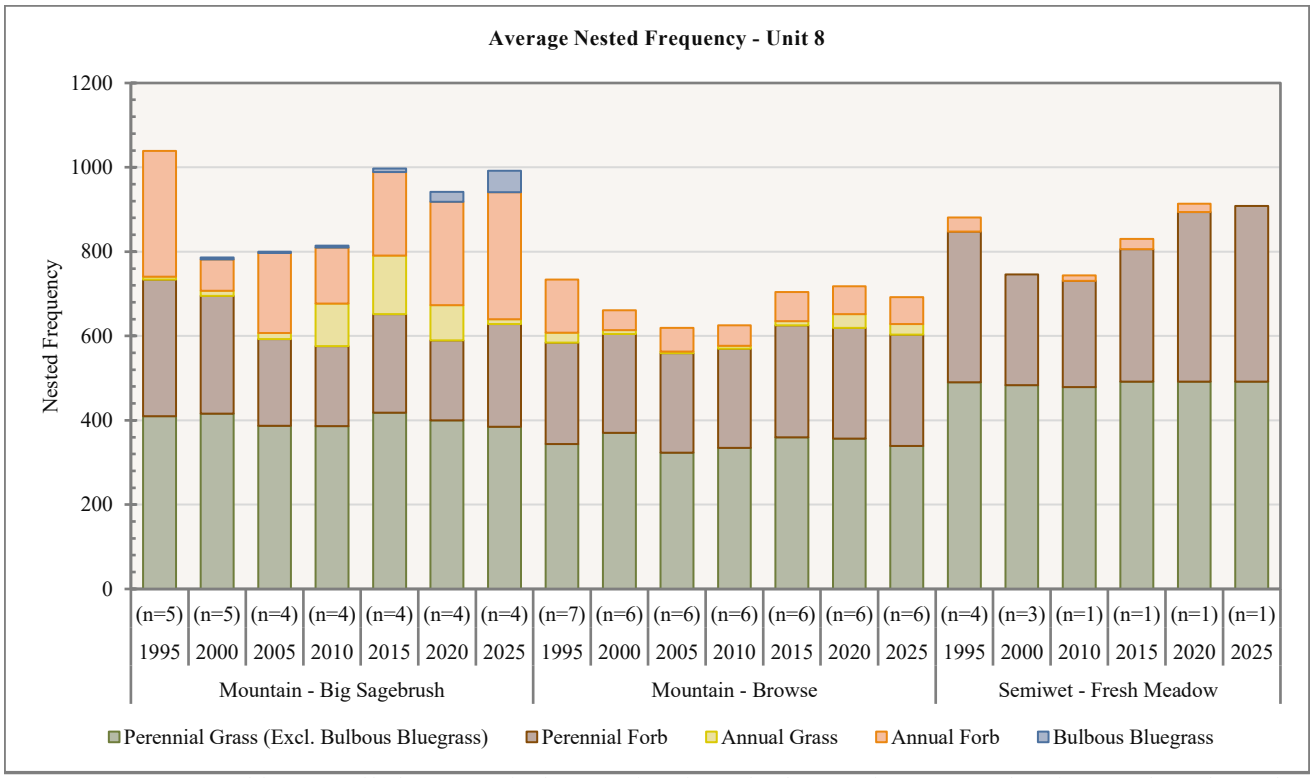


Figure 1.20: Average nested frequency of herbaceous species for Mountain - Big Sagebrush, Mountain - Browse, and Semiwet - Fresh Meadow study sites in WMU 8, North Slope.

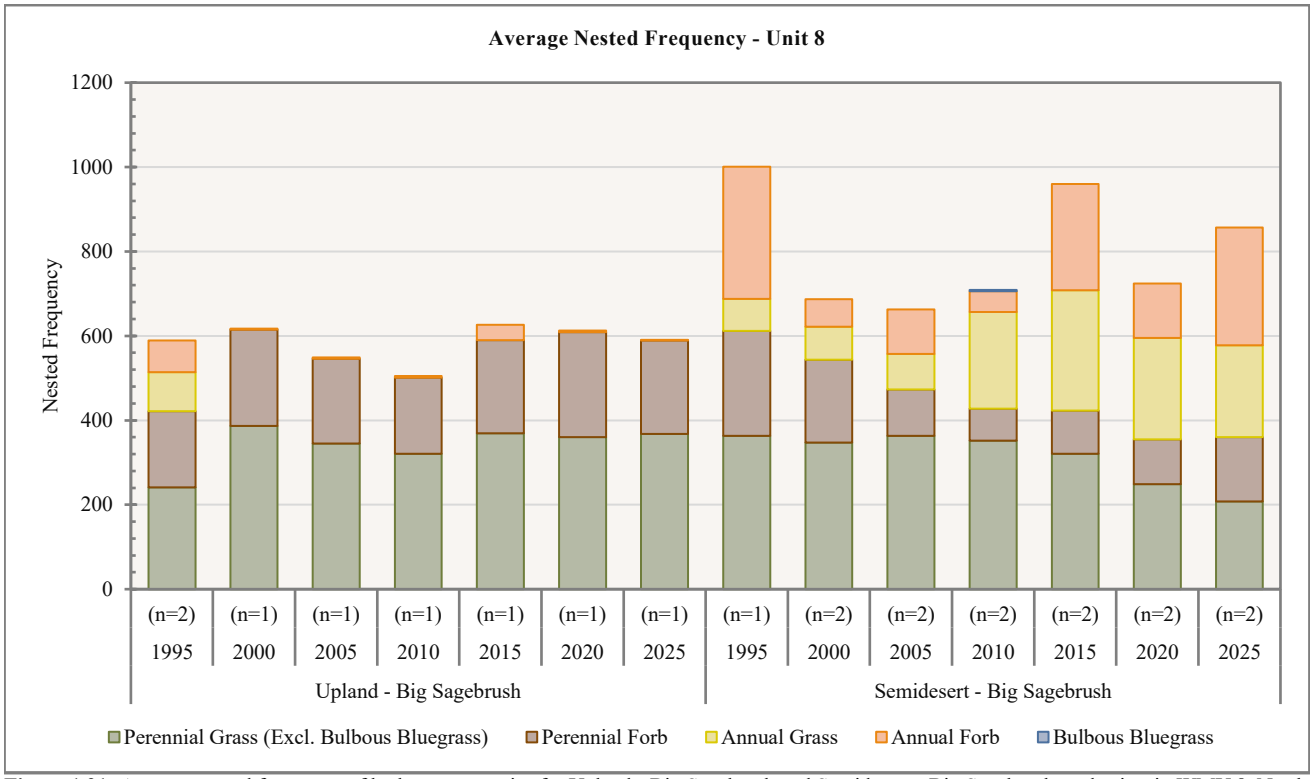


Figure 1.21: Average nested frequency of herbaceous species for Upland - Big Sagebrush and Semidesert - Big Sagebrush study sites in WMU 8, North Slope.

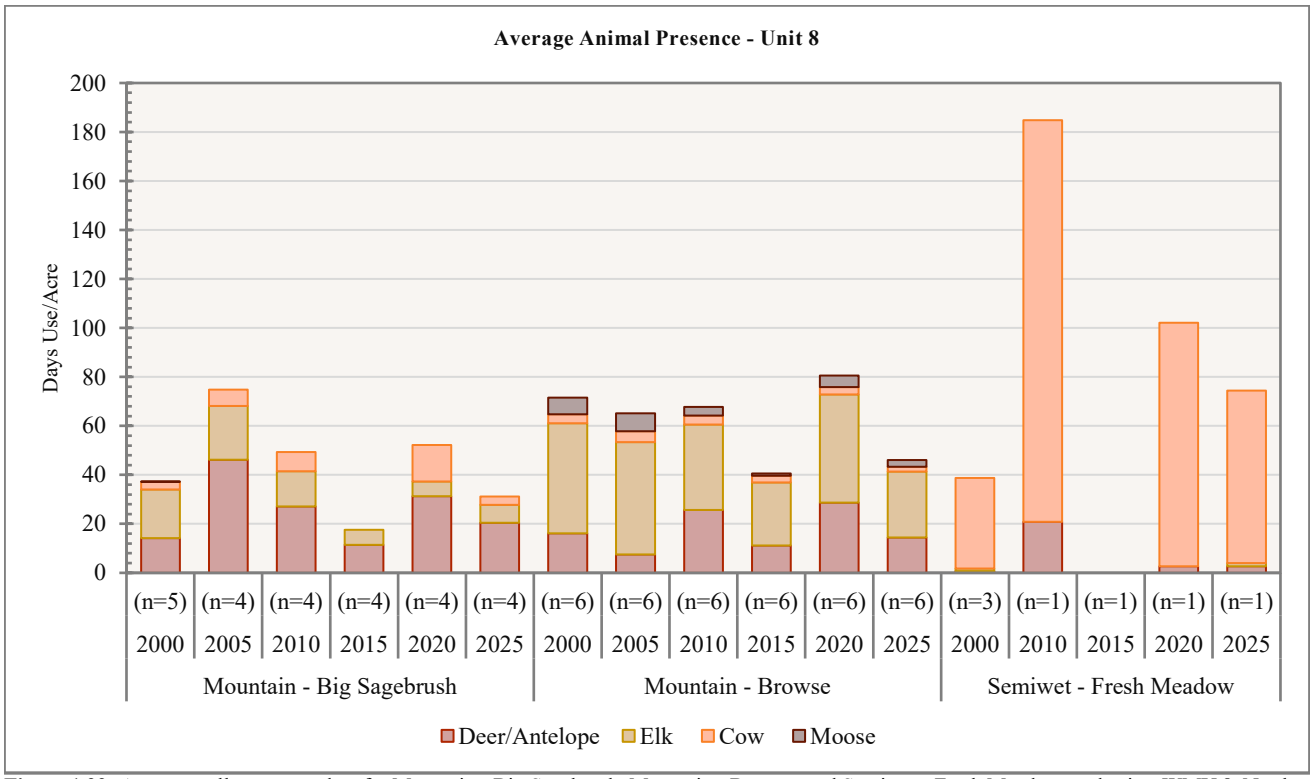


Figure 1.22: Average pellet transect data for Mountain - Big Sagebrush, Mountain - Browse, and Semiwet - Fresh Meadow study sites WMU 8, North Slope.

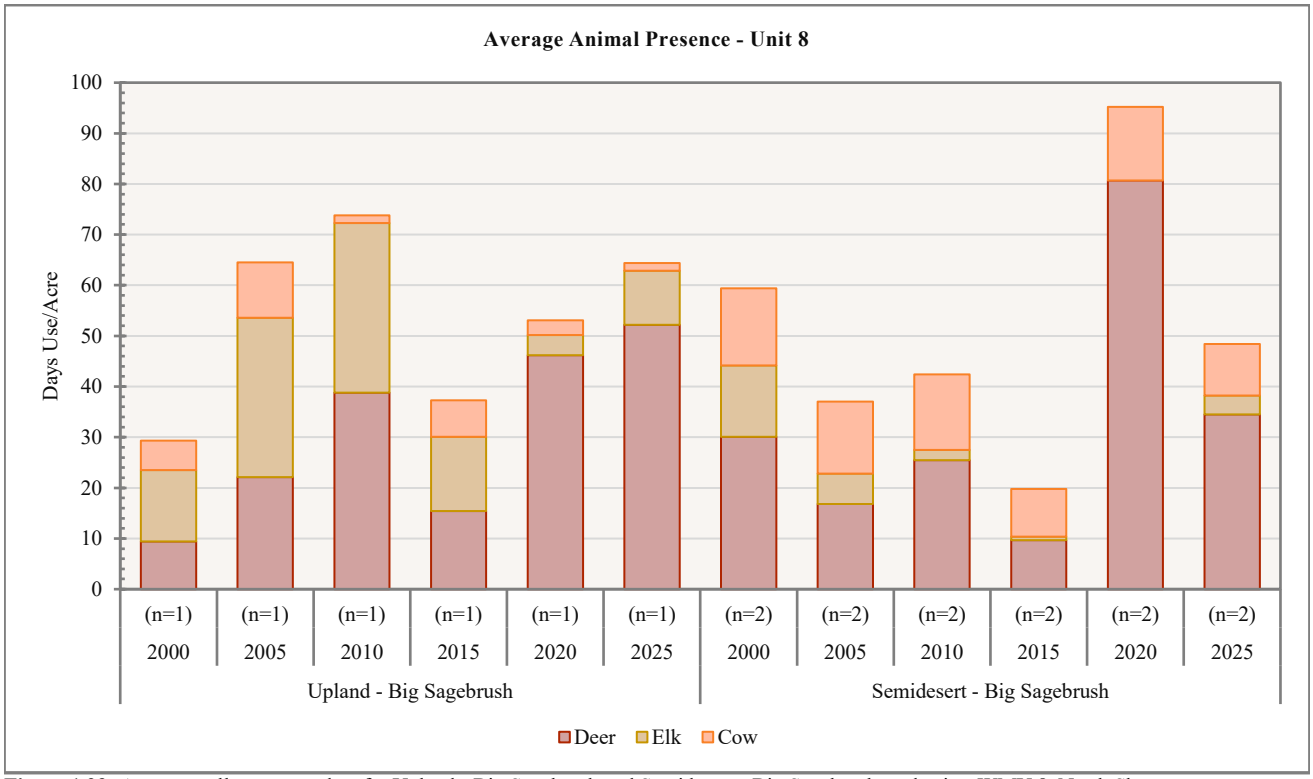


Figure 1.23: Average pellet transect data for Upland - Big Sagebrush and Semidesert - Big Sagebrush study sites WMU 8, North Slope.
*Semidesert - Big Sagebrush deer pellets include deer and antelope pellet groups.

Deer Winter Range Condition Assessment

The overall conditions of deer winter and transitional range (**Map 1.2**) within the North Slope Management Unit have remained similar from year to year with sites averaging between fair and fair-good condition since 1995. Greendale (08B-04), Bennett Ranch (08B-05), Death Valley (08B-06), Phil Pico Mountain (08B-08), and Antelope Flat (08C-07) are the main drivers for the unit's wintering habitat stability and quality, and deer winter range condition for these sites averages between fair-good and good. Winter habitat conditions on Cedar Springs (08B-01) (suspended), Bear Top Mountain (08C-03), and Clay Basin Bench (08C-14) are/have been between very poor and poor consistently from year to year: these poor conditions suppress the unit's overall winter range quality. Range Trend sites in WMU 08B/C that tend to have higher winter habitat variability include Bear Top Mountain and Clay Basin Bench: this may suggest a higher potential for winter range improvement. Bear Top Mountain was in good condition in 2025.

The overall deer winter range assessment in 2025 for WMU 08B/C is that the unit is in fair-good condition. However, the condition on Clay Basin Bench is suppressing the overall condition of the unit; this site was in very poor-poor condition in 2025. Greendale, Bennett Ranch, Death Valley, Phil Pico Mountain, Antelope Flat, and Clay Basin Bench were considered to be in good condition due to the high cover of preferred browse and perennial grass and forbs. Antelope Flat and Clay Basin Bench would benefit from an increase in native perennial grasses and a reduction in annual grass cover. Clay Basin Bench would also benefit from an increase in preferred browse cover and recruitment (**Table 1.7**, **Figure 1.24**).

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 associated with this section (**Figure 1.24**) 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 (**Figure 1.24**). Study sites that intersect/have intersected elk winter habitat include Cedar Springs, Greendale, Phil Pico Mountain, Death Valley, Antelope Flat, and Clay Basin Bench. The sites with elevated suitability include Greendale, Phil Pico Mountain, Death Valley, and Antelope Flat. Clay Basin Bench was considered to be in fair condition between 2000 and 2010. However, winter habitat quality decreased and conditions ranged between poor-fair and very poor-poor wintering conditions between 2015 and 2025 due to a lack of perennial grass and forbs; these conditions suppress the unit's overall winter range quality for elk.

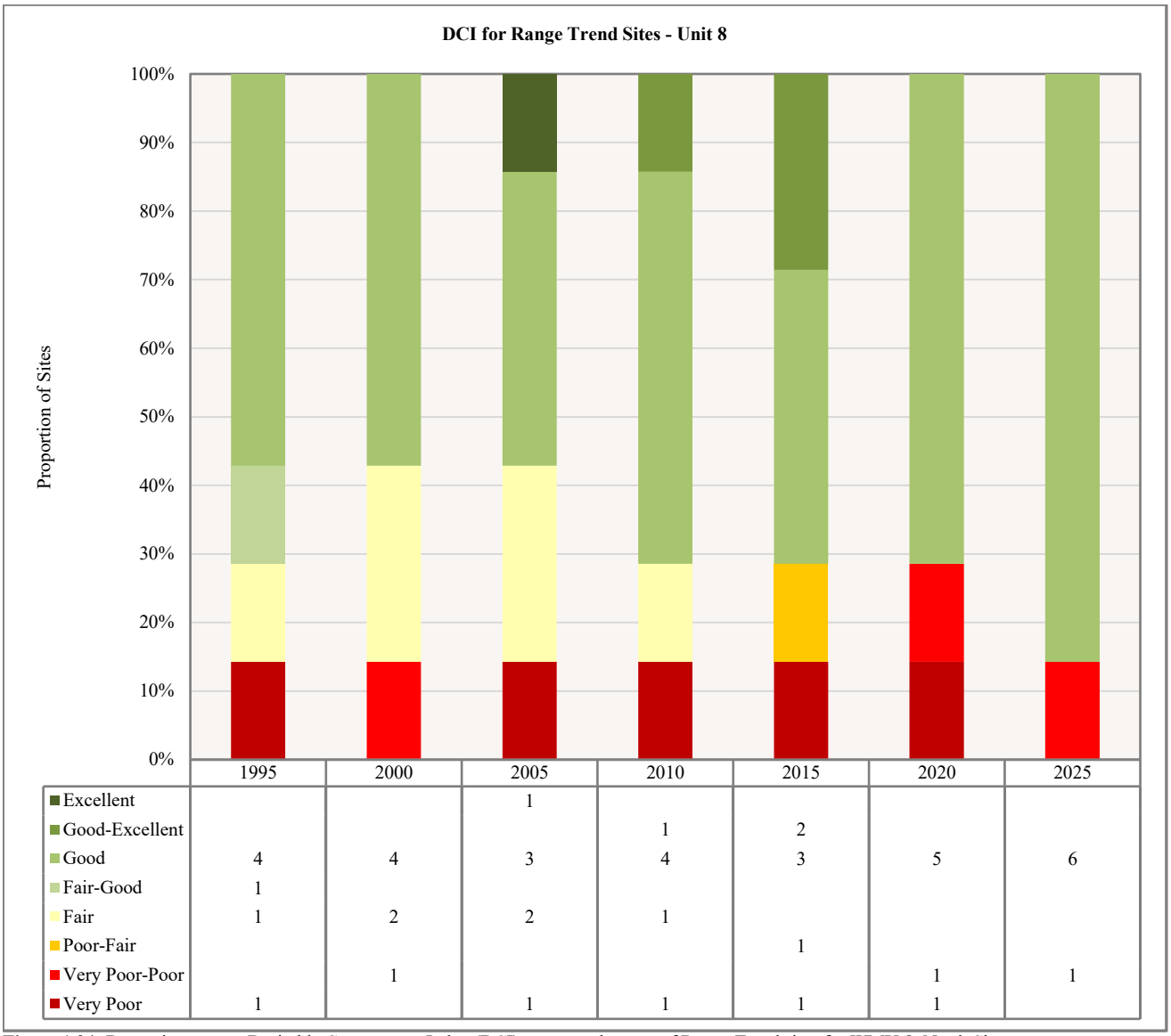


Figure 1.24: Deer winter range Desirable Components Index (DCI) summary by year of Range Trend sites for WMU 8, North Slope.

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
08B-04	1995	24.3	13.7	5.2	26.5	-0.1	10	0	**79.6**	**G**
08B-04	2000	26.4	8.3	5.2	30	0	10	0	**79.9**	**G**
08B-04	2005	30	7.8	6.6	30	0	10	0	**84.4**	**G**
08B-04	2010	30	9.1	7.1	30	-0.4	10	0	**85.8**	**G**
08B-04	2015	30	9.5	2.1	30	-1	10	-2	**78.6**	**G**
08B-04	2020	30	11.2	4.8	30	0	10	-2	**84**	**G**
08B-04	2025	30	8.8	1.5	30	-0.3	10	0	**80**	**G**
08B-05	1995	28	13.4	6.1	16.6	0	9.2	0	**73.3**	**G**
08B-05	2000	25.8	5.3	1.4	17.1	0	10	0	**59.6**	**F**
08B-05	2005	30	6.9	1.9	11.8	0	8.2	0	**58.8**	**F**
08B-05	2010	30	8.6	2.5	18.4	0	7.7	0	**67.2**	**G**
08B-05	2015	30	8.2	1.3	30	0	10	0	**79.5**	**G-E**
08B-05	2020	30	7	1.1	23.6	0	10	0	**71.7**	**G**
08B-05	2025	30	4.9	2.5	19.7	0	10	0	**67.1**	**G**
08B-06	1995	30	13.3	4	12.6	0	9.7	0	**69.6**	**F-G**
08B-06	2000	27.5	7	0.9	30	0	10	0	**75.4**	**G**
08B-06	2005	30	10	5.3	30	0	8.8	0	**84.1**	**G**
08B-06	2010	30	11.6	7.8	28.3	0	10	0	**87.7**	**G**
08B-06	2015	30	6.5	2.8	23.4	-0.1	10	0	**72.6**	**G**
08B-06	2020	30	9.9	3.9	24	-0.2	10	0	**77.6**	**G**
08B-06	2025	30	11.4	7.1	28.3	0	10	0	**86.8**	**G**
08B-08	1995	30	13.9	8	27.9	-1.9	5.8	0	**83.7**	**G**
08B-08	2000	30	10.7	6.1	30	-0.1	7.8	0	**84.5**	**G**
08B-08	2005	30	13	6.8	30	0	6.9	0	**86.7**	**G**
08B-08	2010	30	14.6	5.6	30	-0.1	7.2	0	**87.3**	**G**
08B-08	2015	30	13.9	7	30	-0.9	10	0	**90**	**G-E**
08B-08	2020	30	13.7	4.8	30	-1.8	9.2	0	**85.9**	**G**
08B-08	2025	30	14	3.1	30	-0.8	10	0	**86.3**	**G**
08C-03	1995	22	12.3	5.2	16.3	-0.2	10	0	**65.6**	**F**
08C-03	2000	1.6	0	0	27	-0.5	10	0	**38.1**	**VP-P**
08C-03	2005	0.7	0	0	30	-0.1	2.1	0	**32.7**	**VP**
08C-03	2010	0.7	0	0	30	-12.2	5.1	0	**23.6**	**VP**
08C-03	2015	2	0	0	30	-16.5	4.5	0	**20**	**VP**
08C-03	2020	3.1	0	0	30	-7.6	3.1	-2	**26.6**	**VP**
08C-03	2025	10.9	14.9	15	30	-0.2	6.4	-2	**75**	**G**
08C-07	1995	20	8.5	5.2	11.3	-0.4	5.5	0	**50.1**	**G**
08C-07	2000	24.3	1.2	3.9	19.3	-2.1	10	0	**56.6**	**G**
08C-07	2005	27.4	7.3	4	23.9	-0.6	5.4	0	**67.4**	**E**
08C-07	2010	30	6.8	14.6	17.2	-7.5	3.9	0	**65**	**G-E**
08C-07	2015	28	7.8	10.1	14.6	-17.5	5.5	0	**48.5**	**G**
08C-07	2020	30	6	13	10.1	-8.3	6.3	0	**57.1**	**G**
08C-07	2025	30	1.6	1.8	18	-3.1	9.8	0	**58.1**	**G**
08C-14	2000	19.7	5.5	1.1	10.7	-0.1	3.9	0	**40.8**	**F**
08C-14	2005	2.3	0	0	30	0	0.4	0	**32.7**	**F**
08C-14	2010	2.6	0	0	30	-2	0.5	0	**31.1**	**F**
08C-14	2015	3.4	0	0	30	-7.5	0.8	0	**26.7**	**P-F**
08C-14	2020	1.9	0	0	6.1	-0.6	1.5	0	**8.9**	**VP-P**
08C-14	2025	3.4	0	0	5.6	-1.4	0.8	0	**8.4**	**VP-P**

Table 1.7: Deer winter range Desirable Components Index (DCI) information by site number of Range Trend studies for WMU 8, North Slope. 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
08A-01	Widdop Mtn. South Slope	Animal Use – Elk	High	Reduced shrub vigor/diversity of desirable grass and forb species
		Animal Use – Moose	Medium	Reduced understory shrub and herbaceous vigor
08A-02	Widdop Mtn. North Slope	Animal Use – Big Game	Low	Reduced shrub vigor/diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
08A-04	Bald Range	None Identified		
08A-05	Telephone Hollow	Animal Use – Big Game	Low	Reduced shrub vigor/diversity of desirable grass and forb species

Study #	Study Name	Limiting Factor and/or Threat	Level of Impact	Potential Impact
08B-04	Greendale	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Tourism/Recreation	Moderate	Loss of habitat, reduced shrub and herbaceous vigor
		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
08B-05	Bennett Ranch	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
08B-06	Death Valley	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
08B-08	Phil Pico Mountain	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
08C-02	Goslin Mountain	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
08C-03	Bear Top Mountain	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
08C-07	Antelope Flat	Annual Grass	Medium	Increased fire potential and reduced herbaceous diversity
		Drought		Lowered resilience and resistance to disturbance
08C-09	West Goslin	Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
08C-12	Big Meadow	Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
08C-14	Clay Basin 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
08R-01	Brown's Park db Drum	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
08R-02	Teepee Mountain Bullhog	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
08R-03	Goslin Mountain Bullhog	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
08R-04	Bake Oven	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
08R-05	Birch Creek	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

Table 1.8: Assessment of the potential limiting factors and/or threats and level of threat to study sites for WMU 8, North Slope. 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 condition on the North Slope Management unit averages as good unit wide as of 2025. Greendale, Bennett Ranch, Death Valley, Antelope Flat, and Phil Pico Mountain are considered to be in good condition as of the most recent sample year due to high cover of preferred perennial grasses; most of these sites also have high cover of preferred browse. Bear Top Mountain has reduced preferred browse cover, but the site has seen an increase in preferred browse recruitment and a reduction in annual grass cover during the most recent sampling. In contrast, the Clay Basin Bench study is classified as being in very poor to poor condition as of 2025. Factors contributing to this very poor condition vary between a lack of preferred browse, a lack of perennial native grasses and forbs, and annual grass presence (**Figure 1.24**, **Table 1.7**).

One of the most encouraging observations within this unit is the persistence of preferred browse communities across several Range Trend sites that serve as critical mule deer winter range, including Greendale, Bennett Ranch, Death Valley, Antelope Flat, and Phil Pico Mountain. The browse components at these locations have maintained stable cover and density levels, preventing the plant communities from shifting into degraded ecological states. Furthermore, 2025 data indicates that cheatgrass (*Bromus tectorum*) contributed minimal cover across nearly all study sites; the notable exceptions to this are Antelope Flat and Bear Top Mountain, both of which have historically experienced periods of higher infestation.

The health and resilience of the North Slope subunits have also been significantly bolstered by the targeted removal or reduction of encroaching pinyon pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*). To date, over 24,000 acres across the North Slope have undergone lop and scatter treatments. Specifically, at Telephone Hollow and Goslin Mountain, these methods have successfully maintained or enhanced forb diversity while simultaneously increasing the cover and density of Utah serviceberry (*Amelanchier utahensis*) and alderleaf mountain mahogany (*Cercocarpus montanus*). Similar patterns of improvement have been documented at various other treated sites.

Looking forward, a proposed treatment near Death Valley offers a strategic opportunity for further restoration. As an area currently experiencing active tree infilling that has not yet reached later woodland succession phases, Death Valley is an ideal candidate for tree reduction; such intervention will likely help the browse community retain its inherent resistance to drought and fire. Overall, the Range Trend sites across the North Slope show minimal presence of introduced perennial species, suggesting that these ecosystems remain in a native state characterized by high ecological resilience.

Fire plays a critical role in the ecology of high-potential sagebrush communities, particularly on sites such as Bear Top Mountain and West Goslin. These areas have demonstrated robust recovery following both prescribed fires and wildfires. While initial burning removed significant portions of the mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) population – transitioning the landscape into native perennial grass-dominated communities – sagebrush has successfully returned to its pre-fire composition over time. However, Bear Top Mountain remains a point of concern due to a period of high cover and nested frequency of cheatgrass between 2010 and 2020. This elevated seedbank poses a recurring threat, as cheatgrass can dominate during exceptionally wet years, potentially increasing fire frequency and undermining the ecosystem's resilience. Despite this, recent data showing cheatgrass returning to pre-fire levels suggests the site currently retains its natural resilience.

Large-scale fire events also highlight varying degrees of recovery across the region. The 2002 East Fork wildfire, one of the largest in the Summit subunit, burned approximately 14,000 total acres, including 2,500 acres of Montane Sagebrush Steppe. Recent LANDFIRE Vegetation Departure data (LF2024_VDep_CONUS, 2024) indicates that these acres are currently moderately departed from their historical natural conditions, with the majority falling between 45% and 53% departure. This suggests these areas are still in an active phase of recovery over two decades later. In contrast, other significant fires in the Three Corners and West Daggett subunits (including the Weyman, Mustang, Sheep Creek WFU, and Bender Mountain incidents) show more rapid stabilization. Of the 6,800 acres of Montane Sagebrush Steppe affected by these fires, roughly 6,200 acres now show low departure values, primarily ranging between 13% and 17%. These metrics strongly reinforce the conclusion that high-potential sagebrush steppe in this region is capable of successful ecological recovery following fire disturbances (**Table 1.1**, **Table 1.2**, **Table 1.3**, **Map 1.8**, **Map 1.9**).

Rocky Mountain Lodgepole Pine Forests represent one of the primary vegetation communities on the North Slope, covering approximately 162,000 acres and comprising 23% of the regional mule deer summer range (**Error! Reference source not found.**). Despite their vast footprint, these forests – along with closely associated Rocky Mountain Aspen and Aspen-Mixed Conifer communities – face significant ecological challenges. According to LANDFIRE Vegetation Departure data, approximately 97% of the 69,000 acres of aspen-related communities are classified as moderately departed from their natural state. Furthermore, Rocky Mountain Aspen and Lodgepole Pine forests rank as the second and third most highly departed community types in the area, trailing only the Intermountain Basins Montane Sagebrush Steppe. These high departure levels underscore an urgent need for habitat improvement, which has been addressed through several key restoration initiatives. The Burnt Beaver Phase II project utilized mastication and pile and burn methods to thin 1,600 acres of lodgepole pine. Similarly, the North Slope Uintas Restoration Prescribed Fires employed aerial ignition across 1,148 acres to remove infilling conifers and stimulate aspen suckering and regeneration. In the Bear River watershed, the Watershed Resilience Phase 3 project treated 890 acres of conifer-encroached aspen forest using lop pile burn, commercial thinning, and mastication. These efforts aimed to improve understory species richness while reducing the long-term risk of high-intensity wildfires. Finally, the Cart Creek Watershed Integrated Vegetation Restoration Project focused on 740 acres, removing small-diameter

lodgepole pine through thinning and commercial logging to promote healthier stand maturity and community structure (**Map 1.8, Map 1.9**, **Table 1.1**, **Table 1.2**, **Table 1.4**) (Utah's Watershed Restoration Initiative, 2026).

The Watershed Restoration Initiative (WRI) has treated more than 40,000 acres across the unit, with the Three Corners and Goslin Mountain areas serving as focal points for active habitat and landscape improvement. Herbicide application is the second most common treatment method, covering nearly 7,500 acres. Key projects such as Richard Mountain, Little Davenport, and Clay Basin have utilized herbicides to reduce noxious weeds and cheatgrass, both as a preventative measure following wildfires and as a reactive strategy in already invaded areas. The effectiveness of these efforts is evident at the Goslin Mountain Bullhog site; despite being affected by the Richard Mountain wildfire, the area shows little to no cheatgrass cover and no recorded noxious weeds as of 2022. While unmonitored sections of the burn may still harbor invasive species, these results are promising. Mastication treatments represent the third most common intervention on the North Slope, totaling nearly 3,500 acres. A primary example is the Burnt Beaver Phase II project mentioned above, which treated 1,200 acres to thin lodgepole pine stands and removed trees affected by mountain pine beetles (Utah's Watershed Restoration Initiative, 2026). While many other mastication projects are smaller in scale, their cumulative impact on rangeland health is substantial. For instance, the Teepee Mountain Bullhog study documented a significant increase in mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) cover and a reduction in plants displaying poor vigor. Additionally, these treatments successfully boosted total perennial forb cover, further enhancing the ecological diversity and resilience of the site (**Map 1.10**, **Table 1.4**, **Table 1.5**, **Table 1.6**).

The North Slope contains a high concentration of Wildlife Management Areas (WMAs), particularly within the Three Corners subunit across the Brown's Park and Goslin Mountain regions. Most of these WMAs were established in the early to mid-1960s to benefit waterfowl and serve as extensions to the neighboring Brown's Park National Wildlife Refuge (BPWMA), founded in 1956. While designed for waterfowl, these protected areas provide critical habitat benefits for other key species such as mule deer and elk. Within the BPWMA, the Brown's Park db Drum study site monitors an herbicide and seeding project aimed at rehabilitating a former agricultural field. This site underscores persistent management challenges identified in the BPWMA plan, specifically the presence of scattered noxious weeds like broadleaved pepperweed (*Lepidium latifolium*) and large assemblages of introduced annual forbs and non-preferred shrubs. Although few WRI projects have been implemented directly within the BPWMA, one notable effort included a lop and scatter treatment on approximately 1,250 acres to remove pinyon and juniper trees encroaching into sagebrush flats. Similarly, the Birch Creek Pinyon and Juniper Removal Project utilized mastication to treat comparable habitats. Before treatment, the Birch Creek study site was transitioning from a Phase II to a Phase III woodland; following mastication, the area successfully transitioned back to a community dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), with both cover and density increasing over time. Post-treatment monitoring at Birch Creek also revealed an increase in native perennial grasses and introduced perennial forbs, most notably a significant flush of blue flax (*Linum perenne*) in 2017. While the Birch Creek site is located just outside the BPWMA, its results suggest that similar pinyon and juniper reduction treatments within the management area - whether through mastication or lop and scatter - would likely yield similarly positive ecological responses. (Utah Division of Wildlife Resources, 2025; Utah's Watershed Restoration Initiative, 2026; Utah Division of Wildlife Resources, 2026).

The ecological condition of the North and South Slopes of the Ashley National Forest, along with its surrounding landscapes, has long been a primary focus for local biologists and state and federal agencies. Past restoration efforts along the North Slope have successfully improved a net total of 33,300 acres of habitat, primarily through pinyon-juniper and lodgepole pine reductions, aspen regeneration, and strategic seeding projects. These initiatives have provided substantial benefits to regional wildlife and established a foundation for large-scale land management. Building on this momentum, the development of the Landscape Conservation Forecasting (LCF) model underscores a continued commitment to the Ashley National Forest. This model will evaluate the degradation status of biophysical systems across 1,038,143 acres, offering critical insights into which treatment types yield the greatest ecological impact. Specifically, the Ashley NF/Evanston RD LCF model is designed to assist managers in prioritizing rehabilitation efforts that will sustain wildlife

populations over the next 25 years. Upon the completion of the final report, managers will be equipped with high-resolution remote sensing vegetation maps covering both the Ashley National Forest and the Uinta-Wasatch-Cache National Forest's Evanston Ranger District. The report will also feature sophisticated simulations for wildfire and wildlife management, alongside hydraulic models that estimate the ecological effects of various treated and untreated states. Managers are encouraged to utilize this comprehensive resource to identify priority communities and determine the most effective treatment approaches for future projects (Provencher, 2026).

Several mountain browse communities concentrated near Gregory Basin are of particular interest due to their high utilization rates paired with remarkably low levels of decadence. Key monitoring sites (including Widdop Mtn. South Slope, Widdop Mtn. North Slope, Bald Range, and Telephone Hollow) feature mixed populations of alderleaf mountain mahogany (*Cercocarpus montanus*), Utah serviceberry (*Amelanchier utahensis*), and antelope bitterbrush (*Purshia tridentata*). Despite experiencing consistently moderate to heavy browsing pressure since study establishment, these shrub populations have generally maintained stable or increasing densities. The resilience of alderleaf mountain mahogany on these sites aligns with research by Turley, Roundy, and Walker (2003), which suggests that mahogany can withstand significant utilization if resources like water and soil nutrients are abundant. However, the study also warns that during dry or normal years, high utilization can lead to under-compensation, resulting in reduced shrub cover, size, and overall carrying capacity. This vulnerability was evident during the 2015 sample year following a series of moderate droughts, when poor vigor was recorded at Telephone Hollow (63%), Bald Range (30%), Widdop Mountain South Slope (87%), and Widdop Mountain North Slope (19%). By the 2025 sampling period, however, these poor vigor ratings returned to low estimations. This suggests that while the browsing pressures of 2015 likely compounded the stress of the drought, the 2025 data show a recovery in health. Nevertheless, these findings serve as a cautionary note for managers: if current drought conditions persist alongside high utilization, the long-term health and productivity of these mahogany communities may be compromised (Turley, Roundy, & Walker, 2003).

Cheatgrass (*Bromus tectorum*) and annual forbs remain significant management concerns in localized areas, particularly across broad sections of Goslin Mountain, Clay Basin, Mountain Home Draw, Whisky Springs Draw, and the confluence of Crouse Creek and the Green River. At the Antelope Flat site east of Goslin Mountain, both cover and nested frequency of cheatgrass peaked in 2015; while cover has fluctuated, nested frequency remains high as of 2025. In contrast, other sampled sites on Goslin Mountain show minimal year-to-year cheatgrass presence. At Clay Basin Bench, cheatgrass began increasing in 2010 without an obvious environmental trigger like fire, though its subsequent peak in 2015 aligns with the 2013 installation of a natural gas pipeline (Lane, Payne, & Cox, Utah Big Game Range Trend Studies: 2025 Annual Report, 2026). These historical flushes suggest that such sites are highly susceptible to annual grass expansion following disturbances or under specific environmental conditions. This poses a long-term threat to browse communities, as high cheatgrass loads increase fuel connectivity and the risk of frequent wildfires (Balch, D'Antonio, & Gómez-Dans, 2013). In other areas such as the Brown's Park db Drum and Bake Oven sites, cheatgrass levels are low, but burningbush (*Bassia scoparia*) and prickly Russian thistle (*Salsola tragus*) exhibit high cover and nested frequency. Burningbush presents a complex profile for mule deer winter range; while it is highly palatable and nutritionally similar to alfalfa during its early growth stages, it is also highly invasive. Furthermore, it can be toxic, containing saponins, alkaloids, oxalates, and nitrates, which may lead to photosensitization or neurological issues in wildlife, particularly during droughts or as seeds mature (Casey, 2014). Prickly Russian thistle similarly serves as a double-edged forage source in degraded ecosystems. It is exceptionally water-efficient and provides a source of Vitamin A and phosphorus when more palatable options are scarce. For deer, it is most accessible in the spring when soft, or in winter when moisture softens its sharp spines. In some restoration contexts, it may even function as a "nurse plant" to protect native vegetation from overgrazing. However, it is a prolific invader that relies on frequent disturbance to maintain dominance. Like burningbush, it contains oxalates and nitrates that can reach toxic levels (particularly for sheep) and its stiff, prickly mature state can discourage grazing until weathered (Bernau & Eldredge, 2018).

The influx of tourists and industrial traffic to the Flaming Gorge National Recreation Area, the town of Dutch John, and the Green River corridor creates a complex set of pressures on Utah's big game populations, primarily through behavioral disruption and the flight or avoidance response. Species such as elk and mule deer are particularly sensitive to human presence; research indicates that even non-motorized recreation, including hiking and mountain biking, can trigger significant physiological stress (Taylor, 2003). When these animals perceive humans as a threat, they often flee their preferred grazing or bedding grounds, causing them to burn critical fat reserves. In the harsh high-desert winters of Daggett County, this unnecessary energy expenditure can be harmful. The energetic cost of flight often outweighs the nutritional gain available in the area, directly decreasing survival rates for fawns and calves during the most vulnerable months of the year (Jordan, 2025).

Beyond immediate behavioral changes, the infrastructure required to support the region leads to habitat fragmentation and increased mortality. Although Highway 191 is classified as a “lower-volume” scenic byway with an Average Annual Daily Traffic (UDOT, 2026) of approximately 1,400 to 5,000 vehicles, its character as a vital industrial and recreational corridor poses unique risks (Utah's Watershed Restoration Initiative, 2026). The high composition of heavy trucking – reaching 40% to 50% in northern segments – combined with summer recreational surges that spike 20% above average, creates a dangerous environment for elk and mule deer that frequent the roadside. These vehicles often encounter wildlife during crepuscular hours (dawn and dusk) when visibility is low, but animal movement is high (Jordan, 2025). Furthermore, visitors act as a primary vector for invasive species like cheatgrass, which outcompete the native forage like bitterbrush that big game depend on for winter nutrition.

Finally, the cumulative impact of recreation can lead to long-term ecological shifts and habituation that carriy their own set of risks. In areas like Red Canyon or the Green River “A-Section,” bighorn sheep may become overly accustomed to human proximity. While this offers excellent viewing opportunities, it can lead to the transmission of diseases if domestic animals are brought into close contact with wild herds (Papouchis, 2001). However, the relationship is not entirely negative; some of the economic revenue generated by these visitors and the industrial importance of the US-191 corridor may have funded large habitat restoration projects though the Land and Water Conservation Fund (LWCF). These efforts, such as removing encroaching pinyon-juniper woodlands into sagebrush communities, help mitigate the human footprint and ensure the region remains a viable landscape for Utah’s big game.

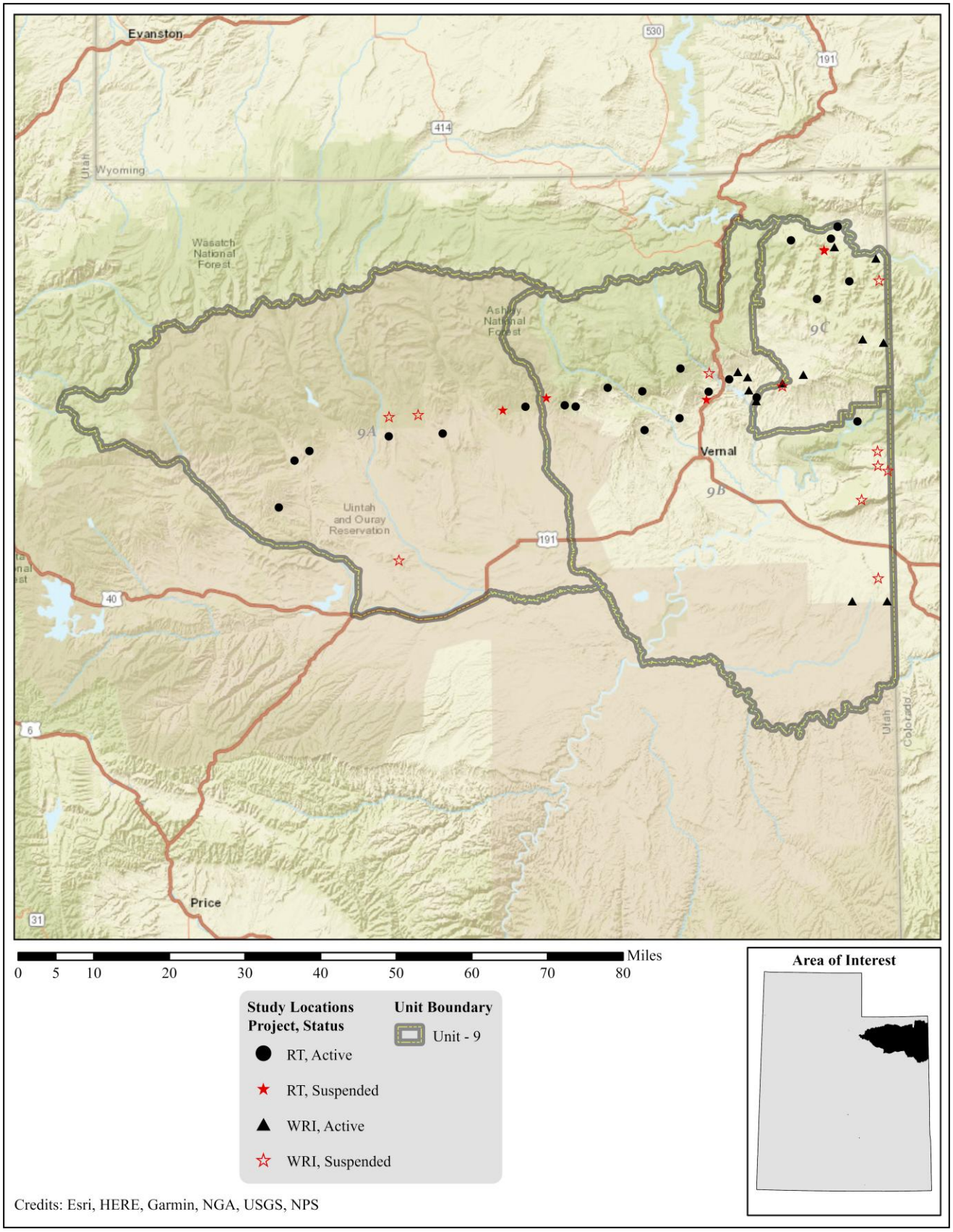
The presence of an estimated 141 oil and gas wells within the North Slope herd unit creates a complex matrix of disturbance that significantly degrades mule deer winter range through both direct and indirect mechanisms. While the physical footprint of a single well pad may only occupy a few acres, the cumulative effect of 141 sites, connected by an extensive network of access roads and pipelines, results in substantial habitat fragmentation. This infrastructure breaks up large, contiguous blocks of sagebrush and bitterbrush – the primary winter forage identified in the Utah Division of Wildlife Resources (UDWR) – and creates “edge effects” that allow invasive species like cheatgrass to outcompete native plants. Once these disturbed areas are dominated by invasive grass, their nutritional value for wintering deer is diminished, effectively shrinking the available carrying capacity of the range. The most profound impact, however, is not the physical loss of acreage, but the indirect displacement caused by human activity and noise. Research synthesized by the USGS (Species Management Research Program, 2025) shows that mule deer exhibit a strong avoidance response, often staying 200 to 1,000 meters away from active well pads and busy access roads. This zone of influence could mean that 141 wells can functionally eliminate thousands of acres of crucial winter range, forcing deer into suboptimal habitats where snow may be deeper or thermal cover less available. In the energetic shell game of winter survival, where deer live off dwindling fat reserves, the stress of avoiding industrial activity forces animals to spend more time in a state of high vigilance and less time foraging. This directly contributes to higher winter mortality rates, particularly among fawns (Jordan, 2025). Furthermore, the intersection of industrial energy development and regional tourism likely creates a compounded stressor effect on the North Slope herd. To alleviate these impacts, the North Slope can be prioritized for reclamation projects, with an attempt to re-establish native vegetation as mitigation for the loss in habitat.

The Range Trend reports for the updated North Slope sites (08C-02, 08C-09, 08C-07, and 08C-14) reveal a shared vulnerability to drought, particularly in how it compromises the long-term sustainability of preferred browse. Across these locations, drought can act as a demographic bottleneck, disproportionately impacting the transition from young to mature shrubs while accelerating the decadence of established plants. In the North Slope area, specifically near sites like Goslin Mountain and West Goslin, prolonged dry spells can lead to thinning of mountain browse and big sagebrush stands. As soil moisture depletes, these shrubs can show signs of poor vigor indicated by a reduction in the current year's foliage and leader growth required to sustain wintering big game herds. A common thread across these sites is the nearly complete cessation of seedling and young shrub recruitment during drought years. The Shrub Characteristics data for Antelope Flat and Clay Basin Bench illustrates a pattern where the population is increasingly skewed toward mature and decadent age classes. Without a young class to recruit into the population, these shrub communities become ecologically imbalanced. When a severe drought year hits, these older plants lack the root depth and metabolic resilience to survive, often resulting in significant die-offs that leave the landscape open to colonization by invasive species like cheatgrass. This age gap is a primary concern for wildlife managers, as it indicates a habitat that may look healthy today but lacks the regenerative capacity to survive into the next sample period. The threat of invasive annuals, specifically cheatgrass, is a dominant theme in the reports for Clay Basin Bench and Antelope Flat (Lane, Payne, & Cox, Utah Big Game Range Trend Studies: 2025 Annual Report, 2026). Drought conditions often favor these opportunistic grasses, which can complete their life cycle on minimal spring moisture before the native shrubs can fully utilize it. This invasion creates a fine fuel hazard that fundamentally alters the fire regime of the area. Since Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) and other key browse species are killed by fire and do not resprout, a drought-intensified wildfire can be a catastrophic loss. This shift from a diverse shrub-steppe to a simplified annual grassland is the most significant long-term risk posed by the interaction of drought and human activity on these Range Trend sites. Finally, drought severely limits the browsing resilience of the remaining vegetation. In a healthy moisture year, a shrub can withstand heavy utilization by deer and elk, but utilization combined with drought can lead to a steady decline in browse production estimated through percent cover and density. This reduction in the winter range carrying capacity makes the herds more susceptible to catastrophic winter loss when heavy snows force them to rely entirely on these diminished drought-stressed shrubs.

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 1.8**).

To mitigate habitat loss and bolster ecosystem resilience within the North Slope Management Unit, restoration of preferred browse communities should be prioritized where feasible. A key opportunity for improvement exists on the eastern side of the unit, specifically the mule deer winter range extending from Clay Basin to Brown's Park. These areas, including the Brown's Park National Wildlife Refuge and WMA, have been severely impacted by persistent drought and require targeted intervention to restore shrub vigor and reverse the trend of aging, decadent populations. Over 28,000 acres (**Table 1.4**) have already been treated for pinyon-juniper encroachment through mastication and hand-crew methods. However, these efforts must be sustained in both new and previously treated areas, specifically targeting Phase I and/or Phase II encroached areas like Death Valley, to prevent a total shift in ecological states. Furthermore, management should focus on the aggressive control of invasive species, particularly cheatgrass and noxious weeds like broadleaved pepperweed, which undermine the nutritional value of the range and increase wildfire risk. In higher elevations, restoration of aspen communities must remain a priority to counteract the encroachment of fir, spruce, and lodgepole pine; timely conifer removal is essential to maintain community vigor and ensure the return of early seral vegetation. When reseeding is required, preference should be given to native species to maximize long-term stability. Finally, to address the energetic cost of flight for fawns and calves, restoration work should be viewed as essential mitigation for the high industrial and recreational traffic in the region. Continued monitoring of Range Trend sites and rehabilitation projects is vital, as future data will provide the necessary guidance to adapt management actions against the intensifying threats of drought, fragmentation, and invasive annuals.

2. WILDLIFE MANAGEMENT UNIT 9 – SOUTH SLOPE – YELLOWSTONE, VERNAL/BONANZA, DIAMOND MOUNTAIN



WILDLIFE MANAGEMENT UNIT 9 – SOUTH SLOPE - YELLOWSTONE, VERNAL/BONANZA, DIAMOND MOUNTAIN

Boundary Description

Wasatch, Summit, Daggett, Uintah, and Duchesne Counties – Boundary begins at the Junction of US-40 and SR-87 in Duchesne; north on SR-87 to SR-35; northwest on SR-35 to the Provo River; north along the Provo River to the North Fork Provo River; north along the North Fork Provo River to SR-150; north along SR-150 to the Summit/Duchesne county line (summit spine of the Uinta Mountains); east along the summit of the Uinta Mountains to US-191; north along US-191 to Cart Creek; north along Cart Creek to Flaming Gorge Reservoir; east along Flaming Gorge Reservoir to the Green River; east along the Green River to the Utah-Colorado state line; south along the Utah-Colorado state line to the White River; west along the White River to the Green River; north along the Green River to the Duchesne River; west along the Duchesne River to US-40 at Myton; west along US-40 to SR-87 in Duchesne.

Management Unit Description

Geography

The South Slope Wildlife Management Unit is located along the south slope of the Uinta Mountains and extends south into the Uintah Basin in Duchesne and Uintah counties. The unit encompasses the land area of two former deer herd units: the Vernal unit (11) and the South Slope unit (12). Elevation ranges from 13,528 feet at Kings Peak (the highest point in Utah) to 4,650 feet at the confluence of the White and Green Rivers. This unit covers a varied area containing the High Uintas Wilderness Area, portions of Ashley National Forest, and desert habitats south of Vernal and Roosevelt. Numerous towns fall within the boundaries of this management unit, as do many rivers and drainages.

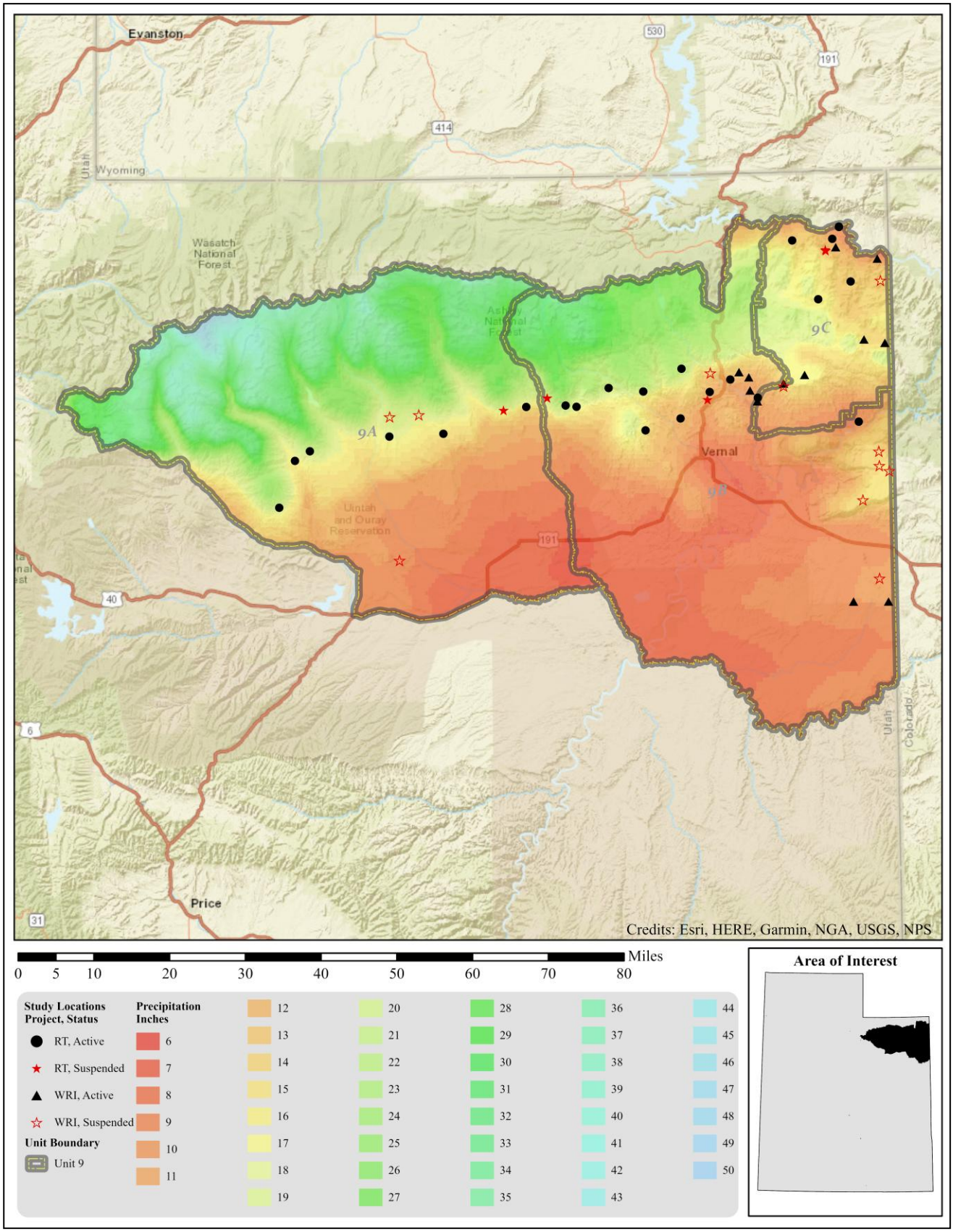
Climate Data

The 30-year (1991-2020) annual precipitation PRISM model shows that precipitation within the South Slope unit ranges from 6 inches near the town of Ft. Duchesne to 50 inches in the Uinta Mountains. All of the Range Trend and WRI monitoring studies in the unit occur within the 9-21 inch precipitation zone (**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 Northern Mountains and Uinta Basin divisions (Division 5 and Division 6, respectively).

Since 1995, the Northern Mountains and Uinta Basin divisions (which encompass the South Slope unit) have predominantly experienced some form of drought or dry spell, indicated by their mean annual PDSI readings. The Uinta Basin division has been in a state of drought for 58% of the time since 1995, while the Northern Mountains climate division has been in drought for nearly 42% of the same period. The severity has been significant, with 77% of drought years in the Northern Mountains being considered either moderate or extreme, compared to 67% in the Uinta Basin. The Northern Mountains division has not recorded a moderately wet year since 2011, and its 14-year stretch of drought or dry conditions has only been interrupted by two single wet year events. The Uinta Basin experienced more frequent, albeit single, wet years (six events) interrupting droughts over the last 26 years. The most notable wet period for the Northern Mountains was a series of events between 1995 and 1999, highlighted by a significant wet year in 1998. In contrast, the Uinta Basin's most remarkable wet year occurred as a single event in 2005 (**Figure 2.1a, Figure 2.2a**). 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 mainly 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, Figure 2.2b**). For the Northern Mountains, the years that follow this pattern of consecutive wet fall and spring occur in 1995/96, 1996/97, 1997/98, 1998/99, 2004/05, 2005/06, and 2010/11. For the Uinta Basin, the years that follow the pattern mentioned above occur in 1996/97, 1997/98, 1998/99, and 2004/05. 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 2.9**). For division 5, the 1995, 2005, and 2010 sample years occur during wet years, but years where drought may have affected plant condition occur in 2000, 2015, 2020, and 2025. For division 6, the 1995 and 2005 sample years occur during wet years, but years where drought may have affected plant condition occur in 2000, 2010, 2015, 2020, and 2025 (**Figure 2.1a, Figure 2.2a, Figure 2.1b, Figure 2.2b**) (National Oceanic and Atmospheric Administration, 2026).



Map 2.1: The 1991-2020 PRISM Precipitation Model for WMU 9, South Slope - Yellowstone, Vernal/Bonanza, Diamond Mountain (PRISM Climate Group, Oregon State University, 2021).

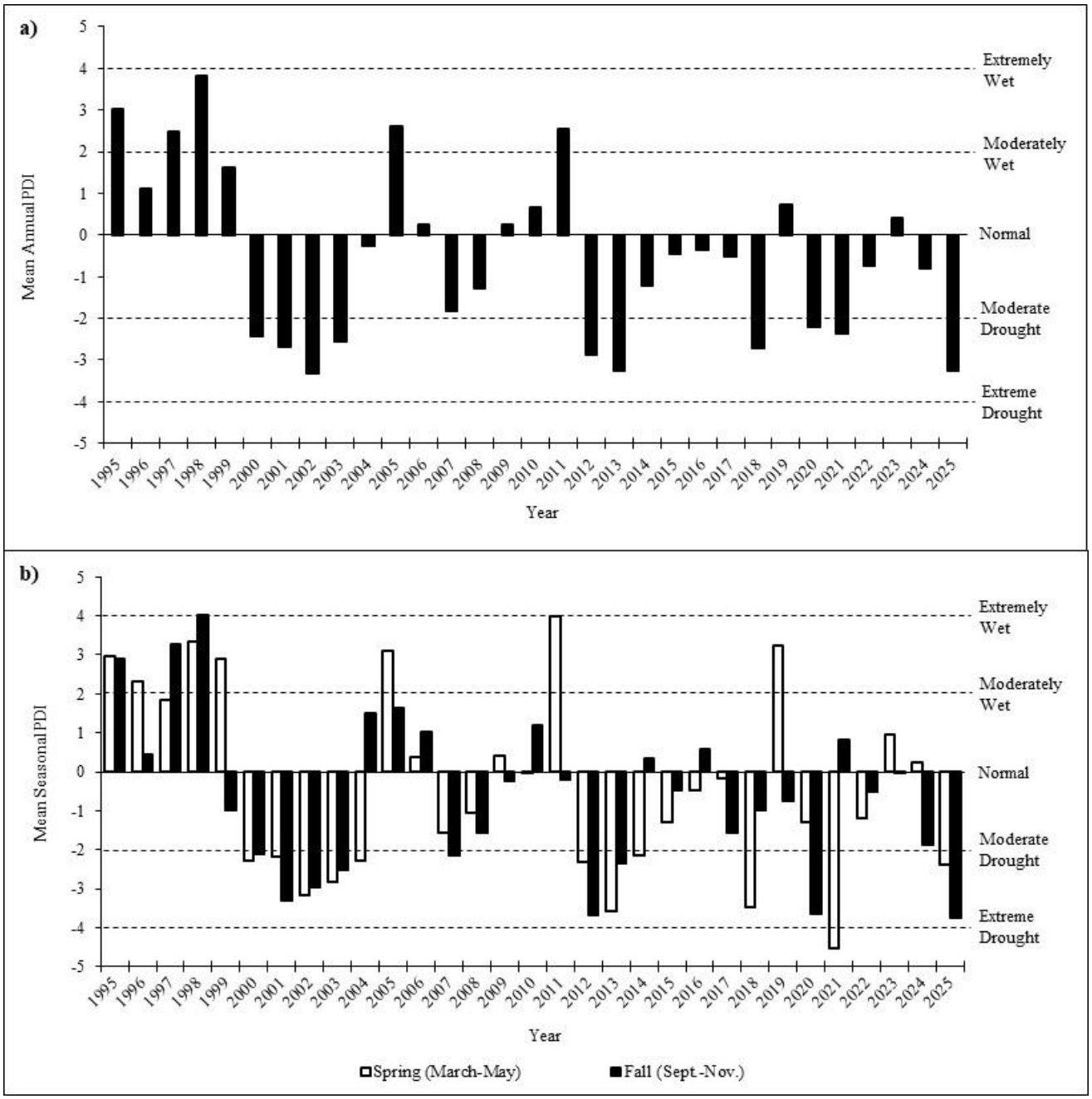


Figure 2.1: The 1995-2025 Palmer Drought Severity Index (PDSI) for the Northern Mountains division (Division 5). The PDSI is based on climate data gathered from 1895 to 2025. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet, and negative deviations indicate drought. Classification 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, 2026).

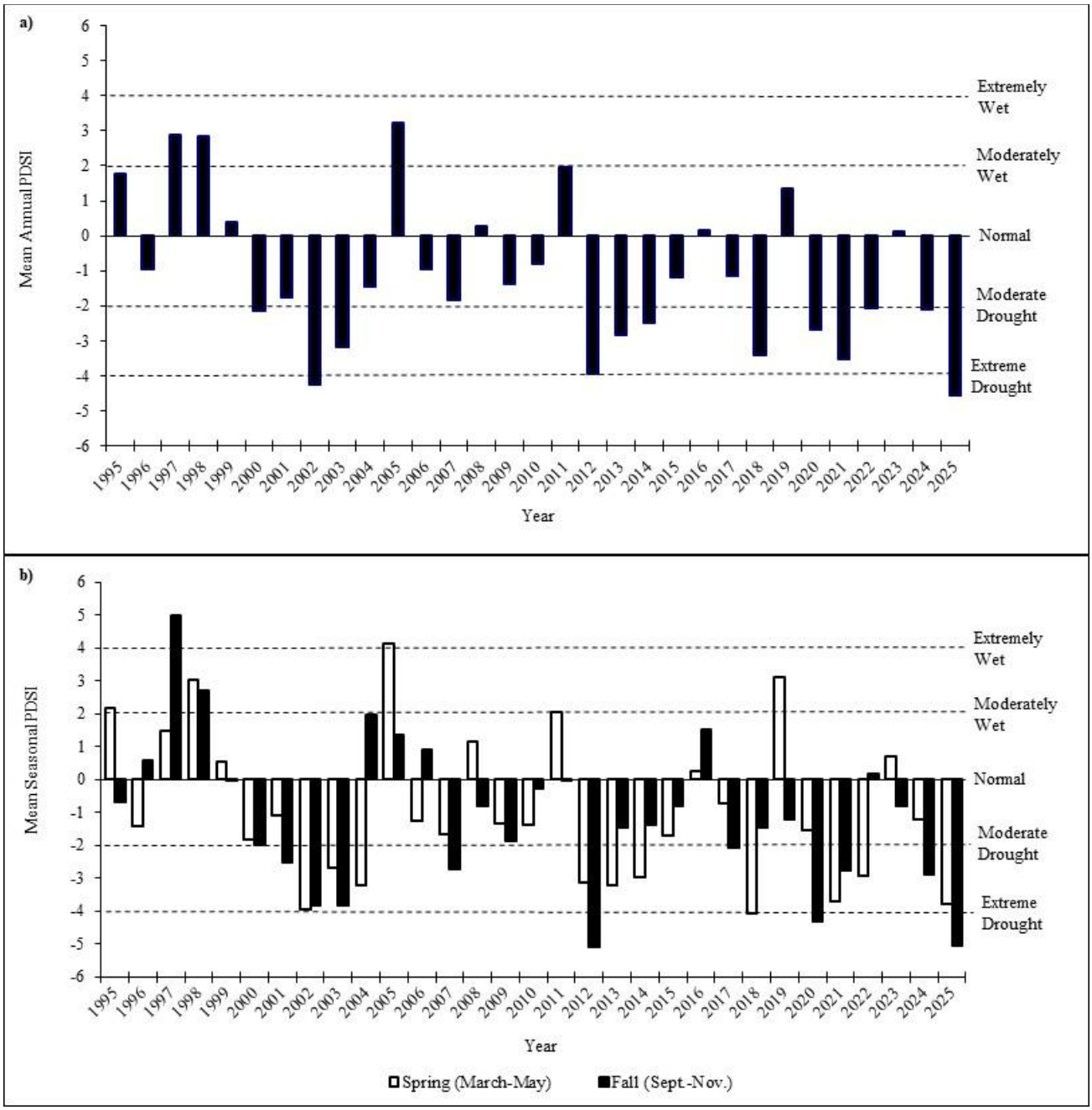


Figure 2.2: The 1995-2025 Palmer Drought Severity Index (PDSI) for the Uinta Basin division (Division 6). The PDSI is based on climate data gathered from 1895 to 2025. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet, and negative deviations indicate drought. Classification 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, 2026).

Big Game Habitat

Winter range within the Vernal/Bonanza and Diamond Mountain deer herd units are comprised mainly of closely associated areas of pinyon-juniper woodlands on the south-facing slopes and foothill benches of the Diamond, Blue, and Taylor Mountains. The upper limits generally follow the 8,500-foot contour, while the lower limits are defined by agricultural lands along the Green River and the deserts of Deadman Bench, Coyote Basin, etc. south of Vernal. Winter ranges within the Yellowstone unit are more limited, though similar to the Vernal/Bonanza and Diamond Mountain unit's habitat. In addition, management is diplomatic, as a large portion of these lands are part of the Uintah and Ouray Indian Reservations. Summer range within the new South Slope unit is plentiful, ranging from aspen and conifer communities to mountain big sagebrush and mountain brush communities.

Key areas for winter range consist of the small sagebrush/grass parks found throughout the pinyon and juniper woodlands, especially on the Vernal side of the unit. Sparse pinyon and juniper communities dominate the foothills where diversity and productivity of desirable browse is usually relatively low. Areas with a sagebrush understory or sagebrush/grass associations are more productive: these areas normally receive more use by big game and livestock. Representing these key areas are Red Mountain, Dry Fork Mountain, Island Park, and Brown's Park. Key areas at Toliver Creek and Brown's Park represent winter range in pinyon and juniper communities, including areas that have either been chained or burned. Higher winter ranges in the mountain brush and mountain big sagebrush zones also provide important winter range for big game in this unit, especially along the south slope of the Uinta Mountains. Key areas within these vegetation types are found mainly in or near the Yellowstone unit and include John Starr Flat, Mosby Mountain, Gooseberry Spring, and Seep Hollow. Key areas in transitional and summer ranges are sampled on the Taylor, Mosby, and Diamond Mountains.

Rangeland Analysis Platform (RAP) – Cover by Mule 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 cover values 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. The following graphs represent vegetation changes by 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 inclusion of the RAP data in this report is to also help illustrate the year-to-year fluctuations or changes that may occur between Range Trend samplings. Also displayed in the following graphs is the change in satellite imaging resolution from 30m to 10m used to calculate cover. This change occurs in 2018 and is denoted by a dashed line. Calculated cover estimations in 2018 and beyond use 10m resolution, so caution should be followed when comparing years before 2018 to years after, as sequential comparisons are not at the same scale.

The RAP data illustrates fluctuations in herbaceous cover on mule deer summer, winter, and year-long ranges. The highest values for overall cover for year-long and winter occurred in the early 1990s. Both ranges decreased in cover but cover spiked again in 2020 on winter range. Cover of annual lifeforms on winter range has generally increased from but with no net change; however, years with elevated annual cover are more common between 2013 and 2025. Conversely, perennial cover has decreased overall with perennial cover decreasing from 20% in 1993 to nearly 10% in 2025. Fluctuations in total percent cover are likely driven by precipitation. However, there are a few precipitation anomies where precipitation decreased and while percent

cover either remains unchanged or increases. This may suggest that other factors also play into herbaceous trends on winter range in this unit. RAP data also shows that annual lifeforms have generally provided more cover on winter and year-long range than on summer habitat, but all ranges display an overall increase in annual cover (but this is more pronounced on winter range) (**Figure 2.3**, **Figure 2.4**, **Figure 2.5**). On Yellowstone's Mountain (Browse) Range Trend sites, data show a loose correlation between herbaceous plant covers/nested frequencies and RAP estimations. However, this correlation is difficult to establish for semidesert Range Trend sites located in the Vernal/Bonanza and Diamond Mountain subunits. These semidesert sites exhibit higher and more variable covers and nested frequencies for annual grass and forbs, making reliable correlation with RAP estimations less practical. Despite these unit differences, the semidesert study sites recorded annual grass and forb cover/frequency values like those found in the mountain ecotype studies (**Figure 2.15**, **Figure 2.16**, **Figure 2.28**, **Figure 2.29**, **Figure 2.30**, **Figure 2.31**). No net change for cover has been observed for perennial herbaceous lifeforms on summer range, while percent cover for these lifeforms on winter range has decreased over time (**Figure 2.3**, **Figure 2.4**, **Figure 2.5**). 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.

RAP (Rangeland Analysis Platform) data exhibits interannual fluctuations in both tree and shrub cover. Over a 39-year period (1986–2025), total shrub cover remained relatively stable across all three mule deer seasonal ranges, despite minor variability. During the same timeframe, tree cover remained consistent on the summer range but increased slightly on the winter and spring/fall ranges. While the values for both cover types occasionally correlate with annual precipitation (or a potential lagged effect), this relationship is less consistent than observed with herbaceous cover. Apart from Mountain (Big Sagebrush) (9B, 9C) and Mountain (Browse) (9A) studies, Range Trend data for mountain study sites generally display either a stable or increasing trend for shrub cover. Total average shrub cover has decreased on upland and semidesert study sites (9B, 9C) when comparing 2005 data with that from 2025 (**Figure 2.9**, **Figure 2.10**, **Figure 2.18**, **Figure 2.19**). Tree cover trends are varied depending on ecotype according to Range Trend data (**Figure 2.11**, **Figure 2.20**, **Figure 2.21**). 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 Cover by Mule Deer Habitat

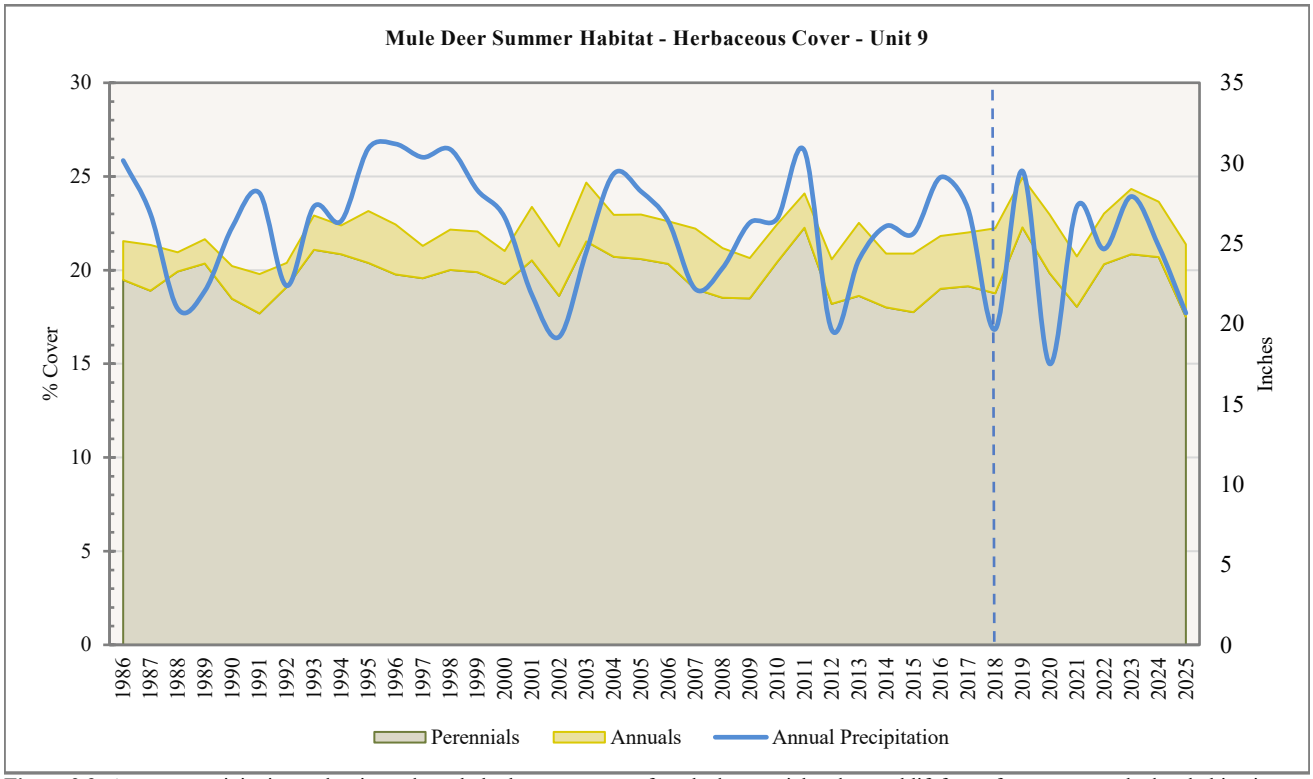


Figure 2.3: Average precipitation and estimated yearly herbaceous cover of stacked perennial and annual lifeforms for summer mule deer habitat in WMU 9, South Slope - Yellowstone, Vernal/Bonanza, Diamond Mountain (Rangeland Analysis Platform, 2026).
*Dashed line indicates shift in depicted datasets from RAP 30m (1986-2017) to RAP 10m (2018-2025) (USDA Agricultural Research Service, 2026).

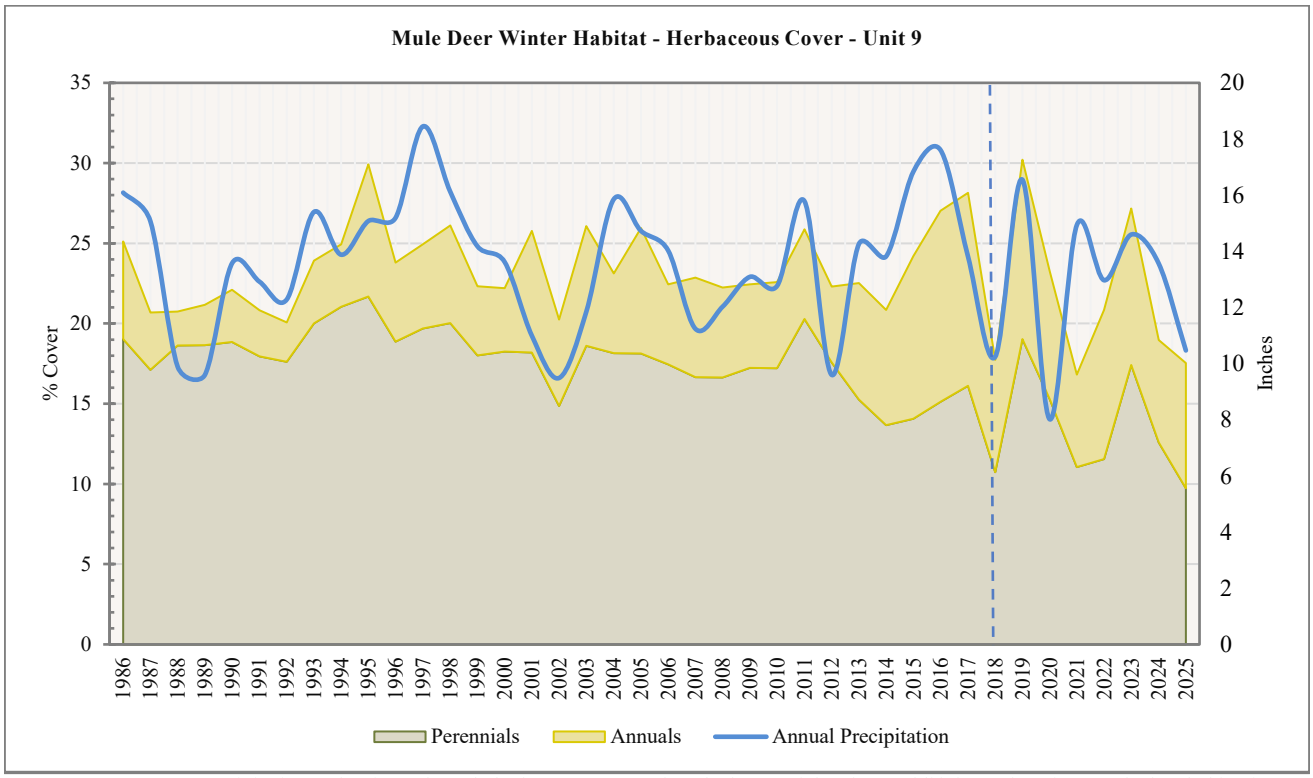


Figure 2.4: : Average precipitation and estimated yearly herbaceous cover of stacked perennial and annual lifeforms for winter mule deer habitat in WMU 9, South Slope - Yellowstone, Vernal/Bonanza, Diamond Mountain (Rangeland Analysis Platform, 2026).
*Dashed line indicates shift in depicted datasets from RAP 30m (1986-2017) to RAP 10m (2018-2025) (USDA Agricultural Research Service, 2026).

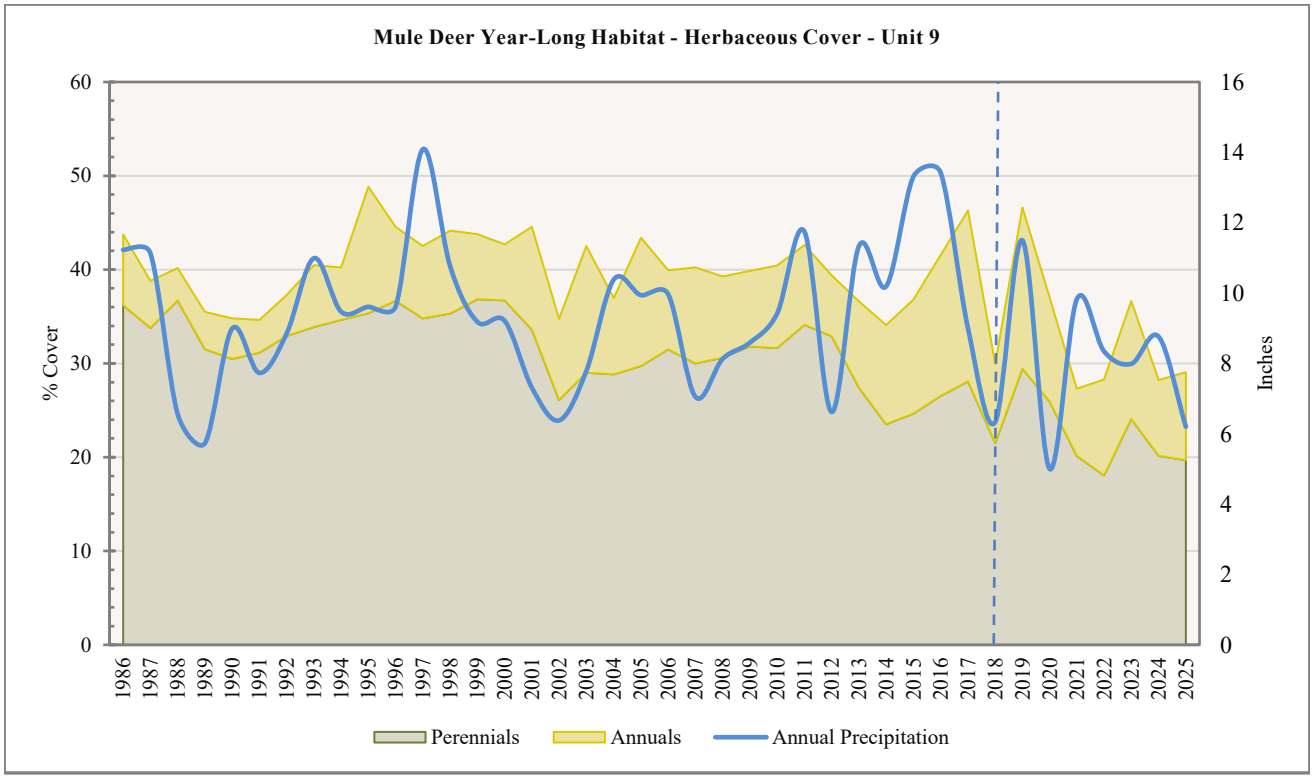


Figure 2.5 : Average precipitation and estimated yearly herbaceous cover of stacked perennial and annual lifeforms for year-long mule deer habitat in WMU 9, South Slope - Yellowstone, Vernal/Bonanza, Diamond Mountain (Rangeland Analysis Platform, 2026).
*Dashed line indicates shift in depicted datasets from RAP 30m (1986-2017) to RAP 10m (2018-2025) (USDA Agricultural Research Service, 2026).

RAP – Shrub and Tree Cover by Mule Deer Habitat

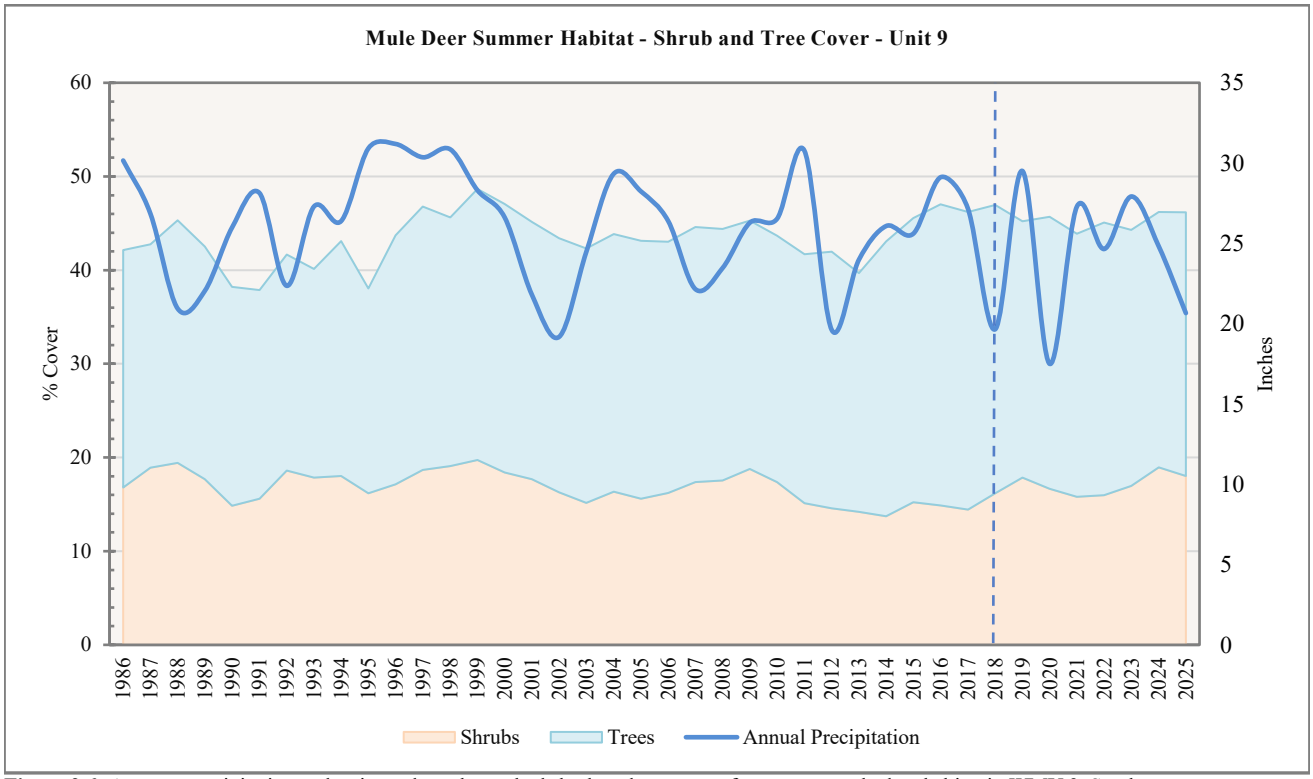


Figure 2.6: Average precipitation and estimated yearly stacked shrub and tree cover for summer mule deer habitat in WMU 9, South Slope - Yellowstone, Vernal/Bonanza, Diamond Mountain (Rangeland Analysis Platform, 2026).
*Dashed line indicates shift in depicted datasets from RAP 30m (1986-2017) to RAP 10m (2018-2025) (USDA Agricultural Research Service, 2026).

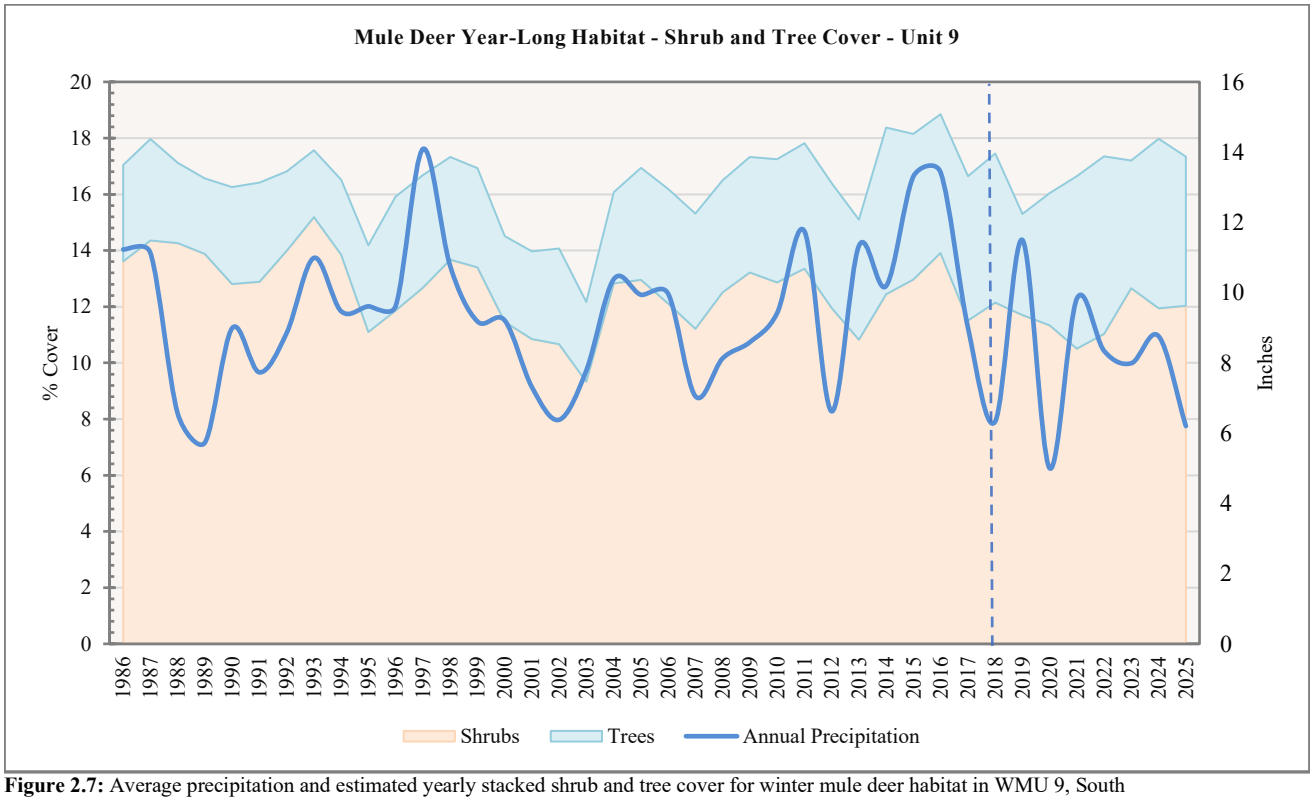


Figure 2.7: Average precipitation and estimated yearly stacked shrub and tree cover for winter mule deer habitat in WMU 9, South Slope - Yellowstone, Vernal/Bonanza, Diamond Mountain (Rangeland Analysis Platform, 2026).
*Dashed line indicates shift in depicted datasets from RAP 30m (1986-2017) to RAP 10m (2018-2025) (USDA Agricultural Research Service, 2026).

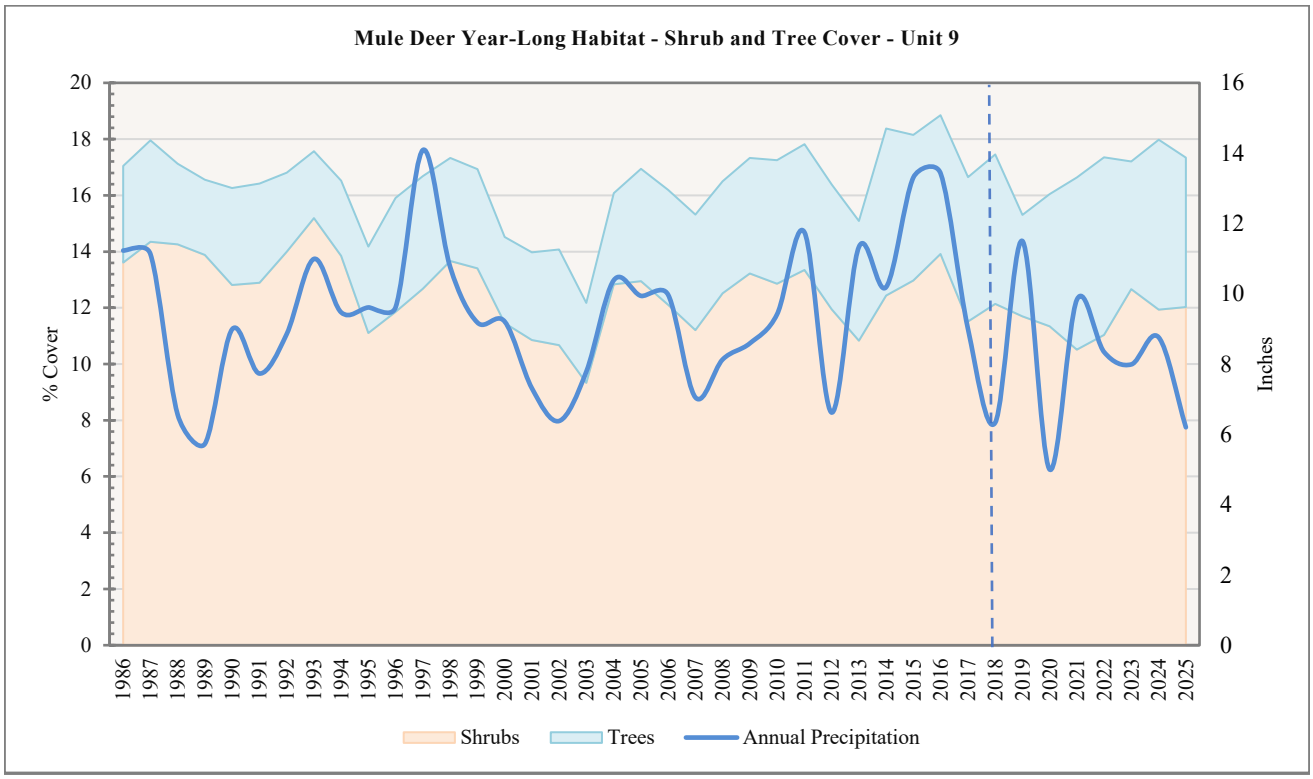
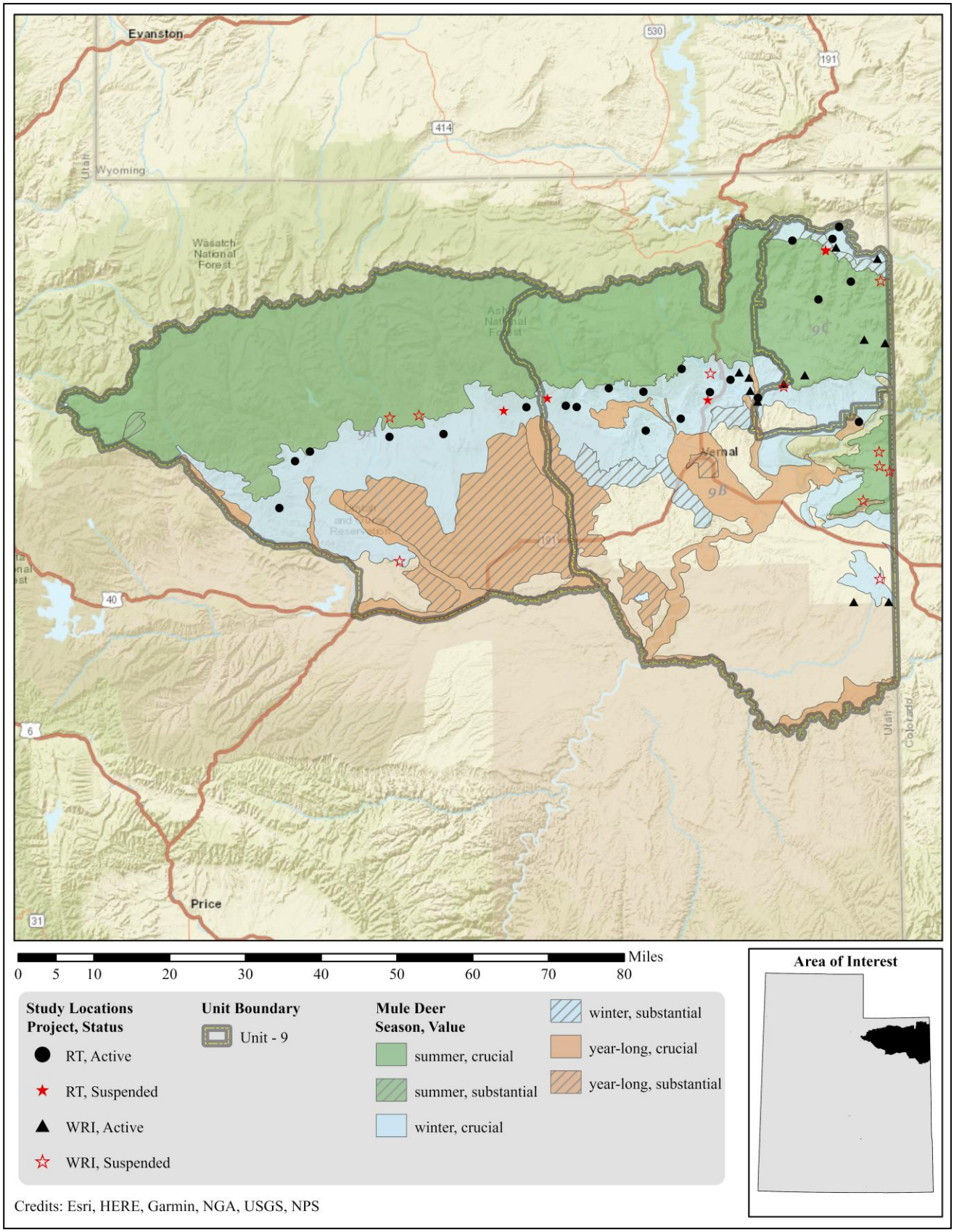
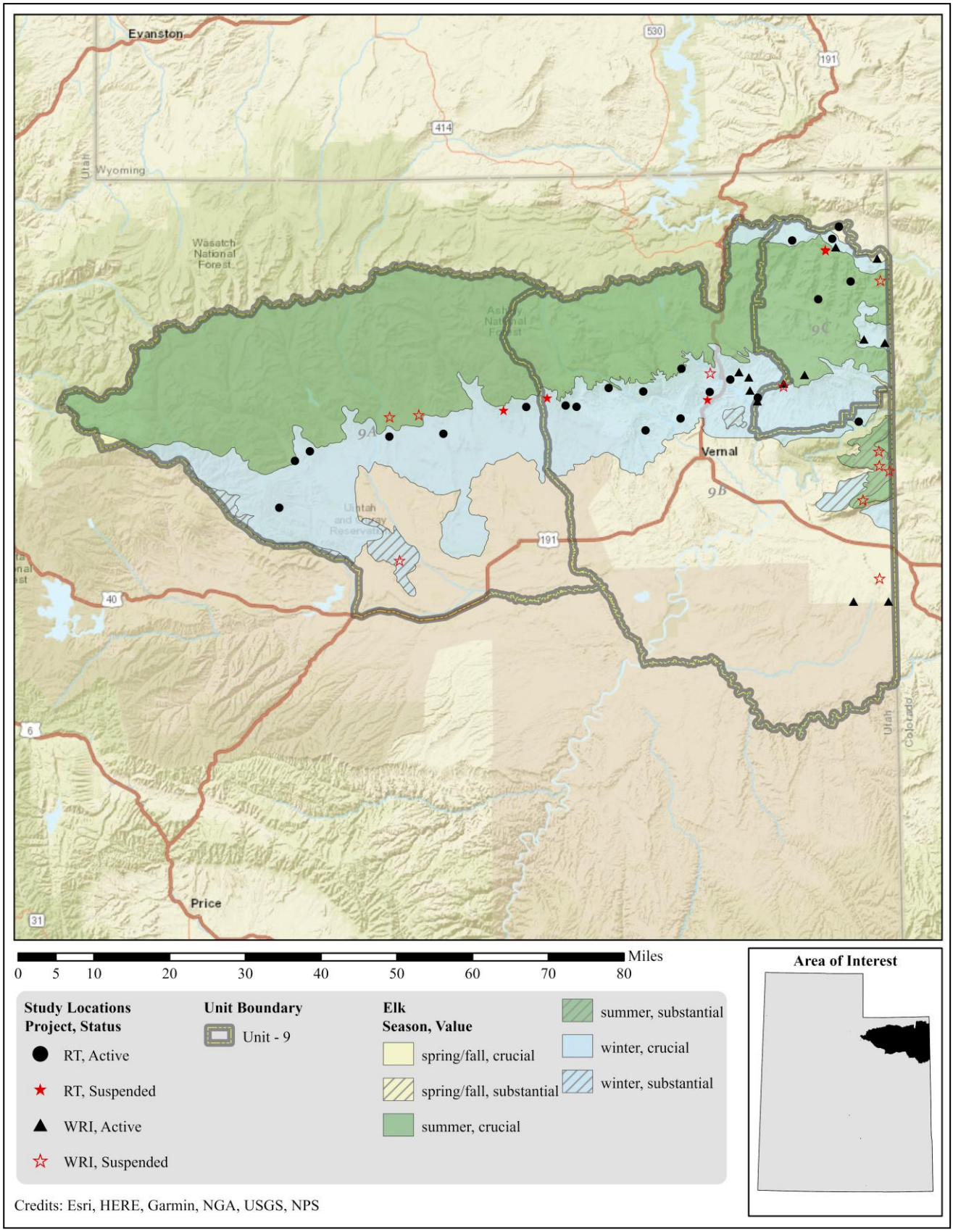


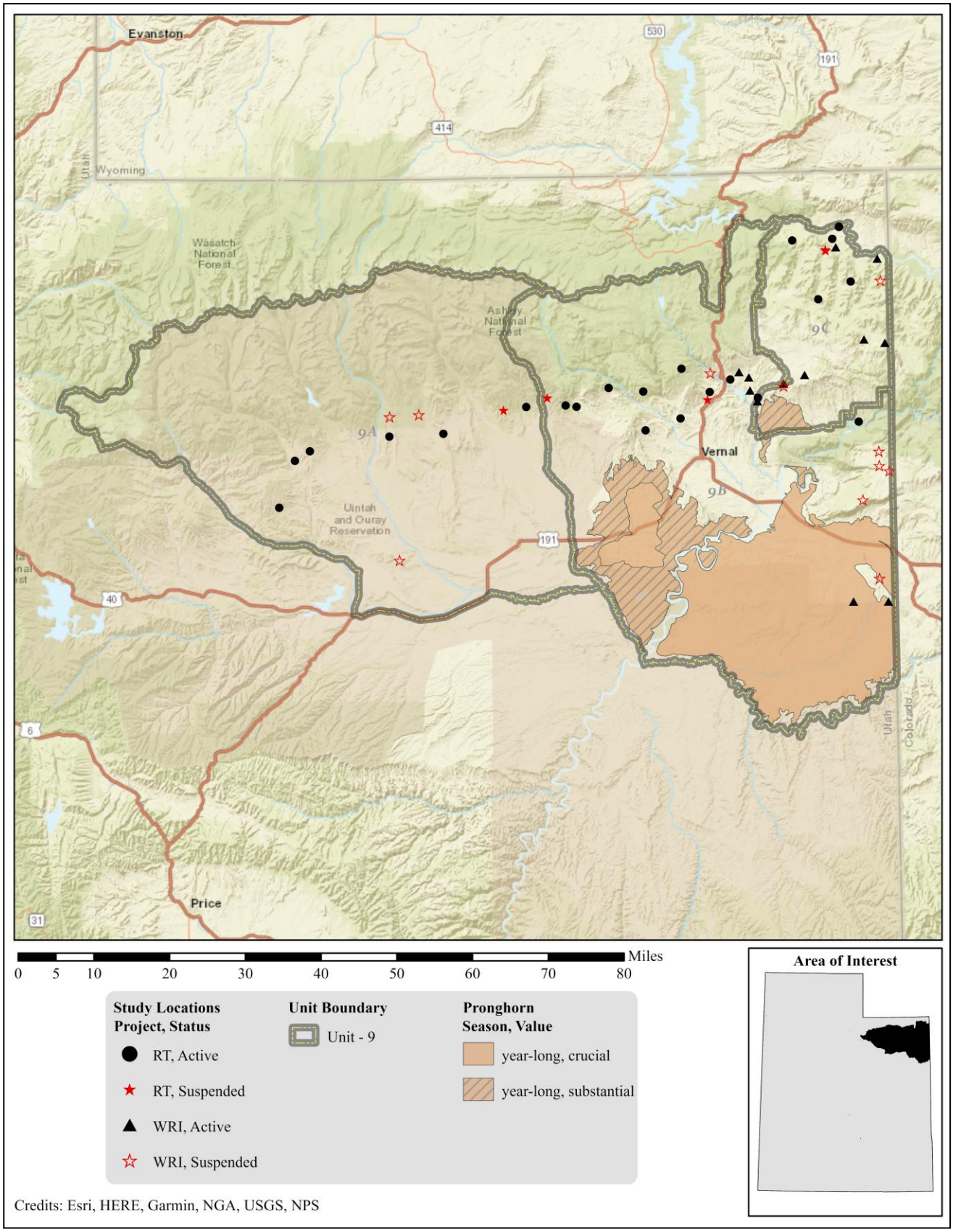
Figure 2.8: Average precipitation and estimated yearly stacked shrub and tree cover for year-long mule deer habitat in WMU 9, South Slope - Yellowstone, Vernal/Bonanza, Diamond Mountain (Rangeland Analysis Platform, 2026).
*Dashed line indicates shift in depicted datasets from RAP 30m (1986-2017) to RAP 10m (2018-2025) (USDA Agricultural Research Service, 2026).



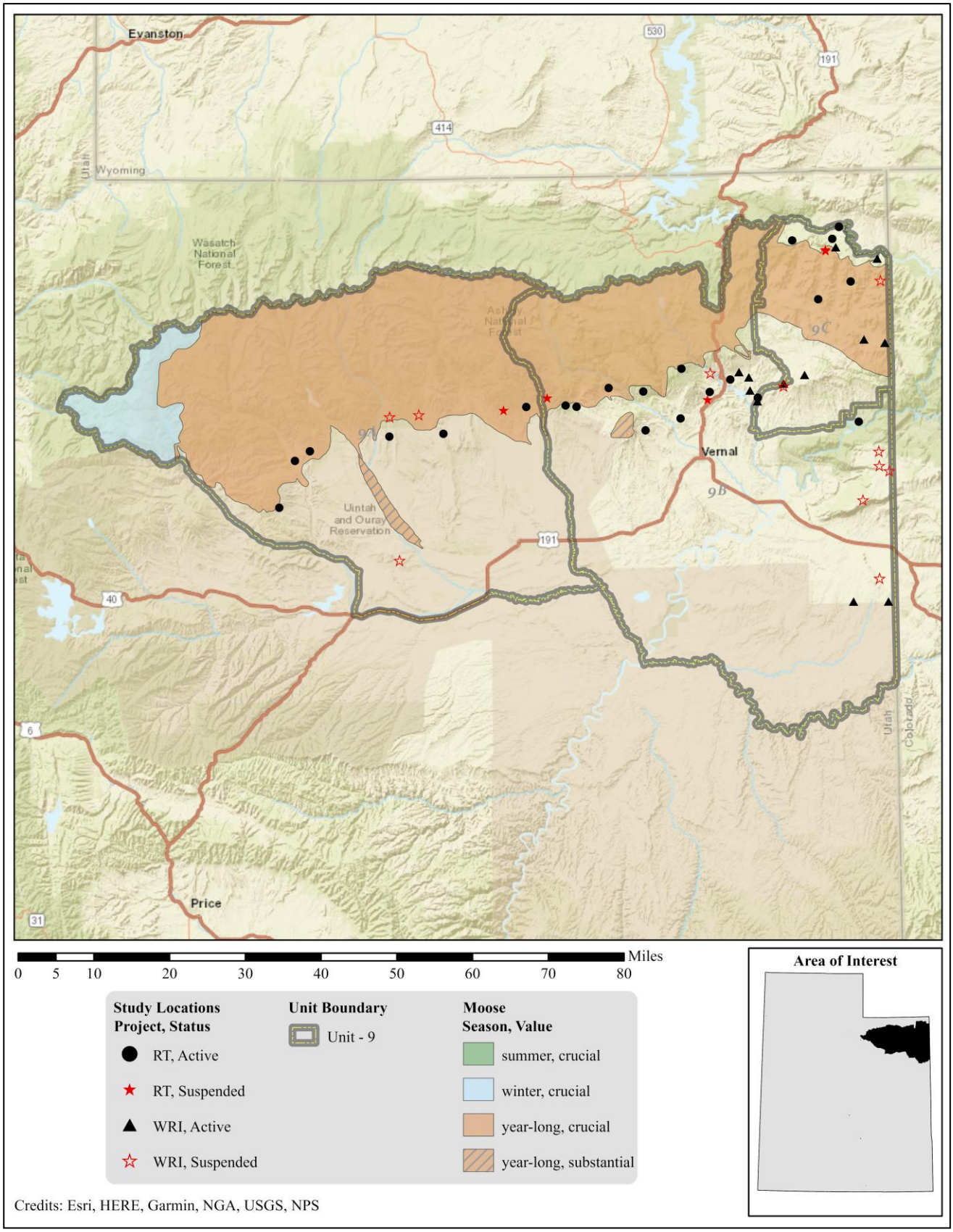
Map 2.2: Estimated mule deer habitat by season and value for WMU 9, South Slope - Yellowstone, Vernal/Bonanza, Diamond Mountain.



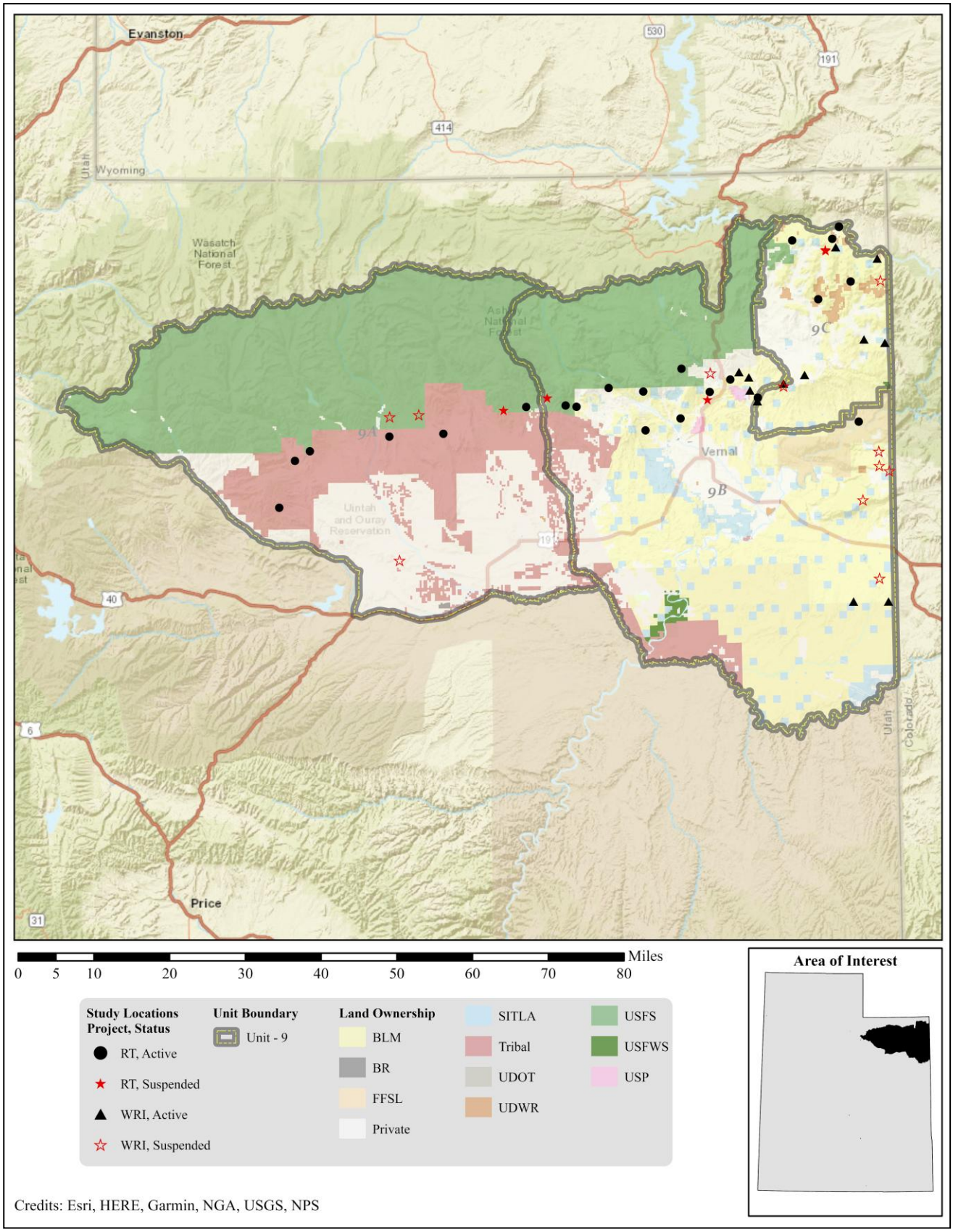
Map 2.3: Estimated elk habitat by season and value for WMU 9, South Slope - Yellowstone, Vernal/Bonanza, Diamond Mountain.



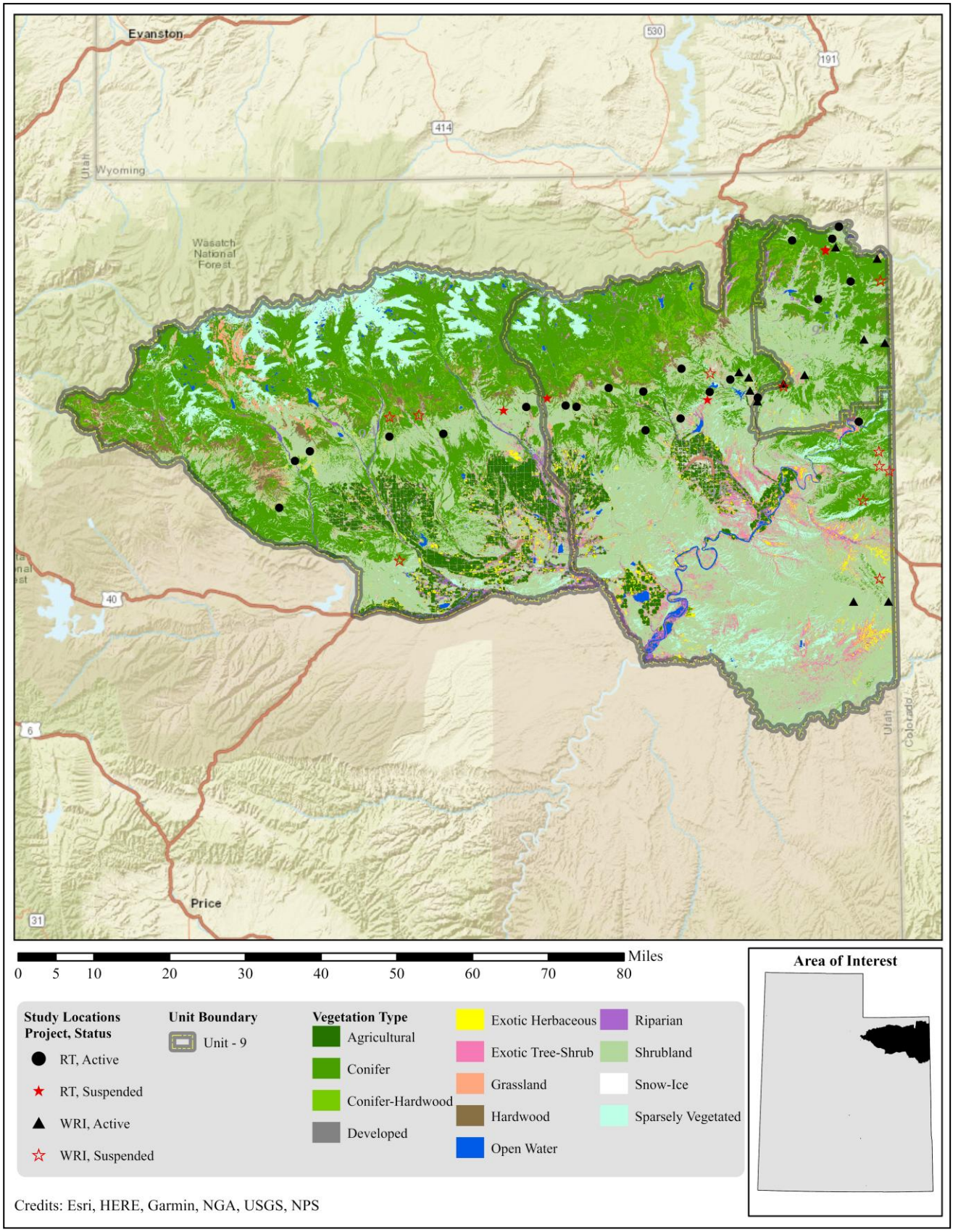
Map 2.4: Estimated pronghorn habitat by season and value for WMU 9, South Slope - Yellowstone, Vernal/Bonanza, Diamond Mountain.



Map 2.5: Estimated moose habitat by season and value for WMU 9, South Slope - Yellowstone, Vernal/Bonanza, Diamond Mountain.



Map 2.6: Land ownership for WMU 9, South Slope - Yellowstone, Vernal/Bonanza, Diamond Mountain.



Map 2.7: LANDFIRE Existing Vegetation Type map (LC24_EVT_250, 2024) for WMU 9, South Slope - Yellowstone, Vernal/Bonanza, Diamond Mountain.

LANDFIRE Existing Vegetation Type for Mule Deer Habitat

Subunit 9A, Yellowstone

The current LANDFIRE Existing Vegetation Type model shows that just over 6% of mule deer summer habitat is comprised of the Rocky Mountain Aspen Forest and Woodland biophysical site (**Table 2.1**); biophysical sites are also referred to here as vegetation types. Although aspen dominates this vegetation type, preferred browse species such as chokecherry (*Prunus virginiana*), serviceberry (*Amelanchier* spp.), and mountain snowberry (*Symphoricarpos oreophilus*) are commonly present. In addition, sites of this type may have abundant understories that could provide forage for mule deer during the summer months. This aspen type may be impacted by threats including conifer encroachment, ungulate browsing, insects, and disease.

Over 21% of the summer range is modeled to be comprised of sparsely vegetated areas: this vegetation class may have less value for deer when compared with other, more productive sites. The model also suggests that the Rocky Mountain Subalpine-Montane Mesic Meadow vegetation type (which is found at high elevations) makes up almost 3% of summer range in this subunit (**Table 2.1**). These meadows are usually dominated by forbs that could provide valuable forage for summering mule deer.

Sagebrush vegetation types make up nearly 40% of the unit's winter range and almost 13.5% of the year-long habitat according to the model (**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. Pinyon-juniper or ponderosa pine (*Pinus ponderosa*) may be present at middle to middle-high elevations, respectively. Although sagebrush-dominated, the higher-elevation Inter-Mountain Montane Sagebrush Steppe biophysical sites in particular may have diverse and robust herbaceous understories. Preferred browse species such as mountain snowberry, currant (*Ribes* spp.), and serviceberry may also be present on sites of this type, although in lesser amounts than sagebrush.

Nearly 33% of year-long range is occupied by agricultural land according to the model. The model also suggests that over 40% of winter mule deer habitat and 10.5% of year-long range is comprised of the Colorado Plateau Pinyon-Juniper Woodland biophysical site. These woodlands are dominated by pinyon (*Pinus* spp.) and juniper (*Juniperus* spp.) and are usually located in lower elevations (**Table 2.2**, **Table 2.3**). Although abundance can vary widely, this type may also be associated with understory browse species known to be beneficial to mule deer such as big sagebrush (*Artemisia tridentata*), mountain mahogany (*Cercocarpus* spp.), and bitterbrush (*Purshia tridentata*), among others.

Several other vegetation types comprise the rest of the mule deer habitat within the Yellowstone subunit (**Map 2.7**, **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	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	173,972	26.54%	
	Rocky Mountain Lodgepole Pine Forest	70,541	10.76%	
	Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland	31,205	4.76%	
	Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland	27,799	4.24%	
	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	18,289	2.79%	
	Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland	16,175	2.47%	
	Colorado Plateau Pinyon-Juniper Woodland	8,581	1.31%	
	Southern Rocky Mountain Ponderosa Pine Woodland	7,248	1.11%	
	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	3,920	0.60%	
	Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland	1,419	0.22%	
	Rocky Mountain Foothill Limber Pine-Juniper Woodland	168	0.03%	54.82%
Other	Sparsely Vegetated	140,271	21.40%	
	Riparian	10,563	1.61%	
	Open Water	7,717	1.18%	
	Developed	4,978	0.76%	
	Agricultural	44	0.01%	
	Snow-Ice	20	0.00%	24.96%
Shrubland	Inter-Mountain Basins Montane Sagebrush Steppe	51,112	7.80%	
	Rocky Mountain Alpine Dwarf-Shrubland	6,341	0.97%	
	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	3,347	0.51%	
	Rocky Mountain Lower Montane-Foothill Shrubland	2,489	0.38%	
	Inter-Mountain Basins Semi-Desert Shrub-Steppe	121	0.02%	
	Inter-Mountain Basins Big Sagebrush Shrubland	35	0.01%	
	Colorado Plateau Mixed Low Sagebrush Shrubland	24	0.00%	
	Inter-Mountain Basins Mixed Salt Desert Scrub	18	0.00%	
	Southern Colorado Plateau Sand Shrubland	<1	0.00%	9.69%
Hardwood	Rocky Mountain Aspen Forest and Woodland	40,684	6.21%	
	Rocky Mountain Bigtooth Maple Ravine Woodland	18	0.00%	6.21%
Grassland	Rocky Mountain Subalpine-Montane Mesic Meadow	16,952	2.59%	
	Southern Rocky Mountain Montane-Subalpine Grassland	4,654	0.71%	
	Rocky Mountain Alpine Turf	2,706	0.41%	
	Rocky Mountain Alpine Fell-Field	1,530	0.23%	
	Inter-Mountain Basins Semi-Desert Grassland	1,246	0.19%	4.13%
Exotic Herbaceous	Interior Western North American Temperate Ruderal Grassland	449	0.07%	
	Great Basin & Intermountain Introduced Annual Grassland	327	0.05%	
	Great Basin & Intermountain Introduced Perennial Grassland and Forbland	301	0.05%	
	Great Basin & Intermountain Introduced Annual and Biennial Forbland	3	0.00%	0.16%
Exotic Tree-Shrub	Interior Western North American Temperate Ruderal Shrubland	133	0.02%	
	Great Basin & Intermountain Ruderal Shrubland	16	0.00%	0.02%
Total		**655,416**	**100%**	**100%**

Table 2.1: LANDFIRE Existing Vegetation Type (LC24_EVT_250, 2024) acreage of summer mule deer habitat for WMU 9A, Yellowstone.

Group	Existing Vegetation Type for Winter Mule Deer Habitat	Acres	% of Total	Group % of Total
Shrubland	Inter-Mountain Basins Montane Sagebrush Steppe	62,349	24.45%	
	Inter-Mountain Basins Big Sagebrush Shrubland	37,334	14.64%	
	Rocky Mountain Lower Montane-Foothill Shrubland	5,163	2.02%	
	Inter-Mountain Basins Semi-Desert Shrub-Steppe	3,701	1.45%	
	Inter-Mountain Basins Mixed Salt Desert Scrub	2,566	1.01%	
	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	1,490	0.58%	
	Colorado Plateau Mixed Low Sagebrush Shrubland	956	0.37%	
	Colorado Plateau Pinyon-Juniper Shrubland	383	0.15%	
	Inter-Mountain Basins Greasewood Flat	184	0.07%	
	Inter-Mountain Basins Mat Saltbush Shrubland	103	0.04%	44.80%
Conifer	Colorado Plateau Pinyon-Juniper Woodland	102,998	40.40%	
	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	2,513	0.99%	
	Southern Rocky Mountain Ponderosa Pine Woodland	2,331	0.91%	
	Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland	705	0.28%	
	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	634	0.25%	
	Rocky Mountain Lodgepole Pine Forest	340	0.13%	
	Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland	335	0.13%	
	Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland	238	0.09%	
	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	196	0.08%	
	Rocky Mountain Foothill Limber Pine-Juniper Woodland	27	0.01%	
	Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland	4	0.00%	43.27%

Group	Existing Vegetation Type for Winter Mule Deer Habitat	Acres	% of Total	Group % of Total
Other	Agricultural	7,464	2.93%	
	Developed	5,242	2.06%	
	Riparian	3,784	1.48%	
	Sparsely Vegetated	1,749	0.69%	
	Open Water	989	0.39%	
	Quarries-Strip Mines-Gravel Pits-Well and Wind Pads	219	0.09%	7.63%
Hardwood	Rocky Mountain Aspen Forest and Woodland	3,589	1.41%	
	Rocky Mountain Bigtooth Maple Ravine Woodland	4	0.00%	1.41%
Grassland	Southern Rocky Mountain Montane-Subalpine Grassland	2,268	0.89%	
	Rocky Mountain Subalpine-Montane Mesic Meadow	667	0.26%	
	Inter-Mountain Basins Semi-Desert Grassland	632	0.25%	1.40%
Exotic Herbaceous	Great Basin & Intermountain Introduced Annual Grassland	1,623	0.64%	
	Interior Western North American Temperate Ruderal Grassland	468	0.18%	
	Great Basin & Intermountain Introduced Perennial Grassland and Forbland	411	0.16%	
	Great Basin & Intermountain Introduced Annual and Biennial Forbland	3	0.00%	0.98%
Exotic Tree-Shrub	Great Basin & Intermountain Ruderal Shrubland	1,259	0.49%	
	Interior Western North American Temperate Ruderal Shrubland	55	0.02%	0.52%
Total		**254,977**	**100%**	**100%**

Table 2.2: LANDFIRE Existing Vegetation Type (LC24_EVT_250, 2024) acreage of winter mule deer habitat for WMU 9A, Yellowstone.

Group	Existing Vegetation Type for Year-Long Mule Deer Habitat	Acres	% of Total	Group % of Total
Other	Agricultural	97,121	32.72%	
	Riparian	25,228	8.50%	
	Developed	18,519	6.24%	
	Open Water	4,082	1.38%	
	Sparsely Vegetated	3,302	1.11%	
	Quarries-Strip Mines-Gravel Pits-Well and Wind Pads	516	0.17%	50.12%
Shrubland	Inter-Mountain Basins Big Sagebrush Shrubland	36,564	12.32%	
	Inter-Mountain Basins Mixed Salt Desert Scrub	15,958	5.38%	
	Inter-Mountain Basins Semi-Desert Shrub-Steppe	11,972	4.03%	
	Inter-Mountain Basins Greasewood Flat	9,585	3.23%	
	Inter-Mountain Basins Mat Saltbush Shrubland	1,985	0.67%	
	Colorado Plateau Mixed Low Sagebrush Shrubland	1,911	0.64%	
	Rocky Mountain Lower Montane-Foothill Shrubland	1,720	0.58%	
	Inter-Mountain Basins Montane Sagebrush Steppe	1,697	0.57%	
	Colorado Plateau Pinyon-Juniper Shrubland	1,276	0.43%	
	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	379	0.13%	
	Colorado Plateau Blackbrush-Mormon-tea Shrubland	5	0.00%	
	Southern Colorado Plateau Sand Shrubland	<1	0.00%	27.98%
Conifer	Colorado Plateau Pinyon-Juniper Woodland	31,349	10.56%	
	Rocky Mountain Foothill Limber Pine-Juniper Woodland	216	0.07%	
	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	105	0.04%	
	Southern Rocky Mountain Ponderosa Pine Woodland	70	0.02%	
	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	11	0.00%	
	Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland	5	0.00%	10.70%
Exotic Herbaceous	Great Basin & Intermountain Introduced Perennial Grassland and Forbland	5,949	2.00%	
	Great Basin & Intermountain Introduced Annual Grassland	4,947	1.67%	
	Interior Western North American Temperate Ruderal Grassland	3,776	1.27%	
	Great Basin & Intermountain Introduced Annual and Biennial Forbland	791	0.27%	5.21%
Exotic Tree-Shrub	Great Basin & Intermountain Ruderal Shrubland	13,982	4.71%	
	Interior Western North American Temperate Ruderal Shrubland	383	0.13%	4.84%
Grassland	Southern Rocky Mountain Montane-Subalpine Grassland	1,839	0.62%	
	Inter-Mountain Basins Semi-Desert Grassland	757	0.25%	
	Rocky Mountain Subalpine-Montane Mesic Meadow	300	0.10%	0.98%
Hardwood	Rocky Mountain Aspen Forest and Woodland	508	0.17%	0.17%
Total		**296809**	**100%**	**100%**

Table 2.3: LANDFIRE Existing Vegetation Type (LC24_EVT_250, 2024) acreage of year-long mule deer habitat for WMU 9A, Yellowstone.

Subunits 9B, 9C, Vernal/Bonanza, Diamond Mountain

According to the current LANDFIRE Existing Vegetation Type model, 16.5% of mule deer summer range; 34% of winter range; and just over 5% of year-long habitat in the Vernal/Bonanza, Diamond Mountain subunits is comprised of the Colorado Plateau Pinyon-Juniper Woodland biophysical site (also referred to here as vegetation type). These woodlands are dominated by pinyon (*Pinus* spp.) and juniper (*Juniperus* spp.) and are usually located in lower elevations. Although abundance can vary widely, this type may also be associated with understory browse species known to be beneficial to mule deer such as big sagebrush (*Artemisia tridentata*), bitterbrush (*Purshia tridentata*), and mountain mahogany (*Cercocarpus* spp.), among others.

The model also suggests that 12% of summer range is made up of biophysical sites that have quaking aspen (*Populus tremuloides*) as a dominant component (**Table 2.4**); in the Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland vegetation type in particular, conifers are also dominant. Although they are tree-dominated, these aspen biophysical sites may have diverse herbaceous components that could provide valuable forage for summering mule deer.

Approximately 33% of winter range; 25% of summer range; and 14% of year-long range is comprised of sagebrush vegetation types according to the model (**Table 2.4**, **Table 2.5**, **Table 2.6**).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. Pinyon-juniper may be present in areas of this biophysical site at mid elevations, and encroachment of these tree species into sagebrush shrublands has been observed in this unit. 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. 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 states that 22% of the year-long range in the Vernal/Bonanza, Diamond Mountain subunits is comprised of agricultural land (**Table 2.6**).

Numerous other vegetation types comprise the rest of the mule deer habitat within the Vernal/Bonanza, Diamond Mountain subunits (**Map 2.7**, **Table 2.4**, **Table 2.5**, **Table 2.6**), 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	80,284	16.54%	
	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	65,426	13.48%	
	Rocky Mountain Lodgepole Pine Forest	55,103	11.35%	
	Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland	36,775	7.58%	
	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	22,228	4.58%	
	Southern Rocky Mountain Ponderosa Pine Woodland	10,475	2.16%	
	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	8,047	1.66%	
	Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland	4,548	0.94%	
	Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland	4,353	0.90%	
	Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland	3,741	0.77%	
	Rocky Mountain Foothill Limber Pine-Juniper Woodland	99	0.02%	
	Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland	4	0.00%	59.98%
Shrubland	Inter-Mountain Basins Montane Sagebrush Steppe	98,239	20.24%	
	Inter-Mountain Basins Big Sagebrush Shrubland	22,399	4.62%	
	Rocky Mountain Lower Montane-Foothill Shrubland	6,332	1.30%	
	Inter-Mountain Basins Semi-Desert Shrub-Steppe	1,862	0.38%	
	Rocky Mountain Alpine Dwarf-Shrubland	586	0.12%	
	Inter-Mountain Basins Big Sagebrush Steppe	551	0.11%	
	Inter-Mountain Basins Mixed Salt Desert Scrub	395	0.08%	
	Colorado Plateau Mixed Low Sagebrush Shrubland	41	0.01%	
	Wyoming Basins Dwarf Sagebrush Shrubland and Steppe	1	0.00%	
	Colorado Plateau Pinyon-Juniper Shrubland	<1	0.00%	
	Inter-Mountain Basins Greasewood Flat	<1	0.00%	
	Inter-Mountain Basins Mat Saltbush Shrubland	<1	0.00%	26.87%
Other	Sparsely Vegetated	18,580	3.83%	
	Riparian	7,691	1.58%	
	Developed	4,246	0.87%	
	Open Water	1,984	0.41%	
	Agricultural	46	0.01%	
	Quarries-Strip Mines-Gravel Pits-Well and Wind Pads	0	0.00%	6.71%
Hardwood	Rocky Mountain Aspen Forest and Woodland	22,737	4.69%	4.69%
Grassland	Southern Rocky Mountain Montane-Subalpine Grassland	3,968	0.82%	
	Rocky Mountain Subalpine-Montane Mesic Meadow	1,275	0.26%	
	Inter-Mountain Basins Semi-Desert Grassland	434	0.09%	
	Rocky Mountain Alpine Turf	99	0.02%	
	Rocky Mountain Alpine Fell-Field	75	0.02%	1.21%
Exotic Herbaceous	Interior Western North American Temperate Ruderal Grassland	861	0.18%	
	Great Basin & Intermountain Introduced Perennial Grassland and Forbland	504	0.10%	
	Great Basin & Intermountain Introduced Annual Grassland	502	0.10%	
	Great Basin & Intermountain Introduced Annual and Biennial Forbland	46	0.01%	0.39%
Exotic Tree-Shrub	Interior Western North American Temperate Ruderal Shrubland	483	0.10%	
	Great Basin & Intermountain Ruderal Shrubland	275	0.06%	0.16%
Total		**485,298**	**100%**	**100%**

Table 2.4: LANDFIRE Existing Vegetation Type (LC24_EVT_250, 2024) acreage of summer mule deer habitat for WMU 9B, 9C, Vernal/Bonanza, Diamond Mountain.

Group	Existing Vegetation Type for Winter Mule Deer Habitat	Acres	% of Total	Group % of Total
Shrubland	Inter-Mountain Basins Big Sagebrush Shrubland	78,477	23.61%	
	Inter-Mountain Basins Semi-Desert Shrub-Steppe	26,834	8.07%	
	Inter-Mountain Basins Mixed Salt Desert Scrub	23,123	6.96%	
	Inter-Mountain Basins Montane Sagebrush Steppe	22,425	6.75%	
	Colorado Plateau Mixed Low Sagebrush Shrubland	8,166	2.46%	
	Rocky Mountain Lower Montane-Foothill Shrubland	7,172	2.16%	
	Colorado Plateau Pinyon-Juniper Shrubland	2,009	0.60%	
	Inter-Mountain Basins Mat Saltbush Shrubland	1,200	0.36%	
	Inter-Mountain Basins Big Sagebrush Steppe	825	0.25%	
	Inter-Mountain Basins Greasewood Flat	597	0.18%	
	Wyoming Basins Dwarf Sagebrush Shrubland and Steppe	4	0.00%	
	Inter-Mountain Basins Curl-leaf Mountain Mahogany Shrubland	<1	0.00%	51.40%

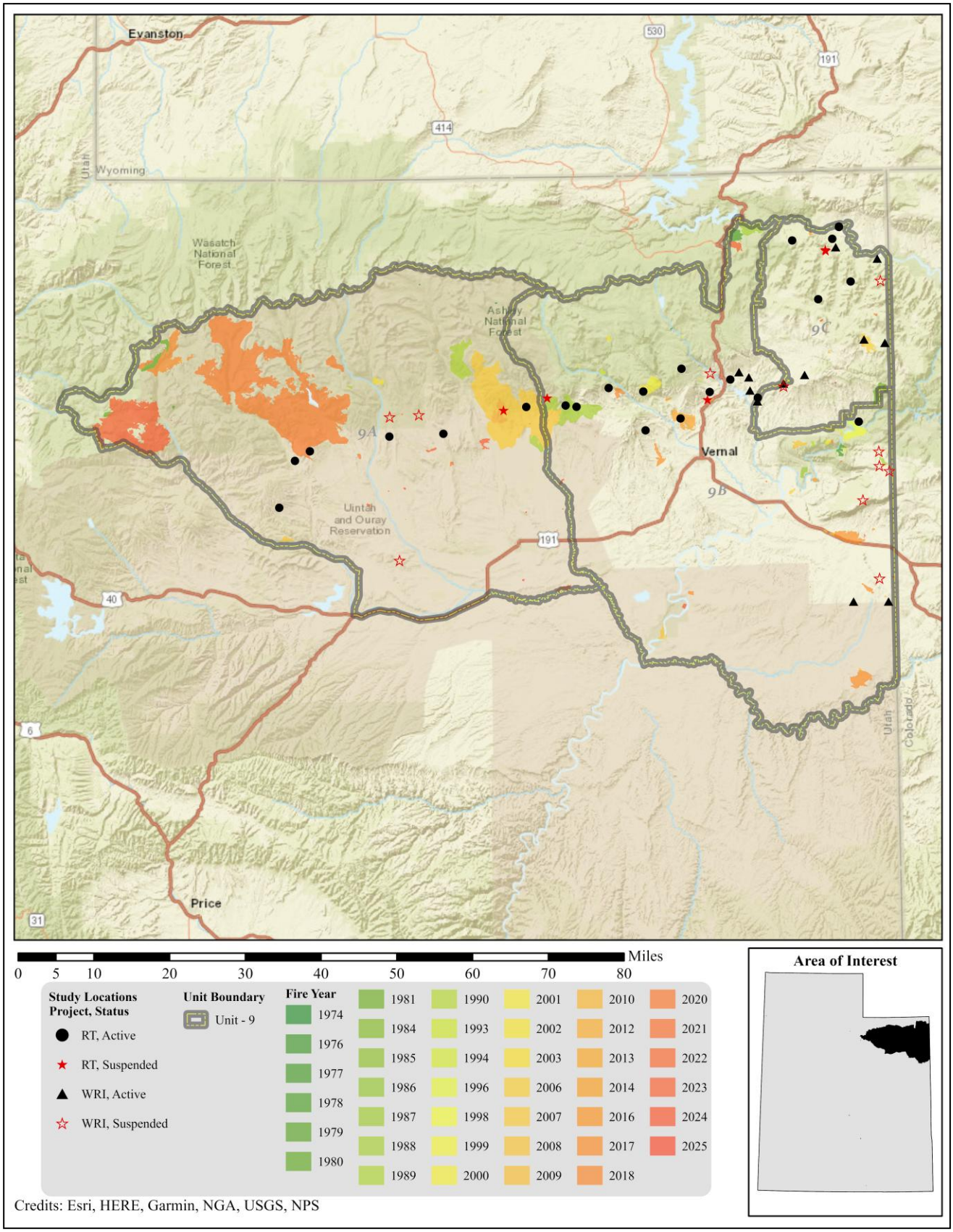
Group	Existing Vegetation Type for Winter Mule Deer Habitat	Acres	% of Total	Group % of Total
Conifer	Colorado Plateau Pinyon-Juniper Woodland	114,360	34.41%	
	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	3,033	0.91%	
	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	1,176	0.35%	
	Southern Rocky Mountain Ponderosa Pine Woodland	982	0.30%	
	Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland	444	0.13%	
	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	415	0.12%	
	Rocky Mountain Lodgepole Pine Forest	342	0.10%	
	Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland	310	0.09%	
	Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland	272	0.08%	
	Rocky Mountain Foothill Limber Pine-Juniper Woodland	269	0.08%	
	Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland	5	0.00%	36.59%
Other	Sparsely Vegetated	10,363	3.12%	
	Agricultural	3,569	1.07%	
	Developed	3,378	1.02%	
	Riparian	2,121	0.64%	
	Open Water	1,850	0.56%	
	Quarries-Strip Mines-Gravel Pits-Well and Wind Pads	415	0.12%	6.53%
Exotic Tree-Shrub	Great Basin & Intermountain Ruderal Shrubland	9,835	2.96%	
	Interior Western North American Temperate Ruderal Shrubland	461	0.14%	3.10%
Exotic Herbaceous	Great Basin & Intermountain Introduced Annual Grassland	3,124	0.94%	
	Great Basin & Intermountain Introduced Perennial Grassland and Forbland	603	0.18%	
	Interior Western North American Temperate Ruderal Grassland	427	0.13%	
	Great Basin & Intermountain Introduced Annual and Biennial Forbland	258	0.08%	1.33%
Grassland	Inter-Mountain Basins Semi-Desert Grassland	779	0.23%	
	Southern Rocky Mountain Montane-Subalpine Grassland	737	0.22%	
	Rocky Mountain Subalpine-Montane Mesic Meadow	266	0.08%	0.54%
Hardwood	Rocky Mountain Aspen Forest and Woodland	1,750	0.53%	0.53%
Total		**332374**	**100%**	**100%**

Table 2.5: LANDFIRE Existing Vegetation Type (LC24_EVT_250, 2024) acreage of winter mule deer habitat for WMU 9B, 9C, Vernal/Bonanza, Diamond Mountain.

Group	Existing Vegetation Type for Year-Long Mule Deer Habitat	Acres	% of Total	Group % of Total
Other	Agricultural	48,958	22.08%	
	Riparian	20,434	9.21%	
	Developed	15,759	7.11%	
	Open Water	10,958	4.94%	
	Sparsely Vegetated	7,659	3.45%	
	Quarries-Strip Mines-Gravel Pits-Well and Wind Pads	109	0.05%	46.84%
Shrubland	Inter-Mountain Basins Big Sagebrush Shrubland	24,893	11.22%	
	Inter-Mountain Basins Mixed Salt Desert Scrub	19,089	8.61%	
	Inter-Mountain Basins Semi-Desert Shrub-Steppe	6,511	2.94%	
	Inter-Mountain Basins Greasewood Flat	6,061	2.73%	
	Colorado Plateau Mixed Low Sagebrush Shrubland	5,896	2.66%	
	Inter-Mountain Basins Mat Saltbush Shrubland	1,319	0.59%	
	Rocky Mountain Lower Montane-Foothill Shrubland	1,024	0.46%	
	Inter-Mountain Basins Montane Sagebrush Steppe	751	0.34%	
	Colorado Plateau Pinyon-Juniper Shrubland	589	0.27%	
	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	32	0.01%	
	Colorado Plateau Blackbrush-Mormon-tea Shrubland	10	0.00%	
	Southern Colorado Plateau Sand Shrubland	1	0.00%	29.84%
Exotic Tree-Shrub	Great Basin & Intermountain Ruderal Shrubland	21,839	9.85%	
	Interior Western North American Temperate Ruderal Shrubland	587	0.26%	10.11%
Exotic Herbaceous	Great Basin & Intermountain Introduced Perennial Grassland and Forbland	5,836	2.63%	
	Great Basin & Intermountain Introduced Annual Grassland	5,103	2.30%	
	Interior Western North American Temperate Ruderal Grassland	2,525	1.14%	
	Great Basin & Intermountain Introduced Annual and Biennial Forbland	1,708	0.77%	6.84%
Conifer	Colorado Plateau Pinyon-Juniper Woodland	11,738	5.29%	
	Rocky Mountain Foothill Limber Pine-Juniper Woodland	70	0.03%	
	Southern Rocky Mountain Ponderosa Pine Woodland	64	0.03%	
	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	34	0.02%	
	Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland	26	0.01%	
	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	9	0.00%	
	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	0	0.00%	5.38%

Group	Existing Vegetation Type for Year-Long Mule Deer Habitat	Acres	% of Total	Group % of Total
Grassland	Inter-Mountain Basins Semi-Desert Grassland	693	0.31%	
	Southern Rocky Mountain Montane-Subalpine Grassland	511	0.23%	
	Rocky Mountain Subalpine-Montane Mesic Meadow	380	0.17%	0.71%
Hardwood	Rocky Mountain Aspen Forest and Woodland	596	0.27%	0.27%
Total		**221,772**	**100%**	**100%**

Table 2.6: LANDFIRE Existing Vegetation Type (LC24_EVT_250, 2024) acreage of year-long mule deer habitat for WMU 9B, 9C, Vernal/Bonanza, Diamond Mountain.



Map 2.8: Land coverage of fires by year from 1974-2025 for WMU 9, South Slope - Yellowstone, Vernal/Bonanza, Diamond Mountain (NIFC Open Data Site: Federal Interagency Wildland Fire Maps and Data for All, 2025; Geosciences and Environmental Change Science Center (GECSC) Outgoing Datasets, 2023).

Treatments/Restoration Work

Subunit 9A, Yellowstone

There has been an active effort to address many of the limitations on this subunit through the Watershed Restoration Initiative (WRI). A total of 35,368 acres of land have been treated within the Yellowstone subunit since the WRI was implemented in 2004 (**Map 2.9**) Treatments frequently overlap one another bringing the net total of completed treatment acres to 33,232 for this unit (**Table 2.7**). 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 subunit is seeding to augment the herbaceous understory, although vegetation removal by hand crew (lop and scatter, lop-pile-burn, etc.) targeting pinyon (*Pinus* spp.) and juniper (*Juniperus* spp.) trees is also common. Other management practices including (but not limited to) forestry practices, anchor chaining, and mastication to remove trees have all been used in this subunit (**Table 2.7**).

Type	Total Completed Acreage
Seeding (Primary)	**26,851**
Broadcast (Aerial-Fixed Wing)	26,766
Drill (Rangeland)	85
Vegetation Removal/Hand Crew	**7,670**
Lop & Scatter	5,960
Lop-Pile-Burn	1,262
Lop (No Scatter)	448
Forestry Practices	**412**
Thinning (Commercial)	412
Anchor Chain	**347**
Ely (Two-Way)	347
Bullhog	**67**
Skid Steer	46
Full Size	21
Harrow	**20**
≤ 15 ft. (One-Way)	20
Grand Total	**35,368**
***Net Total Land Area Treated**	**33,232**

Table 2.7: WRI treatment action size (acres) for completed projects for WMU 9A, Yellowstone. Data accessed on 01/26/2026.
*Does not include overlapping treatments.

Subunits 9B, 9C, Vernal/Bonanza, Diamond Mountain

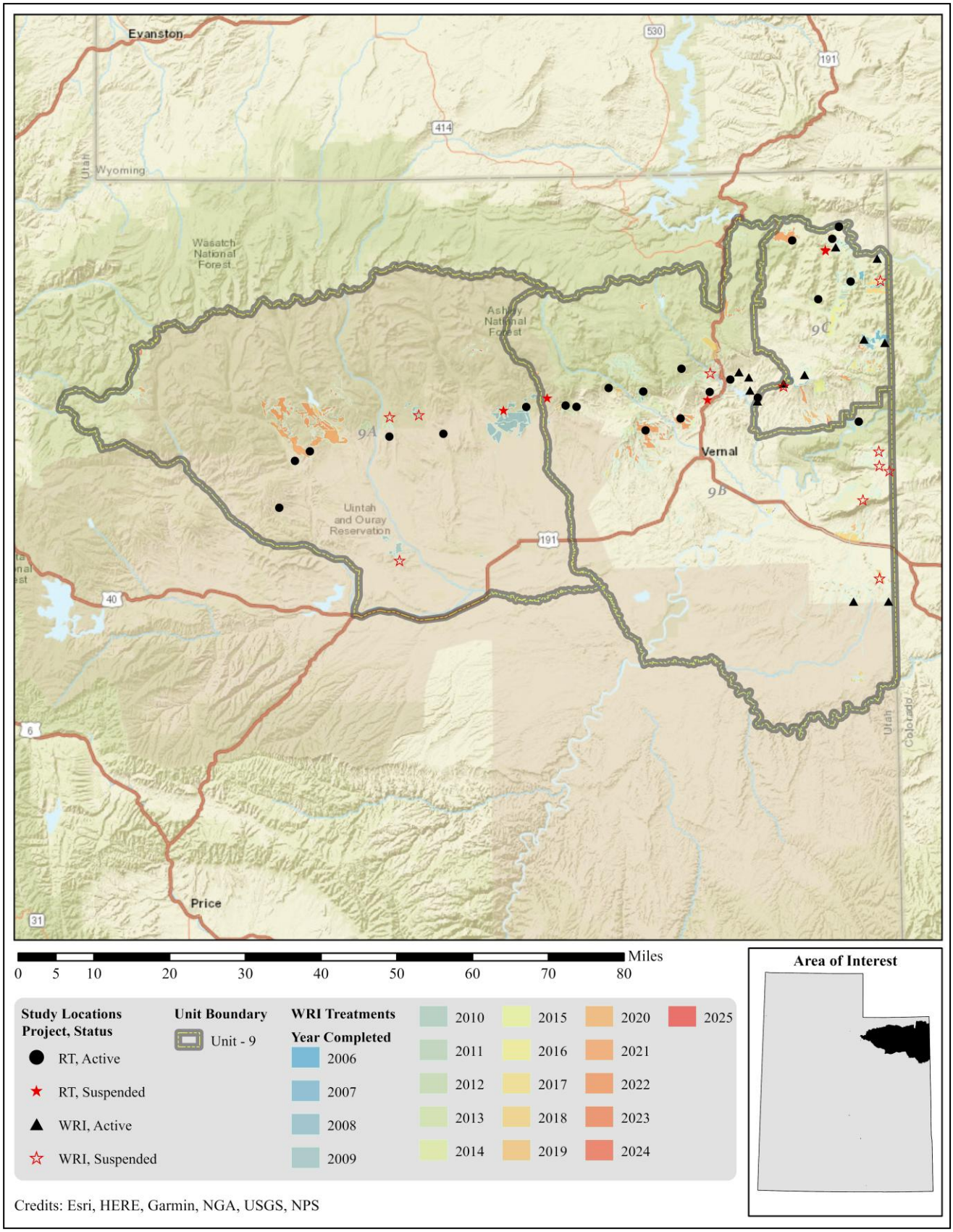
There has been an active effort to address many of the limitations on the Vernal/Bonanza, Diamond Mountain subunits through the Watershed Restoration Initiative (WRI). A total of 103,474 acres of land have been treated within the subunit since the WRI was implemented in 2004 (**Map 2.9**) Treatments frequently overlap one another bringing the net total of completed treatment acres to 71,040 for this unit (**Table 2.8**). 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 by acreage in this subunit is herbicide application to control undesirable vegetation. Vegetation removal by hand crew (lop and scatter, lop-pile-burn, etc.) targeting pinyon (*Pinus* spp.) and juniper (*Juniperus* spp.) trees is also frequently utilized. Other management practices including (but not limited to) seedings to augment the herbaceous understory, mastication treatments to remove trees, prescribed fire, and chain harrowing have all been used across the unit (**Table 2.8**).

Type	Total Completed Acreage
Herbicide Application	**37,709**
Aerial (Fixed-Wing)	21,394
Aerial (Helicopter)	10,211
Spot Treatment	5,770
Ground	334
Vegetation Removal/Hand Crew	**31,481**
Lop & Scatter	30,503
Lop-Pile-Burn	872
Cut Stump	96
Lop (No Scatter)	10
Seeding (Primary)	**8,057**
Broadcast (Aerial-Fixed Wing)	5,752
Drill (Rangeland)	1,267
Ground (Mechanical Application)	793
Drill (Truax)	200
Hand Seeding	46
Bullhog	**6,714**
Full Size	6,592
Skid Steer	122
Chain Harrow	**3,853**
> 15 ft. (One-Way)	2,192
> 15 ft. (Two-Way)	1,481
≤ 15 ft. (Two-Way)	180
Prescribed Fire	**3,419**
Prescribed Fire	3,028
Pile Burn	391
Harrow	**2,167**
> 15 ft. (One-Way)	1,127
≤ 15 ft. (One-Way)	545
≤ 15 ft. (Two-Way)	435
> 15 ft. (Two-Way)	59
Seeding (Secondary/Shrub)	**2,099**
Broadcast (Aerial-Fixed Wing)	2,099
Anchor Chain	**1,968**
Ely (One-Way)	1,455
Ely (Two-Way)	513
Forestry Practices	**1,962**
Thinning (Non-Commercial)	1,119
Group Selection Cuts	474
Thinning (Commercial)	297
Clearcutting	72
Mowing	**1,789**
Brush Hog	1,724
Other	65
Aerator	**1,710**
Double Drum (Two-Way)	1,680
Double Drum (One-Way)	30
Other	**347**
Road/Parking Area Improvements	347

Type	Total Completed Acreage
Planting/Transplanting	**97**
Container Stock	93
Bareroot Stock	4
Disc	**54**
Off-Set (Two-Way)	54
Grazing Management/Changes	**41**
Grazing Management/Changes	41
Bulldozing	**4**
Other	4
Grand Total	**103,474**
***Net Total Land Area Treated**	**71,040**

Table 2.8: WRI treatment action size (acres) for completed projects for WMU 9B, 9C, Vernal/Bonanza, Diamond Mountain. Data accessed on 01/26/2026.
*Does not include overlapping treatments.



Map 2.9: Terrestrial WRI treatments by fiscal year completed for WMU 9, South Slope - Yellowstone, Vernal/Bonanza, Diamond Mountain.

Range Trend Studies

Range Trend studies have been sampled within WMU 9 on a regular basis since 1982, with studies being added or suspended as was deemed necessary (**Table 2.9**). 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 2.10**). Range Trend studies are summarized in this report by ecological site.

Study #	Study Name	Project	Status	Years Sampled	Ecological Site Description
09-01	Red Mountain Allotment	RT	Active	1982, 1988, 1995, 2000, 2005, 2010, 2015, 2020, 2025	Semidesert Loam (Wyoming Big Sagebrush)
09-02	Taylor Mountain	RT	Active	1982, 1988, 1995, 2000, 2005, 2010, 2015, 2020, 2025	Mountain Loam (Mountain Big Sagebrush)
09-03	Dry Fork Mountain	RT	Active	1982, 1988, 1995, 2000, 2010, 2015, 2020, 2025	Mountain Stony Loam (Mountain Big Sagebrush)
09-04	Sawtooth-Flat Spring	RT	Active	1982, 1988, 1995, 2000, 2005, 2010, 2015, 2020, 2025	Mountain Gravelly Loam (Mountain Big Sagebrush)
09-05	Island Park	RT	Active	1982, 1988, 1995, 2000, 2005, 2010, 2015, 2020, 2025	Semidesert Loam (Wyoming Big Sagebrush)
09-06	Above Steinaker Draw	RT	Active	1988, 1995, 2000, 2005, 2015, 2020, 2025	Semidesert Shallow Loam (Wyoming Big Sagebrush)
09-07	Warren Draw	RT	Active	1982, 1988, 1995, 2000, 2005, 2010, 2015, 2020, 2025	Mountain Loam (Mountain Big Sagebrush)
09-08	Rye Grass	RT	Active	1988, 1995, 2000, 2015, 2020, 2025	Mountain Loam (Mountain Big Sagebrush)
09-09	Little Hole	RT	Active	1982, 1988, 1995, 2000, 2005, 2010, 2015, 2020, 2025	Mountain Loam (Mountain Big Sagebrush)
09-10	Toliver Creek Chaining	RT	Active	1988, 1995, 2000, 2005, 2010, 2015, 2020, 2025	Semidesert Stony Loam (Wyoming Big Sagebrush)
09-11	Toliver Creek PJ	RT	Suspended	1988, 1995, 2000	Upland Stony Loam (Pinyon-Utah Juniper)
09-12	Browns Park Burn & PJ	RT	Suspended	1988, 1995, 2000	Upland Stony Loam (Pinyon-Utah Juniper)
09-13	John Star Flat	RT	Active	1982, 1988, 1995, 2000, 2005, 2010, 2020, 2025	Mountain Stony Loam (Browse)
09-14	Red Pine Canyon	RT	Suspended	1982, 1988, 1995, 2000	Mountain Stony Loam (Mountain Big Sagebrush)
09-15	Mud Springs Draw	RT	Active	1982, 1988, 1995, 2005, 2010, 2015, 2020, 2025	Mountain Stony Loam (Browse)
09-16	Mosby Mountain	RT	Active	1982, 1988, 1995, 2000, 2005, 2010, 2015, 2020, 2025	Mountain Stony Loam (Browse)
09-17	Farm Creek	RT	Active	1995, 2000, 2005, 2010, 2015, 2020, 2025	Mountain Stony Loam (Mountain Big Sagebrush)
09-18	Gooseberry Spring	RT	Active	1982, 1988, 1995, 2000, 2005, 2010, 2015, 2025	Mountain Stony Loam (Browse)
09-19	Mosby Mountain South	RT	Active	1988, 1995, 2000, 2005, 2010, 2015, 2020, 2025	Mountain Stony Loam (Browse)
09-20	Seep Hollow	RT	Active	1982, 1988, 1995, 2000, 2005, 2010, 2015	Mountain Stony Loam (Browse)

Study #	Study Name	Project	Status	Years Sampled	Ecological Site Description
09-21	Browns Park River Corridor-Livestock	RT	Active	2000, 2005, 2010, 2015, 2020, 2025	Semidesert Loam (Wyoming Big Sagebrush)
09-22	Browns Park River Corridor-Wildlife	RT	Active	2000, 2005, 2010, 2015, 2020, 2025	Semidesert Loam (Wyoming Big Sagebrush)
09-23	Rock Creek	RT	Active	2005, 2010, 2015, 2020, 2025	Mountain Loam (Mountain Big Sagebrush)
09-24	Brush Creek Substation	RT	Active	1997, 2005, 2010, 2015, 2021, 2025	Semidesert Loam (Wyoming Big Sagebrush)
09-25	Buckhorn Canyon	RT	Active	2001, 2005, 2009, 2010, 2015, 2020, 2025	Semidesert Loam (Wyoming Big Sagebrush)
09-26	Cart Hollow	RT	Suspended	-	Not Verified
09-27	Little Mountain	RT	Active	2015, 2020, 2025	Upland Shallow Loam (Black Sagebrush)
09-28	Steinaker	RT	Suspended	-	Not Verified
09R-03	Deadman Greenstrip	WRI	Active	2004, 2007, 2011, 2015, 2019, 2024	Semidesert Loam (Wyoming Big Sagebrush)
09R-04	Diamond Mountain Bullhog	WRI	Active	2004, 2007, 2009, 2010, 2012, 2016, 2020, 2025	Upland Shallow Loam (Black Sagebrush)
09R-05	Little Donkey	WRI	Active	2004, 2007, 2012, 2016, 2020, 2025	Semidesert Loam (Wyoming Big Sagebrush)
09R-06	North Little Donkey	WRI	Active	2004, 2007, 2012, 2016, 2020, 2025	Semidesert Loam (Wyoming Big Sagebrush)
09R-07	Red Fleet Lop and Scatter	WRI	Active	2004, 2007, 2012, 2016, 2020, 2025	Upland Shallow Loam (Black Sagebrush)
09R-08	Marshall Draw	WRI	Suspended	2005	Not Verified
09R-09	Snake John Lop and Scatter	WRI	Suspended	2005, 2008	Not Verified
09R-10	Ruple Cabin	WRI	Active	2005, 2008, 2013, 2018, 2023	Mountain Loam (Mountain Big Sagebrush)
09R-11	Blue Mtn Burn	WRI	Suspended	2006	Not Verified
09R-12	West Stuntz	WRI	Active	2006, 2010, 2013, 2017	Mountain Loam (Mountain Big Sagebrush)
09R-13	Chew Dixie	WRI	Suspended	2006, 2009, 2010	Not Verified
09R-14	Pot Creek Chaining	WRI	Active	2007, 2011, 2014, 2017, 2020, 2025	Mountain Loam (Mountain Big Sagebrush)
09R-15	Brush Creek Dixie	WRI	Active	2007, 2009, 2010, 2012, 2016, 2020, 2025	Semidesert Loam (Wyoming Big Sagebrush)
09R-16	Brown's Field	WRI	Active	2008, 2011, 2014, 2018, 2023	Upland Loam (Mountain Big Sagebrush)
09R-17	Toliver Creek Bullhog	WRI	Active	2008, 2011, 2014, 2018, 2023	Upland Loam (Mountain Big Sagebrush)
09R-18	Brotherson Chaining	WRI	Active	2008, 2011, 2015, 2018	Upland Loam (Wyoming Big Sagebrush)
09R-19	Diamond Rim Reference	WRI	Suspended	2009	Not Verified
09R-21	Chew Reference	WRI	Suspended	2009	Not Verified
09R-22	North Dry Gulch Ponderosa Thinning	WRI	Active	2009, 2013, 2017	Mountain Gravelly Loam (Ponderosa Pine)
09R-23	North Dry Gulch Reference	WRI	Suspended	2009	Not Verified
09R-24	Raven Ridge	WRI	Active	2011, 2014, 2019, 2025	Semidesert Loam (Wyoming Big Sagebrush)

Study #	Study Name	Project	Status	Years Sampled	Ecological Site Description
09R-25	Davis Draw Sagebrush	WRI	Active	2012, 2015, 2019, 2025	Mountain Loam (Mountain Big Sagebrush)
09R-26	Simplot	WRI	Suspended	2013, 2017	Upland Shallow Loam (Black Sagebrush)

Table 2.9: Range Trend and WRI project studies monitoring history and ecological site potential for WMU 9, South Slope - Yellowstone, Vernal/Bonanza, Diamond Mountain.

Study #	Study Name	Type	Disturbance Name (If Available)	Date	Acres	WRI Project #
09-01	Red Mountain Allotment	Lop and Scatter	Steinaker Draw PJ (CCI)	September 2005	266	28
		Wildfire	Taylor Mountain Road	July 2014	3,147	
		One-Way Smooth	Taylor Mountain Fire Rehabilitation	Fall 2014	1,100	3182
		Rangeland Drill	Taylor Mountain Fire Rehabilitation	October 2014	2,000	3182
		Aerial After	Taylor Mountain Fire--BLM ESR Supplement	December 2014	2,019	3207
09-03	Dry Fork Mountain	Wildfire	Dry Fork	July 2005	517	
09-05	Island Park	Wildfire	Island Park	2010	20	
09-09	Little Hole	Lop and Scatter	Little Hole II Slashing Project	Summer-Fall 2007	333	6755*
		Lop and Scatter	Little Davenport Slashing/Lop and Scatter	Fall 2017	946	3782
		Herbicide	Richard Mtn. and Little Davenport	September 2020	8513	5107
09-10	Toliver Creek Chaining	Two-Way Chain Unknown	Browns Park Trial Reseeding	Fall 1962-Winter 1963	300	1528*
		Aerial After	Browns Park Trial Reseeding	Fall 1962-Winter 1963	300	1528*
		Two-Way Chain Unknown		Fall 1986		
		Seed Unknown		Fall 1986		
		Lop and Scatter	Taylor Flat P/J Removal	August 2005	1,040	10
		Lop and Scatter	Diamond Mountain Maintenance Project	Fall 2020	2,916	5105
09-12	Browns Park Burn & PJ	Prescribed Fire	Spitzenberg Prescribed Burn	Fall 1986	212	11016*
		Aerial After	Spitzenberg Prescribed Burn	Fall 1986	212	11016*
09-16	Mosby Mountain	Wildfire	Lil Water	1988	600	
		Aerial Broadcast	South Slope Vegetation Restoration Phase 2	October 2019	667	4856
09-17	Farm Creek	Wildfire	Neola North	Summer 2007	43,806	
09-19	Mosby Mountain South	Wildfire	Whiterocks	September 1988	16,600	
		Aerial After	Whiterocks Fire Rehabilitation	Fall 1988-Spring 1989	1,160	
09-24	Brush Creek Substation	Imazapic	Brush Creek Bench Sage Restoration	September 2008	279	315
		Broadcast Before	Brush Creek Bench Sage Restoration	December 2008	279	315
		One-Way Dixie	Brush Creek Bench Sage Restoration	December 2008	279	315
		Aerial After	Brush Creek Bench Sage Restoration	March 2009	279	315
		Rangeland Drill	Brush Creek Bench Seeding	October 2010	408	1659
09-25	Buckhorn Canyon	Lop and Scatter	Brush Creek Juniper Removal	November 2004	1,100	1547*
		Lop and Scatter	Red Fleet Maintenance	September-October 2012	317	2273
09-27	Little Mountain	Two-Way Chain Unknown	Coalmine Basin Seeding	Fall 1965-Winter 1966	1,700	2547*
		Aerial After	Coalmine Basin Seeding	Fall 1965-Winter 1966	1,700	2547*
		Hand Planter	Coalmine Basin Seeding	Fall 1965-Winter 1966	1,700	2547*
		Lop and Scatter	Dry Fork Hazardous Fuel Project Phase II	August-September 2013	1,842	2789
		Lop and Scatter		Between 2020 and 2025		
		Imazapic	2021-GRD-Herbicide Treatment – Coalmine Basin, Cottonwood	August 2021	7,697	5721

Study #	Study Name	Type	Disturbance Name (If Available)	Date	Acres	WRI Project #
09R-03	Deadman Greenstrip	Single Drum/Seed	Deadman Greenstrip	September-November 2004	500	3154*
		Broadcast	Deadman Greenstrip	Fall 2004	500	3154*
		Imazapic	Deadman Bench Range Improvement	September 2008	523	1081
		Rangeland Drill	Deadman Bench Range Improvement	November-December 2008	523	1081
		Imazapic	Deadman Bench follow-up herbicide	September 2012	1,003	2202
		Imazapic	Green River District Herbicide Treatments 2019	August 2019	7,101	5000
09R-04	Diamond Mountain Bullhog	Aerial Before	Diamond Rim	September 2004	320	PDB
		Bullhog	Diamond Rim	September 2004	320	PDB
		Aerial After	Diamond Rim	November 2004	320	PDB
		Lop and Scatter	Diamond Mountain Maintenance Project	August-October 2020	2,903	5105
09R-05	Little Donkey	Drill	Vernal Cattle Unit Reseeding 1953	September-November 1953	765	12308*
		Roundup	Red Fleet	October 2004		PDB
		Truax Drill	Red Fleet	November 2004	470	PDB
09R-06	North Little Donkey	Plow	Brush Creek Flat Reseeding 1963	September-December 1963	400	1546*
		Chaining Unknown	Brush Creek Flat Reseeding 1963	September-December 1963	851	1546*
		Aerial Seeding	Brush Creek Flat Reseeding 1963	September-December 1963	851	1546*
		Truax Drill	Red Fleet	Fall 2004	470	PDB
09R-07	Red Fleet Lop and Scatter	Two-Way Unknown	Red Flat Reseeding 1964	July 1964-October 1965	1,764	9405*
		Hand Planter	Red Flat Reseeding 1964	July 1964-October 1965	1,764	9405*
		Lop and Scatter	Red Fleet Lop and Scatter	Fall 2004		PDB
		Lop and Scatter	Red Fleet Phase II/Maintenance	Fall 2012	300	2273
		Lop and Scatter	Diamond Mountain Maintenance Project	August-October 2020	2,903	5105
09R-10	Ruple Cabin	Double Drum	Ruple Vegetation Treatment	Fall 2005	1,680	178
		Aerial Before Tebuthiuron	Ruple Vegetation Treatment	Fall 2005 Between 2008 and 2013	1,680	178
09R-12	West Stuntz	Two-Way Dixie	West Stuntz	Fall 2006	199	357
		Broadcast Before	West Stuntz	Fall 2006	199	357
09R-13	Chew Dixie	Two-Way Dixie	Chew - Blue Mountain Sage Grouse Enhancement	October 2006	236	316
		Broadcast Before	Chew - Blue Mountain Sage Grouse Enhancement	October 2006	236	316
09R-14	Pot Creek Chaining	Prescribed	Ruple Cabin Prescribed fire and Spray 1989	1989	1,281	9883*
		Herbicide Unknown	Ruple Cabin Prescribed fire and Spray 1989	May-June 1989	2,079	9883*
		One-Way Ely	Ruple Cabin Wildfire Rehabilitation	September 2006	1,208	608
		Aerial Before	Ruple Cabin Wildfire Rehabilitation	September 2006	1,208	608
		Dribbler	Ruple Cabin Wildfire Rehabilitation	September 2006	1,208	608
		Aerial After	Ruple Cabin Wildfire Rehabilitation	December 2006	1,208	608
		Wildfire	Pot Hole	June-July 2006	1,396	
09R-15	Brush Creek Dixie	Plateau	Brush Creek Bench Sage Restoration	September 2008	280	315
		One-Way Dixie	Brush Creek Bench Sage Restoration	September 2008	280	315
		Broadcast Before	Brush Creek Bench Sage Restoration	December 2008	280	315
		Aerial After	Brush Creek Bench Sage Restoration	March 2009	280	315
		Rangeland Drill	Brush Creek Bench Seeding	October 2010	400	1659
		Aerial After	Brush Creek Bench Seeding	November 2010	400	1659
09R-16	Brown's Field	Truax Drill	Browns Park Ag Field Rehabilitation	December 2006	200	26
		Plateau	Brown's Park Fields	Fall 2008	143	1152
		Rangeland Drill	Brown's Park Fields	January 2009	143	1152
09R-17	Toliver Creek Bullhog	Aerial Before	Toliver's Creek Bullhog	October 2008	195	1084
		Bullhog	Toliver's Creek Bullhog	Fall 2008	195	1084
		Lop and Scatter	Diamond Mountain Maintenance Project	Fall 2020	2,916	5105
09R-18	Brotherson Chaining	Aerial Before	Brotherson Chaining	November 2008	347	1150
		Two-Way Ely	Brotherson Chaining	November 2008	347	1150
		Aerial After	Brotherson Chaining	December 2008	237	1150

Study #	Study Name	Type	Disturbance Name (If Available)	Date	Acres	WRI Project #
09R-22	North Dry Gulch Ponderosa Thinning	Lop (No Scatter)	North Dry Gulch Ponderosa Pine Thinning Project	September 2010	448	1495
09R-23	North Dry Gulch Reference	Lop (No Scatter)	Burnt Mill Spring Ponderosa Pine Thinning Project	September 2013	590	2282
09R-24	Raven Ridge	Plateau	Raven Ridge Harrow Project	September 2011	500	1989
		Broadcast Before	Raven Ridge Harrow Project	September-October 2011	500	1989
		One-Way Chain	Raven Ridge Harrow Project	September-October 2011	500	1989
		Plateau	Green River District Herbicide Treatments 2019	August 2019	7,102	5000
09R-25	Davis Draw Sagebrush	Two-Way Chain	Davis Draw Sagebrush	September 2012	424	2266
09R-26	Simplot	Strip Mine		Historic		

Table 2.10: Range Trend and WRI studies known disturbance history for WMU 9, South Slope - Yellowstone, Vernal/Bonanza, Diamond Mountain. 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)

Subunit 9A, Yellowstone

Mountain (Big Sagebrush)

There are three studies [Red Pine Canyon (09-14) (suspended), Farm Creek (09-17), and Rock Creek (09-23)] that are classified as Mountain (Big Sagebrush) ecological sites. The Red Pine Canyon study is located on the lower slopes above Red Pine Canyon, which branches off of Whiterocks Canyon. The Farm Creek site is found on the southern slope of the Uinta Mountains adjacent to Farm Creek, while the Rock Creek study is located near Rock Creek and across from Dick Hollow.

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 Red Pine Canyon study only provided data in 1995 and 2000, while Farm Creek has a dataset spanning the entire reported sample period. The Rock Creek study has contributed data since the 2005 sample year.

Shrubs/Trees: Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has dominated these study sites, although antelope bitterbrush (*Purshia tridentata*) has been co-dominant on the Farm Creek study following a fire in 2007. Total shrub cover has decreased overall, with the initial decrease between 2005 and 2010 being largely driven by the burn on the Farm Creek site (**Figure 2.9**). Average preferred browse demographics show that density has exhibited an overall decrease. The decrease in preferred browse density between 2000 and 2005 was largely driven by the suspension of the Red Pine Canyon study, and the decrease between 2005 and 2010 can be attributed to the Farm Creek study. Mature plants have been the dominant age class in these browse populations throughout the sample period, and decadence has exhibited a total decrease between 2005 and 2025. Recruitment of young plants has slightly increased overall, with the trend between the two most recent sample years being entirely driven by the Rock Creek study (**Figure 2.13**). Average preferred browse utilization has fluctuated from year to year. However, utilization has decreased slightly since 2005 (the number of study sites sampled has remained consistent over this time period). More than 50% of preferred browse plants sampled in density strips between 2005 and 2020 were moderately or heavily hedged. Utilization decreased in 2025, however, when 28% of plants were moderately browsed and 16% were heavily hedged (**Figure 2.14**).

Utah juniper (*Juniperus osteosperma*) and/or twoneedle pinyon (*Pinus edulis*) have been observed on all three study sites. Average tree cover and density remain low as of 2025, but both measurements have increased

overall since 2005. These cover and density trends can be attributed to the Rock Creek study, as trees have not been observed in line-intercept cover or point-quarter density data on the Farm Creek site (**Figure 2.11**, **Figure 2.12**).

Herbaceous Understory: The herbaceous understories of the active study sites have been mainly dominated by perennial grasses, namely the introduced species crested wheatgrass (*Agropyron cristatum*) and bulbous bluegrass (*Poa bulbosa*) on the Farm Creek study and the native species needle and thread (*Hesperostipa comata*) on Rock Creek. The introduced annual grass species cheatgrass (*Bromus tectorum*) provided moderate cover on the Red Pine Canyon study in 1995 and 2000, but the site was suspended after the 2000 sample year. Total average cover and frequency of the herbaceous understories have fluctuated from year to year. When comparing data between the 2005 and 2025 sample years, however, total herbaceous cover has increased while nested frequency has decreased. Cheatgrass has provided comparatively low cover on both active study sites. Both annual and perennial forbs were moderately abundant in 2015, but average cover and frequency of these lifeforms have decreased in subsequent sample years (**Figure 2.15**, **Figure 2.16**).

Occupancy: According to average pellet group data, animal presence on these sites has exhibited yearly fluctuations, but deer have been the primary occupants throughout the reported sample period. Mean abundance of deer pellet groups has ranged from 25 days use/acre in 2010 to 52 days use/acre in 2020. Elk pellet groups have had an average abundance as low as 4 days use/acre in 2010 and as high as 12 days use/acre in 2005. Finally, mean abundance of cattle pellet groups has fluctuated between 0 days use/acre in 2015 and 23 days use/acre in 2025 (**Figure 2.17**).

Mountain (Browse)

There are four studies [John Star Flat (09-13), Mud Springs Draw (09-15), Gooseberry Spring (09-18), and Seep Hollow (09-20)] that are classified as Mountain (Browse) ecological sites. The John Star Flat site is located in an alcove just below Tower Ridge on John Starr Flat. The Mud Springs Draw site is found in the northern portion of Mud Springs Draw. Gooseberry Spring is located on the southern slope of Dry Ridge near the Gooseberry and Pigeon Water Springs. Finally, the Seep Hollow study site is found on the southern slope of Dry Mountain in Dry Mountain Hollow.

When discussing 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. The John Star Flat study provided data in all reported sample years except 2015. Mud Springs Draw and Gooseberry Spring have also contributed data in most sample years save for 2000 and 2020, respectively. Finally, Seep Hollow provided data from 1995 through 2015.

Shrubs/Trees: A mixture of preferred browse species such as alderleaf mountain mahogany (*Cercocarpus montanus*), Utah serviceberry (*Amelanchier utahensis*), and/or mountain snowberry (*Symphoricarpos oreophilus*) have dominated these sites throughout the sample period. A number of additional preferred browse species have also been present, but generally to a lesser extent. Total average shrub cover has slightly decreased since 2005, with most of the cover being contributed by serviceberry-mahogany and preferred browse species other than serviceberry-mahogany (**Figure 2.10**). Average preferred browse demographic data shows that density has fluctuated from year to year, but it has remained similar when comparing data from 1995 with that from 2025. Mature plants have comprised most of the browse populations on these sites throughout the reported sample period. Decadence in these browse populations has remained low in comparison with mature individuals. However, average decadence increased between 2020 and 2025, a trend driven by increases of decadent individuals on all sites sampled during the most recent sample year. Recruitment of young preferred browse plants has also remained comparatively low and has decreased since 2010. The number of study sites sampled each year has fluctuated over this timeframe, but site-level data reveals that the overall decrease in recruitment of young since 2010 has been observed on all study sites sampled in 2025 (**Figure 2.13**). Average utilization of preferred browse has also exhibited yearly variation, but it has increased overall since 2000. In 2025 specifically, nearly 34% of preferred browse plants sampled in density strips were moderately used and 25% were heavily hedged (**Figure 2.14**).

Utah juniper (*Juniperus osteosperma*) and/or twoneedle pinyon (*Pinus edulis*) have contributed cover each sample year since 2005. Tree cover has exhibited an overall increase, but it remains low as of 2025. Site-level data indicates that trees have only provided line-intercept cover and point-quarter density data on the Seep Hollow and John Star Flat studies. The Seep Hollow study was last sampled in 2015, leaving John Star Flat to provide all tree data in 2020 and 2025. Average tree cover and density appear to have decreased slightly between the two most recent sample years. However, these trends are likely due to the inclusion of the Gooseberry Spring study (which has no tree data) in 2025; only Mud Springs Draw and John Star Flat provided data in 2020 (**Figure 2.11**, **Figure 2.12**).

Herbaceous Understory: Average total cover of the herbaceous understories on these sites has remained similar when comparing 1995 data with that from 2025, but cover has varied between sample years and has decreased since 2015. Average nested frequency has generally decreased over the sample period despite yearly fluctuations. The herbaceous understories of these sites have been dominated by mainly native perennial grasses – common species as of 2025 include bluebunch wheatgrass (*Pseudoroegneria spicata*) and needle and thread (*Hesperostipa comata*), among others. Perennial forbs have been observed with moderate cover and abundance throughout the reported sample period. Annual forbs have, on average, contributed less cover than their perennial counterparts. The introduced annual grass species cheatgrass (*Bromus tectorum*) contributed moderate cover on the John Star Flat site in 2020, but on average, annual grasses have remained relatively rare otherwise (**Figure 2.15**, **Figure 2.16**).

Occupancy: Average animal presence has fluctuated from year to year. Deer were the primary occupants in 2000 and 2020, and mean abundance of deer pellet groups has ranged from 23 days use/acre in 2015 to nearly 46 days use/acre in 2005. Elk have been the primary occupants in all other sample years reported, and average pellet group abundance has fluctuated between 27.5 days use/acre in 2000 and 50 days use/acre in 2005. Finally, mean abundance of cattle pellet groups has been as low as 1 days use/acre in 2020 and as high as 4 days use/acre in 2010 (**Figure 2.17**).

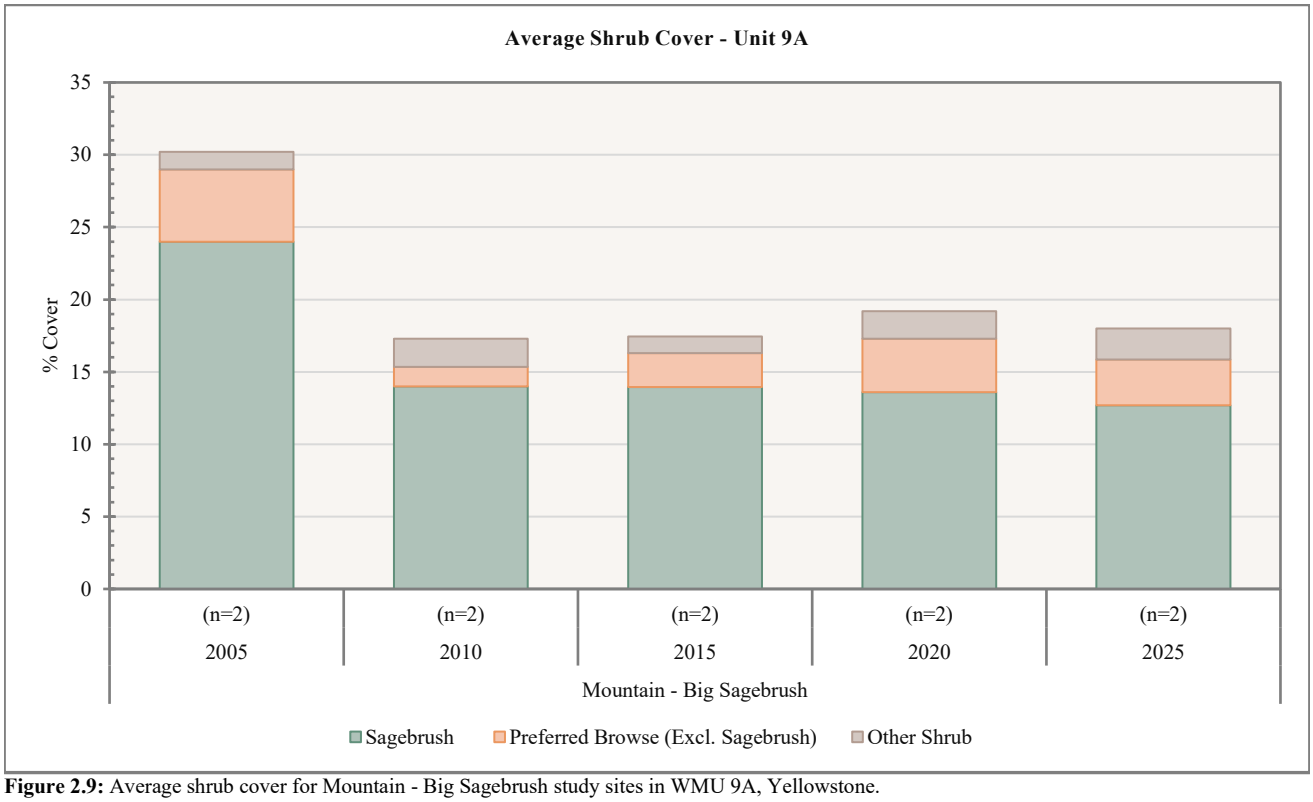


Figure 2.9: Average shrub cover for Mountain - Big Sagebrush study sites in WMU 9A, Yellowstone.

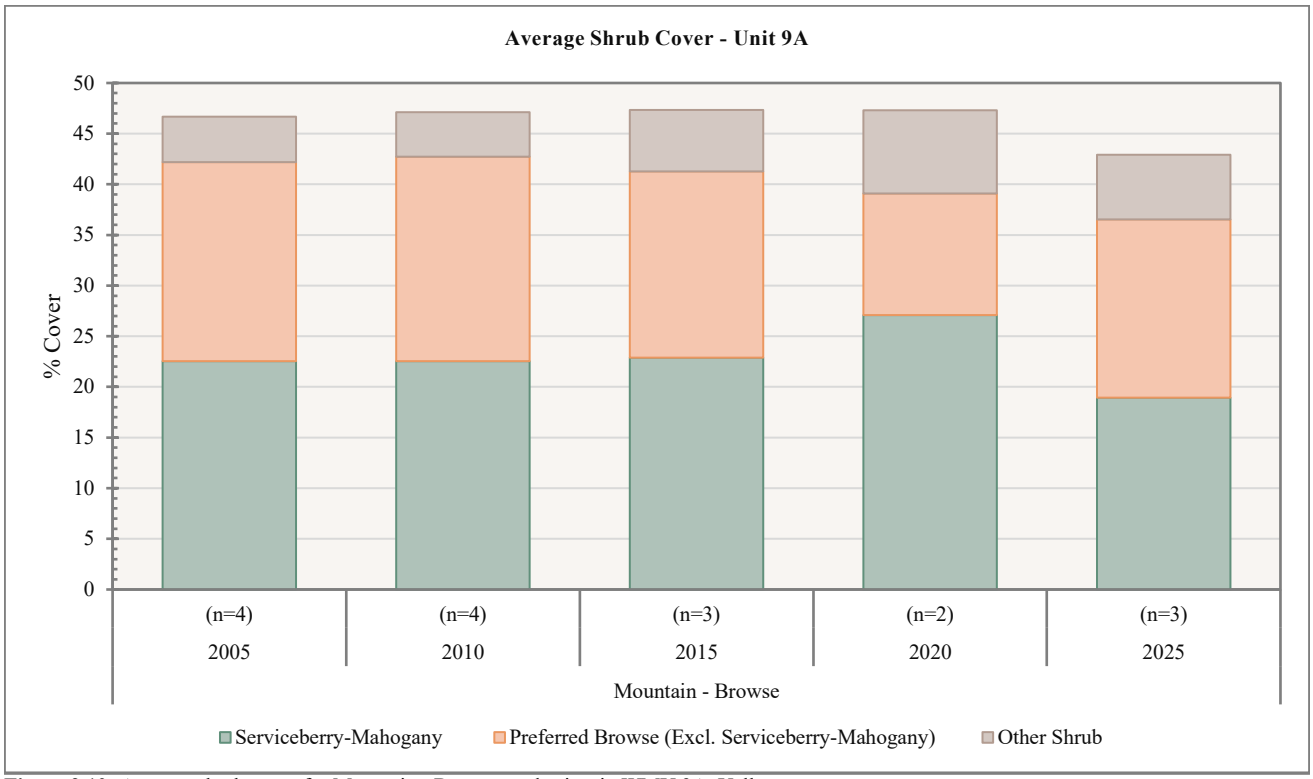


Figure 2.10: Average shrub cover for Mountain - Browse study sites in WMU 9A, Yellowstone.

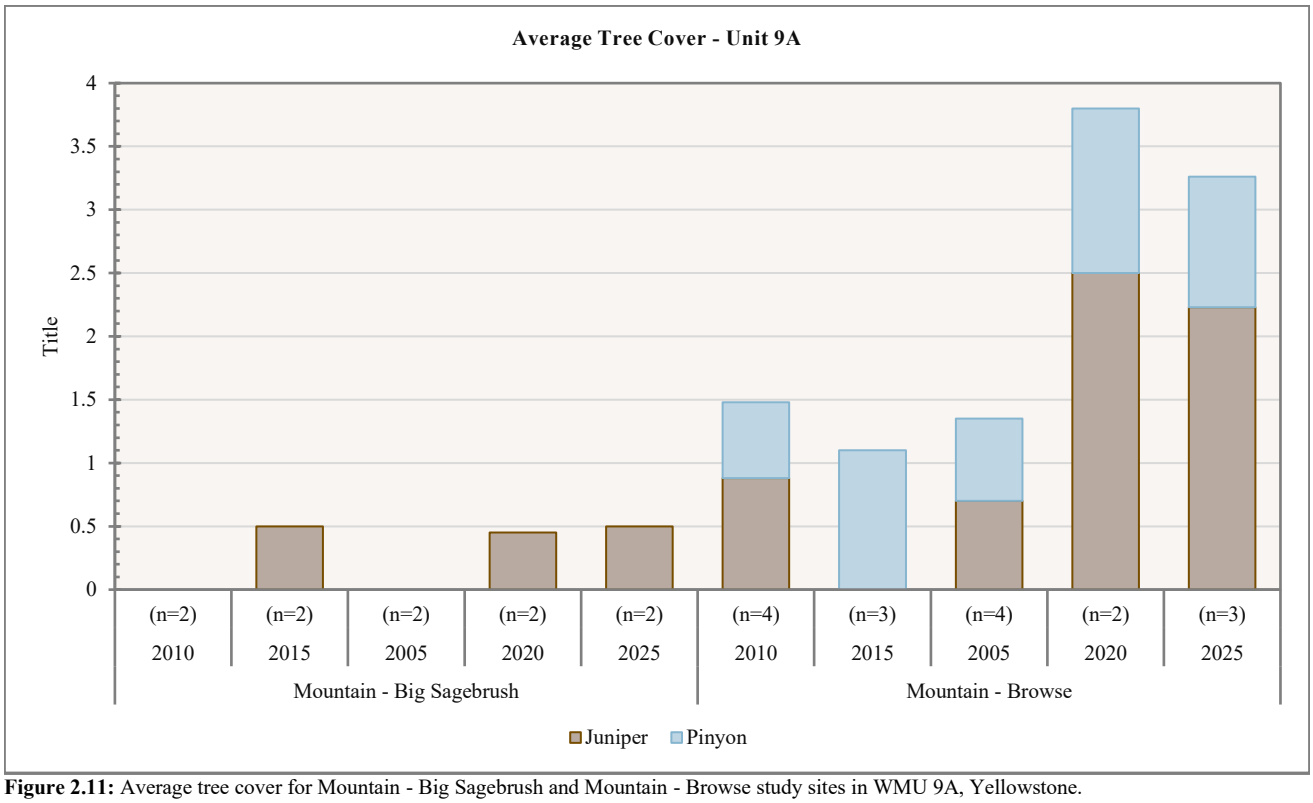


Figure 2.11: Average tree cover for Mountain - Big Sagebrush and Mountain - Browse study sites in WMU 9A, Yellowstone.

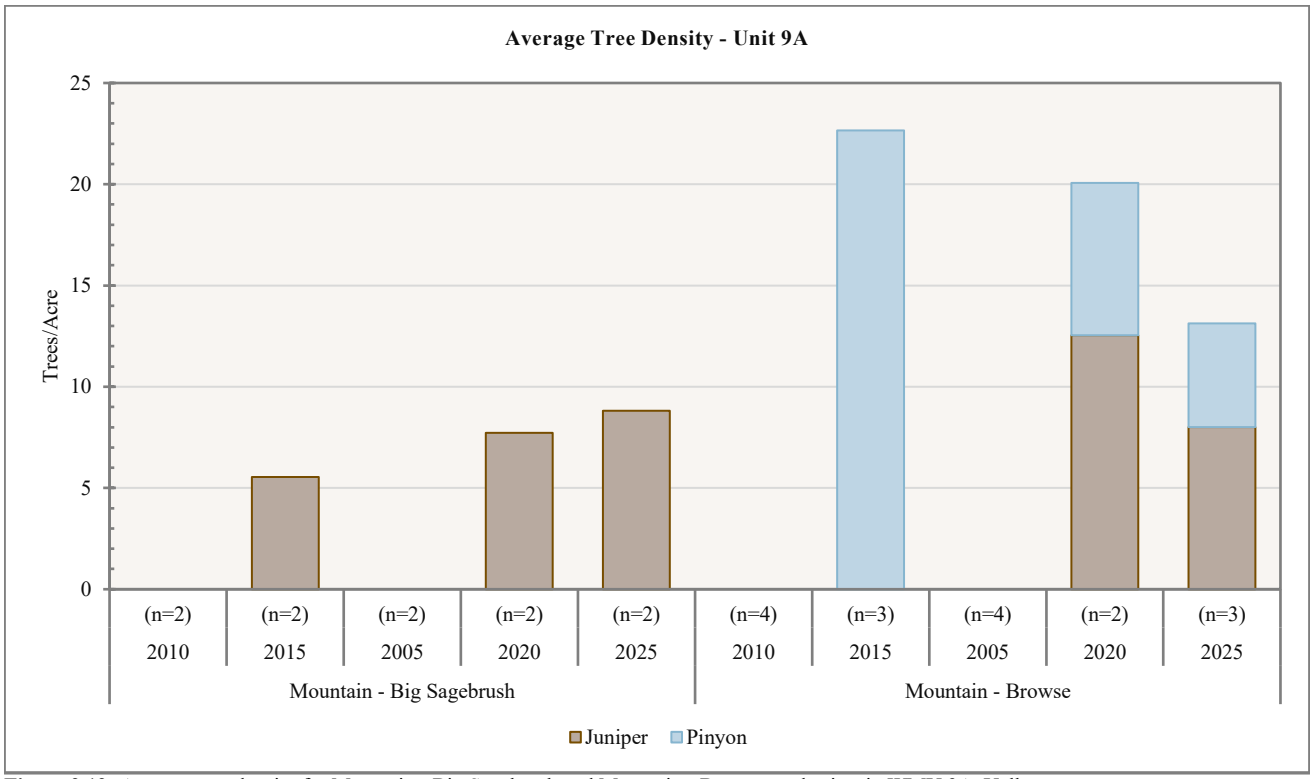


Figure 2.12: Average tree density for Mountain - Big Sagebrush and Mountain - Browse study sites in WMU 9A, Yellowstone.

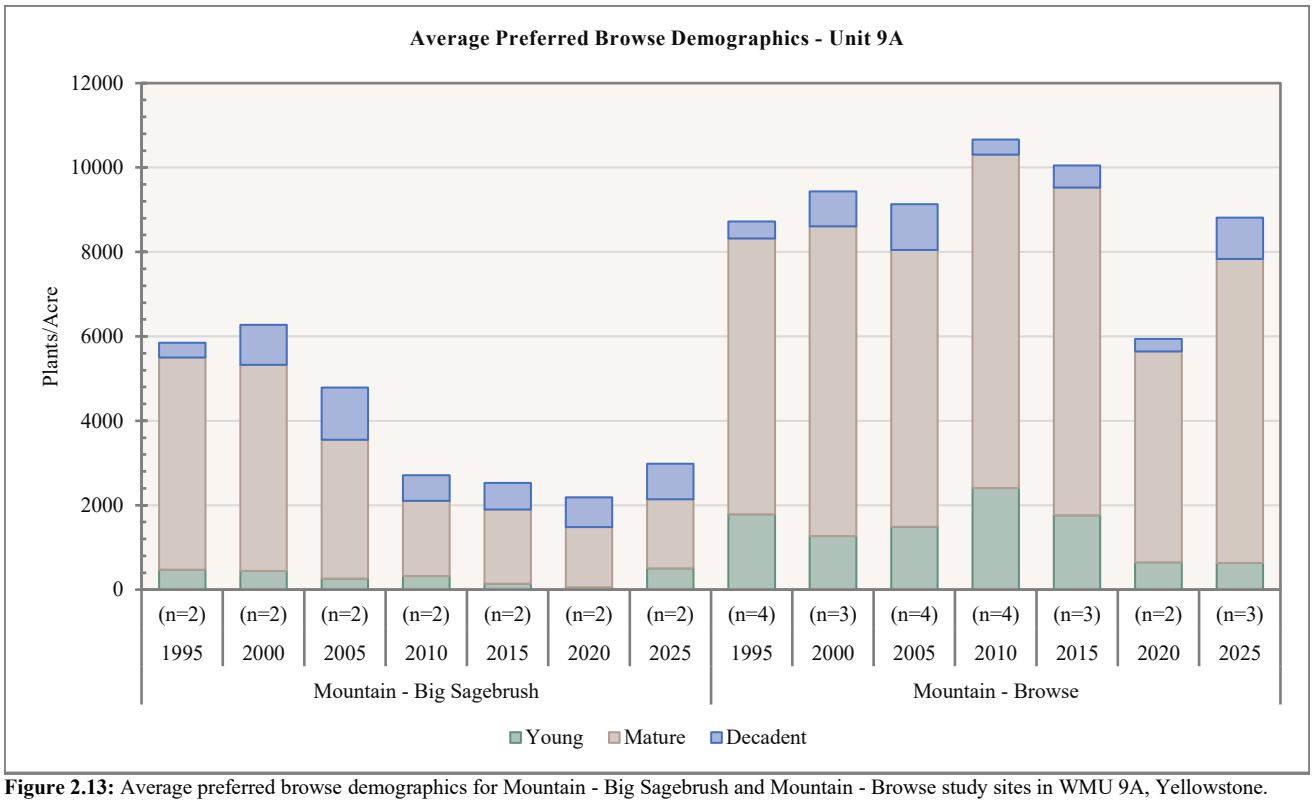


Figure 2.13: Average preferred browse demographics for Mountain - Big Sagebrush and Mountain - Browse study sites in WMU 9A, Yellowstone.

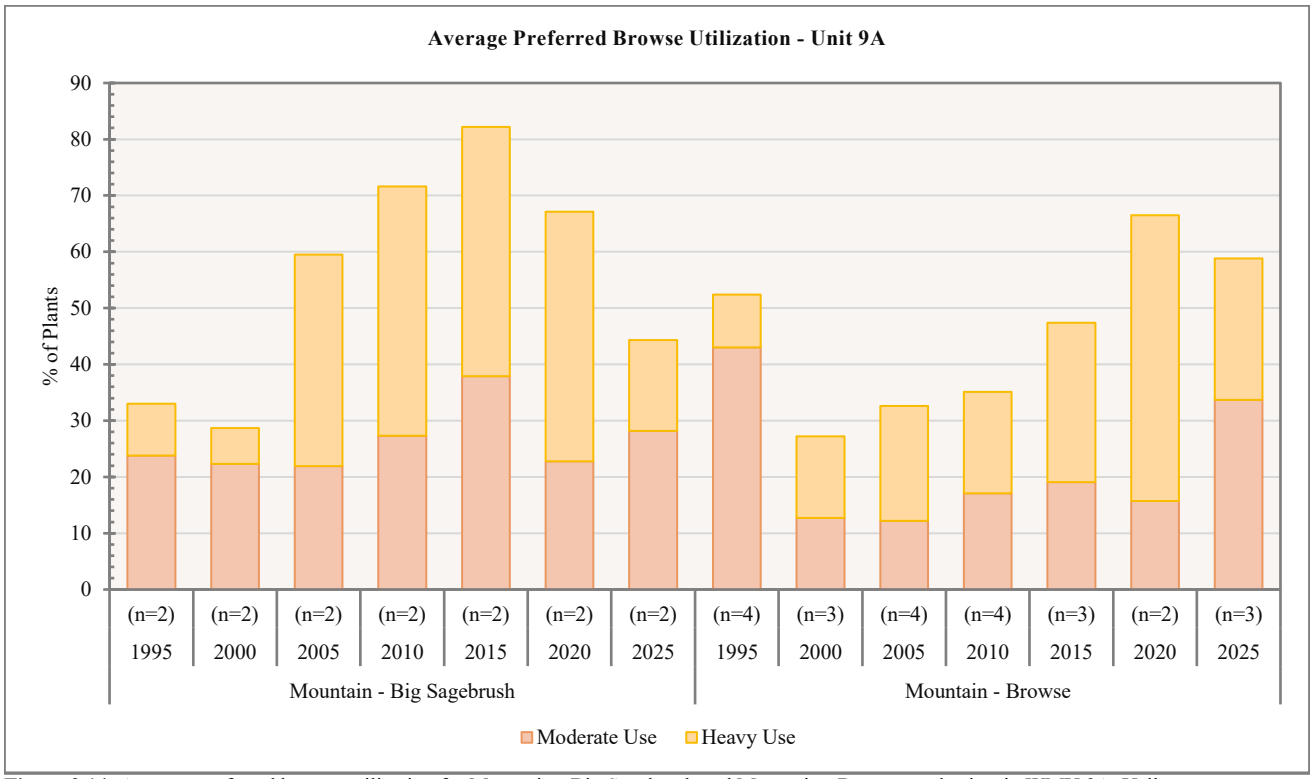


Figure 2.14: Average preferred browse utilization for Mountain - Big Sagebrush and Mountain - Browse study sites in WMU 9A, Yellowstone.

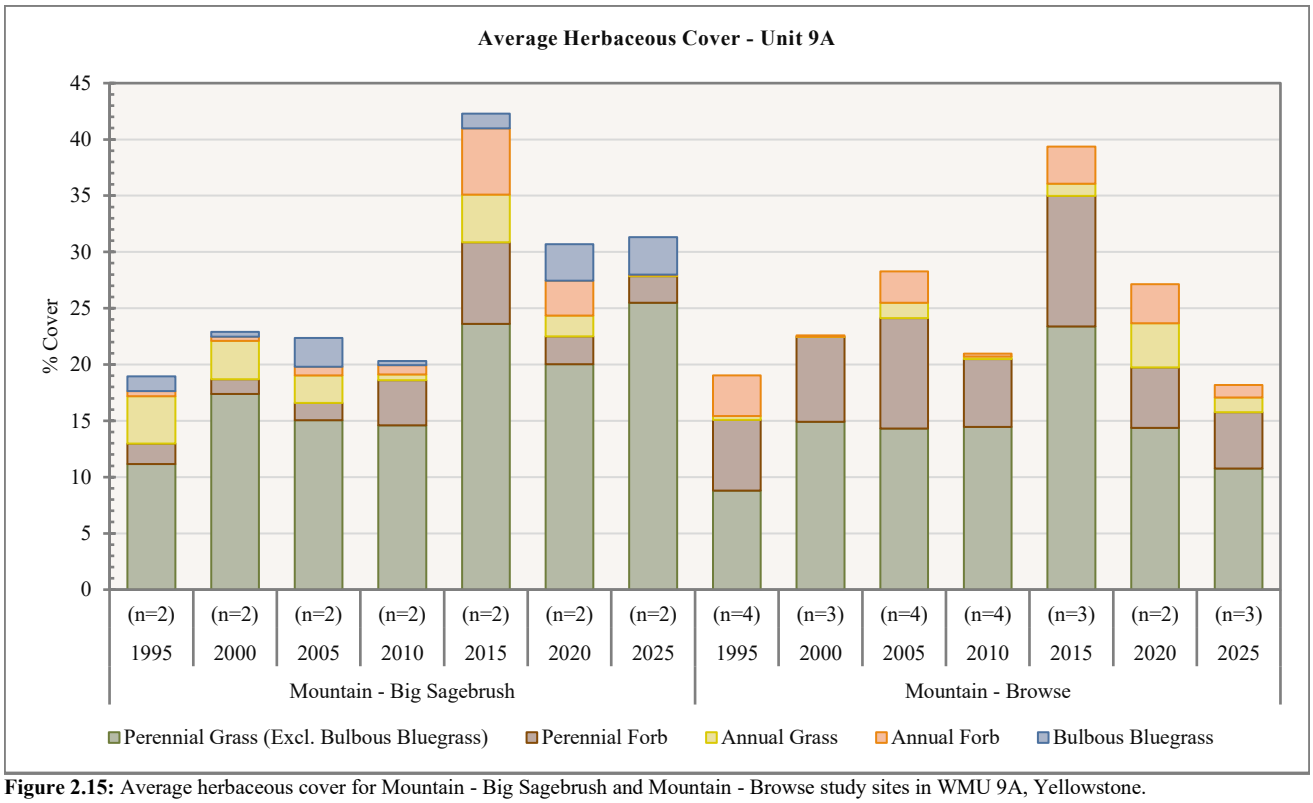


Figure 2.15: Average herbaceous cover for Mountain - Big Sagebrush and Mountain - Browse study sites in WMU 9A, Yellowstone.

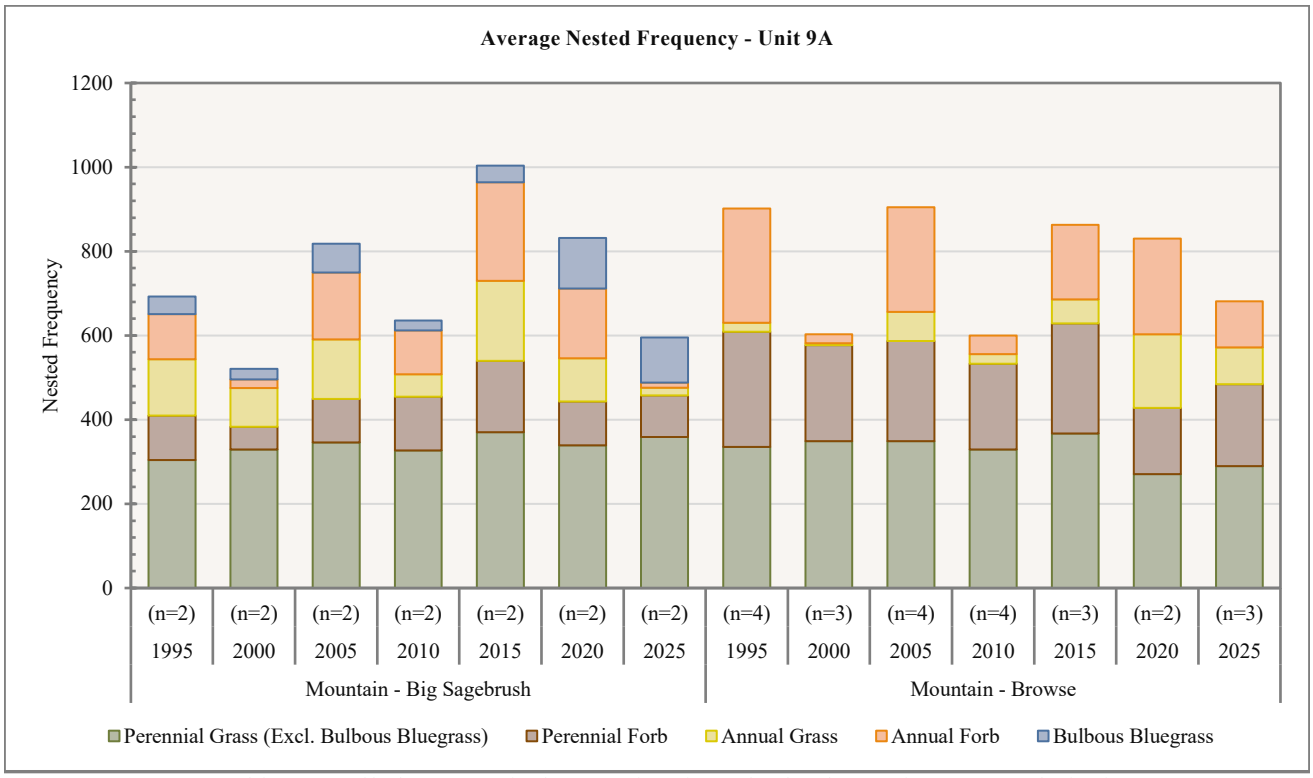


Figure 2.16: Average nested frequency of herbaceous species for Mountain - Big Sagebrush and Mountain - Browse study sites in WMU 9A, Yellowstone.

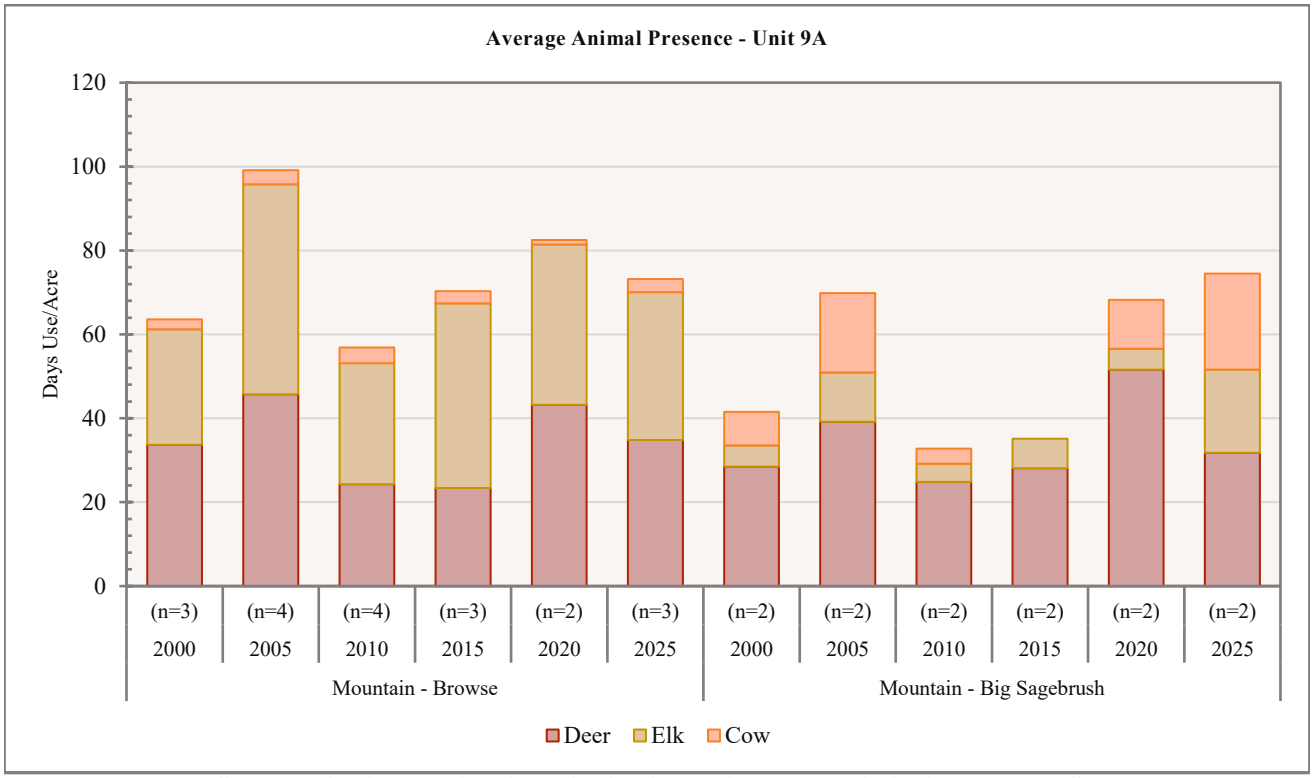


Figure 2.17: Average pellet transect data for Mountain - Big Sagebrush and Mountain - Browse study sites in WMU 9A, Yellowstone.

Subunits 9B, 9C, Vernal/Bonanza, Diamond Mountain

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 2025 sample year:

- Upland (Black/Low Sagebrush) - Little Mountain (09-27)
    - (**Figure 2.18**, **Figure 2.21**, **Figure 2.23**, **Figure 2.25**, **Figure 2.27**, **Figure 2.29**, **Figure 2.31**, **Figure 2.33**)
- Upland (Pinyon-Juniper) - Toliver Creek PJ (09-11) (suspended) and Browns Park Burn & PJ (09-12) (suspended)

Trend summaries and/or additional data for these ecotypes are available in the corresponding site reports (Lane, Payne, & Cox, 2026).

Mountain (Big Sagebrush)

Six study sites [Taylor Mountain (09-02), Dry Fork Mountain (09-03), Sawtooth-Flat Spring (09-04), Warren Draw (09-07), Rye Grass (09-08), and Little Hole (09-09)] are classified as Mountain (Big Sagebrush) ecological sites. The Taylor Mountain site is situated on the South Slope of the Uinta Mountains. The Dry Fork Mountain study is also located on the south slope of the Uinta Mountains, west of Ashley Gorge and the Taylor Mountain study. The Sawtooth-Flat Spring site is found on a flat on the south side of Sawtooth Ridge. The Warren Draw study is located in the southern portion of Warren Draw. Rye Grass is nestled in a valley at the Head of Rye Grass, which is due east of Mail Draw and Sears Creek. Finally, Little Hole is situated on the northern slope of the Uinta Mountains, northwest of Jackson 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, the Rye Grass study has contributed data in all reported sample years except 2005 and 2010, while Dry Fork Mountain has done the same in all years except 2005. The Taylor Mountain, Sawtooth-Flat Spring, Warren Draw, and Little Hole sites have datasets spanning the entire sample period since 1995.

Shrubs/Trees: Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has dominated the browse communities of all six study sites. However, antelope bitterbrush (*Purshia tridentata*) has been co-dominant with sagebrush on the Taylor Mountain study since 2015 and was co-dominant on Little Hole in 2025. Total average shrub cover has slightly decreased between 2005 and 2025, likely due to both the difference in the number of study sites sampled from year to year and actual decreases on the Sawtooth-Flat Spring and Taylor Mountain sites. The same six study sites have only been consistently sampled since 2015; total average shrub cover has slightly increased between 2015 and 2025, a trend largely driven by the Dry Fork Mountain and Little Hole studies (**Figure 2.18**). Despite year-to-year fluctuations, average preferred browse density has increased overall when comparing 1995 data with that from 2025. Mature individuals have been the dominant demographic throughout the reported sample period. Both decadence and recruitment of young plants have exhibited net increases (**Figure 2.24**). More specifically, site-level data reveals that the increase in decadence between 2020 and 2025 was largely driven by the Warren Draw and Rye Grass studies. Recruitment of young increased on all sites except Warren Draw between the two most recent samplings, with the largest increases occurring on the Taylor Mountain and Rye Grass studies. Average preferred browse utilization data displays both a net decrease between 1995 and 2025 and decreases each sample year since 2015. In 2025, only 28% of preferred browse plants sampled in density strips were moderately to heavily hedged, compared with 53% in 1995 and 59% in 2015 (**Figure 2.26**).

Twoneedle pinyon (*Pinus edulis*), Utah juniper and/or Rocky Mountain juniper (*Juniperus osteosperma* and/or *J. scopulorum*) have been observed in cover and/or point-quarter density data on the Little Hole, Rye Grass, and Dry Fork Mountain studies; ponderosa pine (*P. ponderosa*) has also been observed on the Little Hole study. Total average tree cover and density have remained low over the reported sample period and have

decreased overall since 2005. More specifically, the decreases in cover and density between 2015 and 2020 (**Figure 2.20**, **Figure 2.22**) can be entirely attributed to the Little Hole study and associated lop and scatter treatment that took place in the fall of 2017.

Herbaceous Understory: Total average herbaceous cover and frequency have fluctuated from year to year. However, average herbaceous cover has increased overall, while frequency has decreased when comparing 1995 with 2025 data. Mainly native perennial grasses have been the primary herbaceous component on these sites in most sample years. The introduced perennial grass species bulbous bluegrass (*Poa bulbosa*) was observed for the first time in 2025 with low cover but was only present on the Rye Grass study. Average perennial forb cover and abundance have remained notable throughout the reported sample period, while their annual counterparts have been comparatively scarce. The introduced annual grass species cheatgrass (*Bromus tectorum*) provided moderate cover and abundance on the Dry Fork Mountain study in 2010, 2015, and 2020. However, annual grass has otherwise remained rare (**Figure 2.28**, **Figure 2.30**).

Occupancy: Despite yearly fluctuations, pellet transect data shows that the average occupancy of these sites has remained similar overall when comparing data from 2000 with that from the 2025 sample year. Deer have been the primary occupants in all reported sample years, and average pellet group abundance has fluctuated between 21 days use/acre in 2015 and 60 days use/acre in 2005. Mean elk pellet group abundance has been as low as 6 days use/acre in 2010 and as high as 12 days use/acre in 2000. Cattle have also been present on these sites with an average pellet group abundance ranging from 6 days use/acre in 2000 to 15 days use/acre in 2005 (**Figure 2.32**).

Mountain (Browse)

There are two study sites [Mosby Mountain (09-16) and Mosby Mountain South (09-19)] that are classified as Upland (Big Sagebrush) ecological sites. Both the Mosby Mountain and Mosby Mountain South studies are situated on the south slope of Mosby Mountain.

Shrubs/Trees: Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has contributed a majority of the preferred browse cover on both of these study sites since 2005. However, other preferred browse species have also been present to a lesser extent, including (but not limited to) antelope bitterbrush (*Purshia tridentata*) and Utah serviceberry (*Amelanchier utahensis*). Total average shrub cover has increased over the sample period. This trend was largely driven by increases in cover of preferred browse species other than serviceberry, although average serviceberry cover also increased to a smaller degree (**Figure 2.19**). Average preferred browse demographics show that preferred browse density has increased over time with a notable increase occurring between 2005 and 2010. Mature individuals have comprised a majority of the preferred browse populations on these sites in all sample years and were one of the drivers of the total density increase observed in 2010. In addition, the total increase in density between 2005 and 2010 can also be attributed to the increase in young plants between those years. Recruitment of young increased overall between 1995 and 2010, decreased each year through the 2020 sample year, and increased again in 2025. More specifically, site-level data shows that this increase in young plants between the two most recent sample years can be entirely attributed to the Mosby Mountain study. Decadence within these browse populations has remained comparatively rare throughout the reported sample period (**Figure 2.24**). Average preferred browse utilization has varied from year to year but has decreased overall when comparing 1995 data with 2025 data. More than half of preferred browse plants sampled in density strips were moderately or heavily utilized in 1995, 2005, and 2015. Average preferred browse utilization has been lower in other sample years, with 10% of plants being moderately browsed and 17.5% being heavily hedged in 2025 (**Figure 2.26**).

Trees have provided no cover on either study site throughout the reported sample period. Twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) have been observed in point-quarter data on the Mosby Mountain South site in 2020 and 2025. However, tree density has remained low in the years when trees have been observed (**Figure 2.20**, **Figure 2.22**).

Herbaceous Understory: Total average herbaceous cover and frequency have fluctuated from year to year. However, average herbaceous cover has remained similar overall, while frequency has exhibited a net decrease when comparing 1995 data with that from 2025. Perennial grasses have been the primary herbaceous component on these sites in most sample years. Native perennial grass species have provided substantial cover on both study sites. However, the introduced species crested wheatgrass (*Agropyron cristatum*) has also contributed notable cover on the Mosby Mountain South study. The introduced annual grass species cheatgrass (*Bromus tectorum*) has been present on both sites throughout the study period with low to moderate abundance and cover; annual grasses were rare during the most recent sample year. Perennial forbs have provided notable cover in all reported sample years. In 2025, Hooker's balsamroot (*Balsamorhiza hookeri*) contributed the most cover of any perennial forb species on the Mosby Mountain site, while silvery lupine (*Lupinus argenteus*) provided the same on the Mosby Mountain South study. Annual forbs have generally been present in lesser amounts than their perennial counterparts (**Figure 2.28**, **Figure 2.30**).

Occupancy: Pellet transect data shows that the average pellet group abundance on these sites has slightly increased overall between 2000 and 2025 despite yearly fluctuations, and primary occupancy has varied. Cattle were primary occupants from 2000 through the 2010 sample year, and mean pellet group abundance has been as low as 5 days use/acre in 2015 and as high as 41 days use/acre in 2005. Deer were also primary occupants in 2010 and have been the primary occupants in subsequent sample years. Average abundance of deer pellet groups has ranged from 8 days use/acre in 2000 to 42.5 days use/acre in 2025. Finally, elk pellet groups have had a mean abundance fluctuating between 3 days use/acre in 2025 and 17 days use/acre in 2000 (**Figure 2.32**).

Semidesert (Big Sagebrush)

There are eight study sites [Red Mountain Allotment (09-01), Island Park (09-05), Above Steinaker Draw (09-06), Toliver Creek Chaining (09-10), Browns Park River Corridor-Livestock (09-21), Browns Park River Corridor-Wildlife (09-22), Brush Creek Substation (09-24), and Buckhorn Canyon (09-25)] that are classified as Semidesert (Big Sagebrush) ecological sites. The Red Mountain Allotment study is found just west of Steinaker Reservoir, and the Island Park site is located just north of Big Island in Island Park. Above Steinaker Draw is aptly situated on a southern slope above the northern portion of Steinaker Draw. The Toliver Creek Chaining study is found east of Toliver Creek on the lower slopes of the Uinta Mountains near Browns Park. Both the Browns Park River Corridor – Livestock and Browns Park River Corridor – Wildlife studies are located just south of the Green River in Browns Park. Brush Creek Substation is situated on a flat above Brush Creek and opposite Donkey Flat. Finally, the Buckhorn Canyon study is found just east of Buckhorn Canyon.

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 Above Steinaker Draw study has provided data for all recorded sample years except 2010, while Brush Creek Substation has contributed data for all years except 2000. The Browns Park River Corridor-Livestock, Browns Park River Corridor-Wildlife, and Buckhorn Canyon sites have contributed data in all reported sample years since 2000. Finally, the Red Mountain Allotment, Island Park, and Toliver Creek Chaining studies have datasets spanning the entire sample period since 1995.

Shrubs/Trees: Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) has dominated the preferred browse component of many of these study sites. However, sagebrush has been rare on the Red Mountain Allotment, Island Park, and Browns Park River Corridor-Wildlife studies in recent sample years. Total average shrub cover has exhibited a slight overall decrease between 2005 and 2025: this trend largely is driven by decreases in sagebrush cover on the Browns Park River Corridor-Livestock study and the three sites previously mentioned. Preferred browse other than sagebrush has contributed little cover throughout that sample period, as have other shrubs (**Figure 2.18**). Average preferred browse density has also exhibited a decreasing trend, which can mainly be attributed to the same sites that have driven cover trends. Mature individuals have comprised a majority of the preferred browse populations on these sites in all sample years. The density of decadent plants within these populations was at its highest in 2000, but decadence has generally decreased since 2005. Recruitment of young plants has varied from year to year and has remained

comparatively low overall (**Figure 2.25**). However, site-level data shows that density of young plants did increase between 2020 and 2025 on the Browns Park River Corridor-Livestock, Browns Park River Corridor-Wildlife, and Brush Creek Substation studies. Average preferred browse utilization has exhibited a net decrease over the study period and has decreased each year since 2015. More specifically, 23% of preferred browse plants showed signs of moderate utilization and 16% were heavily hedged in 2025 (**Figure 2.27**).

Utah juniper (*Juniperus osteosperma*) has been observed on many study sites during the reported sample period. Both tree density and cover have increased overall since 2010 but remain low as of 2025. Site-level data shows that the Above Steinaker Draw study has a substantial tree component and has remained in Phase II or Phase II transitioning to Phase III of woodland succession since 1988 (Lane, Payne, & Cox, Utah Big Game Range Trend Studies: 2025 Annual Report, 2026). This study was not sampled in 2010 but has been included in data averages in subsequent years. As such, the absence of data in 2010 and subsequent inclusion of the Above Steinaker Draw study in 2015 drives the cover and density increases exhibited between those years (**Figure 2.21**, **Figure 2.23**).

Herbaceous Understory: Total average herbaceous cover and frequency have fluctuated from year to year. Average herbaceous cover has increased overall, while frequency has decreased when comparing 1995 with 2025 data. However, values for both cover and frequency have decreased each sample year since 2015. Annual and/or perennial grasses (depending on the year) have been the primary herbaceous components on these sites since 1995. The introduced annual grass species cheatgrass (*Bromus tectorum*) has been present on most study sites with substantial abundance and cover in many sample years. However, average cover and abundance of annual grasses decreased in 2025, leaving perennial grasses as the dominant herbaceous component during the most recent sample year. The introduced perennial grass species bulbous bluegrass (*Poa bulbosa*) was observed for the first time in 2025 on the Toliver Creek Chaining site with low abundance and cover. Annual and perennial forbs have remained rare in comparison with grasses (**Figure 2.29**, **Figure 2.31**).

Occupancy: Pellet transect data shows that the average occupancy of these sites has decreased overall between 2000 and 2025 despite yearly fluctuations. Deer have been the primary occupants in all sample years, and average pellet group abundance has ranged from 20 days use/acre in 2015 to 54 days use/acre in 2020. Mean elk pellet group abundance has been as low as 3 days use/acre in 2015 and as high as 24 days use/acre in 2005. Cattle have also been present on these sites with an average pellet group abundance fluctuating between 4 days use/acre in 2000 and 16 days use/acre in 2020. Finally, horses were present in 2010 with a mean pellet group abundance of 0.2 days use/acre, but pellet groups have not been sampled in any other year (**Figure 2.33**).

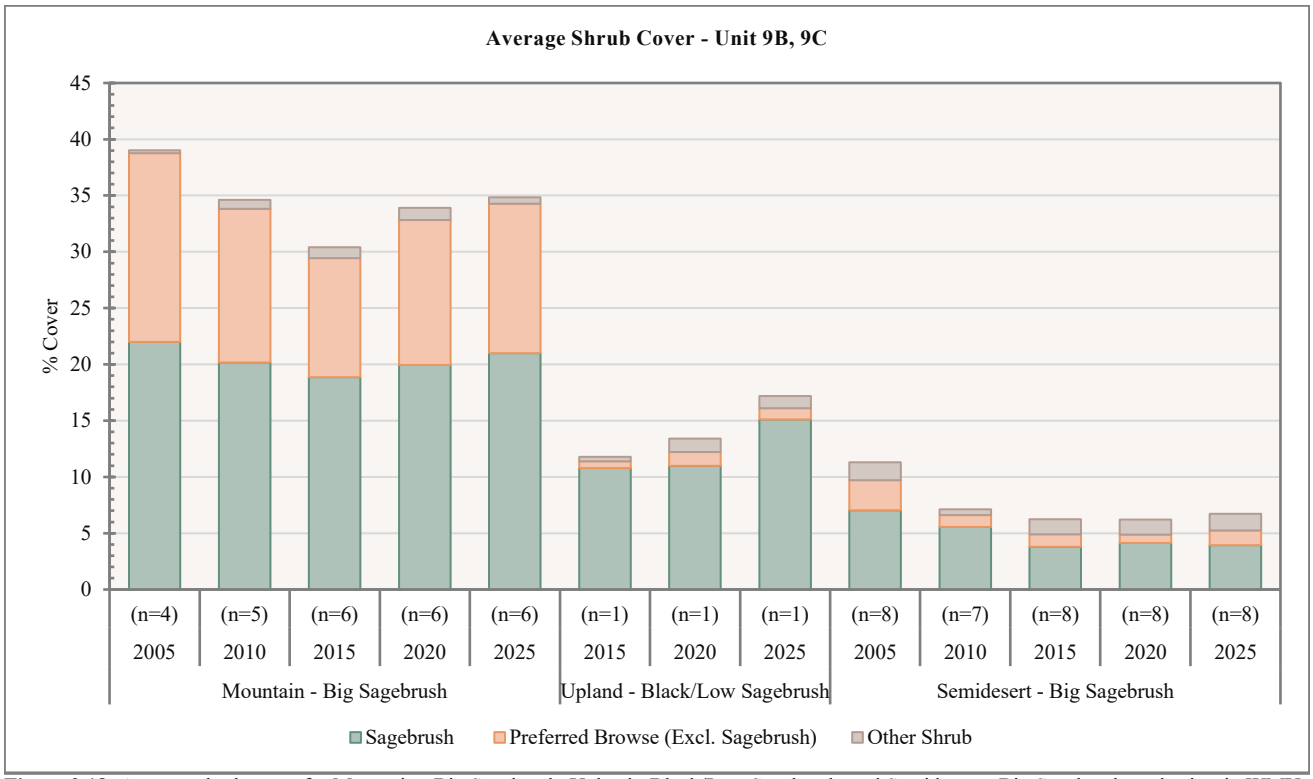


Figure 2.18: Average shrub cover for Mountain - Big Sagebrush, Upland - Black/Low Sagebrush, and Semidesert - Big Sagebrush study sites in WMU 9B, 9C, Vernal/Bonanza, Diamond Mountain.

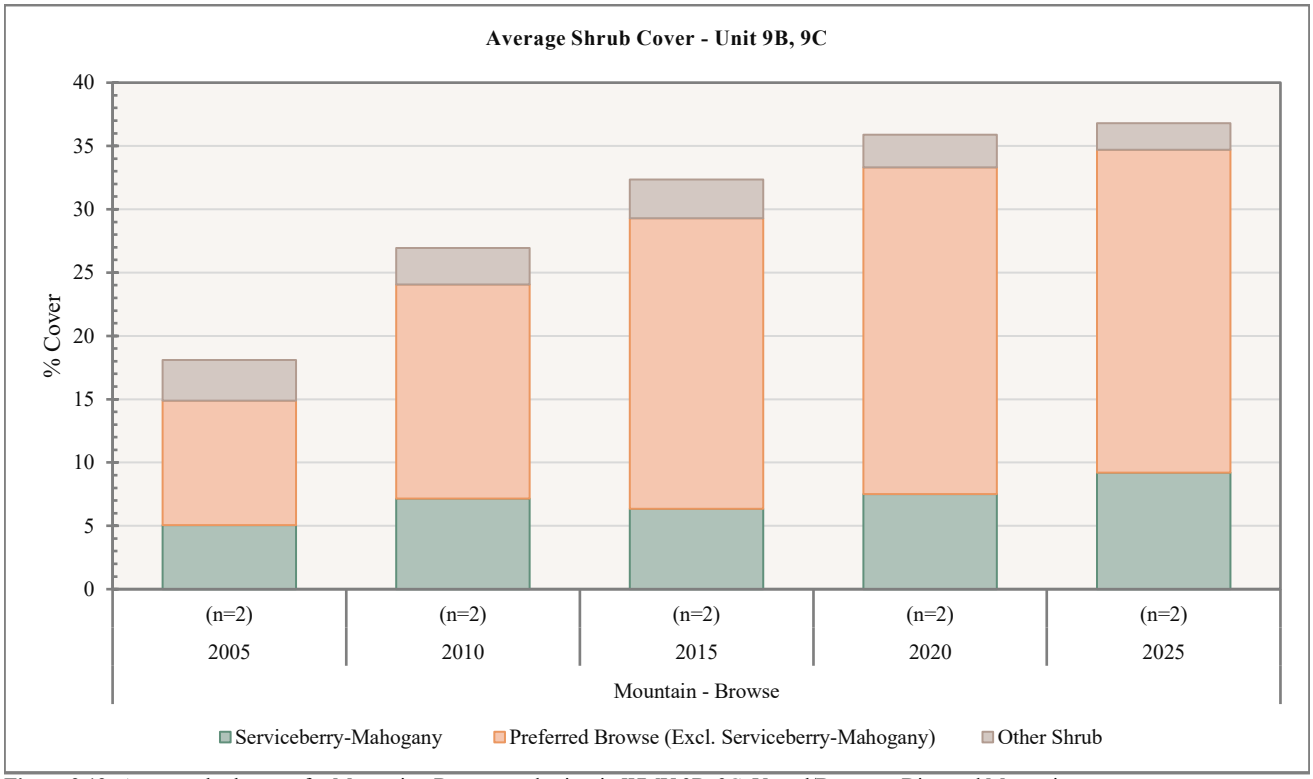


Figure 2.19: Average shrub cover for Mountain - Browse study sites in WMU 9B, 9C, Vernal/Bonanza, Diamond Mountain.

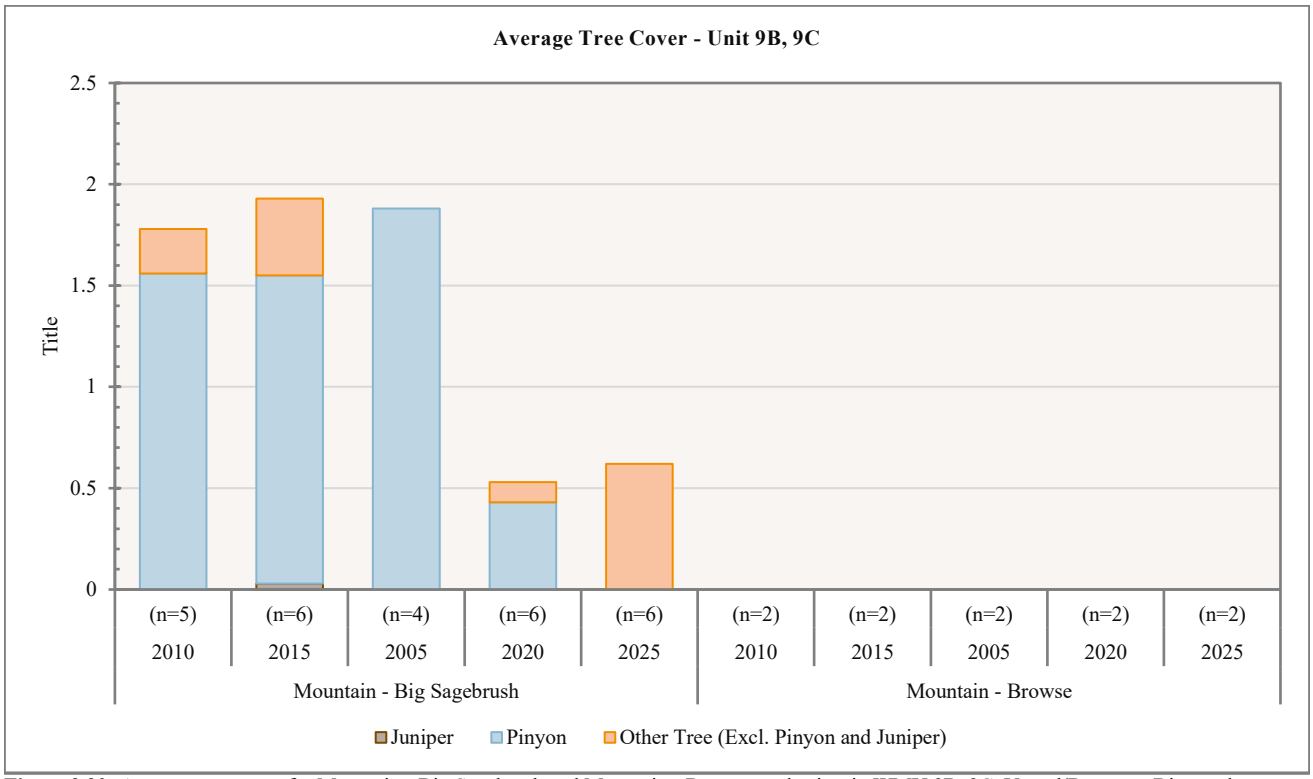


Figure 2.20: Average tree cover for Mountain - Big Sagebrush and Mountain - Browse study sites in WMU 9B, 9C, Vernal/Bonanza, Diamond Mountain.

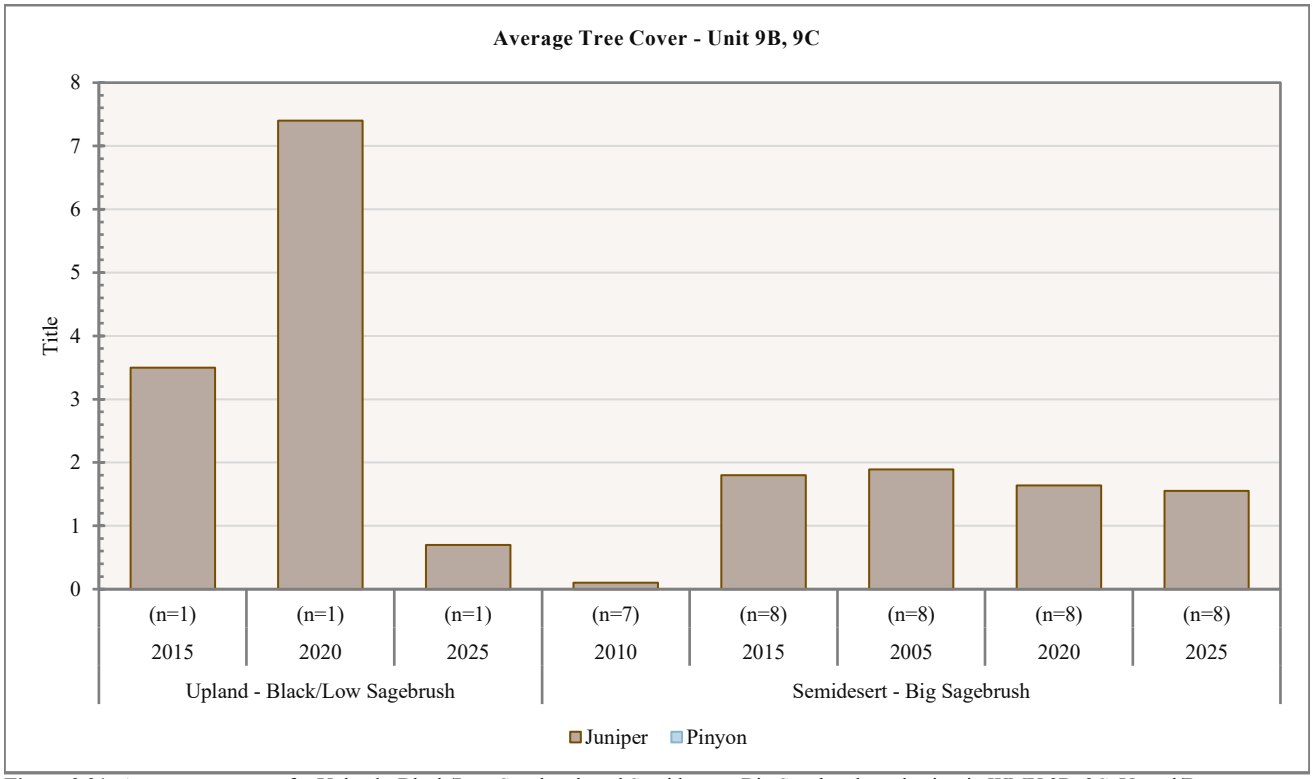


Figure 2.21: Average tree cover for Upland - Black/Low Sagebrush and Semidesert - Big Sagebrush study sites in WMU 9B, 9C, Vernal/Bonanza, Diamond Mountain.

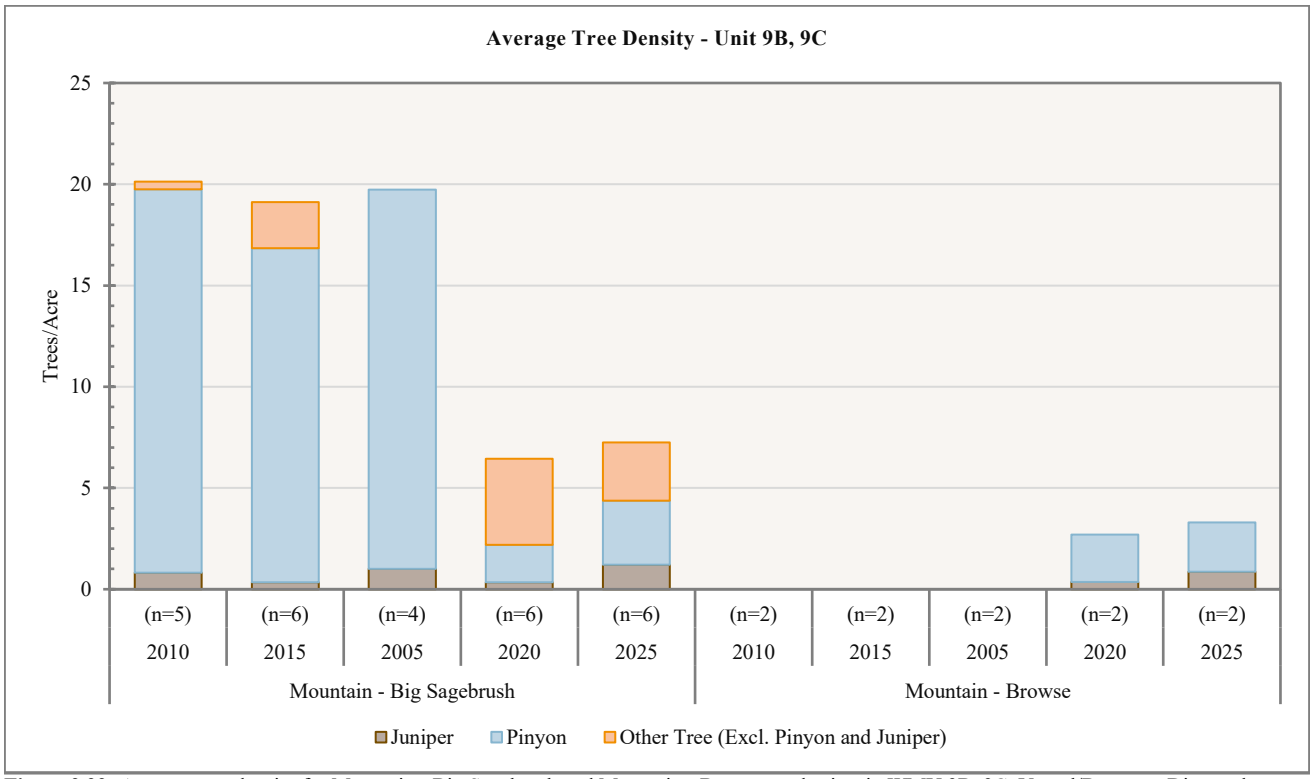


Figure 2.22: Average tree density for Mountain - Big Sagebrush and Mountain - Browse study sites in WMU 9B, 9C, Vernal/Bonanza, Diamond Mountain.

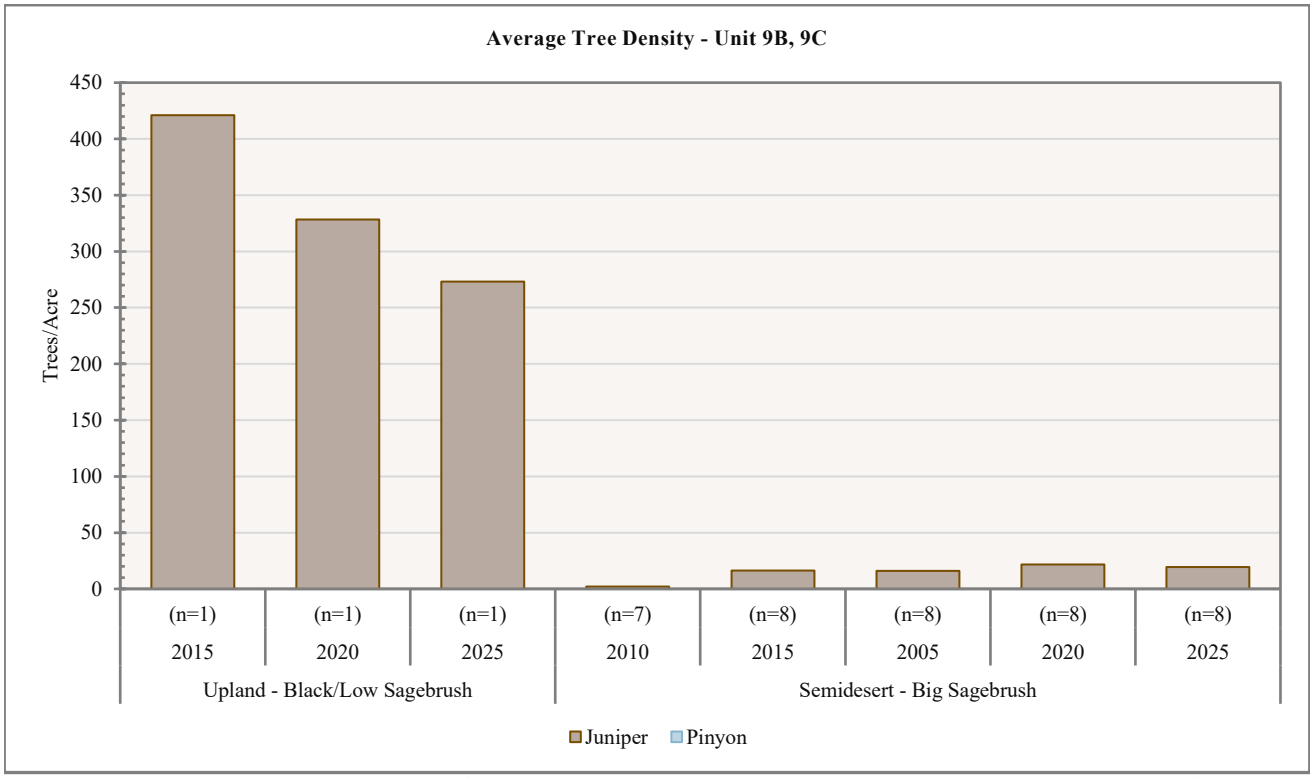


Figure 2.23: Average tree density for Upland - Black/Low Sagebrush and Semidesert - Big Sagebrush study sites in WMU 9B, 9C, Vernal/Bonanza, Diamond Mountain.

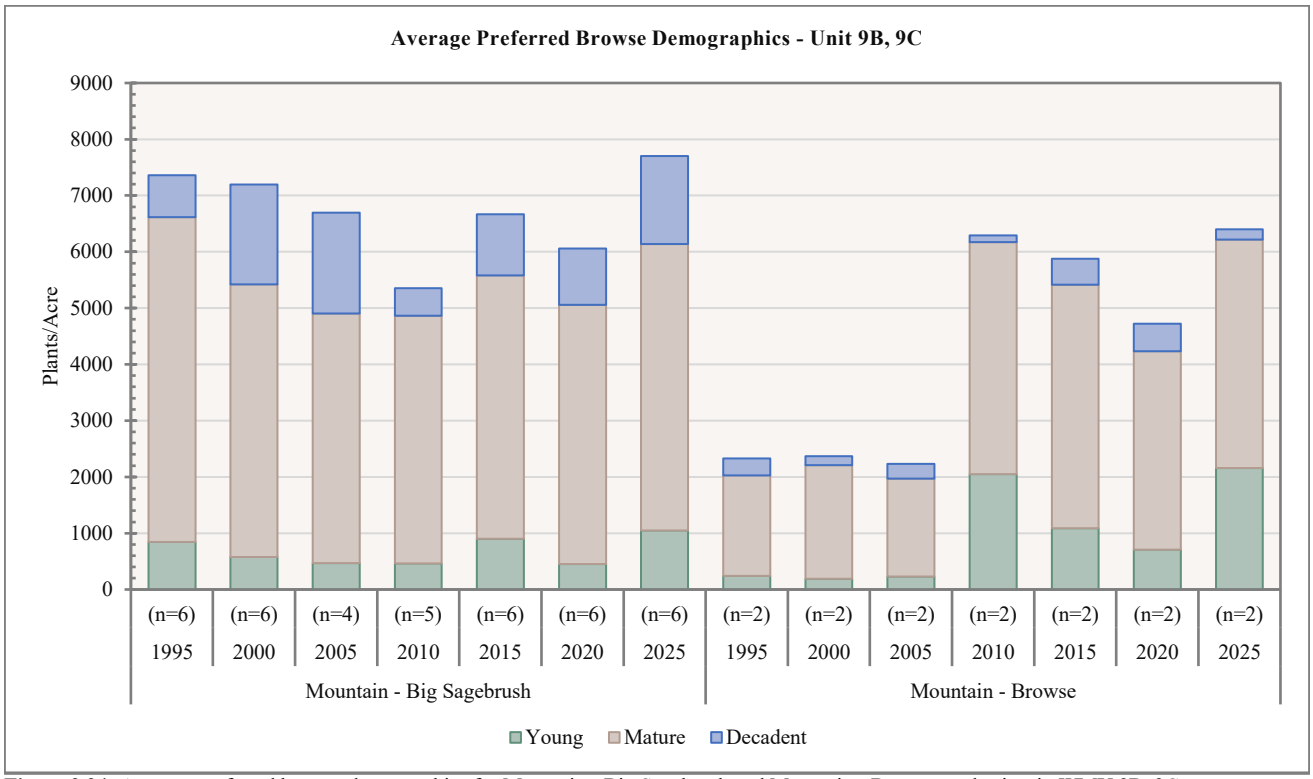


Figure 2.24: Average preferred browse demographics for Mountain - Big Sagebrush and Mountain - Browse study sites in WMU 9B, 9C, Vernal/Bonanza, Diamond Mountain.

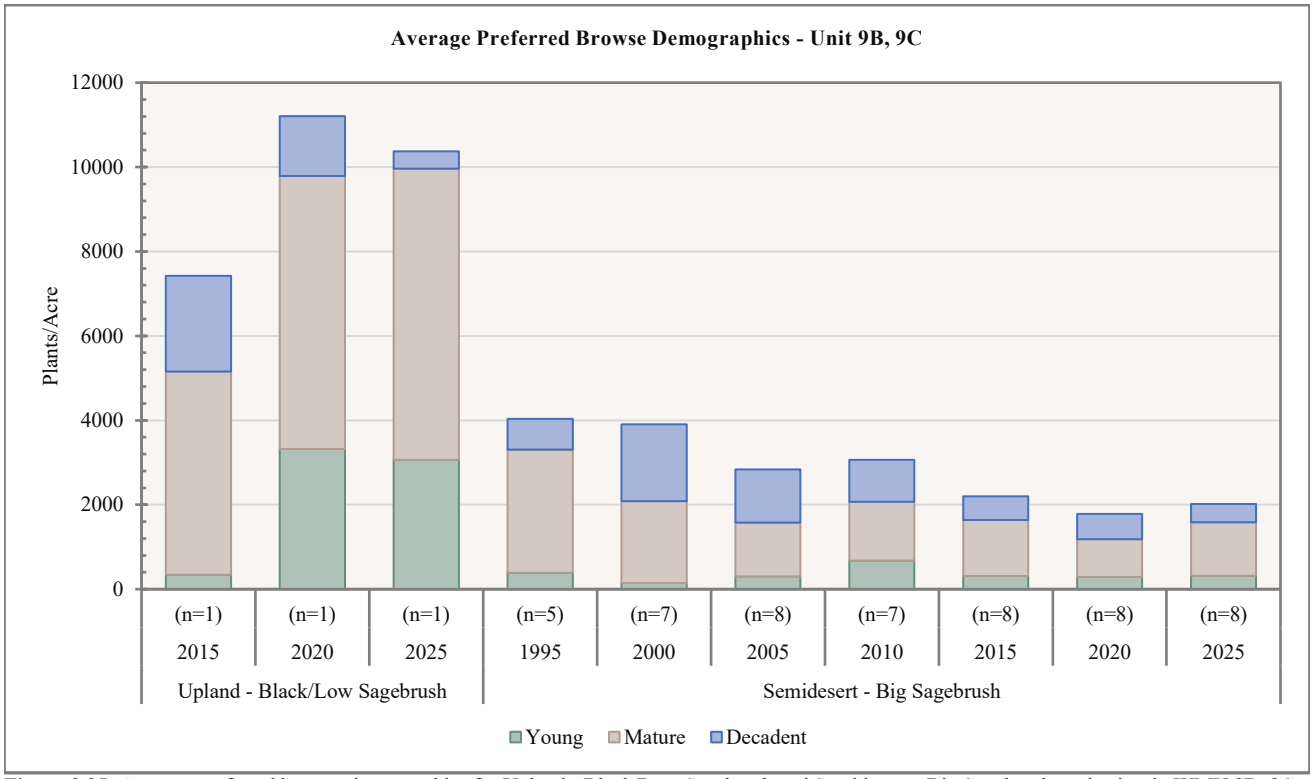


Figure 2.25: Average preferred browse demographics for Upland - Black/Low Sagebrush and Semidesert - Big Sagebrush study sites in WMU 9B, 9C, Vernal/Bonanza, Diamond Mountain.

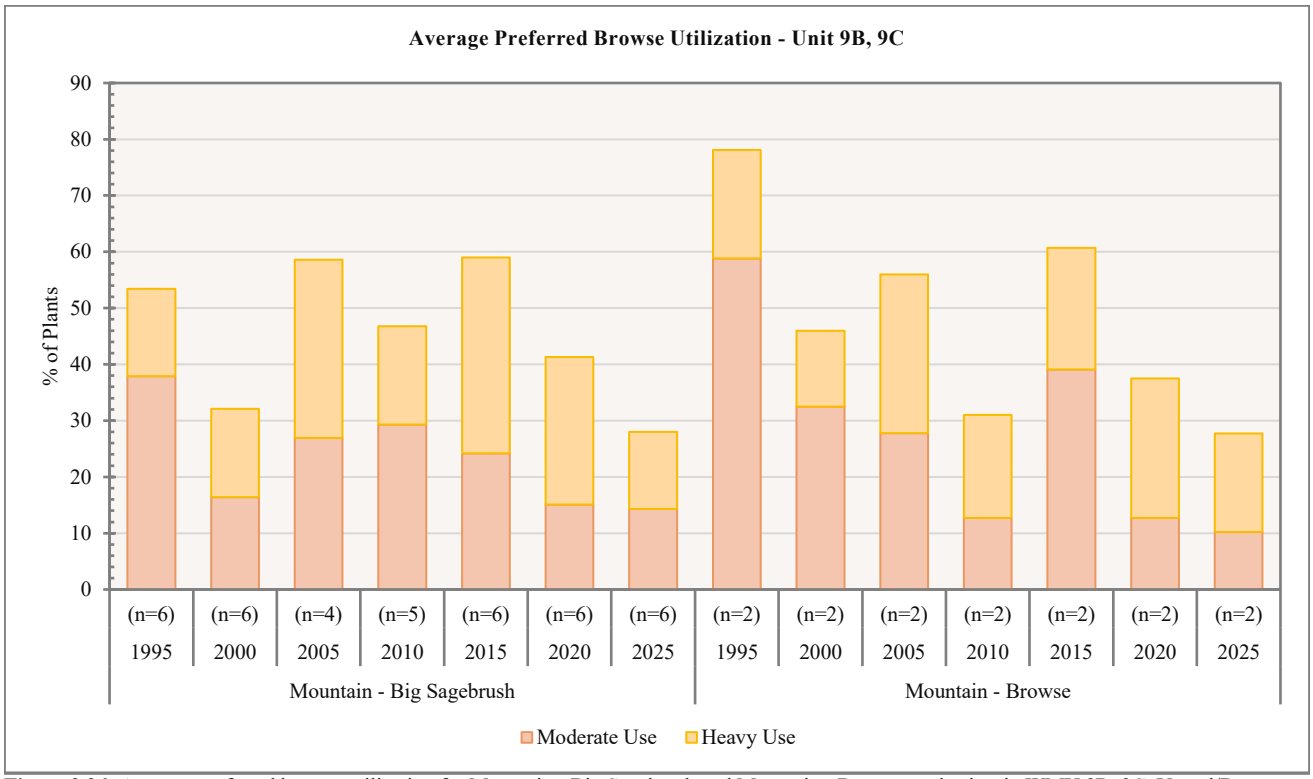


Figure 2.26: Average preferred browse utilization for Mountain - Big Sagebrush and Mountain - Browse study sites in WMU 9B, 9C, Vernal/Bonanza, Diamond Mountain.

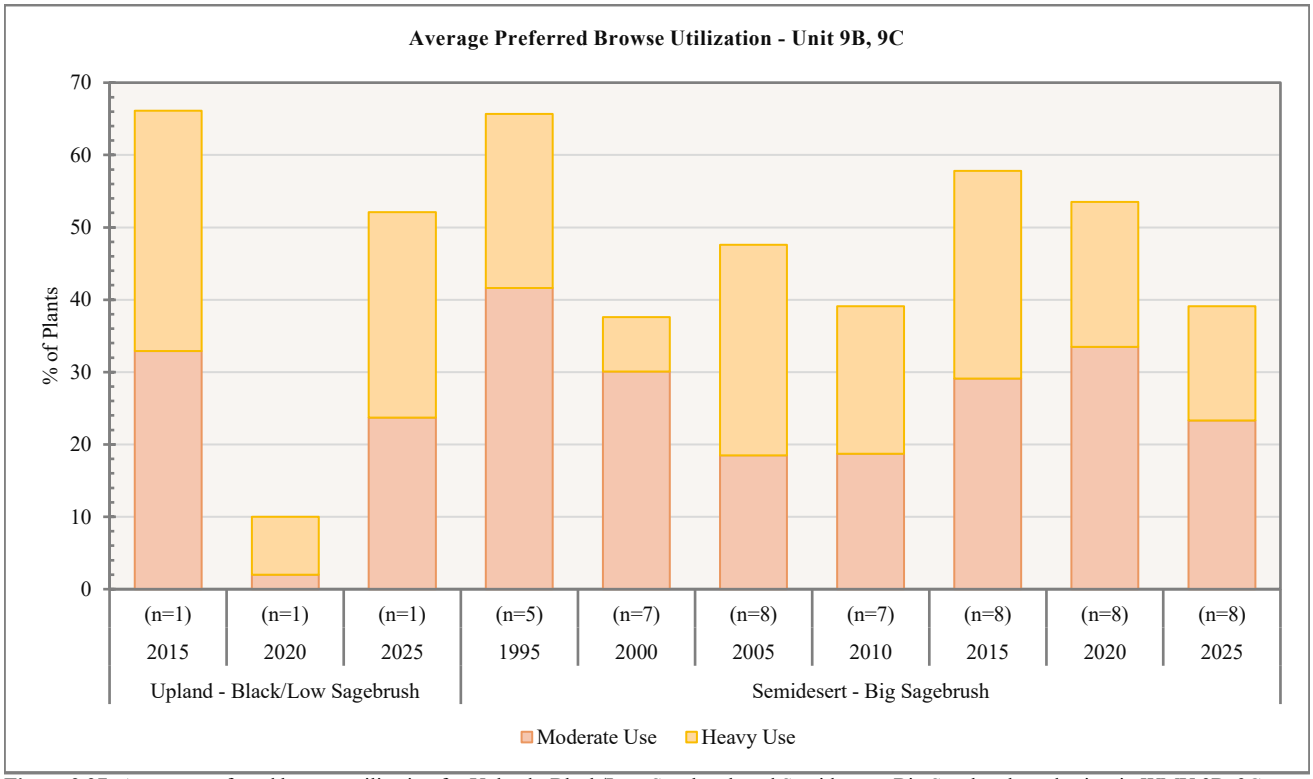


Figure 2.27: Average preferred browse utilization for Upland - Black/Low Sagebrush and Semidesert - Big Sagebrush study sites in WMU 9B, 9C, Vernal/Bonanza, Diamond Mountain.

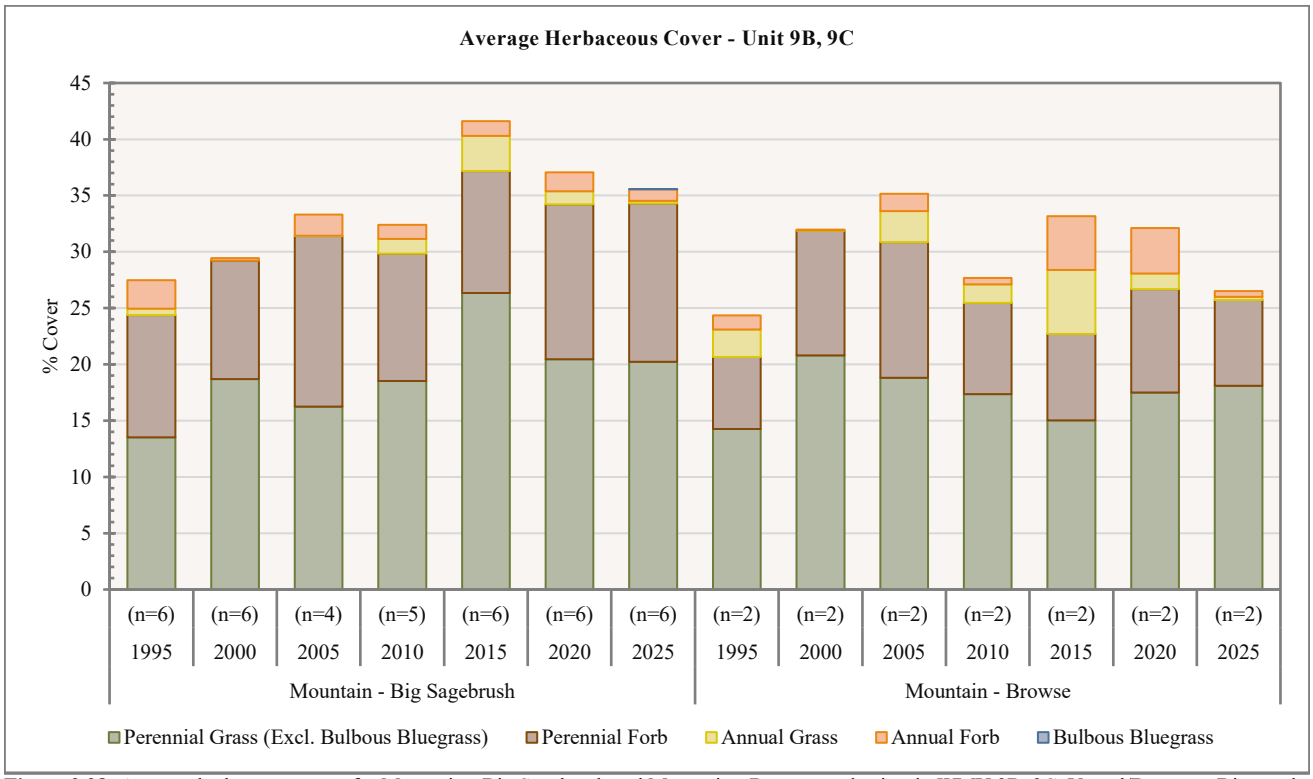


Figure 2.28: Average herbaceous cover for Mountain - Big Sagebrush and Mountain - Browse study sites in WMU 9B, 9C, Vernal/Bonanza, Diamond Mountain.

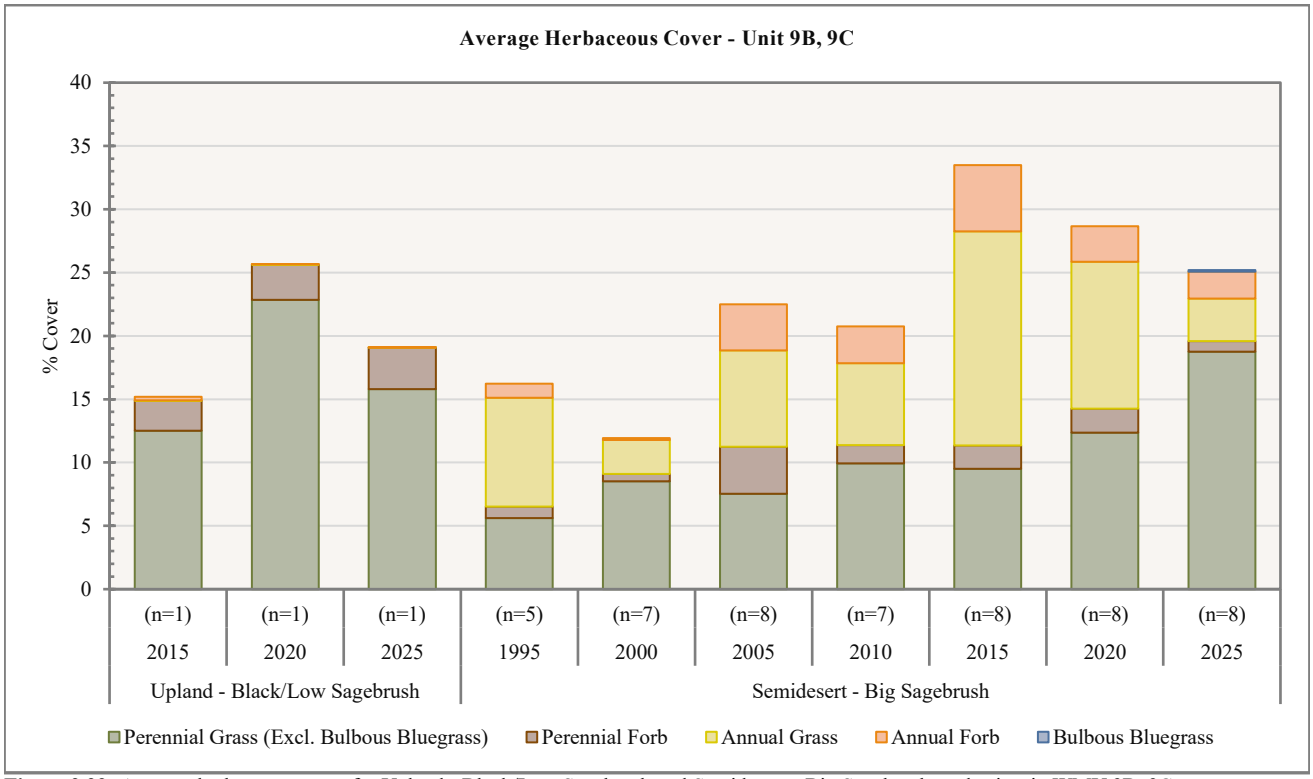


Figure 2.29: Average herbaceous cover for Upland - Black/Low Sagebrush and Semidesert - Big Sagebrush study sites in WMU 9B, 9C, Vernal/Bonanza, Diamond Mountain.

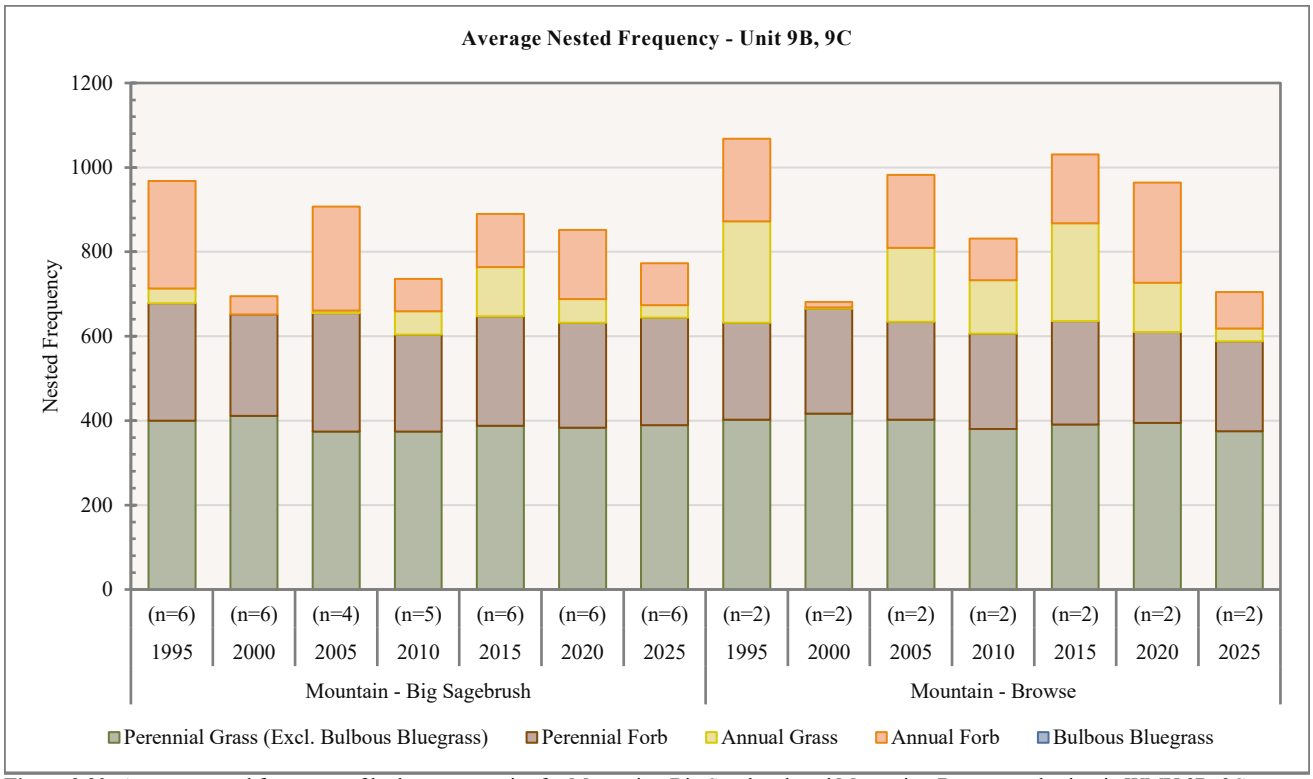


Figure 2.30: Average nested frequency of herbaceous species for Mountain - Big Sagebrush and Mountain - Browse study sites in WMU 9B, 9C, Vernal/Bonanza, Diamond Mountain.

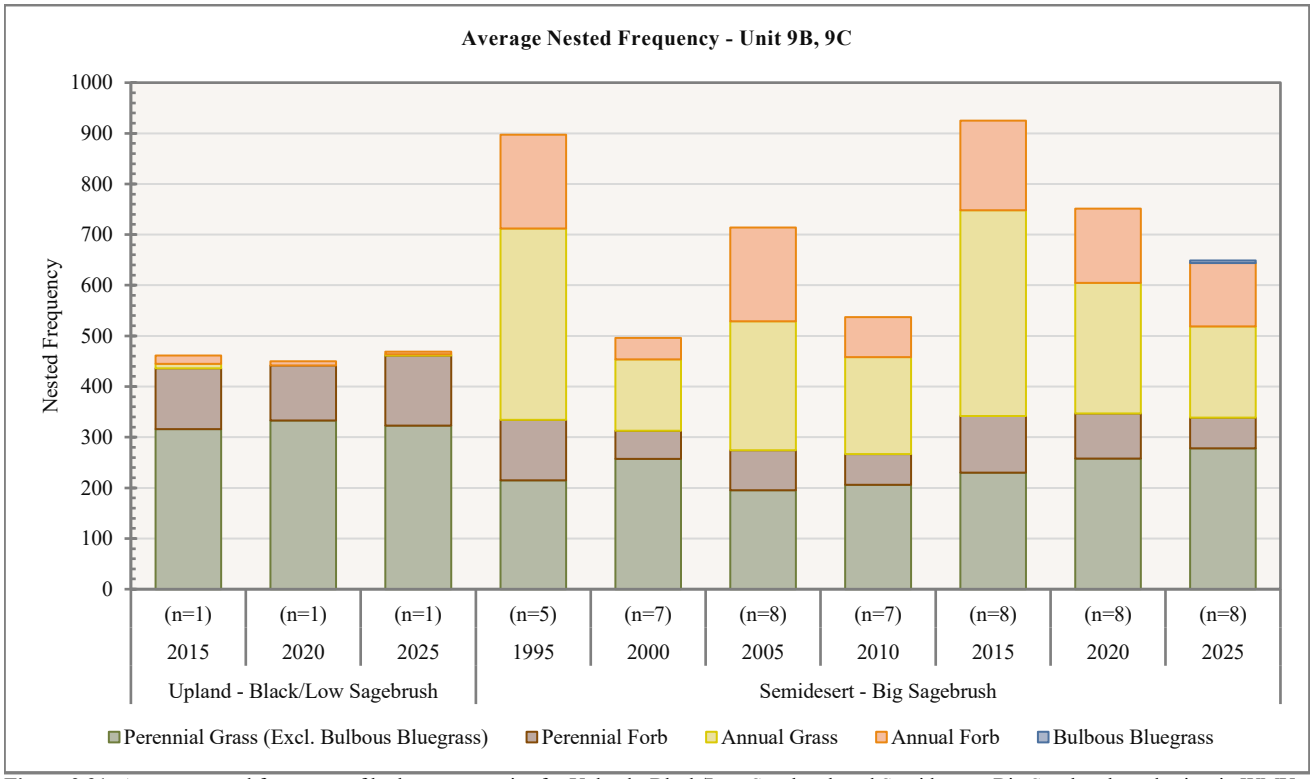


Figure 2.31: Average nested frequency of herbaceous species for Upland - Black/Low Sagebrush and Semidesert - Big Sagebrush study sites in WMU 9B, 9C, Vernal/Bonanza, Diamond Mountain.

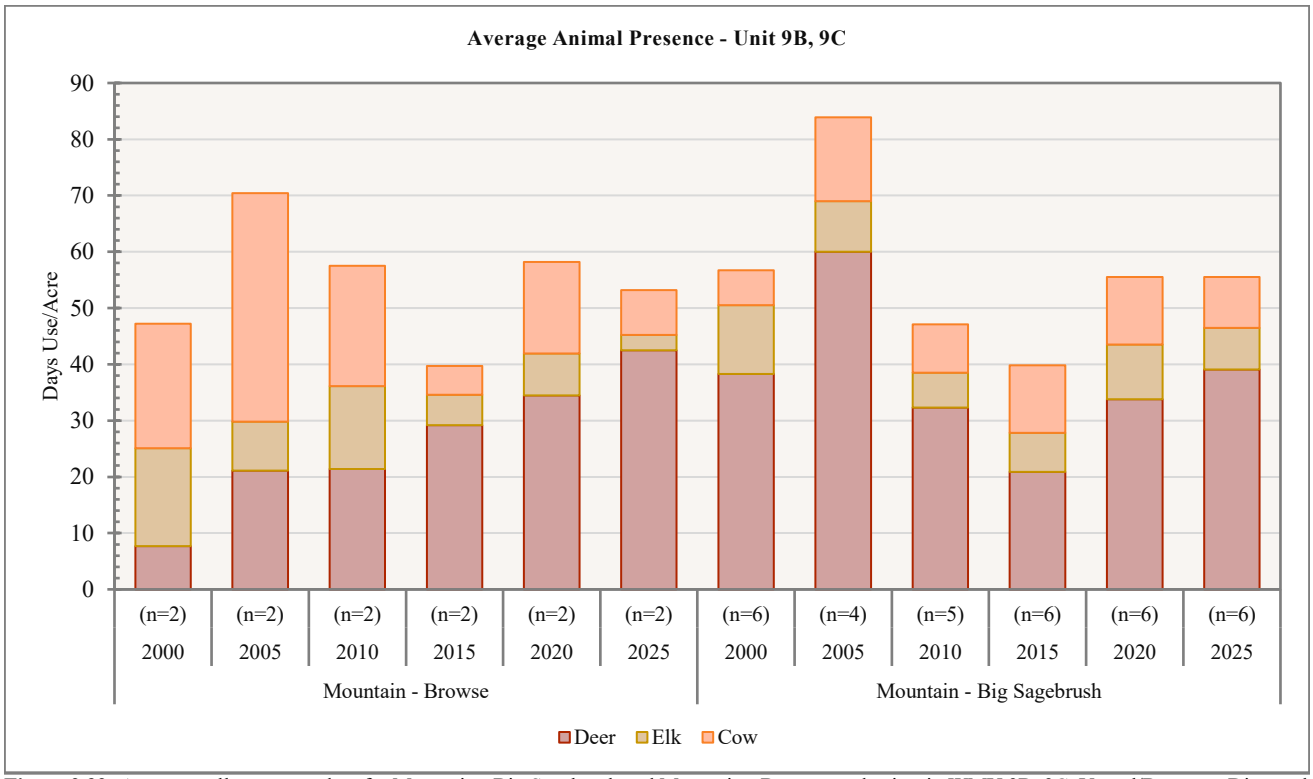


Figure 2.32: Average pellet transect data for Mountain - Big Sagebrush and Mountain - Browse study sites in WMU 9B, 9C, Vernal/Bonanza, Diamond Mountain.

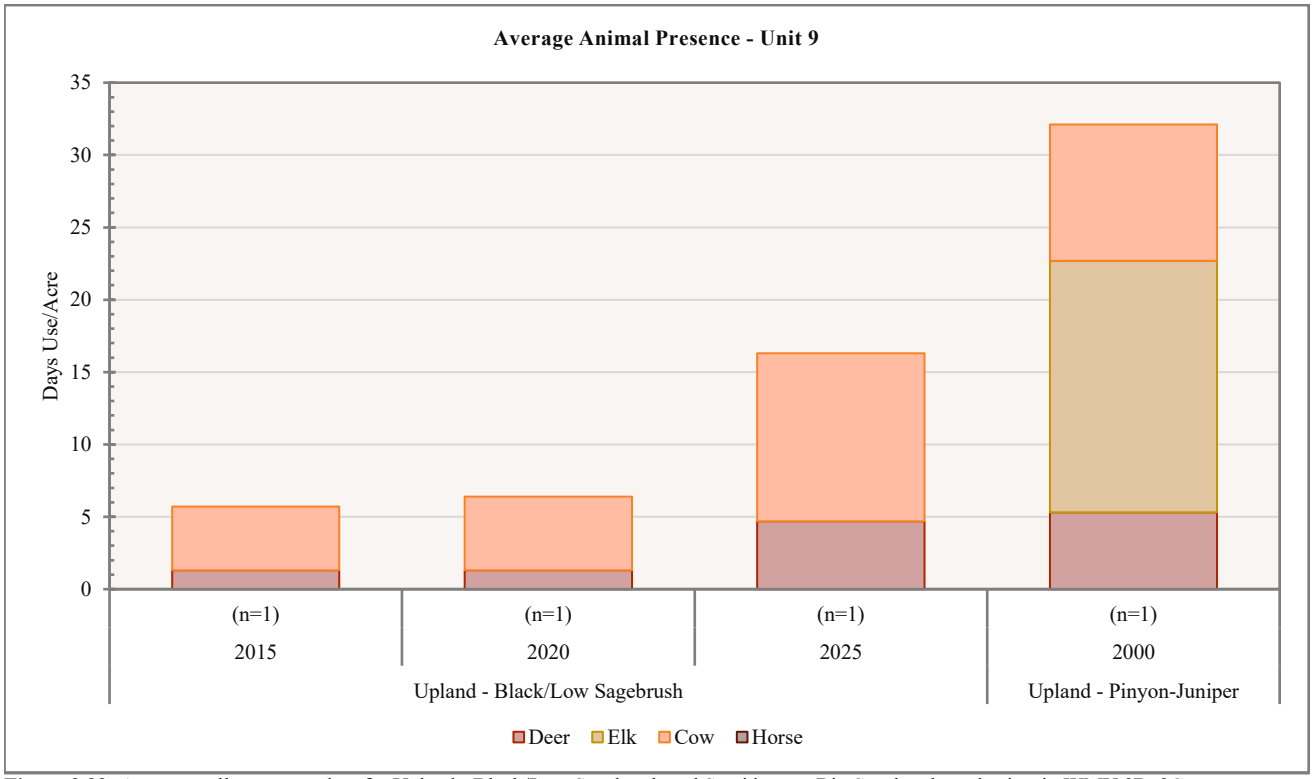


Figure 2.33: Average pellet transect data for Upland - Black/Low Sagebrush and Semidesert - Big Sagebrush study sites in WMU 9B, 9C, Vernal/Bonanza, Diamond Mountain.

Deer Winter Range Condition Assessment

Subunit 9A, Yellowstone

The overall condition of deer winter range (**Map 2.2**) within the Yellowstone Management subunit has deteriorated from good-excellent in 2000 to fair in 2025. Farm Creek (09-17) is the only Range Trend site that has varied in winter conditions ranging from very poor-poor to good, which can be attributed to a wildfire that removed much of the preferred browse in 2007; Farm Creek is recovering with winter range conditions being considered fair in 2025. Preferred shrub cover is increasing slowly, but density for preferred shrubs remains low with little recruitment. However, John Star Flat (09-13), Mud Springs Draw (09-15), Rock Creek (09-23), and Seep Hollow (09-20) all have stable wintering conditions and are the drives for subunit stability. One beneficial factor to the overall winter range health on all Range Trend sites in this unit is a general lack of annual grass though there have been eruptions of annual grass on John Star Flat and Rock Creek. However, most sites could benefit by diversifying preferred browse age classes and by reducing decadence within their respective communities. As mentioned above, Farm Creek has had the highest 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 habitat improvement include increasing preferred browse cover and native perennial grass and forbs.

The overall deer winter range assessment in 2025 was that WMU 9A is in fair-good condition. Factors negatively influencing or limiting conditions are the lack of preferred shrub cover and recruitment on Farm Creek; the presence of annual grass on most sites, albeit in low amounts; and low perennial forb cover on Rock Creek. John Star Flat and Mud Springs Draw would benefit from increases in native perennial grass and forb cover while reducing cheatgrass presence (**Figure 2.34**, **Table 2.11**).

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 2.34**, **Table 2.11**) illustrates the number of Range Trend sites within mule deer winter. 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 2.34**, **Table 2.11**). Study sites that intersect/have intersected elk winter, transitional, or year-long habitat include John Star Flat, Mud Springs Draw, Farm Creek, Seep Hollow, and Rock Creek. The overall condition of elk winter range within the Yellowstone Management Unit has decreased since 1995. More specifically, average unit conditions decreased from fair-good in 1995 to fair in 2025. The sites with elevated suitability include John Star Flat, Mud Springs Draw, Rock Creek, and Seep Hollow. As of 2025, Farm Creek is considered to have fair wintering habitat conditions. Habitat improvements are the same as mentioned above and include increasing preferred browse cover and reducing decadence with the preferred browse community.

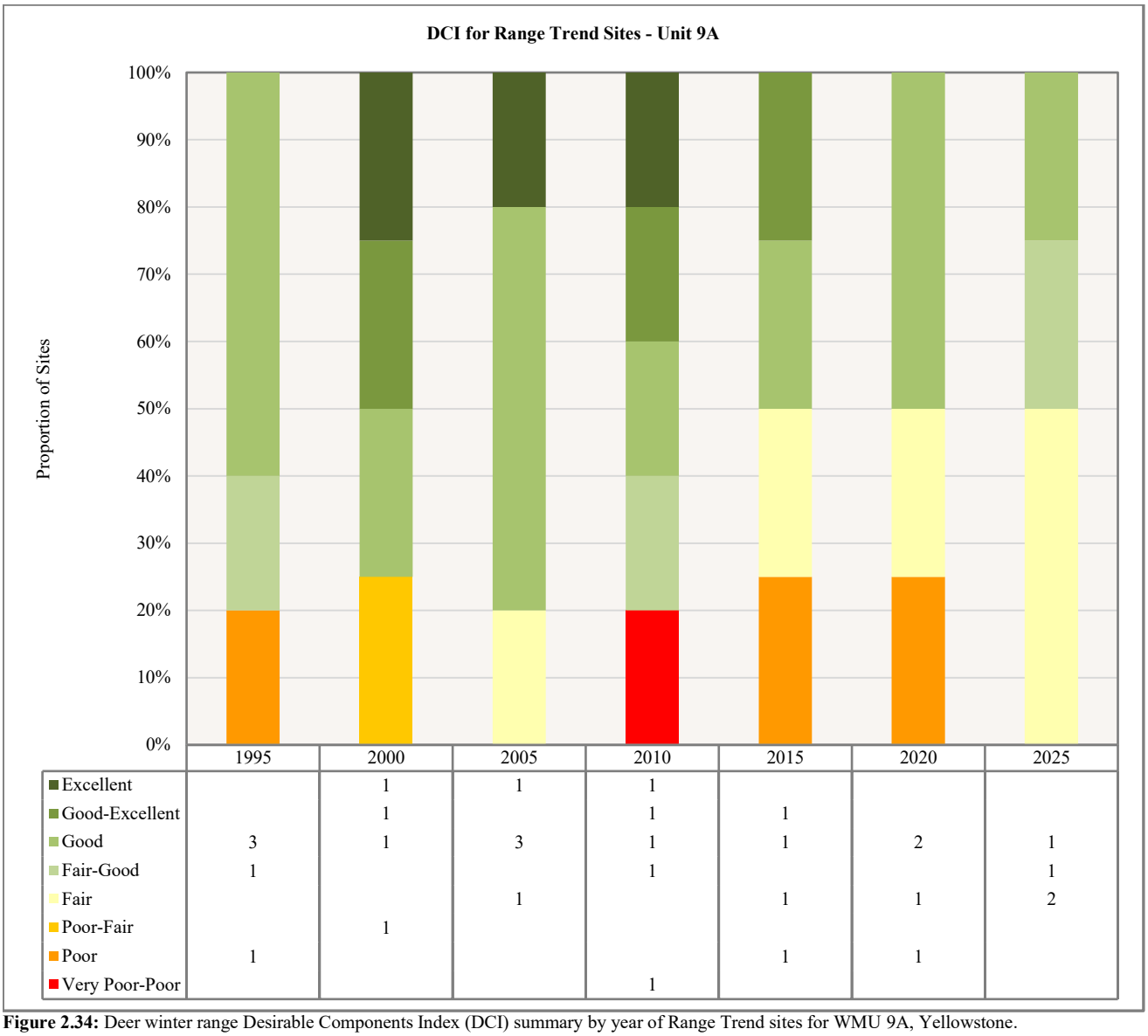


Figure 2.34: Deer winter range Desirable Components Index (DCI) summary by year of Range Trend sites for WMU 9A, Yellowstone.

Subunits 9B, 9C, Vernal/Bonanza, Diamond Mountain

On average, the condition of deer winter range (**Map 2.2**) within the Vernal/Bonanza and Diamond Mountain subunits have improved from poor-fair in 1995 to fair-good in 2025. There was a notable decrease in average habitat suitability in 2015 that corresponds with prolonged drought years that occurred between 2011 through 2018 (**Figure 2.2a**, **Figure 2.2b**). However, deer habitat quality has since improved with average condition being considered fair or better beginning in 2020 and has since improved in condition as of 2025.

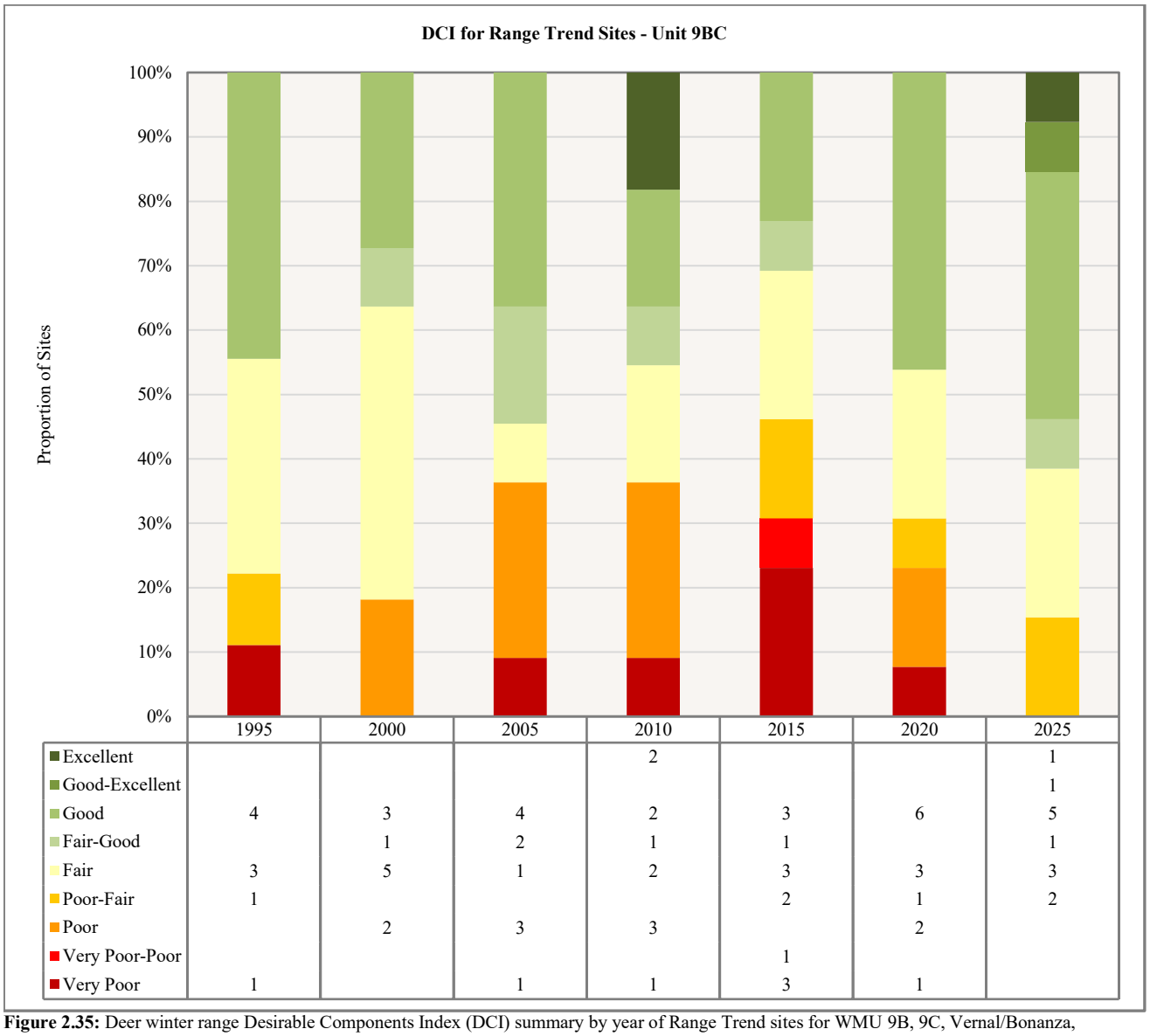
Unit suitability can be attributed to a number of sites; there are 8 sites with average Desirable Component Indices of fair or better. These sites include Dry Fork Mountain (09-03), Sawtooth-Flat Spring (09-04), Little Hole (09-09), Mosby Mountain South (09-19), Browns Park River Corridor-Livestock (09-21), Browns Park River Corridor-Wildlife (09-22), Buckhorn Canyon (09-25), and Little Mountain (09-27), which have been consistently considered to be between fair and good conditions.

On this combined unit, 6 Range Trend sites have lower averaged winter range quality and/or have higher variability in quality from year to year. Red Mountain Allotment (09-01), Island Park (09-05), Above Steinaker Draw (09-06), Toliver Creek Chaining (09-10), Red Pine Canyon (09-14) (suspended), and Brush

Creek Substation (09-24) are all considered or have been considered to be in poor condition (when averaged) and/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. Reasons for site variability are due to wildfire and/or habitat improvement treatments; some treatments are in response to habitat improvement following wildfire as is the case on the Red Mountain Allotment and Island Park study sites. If any of these sites or areas are to be considered for habitat rehabilitation, individual habitat concerns should be evaluated on a site-by-site basis. Red Mountain Allotment, Toliver Creek Chaining, and Brush Creek Substation are all sites that have had habitat improvement projects that have occurred. Although the Red Mountain Allotment has had improvements in perennial grass cover, there have been no net improvements in habitat desirable component score largely due to the lack of preferred browse since the wildfire. However, Toliver Creek Chaining and Brush Creek Substation have had slight overall improvements in conditional change; improvement has been driven by an increase in preferred shrub cover and demographics, or reductions in annual grass cover. Little Mountain and Mosby Mountain South have the highest degree of improving conditional change over time. 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 during their sample histories.

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 where the associated study sites intersect currently mapped elk habitat; there are 11 Range Trend sites intersect with elk winter range. 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 (**Map 2.3**, **Figure 2.35**, **Table 2.12**) 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 2.35**, **Table 2.12**). Sites that intersect/have intersected elk winter habitat include Red Mountain Allotment, Dry Fork Mountain, Sawtooth-Flat Spring, Island Park, Above Steinaker Draw, Little Hole, Toliver Creek Chaining, Mosby Mountain South, Brush Creek Substation, Buckhorn Canyon, and Little Mountain. The overall condition of elk winter range within the Vernal/Bonanza and Diamond Mountain Management subunits has improved since 1995. Average unit conditions improved from fair in 1995 to fair-good in 2025. The sites with elevated suitability between fair-good and good include Dry Fork Mountain, Little Hole, and Sawtooth-Flat Spring. As of 2025, Above Steinaker Draw, Brush Creek Substation, Island Park, Red Mountain Allotment, and Toliver Creek Chaining are all considered poor habitat conditions for elk. 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*). However, Island Park was the only site with elevated cheatgrass cover.



	1995	2000	2005	2010	2015	2020	2025
Excellent				2			1
Good-Excellent							1
Good	4	3	4	2	3	6	5
Fair-Good		1	2	1	1		1
Fair	3	5	1	2	3	3	3
Poor-Fair	1				2	1	2
Poor		2	3	3		2	
Very Poor-Poor					1		
Very Poor	1		1	1	3	1	

Figure 2.35: Deer winter range Desirable Components Index (DCI) summary by year of Range Trend sites for WMU 9B, 9C, Vernal/Bonanza, Diamond Mountain.

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
09-13	1995	29.3	13.2	10.8	7.6	-1	10	0	**69.9**	**F-G**
09-13	2000	30	11.5	8.3	29.1	0	10	0	**88.9**	**G-E**
09-13	2005	30	8.8	6.3	22.7	-2.7	10	0	**75.1**	**G**
09-13	2010	30	13.5	10	21.1	-0.4	10	0	**84.2**	**G**
09-13	2020	30	13.5	4.7	24	-3.5	10	0	**78.7**	**G**
09-13	2025	30	12.4	4.8	17.7	-1.6	6.6	0	**69.9**	**F-G**
09-15	1995	30	13	7.3	18.5	0	7.5	0	**76.3**	**G**
09-15	2005	30	11.6	9.4	29	-1.2	7.4	0	**86.2**	**G**
09-15	2010	30	14.3	8.2	30	-0.3	7	0	**89.2**	**G-E**
09-15	2015	30	11.1	8.3	23	-1.2	9.3	0	**80.5**	**G**
09-15	2020	30	13	5.6	30	-2.3	10	0	**86.3**	**G**
09-15	2025	30	9	0.9	16.2	-1.3	8.9	0	**63.7**	**F**
09-17	1995	26.2	13.5	5.5	30	0	2.6	0	**77.8**	**G**
09-17	2000	30	8.6	4.9	30	0	3	0	**76.5**	**G**
09-17	2005	30	7.9	3.4	30	-0.6	3.2	0	**73.9**	**G**
09-17	2010	1.2	0	0	30	-0.7	10	0	**40.5**	**VP-P**
09-17	2015	4.5	0	0	30	-0.8	10	0	**43.7**	**P**
09-17	2020	7.2	0	0	30	0	9.7	0	**46.9**	**P**
09-17	2025	7.5	15	0	30	0	7.7	0	**60.2**	**F**
09-20	1995	30	13.7	8.6	24	-0.1	10	0	**86.2**	**G**
09-20	2000	30	13.2	9.4	30	0	10	0	**92.6**	**E**
09-20	2005	30	11.9	14	30	-0.3	10	0	**95.6**	**E**
09-20	2010	30	14.5	13.8	30	-0.1	10	0	**98.2**	**E**
09-20	2015	30	14	6.5	30	-1.2	10	0	**89.3**	**G-E**
09-23	2005	30	5.4	1.7	24.1	-3	3.1	0	**61.3**	**F**
09-23	2010	30	7.5	5.9	25.3	-0.1	1.4	0	**70**	**F-G**
09-23	2015	30	6.5	3.1	30	-5.6	1.5	0	**65.5**	**F**
09-23	2020	30	4.6	1.2	30	-2.7	0.3	0	**63.4**	**F**
09-23	2025	30	5.8	9.2	30	-0.1	1.7	0	**76.6**	**G**

Table 2.11: Deer winter range Desirable Components Index (DCI) information by site number of Range Trend studies for WMU 9A, South Slope - Yellowstone. VP = Very Poor, P = Poor, F = Fair, G = Good, E = Excellent. *Studies with an asterisk have been suspended.

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
09-01	1995	26.4	10.6	4.1	3.4	-5.6	0.5	0	**39.4**	**F**
09-01	2000	25	-4.5	0.6	2.3	-5.2	0	0	**18.2**	**P**
09-01	2005	25.1	-3.7	5.8	1.7	-16.1	0.1	0	**12.9**	**P**
09-01	2010	22	5.5	1.6	3.2	-13.2	0.3	0	**19.4**	**P**
09-01	2015	0	0	0	8.4	-12.8	6.2	0	**1.8**	**VP**
09-01	2020	0.1	0	0	30	-0.3	10	0	**39.8**	**F**
09-01	2025	0.3	0	0	30	0	0.1	0	**30.4**	**F**
09-03	1995	30	12.4	4.4	30	-2.2	2	0	**76.6**	**G**
09-03	2000	30	10.1	4.7	30	0	2.3	0	**77.1**	**G**
09-03	2010	18.3	15	1.9	30	-4.5	10	0	**70.7**	**F-G**
09-03	2015	28.6	14.9	3.8	19.8	-5.9	10	0	**71.2**	**F-G**
09-03	2020	30	14.4	3.7	23.3	-3.2	10	0	**78.2**	**G**
09-03	2025	30	14.4	6.3	25.1	-0.6	10	0	**85.2**	**G**
09-04	1995	21.4	10.4	5.1	30	0	10	0	**76.9**	**G**
09-04	2000	24.3	8.7	5.1	30	0	10	0	**78.1**	**G**
09-04	2005	30	9.4	7.3	24.3	0	10	0	**81**	**G**
09-04	2010	30	11.3	4.1	30	0	10	0	**85.4**	**G**
09-04	2015	30	5.6	7.6	30	-2.1	10	0	**81.1**	**G**
09-04	2020	28.7	8.7	2.5	30	-0.1	10	0	**79.8**	**G**
09-04	2025	27.4	6.7	7.9	30	-0.1	10	0	**81.9**	**G**
09-05	1995	9.9	3.4	8.4	27.4	-2.3	1.7	0	**48.5**	**G**
09-05	2000	7.3	-5	1.4	24.3	-1.2	0.5	0	**27.3**	**F**
09-05	2005	3	0	0	26.7	-11.6	2	0	**20.1**	**P**
09-05	2010	0	0	0	6.9	-0.8	0.6	0	**6.7**	**VP**
09-05	2015	0	0	0	20.9	-14.7	3.3	0	**9.5**	**VP-P**
09-05	2020	0	0	0	23	-20	1.4	0	**4.4**	**VP**
09-05	2025	0	0	0	30	-13.8	7.7	0	**23.9**	**P-F**
09-06	1995	15	11.4	8	12	-4.6	1.2	0	**43**	**F**
09-06	2000	13.9	5.5	1.7	6	-4.1	4.8	0	**27.8**	**F**
09-06	2005	11.4	-1.4	0.6	8.2	-13.8	2.1	0	**7.1**	**VP**
09-06	2015	11.3	-0.1	4	0.9	-17.6	1.1	0	**-0.4**	**VP**
09-06	2020	12.8	3.6	3.9	6.2	-5.8	0.6	0	**21.3**	**P**
09-06	2025	8.4	3.4	0.7	11.3	-0.6	0.4	0	**23.6**	**P-F**
09-14*	1995	30	12.7	1.8	8.9	-6.3	4.7	0	**51.8**	**P**
09-14*	2000	30	11.7	1.6	16	-5.1	2.2	0	**56.4**	**P-F**
09-19	1995	7.7	11.2	3	26.4	-2.7	10	0	**55.6**	**P-F**
09-19	2000	10.8	14.5	2.8	30	0	10	0	**68.1**	**F-G**
09-19	2005	19.5	12.9	4.4	30	-2.5	10	0	**74.3**	**G**
09-19	2010	28.9	14.3	13.1	30	-0.5	9.6	0	**95.4**	**E**
09-19	2015	30	12.4	6.1	28.3	-3.6	10	0	**83.2**	**G**
09-19	2020	30	14.1	4.9	30	-1.3	10	0	**87.7**	**G**
09-19	2025	30	14.3	4.2	30	-0.1	10	0	**88.4**	**G-E**
09-24	1995	20	10.3	1.2	1.9	-2.6	1.1	0	**31.9**	**F**
09-24	2005	4.3	0	0	1	-2.7	10	0	**12.6**	**P**
09-24	2010	5.5	0	0	0.6	-3.9	10	0	**12.2**	**P**
09-24	2015	2.6	0	0	6.1	-12.4	10	0	**6.3**	**VP**
09-24	2020	4.8	0	0	3.8	-0.8	10	0	**17.8**	**P**
09-24	2025	9.9	14.4	15	2.8	-1.3	2.3	0	**43.1**	**F-G**
09-25	2000	26.4	0.2	0.8	10.8	-0.1	2.2	0	**40.3**	**F**
09-25	2005	9.3	-2.2	15	15.6	-0.4	10	0	**47.3**	**G**
09-25	2010	12.8	8.8	15	25.7	-1.5	6.5	0	**67.3**	**E**
09-25	2015	18.6	10.2	8	13.9	-20	3.7	0	**34.4**	**F**
09-25	2020	20	6.5	8.5	24.5	-5.3	2.4	0	**56.6**	**G**
09-25	2025	17.4	7.4	2.3	20.6	-0.5	1.2	0	**48.4**	**G**
09-27	2015	14.3	4.8	2.5	25	0	4.8	0	**51.4**	**P-F**
09-27	2020	15.3	11.3	14.9	30	0	5.6	0	**77.1**	**G**
09-27	2025	20.1	13.6	14.4	30	0	6.5	0	**84.6**	**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
09-09	1995	30	11.8	5.6	22.7	-0.3	6.5	0	**76.3**	**G**
09-09	2000	30	6.5	3.4	30	0	5.6	0	**75.5**	**G**
09-09	2005	30	9.7	3.1	30	-0.1	10	0	**82.7**	**G**
09-09	2010	30	13.6	5.7	30	-0.4	5.8	0	**84.7**	**G**
09-09	2015	30	12.4	4.8	30	-4.8	10	0	**82.4**	**G**
09-09	2020	30	12.8	2.8	30	-2	6.5	0	**80.1**	**G**
09-09	2025	30	13.5	3.7	30	-0.3	4.4	0	**81.3**	**G**
09-10	1995	1.1	0	0	11.6	-17	4.5	0	**0.2**	**VP**
09-10	2000	2.2	0	0	22.4	-3.6	0.5	0	**21.5**	**P**
09-10	2005	5.5	0	0	30	-0.4	0.7	0	**35.8**	**F**
09-10	2010	2.6	0	0	30	-14.4	0.2	0	**18.4**	**P**
09-10	2015	3.6	0	0	30	-10.5	0.7	0	**23.8**	**P-F**
09-10	2020	3.8	0	0	30	-10.9	0.6	0	**23.5**	**P-F**
09-10	2025	3.5	0	0	30	-2.6	1.2	0	**32.1**	**F**
09-21	2000	12.8	5.9	3.4	14.6	0	0.1	0	**36.8**	**F**
09-21	2005	16.9	7.5	4.2	16.6	-0.3	0.3	0	**45.2**	**F-G**
09-21	2010	6.8	1.2	3.3	30	0	0.6	0	**41.9**	**F**
09-21	2015	7.2	5.8	3.4	30	-6.8	1.3	0	**40.9**	**F**
09-21	2020	5.5	0	0	22.4	-0.4	0.2	0	**27.7**	**F**
09-21	2025	8.6	5.7	6.7	30	-0.4	0.4	0	**51**	**G**
09-22	2000	6.5	2.4	0.6	30	-0.1	0	0	**39.4**	**F**
09-22	2005	17.1	10	0.4	16.3	-0.4	0	0	**43.4**	**F-G**
09-22	2010	6.6	-0.9	1.6	30	-0.2	0	0	**37.1**	**F**
09-22	2015	4.2	0	0	30	-6.3	0.1	0	**28**	**F**
09-22	2020	1	0	0	30	-1.3	0	0	**29.7**	**F**
09-22	2025	2.8	0	0	30	-1	0	0	**31.8**	**F**

Table 2.12: Deer winter range Desirable Components Index (DCI) information by site number of Range Trend studies for WMU 9B, 9C, South Slope – Vernal/Bonanza, Diamond Mountain. 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
09-01	Red Mountain Allotment	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
09-02	Taylor Mountain	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species
09-03	Dry Fork Mountain	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
09-04	Sawtooth-Flat Spring	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
		Drought		Lowered resilience and resistance to disturbance
09-05	Island Park	Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
09-06	Above Steinaker Draw	Animal Use – Elk	High	Reduced shrub vigor/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
09-07	Warren Draw	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
09-08	Rye Grass	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		Drought		Lowered resilience and resistance to disturbance
09-09	Little Hole	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
09-10	Toliver Creek Chaining	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
09-13	John Star Flat	PJ Encroachment	Medium	Reduced understory shrub and herbaceous vigor
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
09-15	Mud Springs Draw	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		Drought		Lowered resilience and resistance to disturbance
09-16	Mosby Mountain	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species
09-17	Farm Creek	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
09-18	Gooseberry Spring	Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species
		Noxious Weeds	Low	Reduced diversity of desirable grass and forb species
09-19	Mosby Mountain South	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
09-20	Seep Hollow	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
09-21	Browns Park River Corridor-Livestock	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		Drought		Lowered resilience and resistance to disturbance
09-22	Browns Park River Corridor-Wildlife	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		Drought		Lowered resilience and resistance to disturbance
09-23	Rock Creek	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
09-24	Brush Creek Substation	Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	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
		Drought		Lowered resilience and resistance to disturbance
09-25	Buckhorn Canyon	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
09-27	Little Mountain	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
09R-03	Deadman Greenstrip	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
09R-04	Diamond Mountain 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

Study #	Study Name	Limiting Factor and/or Threat	Level of Impact	Potential Impact
09R-05	Little Donkey	Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
09R-06	North Little Donkey	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
09R-07	Red Fleet Lop and Scatter	Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		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
09R-10	Ruple Cabin	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
09R-14	Pot Creek Chaining	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
09R-15	Brush Creek Dixie	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
		Drought		Lowered resilience and resistance to disturbance
09R-16	Brown's Field	Annual Grass	Medium	Increased fire potential and reduced herbaceous diversity
		Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
09R-17	Toliver Creek Bullhog	Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		Animal Use – Deer	Medium	Reduced/less vigorous browse component
		Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
09R-24	Raven Ridge	Annual Grass	Medium	Increased fire potential and reduced herbaceous diversity
		Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
		Drought		Lowered resilience and resistance to disturbance
09R-25	Davis Draw Sagebrush	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity

Table 2.13: Assessment of the potential limiting factors and/or threats and level of threat to study sites for WMU 9, South Slope - Yellowstone, Vernal/Bonanza, Diamond Mountain. 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 Yellowstone subunit average as being in fair-good condition as of the 2025 sample year. Deer winter and transitional range study sites within the Vernal/Bonanza and Diamond Mountain subunits also average as being in fair-good condition. Negative factors contributing to these conditions vary, but undiversified age class structures in the preferred browse communities negatively affect many study sites in the Yellowstone subunit. Factors negatively affecting conditions in the Vernal/Bonanza and Diamond Mountain subunits vary between reduced perennial forb cover, higher cover of annual grasses, reduced preferred browse cover, and/or a lack of recruitment of young plants in the preferred browse community. In contrast, ample preferred browse cover positively influences the condition of deer winter and transitional range on most sites in the Yellowstone subunit. In the Vernal/Bonanza and Diamond Mountain subunits, the absence or lower presence of annual grasses and the ample perennial grass components positively influence many sites (**Figure 2.34**, **Figure 2.35**, **Table 2.11**, **Table 2.12**).

The diversity of ecoregions found in the South Slope Management Unit can be considered a positive attribute. A majority of the unit is comprised of the Colorado Plateaus and Wasatch and Uinta Mountains Level III ecoregions; a small portion of the Diamond Mountain subunit is also considered to be part of the Wyoming Basin ecoregion. These three larger ecoregions are further delineated into Level IV ecoregions which can vary in elevation, climate, geology, soil properties, physiographic features, and vegetation types. Seven of these Level IV ecoregions make up the South Slope Management Unit, and each of these regions can host different vegetation communities (Woods, et al., 2001) of varying usefulness for wildlife. Furthermore, collar data confirms that deer herds use many of the Level IV ecoregions in this management unit over the course of a year. An additional highlight in this unit are the improvements in habitat quality (browse diversification, decreases of annual grasses, augmentation of the herbaceous understory, pinyon-juniper reduction, etc.) that have been observed following treatment on several 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. Approximately 35,368 acres in the Yellowstone subunit and 103,474 acres in the Vernal/Bonanza, Diamond Mountain subunits have been treated through the WRI as of late January 2026 (**Map 2.9**, **Table 2.7**, **Table 2.8**).

Another positive aspect of the South Slope unit is that mountain browse communities on a number of study sites [John Star Flat (09-13), Mud Springs Draw (09-15), Gooseberry Spring (09-18), and Mosby Mountain South (09-19)] have persisted over time despite high levels of utilization from year to year. More than 70% of Utah serviceberry (*Amelanchier utahensis*), alderleaf mountain mahogany (*Cercocarpus montanus*), and/or antelope bitterbrush (*Purshia tridentata*) plants sampled in density strips on these sites have displayed signs of moderate to heavy utilization in many sample years. Despite these higher browsing pressures, densities of these populations have generally remained stable or have not displayed any notable overall decreases. The persistence of alderleaf mountain mahogany in particular on these sites corresponds with previous findings by Turley, Roundy, & Walker (2003) that this species is capable of withstanding high utilization pressures and that growth may even compensate for overutilization if abundant resources (water, soil nutrients, etc.) are available. However, these findings also state that "dry or normal years with reduced or average growth coupled with high utilization may result in under compensation and decreased shrub cover, size, forage production, and range carrying capacity" (Turley, Roundy, & Walker, 2003). On the Mud Springs Draw site, 44% of Utah serviceberry plants sampled in density strips and 47% of alderleaf mountain mahogany plants displayed signs of poor vigor in 2025. The elevated percentage of poor vigor suggests that browsing pressures in recent years (especially when combined with other factors such as drought conditions) may exceed the levels that the browse populations on this site are capable of sustaining. As such, there is the potential for this preferred browse community to decrease over time if heavy utilization compounded by lower available resources persists in the future.

The combination of heavy browsing pressures and persistent drought conditions may also be affecting or have the potential to affect other preferred browse populations in localized areas of this unit. For example, the antelope bitterbrush (*Purshia tridentata*) component on Sawtooth-Flat Spring has shown signs of notable utilization since 1995; more specifically, more than 80% of bitterbrush plants sampled in density strips were moderately to heavily browsed in all reported sample years except 2000. Bitterbrush density and percentage of young plants have exhibited slight net decreases over the same period, while poor vigor has increased. Substantial correlations between the bitterbrush community on this site and high utilization are unclear, and bitterbrush is known to be a plant that is tolerant of heavy browsing pressures given enough resource availability (Wandera, Richards, & Mueller, 1992). However, the PDSI for the Northern Mountains division (which the Sawtooth-Flat Spring study is a part of) experienced a moderate drought in 2025 (**Figure 2.1a**). Drought combined with heavy utilization could negatively affect the bitterbrush population on this site should these conditions persist in the future.

A diverse number of anthropologic influences are present in the South Slope unit that may directly or indirectly affect wildlife and habitat. Publicly owned land administrated by both federal and state agencies comprises a large portion of this management unit, as do privately-owned parcels and tribal land. The diversity of landownership is not negative in itself. However, the complexity of landownership may require higher levels of communication and coordination between agencies and individuals in order to implement habitat improvement projects and larger-scale management decisions. Human development and land use could present additional challenges. According to the LANDFIRE Existing Vegetation Type model (LC24_EVT_250, 2024), over 97,000 acres of year-long mule deer habitat in the Yellowstone subunit and nearly 49,000 acres of the same in the Vernal/Bonanza, Diamond Mountain subunits are modeled as being agricultural land (**Table 2.3**, **Table 2.6**). The cities of Vernal, Roosevelt, and part of Duchesne are also in this unit, and all three overlap year-long mule deer habitat. Human expansion is by nature dynamic in location, extent, and timeframe. Although it is limited and localized, satellite imagery does make evident the occurrence of human development over time in all three cities previously mentioned. Expansion of human presence through new construction of buildings and roads can have unintended consequences for wildlife habitat including (but not limited to) a loss of preferred browse and herbaceous forage for wildlife, habitat fragmentation, and degradation through the introduction of non-native species.

Some of the additional human activities occurring in this unit are those related to energy resource development. There are over 4,400 producing oil and gas wells that fall within the boundaries of the South Slope Management Unit. Approximately 75% of these wells are located in the Vernal/Bonanza, Diamond Mountain subunits with the remaining 25% in the Yellowstone subunit, and many wells overlap mule deer winter or year-long range (Utah Department of Natural Resources; Oil, Gas, and Mining Division, 2026). Furthermore, numerous active oil and gas fields can be found in the southern portion of the Yellowstone and Vernal/Bonanza, Diamond Mountain subunits, with those in the Yellowstone subunit in particular overlapping mule deer winter and/or year-long range (Utah Department of Natural Resources; Oil, Gas, and Mining Division, 2025). Mining operations also take place in the South Slope unit; a mine currently owned and operated by J.R. Simplot is situated north of Vernal and intersects mule deer winter habitat. Ownership of this strip mine has varied throughout the years, but phosphate has been mined in the area since production began in 1961 (Rupke, 2015). However, Simplot does practice concurrent reclamation (Simplot Company, 2026) and has collaborated with the WRI in the past (WRI #2205 and #2682) (Utah's Watershed Restoration Initiative, 2026). In addition, two areas in the Vernal/Bonanza, Diamond Mountain subunits (more specifically, a portion of Diamond Mountain Plateau and part of the Blue Mountain Plateau abutting the Utah-Colorado state line) are classified as Utah Renewable Energy Zones (UREZ) Phase I Wind Energy Zones (Utah Office of Energy Development; Utah Geological Survey, 2026). Although renewable energy-related activities do not currently threaten big game habitat in these areas, there may be potential for localized wind energy development in the future.

The largest direct impacts on the loss and fragmentation of big game habitat likely occur or have occurred during mining operations in new areas; installation of oil and gas wells; and construction of the roads that service these resources. However, there still may be potential for vehicle-animal collisions with mine and/or oil and gas-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).

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. Two state parks are located in this unit and fall within the boundaries of mapped mule deer winter habitat: Red Fleet State Park and Steinaker State Park. Average annual visitors per fiscal year (FY) to Red Fleet State Park decreased between FY 2016-FY 2020 and FY 2021-FY 2025. However, average yearly visitors to Steinaker State Park increased over the same period from 32,744 to 65,148 (respectively) (Utah State Parks, 2026). The Vernal/Bonanza subunit also contains a portion of Dinosaur National Monument, which partially overlaps mule deer ranges of varying seasonality. According to data furnished by the National Park Service, average yearly recreational visitors to Dinosaur National Monument slightly increased from 303,081 between 2015 and 2019 to 324,673 between 2020 and 2024 (National Park Service, 2025). The Flaming Gorge National Recreation Area is situated within the boundaries of the North Slope unit, but the main route to access the area (Highway 191) passes through the South Slope Management Unit. In addition, the Green River is located on the northern perimeter of the Diamond Mountain subunit and is highly regarded as a fly-fishing destination. Although the fly-fishing itself likely does not pose any threats in the context of this report, the popularity of the destination could mean increased vehicular traffic (and thus an increased potential for animal-vehicle collisions) traveling through the unit to reach the Green River.

Part of Ashley National Forest can also be found in the South Slope Management Unit; numerous recreational opportunities (developed and dispersed camping, hiking, biking, OHV use, etc.) are available on land managed by the United States Forest Service (USFS). The USFS not only monitors and manages land and resources within its jurisdiction accordingly (U.S. Department of Agriculture; Forest Service, 2024), but it also has guidelines readily available to inform the public of proper outdoor ethics and wildlife safety (U.S. Department of Agriculture; Forest Service, 2025b; U.S. Department of Agriculture; Forest Service, 2025a). In addition, numerous mountain bike trails are present in this unit. Some of these trail systems are on land administrated by the Bureau of Land Management (BLM), with Red Fleet and McCoy Flats being particularly popular (U.S. Department of the Interior; Bureau of Land Management, n.d. -a): both of these systems overlap mule deer

winter range to some degree. Like the USFS, the BLM also has management plans in place (U.S. Department of the Interior; Bureau of Land Management, 2008) and best practice guidelines available to the general public. (U.S. Department of the Interior; Bureau of Land Management, n.d. -b). However, human recreation can result in degradation of habitat (introduction of non-native plant species, trampling vegetation via unauthorized off-road or off-trail travel, etc.) and disturbances of animals 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 (Utah Wildlife Action Plan Core Team, 2025) that could be exacerbated by other simultaneous stressors. As such, the potential for recreation-related effects on wildlife and wildlife habitat is a possible concern within the South Slope unit.

Utah Roadkill Reports data indicates that highway mortality presents an additional (and known) threat to wildlife (particularly mule deer) in portions of this unit. Roadkill pick-up reports for mule deer between January 2020 and February 2026 appear to be concentrated along US-191 north of Vernal; east on US-40 between Vernal and Jensen; and west along US-40 between Gusher and Duchesne. The data also shows multiple reports over the same period on various roads between the towns north of US-40 between Duchesne and Vernal (Lapoint, Altamont, etc.), and scattered reports northwest of Vernal on Dry Fork Canyon Road. One should keep in mind that collisions occurring at high enough speeds to result in animal fatality 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 portions of the unit (Utah Division of Wildlife Resources, 2026).

Introduced annual grasses pose a low-level threat to a majority of the sites in the South Slope unit as of their most recent sample year. However, these grasses may have the potential to pose a more substantial threat to habitat, particularly on lower-elevation sites in the southern portion of the Vernal/Bonanza and Diamond Mountain subunits. Except for on the Island Park (09-05) study, cheatgrass (*Bromus tectorum*) contributed less than 7% cover (the threshold for an annual grass threat level of "high" – Appendix A - Threat Assessment) on all Range Trend sites sampled in 2025 in the Vernal/Bonanza, Diamond Mountain subunits. However, many studies have had flushes of introduced annual grasses within the last 10 years (2015-2025); the Island Park site had particularly notable cheatgrass cover (20% and 58%) in 2015 and 2020, respectively. Other Range Trend and WRI sites in these subunits that have had ≥7% introduced annual grass cover (primarily cheatgrass) in the last 10 years include the following: Red Mountain Allotment, Dry Fork Mountain, Above Steinaker Draw, Toliver Creek Chaining, Brush Creek Substation, Buckhorn Canyon, Deadman Greenstrip, Little Donkey, Brush Creek Dixie, Brown's Field, Toliver Creek Bullhog, and Raven Ridge. These past flushes may suggest that these sites could be susceptible to higher annual grass loads under the right conditions or after disturbance. High amounts of cheatgrass can increase fuel loads and exacerbate the risk of wildfire (Balch, D'Antonio, & Gómez-Dans, 2013), thus posing a threat to any browse communities that may be present in the affected area.

A number of pinyon-juniper removal projects have taken place over the years through the Watershed Restoration Initiative. However, pinyon-juniper encroachment is still occurring in this unit. The LANDFIRE Existing Vegetation Type model suggests that 103,000 acres of mule deer winter range in the Yellowstone subunit and 116,000 acres of the same in the Vernal/Bonanza, Diamond Mountain subunits is comprised of pinyon and juniper vegetation types (**Table 2.2**, **Table 2.5**). On a more localized level, tree encroachment poses a low-level threat on 15 of the 35 active Range Trend and WRI study sites; and a medium threat on one additional site. In addition, encroachment of twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) poses a high-level threat on the Above Steinaker Draw study (**Table 2.13**). This site is considered to be within Phase II transitioning to Phase III of woodland succession as of 2025, and the condition of vegetation could provide insight on similarly encroached communities in the South Slope unit. The preferred browse component on Above Steinaker Draw has decreased in both cover and density as trees have increased over time. Furthermore, poor vigor and decadence within the Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) population have remained elevated in recent sample years. The herbaceous understory has generally remained degraded; cheatgrass was the dominant component in many previous years, and the introduced annual forb desert madwort (*Alyssum desertorum*) provided most of the herbaceous cover in 2025. Pinyon and juniper will likely continue to increase and preferred browse continue to

decrease in the future without a tree-removing disturbance (Lane, Payne, & Cox, Utah Big Game Range Trend Studies: 2025 Annual Report, 2026).

As of 2025, Range Trend data in higher elevation mule deer summer range is lacking in the South Slope unit and particularly in the Yellowstone subunit. According to the current LANDFIRE Existing Vegetation Type (LC24_EVT_250, 2024) model, however, approximately 71,500 acres of the summer mule deer habitat in the Yellowstone subunit is comprised of the Rocky Mountain Lodgepole Pine Forest biophysical site (also referred to here as "vegetation types"). An additional 68,400 acres of summer range in this subunit are modeled as either Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland or Rocky Mountain Aspen Forest and Woodland vegetation types. The Rocky Mountain Subalpine-Montane Mesic Meadow biophysical site comprises nearly 17,000 acres of summer range in Yellowstone subunit (**Table 2.1)**. Of the summer range in the Vernal/Bonanza, Diamond Mountain subunits, about 55,000 acres are modeled as lodgepole pine forest, approximately 59,5000 are classified as aspen vegetation types, and nearly 1,300 as the Rocky Mountain Subalpine-Montane Mesic Meadow vegetation type (**Table 2.4**). The aforementioned aspen biophysical sites can be susceptible to conifer encroachment, or in the case of the Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland type, increased conifer dominance (The Nature Conservancy LANDFIRE Team, 2015). The LANDFIRE Vegetation Departure Index (LF2024_VDep_CONUS, 2024) suggests that over 90% of summer range comprised of these two aspen vegetation types is moderately departed from reference conditions in both the Yellowstone and Vernal/Bonanza, Diamond Mountain subunits. Additionally, 97% of the Rocky Mountain Subalpine-Montane Mesic Meadow vegetation type on summer range in the Yellowstone subunit and 83% of the same in the Vernal/Bonanza, Diamond Mountain subunits are moderately departed from reference conditions.

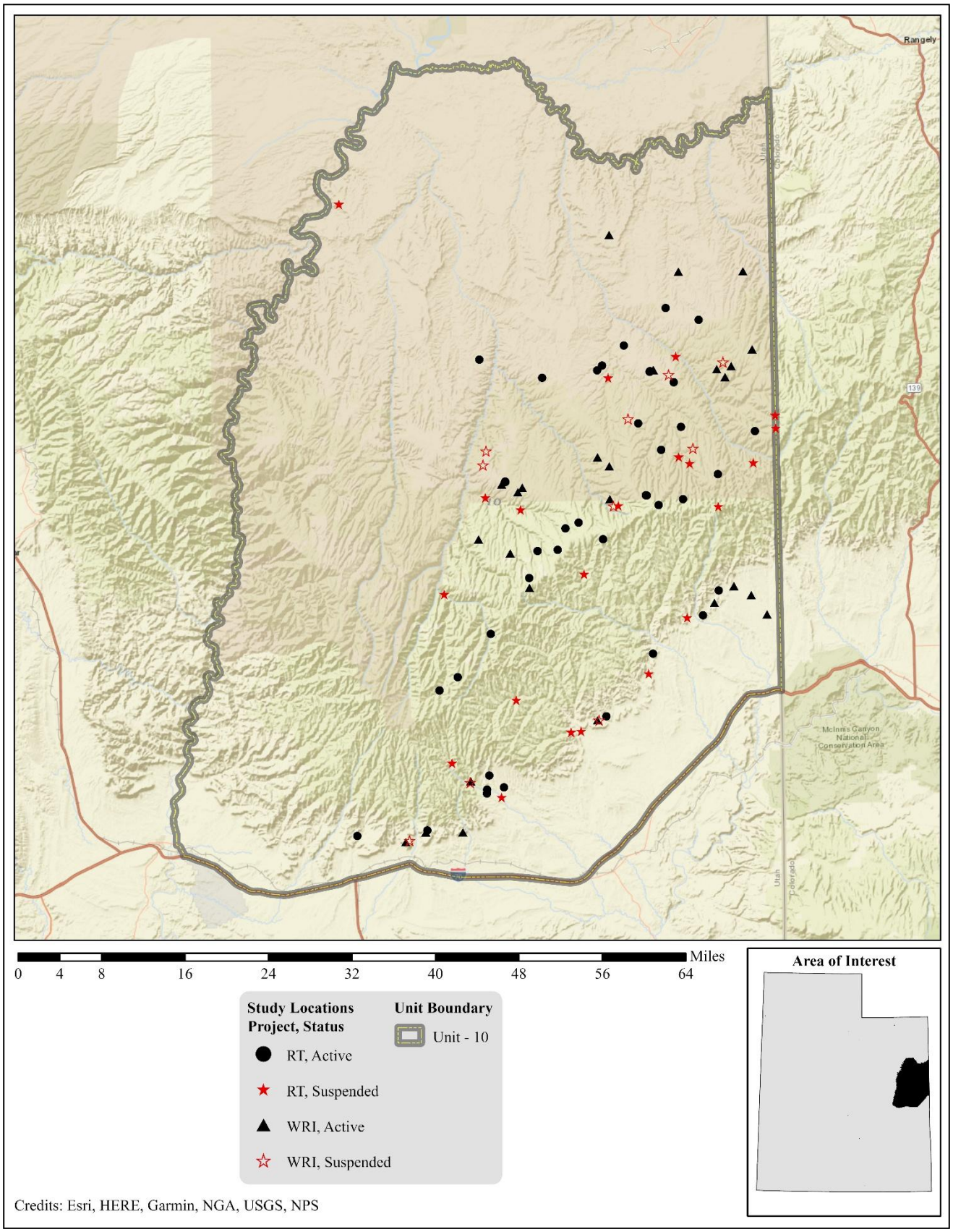
Select WRI treatments have targeted/are targeting some of these lodgepole pine and mountain meadow biophysical sites, including (but not limited to) Vernal Municipal Watershed Restoration Project Phase 1 (WRI Project #5891), Alma Taylor Timber Stand Improvement and Meadow Restoration (WRI Project #4980), and Bennion Park Lop and Scatter Project (WRI Project #6972), among others. These projects have aimed to thin lodgepole pine stands and/or remove encroaching conifers from mountain meadow communities. Other projects such as Ashley NF Aspen Restoration Project (WRI Project #5325) have completed necessary survey work in preparation for future treatments to rejuvenate aspen stands (Utah's Watershed Restoration Initiative, 2026).

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 2.13**).

There are a few suggestions to consider for maintaining or improving big game habitat within the South Slope 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 2.10**) 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. As indicated by the Above Steinaker Draw study site, the area above Steinaker Draw 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 grasses – particularly cheatgrass – often behave opportunistically and can increase when resources are released. As previously discussed, annual grasses are generally not considered to be a high-level threat on Range Trend study sites this unit as of 2025, but flushes have occurred in prior sample years. As such, proactive monitoring of annual grass loads is advisable. Annual grass treatments (herbicide application, changes in grazing management, etc.) may be advisable on the Island Park site and could be prudent in other areas throughout the unit if future flushes occur. As evidenced by the Red Mountain Allotment and Deadman Greenstrip studies, multiple treatments over time may be necessary to control annual grasses and allow for more desirable species to establish. If reseeding is necessary to restore herbaceous species, care should be taken in species selection and preference should be given to native species when possible. Current Range Trend data cannot determine unit-wide condition, extent, and effects of lodgepole pine stands and conifer encroachment into aspen and meadow habitats. However, further investigation should continue to occur along

with appropriate treatments when and where necessary. 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 10 – BOOK CLIFFS



WILDLIFE MANAGEMENT UNIT 10 – BOOK CLIFFS

Boundary Description

> **Grand and Uintah Counties** – Boundary begins at Exit 164 on I-70 near the town of Green River; east on I-70 to the Utah-Colorado state line; north on this state line to the White River; west along this river to the Green River; south along this river to Swasey's Boat Ramp and the Hastings Road; south on this road to SR-19; south and east on SR-19 to Exit 164 on 1-70 near the town of Green River. **Excludes all Native American Trust Land within the boundary**.

Management Unit Description

Geography

The maximum elevation in the combined Book Cliffs unit is just less than 9,500 feet at Roan Peaks. The unit is bordered by Desolation Canyon and the Green River to the west and the White River to the north. Major drainages include Hill Creek, Willow Creek, and Bitter Creek. The southern and western portions of the management unit contain many canyons. The communities of Ouray and Bonanza are located just outside of the northern unit boundary. In the South Book Cliffs subunit (10B), terrain in higher elevations is typically steep and rough. Desolation and Gray Canyons fall partially within the westernmost portions of the subunit, and numerous other canyons are located throughout. The lowest elevation for the combined unit is located near Elgin at just over 4,100 feet. Parts of the city of Green River and the small town of Thompson Springs are within the boundaries of subunit 10B. Pictographs and petroglyphs can also be found in this management unit.

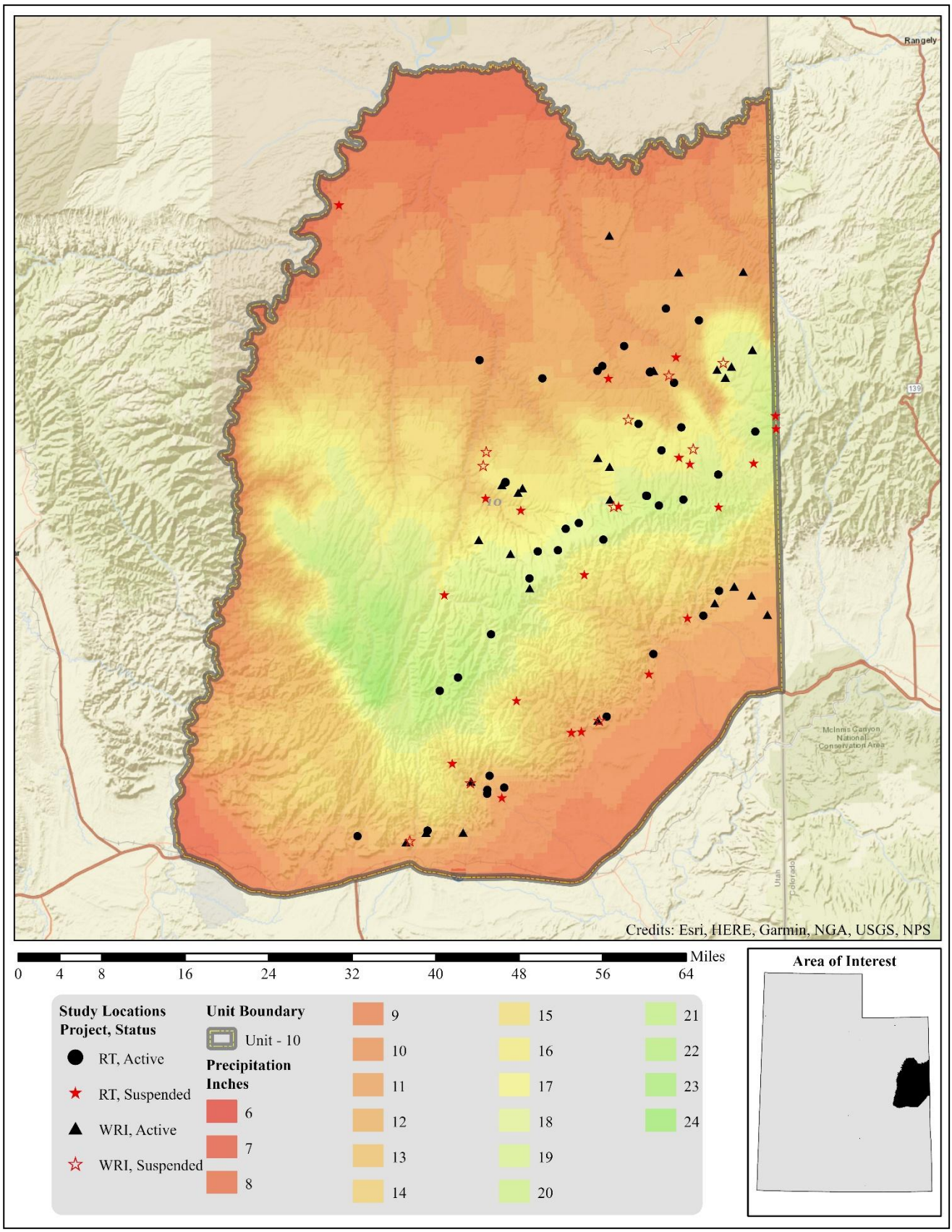
Climate Data

The 30 year (1981-2010) annual precipitation PRISM model shows that precipitation ranges on the unit from 6 inches along portions of the bottomlands of the Green River to 24 inches along the divide near Post Canyon Ridge and Roan Peaks. All of the Range Trend and WRI monitoring studies on the unit occur within 7-21 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 Uinta Basin and Southeast divisions (Division 6 and Division 7, respectively).

Since 1995, the Uinta Basin and Southeast divisions, which encompass the Book Cliff unit, have predominantly experienced some form of drought or dry spell, indicated by their most common mean annual PDSI readings. The Uinta Basin division has been in a state of drought for 64% of the time since 1995, while the Southeast climate division has been in drought for nearly 55% over the same period. The severity has been significant, with 65% of drought years in the Uinta Basin being considered either moderate or extreme, compared to 59% in the Southeast division. The Uinta Basin division has not recorded a moderately wet year since 2011, and it's 26-year stretch of drought or dry conditions has only been interrupted by six single wet year events. Over the 31 years of reported PDSI, the Southeast division has not had any recorded consecutive wet years, and drought years have only been interrupted by six single wet year events. The most notable wet year for the Uinta Basin and Southeast divisions occurred in 2005 (**Figure 3.1a**, **Figure 3.2a).** 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 3.1b**, **Figure 3.2b)** For the Uinta Basin, the years that follow the pattern of consecutive wet fall and spring occur in 1996/97, 1997/98, 1998/99, and 2004/05. For the Southeast division, the years that follow this same pattern occur in 1996/97, 1997/98, 2004/05, 2005/06, 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**). For division 6, the 1995 and 2005 sample years occur during a wet year, but years where drought may have affected plant condition occur in 2000, 2010, 2015, 2020, and 2025. For division 7, the 1995, 2005, 2010, and 2015 sample years occur during a wet year, but years where drought may have affected plant condition occur in 2000, 2020, and 2025 (**Figure 3.1a**, **Figure 3.1b**, **Figure 3.2a**, **Figure 3.2b**) (National Oceanic and Atmospheric Administration, 2026).



Map 3.1: The 1991-2020 PRISM Precipitation Model for WMU 10, Book Cliffs (PRISM Climate Group, Oregon State University, 2021).

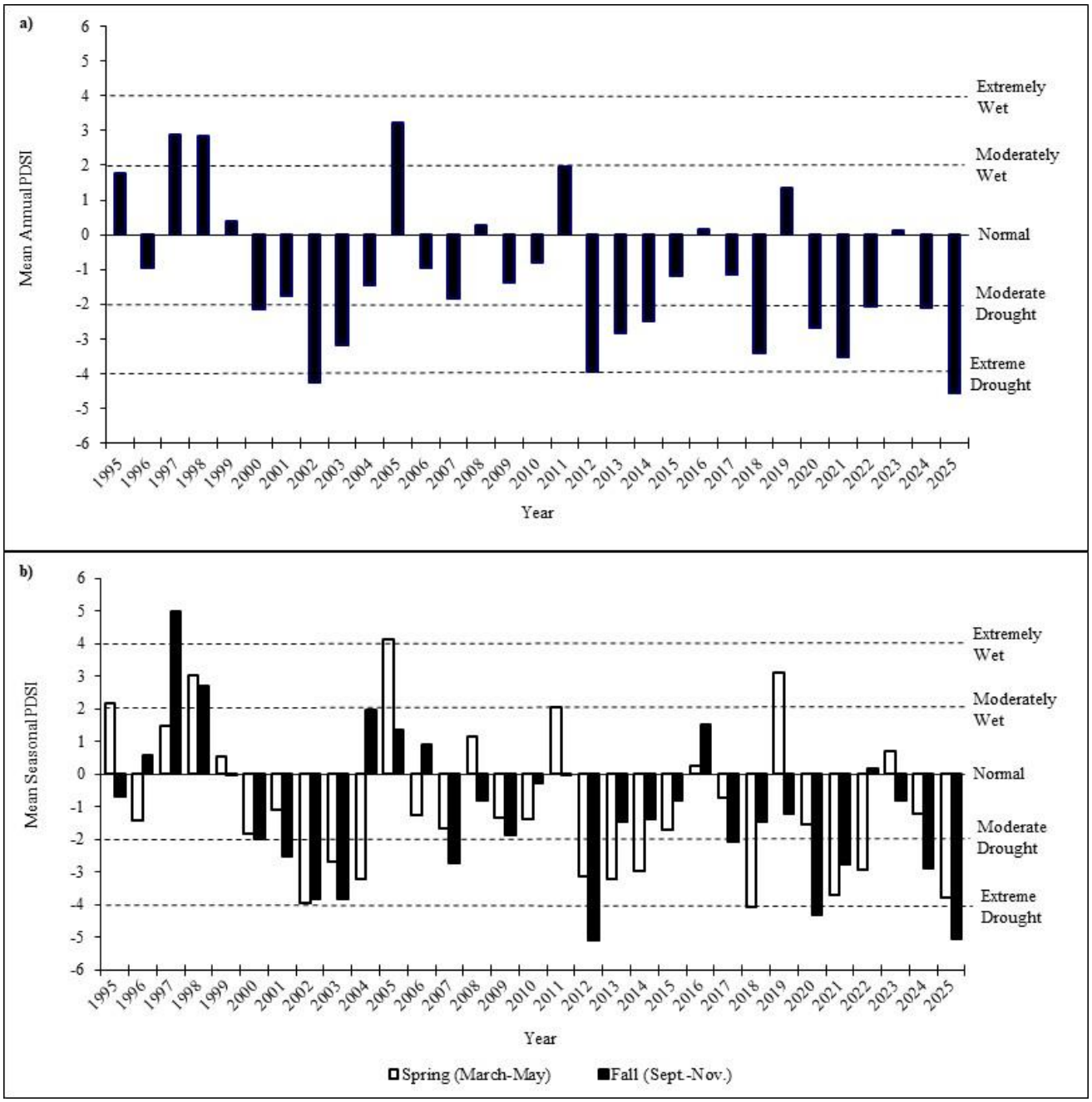


Figure 3.1: The 1995-2025 Palmer Drought Severity Index (PDSI) for the Uinta Basin division (Division 6). The PDSI is based on climate data gathered from 1895 to 2025. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet, and negative deviations indicate drought. Classification 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, 2026).

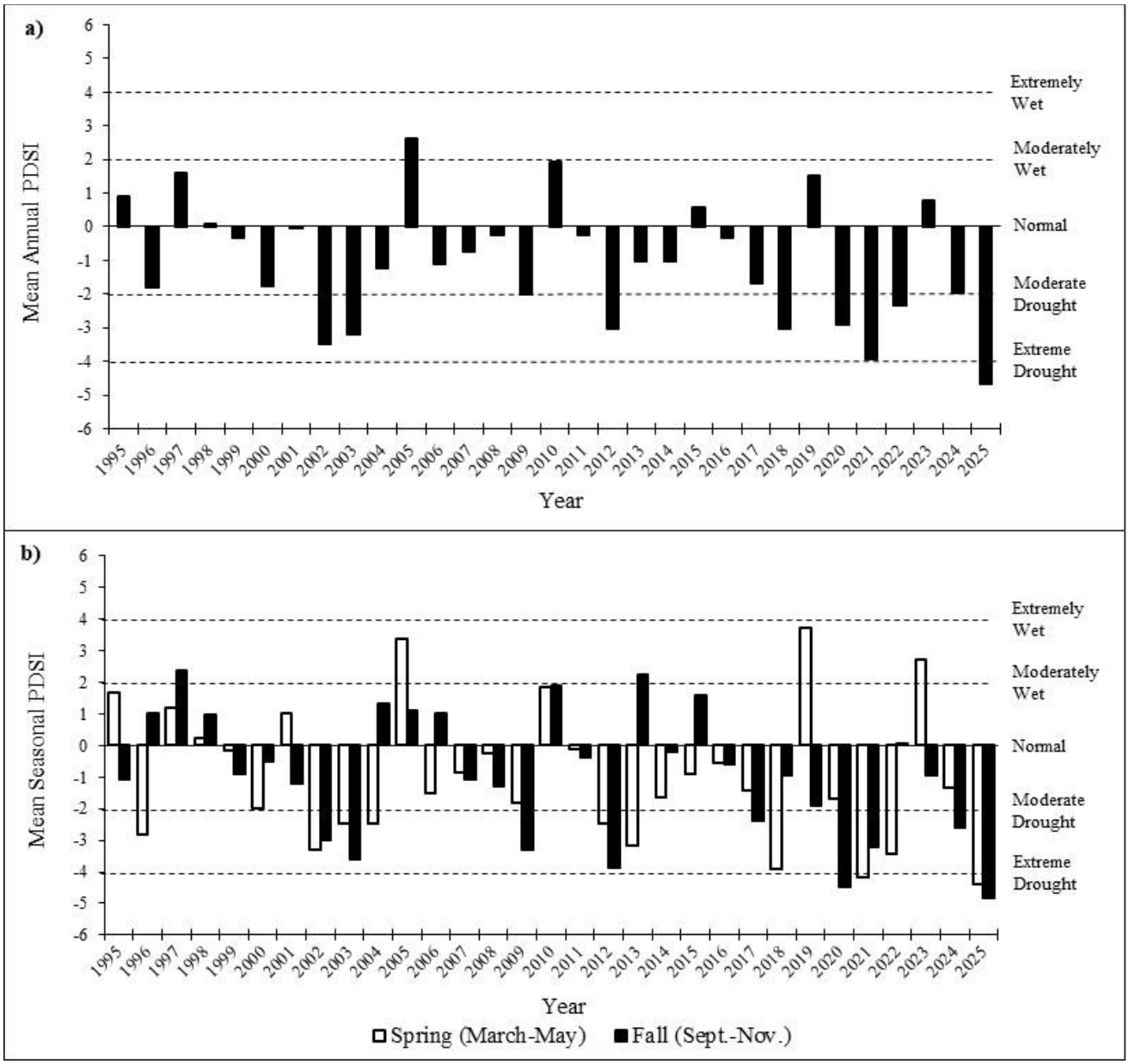


Figure 3.2: The 1995-2025 Palmer Drought Severity Index (PDSI) for the Southeast division (Division 7). The PDSI is based on climate data gathered from 1895 to 2025. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet, and negative deviations indicate drought. Classification 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, 2026).

Big Game Habitat

Key areas of interest for big game in the Bitter Creek subunit (10A) include Lower McCook Ridge, Big Park Mountain, Big Park, Sunday School Canyon, Lower Seep Ridge and East Bench, Indian Ridge, Reservoir Canyon, and Atchee Ridge. These areas all support concentrations of wintering deer, elk, and/or pronghorn in the northern portion of the Book Cliffs. Elk utilize many of the same areas, especially McCook Ridge. The north side of the unit that is considered to be winter range is composed of several main vegetation types including pinyon-juniper, salt desert shrub, and Wyoming big sagebrush. The southern end of the unit is considered summer range for most big game species with the vegetation composition principally comprised of sagebrush/grass and mountain brush, with isolated patches of conifer and aspen. The canyon and ridges along the Divide are principally year-long habitat for bison. Big game key areas of interest in the South Book Cliffs subunit (10B) include Winter Camp Draw, Bryson Wash, Danish Flat, Cisco Mesa, Coral Canyon Bench and Coral Point, and Nash Wash: these areas support concentrations of wintering mule deer, elk, and/or pronghorn. The heaviest presence of deer, elk, and pronghorn appears to occur on and near the benches/flats of Winter Camp Draw, San Arroyo Wash, Bryson Ridge, Cottonwood Ranch, Pear Park, and Nash Wash where the vegetation types are similar to those in the northern Book Cliffs. Wyoming big sagebrush and pinyon-Utah juniper are the major cohorts of this area, and numerous habitat improvement projects have occurred to reestablish vegetation valuable to wildlife and big game following wildfire(s). The southern benches and canyons comprise the principal winter range areas for mule deer and winter/year-long habitat for elk and bison.

With a maximum elevation of just over 9,000 feet, the southern portion of the Bitter Creek unit (10A) contains only small amounts of fawning areas and summer range, and few deer reside in the area year-round. However, many deer that spend the summer on higher ranges in the northern portion migrate annually to winter ranges in the southern portion of the unit. Terrain between the higher summer ranges and lower winter ranges to the south is steep and rugged and is used primarily as a travel corridor with limited migration occurring over a short period of time. In the South Book Cliffs unit (10B), upper limits of the normal winter range are normally found between 8,000 and 8,500 feet, depending on the slope and exposure. During severe winters, however, these upper limits are usually lowered to about 7,000 feet. The lower limits of the winter range in the southern portion are bordered by salt desert communities at approximately 5,000 feet.

Rangeland Analysis Platform (RAP) – Cover by Mule 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 studies, 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 cover values 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. The following graphs represent vegetation changes by 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 inclusion of the RAP data in this report is to also help illustrate the year-to-year fluctuations or changes that may occur between Range Trend samplings. Also displayed in the following graphs is the change in satellite imaging resolution from 30m to 10m used to calculate cover: this change occurs in 2018 and is denoted by a dashed line. Calculated cover estimations in 2018 and beyond use 10m resolution, so caution should be used when comparing years before 2018 to years after, as sequential comparisons are not at the same scale.

The RAP data illustrates yearly fluctuations in herbaceous cover on mule deer winter, summer, and year-long ranges. Herbaceous cover peaked in the early 1990s and has since decreased on ranges of all seasonality. Annual and perennial covers have followed precipitation trends in many years, although lag effects of a year or so have occurred at other times. In general, perennial herbaceous lifeforms have generally provided more cover on winter and summer ranges, but year-long ranges have experienced years where cover for annual herbaceous lifeforms have been inversed (**Figure 3.3**, **Figure 3.4**, **Figure 3.5**). Range Trend data shows that herbaceous cover has exhibited variations from year to year, but generally with an overall increasing trend. On Mountain (Big Sagebrush) and Upland (Big Sagebrush) study sites, total average herbaceous cover has increased when comparing 1995 data with that from 2025. However, on semidesert study sites, average herbaceous cover has largely remained stable to slightly decreasing 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 3.32**, **Figure 3.33**, **Figure 3.34**, **Figure 3.35**).

The RAP data for tree and shrub cover shows fluctuations from year to year. 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. Trees have largely provided equivalent cover to shrubs on deer summer range in most years. However, tree cover has provided generally more cover than shrubs on deer winter and year-long ranges. Excluding year-long habitat, RAP data shows that shrub cover has remained relatively similar from year-to-year while tree cover has increased over time (**Figure 3.6**, **Figure 3.7**, **Figure 3.8**). However, some recent trends for mountain, upland, and semidesert big sagebrush potentials can clarify Range Trend study site behavior in relation to RAP cover estimations. Shrub cover has increased substantially between 2010 and 2025 on Mountain (Big Sagebrush) sites, while shrub cover has experienced no net gain and Semidesert (Big Sagebrush) sites have experienced a decrease in cover (**Figure 3.9**). However, tree covers on Upland and Semidesert (Big Sagebrush) sites display decreases over time, trends that do not follow the same trend as RAP cover data. This discrepancy may be partially due to Range Trend sites often being located in areas of landscape projects that often include tree removal treatments (**Figure 3.14**, **Table 3.6**). 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 Cover by Mule Deer Habitat

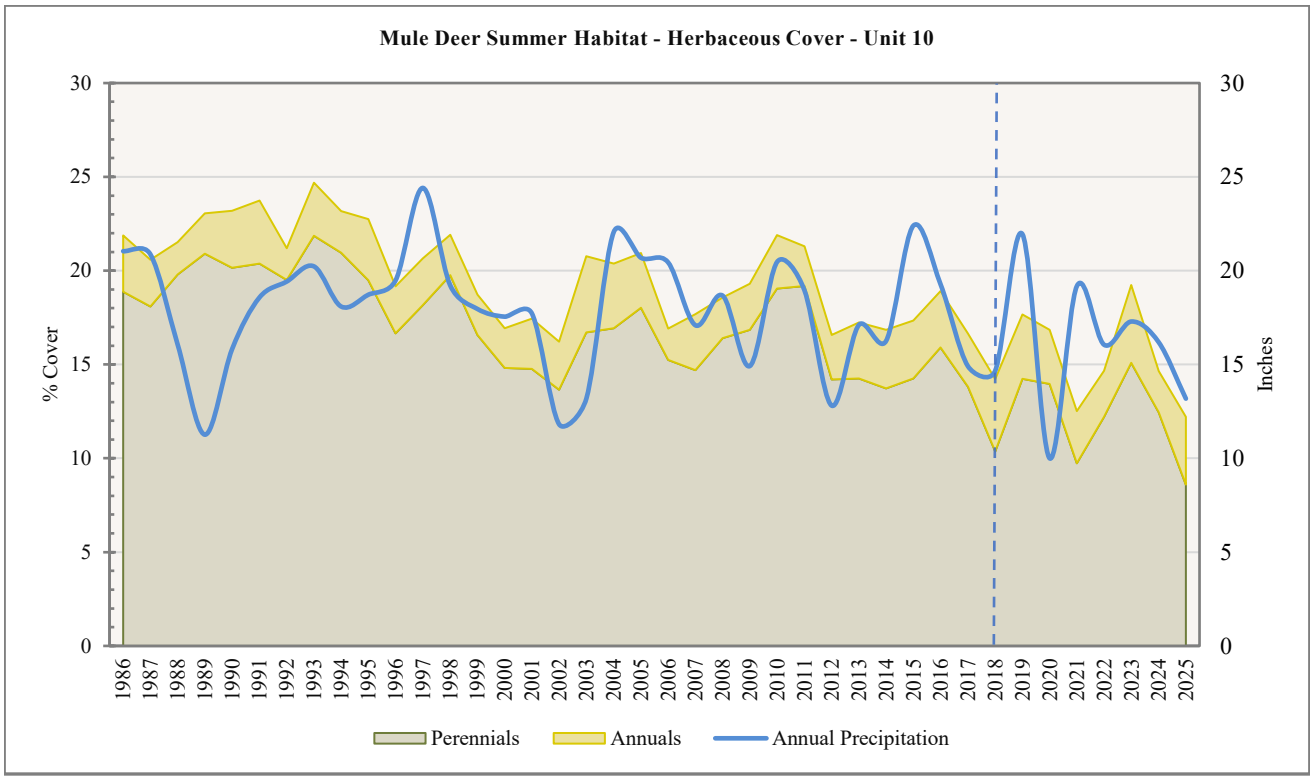


Figure 3.3: Average precipitation and estimated yearly herbaceous cover of stacked perennial and annual lifeforms for summer mule deer habitat in WMU 10, Book Cliffs (Rangeland Analysis Platform, 2026).
*Dashed line indicates shift in depicted datasets from RAP 30m (1986-2017) to RAP 10m (2018-2025) (USDA Agricultural Research Service, 2026).

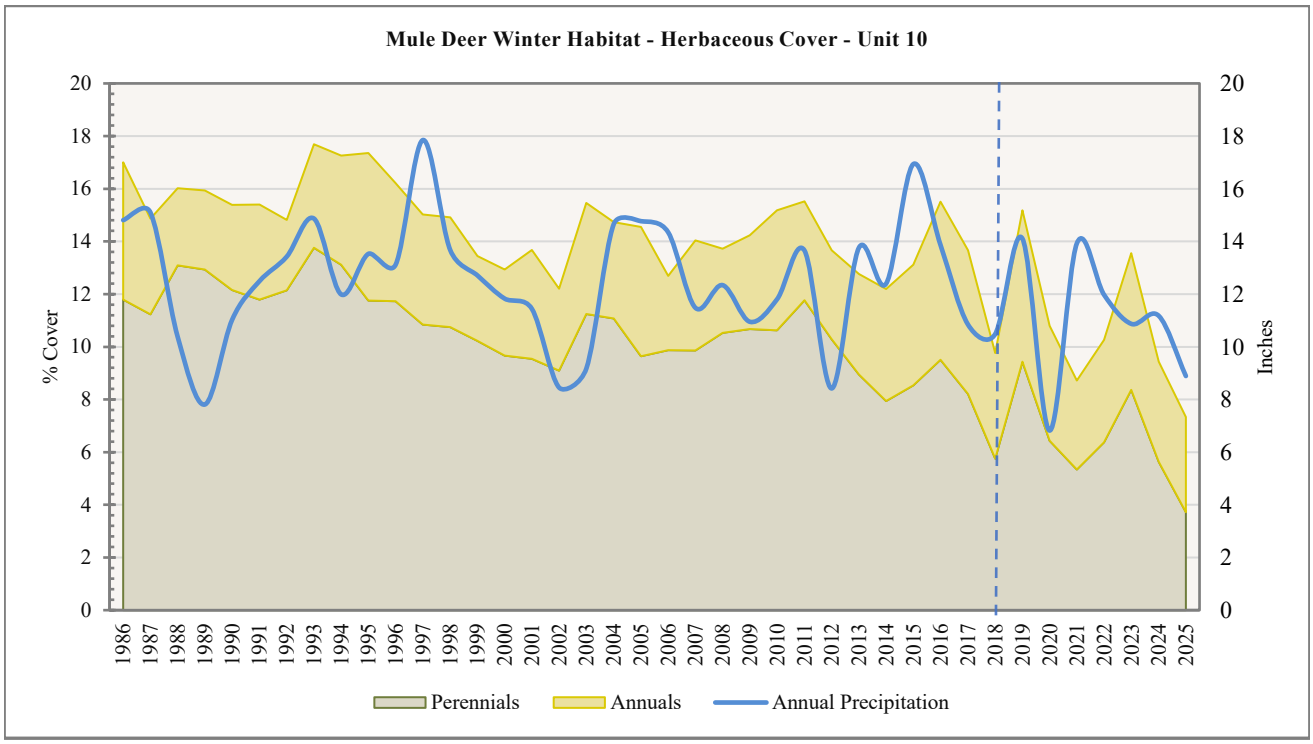


Figure 3.4: Average precipitation and estimated yearly herbaceous cover of stacked perennial and annual lifeforms for winter mule deer habitat in WMU 10, Book Cliffs (Rangeland Analysis Platform, 2026).
*Dashed line indicates shift in depicted datasets from RAP 30m (1986-2017) to RAP 10m (2018-2025) (USDA Agricultural Research Service, 2026).

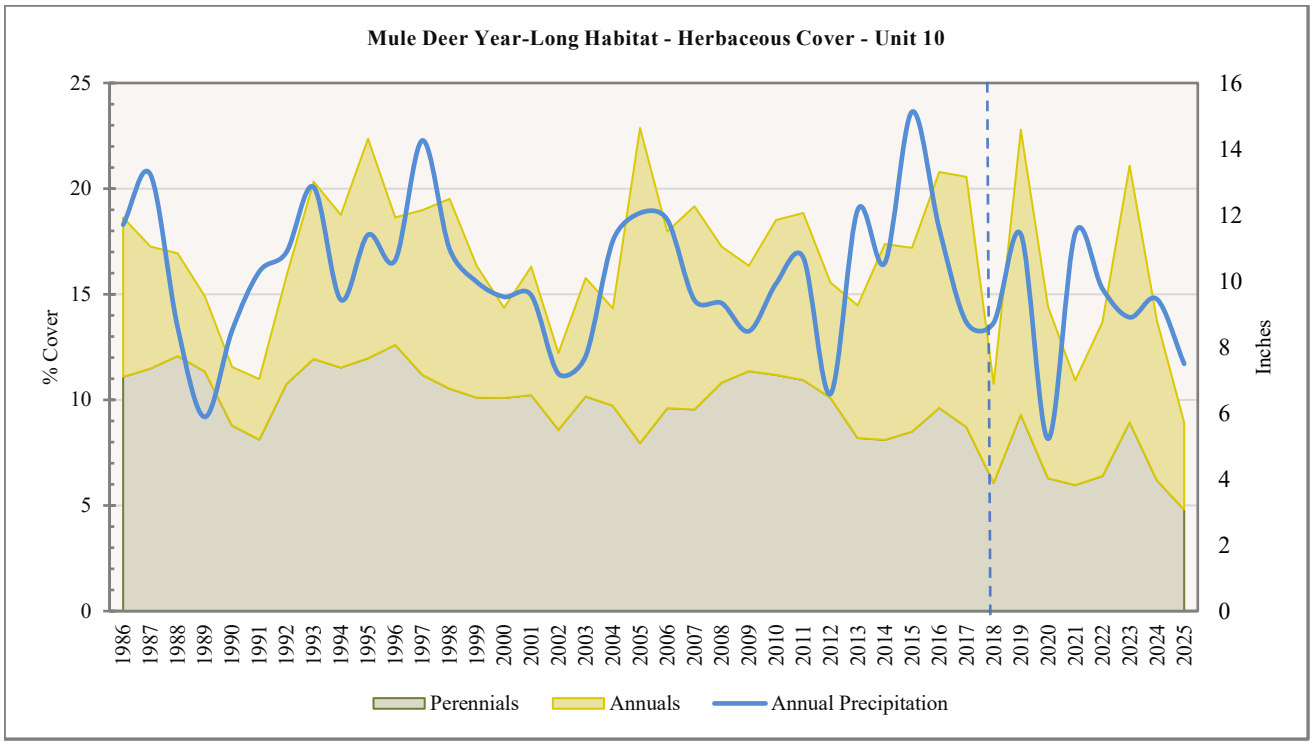


Figure 3.5: Average precipitation and estimated yearly herbaceous cover of stacked perennial and annual lifeforms for year-long mule deer habitat in WMU 10, Book Cliffs (Rangeland Analysis Platform, 2026).
*Dashed line indicates shift in depicted datasets from RAP 30m (1986-2017) to RAP 10m (2018-2025) (USDA Agricultural Research Service, 2026).

RAP – Shrub and Tree Cover by Mule Deer Habitat

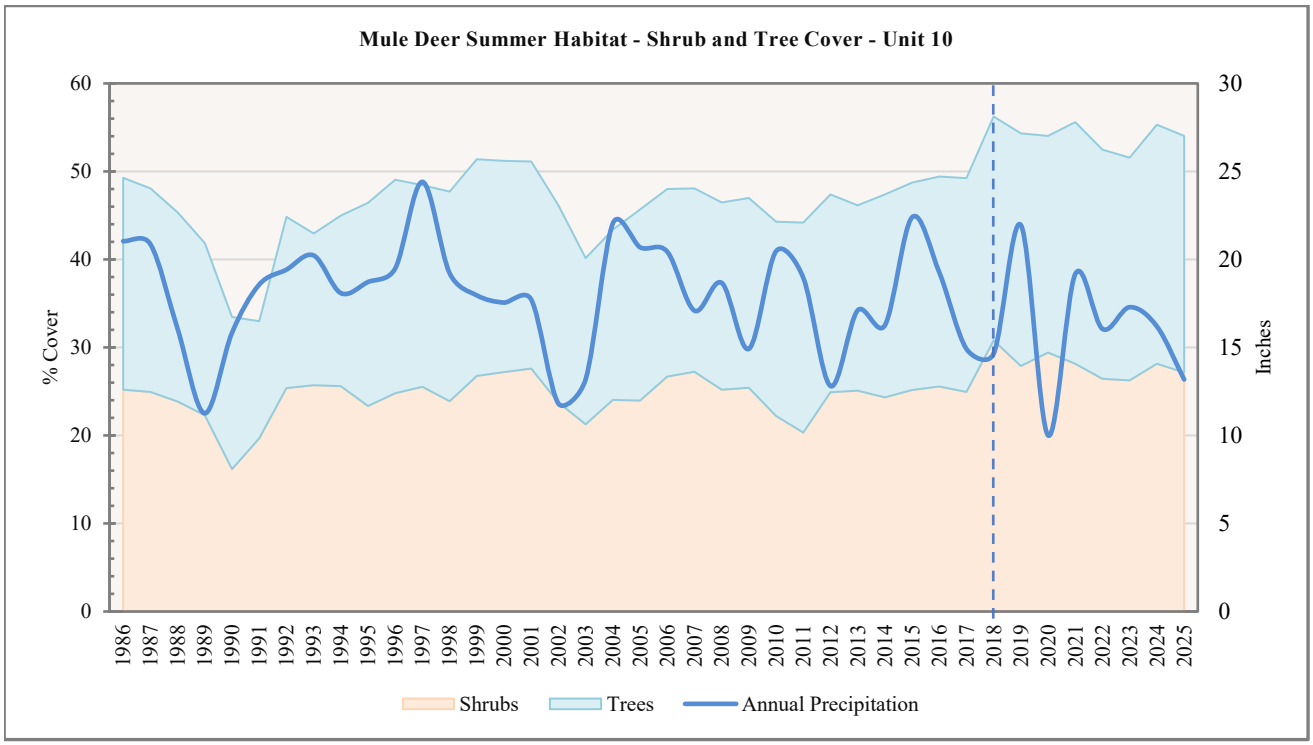


Figure 3.6: Average precipitation and estimated yearly stacked shrub and tree cover for summer mule deer habitat in WMU 10, Book Cliffs (Rangeland Analysis Platform, 2026).
*Dashed line indicates shift in depicted datasets from RAP 30m (1986-2017) to RAP 10m (2018-2025) (USDA Agricultural Research Service, 2026).

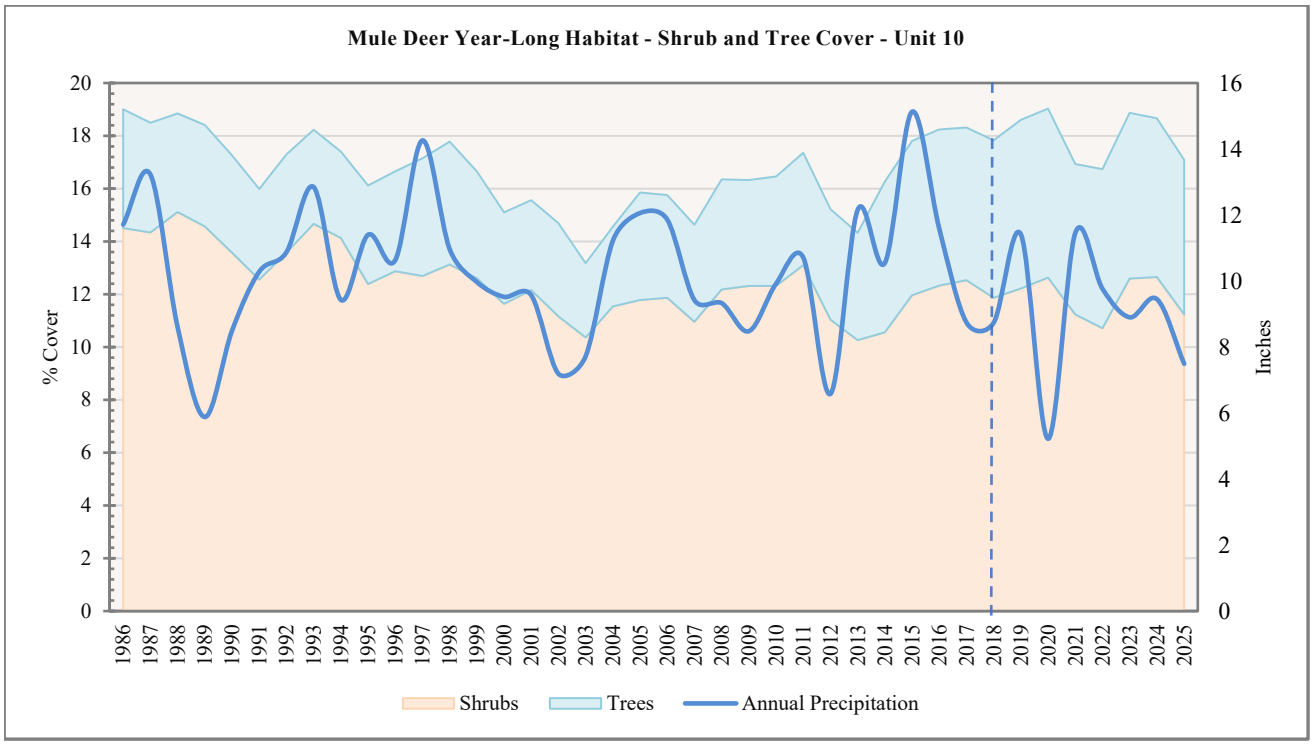


Figure 3.7: Average precipitation and estimated yearly stacked shrub and tree cover for year-long mule deer habitat in WMU 10, Book Cliffs (Rangeland Analysis Platform, 2026).
*Dashed line indicates shift in depicted datasets from RAP 30m (1986-2017) to RAP 10m (2018-2025) (USDA Agricultural Research Service, 2026).

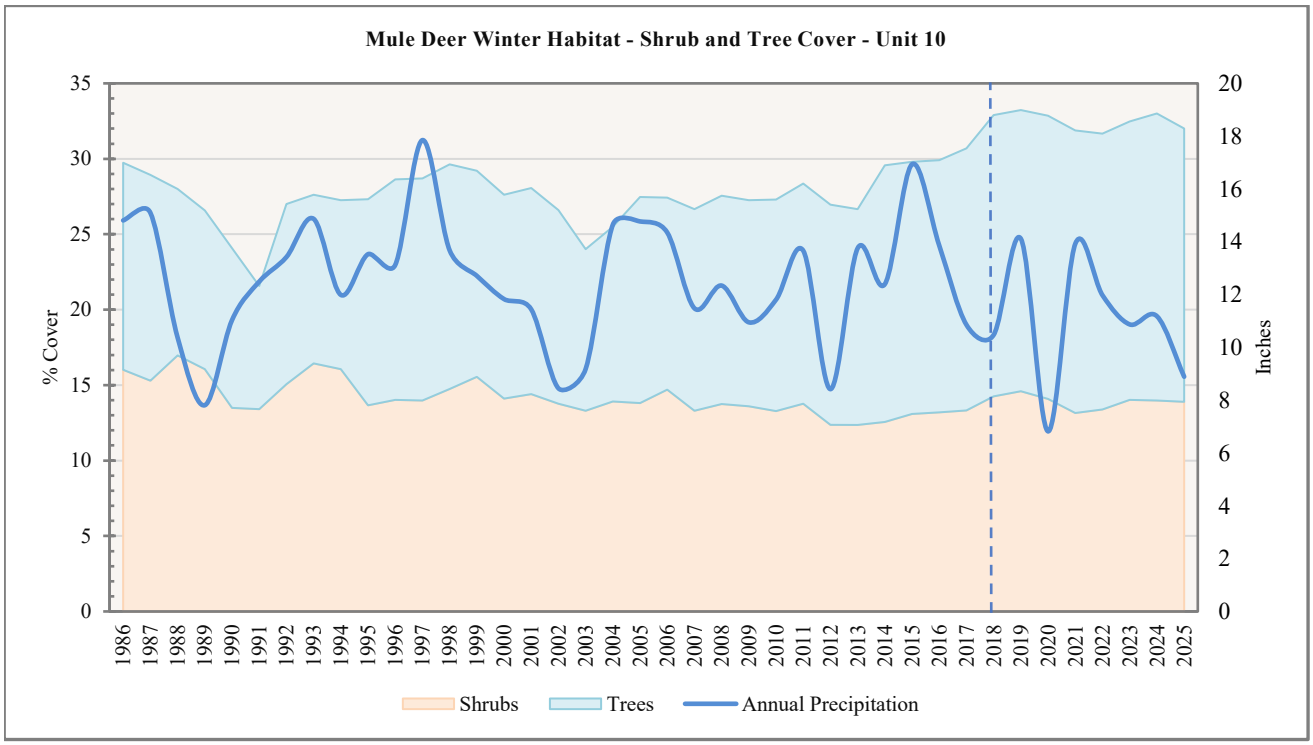
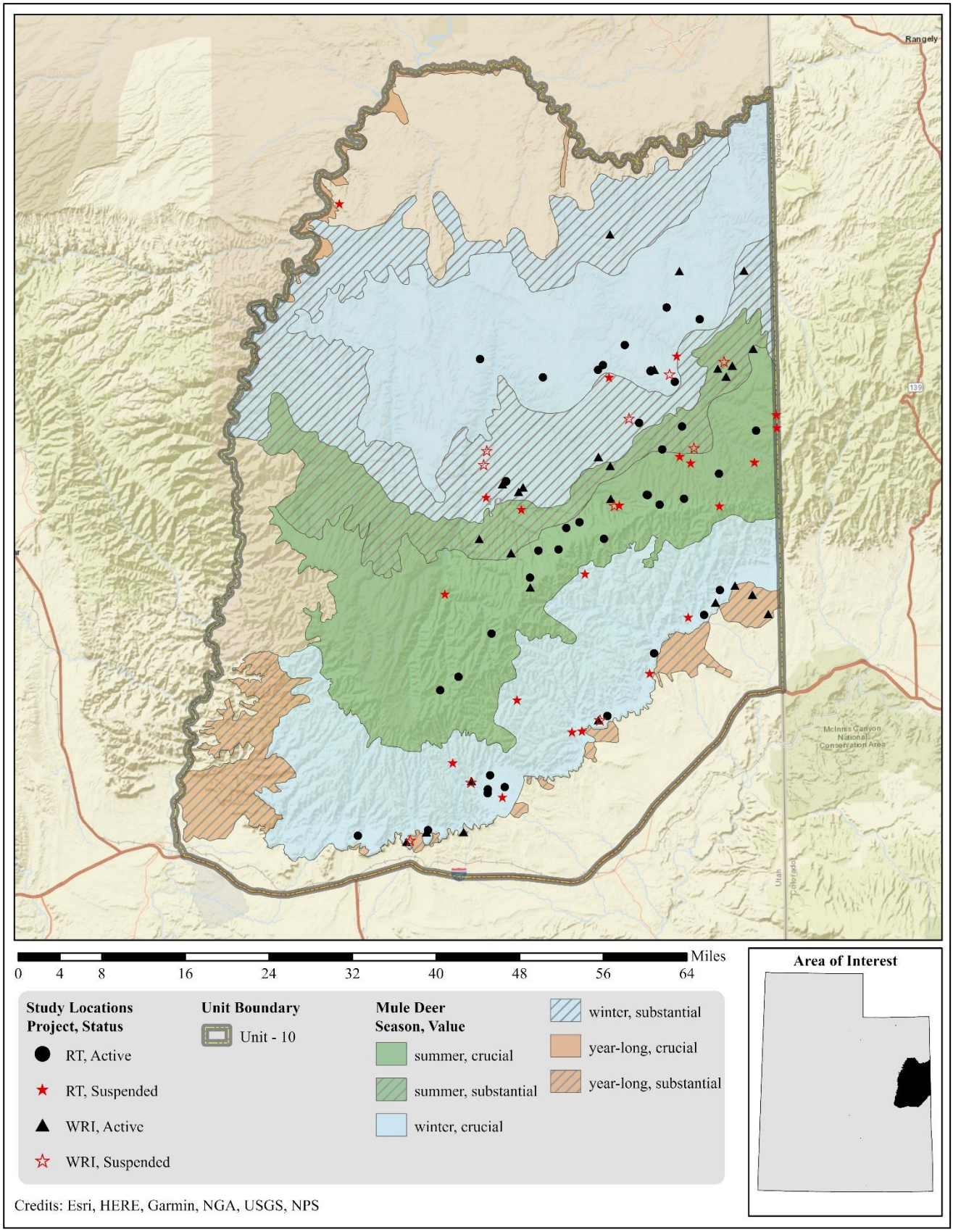
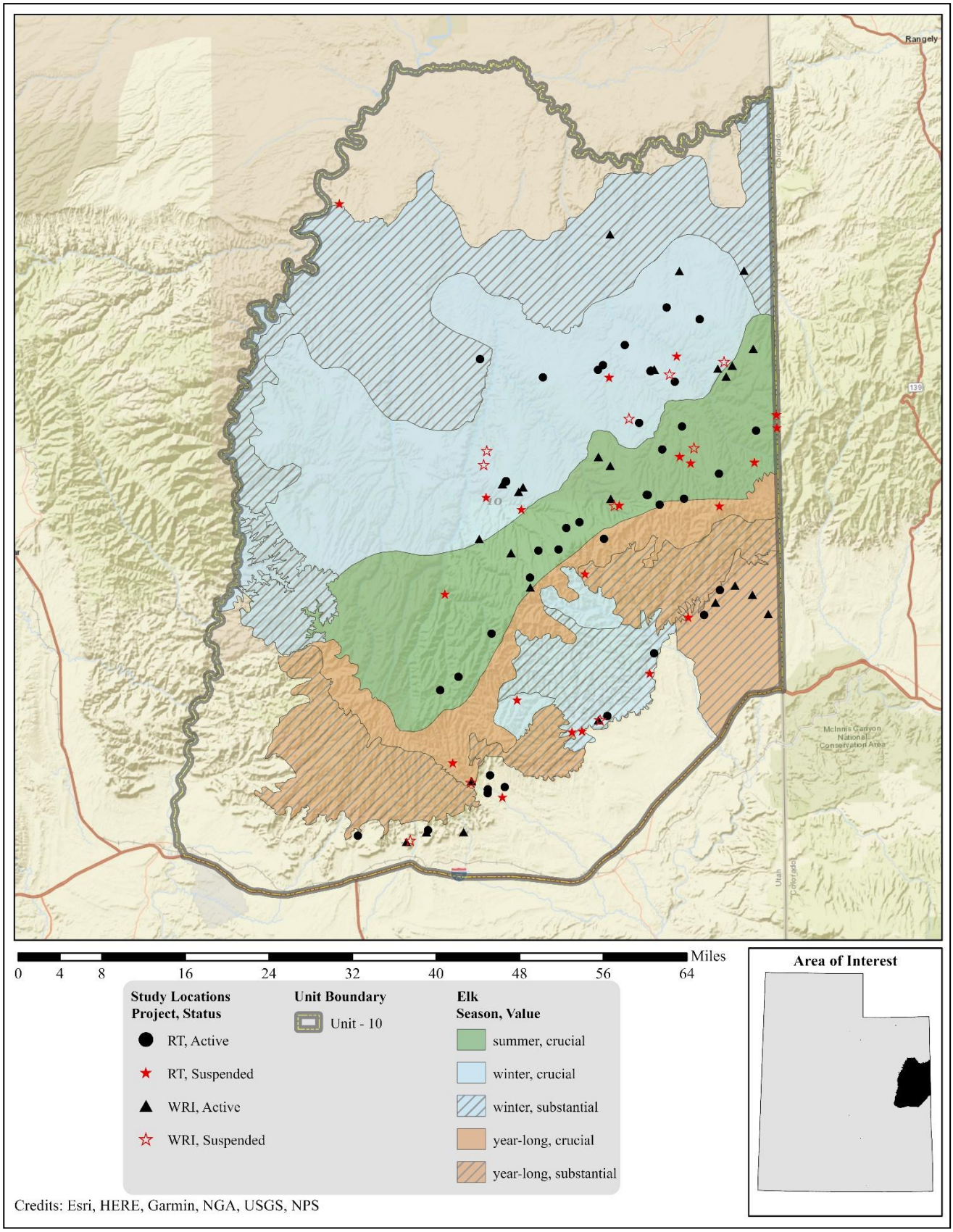


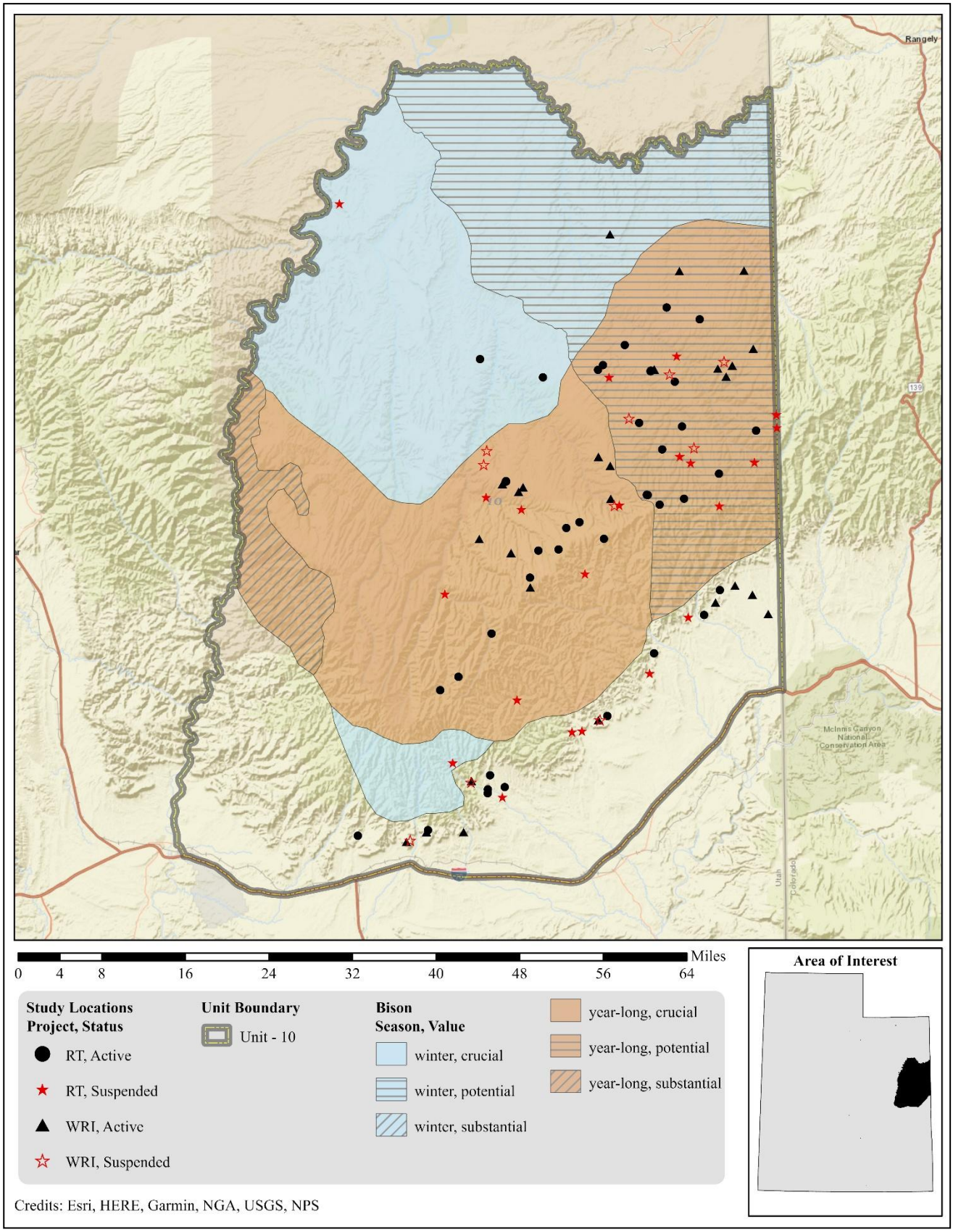
Figure 3.8: Average precipitation and estimated yearly stacked shrub and tree cover for winter mule deer habitat in WMU 10, Book Cliffs (Rangeland Analysis Platform, 2026).
*Dashed line indicates shift in depicted datasets from RAP 30m (1986-2017) to RAP 10m (2018-2025) (USDA Agricultural Research Service, 2026).



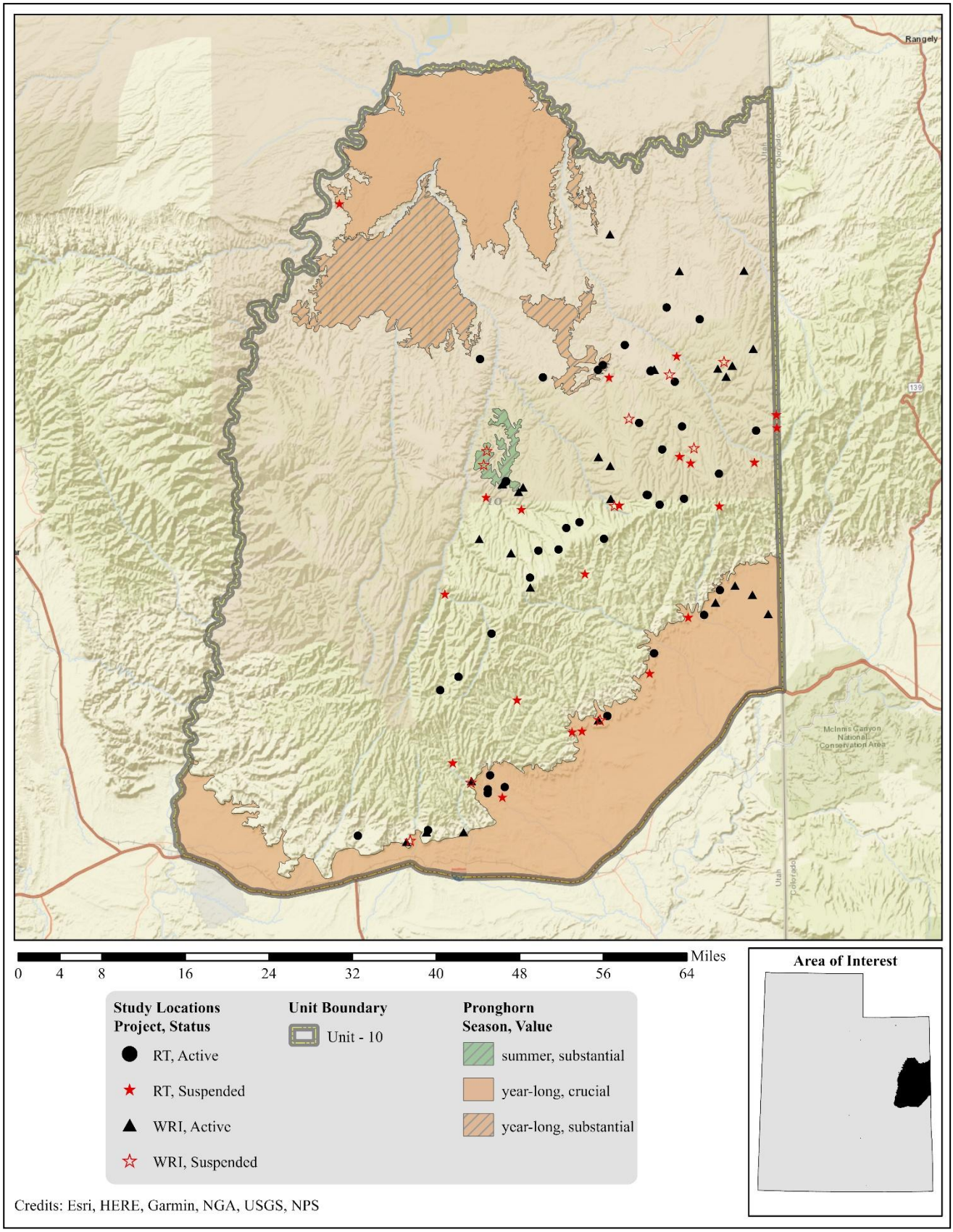
Map 3.2: Estimated mule deer habitat by season and value for WMU 10, Book Cliffs.



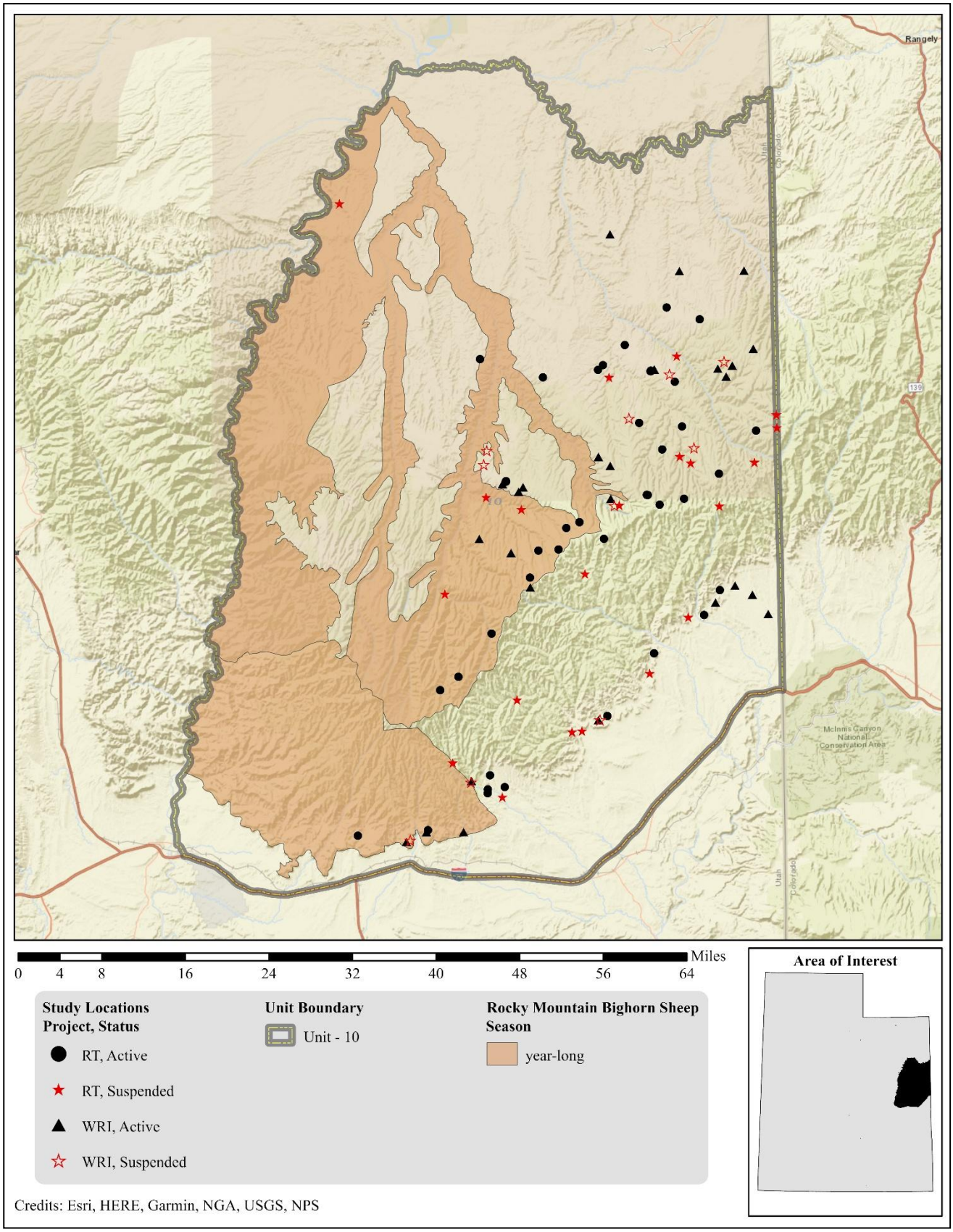
Map 3.3: Estimated elk habitat by season and value for WMU 10, Book Cliffs.



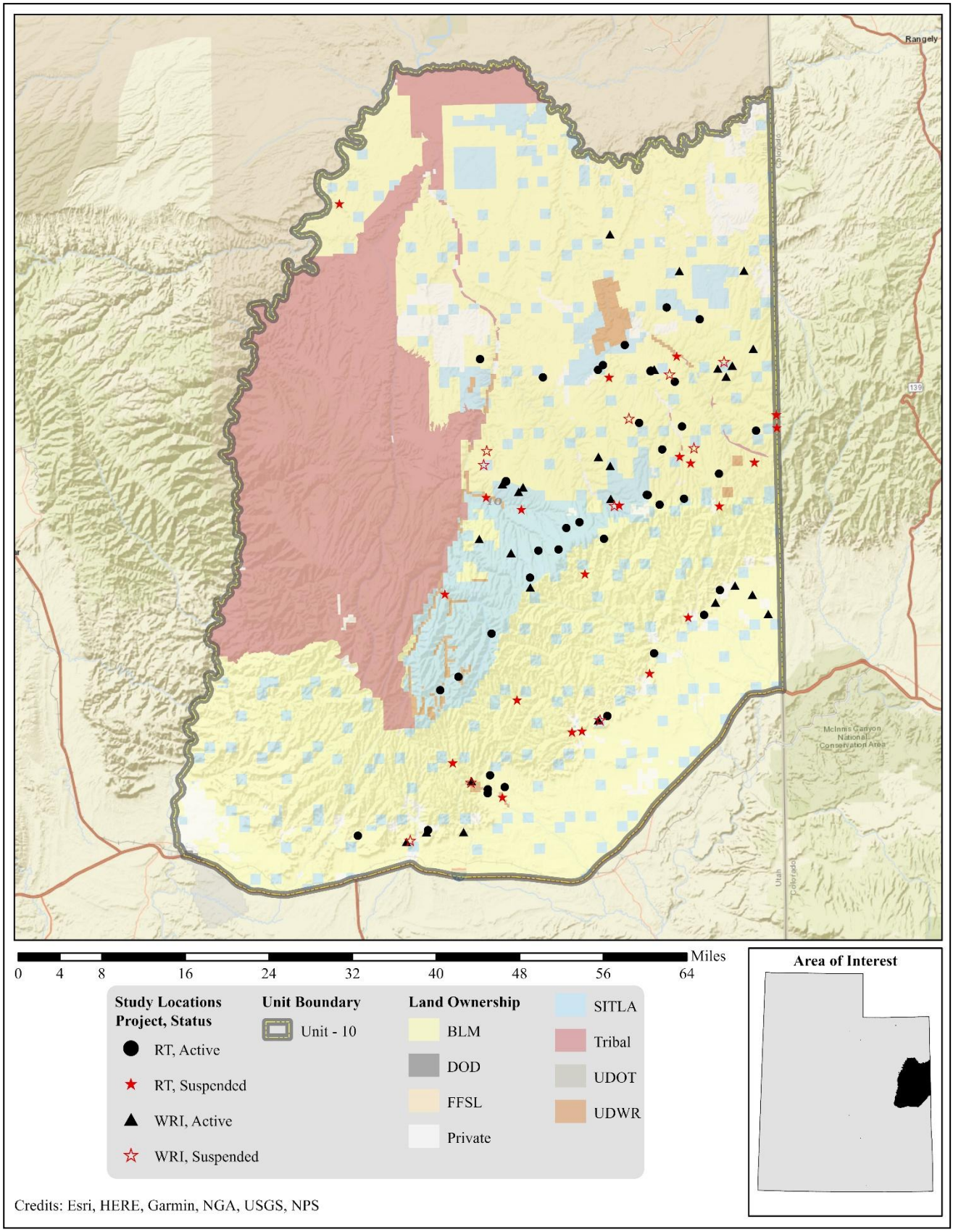
Map 3.4: Estimated bison habitat by season and value for WMU 10, Book Cliffs.



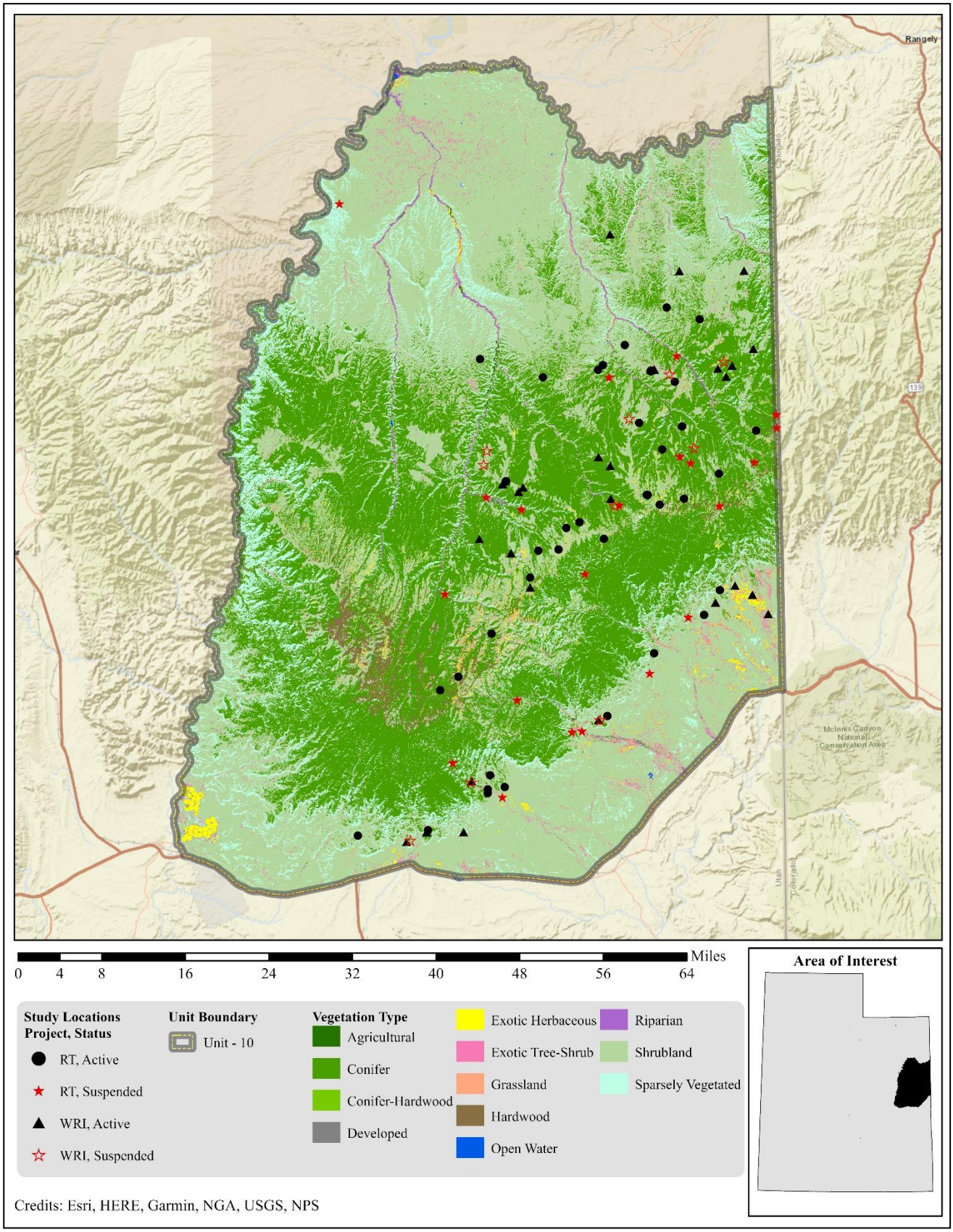
Map 3.5: Estimated pronghorn habitat by season and value for WMU 10, Book Cliffs.



Map 3.6: Estimated Rocky Mountain bighorn sheep habitat by season and value for WMU 10, Book Cliffs.



Map 3.7: Land ownership for WMU 10, Book Cliffs.



Map 3.8: LANDFIRE Existing Vegetation Type map (LC24_EVT_250, 2024) for WMU 10, Book Cliffs.

LANDFIRE Existing Vegetation Type for Mule Deer Habitat

According to the current LANDFIRE Existing Vegetation Type model, 44% of summer range for mule deer; 43% of winter habitat; and 20% of year-long 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.

Of the summer range, the model estimates that nearly 6% is made up of the Rocky Mountain Aspen Forest and Woodland type (**Table 3.1**) is found in higher elevations. Although quaking aspen (*Populus tremuloides*) dominates this biophysical site, preferred browse species such as chokecherry (*Prunus virginiana*), serviceberry (*Amelanchier* spp.), and mountain snowberry (*Symphoricarpos oreophilus*) are commonly found. In addition, sites of this type typically have abundant understories that could provide forage for mule deer during the summer months.

The model suggests that 23% of the unit's winter range; 13% of summer habitat; and nearly 9% of year-long range is made up of sagebrush steppe and shrublands (**Table 3.1**, **Table 3.2**, **Table 3.3**). 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. Some of these sagebrush vegetation types may also be host to other preferred browse species in lesser amounts, and pinyon and juniper may also be present at lower to middle elevations. Nearly 24% of year-long range and almost 11% of winter habitat is modeled to be comprised of the Inter-Mountain Basins Mixed Salt Desert Scrub biophysical site which is found at low elevations. Browse species that could provide valuable forage during the winter months are often present and may include winterfat (*Krascheninnikovia lanata*), fourwing saltbush (*Atriplex canescens*), and Nevada jointfir (*Ephedra nevadensis*), among others. Eleven percent of winter range and 10% of year-long habitat is sparsely vegetated according to the model (**Table 3.2**, **Table 3.3**): this vegetation type may have less value for deer when compared with other, more productive sites but is crucial during severe winters.

Numerous other vegetation classes comprise the rest of the mule deer habitat within the Book Cliffs Management Unit (**Map 3.8**, **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	222,363	43.60%	
	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	58,878	11.54%	
	Southern Rocky Mountain Ponderosa Pine Woodland	13,693	2.68%	
	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	13,478	2.64%	
	Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland	1,106	0.22%	
	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	945	0.19%	
	Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland	756	0.15%	
	Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland	141	0.03%	
	Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland	22	0.00%	
	Rocky Mountain Foothill Limber Pine-Juniper Woodland	2	0.00%	61.05%
Shrubland	Inter-Mountain Basins Montane Sagebrush Steppe	62,807	12.31%	
	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	45,937	9.01%	
	Rocky Mountain Lower Montane-Foothill Shrubland	12,125	2.38%	
	Inter-Mountain Basins Big Sagebrush Shrubland	3,034	0.59%	
	Inter-Mountain Basins Mixed Salt Desert Scrub	1,966	0.39%	
	Inter-Mountain Basins Semi-Desert Shrub-Steppe	970	0.19%	
	Colorado Plateau Mixed Low Sagebrush Shrubland	722	0.14%	
	Inter-Mountain Basins Greasewood Flat	32	0.01%	
	Colorado Plateau Pinyon-Juniper Shrubland	2	0.00%	
	Inter-Mountain Basins Mat Saltbush Shrubland	1	0.00%	25.02%
Hardwood	Rocky Mountain Aspen Forest and Woodland	29,314	5.75%	5.75%
Other	Sparsely Vegetated	20,746	4.07%	
	Riparian	3,357	0.66%	
	Agricultural	185	0.04%	
	Open Water	39	0.01%	
	Developed	31	0.01%	
	Quarries-Strip Mines-Gravel Pits-Well and Wind Pads	4	0.00%	4.78%
Exotic Herbaceous	Great Basin & Intermountain Introduced Annual Grassland	5,712	1.12%	
	Great Basin & Intermountain Introduced Perennial Grassland and Forbland	1,679	0.33%	
	Interior Western North American Temperate Ruderal Grassland	1,092	0.21%	
	Great Basin & Intermountain Introduced Annual and Biennial Forbland	15	0.00%	1.67%
Grassland	Southern Rocky Mountain Montane-Subalpine Grassland	3,559	0.70%	
	Inter-Mountain Basins Semi-Desert Grassland	2,531	0.50%	
	Rocky Mountain Subalpine-Montane Mesic Meadow	640	0.13%	1.32%
Exotic Tree-Shrub	Great Basin & Intermountain Ruderal Shrubland	2,113	0.41%	
	Interior Western North American Temperate Ruderal Shrubland	65	0.01%	0.43%
Total		**510,060**	**100%**	**100%**

Table 3.1: LANDFIRE Existing Vegetation Type (LC24_EVT_250, 2024) acreage of summer mule deer habitat for WMU 10, Book Cliffs.

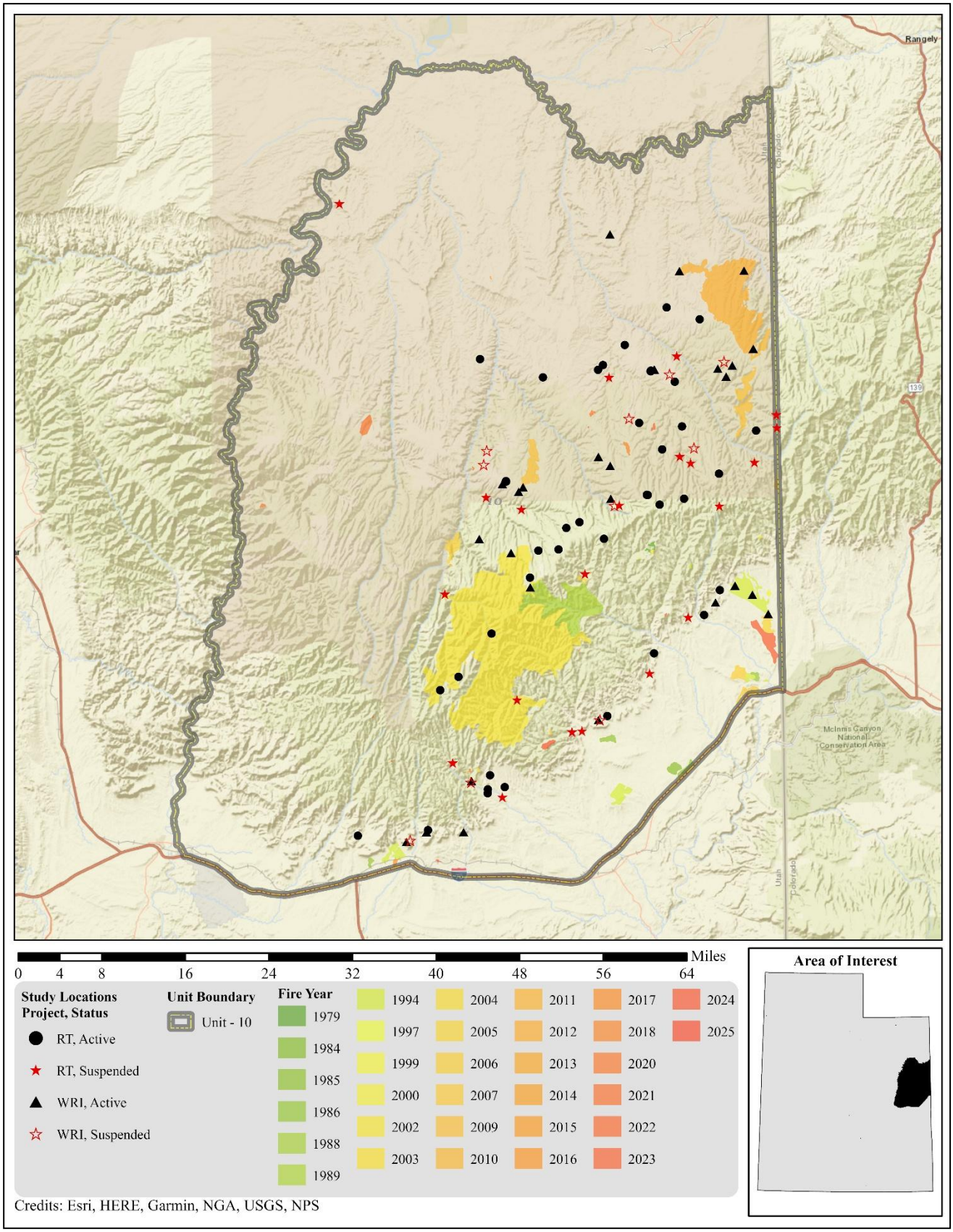
Group	Existing Vegetation Type for Winter Mule Deer Habitat	Acres	% of Total	Group % of Total
Shrubland	Inter-Mountain Basins Big Sagebrush Shrubland	173,256	15.73%	
	Inter-Mountain Basins Mixed Salt Desert Scrub	117,141	10.64%	
	Colorado Plateau Mixed Low Sagebrush Shrubland	58,697	5.33%	
	Inter-Mountain Basins Semi-Desert Shrub-Steppe	44,533	4.04%	
	Colorado Plateau Pinyon-Juniper Shrubland	31,324	2.84%	
	Inter-Mountain Basins Montane Sagebrush Steppe	20,900	1.90%	
	Inter-Mountain Basins Mat Saltbush Shrubland	16,696	1.52%	
	Rocky Mountain Lower Montane-Foothill Shrubland	15,834	1.44%	
	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	9,171	0.83%	
	Inter-Mountain Basins Greasewood Flat	1,932	0.18%	
	Colorado Plateau Blackbrush-Mormon-tea Shrubland	1,167	0.11%	
	Southern Colorado Plateau Sand Shrubland	901	0.08%	44.64%
Conifer	Colorado Plateau Pinyon-Juniper Woodland	44,0753	40.03%	
	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	11,420	1.04%	
	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	2,516	0.23%	
	Southern Rocky Mountain Ponderosa Pine Woodland	2,063	0.19%	
	Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland	4	0.00%	
	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	2	0.00%	
	Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland	<1	0.00%	
	Rocky Mountain Foothill Limber Pine-Juniper Woodland	<1	0.00%	
	Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland	<1	0.00%	41.48%

Group	Existing Vegetation Type for Winter Mule Deer Habitat	Acres	% of Total	Group % of Total
Other	Sparsely Vegetated	121,857	11.07%	
	Riparian	6,719	0.61%	
	Agricultural	1,150	0.10%	
	Open Water	770	0.07%	
	Developed	742	0.07%	
	Quarries-Strip Mines-Gravel Pits-Well and Wind Pads	142	0.01%	11.93%
Exotic Tree-Shrub	Great Basin & Intermountain Ruderal Shrubland	15,472	1.41%	
	Interior Western North American Temperate Ruderal Shrubland	418	0.04%	1.44%
Exotic Herbaceous	Great Basin & Intermountain Introduced Annual Grassland	2,252	0.20%	
	Great Basin & Intermountain Introduced Perennial Grassland and Forbland	634	0.06%	
	Interior Western North American Temperate Ruderal Grassland	363	0.03%	
	Great Basin & Intermountain Introduced Annual and Biennial Forbland	264	0.02%	0.32%
Grassland	Inter-Mountain Basins Semi-Desert Grassland	1,210	0.11%	
	Southern Rocky Mountain Montane-Subalpine Grassland	633	0.06%	
	Rocky Mountain Subalpine-Montane Mesic Meadow	161	0.01%	0.18%
Hardwood	Rocky Mountain Aspen Forest and Woodland	89	0.01%	0.01%
Total		**1,101,186**	**100%**	**100%**

Table 3.2: LANDFIRE Existing Vegetation Type (LC24_EVT_250, 2024) acreage of winter mule deer habitat for WMU 10, Book Cilffs.

Group	Existing Vegetation Type for Year-Long Mule Deer Habitat	Acres	% of Total	Group % of Total
Shrubland	Inter-Mountain Basins Mixed Salt Desert Scrub	31,590	23.68%	
	Inter-Mountain Basins Mat Saltbush Shrubland	10,961	8.22%	
	Inter-Mountain Basins Semi-Desert Shrub-Steppe	10,317	7.73%	
	Inter-Mountain Basins Big Sagebrush Shrubland	9,718	7.28%	
	Colorado Plateau Pinyon-Juniper Shrubland	9,683	7.26%	
	Inter-Mountain Basins Greasewood Flat	3,899	2.92%	
	Colorado Plateau Mixed Low Sagebrush Shrubland	2,135	1.60%	
	Colorado Plateau Blackbrush-Mormon-tea Shrubland	1,705	1.28%	
	Southern Colorado Plateau Sand Shrubland	941	0.71%	
	Rocky Mountain Lower Montane-Foothill Shrubland	481	0.36%	
	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	151	0.11%	
	Inter-Mountain Basins Montane Sagebrush Steppe	28	0.02%	61.18%
Conifer	Colorado Plateau Pinyon-Juniper Woodland	17,254	12.93%	
	Southern Rocky Mountain Ponderosa Pine Woodland	18	0.01%	
	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	18	0.01%	
	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	5	0.00%	
	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	4	0.00%	
	Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland	1	0.00%	
	Inter-Mountain Basins Juniper Savanna	<1	0.00%	12.97%
Other	Sparsely Vegetated	13,842	10.38%	
	Open Water	3,135	2.35%	
	Riparian	2,661	2.00%	
	Agricultural	274	0.21%	
	Developed	154	0.12%	
	Quarries-Strip Mines-Gravel Pits-Well and Wind Pads	82	0.06%	15.10%
Exotic Herbaceous	Great Basin & Intermountain Introduced Annual Grassland	2,827	2.12%	
	Great Basin & Intermountain Introduced Perennial Grassland and Forbland	2,589	1.94%	
	Great Basin & Intermountain Introduced Annual and Biennial Forbland	1,329	1.00%	
	Interior Western North American Temperate Ruderal Grassland	522	0.39%	5.45%
Exotic Tree-Shrub	Great Basin & Intermountain Ruderal Shrubland	6,241	4.68%	
	Interior Western North American Temperate Ruderal Shrubland	142	0.11%	4.78%
Grassland	Inter-Mountain Basins Semi-Desert Grassland	457	0.34%	
	Rocky Mountain Subalpine-Montane Mesic Meadow	18	0.01%	
	Southern Rocky Mountain Montane-Subalpine Grassland	1	0.00%	0.36%
Hardwood	Rocky Mountain Aspen Forest and Woodland	219	0.16%	0.16%
Total		**133,402**	**100%**	**100%**

Table 3.3: LANDFIRE Existing Vegetation Type (LC24_EVT_250, 2024) acreage of year-long mule deer habitat for WMU 10, Book Cliffs.



Map 3.9: Land coverage of fires by year from 1979-2025 for WMU 10, Book Cliffs (NIFC Open Data Site: Federal Interagency Wildland Fire Maps and Data for All, 2025; Geosciences and Environmental Change Science Center (GECSC) Outgoing Datasets, 2023).

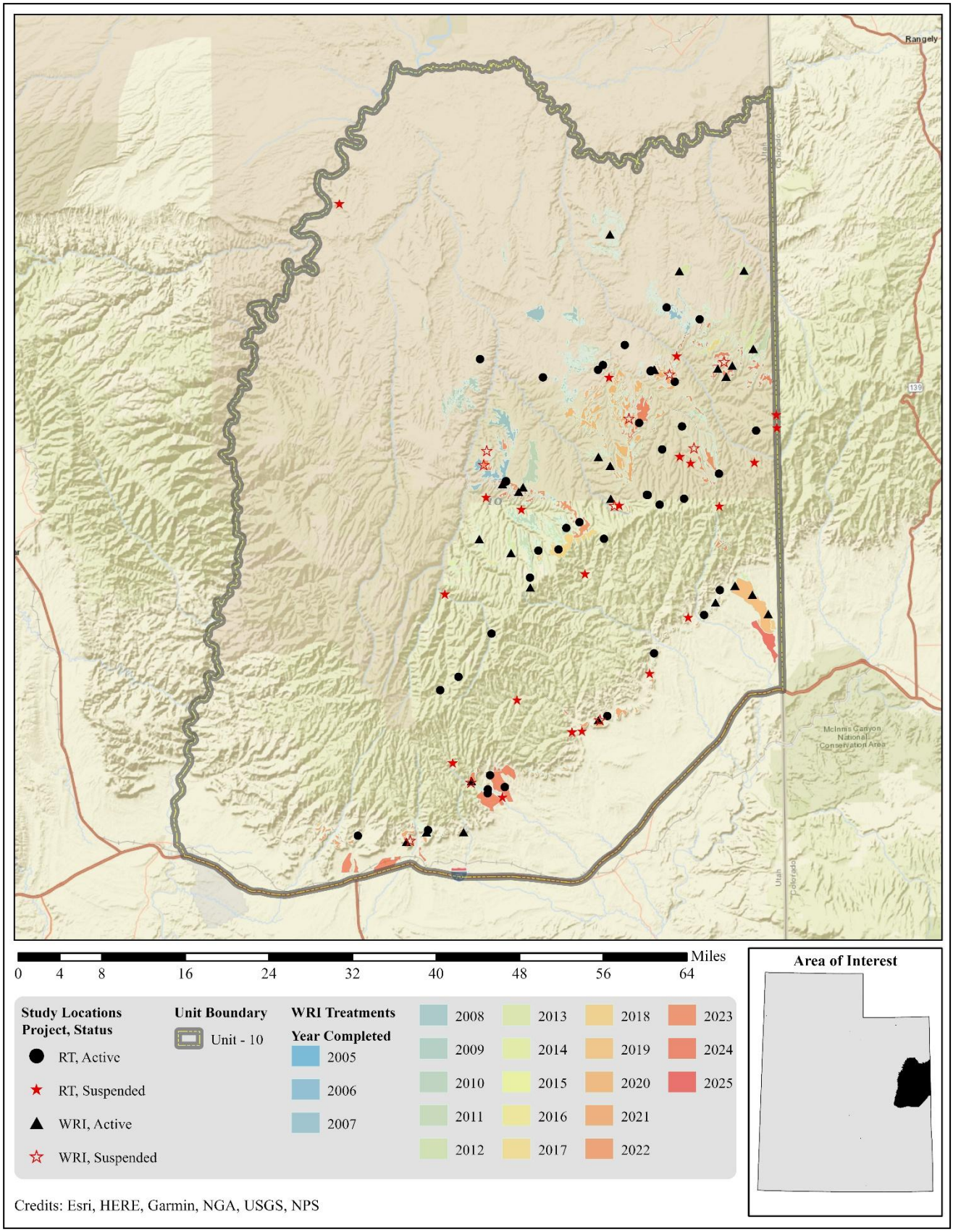
Treatments/Restoration Work

There has been an active effort to address many of the limitations on this unit through the Watershed Restoration Initiative (WRI). A total of 124,609 acres of land have been treated within the Book Cliffs Management Unit since the WRI was implemented in 2004 (**Map 3.10**) Treatments frequently overlap one another, bringing the net total of completed treatment acres to 87,149 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 hand crew (lop and scatter) to remove pinyon (*Pinus* spp.) and juniper (*Juniperus* spp.) trees; additional treatments used to remove trees include mastication (bullhog) treatments. Herbicide application to control undesirable vegetation is a treatment type that is also frequently employed. Other management practices used in this unit include (but are not limited to) seeding species to augment the herbaceous understory and anchor chaining (**Table 3.4**).

Type	Total Completed Acreage
Vegetation Removal/Hand Crew	**48,204**
Lop & Scatter	47,783
Lop-Pile-Burn	212
Cut Stump	209
Herbicide Application	**47,349**
Aerial (Fixed-Wing)	25,089
Ground	12,230
Spot Treatment	7,731
Aerial (Helicopter)	2,298
Bullhog	**19,205**
Full Size	17,981
Skid Steer	1,224
Seeding (Primary)	**8,091**
Broadcast (Aerial-Fixed Wing)	6,874
Broadcast (Aerial-Helicopter)	1,091
Drill (Rangeland)	65
Hand Seeding	52
Ground (Mechanical Application)	9
Anchor Chain	**1,250**
Ely (Two-Way)	541
Ely (One-Way)	403
Smooth (Two-Way)	306
Forestry Practices	**200**
Thinning (Non-Commercial)	200
Skid-Steer Mounted Tree Cutter	**182**
Hydraulic Brush Saw	182
Harrow	**61**
≤ 15 ft. (One-Way)	56
> 15 ft. (One-Way)	5
Mowing	**35**
Brush Hog	35
Planting/Transplanting	**19**
Container Stock	19
Prescribed Fire	**12**
Prescribed Fire	12
Other	**<1**
Road/Parking Area Improvements	<1
Grand Total	**124,609**
***Net Total Land Area Treated**	**87,149**

Table 3.4: WRI treatment action size (acres) for completed projects for WMU 10, Book Cliffs. Data accessed on 01/26/2026.
*Does not include overlapping treatments.



Map 3.10: Terrestrial WRI treatments by fiscal year completed for WMU 10, Book Cliffs.

Range Trend Studies

Range Trend studies have been sampled within WMU 10 on a regular basis since 1982, 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
10-01	Indian Ridge	RT	Active	1982, 1988. 1995, 2000, 2005, 2010, 2015, 2020, 2025	Upland Silt Loam (Fourwing Saltbush-Winterfat)
10-02	McCook Ridge Exclosure	RT	Active	1982, 1988, 1995, 1997, 2000, 2005, 2010, 2015, 2020, 2025	Upland Loam (Wyoming Big Sagebrush)
10-03	McCook Ridge Chaining	RT	Active	1982, 1988, 1995, 2000, 2005, 2007, 2009, 2010, 2015, 2020, 2025	Mountain Loam (Mountain Big Sagebrush)
10-04	Wirefence Point	RT	Active	1982, 1988, 1995, 1997, 2000, 2005, 2010, 2015, 2020, 2025	Mountain Loam (Mountain Big Sagebrush)
10-05	Willow Flat	RT	Active	1982, 1988, 1995, 2000, 2005, 2010, 2015, 2020, 2025	Mountain Loam (Mountain Big Sagebrush)
10-06	Little Jim Canyon	WRI	Active	1988, 1995, 2000, 2012, 2015, 2017, 2021, 2025	Mountain Stony Loam (Browse)
10-07	Cherry Mesa	RT	Active	1988, 1995, 1997, 2000, 2005, 2010, 2015, 2020, 2025	Mountain Loam (Mountain Big Sagebrush)
10-08	Black Horse	RT	Active	1988, 1995, 2000, 2005, 2010, 2015, 2020, 2025	Mountain Stony Loam (Browse)
10-09	Agency Draw	RT	Active	1988, 1995, 2000, 2005, 2010, 2015, 2020, 2025	Semidesert Loam (Wyoming Big Sagebrush)
10-10	Sunday School	RT	Active	1988, 1995, 2000, 2005, 2010, 2015, 2020, 2025	Upland Silt Loam (Fourwing Saltbush-Winterfat)
10-11	Park Ridge	RT	Suspended	1988, 1995, 2000	Upland Silt Loam (Fourwing Saltbush-Winterfat)
10-12	Wolf Den	RT	Active	1988, 1995, 2000, 2005, 2010, 2015, 2020, 2025	Upland Loam (Bonneville Big Sagebrush)
10-13	Moon Ridge Burn	RT	Suspended	1995, 1997, 2000	Semidesert Alkali Loam (Black Greasewood/Wyoming Big Sagebrush)
10-14	East Floy Bench	RT	Active	1986, 1995, 2000, 2005, 2010, 2015, 2020, 2025	Semidesert Loam (Wyoming Big Sagebrush)
10-15	East Thompson Bench	RT	Active	1986, 1995, 2000, 2005, 2010, 2015, 2020, 2025	Semidesert Loam (Wyoming Big Sagebrush)
10-16	West Horse Pasture	RT	Active	1986, 1995, 2000, 2005, 2010, 2015, 2020, 2025	Semidesert Loam (Wyoming Big Sagebrush)
10-17	East Calf Canyon	RT	Active	1986, 1995, 2000, 2005, 2010, 2015, 2020, 2025	Semidesert Loam (Wyoming Big Sagebrush)
10-18	East Horse Pasture	RT	Active	1986, 1995, 2000, 2005, 2010, 2015, 2020, 2025	Semidesert Loam (Wyoming Big Sagebrush)
10-19	Lower Cottonwood	RT	Suspended	1986	Semidesert Loam (Wyoming Big Sagebrush)
10-20	Upper Cottonwood	RT	Suspended	1986, 2000	Semidesert Alkali Loam (Black Greasewood/Wyoming Big Sagebrush)

Study #	Study Name	Project	Status	Years Sampled	Ecological Site Description
10-21	East Sulfur Bench	RT	Suspended	1986, 1995	Semidesert Loam (Wyoming Big Sagebrush)
10-22	Bryson Draw	RT	Suspended	1986,1995	Semidesert Loam (Wyoming Big Sagebrush)
10-23	Bogart- She	RT	Active	1995, 2015, 2020, 2025	Mountain Loamy Bottom (Basin Wildrye)
10-24	Turner Canyon	RT	Active	1990, 1995, 2000, 2015, 2020, 2025	Mountain Loamy Bottom (Basin Wildrye)
10-25	Little Ridge	RT	Active	1990, 1995, 2015, 2020, 2025	High Mountain Loam (Aspen)
10-26	Bitter Creek	RT	Suspended	2000, 2005, 2010, 2015, 2020	Semidesert Loam (Wyoming Big Sagebrush)
10-27	Long Canyon	RT	Active	2005, 2010, 2015, 2020, 2025	Semidesert Loam (Wyoming Big Sagebrush
10-28	Wild Horse Bench	RT	Suspended	2010, 2015	Desert Shallow Loam (Black Sagebrush)
10-29	Lower East Willow Creek	RT	Suspended	1990	Mountain Loamy Bottoms (Basin Wildrye)
10-30	San Arroyo	RT	Active	2025	Semidesert Loam (Wyoming Big Sagebrush)
10-31	Tom Patterseon Ridge	RT	Active	2025	Mountain Loam (Browse)
10-32	Mexico Point	RT	Active	2025	Mountain Stony Loam (Browse)
10-33	Rock Spring	RT	Active	2025	Mountain Shallow Loam (Browse)
10-34	Snowshoe Ridge	RT	Active	2025	Mountain Stony Loam (Browse)
10R-01	Upper Meadow Creek	RT	Suspended	1997	Upland Loam (Wyoming Big Sagebrush)
10R-02	Lone Spring	RT	Suspended	1997, 2000	Mountain Stony Loam (Mountain Big Sagebrush)
10R-03	Burnt Timber	RT	Suspended	1997, 2000	Semidesert Alkali Loam (Black Greasewood/Wyoming Big Sagebrush)
10R-04	Two Water WMA	RT	Active	1997, 2000, 2005, 2010, 2015, 2020, 2025	Upland Shallow Loam (Black Sagebrush)
10R-05	Lower Tom Patterson Point	RT	Active	1997, 2000, 2005, 2010, 2015, 2020, 2025	Mountain Loam (Mountain Big Sagebrush)
10R-06	Sweet Water Canyon	RT	Suspended	1997, 2000	Mountain Loamy Bottom (Basin Wildrye)
10R-07	Monument Ridge	RT	Active	1997, 2000, 2005, 2010, 2015, 2020, 2025	Mountain Stony Loam (Mountain Big Sagebrush)
10R-08	Upper Tom Patterson Point	RT	Suspended	1997, 2000	Mountain Stony Loam (Browse)
10R-09	Winter Ridge Exclosure Out	RT	Active	1997, 2000, 2005, 2010, 2015, 2020, 2025	Mountain Loam (Mountain Big Sagebrush)
10R-10	Winter Ridge Livestock Exclosure	RT	Active	1997, 2000, 2005, 2015, 2020, 2025	Mountain Loam (Mountain Big Sagebrush*)
10R-11	Winter Ridge Total Exclosure	RT	Active	1997, 2000, 2005, 2015, 2020, 2025	Mountain Loam (Mountain Big Sagebrush*)
10R-12	Horse Ridge	RT	Suspended	1997, 2000, 2005	Mountain Stony Loam (Browse)
10R-13	McCook Ridge Livestock Exclosure	RT	Active	1997, 2000, 2005, 2010, 2020, 2025	Upland Loam (Wyoming Big Sagebrush*)
10R-14	McCook Ridge Total Exclosure	RT	Active	1997, 2000, 2005, 2010, 2020, 2025	Upland Loam (Wyoming Big Sagebrush*)
10R-15	Saddle Horse	RT	Active	1998, 2000, 2005, 2010, 2015, 2020, 2025	Mountain Stony Loam (Browse)
10R-16	Monument Ridge #2	RT	Suspended	1998, 2000	Mountain Stony Loam (Browse)

Study #	Study Name	Project	Status	Years Sampled	Ecological Site Description
10R-17	Railroad Canyon	RT	Active	1998, 2000, 2010, 2015, 2020, 2025	Mountain Loam (Mountain Big Sagebrush)
10R-18	Chipeta Canyon	RT	Suspended	1998	Mountain Loam (Mountain Big Sagebrush)
10R-19	Lower South Canyon	RT	Suspended	1998, 2000	Mountain Loamy Bottom (Basin Wildrye)
10R-20	Dick Canyon	RT	Suspended	1998, 2000	Mountain Loamy Bottom (Basin Wildrye)
10R-21	Rathole Canyon	RT	Suspended	1998, 2000	Mountain Loam (Mountain Big Sagebrush)
10R-22	Rathole Ridge	RT	Active	1998, 2000, 2005, 2010, 2015, 2020, 2025	Mountain Loam (Mountain Big Sagebrush)
10R-23	South Rathole	RT	Suspended	1998, 2000	Mountain Loam (Mountain Big Sagebrush)
10R-24	Upper Tent Canyon	RT	Suspended	1998, 2000	Mountain Loam (Mountain Big Sagebrush)
10R-25	Nash Wash #1	RT	Suspended	1998	Semidesert Sandy Loam (Fourwing Saltbush)
10R-26	Nash Wash #2	RT	Active	1998, 2015, 2020, 2025	Semidesert Sandy Loam (Fourwing Saltbush)
10R-27	Nash Wash Burn	RT	Suspended	1999	Upland Loamy Bottom (Basin Big Sagebrush)
10R-28	Indian Ridge 2	RT	Active	1999, 2011, 2015, 2020, 2025	Upland Silt Loam (Fourwing Saltbush-Winterfat)
10R-29	Massey Junction	RT	Active	1999, 2005, 2010, 2015, 2020, 2025	Upland Silt Loam (Fourwing Saltbush-Winterfat)
10R-30	Cottonwood Burn	RT	Suspended	1999	Upland Loamy Bottom (Basin Big Sagebrush)
10R-31	Hay Canyon Burn	RT	Suspended	1999, 2001	Upland Loamy Bottom (Basin Big Sagebrush)
10R-32	PR Spring Total Exclosure	RT	Active	2002, 2005, 2010, 2015, 2020, 2025	Mountain Loam (Browse*)
10R-33	PR Spring Livestock Exclosure	RT	Active	2002, 2005, 2010, 2015, 2020, 2025	Mountain Loam (Browse*)
10R-34	PR Spring Exclosure Outside	RT	Active	2002, 2005, 2010, 2015, 2020, 2025	Mountain Loam (Browse)
10R-35	Winter Ridge Dixie	WRI	Suspended	2005	Upland Loam (Bonneville Big Sagebrush)
10R-36	Indian Springs Bullhog	WRI	Active	2006, 2009, 2010, 2014, 2018, 2022	Mountain Shallow Loam (Black Sagebrush)
10R-37	Winter Ridge Dixie 2	WRI	Suspended	2006	Upland Loam (Bonneville Big Sagebrush)
10R-38	Long Canyon Chaining (Reference)	WRI	Suspended	2006	Semidesert Loam (Wyoming Big Sagebrush)
10R-39	Indian Springs Bullhog 2	WRI	Active	2007, 2011, 2014, 2018, 2022	Mountain Stony Loam (Browse)
10R-40	Indian Springs Bullhog 3	WRI	Active	2007, 2011, 2014, 2018, 2022	Mountain Stony Loam (Browse)
10R-41	Winter Ridge Bullhog	WRI	Active	2007, 2010, 2013, 2017, 2022	Mountain Loam (Mountain Big Sagebrush)
10R-42	Winter Ridge Bullhog 2	WRI	Active	2007, 2010, 2013, 2017, 2024	Mountain Loam (Mountain Big Sagebrush)
10R-43	McCook Ridge Plateau Exclosure North	WRI	Active	2008, 2010, 2013, 2018, 2025	Upland Silt Loam (Fourwing Saltbush-Winterfat*)
10R-44	McCook Ridge Plateau Exclosure South	WRI	Active	2008, 2010, 2013, 2018, 2025	Upland Silt Loam (Fourwing Saltbush-Winterfat*)

Study #	Study Name	Project	Status	Years Sampled	Ecological Site Description
10R-45	McCook Ridge Plateau Exclosure Outside	WRI	Active	2008, 2010, 2013, 2018, 2025	Upland Silt Loam (Fourwing Saltbush-Winterfat)
10R-46	Seep Ridge Chaining	WRI	Active	2008, 2014, 2017, 2021	Mountain Loam (Mountain Big Sagebrush)
10R-47	McCook Ridge Reference	WRI	Suspended	2009	Upland Loam (Wyoming Big Sagebrush)
10R-48	Indian Springs Reference	WRI	Suspended	2009	Mountain Stony Loam (Browse)
10R-49	Long Canyon Bench Chaining	WRI	Active	2010, 2013, 2018, 2025	Semidesert Loam (Wyoming Big Sagebrush)
10R-50	Bitter Creek	WRI	Active	2011, 2015, 2019, 2025	Semidesert Loam (Wyoming Big Sagebrush)
10R-51	Archy Bench	WRI	Active	2011, 2014, 2019, 2024	Semidesert Loam (Wyoming Big Sagebrush)
10R-52	Seep Ridge Bullhog	WRI	Active	2011, 2014, 2017, 2020, 2025	Mountain Loam (Mountain Big Sagebrush)
10R-53	Moon Ridge	WRI	Active	2011, 2014, 2017, 2021, 2025	Mountain Loam (Mountain Big Sagebrush)
10R-54	Bitter Creek Herbicide	WRI	Active	2012, 2015, 2019, 2025	Semidesert Loam (Wyoming Big Sagebrush)
10R-55	South Book Cliffs	WRI	Active	2013, 2016, 2020, 2025	Semidesert Loam (Wyoming Big Sagebrush)
10R-56	Center Fork	WRI	Active	2015, 2018, 2022	Semidesert Loam (Wyoming Big Sagebrush)
10R-57	Rector Ridge	WRI	Active	2015, 2018, 2022	Upland Loam (Bonneville Big Sagebrush)
10R-58	Dry Canyon	WRI	Active	2015, 2019, 2024, 2025	Semidesert Shallow Loam (Wyoming Big Sagebrush)
10R-59	Sagers Bench	WRI	Active	2016, 2019, 2025	Upland Shallow Loam (Cliffrose)
10R-60	Hat Rock	WRI	Active	2017, 2020, 2025	Semidesert Shallow Loam (Wyoming Big Sagebrush)
10R-61	Augusi Ridge	WRI	Active	2018, 2022	Mountain Shallow Loam (Black Sagebrush)
10R-62	West Thompson Bench	WRI	Suspended	2017	Upland Shallow Loam (Cliffrose)
10R-63	Bar X Wash - Bitter Creek	WRI	Active	2018, 2021, 2025	Semidesert Loam (Wyoming Big Sagebrush)
10R-64	Bull Canyon	WRI	Suspended	2019	Semidesert Stony Loam (Utah Juniper-Pinyon)
10R-65	Horse Ridge 2	WRI	Active	2020	Mountain Stony Loam (Browse)
10R-66	West Thompson Bench 2	WRI	Active	2021, 2025	Semidesert Loam (Wyoming Big Sagebrush)
10R-67	Bull Canyon 2	WRI	Active	2023	Semidesert Loam (Wyoming Big Sagebrush)
10R-68	Winter Ridge	WRI	Active	2025	Mountain Loam (Mountain Big Sagebrush)
10R-69	Jump Off Point	WRI	Active	2025	Mountain Loam (Mountain Big Sagebrush)
10R-70	Horse Ridge 3	WRI	Active	2025	Mountain Loam (Mountain Big Sagebrush)

Table 3.5: Range Trend and WRI project studies monitoring history and ecological site potential for WMU 10, Book Cliffs.
*Site found within an exclosure.

Study #	Study Name	Type	Disturbance Name (If Available)	Date	Acres	WRI Project #
10-01	Indian Ridge	Lop and Scatter	Indian Ridge Lop and Scatter	June 2009	1,001	1079
		Rangeland Drill	Indian Ridge Sagebrush	September 2011	218	1952
		Plateau	Indian Ridge Sagebrush	October 2011	218	1952
		Lop and Scatter	Seep Ridge Maintenance Lop & Scatter	Fall 2020	3,814	5517
10-02	McCook Ridge Exclosure	Exclosure		1960s		
		Drill	McCook Ridge Cheatgrass Control	September 2009	400	1109
		Exclosure	Book Cliffs Three-Way Exclosure Reconstruction	August 2010-June 2011		1734
		Lop and Scatter	Seep Ridge Maintenance Lop & Scatter)	Fall 2020	3,814	5517

Study #	Study Name	Type	Disturbance Name (If Available)	Date	Acres	WRI Project #
10-03	McCook Ridge Chaining	Seed Unknown	McCook Ridge Pinyon Juniper Chaining	Fall 1962	2,000	
		One-Way Chain Unknown	McCook Ridge Pinyon Juniper Chaining	Fall 1962	2,000	
		Bullhog	McCook Ridge P/J Removal	April 2005	520	260
		Lop and Scatter	Seep Ridge Maintenance Lop & Scatter	Fall 2020	3,814	5517
10-04	Wirefence Point	Herbicide Unknown		1980s		
		Lop and Scatter	Three Pines L and S	September 2008-March 2009	1,943	1078
		Lop and Scatter	Willow Watershed Improvements FY2023	September 2022-June 2024	3,791	5934
10-05	Willow Flat	Herbicide Unknown		Prior to 1982		
		Tebuthiuron		2005	225	
		Lop and Scatter	Cedar Camp Lop and Scatter	May-June 2010	2,042	1337
10-06	Little Jim Canyon	Bullhog	Little Jim Bullhog	April-July 2013	669	2219
10-07	Cherry Mesa	Chain Unknown		Historic		
		Bullhog	Cherry Mesa Bullhog	July 2009	576	1106
		Tebuthiuron	Book Cliffs Bison Habitat Enhancement Cherry Mesa	September 2019	500	4444
10-15	East Thompson Bench	Aerial Before	South Book Cliffs Vegetation Improvement Phase 1	Oct-13	500	2593
		Bullhog	South Book Cliffs Vegetation Improvement Phase 1	November-December 2013	500	2593
		Aerial After	South Book Cliffs Vegetation Improvement Phase 1	January 2014	500	2593
10-16	West Horse Pasture	Wildfire	22-2	2009	4	
		Wildfire	Nash Wash	June 2010	22	
		Rangeland Drill	Nash Wash WMA Wildfire Rehab	October-November 2012	81	2480/2258
		Plateau	Nash Wash WMA Wildfire Rehab	October-November 2012	115	2480/2258
		Aerial	Moab Cheat grass control and seeding	Fall 2025	9,029	7359
10-17	East Calf Canyon	Aerial	Moab Cheat grass control and seeding	Fall 2025	9,029	7359
		Plateau	Moab Field Office Cheatgrass Control	November 2023	11,016	5573
		Lop and Scatter		January 2023-Winter 2024		
10-18	East Horse Pasture	Imazapic	Moab Field Office Cheatgrass Control	November 2023	9,714	5573
		Aerial	Moab Cheat grass control and seeding	Fall 2025	9,029	7359
10-24	Turner Canyon	Wildfire	Diamond Creek	2002	88,421	
10-25	Little Ridge	Wildfire	Diamond Creek	2002	88,421	
10-31	Tom Patterson Ridge	Imazapic	Tom Patterson Herbicide	August 2022	2,297	5913
10-32	Mexico Point	Prescribed	Bookcliffs Mountain Browse Prescribed Fire 1999	October 1999	523	1316*
10R-05	Lower Tom Patterson Point	Chain Unknown		1960s		
		Seed Unknown		1960s		
		Wildfire		1980s		
		Bullhog	Tom Patterson Mastication	Fall 2025	3,652	7294
10R-07	Monument Ridge	Wildfire	Monument Ridge Fire	January-December 1955		
		Seed Unknown	Monument Ridge Fire Reseeding 1956	January-December 1956	4646	7694*
		Chain Unknown		1960s		
		Lop and Scatter	Monument Ridge PJ Removal	August 2005	1,004	22
		Bullhog	Monument Ridge Bullhog II	October-November 2019	2,081	4381
		Lop and Scatter	Seep Ridge Maintenance Lop & Scatter	Fall 2020	4,491	5517
10R-08	Upper Tom Patterson Point	Prescribed	Bookcliffs Mountain Browse Prescribed Fire 1999	1999	5,308	1316*
10R-09	Winter Ridge Exclosure Out	Lop and Scatter	Wolf Point Lop and Scatter	April 2006	811	259
		Lop and Scatter	Willow Watershed Improvements FY2023	September 2022-June 2024	3791	5934

Study #	Study Name	Type	Disturbance Name (If Available)	Date	Acres	WRI Project #
10R-10	Winter Ridge	Lop and Scatter	Wolf Point Lop and Scatter	April 2006	811	259
	Livestock Exclosure	Lop and Scatter	Willow Watershed Improvements FY2023	September 2022-June 2024	3791	5934
10R-11	Winter Ridge Total Exclosure	Lop and Scatter	Wolf Point Lop and Scatter	April 2006	811	259
		Lop and Scatter	Willow Watershed Improvements FY2023	September 2022-June 2024	3791	5934
10R-13	McCook Ridge	Exclosure		1960s		
	Livestock Exclosure	Exclosure	Fencing - Book Cliffs Three-Way Exclosure Reconstruction	August 2010-June 2011		1734
10R-14	McCook Ridge	Exclosure		1960s		
	Total Exclosure	Exclosure	Fencing - Book Cliffs Three-Way Exclosure Reconstruction	August 2010-June 2011		1734
10R-15	Saddle Horse	Chain Unknown		1960s		
		Seed Unknown		1960s		
		Prescribed Fire	PR Prescribed Fire 2001	September 2001	12,500	9067*
10R-17	Railroad Canyon	Prescribed Fire	Upper Bookcliffs Prescribed Fire 1998	September 1998	484	12168*
10R-22	Rathole Ridge	Prescribed Fire	Bookcliffs Mountain Browse Prescribed Fire 1999	October 1999	1311	1316*
10R-28	Indian Ridge 2	Wildfire		Historic		
		Lop and Scatter	Indian Ridge Lop and Scatter	June 2009	1,001	1079
		Rangeland Drill	Indian Ridge Sagebrush	September 2011	224	1952
		Imazapic	Indian Ridge Sagebrush	October 2011	224	1952
		Lop and Scatter	Seep Ridge Maintenance Lop and Scatter	September-October 2021	3813	5517
10R-29	Massey Junction	Hand Planter	Atchee Ridge Burn Reseeding 1955	October 1955-May 1956	100	379*
		Wildfire		1980s		
10R-35	Winter Ridge Dixie	Lop and Scatter	Wolf Point Phase II P/J Removal	May-June 2007	1,323	298
10R-36	Indian Springs	Prescribed Fire	Indian Springs Prescribed Fire 2001	September 2001	6,070	5825*
	Bullhog	Aerial Before	Indian Springs Ridge Bullhog	December 2006	320	362
		Bullhog	Indian Springs Ridge Bullhog	January-February 2007	320	362
		Lop and Scatter	Indian Springs Phase I Maintenance	May 2016	319	3304
10R-39	Indian Springs	Bullhog	Indian Spring Ridge Bullhog	2009		
	Bullhog 2	Wildfire	Augusi Fire	September 2010	955	
		Aerial After	Augusi Canyon Fire Rehabilitation	November 2010	955	1885
10R-40	Indian Springs	Bullhog	Indian Springs Bullhog Phase 2	June-July 2009	350	677
	Bullhog 3	Lop and Scatter	Indian Springs Bullhog Maintenance	May 2014	610	2640
10R-41	Winter Ridge	2,4-D	Horse Point Sagebrush Spray 1987	January-December 1987	4,286	5539*
	Bullhog	Bulldog	Winter Ridge Bullhog	January-February 2009	474	685
		Lop and Scatter	Willow Watershed Improvements FY2023 (Proposed)	Fall 2022 or Spring 2025	10,455	5934
10R-42	Winter Ridge	Bullhog	Winter Ridge Bullhog	January-February 2009	474	685
	Bullhog 2	Lop and Scatter	Willow Watershed Improvements FY2023	September 2022-January 2023	10,455	5934
10R-43	McCook Ridge Plateau	Rangeland Drill	McCook Ridge Cheatgrass Control	September-October 2008	400	1109
	Exclosure North	Imazapic	McCook Ridge Cheatgrass Control	October 2008	400	1109
10R-44	McCook Ridge Plateau	Rangeland Drill	McCook Ridge Cheatgrass Control	September-October 2008	400	1109
	Exclosure South	Plateau	McCook Ridge Cheatgrass Control	October 2008	400	1109
10R-45	McCook Ridge Plateau	Rangeland Drill	McCook Ridge Cheatgrass Control	September-October 2009	384	1109
	Exclosure Outside	Plateau	McCook Ridge Cheatgrass Control	October 2008	384	1109

Study #	Study Name	Type	Disturbance Name (If Available)	Date	Acres	WRI Project #
10R-46	Seep Ridge Chaining	Aerial Before	Seep Ridge Chaining	September-October 2011	322	1951
		Two-Way Ely	Seep Ridge Chaining	September-October 2011	322	1951
		Dribbler	Seep Ridge Chaining	September-October 2011	322	1951
		Aerial After	Seep Ridge Chaining	December 2011	322	1951
		Lop (No Scatter)	Seep Ridge Chaining Maintenance	September-November 2016	332	3567
		Lop and Scatter	Seep Ridge Maintenance Lop & Scatter	Fall 2021	4,491	5517
10R-47	McCook Ridge Reference	One-Way	Lower McCook Ridge Pinyon Juniper Chaining 1962	January-December 1962	1,911	7009*
		Bullhog	McCook Ridge Phase II PJ Removal	July 2006-June 2007	337	313
10R-49	Long Canyon Bench Chaining	Two-Way Smooth	Long Canyon Bench Pinyon-Juniper Chaining	October 2006	305	29
		Aerial After	Long Canyon Bench Pinyon-Juniper Chaining	October 2006	305	29
		Imazapic	Long Canyon Bench Pinyon-Juniper Chaining	November 2006	305	29
		Lop and Scatter	South Bookcliffs Phase 8 (Cottonwood)	January-February 2021	787	5290
10R-50	Bitter Creek	Wildfire	Bitter Creek	1994	3,659	
		Rangeland Drill	Bitter Creek Fire Rehabilitation 1994	1994	2,595	1030*
		Imazapic	Bitter Creek Restoration Phase 2	September 2012	2,250	2161
		Rangeland Drill	Bitter Creek Restoration Phase 2	October 2012	1,580	2161
		Imazapic	Bitter Creek Phase 3 Seeding	November 2019	4,739	4673
10R-51	Archy Bench	Prescribed Fire	Lower Book Cliffs Prescribed Fire 1989	January-December 1989	425	6978*
		Lop and Scatter	Archy Bench Slashing	Summer 2010	1,339	
		Aerial Before	Archy Bench Sagebrush Restoration	October 2011	607	2050
		One-Way Ely	Archy Bench Sagebrush Restoration	October 2011	607	2050
		Plateau	Archy Bench Sagebrush Restoration	October 2011	607	2050
10R-52	Seep Ridge Bullhog	Aerial Before	Seep Ridge Bullhog Phase II	October 2011	390	1950
		Bullhog	Seep Ridge Bullhog Phase II	November 2011-February 2012	390	1950
		Aerial After	Seep Ridge Bullhog Phase II	December 2011	390	1950
		Lop and Scatter		August 2011-June 2022		
10R-53	Moon Ridge	Two-Way Ely	Moon Ridge Chaining	October-November 2013	540	2218
		Dribbler	Moon Ridge Chaining	October-November 2013	540	2218
		Aerial After	Moon Ridge Chaining	November 2013	540	2218
		Aerial After	Moon Ridge Chaining	December 2013	540	2218
		Lop and Scatter	Moon Ridge Chaining Maintenance	September-November 2016	692	3568
		Lop and Scatter	Winter Ridge FY25 (Proposed)	2025	5,559	7306
10R-54	Bitter Creek Herbicide	Wildfire	Bitter Creek	1994	3,659	
		Hand Planter	Bitter Creek Fire Rehabilitation 1994	1994	480	1030*
		Imazapic	Bitter Creek Restoration Phase 2	September 2012	2,250	2161
		Rangeland Drill	Bitter Creek Restoration Phase 2	October 2012	1,580	2161
		Imazapic	Bitter Creek Phase 3 Seeding	November 2019	4,739	4673
10R-55	South Book Cliffs	Aerial Before	South Book Cliffs Vegetation Phase 1	October 2013	512	2593
		Bullhog	South Book Cliffs Vegetation Phase 1	November 2013	512	2593
		Aerial After	South Book Cliffs Vegetation Phase 1	January 2014	512	2593
10R-56	Center Fork	Wildfire	Wolf Den	July 2012	19,865	
		Aerial Seeding	Wolf Den Fire-Rainbow	November-December 2012	526	2517
10R-57	Rector Ridge	Wildfire	Wolf Den	July 2012	19,865	
		Aerial Seeding	Wolf Den - Rector Ridge Fire Rehabilitation	December 2012	2,229	2453
10R-58	Dry Canyon	Aerial Befor	South Bookcliffs Vegetation Improvement (Hay) Phase III	March 2016	322	3330
		Bullhog	South Bookcliffs Vegetation Improvement (Hay) Phase III	March 2016	322	3330
		Imazapic	South Bookcliffs Phase 9 (Cottonwood/San Arroyo Bullhog)	November 2021	2,711	5654

Study #	Study Name	Type	Disturbance Name (If Available)	Date	Acres	WRI Project #
10R-59	Sagers Bench	Aerial Before	South Bookcliffs Phase 4 (Sagers)	October 2016	360	3673
		Bullhog	South Bookcliffs Phase 4 (Sagers)	October-November 2016	360	3673
		Aerial After	South Bookcliffs Phase 4 (Sagers)	December 2016	360	3673
		Imazapic	South Bookcliffs Phase 9 (Cottonwood/San Arroyo Bullhog)	November 2021	2,711	5654
10R-60	Hat Rock	Aerial Before	South Bookcliffs Phase 5 (Bryson)	October 2017	325	3961
		Bullhog	South Bookcliffs Phase 5 (Bryson)	November 2017-January 2018	255	3961
		Aerial After	South Bookcliffs Phase 5 (Bryson)	January 2018	325	3961
		Imazapic	South Bookcliffs Phase 9 (Cottonwood/San Arroyo Bullhog)	November 2021	2,711	5654
10R-61	Augusi Ridge	Bullhog	Augusi Bullhog	September-December 2019	692	4471
10R-63	Bar X Wash	Wildfire	Bitter Creek	1994	3,659	
	Bitter Creek	Rangeland Drill	Bitter Creek Fire Rehabilitation 1994	1994	2,595	1030*
		Imazapic	Bitter Creek Restoration Phase 3	October 2018	1,869	4465
		Imazapic	Bitter Creek Phase 3 Seeding	November 2019	4,739	4673
10R-66	West	Aerial Before	South Bookcliffs Phase 6 (Blaze)	October 2018	730	4522
	Thompson	Bullhog	South Bookcliffs Phase 6 (Blaze)	January-March 2019	730	4522
	Bench 2	Aerial After	South Bookcliffs Phase 6 (Blaze)	March 2019	730	4522
10R-67	Bull Canyon 2	Lop and Scatter	South Bookcliffs Phase 7 (Nash)	January-February 2020	174	4836
		Lop and Scatter		2020-2023		
		Imazapic	Moab Field Office Cheatgrass Control (Proposed)	Winter-Spring 2024		5573
10R-68	Winter Ridge	Aerial Before	Willow Watershed Improvements FY2024	October 2023	985	6585
		Aerial Before	Book Cliffs Wildlife Habitat Improvements (Proposed)	Fall 2025	938	7475
		Bullhog	Book Cliffs Wildlife Habitat Improvements (Proposed)	Fall 2025	938	7475
10R-69	Jump Off Point	Wildfire	Diamond Creek	2002	88,420	
		One-Way Chain	Book Cliffs Wildlife Habitat Improvements (Proposed)	Fall 2025	185	7475
		Broadcast	Book Cliffs Wildlife Habitat Improvements (Proposed)	Fall 2025	185	7475
10R-70	Horse Ridge 3	Tebuthiuron	Book Cliffs West Water Developments and Spike Treatment	Fall 2021	461	5376

Table 3.6: Range Trend and WRI studies known disturbance history for WMU 10, Book Cliffs. 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 2025 sample year:

- Mountain (Aspen) - Little Ridge (10-25)
  - (**Figure 3.11**, **Figure 3.15**, **Figure 3.19**, **Figure 3.24**, **Figure 3.29**, **Figure 3.33**, **Figure 3.37**, **Figure 3.41**)
- Upland (Black/Low Sagebrush) - Two Water WMA (10R-04)
  - (**Figure 3.12**, **Figure 3.16**, **Figure 3.20**, **Figure 3.25**, **Figure 3.30**, **Figure 3.34**, **Figure 3.38**, **Figure 3.42**)
- Semidesert (Fourwing Saltbush) - Nash Wash #1 (10R-25) (suspended) and Nash Wash #2 (10R-26)
  - (**Figure 3.13**, **Figure 3.17**, **Figure 3.21**, **Figure 3.26**, **Figure 3.31**, **Figure 3.35**, **Figure 3.39**, **Figure 3.43**)

Trend summaries and/or additional data for these ecotypes are available in the corresponding site reports (Lane, Payne, & Cox, 2026).

Mountain (Big Sagebrush)

There are nine studies [McCook Ridge Chaining (10-03), Wirefence Point (10-04), Willow Flat (10-05), Cherry Mesa (10-07), Lower Tom Patterson Point (10R-05), Monument Ridge (10R-07), Winter Ridge Exclosure Out (10R-09), Railroad Canyon (10R-17), and Rathole Ridge (10R-22)] that are classified as Mountain (Big Sagebrush) ecological sites. The McCook Ridge Chaining site is located on top of McCook Ridge, just north of Box Elder Canyon. Wirefence Point is found on the southern portion of Winter Ridge near Wire Fence Canyon. The Willow Flat study is situated on Willow Flats, west of the Wirefence Point study. Cherry Mesa is found on top of Cherry Mesa. The Lower Tom Patterson Point study site is located on top of Tom Patterson Point in the northern portion of the area. The Winter Ridge Exclosure Out study site is found at the junction of Bull Canyon and Winter Ridge. The Monument Ridge study is found on Monument Ridge near Trap Canyon. The Railroad Canyon site is located in Railroad Canyon just south of the Uintah-Grand County border. Finally, the Rathole Ridge study is situated on top of the southeast portion of Rat Hole Ridge.

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 McCook Ridge Chaining and Willow Flat studies provided data in all reported sample years except 1997, while Wirefence Point and Cherry Mesa contributed data spanning the whole sample period. Lower Tom Patterson Point, Monument Ridge, Winter Ridge Exclosure Out, and Rathole Ridge have provided data for all years since 1997; save for 2005, the Railroad Canyon study has also provided data for all other sample years since 1997. The Chipeta Canyon and Rathole Canyon sites only contributed data for 1997. Finally, the South Rathole and Upper Tent Canyon studies provided data in the 1997 and 2000 sample years.

Shrubs/Trees: The primary browse on these study sites has been mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*). Other browse species have also been present in many of these communities, but they have contributed less cover than sagebrush. Sagebrush cover increased from under 8% in 2010 to just under 15% in 2025 and has exhibited an increasing trend overall. The initial decrease in sagebrush cover between 2005 and 2010 is likely due in part to a decrease on the Willow Flat study following a post-sampling herbicide treatment in 2005 (**Table 3.6**). Furthermore, this decrease could also be partially attributed to the difference in the number of studies sampled each year (the 'n value'). The covers of other preferred browse species and other shrubs have generally remained stable since 2010 (**Figure 3.9**). Average preferred browse demographics indicate that mature plants have comprised most of the populations on these study sites. Overall density has increased, with much of the increase occurring between 2020 and 2025 (from 6,620 plants/acre to 10,159 plants/acre, respectively). Recruitment of young plants exhibited a decrease in 2005 and an increase in 2025, but it has otherwise remained generally stable since the 2010 sample year (**Figure 3.22**).

Utilization of preferred browse has fluctuated over time. In general, however, less than 50% of plants have been moderately to heavily utilized in all sample years except 2015, when 32% of plants were moderately browsed and 28% were heavily browsed (**Figure 3.27**).

Combined cover of Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) on these sites has increased overall, but it remains very low as of 2025; the decrease between 2005 and 2010 can largely be attributed to a 2009 bullhog treatment on the Cherry Mesa study (**Table 3.6**). Average tree density has also exhibited an overall increase, a trend which can partially be attributed to increases in juniper density on the Wirefence Point and Willow Flat studies (**Figure 3.14**, **Figure 3.18**).

Herbaceous Understory: The combined herbaceous understories of these study sites have, on average, increased in cover over the study years and have been mainly dominated by perennial grasses. Although native grasses are generally plentiful as of 2025, introduced species such as crested wheatgrass (*Agropyron cristatum*) dominate the understories of the McCook Ridge Chaining, Lower Tom Patterson Point, and Monument Ridge studies. Annual grasses such as cheatgrass (*Bromus tectorum*) have been present on many of these sites since 2010, but they have contributed very little cover and nested frequency. Forbs on these study sites have generally been diverse. Perennial forbs have exhibited fluctuating but slightly decreasing overall trends for both cover and frequency. Annual forbs have remained absent to rare throughout the study years (**Figure 3.32**, **Figure 3.36**).

Occupancy: Average pellet transect data indicates that elk have been the primary occupants of these study sites in most sample years and that occupancy has fluctuated over time. In addition, occupancy appears to be weakly bimodal or asymmetric, which could be related to cyclic resource availability. Mean abundance of elk pellet groups has ranged from 21 days use/acre in 2010 to 45 days use/acre in 2005. Average abundance of cattle pellet groups has been as low as just under 6 days use/acre in 2005 and as high as 15 days use/acre in 2015 and 2020. Finally, mean abundance of deer pellet groups has varied between under 6 days use/acre in 2015 and 27 days use/acre in 2010 (**Figure 3.40**).

Mountain (Browse)

There are eight studies [Black Horse (10-08), Tom Patterson Ridge (10-31), Mexico Point (10-32), Rock Spring (10-33), Snowshoe Ridge (10-34), Horse Ridge (10R-12) (suspended), Saddle Horse (10R-15), and PR Spring Exclosure Outside (10R-34)] that are classified as Mountain (Browse) ecological sites. The Black Horse study is found on top of Black Horse Ridge south of the Uintah-Grand County border, and the Tom Patterson Ridge site is situated just east of McCook Ridge Road and above Chipeta Canyon. The Mexico Point study can be found on Mexico Point, southeast of the major Three Pines intersection. Rock Spring is located north of Moon Ridge Road and west of Rock Spring. The Snowshoe Ridge site can be found just south of the head of Cedar Camp Canyon and just west of Snowshoe Ridge. The Horse Ridge site is situated north of Fence Canyon Road on Horse Ridge. Saddle Horse is situated south of Saddle Horse Point. Finally, the PR Spring Exclosure Outside study is located near the southern portion of PR Canyon, just north of PR Spring.

It is important to note that the number of study sites sampled (the 'n' value) has shifted from year to year and to consider the implications that this may have on data discussed in the following sections. The Black Horse and Saddle Horse studies contributed data in all reported years except 1997, while the Horse Ridge site provided data from 1997 to 2005. PR Spring Exclosure Outside has provided data since 2000. Finally, the Tom Patterson Ridge, Mexico Point, Rock Spring, and Snowshoe Ridge studies were all established in 2025 and as such, only contributed data during the most recent sample year.

Shrubs/Trees: The dominant browse components of these sites have generally been comprised of a mixture of preferred browse species including mountain snowberry (*Symphoricarpos oreophilus*), alderleaf mountain mahogany (*Cercocarpus montanus*), Utah serviceberry (*Amalanchier utahensis*), wild crab apple (*Peraphyllum ramosissimum*), and Gambel oak (*Quercus gambelii*); other shrub species have often been present in lower amounts. However, mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has provided the most cover on the Saddle Horse and PR Spring Exclosure Outside study sites. Overall shrub cover has

increased over time, a trend that is primarily driven by preferred browse other than mountain mahogany and serviceberry (**Figure 3.10**). Preferred browse density has fluctuated from year to year, but it has exhibited an overall increase; it is important to note the differing 'n values' between sample years and consider the potential effects that this variation may have on vegetation trends. Average preferred browse demographics indicate that mature plants have consistently constituted the largest portion of the populations; although decadence has remained comparatively low, it has been variable. Recruitment of young plants has fluctuated, but it has generally decreased (**Figure 3.23**). Average preferred browse utilization across the ecotype has increased over time with less than 30% of plants being moderately and/or heavily hedged between 2000 and 2010 and over 60% of plants being either moderately or heavily hedged in 2025; 41% of preferred browse plants were heavily hedged in 2025 (**Figure 3.28**).

Utah juniper (*Juniperus osteosperma*), twoneedle pinyon (*Pinus edulis*), and other conifers have been present on some study sites. The Saddle Horse study was the main driver for average cover and density trends between 2005 and 2020. However, the addition of Tom Patterson Ridge, Mexico Point, Rock Spring, and Snowshoe Ridge in 2025 suppress the averages for both cover and density in the most recent sample year (**Figure 3.14**, **Figure 3.18**).

Herbaceous Understory: Herbaceous cover and abundance on these sites have exhibited slight fluctuations from year to year but have generally decreased overall. Perennial grasses have consistently been the dominant herbaceous component. The introduced species Kentucky bluegrass (*Poa pratensis*) has contributed some amount of cover on many sites, but many native species have also been present and provide much of the cover on the aggregate as of 2025. The introduced annual grass species cheatgrass (*Bromus tectorum*) has been consistently present on the Saddle Horse study, but in small amounts. These sites have hosted a variety of perennial forbs, the amount of which has fluctuated from year to year but has remained stable overall. Annual forbs have remained rare over time (**Figure 3.32**, **Figure 3.36**).

Occupancy: Average pellet transect data indicates that these sites have remained mainly occupied by elk and deer and that presence has decreased over time. Mean abundance of elk pellet groups has ranged from 15 days use/acre in 2010 to 34 days use/acre in 2000 and 2005. Deer have had a mean pellet group abundance as low as 18 days use/acre in 2015 and as high as 48 days use/acre in 2000 (**Figure 3.40**).

Mountain (Basin Wildrye)

Four study sites [Bogart-She (10-23), Turner Canyon (10-24), Sweet Water Canyon (10R-06) (suspended), Lower South Canyon (10R-19) (suspended), and Dick Canyon (10R-20) (suspended)] are classified as Mountain (Basin Wildrye) ecological sites. Bogart-She is located west of Little Creek Ridge just north of the intersection of the Bogart and She Canyons. Turner Canyon is found west of Diamond Ridge, adjacent to East Willow Creek. The Sweet Water Canyon site is situated in Sweet Water Canyon approximately half of a mile south of the fork with Railroad Canyon. Lower South Canyon is found in South Canyon about half of a mile south of the fork with Sweet Water Canyon. Finally, the Dick Canyon study site is found in the lower slopes above Dick Canyon and about a mile south of Bitter 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 Sweet Water Canyon, Lower South Canyon, and Dick Canyon study sites only provided data in 1997 and 2000. Bogart-She contributed data in 1995 and again from 2015 through 2025. Finally, Turner Canyon has provided data since 1995.

Shrubs/Trees: Browse species and shrubs in general on these sites have been limited, with trends largely driven by the Turner Canyon study; all line intercept cover in 2025 was contributed by prairie sagewort (*Artemisia frigida*) (**Figure 3.11**). Average preferred browse demographics show that the population has been primarily composed of mature individuals and that density has decreased over time, especially since 2015. Recruitment of young has followed a similar decreasing pattern as mature plant densities and was at its lowest in 2025 (**Figure 3.19**). Preferred browse utilization has remained very low throughout the sample period, but it has increased over time (**Figure 3.29**).

Quaking aspen (*Populus tremuloides*) contributed a small amount of line intercept cover for the first time in 2020 and again in 2025 on the Bogart-She study. Tree density has remained low and has also been provided by aspen on the Bogart-She site (**Figure 3.15**, **Figure 3.19**).

Herbaceous Understory: Both study sites have plentiful herbaceous understories that have been largely composed of perennial grasses throughout the study period. Although the introduced perennial grass species Kentucky bluegrass (*Poa pratensis*) has provided the most cover of any species on the Bogart-She study, native grasses have contributed a considerable amount of cover on both sites. The introduced annual grass species cheatgrass (*Bromus tectorum*) has been observed on the Turner Canyon study, but in very low amounts. Perennial forbs have remained diverse and although they have fluctuated in cover and frequency from year to year, they have decreased overall since 2015. Annual forbs have remained rare over the sample period but are increasing in nested frequency and cover as of 2025 (**Figure 3.33**, **Figure 3.37**).

Occupancy: According to average pellet transect data, occupancy has increased over time. Elk were the primary occupants in 2000 and have had a mean pellet group abundance ranging from 5 days use/acre in 2025 to 19 days use/acre in 2000. Cattle and/or bison were the main occupants between 2015 and 2025 and have had an average abundance of pellet groups fluctuating between 5 days use/acre in 2000 and 48 days use/acre in 2020. Mean abundance of deer pellet groups has been as low as 0 days use/acre in 2025 and as high as just over 1 days use/acre in 2015 and 2020 (**Figure 3.41**).

Upland (Big Sagebrush)

There are six studies [McCook Ridge Exclosure (10-02), Wolf Den (10-12), Upper Meadow Creek (10R-01) (suspended), Nash Wash Burn (10R-27) (suspended), Cottonwood Burn (10R-30) (suspended), and Hay Canyon Burn (10R-31) (suspended)] that are classified as Upland (Big Sagebrush) ecological sites. The McCook Ridge Exclosure study is located on McCook Ridge near Slick Rock Canyon and Wolf Den is situated in Big Park, north of Nelson Canyon. The Upper Meadow Creek study is found at the end of Cedar Camp Ridge and above Meadow Creek. Nash Wash Burn is located in the canyon north of Nash Wash, roughly two miles northwest of Bull Canyon. The Cottonwood Burn site is situated up Cottonwood Canyon near the mouth of Lower Twin Canyon. Finally, the Hay Canyon Burn study site is located in Hay Canyon and roughly three miles south of the major Three Pines intersection on the Divide Road.

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 Upper Meadow Creek study only provided data in 1997, while Nash Wash Burn and Cottonwood Burn only contributed data for the 2000 sample year. The Hay Canyon Burn study site contributed data in 1995 and 1997, and the Wolf Den site has provided data in all reported years except 1997. Finally, data for the McCook Ridge Exclosure study spans the entire reported sample period.

Shrubs/Trees: The primary browse species on these sites has been Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) on McCook Ridge and mountain big sagebrush (*A. tridentata* ssp. *vaseyana*) on Wolf Den. Other browse species have often been present but have contributed less cover. Average shrub cover has remained stable overall, but it decreased markedly between 2015 and 2020 (**Figure 3.9**, **Figure 3.14**). Average preferred browse demographics indicate that density has exhibited an overall increase since 1997; however, the decrease in density between 2015 and 2020 is notable. Mature plants have consistently been the primary demographic within the browse populations, although decadent individuals have also been present. Recruitment of young plants has varied from year to year, but it has increased in general over time (**Figure 3.20**). Utilization data indicates that less than 50% of plants have been moderately or heavily hedged in most years. The exception to this is the 2005 sample year, when 31% of plants were moderately used and 41% were heavily used (**Figure 3.27**).

Encroachment by Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) is occurring on these study sites as of 2025, but not in any notable amount (**Figure 3.16**, **Figure 3.20**).

Herbaceous Understory: Except for the Wolf Den study, which has had little herbaceous cover, these studies have hosted moderately abundant herbaceous understories that have remained largely stable since the studies began. Annual grasses, namely the introduced annual species cheatgrass (*Bromus tectorum*), contribute a majority of the herbaceous cover on the McCook Ridge Exclosure study. Cheatgrass has also been present on the Wolf Den study in some years, but in low amounts. Perennial grass has been observed in these understories with low to moderate cover. Annual and perennial forbs have remained comparatively rare (**Figure 3.34**, **Figure 3.38**).

Occupancy: Average pellet transect data shows that although presence has fluctuated from year to year, it has decreased overall since 2005. Deer have been the primary occupants of these study sites and have had a mean pellet group abundance ranging from 36 days use/acre in 2015 and 2025 to 164 days use/acre in 2005. Elk pellet groups have had an average abundance as low as 5 days use/acre in 2005 and as high as 14 days use/acre in 2015. Mean abundance of cattle pellet groups has fluctuated between 0 days use/acre in 2010, 2015 and 2025, and 4 days use/acre in 2005 (**Figure 3.42**).

Upland (Fourwing Saltbush)

Five study sites [Indian Ridge (10-01), Sunday School (10-10), Park Ridge (10-11) (Suspended), Indian Ridge 2 (10R-28), and Massey Junction (10R-29)] are considered to be Upland (Fourwing Saltbush) ecological sites. The Indian Ridge and Indian Ridge 2 studies are located on top of Indian Ridge, and the Park Ridge site is situated on Park Ridge, roughly two miles southwest of the end of the ridge. Sunday School is found between Seep Ridge and Main Canyon. Finally, the Massey Junction study is located adjacent to the road that runs west past Atchee Ridge Cabin.

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 Park Ridge study only contributed data in 1995 and 2000. The Massey Ridge site has provided data since 2000, and the same has been contributed by Indian Ridge 2 except during the 2005 sample year. Finally, the Indian Ridge and Sunday School study sites have provided data spanning the entire reported sample period.

Shrubs/Trees: The primary browse component on these study sites is fourwing saltbush (*Atriplex canescens*) as of 2025, although Sunday School is dominated by Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*). However, other browse species provided most of the cover on average between 2005 and 2015. Total average shrub cover has exhibited an overall increase over the sample period with the trend being driven by increases in fourwing saltbush cover (**Figure 3.13**). Average preferred browse density has fluctuated. The substantial density decrease between 2015 and 2020 was largely due to prairie sagewort (*Artemisia frigida*), and the increase between 2020 and 2025 can be attributed to winterfat (*Krascheninnikovia lanata*) on the Sunday School study. Mature plants have generally comprised most of the preferred browse populations on these sites. Recruitment of young plants has varied from year to year, but it has remained good over the sample period (**Figure 3.26**). In 2005, 19% of preferred browse plants sampled in density strips were moderately used and 58% were heavily used. However, average utilization of preferred browse has remained low in all other sample years despite a slightly increasing trend since 2010 (**Figure 3.31**).

Trees appeared in line-intercept cover data for the first time in 2025 and were assessed as having very low cover. Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) were observed in low amounts in density measurements for the first time in 2020 and displayed a slight decrease in 2025. This trend is entirely driven by the Indian Ridge study (**Figure 3.16**, **Figure 3.20**).

Herbaceous Understory: The herbaceous understories of these sites have remained moderately diverse and plentiful. However, these understories have been mainly comprised of the introduced annual grass species cheatgrass (*Bromus tectorum*) in all study years (although cheatgrass was not observed on the Sunday School site in 2025). Native perennial grass species have contributed relatively high cover and have contributed a large proportion of perennial grasses. Perennial grass has exhibited a stable trend overall since 2010. Perennial

forbs have remained rare throughout the study period, and although annual forb cover has fluctuated from year to year, it has generally decreased over time (**Figure 3.35**, **Figure 3.39**).

Occupancy: Average pellet transect data indicates that occupancy has increased overall. Deer have been the primary occupants in all sample years except 2000, and mean pellet group abundance has ranged from 7 days use/acre in 2000 to 48 days use/acre in 2020. Elk pellet groups have fluctuated between 8 days use/acre in 2020 and 23 days use/acre in 2005. Average abundance of cattle pellet groups has been as low as 2 days use/acre in 2025 and as high as 18 days use/acre in 2010 (**Figure 3.42**).

Semidesert (Big Sagebrush)

There are 13 study sites [Agency Draw (10-09), East Floy Bench (10-14), East Thompson Bench (10-15), West Horse Pasture (10-16), East Calf Canyon (10-17), East Horse Pasture (10-18), Lower Cottonwood (10-19) (suspended), East Sulfur Bench (10-19) (suspended), Bryson Draw (10-22) (suspended), Bitter Creek (10-26), Long Canyon (10-27), San Arroyo (10-30), and Dry Canyon (10R-58)] that are classified as Semidesert (Big Sagebrush) ecological sites. The Agency Draw study is located southeast of Agency Draw Oil Field and west of Willow Creek. East Floy Bench is found due west of Crescent Canyon, and between Crescent Flat to the south and Crescent Butte to the north. The East Thompson Bench study is located east of Thompson Canyon on Thompson Bench. West Horse Pasture is situated southeast of Cunningham Ranch, adjacent to Nash Wash. East Calf Canyon is found just east of Calf Canyon near the Cisco Dome Oil and Gas Field. East Horse Pasture is located almost due east of Cunningham Ranch adjacent to Cisco Dome Oil and Gas Field. The Lower Cottonwood site is situated just over one mile south of the mouth of Cottonwood Canyon. East Sulfur Bench is located on the bench northeast of the mouth of Sulphur Canyon at the base of the Book Cliffs. The Bryson Draw site is found just southwest of the mouth of Bryson Canyon in the south Book Cliffs. Bitter Creek is found at the base of the Book Cliffs just north of the Stateline Gas Field, and the Long Canyon study is situated at the base of the Book Cliffs and just east of Long Canyon. The San Arroyo site is also found at the base of the Book Cliffs and just east of the mouth of San Arroyo Canyon. Finally, the Dry Canyon study site is located on a flat on the southern portion of the Book Cliffs, approximately one mile south of the mouth of Dry Canyon.

One should consider the varying number of study sites sampled each year (the 'n' value) and the relevant implications that this may have in the data. The Lower Cottonwood, East Sulfur Bench, and Bryson Draw studies only contributed data in 1995, while Bitter Creek provided data from 2000 through the 2020 sample year. The Long Canyon site has provided data since 2005, and Dry Canyon has contributed data since 2015. The Agency Draw, East Floy Bench, East Thompson Bench, West Horse Pasture, East Calf Canyon, and East Horse Pasture study sites have contributed data spanning all reported sample years. Finally, the San Arroyo site was established in 2025 and, as such, only contributed data in that year.

Shrubs/Trees: The most dominant browse species within these communities has been Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*); additional browse species have been rare, but present on some sites. Average sagebrush cover has generally been good, but the West Horse Pasture study had much less (< 1%) cover than other studies in 2020. Sagebrush cover has decreased overall since 2005 (**Figure 3.9**). Average preferred browse demographics indicate that mature plants have comprised a majority of the populations on these sites in all sample years except 2005, when combined young and decadent plants were the majority. Recruitment of young plants has varied slightly from year to year but has been stable overall: this appears to have led to the overall stability of these populations (**Figure 3.22**). Browse utilization has fluctuated from year to year, but it appears to have generally increased. More specifically, nearly 27% of mature plants sampled in density strips were moderately utilized while 45% were heavily browsed in the 2025 sample year (**Figure 3.27**).

All average tree cover and most of the average density on these study sites can be attributed to Utah juniper (*Juniperus osteosperma*). Average density and cover have exhibited overall decreasing trends; this decrease can likely be attributed to a tree-reducing project on Dry Canyon. (**Figure 3.17**, **Figure 3.21**, **Table 3.6**).

Herbaceous Understory: The amount of overall herbaceous cover has varied from year to year on these sites. The composition has remained consistent, however, with the annual grass species cheatgrass (*Bromus tectorum*) contributing a majority of the herbaceous cover; cheatgrass may increase the risk of fire and threaten the resiliency of these sites (**Table 3.8**). Native perennial grass species have been present in lesser amounts over the years. Although low, perennial grass cover has exhibited an overall slightly increasing trend over time. Perennial forbs have remained rare on these sites, and cover of annual forbs has fluctuated over the sample years (**Figure 3.35**, **Figure 3.39**).

Occupancy: Pellet group transect data indicates that animal occupancy has fluctuated from year to year and that deer have primarily used these sites. Deer pellet groups have had a mean abundance ranging from 32 days use/acre in 2000 to 60 days use/acre in 2025. Elk presence has decreased over time and mean pellet group abundance has been as low as days use/acre in 2015 and 2025, and as high as 15 days use/acre in 2000. Finally, mean abundance of cattle has remained low with pellet group abundance ranging from 2 days use/acre in 2020 to 9 days use/acre in 2010 (**Figure 3.43**).

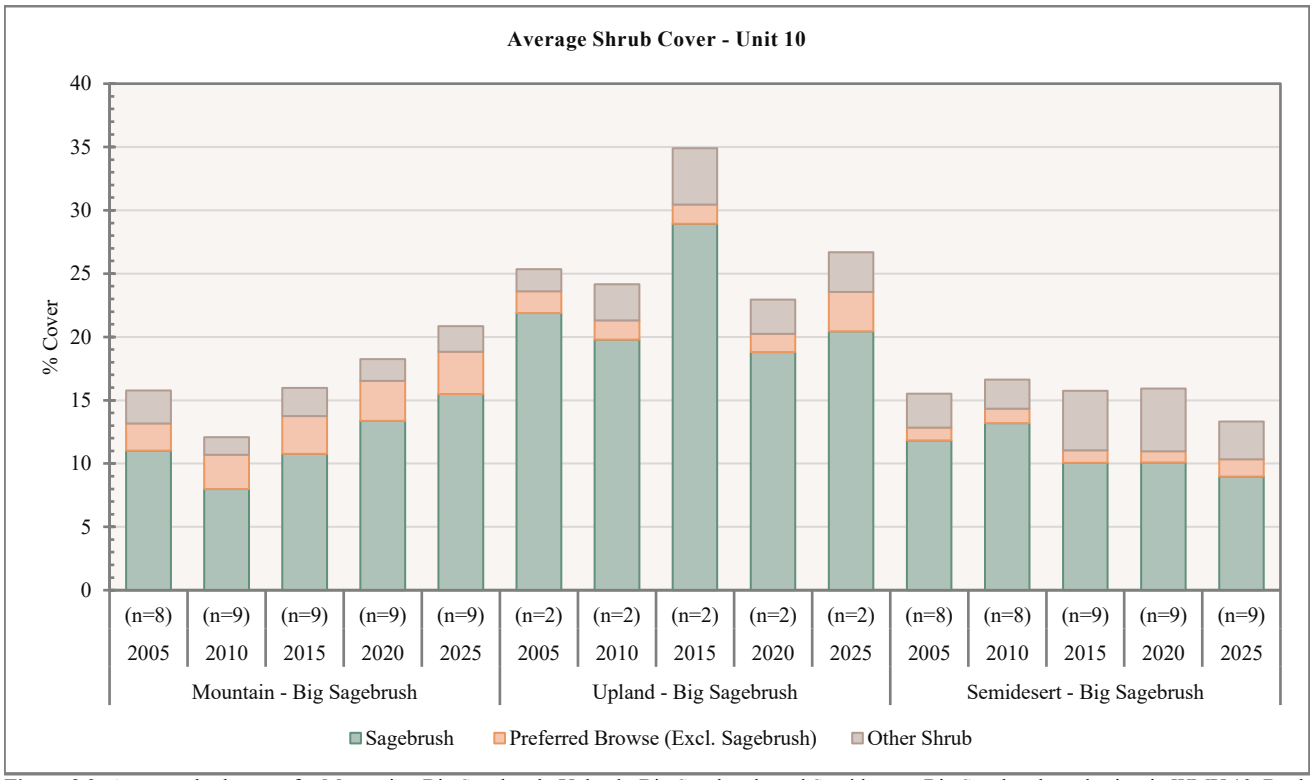


Figure 3.9: Average shrub cover for Mountain - Big Sagebrush, Upland - Big Sagebrush, and Semidesert - Big Sagebrush study sites in WMU 10, Book Cliffs

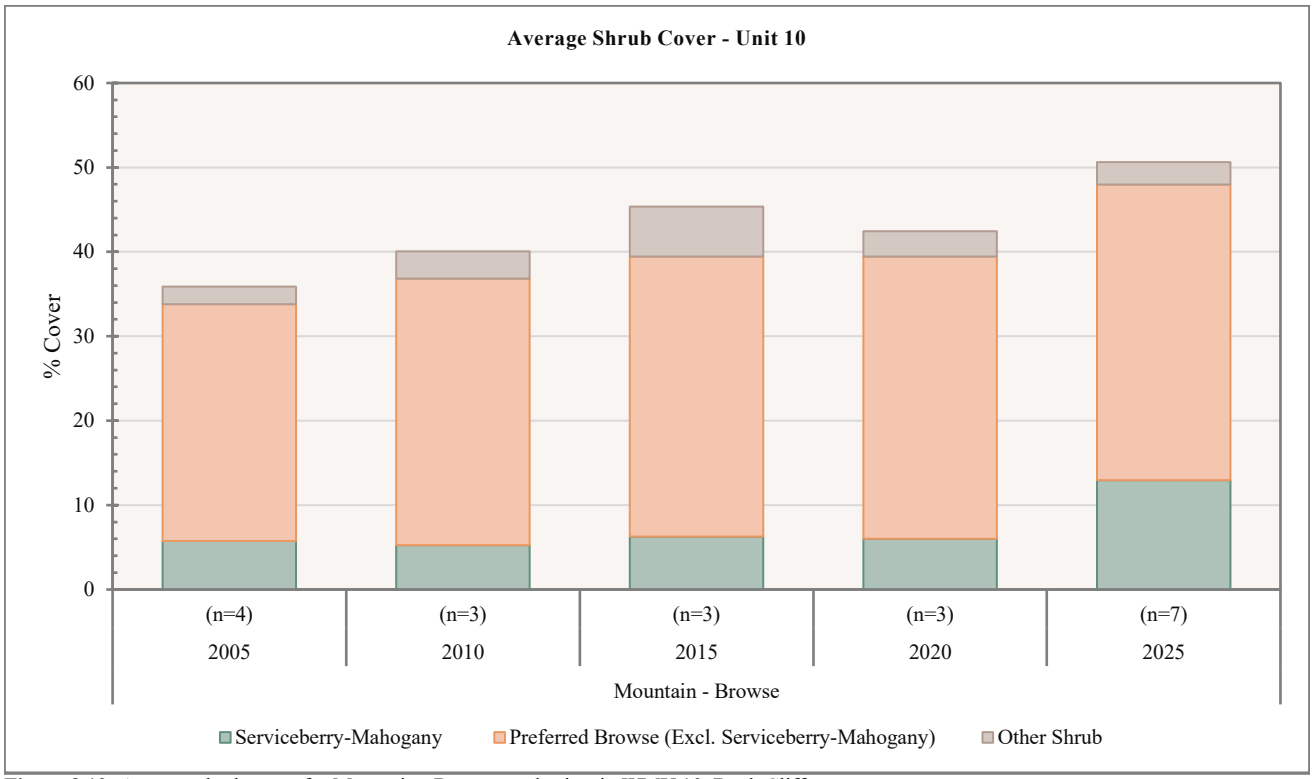


Figure 3.10: Average shrub cover for Mountain - Browse study sites in WMU 10, Book Cliffs.

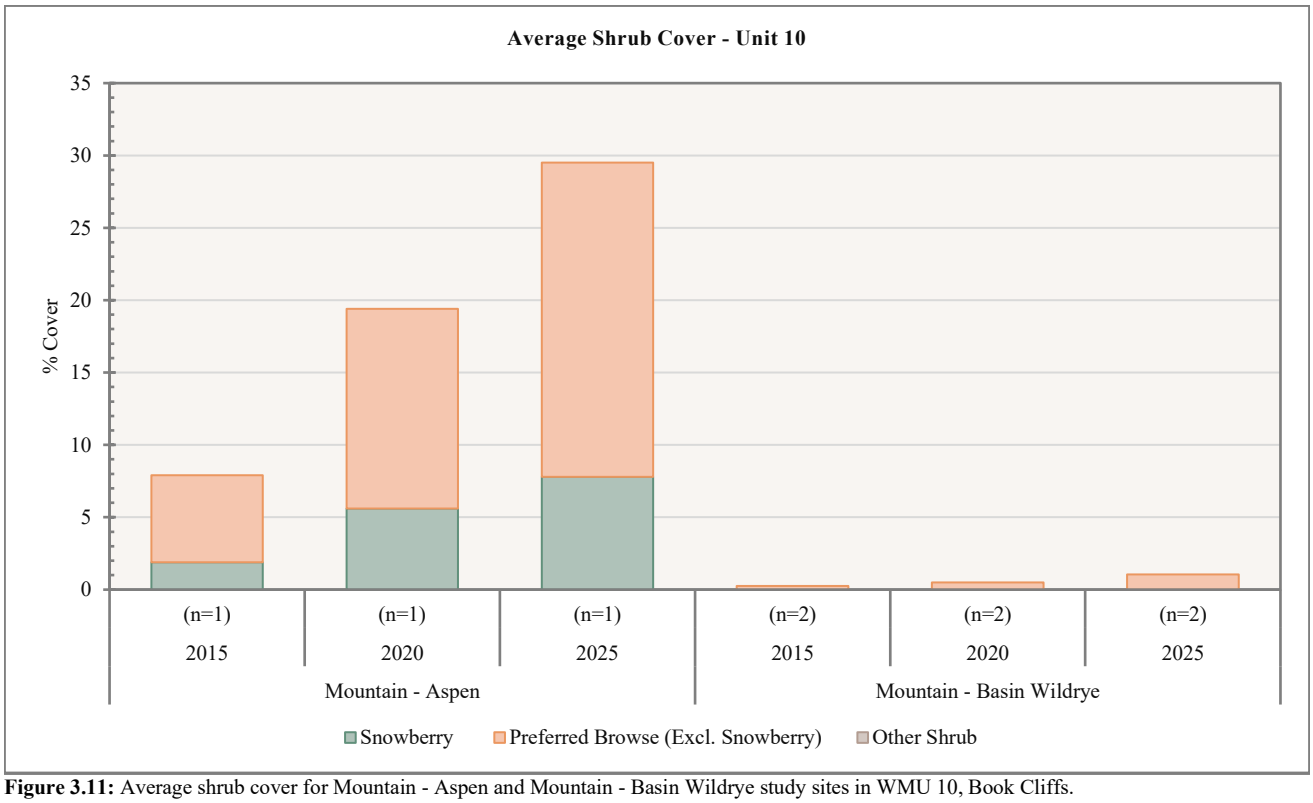


Figure 3.11: Average shrub cover for Mountain - Aspen and Mountain - Basin Wildrye study sites in WMU 10, Book Cliffs.

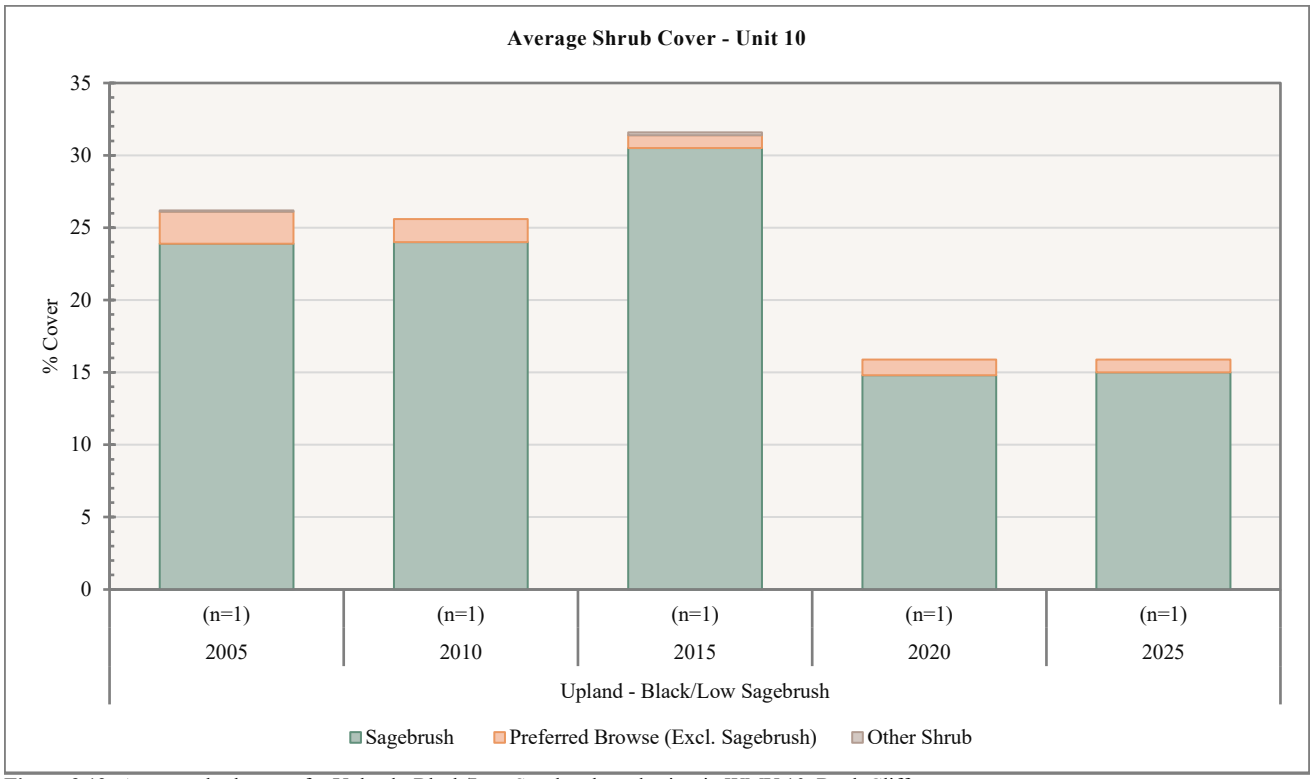


Figure 3.12: Average shrub cover for Upland - Black/Low Sagebrush study sites in WMU 10, Book Cliffs.

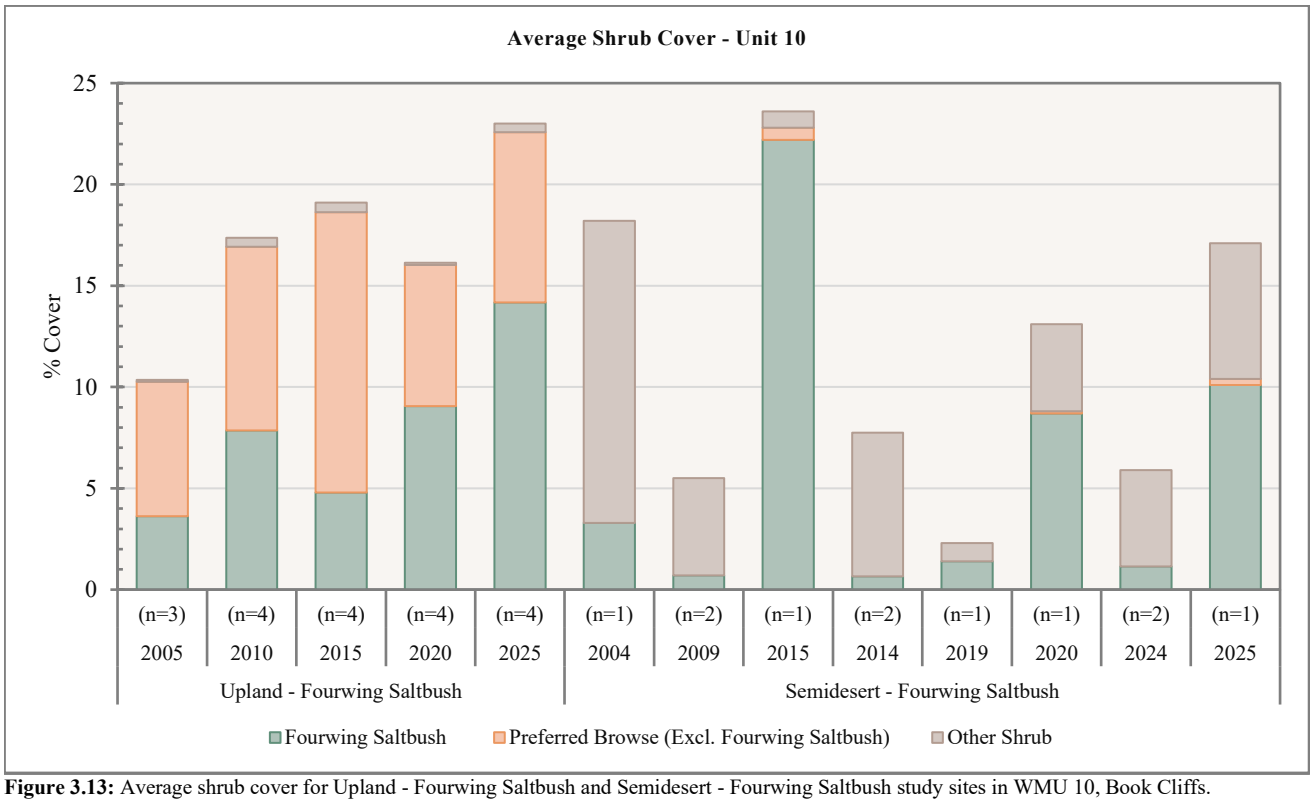


Figure 3.13: Average shrub cover for Upland - Fourwing Saltbush and Semidesert - Fourwing Saltbush study sites in WMU 10, Book Cliffs.

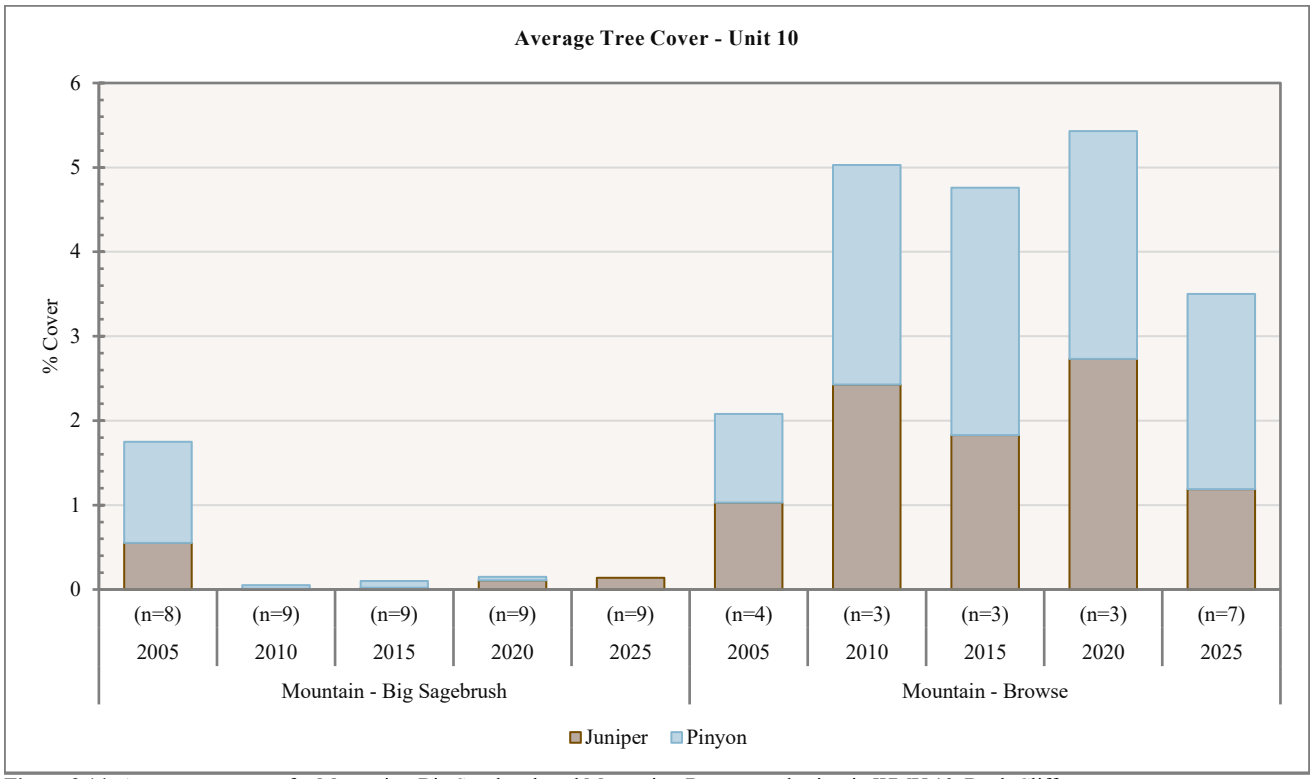


Figure 3.14: Average tree cover for Mountain - Big Sagebrush and Mountain - Browse study sites in WMU 10, Book Cliffs.

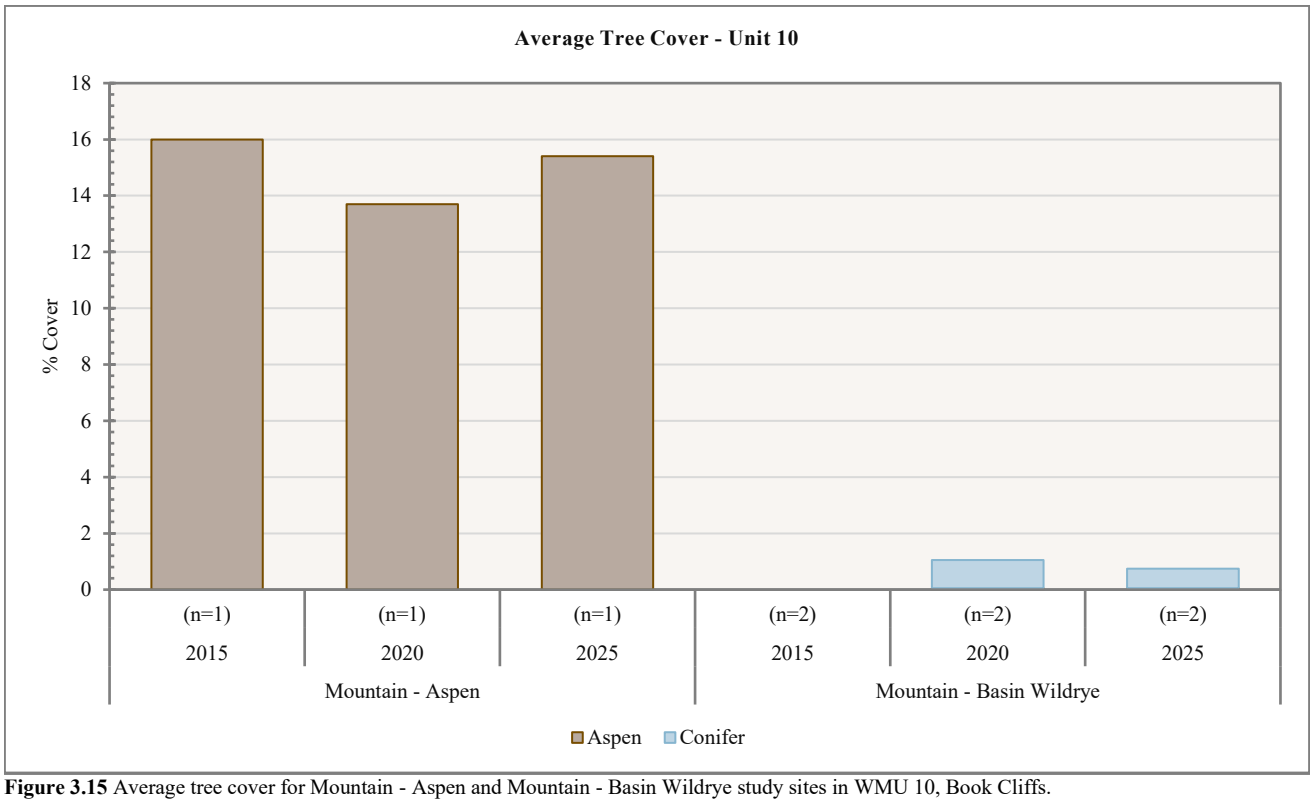


Figure 3.15 Average tree cover for Mountain - Aspen and Mountain - Basin Wildrye study sites in WMU 10, Book Cliffs.

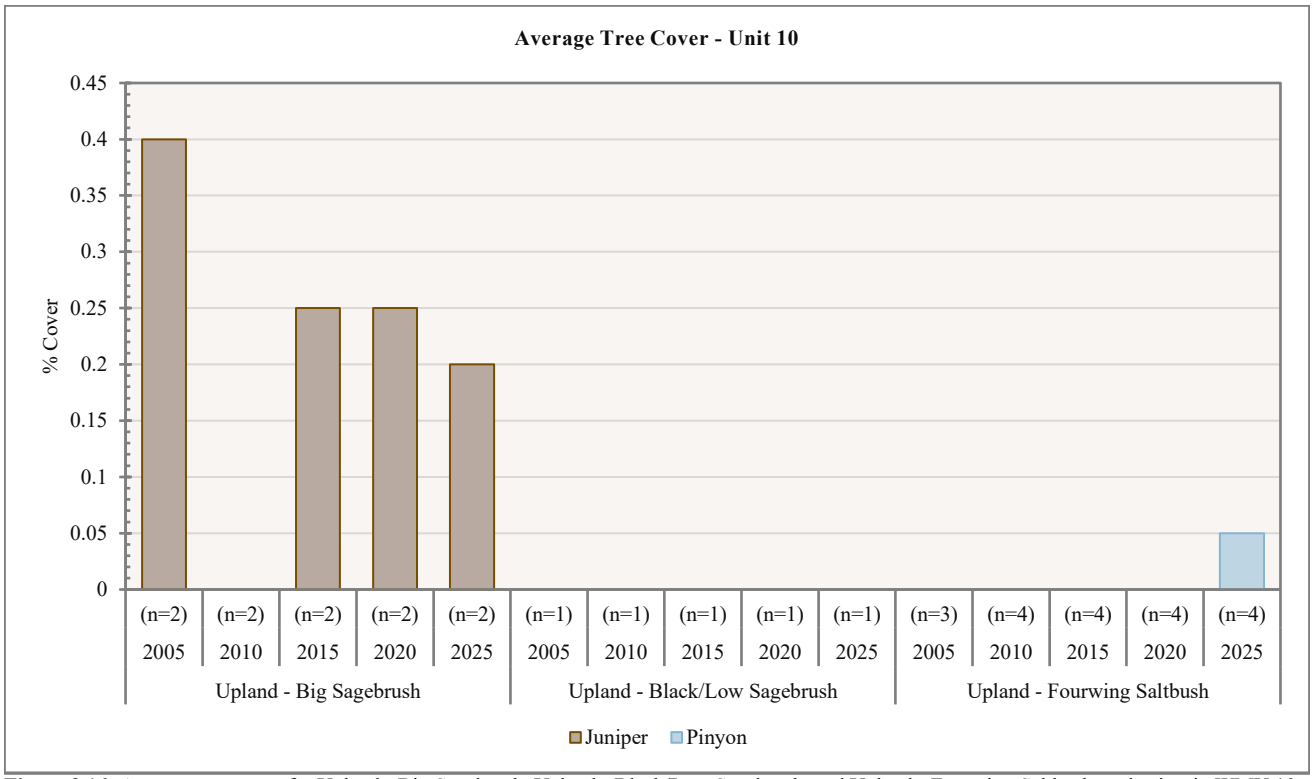


Figure 3.16: Average tree cover for Upland - Big Sagebrush, Upland - Black/Low Sagebrush, and Upland - Fourwing Saltbush study sites in WMU 10, Book Cliffs.

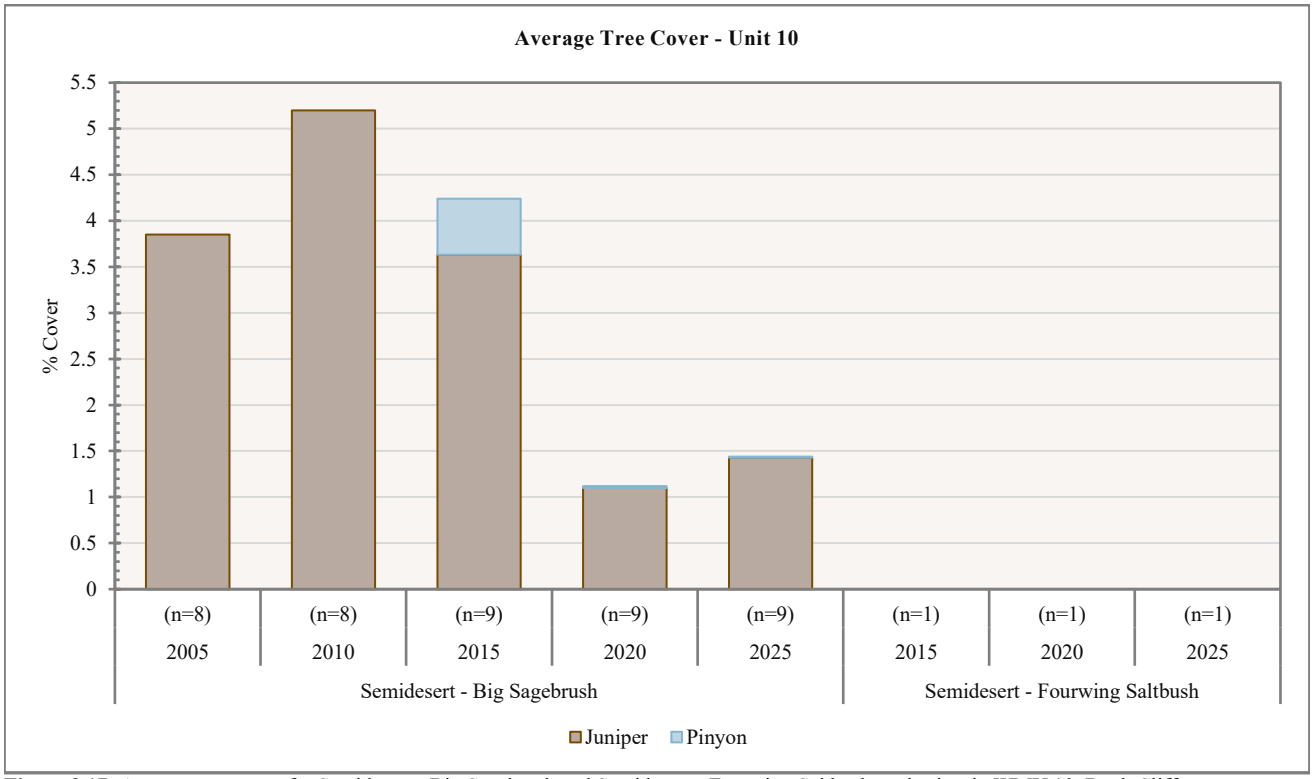


Figure 3.17: Average tree cover for Semidesert - Big Sagebrush and Semidesert - Fourwing Saltbush study sites in WMU 10, Book Cliffs.

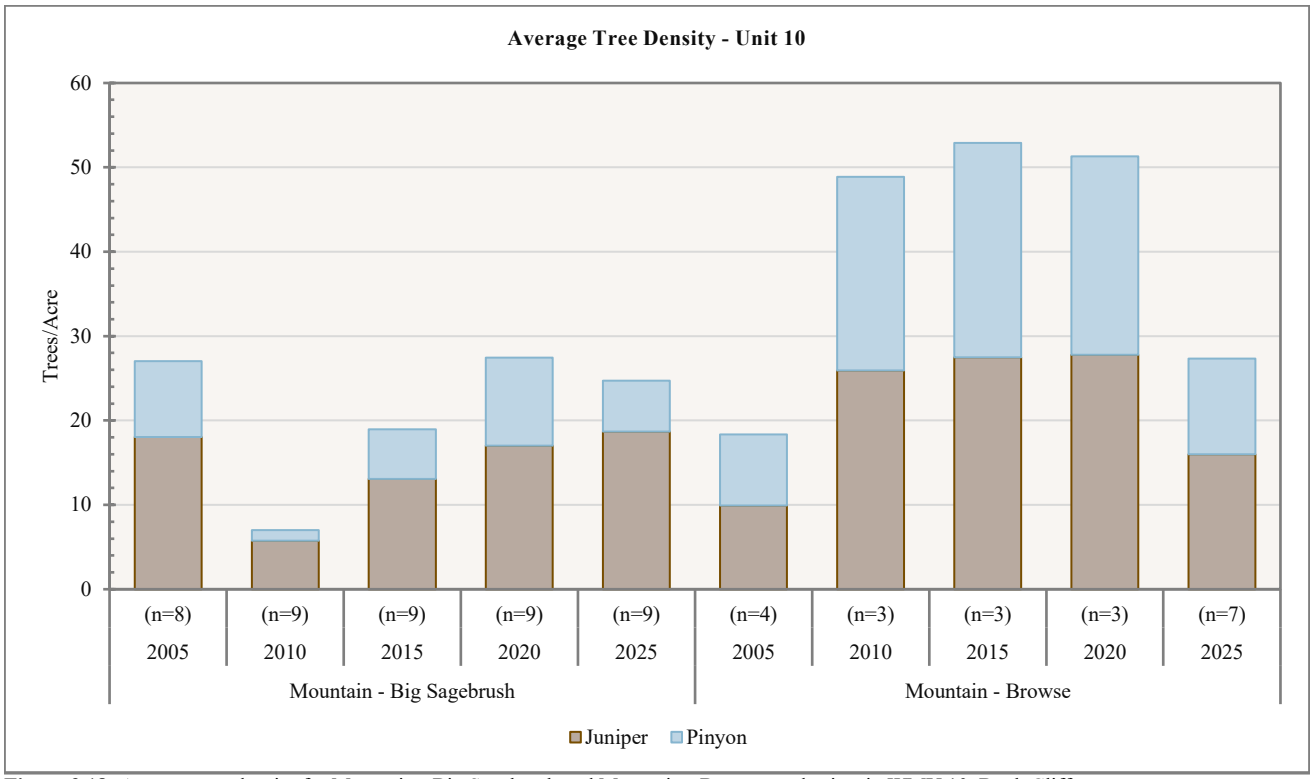


Figure 3.18: Average tree density for Mountain - Big Sagebrush and Mountain - Browse study sites in WMU 10, Book Cliffs.

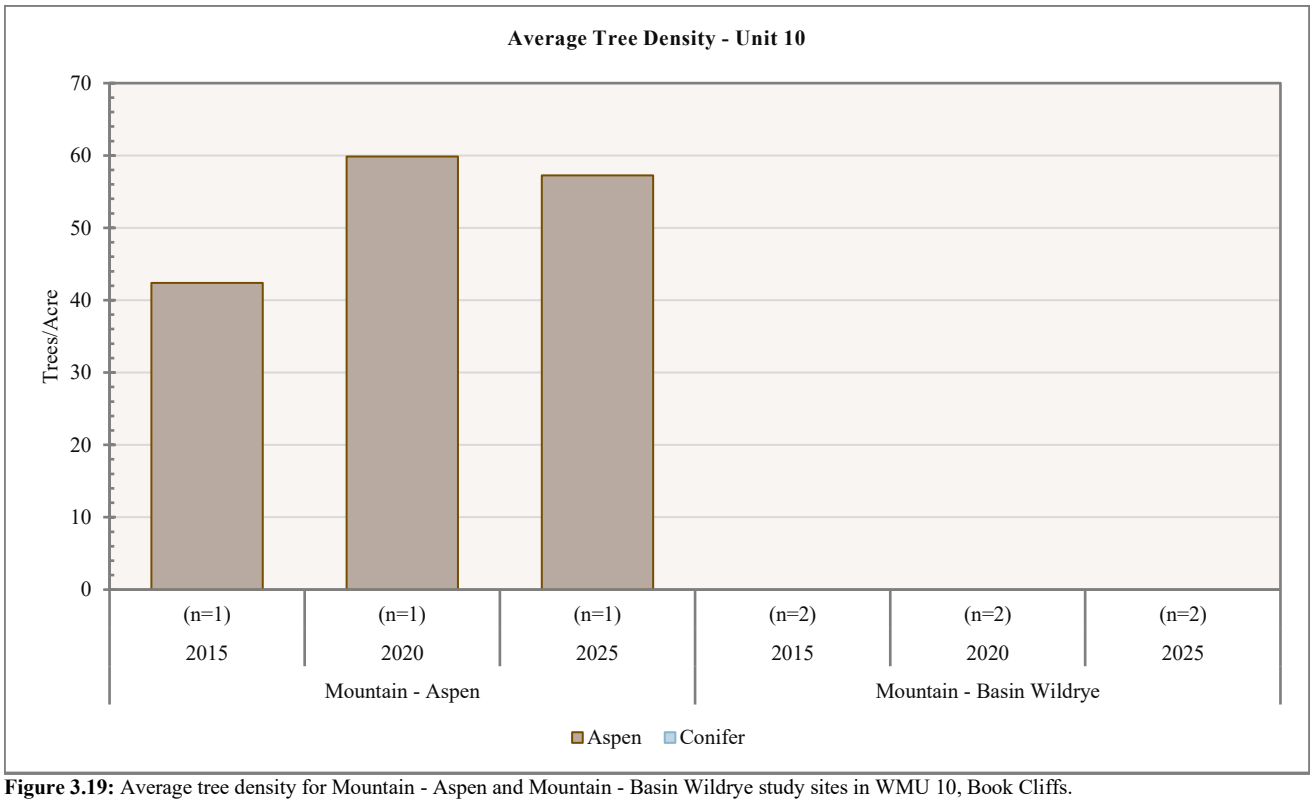


Figure 3.19: Average tree density for Mountain - Aspen and Mountain - Basin Wildrye study sites in WMU 10, Book Cliffs.

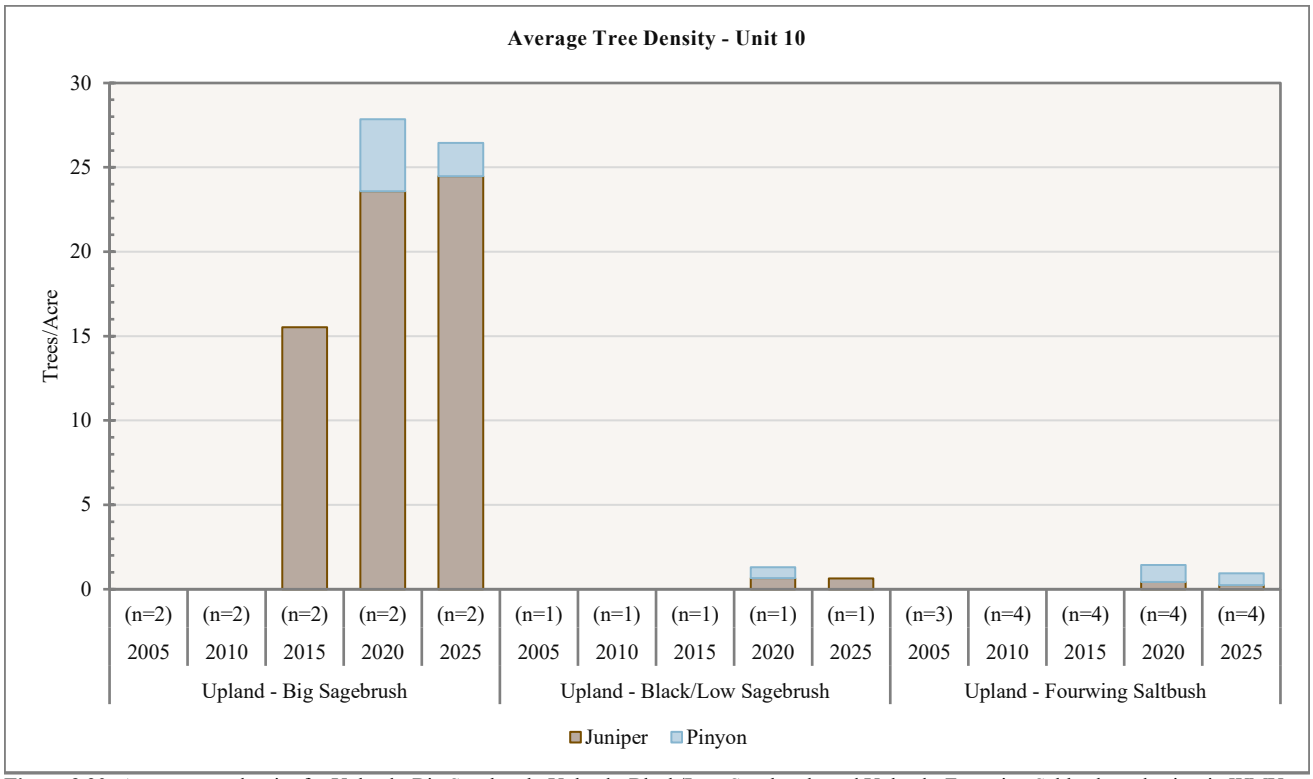


Figure 3.20: Average tree density for Upland - Big Sagebrush, Upland - Black/Low Sagebrush, and Upland - Fourwing Saltbush study sites in WMU 10, Book Cliffs.

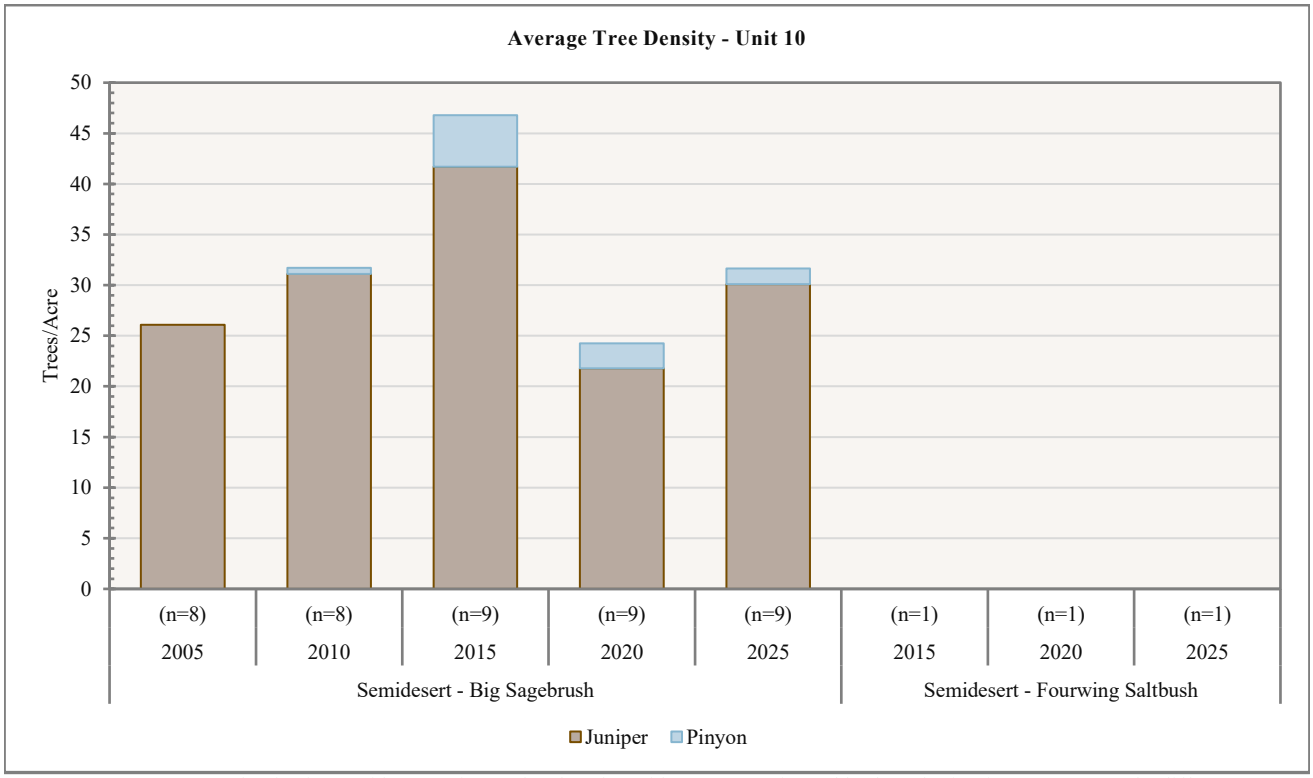


Figure 3.21: Average tree density for Semidesert - Big Sagebrush and Semidesert - Fourwing Saltbush study sites in WMU 10, Book Cliffs.

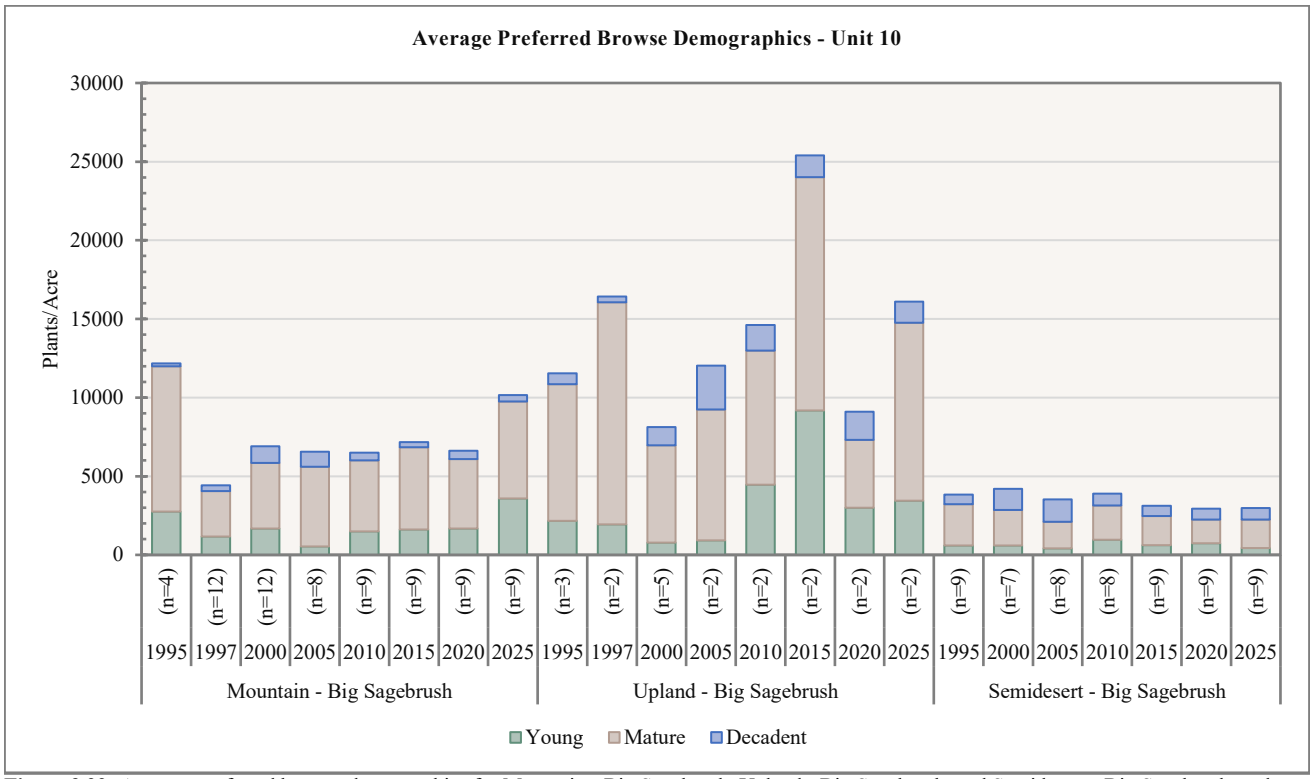


Figure 3.22: Average preferred browse demographics for Mountain - Big Sagebrush, Upland - Big Sagebrush, and Semidesert - Big Sagebrush study sites in WMU 10, Book Cliffs.

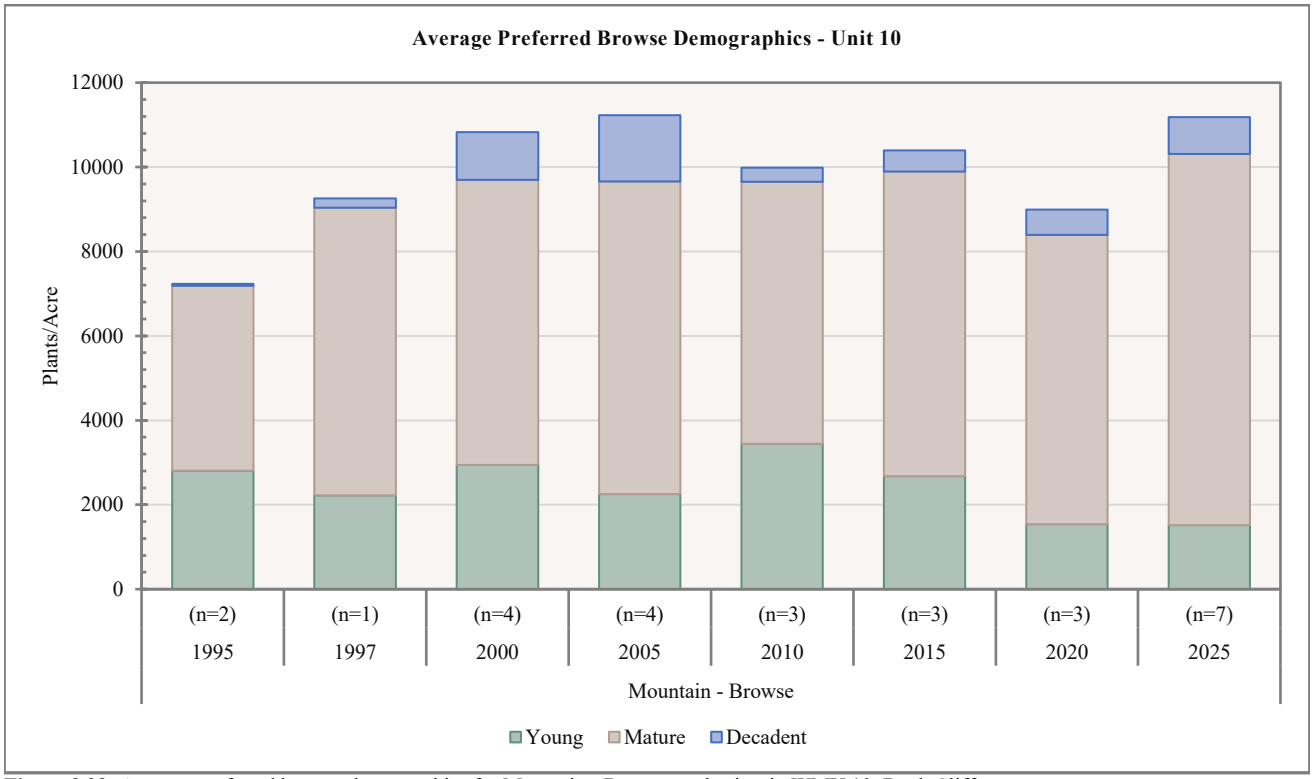


Figure 3.23: Average preferred browse demographics for Mountain - Browse study sites in WMU 10, Book Cliffs.

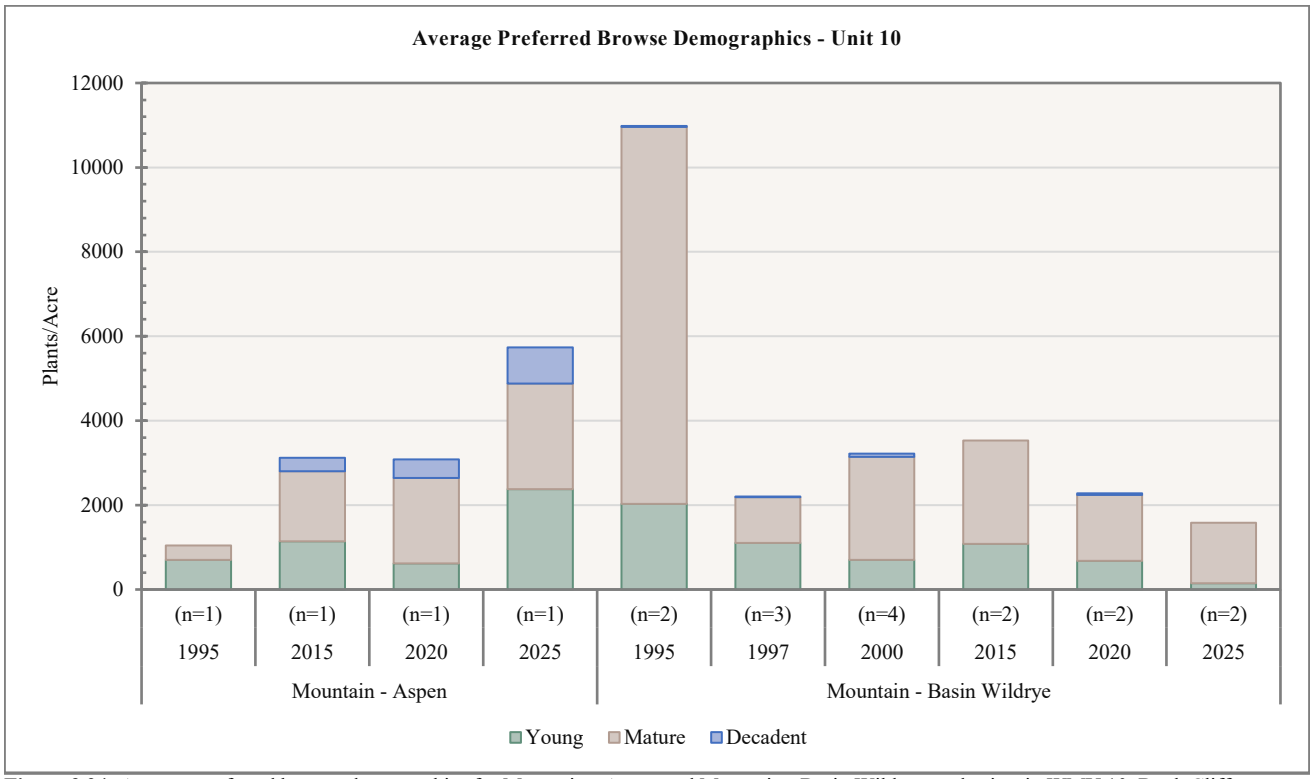


Figure 3.24: Average preferred browse demographics for Mountain - Aspen and Mountain - Basin Wildrye study sites in WMU 10, Book Cliffs.

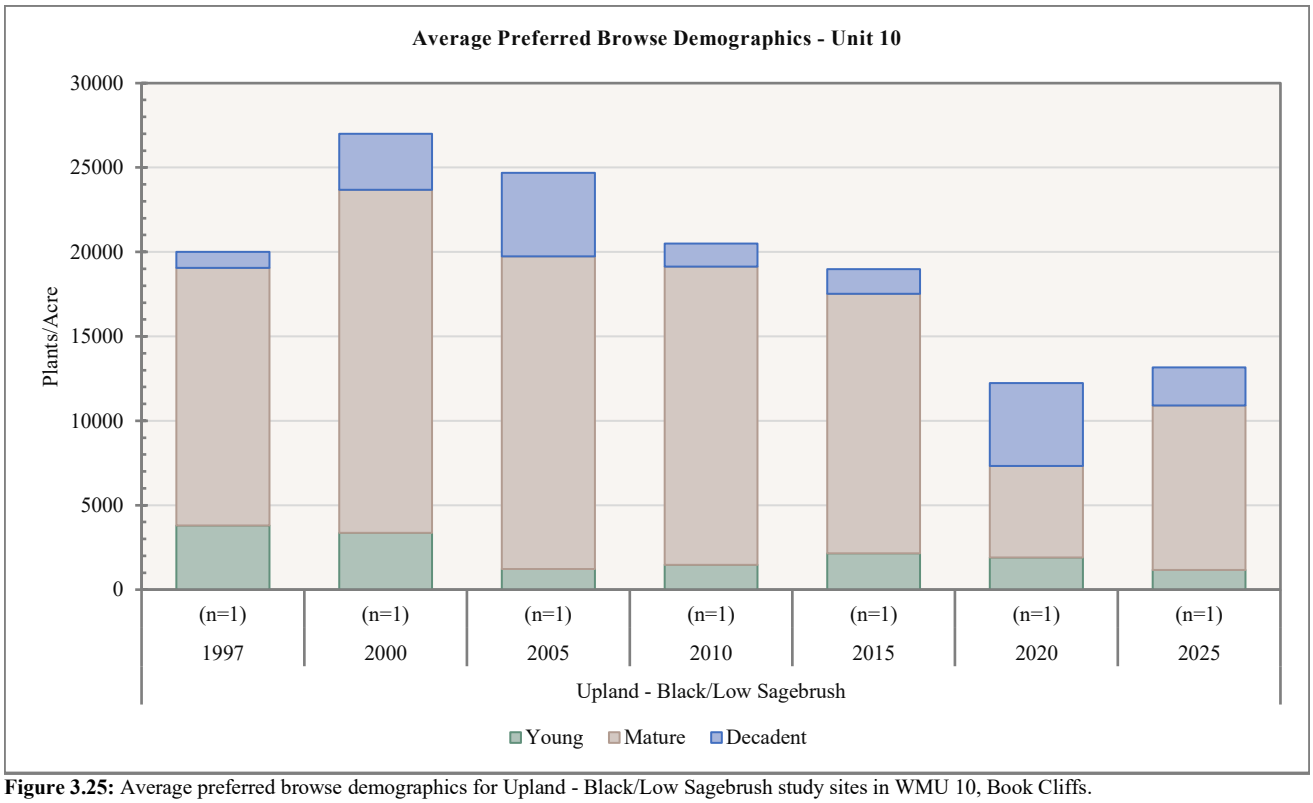


Figure 3.25: Average preferred browse demographics for Upland - Black/Low Sagebrush study sites in WMU 10, Book Cliffs.

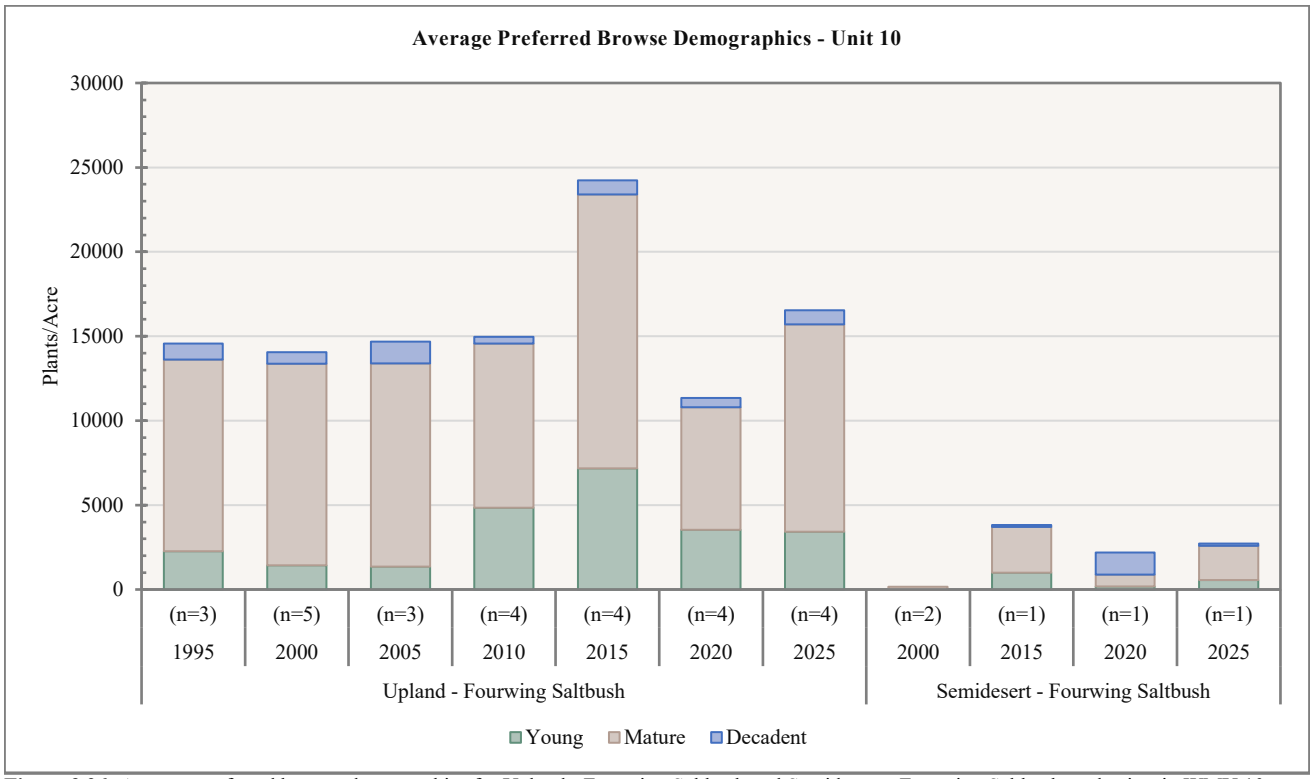


Figure 3.26: Average preferred browse demographics for Upland - Fourwing Saltbush and Semidesert - Fourwing Saltbush study sites in WMU 10, Book Cliffs.

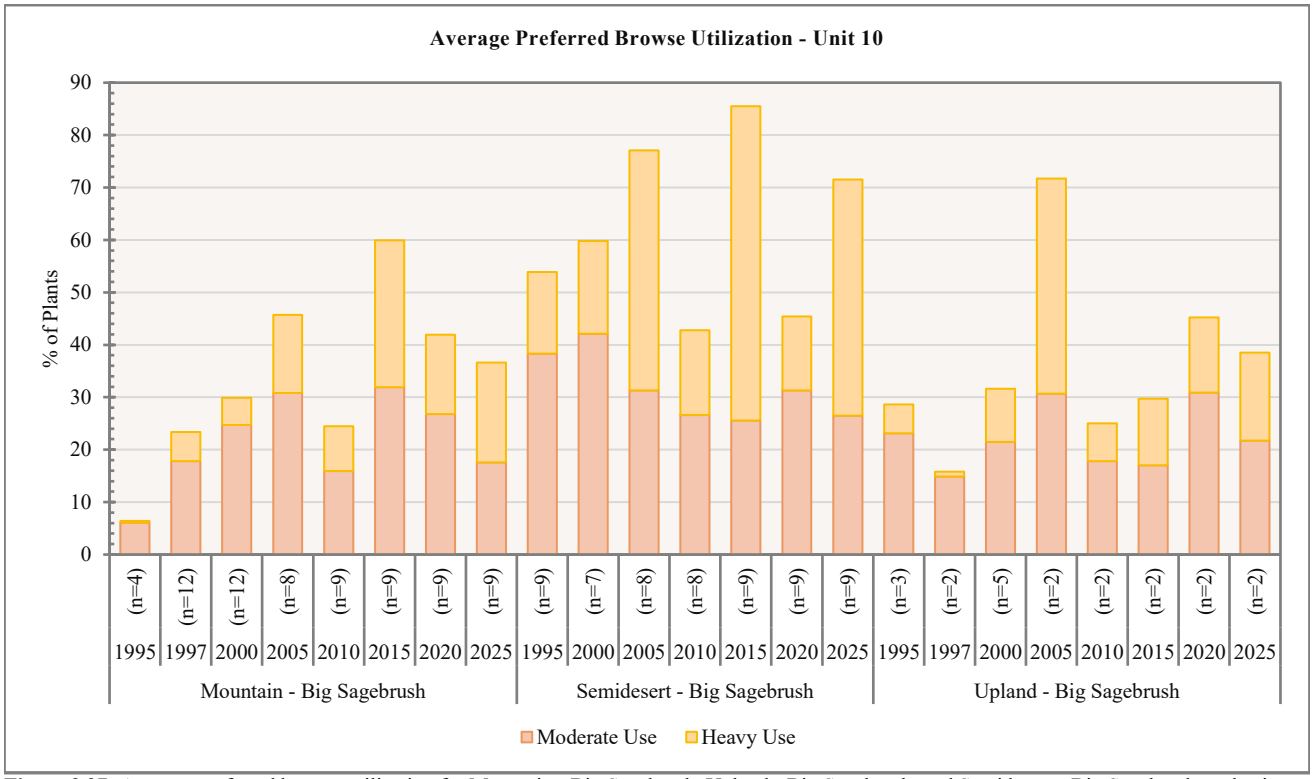


Figure 3.27: Average preferred browse utilization for Mountain - Big Sagebrush, Upland - Big Sagebrush, and Semidesert - Big Sagebrush study sites in WMU 10, Book Cliffs.

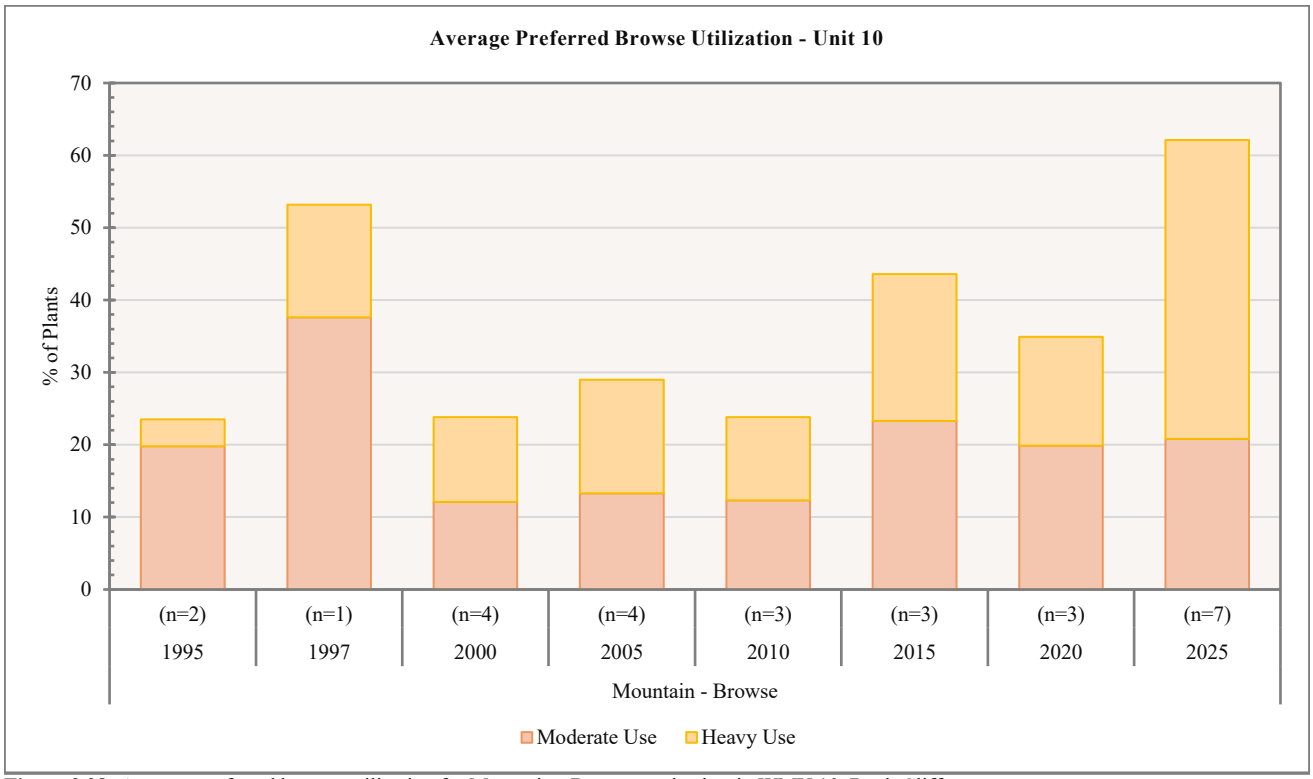


Figure 3.28: Average preferred browse utilization for Mountain - Browse study sites in WMU 10, Book Cliffs.

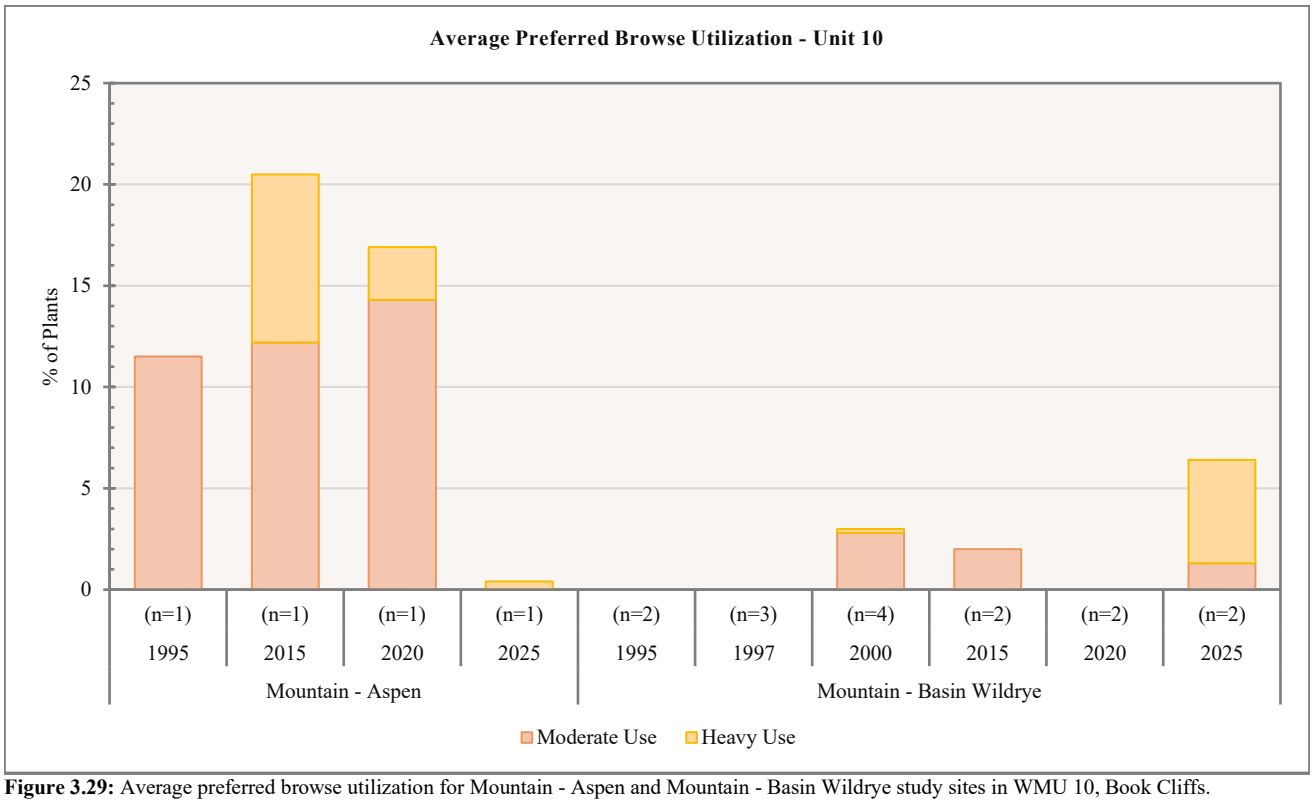


Figure 3.29: Average preferred browse utilization for Mountain - Aspen and Mountain - Basin Wildrye study sites in WMU 10, Book Cliffs.

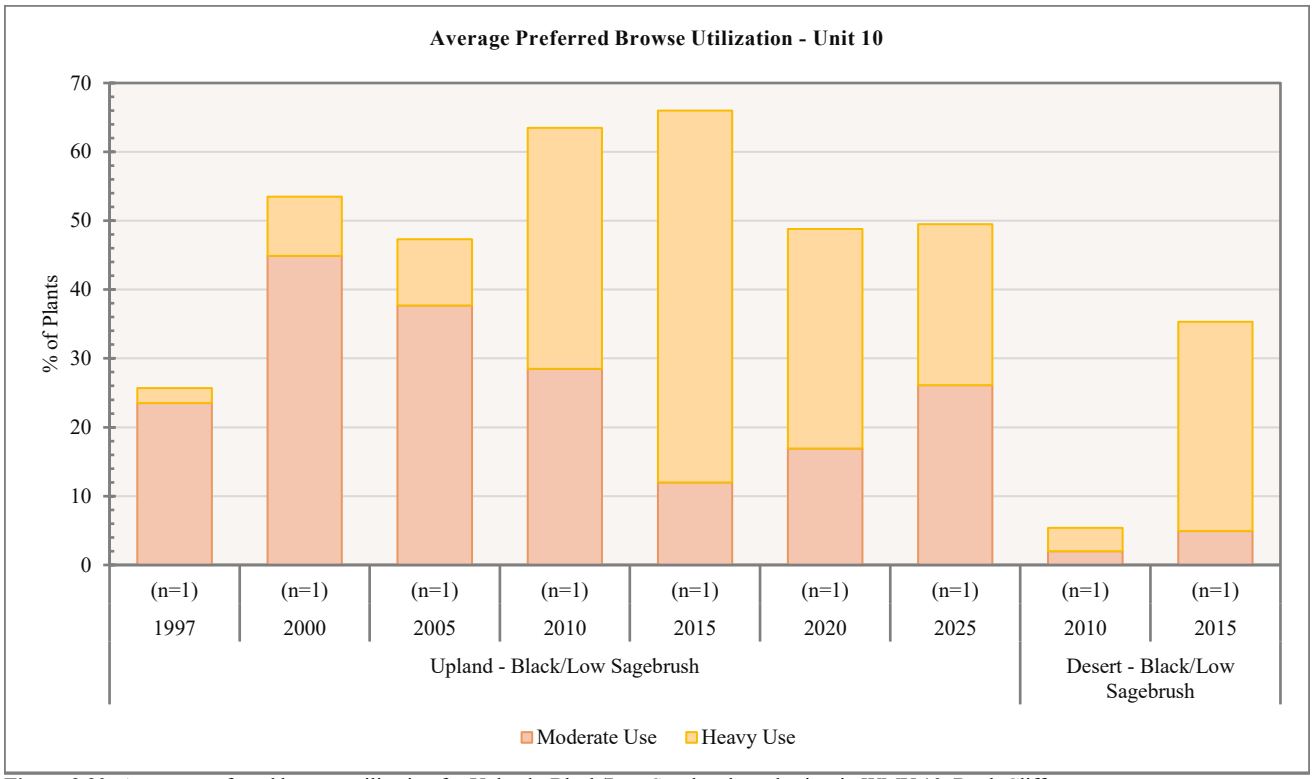


Figure 3.30: Average preferred browse utilization for Upland - Black/Low Sagebrush study sites in WMU 10, Book Cliffs.

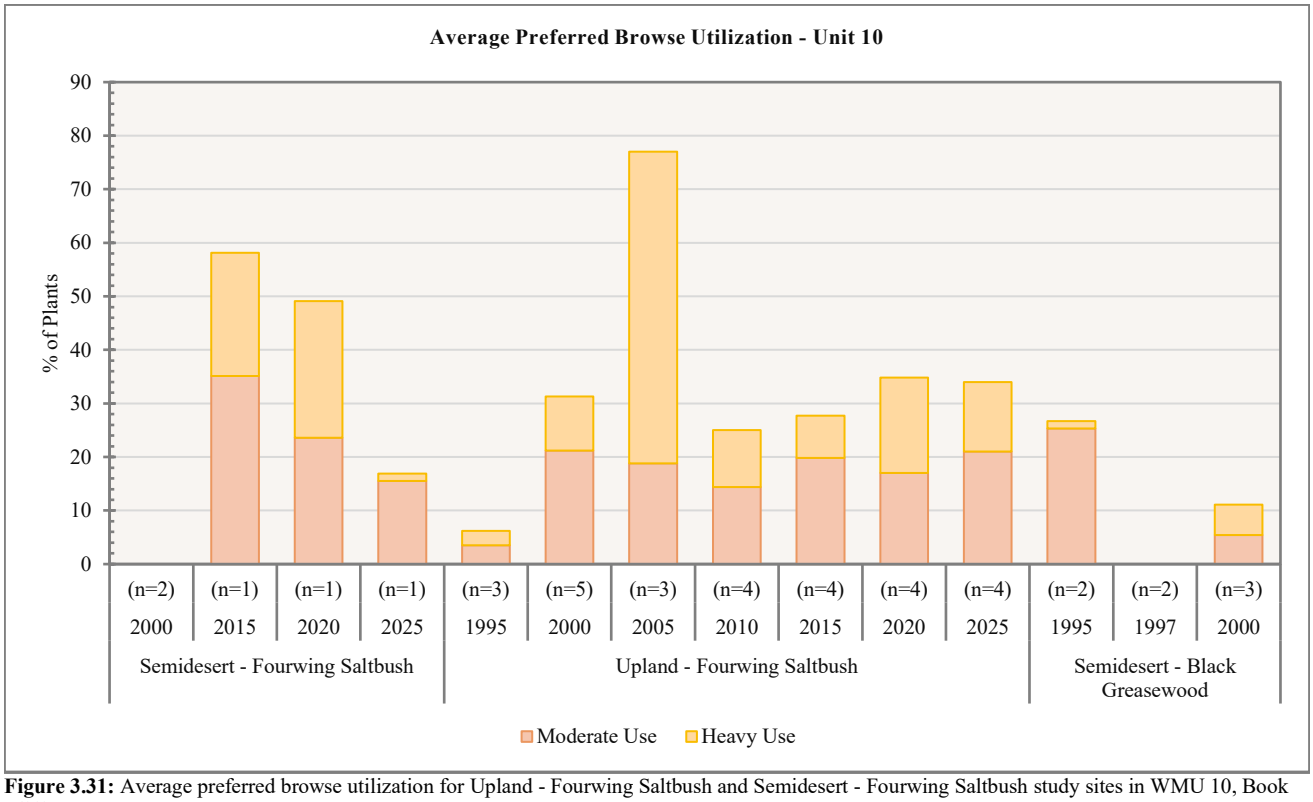


Figure 3.31: Average preferred browse utilization for Upland - Fourwing Saltbush and Semidesert - Fourwing Saltbush study sites in WMU 10, Book Cliffs.

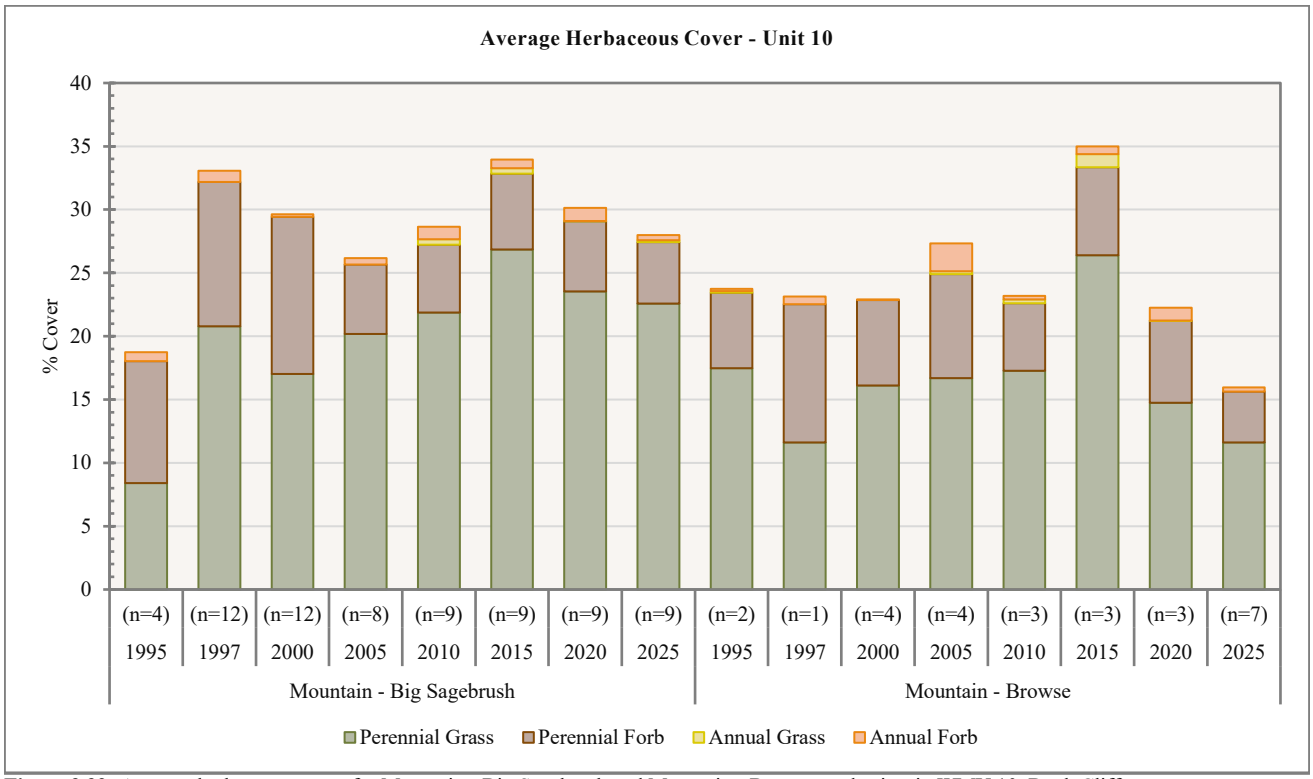


Figure 3.32: Average herbaceous cover for Mountain - Big Sagebrush and Mountain - Browse study sites in WMU 10, Book Cliffs.

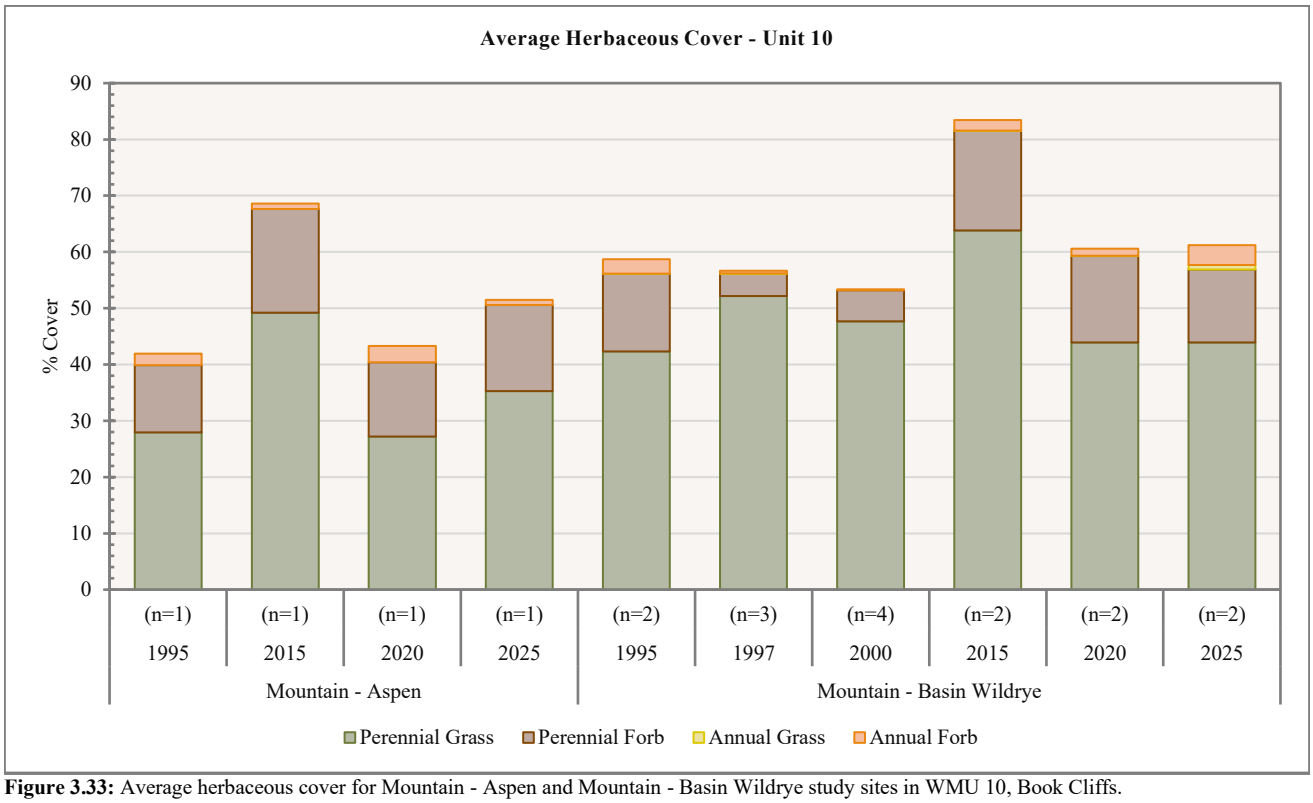


Figure 3.33: Average herbaceous cover for Mountain - Aspen and Mountain - Basin Wildrye study sites in WMU 10, Book Cliffs.

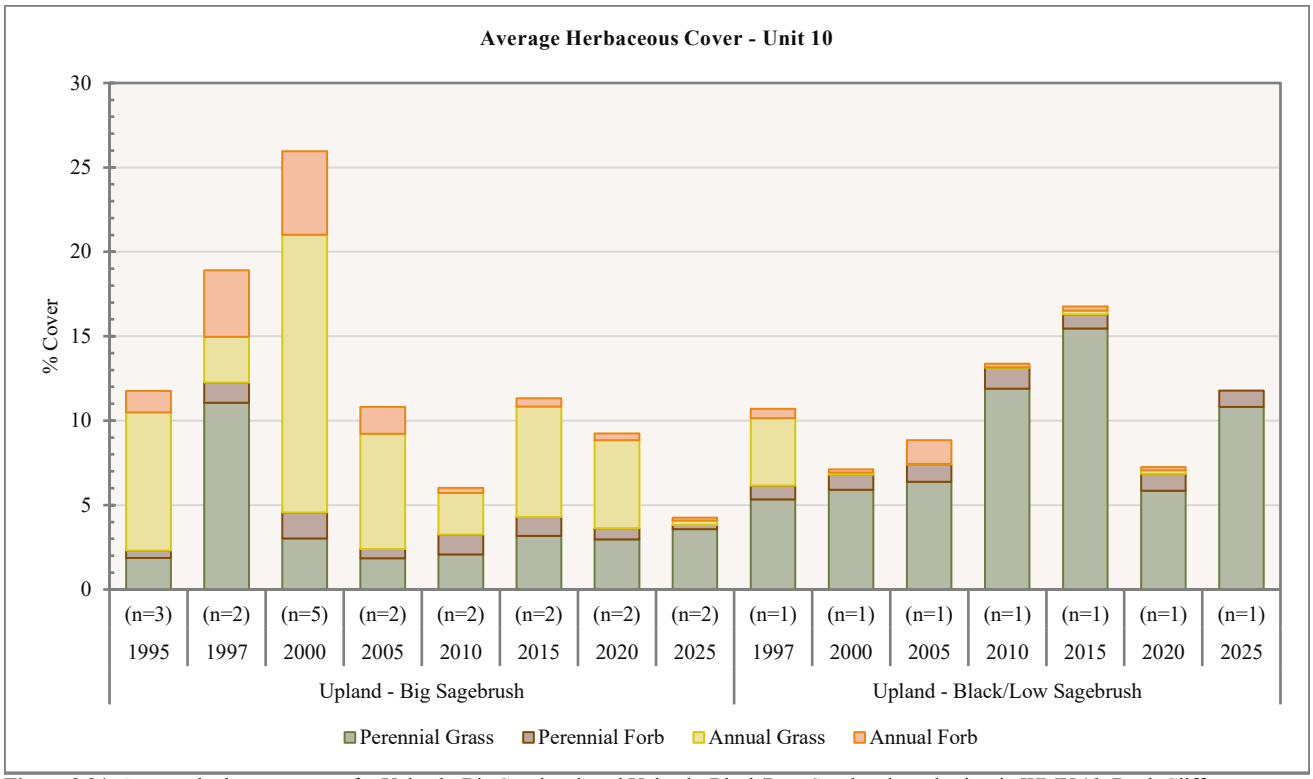


Figure 3.34: Average herbaceous cover for Upland - Big Sagebrush and Upland - Black/Low Sagebrush study sites in WMU 10, Book Cliffs.

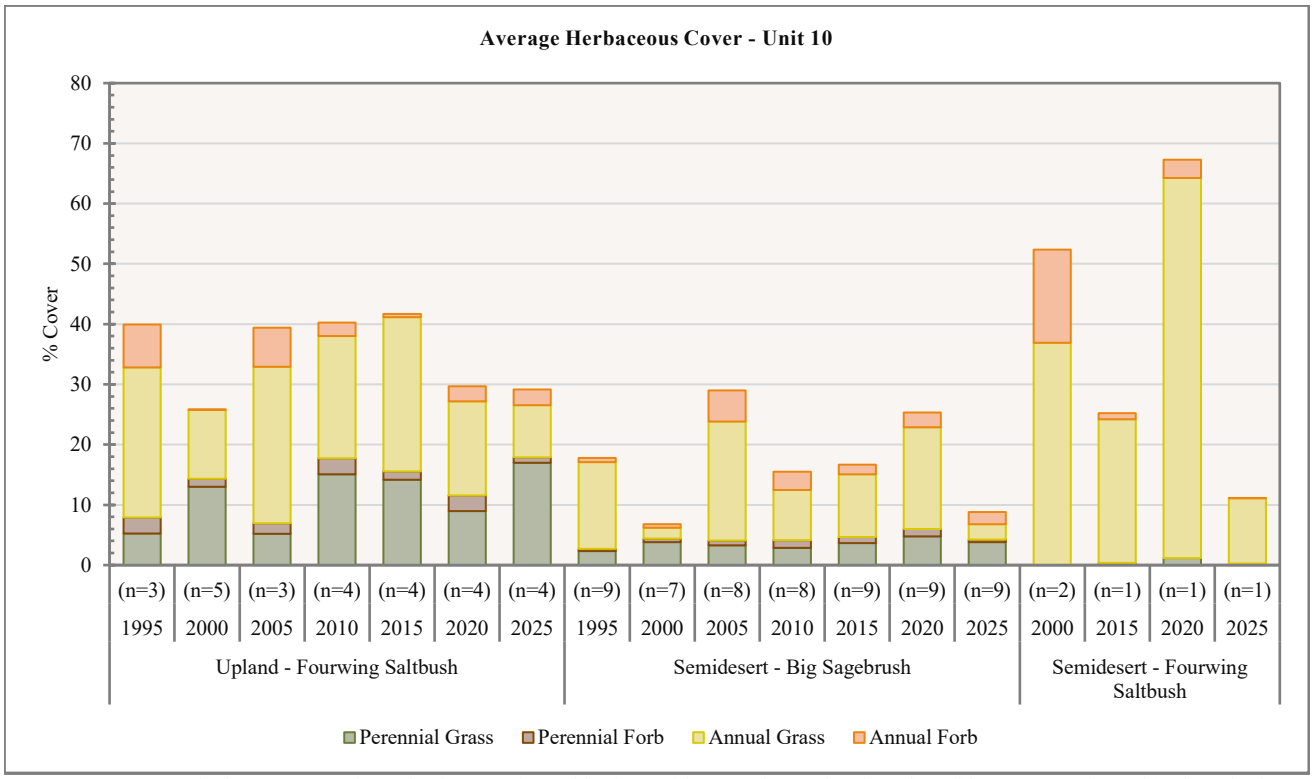


Figure 3.35: Average herbaceous cover for Upland - Fourwing Saltbush, Semidesert - Big Sagebrush, and Semidesert - Fourwing Saltbush study sites in WMU 10, Book Cliffs.

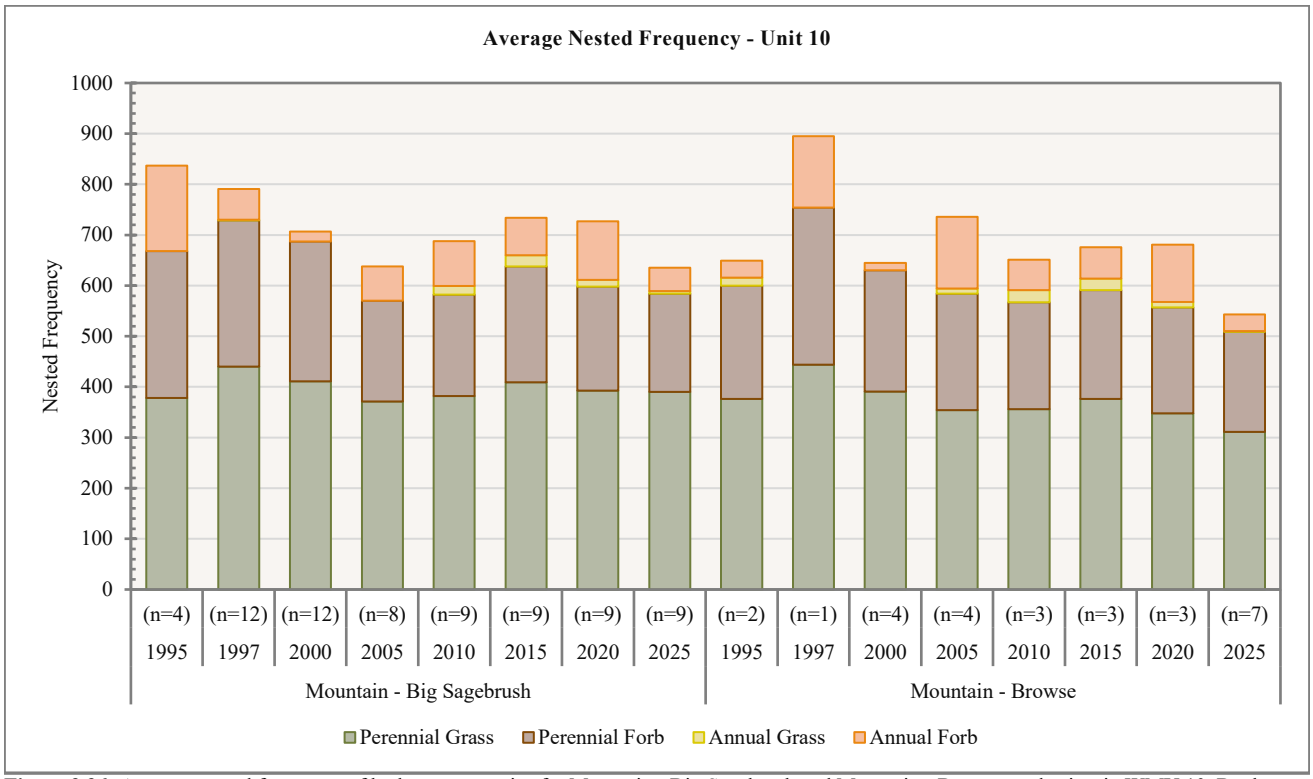


Figure 3.36: Average nested frequency of herbaceous species for Mountain - Big Sagebrush and Mountain - Browse study sites in WMU 10, Book Cliffs.

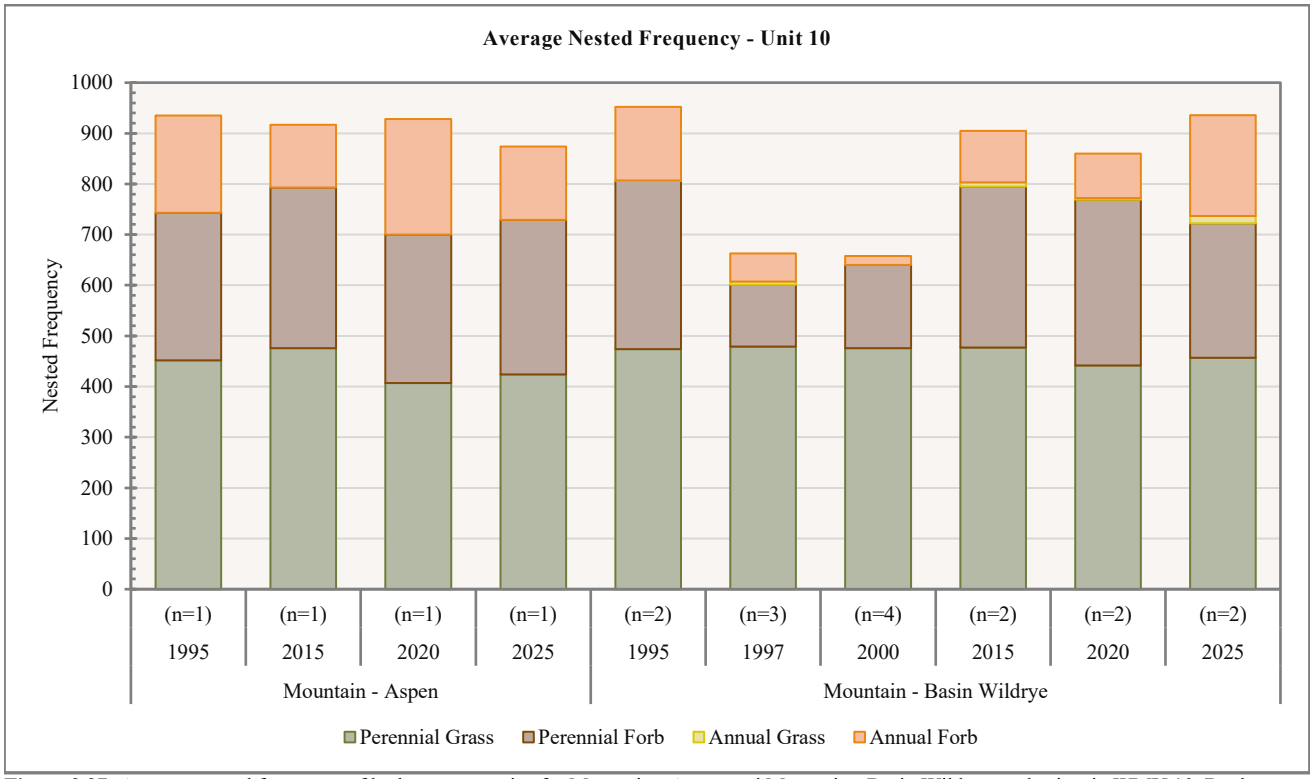


Figure 3.37: Average nested frequency of herbaceous species for Mountain - Aspen and Mountain - Basin Wildrye study sites in WMU 10, Book Cliffs.

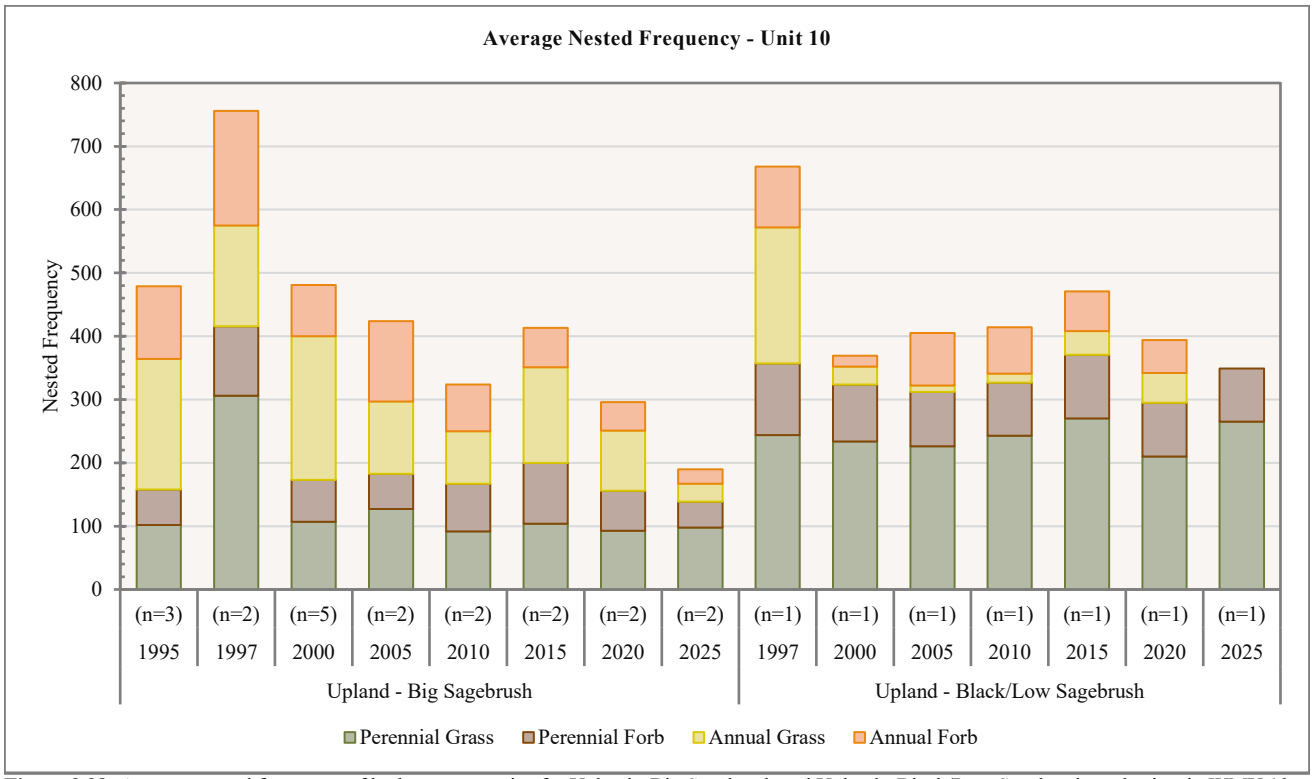


Figure 3.38: Average nested frequency of herbaceous species for Upland - Big Sagebrush and Upland - Black/Low Sagebrush study sites in WMU 10, Book Cliffs.

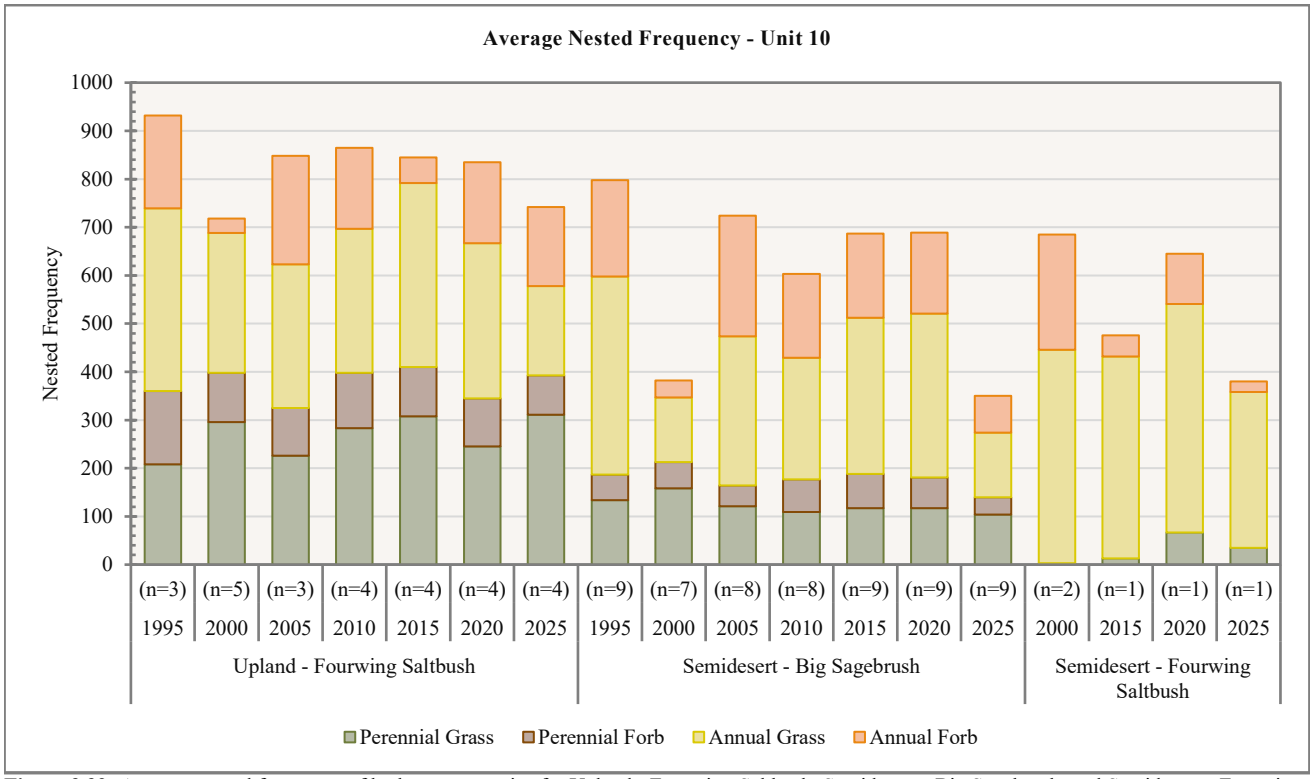


Figure 3.39: Average nested frequency of herbaceous species for Upland - Fourwing Saltbush, Semidesert - Big Sagebrush, and Semidesert - Fourwing Saltbush study sites in WMU 10, Book Cliffs.

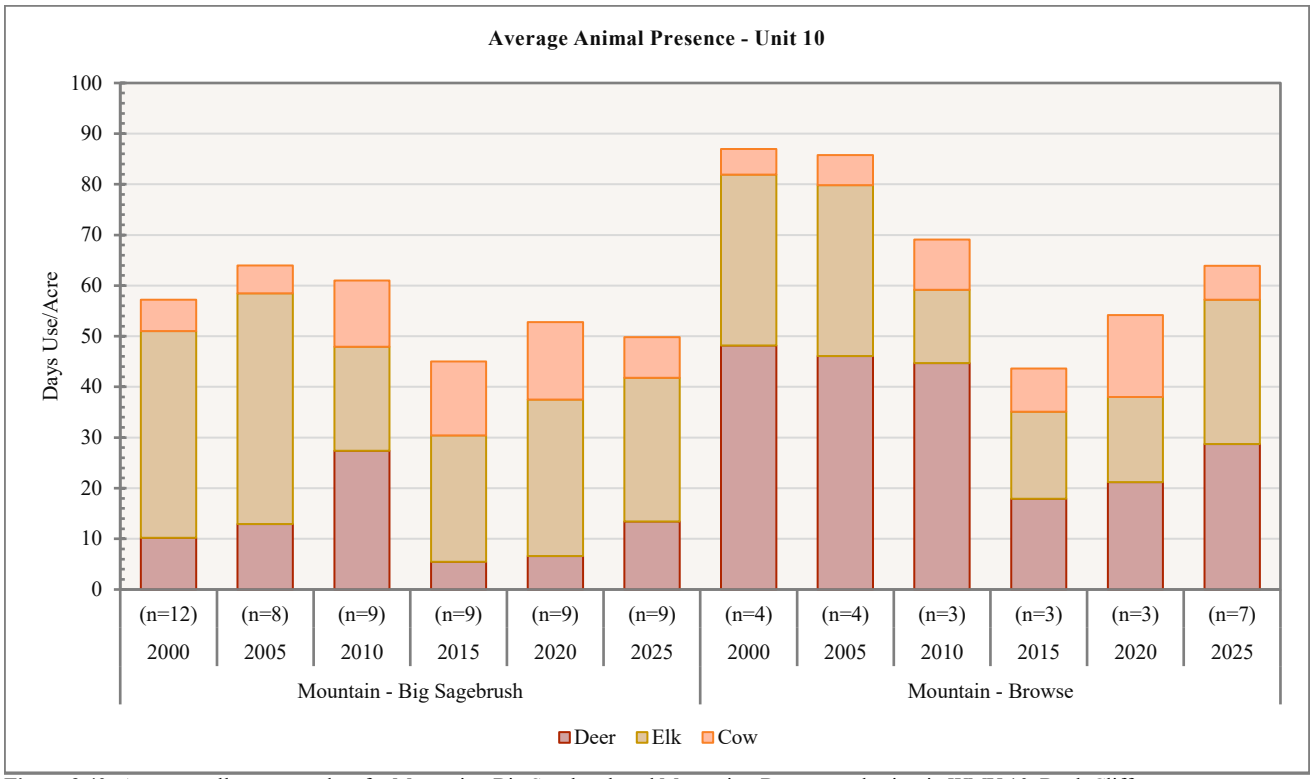


Figure 3.40: Average pellet transect data for Mountain - Big Sagebrush and Mountain - Browse study sites in WMU 10, Book Cliffs.

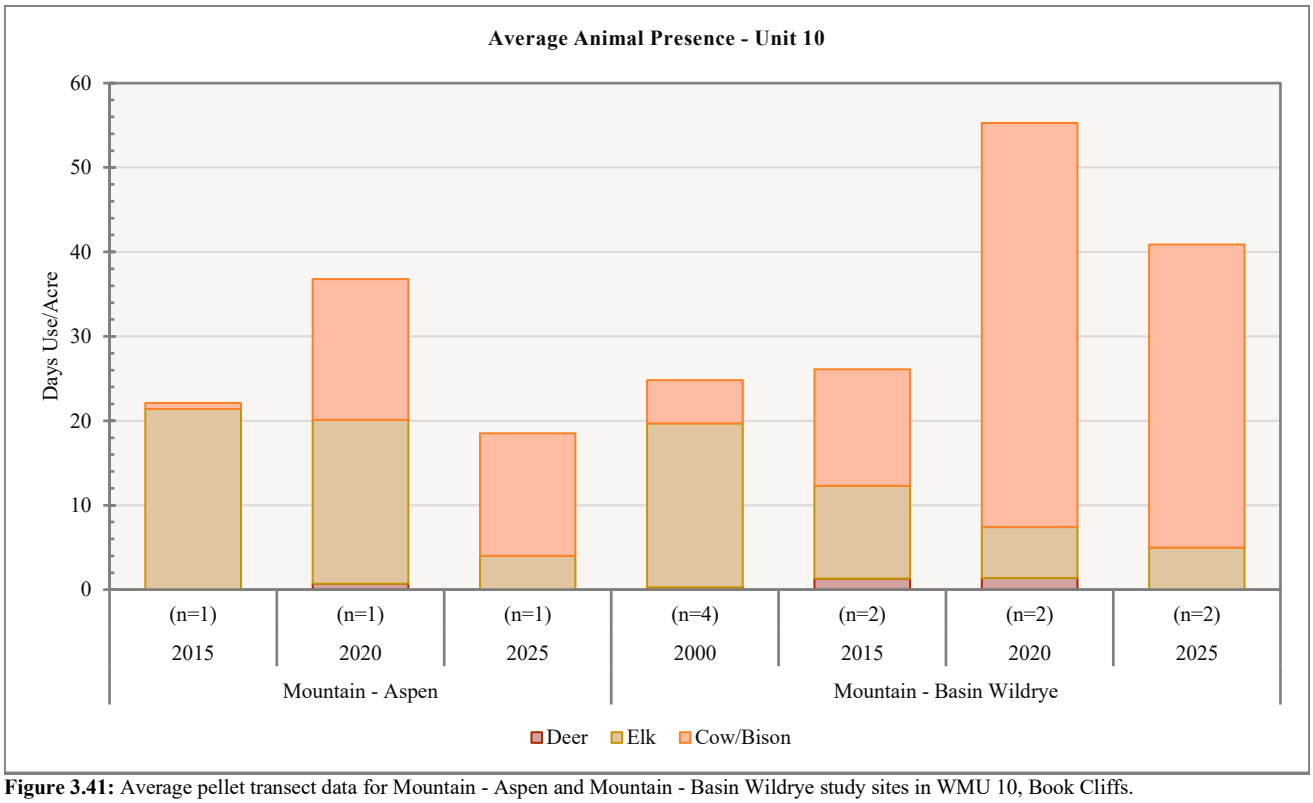


Figure 3.41: Average pellet transect data for Mountain - Aspen and Mountain - Basin Wildrye study sites in WMU 10, Book Cliffs.

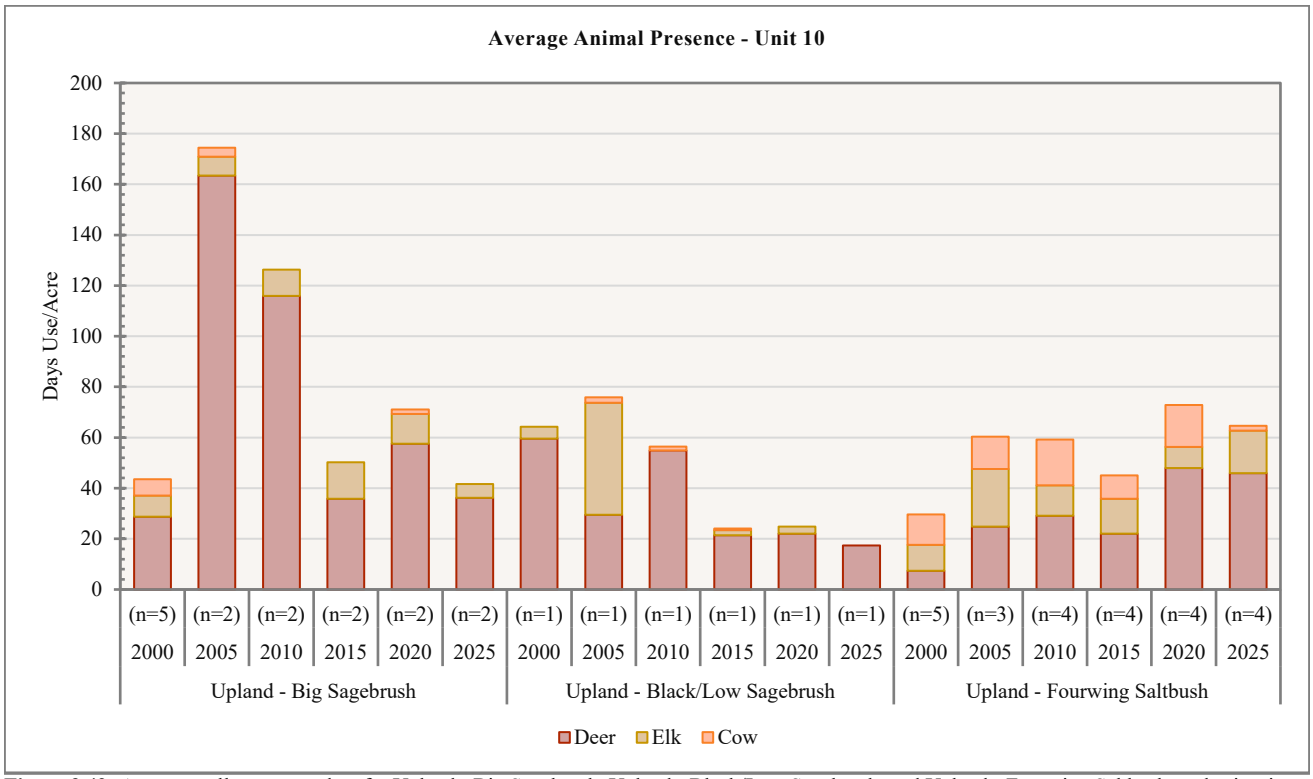


Figure 3.42: Average pellet transect data for Upland - Big Sagebrush, Upland - Black/Low Sagebrush, and Upland - Fourwing Saltbush study sites in WMU 10, Book Cliffs.

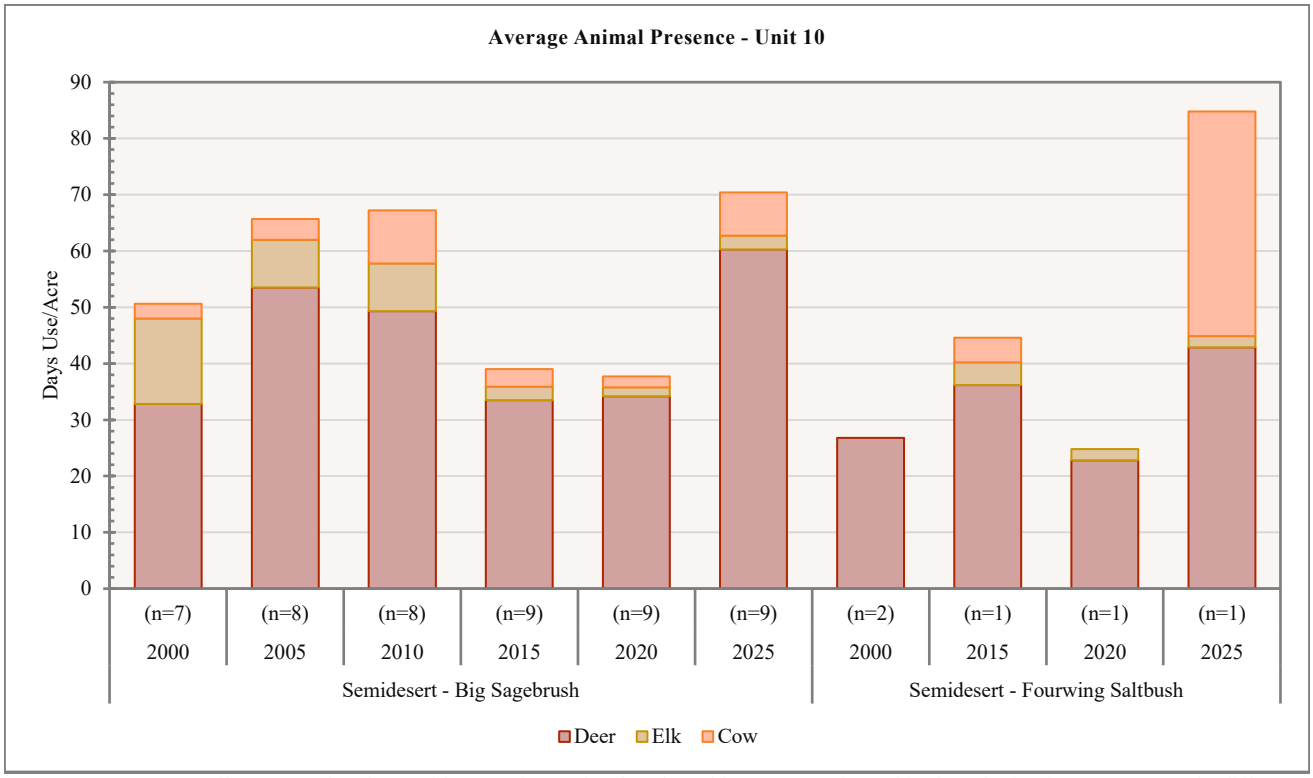


Figure 3.43: Average pellet transect data for Semidesert - Big Sagebrush and Semidesert - Fourwing Saltbush study sites in WMU 10, Book Cliffs.

Deer Winter Range Condition Assessment

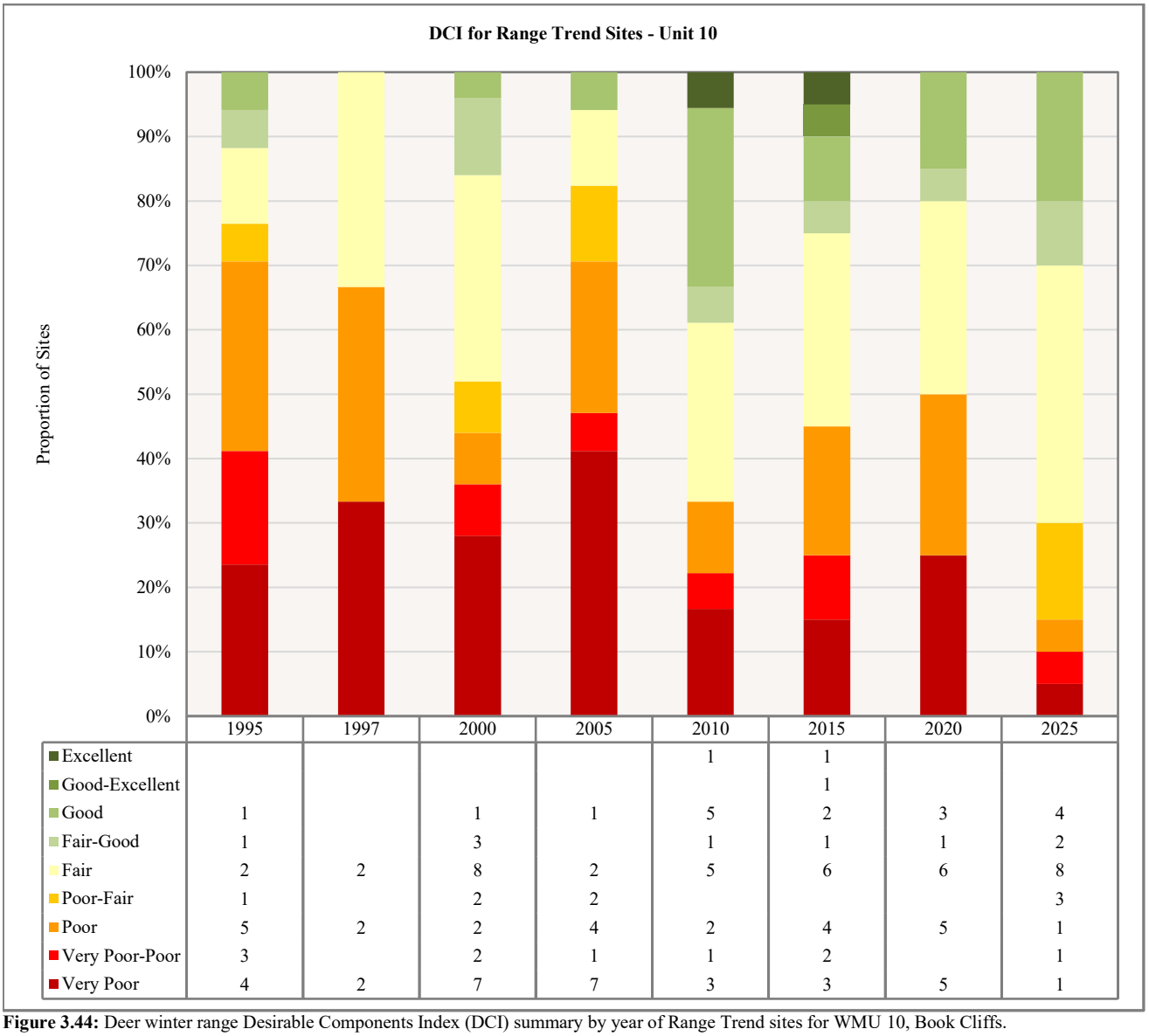
The overall average condition of deer winter and transitional range on the Book Cliffs Management Unit (**Map 3.2**) has slightly improved from poor in 1995 to fair in 2025. McCook Ridge Chaining (10-03), Agency Draw (10-09), East Floy Bench (10-14), East Calf Canyon (10-17), Bryson Draw (10-22) (suspended), Long Canyon (10-27), San Arroyo (10-30), and Winter Ridge Exclosure Out (10R-09) are the main drivers for the unit's wintering habitat suitability and quality, and average between fair and fair-good condition for deer winter range. Indian Ridge (10-01), Moon Ridge Burn (10-13) (suspended), Lower Cottonwood (10-19) (suspended), Upper Cottonwood (10-20) (suspended), East Sulfur Bench (10-21) (suspended), Bryson Draw (10-22) (suspended), Burnt Timber (10R-03) (suspended), Nash Wash #1 (10R-25) (suspended), Nash Wash Burn (10R-27) (suspended), Cottonwood Burn (10R-30) (suspended), Hay Canyon Burn (10R-31) (suspended), and Dry Canyon (10R-58) are/have been considered to have winter range conditions ranging from very poor to poor-fair consistently from year to year: these poor conditions suppress the unit's overall quality of winter habitat. Range Trend sites in unit 10 that tend to have higher winter habitat variability include McCook Ridge Exclosure (10-02), Sunday School (10-10), East Thompson Bench (10-15), West Horse Pasture (10-16), East Horse Pasture (10-18), Two Water WMA (10R-04), Monument Ridge (10R-07), Nash Wash #2 (10R-26), Indian Ridge 2 (10R-28), and Massey Junction (10R-29). 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.

The overall deer winter range assessment in 2025 for WMU 10 is that the unit is in fair condition with most sites ranging between poor-fair and fair condition. In addition, a number of sites range between fair-good and good condition as of 2025; these sites include Agency Draw, Sunday School, East Thompson Bench, Monument Ridge, Winter Ridge Exclosure Out, and Massey Junction. However, three studies (West Horse Pasture, Wolf Den, and Dry Canyon) are considered to be in very poor to poor condition as of the most recent sample year. The West Horse Pasture and Dry Canyon studies would greatly benefit from increased cover in and age class diversification among their preferred browse communities. Increased perennial grass and forb cover on all three studies would also improve winter range conditions. Finally, a reduction in annual grass cover on the West Horse Pasture study in particular would further benefit winter range conditions (**Figure 3.44**, **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 or year-long 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 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 3.44**, **Table 3.7**). Study sites that intersect/have intersected elk winter or year-long habitat include Indian Ridge, McCook Ridge Exclosure, McCook Ridge Chaining, Agency Draw, Sunday School, Wolf Den, Moon Ridge Burn (suspended), Lower Cottonwood (suspended), Upper Cottonwood (suspended), East Sulfur Bench (suspended), Bryson Draw (suspended), Bitter Creek, Long Canyon, San Arroyo, Mexico Point (10-32), Upper Meadow Creek (10R-01) (suspended), Burnt Timber (suspended), Two Water WMA, Monument Ridge, Winter Ridge Exclosure Out, Chipeta Canyon (10R-18) (suspended), Nash Wash Burn (suspended), Indian Ridge 2 (10R-28), Massey Junction, Cottonwood Burn (suspended), Hay Canyon Burn (suspended), and Dry Canyon. Active studies that were in fair or better condition for elk winter/year-long range in 2025 include McCook Ridge Exclosure, McCook Ridge Chaining, Agency Draw, Sunday School, San Arroyo, Mexico

Point, Two Water WMA, Monument Ridge, Winter Ridge Exclosure Out, Indian Ridge 2, and Massey Junction. In contrast, active sites that had habitat conditions ranging between very poor and poor-fair in 2025 include Indian Ridge, Wolf Den, Long Canyon, and Dry Canyon (**Figure 3.44**, **Table 3.7**).



	1995	1997	2000	2005	2010	2015	2020	2025
Excellent					1	1		
Good-Excellent						1		
Good	1		1	1	5	2	3	4
Fair-Good	1		3		1	1	1	2
Fair	2	2	8	2	5	6	6	8
Poor-Fair	1		2	2				3
Poor	5	2	2	4	2	4	5	1
Very Poor-Poor	3		2	1	1	2		1
Very Poor	4	2	7	7	3	3	5	1

Figure 3.44: Deer winter range Desirable Components Index (DCI) summary by year of Range Trend sites for WMU 10, Book Cliffs.

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
10-01	1995	17.8	13.7	15	7.5	-20	1.3	0	**35.3**	**VP-P**
10-01	2000	15	9.9	7	16	-16.4	0.5	0	**32**	**VP**
10-01	2005	12	5.7	6	7.5	-20	1.7	0	**12.9**	**VP**
10-01	2010	16.8	9.1	6.1	9.6	-20	0.9	0	**22.5**	**VP**
10-01	2015	16.6	11.4	5	10.9	-20	2.1	0	**26**	**VP**
10-01	2020	23.5	8.1	2.3	7	-20	4.2	0	**25.1**	**VP**
10-01	2025	25.4	6.5	5.7	26.1	-13.2	1.5	0	**52**	**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
10-02	1995	23.8	12.8	12.9	5.5	-11.8	2.2	0	**45.4**	**P**
10-02	1997	17.8	10.7	6.5	4.6	-4.1	2.8	0	**38.3**	**P**
10-02	2000	27.2	9.2	9.7	15.8	-3.1	5.1	0	**63.9**	**F-G**
10-02	2005	17.7	5.7	2.7	7	-10.2	2.1	0	**25**	**VP**
10-02	2010	19	10	15	8	-3.7	4.2	0	**52.5**	**F**
10-02	2015	22	9.8	14	12.5	-9.8	4.2	0	**52.7**	**F**
10-02	2020	18.6	8.5	9.2	10.7	-7.8	2.6	0	**41.8**	**P**
10-02	2025	22.8	10.8	12.4	13.5	-0.4	1	0	**60.1**	**F**
10-03	1995	15.1	14.4	15	24.3	0	6.4	0	**75.2**	**G**
10-03	2000	15.9	6.9	3.6	28.9	0	2.7	0	**58**	**F**
10-03	2005	10.4	9.6	1.4	24.7	0	1.8	0	**47.9**	**P**
10-03	2007	13.9	10.2	3.6	30	0	1.5	0	**59.2**	**F**
10-03	2009	15.5	0	0	30	0	2.9	0	**48.4**	**P**
10-03	2010	15.4	12.3	8.7	30	0	3.6	0	**70**	**F-G**
10-03	2015	18	12.1	1.6	30	0	6.8	0	**68.5**	**F-G**
10-03	2020	13.5	13.1	8.5	30	0	3.4	0	**68.5**	**F-G**
10-03	2025	15.5	13.7	0.9	30	0	3	0	**63.1**	**F**
10-09	1995	14.2	11.1	13.9	11.9	-8.8	0.8	0	**43.1**	**F-G**
10-09	2000	12.7	6.7	11.7	11.6	-0.6	1	0	**43.1**	**F-G**
10-09	2005	9.5	3.3	5.8	17.6	-1.3	0.5	0	**35.4**	**F**
10-09	2010	10.7	10.4	15	11.2	-2	2.3	0	**47.6**	**G**
10-09	2015	12.6	11.5	15	7.4	-13.6	3.6	0	**36.5**	**F**
10-09	2020	13	12.6	15	11.6	-2.4	1.5	0	**51.3**	**G**
10-09	2025	15.8	11.2	15	3.7	-0.5	1	0	**46.2**	**F-G**
10-10	1995	15	8.7	11.5	3.6	-8	2.6	0	**33.4**	**VP-P**
10-10	2000	23.6	12.4	4.4	25	-0.4	6.4	0	**71.4**	**G**
10-10	2005	15.7	7.5	3.8	19.1	-0.2	3.6	0	**49.5**	**P-F**
10-10	2010	25.7	13.6	15	26.5	-0.6	2	0	**82.2**	**E**
10-10	2015	30	13.7	15	30	-3.5	1.1	0	**86.3**	**E**
10-10	2020	20.6	9.8	8.5	28	-6.6	1.1	0	**61.4**	**F**
10-10	2025	26.9	10.1	10.4	15.6	0	2.3	0	**65.3**	**F-G**
10-12	1995	30	9.7	2.2	0.9	0	0	0	**42.8**	**P**
10-12	2000	30	3.7	3.4	4.2	0	0	0	**41.3**	**P**
10-12	2005	30	1.4	0.5	0.4	0	0.1	0	**32.4**	**VP**
10-12	2010	30	8.8	15	0.3	0	0.5	0	**54.6**	**F**
10-12	2015	30	11.6	15	0.3	0	0.3	0	**57.2**	**F**
10-12	2020	30	6.6	15	1.2	0	0.1	0	**52.9**	**F**
10-12	2025	30	9.1	7.6	0.8	0	0	0	**47.5**	**P**
10-13*	1995	1.6	0	0	9.4	0	1.2	-2	**10.2**	**VP-P**
10-13*	1997	1.6	0	0	21.4	-0.3	0.2	-2	**20.9**	**P**
10-13*	2000	1.1	0	0	23.5	-0.7	0	0	**23.9**	**P-F**
10-14	1995	6.5	14.6	10.2	10.3	-5.2	0	0	**36.4**	**F**
10-14	2000	7.2	8.1	7.1	10.2	-0.8	0	0	**31.8**	**F**
10-14	2005	9.5	8.6	5.8	6.6	-6.7	0.3	0	**24.1**	**P-F**
10-14	2010	9.8	11.3	8.1	6.3	-2.1	0.9	0	**34.3**	**F**
10-14	2015	11.9	8.1	1.4	15.9	-3.2	1.1	0	**35.2**	**F**
10-14	2020	9.4	10.3	4.3	9.2	-4.3	0.7	0	**29.6**	**F**
10-14	2025	11.1	10.1	0	9.6	-0.9	0.7	0	**30.6**	**F**
10-15	1995	6.5	2.5	3.6	4.5	-1.4	1	0	**16.7**	**P**
10-15	2000	7.5	1.5	15	6.1	-0.1	0.6	0	**30.6**	**F**
10-15	2005	9.1	-7.8	1.1	9.2	-0.6	2.3	0	**13.3**	**P**
10-15	2010	1.8	0	0	6.4	-0.1	1.6	0	**9.7**	**VP-P**
10-15	2015	2	0	0	10.6	-0.9	8.3	0	**20**	**P**
10-15	2020	5.6	0	0	29.3	-1.2	4.9	0	**38.6**	**F**
10-15	2025	7.8	10.8	3.4	28.7	-1.8	2	0	**50.9**	**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
10-16	1995	15.3	7	1.1	3.7	-9	1.2	0	**19.3**	**P**
10-16	2000	18.8	7.3	0.3	11.5	-1.1	3.8	0	**40.6**	**F**
10-16	2005	9.6	0.1	0.7	4.3	-20	3.5	0	**-1.8**	**VP**
10-16	2010	5.9	0	0	4.1	-14	8.5	0	**4.5**	**VP**
10-16	2015	1.6	0	0	14.3	-8.9	2.9	0	**9.9**	**VP-P**
10-16	2020	3.7	0	0	15.4	-20	4.5	0	**3.6**	**VP**
10-16	2025	4.7	0	0	7.1	-7.1	1.3	0	**6**	**VP**
10-17	1995	21.8	9.8	10.2	1.3	-12.6	1.4	0	**31.9**	**F**
10-17	2000	24.7	7.3	11.7	0.8	-0.8	0.8	0	**44.5**	**F-G**
10-17	2005	28.8	5.7	15	1.8	-1.4	3.5	0	**53.4**	**G**
10-17	2010	26.4	9.8	15	3.5	-0.5	2.3	0	**56.5**	**G**
10-17	2015	23.1	9.6	15	2.4	-3.1	0.3	0	**47.3**	**G**
10-17	2020	22.5	9.8	14.4	3.4	-13.7	1.4	0	**37.8**	**F**
10-17	2025	16	2.6	8.6	1.9	-0.4	0.3	0	**29**	**F**
10-18	1995	10.6	9.6	0	3.2	-20	1.5	0	**4.9**	**VP**
10-18	2000	14.5	7.4	0.7	8.6	-5.2	1.9	0	**27.9**	**F**
10-18	2005	14.9	3.4	4.1	5.7	-20	1.4	0	**9.5**	**VP-P**
10-18	2010	17.8	7	0.5	5.9	-20	2.6	0	**13.8**	**P**
10-18	2015	12.8	3	0	7.3	-16.8	1.3	0	**7.6**	**VP**
10-18	2020	9.9	2.2	1.4	3.9	-20	0.4	0	**-2.2**	**VP**
10-18	2025	7	12.7	1.6	10	-0.6	0.6	0	**31.3**	**F**
10-19*	1995	3.2	0	0	4.1	-14.7	0.1	0	**-7.3**	**VP**
10-20*	1995	2.5	0	0	6.6	-20	0.3	0	**-10.6**	**VP**
10-20*	2000	2.2	0	0	12	-4.2	0.7	0	**10.7**	**VP-P**
10-21*	1995	11.2	10.6	6.3	0.5	-11.4	0.3	0	**17.5**	**P**
10-22*	1995	13.6	12.2	9.8	2.9	-13.5	0.2	0	**25.2**	**P-F**
10-26	2000	24.8	-1.8	0	4.3	-0.8	0.4	0	**26.9**	**P-F**
10-26	2005	16.6	-7.4	0.3	4.5	-20	0.2	0	**-5.8**	**VP**
10-26	2010	30	4.1	0.6	6.4	-6.4	0.3	0	**35**	**F**
10-26	2015	23.9	7.5	1.5	5.9	-19.4	0.3	0	**19.7**	**P**
10-26	2020	24.3	2.6	1.3	6.9	-19.2	0.2	0	**16.1**	**P**
10-27	2005	29.9	6.1	2.8	2.5	-20	1	0	**22.3**	**P**
10-27	2010	30	11.3	12.4	2.1	-4.5	2	0	**53.3**	**G**
10-27	2015	30	6.7	1.3	1.6	-4.2	0.7	0	**36.1**	**F**
10-27	2020	30	-1.1	1.7	4.7	-4.5	2.3	0	**33.1**	**F**
10-27	2025	21.4	1.9	0.7	1.6	-1.2	0.9	0	**25.3**	**P-F**
10-30	2025	29.1	4.6	0.3	0.2	-3.9	0	0	**30.3**	**F**
10R-03*	1997	0	0	0	0	-20	0	0	**-20**	**VP**
10R-03*	2000	0	0	0	0.5	-17.7	0	0	**-17.2**	**VP**
10R-04	1997	28.5	13.4	10.6	10.7	-3	1.6	0	**61.8**	**F**
10R-04	2000	29.7	11.3	6.4	11.8	-0.1	1.8	0	**60.9**	**F**
10R-04	2005	30	8.7	2.7	12.8	0	2.1	0	**56.3**	**F**
10R-04	2010	30	12.8	3.5	23.8	0	2.5	0	**72.6**	**G**
10R-04	2015	30	12.6	4.5	30	-0.2	1.7	0	**78.6**	**G-E**
10R-04	2020	19.8	1.6	7.2	11.7	-0.2	2	0	**42.1**	**P**
10R-04	2025	19.9	9	2.3	21.6	0	1.9	0	**54.7**	**F**
10R-07	1997	0.4	0	0	25.4	0	8.4	0	**34.2**	**VP**
10R-07	2000	0.1	0	0	30	0	10	0	**40.1**	**VP-P**
10R-07	2005	0.5	0	0	30	0	4.7	0	**35.2**	**VP**
10R-07	2010	0.9	0	0	30	0	4.7	0	**35.6**	**VP**
10R-07	2015	2.5	0	0	30	0	8.7	0	**41.2**	**VP-P**
10R-07	2020	3.9	0	0	30	0	9.1	0	**43**	**P**
10R-07	2025	6.9	14.3	15	30	0	7.7	0	**73.9**	**G**
10R-09	1997	16.3	7.9	1.7	21.7	0	9.9	0	**57.5**	**F**
10R-09	2000	19.6	-0.3	4.2	30	0	10	0	**63.5**	**F**
10R-09	2005	11.8	2.6	1.3	30	0	7.2	0	**52.9**	**P**
10R-09	2010	12.1	4.9	12.1	28.6	0	8.6	0	**66.3**	**F**
10R-09	2015	13.9	10.2	8.1	30	0	10	0	**72.2**	**G**
10R-09	2020	18.1	8.5	15	30	0	10	0	**81.6**	**G**
10R-09	2025	20.4	10.9	12.5	20.8	0	7.8	0	**72.4**	**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
10R-10	1997	17.8	6.4	2.8	29.5	0	9.1	0	**65.6**	**F**
10R-10	2000	20	8.7	5.3	30	0	4.3	0	**68.3**	**F-G**
10R-10	2005	19.9	4.3	1.9	30	0	6.3	0	**62.4**	**F**
10R-10	2015	19.8	11.6	3	30	0	10	0	**74.4**	**G**
10R-10	2020	21.3	9.3	5.6	30	0	10	0	**76.2**	**G**
10R-10	2025	26.4	11.3	5.1	17	0	10	0	**69.8**	**F-G**
10R-11	1997	24.3	7.8	2.9	30	0	7.5	0	**72.5**	**G**
10R-11	2000	25	-0.4	3.1	30	0	8.2	0	**65.9**	**F**
10R-11	2005	25.8	3.9	1.1	30	0	7	0	**67.8**	**F**
10R-11	2015	29.6	0.4	4.9	30	0	10	0	**74.9**	**G**
10R-11	2020	23.9	-1.8	2.9	30	0	10	0	**65**	**F**
10R-11	2025	18.5	4	2.8	30	0	7.9	0	**63.2**	**F**
10R-13	1997	27.7	10	11.1	4.8	-4.3	1.3	0	**50.6**	**P-F**
10R-13	2000	30	5.1	5.1	15.5	-3.6	1.5	0	**53.6**	**F**
10R-13	2005	20	2.9	2.2	9.6	-7.6	0.9	0	**28**	**VP**
10R-13	2010	18.5	11.2	13.7	2.5	-13.4	2	0	**34.5**	**VP-P**
10R-13	2020	21	5.9	5.3	3.5	-12.9	1.8	0	**24.6**	**VP**
10R-13	2025	27.6	10	13.4	7.3	-4.5	0.2	0	**54**	**F**
10R-14	1997	29.8	10.1	6.2	1.1	-20	0.6	0	**27.8**	**VP**
10R-14	2000	30	5.8	4.2	2.3	-1.6	0.7	0	**41.4**	**P**
10R-14	2005	14.5	5.5	2.8	1	-17.7	0.2	0	**6.3**	**VP**
10R-14	2010	26.6	12.1	11.2	9.4	-20	1.9	0	**41.2**	**P**
10R-14	2020	20	2.2	4	29.1	-15	3.5	0	**43.8**	**P**
10R-14	2025	27.6	9.8	4.9	30	-11.4	0.4	0	**61.3**	**F**
10R-25*	1998	0	0	0	0	-20	0	0	**-20**	**VP**
10R-26	2000	4.7	0	0	0.1	-20	0	0	**-15.2**	**VP**
10R-26	2015	28.5	14	13.2	0.7	-17.9	0	0	**38.5**	**F**
10R-26	2020	11	3.3	4.1	2.3	-20	0	0	**0.7**	**VP**
10R-26	2025	13.1	13	7.7	0.5	-8.1	0	0	**26.2**	**P-F**
10R-27*	1999	1.6	0	0	3.1	-0.5	7.8	0	**12**	**VP**
10R-28	2000	11.9	13.9	10.9	21.5	-18.4	1.2	0	41	P
10R-28	2010	29.1	14.4	10.6	30	-18.8	7.8	0	73.1	G
10R-28	2015	9.5	11.9	11.7	30	-20	1.5	0	44.6	P
10R-28	2020	8.6	6.1	10.5	23.9	-14	2.9	0	38	P
10R-28	2025	15.2	7.3	8.8	30	-1.9	1.3	0	60.7	F
10R-29	1999	18.1	11	3.1	30	-5.4	2	0	**58.8**	**F**
10R-29	2005	10.1	8	3.9	4.7	-20	5.2	0	**11.9**	**VP**
10R-29	2010	10.7	12	9	9.7	-8.1	10	0	**43.3**	**P**
10R-29	2015	13.9	9.2	10.7	24.3	-17	6.5	0	**47.6**	**P**
10R-29	2020	25.4	14	15	12.9	-2.7	10	0	**74.6**	**G**
10R-29	2025	30	11.8	7.1	30	-10.9	2	0	**70**	**G**
10R-30*	1999	22.9	10.3	0	4	-20	0	0	**17.2**	**VP**
10R-31*	1999	0	0	0	4.8	-6.6	0.4	0	**-1.4**	**VP**
10R-31*	2001	3.9	0	0	3.3	-20	2.5	0	**-10.3**	**VP**
10R-58	2015	4.9	0	0	0	-0.2	0.2	0	**4.9**	**VP**
10R-58	2020	2.9	0	0	1.6	-4.2	5.9	0	**6.2**	**VP**
10R-58	2025	4	0	0	5.9	-0.7	0.6	0	**9.8**	**VP-P**

Table 3.7: Deer winter range Desirable Components Index (DCI) information by site number of Range Trend studies for WMU 10, Book Cliffs. 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
10-01	Indian Ridge	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
10-02	McCook Ridge Exclosure	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
10-03	McCook Ridge Chaining	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
10-04	Wirefence Point	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
10-05	Willow Flat	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
10-06	Little Jim Canyon	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
10-07	Cherry Mesa	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
10-08	Black Horse	Animal Use – Big Game	High	Reduced shrub vigor/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
		Drought		Lowered resilience and resistance to disturbance
10-09	Agency Draw	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
10-10	Sunday School	Animal Use – Horse	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
10-12	Wolf Den	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
10-14	East Floy Bench	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
		Drought		Lowered resilience and resistance to disturbance
10-15	East Thompson Bench	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
10-16	West Horse Pasture	Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		Energy Development	High	Fragmentation and degradation/loss of habitat
		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
10-17	East Calf Canyon	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
		Drought		Lowered resilience and resistance to disturbance
10-18	East Horse Pasture	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
		Drought		Lowered resilience and resistance to disturbance
10-23	Bogart-She	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Animal Use – Bison	Medium	Reduced diversity of desirable grass and forb species
		Drought		Lowered resilience and resistance to disturbance
10-24	Turner Canyon	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species
10-25	Little Ridge	Animal Use – Bison	Medium	Reduced diversity of desirable grass and forb species
		Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
		Drought		Lowered resilience and resistance to disturbance
10-26	Bitter Creek	Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		Energy Development	High	Fragmentation and degradation/loss of habitat
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor

Study #	Study Name	Limiting Factor and/or Threat	Level of Impact	Potential Impact
10-27	Long Canyon	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
		Drought		Lowered resilience and resistance to disturbance
10-30	San Arroyo	Annual Grass	Medium	Increased fire potential and reduced herbaceous diversity
		Drought		Lowered resilience and resistance to disturbance
10-31	Tom Patterson Ridge	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
		Drought		Lowered resilience and resistance to disturbance
10-32	Mexico Point	Drought		Lowered resilience and resistance to disturbance
10-33	Rock Spring	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
		Drought		Lowered resilience and resistance to disturbance
10-34	Snowshoe Ridge	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
		Drought		Lowered resilience and resistance to disturbance
10R-04	Two Water WMA	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
10R-05	Lower Tom Patterson Point	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
10R-07	Monument Ridge	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
10R-09	Winter Ridge Exclosure Out	Animal Use – Horse	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
10R-10	Winter Ridge Livestock Exclosure	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
		Drought		Lowered resilience and resistance to disturbance
10R-11	Winter Ridge Total Exclosure	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
		Drought		Lowered resilience and resistance to disturbance
10R-13	McCook Ridge Livestock Exclosure	Annual Grass	Medium	Increased fire potential and reduced herbaceous diversity
		Drought		Lowered resilience and resistance to disturbance
10R-14	McCook Ridge Total Exclosure	Annual Grass	High	Increased fire potential and reduced herbaceous diversity
10R-15	Saddle Horse	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
10R-17	Railroad Canyon	Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
10R-22	Rathole Ridge	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
10R-26	Nash Wash #2	Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		Annual Grass	High	Increased fire potential and reduced herbaceous diversity
10R-28	Indian Ridge 2	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		Drought		Lowered resilience and resistance to disturbance
10R-29	Massey Junction	Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		Animal Use – Big Game	Low	Reduced shrub vigor/diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
10R-32	PR Spring Total Exclosure	Noxious Weeds	Low	Reduced diversity of desirable grass and forb species
		Drought		Lowered resilience and resistance to disturbance
10R-33	PR Spring Livestock Exclosure	Animal Use – Big Game	High	Reduced shrub vigor/diversity of desirable grass and forb species
		Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species
		Noxious Weeds	Low	Reduced diversity of desirable grass and forb species
		Drought		Lowered resilience and resistance to disturbance
10R-34	PR Spring Exclosure Outside	Animal Use – Big Game	High	Reduced shrub vigor/diversity of desirable grass and forb species
		Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
		Drought		Lowered resilience and resistance to disturbance
10R-36	Indian Springs Bullhog	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

Study #	Study Name	Limiting Factor and/or Threat	Level of Impact	Potential Impact
10R-39	Indian Springs Bullhog 2	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
10R-40	Indian Springs Bullhog 3	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
10R-41	Winter Ridge Bullhog	PJ Encroachment	Medium	Reduced understory shrub and herbaceous vigor
10R-42	Winter Ridge Bullhog 2	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
10R-43	McCook Ridge Plateau Exclosure North	Annual Grass	Medium	Increased fire potential and reduced herbaceous diversity
		Drought		Lowered resilience and resistance to disturbance
10R-44	McCook Ridge Plateau Exclosure South	Annual Grass	Medium	Increased fire potential and reduced herbaceous diversity
		Drought		Lowered resilience and resistance to disturbance
10R-45	McCook Ridge Plateau Exclosure Outside	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		Drought		Lowered resilience and resistance to disturbance
10R-46	Seep Ridge Chaining	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
10R-49	Long Canyon Bench 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
		Drought		Lowered resilience and resistance to disturbance
10R-50	Bitter Creek	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
		Drought		Lowered resilience and resistance to disturbance
10R-51	Archy Bench	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
		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
10R-52	Seep Ridge Bullhog	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
10R-53	Moon Ridge	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
10R-54	Bitter Creek Herbicide	Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		Energy Development	High	Fragmentation and degradation/loss of habitat
		Drought		Lowered resilience and resistance to disturbance
10R-55	South Book Cliffs	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
10R-56	Center Fork	Annual Grass	Medium	Increased fire potential and reduced herbaceous diversity
		Drought		Lowered resilience and resistance to disturbance
10R-57	Rector Ridge	Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
10R-58	Dry Canyon	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
10R-59	Sagers Bench	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
10R-60	Hat Rock	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
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
10R-61	Augusi Ridge	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
10R-63	Bar X Wash - Bitter Creek	Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
10R-66	West Thompson Bench 2	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
10R-67	Bull Canyon 2	Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
10R-68	Winter Ridge	PJ Encroachment	High	Reduced understory shrub and herbaceous vigor
10R-69	Jump Off Point	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
		Drought		Lowered resilience and resistance to disturbance
10R-70	Horse Ridge 3	Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor

Table 3.8: Assessment of the potential limiting factors and/or threats and level of threat to study sites for WMU 10, Book Cliffs. 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 Book Cliffs unit has generally exhibited a net improvement over time; in 2025, winter range averaged as being in fair condition as a whole. Most sites are considered to be between poor-fair and fair condition as of the most recent sample year, including Agency Draw, Sunday School, East Thompson Bench, Monument Ridge, Winter Ridge Exclosure Out, and Massey Junction. However, the West Horse Pasture, Wolf Den, and Dry Canyon studies are considered to be in very poor or poor condition and lower the overall unit average when evaluated together. The main factors contributing to the poor conditions on the West Horse Pasture and Dry Canyon studies are the lack of preferred browse cover and an undiversified age class structure in the browse populations. All three of these studies have depleted herbaceous understories. On a broader scale, many of the study sites in winter range have cheatgrass (*Bromus tectorum*) invading their understories to varying degrees (**Figure 3.44**, **Table 3.7**).

Deer summer range on the Book Cliffs Management Unit is located along the divide that separates the northern and southern Book Cliffs. This high ridge (known as the "Book Cliffs Divide") extends from the Utah-Colorado border to the higher elevation portion of the unit known as the Little Creek Roadless Area. This higher elevation, more productive summer habitat in the Roadless Area is generally in fairly good shape. This area is comprised of open meadows, high mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) stands, aspen groves, and mixed conifer woodlands. Aspen (*Populus tremuloides*) forest health is an important aspect of summer habitat quality for mule deer and other big game species. LANDFIRE BpS models identify two types of aspen habitat in this area: the Aspen Forest and Woodland and Aspen-Mixed Conifer Forest types. A notable portion of both aspen vegetation types is found in the Book Cliffs Roadless Area. Approximately 76% of all aspen community types are found to be moderately departed from their respective reference states. More specifically, approximately 22,501 acres of Aspen Forest and Woodland and 960 acres of Aspen-Mixed Conifer Forest fall within this moderate departure scale (LF2024_VDep_CONUS, 2024).

In contrast, deer summer range is limited along the lower elevations of Book Cliffs Divide. This area is comprised of a mixed mountain browse and mountain big sagebrush habitats with small, isolated aspen and Douglas fir (*Pseudotsuga menziesii*) groves occurring in the mouth of the upper canyons. Twoneedle pinyon (*Pinus edulis*) and juniper (*Juniperus* spp.) are found on the lower ridge tops and canyon hillsides. The aforementioned mountain brush communities are generally comprised of alderleaf mountain mahogany (*Cercocarpus montanus*), Utah serviceberry (*Amelanchier utahensis*), Gambel oak (*Quercus gambelii*), antelope bitterbrush (*Purshia tridentata*), and/or other valuable browse species. This mountain brush habitat supports a diverse wildlife population which utilizes the associated plant community.

This ecosystem in this location appears to be very resilient to browsing and adapted to withstand drought conditions. However, with prolonged drought and high browsing pressures over an extended period, this plant community is starting to show signs of pronounced stress. Drought conditions during the summer of 2025 were readily apparent. For example, herbaceous understory plants lacked vigor and were senescing on sites that were monitored in early June, including the Winter Ridge exclosure complex and Wirefence

Point study sites. These drought conditions continued throughout the summer. By the first of August, much of the mountain browse community appeared to have already started to enter stress-induced dormancy. According to PDSI data, divisions 6 and 7 (which the Book Cliffs unit is a part of) have been in a prolonged drought since the early 2000s with only a few years of above normal precipitation (**Figure 3.1a**, **Figure 3.2a**). This prolonged drought coupled with heavy browsing pressure is starting to diminish the productivity of this plant community: this is particularly pronounced in the area where Seep Ridge Road meets the Divide Road. Mountain mahogany and Utah serviceberry are both very resilient to high utilization pressures, but serviceberry is more sensitive to extended heavy browsing stress. In order to maintain good vigor and growth, the NRCS plant guide for serviceberry recommends keeping utilization at 50% of the current year's growth during an average to above average precipitation year (Noller). Mountain mahogany is more tolerant of browsing with utilization of 60-80% of the current year's growth being appropriate during an average to above average precipitation year (Shepherd, 1971). As serviceberry appears to be more sensitive to both lack of water and heavy utilization on these sites, it can be used (in this case) as an indicator of the overall health within these mountain brush communities. Despite the resilience of this plant, the prolonged drought and sustained heavy browsing are likely to lead to the highly palatable serviceberry plants dying out of the community and being replaced by more drought-tolerant (but less palatable) plant species such as mountain big sagebrush. An example of this is the Black Horse study, where cover of sagebrush increased from 9.5% in 2005 to 17.5% in 2025. Conversely, Utah serviceberry cover decreased from 7.5% to 2.5% over the same time period (Lane, Payne, & Cox, 2026).

Range Trend data on the PR Springs Exclosure complex (the two sites outside of the exclosure) and the Black Horse study show that some preferred browse plants have been consistently highly hedged over time. More specifically, over 75% of alderleaf mountain mahogany and/or Utah serviceberry plants sampled in density strips have been moderately to heavily utilized in many sample years. Furthermore, serviceberry has decreased overall in density and cover since 2002/05 on these three sites, and a noticeable reduction in the vigor and leaf production in the crown of mountain mahogany and serviceberry can be observed through repeat photography. In addition, the foliar differences between inside and outside of the exclosure are readily observable using aerial imagery.

The extent of historic and current utilization within the mountain browse community type as a whole is not fully known, which is partially due to study locations being restricted to the Seep Ridge area of the Book Cliffs Divide. In light of this, an additional four study sites were established in the first part of August 2025: Tom Patterson Ridge, Mexico Point, Rock Spring, and Snowshoe Ridge. Most of the browse species on these sites were obviously drought stressed, exhibiting very poor vigor (with the exception of oak), and were entering early dormancy with browning leaves. Observationally, the heavy browsing pressure appears to be concentrated in the Seep Ridge area and is less pronounced as distance from this area increases to the east or west. Utilization of the newly established study sites was still moderate to high (albeit not to the same degree as that occurring on the PR Springs Exclosure complex and Black Horse). Drought stress was widespread across the Divide.

Current and historic habitat restoration work has been successful in reducing the impact of tree encroachment in this management unit (**Table 3.4**, **Table 3.6**). However, infilling and/or encroachment of twoneedle pinyon (*Pinus edulis*) and juniper (*Juniperus* spp.) is still an ongoing concern. Based on when the sites were last surveyed, pinyon-juniper trees are present on 51 of the 71 Range Trend and WRI sites. More specifically, pinyon-juniper encroachment/infilling is considered to be a low-level threat on 48 of these sites. Trees pose a medium-level threat on two studies (Saddle Horse and Winter Ridge Bullhog); and a high-level threat on only one site (Winter Ridge), which has been treated since it was last sampled (**Table 3.8**). Most of these 51 study sites have had a treatment to address pinyon-juniper encroachment/infilling. Although the threat posed by trees on most studies 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 222,363 acres of mule deer summer range, 44,753 acres of winter range, and 31,590 acres of year-long range in the unit as a whole (**Map 3.8**, **Table 3.1**, **Table 3.2**, **Table 3.3**). These existing woodlands play a role as a source for pinyon-juniper expansion.

Human activities and influences occurring in this unit include those related to energy resource development. There are nearly 450 producing oil and gas wells in the Book Cliffs Management Unit that intersect currently mapped mule deer habitat (Utah Department of Natural Resources; Oil, Gas, and Mining Division, 2026). Approximately 57% of these 450 wells are within the boundaries of mule deer winter range, 34% intersect year-long habitat, and 9% overlap summer range. These wells are located within larger oil and gas fields that overlap mule deer range of varying seasonality (Utah Department of Natural Resources; Oil, Gas, and Mining Division, 2025). Portions of these fields that intersect winter range are comprised of numerous vegetation types according to the LANDFIRE Vegetation Departure model, with many areas being modeled as pinyon-juniper and salt desert vegetation types. However, the model also identifies a substantial portion of these fields in said habitat as the Inter-Mountain Basins Big Sagebrush Shrubland biophysical site. This vegetation type is dominated by big sagebrush, a valuable browse species for wintering mule deer. There may therefore be potential for additional localized loss of habitat and fragmentation if/when further wells and the associated access roads are constructed.

Impacts of existing and hypothetical energy development are not limited to those directly affecting habitat, however; there is still the possibility for vehicle-animal collisions with oil and gas-related traffic. In addition, noise pollution caused by operational activities may have an impact on local wildlife. The actual impact on animals around existing 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). Furthermore, effects of noise on mule deer have been observed specifically in association with natural gas and oil developments. Kleist, et al. (2021) found that mule deer in the Piceance Basin of Colorado were more likely to be present on quieter sites in a producing natural gas field than louder sites. The strongest relationship between occupancy and noise in this study was found in the context of noise from roads servicing the area.

Direct and indirect human impacts in the context of motorized travel are or may be occurring in the Book Cliffs unit. Highway mortality poses an additional threat to wildlife in certain areas as is indicated by Utah Roadkill Reports data. Mule deer pick-up reports in this unit between January 2020 and February 2026 have not been made on a vast majority of the roads in WMU 10. However, one should keep in mind that collisions occurring at high enough speeds to result in animal mortality (and thus those leading to pick-up reports) are likely more common on main roads that receive the most use such as Seep Ridge Road. Mule deer pick-up reports in this unit over said timeframe are almost entirely located along the paved portion of Seep Ridge Road, from the intersection with West Sand Wash Road to the portion of the road that is just parallel to the head of Hideout Canyon (Utah Division of Wildlife Resources, 2026). However, this limiting factor is well-known in this unit (Utah Division of Wildlife Resources, 2025). The issue has been and continues to be addressed as needed; for example, five culverts to facilitate wildlife crossings are located along Seep Ridge Road between the intersection with East Bench Road and the intersection with Indian Ridge Road (Utah Wildlife Migration Initiative, 2026).

Recreation benefits members of the public and provides opportunities for economic and social growth. If not properly managed, however, recreation has the potential to negatively impact both wildlife and habitat. Recreation likely has limited effects in WMU 10 compared to other management units, but isolated and localized impacts could be occurring in specific parts of the unit. For example, off-highway vehicle (OHV) use remains a popular form of recreation throughout the state of Utah; almost 350,000 OHV education courses have been completed since 2023 (Utah Division of Outdoor Recreation, 2026).

Specific examples of off-road trails in the Book Cliffs Management Unit can be found in the southwest portion of the unit in the larger area around Green River (such as in and around Tusher Canyon) and Sego Canyon: these areas overlap mule deer winter and year-long range. The specific trails in this area are mostly located on land administrated by the Bureau of Land Management (BLM), which monitors and manages land and resources within its jurisdiction accordingly. Federal management and education required by state law likely help mitigate many of the negative outcomes that might otherwise result from OHV recreation in this area. However, deleterious effects on wildlife and habitat are always a possibility. Threats from improperly managed and unauthorized OHV use are by nature dynamic in level and location. However, they can include auditory disturbances to wildlife, physical damage to habitat (including many of those identified by the 2025-2035 Wildlife Action Plan), and the introduction of non-native plant species. Single human-wildlife interactions may not greatly affect local wildlife populations. However, continued incidents may have larger impacts that could be exacerbated by other simultaneous stressors (Utah Wildlife Action Plan Core Team, 2025).

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**).

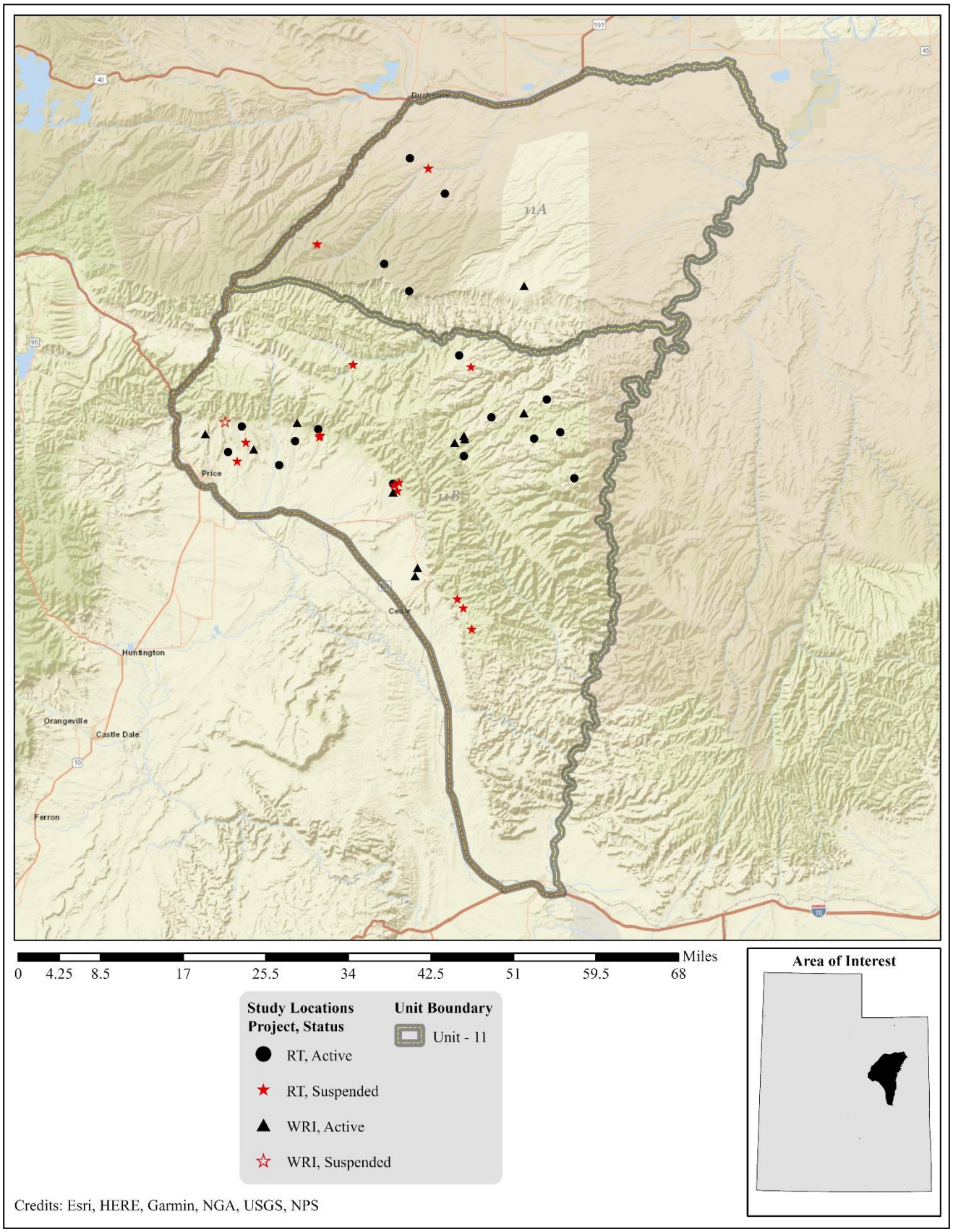
There are some suggestions to consider for maintaining or improving big game habitat within the Book Cliffs Management Unit. Range Trend study sites are surveyed every five years throughout the unit, providing detailed species level data and allowing for changes to be observed over time. However, there are situations where more frequent, generalized monitoring of specific areas or vegetation components by regional personnel is appropriate. This general observational monitoring in years between the Range Trend rotations is strongly recommended for the mountain browse communities on the Divide that receive heavy utilization by big game. As was previously discussed, these plant communities are resilient, but they are beginning to show signs of deterioration precipitated by years of persistent drought in tandem with heavy utilization. Herbaceous communities that would normally be available for summering big game were notably depleted in 2025, a trend that could be persistent should long-term drought continue. It is probable that the browse populations in these communities are more relied upon when the herbaceous biomass providing supplemental summer forage is lacking, further compounding the stress on these communities already induced by drought. If mature alderleaf mountain mahogany and serviceberry plants are lost, recruitment of young would likely be greatly affected by lack of water and browsing pressures (Gucker C. L., 2006; Noller): this could lead to a substantial decrease in the mountain browse species available as a food source. As such, condition of these communities should be vigilantly monitored. Management actions resulting in reduced browsing pressures may be warranted to prevent or mitigate the effects of potential widespread losses of mountain browse species.

Numerous projects targeting tree encroachment have taken place in this unit through the WRI (**Table 3.4**); the Range Trend Program has study sites that monitor or have monitored many of these treatments (**Table 3.6**). However, extant trees remain in many treated and untreated areas. Presence of pinyon and juniper can result in reduced understory shrub and herbaceous health as encroachment advances (Miller, Svejcar, & Rose, 2000). Encroachment/infilling of these trees poses a low-level threat on nearly all Range Trend sites: maintenance projects to remove trees could be appropriate in future years as infilling progresses. The two study sites with a medium-level threat from tree encroachment (Saddle Horse and Winter Ridge Bullhog) (**Table 3.8**) are located along the edges of pinyon-juniper woodlands, which contributes to their woodland succession classifications. However, larger areas of pinyon-juniper are found across the unit, and these locations would likely benefit from additional work focusing on tree removal. 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 grasses – particularly cheatgrass – often behave opportunistically and can increase when resources are released. Although annual grasses pose a low-level threat on many Range Trend and WRI sites where they are

present, many studies have exhibited larger flushes of these grasses in previous sample years. As such, proactive monitoring of annual grass loads is recommended. Based on the threat levels provided above (**Table 3.8**), annual grass treatments (herbicide application, changes in grazing management, etc.) may be advisable on the Indian Ridge, West Horse Pasture, McCook Ridge and McCook Ridge Plateau exclosure complexes, Nash Wash #2, Massey Junction, Bitter Creek Herbicide, Rector Ridge, and Bull Canyon 2 studies. These treatments could also be prudent in other areas throughout the unit if future flushes occur. If reseeding is necessary to restore herbaceous species, care should be taken in species selection and preference should be given to native species whenever feasible.

Publicly owned land administrated by both federal and state agencies comprises a large portion of this management unit. Tribal land also makes up a significant portion of WMU 10, and privately owned parcels are distributed throughout the unit. Given the complexity of ownership boundaries, higher levels of communication and coordination between agencies and individuals in order to implement habitat improvement projects and larger-scale management decisions should be continued. Finally, monitoring of Range Trend studies and areas where rehabilitation projects have occurred should continue in the future. 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.

4. WILDLIFE MANAGEMENT UNIT 11 – NINE MILE



WILDLIFE MANAGEMENT UNIT 11 – NINE MILE

Boundary Description

Carbon, Duchesne, Emery, and Uintah Counties - Boundary begins at US-40 and US-191 in Duchesne; southwest on US-191 to US-6; southeast on US-6 to I-70; east on I-70 to Exit 164 and SR-19 near the town of Green River; north and west on SR-19 to Hastings Road; north on this road to the Swasey boat ramp and the Green River; north along this river to the Duchesne River; west along this river to US-40 at Myton; west on US-40 to US-191 in Duchesne.

Management Unit Description

Geography

The Nine Mile management unit is comprised of two subunits: Nine Mile, Anthro (11A) and Nine Mile, Range Creek (11B). The Nine Mile, Anthro subunit is located south of Duchesne and Highway 40, extending south into the Anthro Mountains. Elevation ranges from about 4,600 feet at the Green River to approximately 9,400 feet along Upper Cottonwood Ridge. This area falls within the Uinta Basin Watershed and major drainages include Sowers, Argyle, and Nine Mile Creeks, Big Wash, and Petes Wash. This management unit includes Nine Mile Canyon, which contains numerous petroglyphs, and a portion of Ashley National Forest. The city of Duchesne is partially located within this subunit and Ouray is just outside of the northeastern boundary.

The Nine Mile, Range Creek subunit contains the eastern portion of Carbon County, the northeastern part of Emery County, and a small piece of southern Duchesne County. This triangular unit encompasses the West Tavaputs Plateau, bounded by the Book Cliffs and Soldier Canyon on the west, the Price River-Duchesne River drainage divide on the north, and the Green River to the east. Topography is steep and rough. The major drainages are Nine Mile Creek, which drains Minnie Maude, Dry, Argyle, Cow, and Harmon Canyons into the Green River; Range Creek which drains the southeast side; and Pace, Whitmore, and Horse Canyons that drain to the west. Elevation ranges from 4,041 feet at Green River to 10,143 feet on Bruin Point. Communities within the unit include Helper, Price, Wellington, Sunnyside, East Carbon, and Green River.

Climate Data

The 30-year (1991-2020) annual precipitation PRISM model shows precipitation on this unit ranges from 6 inches near Green River at the southernmost portion of the combined unit to 26 inches at Bruin Point and the headwaters of Whitmore Canyon. All of the active Range Trend and WRI monitoring studies in this unit occur within 10-25 inches of precipitation (**Map 4.1**) (PRISM Climate Group, Oregon State University, 2021).

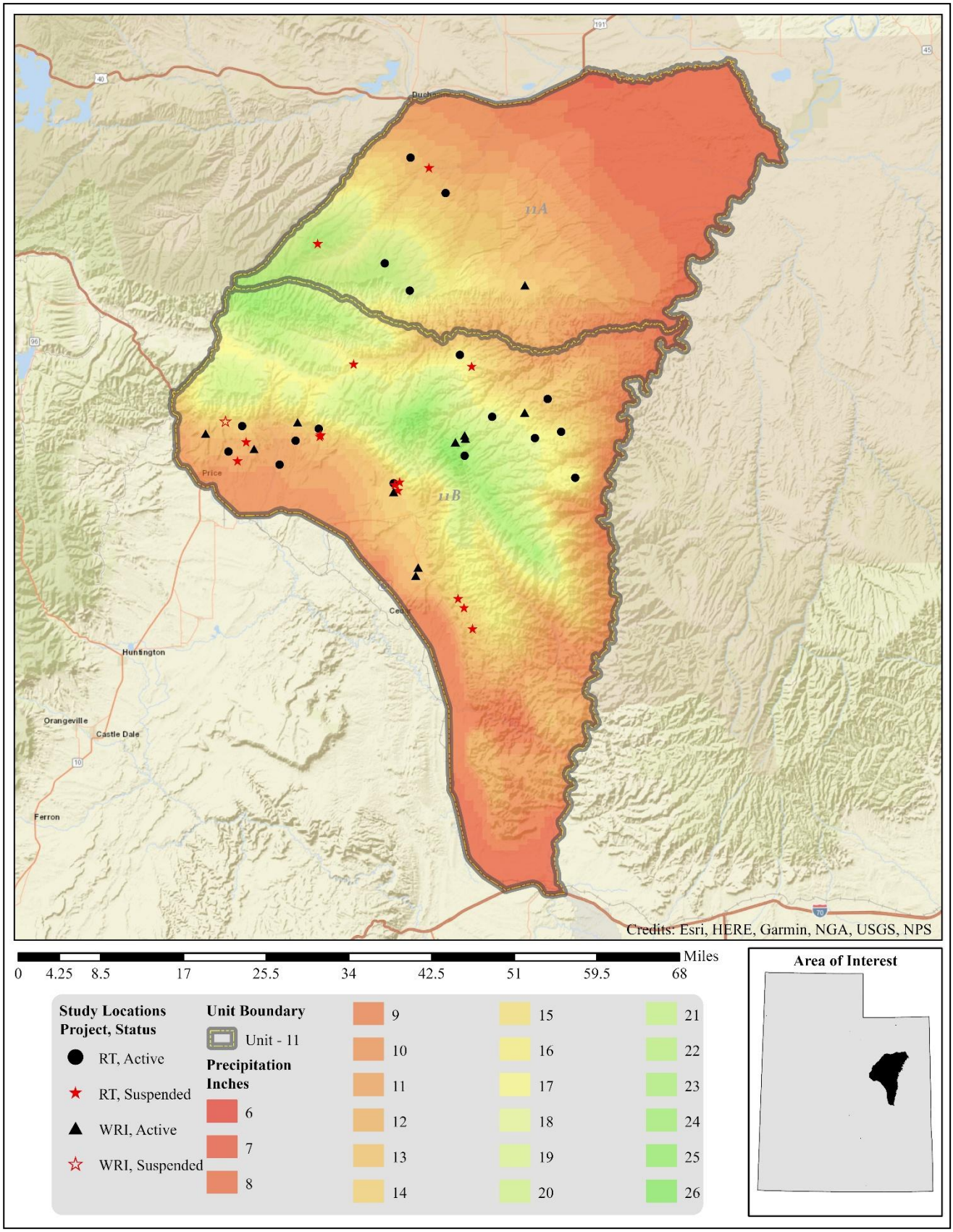
Vegetation trends are dependent upon annual and seasonal precipitation patterns. Palmer Drought Severity Index (PDSI) data for the unit was compiled from the National Oceanic and Atmospheric Administration (NOAA) Physical Sciences Division (PSD) as part of the Northern Mountains division (Division 5), Uinta Basin division (Division 6) and Southeast division (Division 7).

The mean annual PDSI of the Northern Mountains division, which the North Slope unit is part of, has experienced some form of drought or dry spell in most years since 1995. Moreover, this climate division has been considered to be in some form of drought for nearly 42% of the time since 1995. Of the drought years, 77% are considered to be either moderate or extreme droughts. Also remarkable about this climate division is that a moderately wet year has not been experienced since 2011, and the last 14 years of drought or dry conditions have been interrupted by two single wet year events. The most notable wet year occurred in 1998 and was a part of a series of wet year events that occurred between 1995 to 1999 (**Figure 4.1a**). 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 (**Table 4.1b**). The years that follow this pattern of consecutive wet fall and spring occur in 1995/96, 1996/97, 1997/98, 1998/99, 2004/05, 2005/06, and 2010/11. Range Trend sample years occur on a five-year rotation, so the PDSI years of interest should be examined by the corresponding rotation year and the year prior (**Table 4.6**). The 1995, 2005, and 2010 sample years occur during a wet year, but years where drought may have affected plant condition occur in 2000, 2015, 2020, and 2025 (**Table 4.1a, Table 4.1b**).

The mean annual PDSI of the Uinta Basin division has displayed mild to extreme drought for 19 out of the past 31 years. The most recent annual PDSI score with an extreme drought ranking was 2025. Wet years were relatively consistent in the 1990s, with two moderately wet years occurring between 1997 and 1998. However, these "wet" rankings have become less common since 2000. Annual PDSI data shows an asymmetric cyclical pattern over the past 20 years, with two moderate wet years occurring amid longer periods of drought. The most recent moderately wet years were 2005 and 2011, with the majority of the duration between 2012 and 2025 having years of moderate to extreme drought. Overall, 19% of the 1995-2025 period consisted of slightly to very wet years, while 65% was considered to be years of mild to extreme drought; the remaining 16% 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 (**Figure 4.2a**, **Figure 4.2b**). The years that follow this pattern of consecutive wet fall and spring occur in 1996/97, 1997/98, 1998/99, 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 and the year prior (**Table 4.6**). The 1995 and 2005 sample years occur during wet years, but years where drought may have affected plant condition occur in 2000, 2010, 2015, 2020, and 2025 (**Figure 4.2a**, **Figure 4.2b**).

The mean annual PDSI of the Southeast Division has predominantly experienced some form of drought or dry spell since 1995. The Southeast division has been in a state of drought for 55% of the time. The severity has been significant, with 59% of drought years in the Southeast division being considered either moderate or extreme. Over the 31 years of reported PDSI, the Southeast division has not had any recorded consecutive wet years, and drought years have only been interrupted by six single wet year events. The most notable wet year for the Southeast division occurred in 2005 (**Figure 4.3a**). The years that follow the 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 and the year prior (**Table 4.6**). For division 7, the 1995, 2005, 2010, and 2015 sample years occur during wet years, but years where drought may have affected plant condition occur in 2000, 2020, and 2025 (**Figure 4.3a, Figure 4.3b**) (National Oceanic and Atmospheric Administration, 2026).



Map 4.1: The 1991-2020 PRISM Precipitation Model for WMU 11, Nine Mile (PRISM Climate Group, Oregon State University, 2021).

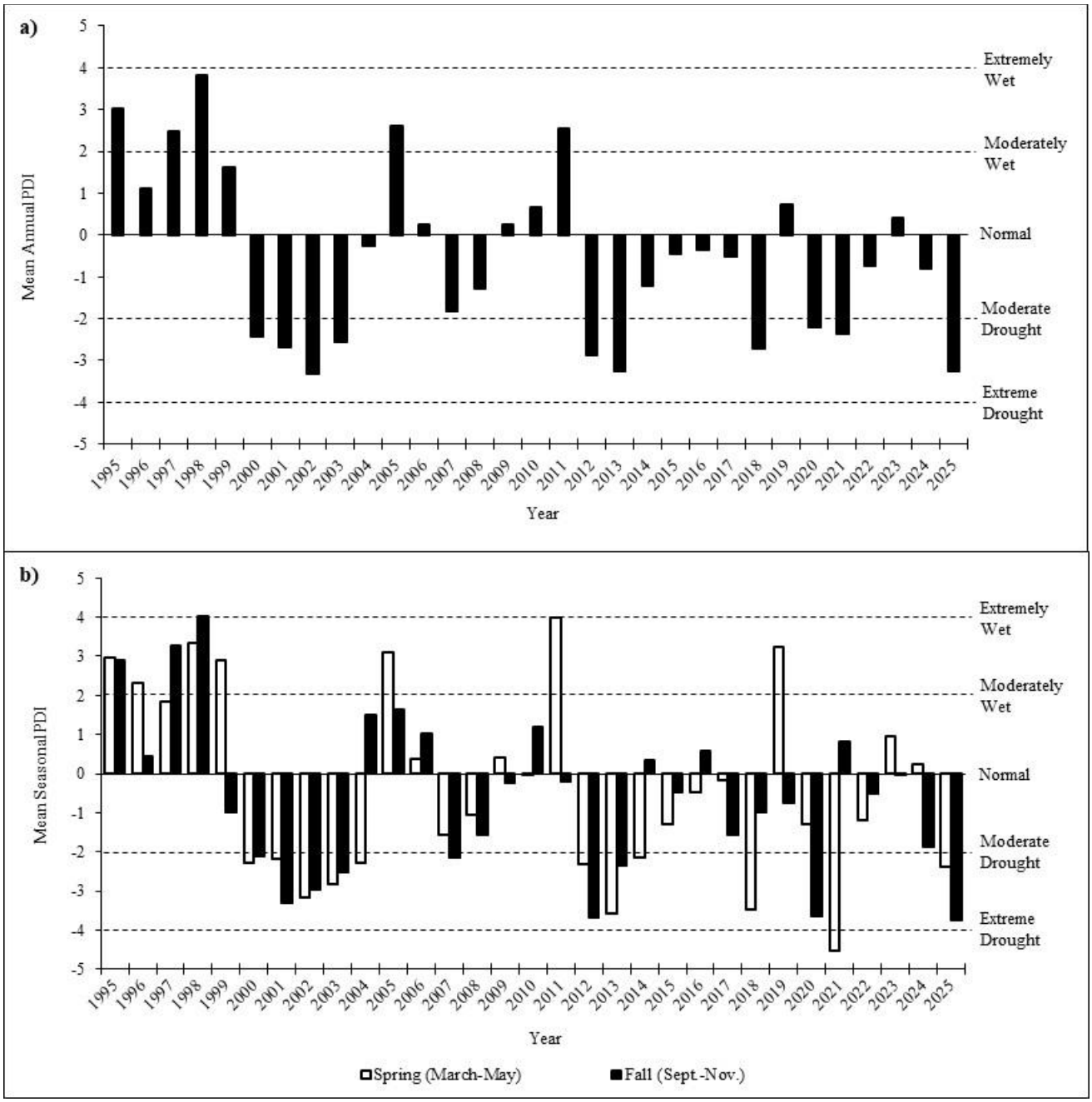


Figure 4.1: The 1995-2025 Palmer Drought Severity Index (PDSI) for the Northern Mountains division (Division 5). The PDSI is based on climate data gathered from 1895 to 2025. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet, and negative deviations indicate drought. Classification 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, 2026).

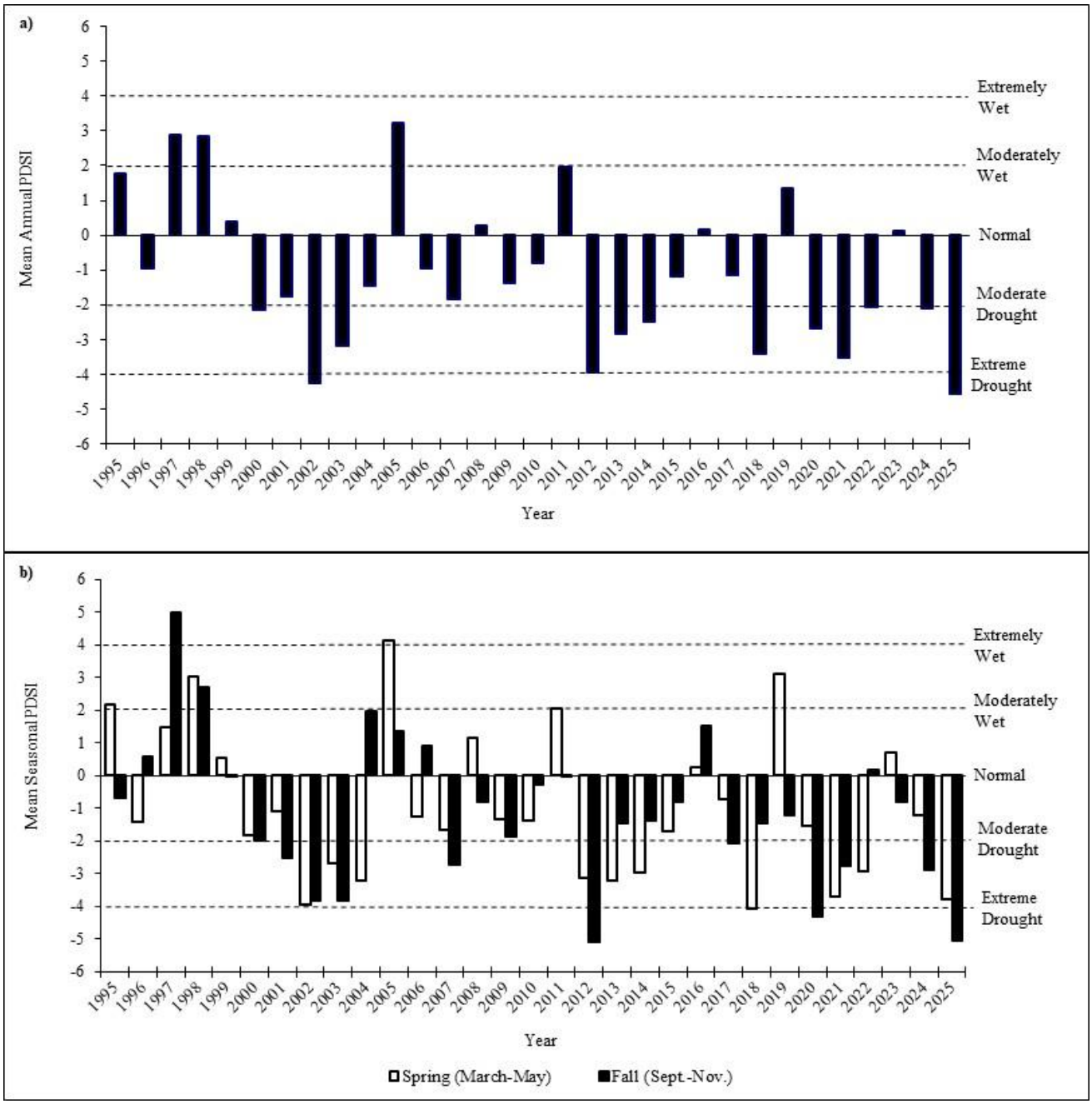


Figure 4.2: The 1995-2025 Palmer Drought Severity Index (PDSI) for the Uinta Basin division (Division 6). The PDSI is based on climate data gathered from 1895 to 2025. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet, and negative deviations indicate drought. Classification 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, 2026).

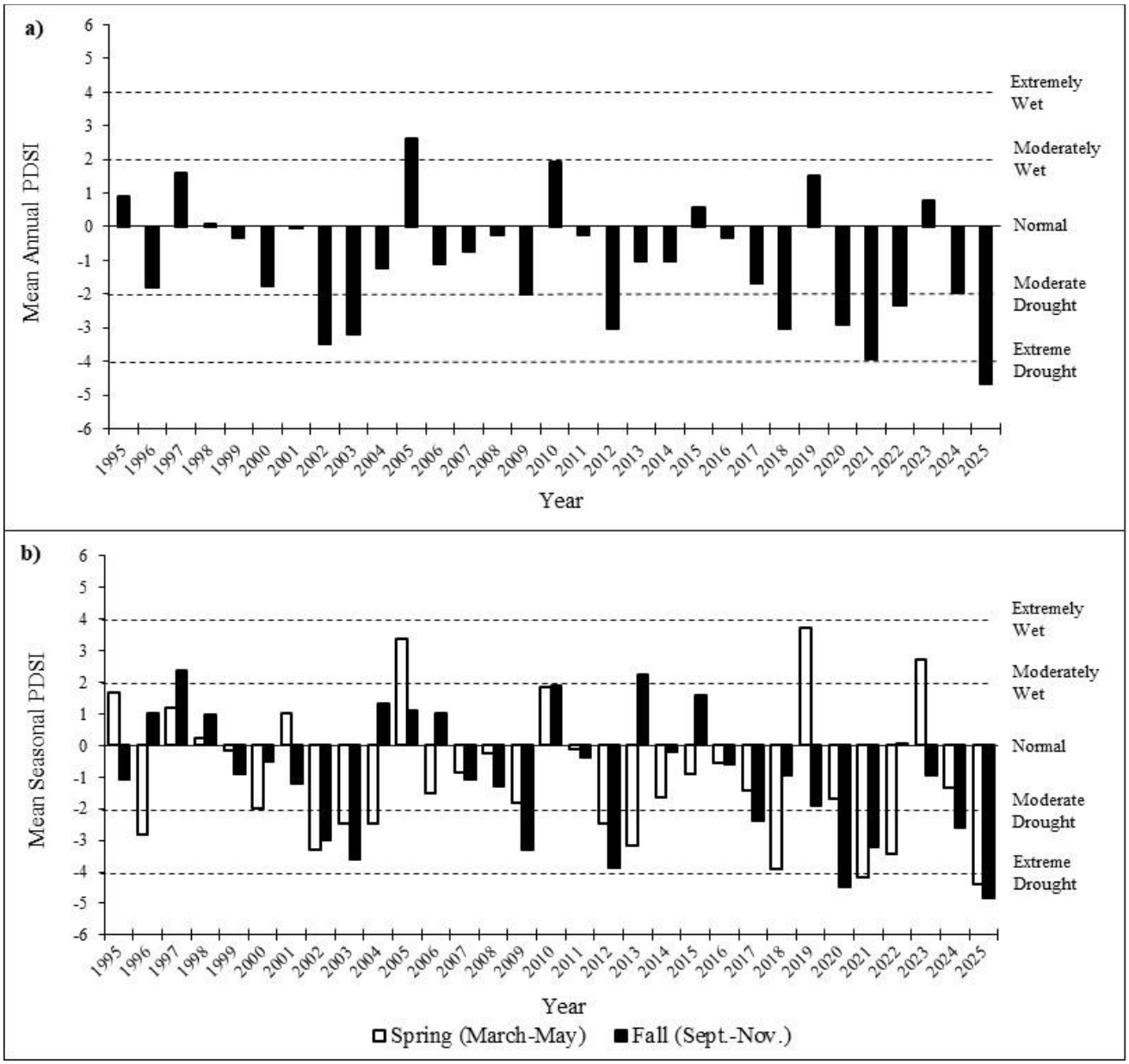


Figure 4.3: The 1995-2025 Palmer Drought Severity Index (PDSI) for the Southeast division (Division 7). The PDSI is based on climate data gathered from 1895 to 2025. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet, and negative deviations indicate drought. Classification 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, 2026).

Big Game Habitat

There is a long and gradual northerly slope to the Anthro Mountain terrain in the Nine Mile, Anthro subunit that lends itself to an abundance of winter range. The long slopes are covered by pinyon-juniper woodland with natural openings of sagebrush. Grassy openings are often found in the drainages, and some ridge tops are covered with black sagebrush. Summer range is limited with most of the high country being comprised of open sagebrush slopes and scattered patches of aspen. Most of the winter range in the unit is available even in severe winters. The upper limits for winter range are generally considered to be between 8,000 and 8,500 feet. The desert country below 5,000 feet is seldom used by migrating deer. Winter concentration areas on the Anthro (11A) side of the unit include northern flats below Anthro Mountain, upper and lower Nutters Canyon, Wells Draw and Jackrabbit Canyon and Bench Mark Loop north and west of Gilsonite Draw. Pronghorn concentrations can be found on areas south of Wilkin Ridge (Petes Wash and Desert Spring Wash), Castle Peak Draw, Pariette Bench, South Myton Bench, and the flats between Cottonwood Canyon and Antelope Canyon.

In the Nine Mile, Range Creek subunit normal winter range is below 8,500 feet and also completely encompasses the summer range. Severe winter range is limited to areas below 7,000 feet. On the south and east sides of the subunit, steep, bare slopes limit use to the ridge tops and canyon bottoms along lower Nine Mile Creek and the Green River. During severe winters, all deer wintering in these areas are forced into the canyon bottoms, usually causing heavy winter losses. Along the west side of the unit from Soldier Creek Canyon (north side) southeast to Horse Canyon (south side), access to the winter range is good. From Horse Canyon south, however, the Roan and Book Cliffs drop off sharply, presenting major obstacles to deer migration and preventing use of much of the lower elevation range. Winter concentration areas on Range Creek (11B) include the canyons and flats near Nine Mile Creek, Rock House Cow Camp area, canyons and flats near Argyle Canyon, and Little Park.

Rangeland Analysis Platform (RAP) – Cover by Mule 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 cover values 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. The following graphs represent vegetation changes by 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. Also displayed in the following graphs is the change in satellite imaging resolution from 30m to 10m used to calculate cover. This change occurs in 2018 and is denoted by a dashed line. Calculated cover estimations in 2018 and beyond uses 10m resolution, so caution should be used when comparing years before 2018 to years after, as sequential comparisons are not at the same scale.

The RAP data illustrates fluctuations in herbaceous cover on mule deer winter, summer, and year-long range. Years showing the highest values for herbaceous cover vary between ranges of different seasonality, but peaks generally occurred in the early 1990s, the early 2010s, and early 2020s. Herbaceous annual and perennial cover 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 4.4**, **Figure 4.5**, **Figure 4.6**). Perennial

lifeforms provided more cover than annual lifeforms on all deer ranges. As for annual lifeforms, RAP data indicates that annuals have generally provided consistent cover on their respective ranges, though with some variability based on precipitation (**Figure 4.4**, **Figure 4.5**, **Figure 4.6**).

The Range Trend data for upland ecotypes displays increases in perennial herbaceous cover since 1994 despite year-to-year variability. However, perennial herbaceous cover has decreased overall over a similar period on sites classified as semidesert ecotypes. Moreover, annual grasses on Upland (Pinyon-Juniper) ecotypes have had increases in cover. 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 4.35**, **Figure 4.36**)

The RAP data for combined tree and shrub cover on deer ranges of all seasonality shows fluctuations over time (**Figure 4.7**, **Figure 4.8**, **Figure 4.9**). Tree cover on all deer seasonal ranges has increased since 1986, while shrub cover has remained similar. Since 1994, tree cover has become higher than shrub cover on summer range; tree cover became surpassed shrub cover in 2013 on the winter range; and tree cover values have been higher than shrub cover values since initial reporting in 1986. Trees and shrubs have generally displayed less drastic peaks and troughs in cover data than those exhibited by herbaceous data. However, a noticeable decrease in both shrub and tree cover occurred on all seasonal ranges in 2003, which follows a decrease in precipitation in 2002. Furthermore, the Palmer Drought Severity Index (PDSI) data for the Northern Mountains, Uinta Basin, and Southeast divisions (which unit 11 is a part of) indicate that 2002 and 2003 were moderate to extreme drought years (**Figure 4.1a, Figure 4.2a, Figure 4.3a**). 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.

RAP – Herbaceous Cover by Mule Deer Habitat

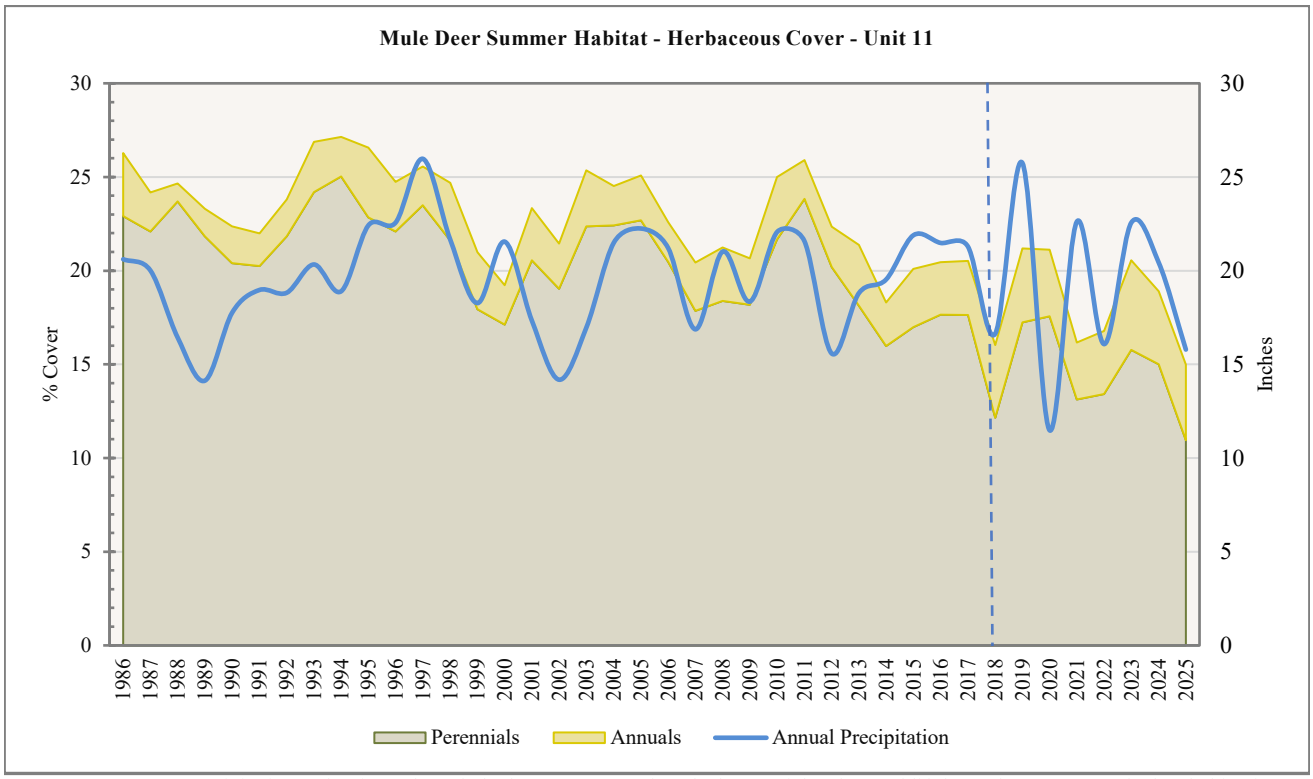


Figure 4.4: Average precipitation and estimated yearly herbaceous cover of stacked perennial and annual lifeforms for summer mule deer habitat in WMU 11, Nine Mile (Rangeland Analysis Platform, 2026).
*Dashed line indicates shift in depicted datasets from RAP 30m (1986-2017) to RAP 10m (2018-2025) (USDA Agricultural Research Service, 2026).

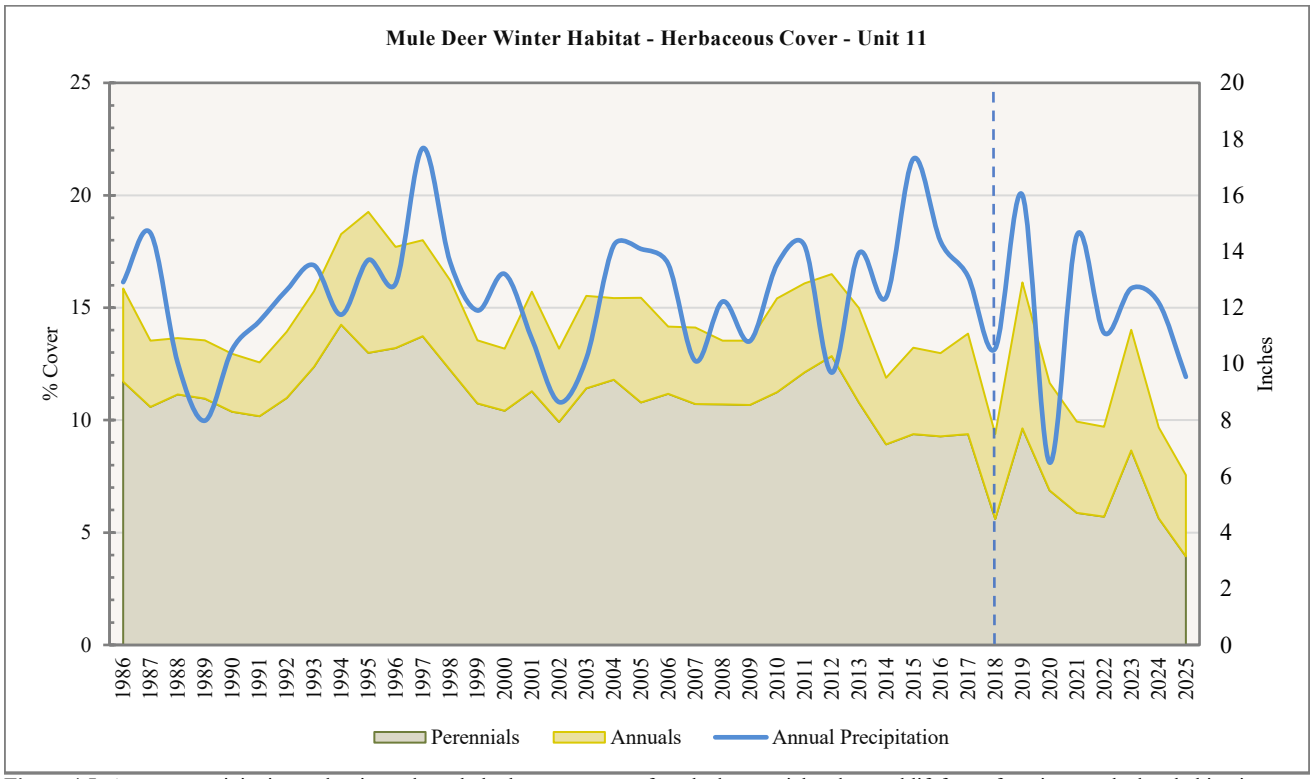


Figure 4.5: Average precipitation and estimated yearly herbaceous cover of stacked perennial and annual lifeforms for winter mule deer habitat in WMU 11, Nine Mile (Rangeland Analysis Platform, 2026).
*Dashed line indicates shift in depicted datasets from RAP 30m (1986-2017) to RAP 10m (2018-2025) (USDA Agricultural Research Service, 2026).

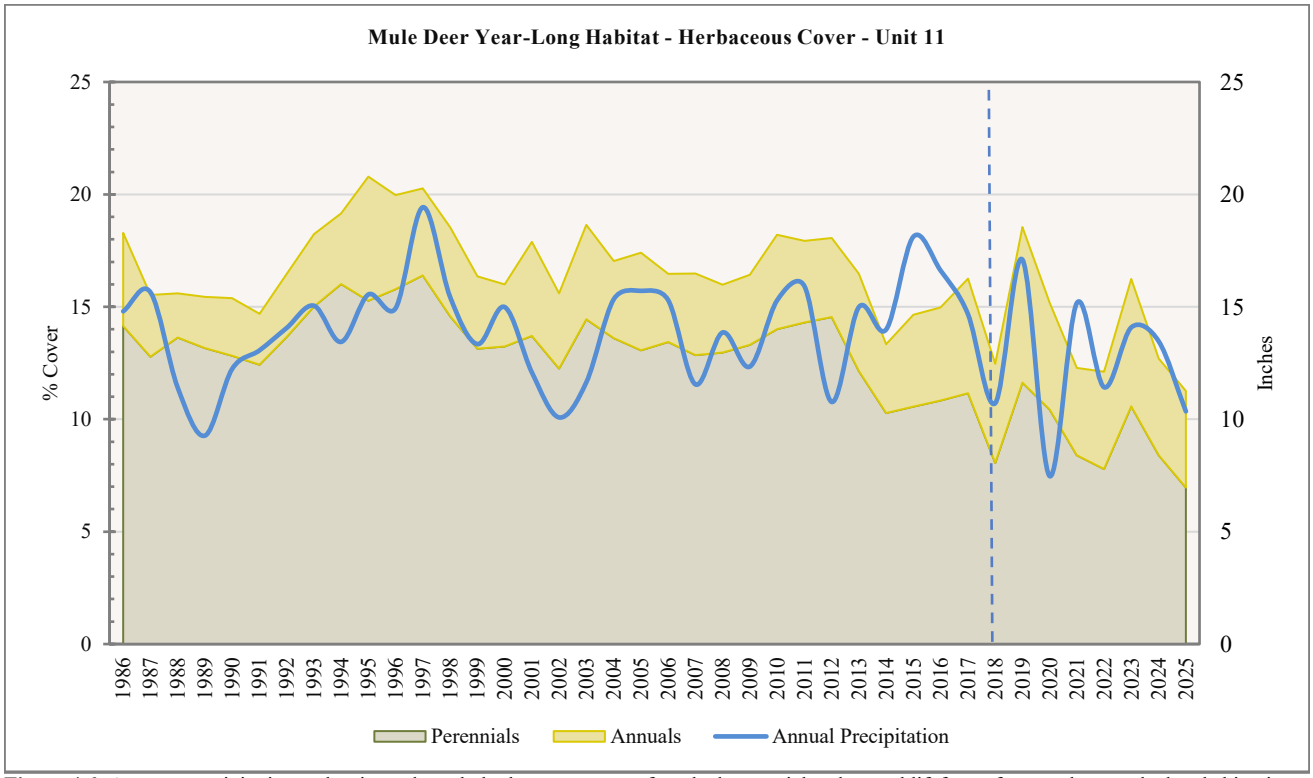


Figure 4.6: Average precipitation and estimated yearly herbaceous cover of stacked perennial and annual lifeforms for year-long mule deer habitat in WMU 11, Nine Mile (Rangeland Analysis Platform, 2026).
*Dashed line indicates shift in depicted datasets from RAP 30m (1986-2017) to RAP 10m (2018-2025) (USDA Agricultural Research Service, 2026).

RAP – Shrub and Tree Cover by Mule Deer Habitat

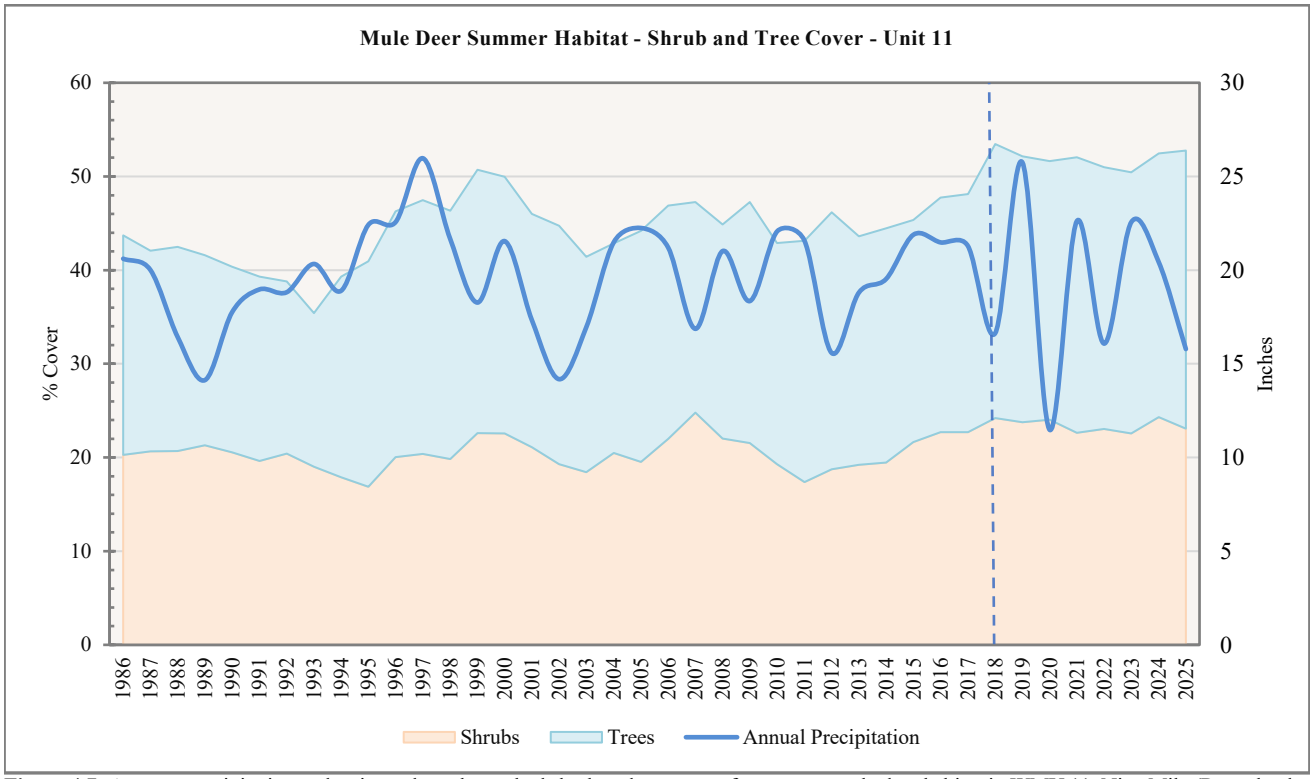


Figure 4.7: Average precipitation and estimated yearly stacked shrub and tree cover for summer mule deer habitat in WMU 11, Nine Mile (Rangeland Analysis Platform, 2026).
*Dashed line indicates shift in depicted datasets from RAP 30m (1986-2017) to RAP 10m (2018-2025) (USDA Agricultural Research Service, 2026).

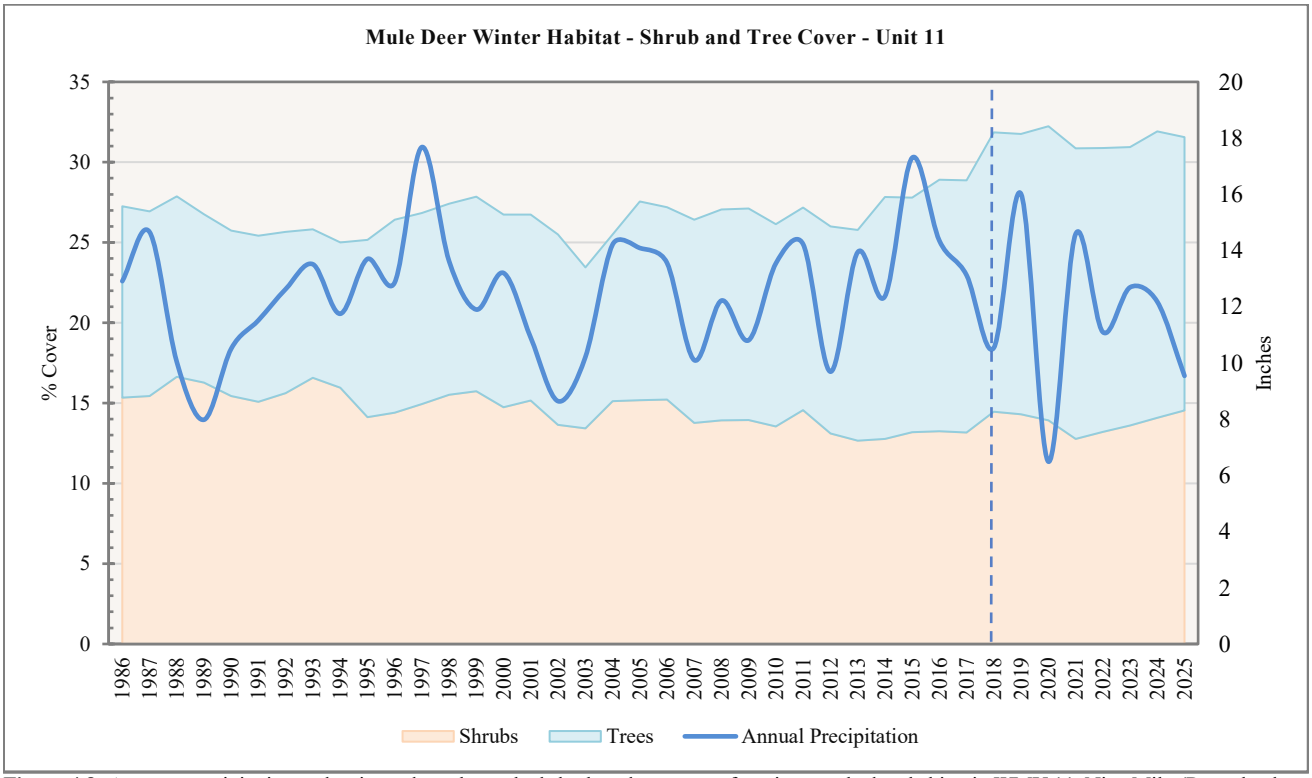


Figure 4.8: Average precipitation and estimated yearly stacked shrub and tree cover for winter mule deer habitat in WMU 11, Nine Mile (Rangeland Analysis Platform, 2026).
*Dashed line indicates shift in depicted datasets from RAP 30m (1986-2017) to RAP 10m (2018-2025) (USDA Agricultural Research Service, 2026).

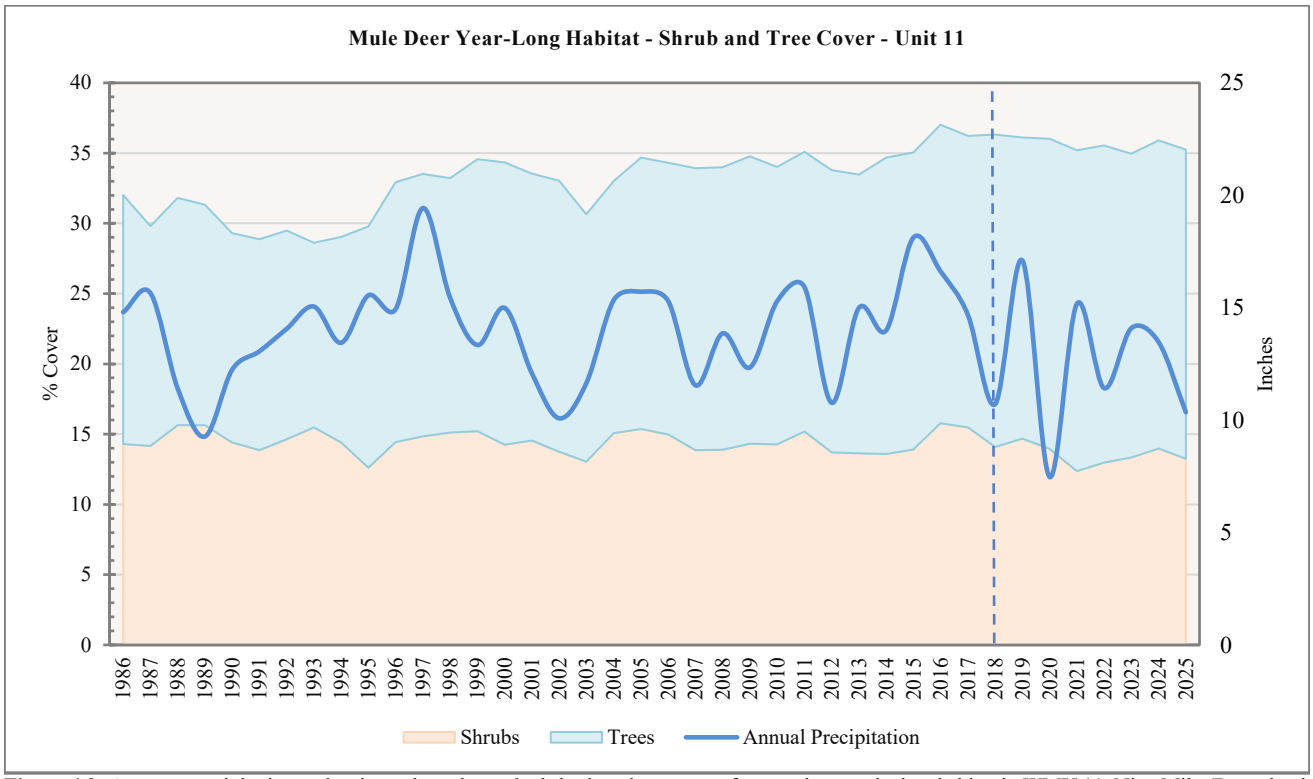
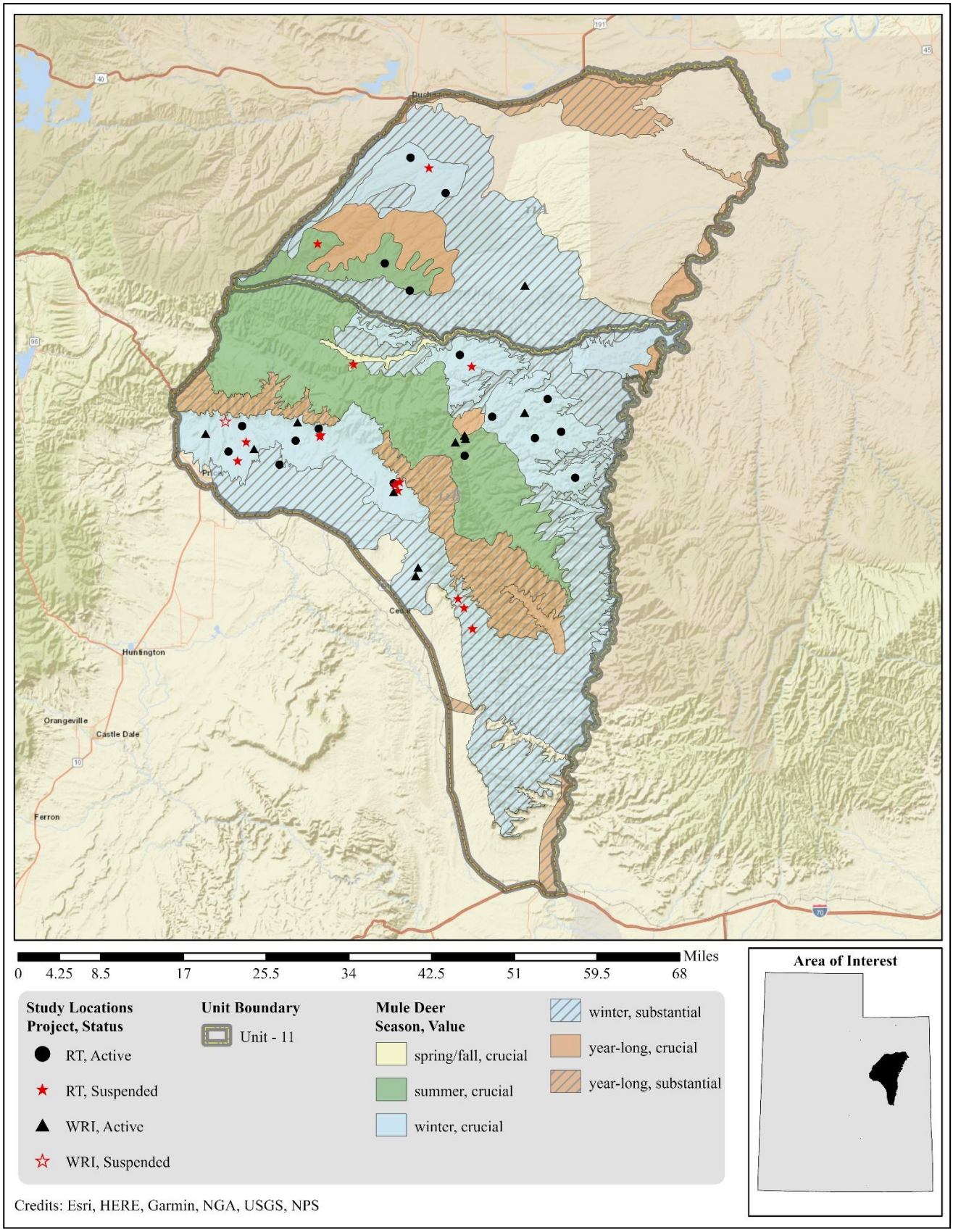
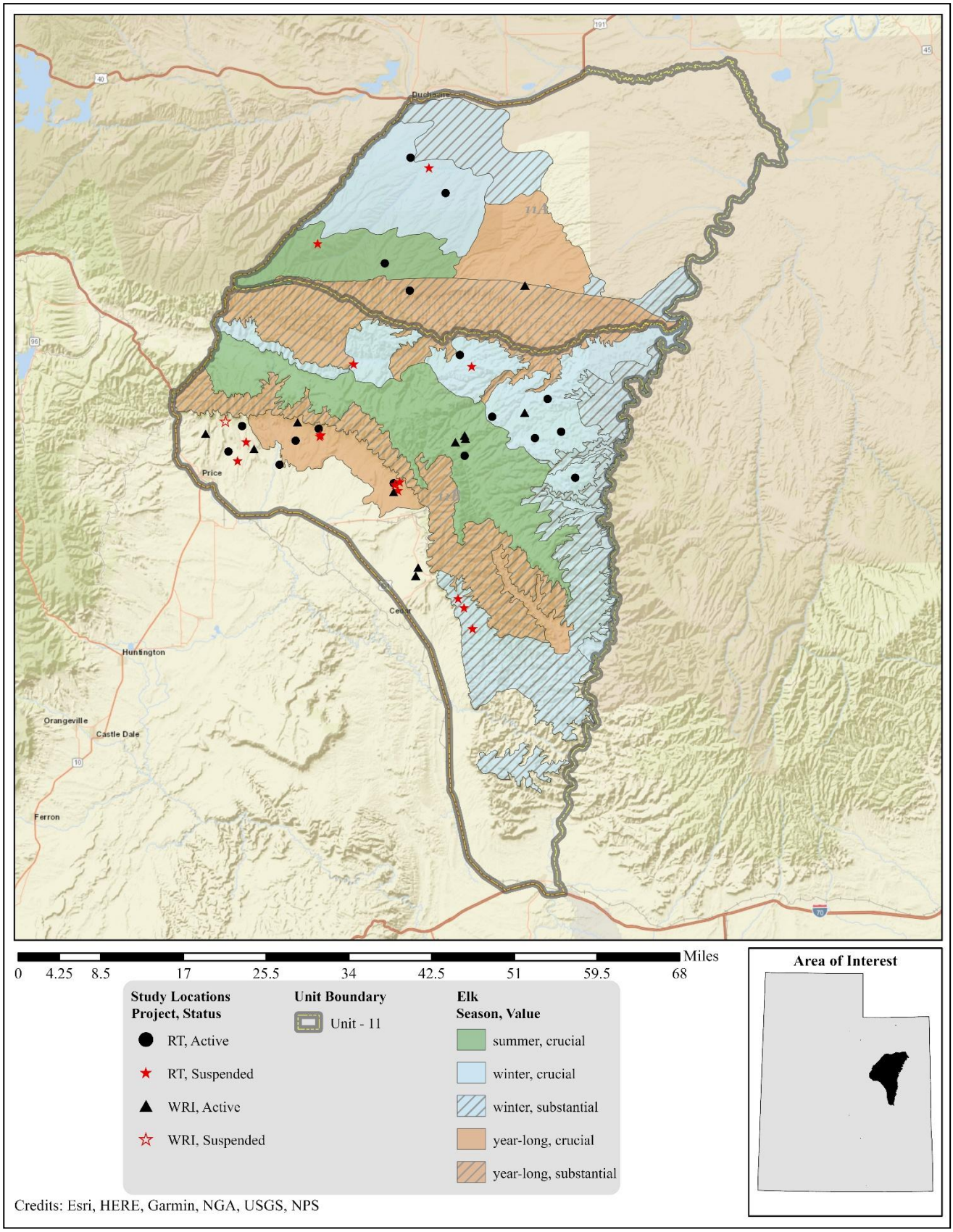


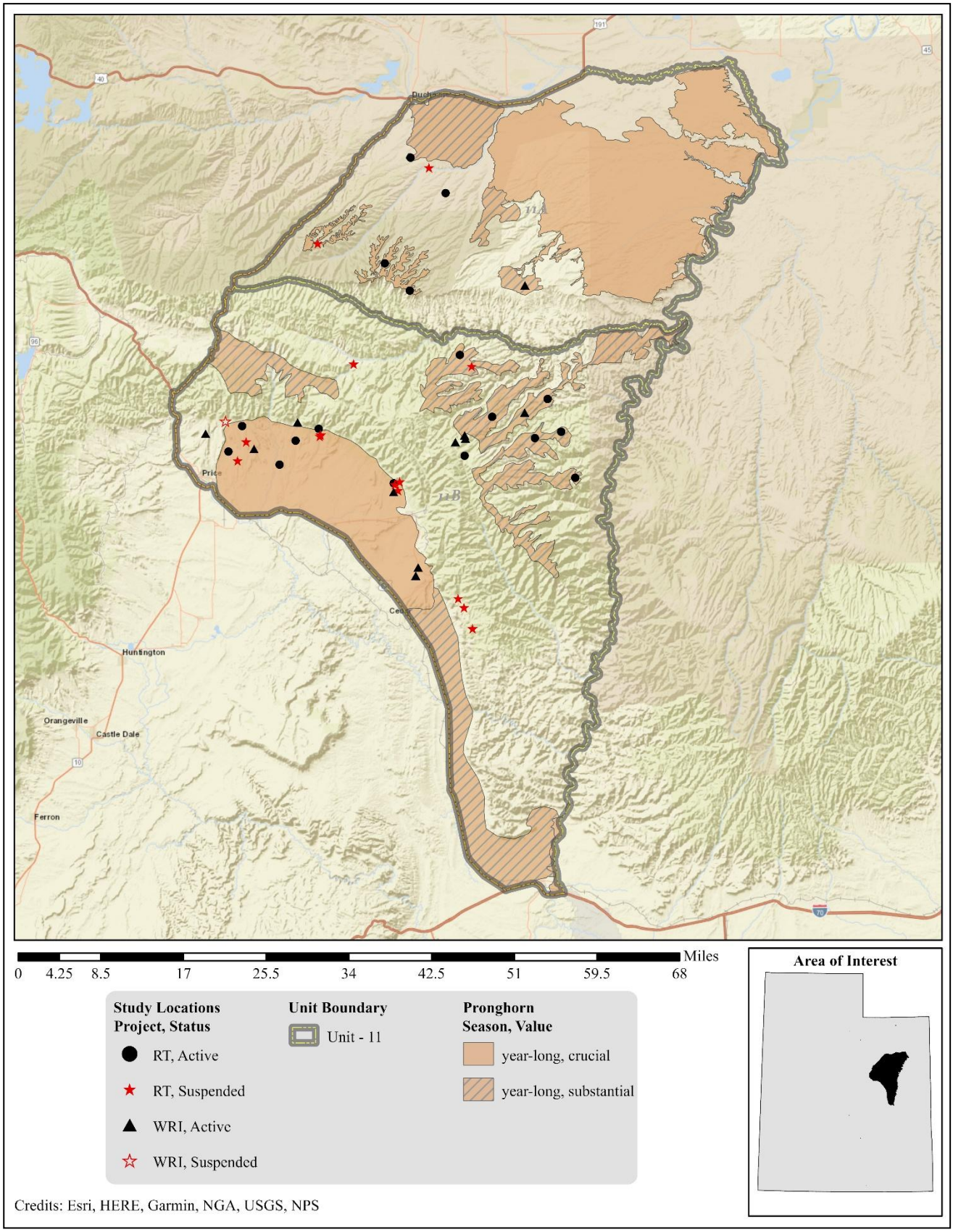
Figure 4.9: Average precipitation and estimated yearly stacked shrub and tree cover for year-long mule deer habitat in WMU 11, Nine Mile (Rangeland Analysis Platform, 2026).
*Dashed line indicates shift in depicted datasets from RAP 30m (1986-2017) to RAP 10m (2018-2025) (USDA Agricultural Research Service, 2026).



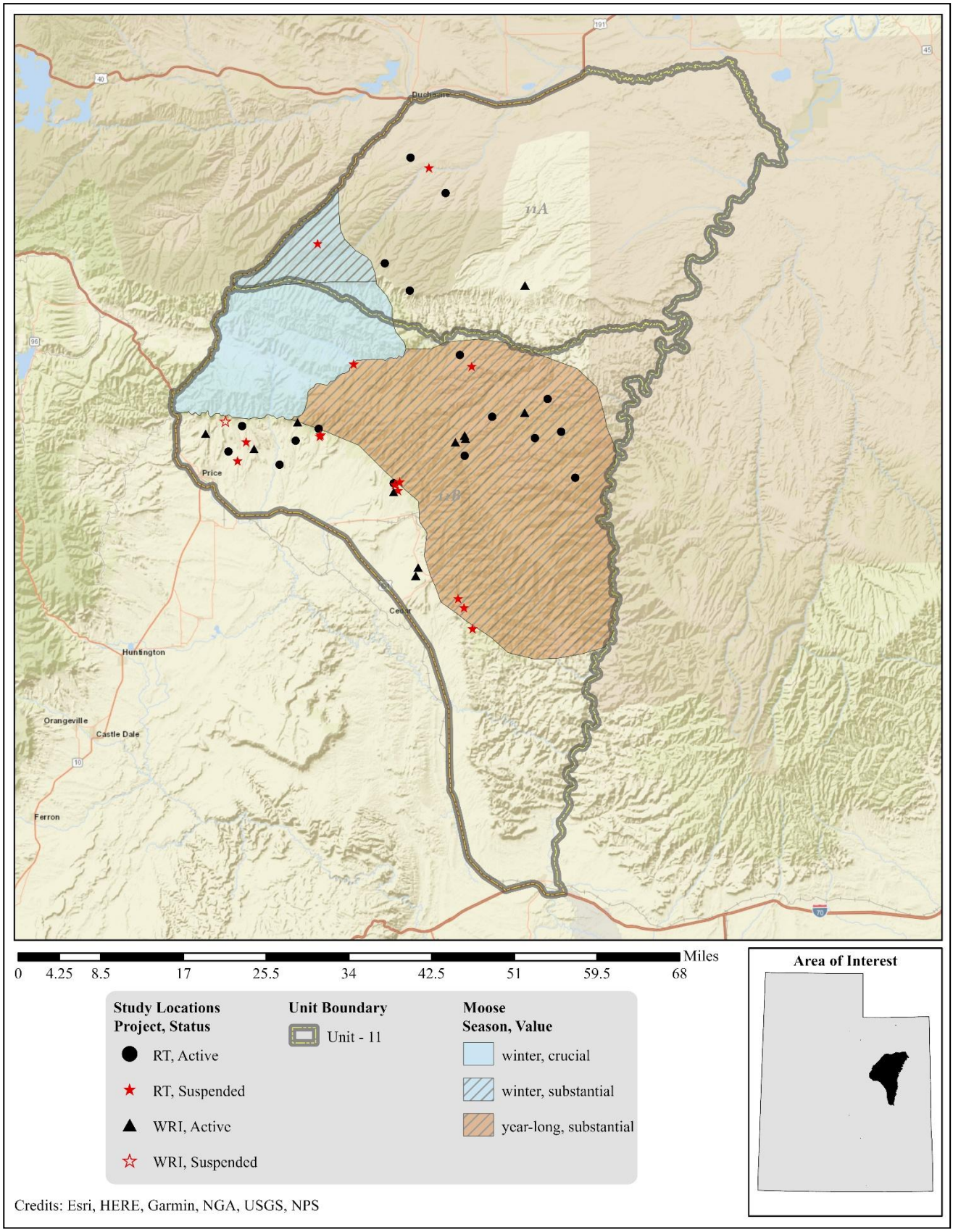
Map 4.2: Estimated mule deer habitat by season and value for WMU 11, Nine Mile.



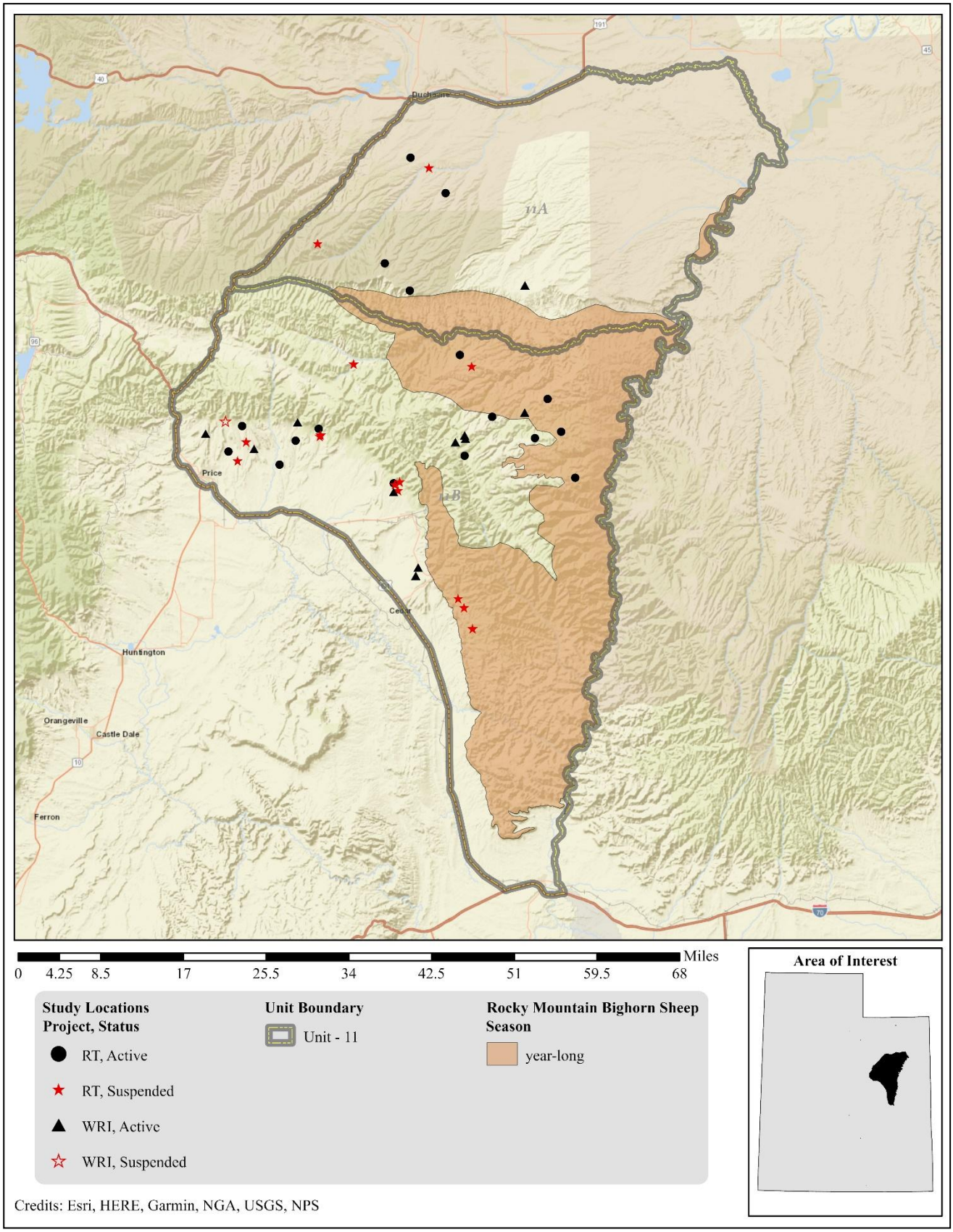
Map 4.3: Estimated elk habitat by season and value for WMU 11, Nine Mile.



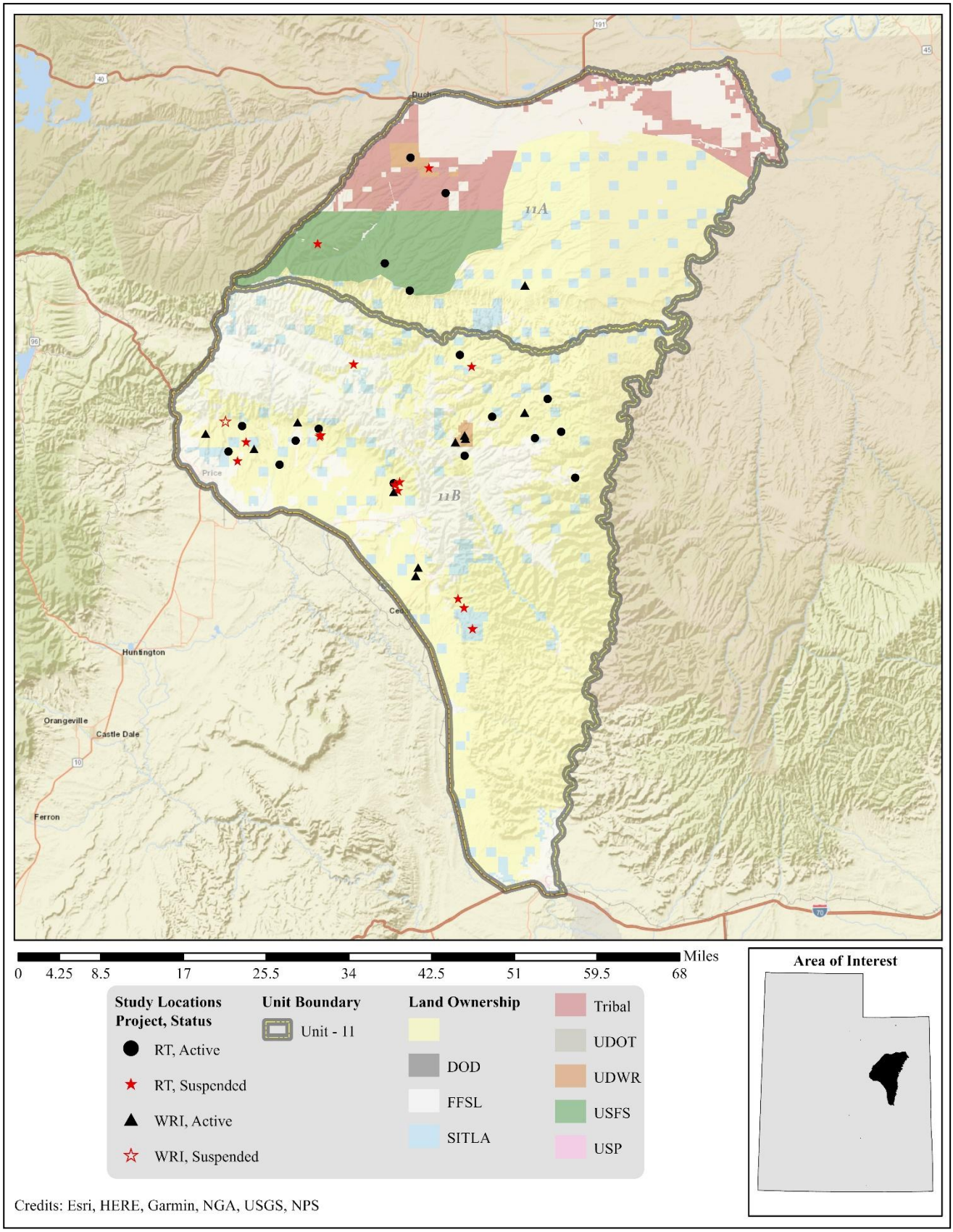
Map 4.4: Estimated pronghorn habitat by season and value for WMU 11, Nine Mile.



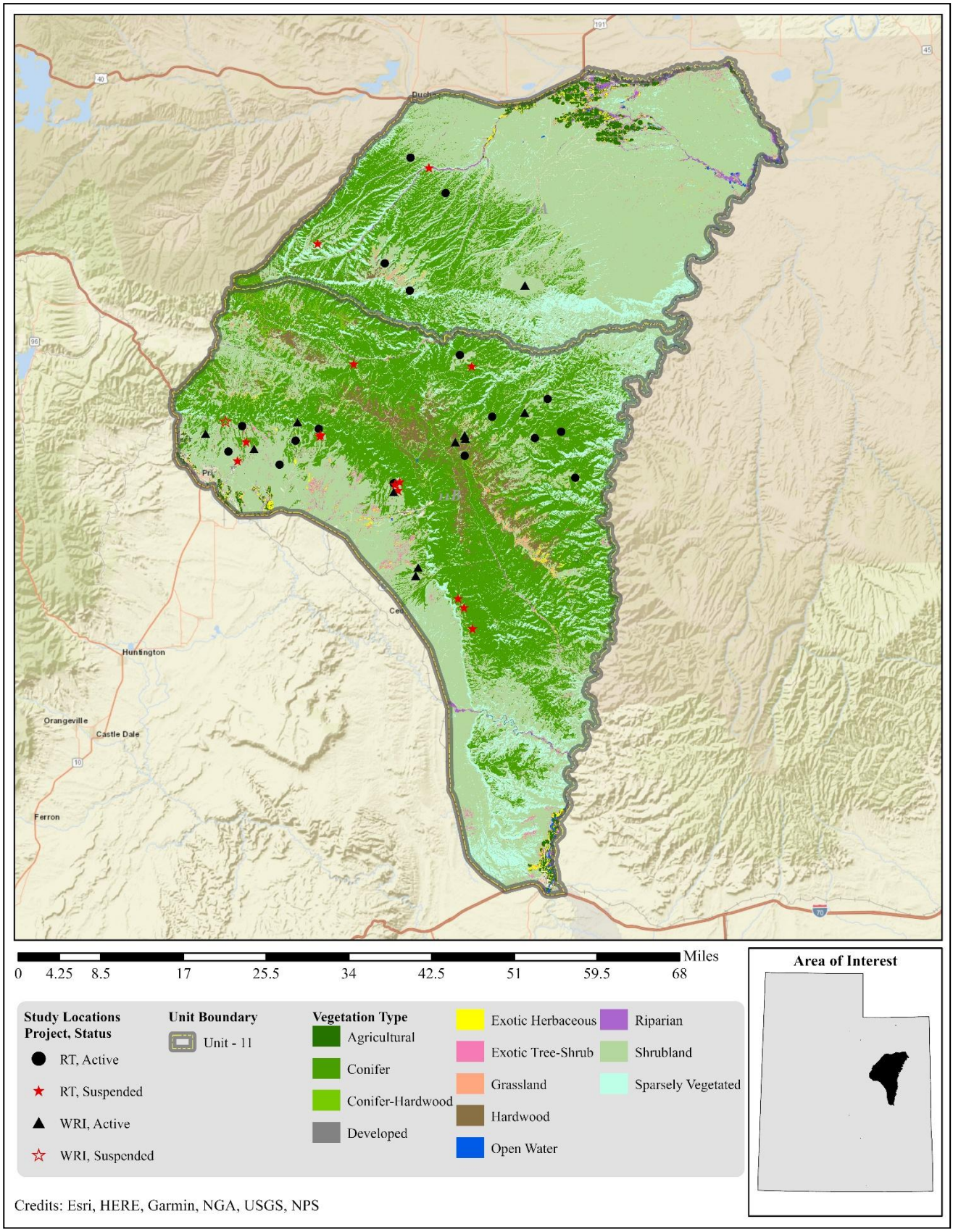
Map 4.5: Estimated moose habitat by season and value for WMU 11, Nine Mile.



Map 4.6: Estimated Rocky Mountain bighorn sheep habitat by season and value for WMU 11, Nine Mile.



Map 4.7: Land ownership for WMU 11, Nine Mile.



Map 4.8: LANDFIRE Existing Vegetation Type map (LC24_EVT_250, 2024) for WMU 11, Nine Mile.

LANDFIRE Existing Vegetation Type for Mule Deer Habitat

Pinyon-juniper biophysical sites (also referred to here as vegetation types) make up approximately 16% of the mule deer summer range; 40% of the winter habitat; 31% of the year-long range; and nearly 34% of the spring/fall habitat in the Nine Mile Management Unit according to the current LANDFIRE Existing Vegetation Type model (**Table 4.1**, **Table 4.2**, **Table 4.3**, **Table 4.4**). These lower to mid-elevation sites can be associated with understory browse species known to be beneficial to mule deer, although abundance may vary widely. Encroachment of pinyon (*Pinus* spp.) and juniper (*Juniperus* spp.) 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 19% of summer range in this unit is made up of biophysical sites that have quaking aspen (*Populus tremuloides*) as a dominant component (**Table 4.1**); in the Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland vegetation type in particular, conifers are also dominant. Although trees dominate these biophysical sites, preferred browse species such as chokecherry (*Prunus virginiana*), serviceberry (*Amelanchier* spp.), and mountain snowberry (*Symphoricarpos oreophilus*) may be present. In addition, sites of these types can have abundant understories that could provide valuable forage for summering mule deer.

Sagebrush steppe and shrubland biophysical sites comprise nearly 20% of the winter range; 19% of the summer habitat; almost 6% of year-long range; and 12.5% of spring/fall range according to the model. These biophysical sites can be found at elevations ranging from low (semidesert) to high (mountain). Sagebrush species typically dominate these sites across the elevation gradient and may provide valuable browse for mule deer during the winter months. Other preferred browse species may also be present on some biophysical sites, and pinyon and juniper may be present at middle elevations. In addition, 13% of winter range; nearly 5% of summer range, 9% of year-long habitat; and 10% of spring/fall range is occupied by sparsely vegetated areas (**Table 4.1**, **Table 4.2**, **Table 4.3**, **Table 4.4**): this vegetation class may have less value for deer when compared with other, more productive sites.

The rest of the mule deer habitat within the Nine Mile Management Unit is comprised of a number of other vegetation types (**Map 4.8**, **Table 4.1**, **Table 4.2**, **Table 4.3**, **Table 4.4**), 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	39,137	15.96%	
	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	36,252	14.78%	
	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	14,527	5.92%	
	Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland	10,149	4.14%	
	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	8,697	3.55%	
	Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland	7,393	3.01%	
	Southern Rocky Mountain Ponderosa Pine Woodland	1,928	0.79%	
	Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland	1,077	0.44%	
	Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland	30	0.01%	
	Rocky Mountain Foothill Limber Pine-Juniper Woodland	10	0.00%	48.60%
Shrubland	Inter-Mountain Basins Montane Sagebrush Steppe	45,604	18.59%	
	Rocky Mountain Lower Montane-Foothill Shrubland	5,525	2.25%	
	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	3,891	1.59%	
	Inter-Mountain Basins Semi-Desert Shrub-Steppe	3,291	1.34%	
	Inter-Mountain Basins Mixed Salt Desert Scrub	1,653	0.67%	
	Inter-Mountain Basins Big Sagebrush Shrubland	1,316	0.54%	
	Colorado Plateau Mixed Low Sagebrush Shrubland	615	0.25%	
	Colorado Plateau Pinyon-Juniper Shrubland	40	0.02%	
	Southern Colorado Plateau Sand Shrubland	7	0.00%	
	Inter-Mountain Basins Greasewood Flat	6	0.00%	
	Inter-Mountain Basins Mat Saltbush Shrubland	3	0.00%	
	Colorado Plateau Blackbrush-Mormon-tea Shrubland	2	0.00%	25.26%
Hardwood	Rocky Mountain Aspen Forest and Woodland	37,076	15.12%	
	Rocky Mountain Bigtooth Maple Ravine Woodland	104	0.04%	15.16%
Other	Sparsely Vegetated	11,866	4.84%	
	Developed	5,447	2.22%	
	Riparian	1,088	0.44%	
	Open Water	106	0.04%	
	Agricultural	5	0.00%	
	Quarries-Strip Mines-Gravel Pits-Well and Wind Pads	5	0.00%	7.55%
Grassland	Inter-Mountain Basins Semi-Desert Grassland	3,933	1.60%	
	Southern Rocky Mountain Montane-Subalpine Grassland	1,222	0.50%	
	Rocky Mountain Subalpine-Montane Mesic Meadow	856	0.35%	2.45%
Exotic Herbaceous	Great Basin & Intermountain Introduced Perennial Grassland and Forbland	833	0.34%	
	Great Basin & Intermountain Introduced Annual Grassland	698	0.28%	
	Interior Western North American Temperate Ruderal Grassland	392	0.16%	
	Great Basin & Intermountain Introduced Annual and Biennial Forbland	1	0.00%	0.78%
Exotic Tree-Shrub	Great Basin & Intermountain Ruderal Shrubland	390	0.16%	
	Interior Western North American Temperate Ruderal Shrubland	94	0.04%	0.20%
Total		**245,268**	**100%**	**100%**

Table 4.1: LANDFIRE Existing Vegetation Type (LC24_EVT_250, 2024) acreage of summer mule deer habitat for WMU 11, Nine Mile.

Group	Existing Vegetation Type for Winter Mule Deer Habitat	Acres	% of Total	Group % of Total
Conifer	Colorado Plateau Pinyon-Juniper Woodland	292,887	37.36%	
	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	22,026	2.81%	
	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	9,074	1.16%	
	Southern Rocky Mountain Ponderosa Pine Woodland	1,814	0.23%	
	Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland	493	0.06%	
	Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland	469	0.06%	
	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	320	0.04%	
	Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland	215	0.03%	
	Rocky Mountain Foothill Limber Pine-Juniper Woodland	12	0.00%	
	Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland	3	0.00%	41.75%

Group	Existing Vegetation Type for Winter Mule Deer Habitat	Acres	% of Total	Group % of Total
Shrubland	Inter-Mountain Basins Big Sagebrush Shrubland	87,013	11.10%	
	Inter-Mountain Basins Mixed Salt Desert Scrub	81,211	10.36%	
	Colorado Plateau Mixed Low Sagebrush Shrubland	54,179	6.91%	
	Inter-Mountain Basins Semi-Desert Shrub-Steppe	26,161	3.34%	
	Colorado Plateau Pinyon-Juniper Shrubland	23,979	3.06%	
	Inter-Mountain Basins Montane Sagebrush Steppe	14,390	1.84%	
	Rocky Mountain Lower Montane-Foothill Shrubland	9,908	1.26%	
	Inter-Mountain Basins Mat Saltbush Shrubland	9,018	1.15%	
	Inter-Mountain Basins Greasewood Flat	6,144	0.78%	
	Southern Colorado Plateau Sand Shrubland	2,707	0.35%	
	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	2,226	0.28%	
	Colorado Plateau Blackbrush-Mormon-tea Shrubland	1,864	0.24%	40.67%
Other	Sparsely Vegetated	102,235	13.04%	
	Developed	10,296	1.31%	
	Riparian	3,462	0.44%	
	Agricultural	2,787	0.36%	
	Quarries-Strip Mines-Gravel Pits-Well and Wind Pads	1,414	0.18%	
	Open Water	1,392	0.18%	15.51%
Exotic Tree-Shrub	Great Basin & Intermountain Ruderal Shrubland	9,131	1.16%	
	Interior Western North American Temperate Ruderal Shrubland	202	0.03%	1.19%
Exotic Herbaceous	Great Basin & Intermountain Introduced Annual Grassland	1,446	0.18%	
	Great Basin & Intermountain Introduced Perennial Grassland and Forbland	898	0.11%	
	Great Basin & Intermountain Introduced Annual and Biennial Forbland	741	0.09%	
	Interior Western North American Temperate Ruderal Grassland	510	0.06%	0.46%
Grassland	Inter-Mountain Basins Semi-Desert Grassland	1,077	0.14%	
	Southern Rocky Mountain Montane-Subalpine Grassland	653	0.08%	
	Rocky Mountain Subalpine-Montane Mesic Meadow	91	0.01%	0.23%
Hardwood	Rocky Mountain Aspen Forest and Woodland	1,471	0.19%	
	Rocky Mountain Bigtooth Maple Ravine Woodland	1	0.00%	0.19%
Total		**783,917**	**100%**	**100%**

Table 4.2: LANDFIRE Existing Vegetation Type (LC24_EVT_250, 2024) acreage of winter mule deer habitat for WMU 11, Nine Mile.

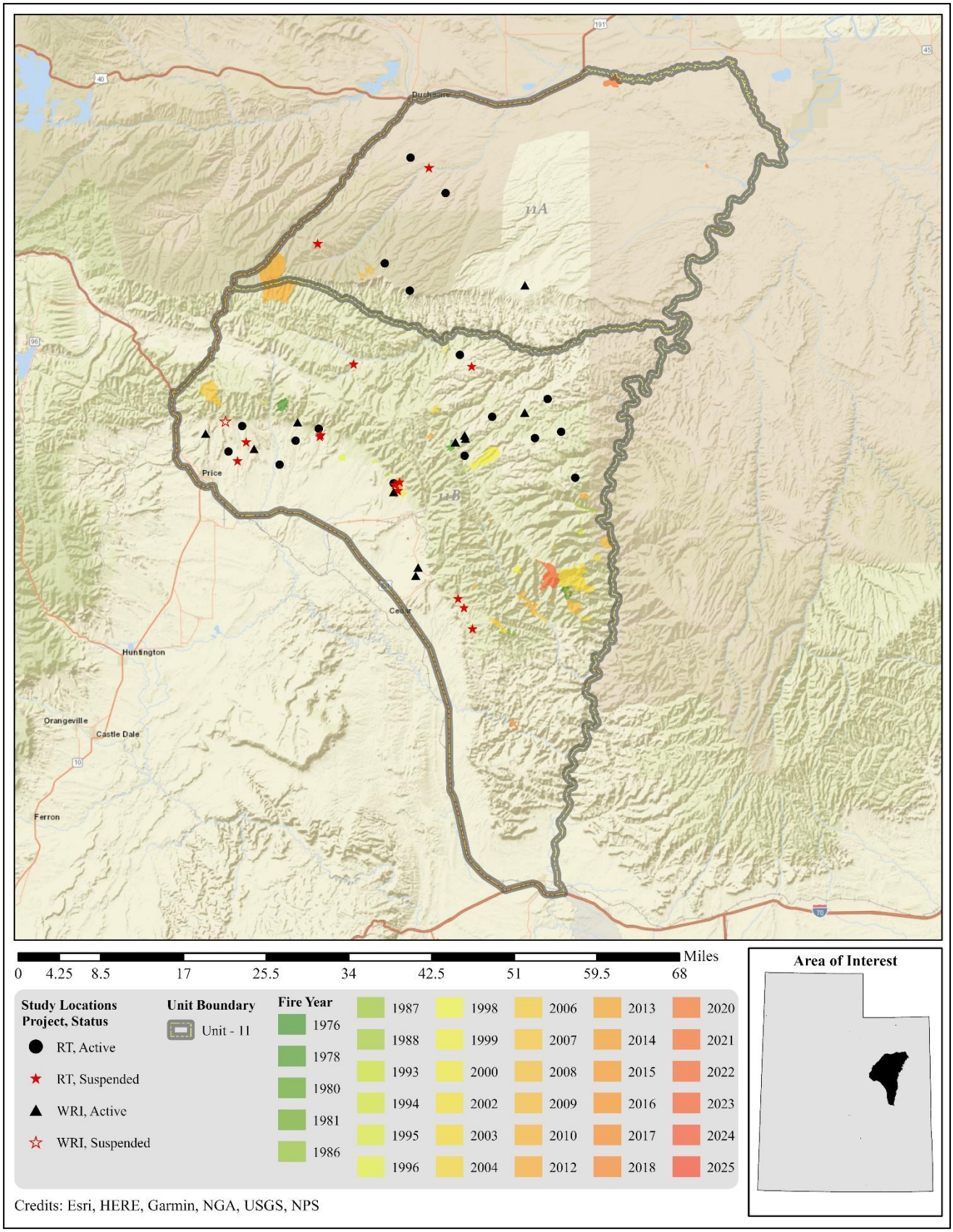
Group	Existing Vegetation Type for Year-Long Mule Deer Habitat	Acres	% of Total	Group % of Total
Conifer	Colorado Plateau Pinyon-Juniper Woodland	74,091	31.12%	
	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	22,304	9.37%	
	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	13,105	5.50%	
	Southern Rocky Mountain Ponderosa Pine Woodland	1,097	0.46%	
	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	567	0.24%	
	Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland	230	0.10%	
	Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland	222	0.09%	
	Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland	180	0.08%	
	Rocky Mountain Foothill Limber Pine-Juniper Woodland	4	0.00%	
	Inter-Mountain Basins Juniper Savanna	<1	0.00%	
	Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland	<1	0.00%	46.95%
Shrubland	Inter-Mountain Basins Mixed Salt Desert Scrub	24,929	10.47%	
	Inter-Mountain Basins Montane Sagebrush Steppe	7,952	3.34%	
	Rocky Mountain Lower Montane-Foothill Shrubland	5,245	2.20%	
	Inter-Mountain Basins Mat Saltbush Shrubland	4,824	2.03%	
	Inter-Mountain Basins Big Sagebrush Shrubland	3,210	1.35%	
	Inter-Mountain Basins Semi-Desert Shrub-Steppe	2,790	1.17%	
	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	2,390	1.00%	
	Inter-Mountain Basins Greasewood Flat	2,294	0.96%	
	Colorado Plateau Mixed Low Sagebrush Shrubland	2,222	0.93%	
	Colorado Plateau Pinyon-Juniper Shrubland	675	0.28%	
	Colorado Plateau Blackbrush-Mormon-tea Shrubland	512	0.21%	
	Southern Colorado Plateau Sand Shrubland	133	0.06%	24.01%
Other	Sparsely Vegetated	21,889	9.19%	
	Agricultural	15,189	6.38%	
	Riparian	9,481	3.98%	
	Developed	5,177	2.17%	
	Open Water	3,904	1.64%	
	Quarries-Strip Mines-Gravel Pits-Well and Wind Pads	209	0.09%	23.45%

Group	Existing Vegetation Type for Year-Long Mule Deer Habitat	Acres	% of Total	Group % of Total
Exotic Herbaceous	Great Basin & Intermountain Introduced Perennial Grassland and Forbland	2,165	0.91%	
	Great Basin & Intermountain Introduced Annual Grassland	1,380	0.58%	
	Interior Western North American Temperate Ruderal Grassland	1,076	0.45%	
	Great Basin & Intermountain Introduced Annual and Biennial Forbland	487	0.20%	2.14%
Exotic Tree-Shrub	Great Basin & Intermountain Ruderal Shrubland	4,070	1.71%	
	Interior Western North American Temperate Ruderal Shrubland	302	0.13%	1.84%
Grassland	Inter-Mountain Basins Semi-Desert Grassland	807	0.34%	
	Southern Rocky Mountain Montane-Subalpine Grassland	252	0.11%	
	Rocky Mountain Subalpine-Montane Mesic Meadow	92	0.04%	0.48%
Hardwood	Rocky Mountain Aspen Forest and Woodland	2,631	1.11%	
	Rocky Mountain Bigtooth Maple Ravine Woodland	26	0.01%	1.12%
Total		**238,112**	**100%**	**100%**

Table 4.3: LANDFIRE Existing Vegetation Type (LC24_EVT_250, 2024) acreage of year-long mule deer habitat for WMU 11, Nine Mile.

Group	Existing Vegetation Type for Spring/Fall Mule Deer Habitat	Acres	% of Total	Group % of Total
Conifer	Colorado Plateau Pinyon-Juniper Woodland	3,506	33.27%	
	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	129	1.23%	
	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	64	0.61%	
	Southern Rocky Mountain Ponderosa Pine Woodland	13	0.12%	
	Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland	1	0.01%	
	Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland	<1	0.00%	
	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	<1	0.00%	35.24%
Other	Sparsely Vegetated	1,090	10.34%	
	Riparian	992	9.41%	
	Developed	769	7.30%	
	Agricultural	356	3.38%	30.43%
Shrubland	Inter-Mountain Basins Big Sagebrush Shrubland	792	7.51%	
	Inter-Mountain Basins Mixed Salt Desert Scrub	576	5.47%	
	Inter-Mountain Basins Semi-Desert Shrub-Steppe	402	3.81%	
	Colorado Plateau Mixed Low Sagebrush Shrubland	311	2.95%	
	Rocky Mountain Lower Montane-Foothill Shrubland	267	2.54%	
	Inter-Mountain Basins Montane Sagebrush Steppe	218	2.07%	
	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	98	0.93%	
	Colorado Plateau Pinyon-Juniper Shrubland	74	0.70%	
	Inter-Mountain Basins Mat Saltbush Shrubland	34	0.32%	
	Inter-Mountain Basins Greasewood Flat	10	0.09%	26.39%
Exotic Herbaceous	Great Basin & Intermountain Introduced Perennial Grassland and Forbland	138	1.31%	
	Interior Western North American Temperate Ruderal Grassland	134	1.27%	
	Great Basin & Intermountain Introduced Annual Grassland	130	1.23%	
	Great Basin & Intermountain Introduced Annual and Biennial Forbland	23	0.22%	4.03%
Exotic Tree-Shrub	Great Basin & Intermountain Ruderal Shrubland	294	2.79%	
	Interior Western North American Temperate Ruderal Shrubland	34	0.32%	3.11%
Grassland	Rocky Mountain Subalpine-Montane Mesic Meadow	39	0.37%	
	Inter-Mountain Basins Semi-Desert Grassland	29	0.27%	
	Southern Rocky Mountain Montane-Subalpine Grassland	16	0.15%	0.79%
Hardwood	Rocky Mountain Aspen Forest and Woodland	1	0.01%	
	Rocky Mountain Bigtooth Maple Ravine Woodland	<1	0.00%	0.01%
Total		**10,541**	**100%**	**100%**

Table 4.4: LANDFIRE Existing Vegetation Type (LC24_EVT_250, 2024) acreage of spring/fall mule deer habitat for WMU 11, Nine Mile.



Map 4.9: Land coverage of fires by year from 1976-2025 for WMU 11, Nine Mile (NIFC Open Data Site: Federal Interagency Wildland Fire Maps and Data for All, 2025; Geosciences and Environmental Change Science Center (GECSC) Outgoing Datasets, 2023).

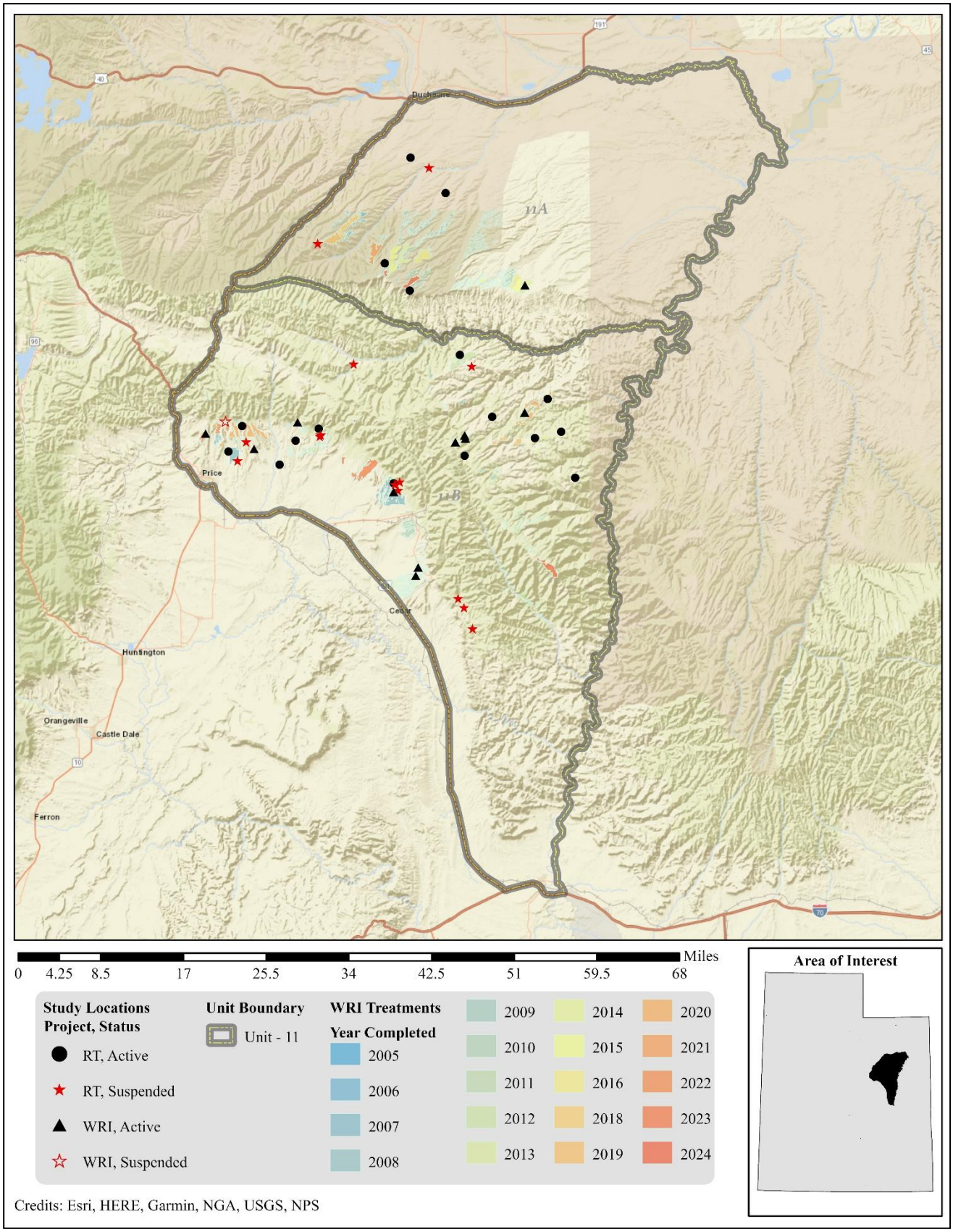
Treatments/Restoration Work

There has been an active effort to address many of the limitations on this unit through the Watershed Restoration Initiative (WRI). A total of 51,312 acres of land has been treated within the Nine Mile 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 44,716 (**Map 4.10**, **Table 4.5**). 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, with bullhog treatments also being frequently used to remove trees. Seeding plants to augment the herbaceous understory is also common, as are herbicide treatments to control undesirable vegetation. Other management practices include (but are not limited to) prescribed fire, aerator treatments, and anchor chaining (**Table 4.5**).

Type	Total Completed Acreage
Vegetation Removal/Hand Crew	**27,907**
Lop & Scatter	26,392
Lop-Pile-Burn	1,514
Bullhog	**11,574**
Full Size	11,278
Skid Steer	296
Seeding (Primary)	**3,129**
Broadcast (Aerial-Fixed Wing)	1,458
Broadcast (Aerial-Helicopter)	881
Ground (Mechanical Application)	487
Drill (Rangeland)	276
Hand Seeding	26
Herbicide Application	**3,300**
Spot Treatment	1,065
Aerial (Fixed-Wing)	926
Aerial (Helicopter)	862
Ground	447
Prescribed Fire	**1,539**
Prescribed Fire	1,323
Pile Burn	216
Aerator	**1,445**
Double Drum (One-Way)	1,445
Anchor Chain	**982**
Ely (Two-Way)	982
Harrow	**717**
> 15 ft. (One-Way)	543
≤ 15 ft. (One-Way)	117
≤ 15 ft. (Two-Way)	57
Bulldozing	**229**
Tree Push	229
Chain Harrow	**166**
≤ 15 ft. (One-Way)	166
Cable	**129**
One-Way	129
Mowing	**107**
Brush Hog	107
Disc	**86**
Off-Set (Two-Way)	86
Planting/Transplanting	**2**
Other	2
Grand Total	**51,312**
***Net Total Land Area Treated**	**44,716**

Table 4.5: WRI treatment action size (acres) of completed projects for WMU 11, Nine Mile. Data accessed on 01/26/2026.
*Does not include overlapping treatments.



Map 4.10: Terrestrial WRI treatments by fiscal year completed for WMU 11, Nine Mile.

Range Trend Studies

Range Trend studies have been sampled within WMU 11 on a regular basis since 1982, with studies being added or suspended as was deemed necessary (**Table 4.6**). 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 4.7**). Range Trend studies are summarized in this report by ecological site.

Study #	Study Name	Project	Status	Years Sampled	Ecological Site Description
11A-01	Upper Cottonwood Ridge	RT	Suspended	1988, 1995	High Mountain Loam (Aspen)
11A-02	Wirefence Canyon	RT	Active	1982, 1988, 1995, 2000, 2005, 2010, 2015, 2020, 2025	Mountain Shallow Loam (Mountain Big Sagebrush)
11A-03	Chokecherry Canyon	RT	Active	1982, 1988, 1995, 2000, 2005, 2010, 2015, 2020, 2025	High Mountain Loam (Mountain Big Sagebrush)
11A-04	Cottonwood Canyon	RT	Active	1988, 1995, 2000, 2005, 2010, 2015, 2021, 2025	Semidesert Silt Loam (Winterfat)
11A-05	Nutter's Canyon	RT	Active	1988, 1995, 2000, 2005, 2010, 2015, 2025	Upland Shallow Loam (Black Sagebrush)
11B-01	Deadman	RT	Active	1986, 1994, 2000, 2005, 2010, 2015, 2020, 2025	Upland Stony Loam (Pinyon-Utah Juniper)
11B-02	Airport Bench	RT	Suspended	1986, 1994, 2000, 2005, 2010, 2015	Semidesert Loam (Wyoming Big Sagebrush)
11B-03	Airport	RT	Suspended	1986, 1994, 2000, 2005, 2010	Semidesert Loam (Wyoming Big Sagebrush)
11B-04	Coal Creek	RT	Active	1986, 1994, 2000, 2005, 2010, 2015, 2020, 2025	Semidesert Loam (Wyoming Big Sagebrush)
11B-05	'B' Canyon	RT	Active	1986, 1994, 2000, 2005, 2010, 2015, 2020, 2025	Upland Shallow Loam (Birchleaf Mountain Mahogany)
11B-06	Upper Cottonwood Ridge	RT	Active	1986, 1994, 2000, 2010, 2015, 2020, 2025	High Mountain Loam (Aspen)
11B-07	Cottonwood	RT	Active	1986, 1994, 2000, 2005, 2010, 2015, 2020, 2025	Upland Loam (Wyoming Big Sagebrush)
11B-08	Cedar Corral	RT	Active	1986, 1994, 2000, 2005, 2010, 2015, 2020, 2025	Mountain Stony Loam (Browse)
11B-09	Cedar Ridge	RT	Active	1986, 1994, 2000, 2005, 2010, 2015, 2020, 2025	Mountain Shallow Loam (Black Sagebrush)
11B-10	Upper Little Park Wash	RT	Suspended	1986, 1994	Upland Loam (Wyoming Big Sagebrush)
11B-11	Little Park Exclosure	RT	Suspended	1986, 1994, 2000	Upland Loam (Wyoming Big Sagebrush)
11B-12	Williams Draw	RT	Suspended	1994	Upland Loam (Birchleaf Mountain Mahogany)
11B-14	Prickly Pear	RT	Suspended	1994, 2000, 2005, 2010, 2015	Upland Loam (Birchleaf Mountain Mahogany)
11B-15	Twin Hollow	RT	Active	1994, 2000, 2005, 2010, 2015, 2020, 2025	Mountain Stony Loam (Browse)
11B-16	Steer Ridge	RT	Active	1994, 2000, 2005, 2010, 2015, 2020, 2025	Mountain Shallow Loam (Mountain Big Sagebrush)
11B-17	Dugout Creek Unchained	RT	Suspended	1997, 2005	Upland Loam (Wyoming Big Sagebrush)
11B-18	Dugout Creek Sagebrush Chaining	RT	Suspended	1997, 2005	Semidesert Loam (Wyoming Big Sagebrush)

Study #	Study Name	Project	Status	Years Sampled	Ecological Site Description
11B-19	Dugout Creek PJ Chained	RT	Active	1997, 2005, 2010, 2015, 2020, 2025	Upland Stony Loam (Pinyon-Utah Juniper)
11B-20	Deadman Creek	RT	Active	2015, 2020, 2025	Semidesert Loam (Wyoming Big Sagebrush)
11B-22	Soldier Creek	RT	Active	2020, 2025	Semidesert Loam (Wyoming Big Sagebrush)
11R-01	Sowers	RT	Suspended	1997	Semidesert Alkali Loam (Black Greasewood/Wyoming Big Sagebrush)
11R-05	East Carbon Burn 1	RT	Suspended	1997	Upland Shallow Loam (Birchleaf Mountain Mahogany)
11R-06	East Carbon Burn 2	RT	Suspended	1997, 2000, 2005	Upland Shallow Loam (Birchleaf Mountain Mahogany)
11R-07	East Carbon Burn 3	RT	Suspended	1997, 2000, 2005	Upland Shallow Loam (Birchleaf Mountain Mahogany)
11R-08	Nine Mile 1	RT	Suspended	1997	Mountain Loam (Mountain Big Sagebrush)
11R-09	East Carbon Bullhog	WRI	Active	2006, 2010, 2014, 2018, 2023	Upland Shallow Loam (Birchleaf Mountain Mahogany)
11R-10	West Coal Creek Bullhog	WRI	Active	2007, 2009, 2013, 2017, 2022	Upland Shallow Loam (Black Sagebrush)
11R-11	West Coal Creek Reference	WRI	Suspended	2009	Not Verified
11R-12	Burnt Cabin Spring	WRI	Active	2012, 2016, 2022, 2025	High Mountain Loam (Aspen)
11R-13	Horse Canyon	WRI	Active	2012, 2015, 2018, 2023	Upland Shallow Loam (Birchleaf Mountain Mahogany)
11R-14	Horse Canyon 2	WRI	Active	2012, 2015, 2018, 2025	Upland Loam (Mountain Big Sagebrush-Indian Ricegrass)
11R-15	Big Wash	WRI	Active	2013, 2016, 2021	Upland Shallow Loam (Wyoming Big Sagebrush)
11R-16	Cold Springs WMA	WRI	Active	2013, 2016, 2022, 2025	High Mountain Loam (Aspen)
11R-17	Dugout	WRI	Active	2013, 2016, 2021	Upland Shallow Loam (Birchleaf Mountain Mahogany)
11R-18	Cottonwood Ridge	WRI	Active	2015, 2018, 2025	Mountain Shallow Loam (Black Sagebrush)
11R-19	Knap Bench	WRI	Active	2019, 2022	Upland Shallow Loam (Birchleaf Mountain Mahogany)
11R-20	Flat Iron Mesa	WRI	Active	2019, 2022, 2024	High Mountain Loam (Aspen)
11R-21	Stone Cabin Gas Field	WRI	Active	2021, 2025	Mountain Loam (Mountain Big Sagebrush)

Table 4.6: Range Trend and WRI project studies monitoring history and ecological site potential for WMU 11, Nine Mile.

Study #	Study Name	Type	Disturbance Name (If Available)	Date	Acres	WRI Project #
11A-02	Wirefence Canyon	Plow Seed Unknown		1958-1959 1958-1959	2,363 2,363	
11A-03	Chokecherry Canyon	Prescribed Fire Prescribed Fire	 Anthro-Mountain Prescribed Burn	1977 Fall 2007	500 642	 841
11B-01	Deadman	Chain Unknown Seed Unknown Aerial Before Bullhog Lop and Scatter	Coal Creek Seeding 1 1964 Coal Creek Seeding 1 1964 West Coal Creek West Coal Creek Miller Creek Watershed Restoration 2.0	July 1964-January 1965 July 1964-January 1965 August 2007 and December 2007 Fall 2007 and Spring 2008 May-June 2020	1,041 1,041 1,868 1,868 2,816	2526* 2526* 847 847 4734
11B-02	Airport Bench	Seeding Chain Unknown Prescribed Fire Lop and Scatter Aerial Seeding	Coal Creek Seeding 31 1964 Coal Creek Seeding 31 1964 East Coal Creek Fuels Treatment Reseeding	July 1964-January1965 July 1964-January1965 May 2005 2005 February 2009	840 840 725	2529 2529 1397

Study #	Study Name	Type	Disturbance Name (If Available)	Date	Acres	WRI Project #
		Lop and Scatter	Miller Creek Watershed Restoration 2.0	May-June 2020	2,816	
11B-03	Airport	Chain Unknown		1965-1966		
		Rangeland Drill		1965-1966		
		Aerial After	Price West Benches (Year 2) (Consumers) (Airport)	March 2005	2,658	228
11B-04	Coal Creek	Lop and Scatter	Carbon and Emery County Habitat Restoration and Maintenance (Proposed)	2025	5,824	6706
11B-05	'B' Canyon	Two-Way Chain Unknown	Mud Springs Chaining and Seeding 8 1966	1966	3,822	7826*
		Seed Unknown	Mud Springs Chaining and Seeding 8 1966	1966	3,822	7826*
		Wildfire	East Carbon	1996	1,094	
		Aerial Seeding	East Carbon Fire Rehabilitation 1996	1996	321	3763*
		Chain Unknown	East Carbon Fire Rehabilitation 1996	1996	321	3763*
		Dribbler	East Carbon Fire Rehabilitation 1996	1996	321	3763*
11B-07	Cottonwood	Lop and Scatter	Cottonwood Ridge PJ Removal	July 2015-July 2016	1,019	3267
		Lop-Pile-Burn	Cottonwood Ridge Maintenance	May-June 2020	372	5404
		Aerial After	Cottonwood Ridge Maintenance	Fall 2020	487	5404
11B-08	Cedar Corral	Aerial Before	Bishop Ridge Pinyon and Juniper Removal	December 2015	490	3448
		Lop and Scatter	Bishop Ridge Pinyon and Juniper Removal	November 2015-January 2016	224	3448
11B-14	Prickly Pear	Chain Unknown		Mid 1970s		
		Seed Unknown		Mid 1970s		
11B-17	Dugout Creek Unchained	Aerial Before	Dugout Creek Pinyon/Juniper Removal	November 2010	208	1881
		Bullhog	Dugout Creek Pinyon/Juniper Removal	November 2010-February 2011	208	1881
		Aerial After	Dugout Creek Pinyon/Juniper Removal	February 2011	208	1881
11B-18	Dugout Creek Sagebrush Chaining	Chaining Unknown		1995		
		Aerial Before	Dugout Creek Pinyon/Juniper Removal	November 2010	208	1881
		Bullhog	Dugout Creek Pinyon/Juniper Removal	November 2010-February 2011	208	1881
		Aerial After	Dugout Creek Pinyon/Juniper Removal	February 2011	208	1881
11B-19	Dugout Creek PJ Chained	Aerial Before	Anadarko Mitigation Project 1995	October 1995	160	174*
		Chain Two-Way	Anadarko Mitigation Project 1995	October 1995	160	174*
		Dribbler	Anadarko Mitigation Project 1995	October 1995	160	174*
		Lop and Scatter	Dugout Creek Fuels Reduction and Habitat Restoration: Phase II	May-September 2011	162	1935
		Lop and Scatter	Carbon and Emery County Habitat Restoration and Maintenance (Proposed)	2025	5,824	6706
11R-09	East Carbon Bullhog	Wildfire	East Carbon	1996	1,130	
		Bullhog	East Carbon Phase II	December 2006	1,953	510
11R-10	West Coal Creek Bullhog	Seed Unknown	Woodhill PJ Control and Seeding	1966-1967		
		Two-Way Chain Unknown	Woodhill PJ Control and Seeding	1966-1967		
		Aerial Before	West Coal Creek	August and December 2007	1,868	847
		Bullhog	West Coal Creek	Fall 2007 and Spring 2008	1,868	847
		Lop and Scatter	Miller Creek Restoration 4.0	Summer 2021-July 2022	1,751	5635
11R-11	West Coal Creek Reference	Two-Way	Coal Creek Seeding 2 1964	July 1964-January 1965	1,030	2527*
		Aerial Seeding	Coal Creek Seeding 2 1964	July 1964-January 1965	966	2527*
11R-12	Burnt Cabin Spring	Prescribed	Cold Spring Aspen Enhancement Phase 2: Tavaputs Ranch	2015	191	1932
		Push	Cold Springs WMA Conifer Removal Aspen Regeneration Phase VI	October 2019-July 2020	129	4840
11R-13	Horse Canyon	Aerial Before	Horse Canyon Juniper Removal and Seeding	Fall 1963	920	LTDL
		Two-Way Chain Unknown	Horse Canyon Juniper Removal and Seeding	Fall 1963	920	LTDL
		Aerial Before	Horse Canyon Fuel Reduction and Habitat Restoration - Phase I	Fall 2012	1,173	2238
		Bullhog	Horse Canyon Fuel Reduction and Habitat Restoration - Phase I	Fall 2012	1,173	2238

Study #	Study Name	Type	Disturbance Name (If Available)	Date	Acres	WRI Project #
11R-14	Horse Canyon 2	Lop and Scatter	Horse Canyon Fuel Reduction and Habitat Restoration	August-December 2012	447	2238
11R-15	Big Wash		Big Wash Chaining Seeding	November 1966-May 1967	6,008	973*
		Two-Way	Big Wash Chaining 1966	November 1966-May 1967	6,008	973*
		Bullhog	Anthro Mountain P-J Treatment	January 2014	403	2465
11R-16	Cold Springs WMA	Push	Cold Springs Conifer Removal/Aspen Regeneration Phase II	July 2013-June 2014	45	2637
11R-17	Dugout	Aerial Before	Dugout Creek Fuels Reduction and Habitat Restoration: Phase III	Fall 2013	395	2540
		Bullhog	Dugout Creek Fuels Reduction and Habitat Restoration: Phase III	Fall 2013	395	2540
11R-18	Cottonwood Ridge	Aerial Before	Cottonwood Ridge PJ Removal	October 2015-January 2016	1,048	3267
		Bullhog	Cottonwood Ridge PJ Removal	October 2015-January 2016	1,048	3267
		Aerial After	Cottonwood Ridge PJ Removal	January 2016-July 2017	1,048	3267
		Plateau/2,4-D	Cottonwood Ridge Maintenance	Fall 2020	1048	5404
11R-19	Knap Bench	Aerial	Coal Creek Seeding 58 1966	September 1966-January 1967	934	
		Prescribed	East Coal Creek Fuels Treatment 2002	October 2004 - May 2005	743	
		Hand Planter	Miller Creek Watershed Restoration 4.0	Fall-Winter 2020	58	4734
11R-20	Flat Iron Mesa	Push	Cold Springs WMA Conifer Removal Aspen Regeneration Phase VI	Fall 2019	129	4840
		Slash Pile	Upper Price River Watershed	November 2022	304	6043

Table 4.7: Range Trend and WRI studies known disturbance history for WMU 11, Nine Mile. 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 2025 sample year:

- Mountain (Aspen) - Upper Cottonwood Ridge (11A-01) (suspended) and Upper Cottonwood Ridge (11B-06)
    - (**Figure 4.12**, **Figure 4.16**, **Figure 4.20**, **Figure 4.24**, **Figure 4.29**, **Figure 4.34**, **Figure 4.38**, **Figure 4.42**)
- Mountain (Black/Low Sagebrush) - Cedar Ridge (11B-09)
    - (**Figure 4.13**, **Figure 4.15**, **Figure 4.19**, **Figure 4.26**, **Figure 4.31**, **Figure 4.33**, **Figure 4.37**, **Figure 4.41**)
- Upland (Big Sagebrush) - Cottonwood (11B-07), Upper Little Park Wash (11B-10) (suspended), Little Park Exclosure (11B-11) (suspended), and Dugout Creek Unchained (11B-17) (suspended)
    - (**Figure 4.10**, **Figure 4.17**, **Figure 4.21**, **Figure 4.23**, **Figure 4.28**, **Figure 4.35**, **Figure 4.39**, **Figure 4.43**)
- Upland (Black/Low Sagebrush) - Nutter's Canyon (11A-05)
    - (**Figure 4.13**, **Figure 4.17**, **Figure 4.21**, **Figure 4.26**, **Figure 4.31**, **Figure 4.35**, **Figure 4.39**, **Figure 4.43**)
- Semidesert (Winterfat) - Cottonwood Canyon (11A-04)
    - (**Figure 4.14**, **Figure 4.18**, **Figure 4.22**, **Figure 4.27**, **Figure 4.32**, **Figure 4.36**, **Figure 4.40**, **Figure 4.44**)

Trend summaries and/or additional data for these ecotypes are available in the corresponding site reports (Lane, Payne, & Cox, 2026).

Mountain (Big Sagebrush)

There are four studies [Wirefence Canyon (11A-02), Chokecherry Canyon (11A-03), Steer Ridge (11B-16), and Stone Cabin Gas Field (11R-21)] that are classified as Mountain (Big Sagebrush) ecological sites. The Wirefence Canyon study is found in the southern portion of Wire Fence Canyon near the southwestern rim of the West Tavaputs Plateau. The Chokecherry Canyon site is found on the southwest rim of the West Tavaputs Plateau just above the Badland Cliffs, and the Steer Ridge study is located on top of Steer Ridge. Finally, the Stone Cabin Gas Field site can be found in Stone Cabin Gas Field and roughly two miles northeast of the head of Harmon Canyon.

When discussing 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. Wirefence Canyon, Chokecherry Canyon, and Steer Ridge provided data for the entire reported sample period. The Stone Cabin Gas Field, however, was established in 2020 and only contributed data in 2020 and 2025.

Shrubs/Trees: Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has been a dominant preferred browse species on all four study sites, although antelope bitterbrush (*Purshia tridenta*) has been co-dominant on the Steer Ridge study. Total average shrub cover has fluctuated from year to year, but it has slightly decreased overall between 2005 and 2025 (**Figure 4.10**). This net decrease in total shrub cover can primarily be attributed to a decrease in preferred browse cover other than sagebrush on the Steer Ridge study. When comparing 1994 data with that from 2025, average preferred browse density has remained stable. However, year-to-year fluctuations have occurred. More specifically, there was a substantial increase in average preferred browse density between 2005 and 2010, largely due to an increase in recruitment of young plants; density of young individuals has decreased in subsequent sample years. Mature plants have been the dominant demographic within these populations in all reported sample years except 2010. Average decadence within these populations has displayed a net increase, but it remains proportionally low as of 2025 (**Figure 4.23**). Average preferred browse utilization has varied between sample years, but it has increased overall. In 2025,

18% of preferred browse plants sampled in density strips were moderately hedged and 44% were heavily utilized (**Figure 4.28**).

Trees have not contributed cover on these sites in any sample year (**Figure 4.15**). Twoneedle pinyon (*Pinus edulis*) and/or Utah juniper (*Juniperus osteosperma*) have been observed in point-quarter density data on the Stone Cabin Gas Field site since 2020 and on Steer Ridge and Chokecherry Canyon sites for the first time in 2025. However, average tree density is very low as of the most recent sample year. Furthermore, average density decreased between 2020 and 2025 (**Figure 4.19**): this can primarily be attributed to a 2023 lop and scatter on the Stone Cabin Gas Field study.

Herbaceous Understory: The herbaceous understories of these study sites have remained dominated by perennial grass. Mainly native species such as bluebunch wheatgrass (*Pseudoroegneria spicata*), needle and thread (*Hesperostipa comata*), and thickspike wheatgrass (*Elymus lanceolatus*) have provided most of the perennial grass cover on the Chokecherry Canyon and Steer Ridge studies. Perennial grasses on the Wirefence Canyon site, however, have been dominated by the introduced species smooth brome (*Bromus inermis*) since 1994. In addition, the introduced perennial grass species crested wheatgrass (*Agropyron cristatum*) has been the dominant grass species on the Stone Cabin Gas Field study. Total average herbaceous cover has decreased each sample year since 2015, but it has remained similar when comparing 1994 with 2025 data. Average nested frequency has fluctuated between sample years, but it has exhibited a net decrease over the study period primarily due to perennial and annual forbs. The introduced annual grass species cheatgrass (*Bromus tectorum*) has been observed on the Steer Ridge and Stone Cabin Gas Field studies but cover and frequency have remained low. Perennial forbs have generally contributed moderate cover, and annual forbs have remained rare in comparison with their perennial counterparts (**Figure 4.33**, **Figure 4.37**).

Occupancy: Average pellet transect data shows an overall decreasing trend in animal presence and indicates that elk have been the primary occupants. Mean abundance of elk pellet groups has ranged from 21 days use/acre in 2015 to 62 days use/acre in 2000. Deer pellet groups have also been observed, with a mean abundance as low as 10.5 days use/acre in 2000 and as high as 29 days use/acre in 2005. Average abundance of cattle pellet groups has fluctuated between 0.7 days use/acre in 2015 and 18 days use/acre in 2025. Finally, horse pellet groups were observed in 2020 with an average abundance of 0.1 days use/acre, but they were absent in all other reported sample years (**Figure 4.41**).

Mountain (Browse)

Two studies [Cedar Corral (11B-08) and Twin Hollow (11B-15)] are classified as Mountain (Browse) ecological sites. The Cedar Corral study is located on Cedar Ridge above Cedar Corral Canyon, and the Twin Hollow study is found at the southeastern edge of Twin Hollow.

Shrubs/Trees: Mixed mountain brush species such as Utah serviceberry (*Amelanchier utahensis*) and mountain mahogany (*Cercocarpus montanus*) have dominated the preferred browse components of these study sites. However, other preferred browse species such as mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), antelope bitterbrush (*Purshia tridentata*), and mountain snowberry (*Symphoricarpos oreophilus*) have also contributed notable cover throughout the reported study period. Total average shrub cover increased between 2005 and 2020, but it decreased in 2025 due to preferred browse other than serviceberry-mahogany. Although total average shrub cover decreased between the two most recent reported years, it has increased overall when 2025 data is compared with that from 2005 (**Figure 4.11**). Average preferred browse demographics show that total density has fluctuated from year to year, but it has exhibited a slight net decrease over the sample period. Mature plants have been the dominant demographic in these populations in all reported study years. Decadence has displayed a net increase, but recruitment of young plants has also increased (albeit to a lesser amount) when comparing 1994 with 2025 data (**Figure 4.25**). Average utilization of preferred browse has exhibited a net increase, but the percentage of plants sampled in density strips that were moderately or heavily hedged has remained below 50% throughout the reported sample period. More specifically, 21% of preferred browse plants were moderately hedged and 21% were heavily utilized in 2025 (**Figure 4.30**).

Twoneedle pinyon (*Pinus edulis*), Utah juniper (*Juniperus osteosperma*), and/or Rocky Mountain juniper (*J. scopulorum*) have been observed on these study sites throughout the reported sample period. However, line-intercept cover for trees has only been observed on (and thus cover trends are driven by) the Cedar Corral site. Both average cover and density have decreased overall, with a notable decrease in both values between 2015 and 2020. These decreases in cover and density can be attributed to a 2015/16 seeding and lop and scatter project on Cedar Corral. Average tree density is moderate as of 2025, but it did increase between the two most recent sample years. This increase in density occurred on both studies but was larger on the Cedar Corral site. As such, infilling or further encroachment will likely continue over time (**Figure 4.15**, **Figure 4.19**).

Herbaceous Understory: The herbaceous understories on these sites have remained (co-)dominated by primarily native perennial grasses and/or forbs throughout the reported study period. Total herbaceous cover displayed a generally increasing trend through the 2020 sample year but decreased in 2025. This decrease in total average herbaceous cover between the two most recent sample years can be attributed to perennial forbs and to a lesser extent perennial grass, particularly on the Twin Hollow study. Average nested frequency has exhibited less drastic yearly variation than cover, but it has decreased overall when comparing 1994 data with that from 2025. The introduced annual grass species cheatgrass (*Bromus tectorum*) has been observed on the Cedar Corral site since 2005 but with low cover and abundance. Annual forbs have remained rare (**Figure 4.33**, **Figure 4.37**).

Occupancy: Average pellet transect data indicates that occupancy of these sites decreased each year between 2000 and 2015 but has increased in subsequent years. This data also suggests that primary occupancy has varied over the study period. Elk were the main occupants in 2000, 2005, and 2025, and mean abundance of pellet groups has ranged from 0.7 days use/acre in 2015 to 39 days use/acre in 2000. Deer were the primary occupants in 2010 and 2015 and have had a mean pellet group abundance as low as 4 days use/acre in 2005 and as high as 16 days use/acre in 2010. Horses were the main occupants in 2020, with an average pellet group abundance fluctuating between 2 days use/acre in 2010 and as high as 18 days use/acre in 2025. Finally, cattle have been present on these sites with a mean pellet group abundance as high as 4 days use/acre in 2015. However, cattle pellet groups were not observed in 2000 or 2020 (**Figure 4.41**).

Upland (Pinyon-Juniper)

There are two studies [Deadman (11B-01) and Dugout Creek PJ Chained (11B-19)] classified as Upland (Pinyon-Juniper) ecological sites. The Deadman study is located northeast of Price City. The Dugout Creek PJ Chained study is located west of Dugout 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. The Dugout Creek PJ Chained study has provided data in all reported sample years except 2000, while Deadman has contributed data spanning the entire sample period since 1994.

Shrubs/Trees: Rubber rabbitbrush (*Ericameria nauseosa* ssp. *nauseosa* var. *hololeuca*) dominates the preferred browse component on the Deadman study, while black sagebrush (*Artemisia nova*) is the dominant preferred browse species on the Dugout Creek PJ Chained site. Total average shrub cover has increased each sample year, driven by both black sagebrush on Dugout Creek PJ Chained and other preferred browse on the Deadman study (**Figure 4.13**). Average preferred browse density has exhibited a net increase between 1994 and 2025. Mature plants have been the dominant demographic in these populations throughout the reported study period over the reported study period. Decadence remains comparatively low as of 2025 despite having increased over time. Recruitment of young plants increased between 2000 and 2015, but it has decreased in subsequent years (**Figure 4.26**). Yearly fluctuations have been displayed by average preferred browse utilization data, but more than half of preferred browse plants sampled in density strips have been moderately or heavily hedged in 2000, 2015, and 2025. More specifically, 39% of plants were moderately browsed and 20% were heavily hedged in 2025 (**Figure 4.31**).

Twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) have been observed on both study sites in all sample years, and both cover and density have displayed net decreases. The notable decrease that occurred between 2005 and 2010 in particular can be attributed to a 2007/2008 bullhog treatment on the Deadman site. The Dugout Creek PJ Chained study also underwent a tree-removal treatment in 2011, driving the smaller decrease in average tree cover observed between 2010 and 2015. Both average cover and density have increased following treatment, indicating that infilling is occurring. However, a maintenance lop and scatter project is planned for the Dugout Creek PJ Chained study and the same occurred on the Deadman site in 2020 (**Figure 4.17**, **Figure 4.21**).

Herbaceous Understory: Total average nested frequency and cover of herbaceous species has fluctuated from year to year, but it has remained similar when comparing 1994 data with that from 2025. Perennial grasses have been a dominant component of these herbaceous understories in many sample years. The introduced annual grass species cheatgrass (*Bromus tectorum*) has been observed on both study sites; average cover and nested frequency of annual grasses have increased overall. Although annual grasses decreased between 2020 and 2025, they have been a dominant or co-dominant herbaceous component since 2015. Furthermore, annual grasses have been a large driver of the net increases in herbaceous cover and frequency. Both average abundance and cover of perennial forbs have decreased over time, and they have remained comparatively rare since 2015. Annual forbs have fluctuated, but they provided little cover in 2025 (**Figure 4.36**, **Figure 4.40**).

Occupancy: Pellet transect data shows that average animal presence has increased overall and that deer have been the primary occupants throughout the reported study period; the notable increase between 2020 and 2025 can be attributed to deer on the Deadman study. Mean abundance of deer pellet groups has ranged between 19 days use/acre in 2000 and 96.5 days use/acre in 2025. Elk pellet groups have had an average abundance as low as 0 days use/acre in 2000 and as high as 16 days use/acre in 2010. Finally, mean abundance of cattle pellet groups has fluctuated between 2.5 days use/acre in 2015 and 4 days use/acre in 2005 and 2020 (**Figure 4.44**).

Semidesert (Big Sagebrush)

Six study sites [Airport Bench (11B-02) (suspended), Airport (11B-03) (suspended), Coal Creek (11B-04), Dugout Creek Sagebrush Chaining (11B-18) (suspended), Deadman Creek (11B-20), and Soldier Creek (11B-22)] are classified as Semidesert (Big Sagebrush) ecological sites. The Airport Bench study is located approximately two miles northeast of Carbon County Regional Airport, while the Airport site is situated just east of the end of the runway at the same airport. Coal Creek is situated adjacent to Coal Creek and west of Soldier Creek. The Dugout Creek Sagebrush Chaining site is found just east of Fish Creek Road and less than a mile south of the Dugout Creek PJ Chained study. The Deadman Creek study is found just north of Deadman Creek. Finally, the Soldier Creek site is found nearly due east of Anderson Reservoir.

When discussing 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. The Airport Bench study provided data from 1994 through the 2015 sample year, while Airport contributed data between 1994 and 2010. The Dugout Creek Sagebrush Chaining site provided data in 1994 and 2005. The Deadman Creek study has contributed data since its establishment in 2015, and Soldier Creek has done the same since 2020. Finally, Coal Creek has a dataset spanning the entire reported sample period.

Shrubs/Trees: Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) has dominated the preferred browse components on most of these study sites. However, mountain big sagebrush (*A. tridentata* ssp. *vaseyana*) has dominated the Soldier Creek study, while fourwing saltbush (*Atriplex canescens*) and Mormon tea (*Ephedra viridis*) provided most of the preferred browse cover on the Airport Bench site until the study was suspended following the 2015 year. Sagebrush drives the average shrub cover trend of these sites, which exhibited an overall increase between 2005 and 2025. Site-level data reveals that the substantial increase between 2015 and 2020 can be attributed to the suspension of the Airport Bench study (which had a depleted browse component) and the establishment of the Soldier Creek site (on which sagebrush has contributed notable cover) (**Figure 4.10**). Average preferred browse demographics show that density has increased both overall and in each sample year since 2015; again, the suspension of the Airport Bench study and

establishment of Soldier Creek influence the increase between 2015 and 2020. Mature individuals have been the main demographic of these preferred browse populations throughout the reported study period. Furthermore, the increase in total preferred browse density between 2020 and 2025 can be attributed to increases in mature plants on all three study sites sampled in those years. Decadence has displayed a net increase. Recruitment of young plants has decreased, with the decrease between the two most recent sample years mainly being driven by the Coal Creek site and to a lesser extent the Soldier Creek study (**Figure 4.23**). The average percentage of percentage of plants sampled in density strips that were moderately or heavily hedged has remained below 50% in most sample years. However, 75% of plants were moderately or heavily utilized in 2015, while 34% and 20% of plants were moderately and heavily browsed (respectively) in 2025 (**Figure 4.28**).

Utah juniper (*Juniperus osteosperma*) and/or twoneedle pinyon (*Pinus edulis*) are the tree species that have been present on these study sites. Cover has remained low, but it has increased overall; the increase between 2015 and 2020 was mainly influenced by the establishment of the Soldier Creek study (**Figure 4.18**). Average tree density has increased since 2015, but it has displayed a net decrease between 2005 and 2025 (**Figure 4.22**). These density trends can also be largely attributed to the suspension and establishment of various study sites over the sample period.

Herbaceous Understory: The herbaceous understories of these studies have fluctuated from year to year. Average total herbaceous cover and frequency have decreased overall. More specifically, the decrease in both values between 2015 and 2020 was primarily influenced by the same drivers of shrub cover trends during that period. Perennial grass has contributed much of the average herbaceous cover in most sample years. However, total average herbaceous cover is low as of 2025. Annual grasses and perennial forbs have remained rare throughout the reported study period. Annual forb frequency and cover have generally remained low to moderate (**Figure 4.36**, **Figure 4.40**).

Occupancy: Average pellet transect data shows a net increase in animal presence between 2000 and 2025, but presence has decreased when comparing 2020 data with that from 2025. Deer have been the primary occupants of these study sites throughout the reported sample period, and mean pellet group abundance has ranged from 17 days use/acre in 2010 to 87 days use/acre in 2020. Elk had a mean pellet group abundance as low as 0 days use/acre in 2000 and 2025 and as high as 11 days use/acre in 2010. Finally, cattle pellet groups have fluctuated between 0.2 days use/acre in 2020 and 6 days use/acre in 2005 (**Figure 4.44**).

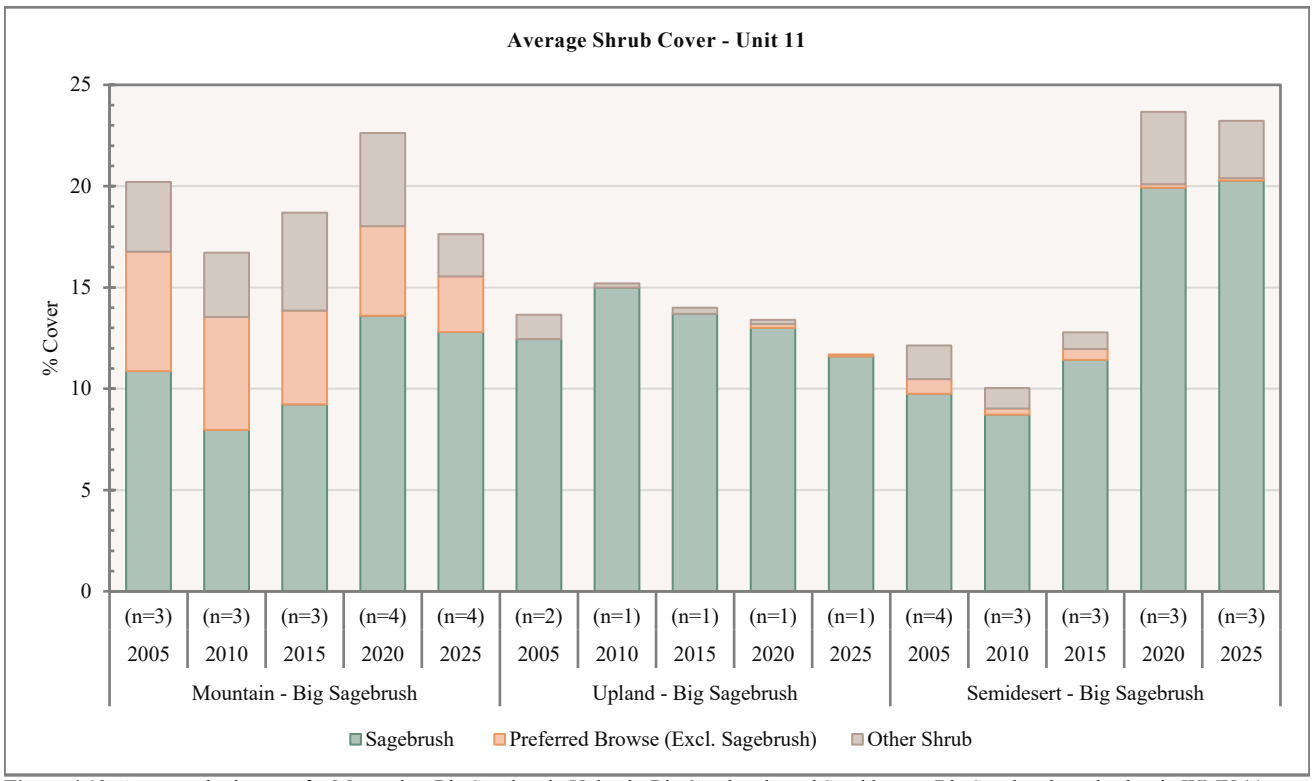


Figure 4.10: Average shrub cover for Mountain - Big Sagebrush, Upland - Big Sagebrush, and Semidesert - Big Sagebrush study sites in WMU 11, Nine Mile.

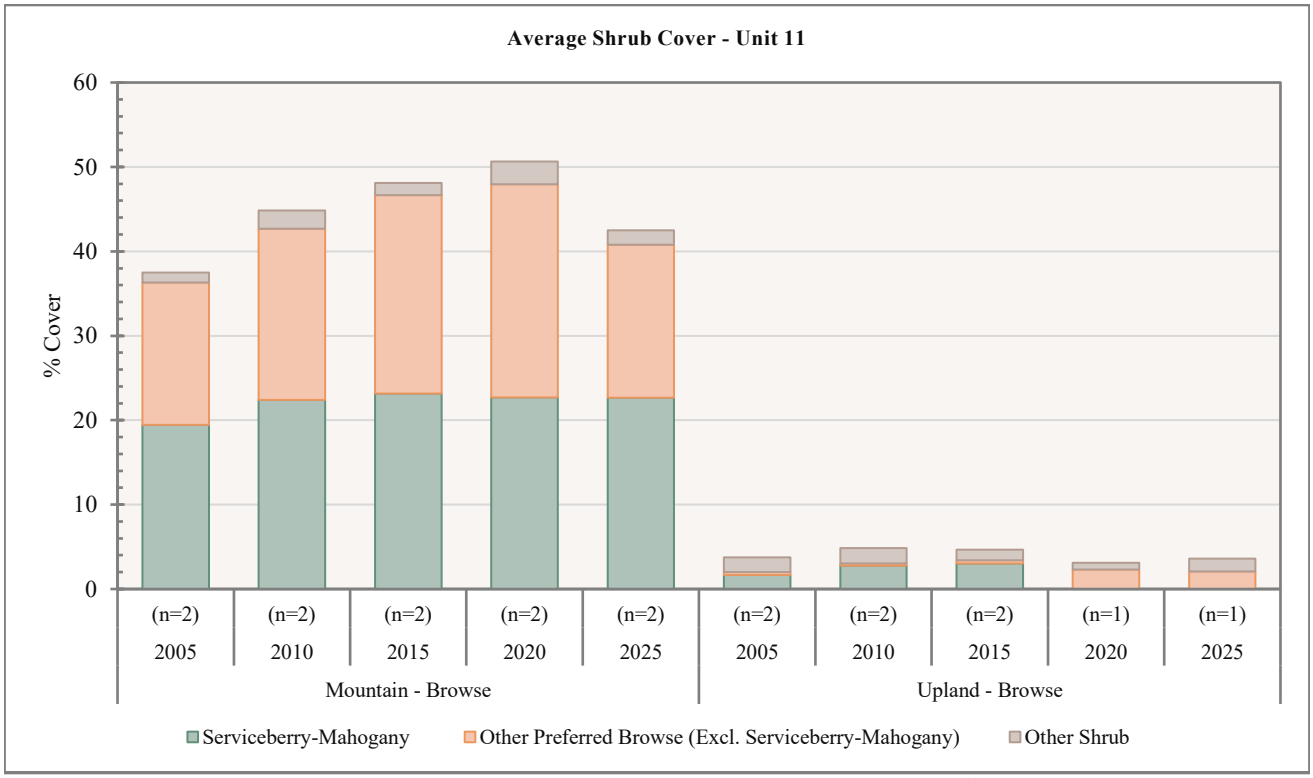


Figure 4.11: Average shrub cover for Mountain - Browse and Upland - Browse study sites in WMU 11, Nine Mile.

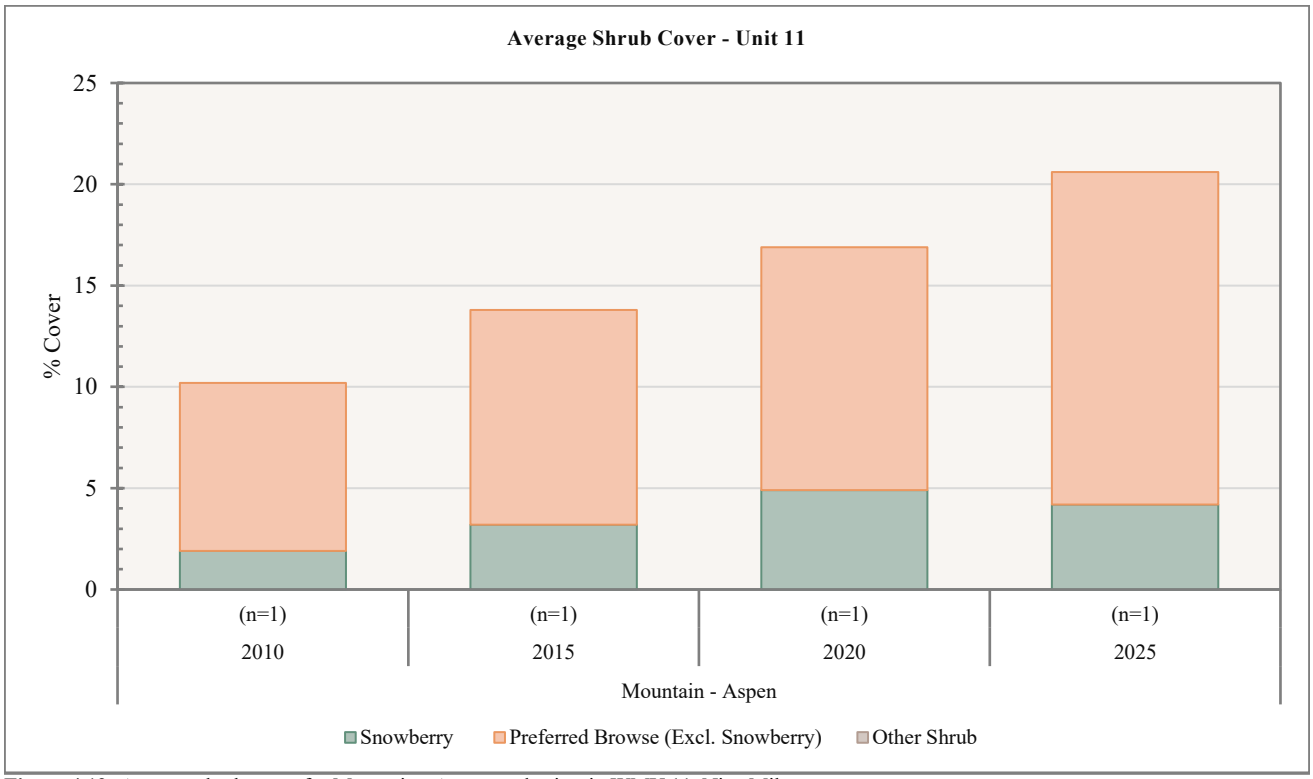


Figure 4.12: Average shrub cover for Mountain - Aspen study sites in WMU 11, Nine Mile.

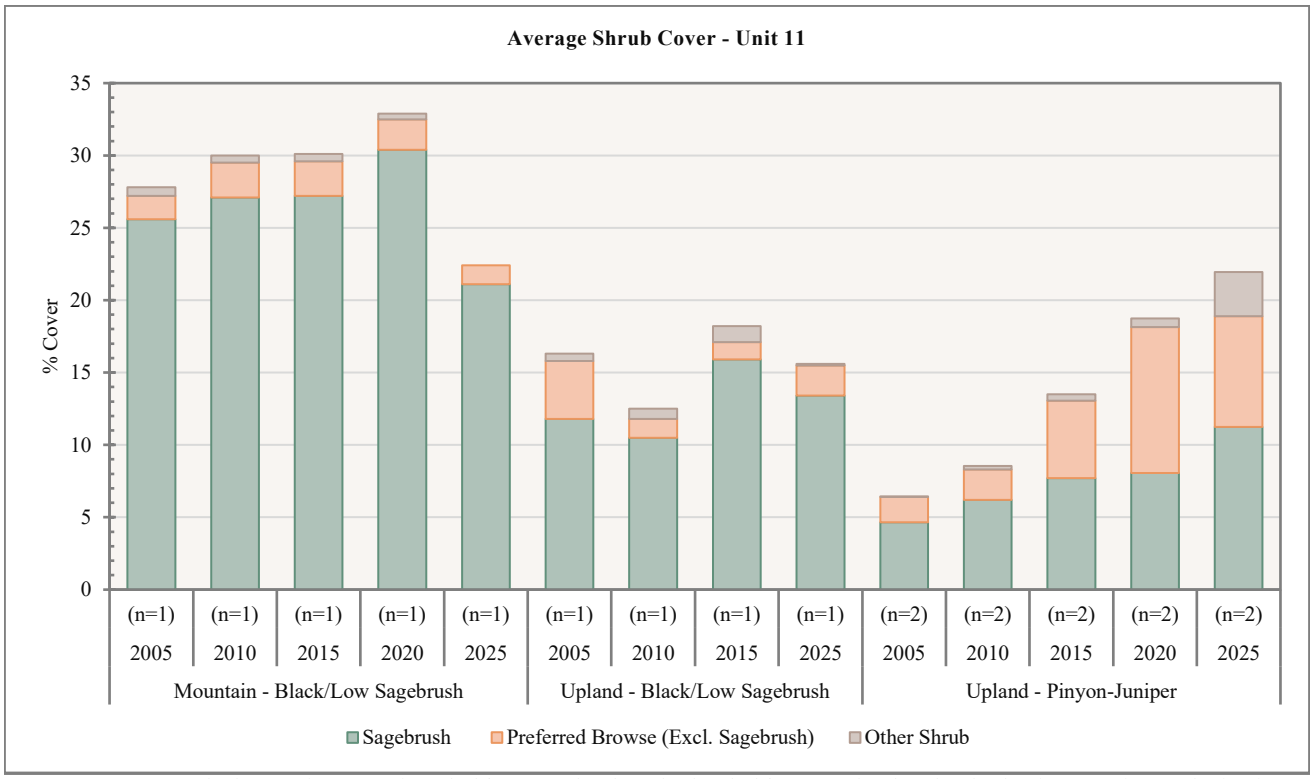


Figure 4.13: Average shrub cover for Mountain - Black/Low Sagebrush, Upland - Black/Low Sagebrush and Upland - Pinyon-Juniper study sites in WMU 11, Nine Mile.

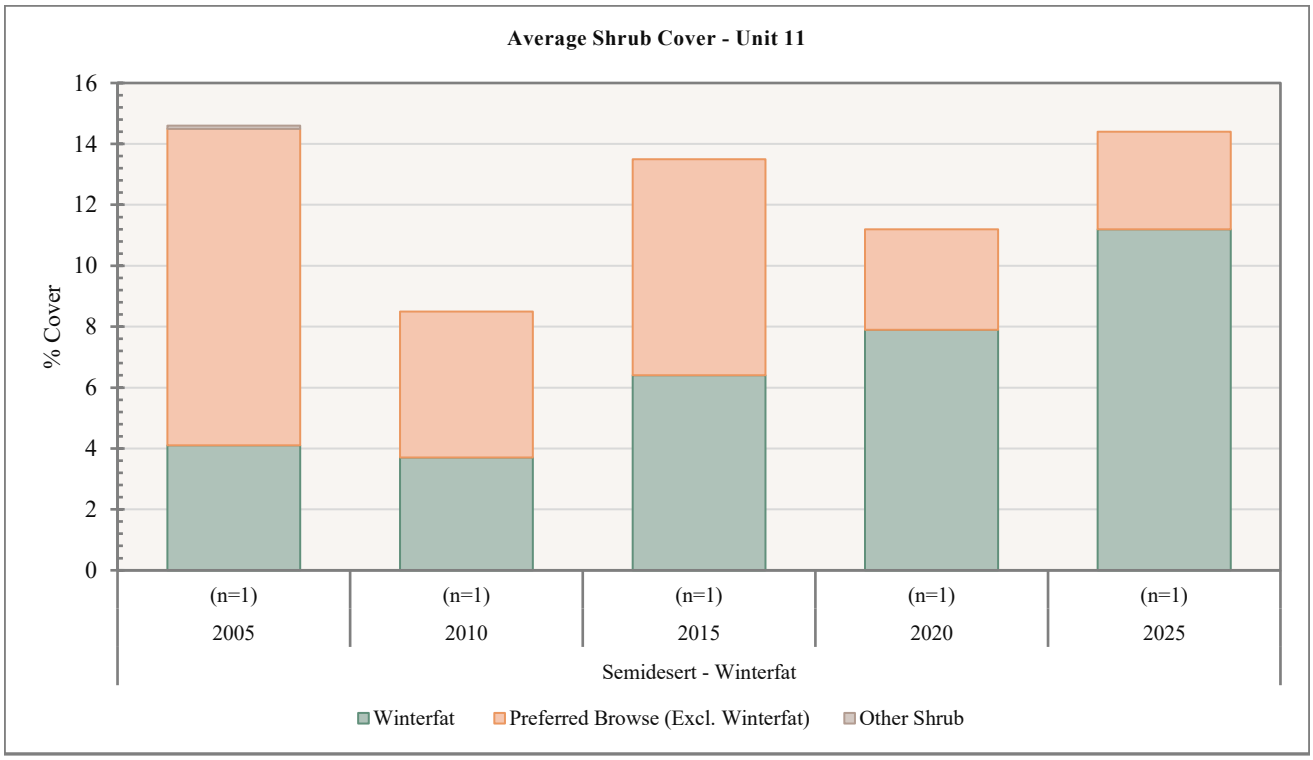


Figure 4.14: Average shrub cover for Semidesert - Winterfat study sites in WMU 11, Nine Mile.

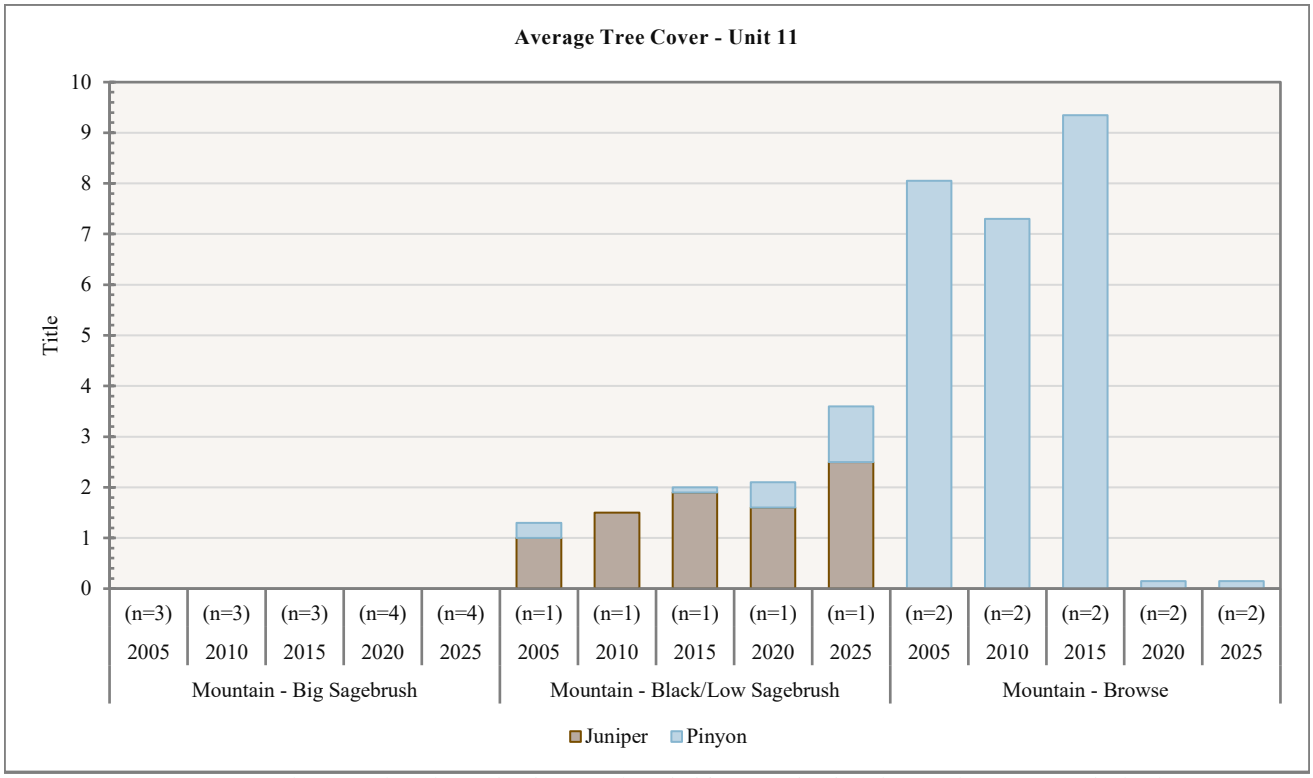


Figure 4.15: Average tree cover for Mountain - Big Sagebrush, Mountain - Black/Low Sagebrush, and Mountain - Browse study sites in WMU 11, Nine Mile.

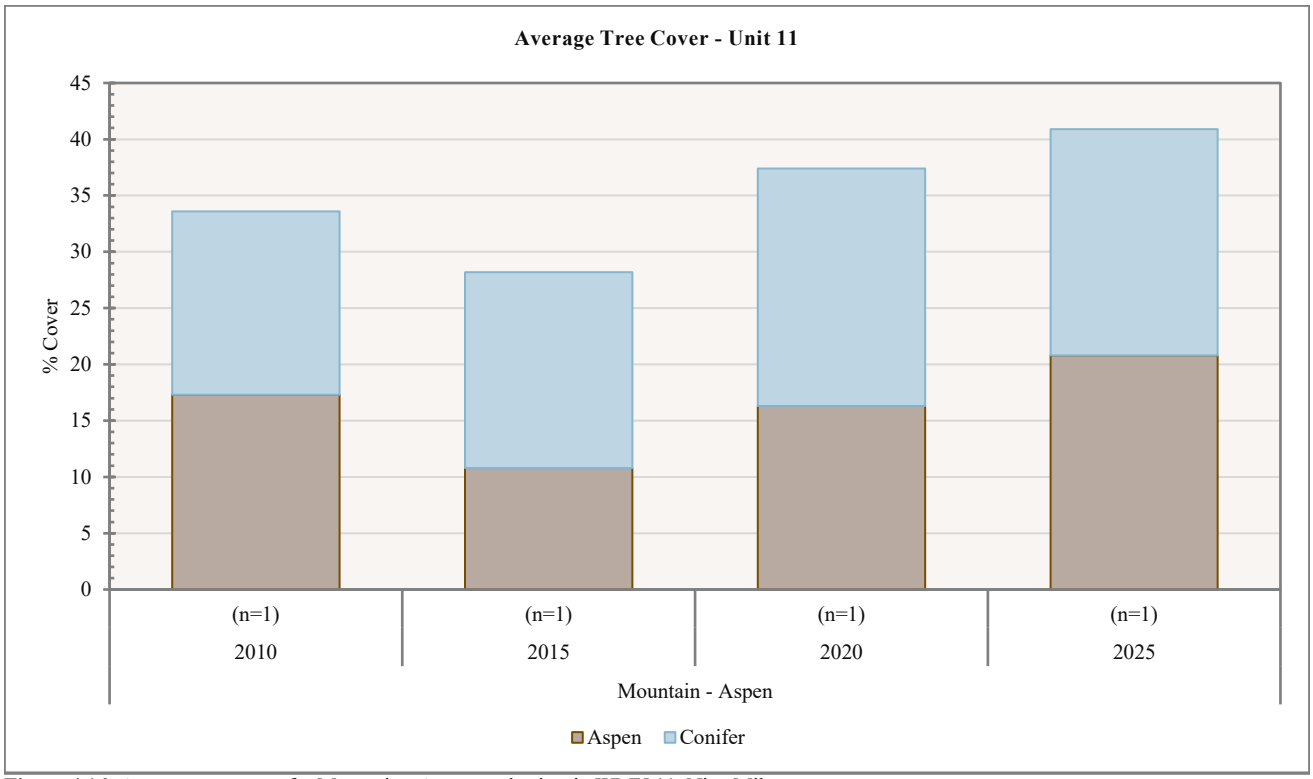


Figure 4.16: Average tree cover for Mountain - Aspen study sites in WMU 11, Nine Mile.

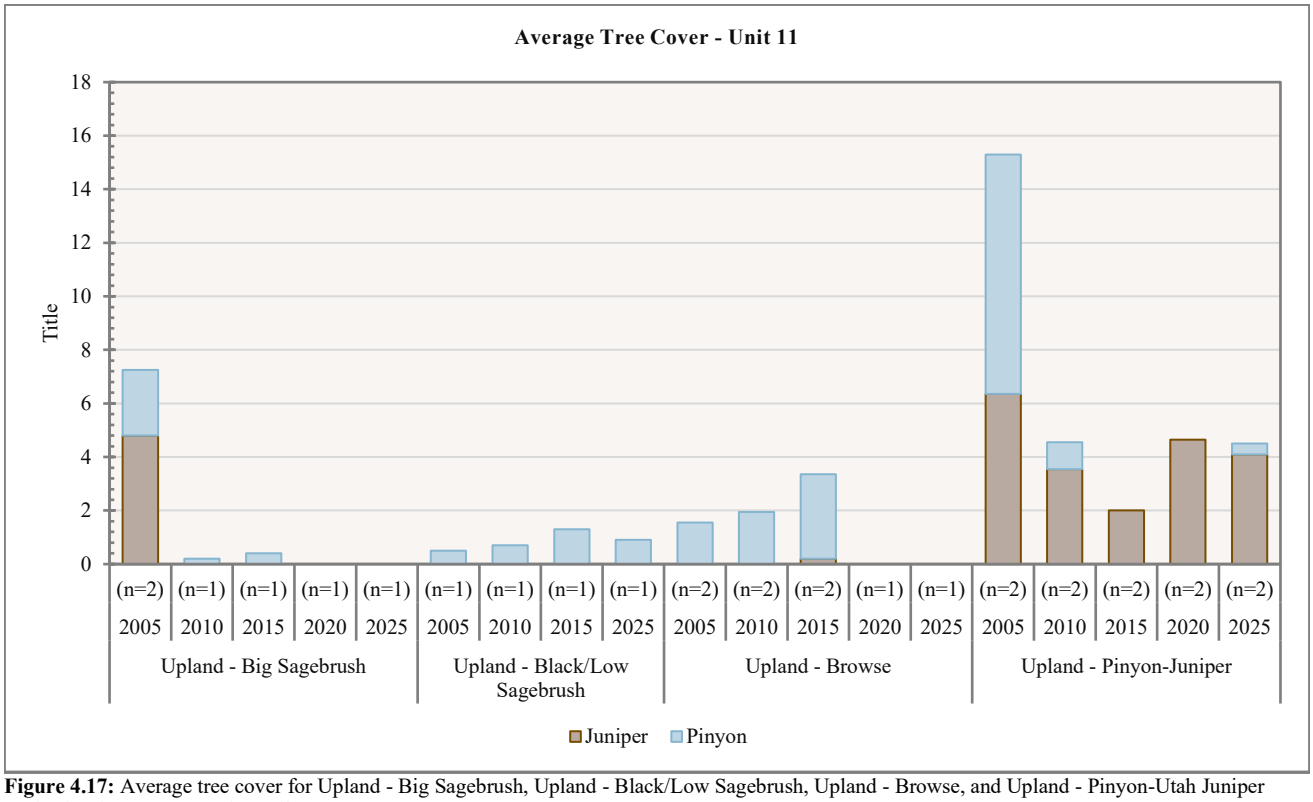


Figure 4.17: Average tree cover for Upland - Big Sagebrush, Upland - Black/Low Sagebrush, Upland - Browse, and Upland - Pinyon-Utah Juniper study sites in WMU 11, Nine Mile.

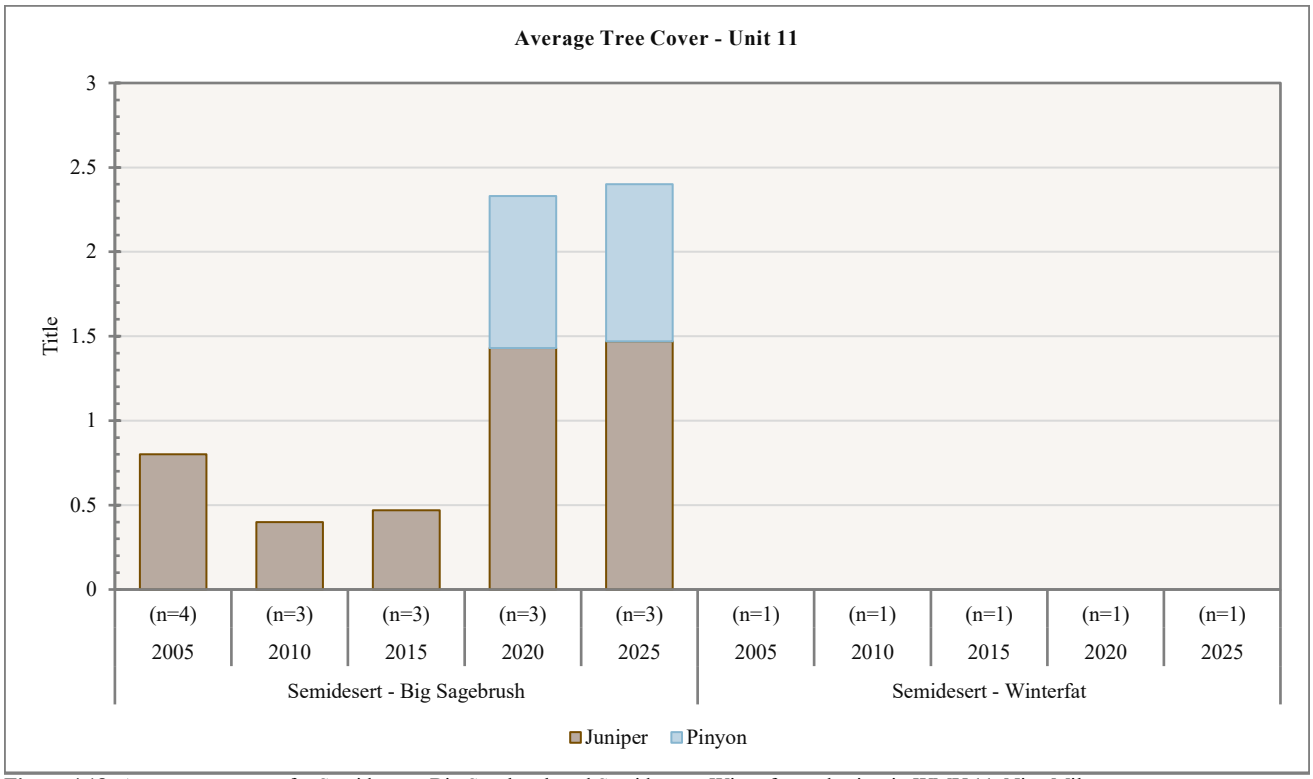


Figure 4.18: Average tree cover for Semidesert - Big Sagebrush and Semidesert - Winterfat study sites in WMU 11, Nine Mile.

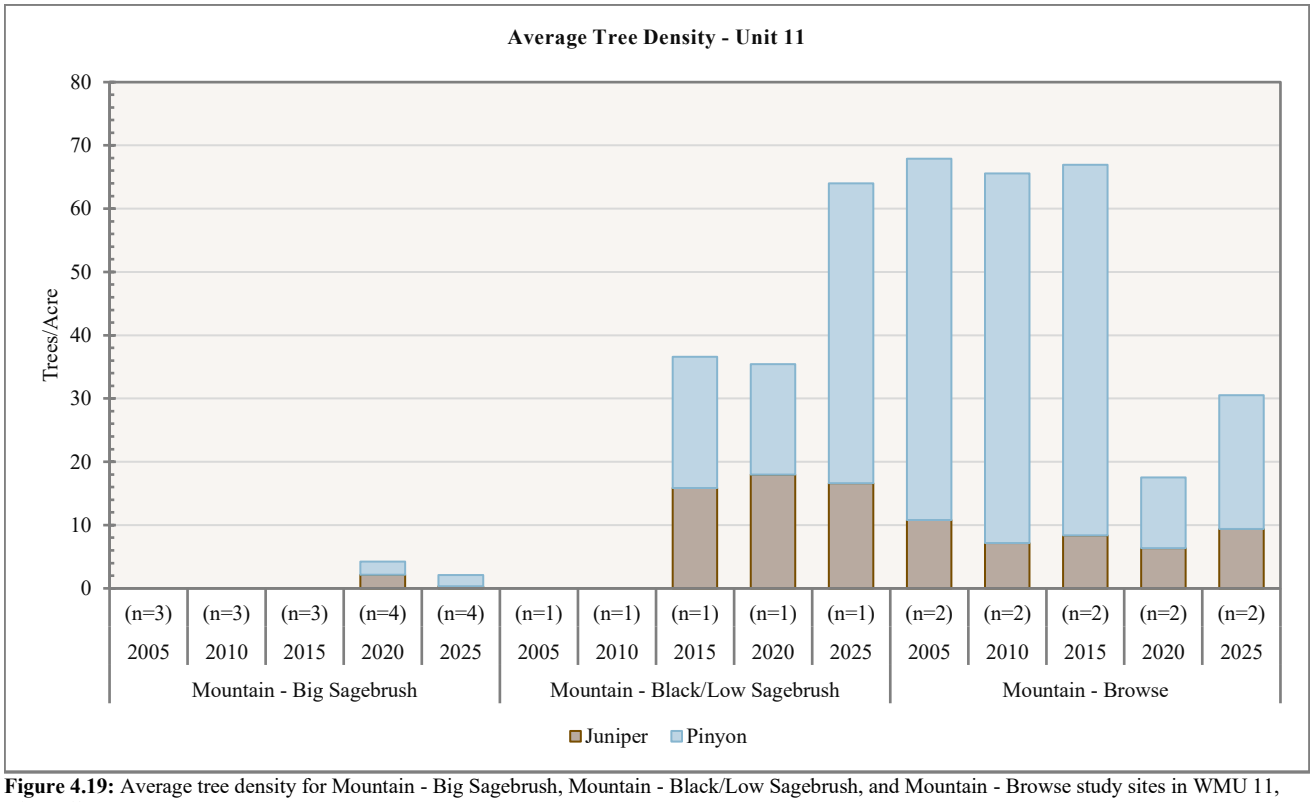


Figure 4.19: Average tree density for Mountain - Big Sagebrush, Mountain - Black/Low Sagebrush, and Mountain - Browse study sites in WMU 11, Nine Mile.

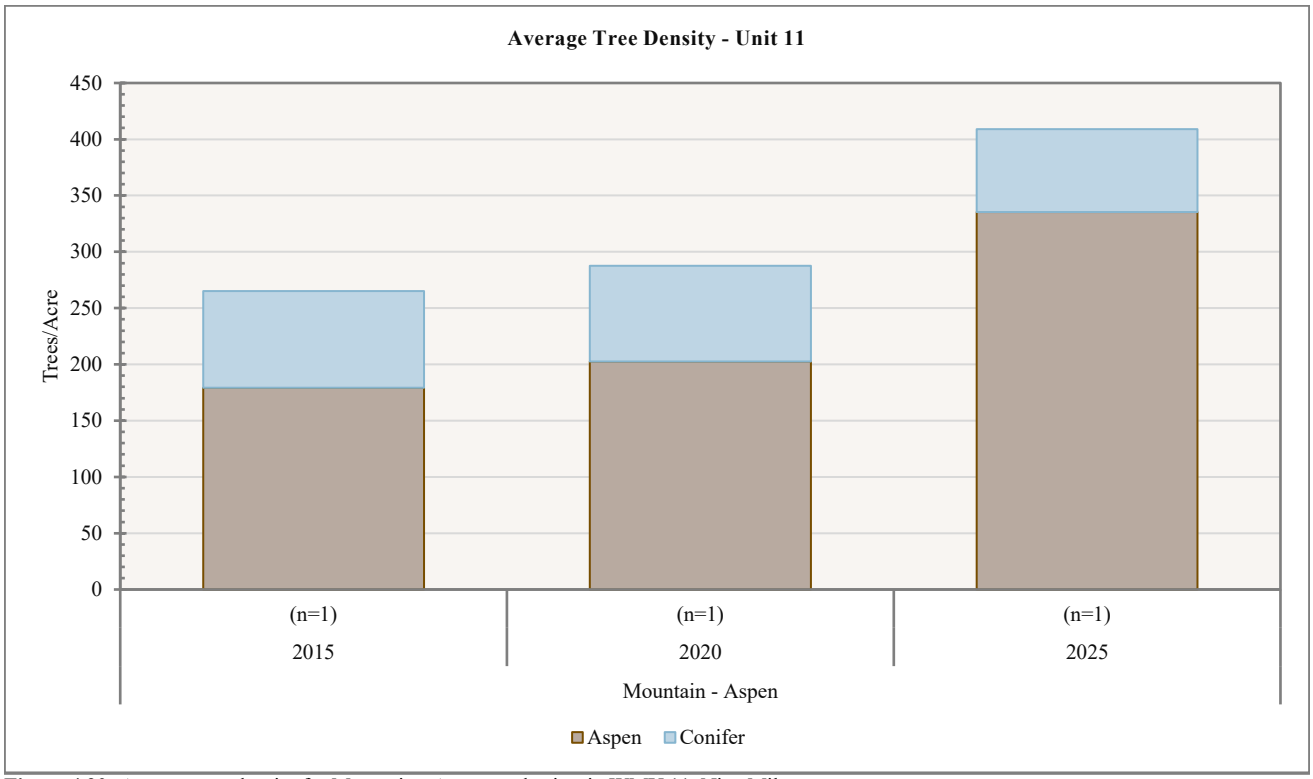


Figure 4.20: Average tree density for Mountain - Aspen study sites in WMU 11, Nine Mile.

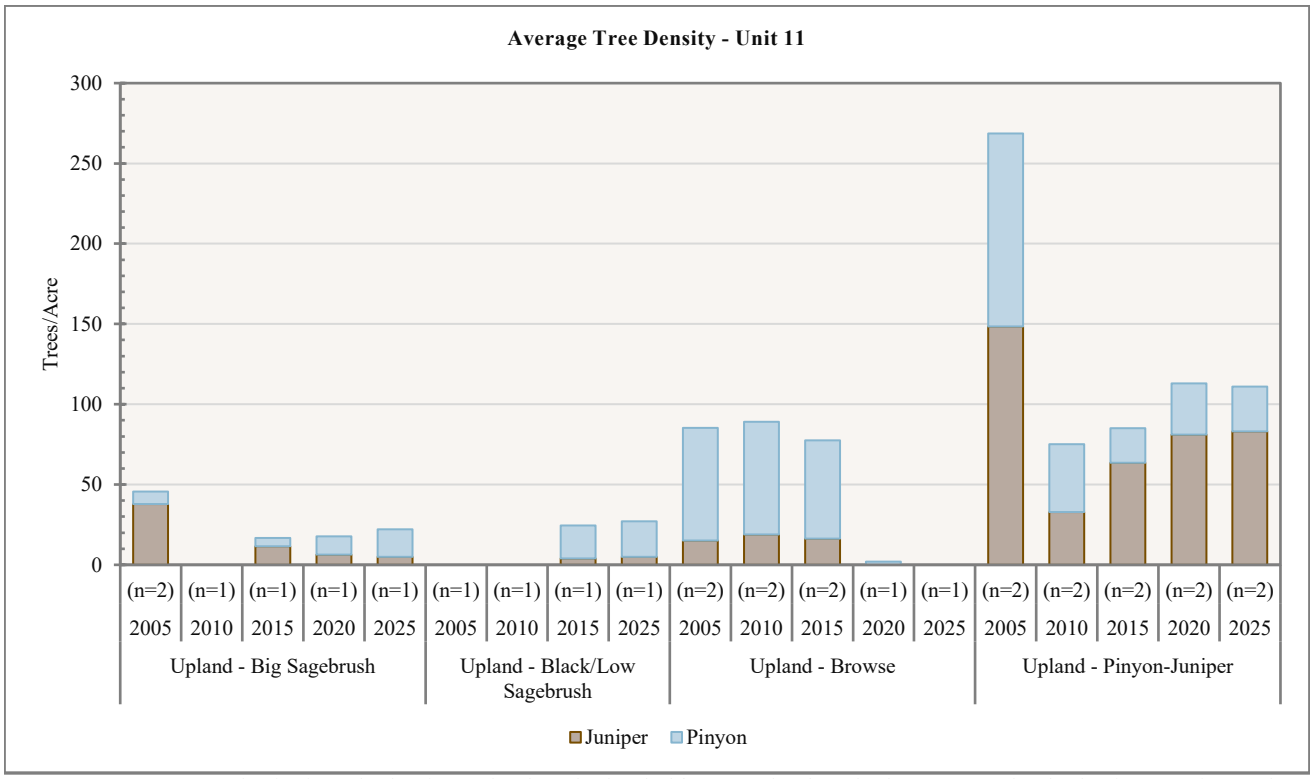


Figure 4.21: Average tree density for Upland - Big Sagebrush, Upland - Black/Low Sagebrush, Upland - Browse, and Upland - Pinyon-Juniper study sites in WMU 11, Nine Mile.

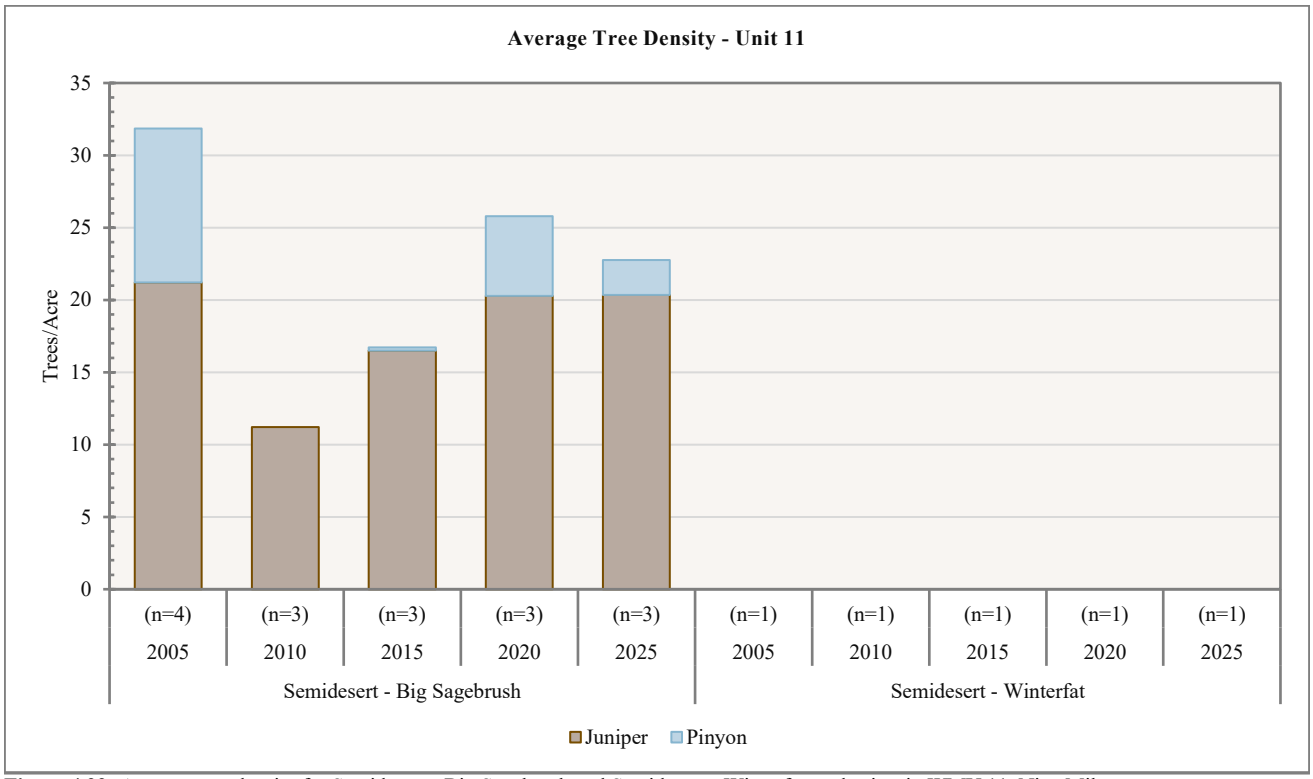


Figure 4.22: Average tree density for Semidesert - Big Sagebrush and Semidesert - Winterfat study sites in WMU 11, Nine Mile.

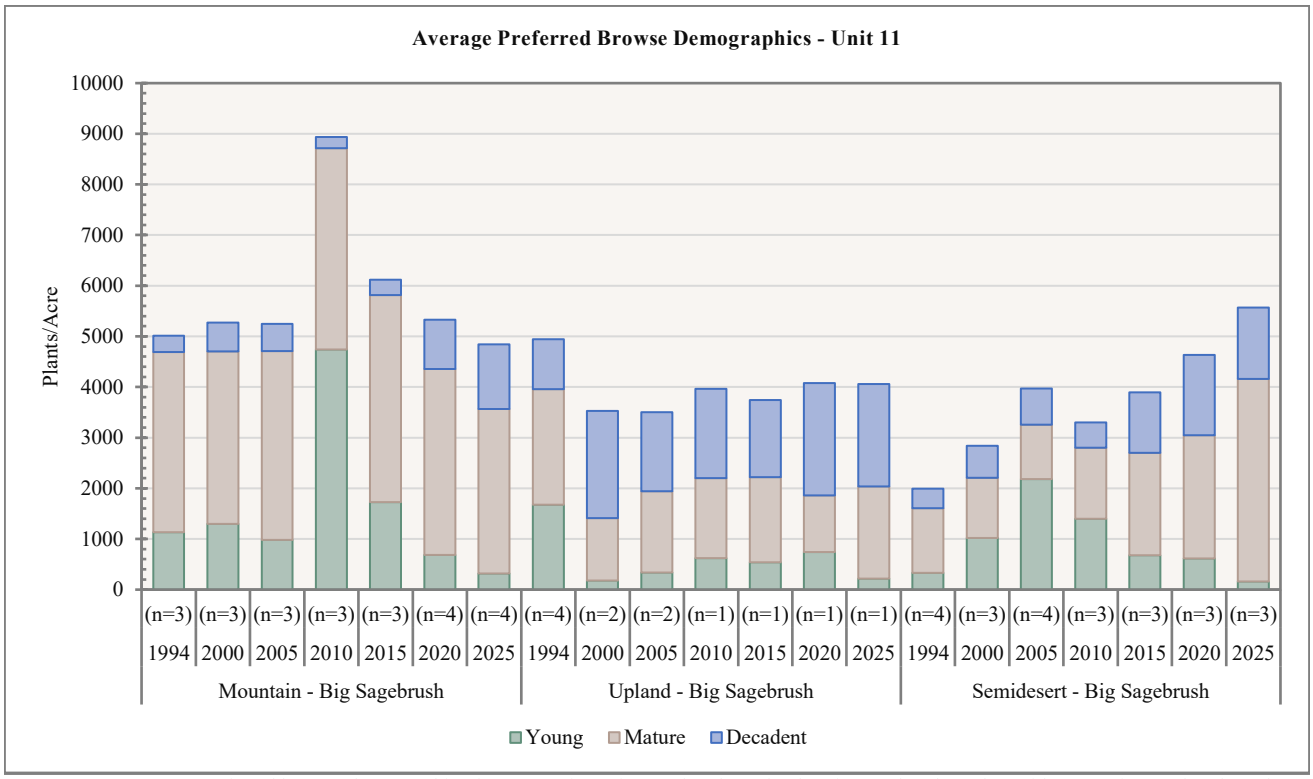


Figure 4.23: Average preferred browse demographics for Mountain - Big Sagebrush, Upland - Big Sagebrush, and Semidesert - Big Sagebrush study sites in WMU 11, Nine Mile.

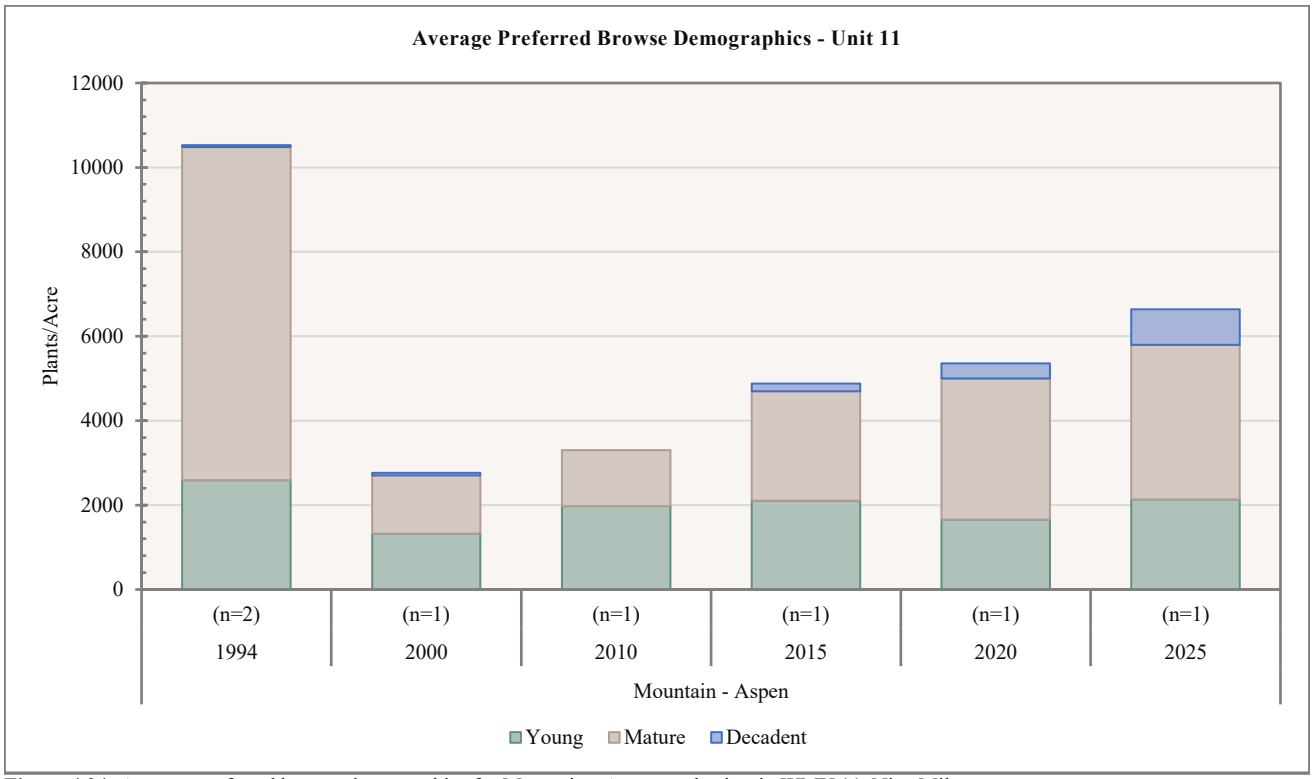


Figure 4.24: Average preferred browse demographics for Mountain - Aspen study sites in WMU 11, Nine Mile.

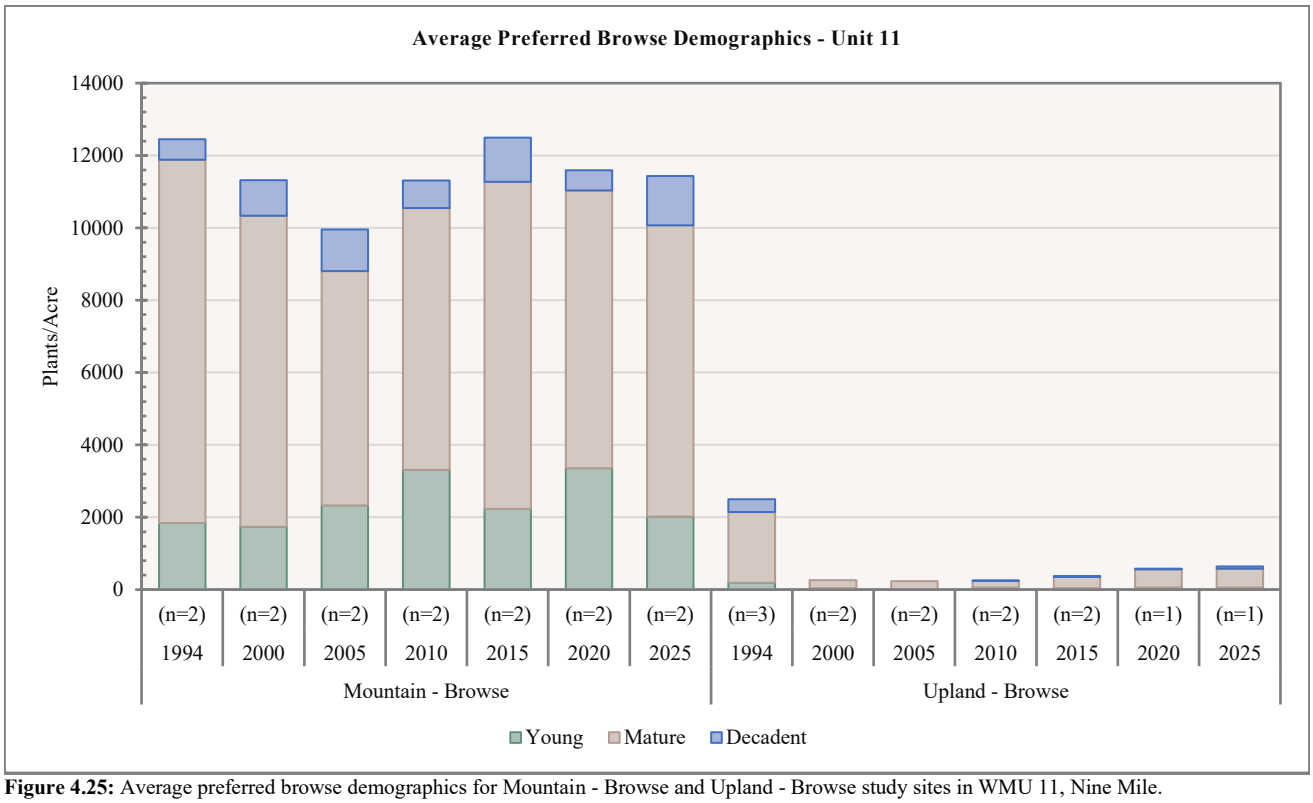


Figure 4.25: Average preferred browse demographics for Mountain - Browse and Upland - Browse study sites in WMU 11, Nine Mile.

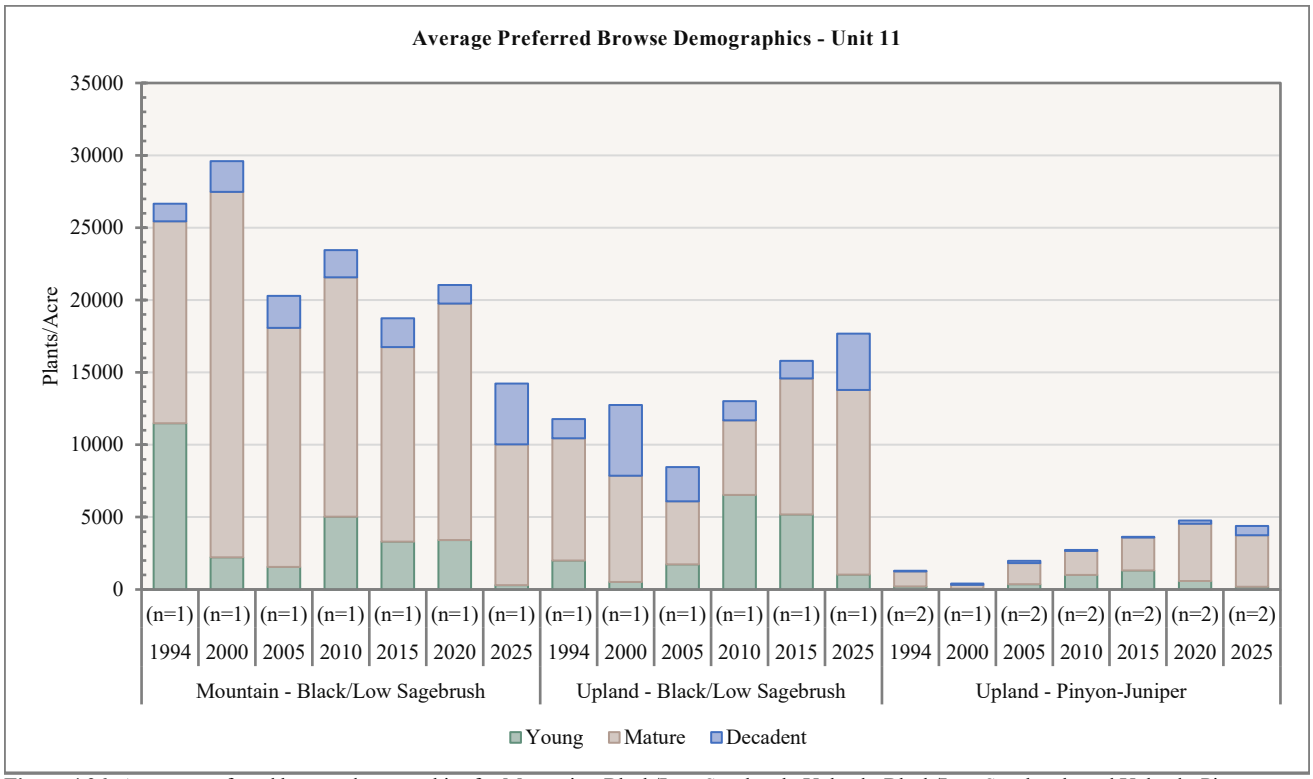


Figure 4.26: Average preferred browse demographics for Mountain - Black/Low Sagebrush, Upland - Black/Low Sagebrush, and Upland - Pinyon-Juniper study sites in WMU 11, Nine Mile.

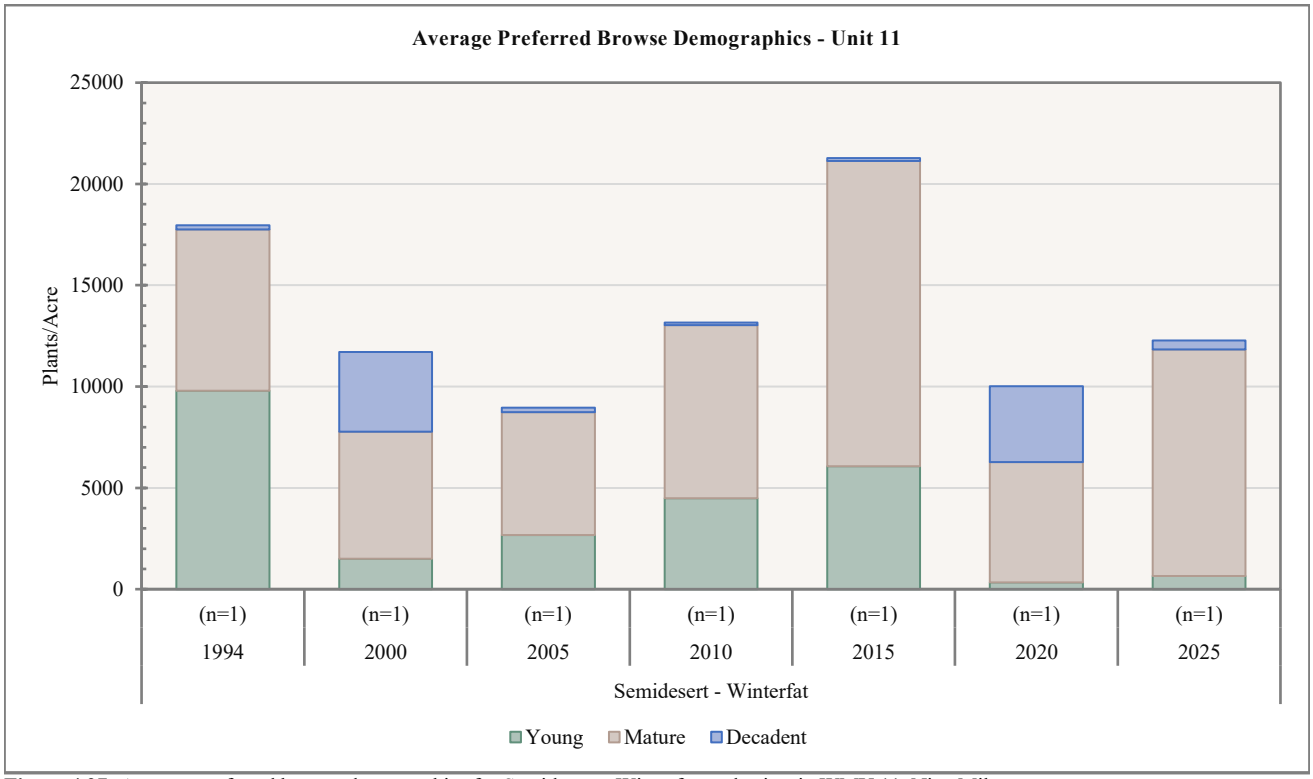


Figure 4.27: Average preferred browse demographics for Semidesert - Winterfat study sites in WMU 11, Nine Mile.

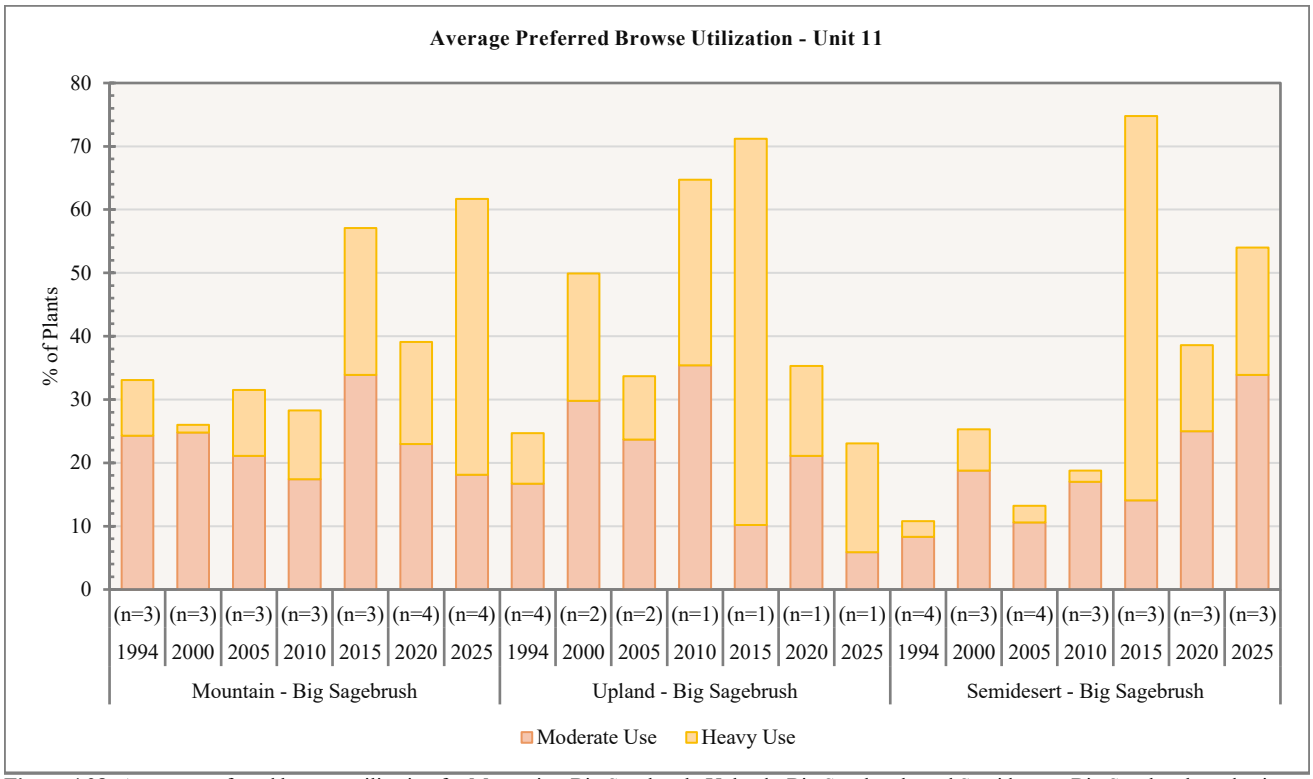


Figure 4.28: Average preferred browse utilization for Mountain - Big Sagebrush, Upland - Big Sagebrush, and Semidesert - Big Sagebrush study sites in WMU 11, Nine Mile.

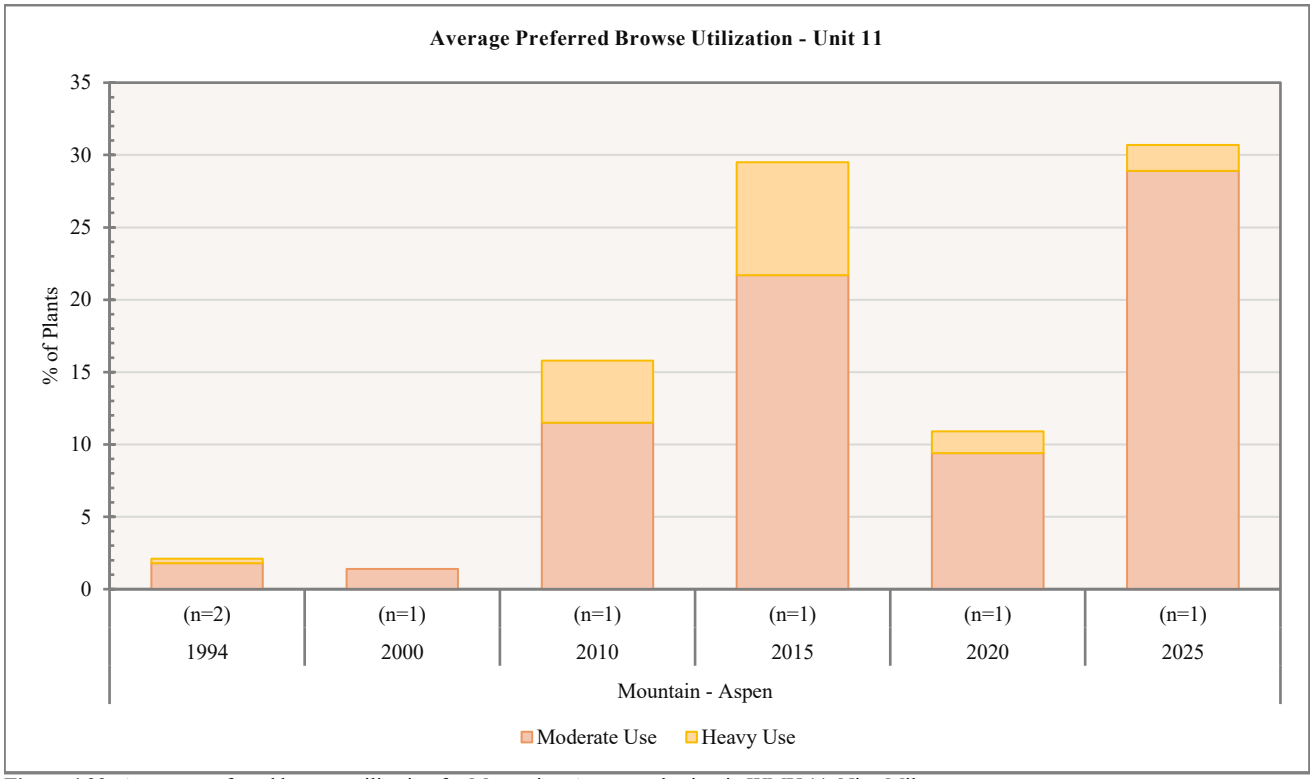


Figure 4.29: Average preferred browse utilization for Mountain - Aspen study sites in WMU 11, Nine Mile.

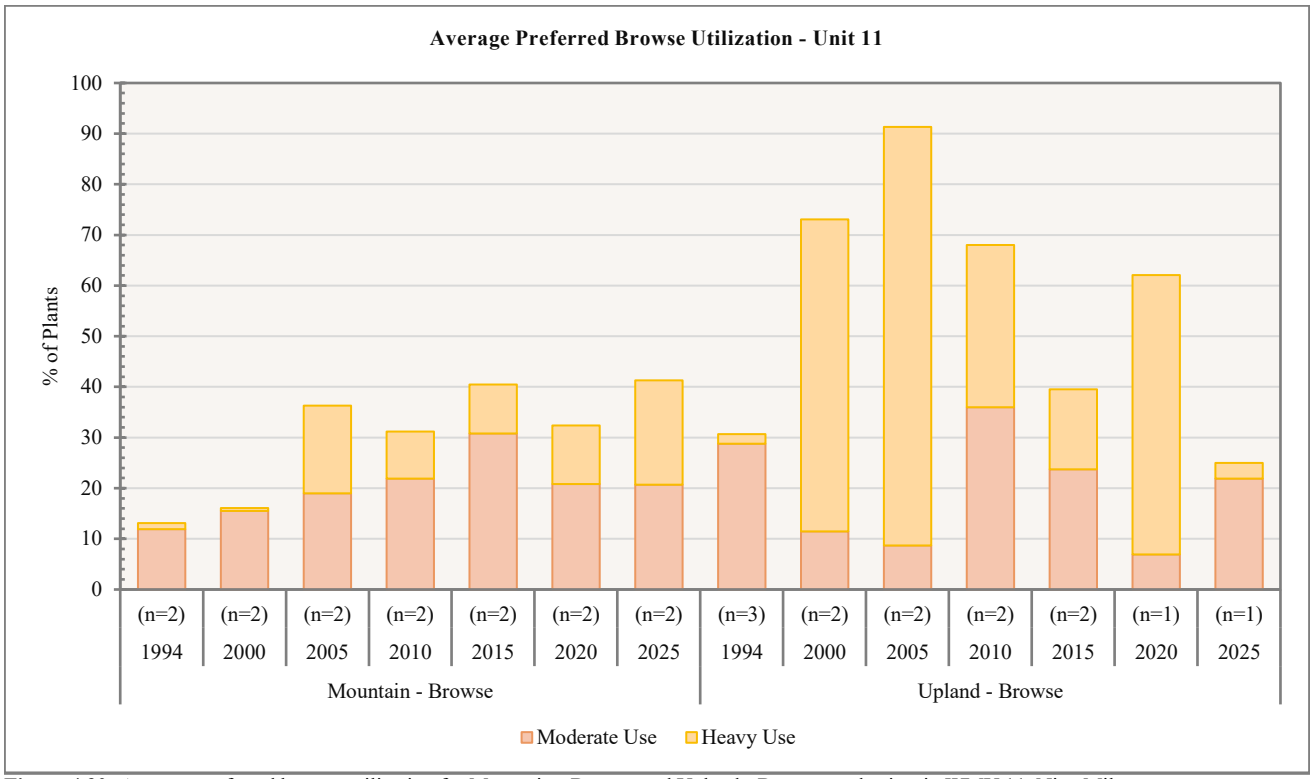


Figure 4.30: Average preferred browse utilization for Mountain - Browse and Upland - Browse study sites in WMU 11, Nine Mile.

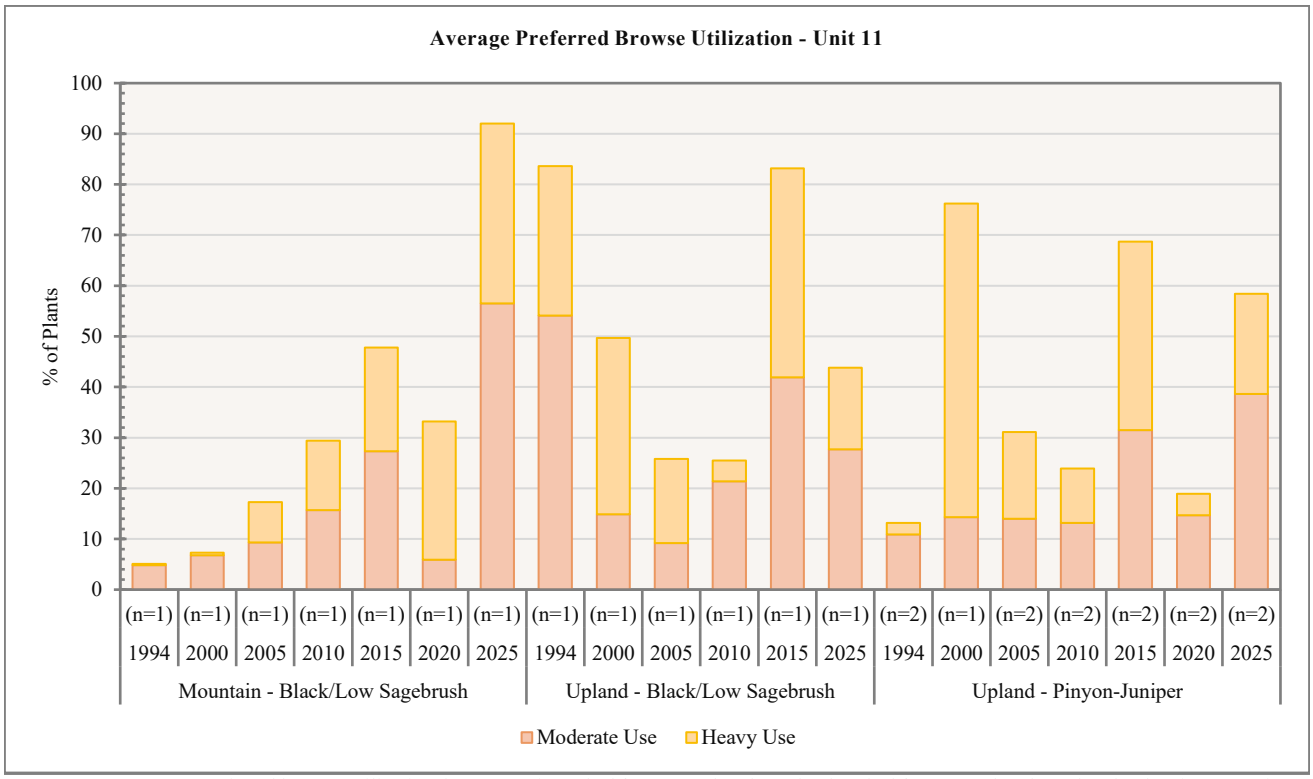


Figure 4.31: Average preferred browse utilization for Mountain - Black/Low Sagebrush, Upland - Black/Low Sagebrush, and Upland - Pinyon-Juniper study sites in WMU 11, Nine Mile.

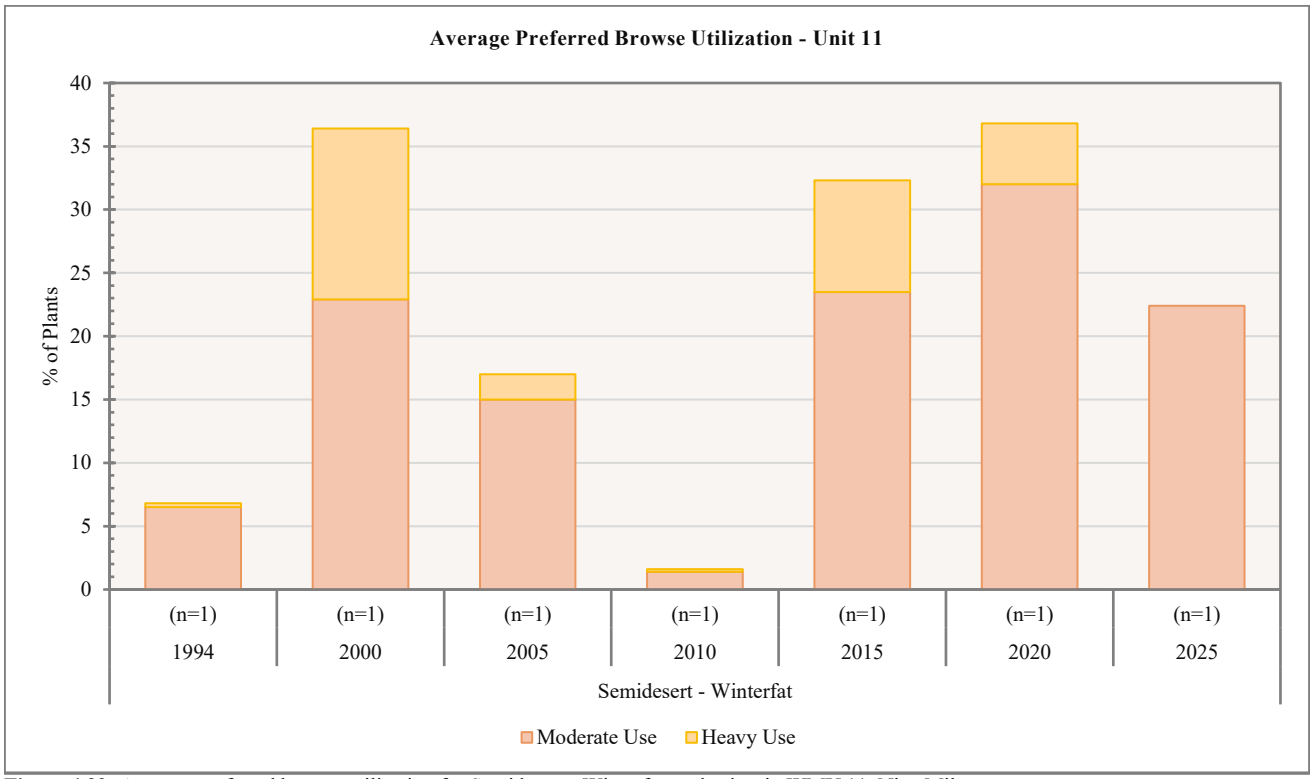


Figure 4.32: Average preferred browse utilization for Semidesert - Winterfat study sites in WMU 11, Nine Mile.

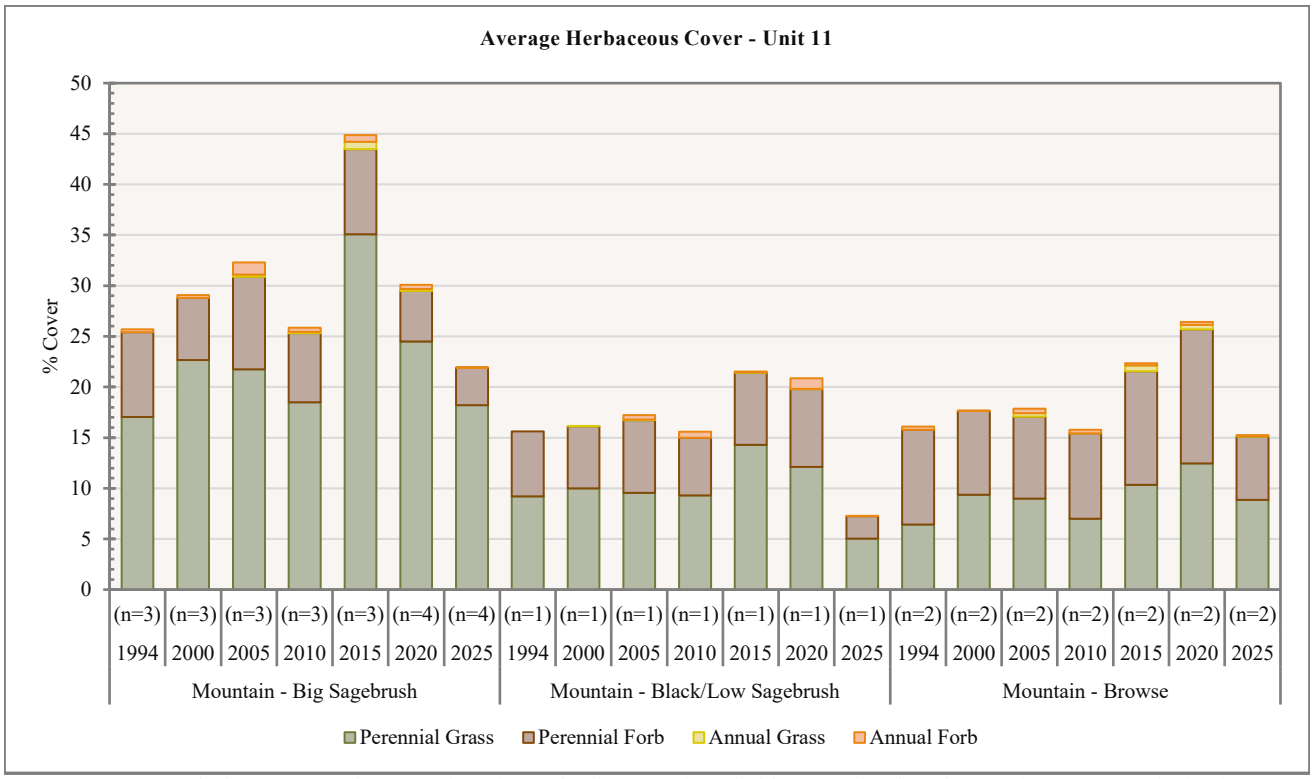


Figure 4.33: Average herbaceous cover for Mountain - Big Sagebrush, Mountain - Black/Low Sagebrush, and Mountain - Browse study sites in WMU 11, Nine Mile.

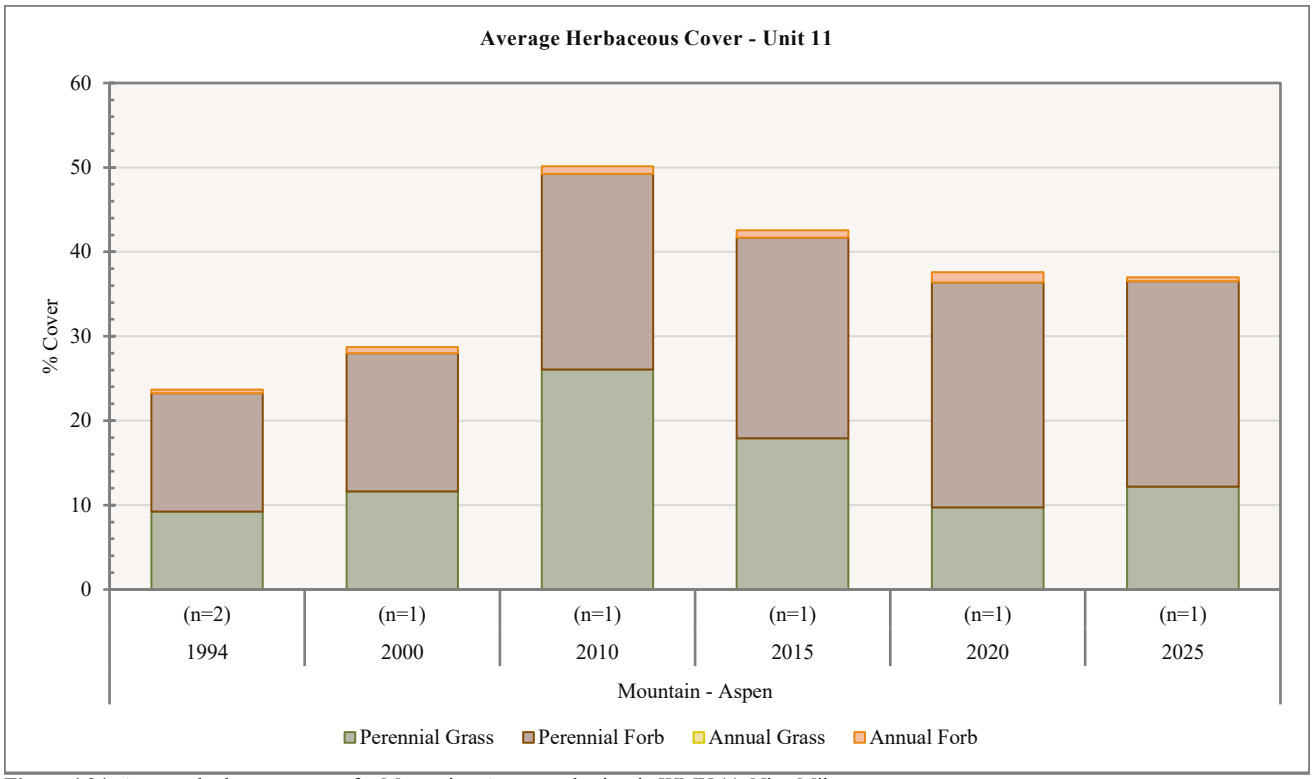


Figure 4.34: Average herbaceous cover for Mountain - Aspen study sites in WMU 11, Nine Mile.

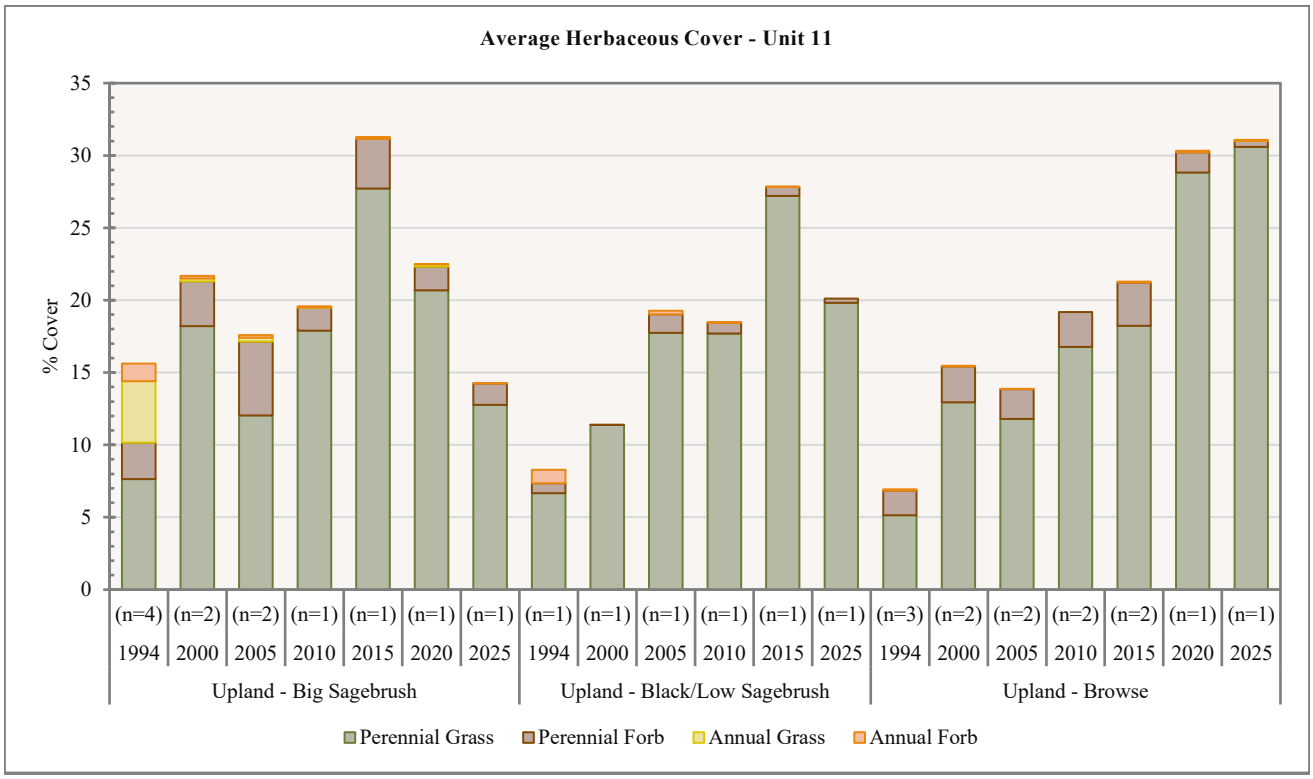


Figure 4.35: Average herbaceous cover for Upland - Big Sagebrush, Upland - Black/Low Sagebrush, and Upland - Browse study sites in WMU 11, Nine Mile.

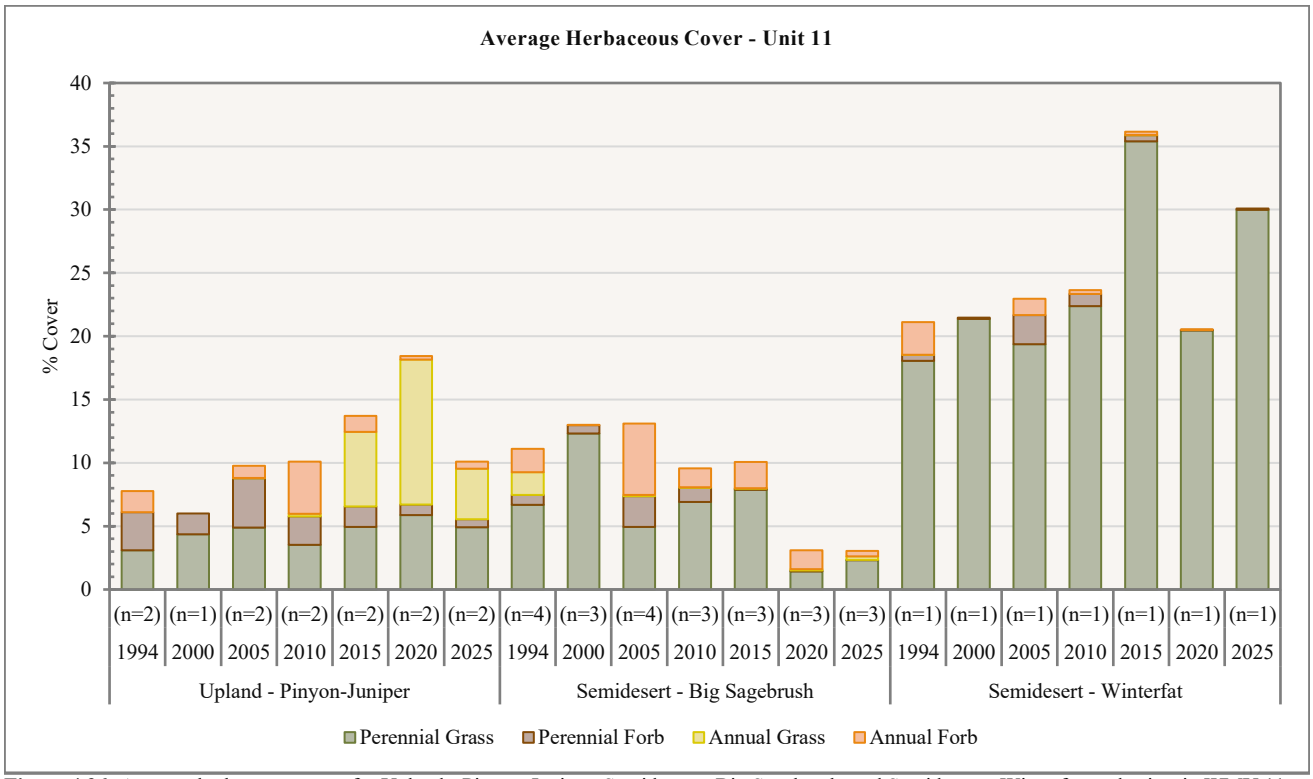


Figure 4.36: Average herbaceous cover for Upland - Pinyon-Juniper, Semidesert - Big Sagebrush, and Semidesert - Winterfat study sites in WMU 11, Nine Mile.

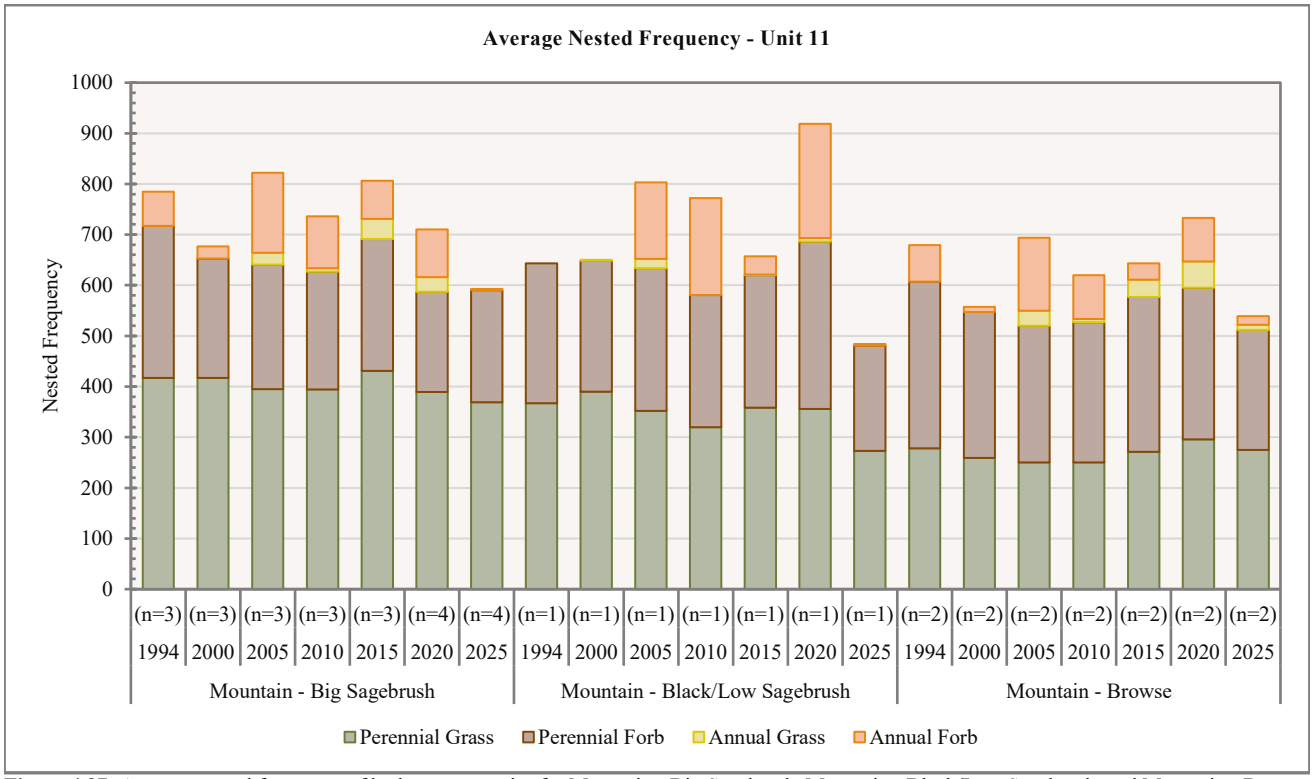


Figure 4.37: Average nested frequency of herbaceous species for Mountain - Big Sagebrush, Mountain - Black/Low Sagebrush, and Mountain - Browse study sites in WMU 11, Nine Mile.

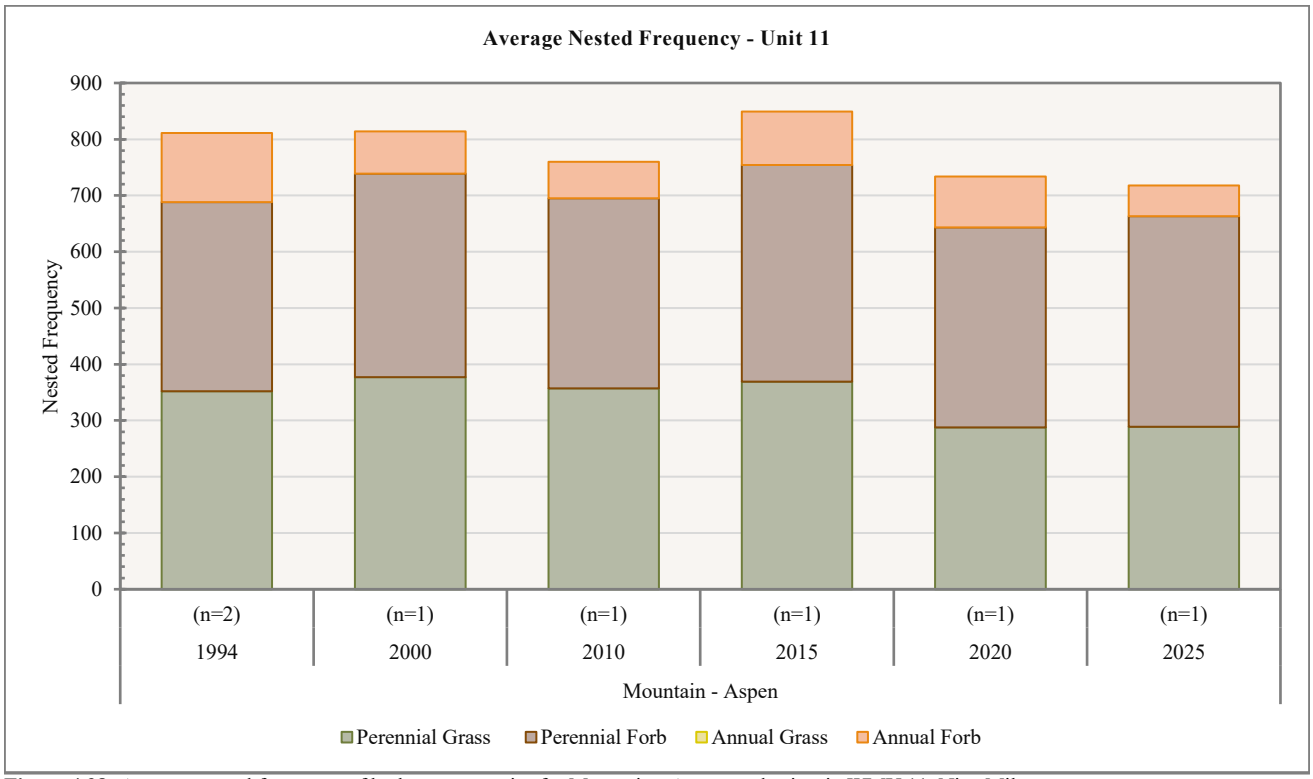


Figure 4.38: Average nested frequency of herbaceous species for Mountain - Aspen study sites in WMU 11, Nine Mile.

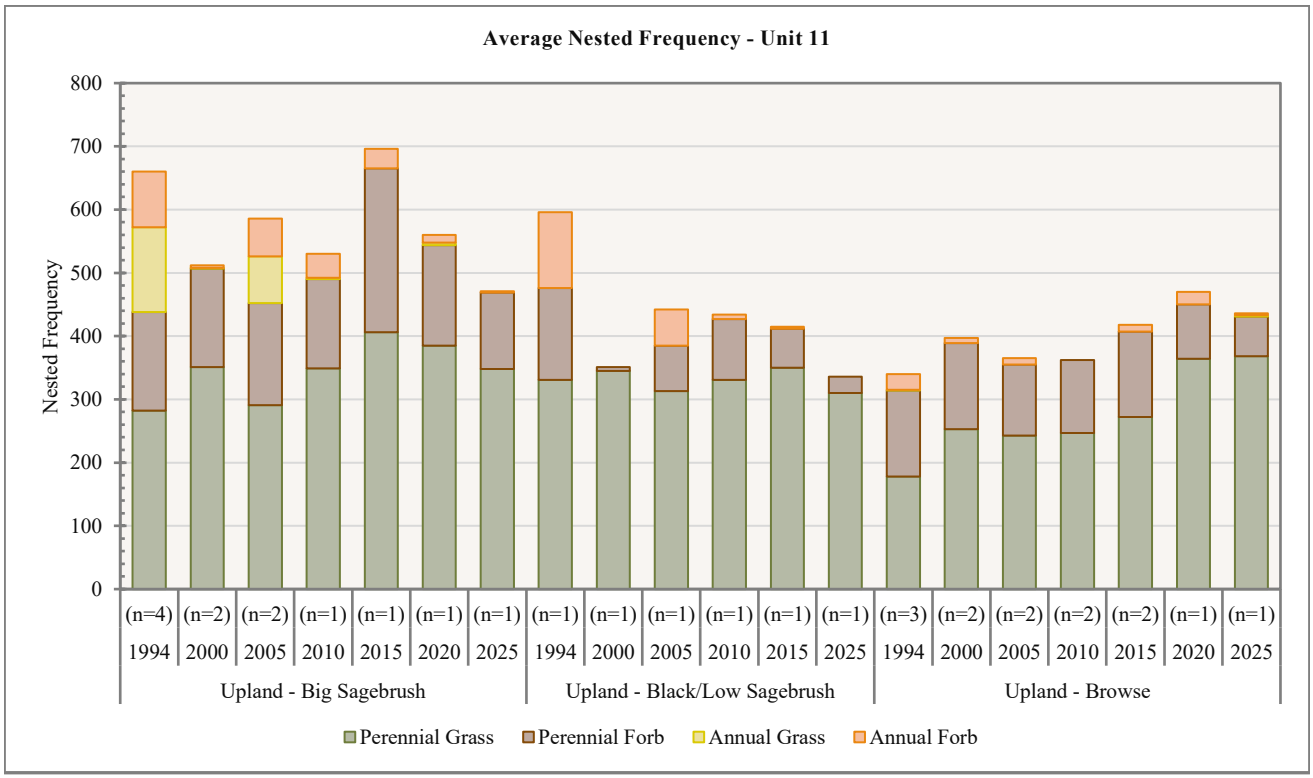


Figure 4.39: Average nested frequency of herbaceous species for Upland - Big Sagebrush, Upland - Black/Low Sagebrush, and Upland - Browse study sites in WMU 11, Nine Mile.

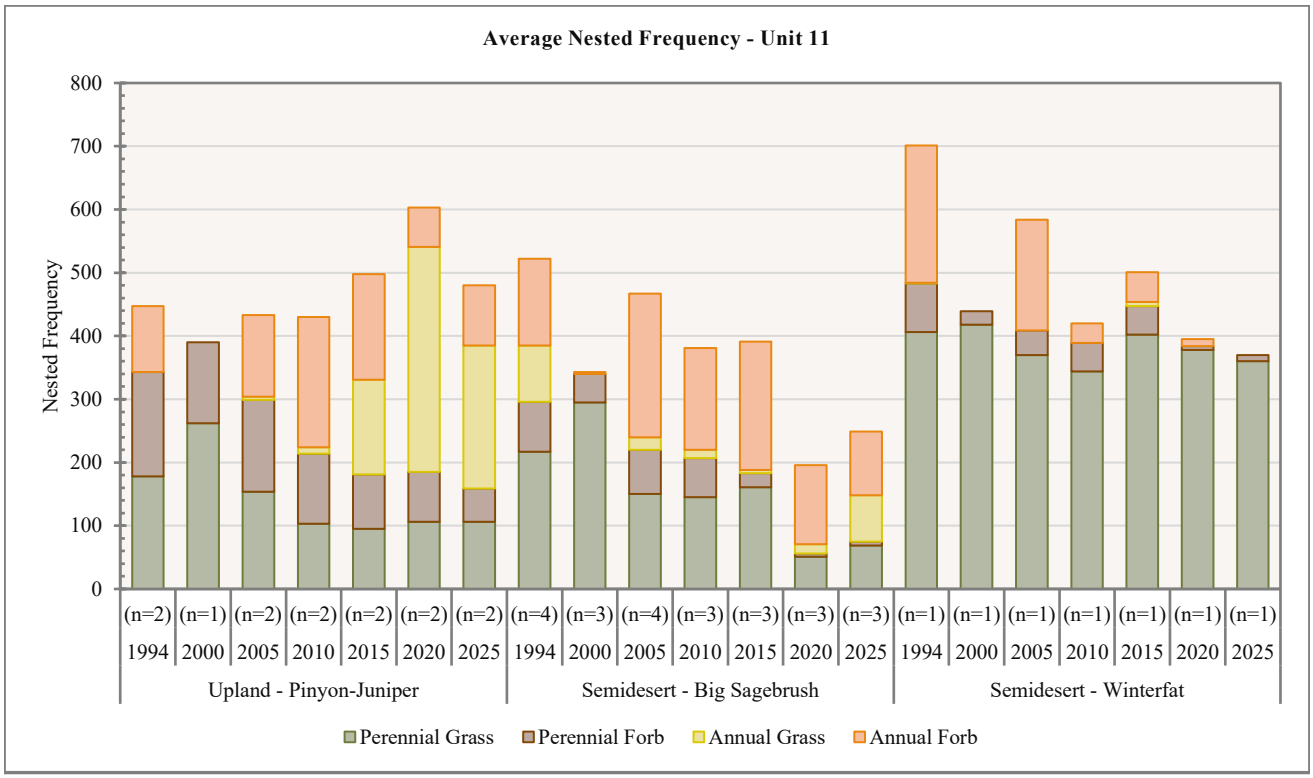


Figure 4.40: Average nested frequency of herbaceous species for Upland - Pinyon-Juniper, Semidesert - Big Sagebrush, and Semidesert - Winterfat study sites in WMU 11, Nine Mile.

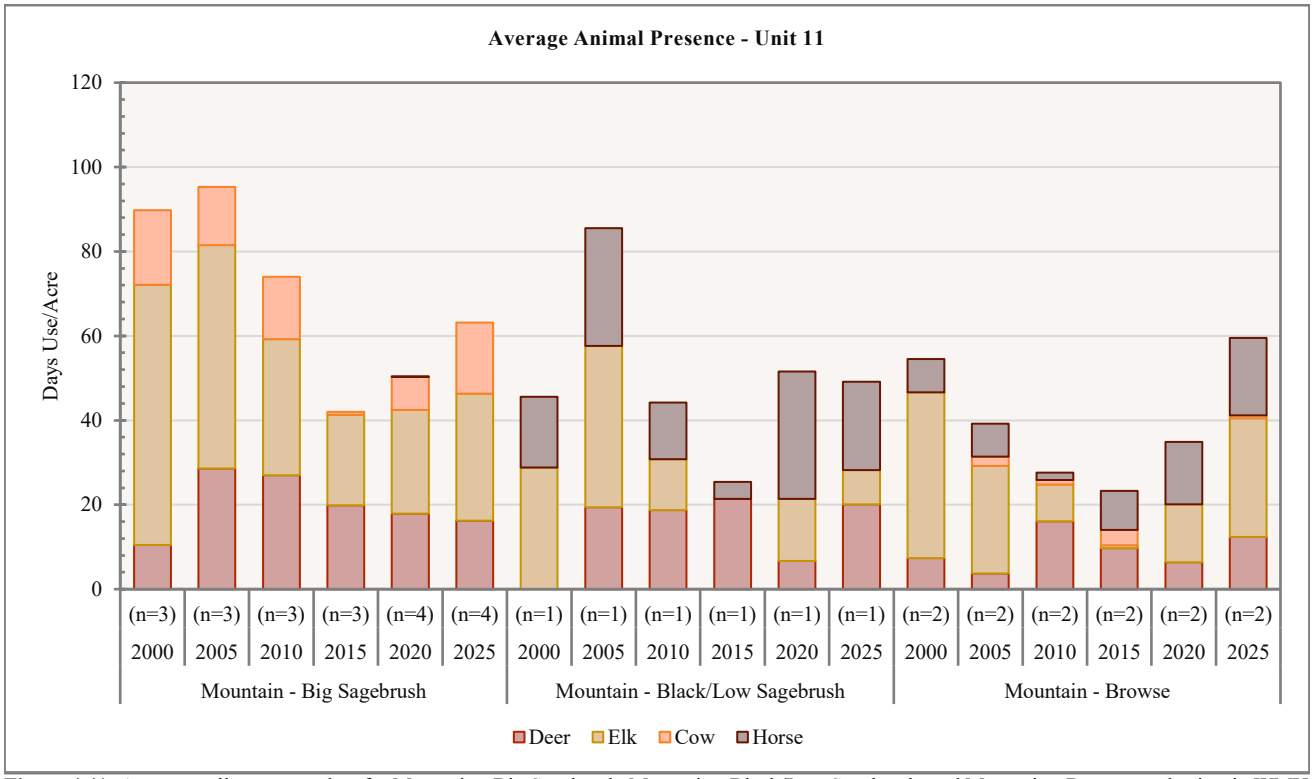


Figure 4.41: Average pellet transect data for Mountain - Big Sagebrush, Mountain - Black/Low Sagebrush, and Mountain - Browse study sites in WMU 11, Nine Mile.

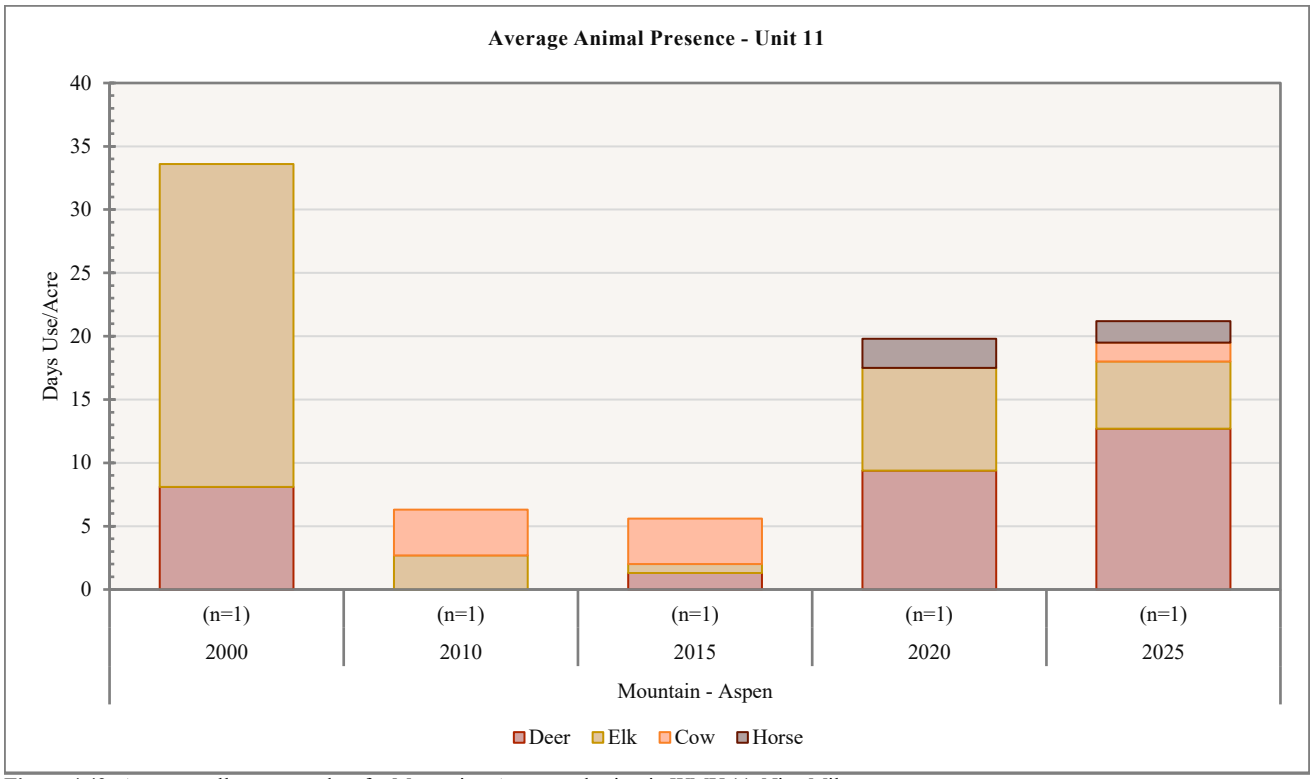


Figure 4.42: Average pellet transect data for Mountain - Aspen study sites in WMU 11, Nine Mile.

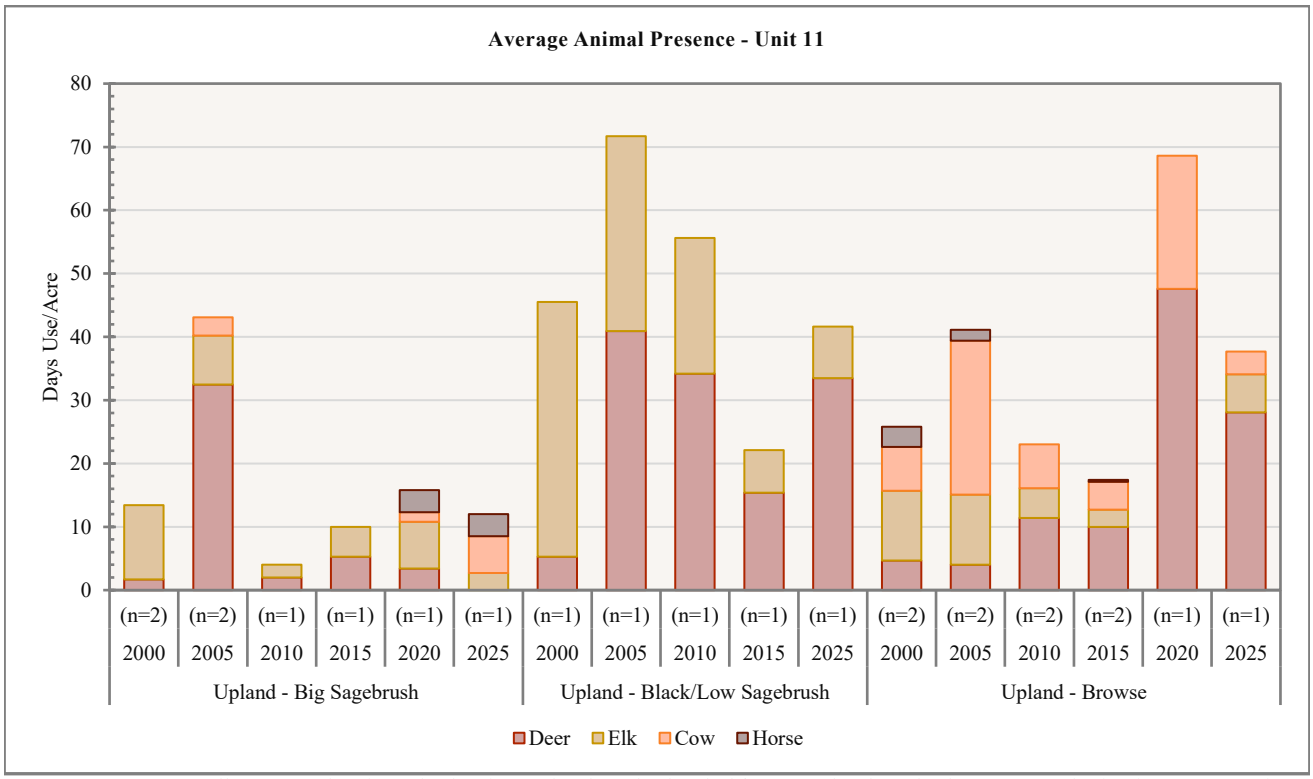


Figure 4.43: Average pellet transect data for Upland - Big Sagebrush, Upland - Black/Low Sagebrush, Upland - Browse study sites in WMU 11, Nine Mile.

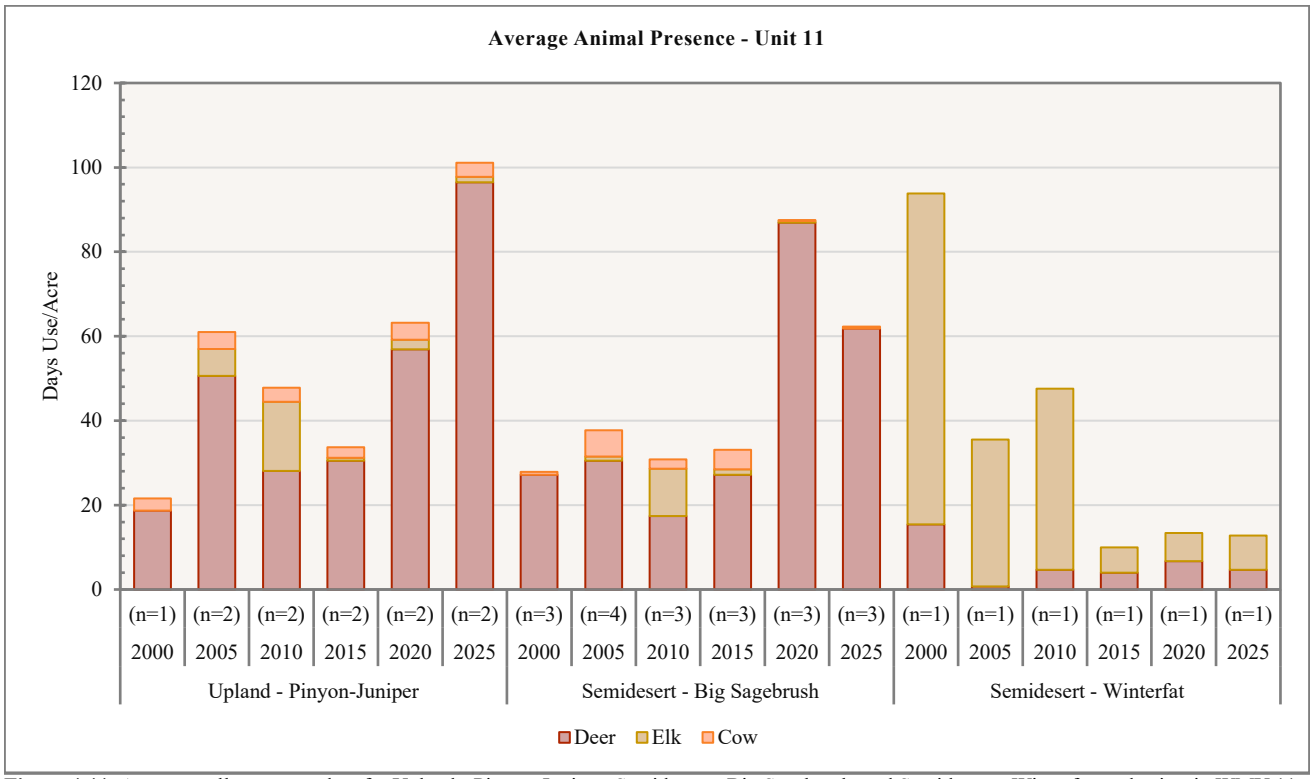


Figure 4.44: Average pellet transect data for Upland - Pinyon-Juniper, Semidesert - Big Sagebrush, and Semidesert - Winterfat study sites in WMU 11, Nine Mile.

Deer Winter Range Condition Assessment

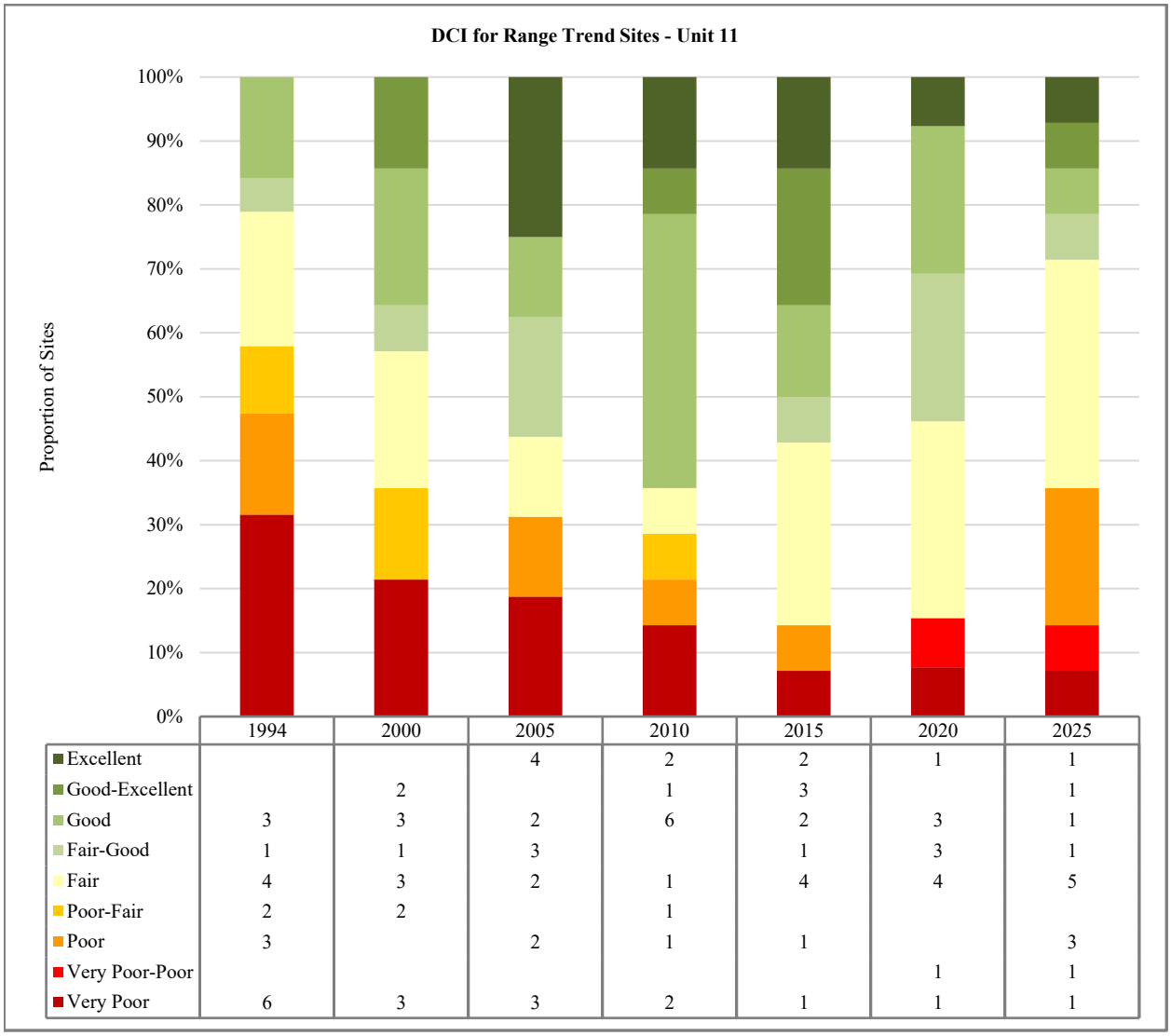
The overall condition of deer winter range (**Map 4.2**) on the Nine Mile Management Unit has slightly improved from poor-fair to fair average conditions between 1994 and 2025. Sites that contribute/have contributed to the unit's wintering habitat stability and quality include Nutter's Canyon (11A-05), Airport (11B-03) (suspended), Coal Creek (11B-04), Cottonwood (11B-07), Cedar Corral (11B-08), Deadman Creek (11B-20), Soldier Creek (11B-22), which all have winter range conditions averaging between fair and good. The Twin Hollow (11B-15) and Steer Ridge (11B-16) also contribute to habitat stability and quality with average winter range conditions of good to good-excellent. In contrast, winter range conditions have been considered to be between very poor and poor in most sample years on the Deadman (11B-01), 'B' Canyon (11B-05), Upper Little Park Wash (11B-10) (suspended), and Williams Draw (11B-12) (suspended) sites. The Airport Bench (11B-02) (suspended), Little Park Exclosure (11B-11) (suspended), Dugout Creek Unchained (11B-17) (suspended), and Stone Cabin Gas Field (11R-21) have had winter range conditions averaging between poor and poor-fair over their respective study periods; these poor conditions suppress the unit's overall quality of winter habitat. Range Trend sites in WMU 11 that tend to have higher winter habitat variability include Cottonwood Canyon (11A-04), Cedar Ridge (11B-09), Prickly Pear (11B-14) (suspended), Dugout Creek Sagebrush Chaining (11B-18) (suspended), and Dugout Creek PJ Chained (11B-19). 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.

The overall deer winter range assessment in 2025 for WMU 11 is that the unit is in fair condition with most sites ranging between fair and excellent conditions. However, Deadman, 'B' Canyon, Cottonwood, Cedar Ridge, and Stone Cabin Gas Field remain between very poor and poor conditions. Main factors driving these very poor to poor conditions include reduced preferred browse cover, reduced age class diversity among the preferred browse populations, reduced perennial grass cover, and/or little perennial forb cover. Annual grass cover also influences the condition on the Deadman study (**Figure 4.45**, **Table 4.8**).

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 habitat (**Map 4.3**) that shares in similar habitat requirements. 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 4.45**, **Table 4.8**) illustrate 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. Studies that intersect/have intersected elk year-long or winter habitat include Chokecherry Canyon (11A-03), Cottonwood Canyon (11A-04), Nutter's Canyon, Upper Little Park Wash (suspended), 'B' Canyon, Cottonwood, Cedar Corral, Cedar Ridge, Little Park Exclosure (suspended), Williams Draw (suspended), Prickly Pear (suspended), Twin Hollow, Steer Ridge, Dugout Creek Unchained (suspended), Dugout Creek Sagebrush Chaining (suspended), Dugout Creek PJ Chained, Sowers (11R-01) (suspended), East Carbon Burn 1 (11R-05) (suspended), East Carbon Burn 2 (11R-06) (suspended), East Carbon Burn 3 (11R-07) (suspended), Nine Mile Burn (11R-08) (suspended), and Stone Cabin Gas Field. The sites in fair or better condition (as of the most recent sampling) include Chokecherry Canyon, Cottonwood

Canyon, Nutter's Canyon, Prickly Pear, Twin Hollow, Steer Ridge, Dugout Creek Sagebrush Chaining, Dugout Creek PJ Chained, Soldier Creek, and Sowers. In contrast, 'B' Canyon, Cottonwood, Cedar Ridge, Upper Little Park Wash, Little Park Exclosure, Williams Draw, Dugout Creek Unchained, East Carbon Burn 1, East Carbon Burn 2, East Carbon Burn 3, Nine Mile Burn, and Stone Cabin Gas Field are considered to have very poor to poor-fair wintering habitat conditions as of their most recent sample years.



	1994	2000	2005	2010	2015	2020	2025
Excellent			4	2	2	1	1
Good-Excellent		2		1	3		1
Good	3	3	2	6	2	3	1
Fair-Good	1	1	3		1	3	1
Fair	4	3	2	1	4	4	5
Poor-Fair	2	2		1			
Poor	3		2	1	1		3
Very Poor-Poor						1	1
Very Poor	6	3	3	2	1	1	1

Figure 4.45: Deer winter range Desirable Components Index (DCI) summary by year of Range Trend sites for WMU 11, Nine Mile.

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
11A-04	1995	8.1	13.2	7	30	0	0.9	0	**59.2**	**G**
11A-04	2000	3.8	0	0	30	0	0.2	0	**34**	**F**
11A-04	2005	15.6	12.6	7	30	0	4.6	0	**69.8**	**E**
11A-04	2010	9.5	14	13.9	30	0	2	0	**69.4**	**E**
11A-04	2015	15.1	14.3	12.5	30	0	1	0	**72.9**	**E**
11A-04	2021	13.2	1.9	1.8	30	0	0.1	0	**47**	**F-G**
11A-04	2025	17.2	13.4	2.9	30	0	0.2	0	**63.7**	**G-E**
11A-05	1995	21.5	11.6	7.9	13.3	0	1.4	0	**55.7**	**F**
11A-05	2000	21.5	3.1	2	22.7	0	0	0	**49.3**	**P-F**
11A-05	2005	18.9	6.3	6.4	30	0	2.5	0	**64.1**	**F-G**
11A-05	2010	14.5	11.2	15	30	0	1.5	0	**72.2**	**G**
11A-05	2015	21.1	12.3	15	30	0	1.2	0	**79.6**	**G-E**
11A-05	2025	19.1	8.8	3	30	0	0.6	0	**61.5**	**F**
11B-01	1994	2.8	0	0	10.5	0	2.7	0	**16**	**VP**
11B-01	2000	3.8	0	0	8.7	0	3.3	0	**15.8**	**VP**
11B-01	2005	2.2	0	0	0.3	0	4.8	0	**7.3**	**VP**
11B-01	2010	1.2	0	0	1.8	0	4	0	**7**	**VP**
11B-01	2015	9.7	14.4	15	1.8	-1.1	3.1	0	**42.9**	**P**
11B-01	2020	20.2	13.9	1.3	1.5	-12.1	0.9	0	**25.7**	**VP**
11B-01	2025	15	3.8	0	2.1	-5.4	2.1	0	**17.6**	**VP**
11B-02*	1994	0.3	0	0	14.3	0	2.2	0	**16.8**	**P**
11B-02*	2000	0.2	0	0	30	0	0.5	0	**30.7**	**F**
11B-02*	2005	3	0	0	6	0	5.6	0	**14.6**	**P**
11B-02*	2010	1.3	0	0	24.1	0	0.9	0	**26.3**	**P-F**
11B-02*	2015	2.3	0	0	30	0	0.2	0	**32.5**	**F**
11B-03*	1994	5.7	0	0	30	0	1	0	**36.7**	**F**
11B-03*	2000	6.5	11.6	15	30	0	3.3	0	**66.4**	**G-E**
11B-03*	2005	9.5	13.5	15	1.7	0	10	0	**49.7**	**G**
11B-03*	2010	14.5	13.5	15	4.1	0	5.9	0	**53**	**G**
11B-04	1994	19.2	7.6	1.4	5.2	0	0.4	0	**33.8**	**F**
11B-04	2000	20.9	8	15	8.5	0	0.1	0	**52.5**	**G**
11B-04	2005	18.2	-5.7	3.8	12.8	0	0.3	0	**29.4**	**F**
11B-04	2010	18.1	7.1	15	13.3	0	0.1	0	**53.6**	**G**
11B-04	2015	16.4	7.8	15	13	0	0.3	0	**52.5**	**G**
11B-04	2020	22.3	6.2	12.9	4.8	0	0	0	**46.2**	**F-G**
11B-04	2025	20.3	8.4	3.2	5	0	0.2	0	**37.1**	**F**
11B-05	1994	14	11.5	3.8	20.7	0	1.5	0	**51.5**	**P-F**
11B-05	2000	0.5	0	0	30	0	1.9	0	**32.4**	**VP**
11B-05	2005	0.9	0	0	30	0	0.8	0	**31.7**	**VP**
11B-05	2010	1.1	0	0	30	0	1.7	0	**32.8**	**VP**
11B-05	2015	0.7	0	0	30	0	1.3	0	**32**	**VP**
11B-05	2020	2.9	0	0	30	0	2.8	0	**35.7**	**VP-P**
11B-05	2025	2.8	0	0	30	0	0.8	0	**33.6**	**VP-P**
11B-07	1994	17.7	4.6	0.7	11.3	0	10	0	**44.3**	**P**
11B-07	2000	19.7	-5.7	1.7	30	0	10	0	**55.7**	**F**
11B-07	2005	17.9	0	1.2	27.6	0	10	0	**56.7**	**F**
11B-07	2010	18.8	1.4	7.8	30	0	3.2	0	**61.2**	**F**
11B-07	2015	17.1	2.5	7.2	30	0	6.9	0	**63.7**	**F-G**
11B-07	2020	16.5	-1.3	9	30	-0.1	3.3	0	**57.4**	**F**
11B-07	2025	14.6	0	2.7	25.5	0	3	0	**45.8**	**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
11B-08	1994	22.3	13.3	7.6	7.1	0	10	0	**60.3**	**F**
11B-08	2000	30	11.1	8.9	11.5	0	10	0	**71.5**	**F-G**
11B-08	2005	30	9.8	15	6.3	-0.5	10	0	**70.6**	**F-G**
11B-08	2010	30	12.5	15	6	0	10	0	**73.5**	**G**
11B-08	2015	30	12.2	8.7	6.2	-0.8	10	0	**66.3**	**F**
11B-08	2020	30	12.7	10	14.9	-0.7	10	0	**76.9**	**G**
11B-08	2025	30	12.1	2.1	7.6	-0.1	6	0	**57.7**	**F**
11B-09	1994	16	13.6	15	18.4	0	10	0	**73**	**G**
11B-09	2000	26.8	12.6	3.9	20	0	10	0	**73.3**	**G**
11B-09	2005	30	11.7	3.8	19.1	-0.1	10	0	**74.5**	**G**
11B-09	2010	30	12.3	11.7	18.6	0	10	0	**82.6**	**G**
11B-09	2015	30	11.3	9.8	28.6	0	10	0	**89.7**	**G-E**
11B-09	2020	30	12.8	10	24.2	0	10	0	**87**	**G**
11B-09	2025	28	5	1.2	10.1	0	4.4	0	**48.7**	**P**
11B-10*	1994	2.9	0	0	8.8	-11.6	0.6	0	**0.7**	**VP**
11B-11*	1994	11.6	0.3	2.4	27.5	0	3.9	0	**45.7**	**P**
11B-11*	2000	14.1	0.1	3.9	30	-0.3	1.2	0	**49**	**P-F**
11B-12*	1994	5.2	0	0	0.1	0	0.7	0	**6**	**VP**
11B-14*	1994	1	0	0	10	0	8	0	**19**	**VP**
11B-14*	2000	2.2	0	0	9.9	0	8.1	0	**20.2**	**VP**
11B-14*	2005	5	0	0	13.1	0	7.5	0	**25.6**	**VP**
11B-14*	2010	8	12	5	10.6	0	7.9	0	**43.5**	**P**
11B-14*	2015	9.4	10.2	11.9	16	0	10	0	**57.5**	**F**
11B-15	1994	29.7	13.7	10	18.6	0	10	0	**82**	**G**
11B-15	2000	30	13.5	11.3	25.9	0	10	0	**90.7**	**G-E**
11B-15	2005	30	13.5	14.4	29.7	0	10	0	**97.6**	**E**
11B-15	2010	30	14	15	21.9	0	10	0	**90.9**	**G-E**
11B-15	2015	30	12.1	10.2	30	0	10	0	**92.3**	**E**
11B-15	2020	30	13.8	15	30	0	10	0	**98.8**	**E**
11B-15	2025	30	11.6	15	27.8	0	10	0	**94.4**	**E**
11B-16	1994	16.3	12	5.9	28.5	0	7	0	**69.7**	**F-G**
11B-16	2000	20.6	10.9	5.2	30	0	6.6	0	**73.3**	**G**
11B-16	2005	30	13.6	9.6	30	-0.5	10	0	**92.7**	**E**
11B-16	2010	30	14.8	15	30	-0.3	6.7	0	**96.2**	**E**
11B-16	2015	30	12.1	11.9	30	-1.7	8.3	0	**90.6**	**G-E**
11B-16	2020	30	12	6.2	30	-0.5	10	0	**87.7**	**G**
11B-16	2025	30	10.2	2.9	30	0	8.6	0	**81.7**	**G**
11B-17*	1997	12.3	5.7	14.2	13.4	-1.1	3.7	0	**48.2**	**P-F**
11B-17*	2005	13.3	3	8.2	20.5	-0.4	3.2	0	**47.8**	**P**
11B-18*	1997	5	0	0	3.5	-5.4	2.7	0	**5.8**	**VP**
11B-18*	2005	21.6	13	15	19	-0.3	3.4	0	**71.7**	**E**
11B-19	1997	3.7	0	0	1.9	0	9.3	0	**14.9**	**VP**
11B-19	2005	14.5	14	8.8	19.2	0	10	0	**66.5**	**F-G**
11B-19	2010	20.5	14.7	14.9	12.4	-0.3	5	0	**67.2**	**G**
11B-19	2015	23.9	14.8	15	18	-7.8	3.5	0	**67.4**	**G**
11B-19	2020	26.6	12.8	7.5	22	-5.1	2.5	0	**66.3**	**F-G**
11B-19	2025	30	13.2	2.6	17.5	-0.6	0.5	0	**63.2**	**F-G**
11B-20	2015	26.3	3.6	1.7	0	0	0.1	0	**31.7**	**F**
11B-20	2020	28.4	2.1	1.5	0	0	0	0	**32**	**F**
11B-20	2025	30	7.4	0.8	0.3	-0.2	0	0	**38.3**	**F**
11B-22	2020	24.8	5.6	6.1	3.7	-0.2	0.5	0	**40.5**	**F**
11B-22	2025	26.3	6.5	0.4	8.6	-0.4	0	0	**41.4**	**F**
11R-01*	1997	6.8	14.9	8.7	13.9	0	0.9	0	**45.2**	**F-G**
11R-05*	1997	0.2	0	0	11.5	0	1.7	0	**13.4**	**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
11R-06*	1997	0	0	0	11.1	0	3.8	0	**14.9**	**VP**
11R-06*	2000	0	0	0	30	0	6.3	0	**36.3**	**VP-P**
11R-06*	2005	0	0	0	30	0	3.8	0	**33.8**	**VP-P**
11R-07*	1997	0.8	0	0	6.5	0	0.6	0	**7.9**	**VP**
11R-07*	2000	0.8	0	0	30	0	3.8	0	**34.6**	**VP-P**
11R-07*	2005	2.7	0	0	30	0	0.5	0	**33.2**	**VP-P**
11R-08*	1997	4	0	0	10	0	10	0	**24**	**VP**
11R-21	2021	27.3	1.3	6.6	23	0	1.1	0	**59.3**	**F**
11R-21	2025	24.8	-1.2	2.2	19.8	0	3.3	0	**48.9**	**P**

Table 4.8: Deer winter range Desirable Components Index (DCI) information by site number of Range Trend studies for WMU 11, Nine Mile. 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
11A-02	Wirefence Canyon	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Animal Use – Cattle	Medium	Reduced diversity of desirable grass and forb species
		Drought		Lowered resilience and resistance to disturbance
11A-03	Chokecherry Canyon	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
		Drought		Lowered resilience and resistance to disturbance
11A-04	Cottonwood Canyon	Energy Development	High	Fragmentation and degradation/loss of habitat
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		Drought		Lowered resilience and resistance to disturbance
11A-05	Nutter's Canyon	Energy Development	High	Fragmentation and degradation/loss of habitat
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
		Drought		Lowered resilience and resistance to disturbance
11B-01	Deadman	Annual Grass	High	Increased fire potential and reduced herbaceous diversity
		Energy Development	High	Fragmentation and degradation/loss of habitat
		Animal Use – Deer	Medium	Reduced/less vigorous browse component
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
11B-04	Coal Creek	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
11B-05	'B' Canyon	Introduced Perennial Grass	High	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
11B-06	Upper Cottonwood Ridge	Conifer Encroachment	High	Reduced understory shrub, aspen stand, and herbaceous vigor
		Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
11B-07	Cottonwood	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
		Drought		Lowered resilience and resistance to disturbance
11B-08	Cedar Corral	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
11B-09	Cedar Ridge	Animal Use – Horse	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
11B-15	Twin Hollow	Animal Use – Horse	High	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
11B-16	Steer Ridge	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
11B-19	Dugout Creek PJ Chained	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
11B-20	Deadman Creek	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

Study #	Study Name	Limiting Factor and/or Threat	Level of Impact	Potential Impact
11B-22	Soldier Creek	Animal Use – Deer	High	Reduced/less vigorous browse component
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
11R-09	East Carbon	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
	Bullhog	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
11R-10	West Coal Creek	Energy Development	High	Fragmentation and degradation/loss of habitat
	Bullhog	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
11R-12	Burnt Cabin Spring	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		Conifer Encroachment	Low	Reduced understory shrub, aspen stand, and herbaceous vigor
		Noxious Weeds	Low	Reduced diversity of desirable grass and forb species
11R-13	Horse Canyon	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
11R-14	Horse Canyon 2	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
11R-15	Big Wash	Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
		Drought		Lowered resilience and resistance to disturbance
11R-16	Cold Springs WMA	Conifer Encroachment	Low	Reduced understory shrub, aspen stand, and herbaceous vigor
		Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species
		Noxious Weeds	Low	Reduced diversity of desirable grass and forb species
11R-17	Dugout	PJ Encroachment	Medium	Reduced understory shrub and herbaceous vigor
		Noxious Weeds	Low	Reduced diversity of desirable grass and forb species
11R-18	Cottonwood Ridge	Animal Use – Horse	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
11R-19	Knap Bench	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
11R-20	Flat Iron Mesa	Conifer Encroachment	Low	Reduced understory shrub, aspen stand, and herbaceous vigor
		Noxious Weeds	Low	Reduced diversity of desirable grass and forb species
11R-21	Stone Cabin Gas	Energy Development	High	Fragmentation and degradation/loss of habitat
	Field	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
		Drought		Lowered resilience and resistance to disturbance

Table 4.9: Assessment of the potential limiting factors and/or threats and level of threat to study sites for WMU 11, Nine Mile. 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 Nine Mile Management Unit averages as being in fair condition as of 2025. Five sites are considered to be in fair condition, and the condition of four additional studies ranges from fair-good to excellent. However, the Deadman, 'B' Canyon, Cottonwood, Cedar Ridge, and Stone Cabin Gas Field studies all range in condition from very poor to poor as of 2025 and lower the overall unit average when evaluated together. Reasons for these poorer conditions vary depending on study site, but they generally include lower preferred browse cover; undiversified age structure within preferred browse communities; lower perennial grass cover; and limited perennial forb cover. Increased annual grass cover also negatively affects the condition of the Deadman study site in particular. Study sites that are in fair-good to excellent condition as of the most recent sample year are Twin Hollow, Steer Ridge, Dugout Creek PJ Chained, Deadman Creek, and Soldier Creek; these sites contribute to the overall stability and habitat quality in this unit. Shared factors among these sites that contribute to quality habitat condition include ample cover of preferred browse, increased recruitment of young into the preferred browse communities, and higher perennial grass cover (**Figure 4.45**, **Table 4.8**).

Of positive note within the Nine Mile Management Unit are the improvements in habitat quality (particularly with pinyon-juniper reduction and aspen rejuvenation) that have been observed following treatment on many Range Trend and Watershed Restoration Initiative (WRI) sites. Habitat treatments in general have also been and continue to be implemented in areas not monitored by the Range Trend program. As of January 2026, an estimated 51,312 acres have been treated in the Nine Mile Management Unit through the WRI (**Table 4.5**). Examples of some of these improvements in areas where studies have been established include the responses to treatment on the Burnt Cabin Spring, Cold Springs WMA, and Flat Iron Mesa studies. These sites existed as quaking aspen (*Populus tremuloides*) stands that were highly encroached by conifers prior to their respective treatments. However, a prescribed fire occurred on the Burnt Cabin Spring study in 2015, and a bulldozer push treatment removed the standing dead timber in 2019. Both Cold Springs WMA and Flat Iron Mesa underwent push treatments in 2014 and 2019, respectively (Utah's Watershed Restoration Initiative, 2026). As time treatment has elapsed on each of these studies, the aspen stands have exhibited overall density increases and conversions to younger age classes. The herbaceous understories have also displayed positive responses; perennial grass cover and diversity increased on the Flat Iron Mesa study, and the perennial forb community has diversified. Perennial grass and forb cover and diversity also exhibited notable increases on the Burnt Cabin Spring and Cold Springs WMA sites, as has cover of preferred browse (Lane, Payne, & Cox, Utah Big Game Range Trend Studies: 2025 Annual Report, 2026).

Habitat change fueled by fire can rely on multiple variables, and a single fire can have both positive and negative impacts depending on localized factors. Fire activity in the Nine Mile unit has been relatively limited (**Map 4.9**) when compared with that in other management units, and a vast majority of the higher elevation areas that have burned in the last 20 years (for example, in the Church Camp Fire of 2012) are not monitored by the Range Trend program. However, the effects of prescribed fire observed on the Burnt Cabin Spring study could provide some insight on potential responses of other similar aspen stands in the unit that have burned. The relative lack of recent fire activity over the last 20 years in lower elevations may itself be a positive aspect in this unit; ecological communities in lower elevations are generally less resistant and resilient to disturbance than those in higher elevations (Chambers, et al., 2013).

Previous WRI treatments targeting aspen stands indicate that the condition of these communities is a known concern in this unit. The aspen study sites mentioned previously in this discussion have responded well to treatment, conifer encroachment into aspen has been observed on the Upper Cottonwood Ridge site; aspen and conifer have remained co-dominant throughout the study period. Aspen cover and density have not decreased on this study site, but poor vigor of the aspen community has increased since 2015. Aspen condition almost certainly varies in this unit, but conifer encroachment is likely occurring in other areas. Although Range Trend data is lacking in other parts of the management unit, the LANDFIRE Vegetation Departure model can be used to obtain a general sense of how ecologically intact the aspen communities unit-wide may be. As was discussed in the LANDFIRE Existing Vegetation Type section, approximately 19% of mule deer summer range in this unit is modeled as being comprised of aspen biophysical types (**Table 4.1**). According to the LANDFIRE Vegetation Departure model, nearly 96% of these modeled aspen types are considered to be moderately departed from reference conditions (LF2024_VDep_CONUS, 2024).

Human activities and influences are present or occurring in the Nine Mile Management Unit that may directly or indirectly affect wildlife and habitat. Publicly owned land administrated by both federal and state agencies comprises a large portion of this management unit, as do tribal lands and privately-owned parcels. The diversity of landownership is not negative in itself. However, the complexity of ownership boundaries may require higher levels of communication and coordination between agencies and individuals in order to implement habitat improvement projects and larger-scale management decisions.

Additional human activities occurring in Unit 11 include those related to energy development and resource extraction. Localized effects of these activities have been observed on the Cottonwood Canyon study. Between 2011 and 2013 a well was drilled just south of this site, and an access road was expanded that directly altered the transect. On a larger scale, there are roughly 3,500 producing oil and gas wells within the boundaries of the Nine Mile unit. Approximately 1,750 of these wells overlap mule deer habitat of varying seasonality, with 71% being located in the Anthro subunit and the remaining 29% in the Range Creek subunit (Utah Department of Natural Resources; Oil, Gas, and Mining Division, 2026). Wells in mule deer habitat are located adjacent to a number of different habitats according to the LANDFIRE Vegetation Departure model. A majority of these adjacent habitats are modeled as being dominated by salt desert scrub vegetation and pinyon-juniper woodlands and shrublands. However, notable additional portions are classified as biophysical sites that may have more importance to wintering mule deer, including the Colorado Plateau Mixed Low Sagebrush Shrubland and Inter-Mountain Basins Big Sagebrush Shrubland vegetation types (LF2024_VDep_CONUS, 2024). Habitat in this management unit could also be affected by the installation of new infrastructure to service energy developments and other industries in the larger region: the Uinta Basin Railway is one such installation. The final route selected for this railway (the "Whitmore Park" route) traverses the area just south of the Anthro subunit's northern border, continues southwest down Indian Canyon on the Anthro subunit's western border, continues on this trajectory across Argyle Ridge and into Emma Park in the very northwestern portion of the Range Creek subunit; and continues west across Emma Park to Kyune (Uinta Basin Railway, 2026). The Environmental Impact Statement (EIS) associated with the railway thoroughly defines and addresses the potential impacts on wildlife and habitat. As such, these impacts will not be discussed further in this report, but detailed information is readily available in the Biological Resources section of the EIS (Surface Transportation Board, Office of Environmental Analysis, 2021).In addition to these activities, two areas in the Nine Mile unit have been identified as Utah Renewable Energy Zones (UREZ) Phase I Wind Energy Zones, including narrow areas on the ridge above the Bad Land Cliffs and on Argyle Ridge (Utah Office of Energy Development; Utah Geological Survey, 2026). Although renewable energy-related activities do not currently threaten big game habitat in these areas, there may be potential for localized wind energy development in the future.

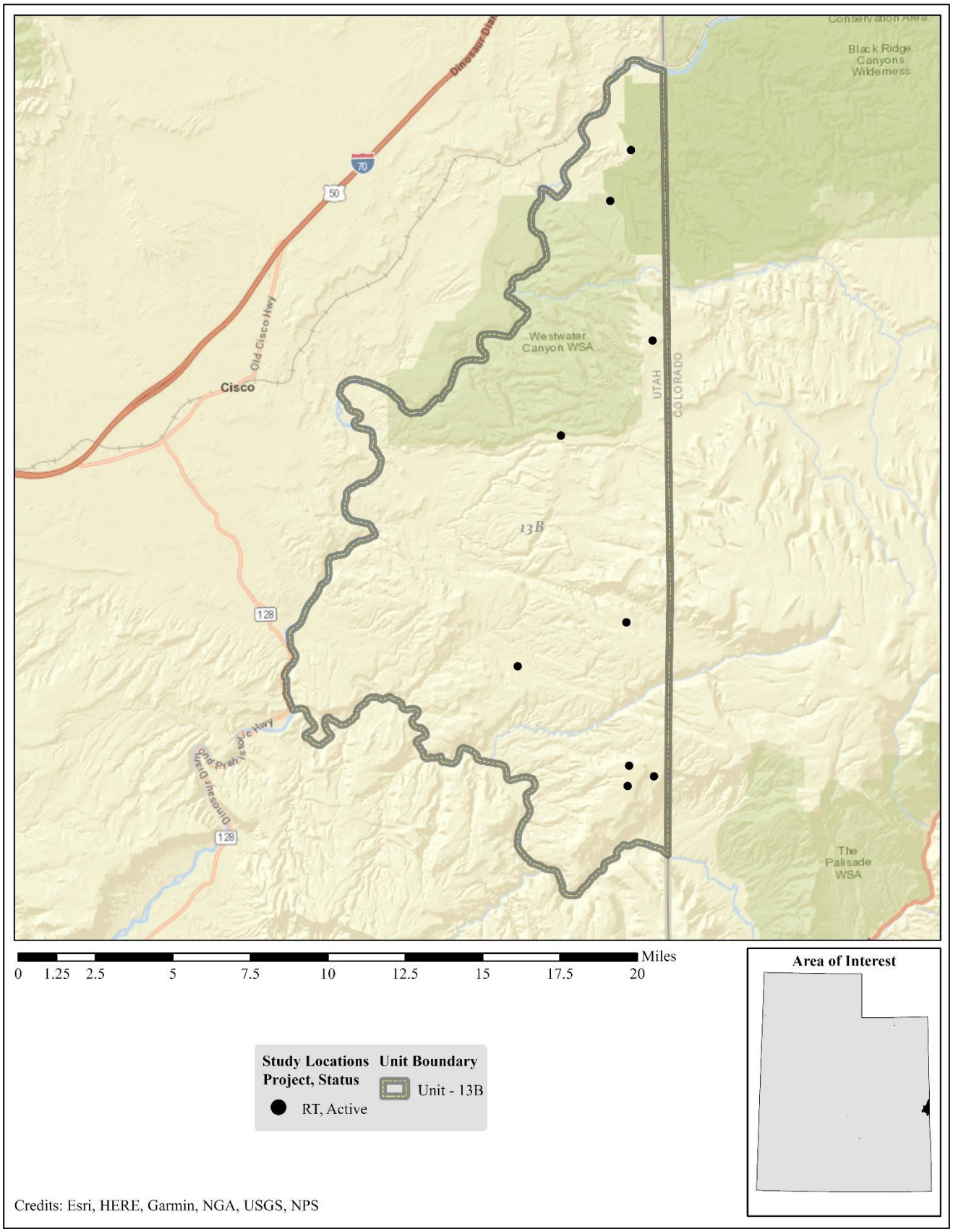
The most obvious direct impacts on the loss and fragmentation of big game habitat in areas affected by energy development have likely occurred or will occur during installation of oil and gas wells and construction of the infrastructure that services them. However, there still may be potential for vehicle-animal collisions with oil and gas-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). Furthermore, effects of noise on mule deer have been observed specifically in association with natural gas and oil developments. Kleist, et al. (2021) found that mule deer in the Piceance Basin of Colorado were more likely to be present on quieter sites in a producing natural gas field than louder sites. The strongest relationship between occupancy and noise in this study was found in the context of noise from roads servicing the area.

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 4.9**).

A number of recommendations should be taken into consideration when trying to maintain or improve big game habitat within the Nine Mile Management Unit. Notable acreage within this unit has already been treated for tree encroachment, with many projects occurring in the larger area around Price. The treatments on sites monitored by the Range Trend Project (**Table 4.7**) have generally reset the affected communities back to an earlier phase of woodland succession. However, extant tree components remain

on many sites (see **Table 4.9** for study sites with a current threat from pinyon-juniper encroachment). Previously treated and untreated areas should continue to be monitored, and both maintenance and initial projects should continue to occur when and where they are deemed necessary. Habitat improvement projects in general should also continue when and where appropriate. If reseeding is necessary to restore herbaceous species, care should be taken in species selection and preference should be given to native species when feasible. 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 13B – DOLORES TRIANGLE



WILDLIFE MANAGEMENT UNIT 13B – DOLORES TRIANGLE

Boundary Description

Grand County – Boundary begins at the Colorado River and the Utah-Colorado state line; south on this state line to the Dolores River; northwest along this river to the Colorado River; northeast along this river to the Utah-Colorado state line.

Management Unit Description

Geography

The Dolores Triangle unit is formed by the Colorado River, the Dolores River, and the Colorado-Utah state line. Topography is varied with relatively high, flat mesas above 7,000 feet, with the highest elevation just above 7,600 feet along the flats sloping west, away from Renegade Point in Colorado. Large rocky, rough canyons and broken country are found at middle elevations, and low desert areas are found along the Colorado River. The lowest elevation point is found at the confluence of the Dolores and Colorado rivers at 4,104 feet. There are several notable drainages in this unit: Granite Creek flows into the Dolores River, and Ryan Creek, Coates Creek, and Little Dolores River empty into the Colorado River. There are ranches scattered throughout the area, but Fruita and Grand Junction, Colorado are the closest municipalities. Access to the unit is through Colorado by way of Glade Park or by fording the Dolores River near its confluence with the Colorado River at Dewey; however, fluctuating water levels and undulating bottom contours make crossing the river hazardous.

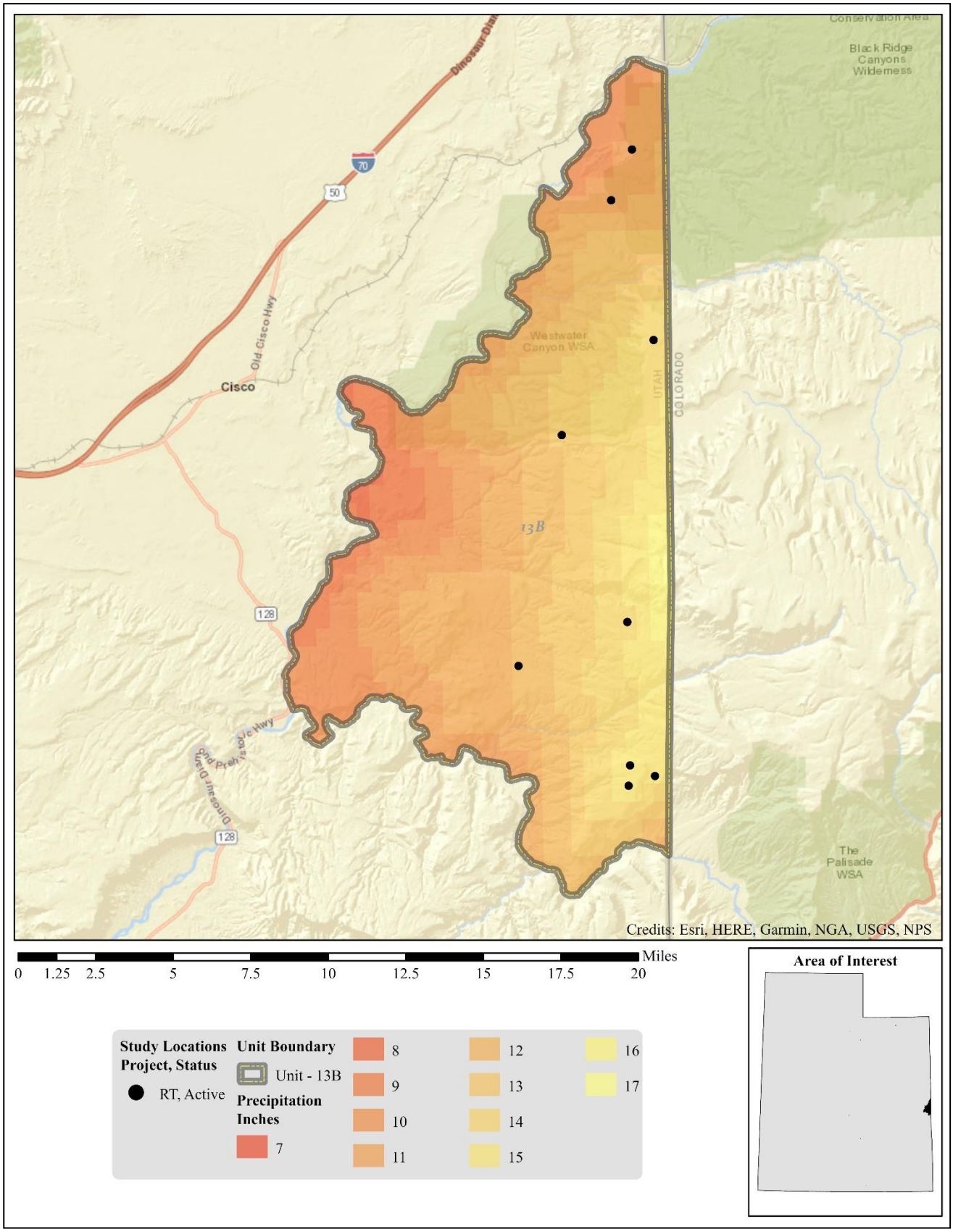
Climate Data

The 30-year (1991-2020) annual precipitation PRISM model shows that precipitation on this unit ranges from 7 inches near the bottoms of the Colorado River to 17 inches on the slopes west of Renegade Point. All of the active Range Trend and Watershed Restoration Initiative (WRI) monitoring studies in this unit occur between 9 and 14 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 Southeast division (Division 7).

The mean annual PDSI of the Southeast division, which the Dolores unit is part of, has predominantly experienced some form of drought or dry spell since 1995. The Southeast division has been in a state of drought for 55% of the time. The severity has been significant, with 59% of drought years in the Southeast division being considered either moderate or extreme. Over the 31 years of reported PDSI, the Southeast division has not had any recorded consecutive wet years, and drought years have only been interrupted by six single wet year events. The most notable wet year for the Southeast division occurred in 2005 (**Figure 5.1a**). 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 5.1b**). 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 5.3**). For division 7, the 1995, 2005, 2010, and 2015 sample years occur during wet years, but years where drought may have affected plant condition occur in 2000, 2020, and 2025 (**Figure 5.1a, Figure 5.1b**) (National Oceanic and Atmospheric Administration, 2026).



Map 5.1: The 1991-2020 PRISM Precipitation Model for WMU 13B, Dolores Triangle (PRISM Climate Group, Oregon State University, 2021).

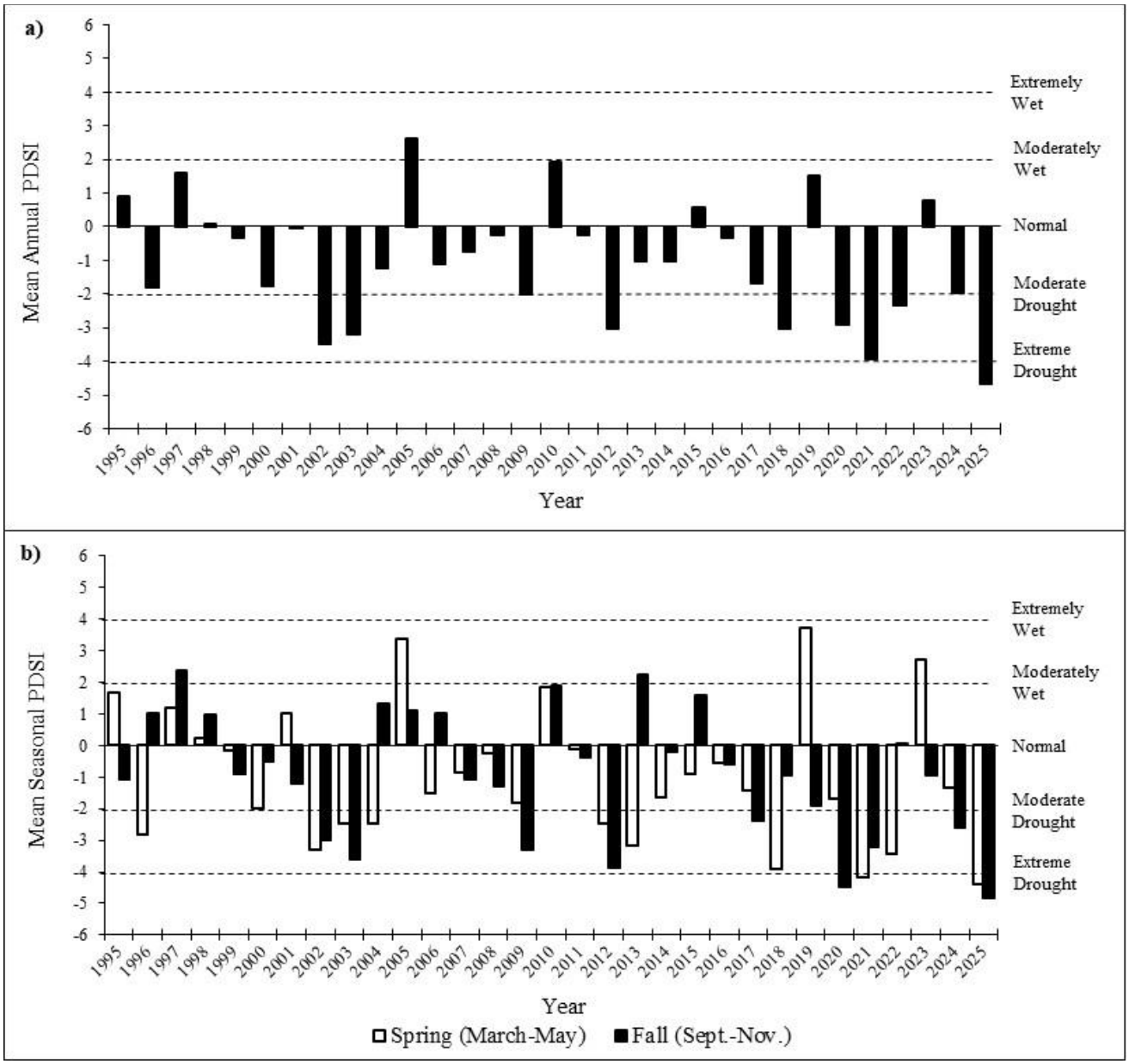


Figure 5.1: The 1995-2025 Palmer Drought Severity Index (PDSI) for the Southeast division (Division 7). The PDSI is based on climate data gathered from 1895 to 2025. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet, and negative deviations indicate drought. Classification 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, 2026).

Big Game Habitat

The Dolores Triangle Management Unit (13B) serves as winter range for deer, but deer spend the remainder of the year in Colorado's Pinon Mesa area. Few deer reside in the unit year-round, and those that do are found along the Colorado River. Concentrated areas for deer during normal winters include Steamboat Mesa, Lower Steamboat Mesa, Fish Park, Big Triangle, Ryan Park, and Granite Park. Only during severe winters with abnormally heavy snowfall are deer forced to disperse into the lower desert range where forage quality is poor. Severe winter range and normal winter range are not separated into different categories because much of the land to the east is too high for normal winter range; the whole unit could therefore be considered crucial. The ranches with agricultural land scattered throughout the herd unit offer valuable forage to the deer in the spring and fall.

Coles and Pederson (1967) identified and described five vegetation types which make up the winter range on the unit. The desert shrub type is dominated by blackbrush (*Coleogyne ramosissima*), which occupies the lower portions of this winter range; this is supported by LANDFIRE imaging data (LC24_EVT_250, 2024). This type is most important during severe winters although few desirable forage species are found within it. The grass type is found in the Granite Park and Steamboat Mesa areas. These were once large sagebrush (*Artemisia* spp.) parks, but they have undergone a conversion to grasses – much of it cheatgrass (*Bromus tectorum*) and/or bulbous bluegrass (*Poa bulbosa*) – after overgrazing during the wrong time of the year (fall and/or spring), wildfires (reoccurring more often after the increase in weedy species), and sagebrush treatments. These areas were formerly important deer wintering areas but now receive increased use by elk. Also supported by LANDFIRE, the sagebrush type is found above the desert shrub type, up to and within the pinyon-juniper woodlands (LC24_EVT_250, 2024), and provides important browse to both deer and livestock. The pinyon-juniper type, like the grass type, has undergone some changes due to competition with the mature trees, extended drought, and heavy use in some years. An understory of cliffrose (*Purshia stansburiana*) and black sagebrush (*A. nova*) has diminished somewhat through the years and is the least productive vegetation type on the unit: this type is common on the slopes and higher mesas. The pinyon-juniper-sagebrush type occupies the upper portions of the winter range and provides important cover and forage for wildlife. In recent years, many wildfires have burned a large number of acres of this vegetation type (**Map 5.5**, **Map 5.6**).

Rangeland Analysis Platform (RAP) – Cover by Mule 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 cover values 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. The following graphs represent vegetation changes by 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 inclusion of the RAP data in this report is also to help illustrate the year-to-year fluctuations or changes that may occur between Range Trend samplings. Also displayed in the following graphs is the change in satellite imaging resolution from 30m to 10m used to calculate cover. This change occurs in 2018 and is denoted by a dashed line. Calculated cover estimations in 2018 and beyond use10m resolution, so caution should be followed when comparing years before 2018 to years after, as sequential comparisons are not at the same scale.

The RAP data shows fluctuations of herbaceous cover on mule deer winter range. The highest values for herbaceous cover of perennial lifeforms occurred in the late 1980s and early 1990s and have since decreased.

Total herbaceous cover values have decreased overall despite year-to-year variation. The greatest variation in cover occurs within the annual lifeforms; much of this variation in annual cover is likely reflects precipitation trends for years with high pulses in cover. 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. Annual lifeforms also appear to contribute a larger proportion of total cover beginning in 2005 (**Figure 5.2**).

Range Trend data for herbaceous cover from 1995 to present shows sampling 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 upland and semidesert study sites. A large majority of herbaceous cover is provided by annual lifeforms on semidesert ecotypes (**Figure 5.14**, **Figure 5.15**): this broadly correlates with RAP data for herbaceous cover of annual lifeforms on mule deer winter habitat (**Figure 5.2**).

According to the RAP data and despite yearly fluctuations, shrub and tree cover on this winter range is similar when comparing 1986 data with that from 2025. Over recent years, shrub and tree covers have generally remained stable with minor variations (**Figure 5.3**). When potential 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. Tree cover data for Range Trend sites exhibit relatively no net gain. Shrub cover has decreased on upland Range Trend sites, and it has been stable for Semidesert (Blackbrush) sites. Range Trend data for tree and shrub cover values since 2005 have exhibited yearly fluctuations depending on ecotype, and correlations with RAP data are not readily apparent (**Figure 5.4**, **Figure 5.5**, **Figure 5.6**, **Figure 5.7**). Some of this ambiguity may be due to low sample size on winter 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 this unit. It is important to note that variations in cover on Range Trend sites will not always correspond with the fluctuations estimated by 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 Cover by Mule Deer Habitat

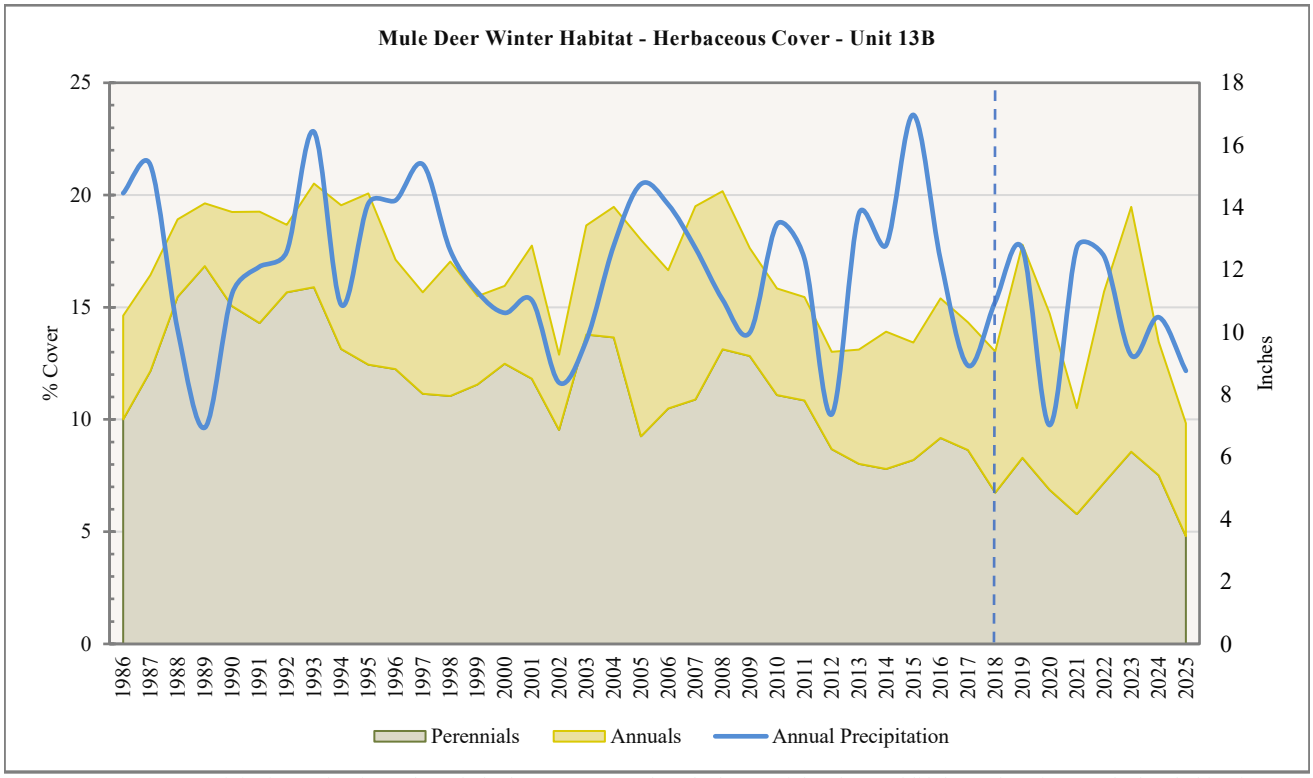


Figure 5.2: Average precipitation and estimated yearly herbaceous cover of stacked perennial and annual lifeforms for winter mule deer habitat in WMU 13B, Dolores Triangle (Rangeland Analysis Platform, 2026).
*Dashed line indicates shift in depicted datasets from RAP 30m (1986-2017) to RAP 10m (2018-2025) (USDA Agricultural Research Service, 2026).

RAP – Shrub and Tree Cover by Mule Deer Habitat

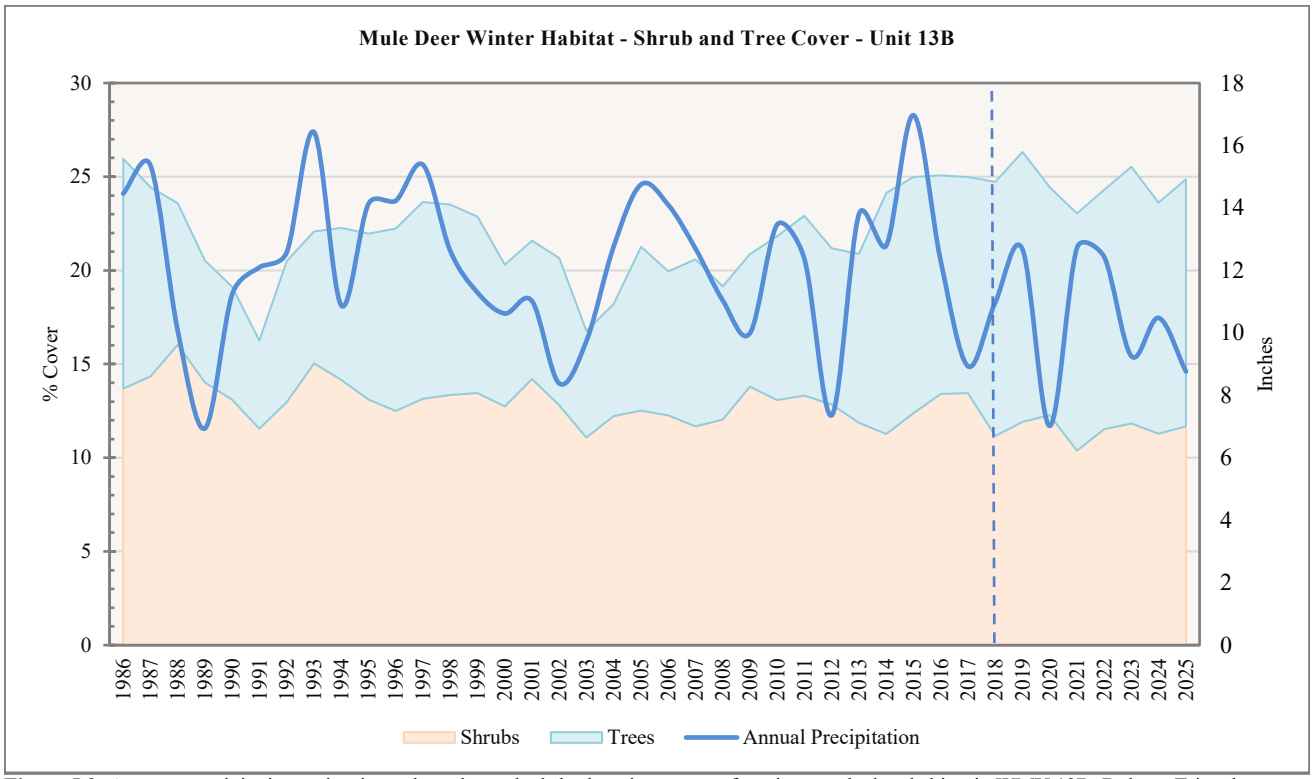
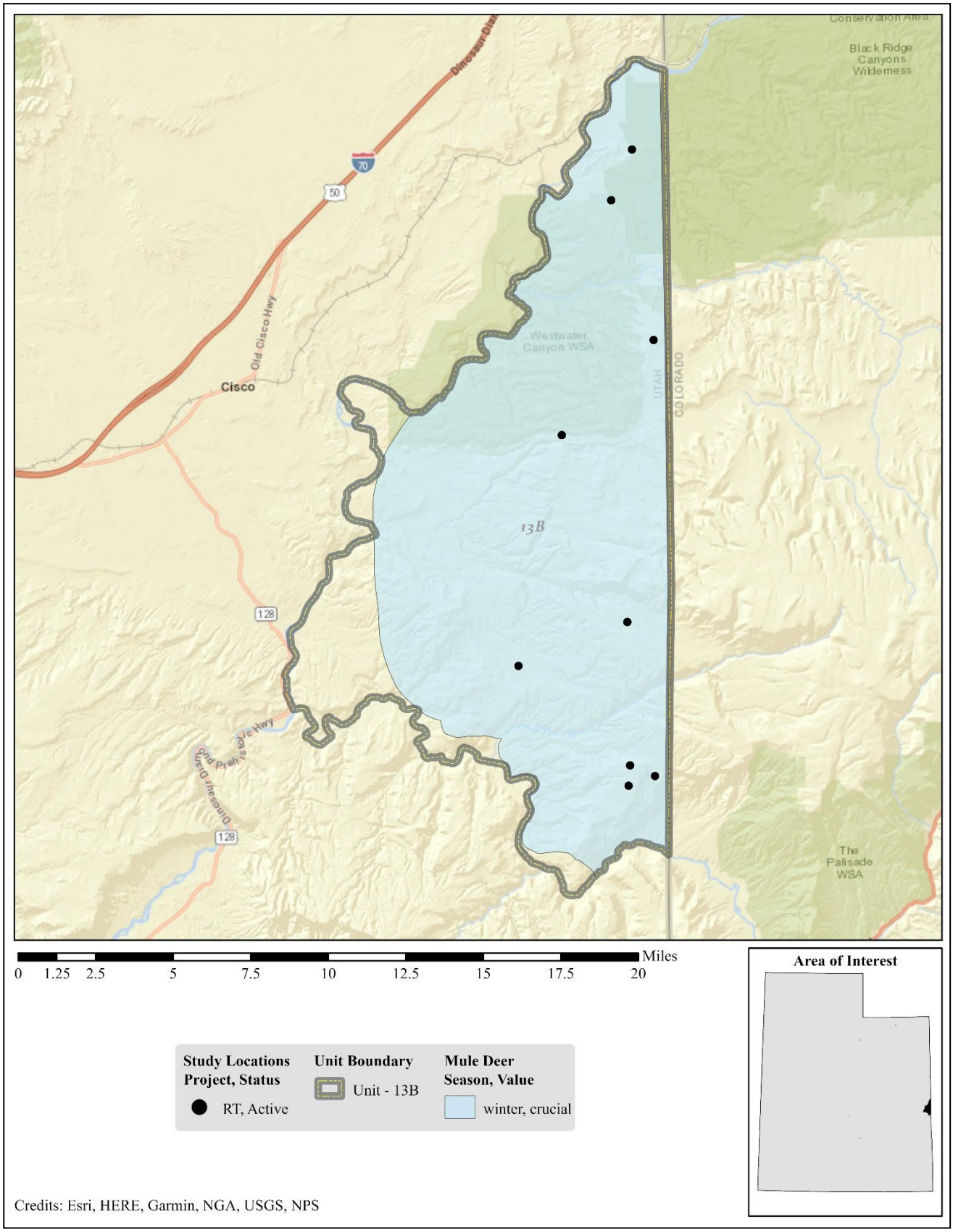
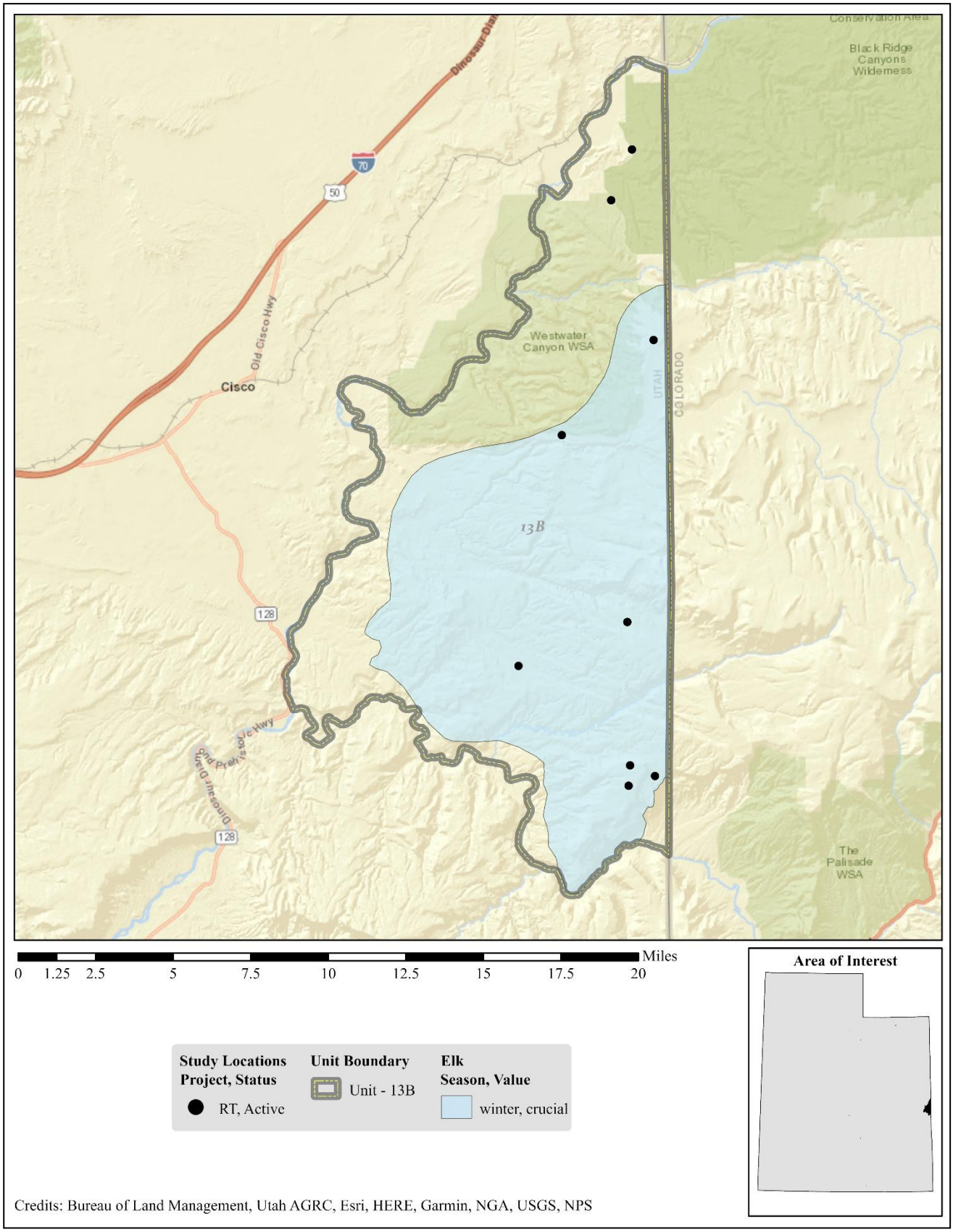


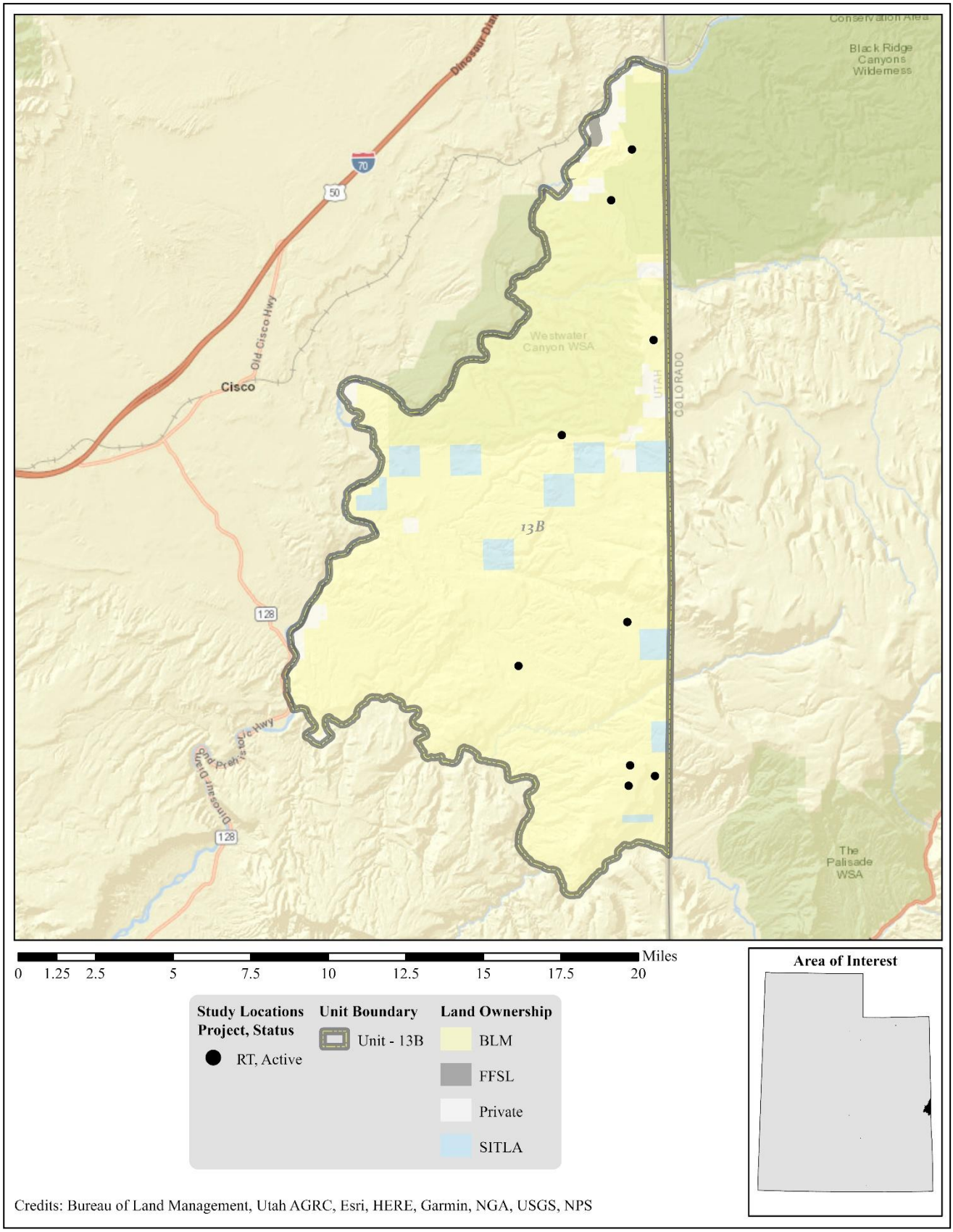
Figure 5.3: Average precipitation and estimated yearly stacked shrub and tree cover for winter mule deer habitat in WMU 13B, Dolores Triangle (Rangeland Analysis Platform, 2026).
*Dashed line indicates shift in depicted datasets from RAP 30m (1986-2017) to RAP 10m (2018-2025) (USDA Agricultural Research Service, 2026).



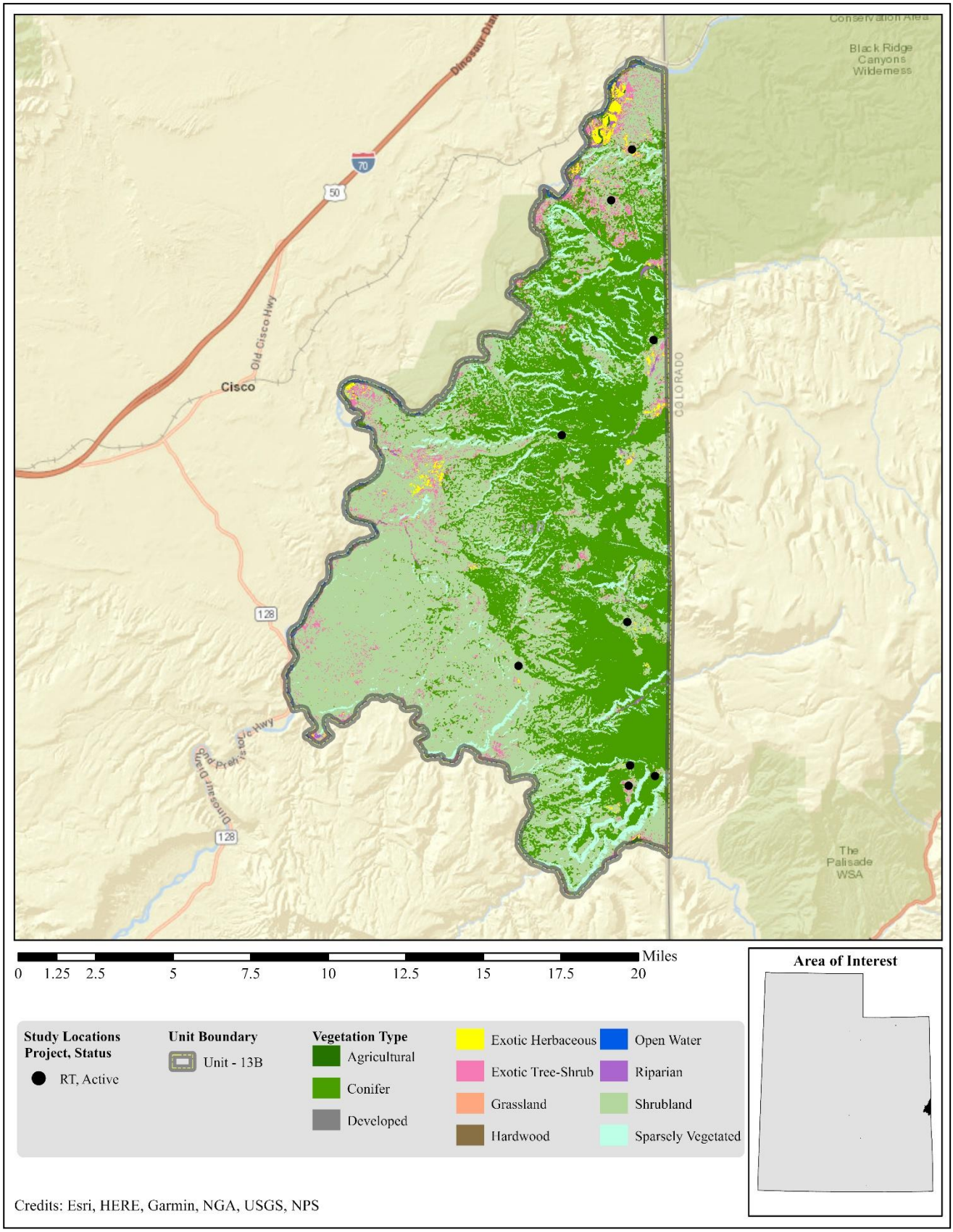
Map 5.2: Estimated mule deer habitat by season and value for WMU 13B, Dolores Triangle.



Map 5.3: Estimated elk habitat by season and value for WMU 13B, Dolores Triangle.



Map 5.4: Land ownership for WMU 13B, Dolores Triangle.



Map 5.5: LANDFIRE Existing Vegetation Type map (LC24_EVT_250, 2024) for WMU 13B, Dolores Triangle.

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 53% of the mule deer winter range in the Dolores Triangle unit (LC24_EVT_250, 2024). 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.

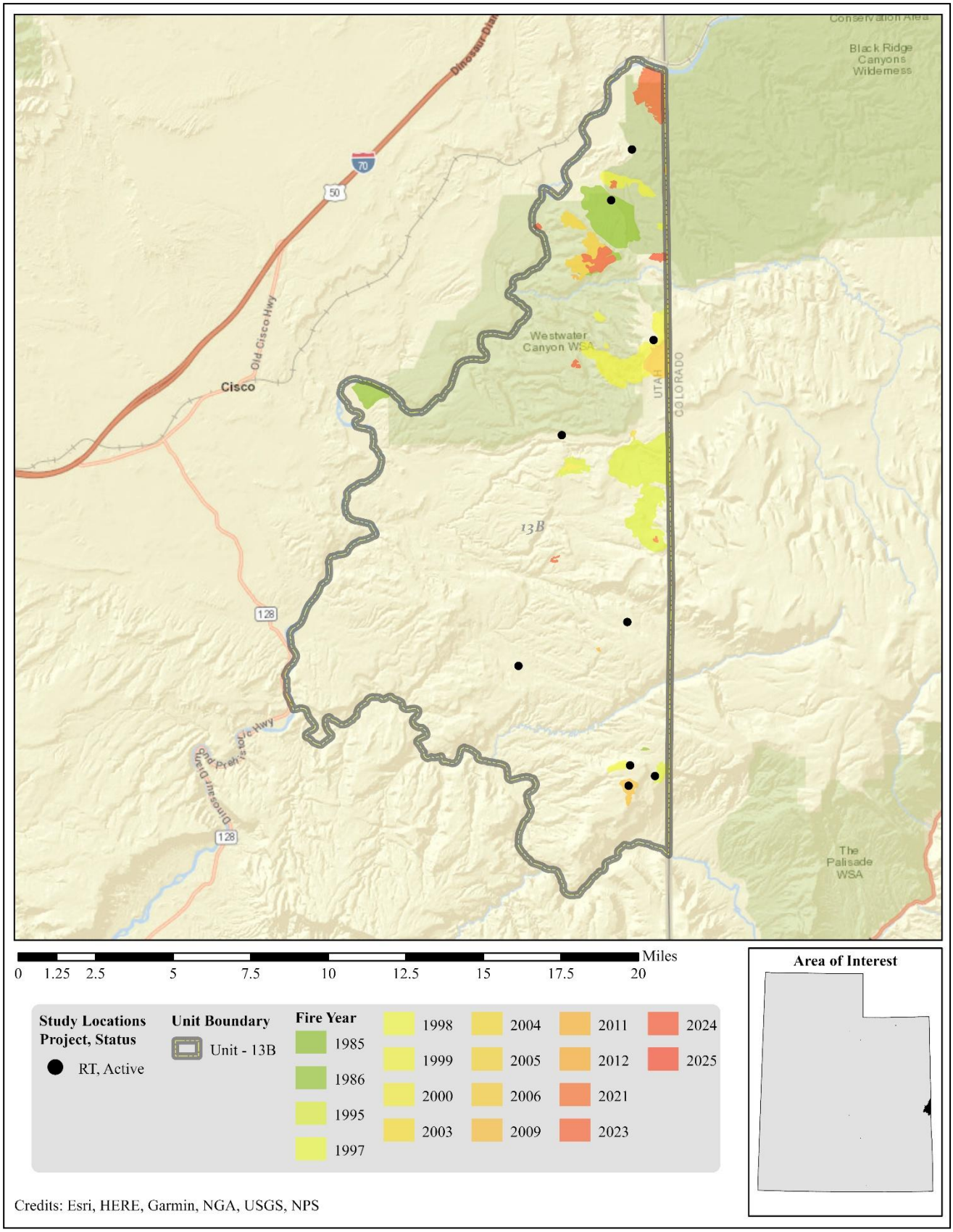
The model also indicates that nearly 19% of winter range is comprised of the Colorado Plateau Blackbrush-Mormon-tea Shrubland type; sites of this vegetation type are low in elevation. Browse species that could provide valuable forage during the winter months are often present and may include species such as blackbrush (*Coleogyne ramosissima*), Mormon tea or Torrey's jointfir (*Ephedra viridis* or *E. torreyana*), and spiny hopsage (*Grayia spinosa*). The model also indicates that sagebrush shrublands make up nearly 9% of the unit's winter range for mule deer. Sagebrush species typically dominate these biophysical sites 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 mid-elevations. An additional 6% of this unit's winter range is modeled to be sparsely vegetated (**Table 5.1**), a vegetation class that may have less value for mule deer than other, more productive sites.

A variety of other vegetation types comprise the rest of the mule deer winter habitat within the Dolores Triangle Management Unit (**Map 5.5**, **Table 5.1**), 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 Winter Mule Deer Habitat	Acres	% of Total	Group % of Total
Shrubland	Colorado Plateau Blackbrush-Mormon-tea Shrubland	18,781	18.62%	
	Colorado Plateau Pinyon-Juniper Shrubland	9,130	9.05%	
	Inter-Mountain Basins Big Sagebrush Shrubland	8,876	8.80%	
	Inter-Mountain Basins Mixed Salt Desert Scrub	3,278	3.25%	
	Inter-Mountain Basins Semi-Desert Shrub-Steppe	1,620	1.61%	
	Southern Colorado Plateau Sand Shrubland	1,092	1.08%	
	Rocky Mountain Lower Montane-Foothill Shrubland	840	0.83%	
	Inter-Mountain Basins Mat Saltbush Shrubland	521	0.52%	
	Inter-Mountain Basins Greasewood Flat	395	0.39%	
	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	212	0.21%	
	Colorado Plateau Mixed Low Sagebrush Shrubland	40	0.04%	
	Inter-Mountain Basins Montane Sagebrush Steppe	37	0.04%	44.43%
Conifer	Colorado Plateau Pinyon-Juniper Woodland	44,481	44.09%	
	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	44	0.04%	
	Southern Rocky Mountain Ponderosa Pine Woodland	8	0.01%	
	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	3	0.00%	
	Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland	1	0.00%	
	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	1	0.00%	44.15%
Other	Sparsely Vegetated	6,221	6.17%	
	Riparian	357	0.35%	
	Open Water	139	0.14%	
	Agricultural	93	0.09%	
	Developed	39	0.04%	
	Quarries-Strip Mines-Gravel Pits-Well and Wind Pads	<1	0.00%	6.79%
Exotic Tree-Shrub	Great Basin & Intermountain Ruderal Shrubland	3,457	3.43%	
	Interior Western North American Temperate Ruderal Shrubland	55	0.05%	3.48%
Exotic Herbaceous	Great Basin & Intermountain Introduced Annual Grassland	642	0.64%	
	Great Basin & Intermountain Introduced Annual and Biennial Forbland	228	0.23%	
	Great Basin & Intermountain Introduced Perennial Grassland and Forbland	74	0.07%	
	Interior Western North American Temperate Ruderal Grassland	13	0.01%	0.95%

Group	Existing Vegetation Type for Winter Mule Deer Habitat	Acres	% of Total	Group % of Total
Grassland	Inter-Mountain Basins Semi-Desert Grassland	186	0.18%	
	Rocky Mountain Subalpine-Montane Mesic Meadow	2	0.00%	
	Southern Rocky Mountain Montane-Subalpine Grassland	1	0.00%	0.19%
Hardwood	Rocky Mountain Aspen Forest and Woodland	14	0.01%	0.01%
Total		**100,884**	**100%**	**100%**

Table 5.1: LANDFIRE Existing Vegetation Type (LC24_EVT_250, 2024) acreage of winter mule deer habitat for WMU 13B, Dolores Triangle.



Map 5.6: Land coverage of fires by year from 1985-2025 for WMU 13B, Dolores Triangle (NIFC Open Data Site: Federal Interagency Wildland Fire Maps and Data for All, 2025; Geosciences and Environmental Change Science Center (GECSC) Outgoing Datasets, 2023).

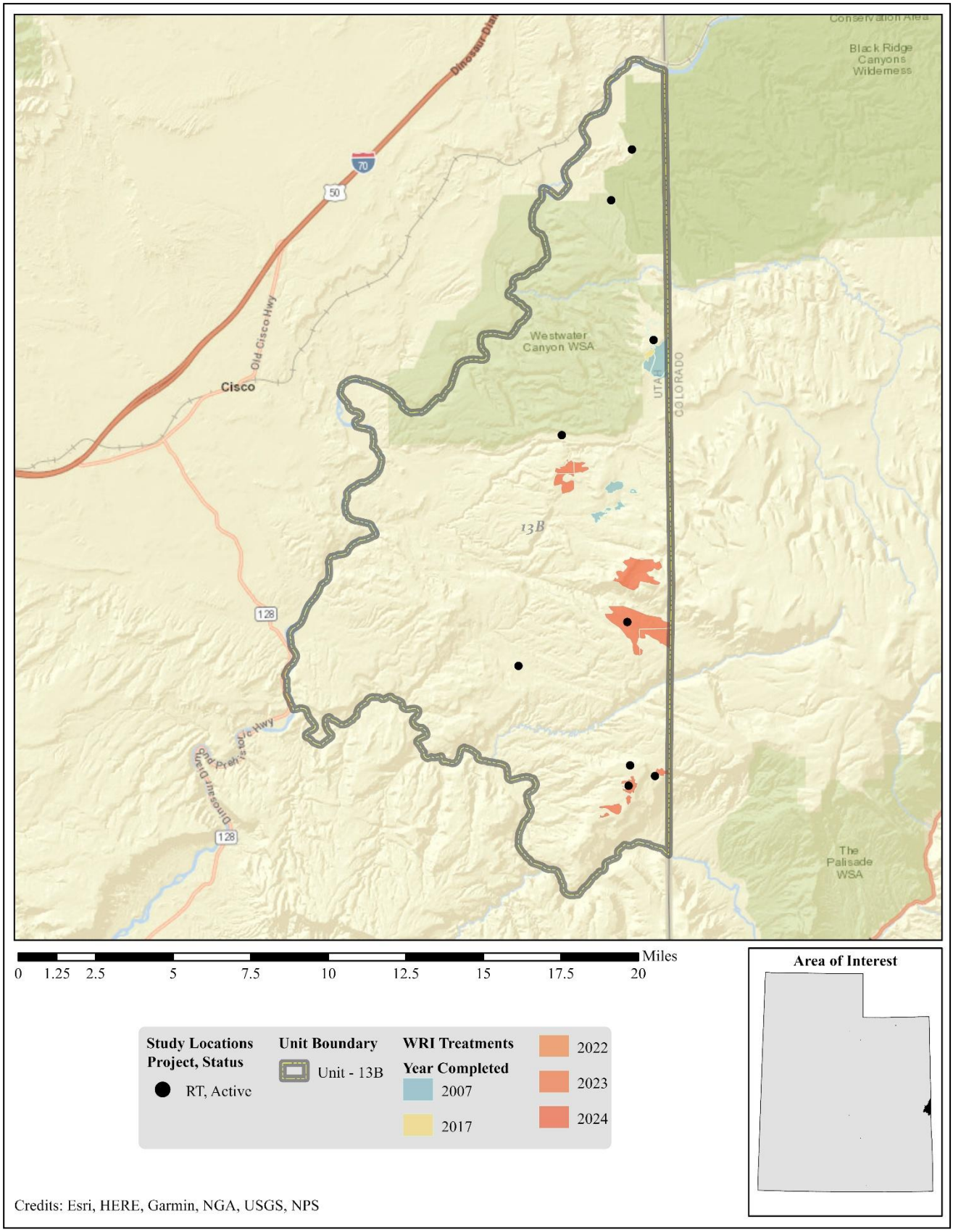
Treatments/Restoration Work

There has been an active effort to address many of the limitations on this unit through the Watershed Restoration Initiative (WRI). A total of 3,277 acres of land has been treated within the Dolores Triangle unit since the WRI was implemented in 2004. Treatments frequently overlap one another, bringing the net total of completed treatment acres to 3,217 for this unit (**Map 5.7**, **Table 5.2**). 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.

Herbicide application to control undesirable vegetation is the treatment type with the most completed acreage in the Dolores Triangle unit. Other management practices used in this unit include anchor chaining, lop and scatter treatments to remove trees, and greenstripping (**Table 5.2**).

Type	Total Completed Acreage
Herbicide Application	**2,459**
Aerial (Fixed-Wing)	2,443
Spot Treatment	17
Anchor Chain	**457**
Smooth (One-Way)	457
Vegetation Removal/Hand Crew	**307**
Lop & Scatter	307
Greenstripping	**54**
Greenstripping	54
Grand Total	**3,277**
***Net Total Land Area Treated**	**3,217**

Table 5.2: WRI treatment action size (acres) of completed projects for WMU 13B, Dolores Triangle. Data accessed on 01/26/2026.
*Does not include overlapping treatments.



Map 5.7: Terrestrial WRI treatments by fiscal year completed for WMU 13B, Dolores Triangle.

Range Trend Studies

Range Trend studies have been sampled within WMU 13B on a regular basis since 1986, with studies being added or suspended as was deemed necessary (**Table 5.3**). 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 5.4**). Range Trend studies are summarized in this report by ecological site.

Study #	Study Name	Project	Status	Years Sampled	Ecological Site Description
13B-01	Lower Westwater-Dolores	RT	Active	1986, 1995, 2000, 2005, 2010, 2015, 2020, 2025	Semidesert Sandy Loam (Wyoming Big Sagebrush)
13B-02	Upper Westwater-Dolores	RT	Active	1986, 1995, 2000, 2005, 2010, 2015, 2020, 2025	Semidesert Sandy Loam (Wyoming Big Sagebrush)
13B-03	Fish Park	RT	Active	1986, 1995, 2000, 2005, 2010, 2020, 2025	Upland Loam (Big Sagebrush)
13B-04	Red Cliffs	RT	Active	1986, 1995, 2000, 2005, 2010, 2015, 2020, 2025	Semidesert Sandy Loam (Blackbrush)
13B-05	Buckhorn Draw	RT	Active	1986, 1995, 2000, 2005, 2010, 2015, 2020, 2025	Semidesert Sandy Loam (Blackbrush)
13B-06	Ryan Creek	RT	Active	1986, 1995, 2000, 2005, 2010, 2015, 2020, 2025	Upland Shallow Loam (Pinyon/Utah Juniper)
13B-07	Steamboat Mesa North	RT	Active	1986, 1995, 2000, 2005, 2010, 2015, 2025	Upland Loam (Big Sagebrush) d
13B-08	Steamboat Mesa South	RT	Active	1986, 1995, 2000, 2005, 2010, 2015, 2020, 2025	Upland Loam (Big Sagebrush)
13B-09	Steamboat East Bench	RT	Active	1986, 1995, 2000, 2005, 2010, 2015, 2020, 2025	Upland Shallow Loam (Pinyon/Utah Juniper)

Table 5.3: Range Trend and WRI project studies monitoring history and ecological site potential for WMU 13B, Dolores Triangle.

Study #	Study Name	Type	Disturbance Name (If Available)	Date	Acres	WRI Project #
13B-02	Upper Westwater-Dolores	Wildfire	Snyder 3	July 1986	1,200	7359
		Plateau	Moab Cheatgrass Control and Seeding (Proposed)	Winter-Spring 2026	7,292	
13B-03	Fish Park	Chain Unknown	Fish Park Seeding 1967	1968	490	4259*
		Seed Unknown	Fish Park Seeding 1967	1968	490	4259*
		Plateau	Moab Cheatgrass Control and Seeding (Proposed)	Winter-Spring 2026	7,292	7359
13B-06	Ryan Creek	Chain Unknown	Granite Park Reseeding 1967	August 1967-May 1968	1,888	4813*
		Aerial Unknown	Granite Park Reseeding 1967	August 1967-May 1968	1,888	4813*
		Tebuthiuron		1968	300	
		Wildfire	Ryan Creek	1989	3,947	
		Plateau	Moab Field Office Cheatgrass Control	November 2023	9,714	5573
		Aerial Seeding	Moab Cheatgrass Control and Seeding (Proposed)	Winter-Spring 2026	9,029	7359
13B-07	Steamboat Mesa North	Aerial Before	Steamboat Mesa Reseeding 1967	August-December 1967	1,352	11188*
		Two-Way Chain Unknown	Steamboat Mesa Reseeding 1967	August-December 1967	1,352	11188*
13B-08	Steamboat Mesa South	Wildfire	Steamboat Mesa	July 2009	172	
		Imazapic	Moab Field Office Cheatgrass Control	November 2024	11,016	5573
		Aerial Seeding	Moab Cheatgrass Control and Seeding (Proposed)	Winter-Spring 2026	9,029	7359

13B-09	Steamboat East Bench	Aerial Before	Steamboat Mesa Reseeding 1967	August-December 1967	1,352	11188*
		Two-Way Chain Unknown	Steamboat Mesa Reseeding 1967	August-December 1967	1,352	11188*

Table 5.4: Range Trend and WRI studies known disturbance history for WMU 13B, Dolores Triangle. 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)

Upland (Big Sagebrush)

There are three studies [Fish Park (13B-03), Steamboat Mesa North (13B-07), and Steamboat Mesa South (13B-08)] classified as Upland (Big Sagebrush) ecological sites that are found in the Dolores Triangle Management Unit. The Fish Park study is found in a valley east of Marble Canyon. The Steamboat Mesa North study is found on the north end of Steamboat Mesa. The Steamboat Mesa South study is located at the midpoint of Steamboat Mesa.

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 Fish Creek study provided data for all reported sample years except 2015. The Steamboat Mesa South site contributed data in all sample years except 2020.

Shrubs/Trees: Each study has shared Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) as a common browse species, although it has contributed little to no cover on the Steamboat Mesa North and Steamboat Mesa South studies. Total shrub cover has decreased overall, a trend that can be partially attributed to a 2009 wildfire on the Steamboat Mesa South study. The increase in cover and shift in dominance from other shrubs to sagebrush between 2015 and 2020, however, is due to which studies were sampled each year: As of 2025, sagebrush cover has decreased while other shrubs have increased in cover. All sites were sampled in 2025, the sample year that is best representative for current community composition (**Figure 5.4**). Preferred browse demographics indicate that total density has decreased overall, but there was an increase between 2010 and 2015. Again, this increase is largely due to the difference in which sites were sampled each year. Mature plants have comprised a majority of these populations throughout the study period. Although the number of decadent individuals was nearly equal to that of mature plants in 2020, it was less so in 2025. Recruitment of young has also decreased over time and has been minimal between 2005 and 2025 (**Figure 5.8**). Total average utilization of preferred browse has fluctuated, but it has generally remained moderate to high; 18% of plants were moderately hedged and 30% were heavily browsed in 2025 (**Figure 5.12**).

Active encroachment by Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) is occurring on all three study sites as of 2025. Tree cover and density have generally decreased overall. However, the significant decrease in density between 2015 and 2020 is mainly due to the difference in which sites were read each year. For example, juniper and pinyon on Steamboat Mesa North had densities of 137 trees/acre and 113 trees/acre (respectively) in 2015, but the site was not sampled in 2020; however, all sites were sampled in 2025 and densities for twoneedle displayed a notable decrease. No landscape treatments were noted between 2015 and 2025, but it was observed that twoneecdle pinyon trees were drought stressed in 2020 and 2025 which may be related to the decrease in density and cover (**Figure 5.6**, **Figure 5.8**).

Herbaceous Understory: The herbaceous understories of these study sites have generally remained abundant, although the composition has differed from site to site. The Steamboat Mesa North study has remained dominated by the perennial grass species such as crested wheatgrass (*Agropyron cristatum*), although bulbous bluegrass (*Poa bulbosa*) has increased in abundance and cover. Annual grass contributes little cover on this site as of 2025. In contrast, the Steamboat Mesa South study has remained dominated by the introduced annual grass species cheatgrass (*Bromus tectorum*) throughout the study years. Total average herbaceous cover has decreased overall, a trend largely driven by annual grass. The perennial and annual forb communities have remained diverse in composition over the sample years but have generally been minor understory components overall (**Figure 5.14**, **Figure 5.16**).

Occupancy: Pellet group transect data indicates that the identity of the primary occupants has fluctuated and that overall occupancy has generally decreased over the sample years. Deer were the primary occupants between 2000 and 2010 and have had a mean pellet group abundance as low as 7 days use/acre in 2020 and as high as 47 days use/acre in 2000. Elk were the main occupants in 2015 and 2020, and average pellet group abundance has ranged from less than 1 days use/acre in 2000 to 26 days use/acre in 2025. Finally, cattle have been present with a mean pellet group abundance fluctuating between 3 days use/acre in 2020 and 23 days use/acre in 2000 (**Figure 5.18**).

Upland (Pinyon/Utah Juniper)

There are two study sites [Ryan Creek (13B-06) and Steamboat East Bench (13B-09)] that are classified as Upland (Pinyon/Utah Juniper) ecological sites. Ryan Creek is located on a rolling flat southwest of Ryan Creek. The Steamboat East Bench study is found east of and below Steamboat Mesa.

Shrubs/Trees: The shrub community on Ryan Creek has remained limited with rubber rabbitbrush (*Ericameria nauseosa* ssp. *hololeuca*) as the main species. In contrast, broom snakeweed (*Gutierrezia sarothrae*) and alderleaf mountain mahogany (*Cercocarpus montanus*) have contributed the most shrub cover on the Steamboat East Bench study. Preferred browse cover other than sagebrush has decreased over the study period, while that of other shrubs has increased. Total shrub cover has varied from year to year, but it has remained generally stable to slightly decreasing over time (**Figure 5.4**). Average preferred browse density has exhibited a stable to slight overall decrease. Mature individuals have comprised a majority of these browse populations throughout the study period, although decadent and young plants have also been present in low proportions (**Figure 5.8**). Average utilization of preferred browse has generally remained low, with 30% or less of plants displaying signs of moderate to heavy usage in most sample years. However, utilization was substantial in 1995 and 2015, with 43% and 65% of plants receiving moderate and heavy use, respectively (**Figure 5.13**).

Cover and density trends for trees are entirely driven by the Steamboat East Bench study site, as no trees have been present on the Ryan Creek study since 1986. Both Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) have been observed on Steamboat East Bench. Tree cover has fluctuated from year to year, but it has remained stable overall. Averaged juniper cover has increased over time while pinyon cover has decreased, with much of that decrease occurring between 2015 and 2020 (**Figure 5.6**). Density has also varied between sample years, but it has generally decreased over the sample period (**Figure 5.8**).

Herbaceous Understory: Data shows that average herbaceous frequency has fluctuated but has decreased overall. Average herbaceous cover has also varied between sample years, but it has displayed an overall trend that is mainly stable or slightly increasing over time. Herbaceous trends have largely been driven by the Ryan Creek study site; although the understory on Steamboat East Bench is diverse, it has generally not been very abundant when compared with Ryan Creek. The Ryan Creek study has been dominated by perennial and/or annual grasses in all sample years. In addition, the introduced annual grass species cheatgrass (*Bromus tectorum*) on Ryan Creek has varied in abundance between low and high over the sample period, and it may place the site at an increased risk of fire and lower ecological resiliency. Cover of perennial forbs has been variable and has ranged from nearly 1% in 2025 to 4% in 2005. Annual forb cover has remained low in most sample years except 2005, when redstem stork's bill (*Erodium cicutarium*) was the dominant component of the herbaceous understory (**Figure 5.14**, **Figure 5.16**).

Occupancy: Pellet transect data indicates that deer have been the primary occupants of these sites in most sample years; elk were the primary occupants in 2015. Average pellet transect data also shows that occupancy has fluctuated from year to year, but it has increased overall. Mean abundance of deer pellet groups has ranged from 13 days use/acre in 2015 to 38 days use/acre in 2010. Elk pellet groups have had an average abundance as low as 4 days use/acre in 2010 and as high as 24 days use/acre in 2015. Mean abundance of cattle pellet groups has fluctuated between 3 days use/acre in 2015 and 15 days use/acre in 2010 (**Figure 5.18**).

Semidesert (Big Sagebrush)

There are two study sites [Lower Westwater-Dolores (13B-01) and Upper Westwater-Dolores (13B-02)] that are classified as Semidesert (Big Sagebrush) ecological sites. The Lower Westwater-Dolores study is found on the north side of Jones Canyon while the Upper Westwater-Dolores study is located to the south of the canyon.

Shrubs/Trees: Despite being classified as semidesert sagebrush sites, shrub species are limited to nearly absent on these studies as of 2025. Basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*) and fourwing saltbush (*Atriplex canescens*) have been the only preferred browse species sampled and have only been observed on the Lower Westwater-Dolores study site. Furthermore, line intercept cover of any shrub species has not been recorded since 2005 on either study site (**Figure 5.4**). In 1995, mature plants were the dominant demographic in these preferred browse populations. However, decadence increased as overall density decreased. Decadent individuals were the population majority from 2000 through 2005, after which no preferred browse has been observed in density data. There has been no recruitment of young plants within these populations since 2000 (**Figure 1.14**). Utilization of preferred browse increased as density decreased; all plants were heavily used in 2005. However, no utilization has been observed since that time, as no browse species have been recorded in density measurements. Persistent drought in combination with heavy utilization on declining population densities is likely responsible for the loss of sagebrush on Lower Westwater-Dolores (**Figure 5.1a**, **Figure 5.12**).

Tree encroachment has not occurred on this study site and will therefore not be discussed in this section (**Figure 5.7**, **Figure 5.9**).

Herbaceous Understory: Although total herbaceous cover has fluctuated over the sampling period, combined mean cover for annual grass and forbs has shown an overall increasing trend, the herbaceous understories of these studies have been plentiful. However, the herbaceous communities have remained dominated by annual grasses and forbs, mainly cheatgrass (*Bromus tectorum*) and redstem stork's bill (*Erodium cicutarium*). Perennial grass abundance and cover have displayed slight increases over time, but they have been a minor component in all sample years. Perennial forbs have remained rare throughout the study period (**Figure 5.15**, **Figure 5.17**).

Occupancy: Pellet group transect data indicates that animal presence has exhibited an overall decrease. Deer were the primary occupants in 2000, with a mean pellet group abundance ranging from 6 days use/acre in 2020 to 44 days use/acre in 2000. Cattle have been the primary occupants in all other sample years, and average pellet group abundance has been as low as 17 days use/acre in 2015 and as high as 46 days use/acre in 2020. Finally, mean abundance of elk pellet groups has fluctuated between less than 1 days use/acre in 2005, 2015, and 2020 and11 days use/acre in 2025 (**Figure 5.19**).

Semidesert (Blackbrush)

There are two study sites [Red Cliffs (13B-04) and Buckhorn Draw (13B-05)] that are classified as Semidesert (Blackbrush) ecological sites. The Red Cliffs study is found east of Dry Gulch while the Buckhorn Draw study is located on a flat south of Buckhorn Draw and east of Scharf Mesa.

Shrubs/Trees: The shrub component of the Red Cliffs study has remained dominated by blackbrush (*Coleogyne ramosisima*), while spiny hopsage (*Grayia spinosa*) has dominated that of Buckhorn Draw. The other preferred browse species that has been present on both sites is Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), but it has provided little cover. Average line intercept cover of blackbrush has remained fairly stable overall and was at 9% in 2025. Cover of other preferred browse has been consistent since 2010, but it has remained minimal throughout the study period (**Figure 5.5**). Most of the preferred browse populations have been classified as mature in all sample years, although decadent individuals increased significantly between 2015 and 2020 and have remained elevated into 2025. Recruitment of young plants has varied but has generally decreased. Total preferred browse density has had no net decrease over the sample period (**Figure 5.11**). Utilization has fluctuated over the sample period. Forty percent or less of the browse

population sampled in density strips displayed signs of moderate to heavy use between 1995 and 2010. However, utilization increased between 2015 and 2025, when over 80% of plants were moderately to heavily browsed (**Figure 5.13**).

Both twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) have been observed on these sites, the latter of which has provided the entirety of the tree cover in all sample years. Tree density has fluctuated, but has decreased overall while cover has remained stable (**Figure 5.7**, **Figure 5.9**).

Herbaceous Understory: The herbaceous understories of these studies have fluctuated in cover and nested frequency but are abundant and provide good cover as of 2025. However, the introduced annual grass species cheatgrass (*Bromus tectorum*) has been the most abundant herbaceous component in all sample years. Perennial grass has fluctuated over the sample period, with much of the cover trend being driven by the Buckhorn Draw study. Annual forbs have provided little cover, but they have been moderately abundant in some sample years. Perennial forbs have remained rare (**Figure 5.15**, **Figure 5.17**).

Occupancy: Pellet group transect data indicates that deer have primarily occupied these study sites and that total animal occupation has fluctuated over the sample period. The mean abundance of deer pellet groups has ranged from 31 days use/acre in 2015 to 64 days use/acre in 2010. Elk have had an average pellet group abundance as low as less than 1 days use/acre in 2020 and 2025 and as high as 6 days use/acre in 2010. Finally, the mean abundance of cattle pellet groups has ranged from 2 days use/acre in 2015 to 25 days use/acre in 2010 (**Figure 5.19**).

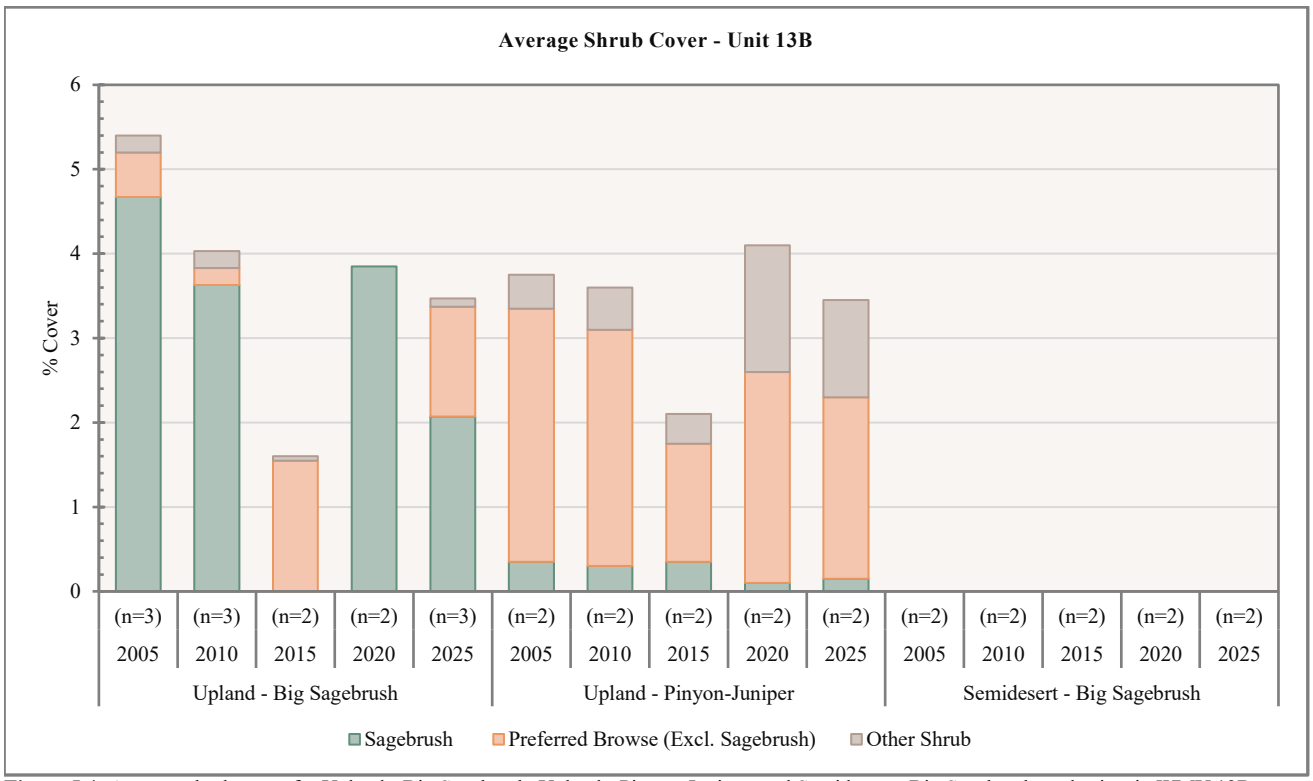


Figure 5.4: Average shrub cover for Upland - Big Sagebrush, Upland - Pinyon-Juniper, and Semidesert - Big Sagebrush study sites in WMU 13B, Dolores Triangle.

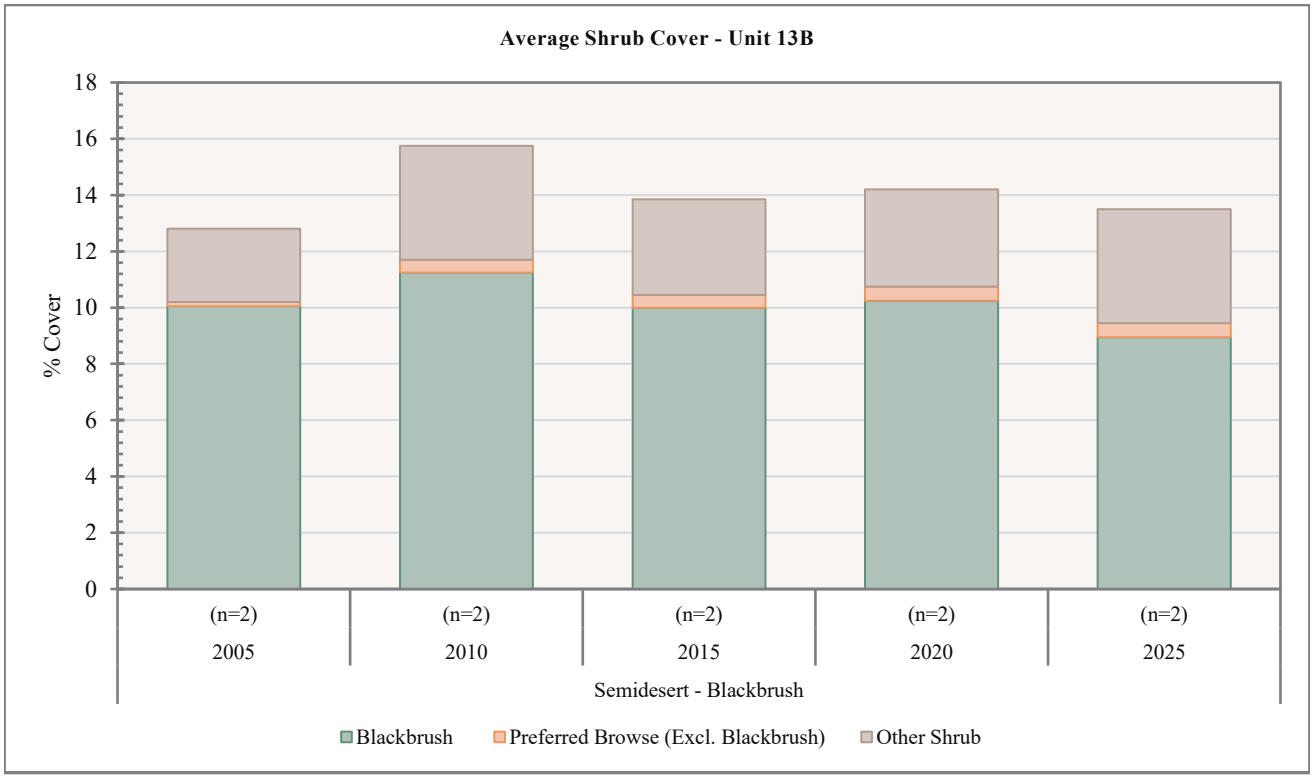


Figure 5.5: Average shrub cover for Semidesert - Blackbrush study sites in WMU 13B, Dolores Triangle.

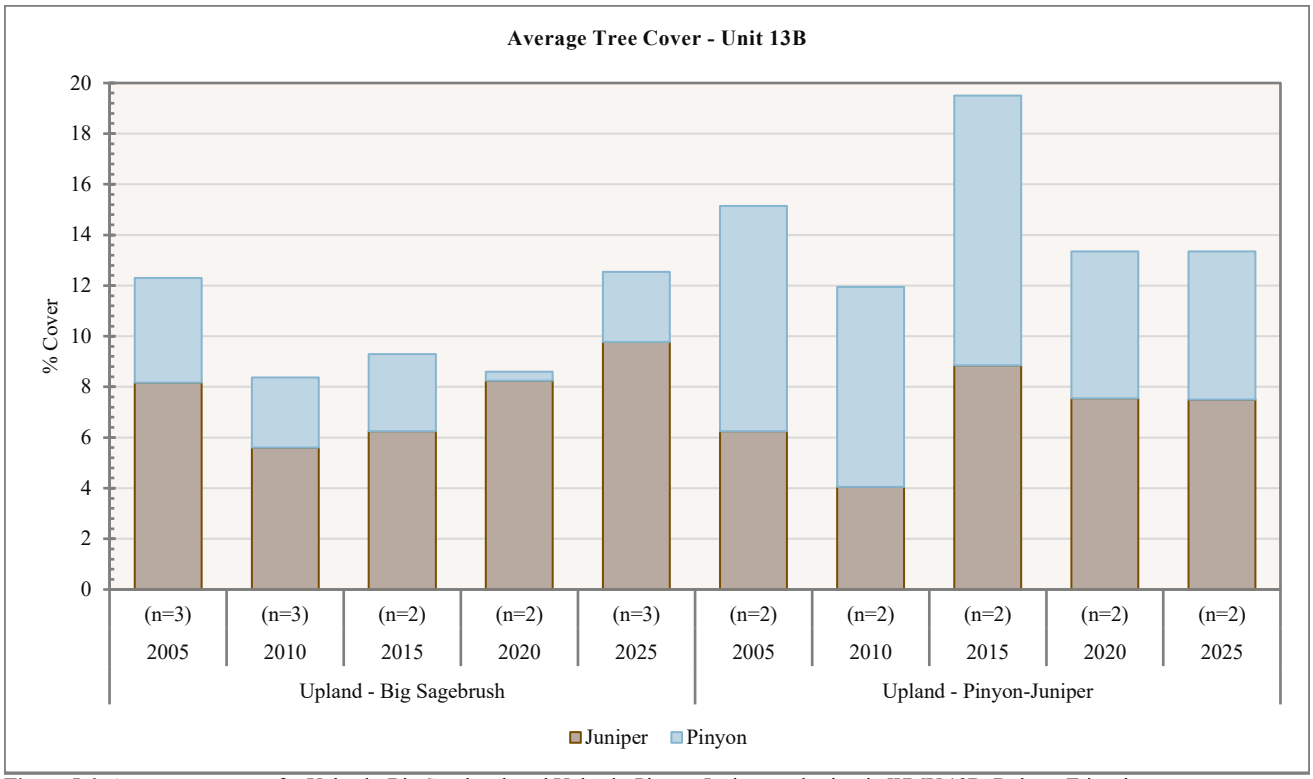


Figure 5.6: Average tree cover for Upland - Big Sagebrush and Upland - Pinyon-Juniper study sites in WMU 13B, Dolores Triangle.

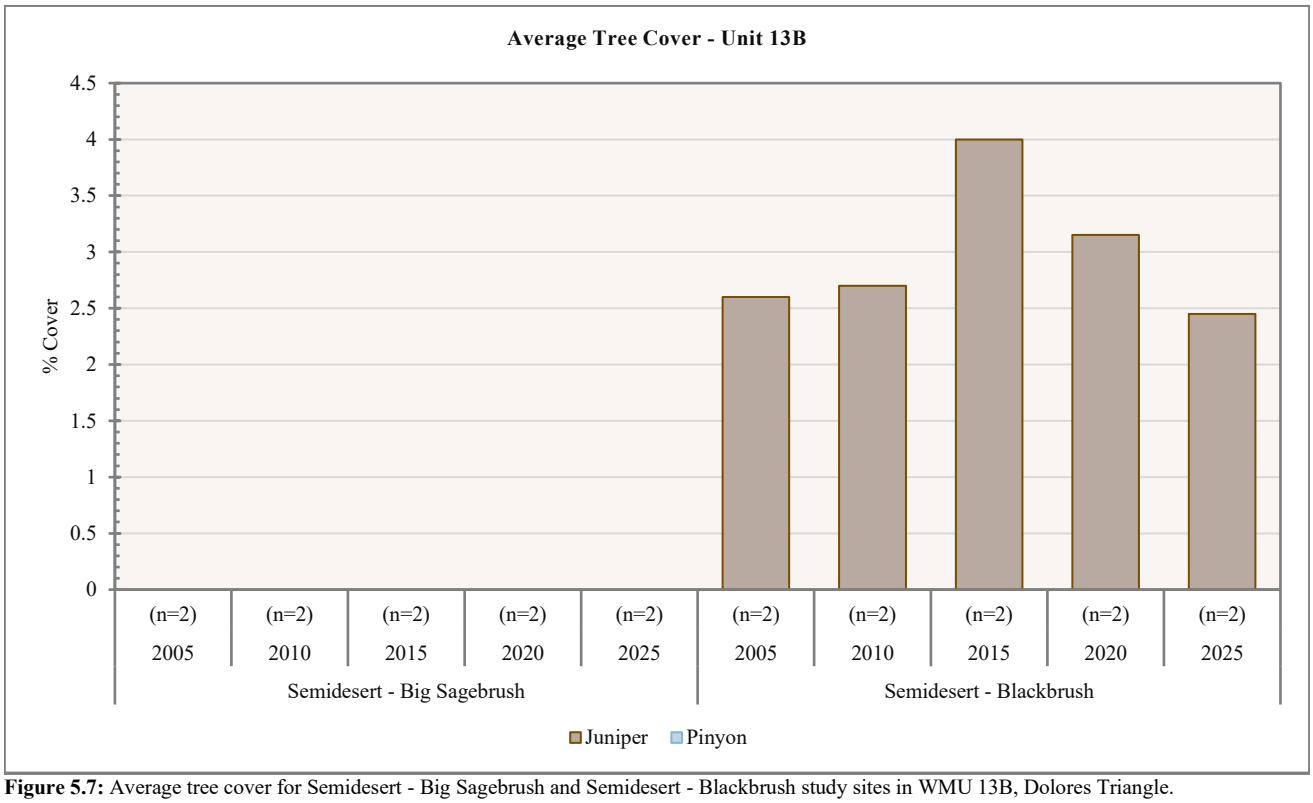


Figure 5.7: Average tree cover for Semidesert - Big Sagebrush and Semidesert - Blackbrush study sites in WMU 13B, Dolores Triangle.

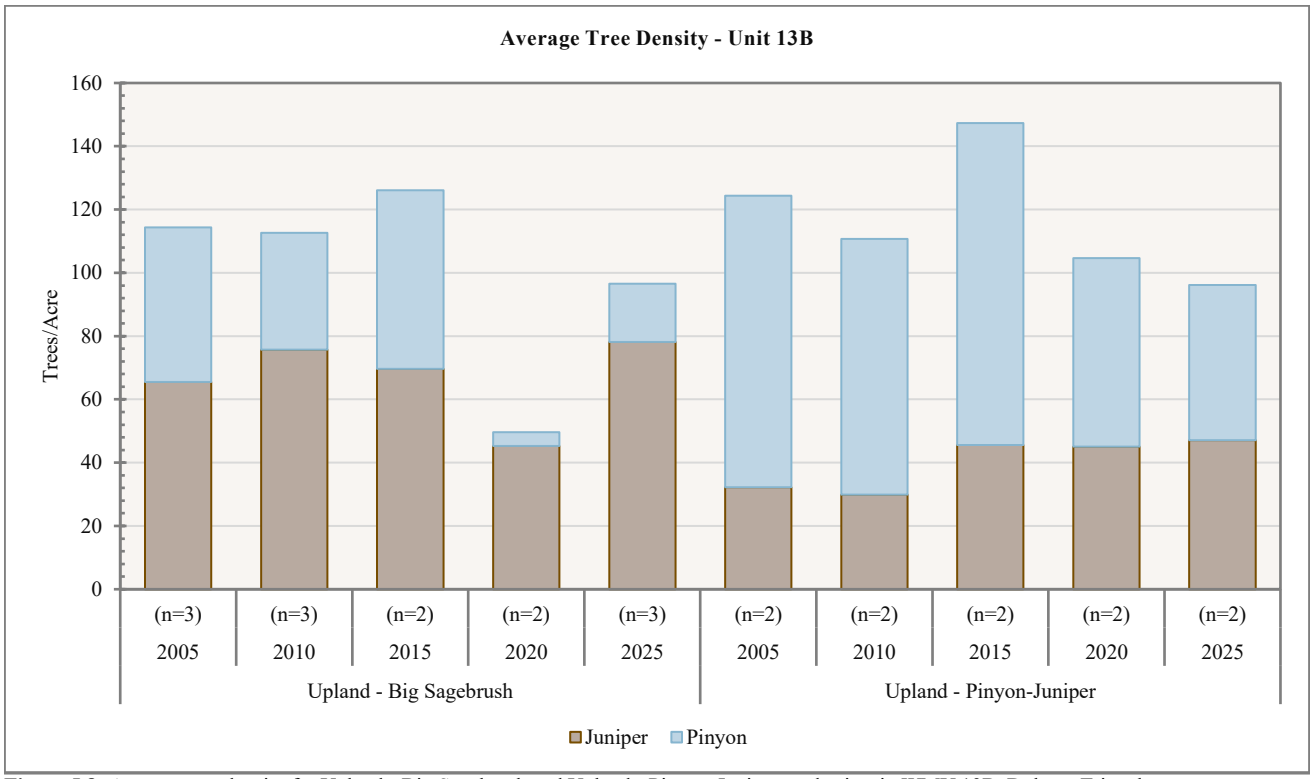


Figure 5.8: Average tree density for Upland - Big Sagebrush and Upland - Pinyon-Juniper study sites in WMU 13B, Dolores Triangle.

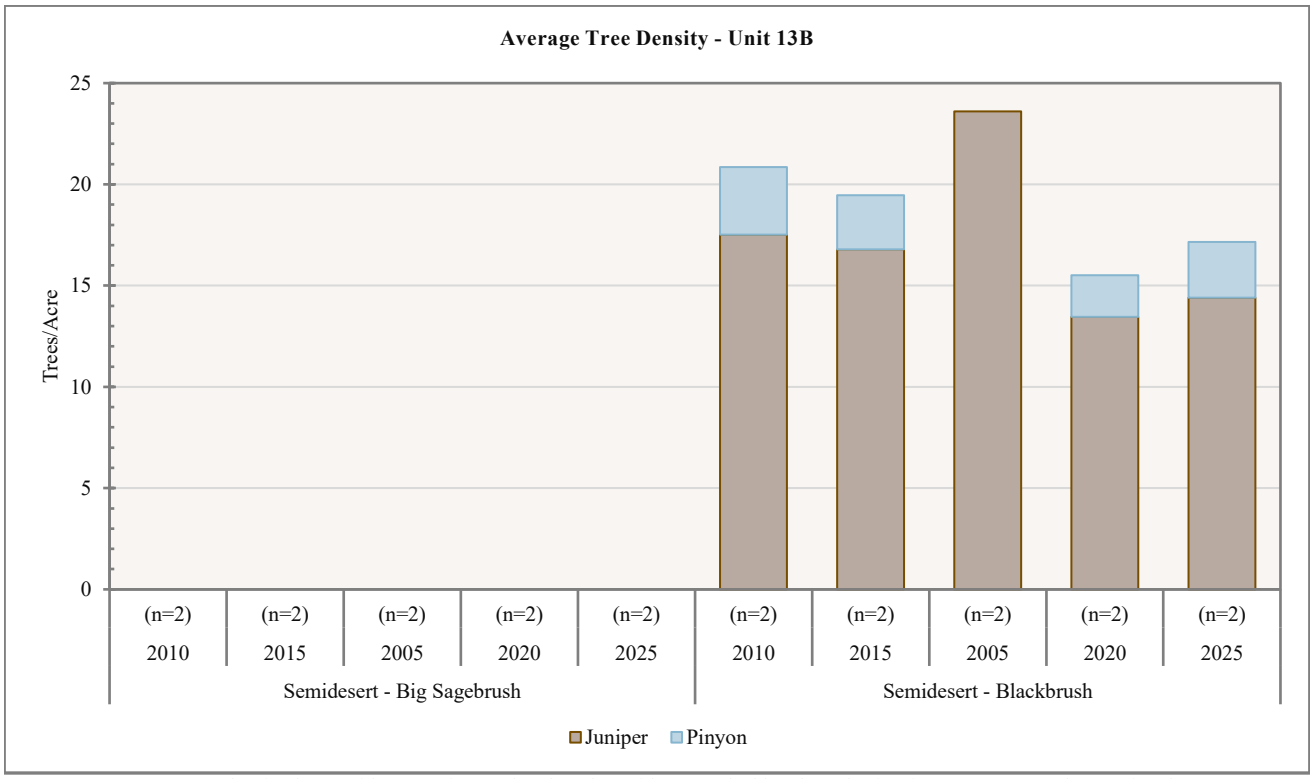


Figure 5.9: Average tree density for Semidesert - Big Sagebrush and Semidesert - Blackbrush study sites in WMU 13B, Dolores Triangle.

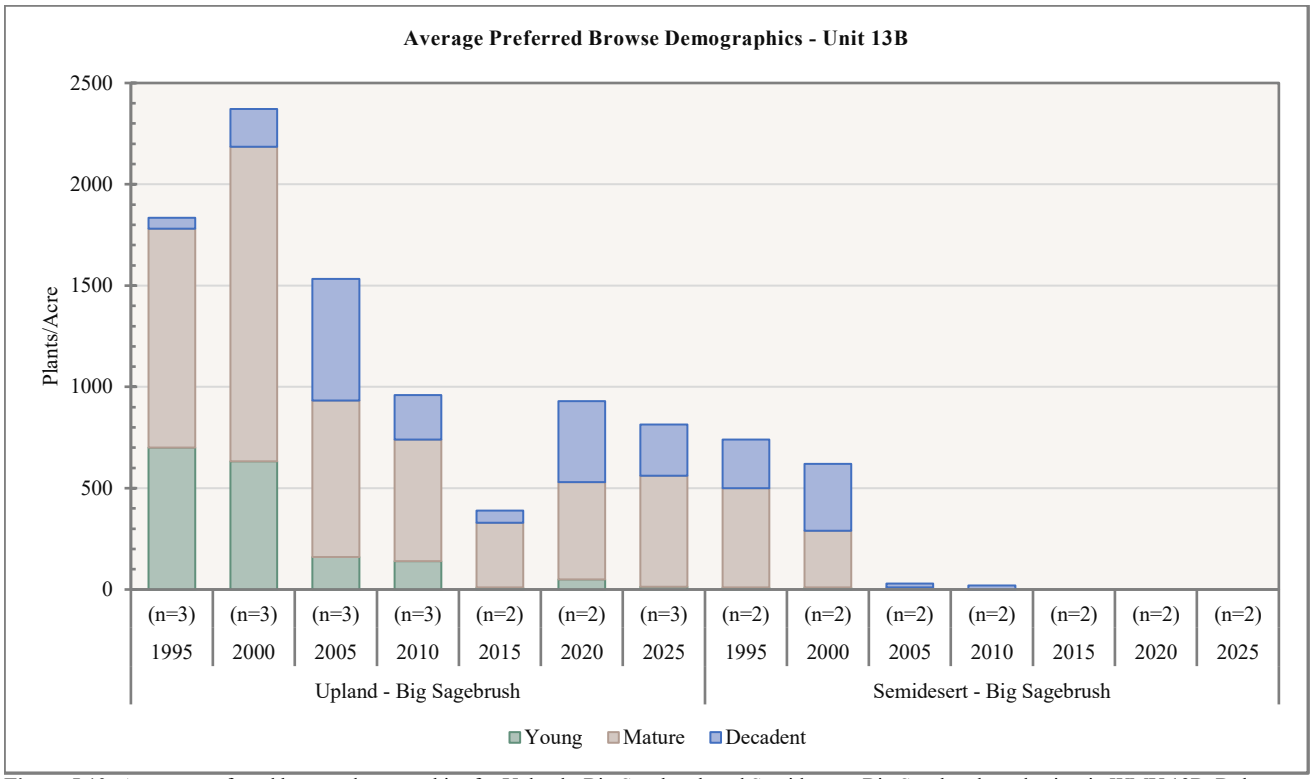


Figure 5.10: Average preferred browse demographics for Upland - Big Sagebrush and Semidesert - Big Sagebrush study sites in WMU 13B, Dolores Triangle.

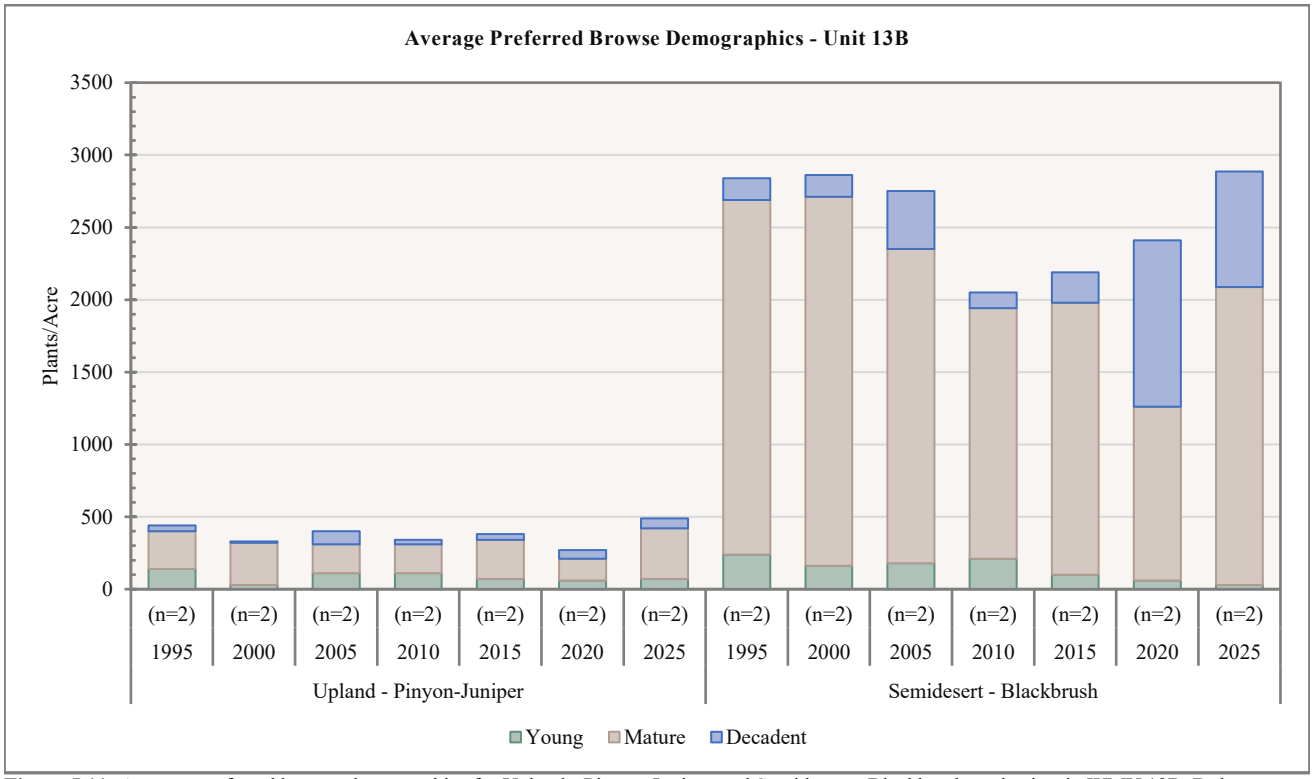


Figure 5.11: Average preferred browse demographics for Upland - Pinyon-Juniper and Semidesert - Blackbrush study sites in WMU 13B, Dolores Triangle.

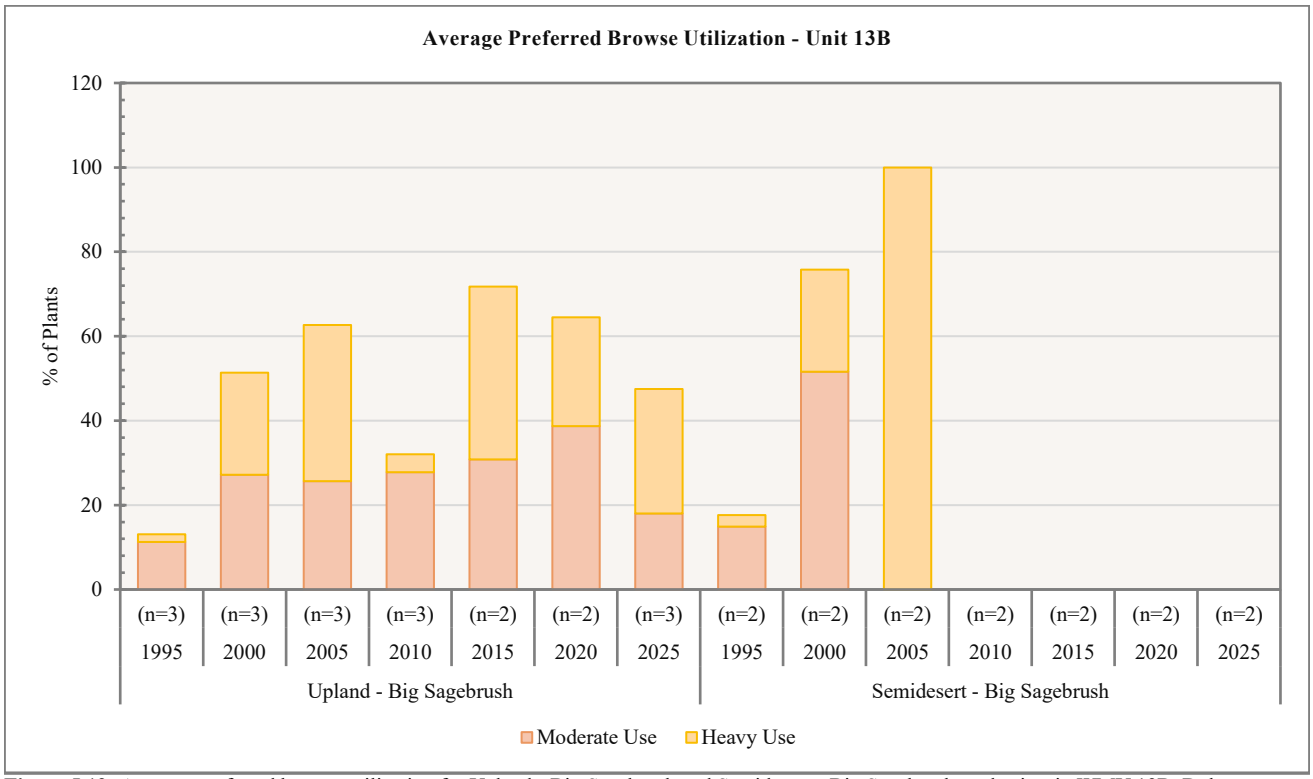


Figure 5.12: Average preferred browse utilization for Upland - Big Sagebrush and Semidesert - Big Sagebrush study sites in WMU 13B, Dolores Triangle.

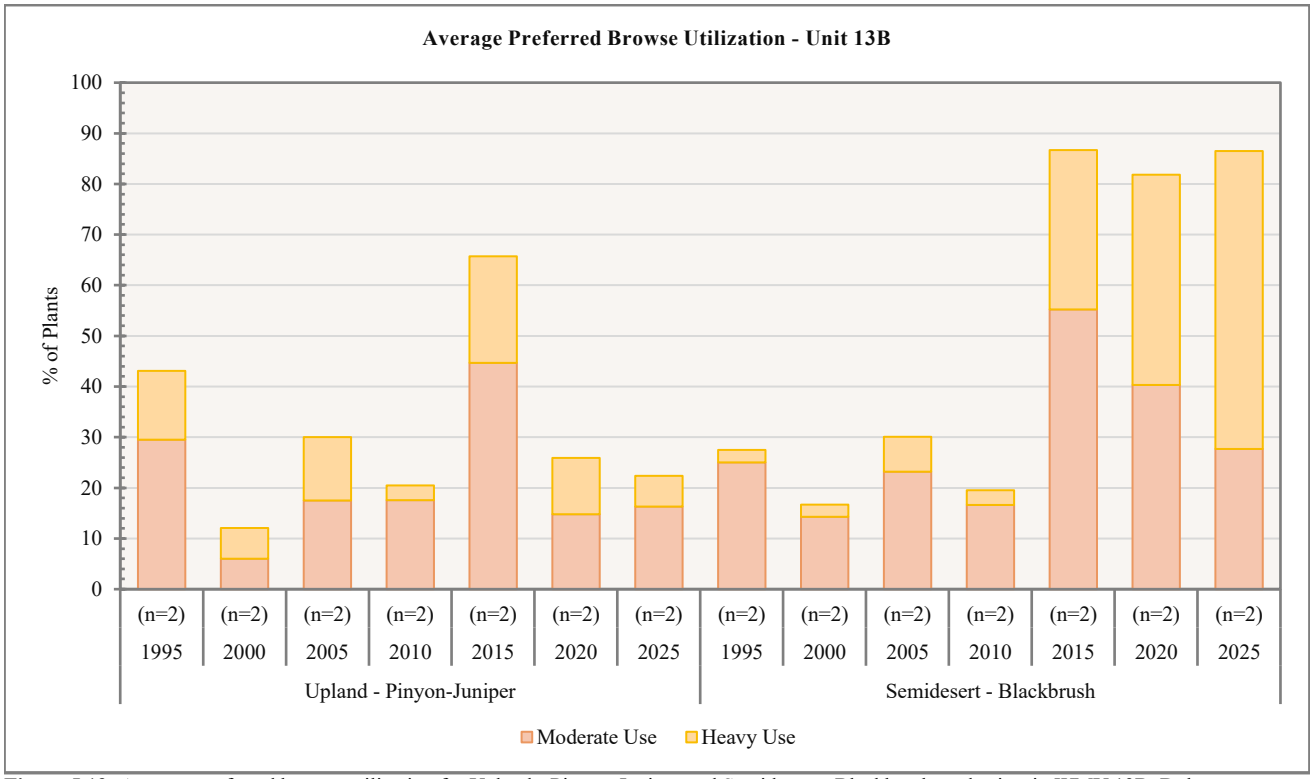


Figure 5.13: Average preferred browse utilization for Upland - Pinyon-Juniper and Semidesert - Blackbrush study sites in WMU 13B, Dolores Triangle.

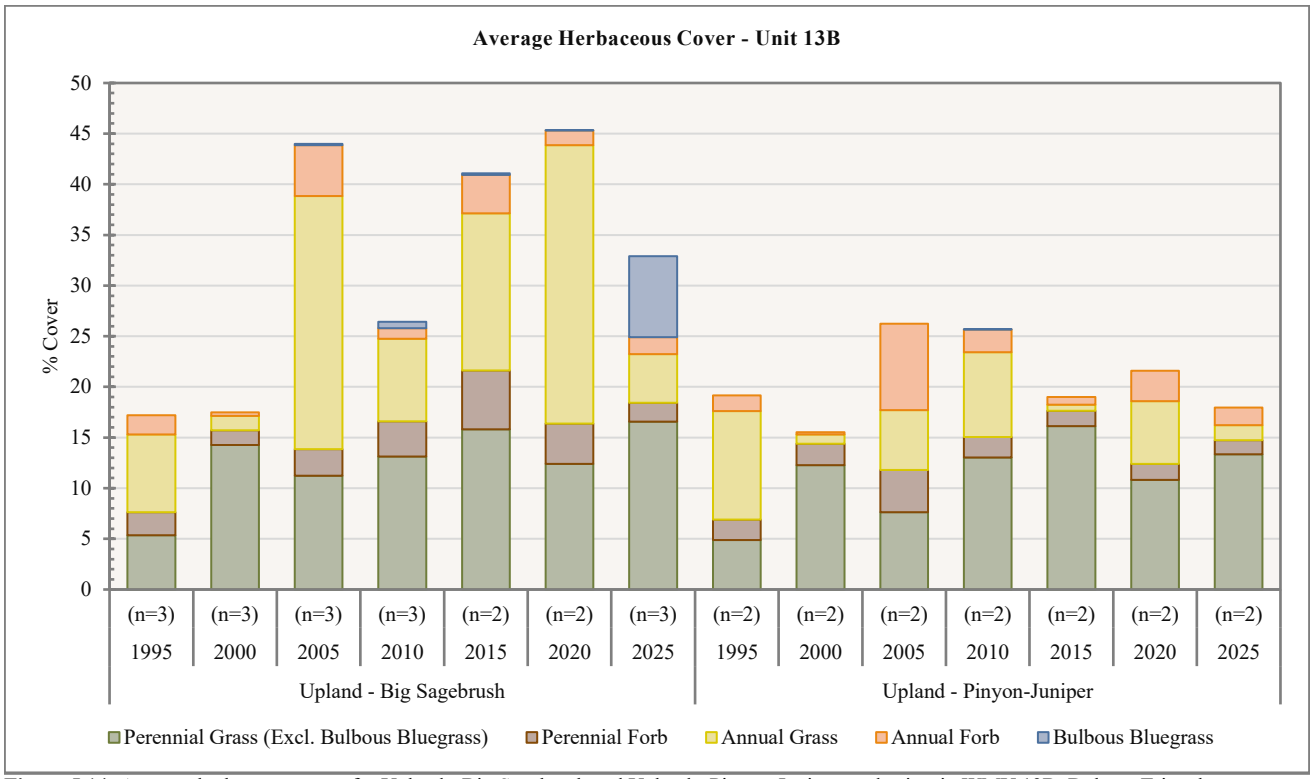


Figure 5.14: Average herbaceous cover for Upland - Big Sagebrush and Upland - Pinyon-Juniper study sites in WMU 13B, Dolores Triangle.

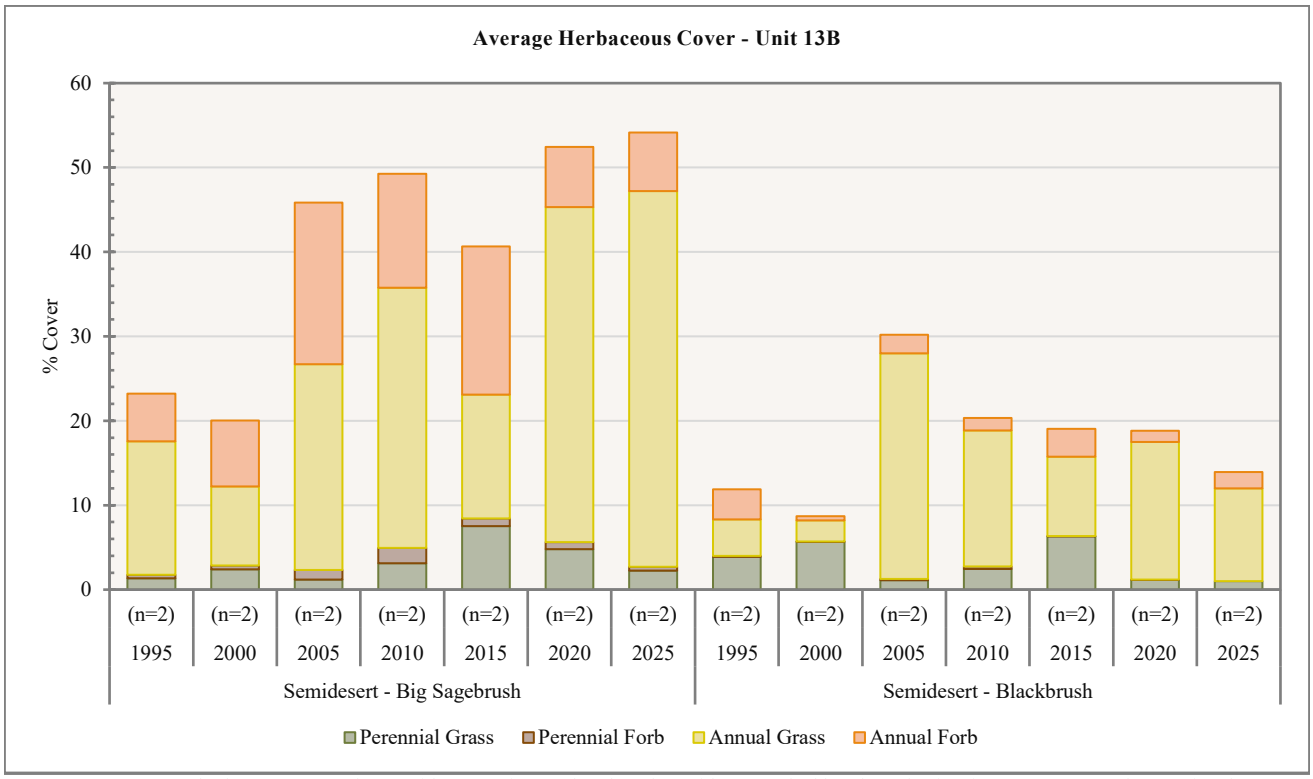


Figure 5.15: Average herbaceous cover for Semidesert - Big Sagebrush and Semidesert - Blackbrush study sites in WMU 13B, Dolores Triangle.

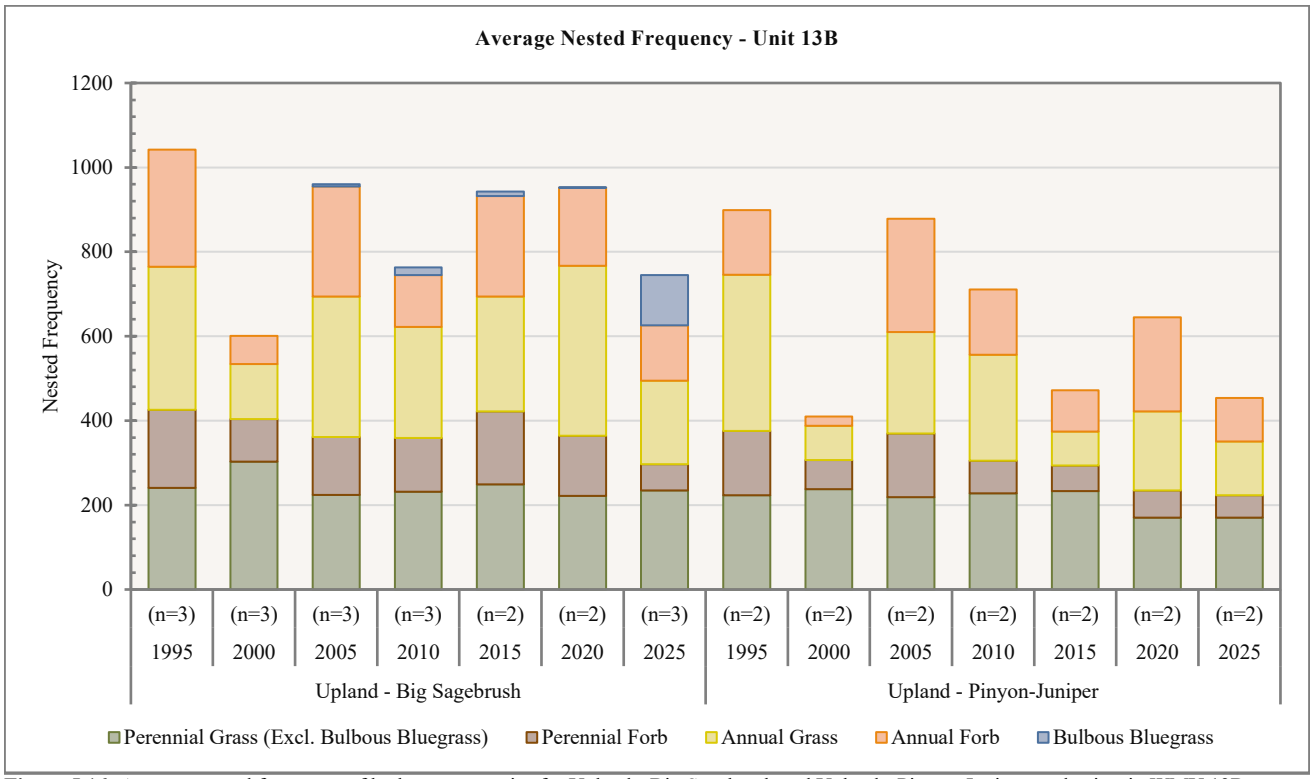


Figure 5.16: Average nested frequency of herbaceous species for Upland - Big Sagebrush and Upland - Pinyon-Juniper study sites in WMU 13B, Dolores Triangle.

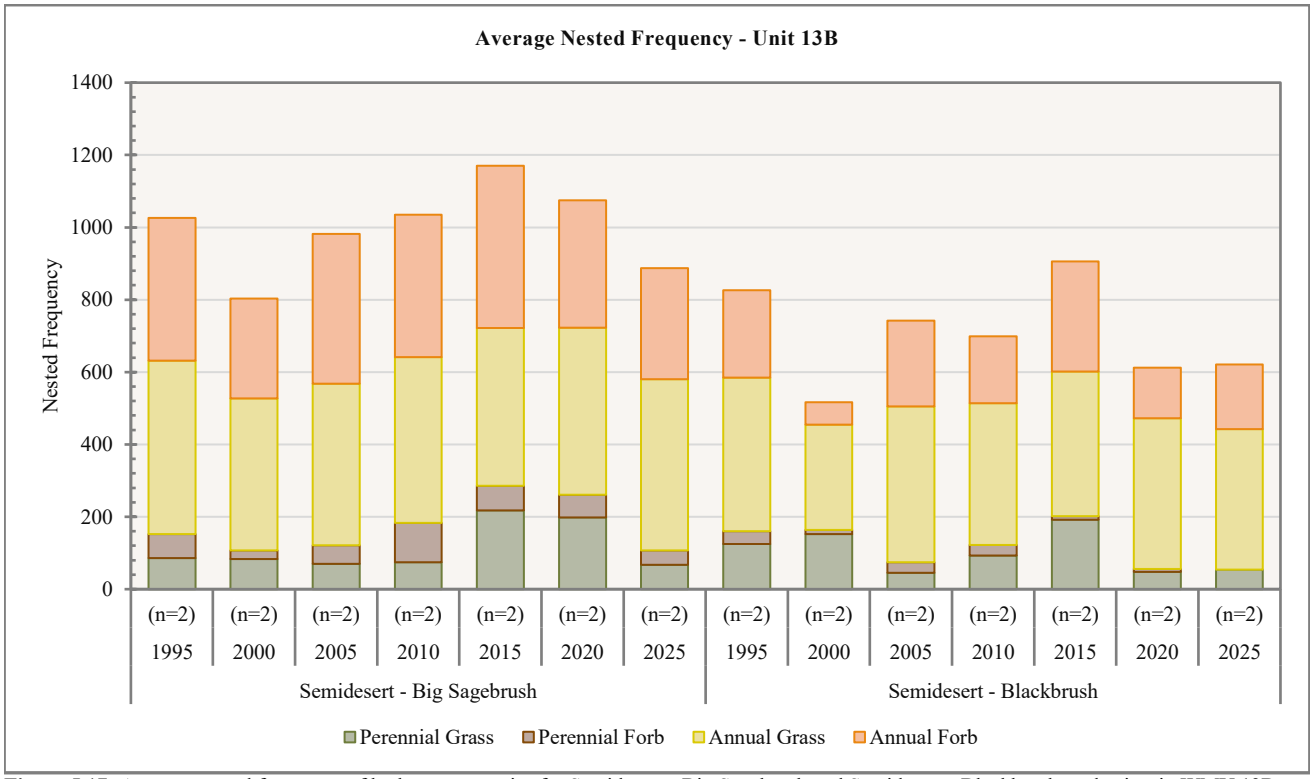


Figure 5.17: Average nested frequency of herbaceous species for Semidesert - Big Sagebrush and Semidesert - Blackbrush study sites in WMU 13B, Dolores Triangle.

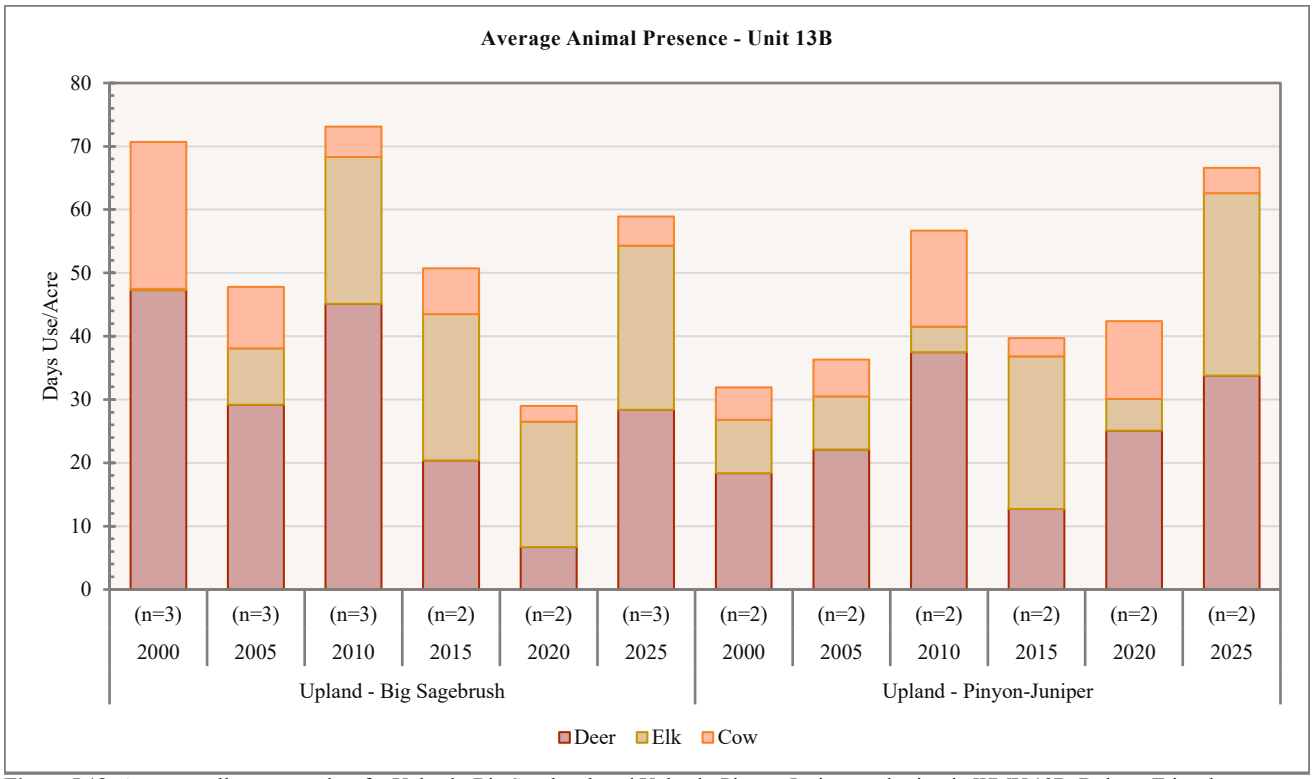


Figure 5.18: Average pellet transect data for Upland - Big Sagebrush and Upland - Pinyon-Juniper study sites in WMU 13B, Dolores Triangle.

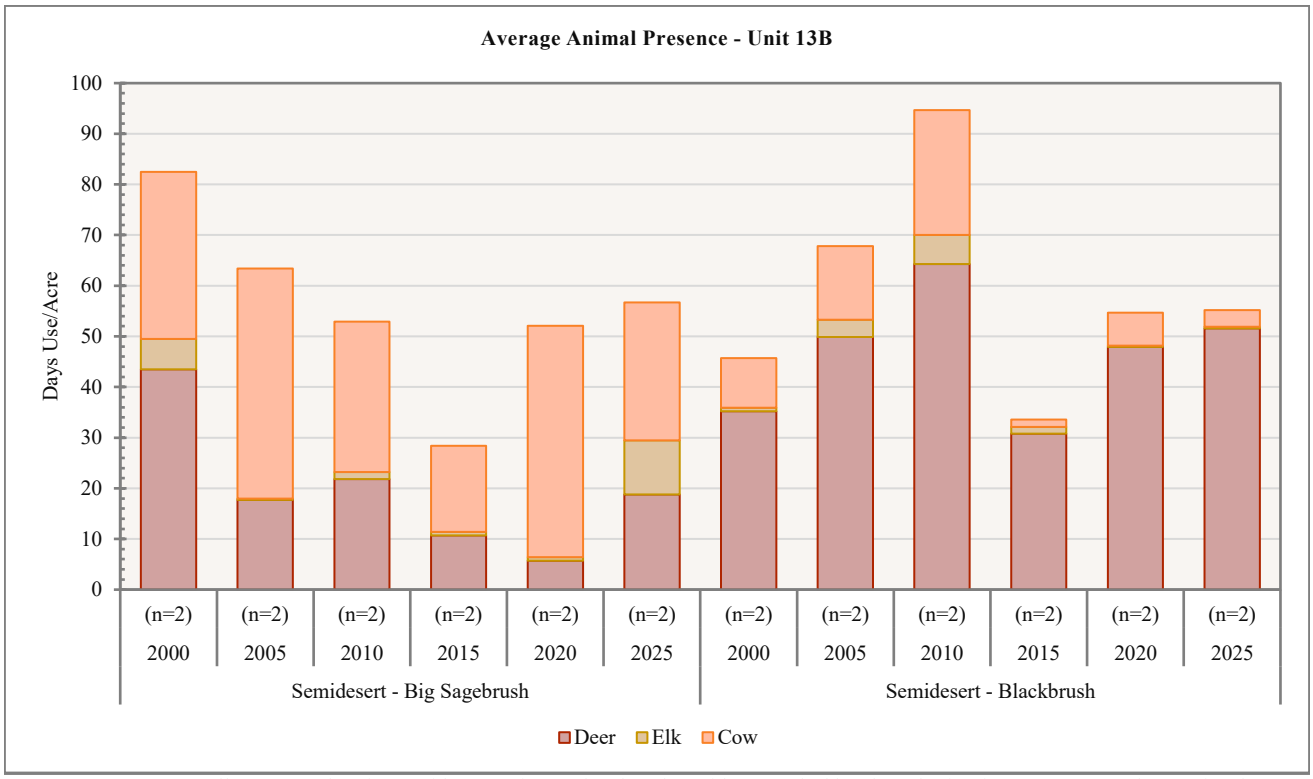


Figure 5.19: Average pellet transect data for Semidesert - Big Sagebrush and Semidesert - Blackbrush study sites in WMU 13B, Dolores Triangle.

Deer Winter Range Condition Assessment

The overall condition of deer winter range (**Map 5.2**) within the Dolores Triangle Management Unit has remained similar from year to year with sites averaging between very poor and poor condition since 1995. The Red Cliffs study (13B-04) is the main driver for the unit's wintering habitat stability and quality, but deer winter range condition for this site averages as poor-fair. Lower Westwater-Dolores (13B-01), Upper Westwater-Dolores (13B-02), Buckhorn Draw (13B-05), Ryan Creek (13B-06), Steamboat Mesa North (13B-07), and Steamboat Mesa South (13B-08) have been considered to be between very poor and poor wintering habitat conditions consistently from year to year: these poor conditions suppress the unit's overall winter range quality. Range Trend sites in WMU 13B that tend to have higher winter habitat variability include Fish Park (13B-03) and Steamboat East Bench (13B-09): this may suggest a higher potential for winter range improvement. However, both of these sites average as being in very poor-poor to poor condition.

The overall deer winter range assessment in 2025 for WMU 13B is that the unit is in very poor-poor condition, with no individual sites having a ranking better than "poor" during the most recent sample year. Reduced or a lack of preferred browse cover negatively influences winter range conditions on all studies except Red Cliffs. Winter habitat conditions on all study sites in this unit are further impacted by a lack of diversification in the age class structure of their preferred browse populations. Although annual grasses are present on all study sites as of 2025, a reduction of these grasses would particularly benefit the Lower Westwater-Dolores, Upper Westwater-Dolores, Fish Park, Red Cliffs, Buckhorn Draw, and Steamboat Mesa South sites. In addition, an increase in perennial grass cover on the Lower Westwater-Dolores, Upper Westwater-Dolores, Red Cliffs, Buckhorn Draw, and Steamboat East Bench studies would increase habitat suitability in these areas. Finally, all sites except Steamboat Mesa South would benefit from an increase in perennial forbs (**Figure 5.20**, **Table 5.5**).

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 5.3**). 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 illustrate 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 5.20**, **Table 5.5**). Study sites that intersect elk winter habitat include Fish Park, Red Cliffs, Buckhorn Draw, Ryan Creek, Steamboat Mesa North, Steamboat Mesa South, and Steamboat East Bench. All of these studies are considered to be in very poor to poor wintering habitat condition for elk as of 2025.

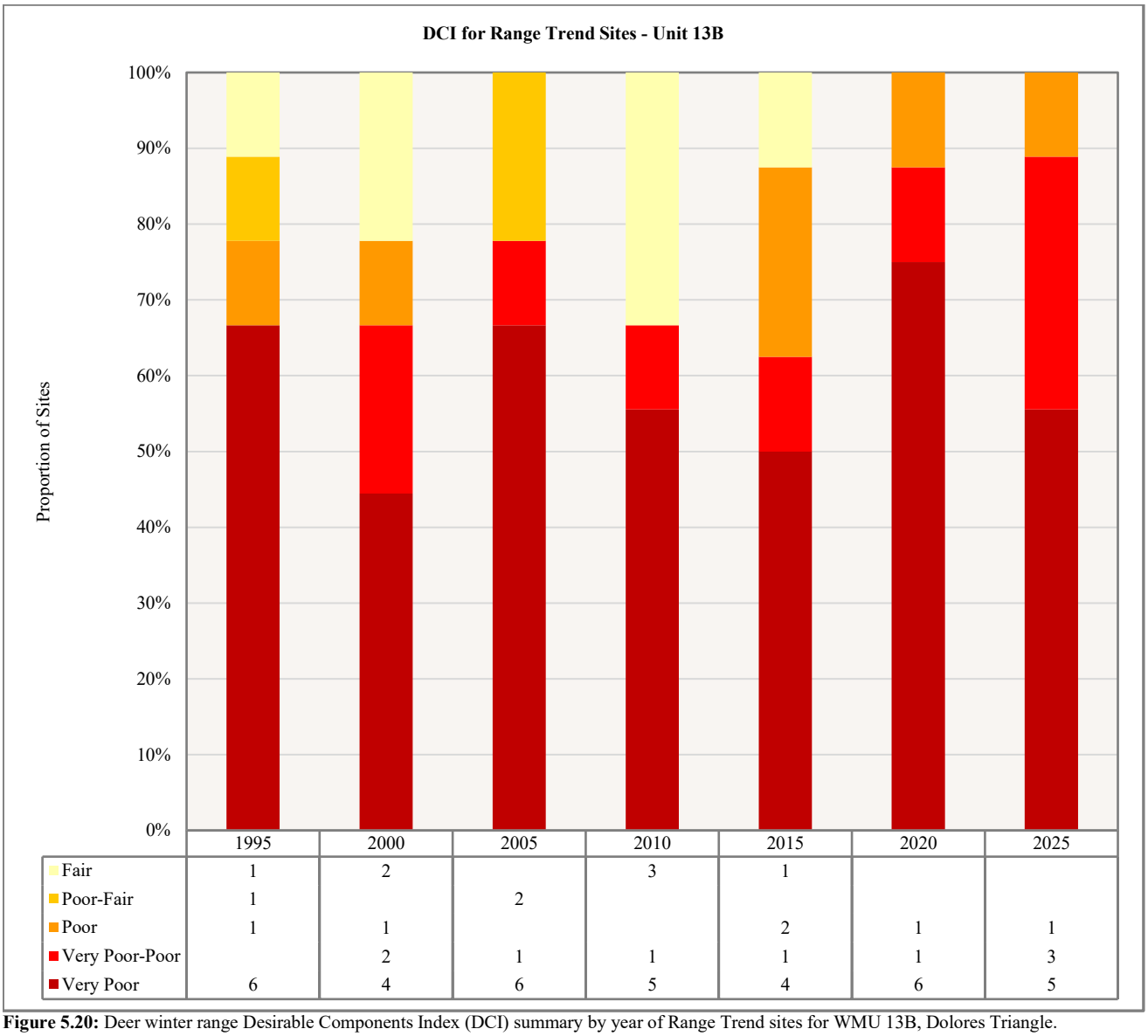


Figure 5.20: Deer winter range Desirable Components Index (DCI) summary by year of Range Trend sites for WMU 13B, Dolores Triangle.

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
13B-01	1995	2.1	0	0	4	-9.3	1.1	0	**-2.1**	**VP**
13B-01	2000	3	0	0	5.5	-9.3	0.3	0	**-0.5**	**VP**
13B-01	2005	0	0	0	2.8	-20	1.7	0	**-15.5**	**VP**
13B-01	2010	0	0	0	9	-17.5	5.5	0	**-3**	**VP**
13B-01	2015	0	0	0	10.6	-5.8	1.1	0	**5.9**	**VP**
13B-01	2020	0	0	0	9.8	-13.3	1.6	0	**-1.9**	**VP**
13B-01	2025	0	0	0	7.6	-14.1	1.4	0	**-5.1**	**VP**
13B-02	1995	0	0	0	1.4	-14.4	0.6	0	**-12.4**	**VP**
13B-02	2000	0	0	0	4.2	-4.7	1.5	0	**1**	**VP**
13B-02	2005	0	0	0	2	-15.6	2.8	0	**-10.8**	**VP**
13B-02	2010	0	0	0	3.5	-20	1.8	0	**-14.7**	**VP**
13B-02	2015	0	0	0	19.5	-16.2	2.6	0	**5.9**	**VP**
13B-02	2020	0	0	0	9.5	-20	1.6	0	**-8.9**	**VP**
13B-02	2025	0	0	0	1.4	-20	0.4	0	**-18.2**	**VP**
13B-03	1995	14.4	14.4	15	7.8	-4.2	2.7	0	**50.1**	**P-F**
13B-03	2000	20.7	12.3	7.9	13.5	-0.9	3.2	0	**56.7**	**F**
13B-03	2005	13.6	-2.2	0.9	21.8	-15.6	3.1	0	**21.6**	**VP**
13B-03	2010	13.6	7.3	4.8	30	-4.7	1.2	0	**52.2**	**F**
13B-03	2020	9.6	2	2.7	28.9	-7.4	1.2	0	**37**	**VP-P**
13B-03	2025	7.8	1.7	0.6	30	-5	1.6	0	**36.7**	**VP-P**
13B-04	1995	16.6	13.9	1.3	1	-3.4	0.1	0	**29.5**	**F**
13B-04	2000	14.4	13.7	1.5	1.8	-1.7	0	0	**29.7**	**F**
13B-04	2005	18.7	11.4	0.9	4	-11.5	0.1	0	**23.6**	**P-F**
13B-04	2010	21.6	13.6	2.2	2.2	-9.6	0.6	0	**30.6**	**F**
13B-04	2015	18.9	11.8	2.4	2	-4.6	0.1	0	**30.6**	**F**
13B-04	2020	19.9	0.1	1.2	2.7	-10.7	0.2	0	**13.4**	**P**
13B-04	2025	17.3	7.1	0.4	2.5	-10.9	0	0	**16.4**	**P**
13B-05	1995	1	0	0	14.5	-3.1	0.4	0	**12.8**	**P**
13B-05	2000	3.7	0	0	20.9	-2	0.1	0	**22.7**	**P**
13B-05	2005	1.8	0	0	0.4	-20	0.5	0	**-17.3**	**VP**
13B-05	2010	2	0	0	7.5	-14.5	0.8	0	**-4.2**	**VP**
13B-05	2015	2.3	0	0	23.3	-9.5	0.2	0	**16.3**	**P**
13B-05	2020	1.9	0	0	1.9	-13.7	0.1	0	**-9.8**	**VP**
13B-05	2025	1.9	0	0	1.6	-5.5	0	0	**-2**	**VP**
13B-06	1995	0.2	0	0	12.7	-13.8	5.4	0	**4.5**	**VP**
13B-06	2000	0.2	0	0	30	-1.3	5.1	0	**34**	**VP-P**
13B-06	2005	1.3	0	0	19.7	-6.9	9.4	0	**23.5**	**VP**
13B-06	2010	1.1	0	0	30	-10.7	2.4	0	**22.8**	**VP**
13B-06	2015	1.1	0	0	30	-0.8	4.4	0	**34.7**	**VP-P**
13B-06	2020	1.8	0	0	30	-9.2	3.5	0	**26.1**	**VP**
13B-06	2025	1	0	0	30	-0.9	3.8	0	**33.9**	**VP-P**
13B-07	1995	1.9	0	0	18.4	-1	6.7	0	**26**	**VP**
13B-07	2000	2	0	0	30	0	4.2	0	**36.2**	**VP-P**
13B-07	2005	2	0	0	30	-1.6	6.6	0	**37**	**VP-P**
13B-07	2010	0.8	0	0	30	-2.6	5.5	0	**33.7**	**VP-P**
13B-07	2015	4.3	0	0	30	-0.3	6.2	0	**40.2**	**P**
13B-07	2025	5.6	0	0	30	-0.4	1.2	0	**36.4**	**VP-P**
13B-08	1995	1.9	0	0	6	-12	4.1	0	**0**	**VP**
13B-08	2000	2.9	0	0	30	-2.3	1.4	0	**32**	**VP**
13B-08	2005	4	0	0	9	-20	6.2	0	**-0.8**	**VP**
13B-08	2010	0	0	0	9.4	-11	10	0	**8.4**	**VP**
13B-08	2015	0	0	0	27.9	-20	10	0	**17.9**	**VP**
13B-08	2020	0	0	0	20.6	-20	10	0	**10.6**	**VP**
13B-08	2025	0	0	0	25.2	-5.3	8.5	0	**28.4**	**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
13B-09	1995	6.5	0	0	6.9	-2.3	2.7	0	**13.8**	**VP**
13B-09	2000	5.9	0	0	15.5	-0.1	3.3	0	**24.6**	**VP**
13B-09	2005	8.2	11	15	10.9	-2	7.2	0	**50.3**	**P-F**
13B-09	2010	7.7	12.4	15	14.6	-1.9	5.6	0	**53.4**	**F**
13B-09	2015	3.5	0	0	4.3	-0.1	1.7	0	**9.4**	**VP**
13B-09	2020	5.5	0	0	4.2	-0.1	2.8	0	**12.4**	**VP**
13B-09	2025	5.5	0	0	4.7	-1.3	1.8	0	**10.7**	**VP**

Table 5.5: Deer winter range Desirable Components Index (DCI) information by site number of Range Trend studies for WMU 13B, Dolores Triangle. 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
13B-01	Lower Westwater-Dolores	Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		Annual Grass	High	Increased fire potential and reduced herbaceous diversity
13B-02	Upper Westwater-Dolores	Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		Annual Grass	High	Increased fire potential and reduced herbaceous diversity
13B-03	Fish Park	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Medium	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Medium	Reduced understory shrub and herbaceous vigor
13B-04	Red Cliffs	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
13B-05	Buckhorn Draw	Animal Use – Cattle	High	Reduced diversity of desirable grass and forb species
		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
		Drought		Lowered resilience and resistance to disturbance
13B-06	Ryan Creek	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
13B-07	Steamboat Mesa North	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
13B-08	Steamboat Mesa South	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
13B-09	Steamboat East Bench	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

Table 5.6: Assessment of the potential limiting factors and/or threats and level of threat to study sites for WMU 13B, Dolores Triangle. 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

The overall condition of deer winter range (**Map 5.2**) within the Dolores Triangle Management Unit has remained similar from year to year with sites averaging between very poor and poor condition since 1995. Despite the little change in range conditions over time, there are some detectable changes in average habitat suitability between 2000 and 2025 that likely correspond with prolonged drought years that occurred over the same time period (**Figure 5.1a**, **Figure 5.1b**). Average winter habitat condition was considered to be poor in 2000 and has since worsened to very poor as of 2025.

Unit suitability can be attributed to a few sites; there are three sites that began with average Desirable Component Indices of fair. These sites include Fish Park, Red Cliffs, and Buckhorn Draw, which have decreased from fair between 2000 and 2010 to poor or very poor conditions in 2025.

Many vegetation communities on this unit have robust browse components that have persisted despite persistent drought conditions. The Colorado Plateau Blackbrush-Mormon-tea Shrubland vegetation community is the most dominant vegetation type found on the Dolores Triangle Management Unit. According to LANDFIRE vegetation departure estimations, there are approximately 21,200 acres (or 82%) of blackbrush/Mormon-tea that are in a low departure state, and 2,800 acres considered to be moderately

departed. However, there are just over 2,200 acres of highly departed blackbrush/Mormon-tea communities (LF2024_VDep_CONUS, 2024). Given this, the Blackbrush-Mormon-tea Shrubland serves as an important ecological system for wildlife, characterized by open shrublands dominated by blackbrush (*Coleogyne ramosissima*), Mormon tea (*Ephedra viridis*), and spiny hopsage (*Grayia spinosa*). While blackbrush is a primary component of this system, the presence of spiny hopsage is particularly significant for deer winter range as it provides an additional palatable browse species from late winter through spring. During these winter months, spiny hopsage offers 18% crude protein levels of its foliage biomass, making it a valuable salt-desert shrub for big game. Despite this higher forage value, hopsage branches are armed with spine like tips that may deter wildlife utilization, which is why the species is considered a key browse rather than a preferred species (Tirmenstein, 1999; The Nature Conservancy LANDFIRE Team, 2015).

Management of blackbrush landscapes requires careful attention to fire sensitivity and successional shifts. Blackbrush is notably fire-intolerant and does not resprout, often requiring 20 to 30 years to re-establish following a burn. In contrast, spiny hopsage is more resilient to such disturbances because it sprouts readily. Managers must also contend with the threat of non-native annual grasses, which can invade following fire and drastically alter the natural fire regime. While fire typically creates small patches of tens to hundreds of acres due to discontinuous fuels, cumulative drought stress can impact areas exceeding 100,000 acres in this community type, shifting the community toward more open, less productive states (Anderson M. B., 2001; Tirmenstein, 1999).

To maintain the quality of the winter range, grazing and browsing levels should be monitored closely. Spiny hopsage is fairly tolerant of browsing, but it risks being replaced by less palatable species (such as green rabbitbrush) if subjected to heavy pressure during the spring and early summer. On ranges maintained in good condition, it is recommended that winter use of annual spiny hopsage growth be limited to 80% to ensure the long-term persistence of the stand. By balancing these disturbance factors, managers can preserve the essential spring and winter forage that supports local deer populations (Tirmenstein, 1999). The primary threat to the long-term viability of this winter range is the invasion of cheatgrass (*Bromus tectorum*), which has contributed to shorter fire return intervals and larger fire events. To combat this, maintaining a healthy composition of native perennial grasses like bluebunch wheatgrass (*Pseudoroegneria spicata*) and Indian ricegrass (*Achnatherum hymenoids*) is critical. Additionally, because spiny hopsage is a preferred browse species, managers should consider that it can be replaced by less palatable species like green or yellow rabbitbrush (*Chrysothamnus* spp.) if subjected to heavy livestock pressure during the spring and early summer.

Another important vegetation type (or one of interest) for the Dolores Triangle is the Colorado Plateau Pinyon-Juniper Shrubland; this is the third largest community type within the unit. Of this community type approximately 6,200 acres (65%) are classified as being in low departure; 2,600 acres (28%) are found to be moderately departed; and 690 acres (7%) are classified as highly departed from its natural ecological cycles (LF2024_VDep_CONUS, 2024). This vegetation type is characterized by stunted twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) trees that typically remain under 3m tall; this system provides essential structural and thermal cover for mule deer. While the tree canopy offers protection, the understory contains important forage species such as black sagebrush (*Artemisia nova*) and Wyoming big sagebrush (*A. tridentata* ssp. *wyomingensis*). Wyoming big sagebrush in particular is a critical background component for these systems. In the context of deer winter range, Wyoming big sagebrush is essential for forage, but like other sagebrush species and blackbrush in the Colorado Plateau, it is highly sensitive to fire. Wildfires in these communities are generally stand-replacing because Wyoming big sagebrush is easily killed by fire and does not resprout. Full recovery of sagebrush canopy can be especially slow, often failing to reach pre-fire levels even 60 years after a burn. This sensitivity mirrors the fire dynamics of the broader pinyon-juniper shrubland, where replacement fires are rare (occurring at an average interval of 330 years) and usually only happen during extreme weather conditions (Innes, 2019); however, this Climate Division has remained in long-term drought (**Figure 5.1**) that may increase the likelihood of fire. Because the shallow, rocky, and shaley soils limit productivity in this ecotype, total vegetation cover remains low and recovery following any disturbance is slow. To preserve the 6,200 acres currently in low departure from reference conditions and

address the 35% of the unit that is moderately or highly departed, managers should prioritize the health of the perennial understory. In late-development stages, the understory can become depauperate with high amounts of bare ground, which may reduce forage availability in the presence of older tree cover. Forage persistence is best ensured by limiting the winter use of annual growth on key shrubs like hopsage. By maintaining the natural mosaic of age classes and resisting the loss of the sparse herbaceous layer, the Dolores Triangle can continue to function as high-quality winter habitat for local deer populations (The Nature Conservancy LANDFIRE Team, 2015).

The Inter-Mountain Basins Big Sagebrush Shrubland serves as a vital ecological system for mule deer winter range. This ecotype is another major system on the Dolores Triangle where approximately 5,700 acres (or 62%) of the total system are considered to be moderately departed from historic disturbance cycles (LF2024_VDep_CONUS, 2024). Big sagebrush shrubland can be characterized by well-drained upland soils with soil moisture levels sufficient to support pinyon and juniper trees that can eventually reach up to 90% canopy cover in areas that escape fire for long periods of time. This type of uncharacteristic state is typical for highly departed biophysical states. These encroaching conifers offer increased thermal and wind protection for deer; however, their expansion often leads to a subsequent loss of the essential shrub and herbaceous understory cover. The landscape is naturally dominated by Wyoming big sagebrush, and as mentioned above, occurs alongside yellow rabbitbrush (*Chrysothamnus viscidiflorus*), hopsage, and blackbrush. Management of these upland sites requires an understanding of replacement fire regimes defined by infrequent fires frequencies. Beyond fire, severe drought also acts as a significant disturbance that kills or thins shrubs and trees. The disturbances often lead to the conversion to cheatgrass and other non-native annual species, which can also alter or reinforce increased fire frequencies and lead to decreased resilience and resistance to post-settlement disturbances. To maintain the long-term viability of the winter range, browsing levels on key forage species must be monitored on ranges in good condition (or in low departure states) (The Nature Conservancy LANDFIRE Team, 2015).

The Fish Park, Steamboat Mesa North and Steamboat Mesa Eash Bench study sites are areas where pinyon-juniper encroachment occurs, with all three reaching over 15% combined cover in their respective areas. These areas are considered to be a medium- or high-level threat to mule deer habitat (**Table 5.6**). As described for Big Sagebrush Shubland community dynamics, sagebrush and other preferred browse species are often crowded out through competition from pinyon and juniper where valuable forage can be lost or diminished in late seral or uncharacteristic stages of community succession. Excluding antelope bitterbrush (*Purshia tridentata*) on Steamboat Mesa North, all preferred browse species show some indicative decline as pinyon and juniper trees increase in community dominance (Lane, Payne, & Cox, Utah Big Game Range Trend Studies: 2025 Annual Report, 2026). To address these issues, a mastication and lop and scatter project has been proposed by the WRI Triangle Uplands project (WRI Project #7745). Through this project, areas of high pinyon-juniper cover will be reduced to control hazardous fuels and to improve or increase wildlife habitat through increased forage and community resilience (Utah's Watershed Restoration Initiative, 2026).

The Dolores Triangle is an area historically prone to wildfire and increased fire frequency appears to have been evident since the 1990s. Some of the largest fires that are over 1,000 acres include the Triangle (5,337 acres), Wrigley Complex (4,427 acres), Snyder 3 (1,537 acres), Spring (1,400 acres), and Border (1,194 acres) fires; the remaining 30 burns were relatively small and pock the unit with scars (**Map 5.6**). When acreage is combined, fires have affected approximately 11,000 acres on the Utah side of the state line. Three of the communities (or biophysical sites/BpS) most affected by these fires include Colorado Plateau Pinyon-Juniper Woodland, Inter-Mountain Basins Big Sagebrush Shrublands, Great Basin and Intermountain Ruderal Shrublands. The pinyon-juniper woodland is characterized by long fire intervals. However, following fires, the young successional classes were defined by the presence of blue grama (*Bouteloua gracilis*), sagebrush, and yellow rabbitbrush prior to settlement. Of the areas that have burned that contain this community, the large majority are either considered to be in moderate or low departure states: this suggests that these pinyon-juniper woodlands that have burned are in early- to mid-successional stages. The sagebrush shrubland communities that burned follow a similar pattern: the majority of the burned acres are considered to be in moderate or low departure states. Again, this suggests that big sagebrush shrublands that have burned are only in mid-

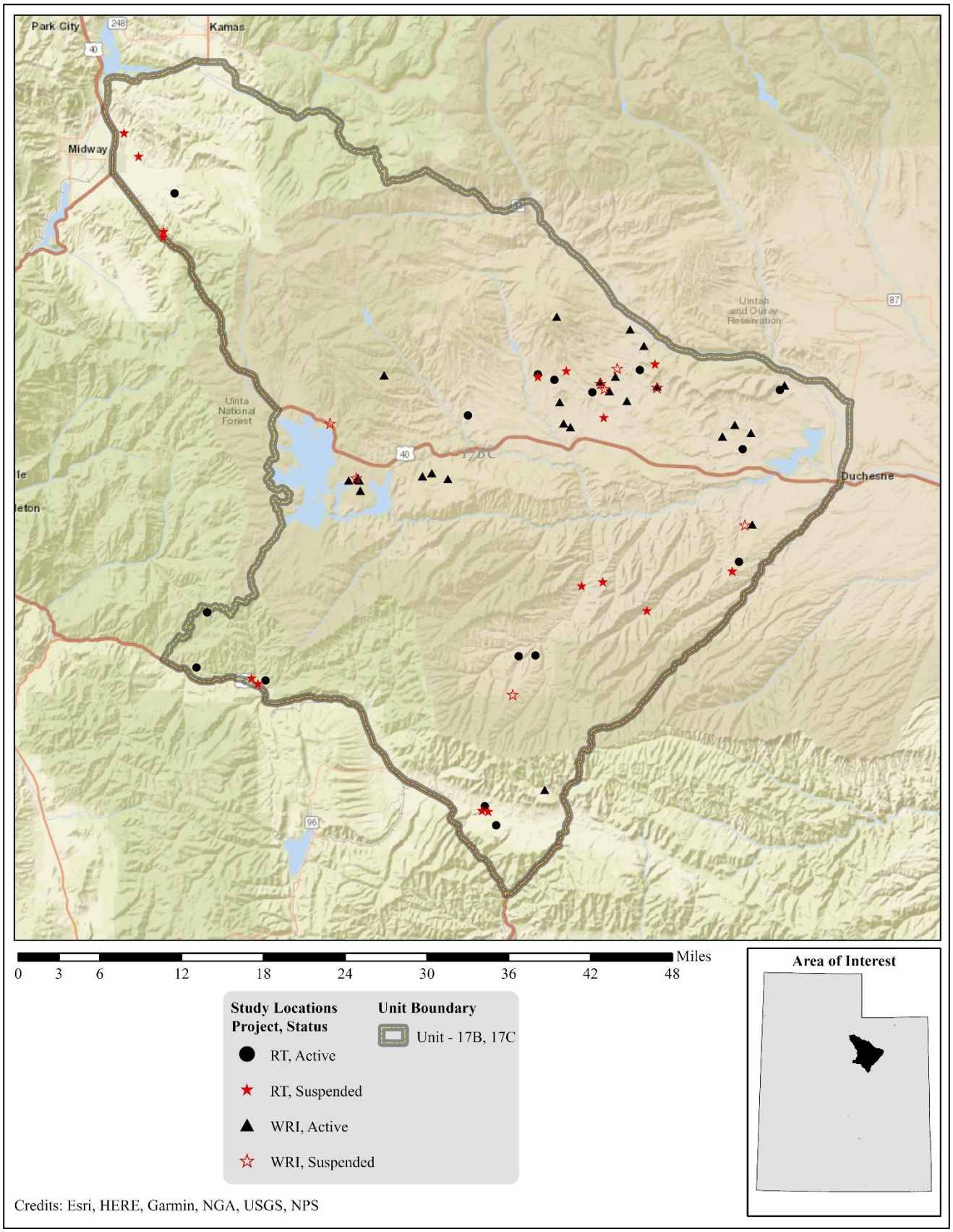
successional stages. The Snyder 3 wildfire burned large portions of Great Basin and Intermountain Ruderal Shrubland on the Dolores Triangle unit, especially on the north side. This community is dominated by non-native and/or invasive species like cheatgrass and Russian thistle (*Salsola tragus*), but the native component is mostly sagebrush. Again, this community's vegetation characteristics are driven by fire cycles, which perpetuate the presence of annuals. The Lower and Upper Westwater-Dolores sites are studies that both sample annual-dominated communities. This is particularly true for the Upper Westwater-Dolores site where annual grass has reached 70% cover. This area of the unit has the most concentration of fires, which may lead to a possible shift in fire frequency (**Map 5.6**). The Moab Cheatgrass Control and Seeding project (WRI Project #7359) will target this area for cheatgrass control; herbicide will be aerially applied to control the spread of cheatgrass and increase fire return intervals that allow for the re-establishment of native perennial grasses and shrubs (Utah's Watershed Restoration Initiative, 2026). On the opposite side of the unit, the Steamboat Mesa South samples an additional ruderal shrubland that has had a similar post-fire response to the Westwater sites. However, this site has also experienced a rapid increase in bulbous bluegrass (*Poa bulbosa*) - an introduced perennial with invasive behaviors. This area is also scheduled for herbicide treatment under WRI project 7359. Finally, the Ryan Creek study samples an area that was burned in 1989 by a stand-replacing wildfire. This was a site with a mixed, but sparse, canopy of sagebrush and pinyon-juniper prior to the burn (Photos, Pre-1992 Report). However, being defined as a Big Sagebrush Shrubland, a return to mid- to late successional stages and a return of sagebrush cover will take decades.

As noted above, bulbous bluegrass has been increasing on Steamboat Mesa and there are special management considerations when controlling its spread due to its reproductive biology basal bulbs and bulbils. This grass thrives in disturbed areas, and the most long-term management strategy is to maintain healthy, dense canopies of native perennial grasses. However, when bulbous bluegrass is established, it can be so invasive that it can outcompete cheatgrass (Gucker C. , 2007). This means that the timing of intervention is critical and that winter and early spring treatment is needed before bulbils are present and root and spread becomes significant. However, if bulbils are buried during treatment under an inch and half or more of soil, bulbil germination rate decreases to 8% or less (Gucker C. , 2007), so deep soil disturbances have an effect on germination success and suppress recruitment. Another consideration in preventing bulbous bluegrass spread is to be mindful of clean treatment machinery to avoid the spread. Consider using protocol for cleaning machinery when transporting them to and from areas where bulbous bluegrass is known to occur.

There are other threats to wildlife habitat 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 5.6**).

A number of recommendations for the Dolores Triangle unit should be considered for the benefit of both wildlife and habitat. A portion of this unit has already been treated both historically and currently for pinyon-juniper encroachment (**Table 5.2**, **Table 5.4**), 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, Payne, & Cox, Utah Big Game Range Trend Studies: 2025 Annual Report, 2026), specific opportunities for tree removal may exist in the larger areas on the fingers and bluffs around Marble and Star Canyons; the high plateaus between Coates and Renegade Creeks; the high plateaus between Ryan and Granite Creeks; and the surrounding areas of Steamboat Mesa. If reseeding is necessary to restore herbaceous species, care should be taken in species selection and preference given to native species whenever possible. Furthermore, soil disturbances from treatment projects should consider strategies that limit the spread of both cheatgrass and bulbous bluegrass. 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.

6. WILDLIFE MANAGEMENT UNIT 17B, 17C – WASATCH MOUNTAINS, EAST



WILDLIFE MANAGEMENT UNIT 17B, 17C – WASATCH MOUNTAINS, EAST

Boundary Description

Carbon, Duchesne, Utah, and Wasatch Counties – Boundary begins at SR-87 and US-40 in Duchesne; north on SR-87 to SR-35; west on SR-35 to SR-32 at Francis; west on SR-32 to US-40; southeast on US- 40 to Strawberry Bay Marina Road; south on this road to USFS Road 042 (Indian Creek); south and west on this road to USFS Road 051; south on this road to US-6; southeast on US-6 to US-191; north on US- 191 to US-40; east on US-40 to SR-87 in Duchesne. **Excludes all Native American Trust Lands within this boundary.**

Management Unit Description

Geography

Wildlife Management Unit 17 is divided into six smaller, more manageable subunits; these include Diamond Fork (17A), Timpanogos (17A), Salt Lake (17A), Heber (17A), and Currant Creek-Avintaquin (17B and 17C). The Northeastern Region 2025 report covers only the Currant Creek-Avintaquin subunits. The Salt Lake subunit no longer contains range trend studies due to lack of access and development. The Diamond Fork, Timpanogos, and Heber subunits are monitored as part of the Central Region rotation.

Subunits 17B and 17C contain Starvation and Currant Creek Reservoirs and portions of Ashley National Forest. Major drainages include the West Fork Duchesne River, Currant Creek, Red Creek, the Strawberry River, and Avintaquin Creek. The town of Fruitland also falls within the boundaries of Unit 17B, 17C. Elevation of this unit ranges from 5,600 near the city of Duchesne to over 10,500 feet on Red Creek Mountain.

Climate Data

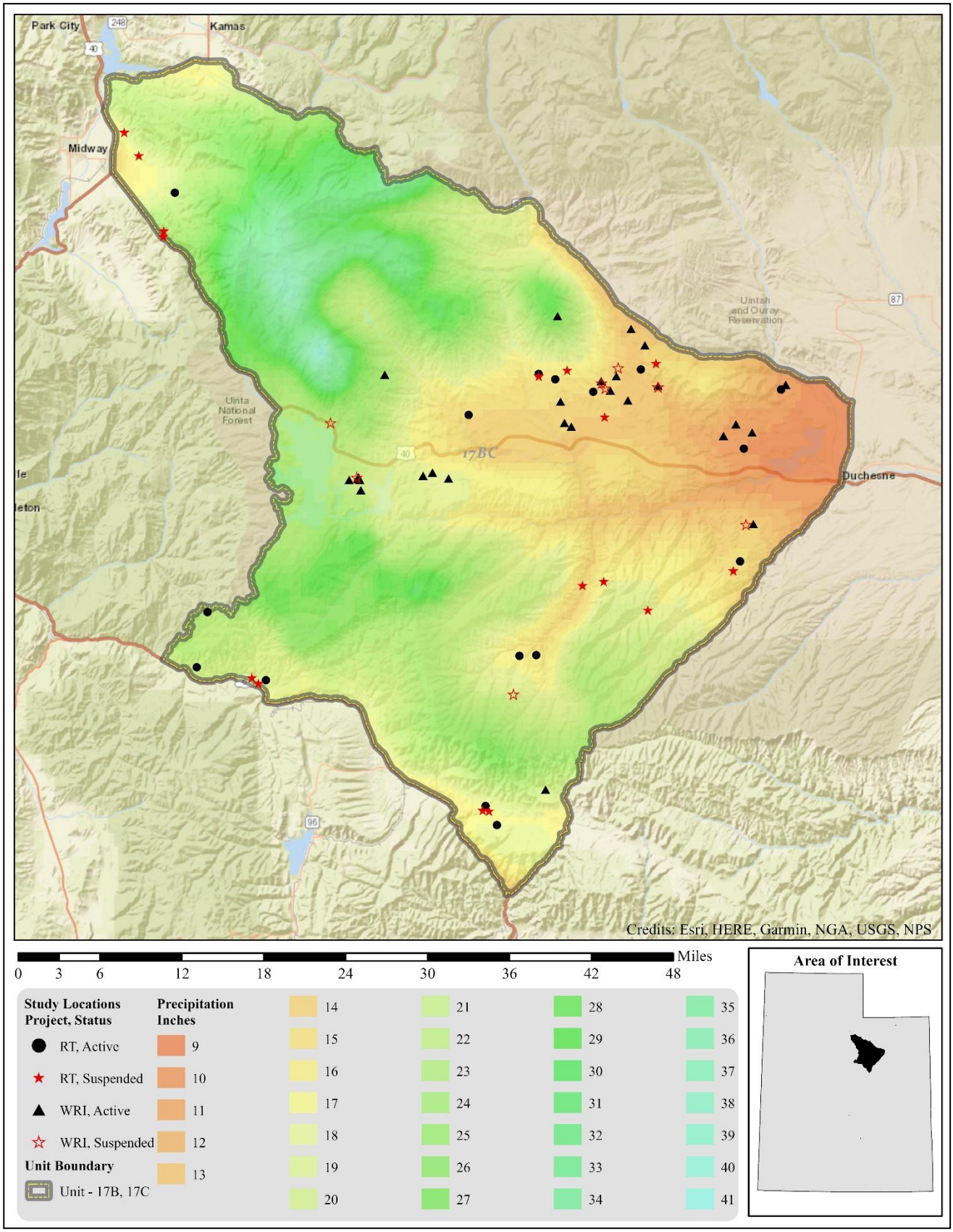
The 30-year (1991-2020) annual precipitation PRISM model shows that precipitation on this unit ranges from 9 inches along the eastern border near Starvation Reservoir and Duchesne to 41 inches on Racetrack Peak just above Trout Creek. All of the active Range Trend and Watershed Restoration Initiative (WRI) monitoring studies on the unit occur within 9-26 inches of precipitation (**Map 6.1**) (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 Northern Mountains (Division 5) and Uinta Basin divisions (Division 6).

The mean annual PDSI of the Northern Mountains division, which the North Slope unit is part of, has experienced some form of drought or dry spell in most years since 1995. Moreover, this climate division has been considered to be in some form of drought for nearly 42% of the time since 1995. Of the drought years, 77% are considered to be either moderate or extreme droughts. Also remarkable about this climate division is that a moderately wet year has not been experienced since 2011, and the last 14 years of drought or dry conditions have been interrupted by two single wet year events. The most notable wet year occurred in 1998 and was a part of a series of wet year events that occurred between 1995 and 1999 (**Figure 6.1a**). 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 6.1b**). The years that follow this pattern of consecutive wet fall and spring occur in 1995/96, 1996/97, 1997/98, 1998/99, 2004/05, 2005/06, and 2010/11. 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 6.5**). The 1995, 2005, and 2010 sample years occur during wet years, but years where drought may have affected plant condition occur in 2000, 2015, 2020, and 2025 (**Figure 6.1a, Figure 6.1b**) (National Oceanic and Atmospheric Administration, 2026).

The mean annual PDSI of the Uinta Basin division has displayed mild to extreme drought for 19 out of the past 31 years. The most recent annual PDSI score with an extreme drought ranking was 2025. Wet years were relatively consistent in the 1990s, with two moderately wet years occurring between 1997 and 1998. However, these "wet" rankings have become less common since 2000. Annual PDSI data shows an asymmetric cyclical pattern over the past 20 years, with two moderate wet years occurring amid longer periods of drought. The most recent moderately wet years were 2005 and 2011, with the majority of the period between 2012 and 2025 having years of moderate to extreme drought. Overall, 19% of the 1995-2025 period consisted of slightly to very wet years, while 65% was considered to be years of mild to extreme drought; the remaining 16% 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 (**Figure 6.2a**, **Figure 6.2b**). The years that follow this pattern of consecutive wet fall and spring occur in 1996/97, 1997/98, 1998/99, 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 6.5**). The 1995 and 2005 sample years occurs during wet years, but years where drought may have affected plant condition occur in 2000, 2010, 2015, 2020, and 2025 (**Figure 6.2a**, **Figure 6.2b**) (National Oceanic and Atmospheric Administration, 2026).



Map 6.1: The 1991-2020 PRISM Precipitation Model for WMU 17B, 17C, Wasatch Mountains, East (PRISM Climate Group, Oregon State University, 2021).

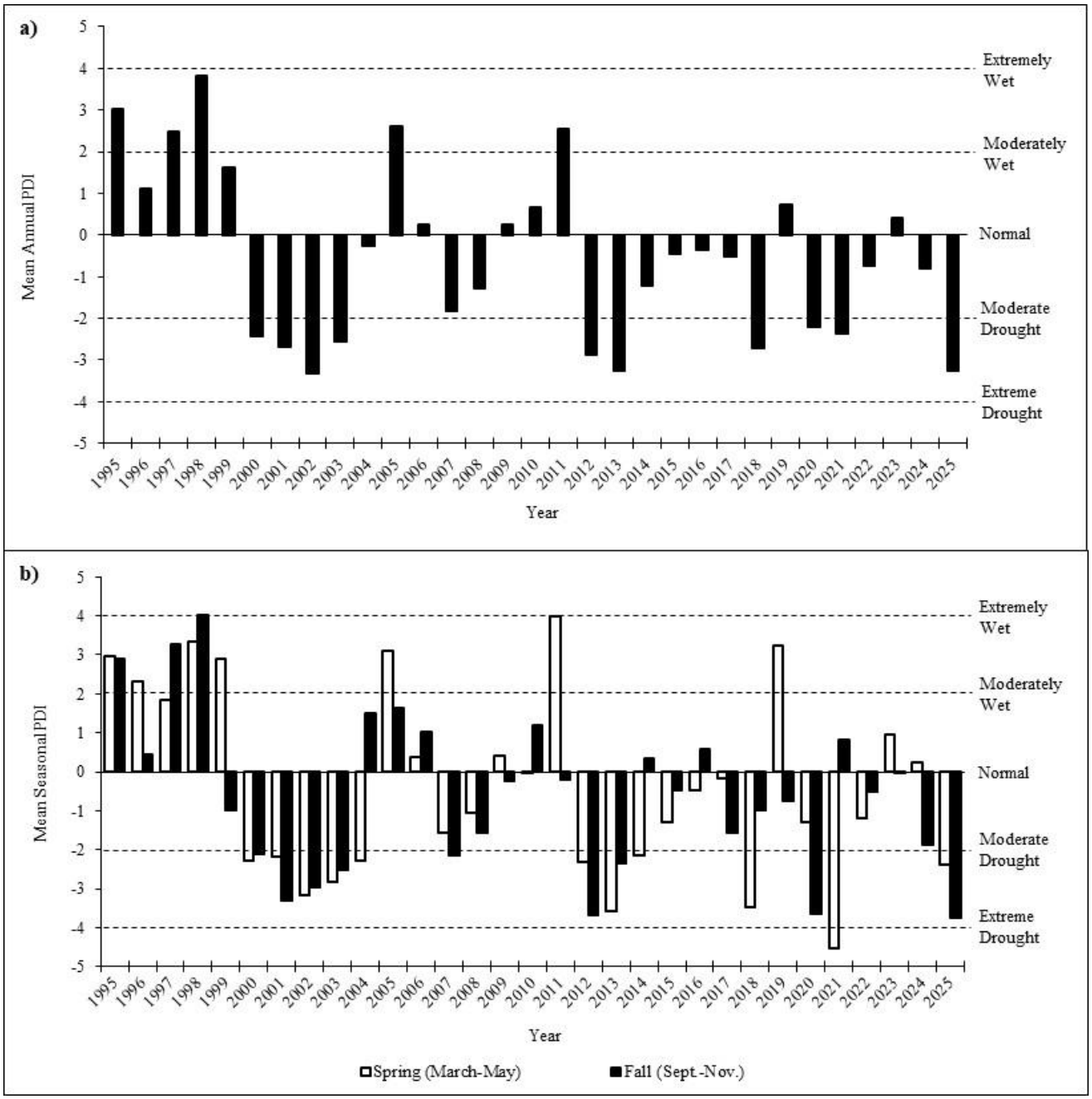


Figure 6.1: The 1995-2025 Palmer Drought Severity Index (PDSI) for the Northern Mountains division (Division 5). The PDSI is based on climate data gathered from 1895 to 2025. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet, and negative deviations indicate drought. Classification 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, 2026).

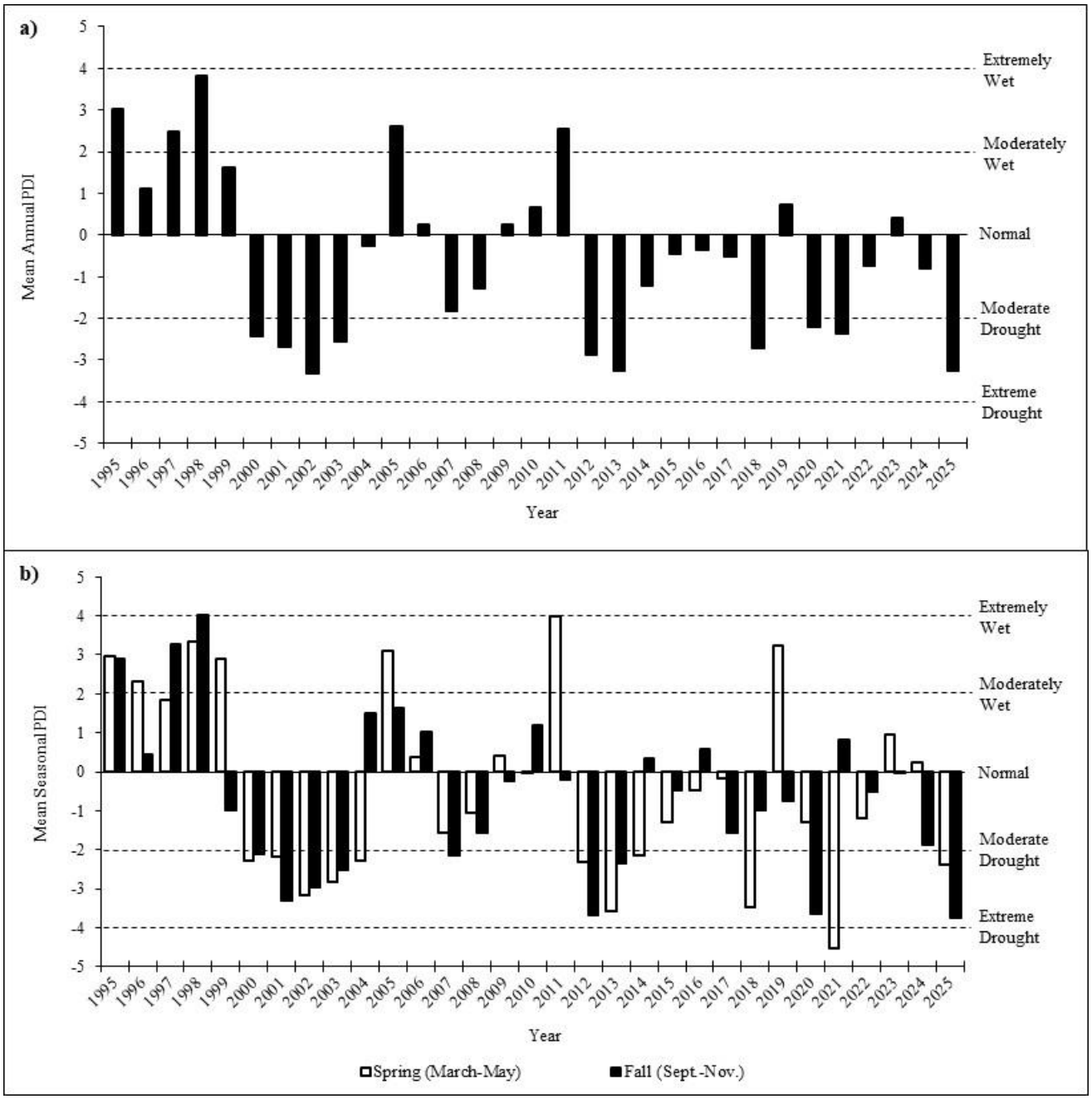


Figure 6.2: The 1995-2025 Palmer Drought Severity Index (PDSI) for the Uinta Basin division (Division 6). The PDSI is based on climate data gathered from 1895 to 2025. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet, and negative deviations indicate drought. Classification 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, 2026).

Big Game Habitat

There is a long and gradual easterly slope that extends from the base of Tabby Mountain, Raspberry Knoll, and Buck Knoll toward the Duchesne River Formation. This northern portion of deer winter range is found between the approximate elevations of 7,500ft and 5,800ft. Vegetation cohorts in this area are vital for deer winter success including mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) ecotypes in higher elevations and Wyoming big sagebrush (*A. tridentata* ssp. *wyomingensis*) ecotypes in lower elevations. The southern portion (Avintaquin) of deer winter range is more rugged and comprised of canyons and ridges. Elevation ranges included in this winter range extend from approximately 9,000ft on Gray Head Peak down to 6,500ft on the benches of the Strawberry River Valley; the majority of this area serves more functionally as transitional and summer range for mule deer while true winter range is found below 8,000ft. Vegetation cohorts of interest include mountain browse, black and mountain big sagebrush, and perennial grass ecotypes. Summer range extends to over 10,000ft down to 7,500ft in the Currant Creek subunit. Vegetation cohorts include aspen and mountain browse and sagebrush ecotypes; these vegetation ecotypes are also applicable to the Avintaquin deer summer range. Winter concentration areas on Currant Creek-Avintaquin that are considered to be crucial deer winter habitat include the lower foothills surrounding Tabby Mountain, Blacktail Mountain, Grey Wolf Mountain, Santaquin Draw, Beer Springs, Rabbit Gulch, Sink Draw, the lower ends of Little Horse Ridge and Horse Ridge, West Bench, and the lower ridges above the Strawberry River Valley.

Rangeland Analysis Platform (RAP) – Cover by Mule 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 cover values 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. The following graphs represent vegetation changes by 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 inclusion of the RAP data in this report is to also help illustrate the year-to-year fluctuations or changes that may occur between Range Trend samplings. Also displayed in the following graphs is the change in satellite imaging resolution from 30m to 10m used to calculate cover. This change occurs in 2018 and is denoted by a dashed line. Calculated cover estimations in 2018 and beyond use 10m resolution; caution should be followed when comparing years before 2018 to years after, as sequential comparisons are not at the same scale.

According to the RAP data, herbaceous cover has exhibited yearly fluctuations on summer, winter, and year-long mule deer ranges. When comparing 1986 data to that from 2025, averaged herbaceous cover has generally decreased on all deer habitats. Despite an overall decrease in total average cover, average cover for annual lifeforms exhibited net increases on deer ranges of all seasonalities. Large flushes of annuals have occurred during many years of good precipitation and have been particularly pronounced. 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. Additionally, net decreases in herbaceous perennial cover correlate with the prolonged drought occurring between 2000 and 2025. The decrease in cover may be a result of the cumulative effects of repeated drought despite intermittent wet years (**Figure 6.1**, **Figure 6.2**, **Figure 6.3**, **Figure 6.4**, **Figure 6.5**). However, Range Trend data from 1995 to present shows increases in herbaceous cover (driven by perennial grass) across all sampled ecotypes. 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 6.19**, **Figure 6.20**). As such, incongruences between Range Trend data and that reported by the RAP are probable.

The RAP data for tree cover shows fluctuation over time on all three range types, but total values have generally increased when comparing 1986 and 2025 data; the increase is more pronounced on deer winter range. Cover for shrub lifeforms has had variable trends, but overall cover appears to be stable. 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 6.6**, **Figure 6.7**, **Figure 6.8**). Range Trend data shows overall increases in average shrub cover on Mountain (Big Sagebrush) and Mountain (Browse) potentials, but stable cover values for shrubs on Upland (Big Sagebrush) potentials. Average tree cover measured by Range Trend shows an increase on sites found on Upland (Big Sagebrush) potentials (**Figure 6.9**, **Figure 6.10**, **Figure 6.11**, **Figure 6.12**). 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 Cover by Mule Deer Habitat

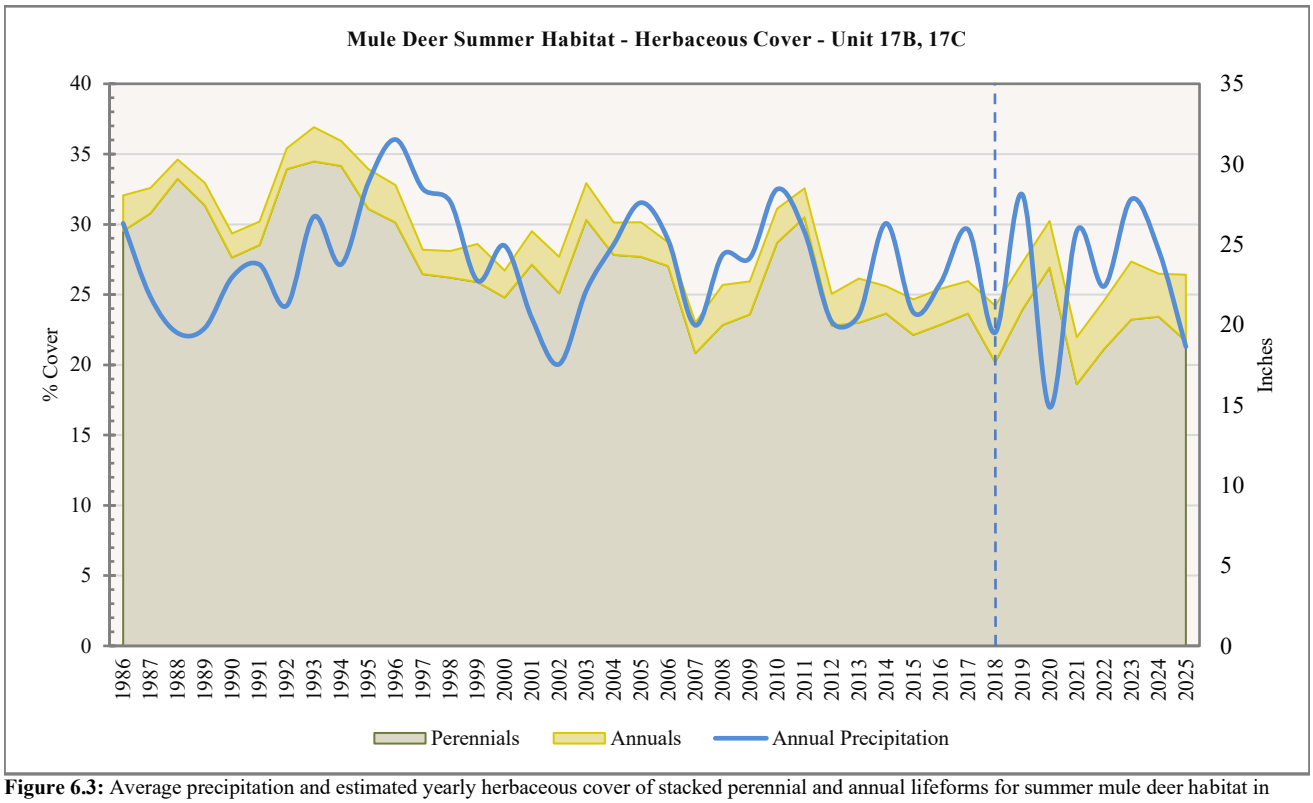


Figure 6.3: Average precipitation and estimated yearly herbaceous cover of stacked perennial and annual lifeforms for summer mule deer habitat in WMU 17B, 17C, Wasatch Mountains, East (Rangeland Analysis Platform, 2026).
*Dashed line indicates shift in depicted datasets from RAP 30m (1986-2017) to RAP 10m (2018-2025) (USDA Agricultural Research Service, 2026).

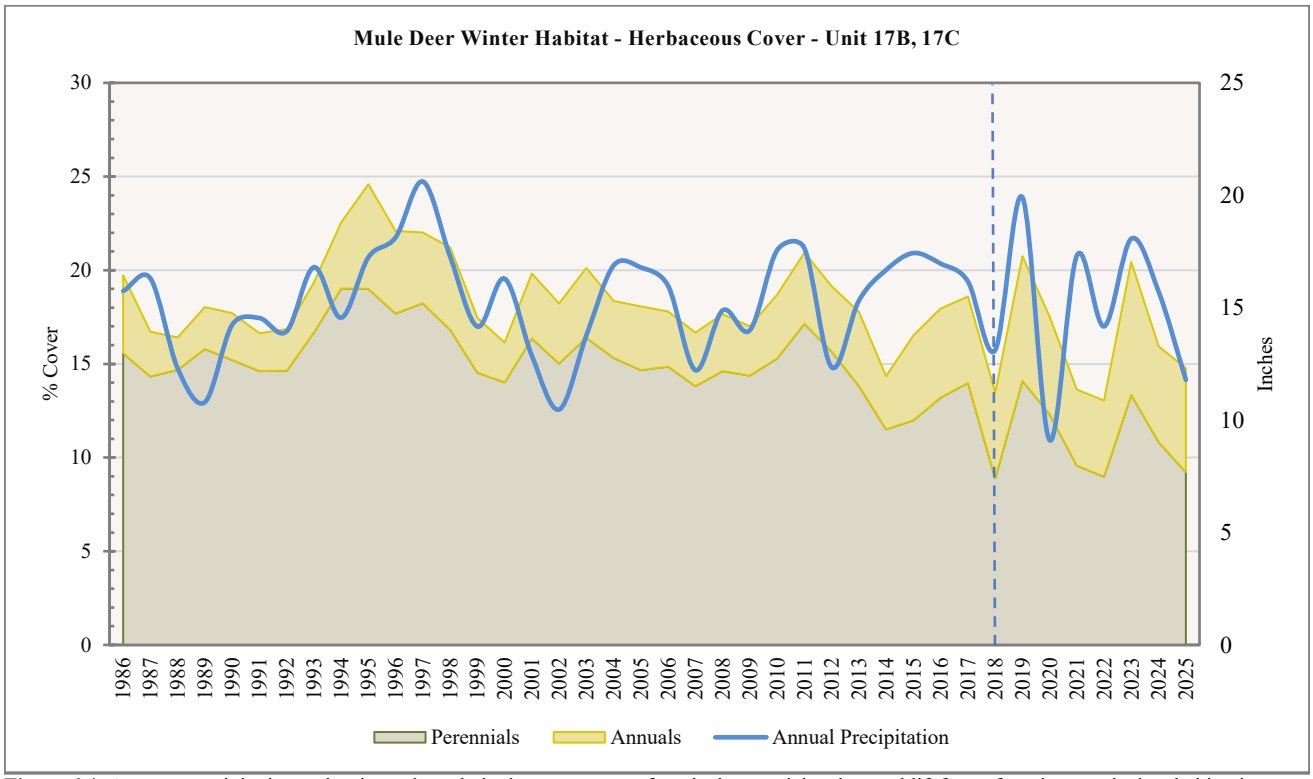


Figure 6.4: Average precipitation and estimated yearly herbaceous cover of stacked perennial and annual lifeforms for winter mule deer habitat in WMU 17B, 17C, Wasatch Mountains, East (Rangeland Analysis Platform, 2026).
*Dashed line indicates shift in depicted datasets from RAP 30m (1986-2017) to RAP 10m (2018-2025) (USDA Agricultural Research Service, 2026).

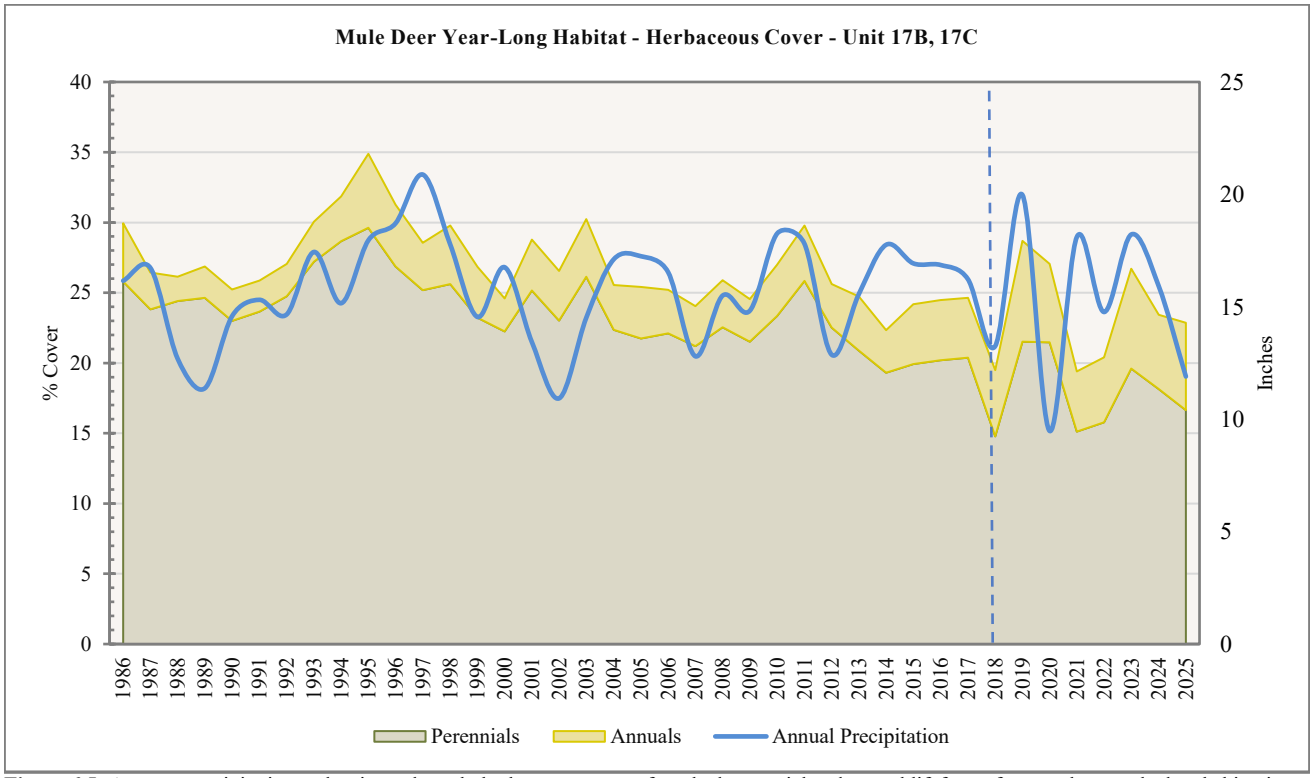


Figure 6.5: Average precipitation and estimated yearly herbaceous cover of stacked perennial and annual lifeforms for year-long mule deer habitat in WMU 17B, 17C, Wasatch Mountains, East (Rangeland Analysis Platform, 2026).
*Dashed line indicates shift in depicted datasets from RAP 30m (1986-2017) to RAP 10m (2018-2025) (USDA Agricultural Research Service, 2026).

RAP – Shrub and Tree Cover by Mule Deer Habitat

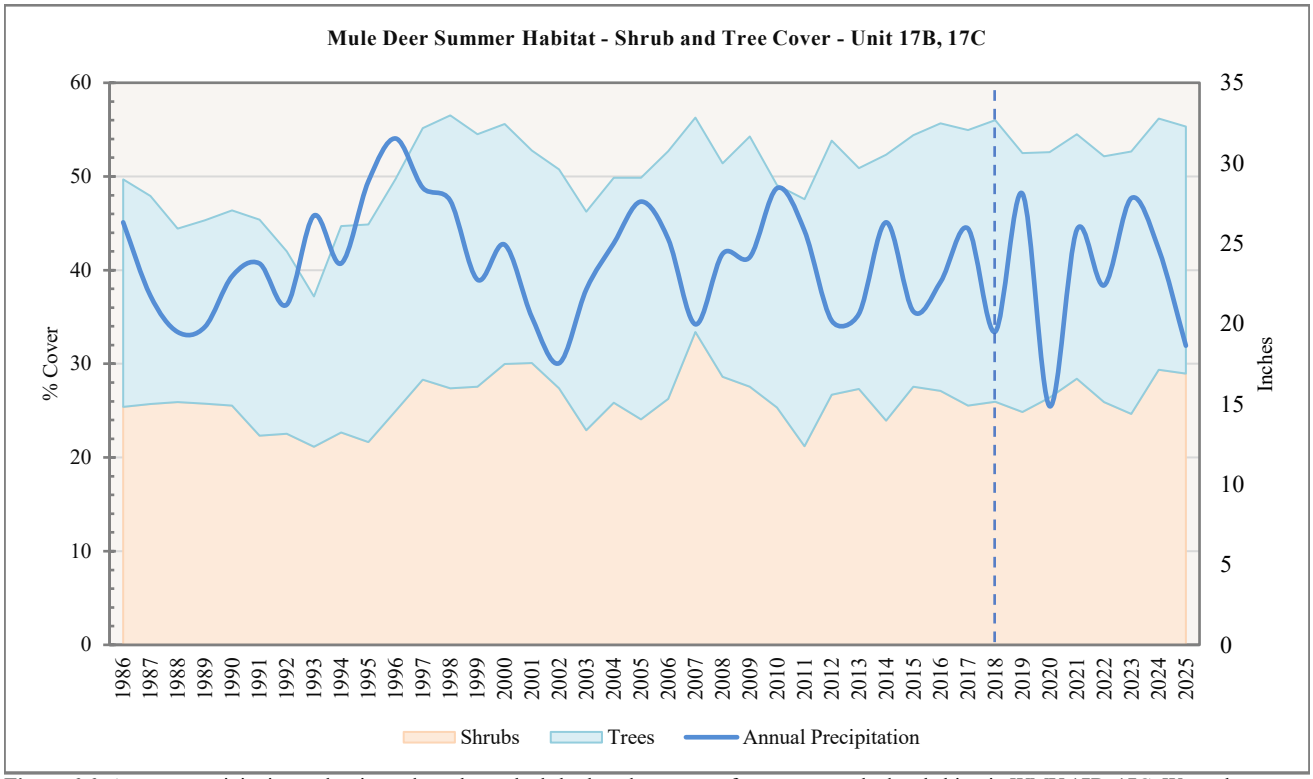


Figure 6.6: Average precipitation and estimated yearly stacked shrub and tree cover for summer mule deer habitat in WMU 17B, 17C, Wasatch Mountains, East (Rangeland Analysis Platform, 2026).
*Dashed line indicates shift in depicted datasets from RAP 30m (1986-2017) to RAP 10m (2018-2025) (USDA Agricultural Research Service, 2026).

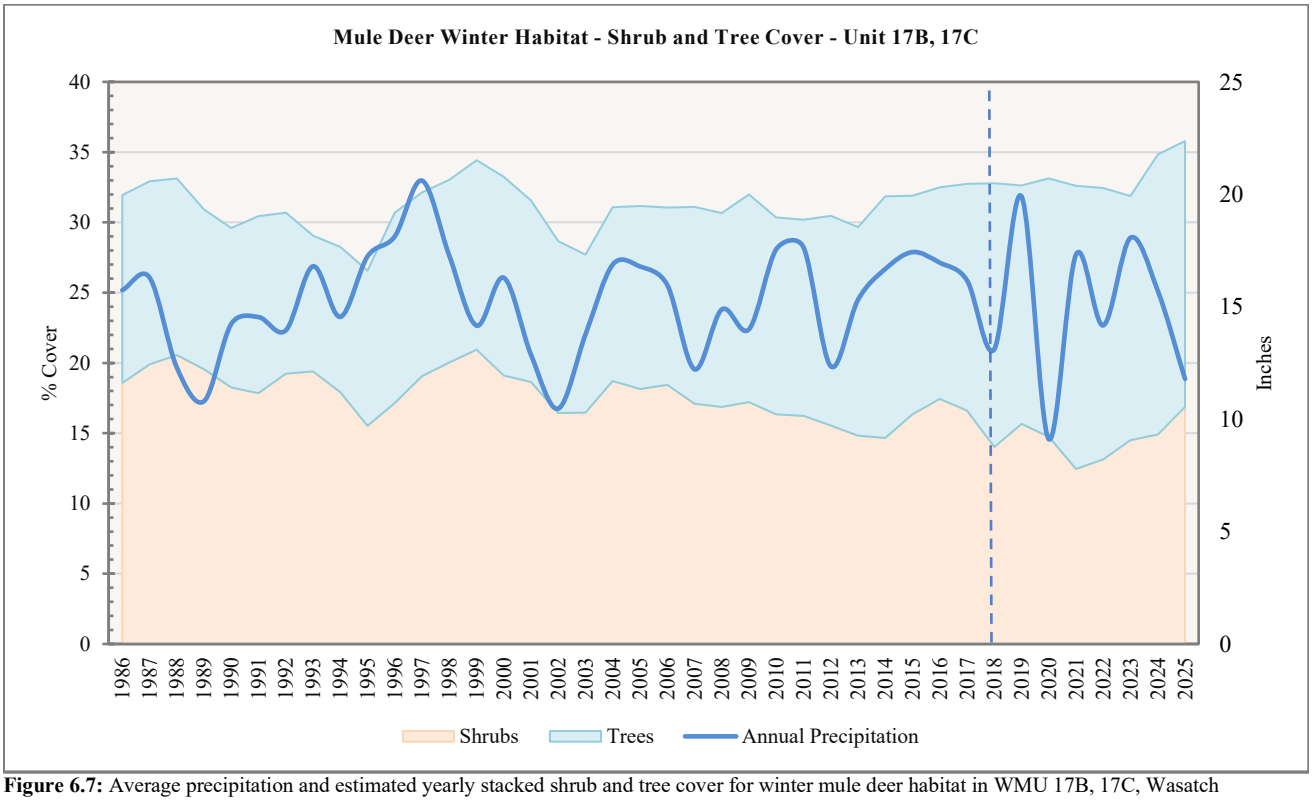


Figure 6.7: Average precipitation and estimated yearly stacked shrub and tree cover for winter mule deer habitat in WMU 17B, 17C, Wasatch Mountains, East (Rangeland Analysis Platform, 2026).
*Dashed line indicates shift in depicted datasets from RAP 30m (1986-2017) to RAP 10m (2018-2025) (USDA Agricultural Research Service, 2026).

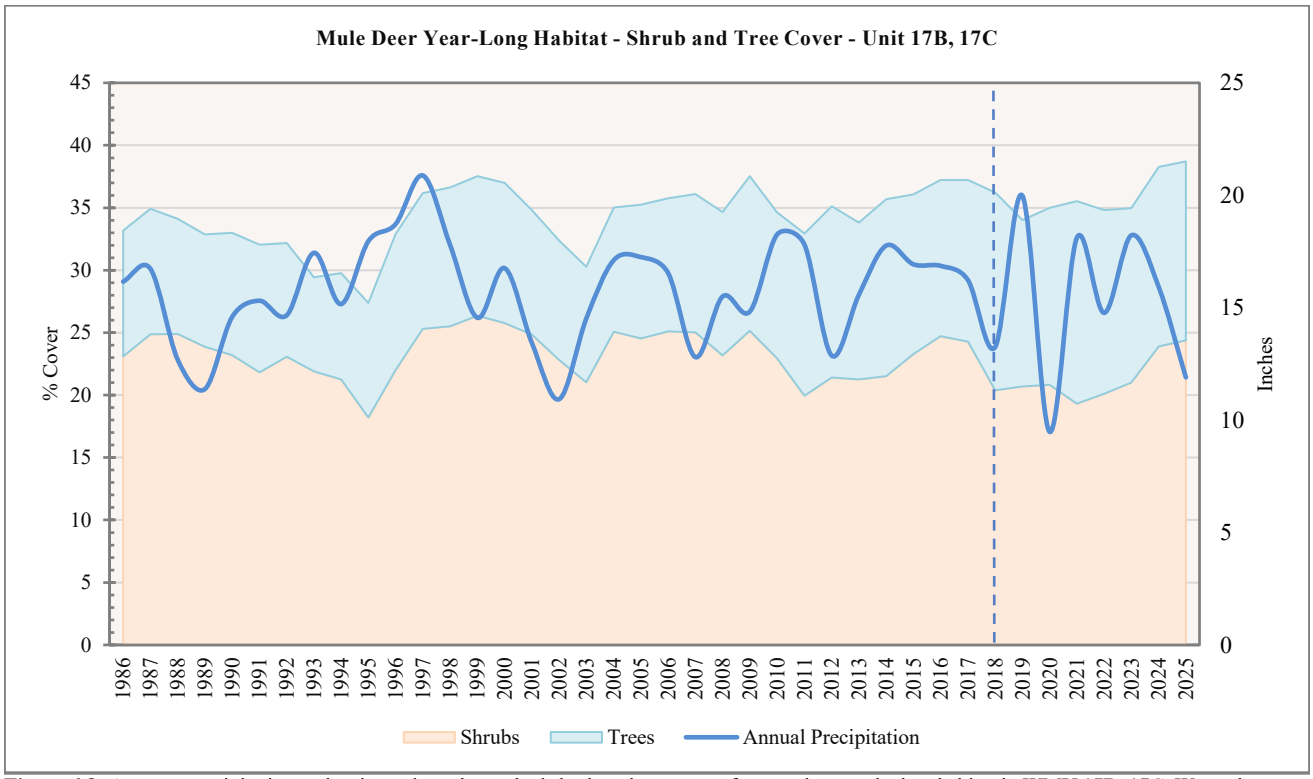
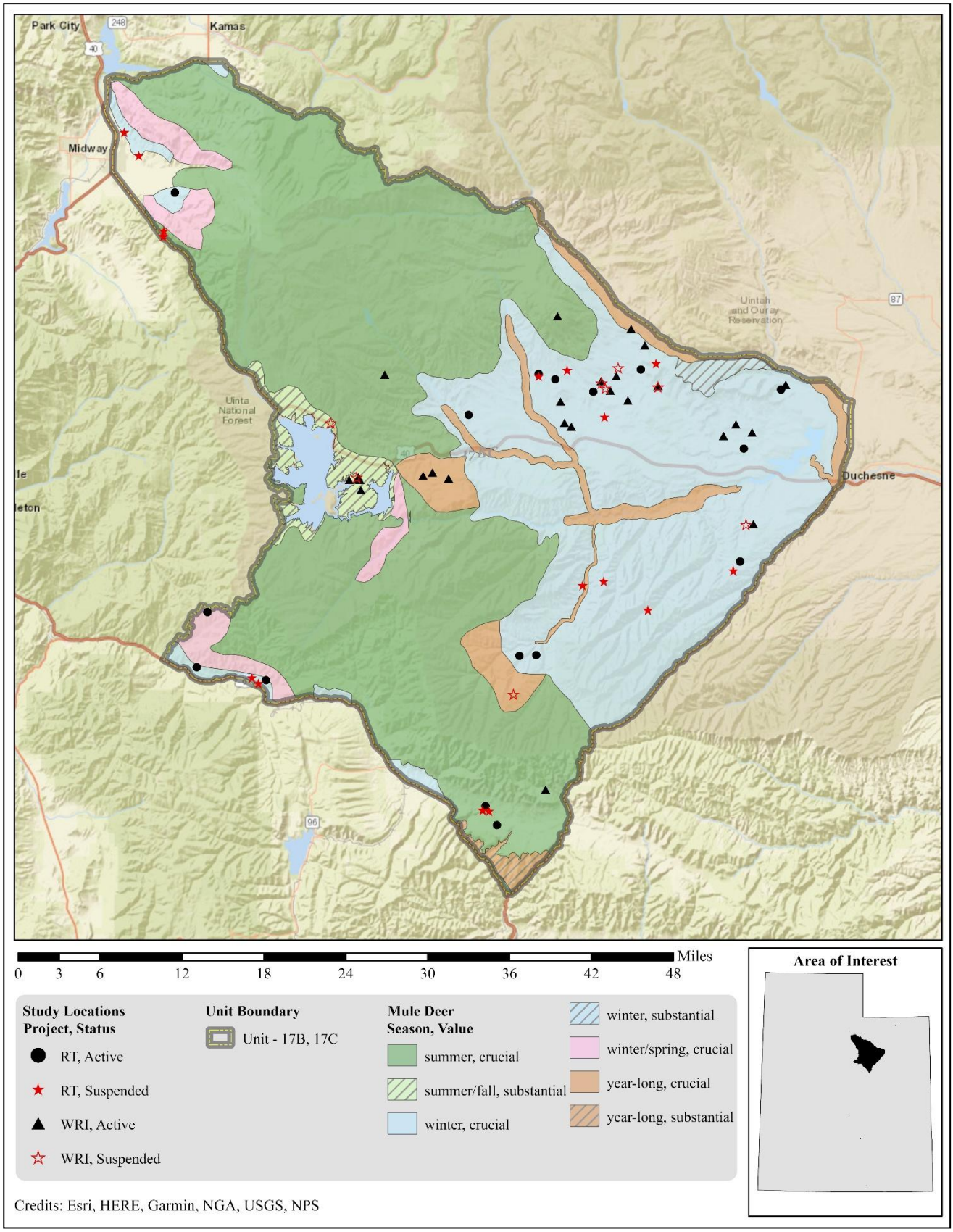
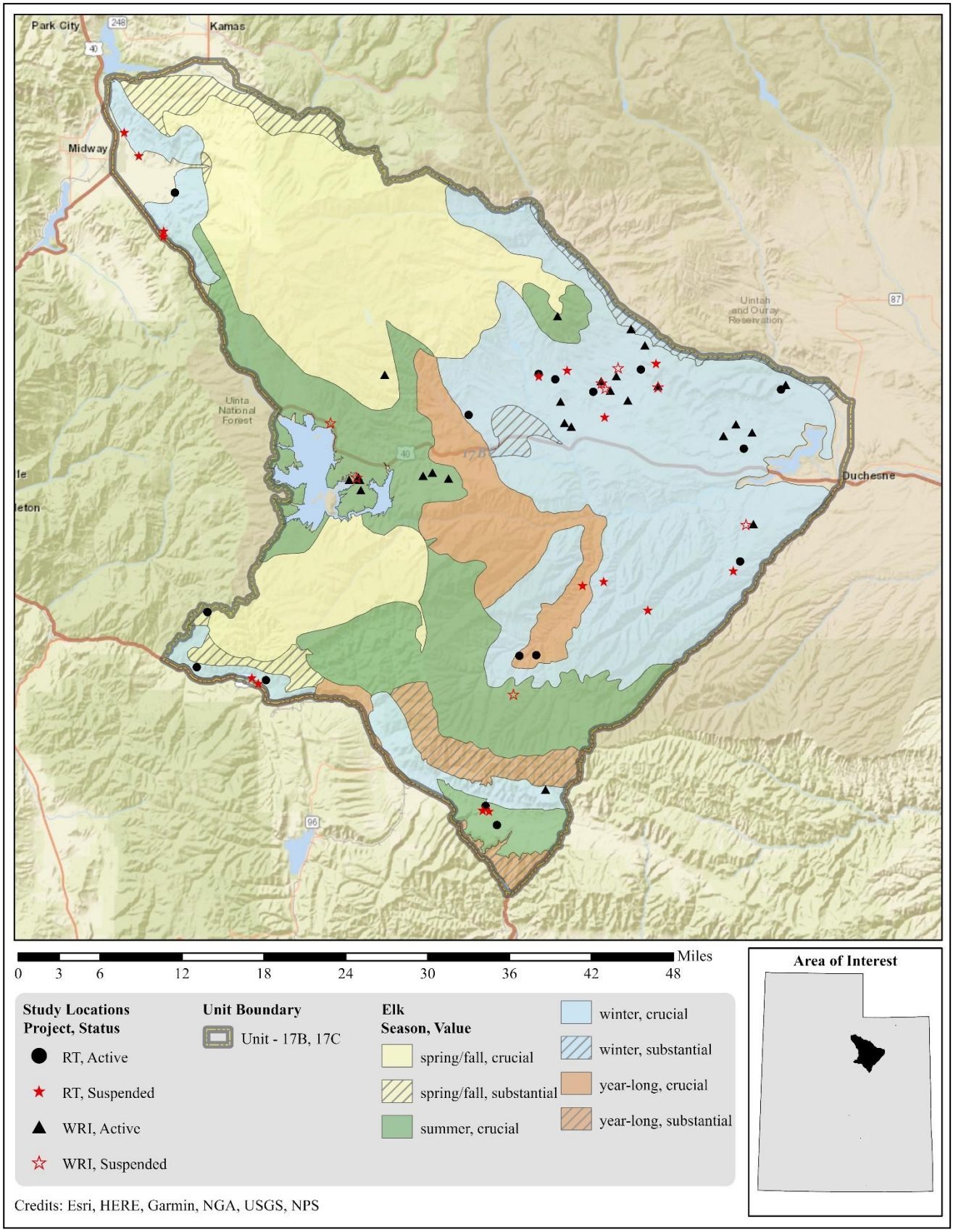


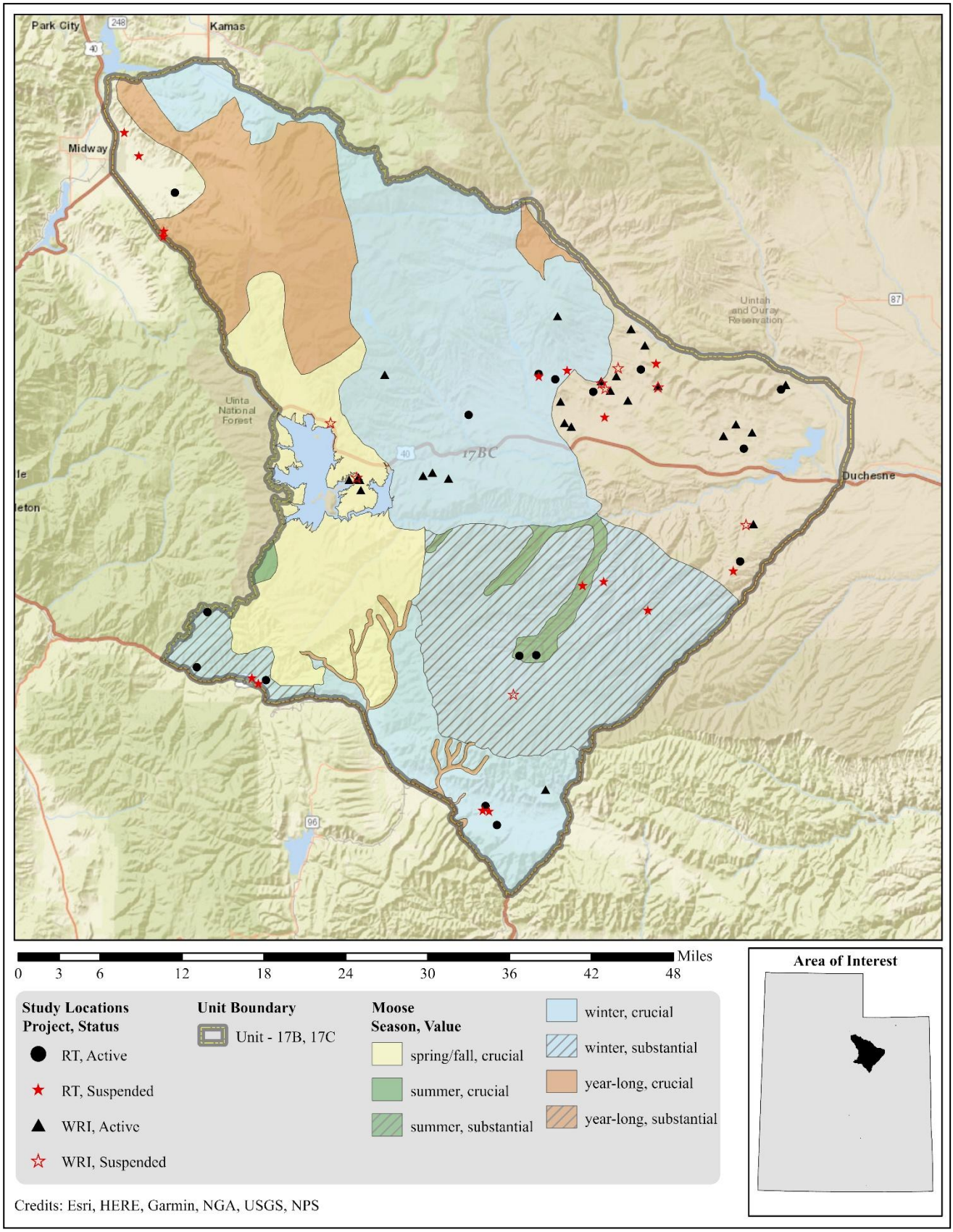
Figure 6.8: Average precipitation and estimated yearly stacked shrub and tree cover for year-long mule deer habitat in WMU 17B, 17C, Wasatch Mountains, East (Rangeland Analysis Platform, 2026).
*Dashed line indicates shift in depicted datasets from RAP 30m (1986-2017) to RAP 10m (2018-2025) (USDA Agricultural Research Service, 2026).



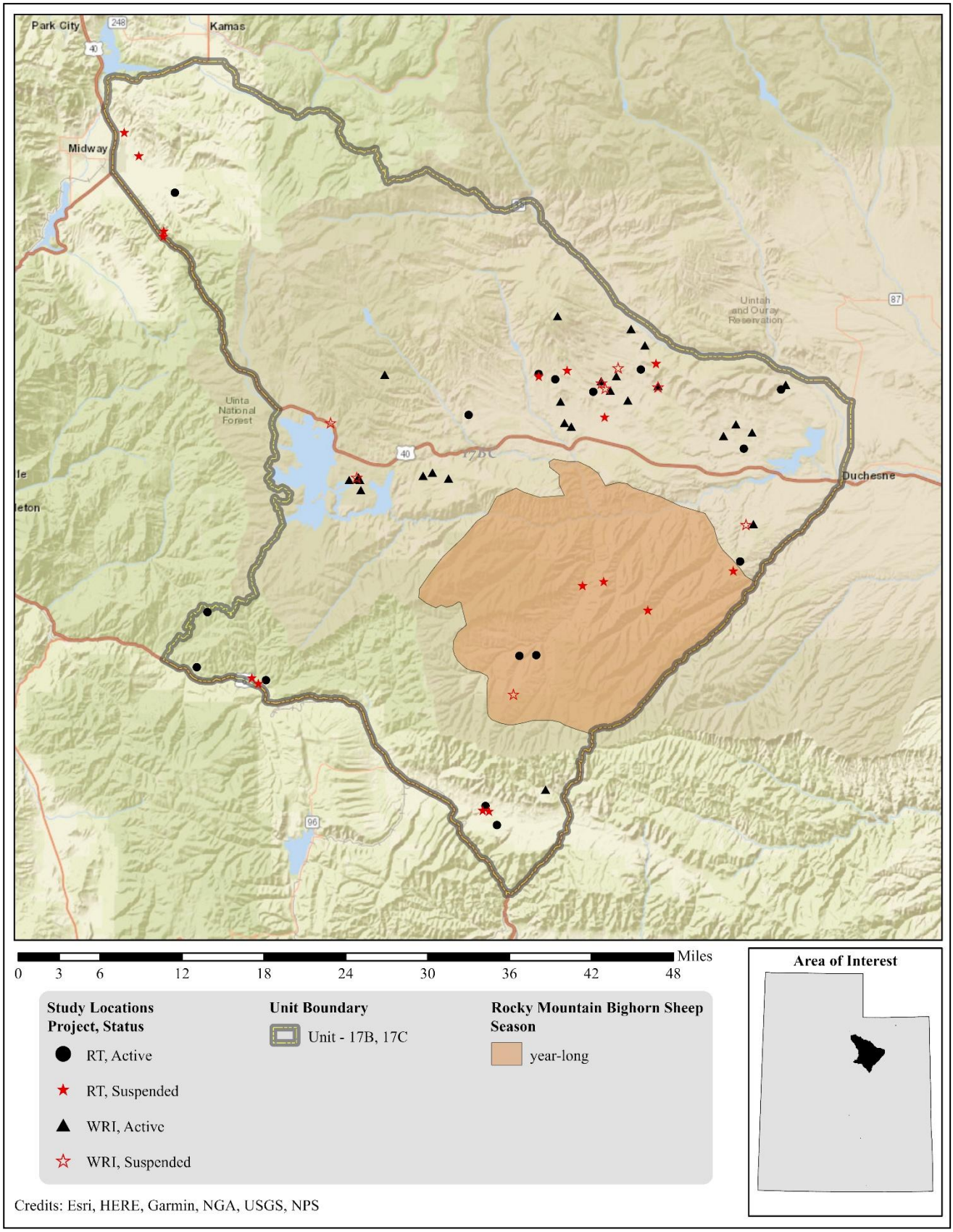
Map 6.2: Estimated mule deer habitat by season and value for WMU 17B, 17C, Wasatch Mountains, East.



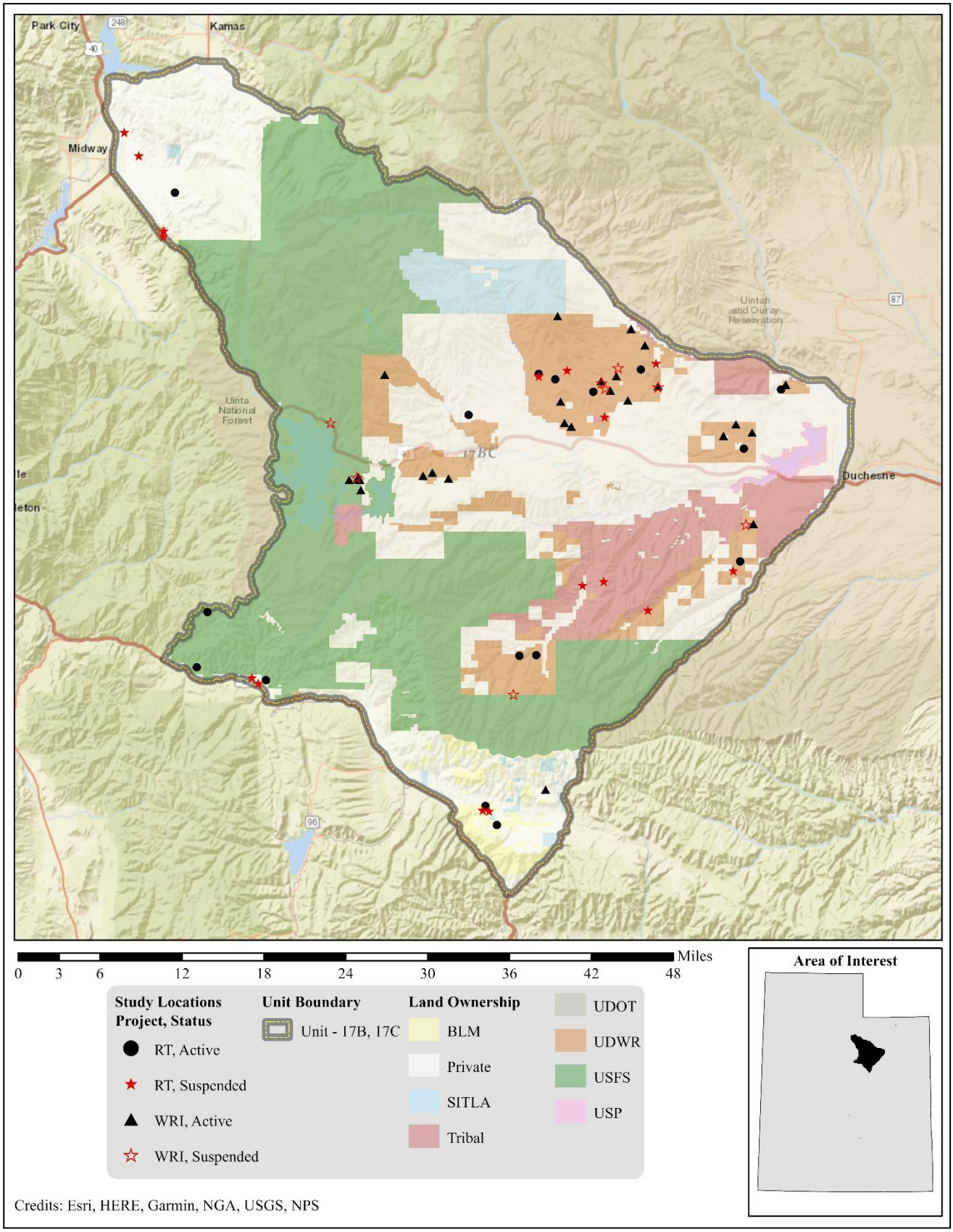
Map 6.3: Estimated elk habitat by season and value for WMU 17B, 17C, Wasatch Mountains, East.



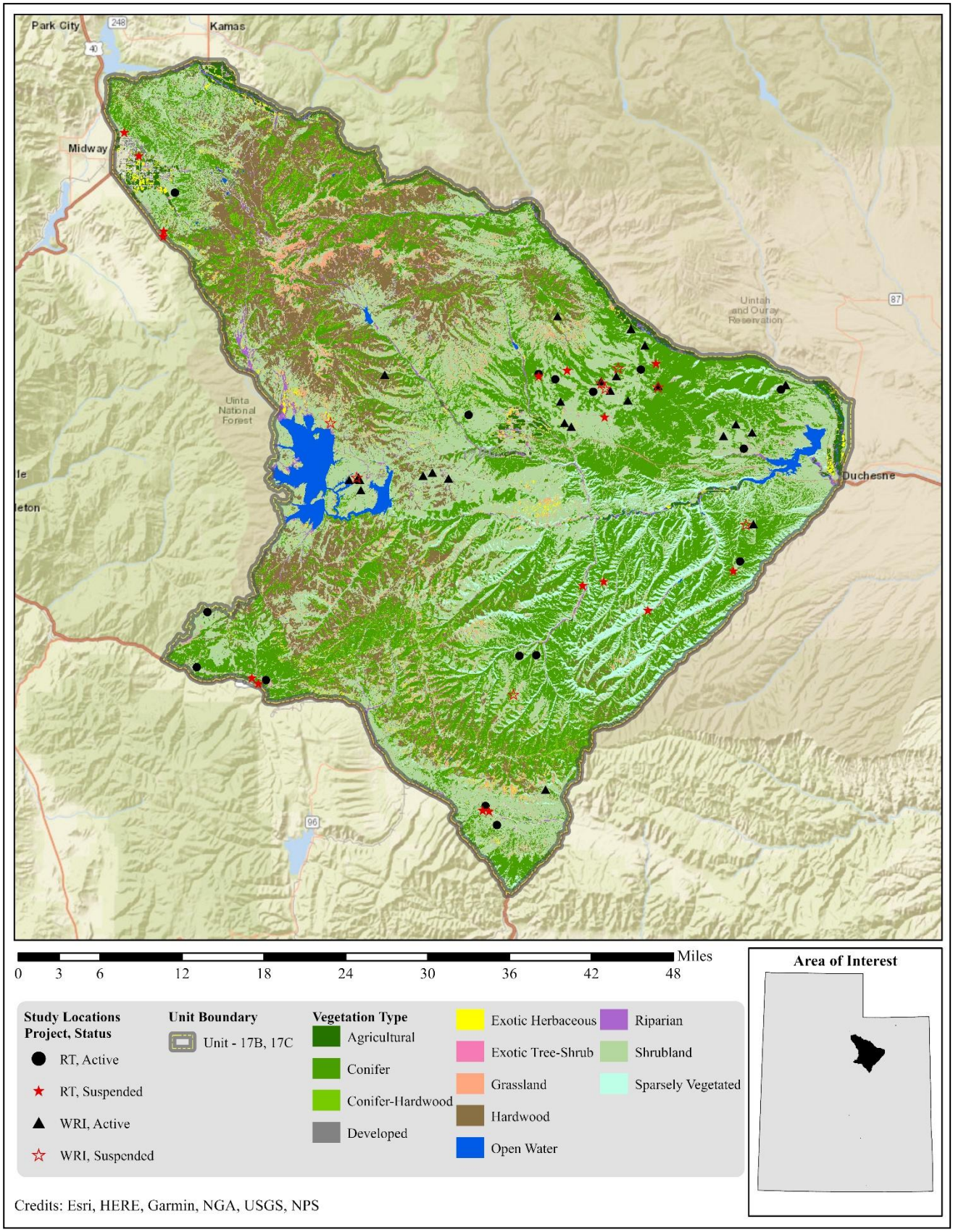
Map 6.4: Estimated moose habitat by season and value for WMU 17B, 17C, Wasatch Mountains, East.



Map 6.5: Estimated Rocky Mountain bighorn sheep habitat by season and value for WMU 17B, 17C, Wasatch Mountains, East.



Map 6.6: Land ownership for WMU 17B, 17C, Wasatch Mountains, East.



Map 6.7: LANDFIRE Existing Vegetation Type map (LC24_EVT_250, 2024) for WMU 17B, 17C, Wasatch Mountains, East.

LANDFIRE Existing Vegetation Type for Mule Deer Habitat

The current LANDFIRE Existing Vegetation Type model shows that approximately 31.5% of mule deer summer range within the Wasatch Mountains, East unit is comprised of the Rocky Mountain Aspen Forest and Woodland and Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland biophysical sites. Both of these biophysical sites (also referred to here as vegetation types) have quaking aspen (*Populus tremuloides*) as a dominant component, although conifers are also co-dominant in the Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland vegetation type. Although trees dominate these higher elevation biophysical sites, preferred browse species such as serviceberry (*Amelanchier* spp.), mountain snowberry (*Symphoricarpos oreophilus*), and chokecherry (*Prunus virginiana*) may also be present. In addition, sites of these types can have abundant herbaceous understories that could provide valuable forage for summering mule deer.

Nearly 37% of mule deer winter range and 25.5% of year-long habitat is made up of biophysical sites that are dominated by pinyon (*Pinus* spp.) and juniper (*Juniperus* spp.) according to the model. These low to mid-elevation sites can be associated with understory browse species known to be beneficial to mule deer, although abundance may vary widely. However, 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 sagebrush ecological sites comprise 25% of the unit's mule deer summer habitat; nearly 23% of the winter range; and 23% of the year-long range. These sites are found at elevations ranging from low (semidesert) to high (mountain). Sagebrush species typically dominate these sites across the elevation gradient and may provide valuable browse for mule deer during the winter months. Other preferred browse species may also be present on some biophysical sites, and pinyon and juniper may be present at middle elevations. The Inter-Mountain Basins Montane Sagebrush Steppe vegetation type in particular is modeled to comprise just over 24% of the summer range in this unit. Although sagebrush typically dominates this biophysical site, this type 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 Wasatch Mountains, East management unit (**Map 6.7**, **Table 6.1**, **Table 6.2**, **Table 6.3**), 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
Shrubland	Inter-Mountain Basins Montane Sagebrush Steppe	137,786	24.19%	
	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	30,360	5.33%	
	Rocky Mountain Lower Montane-Foothill Shrubland	11,361	1.99%	
	Inter-Mountain Basins Semi-Desert Shrub-Steppe	5,891	1.03%	
	Colorado Plateau Mixed Low Sagebrush Shrubland	2,293	0.40%	
	Inter-Mountain Basins Big Sagebrush Shrubland	2,080	0.37%	
	Inter-Mountain Basins Mixed Salt Desert Scrub	1,003	0.18%	
	Rocky Mountain Alpine Dwarf-Shrubland	27	0.00%	
	Inter-Mountain Basins Mat Saltbush Shrubland	1	0.00%	
	Colorado Plateau Pinyon-Juniper Shrubland	1	0.00%	33.49%

Group	Existing Vegetation Type for Summer Mule Deer Habitat	Acres	% of Total	Group % of Total
Conifer	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	41,901	7.36%	
	Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland	35,590	6.25%	
	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	24,508	4.30%	
	Colorado Plateau Pinyon-Juniper Woodland	22,598	3.97%	
	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	15,578	2.73%	
	Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland	9,244	1.62%	
	Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland	3,859	0.68%	
	Rocky Mountain Foothill Limber Pine-Juniper Woodland	2,937	0.52%	
	Rocky Mountain Lodgepole Pine Forest	2,820	0.50%	
	Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland	1,837	0.32%	
	Southern Rocky Mountain Ponderosa Pine Woodland	1,738	0.31%	28.54%
Hardwood	Rocky Mountain Aspen Forest and Woodland	144,085	25.29%	
	Rocky Mountain Bigtooth Maple Ravine Woodland	2,042	0.36%	25.65%
Other	Developed	12,623	2.22%	
	Riparian	11,127	1.95%	
	Sparsely Vegetated	10,915	1.92%	
	Agricultural	1,805	0.32%	
	Open Water	832	0.15%	
	Quarries-Strip Mines-Gravel Pits-Well and Wind Pads	5	0.00%	6.55%
Grassland	Rocky Mountain Subalpine-Montane Mesic Meadow	13,129	2.30%	
	Southern Rocky Mountain Montane-Subalpine Grassland	10,986	1.93%	
	Inter-Mountain Basins Semi-Desert Grassland	1,517	0.27%	4.50%
Exotic Herbaceous	Interior Western North American Temperate Ruderal Grassland	2,700	0.47%	
	Great Basin & Intermountain Introduced Perennial Grassland and Forbland	2,242	0.39%	
	Great Basin & Intermountain Introduced Annual Grassland	1,551	0.27%	
	Great Basin & Intermountain Introduced Annual and Biennial Forbland	<1	0.00%	1.14%
Exotic Tree-Shrub	Interior Western North American Temperate Ruderal Shrubland	454	0.08%	
	Great Basin & Intermountain Ruderal Shrubland	254	0.04%	0.12%
Total		**569,680**	**100%**	**100%**

Table 6.1: LANDFIRE Existing Vegetation Type (LC24_EVT_250, 2024) acreage of summer mule deer habitat for WMU 17B, 17C, Wasatch Mountains, East.

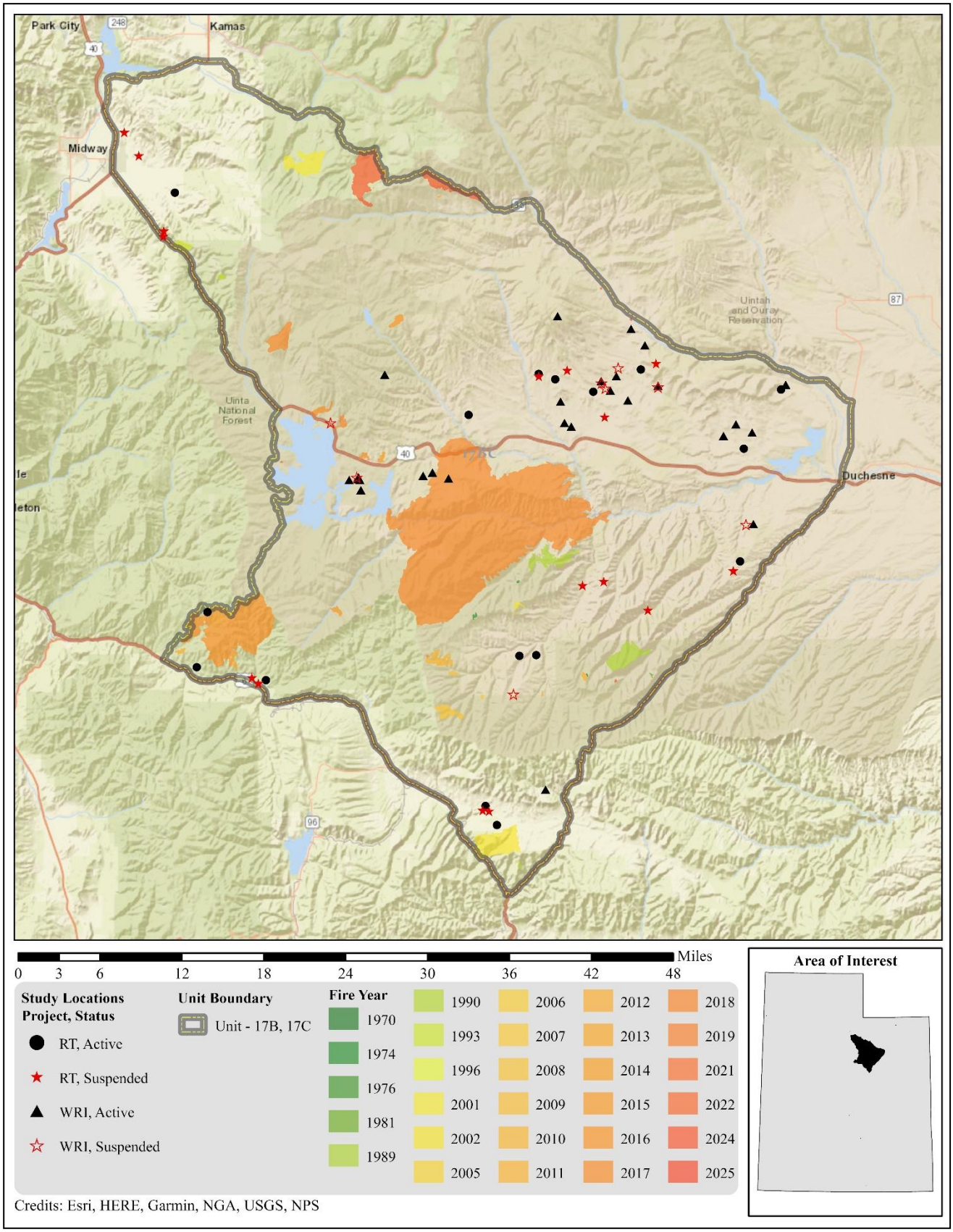
Group	Existing Vegetation Type for Winter Mule Deer Habitat	Acres	% of Total	Group % of Total
Conifer	Colorado Plateau Pinyon-Juniper Woodland	138,109	36.17%	
	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	12,361	3.24%	
	Rocky Mountain Foothill Limber Pine-Juniper Woodland	6,097	1.60%	
	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	5,803	1.52%	
	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	2,650	0.69%	
	Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland	1,416	0.37%	
	Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland	937	0.25%	
	Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland	849	0.22%	
	Southern Rocky Mountain Ponderosa Pine Woodland	714	0.19%	
	Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland	60	0.02%	
	Rocky Mountain Lodgepole Pine Forest	9	0.00%	44.26%
Shrubland	Inter-Mountain Basins Big Sagebrush Shrubland	42,680	11.18%	
	Inter-Mountain Basins Montane Sagebrush Steppe	36,930	9.67%	
	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	16,525	4.33%	
	Inter-Mountain Basins Mixed Salt Desert Scrub	16,054	4.20%	
	Rocky Mountain Lower Montane-Foothill Shrubland	10,542	2.76%	
	Inter-Mountain Basins Semi-Desert Shrub-Steppe	10,360	2.71%	
	Colorado Plateau Mixed Low Sagebrush Shrubland	7,442	1.95%	
	Colorado Plateau Pinyon-Juniper Shrubland	2,422	0.63%	
	Inter-Mountain Basins Mat Saltbush Shrubland	404	0.11%	
	Inter-Mountain Basins Greasewood Flat	270	0.07%	
	Southern Colorado Plateau Sand Shrubland	3	0.00%	37.61%
Other	Sparsely Vegetated	37,349	9.78%	
	Developed	7,445	1.95%	
	Open Water	3,249	0.85%	
	Agricultural	2,332	0.61%	
	Riparian	1,857	0.49%	
	Quarries-Strip Mines-Gravel Pits-Well and Wind Pads	812	0.21%	13.89%
Hardwood	Rocky Mountain Aspen Forest and Woodland	6,204	1.62%	
	Rocky Mountain Bigtooth Maple Ravine Woodland	1,545	0.40%	2.03%

Group	Existing Vegetation Type for Winter Mule Deer Habitat	Acres	% of Total	Group % of Total
Grassland	Southern Rocky Mountain Montane-Subalpine Grassland	1,453	0.38%	
	Inter-Mountain Basins Semi-Desert Grassland	1,373	0.36%	
	Rocky Mountain Subalpine-Montane Mesic Meadow	662	0.17%	0.91%
Exotic Herbaceous	Great Basin & Intermountain Introduced Annual Grassland	1,174	0.31%	
	Great Basin & Intermountain Introduced Perennial Grassland and Forbland	1,002	0.26%	
	Interior Western North American Temperate Ruderal Grassland	644	0.17%	
	Great Basin & Intermountain Introduced Annual and Biennial Forbland	11	0.00%	0.74%
Exotic Tree-Shrub	Great Basin & Intermountain Ruderal Shrubland	1,878	0.49%	
	Interior Western North American Temperate Ruderal Shrubland	250	0.07%	0.56%
Total		**381,878**	**100%**	**100%**

Table 6.2: LANDFIRE Existing Vegetation Type (LC24_EVT_250, 2024) acreage of winter mule deer habitat for WMU 17B, 17C, Wasatch Mountains, East.

Group	Existing Vegetation Type for Year-Long Mule Deer Habitat	Acres	% of Total	Group % of Total
Shrubland	Inter-Mountain Basins Montane Sagebrush Steppe	11,316	17.66%	
	Inter-Mountain Basins Big Sagebrush Shrubland	2,718	4.24%	
	Inter-Mountain Basins Mixed Salt Desert Scrub	2,532	3.95%	
	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	2,431	3.79%	
	Inter-Mountain Basins Semi-Desert Shrub-Steppe	1,902	2.97%	
	Rocky Mountain Lower Montane-Foothill Shrubland	1,430	2.23%	
	Colorado Plateau Mixed Low Sagebrush Shrubland	883	1.38%	
	Colorado Plateau Pinyon-Juniper Shrubland	128	0.20%	
	Inter-Mountain Basins Mat Saltbush Shrubland	120	0.19%	
	Inter-Mountain Basins Greasewood Flat	73	0.11%	36.73%
Conifer	Colorado Plateau Pinyon-Juniper Woodland	16,237	25.35%	
	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	1,529	2.39%	
	Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland	702	1.10%	
	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	624	0.97%	
	Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland	183	0.29%	
	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	142	0.22%	
	Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland	135	0.21%	
	Southern Rocky Mountain Ponderosa Pine Woodland	107	0.17%	
	Rocky Mountain Foothill Limber Pine-Juniper Woodland	13	0.02%	
	Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland	5	0.01%	30.72%
Other	Agricultural	5,844	9.12%	
	Sparsely Vegetated	3,801	5.93%	
	Riparian	2,918	4.55%	
	Developed	2,648	4.13%	
	Open Water	921	1.44%	
	Quarries-Strip Mines-Gravel Pits-Well and Wind Pads	28	0.04%	25.22%
Hardwood	Rocky Mountain Aspen Forest and Woodland	2,126	3.32%	
	Rocky Mountain Bigtooth Maple Ravine Woodland	37	0.06%	3.38%
Exotic Herbaceous	Great Basin & Intermountain Introduced Perennial Grassland and Forbland	549	0.86%	
	Interior Western North American Temperate Ruderal Grassland	402	0.63%	
	Great Basin & Intermountain Introduced Annual Grassland	217	0.34%	
	Great Basin & Intermountain Introduced Annual and Biennial Forbland	16	0.02%	1.85%
Grassland	Southern Rocky Mountain Montane-Subalpine Grassland	476	0.74%	
	Inter-Mountain Basins Semi-Desert Grassland	227	0.35%	
	Rocky Mountain Subalpine-Montane Mesic Meadow	180	0.28%	1.38%
Exotic Tree-Shrub	Great Basin & Intermountain Ruderal Shrubland	366	0.57%	
	Interior Western North American Temperate Ruderal Shrubland	99	0.15%	0.72%
Total		**64,063**	**100%**	**100%**

Table 6.3: LANDFIRE Existing Vegetation Type (LC24_EVT_250, 2024) acreage of year-long mule deer habitat for WMU 17B, 17C, Wasatch Mountains, East.



Map 6.8: Land coverage of fires by year from 1970-2025 for WMU 17B, 17C, Wasatch Mountains, East (NIFC Open Data Site: Federal Interagency Wildland Fire Maps and Data for All, 2025; Geosciences and Environmental Change Science Center (GECSC) Outgoing Datasets, 2023).

Treatments/Restoration Work

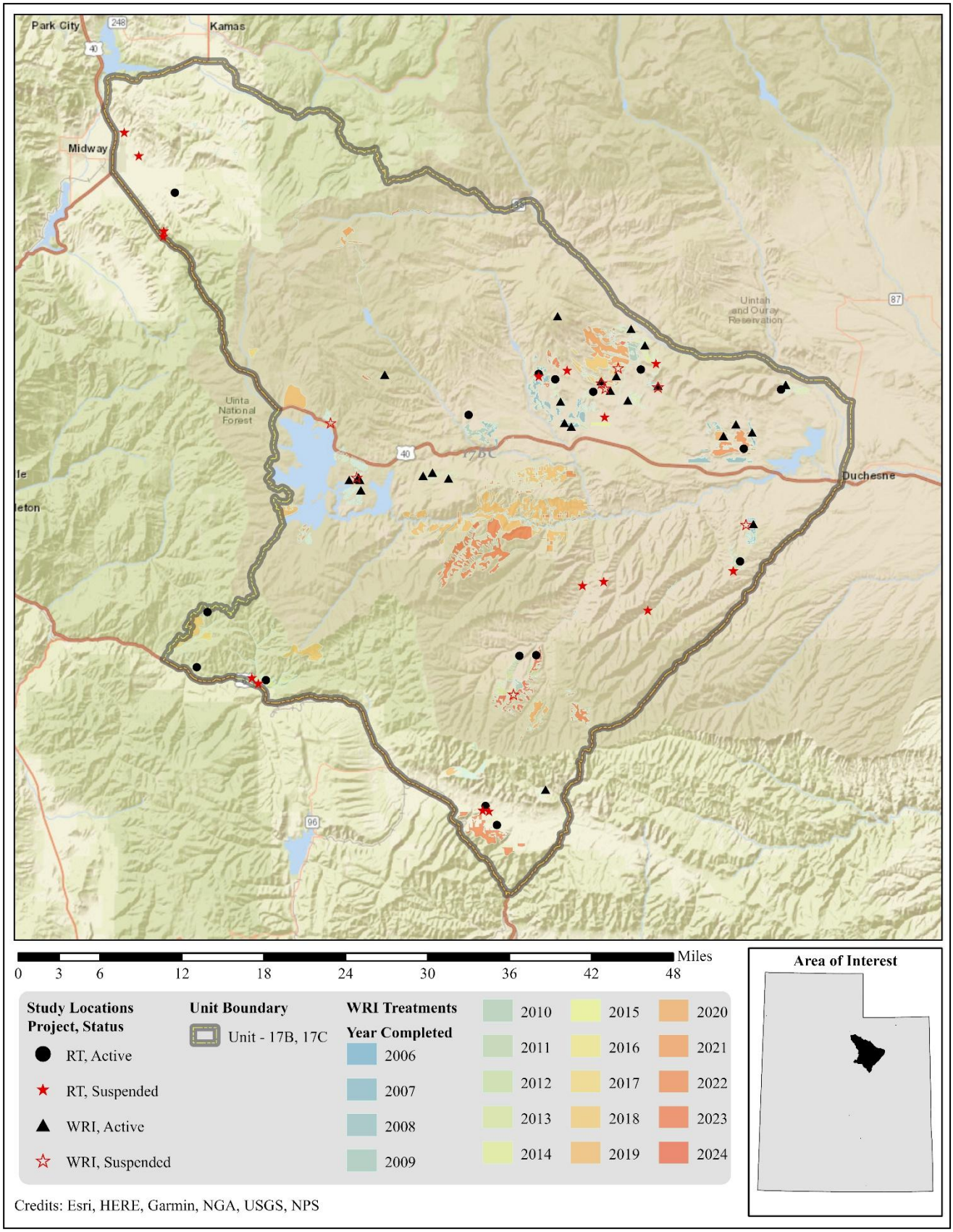
There has been an active effort to address many of the limitations on this unit through the Watershed Restoration Initiative (WRI). A total of 62,680 acres of land has been treated within the Wasatch Mountains, East unit since the WRI was implemented in 2004 (**Map 6.9**). Treatments frequently overlap one another, bringing the net total of completed treatment acres to 52,949 for this unit (**Table 6.4**). 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.

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. 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) shrub transplants, herbicide application to control undesirable vegetation, anchor chaining, and bullhog treatments to remove trees, among others (**Table 6.4**).

Type	Total Completed Acreage
Vegetation Removal/Hand Crew	**22,858**
Lop & Scatter	22,652
Lop (No Scatter)	137
Lop-Pile-Burn	55
Cut Stump	14
Seeding (Primary)	**21,753**
Broadcast (Aerial-Fixed Wing)	21,381
Drill (Rangeland)	316
Ground (Mechanical Application)	43
Broadcast (Aerial-Helicopter)	8
Hand Seeding	5
Planting/Transplanting	**3,420**
Container Stock	3,420
Herbicide Application	**3,124**
Spot Treatment	2,254
Aerial (Fixed-Wing)	603
Ground	268
Anchor Chain	**3,016**
Ely (Two-Way)	2,309
Ely (One-Way)	706
Bullhog	**2,534**
Full Size	2,491
Skid Steer	43
Prescribed Fire	**2,267**
Prescribed Fire	2,267
Chain Harrow	**1,320**
> 15 ft. (Two-Way)	1,058
> 15 ft. (One-Way)	199
≤ 15 ft. (Two-Way)	63
Harrow	**744**
≤ 15 ft. (One-Way)	389
> 15 ft. (Two-Way)	270
> 15 ft. (One-Way)	85
Mowing	**699**
Brush Hog	685
Other	13
Interseeding	**547**
Interseeding	547
Cable	**93**
One-Way	93
Seeding (Secondary/Shrub)	**92**
Ground (Mechanical Application)	92
Skid-Steer Mounted Tree Cutter	**83**
Hydraulic Shears	83
Other	**69**
Road/Parking Area Improvements	69
Road Decommissioning	<1
Forestry Practices	**39**
Coppice Cutting	39

Type	Total Completed Acreage
Bulldozing	**14**
Tree Push	14
Disc	**7**
Off-Set (One-Way)	7
Grand Total	**62,680**
***Net Total Land Area Treated**	**52,949**

Table 6.4: WRI treatment action size (acres) of completed projects for WMU 17B, 17C, Wasatch Mountains, East. Data accessed on 01/26/2026.
*Does not include overlapping treatments.



Map 6.9: Terrestrial WRI treatments by fiscal year completed for WMU 17B, 17C, Wasatch Mountains, East.

Range Trend Studies

Range Trend studies have been sampled within WMU 17 on a regular basis since 1982, with studies being added or suspended as was deemed necessary **(Table 6.5**). 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 6.6**). Range Trend studies are summarized in this report by ecological site.

Study #	Study Name	Project	Status	Years Sampled	Ecological Site Description
17-48	Blacktail Ridge	RT	Suspended	1982, 1988, 1995	Upland Loam (Mountain Big Sagebrush)
17-49	Grey Wolf Mountain	RT	Active	1982, 1988, 1995, 2000, 2005, 2010, 2015, 2020, 2025	Upland Loam (Mountain Big Sagebrush)
17-50	Lower Santaquin Draw	RT	Active	1982, 1988, 1995, 2000, 2005, 2010, 2015, 2020, 2025	Upland Loam (Mountain Big Sagebrush)
17-51	Santaquins Cabin	RT	Active	1982, 1988, 1995, 2000, 2005, 2010, 2015, 2020, 2025	Upland Loam (Mountain Big Sagebrush)
17-52	Cutoff	RT	Active	1982, 1988, 1995, 2000, 2005, 2010, 2015, 2020, 2025	Upland Loam (Mountain Big Sagebrush)
17-53	Two Bar Ranch	RT	Active	1982, 1988, 1995, 2000, 2005, 2009, 2010, 2015, 2020, 2025	Upland Loam (Wyoming Big Sagebrush)
17-54	Peatross Ranch	RT	Suspended	1982. 1988, 1995, 2000	Mountain Stony Loam (Browse)
17-55	Lower Horse Ridge	RT	Active	1982, 1988, 1995, 2000, 2005, 2010, 2015, 2020, 2025	Mountain Stony Loam (Browse)
17-56	Sams Canyon	RT	Suspended	1982, 1988, 1995, 2005, 2010	Mountain Stony Loam (Browse)
17-57	Skitzy Canyon	RT	Suspended	1982, 1988, 1995, 2000, 2005, 2010	Mountain Loam (Mountain Big Sagebrush)
17-58	Buck Knoll	RT	Suspended	1982, 1988, 1995, 2000, 2005, 2010	Mountain Stony Loam (Browse)
17-59	Emma Park	RT	Active	1994, 2000, 2005, 2010, 2015, 2020, 2025	Mountain Stony Loam (Mountain Big Sagebrush)
17-65	Little Horse Ridge	RT	Active	2005, 2010, 2015, 2020, 2025	Mountain Stony Loam (Browse)
17-66	Sand Wash	RT	Active	2005, 2010, 2015, 2025	Upland Loam (Wyoming Big Sagebrush)
17-67	Rabbit Gulch	RT	Active	1997, 2001, 2005, 2010, 2015, 2020, 2025	Semidesert Loam (Wyoming Big Sagebrush)
17-68	Road Hollow	RT	Active	2015, 2020, 2025	Mountain Shallow Loam (Black Sagebrush)
17R-2	Beer Spring	RT	Suspended	1997	Upland Loam (Mountain Big Sagebrush)
17R-3	Santaquin Draw	RT	Suspended	1997	Upland Loam (Mountain Big Sagebrush)
17R-5	Smith Property	RT	Suspended	1997	Upland Loam (Mountain Big Sagebrush)
17R-6	Lake Canyon	RT	Suspended	1997	Upland Loamy Bottom (Basin Big Sagebrush)
17R-7	Emma Park Harrow Grazed	RT	Active	2001, 2005, 2010, 2015, 2020, 2025	Mountain Loam (Mountain Big Sagebrush)
17R-8	Emma Park Harrow Ungrazed	RT	Suspended	2001, 2005, 2010	Mountain Loam (Mountain Big Sagebrush)
17R-9	Emma Park Meadow	RT	Suspended	2001, 2005	Semiwet (Fresh Meadow)

Study #	Study Name	Project	Status	Years Sampled	Ecological Site Description
17R-10	Santaquin Draw	WRI	Suspended	2004	Not Verified
17R-11	Santaquin Greasewood	WRI	Active	2004, 2007, 2009, 2010, 2012, 2016, 2020, 2025	Upland Loam (Mountain Big Sagebrush)
17R-12	Santaquin Chaining	WRI	Active	2004, 2007, 2009, 2010, 2012, 2016, 2020, 2024	Upland Loam (Mountain Big Sagebrush)
17R-13	Rabbit Gulch Chaining	WRI	Active	2005, 2008, 2013, 2017, 2020, 2025	Semidesert Alkali Loam (Black Greasewood/Wyoming Big Sagebrush)
17R-14	Skitzy Chaining	WRI	Active	2005, 2008, 2009, 2013, 2015, 2018, 2023	Upland Stony Loam (Black Sagebrush)
17R-15	Golden Stairs Chaining	WRI	Active	2005, 2008, 2013, 2017, 2020, 2025	Upland Loam (Mountain Big Sagebrush)
17R-16	Grey Wolf Chaining	WRI	Active	2005, 2008, 2013, 2017, 2020, 2025	Upland Loam (Mountain Big Sagebrush)
17R-17	Strawberry Grouse 1	WRI	Active	2005, 2012, 2016, 2021	Mountain Loam (Mountain Big Sagebrush)
17R-18	Wildcat Sage-grouse	WRI	Active	2005, 2012, 2015, 2020, 2024	High Mountain Loam (Silver Sagebrush)
17R-19	Road Hollow	WRI	Active	2005, 2012, 2016, 2021	Mountain Shallow Loam (Mountain Big Sagebrush)
17R-20	Road Hollow Ridge	WRI	Active	2005, 2012, 2016, 2021	Mountain Loam (Mountain Big Sagebrush)
17R-21	Blacktail Chaining	WRI	Active	2006, 2009, 2010, 2013, 2019, 2024	Upland Loam (Mountain Big Sagebrush)
17R-22	Allen Smith Reseed	WRI	Active	2006, 2010, 2015, 2020, 2024	Upland Loam (Mountain Big Sagebrush)
17R-23	Rabbit Gulch Interseed	WRI	Active	2006, 2010, 2013, 2017, 2022	Semidesert Loam (Wyoming Big Sagebrush)
17R-24	East Santaquin Chaining	WRI	Active	2006, 2010, 2013, 2017, 2020, 2024	Upland Loam (Mountain Big Sagebrush)
17R-25	Trout Creek Dixie	WRI	Active	2006, 2010, 2014, 2018	Mountain Loam (Mountain Big Sagebrush)
17R-26	Two Bar-Sand Wash Chaining	WRI	Active	2007, 2010, 2013, 2017, 2022	Upland Shallow Loam (Black Sagebrush)
17R-27	Two Bar-Black Tail Chaining	WRI	Active	2007, 2009, 2011, 2014, 2018, 2024	Upland Loam (Mountain Big Sagebrush)
17R-28	Santaquin PJ Reference	WRI	Suspended	2009	Not Verified
17R-29	Skitzy Reference	WRI	Suspended	2009	Not Verified
17R-30	Two Bar PJ Reference	WRI	Suspended	2009	Not Verified
17R-31	Badger Hollow Mow	WRI	Active	2011, 2014, 2019, 2024	Mountain Loam (Mountain Big Sagebrush)
17R-32	Badger Hollow Control	WRI	Suspended	2011	Not Verified
17R-33	Badger Hollow Harrow	WRI	Active	2011, 2014, 2019, 2024	Mountain Loam (Mountain Big Sagebrush)
17R-34	Wildcat	WRI	Active	2012, 2015, 2019, 2025	Mountain Loam (Mountain Big Sagebrush)
17R-35	Tabby Mountain	WRI	Active	2013, 2016, 2020, 2024	Upland Loam (Mountain Big Sagebrush)
17R-36	Horse Ridge	WRI	Suspended	2015	High Mountain Loam (Aspen)
17R-37	West Fork Willow Creek	WRI	Active	2015, 2018, 2023	High Mountain Loam (Aspen)
17R-38	North Rabbit Gulch	WRI	Active	2018, 2022	Semidesert Loam (Wyoming Big Sagebrush)
17R-39	Cockey Hollow	WRI	Active	2018	Upland Loam (Mountain Big Sagebrush)
17R-41	Wildcat Aspen	WRI	Active	2019, 2022	High Mountain Loam (Aspen)

Table 6.5: Range Trend and WRI project studies monitoring history and ecological site potential for WMU 17B, 17C, Wasatch Mountains, East.

Study #	Study Name	Type	Disturbance Name (If Available)	Date	Acres	WRI Project #
17-49	Grey Wolf Mountain	Disc Unknown		Fall 1990		
		Seed Unknown		Fall 1990		
17-51	Santaquins Cabin	Chain Unknown		Historic		
		Seed Unknown		Historic		
		Disc Unknown		Fall 1995	270	
		Seed Unknown		Fall 1995	270	
		Lop and Scatter	Coyote Draw Pinyon and Juniper Thinning	Summer 2006	1,240	328
17-55	Lower Horse Ridge	Bullhog	Horse Ridge Bullhog	June 2016	759	3293
		Lop and Scatter	Anthro/Avintaquin Lop and Scatter	September-October 2023	759	6694
17-57	Skitzy Canyon	Chain Unknown		1977-1978		
		Seed Unknown		1977-1978		
		Lop and Scatter	Skitzy Canyon Lop and Scatter	November-December 2010	390	1729
17-58	Buck Knoll	Chain Unknown		Historic		
		Seed Unknown		Historic		
		Lop and Scatter	Skitzy Lop and Scatter	November-December 2010	390	1729
17-67	Rabbit Gulch	Chain Unknown		Historic		
		Seed Unknown		Historic		
		Lop and Scatter		2004-2005	1,250	
		Lop and Scatter	Rabbit Gulch Lop and Scatter	June 2021	1,507	5624
17-68	Road Hollow	Lop and Scatter	Skitzy Lop and Scatter	Fall 2010	392	1729
17R-2	Beer Spring	Lop and Scatter	Coyote Draw Pinyon and Juni	July 2006-June 2007	1,240	328
17R-7	Emma Park Harrow Grazed	One-Way Dixie		2000		
		Seed Unknown		2000		
17R-8	Emma Park Harrow Ungrazed	One-Way Dixie		2000		
		Seed Unknown		2000		
17R-11	Santaquin Greasewood	Aerial Before	Santaquin Greasewood	October 2004	380	PDB
		One-Way Smooth	Santaquin Greasewood	October-November 2004	380	PDB
		Dribbler	Santaquin Greasewood	October-November 2004	380	PDB
		Aerial After	Santaquin Greasewood	December 2004	1,755	PDB
17R-12	Santaquin Chaining	Aerial Before	Santaquin P-J	October 2004	300	PDB
		Two-Way Ely	Santaquin P-J	October-November 2004	300	PDB
		Aerial After	Santaquin P-J	December 2004	1,755	PDB
		Lop and Scatter	Cockey Hollow Vegetation Management Project	October-November 2017	1,400	3969
17R-13	Rabbit Gulch Chaining	Tordon, 2,4-D	Rabbit Gulch WMA Range Rehabilitation	June 2005	167	66
		Aerial Before	Rabbit Gulch WMA Range Rehabilitation	November 2005	300	66
		Two-Way Ely	Rabbit Gulch WMA Range Rehabilitation	January 2006	167	66
		Aerial After	Rabbit Gulch WMA Range Rehabilitation	January 2006	167	66
17R-14	Skitzy Chaining	Aerial Before	Skitzy Canyon Range Rehabilitation	November 2005	529	69
		Two-Way Ely	Skitzy Canyon Range Rehabilitation	November 2005	529	69
		Aerial After	Skitzy Canyon Range Rehabilitation	November 2005	529	69
17R-15	Golden Stairs Chaining	Aerial Before	Golden Stairs Range Rehabilitation	September 2005	170	52
		Two-Way Ely	Golden Stairs Range Rehabilitation	October-November 2005	170	52
		Dribbler	Golden Stairs Range Rehabilitation	November 2005	170	52
		Aerial After	Golden Stairs Range Rehabilitation	December 2005	170	52
		Lop and Scatter	Tabby Mountain Chaining Maintenance	October 2013	2,200	2570
17R-16	Grey Wolf Chaining	Aerial Before	Grey Wolf Mountain Rehabilitation	October 2005	463	93
		Two-Way Ely	Grey Wolf Mountain Rehabilitation	October-November 2005	463	93
		Dribbler	Grey Wolf Mountain Rehabilitation	November 2005	463	93
		Aerial After	Grey Wolf Mountain Rehabilitation	February 2006	463	93
		Lop and Scatter	Tabby Mountain Chaining Maintenance	October 2013	2,200	2570
17R-19	Road Hollow	Mower	Badger Hollow /Chicken Spring Ridge Habitat Improvement	August-September 2011	60	1816
		One-Way Chain	Badger Hollow /Chicken Spring Ridge Habitat Improvement	August-September 2011	125	1816
17R-21	Blacktail Chaining	Aerial Before	East Santaquin Draw P/J Chaining	September 2006	450	367
		Two-Way Ely/Smooth	East Santaquin Draw P/J Chaining	September-October 2006	450	367
		Dribbler	East Santaquin Draw P/J Chaining	September-October 2006	450	367
		Aerial After	East Santaquin Draw P/J Chaining	January 2007	450	367

17R-22	Allen Smith Reseed	Disc Unknown		Early 1990s		
		Seed Unknown		Early 1990s		
		Spike		Early 2000s		
		Aerial Before	Sink Draw Interseeding	November 2006	546	417
		Cattle	Sink Draw Interseeding	November 2006	546	417
		Scalper	Tabby Browse Plots	November 2013	78	2681
		Dribbler	Tabby Browse Plots	November 2013	78	2681
17R-23	Rabbit Gulch Interseed	Rangeland Drill	Rabbit Gulch Interseeding	February-March 2007	129	420
		Plateau	Rabbit Gulch Winter Range Improvement Phase II	September 2019	362	4799
17R-24	East Santaquin Chaining	Aerial Before	East Santaquin Draw P/J Chaining	September 2006	449	367
		Two-Way Ely/Smooth	East Santaquin Draw P/J Chaining	September-October 2006	449	367
		Dribbler	East Santaquin Draw P/J Chaining	September-October 2006	449	367
		Aerial After	East Santaquin Draw P/J Chaining	January 2007	449	367
		Lop and Scatter	Tabby Mountain chaining maintenance	October 2013	1,915	2570
17R-25	Trout Creek Dixie	Broadcast Unknown	Trout Creek Sagebrush Enhancement	July-September 2007	112	323
		Two-Way Dixie	Trout Creek Sagebrush Enhancement	July-September 2007	112	323
17R-26	Two Bar-Sand Wash Chaining	Two-Way Ely	2-bar Pinyon and Juniper Thinning	September-October 2007	978	368
		Dribbler	2-bar Pinyon and Juniper Thinning	September-October 2007	978	368
		Aerial After	2-bar Pinyon and Juniper Thinning	October 2007	978	368
		Aerial After	2-bar Pinyon and Juniper Thinning	January 2008	978	368
		Lop and Scatter	Tabby Mountain chaining maintenance	October 2013	1,915	2570
17R-27	Two Bar-Black Tail Chaining	Aerial Before	2-Bar Pinyon and Juniper Thinning	September 2007	978	368
		Two-Way Ely	2-Bar Pinyon and Juniper Thinning	September 2007	978	368
		Dribbler	2-Bar Pinyon and Juniper Thinning	September 2007	978	368
		Aerial After	2-Bar Pinyon and Juniper Thinning	January 2008	978	368
		Lop and Scatter	Tabby Mountain chaining maintenance	October 2013	1,915	2570
17R-31	Badger Hollow Mow	Mower	Badger Hollow/Chicken Spring Ridge Habitat Improvement	August-September 2011	60	1816
17R-33	Badger Hollow Harrow	Two-Way Chain	Badger Hollow /Chicken Spring Ridge Habitat Improvement	August-September 2011	253	1816
17R-34	Wildcat	Two-Way Chain	Wildcat Harrow	October 2012	244	2309
17R-35	Tabby Mountain	Scalper	Tabby Browse Plots	October-November 2013	79	2681
17R-37	West Fork Willow Creek	Coppice Cutting	West Fork Willow Creek Aspen Restoration Phase 1	May 2016	25	3222
		Lop-Pile-Burn	Upper Price River Watershed FY24	Fall-Winter 2023	25	6508
17R-38	North Rabbit Gulch	Plateau	Rabbit Gulch Winter Range Improvement Phase I	October 2018	224	4447
17R-39	Cockey Hollow	Aerial Before	Cockey Hollow phase II	September 2018	663	4433
		Bullhog	Cockey Hollow phase II	September-November 2018	663	4433
		Aerial After	Cockey Hollow phase II	December 2018	663	4433

Table 6.6: Range Trend and WRI studies known disturbance history for WMU 17B, 17C, Wasatch Mountains, East. 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 2025 sample year:

- Mountain (Black/Low Sagebrush) - Road Hollow (17-68)
  - (**Figure 6.9**, **Figure 6.11**, **Figure 6.13**, **Figure 6.16**, **Figure 6.18**, **Figure 6.19**, **Figure 6.21**, **Figure 6.23**)
- Semiwet (Fresh Meadow) - Emma Park Meadow (17R-09) (suspended)
- Semidesert (Big Sagebrush) - Rabbit Gulch (17-67)
  - (**Figure 6.9**, **Figure 6.12**, **Figure 6.14**, **Figure 6.15**, **Figure 6.17**, **Figure 6.20**, **Figure 6.22**, **Figure 6.24**)

Trend summaries and/or additional data for these ecotypes are available in the corresponding site reports (Lane, Payne, & Cox, 2026).

Mountain (Big Sagebrush)

Four studies [Skitzy Canyon (17-57) (suspended), Emma Park (17-59), Emma Park Harrow Grazed (17R-07), and Emma Park Harrow Ungrazed (17R-08) (suspended)] are classified as Mountain (Big Sagebrush) ecological sites. The Skitzy Canyon study is located about one mile south of the mouth of Skitzy Canyon and the Road Hollow study (17-68). The Emma Park, Emma Park Harrow Grazed, and Emma Park Harrow Ungrazed sites are found in Emma Park.

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. The Skitzy Canyon study provided data from 1995 through the 2010 sample year, while Emma Park Harrow Ungrazed contributed data from 2000 through 2010. Data has been provided by the Emma Park Harrow Grazed site since 2000, while Emma Park has contributed data spanning the entire sample period.

Shrubs/Trees: Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) has dominated the browse components of all studies except Skitzy Canyon, on which black sagebrush (*A. nova*) was dominant until the study was suspended after the 2010 sampling. Total average shrub cover has increased overall. The increase between 2010 and 2015 in particular can in large part be attributed to the suspension of the Skitzy Canyon study, which had only 1.5% sagebrush cover in 2010 (**Figure 6.9**). Average preferred browse demographic data shows that density has increased over time. Mature individuals have been the dominant demographic in all sample years, but the notable overall density increase between 2005 and 2010 was mainly due to increases in recruitment of young on all studies except Skitzy Canyon. However, the density of young plants within these populations has since decreased. Decadence has remained low in proportion with total populations (**Figure 6.15**). Overall average utilization of preferred browse has generally increased over time when the 1995-2010 sample years are taken into consideration. However, average utilization has decreased since 2015, over which period the same two studies have been sampled. More specifically, 41% of plants sampled in density strips were moderately hedged and 42% were heavily utilized in 2015. In contrast, 28% of plants were moderately used and only 5% were heavily browsed in 2025 (**Figure 6.17**).

Twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) were observed in cover measurements on the Skitzy Canyon study, but they have not contributed cover on any other site. The Skitzy Canyon site was suspended after the 2010 sampling, driving the decrease and subsequent lack of average tree cover observed since 2015 (**Figure 6.11**). Average tree density has decreased over time and has remained low throughout the study period. As with cover, the Skitzy Canyon study drove the density trend through 2010, with the decrease between 2010 and 2015 being due to that site's suspension. Rocky Mountain juniper (*J. scopulorum*) has been present on both active study sites since 2020 with very low density (**Figure 6.13**).

Herbaceous Understory: The herbaceous understories of these sites have been abundant and mainly comprised of perennial grass. Furthermore, native species such as thickspike wheatgrass (*Elymus lanceolatus*) and saline wildrye (*Leymus salinus*) have provided much of the perennial grass cover on the two active study sites. Total net average herbaceous cover and nested frequency have increased when 1995 data is compared with that from 2025. The same two study sites have only been consistently sampled since 2015, however, and average frequency and cover have remained similar overall over this period. Perennial forbs have remained abundant throughout the study years. Furthermore, perennial forbs contributed as much average herbaceous cover as perennial grasses in 2025: this can in large part be attributed to mountain phlox (*Phlox austromontana*) on the Emma Park study. Annual grasses and forbs have been rare in comparison with their perennial counterparts (**Figure 6.19**, **Figure 6.21**).

Occupancy: Average animal presence has exhibited variations from year to year, but it has increased since 2015. Primary occupancy has also fluctuated over the sample period. Cattle have been the main occupants of these study sites in 2010, 2020, and 2025, with a mean pellet group abundance as low as 7 days use/acre in 2000 and as high as 24 days use/acre in 2025. Elk were the primary occupants in all other reported sample years, and average pellet group abundance has ranged from 4 days use/acre in 2020 to 57 days use/acre in

2005. Finally, mean abundance of deer pellet groups has fluctuated between 4 days use/acre in 2015 and 24 days use/acre in 2005 (**Figure 6.23**).

Mountain (Browse)

There are five studies [Peatross Ranch (17-54) (suspended), Lower Horse Ridge (17-55), Sams Canyon (17-56) (suspended), Buck Knoll (17-58) (suspended), and Little Horse Ridge (17-65)] that are classified as Mountain (Browse) ecological sites. The Peatross Ranch study is located on the lower slopes just above Avintaquin Canyon and Avintaquin Creek. The Lower Horse and Little Horse Ridge sites are located on Little Horse Ridge, south of Avintaquin Creek. Sams Canyon can be found near the head of Half Moon Hollow, which branches off to the west of Sams Canyon. Finally, The Buck Knoll study site is located approximately one and a half miles northeast of Buck Knoll and just southwest of the head of Road Hollow.

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 Peatross Ranch study provided data in 1995 and 2000, while Sams Canyon contributed data in 1995, 2005, and 2010. Data was provided by Buck Knoll from 1995 through 2010, and Little Horse Ridge has contributed data since the 2005 sample year. Finally, the Lower Horse Ridge study has contributed data spanning the entire sample period since 1995.

Shrubs/Trees: The preferred browse components on these study sites have generally been dominated by alderleaf mountain mahogany (*Cercocarpus montanus*). Other preferred browse species including (but not limited to) mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), Utah serviceberry (*Amelanchier utahensis*), and/or mountain snowberry (*Symphoricarpos oreophilus*) have also been present on many study sites to a lesser extent than alderleaf mountain mahogany. Total average shrub cover has exhibited a net increase between 2005 and 2025. The increase in total average shrub cover since 2015 in particular can largely be attributed to alderleaf mountain mahogany on the Little Horse Ridge study (**Figure 6.10**). Average preferred browse demographic data indicates that total average density has remained similar overall both between 1995 and 2025 and between 2015 and 2025. A notable decrease in density occurred between 1995 and 2000, but it increased between 2000 and 2005. This fluctuation can be attributed to the fact that the Sams Canyon study (which had the highest preferred browse density of any site of this ecotype) was not sampled in 2000. Average preferred browse demographic data also indicates that mature plants have been the primary demographic throughout the reported study period. Recruitment of young plants to the preferred browse populations has decreased each year since 2015, a trend that remains consistent when site-level data is examined for the two active study sites. Decadent plants have been a minor portion of the populations on these sites throughout the reported sample period (**Figure 6.16**). Average preferred browse utilization has fluctuated over the study period, but less than 50% of plants sampled in density strips have been moderately or heavily hedged in most reported sample years. More specifically, 25% of plants sampled in density strips were moderately utilized and 18% were heavily browsed in 2025 (**Figure 6.18**).

Trees that have been sampled on these study sites include twoneedle pinyon (*Pinus edulis*), Utah juniper (*Juniperus osteosperma*), and/or Rocky Mountain juniper (*J. scopulorum*); Douglas-fir (*Pseudotsuga menziesii*) was also observed on Sams Canyon prior to study suspension. Average tree cover has displayed a net increase between 2005 and 2025; the notable increase between 2010 and 2015 in particular can be attributed to both the suspension of Sams Canyon and Buck Knoll and actual cover increase on Lower Horse Ridge and Little Horse Ridge. However, average tree cover has decreased each year since 2015 (**Figure 6.11**), a trend mainly driven by a bullhog treatment in 2016 and a 2023 lop and scatter treatment on Lower Horse Ridge. Average tree density has followed a similarly increasing and then decreasing trend. Tree density drivers are the same as the ones driving tree cover trends. In addition, point quarter density data was only provided by Little Horse Ridge and Lower Horse Ridge during the reported sample years (**Figure 6.13**).

Herbaceous Understory: The herbaceous understories of these study sites have remained dominated by mainly native perennial grass species such as bluebunch wheatgrass (*Pseudoroegneria spicata*) and saline wildrye (*Leymus salinus*). Average cover of the herbaceous understory has exhibited a notable net increase, a trend

primarily driven by perennial grass. Furthermore, total herbaceous cover has increased each sample year since 2015 (over which period the same two studies have been consistently sampled). Average nested frequency has exhibited a slight decrease overall, but it has largely remained stable since 2015. Perennial forbs have been observed on these sites with low to moderate average cover and abundance, but annual forbs have remained rare in comparison. Annual grass has not been observed on any study site (**Figure 6.19**, **Figure 6.21**).

Occupancy: According to pellet transect data, average animal presence has exhibited yearly fluctuations, but it has increased overall since 2015. Elk were the primary occupants of these study sites in 2005, and mean pellet group abundance has ranged from 2 days use/acre in 2025 to 31 days use/acre in 2005. Deer have been the primary occupants in all other sample years with an average pellet group abundance fluctuating between 14 days use/acre in 2000 and 37 days use/acre in 2025. Mean abundance of cattle pellet groups has been as low as 0 days use/acre in 2015, 2020, and 2025; and as high as 7.5 days use/acre in 2000. Finally, moose pellet groups have also been observed in some years, with a mean abundance ranging from 0 days use/acre in 2000, 2010, and 2025; to 2 days use/acre in 2020 (**Figure 6.23**).

Upland (Big Sagebrush)

11 studies [Blacktail Ridge (17-48) (suspended), Grey Wolf Mountain (17-49), Lower Santaquin Draw (17-50), Santaquins Cabin (17-51), Cutoff (17-52), Two Bar Ranch (17-53), Sand Wash (17-66), Beer Spring (17R-02) (suspended), Santaquin Draw (17R-03) (suspended), Smith Property (17R-05) (suspended), and Lake Canyon (17R-06) (suspended)] are classified as Upland (Big Sagebrush) ecological sites. The Blacktail Ridge study site is located on Blacktail Ridge, south of SR-35 and east of SR-208. The Grey Wolf Mountain study is located on the northern slope of Grey Wolf Mountain, adjacent to Coyote Draw. Lower Santaquin Draw is situated in the southern portion of Santaquin Draw. The Santaquins Cabin study is found west of Beer Spring. The Cutoff study site is located east of Currant Creek and southeast of Water Hollow. Two Bar Ranch is found in Rabbit Gulch below Blacktail Ridge. The Sand Wash study site is located on Blacktail Mountain, just west of West Bench. The Beer Spring study is found southwest of Beer Spring and just south of the Santaquins Cabin site. Santaquin Draw is found in Santaquin Draw, just south of Rough Hollow. The Smith Property site is located less than a mile west of SR-208 and roughly two miles north of US-40. Finally, the Lake Canyon study is located in Lake Canyon, roughly six miles west of US-191.

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. The Blacktail Ridge, Beer Spring, Santaquin Draw, Smith Property, and Lake Canyon studies only contributed data in 1995, while Sand Wash provided data from 2005 through 2015 and again in 2025. The Grey Wolf Mountain, Lower Santaquin Draw, Santaquins Cabin, Cutoff, and Two Bar Ranch study sites have contributed data spanning the entire reported sample period.

Shrubs/Trees: The preferred browse components of these study sites have been dominated by Wyoming, mountain, or basin big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*, *A. tridentata* ssp. *vaseyana*, or *A. tridentata* ssp. *tridentata*). Mountain and Wyoming big sagebrush are the dominant browse components on the sites that are active as of 2025, although shadscale saltbush (*Atriplex confertifolia*) co-dominates on the Two Bar Ranch study. Total average shrub cover has fluctuated from year to year, but it has remained similar when comparing 2005 with 2025 data. Site-level data reveals that net preferred browse cover increased by nearly 9% on the Santaquins Cabin study. However, the larger average trend of net similar cover is consistent on the site level for most active studies (**Figure 6.9**). Average preferred browse density data displays an overall decrease between 1995 and 2025. However, similar numbers of study sites have only been sampled since 2000, over which period average density has decreased overall. The decrease between 2000 and 2005 in particular can be in part attributed to actual decreases on individual study sites. The addition of the Sand Wash study in 2005 further contributed to this decrease, as total preferred browse density on Sand Wash in that year was notably less than on other sites. Mature plants have been the dominant demographic in these populations throughout the sample period. Recruitment of young has displayed a net decrease between both 1995 and 2025 and 2000 and 2025. Decadence within this population has remained fairly low in comparison with population size in all sample years (**Figure 6.15**). Average preferred browse utilization has generally remained high, with more than

50% of plants sampled in density strips being moderately or heavily browsed in most sample years. In 2025 specifically, 25% of plants were moderately hedged and 29% were heavily utilized (**Figure 6.17**).

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 despite an apparent slight net increase, has been similar over the reported sample period. The lack of juniper cover in 2020 can be attributed to the fact that the Sand Wash study (which has provided all juniper cover since 2010) was not sampled that year (**Figure 6.12**). Average tree density has increased very slightly overall when comparing 2005 data with that from 2025. Larger year-to-year variations have occurred, however; the notable decrease in average density between 2010 and 2015 can mainly be attributed to a decrease in pinyon on the Santaquins Cabin site (**Figure 6.14**).

Herbaceous Understory: The herbaceous understories of these study sites have remained dominated by perennial grasses, with native species such as needle and thread (*Hesperostipa comata*) and thickspike wheatgrass (*Elymus lanceolatus*) being common on many sites. The exceptions to this are the Santaquins Cabin, Lower Santaquin Draw, and Grey Wolf Mountain sites, on which the introduced species crested wheatgrass (*Agropyron cristatum*) has been the most abundant perennial grass species. Total average herbaceous cover has displayed a net increase, a trend driven by perennial grass. Average nested frequency has decreased overall between the 1995 and 2025 sample years. The initial decrease in total herbaceous frequency between 1995 and 2000 can largely be attributed to a decrease in annual forbs on the sites that were read during both years. When comparing total average nested frequency between 2000 and 2025, it has remained fairly stable. Average perennial forb cover has remained low to moderate, and annual grass has been rare throughout the study period (**Figure 6.20**, **Figure 6.22**).

Occupancy: Average pellet transect data shows that animal presence has decreased overall since 2000 despite yearly fluctuations. Deer have been the primary occupants of these studies throughout the reported sample period with a mean pellet group abundance ranging from 28 days use/acre in 2015 to 64 days use/acre in 2000. Average abundance of elk pellet groups has been as low as 18 days use/acre in 2000 and as high as 35 days use/acre in 2005. Finally, mean cattle pellet group abundance has fluctuated between 0.7 days use/acre in 2015 and 5 days use/acre in 2000, 2005, and 2020 (**Figure 6.24**).

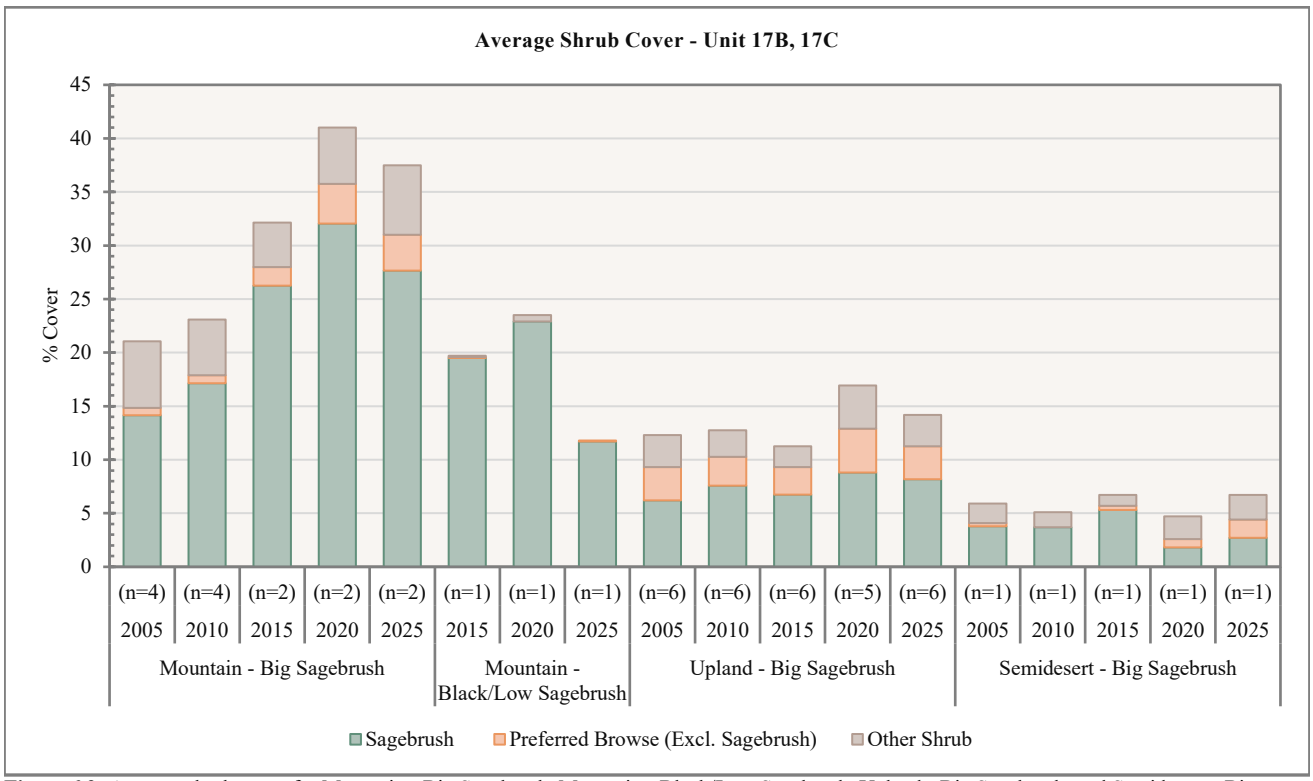


Figure 6.9: Average shrub cover for Mountain - Big Sagebrush, Mountain - Black/Low Sagebrush, Upland - Big Sagebrush, and Semidesert - Big Sagebrush study sites in WMU 17B, 17C, Wasatch Mountains, East.

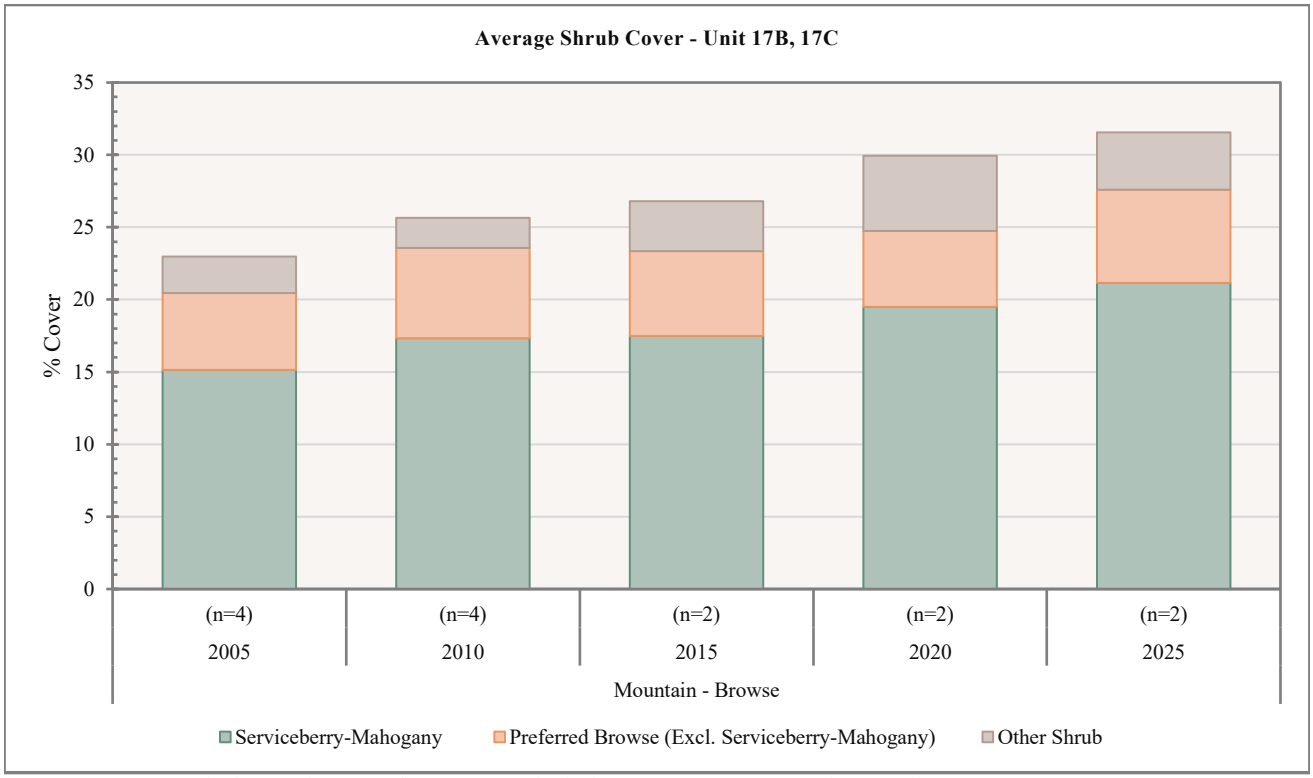


Figure 6.10: Average shrub cover for Mountain - Browse study site in WMU 17B, 17C, Wasatch Mountains, East.

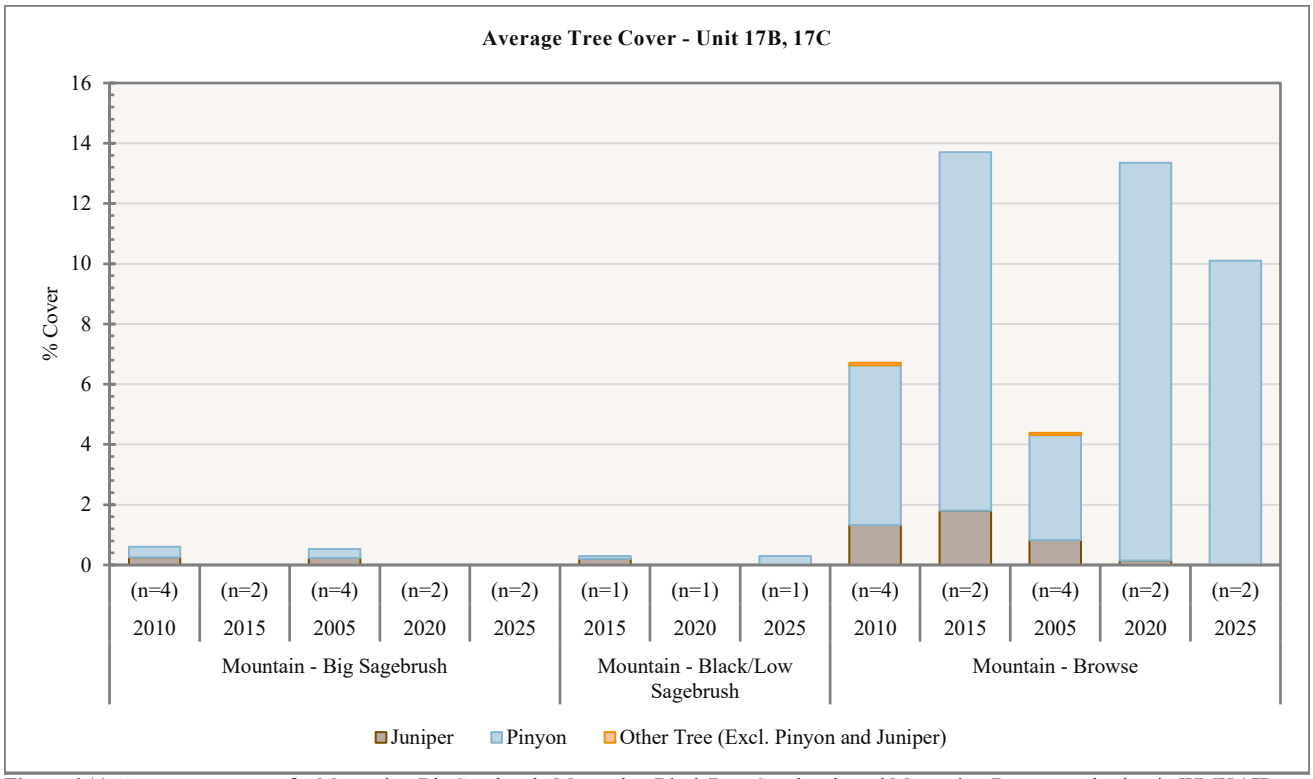


Figure 6.11: Average tree cover for Mountain - Big Sagebrush, Mountain - Black/Low Sagebrush, and Mountain - Browse study sites in WMU 17B, 17C, Wasatch Mountains, East.

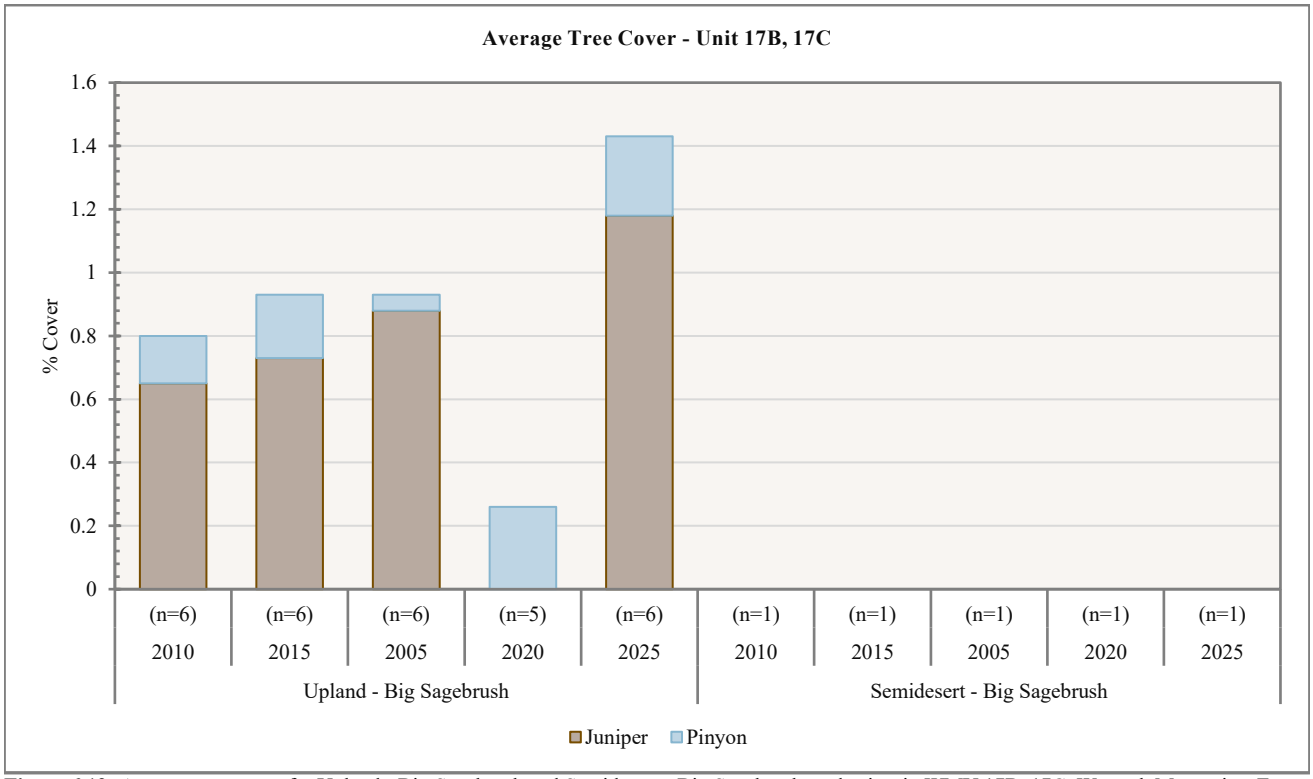


Figure 6.12: Average tree cover for Upland - Big Sagebrush and Semidesert - Big Sagebrush study sites in WMU 17B, 17C, Wasatch Mountains, East.

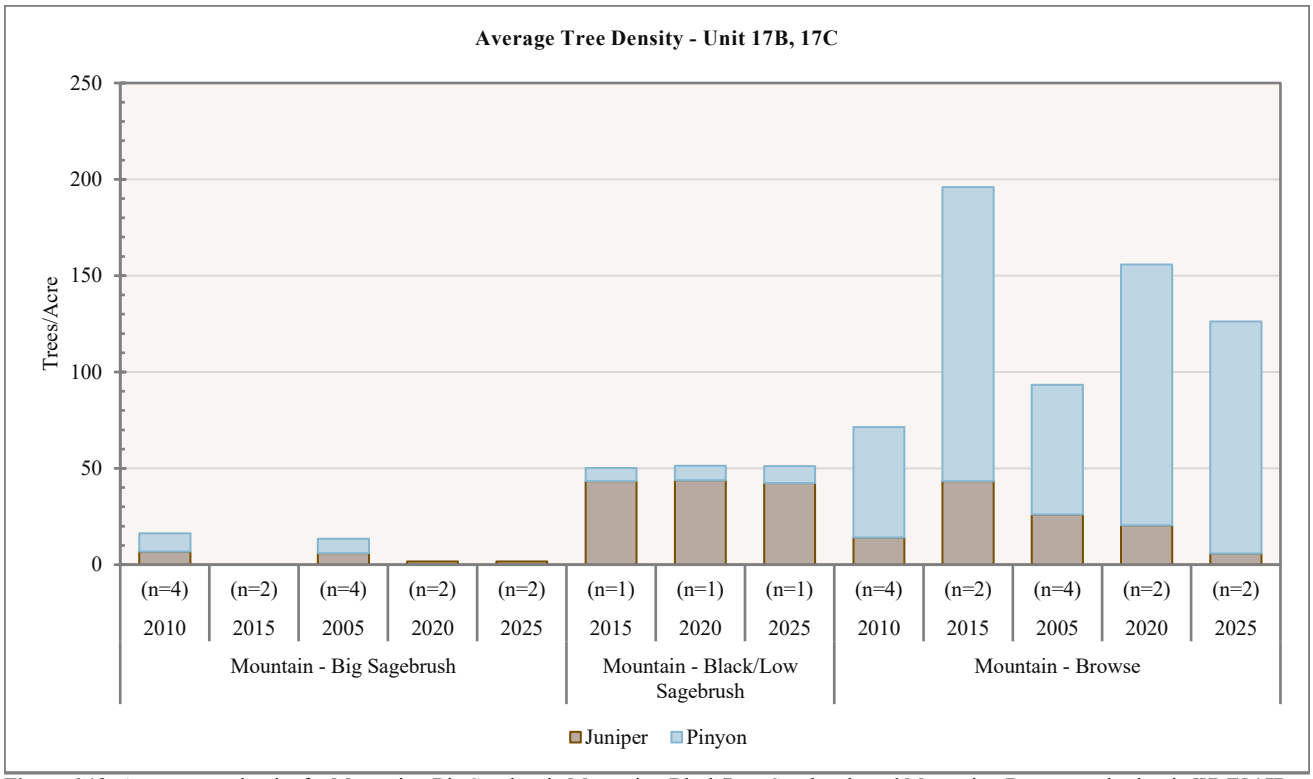


Figure 6.13: Average tree density for Mountain - Big Sagebrush, Mountain - Black/Low Sagebrush, and Mountain - Browse study sites in WMU 17B, 17C, Wasatch Mountains, East.

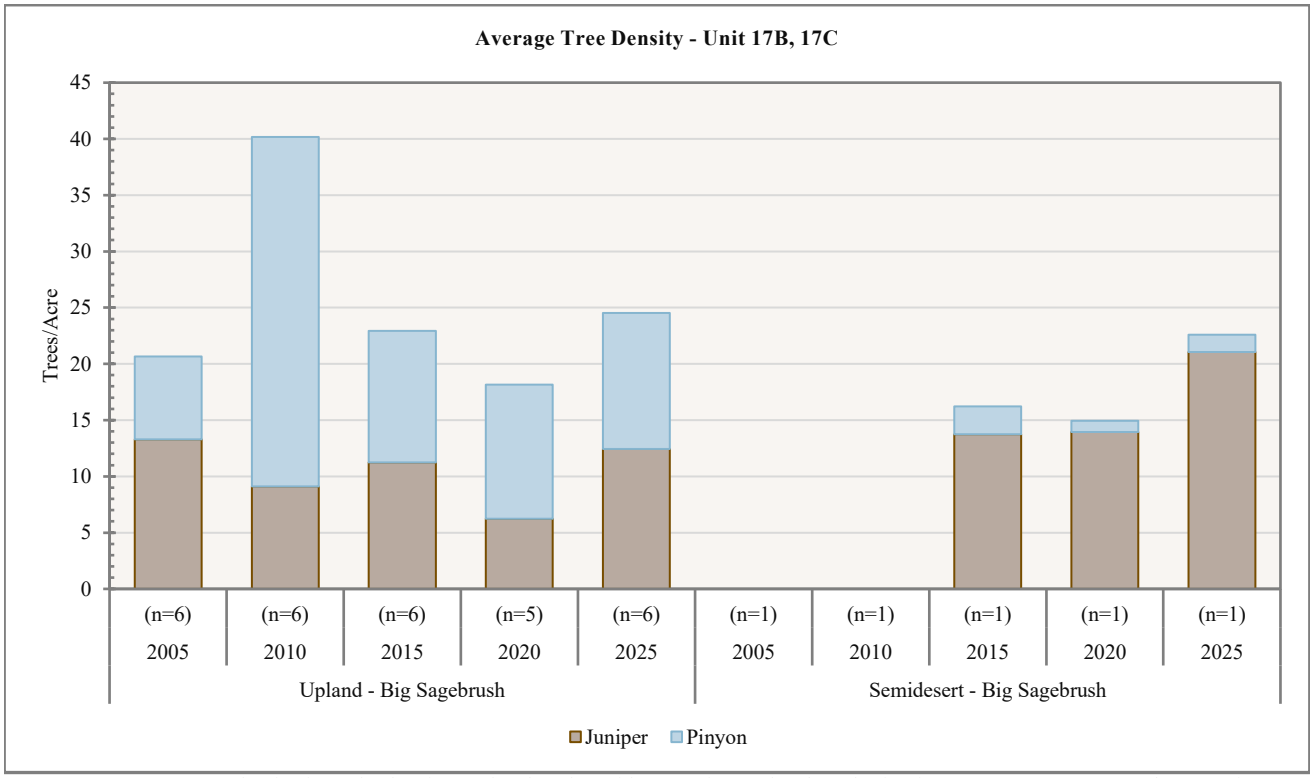


Figure 6.14: Average tree density for Upland - Big Sagebrush and Semidesert - Big Sagebrush study sites in WMU 17B, 17C, Wasatch Mountains, East.

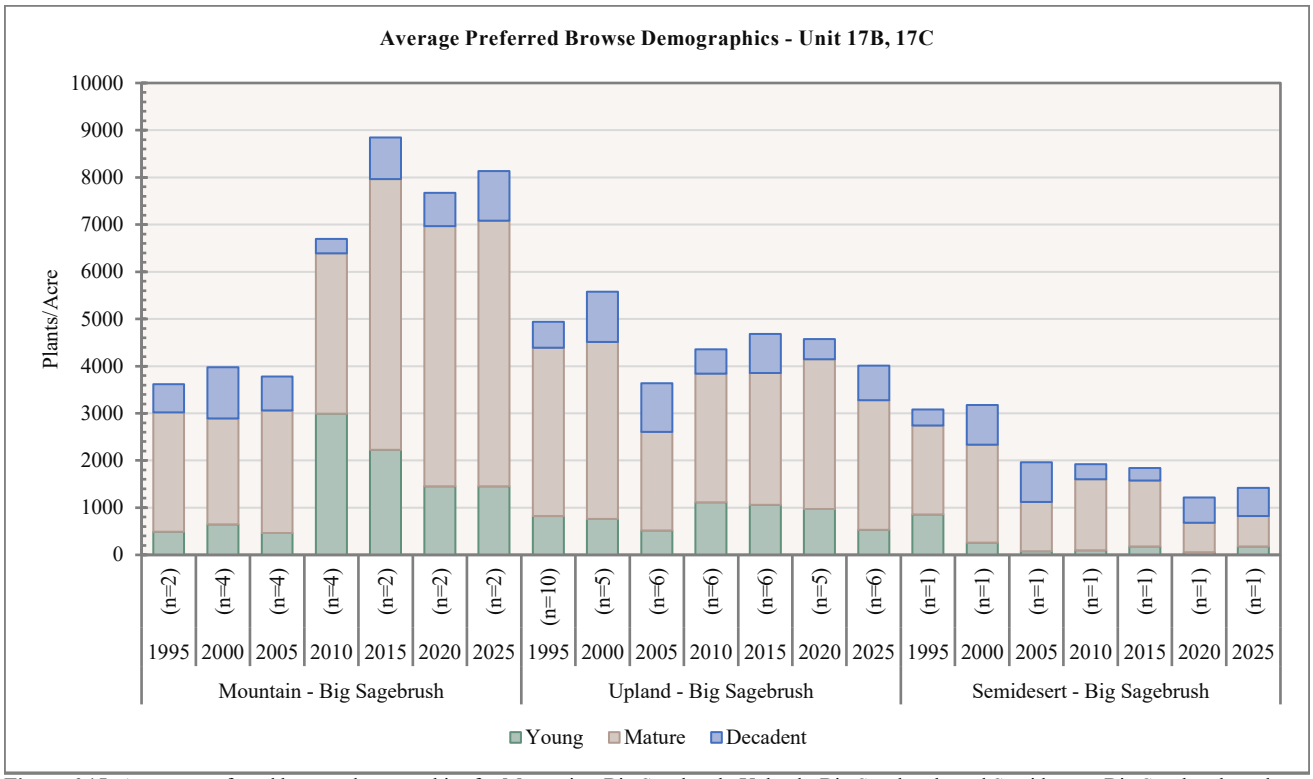


Figure 6.15: Average preferred browse demographics for Mountain - Big Sagebrush, Upland - Big Sagebrush, and Semidesert - Big Sagebrush study sites in WMU 17B, 17C, Wasatch Mountains, East.

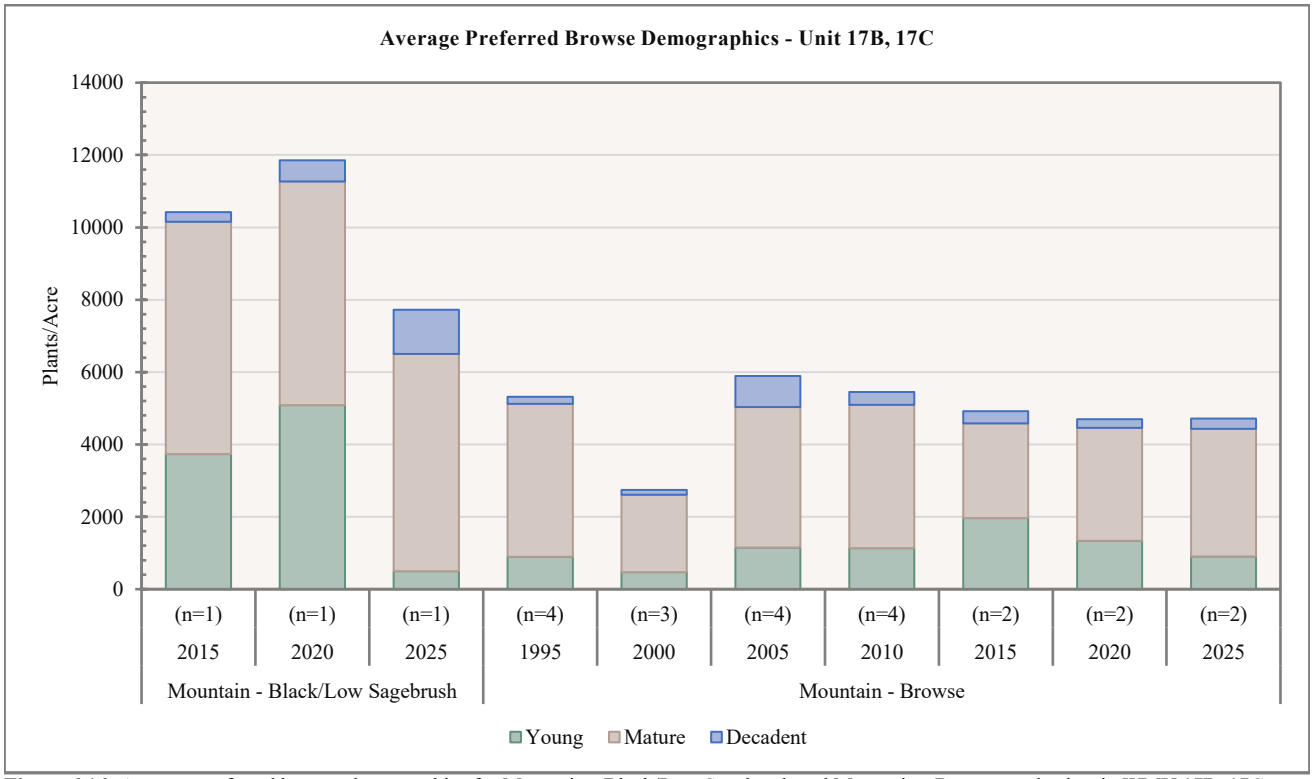


Figure 6.16: Average preferred browse demographics for Mountain - Black/Low Sagebrush and Mountain - Browse study sites in WMU 17B, 17C, Wasatch Mountains, East.

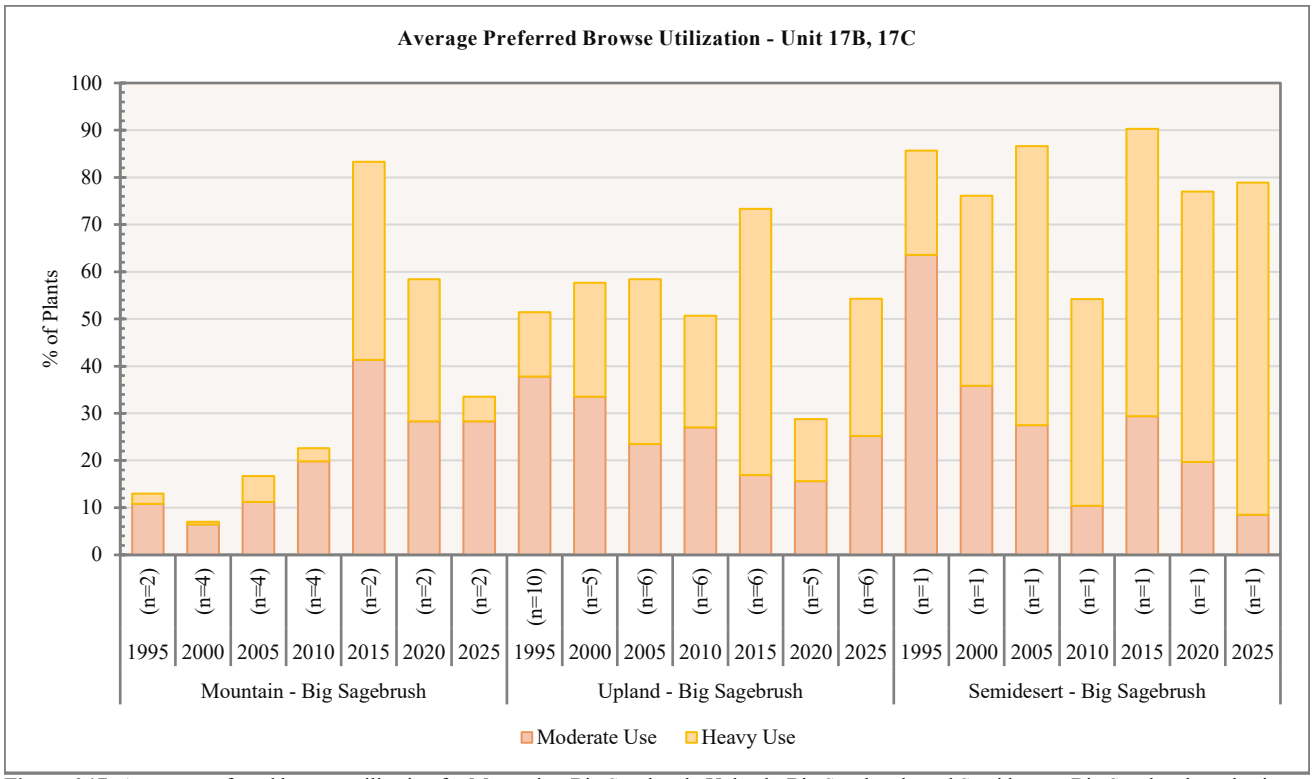


Figure 6.17: Average preferred browse utilization for Mountain - Big Sagebrush, Upland - Big Sagebrush, and Semidesert - Big Sagebrush study sites in WMU 17B, 17C, Wasatch Mountains, East.

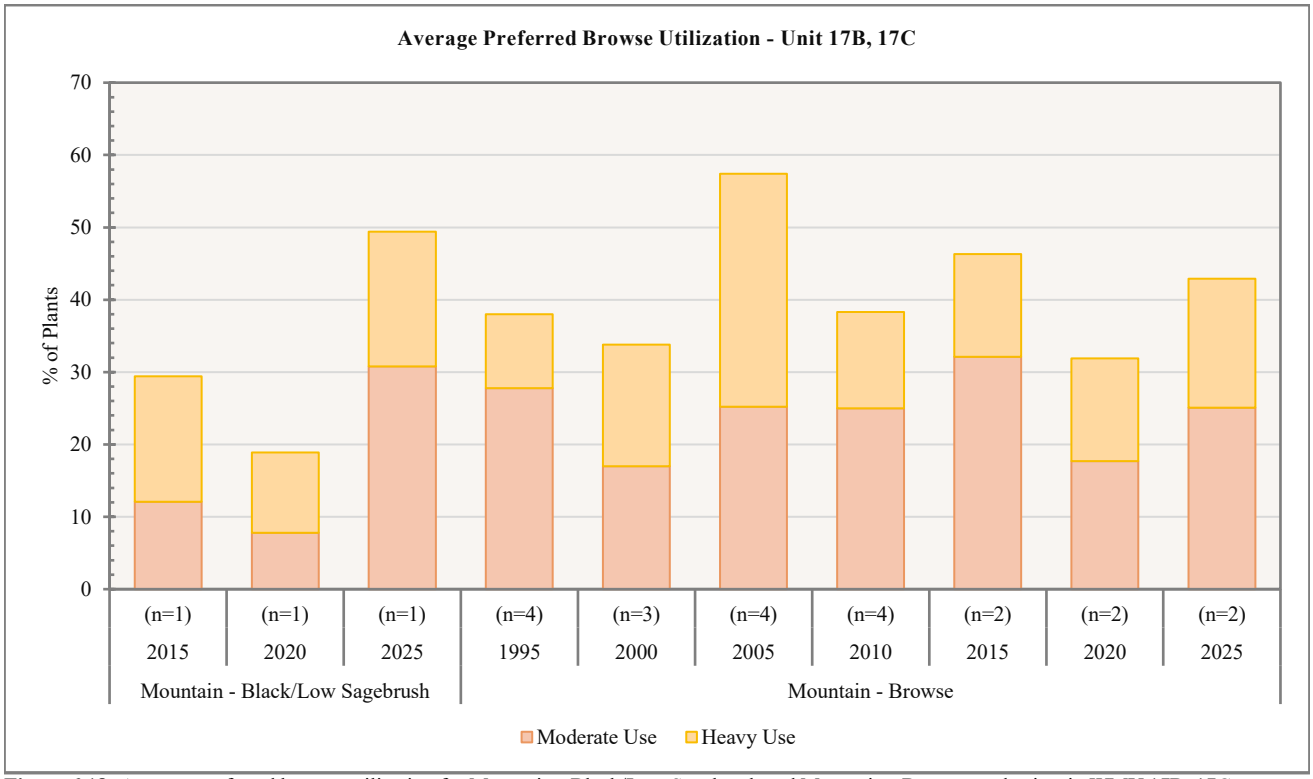


Figure 6.18: Average preferred browse utilization for Mountain - Black/Low Sagebrush and Mountain - Browse study sites in WMU 17B, 17C, Wasatch Mountains, East.

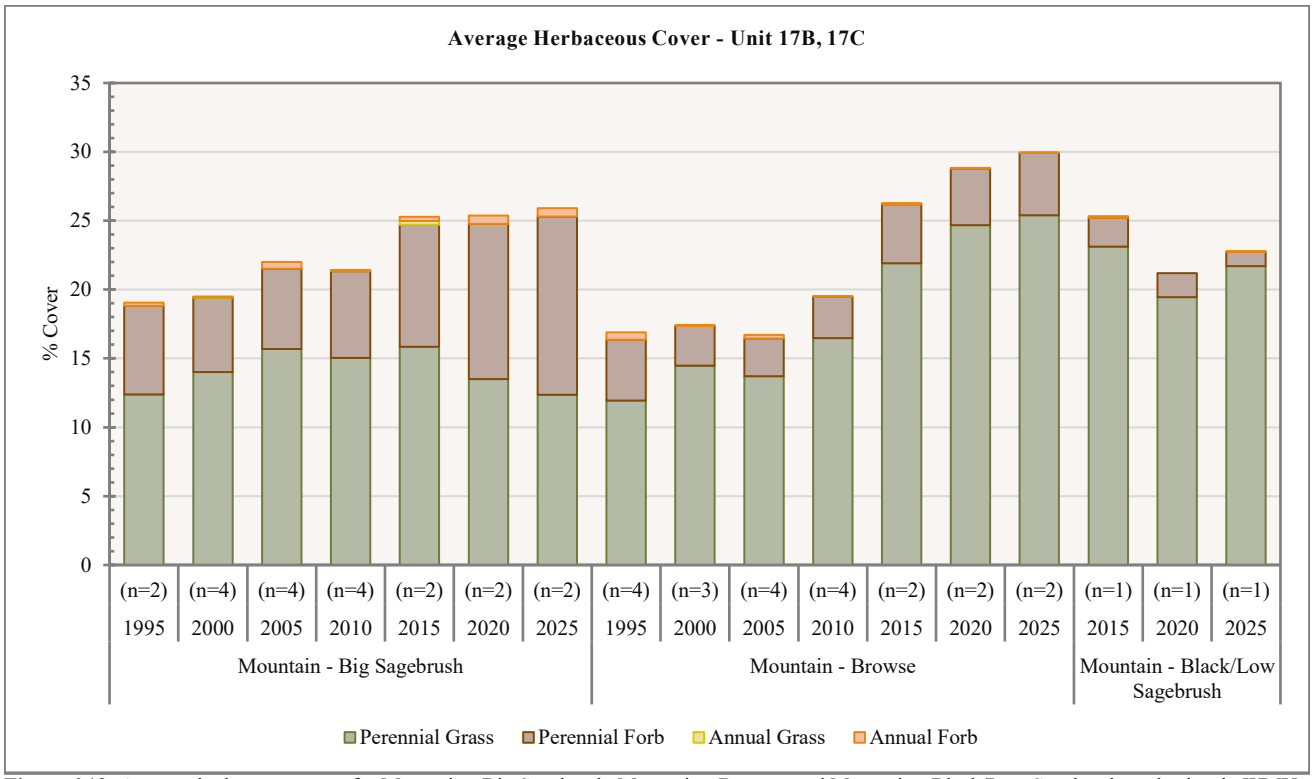


Figure 6.19: Average herbaceous cover for Mountain - Big Sagebrush, Mountain - Browse, and Mountain - Black/Low Sagebrush study sites in WMU 17B, 17C, Wasatch Mountains, East.

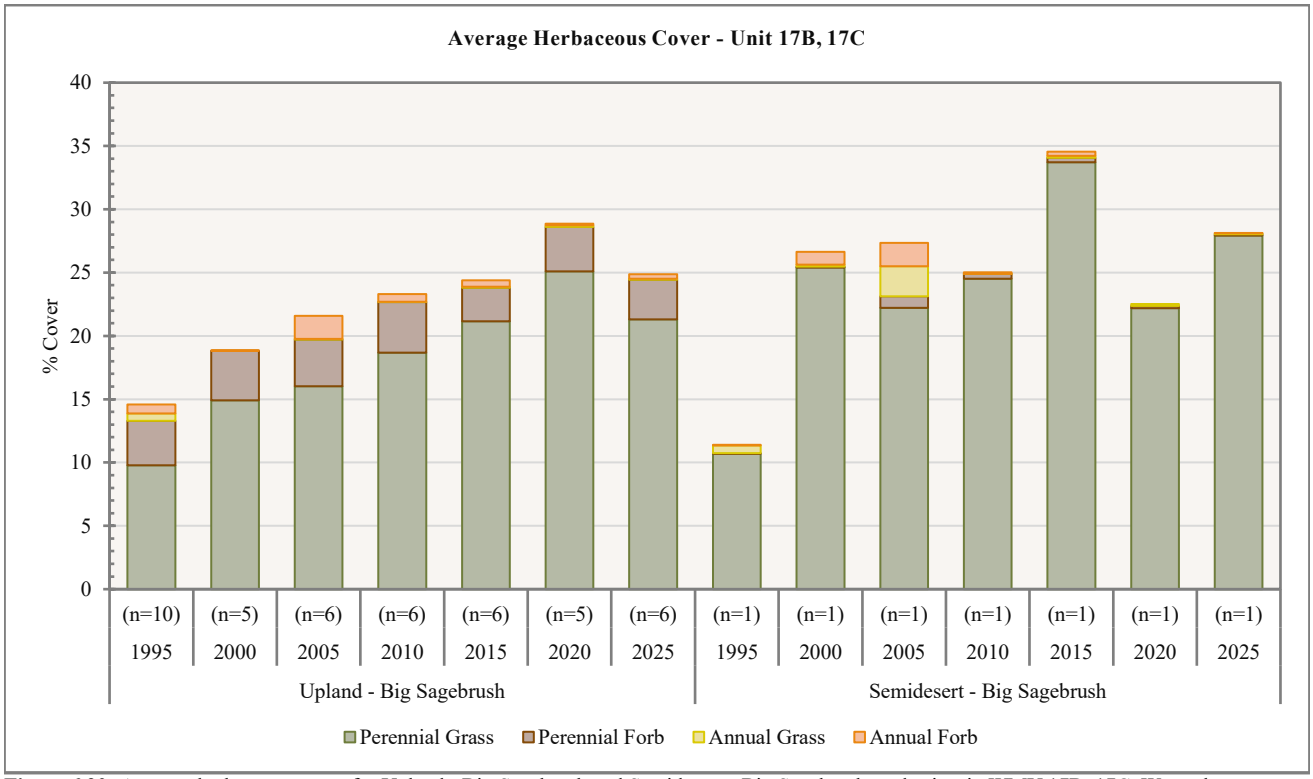


Figure 6.20: Average herbaceous cover for Upland - Big Sagebrush and Semidesert - Big Sagebrush study sites in WMU 17B; 17C, Wasatch Mountains, East.

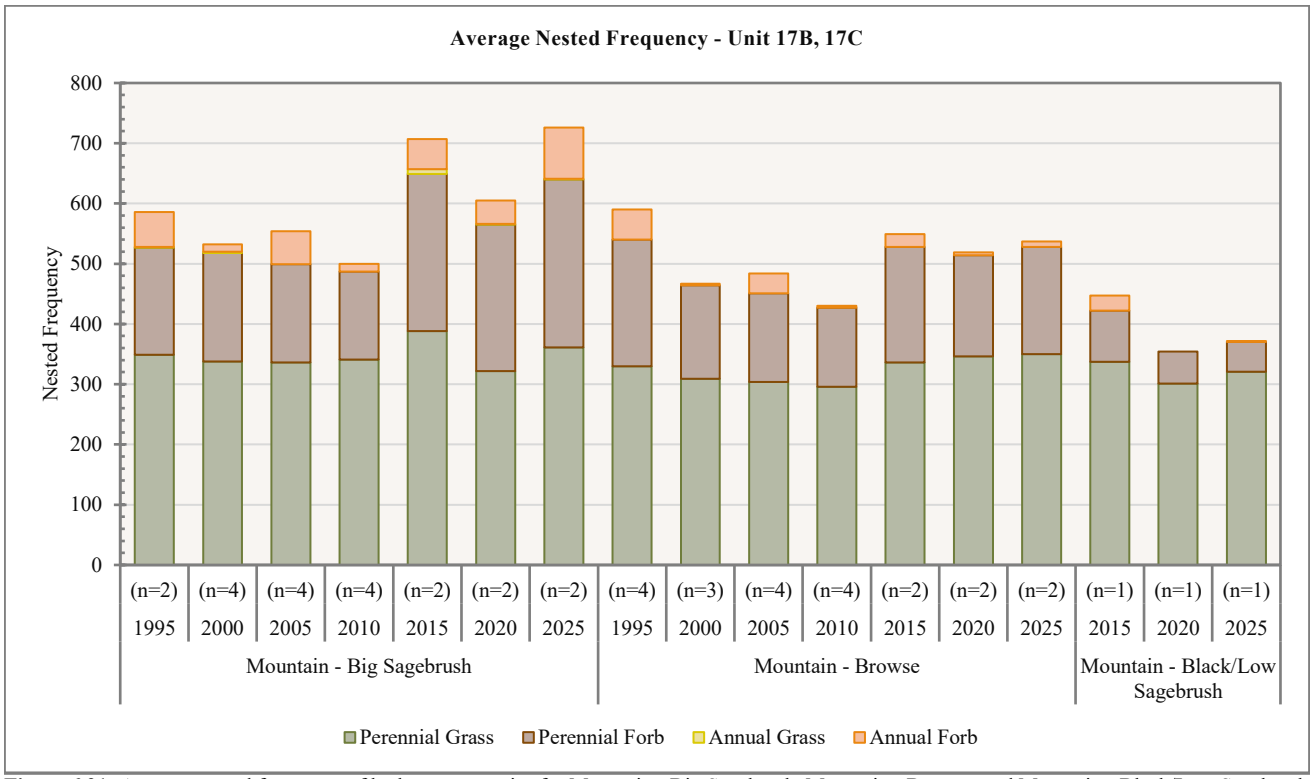


Figure 6.21: Average nested frequency of herbaceous species for Mountain - Big Sagebrush, Mountain - Browse, and Mountain - Black/Low Sagebrush study sites in WMU 17B, 17C, Wasatch Mountains, East.

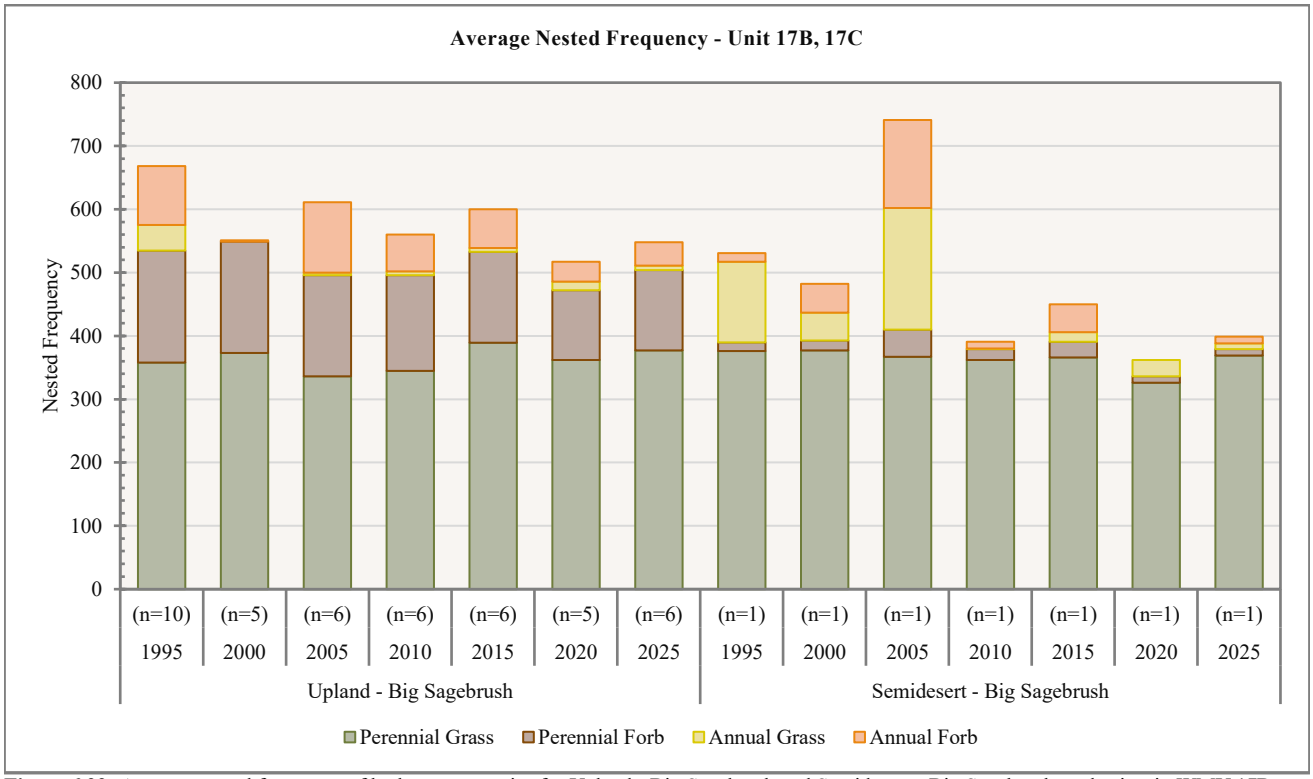


Figure 6.22: Average nested frequency of herbaceous species for Upland - Big Sagebrush and Semidesert - Big Sagebrush study sites in WMU 17B, 17C, Wasatch Mountains, East.

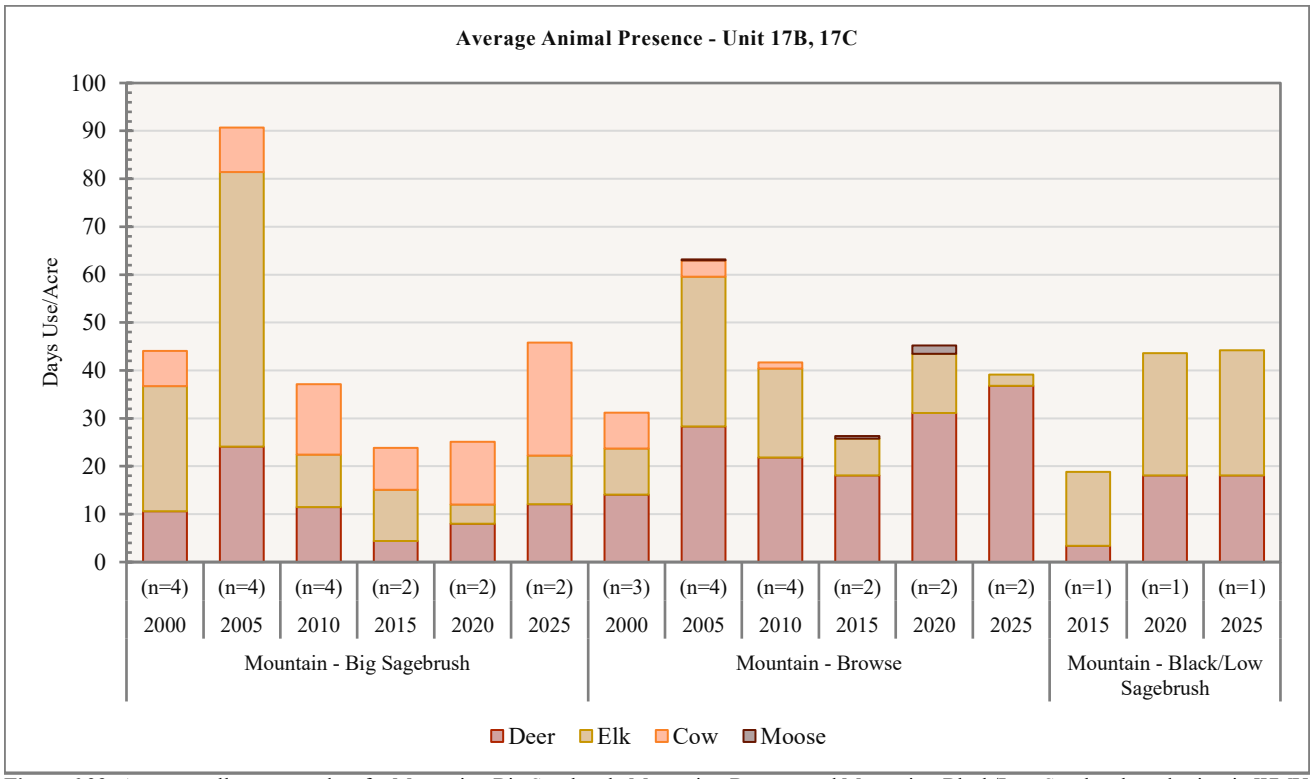


Figure 6.23: Average pellet transect data for Mountain - Big Sagebrush, Mountain - Browse, and Mountain - Black/Low Sagebrush study sites in WMU 17B, 17C, Wasatch Mountains, East.

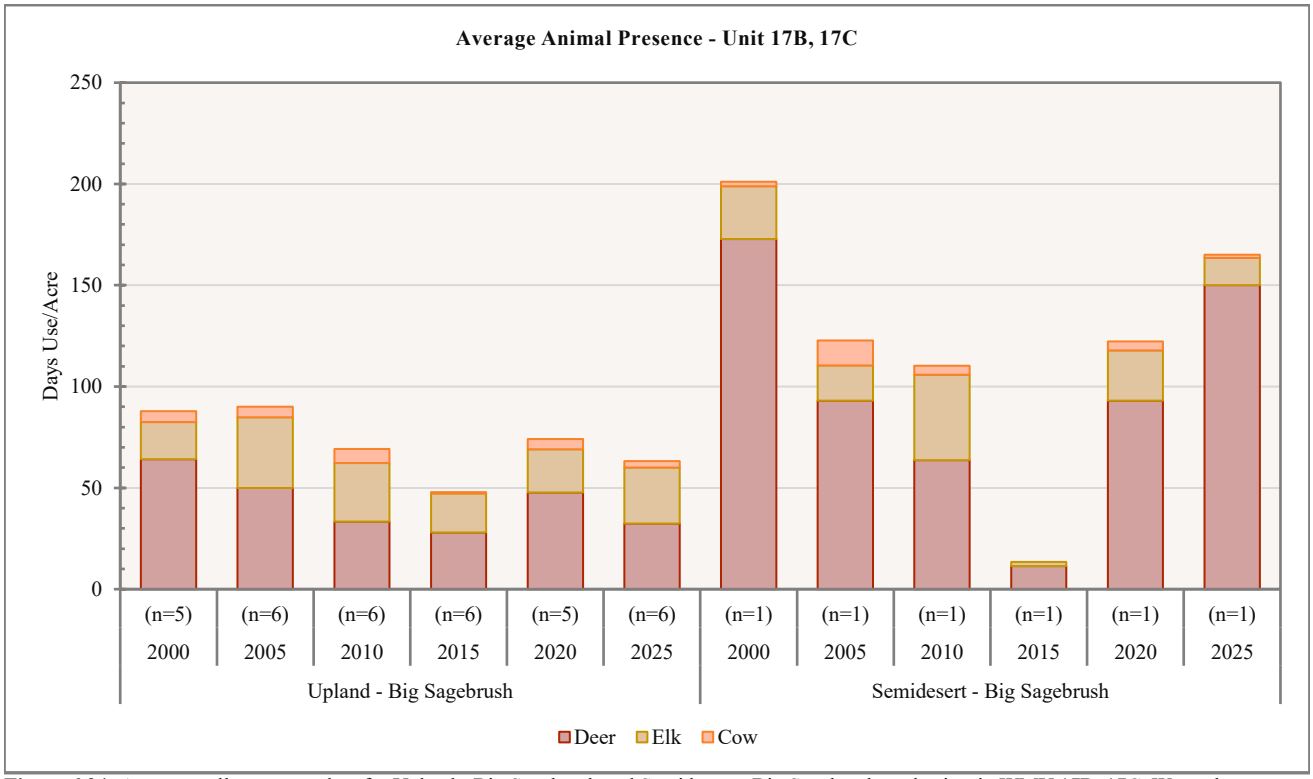


Figure 6.24: Average pellet transect data for Upland - Big Sagebrush and Semidesert - Big Sagebrush study sites in WMU 17B, 17C, Wasatch Mountains, East.

Deer Winter Range Condition Assessment

The overall condition of deer winter range (**Map 6.2**) on the Wasatch Mountains East Management Unit has improved from poor-fair average conditions between 1995 to fair-good conditions in 2025. However, this improvement in conditions could not only be driven the removal of the Beer Spring (17R-02) (suspended), Santaquin Draw (17R-03) (suspended), Smith Property (17R-05) (suspended), Lake Canyon (17R-06) (suspended), and Blacktail Ridge (17-48) (suspended) study sites in the 2000 sample year, but also by improving conditions on long-standing sampling areas, namely Grey Wolf Mountain (17-49), Lower Santaquin Draw (17-50), Santaquins Cabin (17-51), Cutoff (17-52), Two Bar Ranch (17-53), Lower Horse Ridge (17-55), Sams Canyon (17-56) (suspended), Skitzy Canyon (17-57) (suspended), Buck Knoll (17-58) (suspended), Little Horse Ridge (17-65), Sand Wash (17-66), Rabbit Gulch (17-67) and Road Hollow (17-68).

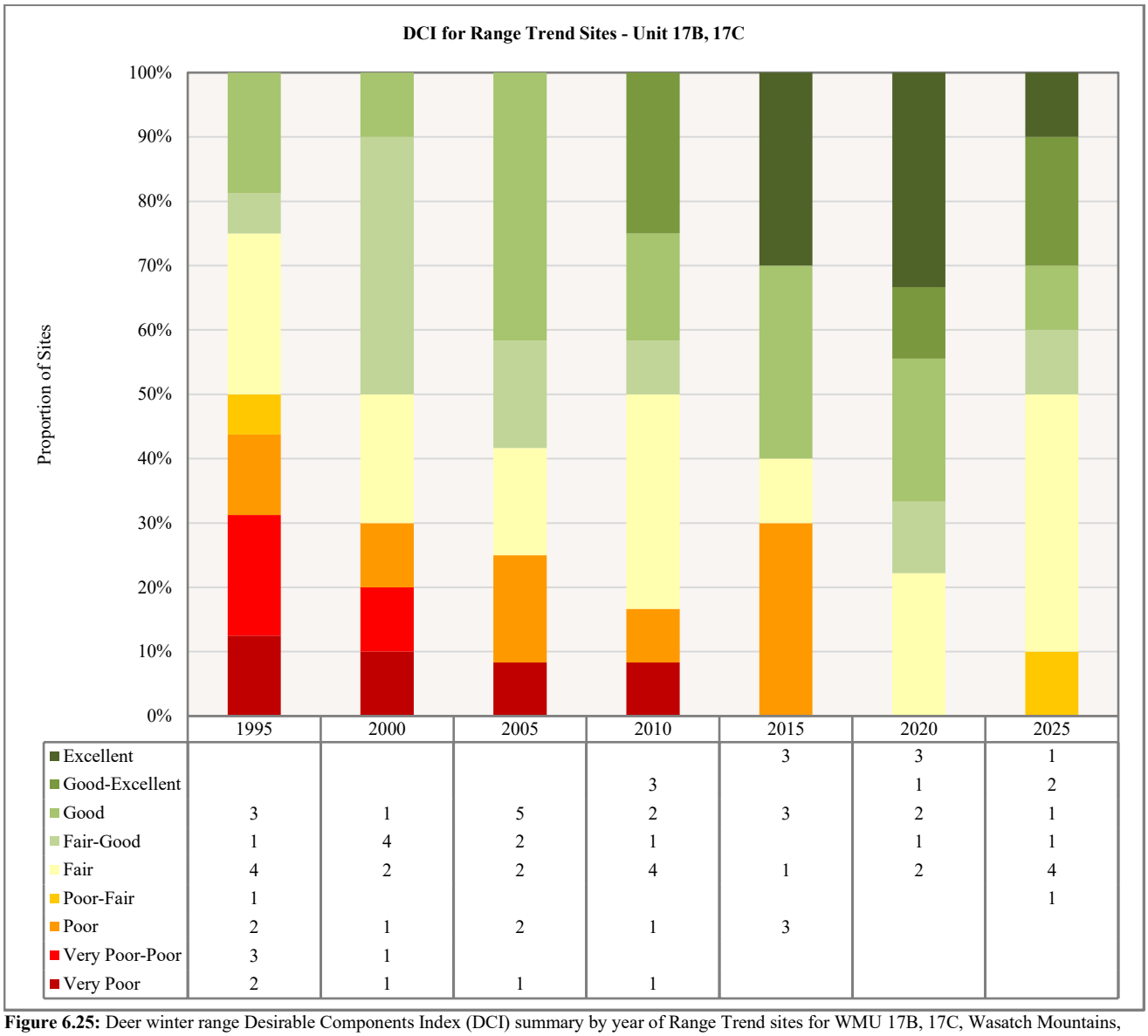
The main drivers for the unit's wintering habitat stability and quality, and for the overall deer winter range condition averages between fair and good include Lower Santaquin Draw, Cutoff, Two Bar Ranch, Lower Horse Ridge, Sams Canyon (suspended), Buck Knoll (suspended), Little Horse Ridge, Rabbit Gulch, and Road Hollow. Although suspended, Buck Knoll has displayed the most notable positive change where density and cover of preferred browse species increased on the site; however, the site was removed due to energy development. Buck Knoll is also located approximately a mile from the Road Hollow site, which shares similar vegetation compositions but different ecological potentials. Road Hollow has shown a decrease in winter range conditions since 2015 when it was established as a replacement study for Buck Knoll. The Grey Wolf Mountain, Peatross Ranch, Skitzy Canyon, and Sand Wash 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 the Wasatch Mountains, East WMU that tend to have higher winter habitat variability than other sites include Lower Santaquin Draw, Cutoff, Sand Wash, and Road Hollow. 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 sites except for Lower Santaquin Draw appear to exhibit overall improvement in winter habitat and might experience success if treatments were applied in these areas. Lower Santaquin Draw displays a decrease in winter range condition as preferred browse cover and recruitment has decreased. However, there has also been an increase in perennial grass, namely crested wheatgrass (*Agropyron cristatum*), on this site: this may have offset diminishing range conditions over the life of the study (**Table 6.7**).

The overall deer winter range assessment in 2025 for WMU 17B, 17C is that the unit is in fair-good condition with most sites ranging between fair and excellent conditions. However, Two Bar Ranch was found to be in poor-fair condition in 2025 due to reduced preferred browse and perennial forb cover. Additional factors limiting habitat quality on Two Bar Ranch include an undiversified age class structure for preferred browse (**Figure 6.25**, **Table 6.7**).

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 habitat (**Map 6.3**, **Table 6.7**). 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 exactly 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 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 6.25**, **Table 6.7**). Studies that intersect/have intersected elk year-long habitat include Grey Wolf Mountain, Lower Santaquin Draw, Santaquins Cabin, Cutoff, Two Bar Ranch, Lower Horse Ridge, Little Horse Ridge, Sand Wash, Rabbit Gulch

and Road Hollow. The sites with elevated habitat quality and suitability include Santaquins Cabin, Two Bar Ranch, Lower Horse Ridge, Little Horse Ridge, and Sage Flat. In contrast, Grey Wolf Mountain and Sand Wash are considered to have very poor and poor wintering habitat conditions consistently from year to year; both study sites have limited preferred browse and perennial forb cover. However, browse cover, decadence, and recruitment have been improving on Sand Wash, shifting the site from long-standing poor conditions to fair-good in 2025.



	1995	2000	2005	2010	2015	2020	2025
Excellent					3	3	1
Good-Excellent				3		1	2
Good	3	1	5	2	3	2	1
Fair-Good	1	4	2	1		1	1
Fair	4	2	2	4	1	2	4
Poor-Fair	1						1
Poor	2	1	2	1	3		
Very Poor-Poor	3	1					
Very Poor	2	1	1	1			

Figure 6.25: Deer winter range Desirable Components Index (DCI) summary by year of Range Trend sites for WMU 17B, 17C, Wasatch Mountains, East.

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
17-48*	1995	18.9	6.5	3	21.8	-0.1	3.7	0	**53.8**	**F**
17-49	1995	3.3	0	0	20	0	10	0	**33.3**	**VP-P**
17-49	2000	5.2	0	0	30	0	6.5	0	**41.7**	**P**
17-49	2005	5.9	0	0	30	0	7.6	0	**43.5**	**P**
17-49	2010	6.8	12.4	6.7	30	0	4.9	0	**60.8**	**F**
17-49	2015	6.4	0	0	30	0	2.4	0	**38.8**	**P**
17-49	2020	9.4	12.3	6.4	30	0	3.2	0	**61.3**	**F**
17-49	2025	8.8	12.7	1.6	30	0	3.1	0	**56.2**	**F**
17-50	1995	14	12.7	7.8	25.6	0	8.5	0	**68.6**	**G**
17-50	2000	13.3	8.8	6.9	30	0	5.2	0	**64.2**	**F-G**
17-50	2005	8.8	6.4	10.8	30	0	8.6	0	**64.6**	**F-G**
17-50	2010	7.6	5.7	10.3	30	0	3.9	0	**57.5**	**F**
17-50	2015	6.5	2.4	6.4	30	0	2.4	0	**47.7**	**P**
17-50	2020	9.8	10.5	14.2	30	0	3.5	0	**68**	**G**
17-50	2025	9.1	8.1	3.7	30	0	3.5	0	**54.4**	**F**
17-51	1995	13.6	13.1	8	21.4	0	8	0	**64.1**	**F-G**
17-51	2000	10.7	12.6	9.3	30	0	4.2	0	**66.8**	**F-G**
17-51	2005	11.3	8.7	15	30	-0.1	4.2	0	**69.1**	**G**
17-51	2010	15.8	13.9	15	30	-0.1	3.8	0	**78.4**	**G-E**
17-51	2015	15.4	10.8	15	30	0	1.1	0	**72.3**	**G**
17-51	2020	19	12.4	15	30	0	0.6	0	**77**	**G**
17-51	2025	22.1	11.1	12.7	30	0	1.3	0	**77.2**	**G**
17-52	1995	16.5	5.4	7.3	18.9	0	10	0	**58.1**	**F**
17-52	2000	14.2	5.7	8	25.4	0	10	0	**63.3**	**F-G**
17-52	2005	24.3	4.6	6.7	21.8	-0.1	10	0	**67.3**	**G**
17-52	2010	25.7	11.9	11.9	16.2	0	10	0	**75.7**	**G**
17-52	2015	20	10.8	14.3	30	0	10	0	**85.1**	**E**
17-52	2020	23.4	10.8	13.5	30	0	10	0	**87.7**	**E**
17-52	2025	22.3	9.1	8.3	30	0	10	0	**79.7**	**G-E**
17-53	1995	16.5	11.2	12.2	14.1	0	2	0	**56**	**F**
17-53	2000	20.9	6.7	5.7	19.9	0	1.3	0	**54.5**	**F**
17-53	2005	13.1	6.6	3.4	23.9	0	6.2	0	**53.2**	**F**
17-53	2010	13.7	11.3	6.4	30	0	5.3	0	**66.7**	**F-G**
17-53	2015	13.8	6.8	4.3	30	-0.2	1.3	0	**56**	**F**
17-53	2020	19.1	11.9	4.6	30	-0.5	0.7	0	**65.8**	**F-G**
17-53	2025	11.5	3.9	2	30	-0.2	1.5	0	**48.7**	**P-F**
17-54*	1995	4.1	0	0	13	0	10	0	**27.1**	**VP**
17-54*	2000	2.4	0	0	20.3	0	9.5	0	**32.2**	**VP**
17-55	1995	10.1	14.5	10.1	28.7	0	9.4	0	**72.8**	**G**
17-55	2000	17.4	13.3	8.5	30	0	6.3	0	**75.5**	**G**
17-55	2005	22.3	10.4	10.9	22.6	0	10	-2	**74.2**	**G**
17-55	2010	28.9	13.1	7.6	30	0	7.1	0	**86.7**	**G**
17-55	2015	30	13.6	15	30	0	10	0	**98.6**	**E**
17-55	2020	30	12.7	14.3	30	0	9	-2	**94**	**E**
17-55	2025	30	13.4	11.2	30	0	10	0	**94.6**	**E**
17-56*	1995	30	13.2	7.7	20.4	0	9.4	0	**80.7**	**G**
17-56*	2005	30	11.3	9.5	15.7	0	4.7	0	**71.2**	**F-G**
17-56*	2010	30	14.3	8.1	30	0	7.8	0	**90.2**	**G-E**
17-57*	1995	1.1	0	0	30	0	10	0	**41.1**	**VP-P**
17-57*	2000	2.5	0	0	30	0	6.1	0	**38.6**	**VP-P**
17-57*	2005	1.8	0	0	30	0	5.1	0	**36.9**	**VP**
17-57*	2010	1.9	0	0	30	0	1.9	0	**33.8**	**VP**
17-58*	1995	5.6	0	0	30	0	3.6	0	**39.2**	**VP-P**
17-58*	2000	9.3	14.8	14	30	0	1.6	0	**69.7**	**F-G**
17-58*	2005	17.6	15	8.8	30	0	2	0	**73.4**	**G**
17-58*	2010	19.3	13.1	2.3	30	0	1.5	0	**66.2**	**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
17-65	2005	26.3	11.7	15	30	0	4.9	0	**87.9**	**G**
17-65	2010	24.3	13.2	13.6	30	0	7.6	0	**88.7**	**G-E**
17-65	2015	30	12.9	15	30	0	6.8	0	**94.7**	**E**
17-65	2020	30	13.9	15	30	0	7.4	0	**96.3**	**E**
17-65	2025	30	13.8	11.4	30	0	4.4	0	**89.6**	**G-E**
17-66	2005	6	0	0	30	0	1.1	0	**37.1**	**P**
17-66	2010	7.3	1.4	8.5	30	0	0.8	0	**48**	**P**
17-66	2015	7.3	2.7	6.5	30	0	0.4	0	**46.9**	**P**
17-66	2025	10.4	9.6	13.5	30	0	0.5	0	**64**	**F-G**
17-67	1995	5.4	0	0	21.4	-0.5	0.1	0	**26.4**	**P-F**
17-67	2000	5.5	0	0	30	-0.1	0.2	0	**35.6**	**F**
17-67	2005	5.1	0	0	30	-1.8	1.8	0	**35.1**	**F**
17-67	2010	4.6	0	0	30	0	0.8	0	**35.4**	**F**
17-67	2015	7.1	10.9	4.8	30	-0.1	0.7	0	**53.4**	**G**
17-67	2020	3.2	0	0	30	-0.1	0.4	0	**33.5**	**F**
17-67	2025	5.4	0	0	30	0	0.2	0	**35.6**	**F**
17-68	2015	24.5	14.2	15	30	0	4.2	0	**87.9**	**G**
17-68	2020	28.6	13.6	15	30	0	3.5	0	**90.7**	**G-E**
17-68	2025	14.8	10.3	3.1	30	0	2.1	0	**60.3**	**F**
17R-02*	1995	1.1	0	0	20.8	-0.8	10	0	**31.1**	**VP**
17R-03*	1995	8.8	9.2	3.1	26.8	0	1.3	-2	**47.2**	**P**
17R-05*	1995	8.8	14.2	12.5	19.4	0	3	0	**57.9**	**F**
17R-06*	1995	27.8	14.2	0.8	6.9	-3.4	0.2	0	**46.5**	**P**

Table 6.7: Deer winter range Desirable Components Index (DCI) information by site number of Range Trend studies for WMU 17B, 17C, Wasatch Mountains, East. 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
17-49	Grey Wolf Mountain	Animal Use – Big Game	High	Reduced shrub vigor/diversity of desirable grass and forb species
		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
17-50	Lower Santaquin Draw	Animal Use – Big Game	High	Reduced shrub vigor/diversity of desirable grass and forb species
		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
17-51	Santaquins Cabin	Introduced Perennial Grass	Medium	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
17-52	Cutoff	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
17-53	Two Bar Ranch	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
17-55	Lower Horse Ridge	Animal Use – Big Game	Low	Reduced shrub vigor/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
		Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species
17-59	Emma Park	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
17-65	Little Horse Ridge	PJ Encroachment	Medium	Reduced understory shrub and herbaceous vigor
17-66	Sand Wash	Energy Development	High	Fragmentation and degradation/loss of habitat
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
17-67	Rabbit Gulch	Energy Development	High	Fragmentation and degradation/loss of habitat
		Introduced Perennial Grass	Medium	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

Study #	Study Name	Limiting Factor and/or Threat	Level of Impact	Potential Impact
17-68	Road Hollow	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
17R-07	Emma Park Harrow Grazed	Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
17R-11	Santaquin Greasewood	Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
17R-12	Santaquin Chaining	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	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
17R-13	Rabbit Gulch Chaining	Energy Development	High	Fragmentation and degradation/loss of habitat
		Annual Grass	Medium	Increased fire potential and reduced herbaceous diversity
17R-14	Skitzy Chaining	Energy Development	High	Fragmentation and degradation/loss of habitat
		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
17R-15	Golden Stairs Chaining	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
17R-16	Grey Wolf Chaining	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
17R-17	Strawberry Grouse 1	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
17R-18	Wildcat Sage-grouse	None Identified		
17R-19	Road Hollow	Urban Development	High	Fragmentation and loss of habitat
		Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species
17R-20	Road Hollow Ridge	Annual Grass	Medium	Increased fire potential and reduced herbaceous diversity
		Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species
17R-21	Blacktail Chaining	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
17R-22	Allen Smith Reseed	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
17R-23	Rabbit Gulch Interseed	Energy Development	High	Fragmentation and degradation/loss of habitat
		Animal Use – Cattle	Low	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
17R-24	East Santaquin Chaining	Introduced Perennial Grass	Low	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
17R-25	Trout Creek Dixie	Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
		Energy Development	Low	Fragmentation and degradation/loss of habitat
17R-26	Two Bar-Sand Wash Chaining	Energy Development	High	Fragmentation and degradation/loss of habitat
		PJ Encroachment	Medium	Reduced understory shrub and herbaceous vigor
		Animal Use – Deer	Medium	Reduced/less vigorous browse component
		Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
17R-27	Two Bar-Black Tail Chaining	Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
		Energy Development	Low	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
17R-31	Badger Hollow Mow	Urban Development	Medium	Fragmentation and loss of habitat
17R-33	Badger Hollow Harrow	Urban Development	Medium	Fragmentation and loss of habitat
		Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species
17R-34	Wildcat	Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species
17R-35	Tabby Mountain	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
17R-37	West Fork Willow Creek	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Noxious Weeds	Medium	Reduced diversity of desirable grass and forb species
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
		Animal Use – Cattle	Low	Reduced diversity of desirable grass and forb species

Study #	Study Name	Limiting Factor and/or Threat	Level of Impact	Potential Impact
17R-38	North Rabbit Gulch	Energy Development	High	Fragmentation and degradation/loss of habitat
		Animal Use – Deer	High	Reduced/less vigorous browse component
		Introduced Perennial Grass	Medium	Reduced diversity of desirable grass and forb species
		Drought	Medium	Lowered resilience and resistance to disturbance
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor
17R-39	Cockey Hollow	PJ Encroachment	High	Reduced understory shrub and herbaceous vigor
		Annual Grass	Low	Increased fire potential and reduced herbaceous diversity
17R-41	Wildcat Aspen	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species
		Noxious Weeds	Low	Reduced diversity of desirable grass and forb species

Table 6.8: Assessment of the potential limiting factors and/or threats and level of threat to study sites for WMU 17B, 17C, Wasatch Mountains, East. 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 range within the Wasatch Mountains, East Management Unit are considered to be fair-good as of 2025. The conditions of most study sites range between fair and excellent as of the most recent sample year, but Two Bar Ranch is considered to be in poor-fair condition. Factors contributing to the lower condition score on this study site include reduced perennial forb and preferred browse cover and an undiversified age class structure in the preferred browse population (**Figure 6.25**, **Table 6.7**).

Of positive note within the Wasatch Mountains, East unit are the stabilities of the mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and alderleaf mountain mahogany (*Cercocarpus montanus*) communities on the Santaquins Cabin and Lower Horse Ridge sites, respectively. These sagebrush and mountain mahogany populations have exhibited signs of higher utilization throughout much of the study period; 50% or more of the plants sampled in density strips on these sites have displayed signs of moderate to heavy hedging in most sample years since 2010. Mountain big sagebrush density has increased overall on the Santaquins Cabin study between 1995 and 2025. However, it should be noted that poor vigor was elevated in 2025 compared to previous years. Although the sagebrush population has withstood higher browsing pressures through the 2025 sample year, persistent heavy utilization combined with other stressors could lead to a decreasing population over time. On the Lower Horse Ridge site, density of alderleaf mountain mahogany plants has exhibited a net increase since 1995; the browse community likely benefitted from tree-removal projects in 2016 and 2023 (Lane, Payne, & Cox, Utah Big Game Range Trend Studies: 2025 Annual Report, 2026). Response to habitat improvement projects performed through the Watershed Restoration Initiative (WRI) are additional highlights in this unit. Examples of this include (but are not limited to) pinyon-juniper reduction on multiple WRI sites around Tabby Mountain, conifer removal and aspen rejuvenation on the Tabby Mountain Top study, and reduced abundance of the introduced annual grass species cheatgrass (*Bromus tectorum*) on the North Rabbit Gulch site.

Browse components on the study sites mentioned above have thus far been capable of handling higher browsing pressures. However, shrub populations in other areas may be being utilized at higher levels than they are capable of sustaining given the persistent drought conditions (as indicated by PDSI data for divisions 5 and 6) that have been affecting this unit (**Figure 6.1a**, **Figure 6.2a**). Over 60-70% of mountain big sagebrush plants sampled in density strips have been moderately to heavily hedged in most sample years since 1995 on the Lower Santaquin Draw and Grey Wolf Mountain studies. However, sagebrush density and recruitment of young have exhibited net decreases over the same period; sagebrush has been shown to be less tolerant of heavy browsing than shrubs like mountain mahogany and antelope bitterbrush (*Purshia tridentata*) (Wandera, Richards, & Mueller, 1992). These sagebrush communities (and thus their utility as valuable browse for wintering mule deer) could be lost from these sites over time should heavy utilization in tandem with drought conditions persist in the future.

Introduced perennial grasses – mainly crested wheatgrass (*Agropyron cristatum*), Russian wildrye (*Psathyrostachys juncea*), and/or intermediate wheatgrass (*Thinopyrum intermedium*) – may pose an additional

threat on select sites in this unit. Although they can be observed elsewhere in the unit, these grasses are particularly present in the larger area around Tabby Mountain (and will be discussed here in that context). More specifically, these introduced perennial grasses contribute more than half of the total perennial grass cover on the Lower Santaquin Draw, Grey Wolf Mountain, Santaquin Chaining, Grey Wolf Chaining, Allen Smith Reseed, and Tabby Mountain studies. While they provide forage, introduced perennial grasses may outcompete other more desirable and/or native species for resources (Mack, et al., 2000). Furthermore, crested wheatgrass specifically can outcompete establishing, young shrubs (Gunnell, Monaco, Call, & Ransom, 2010). Competition for resources may be occurring on the Grey Wolf Mountain study in particular, on which crested wheatgrass has been a dominant vegetation component since 1995. As discussed above, mountain big sagebrush density has decreased over time, as has the percentage of young in the population (Lane, Payne, & Cox, Utah Big Game Range Trend Studies: 2025 Annual Report, 2026). Although it is probable that several factors contribute to the reduced recruitment of young sagebrush plants on this site, it may be being negatively affected by the high presence of crested wheatgrass.

The Dollar Ridge fire burned over 70,000 acres in 2018. A number of rehabilitation projects have taken place through the WRI in the years following the burn in an effort to mitigate negative effects. The Range Trend Program has only one study site (Wildcat Aspen) within the fire's perimeter that was established after the burn, but it is likely that fire had some positive effects on the vegetation community. The quaking aspen (*Populus tremuloides*) stand has been mainly comprised of younger individuals in both sample years, and this can be seen in photos from 2022. Aspen cover increased between 2019 and 2022, and the herbaceous understory has been abundant and diverse throughout the study period (Lane, Cox, & Payne, 2022). The LANDFIRE Vegetation Departure model suggests that nearly 6,400 acres of the Rocky Mountain Aspen Forest and Woodland biophysical site within the fire's perimeter are moderately departed from reference conditions (LF2024_VDep_CONUS, 2024). Responses of aspen stands to fire undoubtedly differ depending on location. However, the effects of fire on Wildcat Aspen could provide generalized insight on other burned stands in the unit.

Range Trend data on other plant communities within the perimeter of the Dollar Ridge fire is lacking. However, the WRI project narrative for the Dollar Ridge Reforestation Year 3 project states that the fire was intense, severe, and left a notable portion of the burn with a diminished or absent vegetation component (Abraham, 2022). The LANDFIRE Vegetation Departure model classifies over 28,000 burned acres as being Inter-Mountain Basins Montane Sagebrush Steppe communities. Nearly 14,000 of these acres overlap with deer winter, transitional, or year-long range and are considered to be moderately departed from reference conditions (LF2024_VDep_CONUS, 2024). However, these communities may have been more highly departed in the years immediately following the burn. The description for this biophysical site states that the timeline of fire recovery in this community type varies. However, the description states that on average, sagebrush cover takes eight to 14 years to reach five percent (The Nature Conservancy LANDFIRE Team, 2015). Range Trend data for other burned sites at similar elevations throughout the state generally corroborates this timeframe. Although localities and exact conditions are unknown to the authors of this report, some recovery has almost certainly taken place in the eight years following the Dollar Ridge fire. However, sagebrush may take longer to re-establish in other burned communities: in some locations, this slower recovery of shrubs in modeled sagebrush steppe areas can be observed using aerial imagery over time. Although fire has likely had different effects depending on specific locations, the loss and subsequent slow recovery of shrubs in some areas could mean less browse available for wintering mule deer.

Annual and ruderal community types are widely distributed throughout the Wasatch Mountains, East unit. These biophysical communities include Great Basin and Intermountain Introduced Annual and Biennial Forblands, Introduced Annual Grasslands, and Ruderal Shrublands, as well as Interior Western North American Temperate Ruderal Shrublands and Grasslands. Typically, these areas represent former sagebrush rangelands that have transitioned into communities dominated by cheatgrass (*Bromus tectorum*). This shift has trapped these communities in a self-perpetuating fire disturbance cycle, significantly diminishing their forage value. According to LANDFIRE, these community dynamics are primarily driven by disturbances such as fire and heavy grazing (The Nature Conservancy LANDFIRE Team, 2015).

Geographically, the highest concentrations of annual grasses are found within the footprints of the Daniels Canyon, Dollar Ridge, and Tank Hollow wildfires. More specifically, LANDFIRE data identifies the east face at the base of Sheep Creek as a high-concentration area, while the southwest face of Hogsback Ridge and the south face of Currant Creek Mountain are dominated by Temperate Ruderal Shrubland and Grassland communities. These "Temperate Ruderal" areas are characterized by the presence of introduced perennial grasses – such as quackgrass (*Elymus repens*), smooth brome (*Bromus inermis*), and crested wheatgrass – often in combination with various invasive annual forbs.

While many of these locations lack Range Trend or WRI monitoring sites – meaning their exact vegetation composition remains unverified – they are noted as potential areas of concern. In contrast, annual grass issues in Rabbit Gulch and Sand Wash are actively observed in Range Trend data. With the exception of Sand Wash, all monitored sites in these areas show some level of cheatgrass invasion. Rabbit Gulch has exhibited the most significant impacts, with cheatgrass and weedy annual forbs remaining abundant in the understory for most years since 2005. Although cheatgrass cover reached a peak of 25% in 2017, it has since decreased to 8% in 2020 and 6% in 2025, a trend likely driven by persistent drought conditions rather than a true ecological recovery (Lane, Payne, & Cox, 2026).

Aspen stands in general in the Wasatch Mountains, East Management Unit may be an additional vegetation community of interest. The Tabby Mountain Top study site prior to treatment in particular is an example of a departed aspen system that was being encroached by conifers (Lane, Cox, & Payne, 2024): this site could give insights on what may be happening on aspen stands in the general vicinity. On a larger scale, more than 144,0000 acres on mule deer summer range in this unit are classified as Rocky Mountain Aspen Forest and Woodland vegetation communities according to the LANDFIRE Existing Vegetation Type model. Over 35,500 additional acres are modeled as the Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland ecotype (**Table 6.1**). The LANDFIRE Vegetation Departure model suggests that over 90% of both modeled biophysical sites are moderately departed from reference conditions (LF2024_VDep_CONUS, 2024). However, “moderate departure” likely has different meanings depending on location and disturbance, if any. For example, “moderate departure” could refer to the (possibly uncharacteristic) vegetation returning in both the overstory and understory following fires that have burned. In other areas that have not burned, however, “moderate departure” may be happening in the context of conifer encroachment (or in the case of the Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland site, increased conifer dominance). Further investigation into the actual areas highlighted by the model would elucidate the mechanism of departure from reference condition in their respective areas.

Approximately 9% of the Wasatch Mountains, East unit is composed of Colorado Plateau Pinyon-Juniper Woodland and Shrubland communities, which are located primarily in the eastern portion of the unit. Of these communities, the vast majority (98%, or 176,502 acres) are classified as Pinyon-Juniper Woodland, while the remaining 2% (2,520 acres) are identified as Pinyon-Juniper Shrubland. Most of this acreage is considered moderately departed from its historical reference state (LF2024_VDep_CONUS, 2024). This shift is largely attributed to the suppression of natural fire cycles, which has permitted pinyon and juniper trees to infill areas far beyond their late seral phases and expand into communities where they were historically atypical.

The Little Horse Ridge Range Trend site exemplifies this trend. Situated within a high-potential pinyon-juniper woodland that is currently between a low and moderate departure state, the site has seen active infilling since its establishment in 2005. Total tree cover has increased substantially, rising from just over 7% in 2005 to 26% in 2020, before settling at 20% in 2025. While this expansion has currently had little effect on preferred browse density and cover, prolonged infilling poses a long-term risk to the shrub component through resource competition or catastrophic fire. Although species such as alderleaf mountain mahogany (*Cercocarpus montanus*) and Utah serviceberry (*Amelanchier utahensis*) are fire-tolerant and can rejuvenate through resprouting, sagebrush would likely be eliminated and require a lengthy period to reestablish following a high-intensity fire.

Management interventions have shown success in restoring these landscapes to their reference states. The Cockey Hollow 2 WRI site samples a 2018 treatment that targeted pinyon-juniper removal and thinning; as of

2024, LANDFIRE estimates this area to be in a low-departure state. In contrast, the untreated reference site, Cockey Hollow – a lower-potential area nearby – had an estimated total tree cover of 50%, with no detectable preferred shrub cover and only two sagebrush plants sampled across the entire transect. However, following a mastication treatment, Cockey Hollow 2 maintained a tree cover of just over 6%, while sagebrush cover exceeded 4.5% with mountain big sagebrush densities estimated at approximately 2,500 plants per acre (Lane, Payne, & Cox, 2021). Despite being distinct sites, their proximity (775 feet apart) suggests they share similar community structures, highlighting the effectiveness of active pinyon-juniper management in maintaining shrub diversity.

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 6.6**).

There are a few suggestions to consider for maintaining or improving big game habitat within the Wasatch Mountains, East Management Unit. Notable acreage has been treated in this unit by various projects through the WRI (**Table 6.4**). Habitat improvement projects in general should continue when and where they are deemed appropriate. If reseeding is necessary to restore herbaceous understories, native species should be used whenever possible. Range Trend study sites are surveyed every five years throughout the unit, providing detailed species level data and allowing for changes to be observed over time. However, there are situations where more frequent, generalized observations may prove beneficial. This may be the case with the Lower Santaquin Draw and Grey Wolf Mountain study sites. As discussed above, the sagebrush components on these sites have been highly utilized in many years and densities have exhibited net decreases over time. These sagebrush populations could be at risk of further decreases should browsing pressures continue in tandem with long-term drought. More frequent observations could allow for more prompt recognition of further decreases or deterioration, in turn providing more opportunity for mitigation efforts or implementation of management decisions before substantial community transitions begin. In a broader context, 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.

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:

Big Game: Reduced shrub vigor/diversity of desirable grass and forb species.
Bison: Reduced diversity of desirable grass and forb species.
Cattle: Reduced diversity of desirable grass and forb species.
Deer: Reduced/less vigorous browse component.
Elk: Reduced shrub vigor/diversity of desirable grass and forb species.
Horse: Reduced diversity of desirable grass and forb species.

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

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.

Drought:

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 they are not all-inclusive and do not exclusively delineate drought conditions.

Potential Impact: Lowered resilience and resistance to disturbance.

Energy Development:

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 AND 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: Early Phase I or 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.