UTAH BIG GAME RANGE TREND SUMMARIES 2015

WILDLIFE MANAGEMENT UNITS 8, 9, 10, 11, 13B, 17B&C & NORTHEASTERN REGION TREATED OR DISTURBED SUMMARY

PUBLICATION NUMBER 16-09
REPORT FOR FEDERAL AID PROJECT W-82-R-60

STATE OF UTAH
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WILDLIFE RESOURCES

UTAH BIG GAME RANGE TREND UNIT SUMMARIES
2015
WILDLIFE MANAGEMENT UNITS
8, 9, 10, 11, 13B, 17B&C
&
NORTHEASTERN REGION TREATED OR DISTURBED SUMMARY

Written and Edited by

Ciaran Payne
Jason Cox
Jason Lane

Tables prepared by

Ciaran Payne
Jason Cox
Jason Lane

Data Collection by

Jordan Bybee
Jason Cox
Jason Lane
Zane Stevens
Hayley Rasmussen
Derek Hedges
William Behling
LeRoy Christensen
Misty Carter
Devin Wadsworth
Russell Wimmer
Seth Jones

Performance Report for Federal Aid Project W-82-R-60

Publication No. 16-09

UTAH DEPARTMENT OF NATURAL RESOURCES
Division of Wildlife Resources
1594 West North Temple
Salt Lake City, Utah 84114

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

PROGRAM NARRATIVE

State: UTAH

Project Number: W-82-R-60

Grant Title: Wildlife Habitat Research and Monitoring

Project Title: Wildlife Habitat Monitoring/Range Trend Studies

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

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

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

REMARKS

The work completed during the 2015 field season and reported in this publication involves the reading of interagency range trend studies in the DWR Northeastern Region. Most trend studies surveyed in these management units were established in the 1980s and reread at 5-year intervals.

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

Bureau of Land Management
- Price Resource Area
- Vernal Resource Area
- Moab Resource Area

Ashley National Forest
- Vernal Ranger District
- Roosevelt Ranger District
- Duchesne Ranger District
- Flaming Gorge National Recreation Area

Uinta Wasatch Cache National Forest
- Mountain View Ranger District

US National Park Service
- Dinosaur National Monument

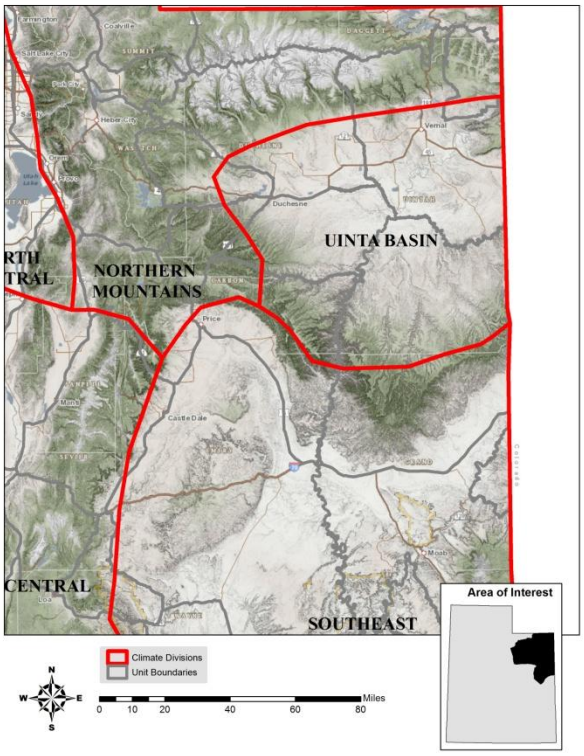
Ute Indian Tribe Natural Resources
- Fort Duchesne, Utah

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 for the unit. The geography section details the major features of the unit

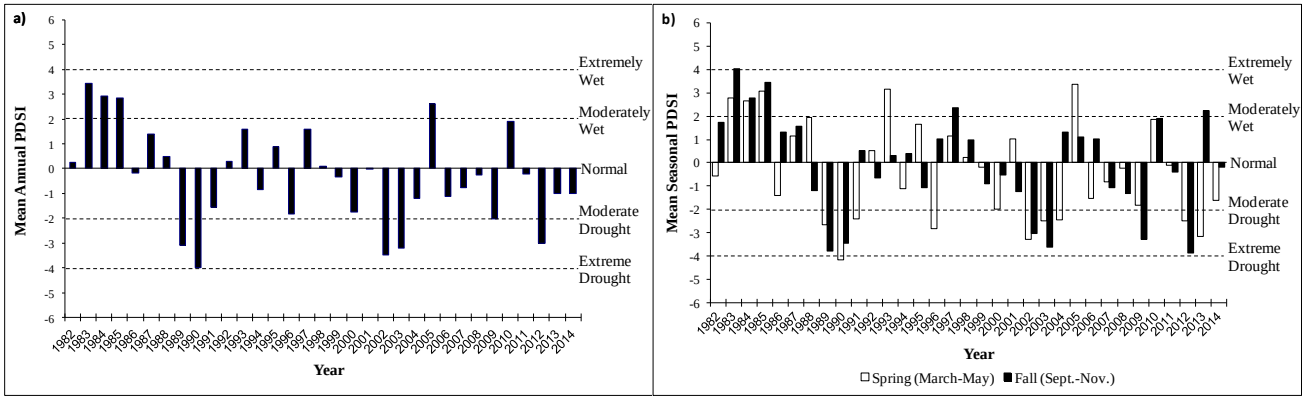
Palmer Drought Severity Index Climate Divisions



Climate Data: The state of Utah is divided into seven climatic divisions for estimating the Palmer Drought Severity Index (PDSI) and the northeastern region occurs within three of these divisions: Northern Mountains (Division 5), Uinta (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 (Climate Prediction Center Internet Team, 2005).

The PDSI is based on climate data gathered from 1895 to 2015. The data reported in this summary covers the years over which these sites have been sampled (1982-2015). 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 to2.9 = 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 -.9 = Incipient Dry Spell, -1.0 to -1.9 = Mild Drought, -2.0 to -2.9 = Moderate Drought, -3.0 to -3.9 = Severe Drought and ≤-4.0 = Extreme Drought (Time Series Data 2015).

In the figure below, graph "a" represents the mean annual PDSI for the south central region and graph "b" shows the mean PDSI by season, spring (March-May) and fall (Sept.-Nov.) for the south central region(Climate Prediction Center Internet Team, 2005).



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.

Land Ownership: Land ownership and big game seasonal range were overlaid within a Geographic Information System (GIS) program to create tables for big game animals to represent estimated habitat acreage by season and ownership. If there was not habitat for a specific season (summer, winter, transitional, year-long) then that column was omitted.

LANDFIRE Existing Vegetation Coverage: The Existing Vegetation Cover (EVC) layer represents the vertically projected percent cover of the live canopy layer for a 30-m grid cell. EVC is generated separately for tree, shrub, and herbaceous cover functional groups using training data and other layers. Percentage tree, shrub, and herbaceous canopy cover training data are generated using plot-level ground-based visual assessments. Once the training data is developed, relationships are then established separately for each functional group between the training data and combination of Landsat, elevation, and ancillary data. Each of the derived data layers (tree, shrub, herbaceous) has a potential range from 0-100 percent, which are merged into a single composite EVC layer (LANDFIRE).

The LANDFIRE data reported in this summary includes the major functional groups (shrubland, conifer, grassland, and other) and various subgroups of importance found within the unit boundaries. Acres and percent of total 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.

Limiting Factors to Big Game Habitat: This section discusses some of the major limiting factors for big game habitat in the unit. Many of the limitations are determined from the range trend study site data, such as abundance of cheatgrass, pinyon and juniper, sagebrush, and other habitat types. Other known limitations such as wildfire, energy development, habitat fragmentation, etc. are determined from other sources.

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 unit through the WRI program and a map of the fire history from 2000-2015 is available for each unit. A total amount of acres 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 many 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. 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 sites 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 and covers for shrubs and trees. Not all sites had shrubs or trees present: when this was the case, these graphs were omitted from the summary. 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 were 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. Additionally, 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.

WRI and Range Trend Summary (Disturbed Sites): Study sites that have experienced a treatment or disturbance over the study years have been grouped together based on treatment or disturbance type. Treatments were further broken down into pre and post-treatment categories. Only the latest pre-treatment year from each site was averaged into pre-treatment data while the post-treatment years were categorized into five-year increments that were averaged with their corresponding post-treatment years and are presented as 1-5 years post-treatment, 6-10 years-post treatment, etc. Changes in shrubs, trees, herbaceous understory, and occupancy of wildlife and domestic animals were also described for each of the treatment types.

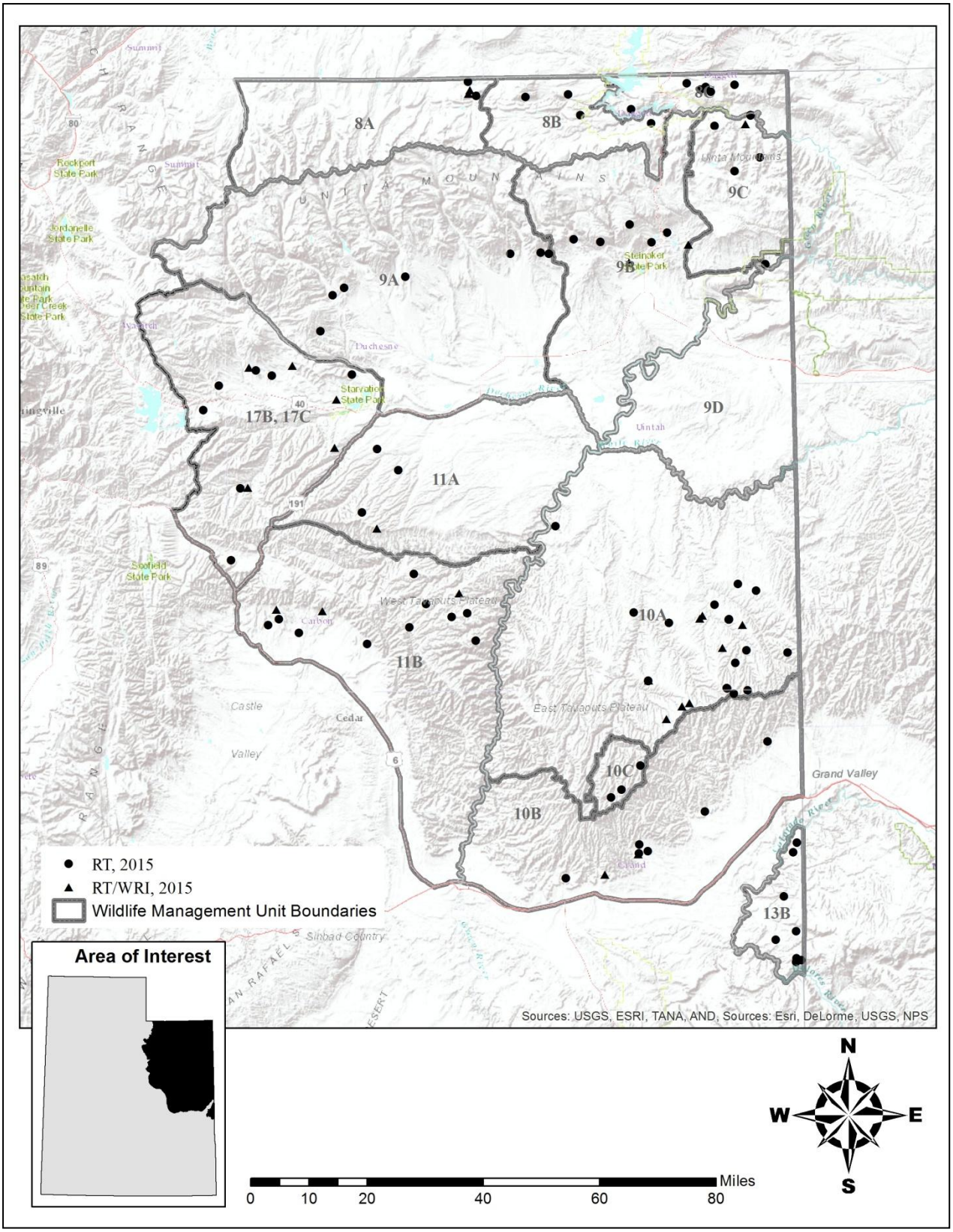
Deer Winter Range Condition Assessment: The desirable components index (DCI) for deer was created by Range Trend Program personnel as a tool to address condition and/or value of winter ranges for mule deer. This index is meant to be a companion to, not a replacement for, the site-specific range trend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

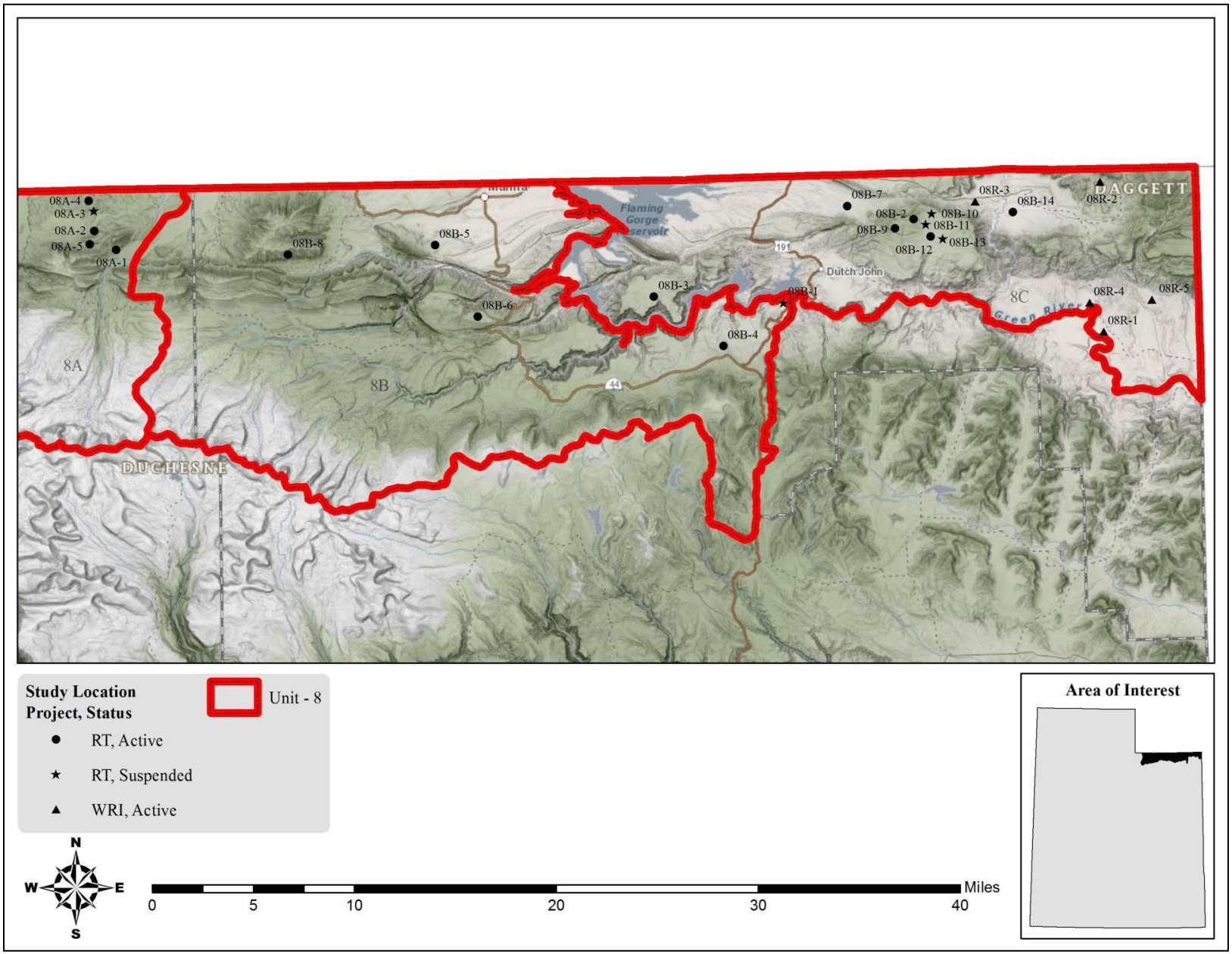
Changes in DCI over the sample years for both treated and untreated sites are included in the figures near the end of the summary. Care should be taken when interpreting these tables as the number of sites included in each year may vary. This could be misleading if the overall DCI seems to be improving, 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 were assessed for their overall threats based on species composition and cover. Common threats to these sites were pinyon-juniper encroachment and introduced perennial and/or annual grass species. Impacts of these threats include reduced vigor of understory species, a decrease in herbaceous diversity, and/or increased fire potential. Some sites did not have these 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 the junction of State Route (SR) 150 and the Summit-Duchesne county line (summit of the Uinta Mountains); north along SR-150 to the Utah-Wyoming state line; east along this state line to the Utah-Wyoming-Colorado state lines (Three Corners); south along the Utah-Colorado state line to the Green River; west along the Green River to Flaming Gorge Reservoir; west along the south shore of Flaming Gorge Reservoir to Cart Creek; south along Cart Creek to SR-191; south on SR-191 to the Uintah-Daggett County line (summit of the Uinta Mountains); west along the summit of the Uinta mountains to SR-150 and the beginning point.

Management Unit Description

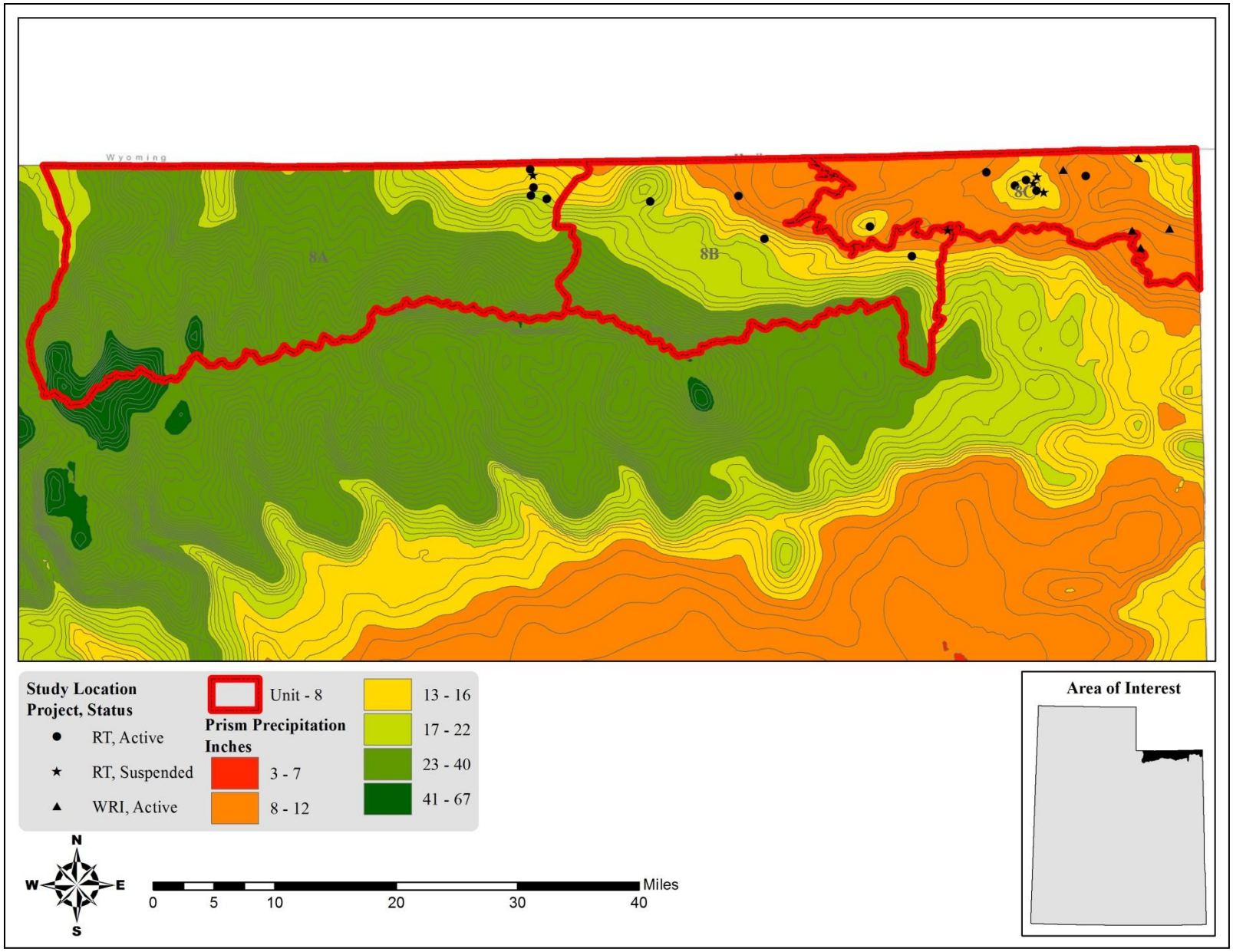
Geography

The North Slope wildlife management unit is located along the north slope of the Uinta Mountains in Summit and Daggett Counties. It 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. 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 precipitation ranges on the unit from 8 inches along the Green River near the Utah-Colorado border to 41 inches on the peaks of the Uinta Mountains. All of the Range Trend and WRI monitoring studies on the unit occur within 8-16 inches of precipitation (Map 1.1).

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 displayed years of moderate to extreme drought from 1988-1990, 2000-2003, and 2012-2013. The mean annual PDSI displayed moderately to extremely wet years from 1982-1986, 1995, 1997-1998, 2005, and 2011 (Figure 1.1a). The mean spring (March-May) PDSI displayed years of moderate to extreme drought in 1989-1990, 1992, 2000-2004, and 2012-2014; moderately to extremely wet years were displayed in 1982-1986, 1995-1996, 1998-1999, 2005, and 2011. The mean fall (Sept.-Nov.) PDSI displayed years of moderate to extreme drought in 1982-1986, 1995, 1997-1998; moderately to extremely wet years were displayed in 1982-1986, 1995, and 1997-1998 (Figure 1.1b) (Time Series Data, 2016).



Map 1.1: The 1981-2010 PRISM Precipitation Model for WMU 8, North Slope (PRISM Climate Group, Oregon State University, 2016).

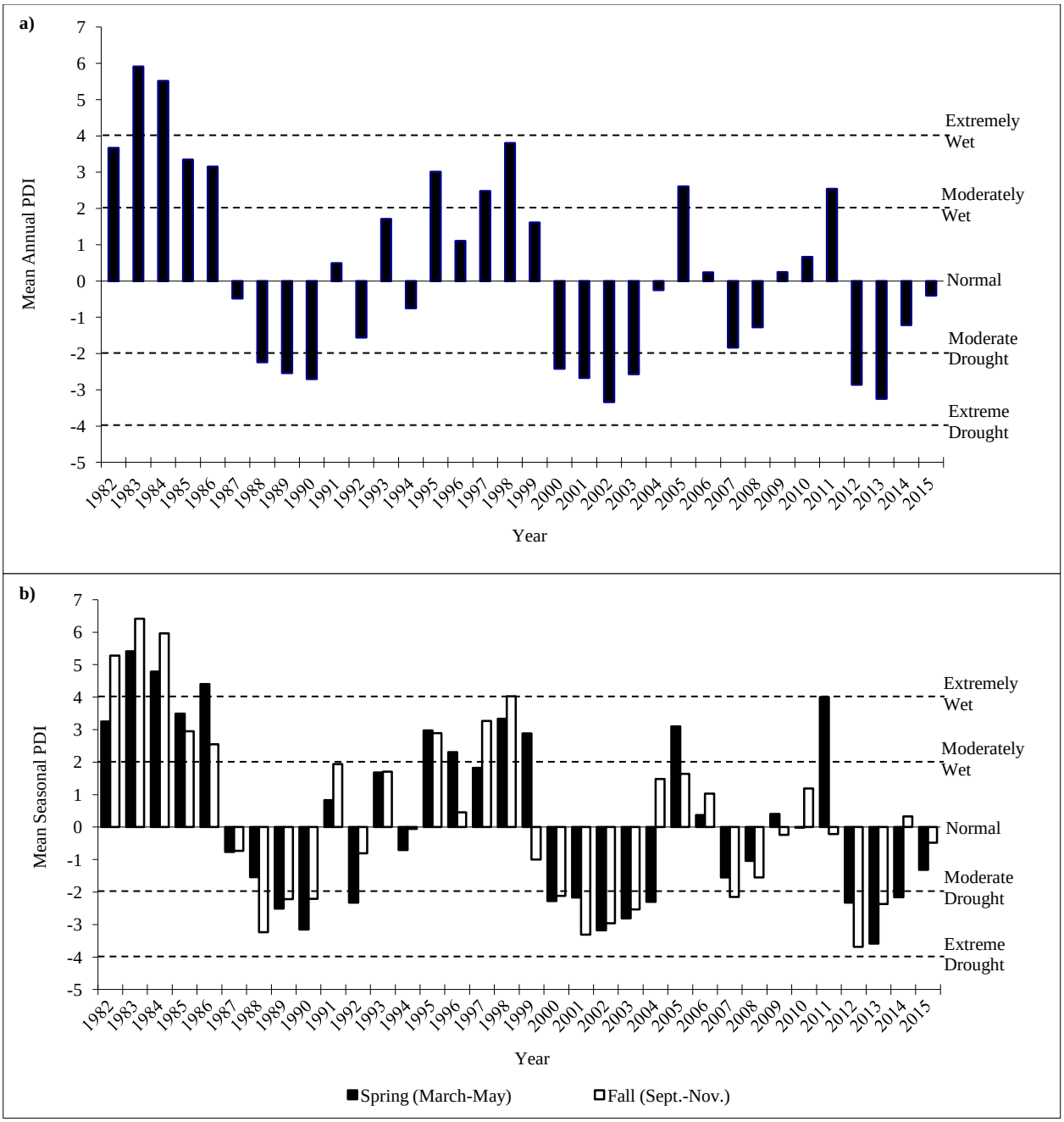


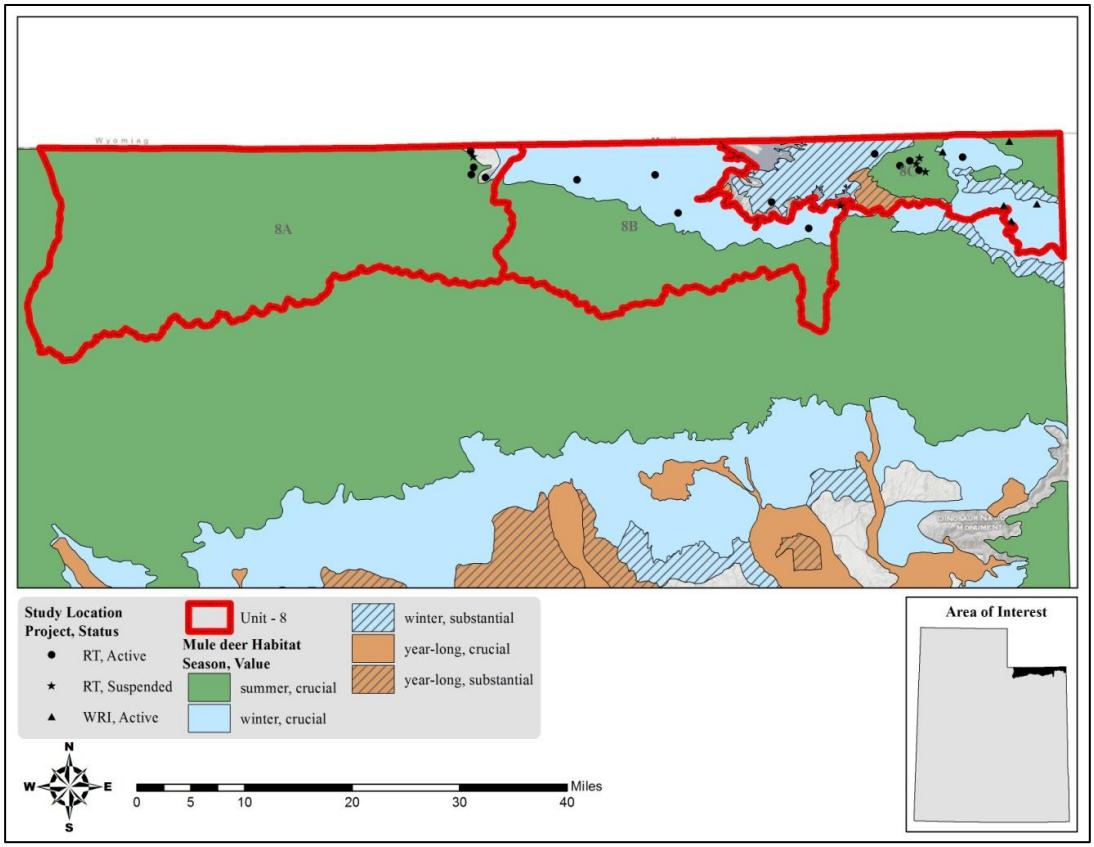
Figure 1.1: The 1982-2015 Palmer Drought Severity Index (PDSI) for the Northern Mountains division (Division 5). The PDSI is based on climate data gathered from 1895 to 2015. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet and negative deviations indicate drought. Classification of the scale is ≥4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to2.9 = 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 -.9 = Incipient Dry Spell, -1.0 to -1.9 = Mild Drought, -2.0 to -2.9 = Moderate Drought, -3.0 to -3.9 = Severe Drought and ≤-4.0 = Extreme Drought (Time Series Data 2014). a) Mean annual PDSI. b) Mean spring (March-May) and fall (Sept.-Nov.).

Big Game Habitat

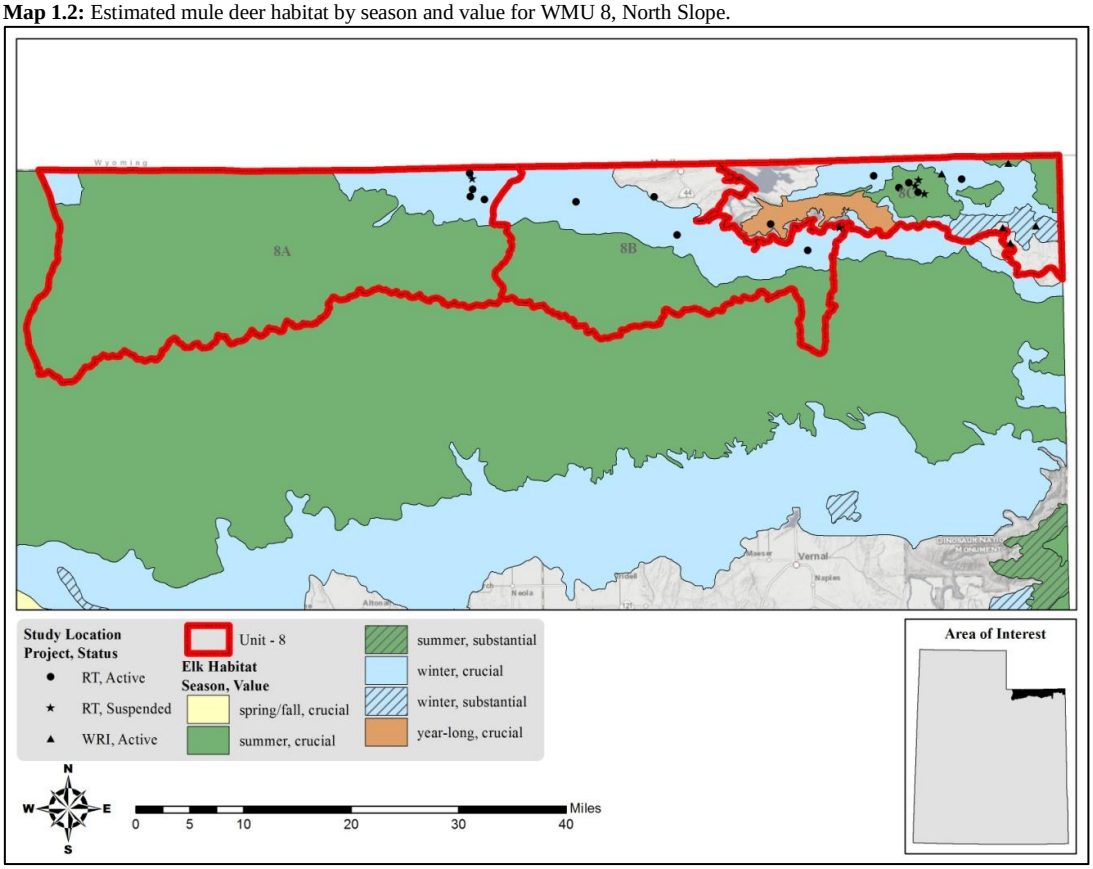
There are approximately 180,000 acres in Unit 8 (Subunits 8A, 8B, and 8C) that are considered to be deer winter range and approximately 196,000 acres are considered to be elk winter range (Map 1.2, Map 1.3, Table 1.1). 42% of deer winter range is on land owned by the U.S. Forest Service (USFS), 21% is managed by the Bureau of Land Management (BLM), 21% is privately owned, 11% is administered by the Utah School and Institutional Trust Lands Administration (SITLA), 3% is managed by the Utah Division of Wildlife Resources (DWR), and less than 1% is owned by the Utah Department of Transportation (UDOT) or Fire and State Lands (SL&F). A majority (87%) of the summer range is on USFS land, 8% is privately owned, and the remaining

5% is managed by the BLM, SITLA, or UDWR. Much of the year long range (65%) is also managed by the USFS, 31% is privately owned, 4% is administered by SITLA, and less than 1% is managed by UDWR (Table 1.2). Habitat in the North Slope unit is variable and ranges from sagebrush and mountain brush communities to alpine tundra above the timberline, which includes vast expanses of lodgepole pine (*Pinus contorta*).

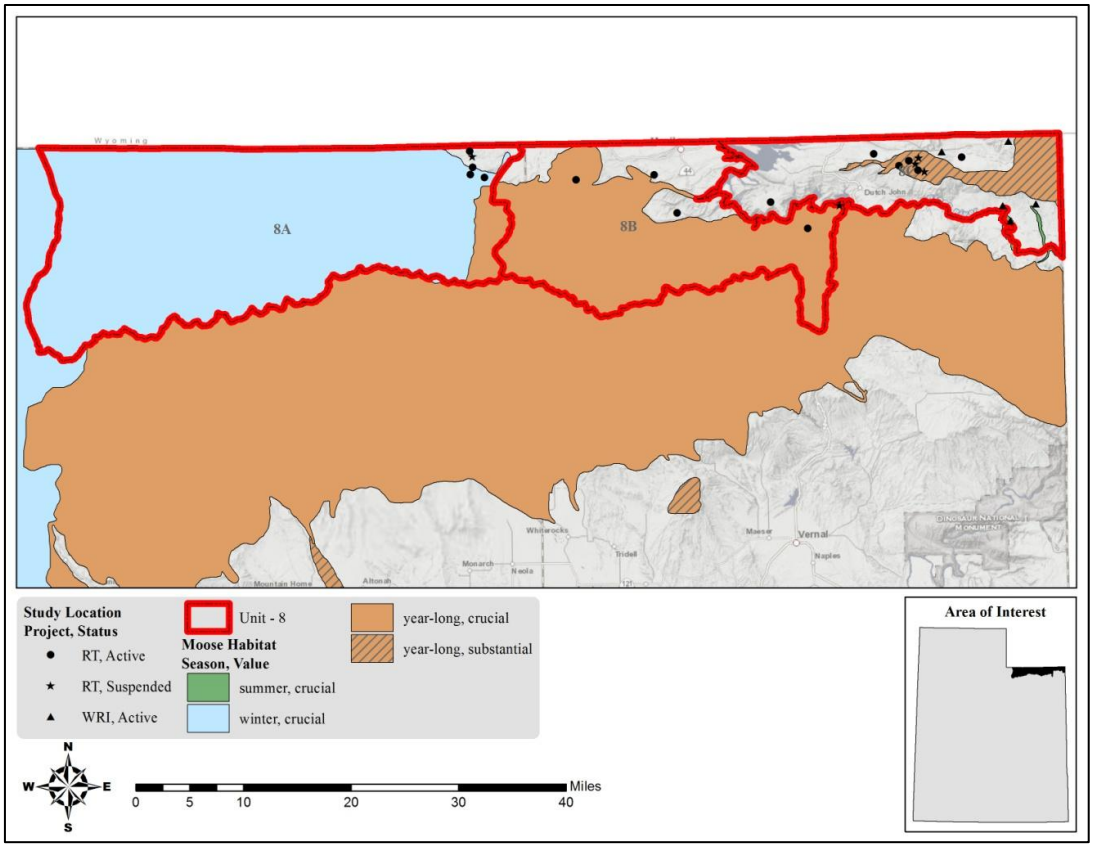
Several important deer winter concentration areas were identified within the unit in the 1974 range inventory. They include the Dowd Mountains, Bear Mountains, Goslin Mountains, Dutch John Flat, Little Hole, Red Creek Flat, Taylor Flat, Death Valley and Digger Basin (Olson 1975). The key areas for elk winter range are found on the alderleaf mountain mahogany slopes of Phil Pico Mountain, Bald Range, Widdop Mountain, and Jessen Butte.



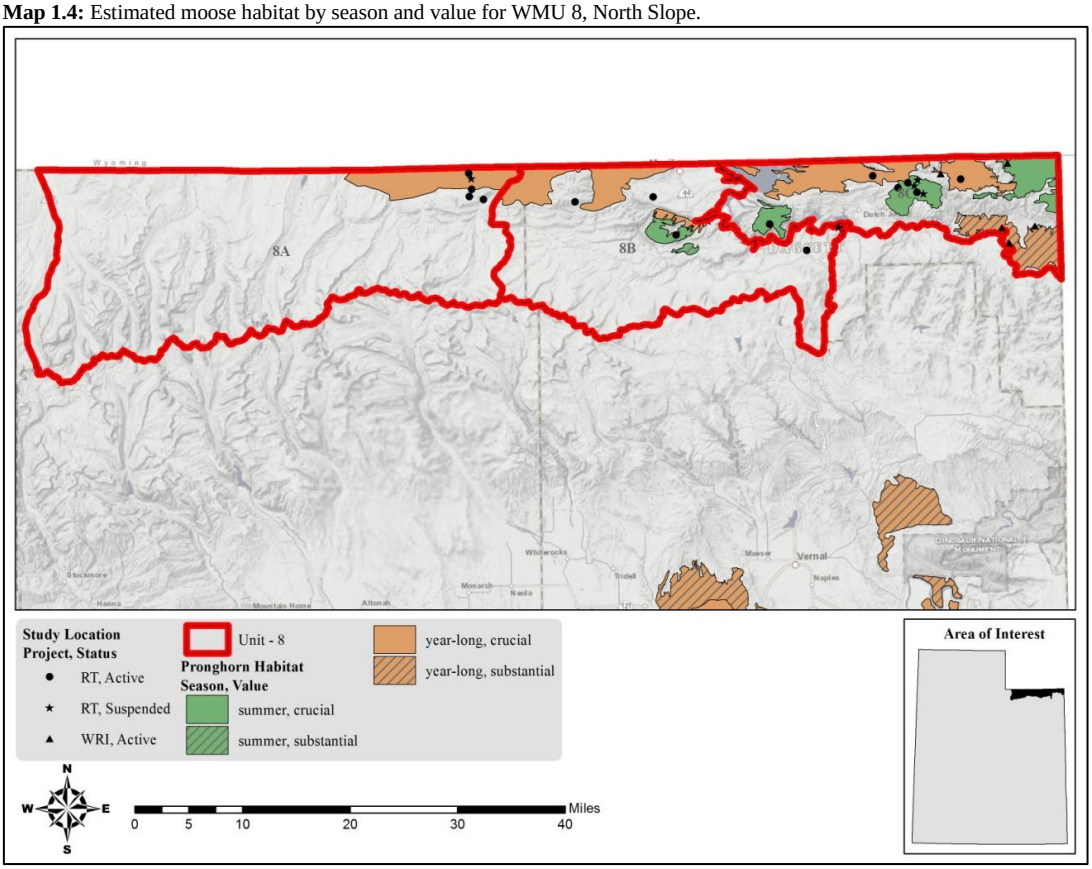
Map 1.2: Estimated mule deer habitat by season and value for WMU 8, North Slope.



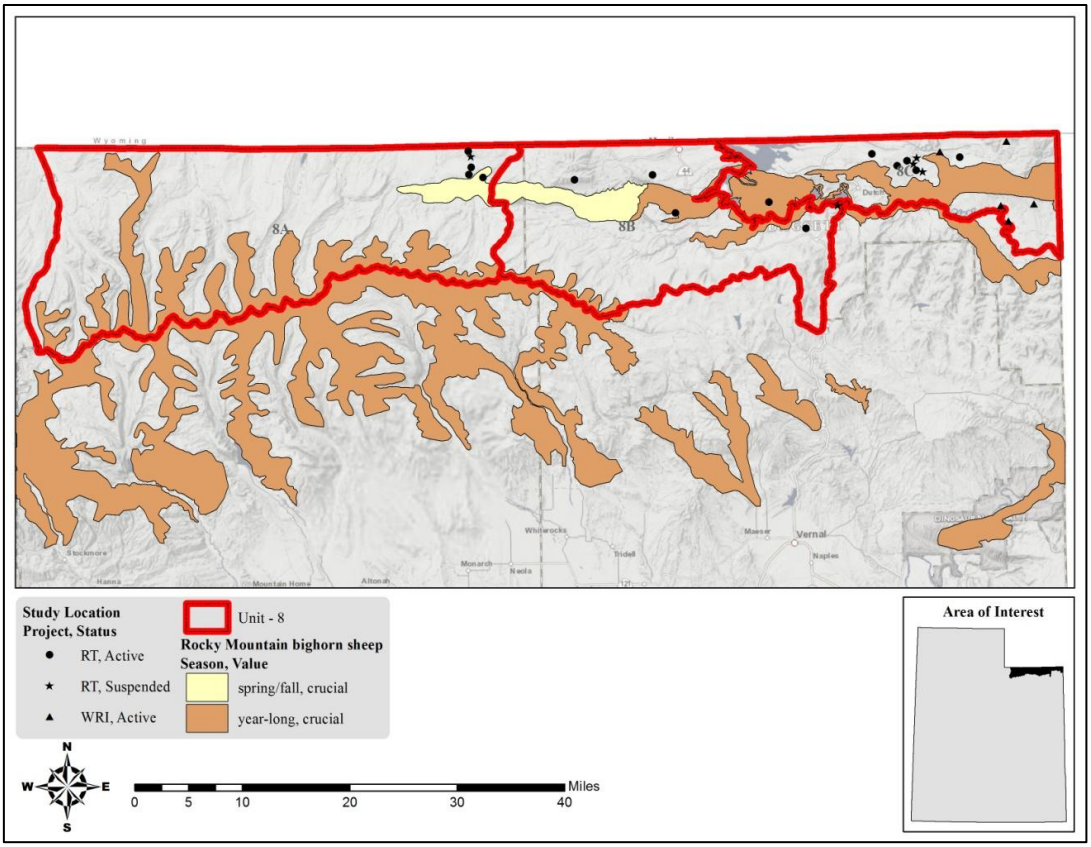
Map 1.3: Estimated elk habitatat by season and value for WMU 8, North Slope.



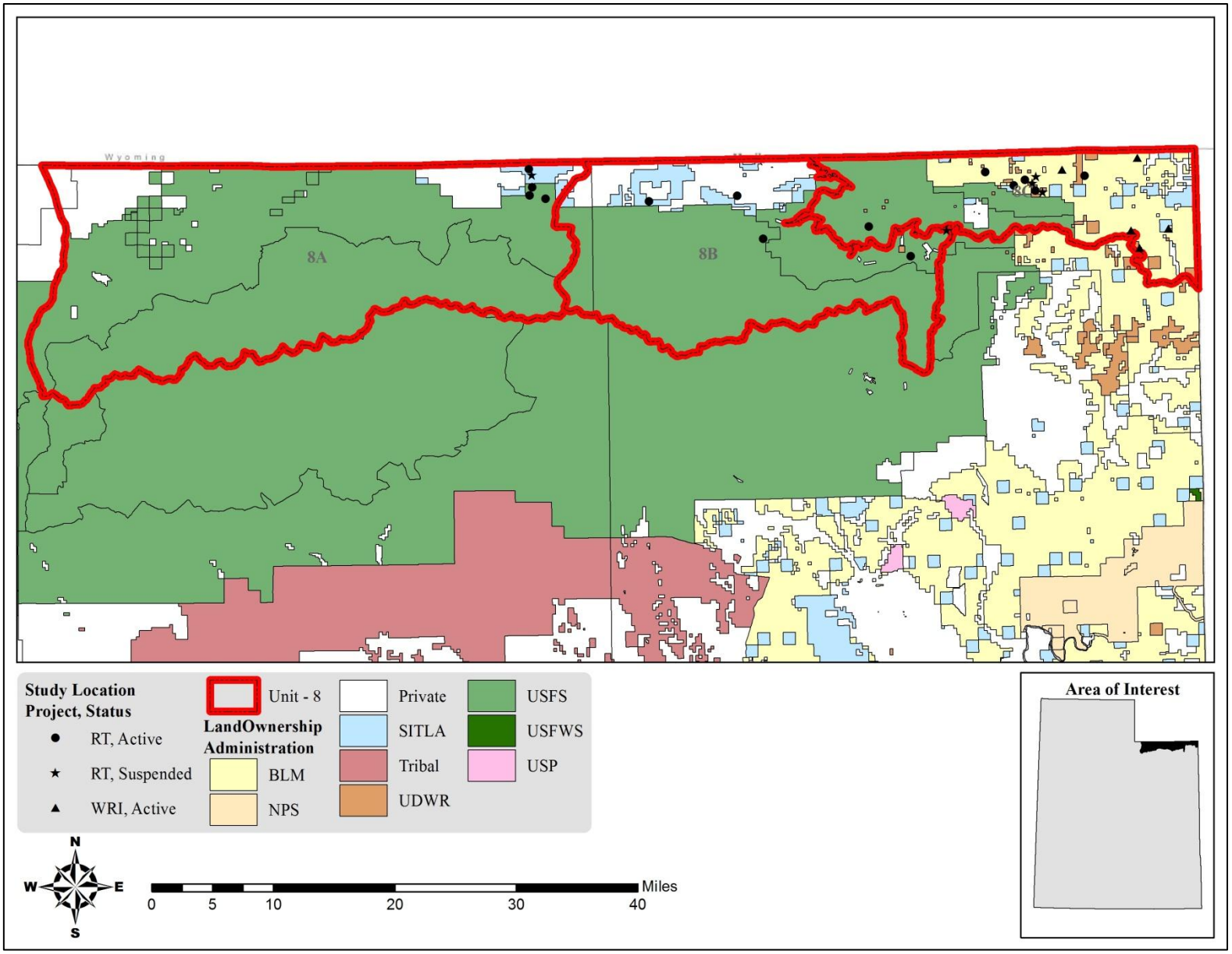
Map 1.4: Estimated moose habitat by season and value for WMU 8, North Slope.



Map 1.5: Estimated pronghorn 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.

	Year Long Range		Summer Range		Winter Range		Spring/Fall	
	Area (acres)	*%*	*Area (acres)*	*%*	*Area (Acres)*	*%*	*Area (Acres)*	*%*
Mule Deer	7,338	1%	569,597	75%	180,389	24%	0	0%
Elk	18,655	3%	502,118	70%	196,294	27%	0	0%
Moose	228,107	37%	2,479	<1%	379,586	62%	0	0%
Pronghorn	85,128	75%	27,716	25%	0	0%	0	0%
RMBS	172,105	86%	0	0%	0	0%	28,952	14%

Table 1.1: Estimated mule deer, elk, moose, pronghorn, and Rocky Mountain bighorn sheep (RMBS) habitat acreage by season for WMU 8, North Slope.

	Year Long Range		Summer Range		Winter Range	
Ownership	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
BLM	0	0%	20,033	4%	43,202	24%
DOD	0	0%	0	0%	0	0%
NPS	0	0%	0	0%	0	0%
Private	2,249	31%	45,825	8%	37,188	21%
SITLA	302	4%	7,819	1%	19,276	11%
UDWR	7	<1%	989	<1%	4,627	3%
UDOT	0	0%	0	0%	9	<1%
SL&F	0	0%	0	0%	2	<1%
USFS	4,780	65%	494,914	87%	76,070	42%
Total	7,338	100%	569,580	100%	180,374	100%

Table 1.2: Estimated mule deer habitat acreage by season and ownership for WMU 8, North Slope.

	Year Long Range		**Summer Range**		**Winter Range**	
Ownership	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
BLM	0	0%	13,933	3%	40,624	21%
Private	2,268	12%	23,905	5%	41,724	21%
SITLA	314	2%	4,311	1%	21,903	11%
UDWR	127	1%	1,075	<1%	2,545	1%
UDOT	0	0	0	0%	9	<1%
USFS	15,946	85%	458,890	91%	89,470	46%
Total	18,655	100%	502,114	100%	196,275	100%

Table 1.3: Estimated elk habitat acreage by season and ownership for WMU 8, North Slope.

	Year Long Range		**Summer Range**		**Winter Range**	
Ownership	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
BLM	19,188	8%	1,171	47%	0	0%
Private	9,985	4%	535	22%	41,949	11%
SITLA	13,814	6%	27	1%	1,599	<1%
SL&F	0	0%	28	1%	0	0%
UDWR	1,076	<1%	719	29%	0	0%
USFS	184,041	81%	0	0%	336,039	89%
Total	228,103	**100%**	2,479	**100%**	379,586	**100%**

Table 1.4: Estimated moose habitat acreage by season and ownership for WMU 8, North Slope.

	Year Long Range		**Summer Range**	
Ownership	*Area (acres)*	*%*	*Area (acres)*	*%*
BLM	28,167	33%	9,060	33%
Private	28,638	34%	2,610	9%
SITLA	12,147	14%	3,420	12%
UDOT	9	<1%	0	0%
UDWR	3,614	4%	646	2%
USFS	12,544	15%	11,978	43%
Total	85,120	**100%**	27,713	**100%**

Table 1.5: Estimated pronghorn habitat by season and ownership for WMU 8, North Slope

	Year Long Range		**Spring/Fall**	
Ownership	*Area (acres)*	*%*	*Area (acres)*	*%*
BLM	14,683	8%	0	0%
Private	5,018	3%	761	3%
SITLA	4,607	3%	229	<1%
UDWR	393	<1%	0	0%
USFS	147,400	86%	27,962	97%
Total	172,102	**100%**	28,952	**100%**

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

Group	Existing Vegetation Type	Acres	% of Total	Group % of Total
Conifer	Rocky Mountain Lodgepole Pine Forest	193,161	24.66%	
	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	114,587	14.63%	
	Colorado Plateau Pinyon-Juniper Woodland	52,539	6.71%	
	Conifer-Hardwood	29,488	3.76%	
	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	10,316	1.32%	
	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	9,953	1.27%	
	Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland	7,068	0.90%	
	Southern Rocky Mountain Ponderosa Pine Woodland	6,660	0.85%	
	Rocky Mountain Foothill Limber Pine-Juniper Woodland	5,392	0.69%	
	Other Conifer	1,810	0.23%	55.01%
Exotic Herbaceous	Introduced Upland Vegetation-Annual Grassland	10,426	1.33%	
	Introduced Upland Vegetation-Perennial Grassland and Forbland	1,629	0.21%	
	Introduced Upland Vegetation-Annual and Biennial Forbland	1,045	0.13%	1.67%
Grassland	Rocky Mountain Subalpine-Montane Mesic Meadow	21,204	2.71%	
	Southern Rocky Mountain Montane-Subalpine Grassland	8,492	1.08%	
	Inter-Mountain Basins Semi-Desert Grassland	7,403	0.95%	
	Northern Rocky Mountain Lower Montane-Foothill-Valley Grassland	2,603	0.33%	
	Rocky Mountain Alpine Dwarf-Shrubland	1,579	0.20%	
	Other Grassland	399	0.05%	5.32%
Shrubland	Artemisia tridentata ssp. vaseyana Shrubland Alliance	39,369	5.03%	
	Inter-Mountain Basins Big Sagebrush Shrubland	31,797	4.06%	
	Inter-Mountain Basins Big Sagebrush Steppe	17,261	2.20%	
	Rocky Mountain Lower Montane-Foothill Shrubland	12,458	1.59%	
	Inter-Mountain Basins Montane Sagebrush Steppe	11,633	1.48%	
	Inter-Mountain Basins Greasewood Flat	9,352	1.19%	
	Inter-Mountain Basins Mat Saltbush Shrubland	2,969	0.38%	
	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	2,634	0.34%	
	Wyoming Basins Dwarf Sagebrush Shrubland and Steppe	2,194	0.28%	
	Inter-Mountain Basins Mixed Salt Desert Scrub	1,892	0.24%	
	Colorado Plateau Mixed Low Sagebrush Shrubland	1,025	0.13%	
	Other Shrubland	1,031	0.13%	17.06%
Other	Barren	43,023	5.49%	
	Sparsely Vegetated	32,787	4.19%	
	Hardwood	31,358	4.00%	
	Riparian	23,179	2.96%	
	Open Water	15,593	1.99%	
	Developed	9,154	1.17%	
	Agricultural	8,810	1.12%	
	Other	114	0.01%	20.94%
Total		783,387	100%	100%

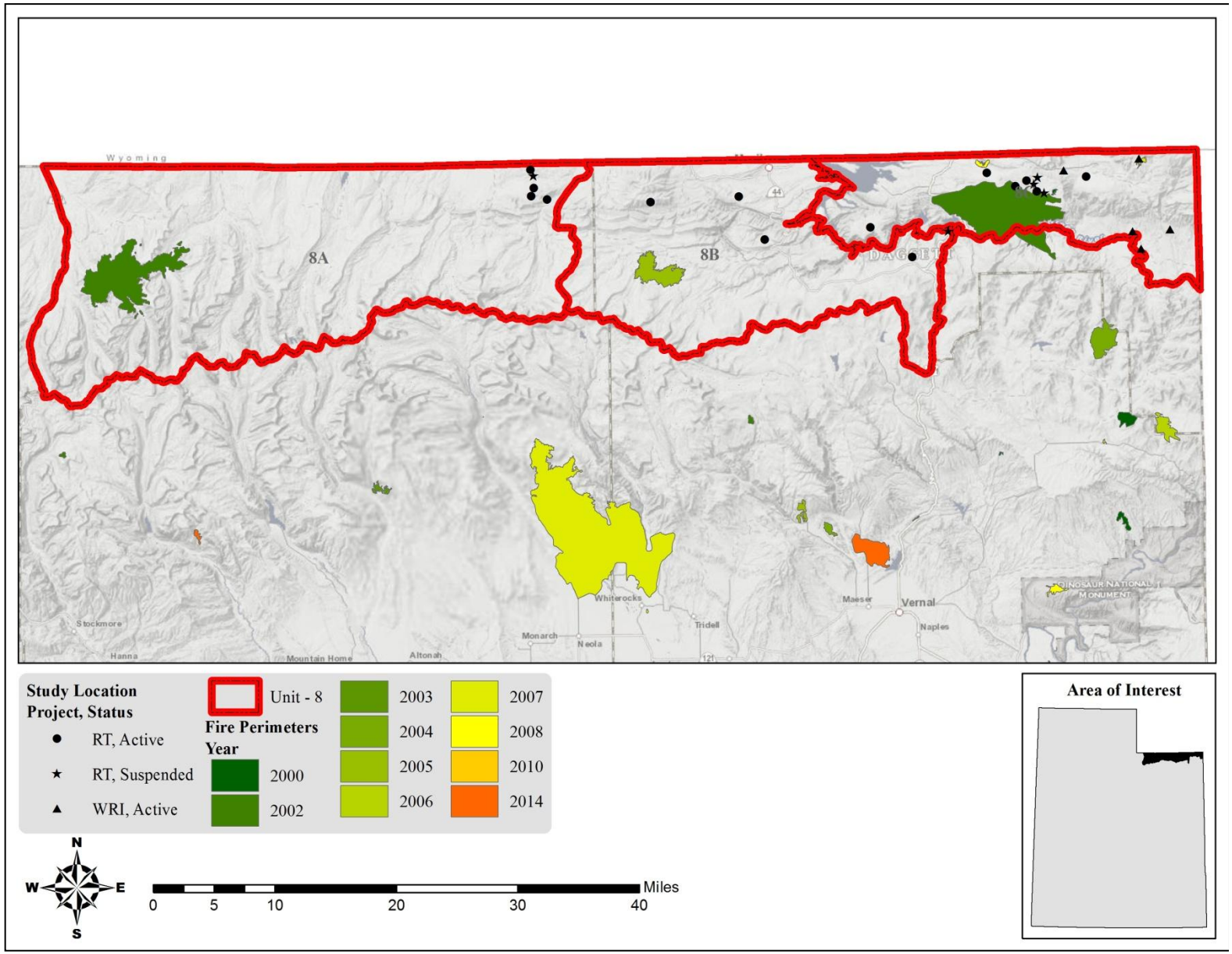
Table 1.7: Landfire existing vegetation coverage (LANDFIRE: LANDFIRE 1.3.0, 2014) for WMU 8, North Slope.

Limiting Factors to Big Game Habitat

Deer winter range on the Utah side of the border is a major limiting factor on the unit, with many deer wintering in Wyoming. The area supports a variety of wildlife and outdoor recreation, livestock grazing, ranches and farms, energy developments and some forest industry. Flaming Gorge Reservoir supports various forms of water recreation as well as energy production from the dam. Following construction of the Flaming Gorge dam, approximately 14,000 acres of deer winter range was flooded, but the reservoir does not appear to be a serious barrier to migration (Warren 1973). Most livestock grazing was concurrently eliminated within the Green River corridor. The area is now managed for recreation and electrical power generation associated with the reservoir.

Although not an immediate threat, encroachment of pinyon (*Pinus edulis*) and juniper (*Juniperus* sp.) is a potential limiting factor; approximately 7% of the unit is classified as pinyon-juniper woodland (Table 1.7). Encroachment of these woodlands into sagebrush communities has been shown to limit browse and herbaceous cover, therefore decreasing available forage for wildlife (Miller, Svejcar, & Rose, 2000).

Finally, deer fences and crossings limiting range are a concern, but cooperation with the Utah Department of Transportation in construction of highway fences, passage structures, warning signs, etc. will continue in order to ensure proper access to habitat as well as deer and human safety.



Map 1.8: Land coverage of fires by year from 2000-2014 for WMU 8, North Slope.

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Treatments/Restoration Work

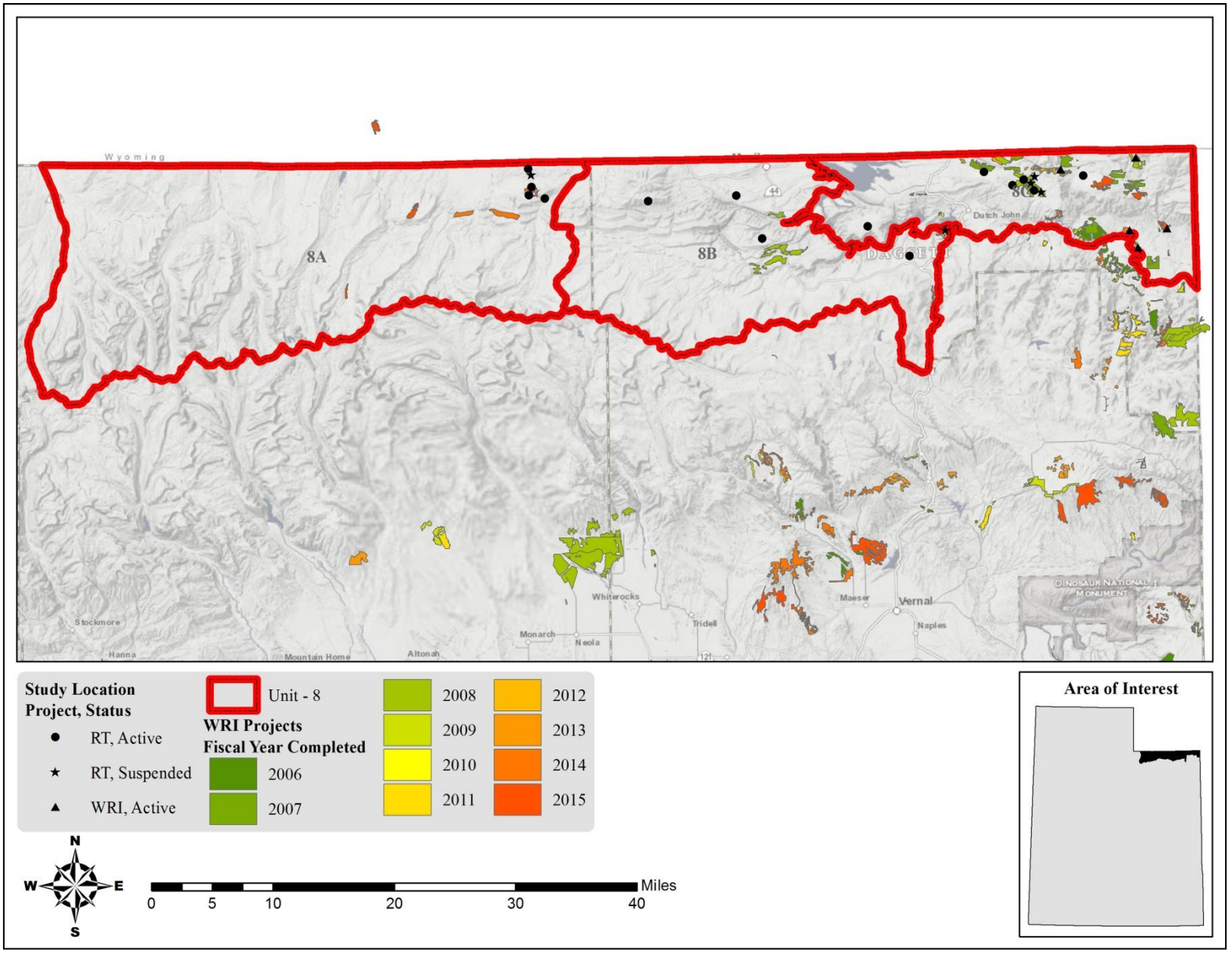
There has been an active effort to address many of the limitations on this unit through the Watershed Restoration Initiative (WRI). A total of 13,407 acres of land have been treated within the North Slope unit since the WRI was implemented in 2004 (Map 1.9). Treatments frequently overlap one another, which brings the total treatment acres to 13,550 acres for this unit (Table 1.8). Other treatments have occurred outside of the WRI through independent agencies and landowners, but the WRI comprises the majority of work done on deer winter ranges throughout the State of Utah.

Vegetation removal via hand crew is the most common management practice. Bullhog use to remove pinyon and Utah juniper is also common. Other management practices include seeding of herbaceous and shrub species to amplify the understory and other vegetation improvements (Table 1.8).

Treatment Action	**Acres**
Vegetation Removal/Hand Crew	10,056
Bullhog	1,146
Vegetation Improvements	910
Seeding (Primary)	684
Seeding (Secondary/Shrub)	566
Forestry Practices	187
***Total Land Area Treated**	13,407
Total Treatment Acres	13,550

Table 1.8: WRI treatment action size (acres) for WMU 8, North Slope.

*Does not include overlapping treatments.



Map 1.9: WRI treatments by fiscal year completed for WMU 8, North Slope.

Range Trend Studies

Range Trend studies have been sampled on a regular basis within subunit 8A since 1988 and within subunits 8B and 8C since 1982; studies have been added or suspended as has been deemed necessary (Table 1.9). Due to changes in sampling methodologies, only data sampled 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 and sampled on a regular basis following treatment. Due to the long-term nature of the studies, many of the Range Trend or WRI study sites have had some sort of disturbance or treatment prior to or since study establishment (Table 1.10).

Range Trend studies are summarized in this report by ecological site. Range Trend and WRI studies that have had a disturbance or treatment during the reported sample period are summarized in this report by the disturbance or treatment type and are summarized by region.

Study #	Study Name	Project	Status	Year(s) Sampled	Ecological Site Description
08A-1	Widdop Mtn. South Slope	RT	Active	‘88, ‘95, ‘00, ‘05, ‘10	Mountain Stony Loam (Browse)
08A-2	Widdop Mtn. North Slope	RT	Active	‘88, ‘95, ‘00, ‘05, ‘10	Mountain Stony Loam (Browse)
08A-3	Bald Range South	RT	Suspended	‘88, ‘95	Not Verified
08A-4	Bald Range	RT	Active	‘88, ‘95, ‘00, ‘05, ‘10, ‘15	Mountain Stony Loam (Browse)
08A-5	Telephone Hollow	RT	Active	‘88, ‘95, ‘00, ‘05, ‘10, ‘15	Mountain Stony Loam (Browse)
08B-1	Cedar Springs	RT	Suspended	‘82, ‘88, ‘95	Not Verified
08B-4	Greendale	RT	Active	‘82, ‘88, ‘95, ‘00, ‘05, ‘10, ‘15	Mountain Loam (Mountain Big Sagebrush)
08B-5	Bennett Ranch	RT	Active	‘82, ‘88, ‘95, ‘00, ‘05, ‘10, ‘15	Upland Loam (Mountain Big Sagebrush)
08B-6	Death Valley	RT	Active	‘82, ‘88, ‘95, ‘00, ‘05, ‘10, ‘15	Mountain Shallow Loam (Birchleaf Mountain Mahogany)
08B-8	Phil Pico Mountain	RT	Active	‘88, ‘95, ‘00, ‘05, ‘10, ‘15	Mountain Very Steep Stony Loam (Browse)
08C-2	Goslin Mountain	RT	Active	‘82, ‘88, ‘95, ‘00, ‘05, ‘10, ‘15	Mountain Loam (Mountain Big Sagebrush)
08C-3	Bear Top Mountain	RT	Active	‘82, ‘88, ‘95, ‘00, ‘05, ‘10, ‘15	Mountain Loam (Mountain Big Sagebrush)
08C-7	Antelope Flat	RT	Active	‘88, ‘95, ‘00, ‘05, ‘10, ‘15	Upland Loam (Wyoming Big Sagebrush)
08C-9	West Goslin	RT	Active	‘95, ‘00, ‘05, ‘10, ‘15	Mountain Loam (Mountain Big Sagebrush)
08C-10	Sagebrush Ridge	RT	Suspended	‘95, ‘00	Not Verified
08C-11	Triangle Meadow	RT	Suspended	‘95, ‘00	Not Verified
08C-12	Big Meadow	RT	Active	‘95, ‘00, ‘10, ‘15	Semiwet Fresh Meadow
08C-13	Lower Big Meadow	RT	Suspended	‘95, ‘00	Not Verified
08C-14	Clay Basin Bench	RT	Active	‘00, ‘05, ‘10, ‘15	Semidesert Loam (Wyoming Big Sagebrush)
08R-1	Brown’s Park db Drum	WRI	Active	‘05, ‘08, ‘12	Semidesert Sandy Loam (Fourwing Saltbush)
08R-2	Teepee Mountain Bullhog	WRI	Active	‘07, ‘10, ‘13	Upland Stony Loam (Mountain Big Sagebrush)
08R-3	Goslin Mountain Bullhog	WRI	Active	‘08, ‘10, ‘13	Upland Loam (Mountain Big Sagebrush)
08R-4	Bake Oven	WRI	Active	‘12	Semidesert Sandy Loam (Fourwing Saltbush)
08R-5	Birch Creek	WRI	Active	‘14	Semidesert Gravelly Sandy Loam (Wyoming Big Sagebrush)

Table 1.9: 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	Size (acres)	WRI Project #
08A-2	Widdop Mtn. North Slope	Lop and Scatter	Telephone Hollow Lop and Scatter	September 2014	303	2536
08A-5	Telephone Hollow	Lop and Scatter	Telephone Hollow Lop and Scatter	September 2014	303	2536
08C-2	Goslin Mountain	Lop and Scatter	Goslin Mountain Phase 2 Lop and Scatter	May 2008	1,221	691
08C-3	Bear Top Mountain	Prescribed Fire		1998		
08C-9	West Goslin	Wildfire	Mustang	2002	21,638	

Study #	Study Name	Type	Disturbance Name (if available)	Date	Size (acres)	WRI Project #
08R-1	Brown's Park db Drum	Herbicide-Tordon, 2-4D	Brown's Park	June 2005	141	26
		Aerator	Brown's Park	2005	141	26
		Broadcast After	Brown's Park	2005	141	26
08R-2	Teepee Mountain Bullhog	Bullhog	Teepee Mountain Bullhog Project	Summer 2007	535	692
08R-3	Goslin Mountain Bullhog	Seed Unknown	Goslin Bullhog Phase 2	October 2008	250	1090
		Bullhog	Goslin Bullhog Phase 2	Spring 2009	250	1090
08R-4	Bake Oven	Herbicide-Arsenal	Bake Oven Sagebrush Restoration	December 2013 - January 2014	129	2268
		Truax Drill	Bake Oven Sagebrush Restoration	December 2013 - January 2014	129	2268
08R-5	Birch Creek	Aerial Before	Birch Creek Pinyon and Juniper Removal	November 2014	276	2913
		Bullhog	Birch Creek Pinyon and Juniper Removal	December 2014	276	2913
		Aerial After	Birch Creek Pinyon and Juniper Removal	January 2015	276	2913

Table 1.10: Range trend and WRI studies known disturbance history for WMU 8, North Slope.

Study Trend Summary (Range Trend)

Mountain (Sagebrush)

There are four study sites [Greendale (08B-4), Goslin Mountain (08C-2), Bear Top Mountain (08C-3), and West Goslin (08C-9)] classified as Mountain (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.

Shrubs/Trees: The primary browse species on these sites is mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), although other browse species are present in smaller amounts. Line intercept cover of sagebrush has increased from year to year and is good overall with 15% cover in 2015 (Figure 1.2). Density of sagebrush has remained stable since 2005. The recruitment of young plants has varied, but has overall remained low, as has the density of decadent plants. Mature plants have been the most dominant age group throughout the study years (Figure 1.5).

The increased cover and density of conifers as shown in Figures 1.3 and 1.4 is due entirely to the Greendale study site.

Herbaceous Understory: The general herbaceous understory has increased over the sample years and is mainly dominated by perennial grasses; the exception to this is the Bear Top Mountain study, which was dominated by the invasive annual grass cheatgrass (*Bromus tectorum*) in 2010 and 2015. Overall cover of annual grasses has generally increased over the sample years, from less than 1% in 2005 to 5% in 2010 and 6% in 2015.

Cover of perennial and annual forbs has fluctuated, but has shown an overall decreasing trend (Figure 1.6).

Occupancy: Pellet transect data indicates that elk and deer/pronghorn have been present on these sites; cattle pellet groups were not found in 2015, but were observed in previous sample years. Although days use exhibited an initial increase, it has shown an overall decrease for all animals (Figure 1.7).

Mountain (Browse)

There are six study sites [Widdop Mountain South Slope (08A-1), Widdop Mountain North Slope (08A-2), Bald Range (08A-4), Telephone Hollow (08A-5), Death Valley (08B-6), and Phil Pico Mountain (08B-8)] classified as Mountain (Browse) ecological sites. Widdop Mountain South Slope is located on the south slope of Widdop Mountain, and the Widdop Mountain North Slope and Telephone Hollow studies are located on the north slope. The Bald Range study site is found on Bald Range, north of Widdop Mountain. Death Valley occurs southwest of Flaming Gorge Reservoir on the north slope of Windy Ridge. The Phil Pico Mountain study is found on the south slope of Phil Pico Mountain.

Shrubs/Trees: These sites are 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 are present, but contribute much less cover. Overall, the mean cover of preferred browse species has increased over the study years, from 25% in 2005, 31% in 2010, and 33% in 2015. Sagebrush has occurred in much lower amounts, with average cover ranging from 2.5% in 2005 to 4% in 2015 (Figure 1.2): an exception to this is the Death Valley study, on which sagebrush cover ranged from 8% in 2005 to 10% in 2015. The density of sagebrush plants has exhibited an overall downward trend over the study years. Recruitment of young plants has remained consistently low as has the number of decadent plants. Mature plants make up a majority of the sagebrush population (Figure 1.5).

Overall tree encroachment is minimal. However, pinyon pine was recorded in 2015 with density measurements on the Telephone Hollow and Death Valley study sites. The population comprised mainly of seedlings and young trees (Figure 1.3, Figure 1.4). Although overall encroachment may vary from site to site, it is likely over time these seedlings and young trees will increase in size.

Herbaceous Understory: In general, herbaceous cover has fluctuated on these sites over the study years with the dominant component being perennial grasses. Perennial forbs have exhibited an overall increase and contributed 8% cover in 2015. The cover provided by annual grasses and forbs has varied over time, but has been less than 1% in all sample years (Figure 1.6).

Occupancy: Pellet transect data indicates that these sites have largely been occupied by elk, and to a lesser extent, deer/pronghorn, and cattle. Animal presence on these sites has fluctuated, but has shown an overall decreasing trend over the study years. The mean abundance of elk pellet groups has ranged from 26 days use/acre in 2015 to 46 days use/acre in 2005. The mean abundance of deer/pronghorn pellet groups has ranged from 7 days use/acre in 2005 to 26 days use/acre in 2010. The mean abundance of cattle pellet groups has ranged from 3 days use/acre in 2015 to 4 days use/acre in 2005 (Figure 1.7).

Upland (Sagebrush)

There are two study sites [Bennett Ranch (08B-5) and Antelope Flat (08C-7)] that are classified as Upland (Sagebrush) ecological sites. Bennett Ranch is located southwest of Manila on the low northern slope of Jessen Butte. The Antelope Flat study site is found in the eastern portion of Antelope Flat near Goslin Mountain.

Shrubs/Trees: The shrub understory of Bennett Ranch is dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), while that of Antelope Flat is dominated by Wyoming big sagebrush (*A. tridentata* ssp. *wyomingensis*). Save for black sagebrush (*A. nova*) on Bennett Ranch, other preferred browse species are lacking on both sites. Average sagebrush cover has remained relatively stable, ranging from 24.5% in 2005 to 26% in 2010 (Figure 1.2). A majority of the sagebrush population has been classified as mature for all sample years, although decadent individuals have remained moderately abundant. Recruitment of young plants has varied, but has generally remained low (Figure 1.5).

No tree cover was recorded on these study sites, but twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) were recorded in 2015 density measurements for Bennett Ranch. Although density values are low, this site is considered to be within Phase I of woodland succession (Figure 1.3, Figure 1.4).

Herbaceous Understory: These study sites have a moderately abundant herbaceous understory. The Bennett Ranch site has been dominated by perennial grasses in all sample years. The herbaceous understory of Antelope Flat was also dominated by perennial grasses through the 2005 study year, but annual grasses, namely cheatgrass (*Bromus tectorum*), became dominant in 2010, placing the site at an increased risk for fire. Cover of perennial forbs has ranged from 3% in 2010 to just over 5% in 2000, while that of annual forbs has remained low (Figure 1.6).

Occupancy: Pellet transect data indicates that deer/pronghorn currently occupy these studies along with elk and cattle to a lesser extent. The mean abundance of deer/pronghorn pellet groups has ranged from 8 days use/acre in 2000 to 26 days use/acre in 2010. The mean abundance of elk pellet groups has ranged from 8 days use/acre in 2015 to 20 days use/acre in 2005. Cattle have consistently been the most infrequent occupiers of these sites, with pellet groups ranging from 6 days use/acre in 2015 to 13 days use/acre in 2005 (Figure 1.7).

Semidesert (Sagebrush)

One study site [Clay Basin Bench (8C-14)] is classified as a Semidesert (Sagebrush) ecological site. The Clay Basin Bench study is located south of the Utah-Wyoming border in central Clay Basin.

Shrubs/Trees: Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) is the primary browse on the Clay Basin Bench study, and although cover has exhibited an increasing trend since 2005, it has remained low throughout the study years. Other browse species are present on the site, but provide little cover. Other shrubs, mainly broom snakeweed (*Gutierrezia sarothrae*) and pricklypear cactus (*Opuntia* sp.) contribute the most cover in the shrub understory, ranging from 2% in 2005 to 5.5% in 2015 (Figure 1.2). The demographics of the sagebrush population have fluctuated over the study years, but have mainly been a mixture of mature and decadent individuals. Recruitment of young plants has remained low (Figure 1.5). Pinyon-juniper encroachment is not discussed in this report as it is not occurring at this time.

Herbaceous Understory: The herbaceous understory of the Clay Basin Bench study is plentiful and is dominated by perennial grasses, mainly needle and thread (*Hesperostipa comata*). Although cover has fluctuated slightly in recent sample years, perennial grasses have shown an overall increasing trend. Cover of both annual grasses and annual forbs has increased over time, with each contributing about 10% cover in 2015; much of the 2015 annual grass cover is contributed by the invasive species cheatgrass (*Bromus tectorum*). Perennial forbs have remained rare, with cover ranging from 0.2% in 2005 and 2010 to 2% in 2000 (Figure 1.6).

Occupancy: The mean abundance of elk pellet groups has ranged from 0 days use/acre in 2010 and 2015 to 6 days use/acre in 2000. The mean abundance of deer/pronghorn groups has ranged from 7 days use/acre in 2015 to 53 days use/acre in 2000. The mean abundance of cattle pellet groups has ranged from 12 days use/acre in 2005 to 20 days use/acre in 2000.

Semiwet Fresh Meadow

One study site [Big Meadow (8C-12)] is classified as a Semiwet Fresh Meadow ecological site. Big Meadow is located on the lower southern slope of Goslin Mountain, southeast of the Goslin Mountain (8C-2) and West Goslin (8C-9) study sites.

Shrubs/Trees: Shrubs and trees are absent from this study site.

Herbaceous Understory: This site is dominated by perennial grasses, which have exhibited an increasing trend over the study years. Although arctic rush (*Juncus arcticus*) has been the most abundant perennial graminoid in the past, cover has decreased from 34% in 2010 to just 6% in 2015. The cover of Kentucky bluegrass (*Poa pratensis*) has become the most dominant perennial grass species, with cover more than doubling from 23% in 2010 to 49% in 2015: this substantial increase could possibly be in response to heavy grazing. Perennial forbs are also quite abundant, with cover has ranging from 11% in 2010 to 20% in 2015. Annual grasses do not and have not occurred on this study site, and annual forbs contribute a very low amount of cover. (Figure 1.6).

Occupancy: Pellet transect data shows no current occupancy of this site although animals have been present in previous sample years. Mean abundance of pellet groups for deer/pronghorn has ranged from 0 days use/acre in 2000 and 2015 to 21 days use/acre in 2010. Mean abundance of pellet groups for cattle has ranged from 0 days use/acre in 2015 to 164 days use/acre in 2010 (Figure 1.7).

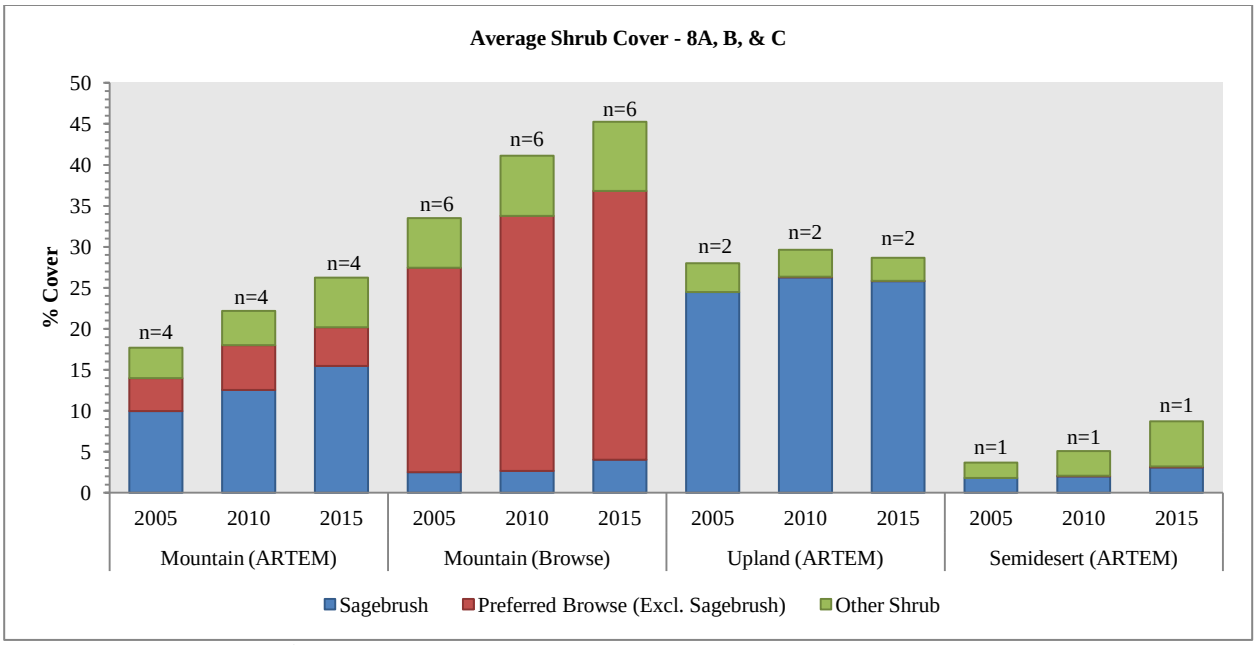


Figure 1.2: Average shrub cover for Mountain (ARTEM), Mountain (Browse), Upland (ARTEM), and Semidesert (ARTEM) study sites in WMU 8, North Slope.

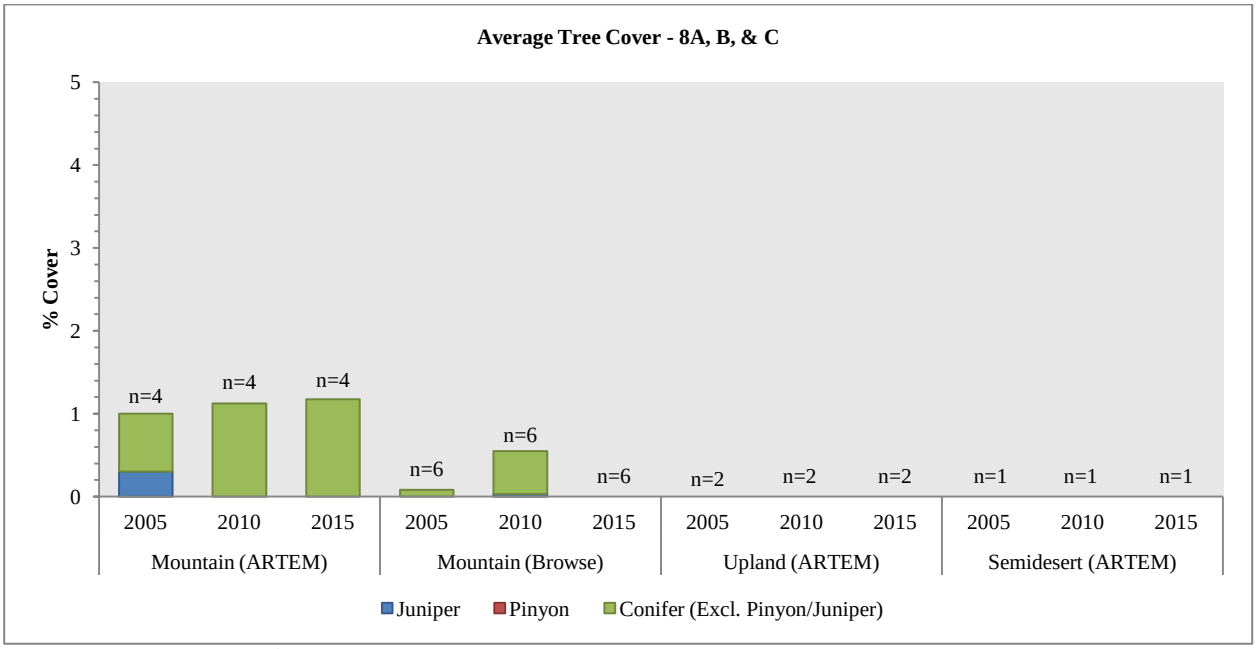


Figure 1.3: Average tree cover for Mountain (ARTEM), Mountain (Browse), Upland (ARTEM), and Semidesert (ARTEM) study sites in WMU 8, North Slope.

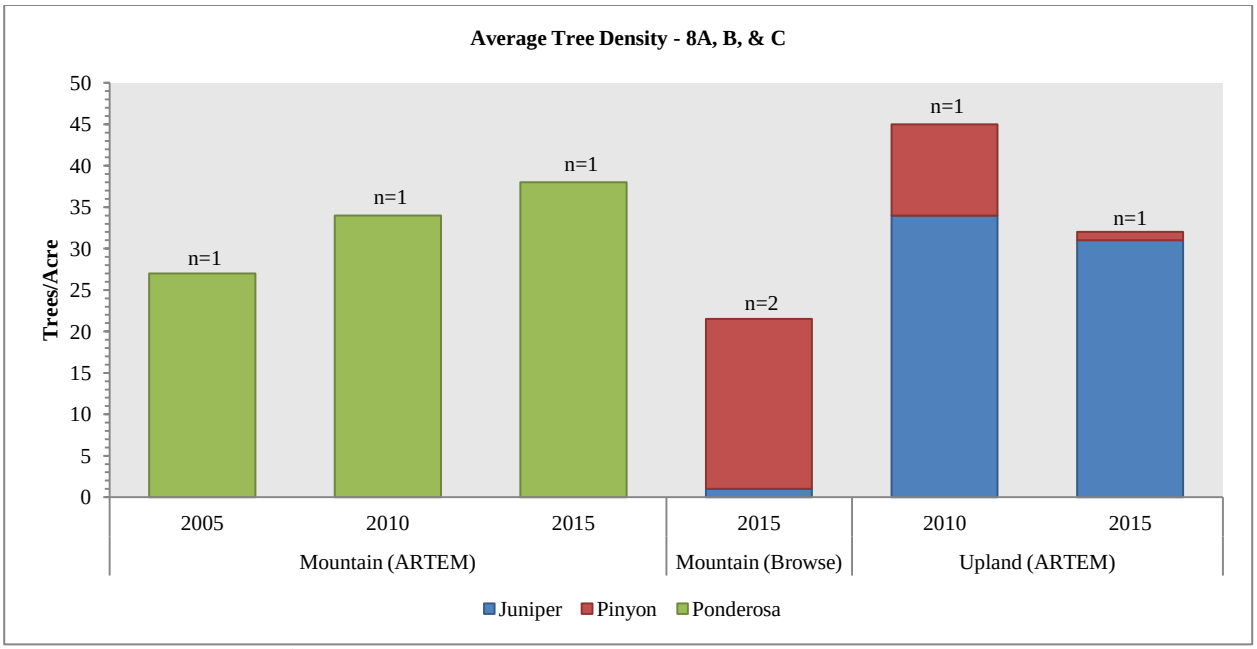


Figure 1.4: Average tree density for Mountain (ARTEM), Mountain (Browse), and Upland (ARTEM) study sites in WMU 8, North Slope.

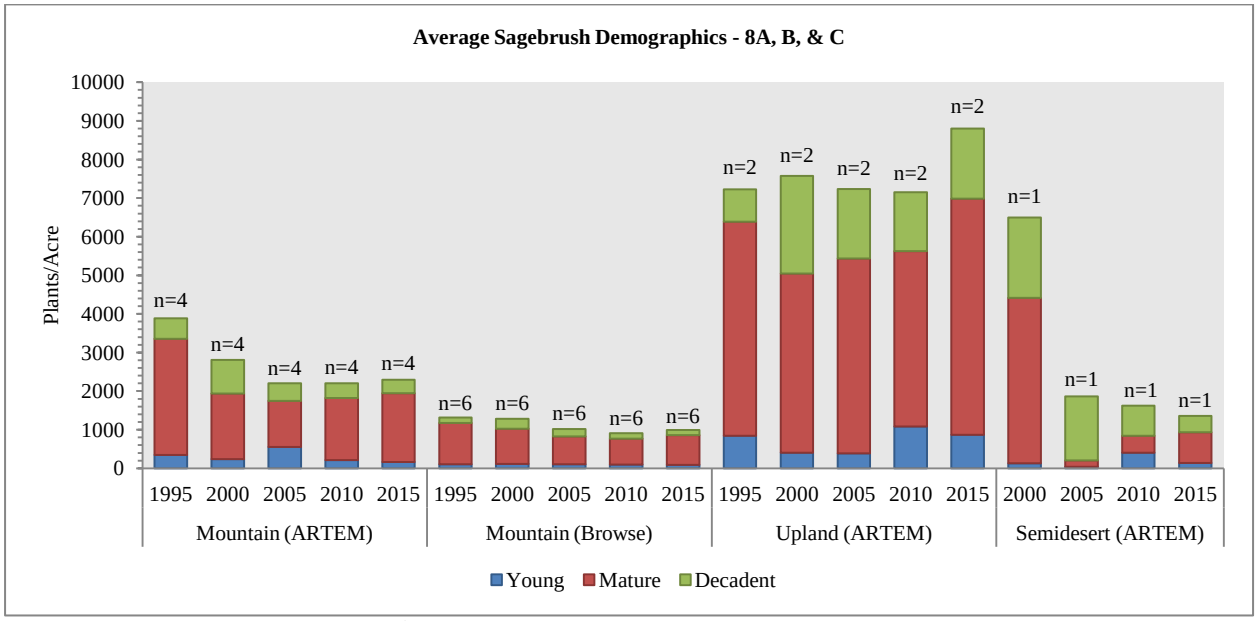


Figure 1.5: Average sagebrush demographics for Mountain (ARTEM), Mountain (Browse), Upland (ARTEM), and Semidesert (ARTEM) study sites in WMU 8, North Slope.

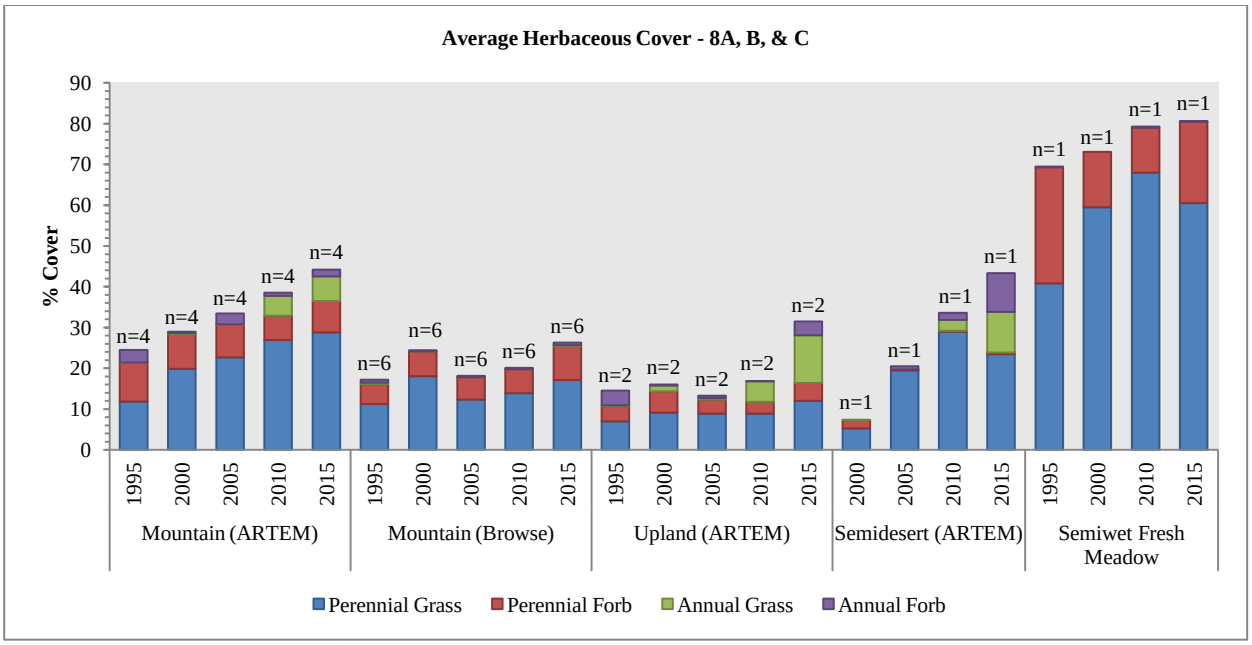


Figure 1.6: Average herbaceous cover for Mountain (ARTEM), Mountain (Browse), Upland (ARTEM), Semidesert (ARTEM), and Semiwet Fresh Meadow study sites in WMU 8, North Slope.

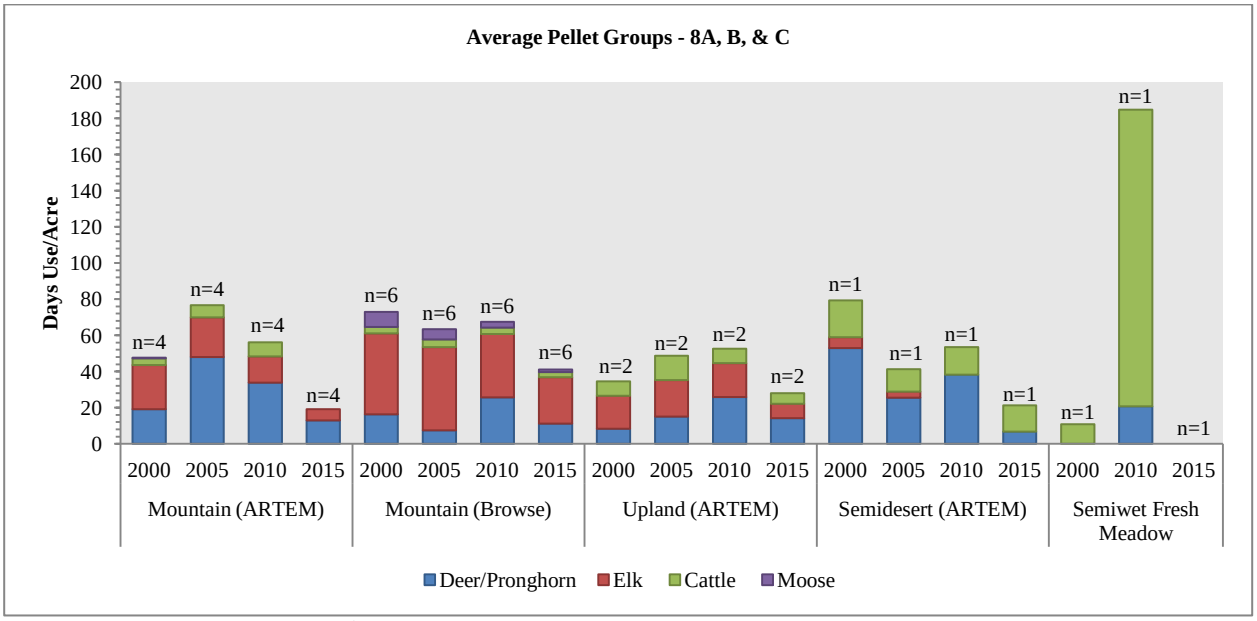


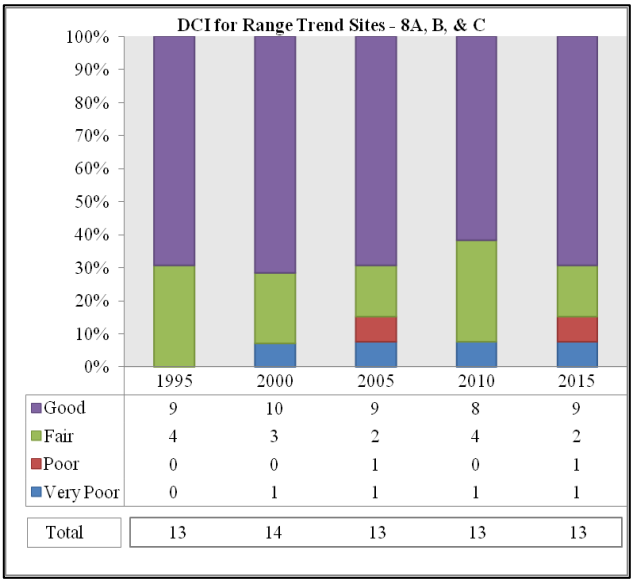
Figure 1.7: Average pellet transect data for Mountain (ARTEM), Mountain (Browse), Upland (ARTEM), Semidesert (ARTEM), and Semiwet Fresh Meadow study sites in WMU 8, North Slope.

Deer Winter Range Condition Assessment

The condition of deer winter range within the North Slope management unit has continually changed on the sites sampled since 1995. A majority of the Range Trend sites in WMU 8 are considered to be in good condition as of 2015 (Figure 1.8, Map 1.14). Bear Top Mountain remains in very poor condition due to an abundance of annual grass and a lack of perennial forb and browse cover. Death Valley, Antelope Flat, and Clay Basin Bench ranged from poor to fair and Widdop Mountain South Slope, Widdop Mountain North Slope, Bald Range, Telephone Hollow, Greendale, Bennett Ranch, Phil Pico Mountain, Goslin Mountain, and West Goslin are all considered to be in good condition. The treated sites ranged from very poor to good

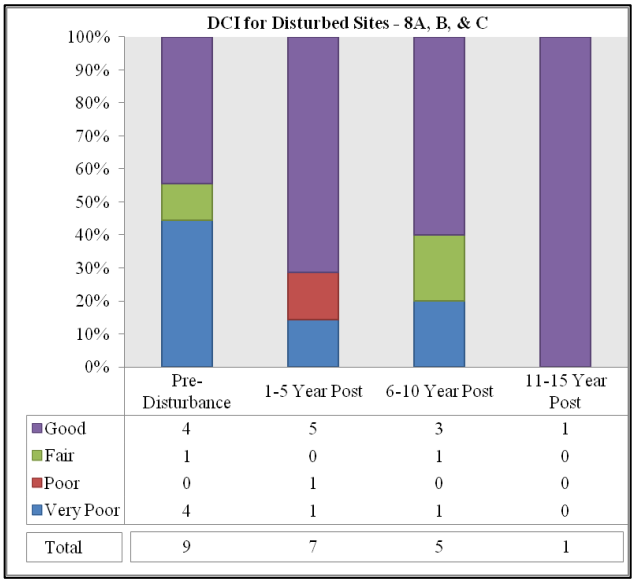
condition (Figure 1.9, Map 1.14). Widdop Mountain South Slope, Telephone Hollow, Goslin Mountain, and West Goslin are also considered to be Range Trend sites and are therefore discussed above.

The conditions of deer winter range for sites following treatment or disturbance have generally improved in the years post-disturbance. Brown's Park db Drum was considered to be in very poor condition prior to treatment due to the lack of available browse and herbaceous cover. Bake Oven and Birch Creek, which ranked as very poor, were sampled prior to treatment and have not been sampled since that time. Goslin Mountain Bullhog and Teepee Mountain Bullhog have improved from very poor and fair condition (respectively) prior to treatment to good condition as of 2013. Given more time and continual monitoring it is possible that these sites will continue to improve.



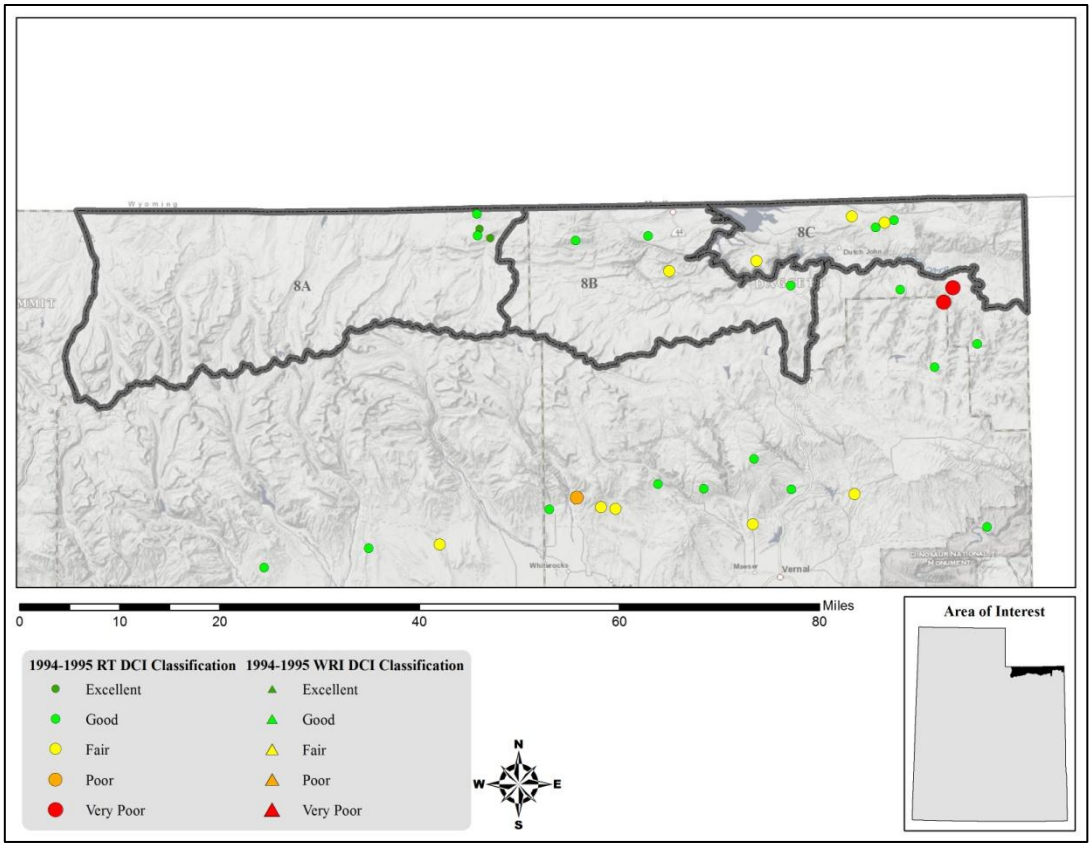
	1995	2000	2005	2010	2015
Good	9	10	9	8	9
Fair	4	3	2	4	2
Poor	0	0	1	0	1
Very Poor	0	1	1	1	1
Total	13	14	13	13	13

Figure 1.8: Deer winter range Desirable Components Index (DCI) summary by year of Range Trend sites for WMU 8, North Slope.

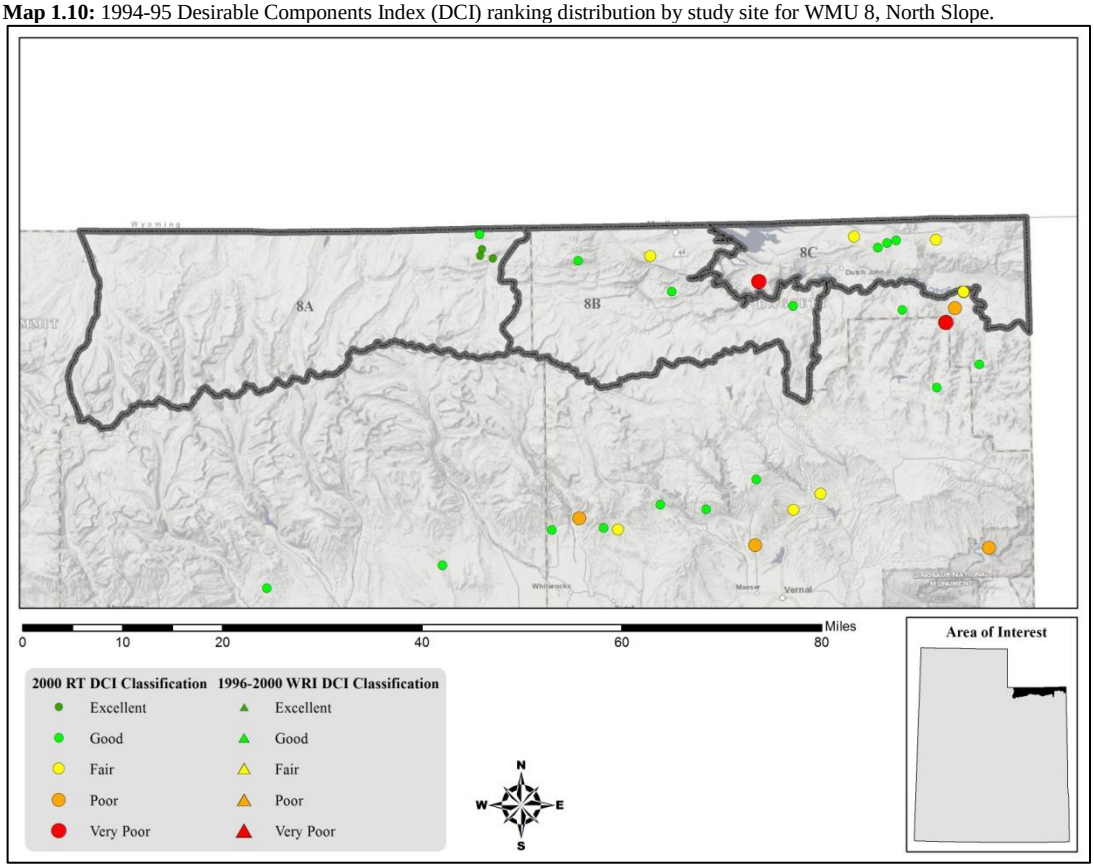


	Pre-Disturbance	1-5 Year Post	6-10 Year Post	11-15 Year Post
Good	4	5	3	1
Fair	1	0	1	0
Poor	0	1	0	0
Very Poor	4	1	1	0
Total	9	7	5	1

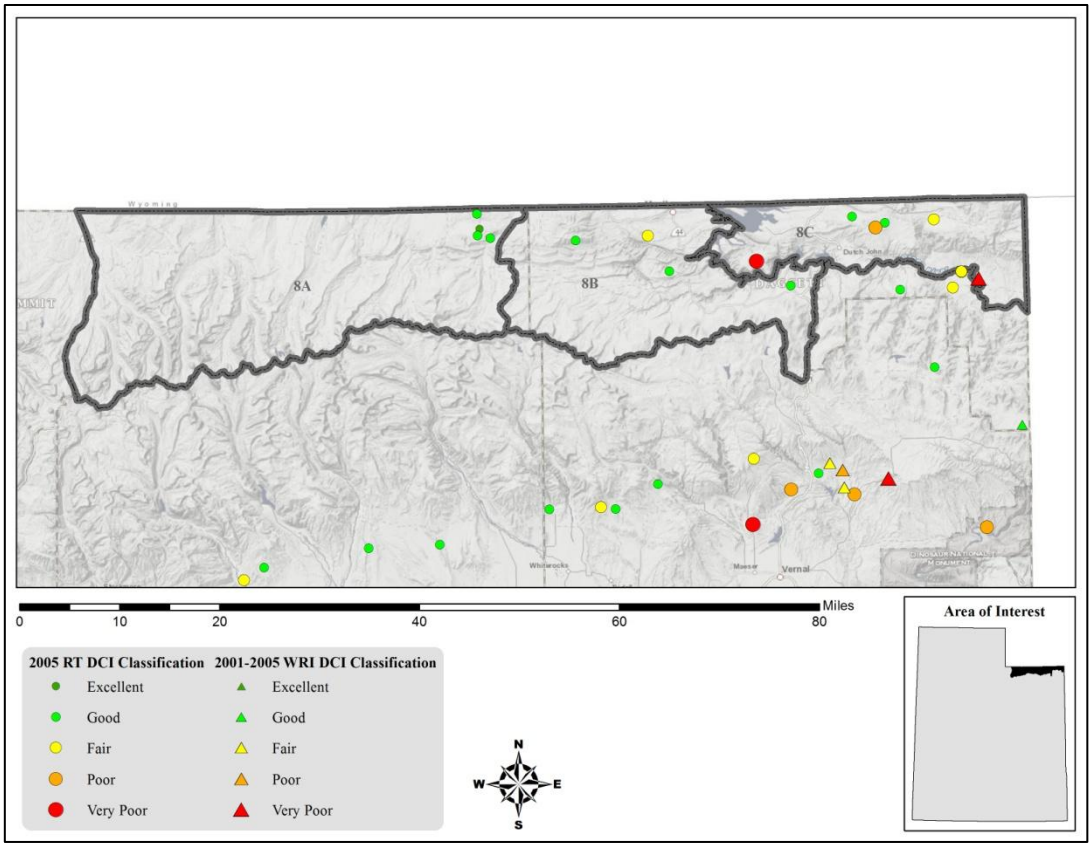
Figure 1.9: Deer winter range Desirable Components Index (DCI) summary by year of treated/disturbed sites for WMU 8, North Slope.



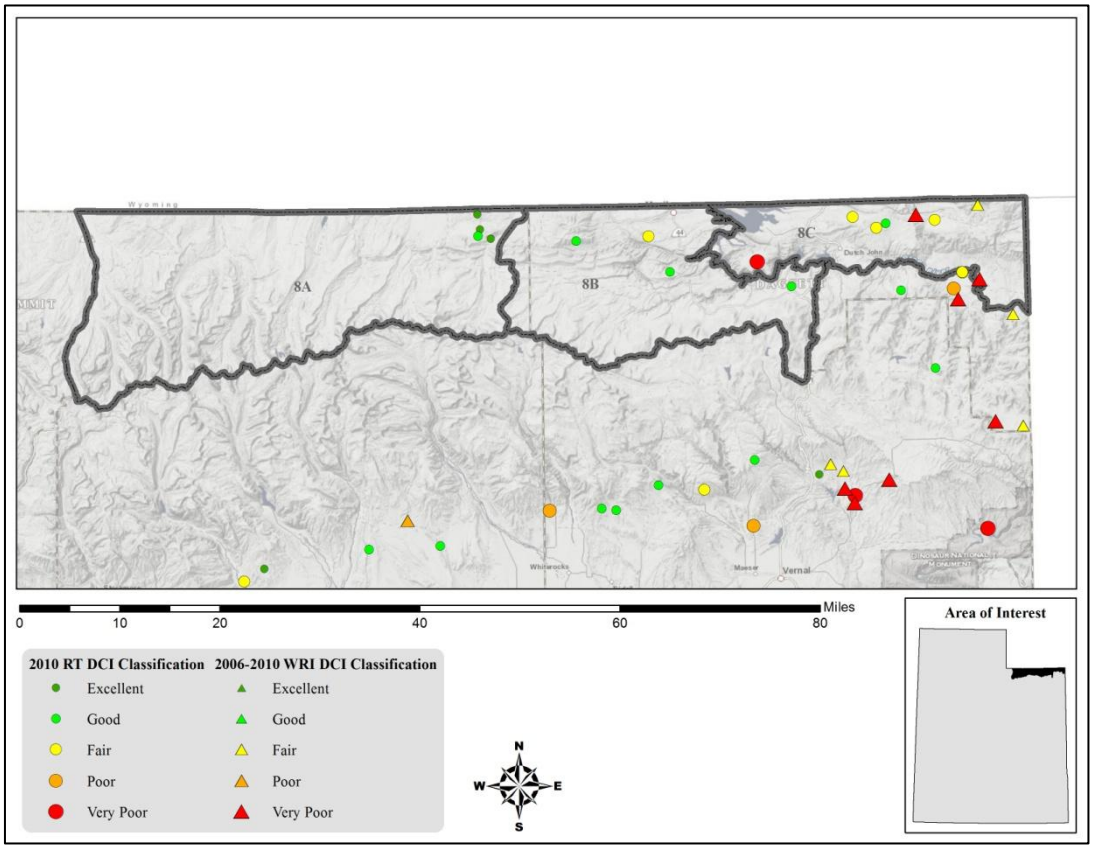
Map 1.10: 1994-95 Desirable Components Index (DCI) ranking distribution by study site for WMU 8, North Slope.



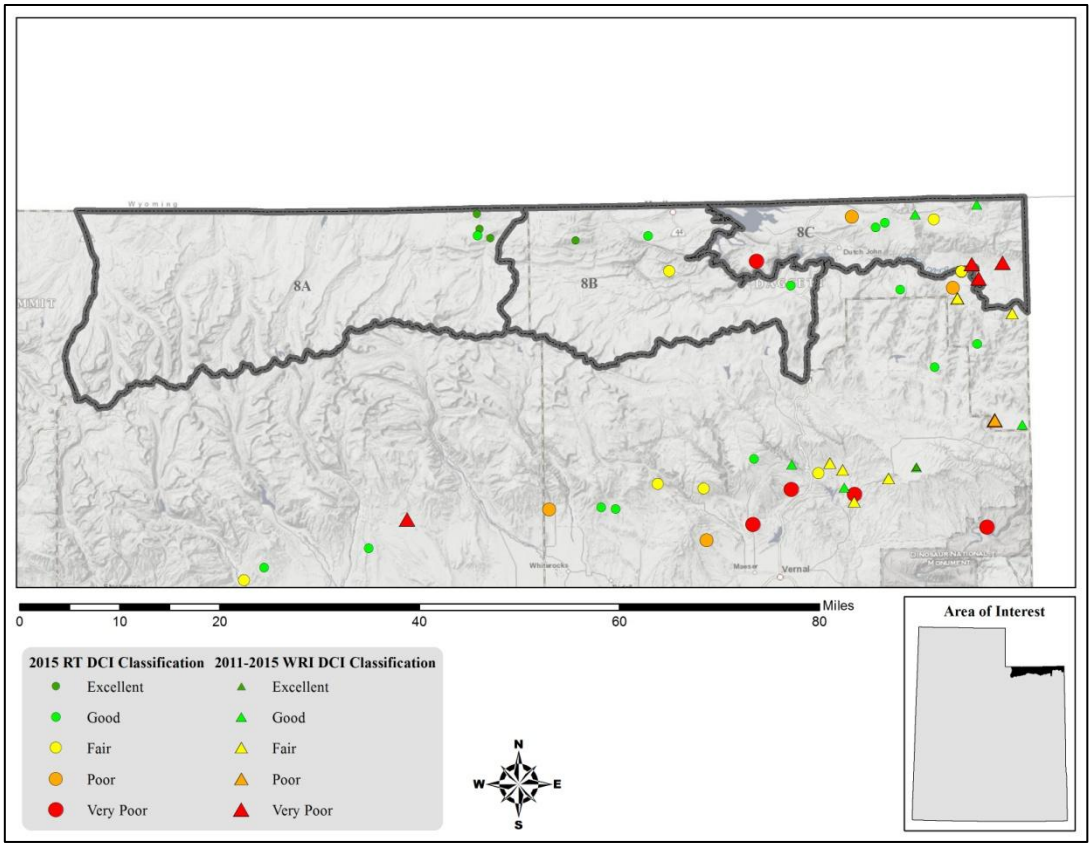
Map 1.11: 2000 Desirable Components Index (DCI) ranking distribution by study site for WMU 8, North Slope.



Map 1.12: 2005 Desirable Components Index (DCI) ranking distribution by study site for WMU 8, North Slope.



Map 1.13: 2010 Desirable Components Index (DCI) ranking distribution by study site for WMU 8, North Slope.



Map 1.14: 2015 Desirable Components Index (DCI) ranking distribution by study site for WMU 8, North Slope.

Study #	Study Name	Limiting Factor and/or Threat	Level of Threat	Potential Impact
08A-1	Widdop Mtn. South Slope	None Identified		
08A-2	Widdop Mtn. North Slope	Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species.
08A-4	Bald Range	None Identified		
08A-5	Telephone Hollow	None Identified		
08B-1	Cedar Springs	PJ Encroachment	High	Reduced understory shrub and herbaceous vigor.
08B-4	Greendale	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
08B-5	Bennett Ranch	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
08B-6	Death Valley	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
08B-8	Phil Pico Mountain	Annual Grass	Low	Increased fire potential.
08C-2	Goslin Mountain	Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species.
08C-3	Bear Top Mountain	Annual Grass	High	Increased fire potential.
		Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species.
08C-7	Antelope Flat	Annual Grass	High	Increased fire potential.
08C-9	West Goslin	Annual Grass	Low	Increased fire potential.
08C-10	Sagebrush Ridge	None Identified		
08C-11	Triangle Meadow	None Identified		
08C-12	Big Meadow	Intensive Grazing	High	Reduced diversity of desirable grass and forb species.
08C-13	Lower Big Meadow	None Identified		
08C-14	Clay Basin Bench	Annual Grass	Low	Increased fire potential.
08R-1	Brown's Park db Drum	Introduced Annual Forbs	Moderate	Reduced diversity of desirable grass and forb species.
08R-2	Teepee Mountain Bullhog	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
08R-3	Goslin Mountain Bullhog	PJ Encroachment	High	Reduced understory shrub and herbaceous vigor.
08R-4	Bake Oven	Introduced Annual Forbs	Moderate	Reduced diversity of desirable grass and forb species.
		Annual Grass	Low	Increased fire potential.
08R-5	Birch Creek	PJ Encroachment	High	Reduced understory shrub and herbaceous vigor.

Table 1.11: 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 of the most current sample date for each study site.

Discussion and Recommendations

Mountain (Sagebrush)

Besides the Bear Top Mountain study site (which burned), these high elevation mountain ecological sites support sagebrush communities and are generally considered to be in good condition for deer and elk winter range habitat on the North Slope management unit. These communities support robust shrub populations that provide valuable browse in mild and moderate winters. While generally in good condition, introduced perennial grasses are present in the herbaceous understory. Although providing valuable forage, these grass species can often be aggressive at higher elevations and can reduce the prevalence and abundance of other more desirable native grass and forb species. At least one of these sites also appears to be vulnerable to encroachment from conifer trees, an event which can reduce understory shrub and herbaceous health if not addressed. In addition, some sites appear to be prone to invasion by annual grasses, namely cheatgrass. Higher amounts of cheatgrass can increase fuel loads and exacerbate the risk of fire.

It is recommended that monitoring and work to reduce conifer encroachment (e.g. bullhog, chaining, lop and scatter, etc.) should continue in these communities. When reseeding is necessary to restore herbaceous species, care should be taken in species selection and preference should be given to native grass species when possible.

Mountain (Browse)

These high elevation mountain ecological sites support mixed mountain brush communities and are generally considered to be in good condition for deer and elk summer range habitat on the North Slope management unit. These communities support robust shrub populations that provide valuable browse in mild and moderate winters. While the herbaceous understory is in generally good condition, introduced perennial grasses are frequently present. Although providing valuable forage, these grass species can be aggressive at higher elevations and can reduce the prevalence and abundance of other more desirable native grass and forb species.

It is recommended that monitoring of these communities continue. When reseeding is necessary to restore herbaceous species, care should be taken in species selection and preference should be given to native grass species when possible.

Upland (Sagebrush)

These low to mid elevation ecological sites are considered to be in poor to good condition for deer and elk winter range habitat on the North Slope management unit. These sites support robust sagebrush populations that provide valuable browse in mild and moderate winters. Although in generally good condition, the Bennett Ranch study site appears to be prone to encroachment from pinyon and juniper trees, an event that may eventually reduce understory shrub and herbaceous health if not addressed. While the herbaceous understory of these communities are also in generally good condition, the introduced annual grass cheatgrass is the dominant grass species on the Antelope Flat site; increased amounts of cheatgrass can increase fuel loads, thereby increasing the threat of wildfire. In addition, introduced perennial grass species are also present on the Bennett Ranch study site. Although providing valuable forage, these introduced grass species can be aggressive and can reduce the prevalence and abundance of other more desirable native grass and forb species.

It is recommended that when necessary, work to reduce pinyon-juniper encroachment (e.g. bullhog, chaining, lop and scatter, etc.) should continue in these communities; care should be taken in order to select treatment methods that will not increase annual grass cover. Treatments to reduce annual grass cover may be necessary on the Antelope Flat study. When reseeding is necessary to restore herbaceous species, care should be taken in species selection, and preference should be given to native grass species when possible.

Semiwet Fresh Meadow

This semiwet fresh meadow ecological site supports a vigorous herbaceous community dominated by perennial grasses and is generally considered to be in fair condition for deer and elk summer range habitat on the North Slope management unit. Although plentiful, the herbaceous understory is dominated by the introduced perennial grass species Kentucky bluegrass which appears to be reducing the prevalence of other more desirable native grass and forb species; this is likely a response to the high levels of grazing that have occurred on this site in the past (Table 1.11).

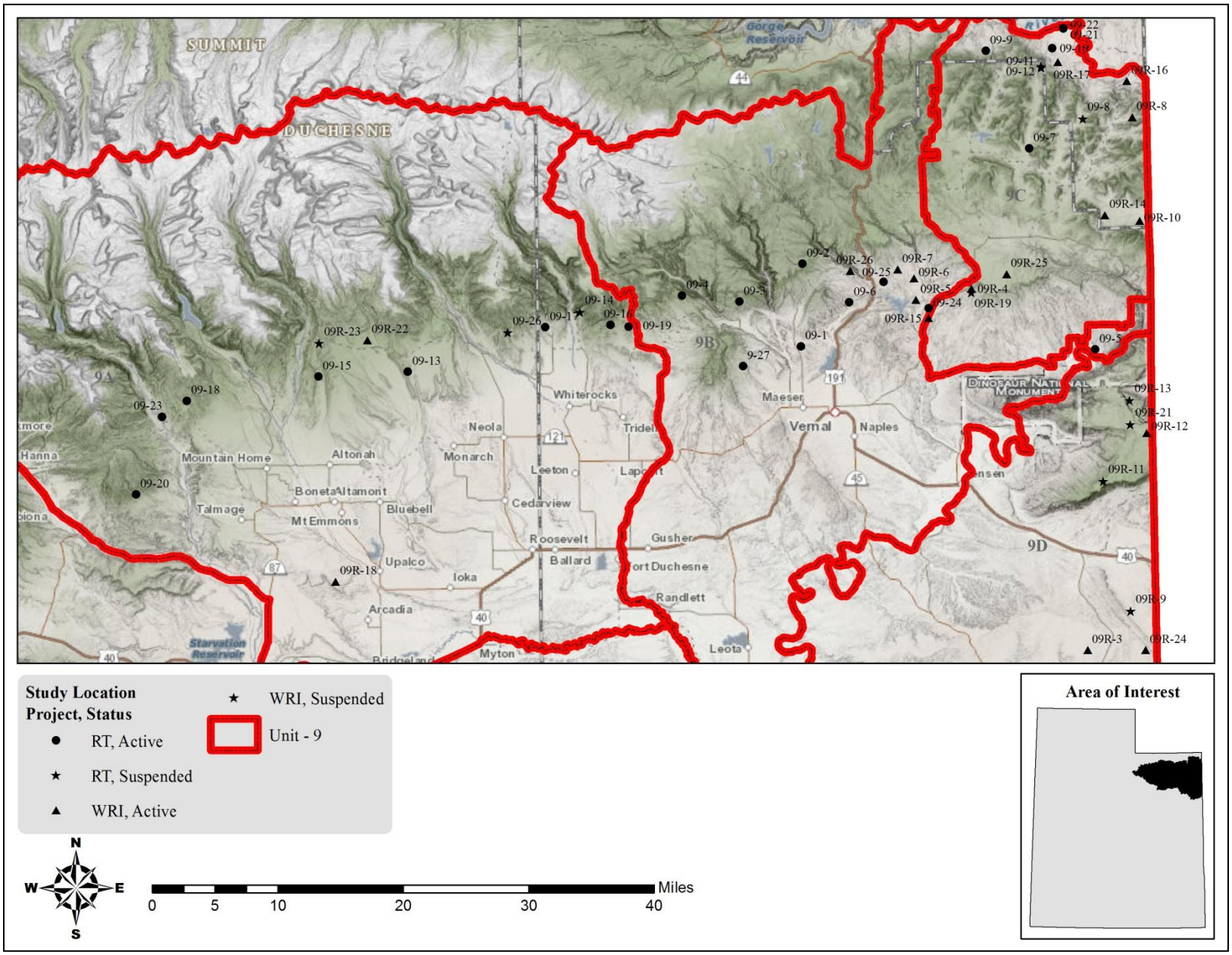
Treatment to reduce introduced perennial grass may be necessary, or changes in grazing management to decrease grazing pressure within this semi-wet ecosystem. When reseeding is required to restore herbaceous species, care should be taken in species selection and preference should be given to native grass species when possible.

Semidesert (Sagebrush)

This semidesert sagebrush ecological site is generally considered to be in fair condition for deer winter range habitat on this unit. This community supports shrub populations that provide valuable browse in moderate to severe winters. This community is susceptible to invasion from annual grasses, primarily cheatgrass; increased amounts of cheatgrass can increase fuel loads and heighten the potential for wildfire. Encroachment from pinyon-juniper trees has not been an issue within this community.

If a treatment to rejuvenate sagebrush occurs, care should be taken in selecting treatment methods that will not increase annual grass loads. Treatments to reduce annual grass and work to diminish fuel loads and create fire breaks may eventually be necessary on this site if cheatgrass continues to increase.

2. WILDLIFE MANAGEMENT UNIT 9 – SOUTH SLOPE



WILDLIFE MANAGEMENT UNIT 9 – SOUTH SLOPE

Boundary Description

Wasatch, Summit, Daggett, Uintah, Duchesne counties - Boundary begins at the junction of Highway US-40 and State Route (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 of the Uinta Mountains); east along the summit of the Uinta Mountains to SR-191; north along SR-191 to Cart Creek; northeast 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; northwest along the Duchesne River to US-40 at Myton; west along US-40 to SR-87 in Duchesne and beginning point.

Management Unit Description

Geography

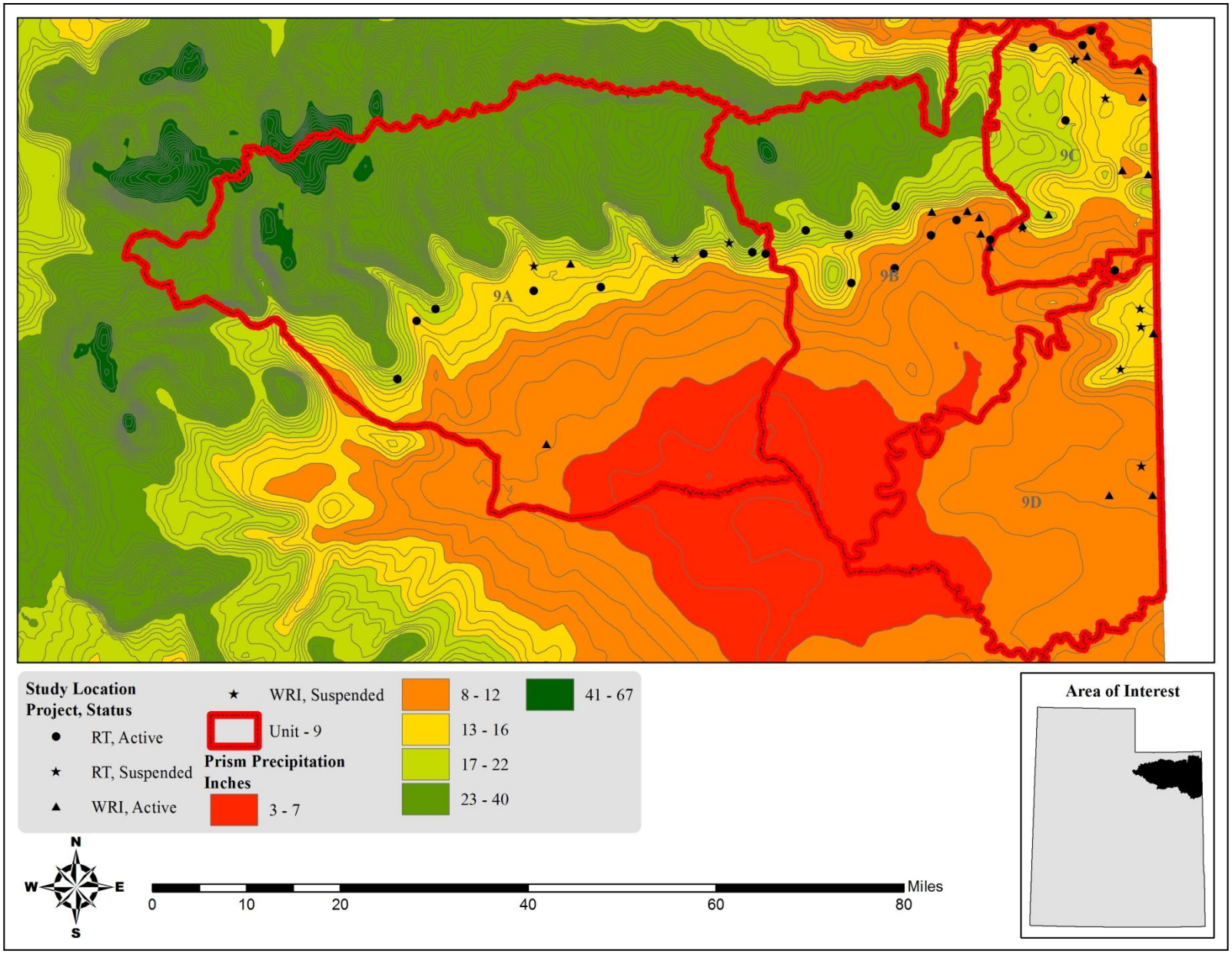
The South Slope Wildlife Management Unit is located along the south slope of the Uinta Mountains and extends south into the Uintah Basin in Duchesne and Uintah counties. The unit encompasses the land area of two former deer herd units: the Vernal Unit (11) and the South Slope Unit (12). Elevation ranges 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 below Vernal and Roosevelt. Numerous towns fall within the boundaries of this management unit, as do many rivers and drainages.

Climate Data

The 30-year (1981-2010) annual precipitation PRISM model shows precipitation ranges from 5 inches near the town of Ft. Duchesne to 50 inches in the Uinta Mountains. All of the Range Trend and WRI monitoring studies on the unit occur within the 8-20 inch precipitation zone (Map 2.1) (PRISM Climate Group, Oregon State University).

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 division (Divisions 5 and 6). The mean annual PDSI of the Northern Mountains division displayed years of moderate to extreme drought from 1988-1990, 2000-2003, and 2012-2013. The mean annual PDSI displayed moderately to extremely wet years from 1982-1986, 1995, 1997-1998, 2005, and 2011 (Figure 2.1a). The mean spring (March-May) PDSI displayed years of moderate to extreme drought in 1989-1990, 1992, 2000-2004, and 2012-2014; moderately to extremely wet years were displayed in 1982-1986, 1995-1996, 1998-1999, 2005, and 2011. The mean fall (Sept.-Nov.) PDSI displayed years of moderate to extreme drought in 1982-1986, 1995, 1997-1998; moderately to extremely wet years were displayed in 1982-1986, 1995, and 1997-1998 (Figure 2.1b)

The mean annual PDSI of the Uinta Basin division displayed years of moderate to extreme drought from 1989-1991, 2000, 2002-2003, and 2012-2015. The mean annual PDSI displayed moderately to extremely wet years from 1982-1985, 1993, 1997-1998, and 2005. The mean spring (March-May) PDSI displayed years of moderate to extreme drought in 1989-1992, 2002-2004, and 2012-2015. Moderately to extremely wet years for this time period were displayed in 1983-1985, 1993, 1995, 1998, 2005, and 2011 (Figure 2.2a). The mean fall (Sept.-Nov.) PDSI displayed years of moderate to extreme drought in 1989-1990, 2001-2003, 2007, and 2012; moderately to extremely wet years were displayed in 1982-1986, 1993, and 1997-1998 (Figure 2.2b) (Time Series Data, 2016).



Map 2.1: The 1981-2010 PRISM Precipitation Model for WMU 9, South Slope (PRISM Climate Group, Oregon State University, 2016).

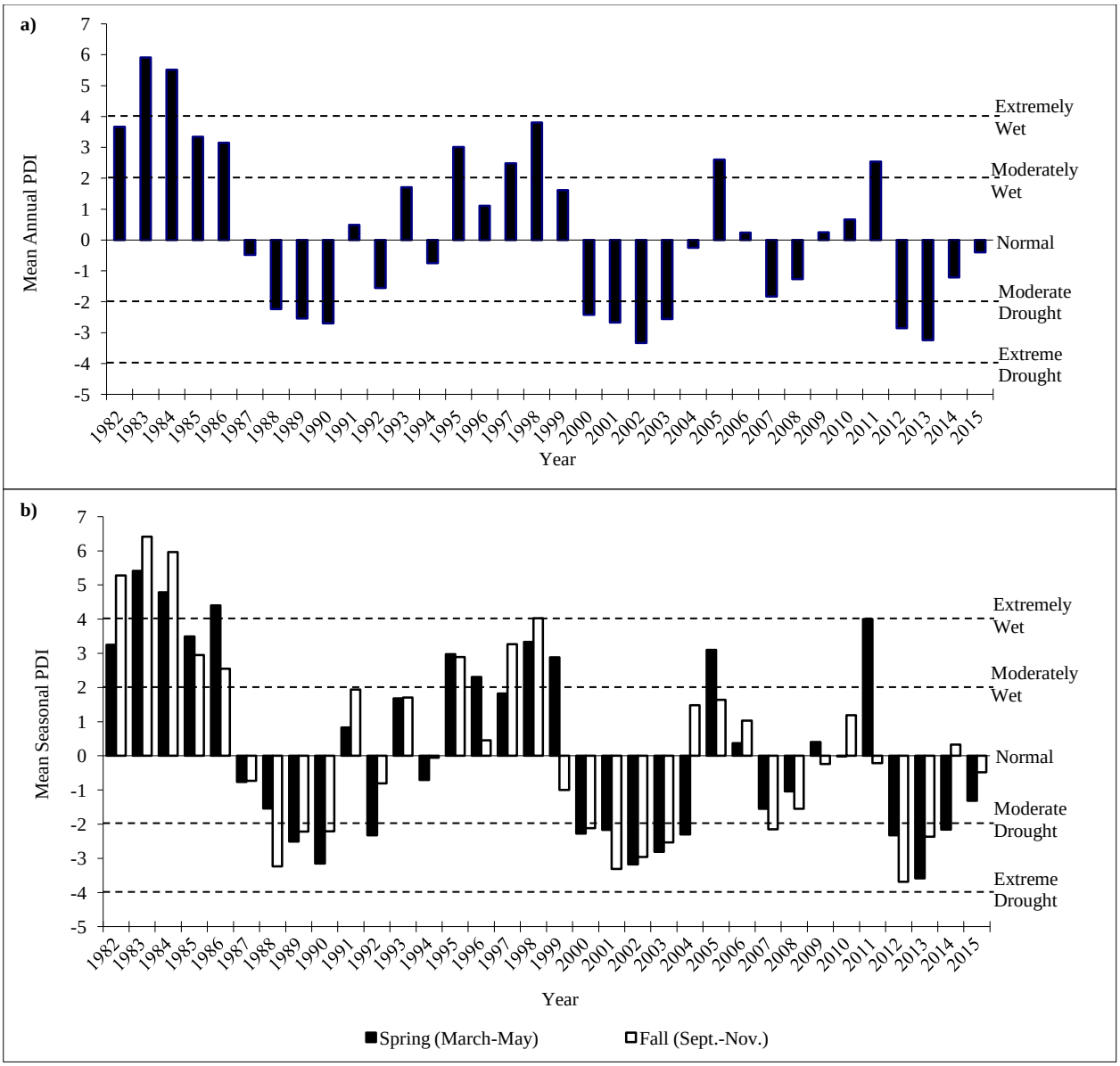


Figure 2.1: The 1982-2015 Palmer Drought Severity Index (PDSI) for the Northern Mountains division (Division 5). The PDSI is based on climate data gathered from 1895 to 2015. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet and negative deviations indicate drought. Classification of the scale is ≥4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to2.9 = 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 -.9 = Incipient Dry Spell, -1.0 to -1.9 = Mild Drought, -2.0 to -2.9 = Moderate Drought, -3.0 to -3.9 = Severe Drought and ≤-4.0 = Extreme Drought (Time Series Data 2014). a) Mean annual PDSI. b) Mean spring (March-May) and fall (Sept.-Nov.).

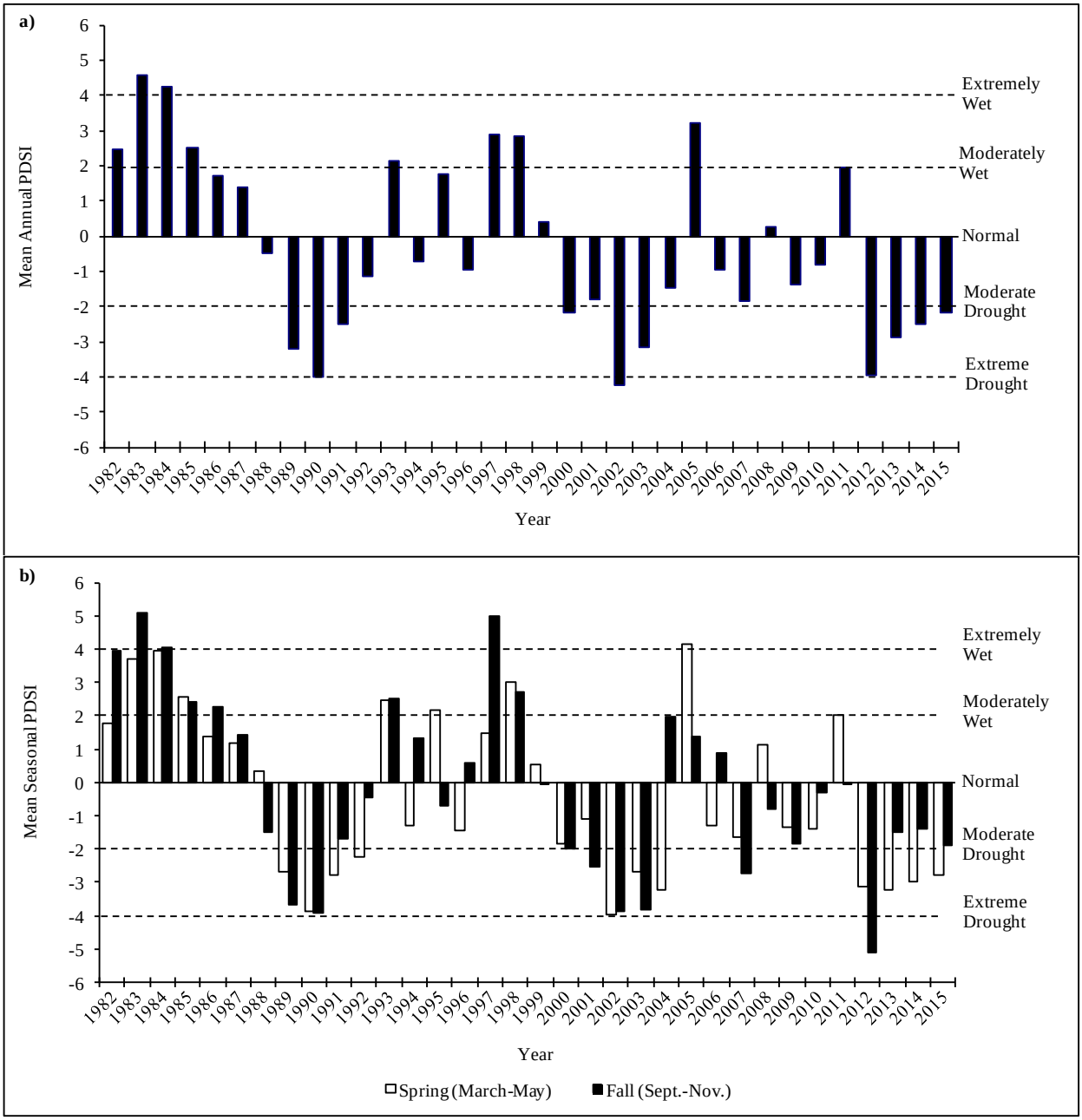


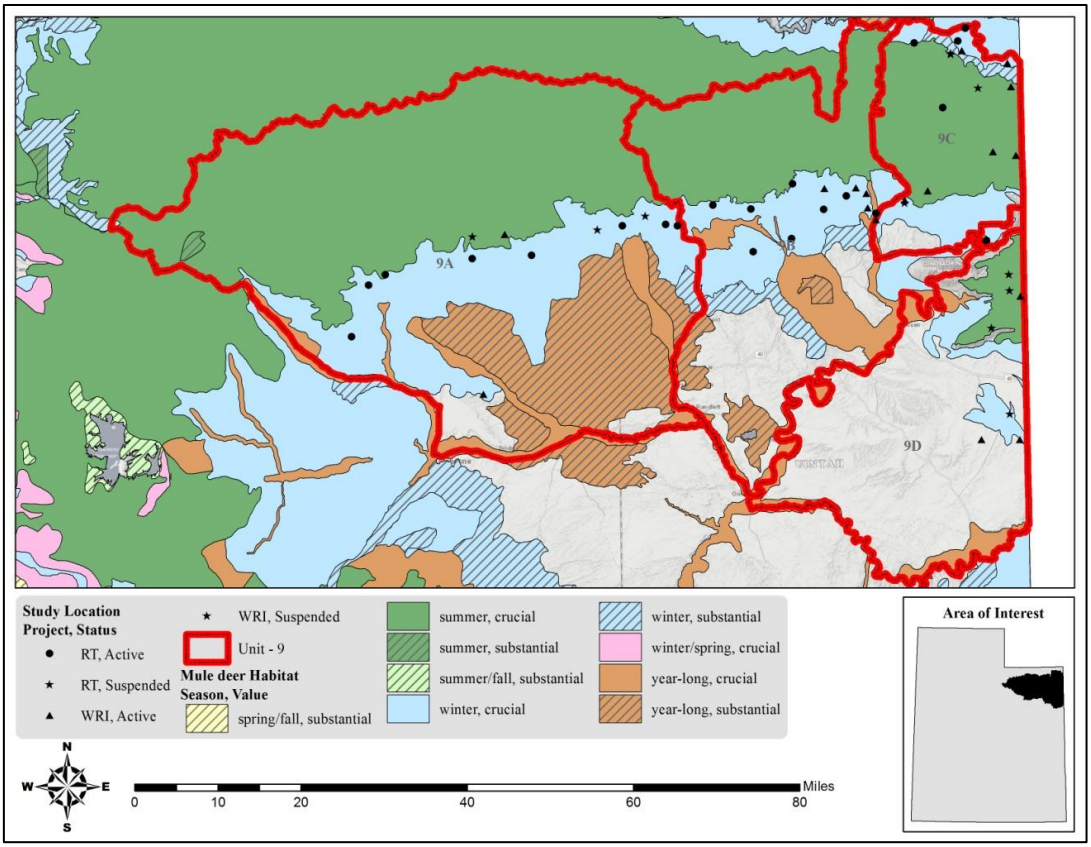
Figure 2.2: The 1982-2015 Palmer Drought Severity Index (PDSI) for the Uinta Basin division (Division 6). The PDSI is based on climate data gathered from 1895 to 2015. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet and negative deviations indicate drought. Classification of the scale is ≥4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to2.9 = 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 -.9 = Incipient Dry Spell, -1.0 to -1.9 = Mild Drought, -2.0 to -2.9 = Moderate Drought, -3.0 to -3.9 = Severe Drought and ≤-4.0 = Extreme Drought (Time Series Data 2014). a) Mean annual PDSI. b) Mean spring (March-May) and fall (Sept.-Nov.).

Big Game Habitat

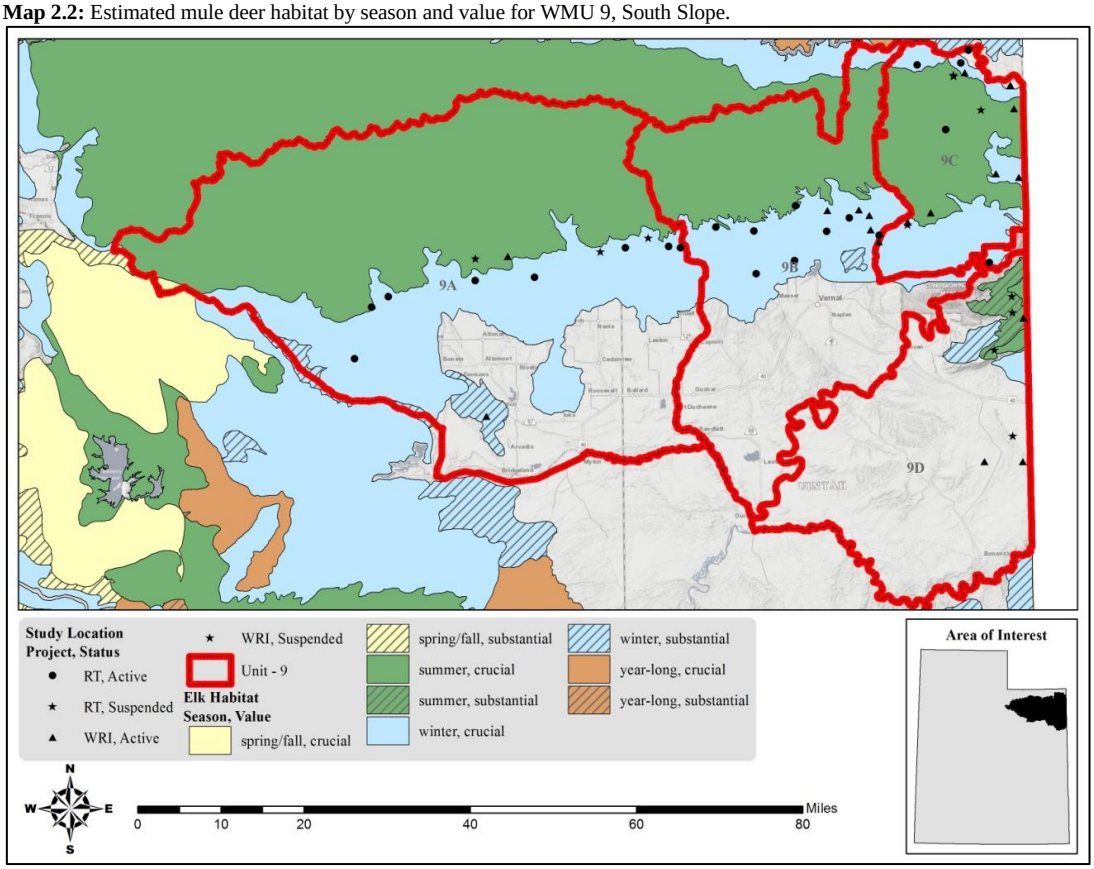
The South Slope unit contains over 2.2 million acres of deer range with summer, year-long, and winter ranges making up 51%, 23%, and 26% of this area, respectively. Most of the year-long range in this unit occurs in land owned by private landowners or the Uintah and Ouray Indian Reservation. A minor portion of the year-long range is owned by the Bureau of Land Management (BLM), the Utah School and Institutional Trust Lands Administration (SITLA), or the National Park Service (NPS). Finally, the Utah Division of Wildlife Resources (UDWR), Fire and State Lands (SL&F), the U.S. Forest Service (USFS), Utah State Parks (USP), the U.S. Fish and Wildlife Service (USFWS), and the U.S Bureau of Reclamation (BR) each manage 1% or less of the unit (Map 2.2, Map 2.7, Table 2.2).

Winter range within the old Vernal deer herd unit (11) is 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. The lower limits are defined by agricultural lands and the desert below Vernal. Winter ranges within the old South Slope (12) unit are more limited, and management is complicated as a large portion of these lands are part of the Uintah and Ouray Indian Reservation. Summer range within the new South Slope unit is plentiful, ranging from aspen and conifer communities to mountain big sagebrush and mountain brush communities.

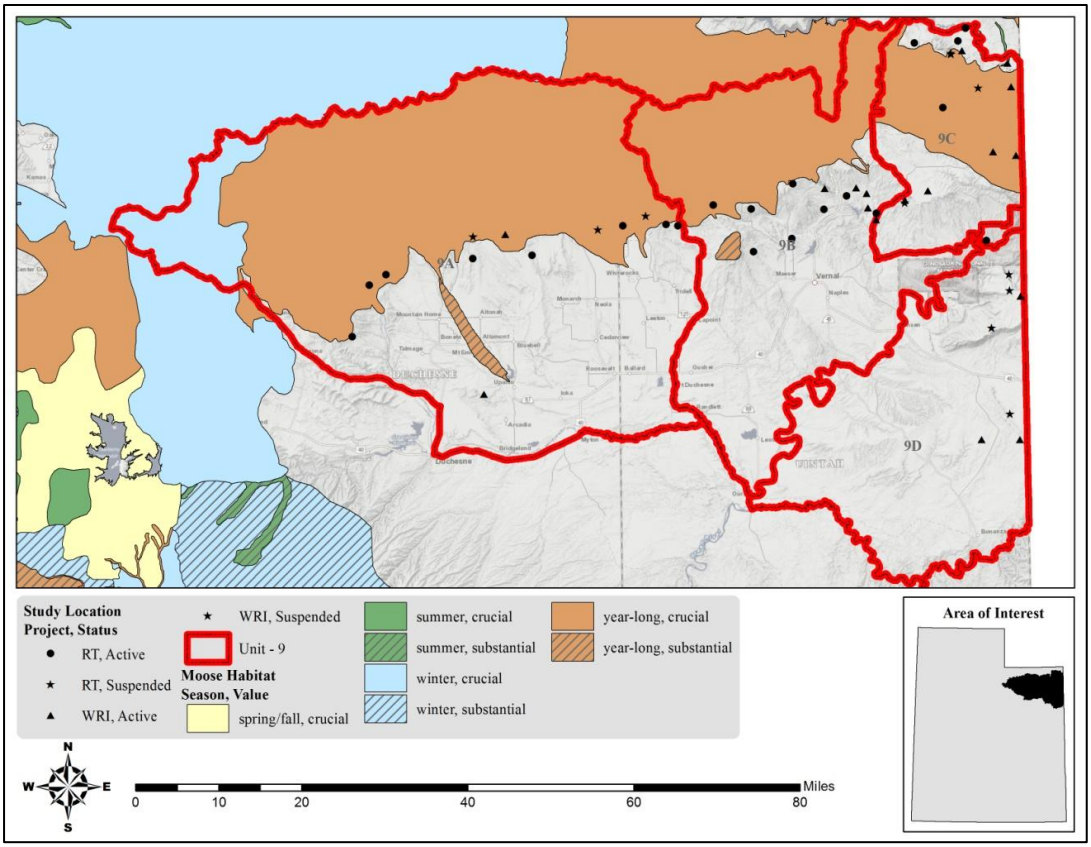
Key areas for winter range consist of the small sagebrush/grass parks found throughout the pinyon and juniper woodlands, especially on the Vernal side of the unit. Sparse pinyon and juniper communities dominate the foothills where diversity and productivity of desirable browse is usually relatively low. Areas with a sagebrush understory or sagebrush/grass associations are more productive: these areas normally receive more use by big game and livestock. Key areas that represent this 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 include Little Hole, 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.



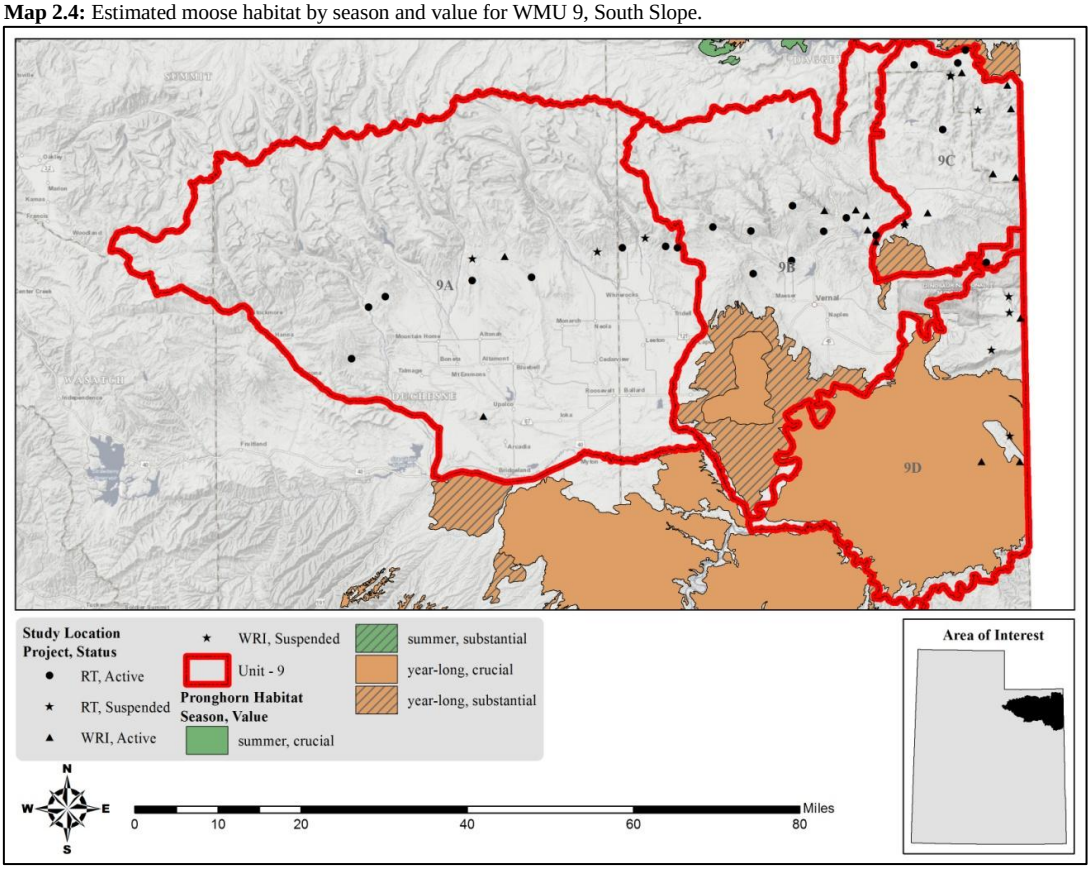
Map 2.2: Estimated mule deer habitat by season and value for WMU 9, South Slope.



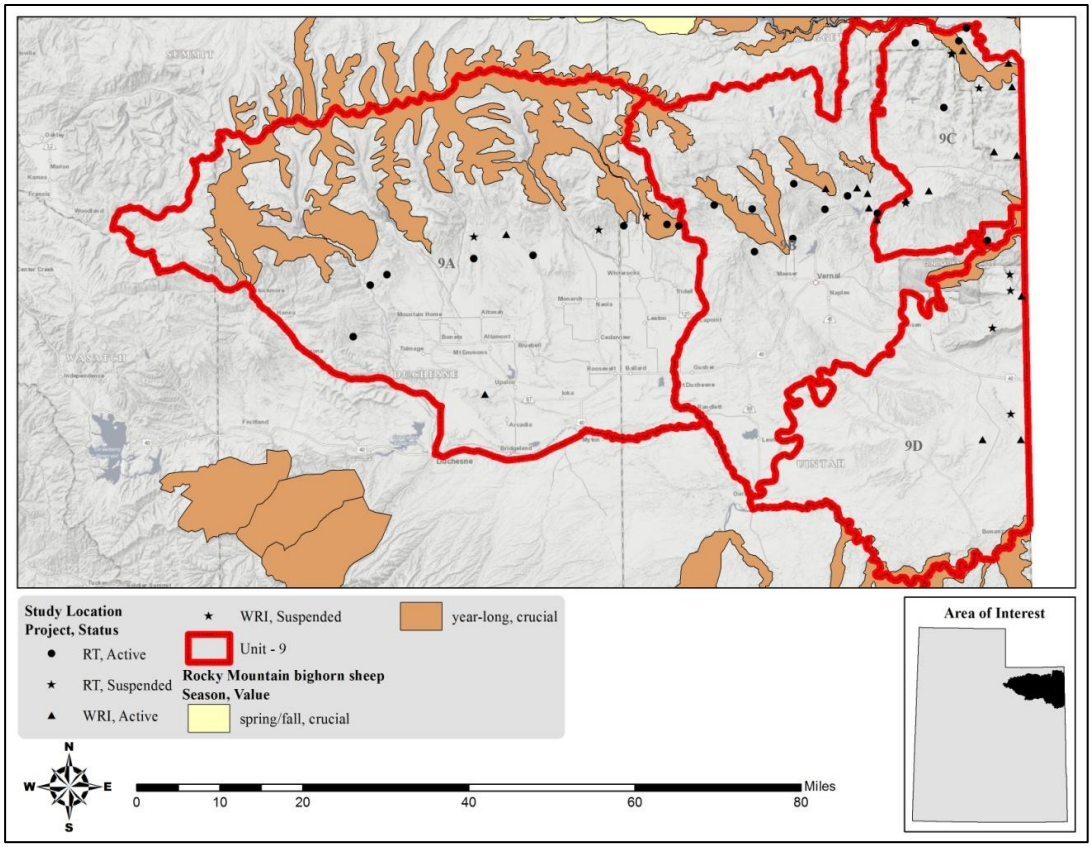
Map 2.3: Estimated elk habitatat by season and value for WMU 9, South Slope.



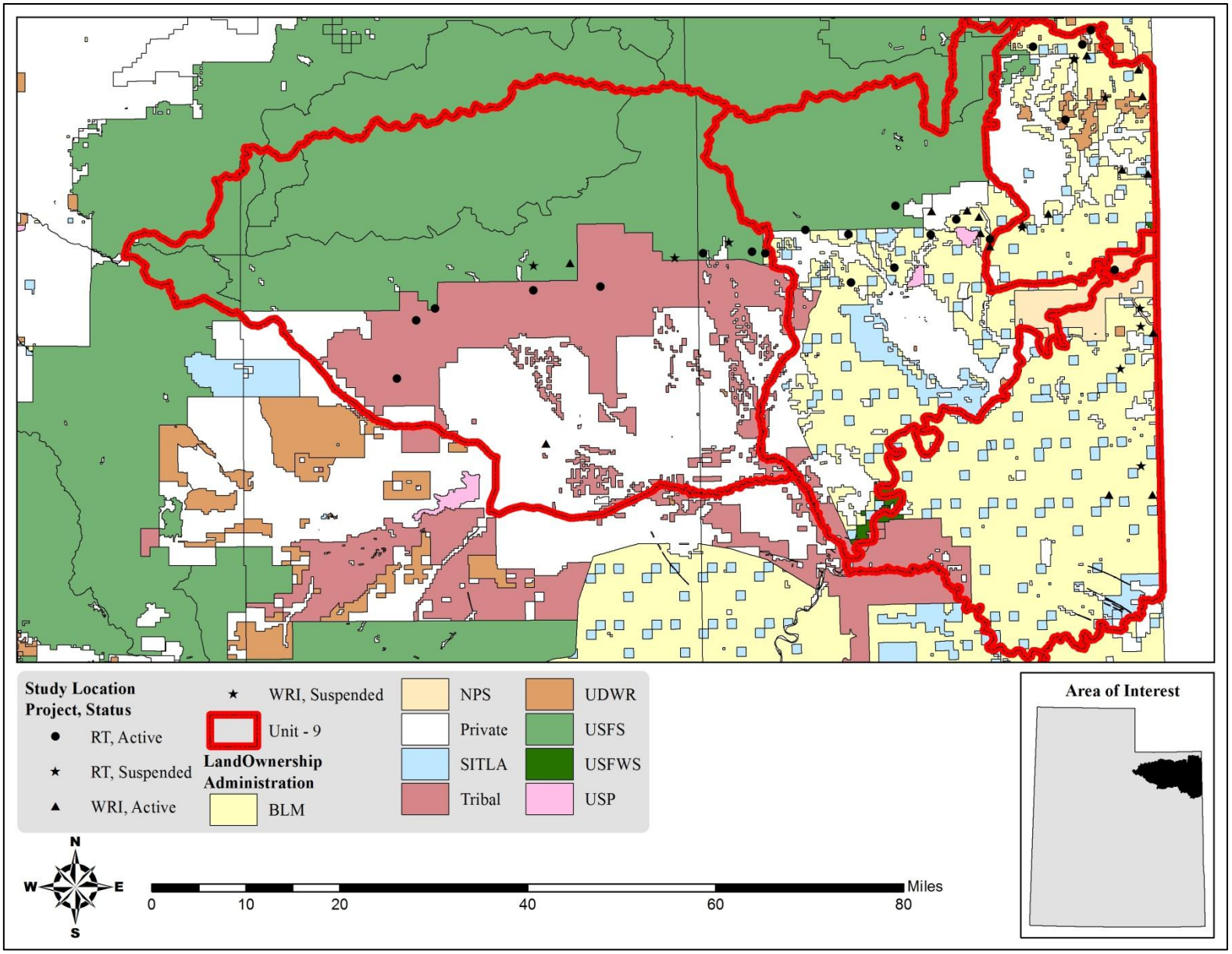
Map 2.4: Estimated moose habitat by season and value for WMU 9, South Slope.



Map 2.5: Estimated pronghorn habitat by season and value for WMU 9, South Slope.



Map 2.6: Estimated Rocky Mountain bighorn sheep habitat by season and value for WMU 9, South Slope.



Map 2.7: Land ownership for WMU 9, South Slope.

	Year Long Range		Summer Range		Winter Range		Spring/Fall	
	Area (acres)	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
Mule Deer	518,392	23%	1,142,021	51%	587,007	26%	0	0%
Elk	0	0%	1,077,828	61%	677,518	39%	3,423	<1%
Moose	1,063,165	92%	2,139	<1%	94,699	8%	0	0%
Pronghorn	557,104	100%	0	0%	0	0%	0	0%
RMBS	391,837	100%	0	0%	0	0%	0	0%

Table 2.1: Estimated mule deer, elk, moose, pronghorn, and Rocky Mountain bighorn sheep (RMBS) habitat acreage by season for WMU 9, South Slope.

	Year Long Range		Summer Range		Winter Range	
Ownership	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
BLM	33,042	6%	94,873	8%	183,516	31%
NPS	9,576	2%	7,925	1%	11,706	2%
Private	342,288	66%	108,133	9%	107,791	18%
SITLA	16,195	3%	8,848	1%	36,543	6%
Tribal	102,738	20%	35,291	3%	200,458	34%
UDWR	897	<1%	13,716	1%	2,994	1%
SL&F	6,846	1%	0	0%	4	<1%
USFS	69	<1%	873,235	76%	39,946	7%
USP	346	<1%	0	0%	4,050	1%
USFWS	5,737	1%	0	0%	0	0%
BR	659	<1%	0	0%	0	0%
Total	518,392	**100%**	1,142,021	**100%**	587,007	**100%**

Table 2.2: Estimated mule deer habitat acreage by season and ownership for WMU 9, South Slope.

	Summer Range		Winter Range		Spring/Fall	
Ownership	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
BLM	77,632	7%	173,187	26%	0	0%
NPS	7,209	1%	9,647	1%	0	0%
Private	88,250	8%	180,372	27%	360	11%
SITLA	6,708	1%	25,350	4%	0	0%
Tribal	30,119	3%	228,530	34%	0	0%
UDWR	13,426	1%	1,599	0%	0	0%
SL&F	0	0%	0	0%	0	0%
USFS	854,483	79%	55,775	8%	3,063	89%
USP	0	0%	2,933	0%	0	0%
USFWS	0	0%	125	0%	0	0%
Total	1,077,828	**100%**	677,518	**100%**	3,423	**100%**

Table 2.3: Estimated elk habitat acreage by season and ownership for WMU 9, South Slope.

	Year Long Range		Summer Range		Winter Range	
Ownership	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
BLM	69,595	7%	1,276	60%	0	0%
Private	83,240	8%	0	0%	3,698	4%
SITLA	6,123	1%	16	1%	0	0%
Tribal	87,741	8%	0	0%	0	0%
UDWR	14,165	1%	836	39%	0	0%
SL&F	0	0%	11	1%	0	0%
USFS	802,300	75%	0	0%	91,001	96%
Total	1,063,165	**100%**	2,139	**100%**	94,699	**100%**

Table 2.4: Estimated moose habitat acreage by season and ownership for WMU 9, South Slope.

	Year Long Range	
Ownership	*Area (acres)*	*%*
BLM	402,288	72%
NPS	2,678	<1%
Private	48,788	9%
SITLA	64,684	12%
Tribal	36,064	6%
UDOT	30	<1%
SL&F	153	<1%
USFWS	2,418	<1%
Total	557,104	**100%**

Table 2.5: Estimated pronghorn habitat acreage by season and ownership for WMU 9, South Slope.

	Year Long Range	
Ownership	*Area (acres)*	*%*
BLM	31,764	8%
NPS	16,246	4%
Private	14,968	4%
SITLA	6,507	2%
Tribal	3,754	1%
UDWR	981	0%
USFS	317,239	81%
USFWS	378	0%
Total	391,837	**100%**

Table 2.6: Estimated Rocky Mountain bighorn sheep habitat acreage by season and ownership for WMU9, South Slope.

Group	Existing Vegetation Type	Acres	% of Total	Group % of Total
Conifer	Colorado Plateau Pinyon-Juniper Woodland	331,302	11.69%	
	Rocky Mountain Lodgepole Pine Forest	245,371	8.65%	
	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	216,578	7.64%	
	Conifer-Hardwood	63,106	2.23%	
	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	28,711	1.01%	
	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	17,875	0.63%	
	Southern Rocky Mountain Ponderosa Pine Woodland	13,047	0.46%	
	Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland	9,336	0.33%	
	Rocky Mountain Foothill Limber Pine-Juniper Woodland	4,383	0.15%	
	Other Conifer	1,351	0.05%	32.84%
Exotic Herbaceous	Introduced Upland Vegetation-Annual Grassland	115,636	4.08%	
	Other Exotic Herbaceous	28	0.00%	4.08%
Exotic Tree-Shrub	Introduced Riparian Shrubland	8,348	0.29%	
	Introduced Riparian Forest and Woodland	1,026	0.04%	0.33%
Grassland	Rocky Mountain Subalpine-Montane Mesic Meadow	33,559	1.18%	
	Southern Rocky Mountain Montane-Subalpine Grassland	7,600	0.27%	
	Inter-Mountain Basins Semi-Desert Grassland	5,972	0.21%	
	Rocky Mountain Alpine Dwarf-Shrubland	4,569	0.16%	
	Northern Rocky Mountain Lower Montane-Foothill-Valley Grassland	1,973	0.07%	
	Other Grassland	674	0.02%	1.92%
Shrubland	Inter-Mountain Basins Big Sagebrush Shrubland	504,489	17.79%	
	Inter-Mountain Basins Mixed Salt Desert Scrub	163,273	5.76%	
	Inter-Mountain Basins Mat Saltbush Shrubland	93,766	3.31%	
	Artemisia tridentata ssp. vaseyana Shrubland Alliance	68,046	2.40%	
	Colorado Plateau Mixed Low Sagebrush Shrubland	55,504	1.96%	
	Inter-Mountain Basins Montane Sagebrush Steppe	44,193	1.56%	
	Rocky Mountain Lower Montane-Foothill Shrubland	28,956	1.02%	
	Inter-Mountain Basins Greasewood Flat	28,475	1.00%	
	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	23,987	0.85%	
	Grayia spinosa Shrubland Alliance	6,937	0.24%	
	Great Basin Semi-Desert Chaparral	5,222	0.18%	
	Quercus gambelii Shrubland Alliance	4,966	0.18%	
	Inter-Mountain Basins Big Sagebrush Steppe	3,539	0.12%	
	Other Shrubland	2,506	0.09%	36.47%
Other	Agricultural	198,722	7.01%	
	Barren	132,376	4.67%	
	Sparsely vegetated	109,469	3.86%	
	Hardwood	104,148	3.67%	
	Developed	85,820	3.03%	
	Riparian	35,448	1.25%	
	Open Water	24,442	0.86%	
	Other	342	0.01%	24.37%
Total		2,835,071	100.00%	

Table 2.7: Landfire existing vegetation coverage (LANDFIRE: LANDFIRE 1.3.0, 2014) for WMU 9, South Slope.

Limiting Factors to Big Game Habitat

One of the major limiting factors in this management unit is limited winter range availability: many of these areas are located on Uintah and Ouray Indian Reservation, making management difficult. Additional factors include habitat degradation and loss, winter range forage condition, and landowner acceptance. Continued range monitoring could maintain and protect ranges from loss and further deterioration. Cooperation between federal, state, local, tribal governments, and private landowners could further maintain and preserve crucial

habitat through agreements with land management agencies, the use of conservation easements and the like on private lands, planning and evaluating resource use and developments that might affect habitat quality, and developing specific vegetation objectives to maintain the quality of important deer use areas. In addition, forage production could be maintained or improved through direct range improvements such as reseedings, controlled burns, water developments, tree removal, etc.

The presence of cheatgrass on many study sites in this unit may limit effective recruitment of desirable species and increase fire frequency. Encroachment of pinyon and juniper is also a possible threat and may affect important sagebrush rangelands. Pinyon-juniper woodlands constitute nearly 12% of the land area in this unit (Table 2.7)

Finally, deer fences and crossings limiting range are a concern, but cooperation with the Utah Department of Transportation in construction of highway fences, passage structures, warning signs, etc. will continue in order to ensure proper access to habitat as well as deer and human safety.
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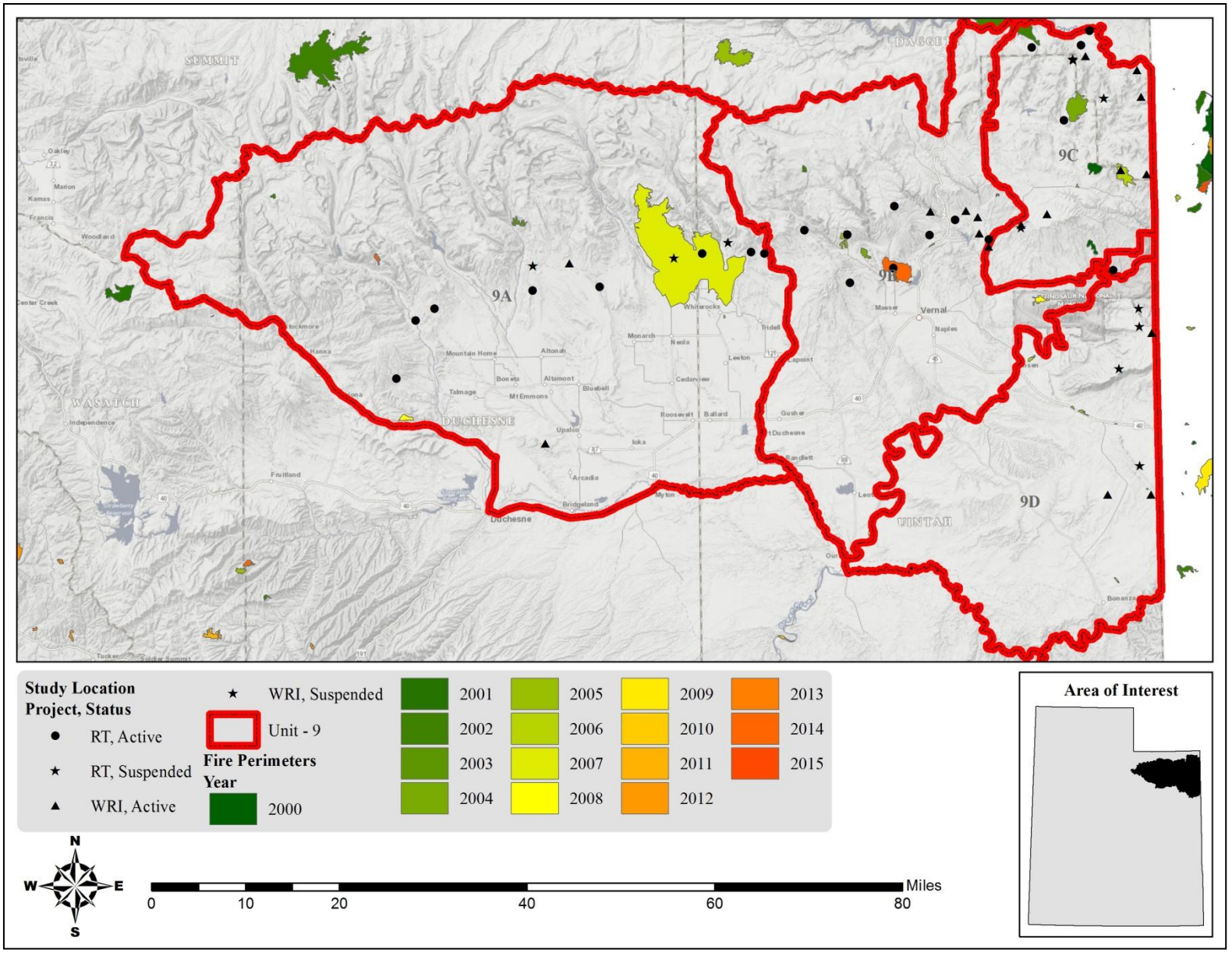

Map 2.8: Land coverage of fires by year from 2000-2015 for WMU 9, South Slope.

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Treatments/Restoration Work

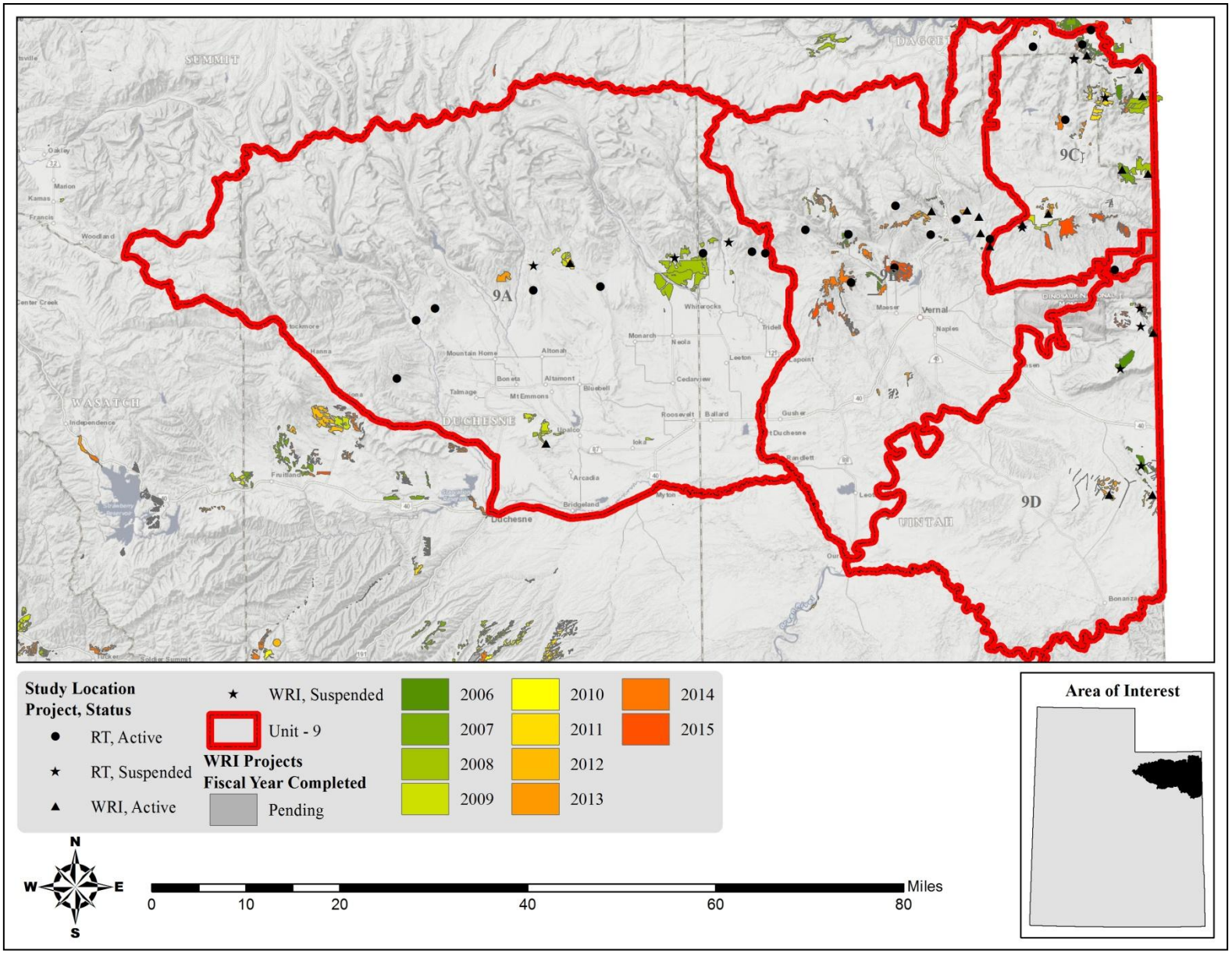
There has been an active effort to address many of the limitations on this unit through the Watershed Restoration Initiative (WRI). A total of 44,711 acres of land have been treated within the South Slope unit since the WRI was implemented in 2004 (Map 2.9). Treatments frequently overlap one another bringing the total treatment acres to 47,764 acres for this unit (Table 2.8). Other treatments may have occurred outside of the WRI through independent agencies and landowners, but the WRI comprises the majority of work done on deer winter ranges throughout the state of Utah.

Vegetation removal via hand crew is the most common management practice. The use of seeding to supplement the herbaceous understory is also very common. Other management practices include seeding of desired shrub species, herbicide application to control weeds, prescribed burns, and harrow and bullhog projects to remove pinyon and juniper (Table 2.8).

Treatment Action	**Acres**
Vegetation Removal/Hand Crew	16,608
Seeding (Primary)	15,808
Seeding (Secondary/Shrub)	4,152
Herbicide Application	3,087
Chain Harrow	2,314
Prescribed Fire	2,121
Bullhog	2,052
Forestry Practices	765
Vegetation Improvements	428
Road/Parking Area Improvements	346
Stream Corridor/Channel Improvements	42
Research	41
***Total Land Area Treated**	44,711
Total Treatment Acres	47,764

Table 2.8: WRI treatment action size (acres) for WMU 9, South Slope.

*Does not include overlapping treatments.



Map 2.9: WRI treatments by fiscal year completed for WMU 9, South Slope.

Range Trend Studies

Range Trend studies have been sampled on a regular basis within unit 9 since 1982; studies have been added or suspended as has been deemed necessary (Table 2.9). Due to changes in sampling methodologies, only data sampled following the 1992 sample year is included in this study. Monitoring studies of WRI projects began in 2004; when possible, WRI monitoring studies are established prior to and sampled on a regular basis following treatment. Due to the long-term nature of the studies, many of the Range Trend or WRI study sites 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. Range Trend and WRI studies that have had a disturbance or treatment during the reported sample period are summarized in this report by the disturbance or treatment type and are summarized by region.

Study #	Study Name	Project	Status	Year(s) Sampled	Ecological Site Description
09-1	Red Mountain Allotment	RT	Active	‘82, ‘88, ‘95, ‘00, ‘05, ‘10, ‘15	Semidesert Loam (Wyoming Big Sagebrush)
09-2	Taylor Mountain	RT	Active	‘82, ‘88, ‘95, ‘00, ‘05, ‘10, ‘15	Mountain Loam (Mountain Big Sagebrush)
09-3	Dry Fork Mountain	RT	Active	‘82, ‘88, ‘95, ‘00, ‘10, ‘15	Mountain Gravely Loam (Mountain Big Sagebrush)
09-4	Sawtooth-Flat Spring	RT	Active	‘82, ‘88, ‘95, ‘00, ‘05, ‘10, ‘15	Mountain Gravely Loam (Mountain Big Sagebrush)
09-5	Island Park	RT	Active	‘82, ‘88, ‘95, ‘00, ‘05, ‘10, ‘15	Semidesert Loam (Wyoming Big Sagebrush)
09-6	Above Steinaker Draw	RT	Active	‘88, ‘95, ‘00, ‘05, ‘15	Semidesert Shallow Loam (Wyoming Big Sagebrush)
09-7	Warren Draw	RT	Active	‘82, ‘88, ‘95, ‘00, ‘05, ‘10,, ‘15	Mountain Loam (Mountain Big Sagebrush)
09-8	Rye Grass	RT	Active	‘82, ‘88, ‘95, ‘00, ‘15	Upland Loam (Mountain Big Sagebrush)
09-9	Little Hole	RT	Active	‘82, ‘88, ‘95, ‘00, ‘05, ‘10, ‘15	Mountain Loam (Mountain Big Sagebrush)
09-10	Toliver Creek Chaining	RT	Active	‘88, ‘95, ‘00, ‘05, ‘10, ‘15	Semidesert Stony Loam (Wyoming Big Sagebrush)
09-11	Toliver Creek PJ	RT	Suspended	‘88, ‘95,	Not Identified
09-12	Browns Park Burn & PJ	RT	Suspended	‘88, ‘95, ‘00	Not Identified
09-13	John Star Flat	RT	Active	‘82, ‘88, ‘95, ‘00, ‘05, ‘10,	Not Identified
09-14	Red Pine Canyon	RT	Suspended	‘82, ‘88, ‘95, ‘00	Not Identified
09-15	Mud Springs Draw	RT	Active	‘82, ‘88, ‘95, ‘05, ‘10, ‘15	Mountain Loam (Browse)
09-16	Mosby Mountain	RT	Active	‘82, ‘88, ‘95, ‘00, ‘05, ‘10, ‘15	Mountain Stony Loam (Browse)
09-17	Farm Creek	RT	Active	‘95, ‘00, ‘05, ‘10, ‘15	Mountain Stony Loam (Mountain Big Sagebrush)
09-18	Gooseberry Spring	RT	Active	‘82, ‘88, ‘95, ‘00, ‘05, ‘10, ‘15	Mountain Stony Loam (Browse)
09-19	Mosby Mountain South	RT	Active	‘82, ‘88, ‘95, ‘00, ‘05, ‘10 ‘15	Mountain Stony Loam (Browse)
09-20	Seep Hollow	RT	Active	‘82, ‘88, ‘95, ‘00, ‘05, ‘10, ‘15	Mountain Stony Loam (Browse)
09-21	Browns Park River Corridor-Livestock	RT	Active	‘00, ‘05, ‘10, ‘15	Semidesert Loam (Wyoming Big Sagebrush)
09-22	Browns Park River Corridor-Wildlife	RT	Active	‘00, ‘05, ‘10, ‘15	Semidesert Loam (Wyoming Big Sagebrush)
09-23	Rock Creek	RT	Active	‘05, ‘10, ‘15	Mountain Loam (Mountain Big Sagebrush)
09-24	Brush Creek Substation	RT	Active	‘97, ‘05, ‘10, ‘15	Semidesert Loam (Wyoming Big Sagebrush)
09-25	Buckhorn Canyon	RT	Active	‘01, ‘05, ‘10, ‘15	Semidesert Loam (Wyoming Big Sagebrush)
09-26	Cart Hollow	RT	Suspended	‘88	Not Identified
09-27	Little Mountain	RT	Active	‘15	Upland Loam (Mountain Big Sagebrush)
09R-3	Deadman Greenstrip	WRI	Active	‘04, ‘07, ‘11, ‘15	Semidesert Loam (Wyoming Big Sagebrush)
09R-4	Diamond Mountain Bullhog	WRI	Active	‘04, ‘07, ‘09, ‘10, ‘12	Upland Stony Loam (Wyoming Big Sagebrush)
09R-5	Little Donkey	WRI	Active	‘04, ‘07, ‘12	Semidesert Loam (Wyoming Big Sagebrush)
09R-6	North Little Donkey	WRI	Active	‘04, ‘07, ‘12	Semidesert Loam (Wyoming Big Sagebrush)
09R-7	Red Fleet Lop and Scatter	WRI	Active	‘04, ‘07, ‘12	Semidesert Gravelly Loam (Wyoming Big Sagebrush)

Study #	Study Name	Project	Status	Year(s) Sampled	Ecological Site Description
09R-8	Marshall Draw	WRI	Active	‘05	Not Identified
09R-9	Snake John Lop and Scatter	WRI	Suspended	‘05, ‘08	Not Identified
09R-10	Ruple Cabin	WRI	Active	‘05, ‘08, ‘13	Mountain Loam (Mountain Big Sagebrush)
09R-11	Blue Mtn Burn	WRI	Suspended	‘06	Not Identified
09R-12	West Stuntz	WRI	Active	‘06, ‘10, ‘13	Mountain Loam (Mountain Big Sagebrush)
09R-13	Chew Dixie	WRI	Suspended	‘06, ‘09, ‘10	Not Identified
09R-14	Pot Creek Chaining	WRI	Active	‘07, ‘11, ‘14	Mountain Loam (Mountain Big Sagebrush)
09R-15	Brush Creek Dixie	WRI	Active	‘07, ‘09, ‘10, ‘12	Semidesert Loam (Wyoming Big Sagebrush)
09R-16	Brown’s Field	WRI	Active	‘08, ‘11, ‘14	Semidesert Gravelly Loam (Wyoming Big Sagebrush)
09R-17	Toliver Creek Bullhog	WRI	Active	‘08, ‘11, ‘14	Upland Loam (Mountain Big Sagebrush)
09R-18	Brotherson Chaining	WRI	Active	‘08, ‘11	Semidesert Loam (Wyoming Big Sagebrush)
09R-19	Diamond Rim Reference	WRI	Suspended	‘09	Not Identified
09R-21	Chew Reference	WRI	Suspended	‘09	Not Identified
09R-22	North Dry Gulch Ponderosa Thinning	WRI	Active	‘09, ‘13	Mountain Loam (Ponderosa Pine)
09R-23	North Dry Gulch Reference	WRI	Suspended	‘09	Not Identified
09R-24	Raven Ridge	WRI	Active	‘11, ‘14	Semidesert Loam (Wyoming Big Sagebrush)
09R-25	Davis Draw Sagebrush	WRI	Active	‘12, ‘15	Upland Loam (Mountain Big Sagebrush)
09R-26	Simplot	WRI	Active	‘13	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.

Study #	Study Name	Type	Disturbance Name (if available)	Date	Size (acres)	WRI Project #
9-1	Red Mountain Allotment	Wildfire	Taylor Mountain Road	July 2014	3,147	
		Rangeland Drill	Taylor Mountain Fire Rehabilitation	October 2014	2,000	3182
		Two-Way Ely Chain	Taylor Mountain Fire Rehabilitation	Fall 2014	1,100	3182
		Herbicide	Taylor Mountain Fire Rehabilitation	Fall 2014	2,200	3182
		Aerial After	Taylor Mountain Fire--BLM ESR Supplement	December 2014	2,019	3207
9-3	Dry Fork Mountain	Wildfire	Dry Fork	July 2005	517	
9-5	Island Park	Wildfire	Island Park	2010		
9-10	Toliver Creek Chaining	Two-Way Chaining		Fall 1986		
		Seeding Unknown		Fall 1986		
		Lop and Scatter	Taylor Flat P/J Removal	August 2005	1,040	10
9-16	Mosby Mountain	Wildfire	Lil’ Water	1988	600	
9-17	Farm Creek	Wildfire	Neola North	Summer 2007	43,806	
9-19	Mosby Mountain South	Wildfire	Lil’ Water	1988	600	
9-24	Brush Creek Substation	Plateau	Brush Creek Bench Sage Restoration	September 2008	279	315
		One-Way Dixie	Brush Creek Bench Sage Restoration	December 2008	279	315
		Broadcast Before	Brush Creek Bench Sage Restoration	January 2009	279	315
		Aerial After	Brush Creek Bench Sage Restoration	March 2009	279	315
		Rangeland Drill	Brush Creek Bench Seeding	October 2010	408	1659
		Herbicide-Plateau	Brush Creek Bench Sage Restoration	September 2008	279	315
9-27	Little Mountain	Lop and Scatter	Dry Fork Hazardous Fuel Project Phase 2	September 2013	1,842	2789
09R-3	Deadman Greenstrip	One-Aerator/Seed	Deadman Greenstrip	Fall 2004	680	PDB
		Herbicide-Plateau	Deadman Bench Range Improvement	September 2008	525	1081
		Rangeland Drill	Deadman Bench Range Improvement	December 2008	525	1081
		Herbicide-Plateau	Deadman Bench follow-up herbicide	September 2012	1,003	2202

Study #	Study Name	Type	Disturbance Name (if available)	Date	Size (acres)	WRI Project #
09R-4	Diamond Mountain Bullhog	Bullhog	Diamond Rim	Sept. 2004	320	PDB
		Aerial Before	Diamond Rim	Sept. 2004	320	PDB
		Aerial After	Diamond Rim	Sept. 2004	320	PDB
09R-5	Little Donkey	Herbicide	Red Fleet	October 2004		PDB
		Truax	Red Fleet	November 2004	470	PDB
09R-6	North Little Donkey	Truax	Red Fleet	Fall 2004	470	PDB
09R-7	Red Fleet Lop and Scatter	Chaining Unknown		1960s or '70		
		Lop and Scatter	Red Fleet Lop and Scatter	Fall 2004		PDS
09R-10	Ruple Cabin	Aerial Before	Ruple Vegetation Treatment	Fall 2005	1,680	178
		Aerator (Double Drum) Herbicide-Spike	Ruple Vegetation Treatment	Fall 2005	1,680	178
09R-12	West Stuntz	Two-Way Dixie Harrow	West Stuntz	Fall 2006	200	357
		Broadcast Before	West Stuntz	Fall 2006	200	357
09R-14	Pot Creek Chaining	Wildfire	Pot Hole	2006	1,396	
		One-way Ely Chain	Ruple Cabin Wildfire Rehabilitation	September 2006	1,200	608
		Aerial Before	Ruple Cabin Wildfire Rehabilitation	September 2006	1,200	608
		Dribbler	Ruple Cabin Wildfire Rehabilitation	September 2006	1,200	608
		Aerial After	Ruple Cabin Wildfire Rehabilitation	December 2006	1,200	608
09R-15	Brush Creek Dixie	Herbicide-Plateau	Brush Creek Bench Sage Restoration	September 2008	280	315
		One-Way Dixie Harrow	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
09R-16	Brown's Field	Herbicide-Tordon, 2-4D	Browns Park Ag Field Rehabilitation	Jun. 2005	141	26
		Two-Aerator/Seed	Browns Park Ag Field Rehabilitation	Sept. 2006	141	26
		Broadcast After	Browns Park Ag Field Rehabilitation	Fall 2006	141	26
		Herbicide-Plateau	Brown's Park Fields	Fall 2008	143	1152
		Rangeland Drill	Brown's Park Fields	Jan. 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
09R-18	Brotherson Chaining	Two-Way Ely Chain	Brotherson Chaining	November 2008	347	1150
		Aerial Before	Brotherson Chaining	November 2008	347	1150
		Aerial After	Brotherson Chaining	December 2008	237	1150
09R-22	North Dry Gulch Ponderosa Thinning	Lop and Scatter	North Dry Gulch Ponderosa Pine Thinning Project	September 2010	450	1495
09R-24	Raven Ridge	Herbicide-Plateau	Raven Ridge Harrow Project	September 2011	500	1989
		Broadcast Before	Raven Ridge Harrow Project	Fall 2011	500	1989
		One-way Chain Harrow	Raven Ridge Harrow Project	Fall 2011	500	1989
09R-25	Davis Draw Sagebrush	Two-Way Chain Harrow	Davis Draw Sagebrush	September	424	2266
09R-26	Simplot	Strip Mine		Historic		

Table 2.10: Range trend and WRI studies known disturbance history for WMU 9, South Slope.

Study Trend Summary (Range Trend)

Mountain (Sagebrush)

There are seven study sites [Taylor Mountain (09-2), Dry Fork Mountain (09-3), Sawtooth-Flat Spring (09-4), Warren Draw (09-7), Little Hole (09-9), Farm Creek (09-17), and Rock Creek (09-23)] classified as Mountain (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 study 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. The Little Hole study is situated on the northern slope of the Uinta Mountains, northwest of Jackson Draw. The Farm Creek site is found on the southern slope of the Uinta Mountains adjacent to Farm Creek. Finally, the Rock Creek study site is located near Rock Creek and across from Dick Hollow.

Shrubs/Trees: The primary browse species on these sites is mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*); the exception to this is the Farm Creek study, where antelope bitterbrush (*Purshia tridentata*) has more cover than mountain big sagebrush. Other browse species are present with antelope bitterbrush being co-dominant on a few sites. Shrub line intercept cover has remained stable from 2010 to 2015, and although cover is generally good, it has exhibited an overall slightly decreasing trend (Figure 2.3). The sagebrush populations on these sites are largely composed of mature and, to a lesser extent, decadent individuals. Although recruitment of young plants has remained low throughout the study years, it has increased since the 2010 sample year. Some of the decrease in sagebrush cover can be attributed to fires that affected the Farm Creek and Dry Fork Mountain studies (Figure 2.6).

Conifer encroachment is a concern on these study sites, and cover has increased from 7.5% in 2005 to 8.9% in 2010 and 12.4% in 2015. Much of this encroachment is driven by twoneedle pinyon (*Pinus edulis*) which had 9.1% average cover in 2015 (Figure 2.4).

Herbaceous Understory: The herbaceous understory of these study sites is plentiful, diverse, and overall in good condition. Perennial grasses have been the largest component in the understory throughout the study years. However, on the Taylor Mountain, Sawtooth Flat, and Little Hole studies, the dominant grass species is the introduced species Kentucky bluegrass (*Poa pratensis*) and on the Farm Creek study the dominant species is the introduced species crested wheatgrass (*Agropyron cristatum*); competition with these introduced grass species may limit other desirable herbaceous species. On average, the cover of annual grasses – namely the invasive species cheatgrass (*Bromus tectorum*) is low on these sites, but has steadily increased each sample year. A diverse number of perennial forbs provide substantial cover, which has ranged from just over 9% in 2010 to 10.5% in 2005 and 2015. Annual forb cover has remained low and has never exceeded 3% (Figure 2.7).

Occupancy: Pellet group transect data indicates that animal occupancy fluctuates from year to year on these study sites. Deer pellet groups have consistently remained present in the highest amounts, ranging from 24 days use/acre in 2015 to 53 days use/acre in 2005. The mean abundance of elk pellet groups has been as low as 6 days use/acre in 2010 and as high as 11 days use/acre in 2000. Finally, the mean abundance of cattle pellet groups has ranged from 7 days use/acre in 2010 to 16 days use/acre in 2005 (Figure 2.8).

Mountain (Browse)

Five study sites [Mud Springs Draw (09-15), Mosby Mountain (09-16), Gooseberry Spring (09-18), Mosby Mountain South (09-19), and Seep Hollow (09-20)] are classified as Mountain (Browse) ecological sites. The Mud Springs Draw site is found in the northern portion of Mud Springs Draw. Both the Mosby Mountain and Mosby Mountain South studies are situated on the south slope of Mosby Mountain. The Gooseberry Spring study 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.

Shrubs/Trees: The dominant shrub species on these sites is generally a mixture of preferred browse including alderleaf mountain mahogany (*Cercocarpus montanus*), mountain snowberry (*Symphoricarpos oreophilus*), and antelope bitterbrush (*Purshia tridentata*). Overall preferred browse cover is good and has remained stable throughout the sample years ranging from 20% in 2005 to 22% in 2010. The overall cover of sagebrush, mainly mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) is moderate and has increased steadily over the sample years, from just over 6% in 2005 to over 9% in 2010 and over 11% in 2015. A majority of the plants in these sagebrush populations are mature, although decadent individuals are present to a lesser extent. Recruitment of young plants has decreased from 1,242 plants/acre in 2010 to 678 plants/acre in 2015, but has exhibited an overall increase (Figure 2.6). On average, other shrub species contribute 10% cover as of the 2015 sample year (Figure 2.3).

The mean twoneedle pinyon (*Pinus edulis*) cover for these sites has remained low throughout the sample years. However, it should be noted that this trend is driven entirely by the Seep Hollow site as no other sites have had any pinyon cover recorded. Density of pinyon pine was first recorded in the 2015 sample year with a value of 68 trees/acre (Figure 2.4, Figure 2.5).

Herbaceous Understory: The herbaceous understory has fluctuated throughout the sample years, but 2015 average cover was higher than 2010 cover. Perennial grasses have consistently contributed the most herbaceous cover. Although introduced perennial grasses such as crested wheatgrass (*Agropyron cristatum*) and Kentucky bluegrass (*Poa pratensis*) are often present, native grasses dominate a majority of these sites. Perennial forb cover has fluctuated, but has remained moderate ranging from 5.5% cover in 1995 to 10% cover in 2005. The annual invasive grass species cheatgrass (*Bromus tectorum*) is present on a majority of these sites, but in generally occurs in low abundance. Other annual introduced brome species such as rattlesnake brome (*B. briziformis*) and field brome (*B. arvensis*) have been observed in small amounts on the Mosby Mountain South study site. Annual forbs have contributed slightly more cover than annual grasses, but still remain a minor component of the herbaceous understory. The noxious weed gypsyflower (*Cynoglossum officinale*) is present on the Gooseberry Spring site, but in low amounts (Figure 2.7).

Occupancy: Pellet transect data indicates that occupancy has varied over the sample years, but has generally decreased. Mean abundance of elk pellet groups has ranged from 20 days use/acre in 2015 to 56 days use/acre in 1995. Mean abundance of deer/pronghorn pellet groups has ranged from 19 days use/acre in 2000 to 39 days use/acre in 2005. Finally, mean abundance of cattle pellet groups has varied from 1.5 days use/acre in 1995 to 23 days use/acre in 2005 (Figure 2.8).

Upland (Sagebrush)

There are two sites [Rye Grass (9-8) and Little Mountain (9-27)] classified as Upland (Sagebrush) ecological sites. Rye Grass is located on the southern slope of the Uinta Mountains in the southern portion of Rye Grass Draw. Little Mountain is found northwest of Coal Mine Basin and the city of Vernal.

Shrubs/Trees: The Rye Grass and Little Mountain study sites are dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and black sagebrush (*A. nova*), respectively, but both species are present on both sites. Other preferred browse species are present, but provide minimal cover. As only 2015 line-intercept data is available, no assessment on overall trend for shrub and tree cover can be made at this time (Figure 2.3). Average sagebrush demographics indicate that the population has been comprised of mainly mature individuals throughout the study years, followed by decadent plants. Recruitment of young plants has increased from 382 plants/acre in 2000 to 1,348 plants/acre in 2015 (Figure 2.6).

Encroachment by Utah juniper (*Juniperus osteosperma*) is occurring on the Little Mountain study site. The density of juniper on this study site was 421 trees/acre in 2015, all of which were young trees or seedlings, even though the site was recently lopped and scattered (Figure 2.4, Figure 2.5).

Herbaceous Understory: These study sites have a good herbaceous understory which has shown an overall increasing trend over the study years. Perennial grasses have consistently been the most dominant component, although the Little Mountain study is dominated by the introduced species crested wheatgrass (*Agropyron cristatum*). The invasive annual grass cheatgrass (*Bromus tectorum*) is present on these sites, but it provides little cover. Perennial forbs are fairly abundant, but have exhibited a decreasing trend over the study years; cover has decreased from nearly 10% in 1995 to 4% in 2015. Annual forbs have consistently remained rare (Figure 2.7).

Occupancy: Average pellet transect data indicates that occupancy has decreased from 2000 to 2015; it is important to note that data for the 2000 sample year is entirely contributed by the Rye Grass study. Mean abundance for elk pellet groups has ranged from 5 days use/acre in 2015 to 14 days use/acre in 2000. The mean abundance for deer/pronghorn pellet groups has remained almost stable, ranging from 8.4 days use/acre in 2015 to 8.7 days use/acre in 2000. Finally, the mean abundance of cattle pellet groups has ranged from nearly 1 days use/acre in 2000 to just over 2 days use/acre in 2015 (Figure 2.8).

Semidesert (Sagebrush)

There are eight sites [Red Mountain Allotment (09-1), Island Park (09-5), Above Steinaker Draw (09-6), 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)] classified as Semidesert (Sagebrush) ecological sites. The Red Mountain Allotment study is found just west of Steinaker Reservoir. The Island Park study 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.

Shrubs/Trees: It is important to note that the n value for these sites varies from year to year. The dominant browse species varies from site to site. The Red Mountain Allotment and Island Park study sites, both of which burned, had no browse cover recorded in 2015, while shadscale saltbush (*Atriplex confertifolia*) is the main browse species on the Browns Park River Corridor – Wildlife study site. Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) is the primary browse species on the Above Steinaker Draw, Toliver Creek Chaining, Browns Park River Corridor – Livestock, Brush Creek Substation, and Buckhorn Canyon studies. Sagebrush cover and shrub cover in general vary from site to site, but have generally decreased throughout the study years (Figure 2.3). The exception to this is the Buckhorn Canyon study site, on which Wyoming big sagebrush had 10% cover in 2010 and nearly 15% cover in 2015. Average sagebrush demographics indicate that these study sites are largely composed of mature and decadent individuals. Recruitment of young plants has fluctuated, ranging from 107 plants/acre in 2000 to 634 plants/acre in 2010 (Figure 2.6).

Encroachment of Utah juniper (*Juniperus osteosperma*) is a concern on these sites. Although density has exhibited an overall decrease, cover has increased. This increase in cover and density in 2015 can probably be attributed to the Above Steinaker Draw study, which was not sampled in 2010, the year in which juniper cover and density was lowest (Figure 2.4, Figure 2.5).

Herbaceous Understory: While the herbaceous understory of these sites is generally abundant, composition has varied throughout the years. These sites have been dominated by perennial and/or annual grasses in each sample year. The invasive annual species cheatgrass (*Bromus tectorum*) is present on many sites in significant amounts, increasing the risk for catastrophic fire. Perennial grasses are largely native, but the introduced species crested wheatgrass (*Agropyron cristatum*) has been observed on select sites. Cover of both perennial forbs and annual forbs has fluctuated over time, but both have remained relatively rare (Figure 2.7).

Occupancy: Average pellet transect data indicates that occupancy has fluctuated over time and has generally exhibited an overall decreasing trend. Mean abundance of elk pellet groups has ranged from 3 days use/acre in 2015 to 24 days use/acre in 2005. Mean abundance of deer/pronghorn pellet groups has ranged from 20 days use/acre in 2015 to 49 days use/acre in 2010. Finally, mean abundance of cattle pellet groups has ranged from under 1 days use/acre in 2000 to 11 days use/acre in 2005 (Figure 2.8).

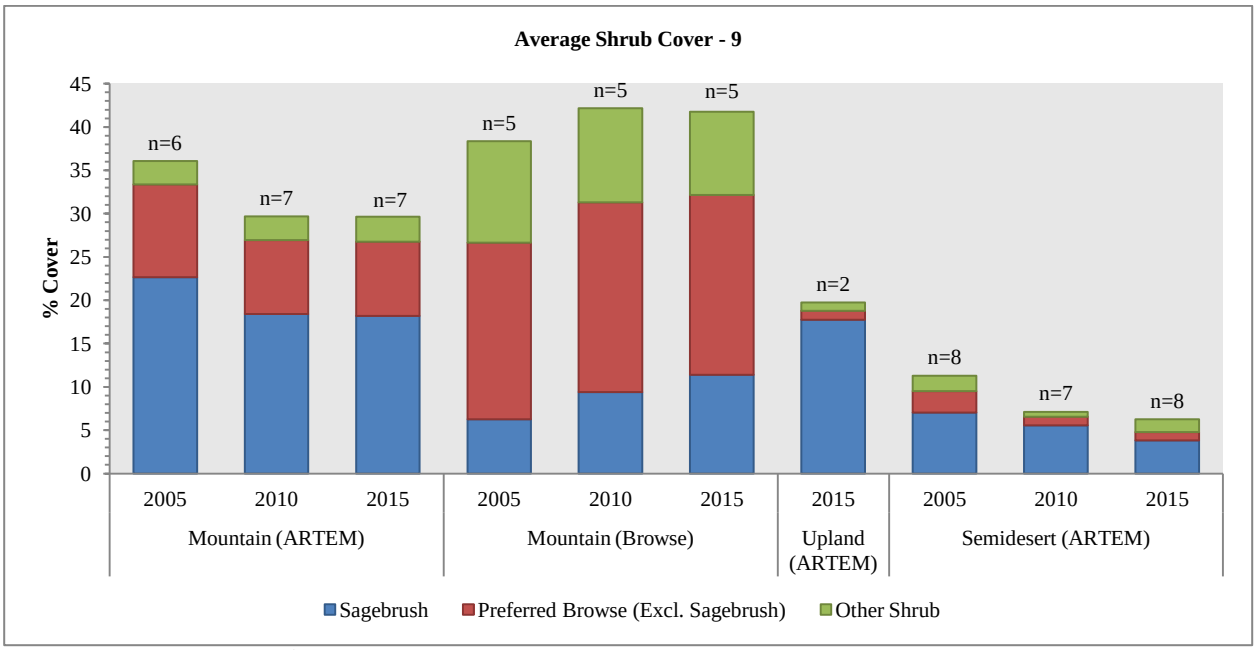


Figure 2.3: Average shrub cover for Mountain (ARTEM), Mountain (Browse), Upland (ARTEM), and Semidesert (ARTEM) study sites in WMU 9, South Slope.

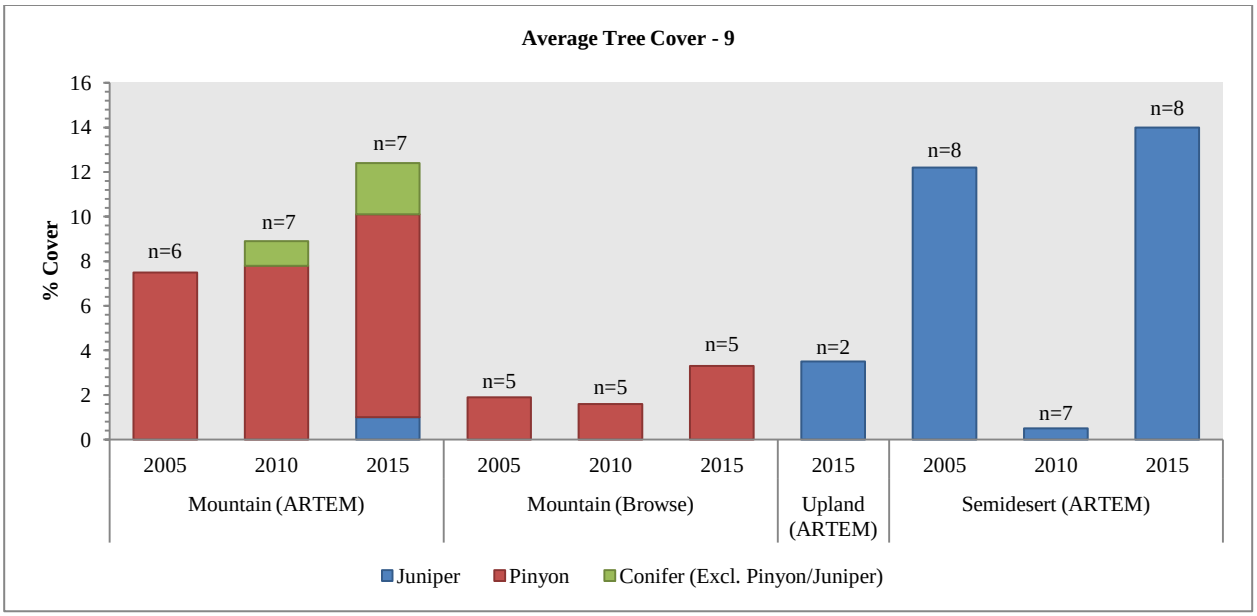


Figure 2.4: Average tree cover for Mountain (ARTEM), Mountain (Browse), Upland (ARTEM), and Semidesert (ARTEM) study sites in WMU 9, South Slope.

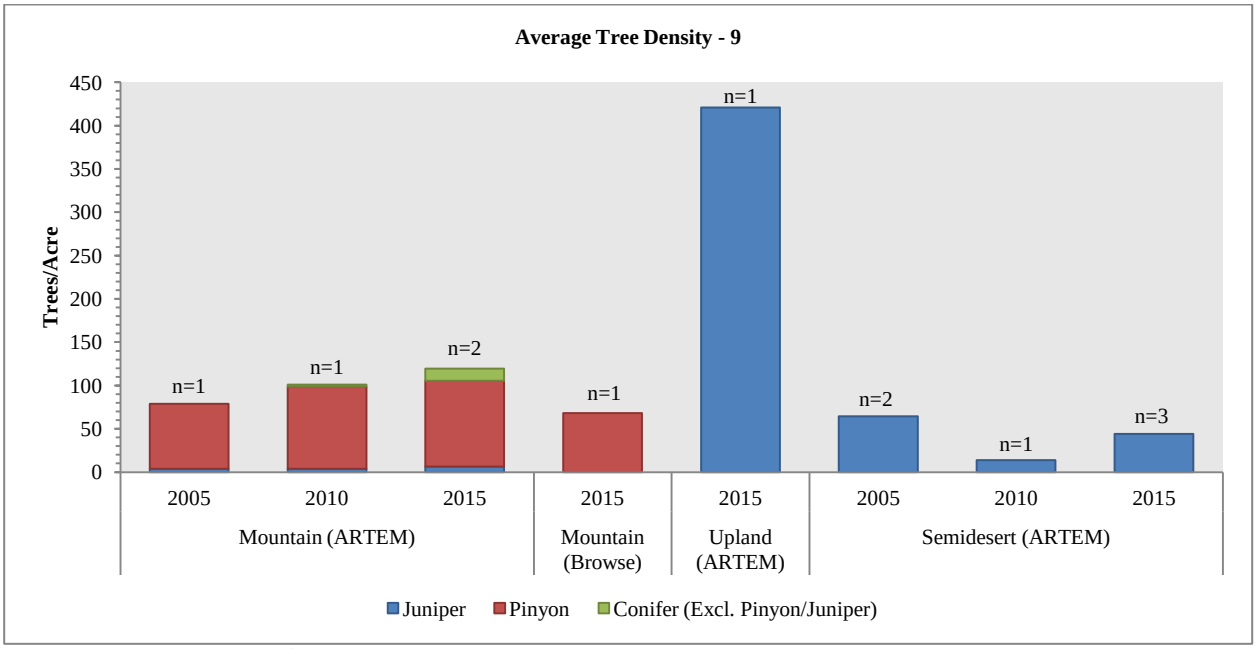


Figure 2.5: Average tree density for Mountain (ARTEM), Mountain (Browse), Upland (ARTEM), and Semidesert (ARTEM) study sites in WMU 9, South Slope.

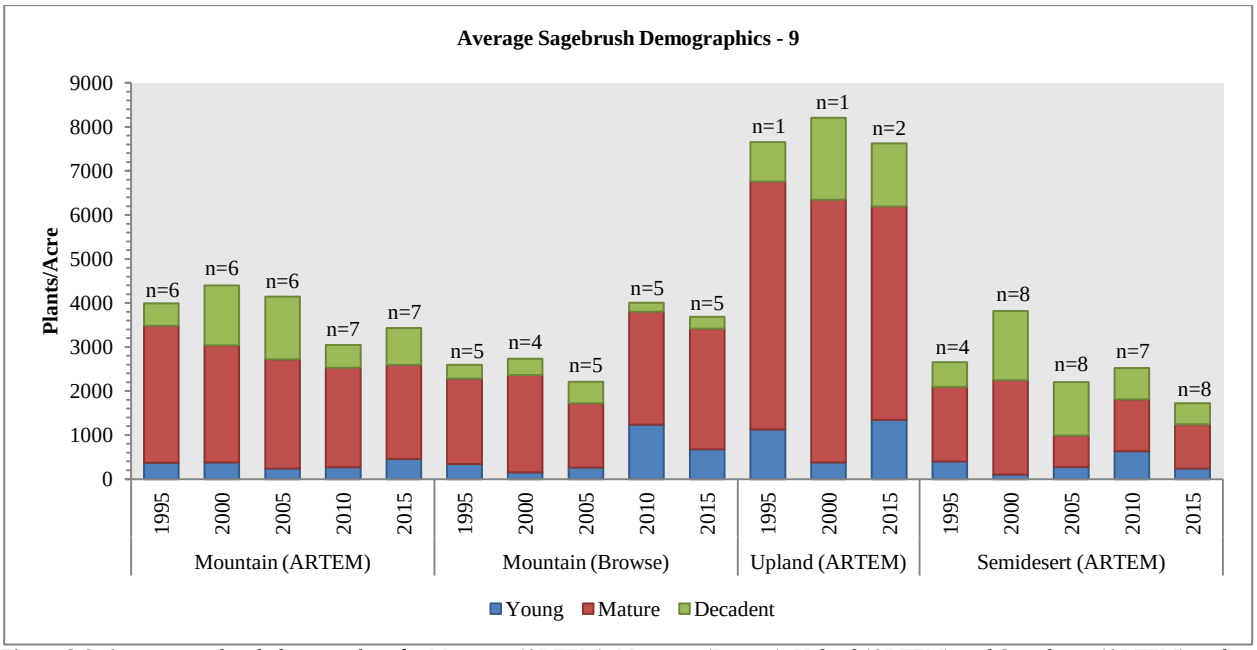


Figure 2.6: Average sagebrush demographics for Mountain (ARTEM), Mountain (Browse), Upland (ARTEM), and Semidesert (ARTEM) study sites in WMU 9, South Slope.

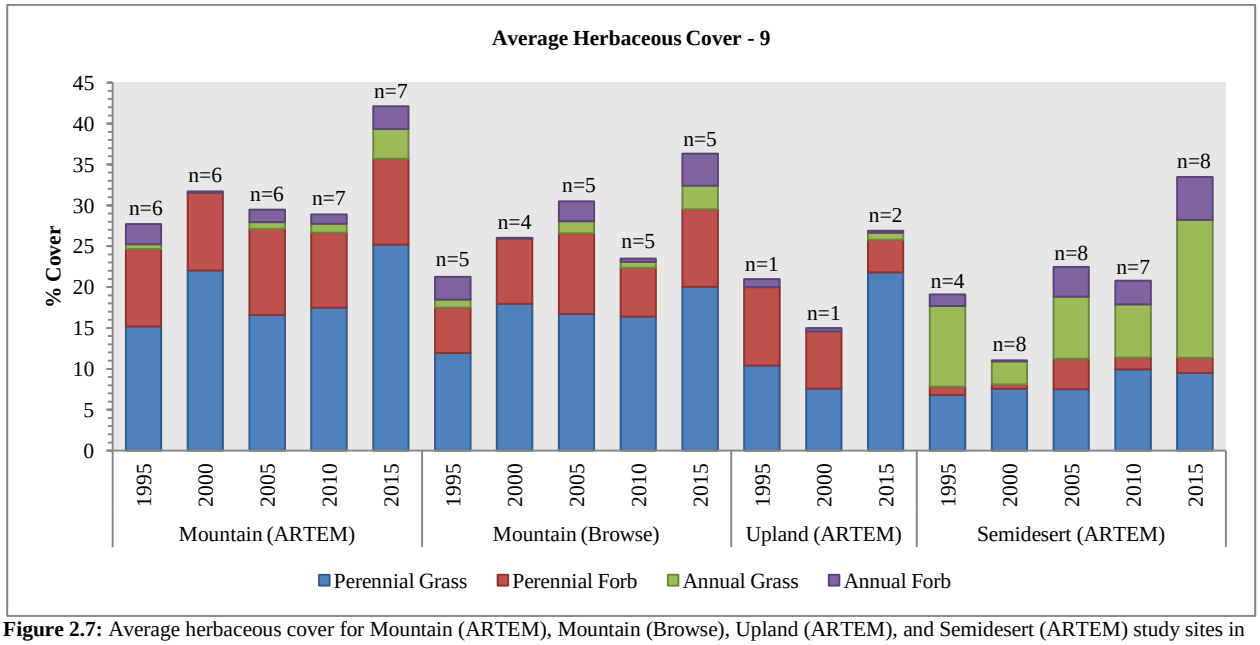


Figure 2.7: Average herbaceous cover for Mountain (ARTEM), Mountain (Browse), Upland (ARTEM), and Semidesert (ARTEM) study sites in WMU 9, South Slope.

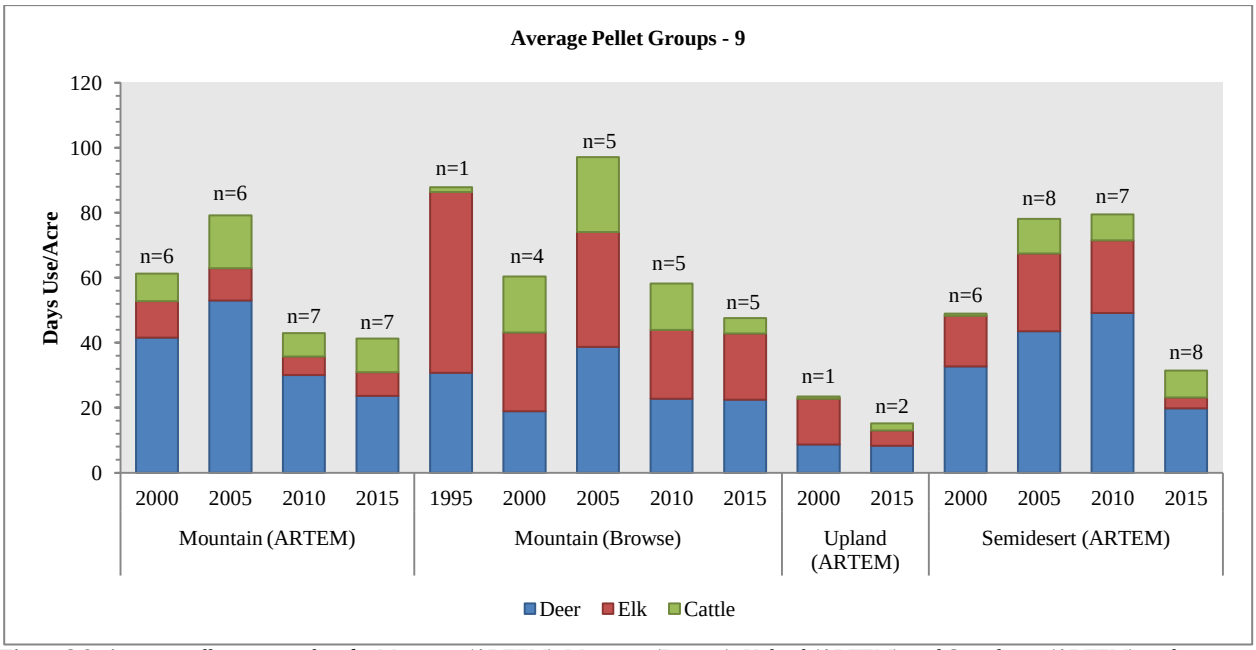
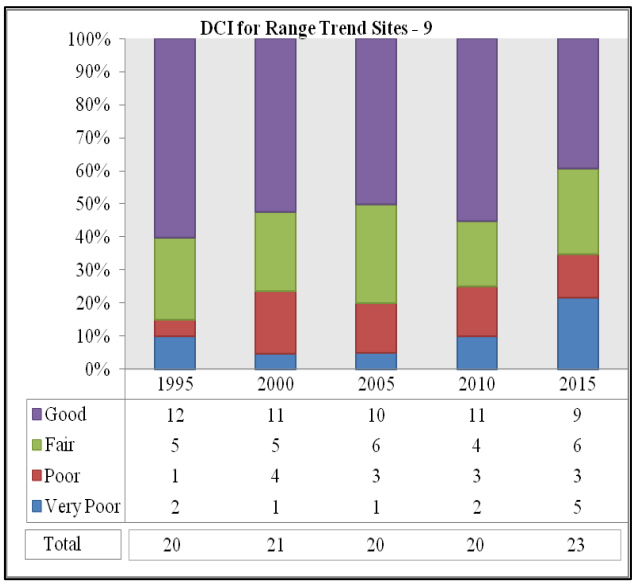


Figure 2.8: Average pellet transect data for Mountain (ARTEM), Mountain (Browse), Upland (ARTEM), and Semidesert (ARTEM) study sites in WMU 9, South Slope.

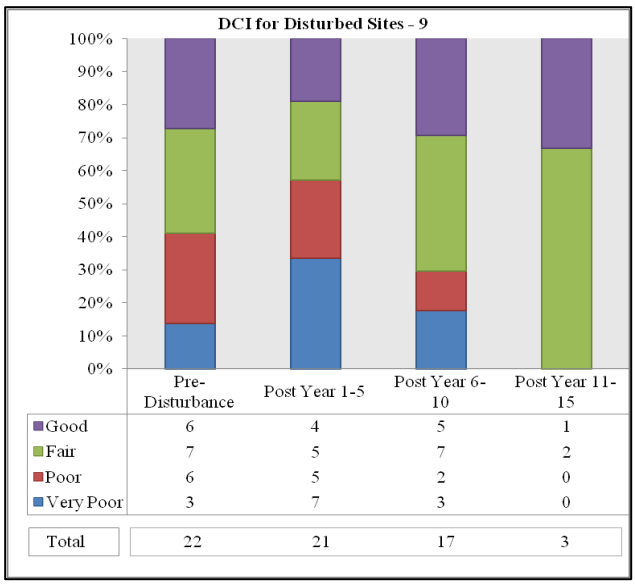
Deer Winter Range Condition Assessment

The condition of deer winter range within the South Slope management unit has continually changed on the sites sampled since 1995. The Range Trend sites sampled within the unit are considered to be in very poor to good condition as of the 2015 sample year (Map 2.14, Figure 2.9). Red Mountain Allotment, Island Park, Above Steinaker Draw, and Brush Creek substation are considered to be in very poor condition due to the amount of annual grass present, having few perennial forbs, a lack of diversity within the sagebrush demographics, and a lack of browse cover. Dry Fork Mountain, Sawtooth Flat Springs, Toliver Creek Chaining, Farm Creek, Browns Park River Corridor – Livestock, Browns Park River Corridor – Wildlife, Rock Creek, Buckhorn Canyon, and Little Mountain are considered to be in poor to fair condition. Finally, Taylor Mountain, Warren Draw, Rye Grass, Little Hole, Mud Springs Draw, Mosby Mountain, Gooseberry Spring, Mosby Mountain South, and Seep Hollow are considered to be in good condition The treated study sites ranged from very poor to good (Map 2.14, Figure 2.10). In general, the treated sites have improved as time since treatment has increased. Red Mountain Allotment, Dry Fork Mountain, Island Park, Toliver Creek Chaining, Farm Creek, Brush Creek Substation, and Little Mountain are also considered to be Range Trend sites and are therefore discussed above. Simplot was sampled pretreatment and was in good condition, Little Donkey went from very poor to good, and Ruple Canyon went from fair to good. Deadman Greenstrip, West Stuntz, Brotherson Chaining, and Davis Draw Sagebrush remained in good condition, while Diamond Mountain Bullhog, North Little Donkey, Red Fleet Lop and Scatter, Brush Creek Dixie, and Brown's Field remained in fair condition. Exceptions of the improvement seen over time on most sites include Pot Creek Chaining which went from poor to very poor, Toliver Creek Bullhog which went from good to fair, North Dry Gulch Ponderosa Thinning which went from poor to very poor, and Raven Ridge which went from fair to poor. It is possible given more time and continual monitoring that these sites will improve.



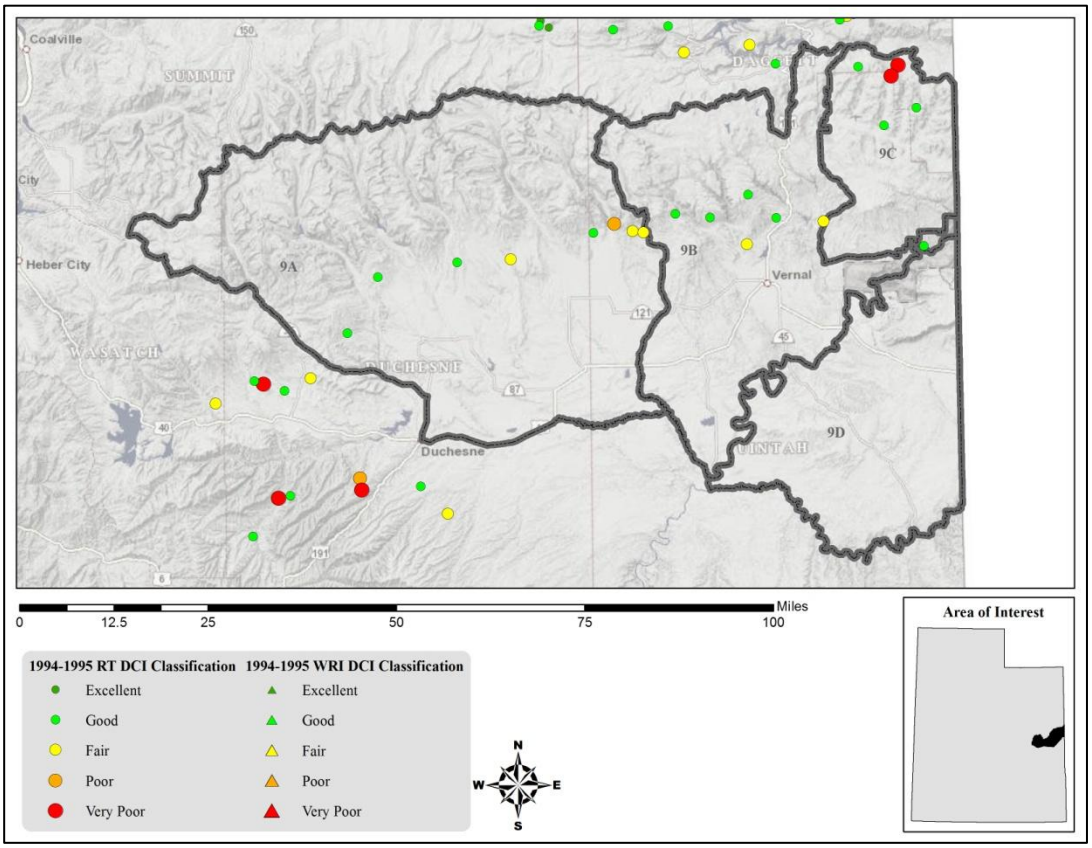
	1995	2000	2005	2010	2015
Good	12	11	10	11	9
Fair	5	5	6	4	6
Poor	1	4	3	3	3
Very Poor	2	1	1	2	5
Total	20	21	20	20	23

Figure 2.9: Deer winter range Desirable Components Index (DCI) summary by year of Range Trend sites for WMU 9, South Slope.

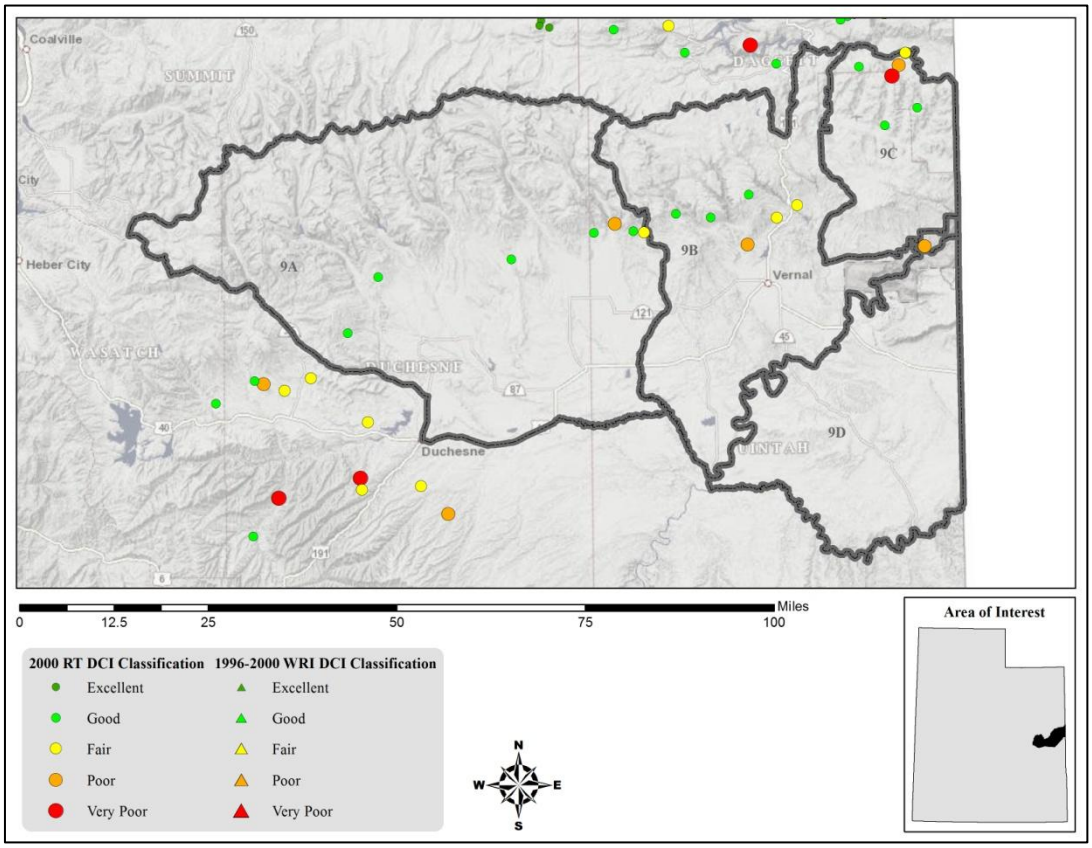


	Pre-Disturbance	Post Year 1-5	Post Year 6-10	Post Year 11-15
Good	6	4	5	1
Fair	7	5	7	2
Poor	6	5	2	0
Very Poor	3	7	3	0
Total	22	21	17	3

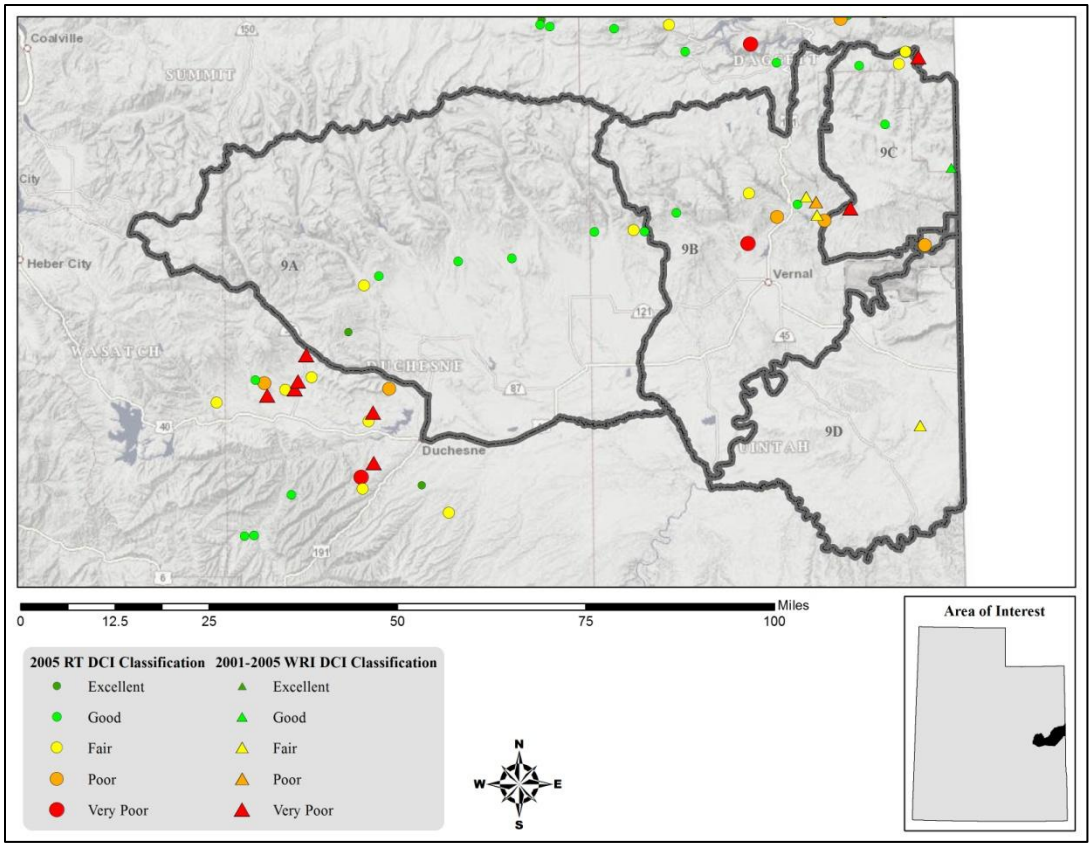
Figure 2.10: Deer winter range Desirable Components Index (DCI) summary by year of treated/disturbed sites for WMU 9, South Slope.



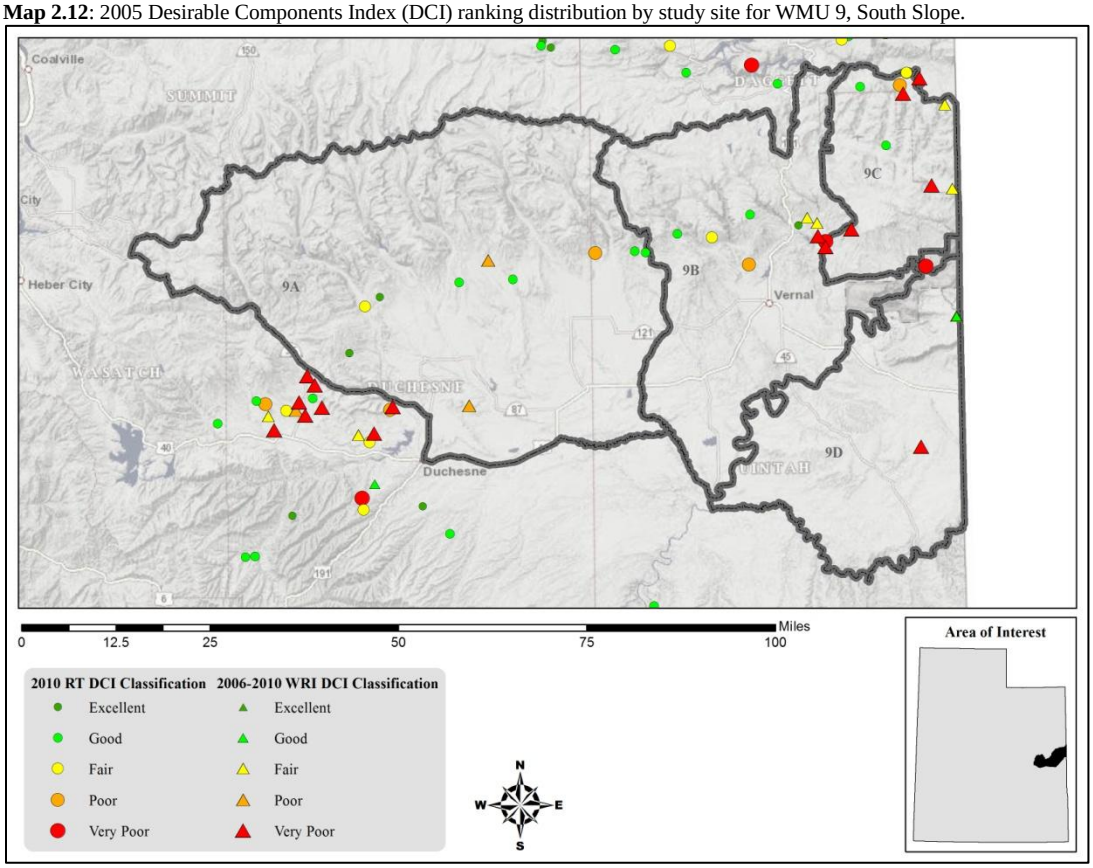
Map 2.10: 1994-95 Desirable Components Index (DCI) ranking distribution by study site for WMU 9, South Slope.



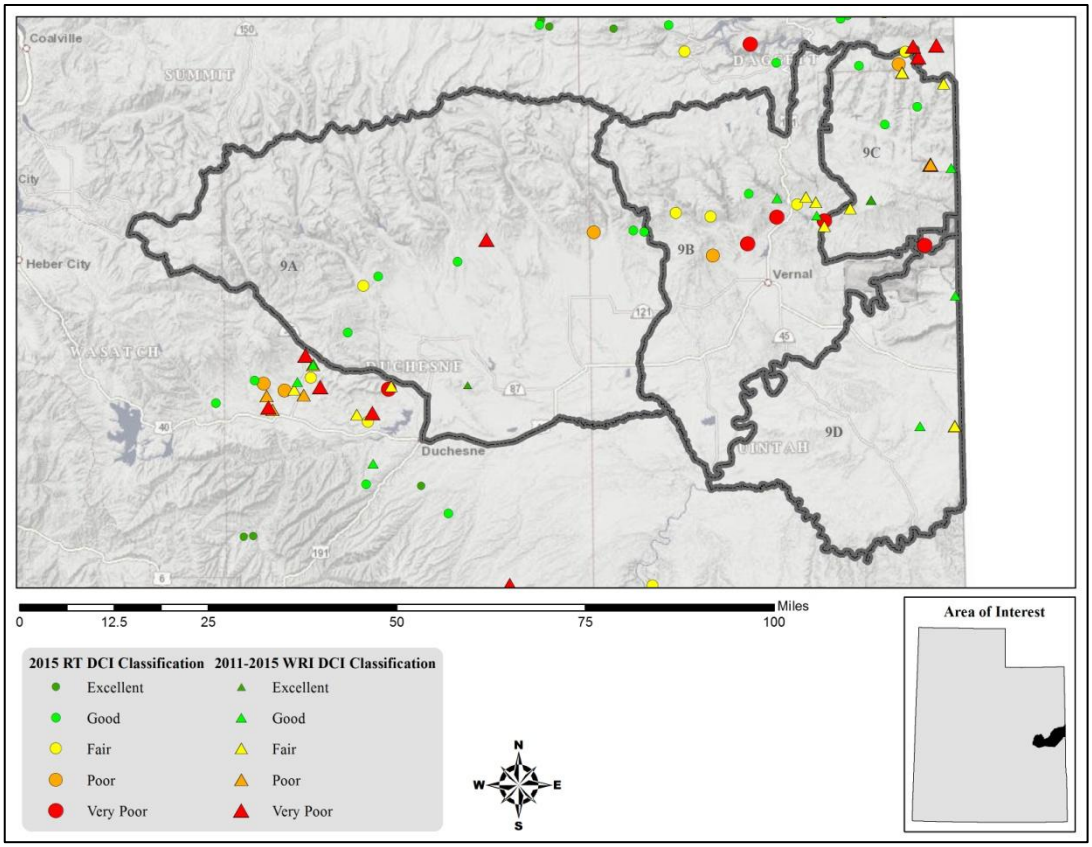
Map 2.11: 2000 Desirable Components Index (DCI) ranking distribution by study site for WMU 9, South Slope.



Map 2.12: 2005 Desirable Components Index (DCI) ranking distribution by study site for WMU 9, South Slope.



Map 2.13: 2010 Desirable Components Index (DCI) ranking distribution by study site for WMU 9, South Slope.



Map 2.14: 2015 Desirable Components Index (DCI) ranking distribution by study site for WMU 9, South Slope.

Study #	Study Name	Limiting Factor and/or Threat	Level of Threat	Potential Impact
09-1	Red Mountain Allotment	Annual Grass	High	Increased fire potential.
09-2	Taylor Mountain	None Identified		
09-3	Dry Fork Mountain	Annual Grass	Low	Increased fire potential.
09-4	Sawtooth-Flat Spring	Annual Grass	Low	Increased fire potential.
09-5	Island Park	Annual Grass	High	Increased fire potential.
09-6	Above Steinaker Draw	Annual Grass	High	Increased fire potential.
		PJ Encroachment	Moderate	Reduced understory shrub and herbaceous vigor.
09-7	Warren Draw	Annual Grass	Low	Increased fire potential.
09-8	Rye Grass	Annual Grass	Low	Increased fire potential.
09-9	Little Hole	Annual Grass	Moderate	Increased fire potential.
		PJ Encroachment	Moderate	Reduced understory shrub and herbaceous vigor.
09-10	Toliver Creek Chaining	Annual Grass	Low	Increased fire potential.
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
09-13	John Star Flat	Annual Grass	Low	Increased fire potential.
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
09-15	Mud Springs Draw	Annual Grass	Low	Increased fire potential.
09-16	Mosby Mountain	Annual Grass	Moderate	Increased fire potential.
09-17	Farm Creek	Annual Grass	Low	Increased fire potential.
		Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species.
09-18	Gooseberry Spring	Noxious Weeds	Low	Reduced diversity of desirable grass and forb species.
09-19	Mosby Mountain South	Annual Grass	Moderate	Increased fire potential.
09-20	Seep Hollow	Annual Grass	Low	Increased fire potential.
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
09-21	Browns Park River Corridor-Livestock	Annual Grass	Low	Increased fire potential.
09-22	Browns Park River Corridor-Wildlife	Annual Grass	High	Increased fire potential.
09-23	Rock Creek	Annual Grass	Low	Increased fire potential.
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
09-24	Brush Creek Substation	Annual Grass	Moderate	Increased fire potential.
09-25	Buckhorn Canyon	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
		Annual Grass	High	Increased fire potential.
09-27	Little Mountain	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
		Introduced Perennial Grass	Moderate	Reduced diversity of desirable grass and forb species.
09R-3	Deadman Greenstrip	Annual Grass	Low	Increased fire potential.
09R-4	Diamond Mountain Bullhog	Annual Grass	Low	Increased fire potential.
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
09R-5	Little Donkey	Annual Grass	Low	Increased fire potential.
09R-7	Red Fleet Lop and Scatter	Introduced Perennial Grass	Moderate	Reduced diversity of desirable grass and forb species.
09R-10	Ruple Cabin	Annual Grass	Low	Increased fire potential.
09R-12	West Stuntz	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
09R-14	Pot Creek Chaining	Annual Grass	Low	Increased fire potential.
09R-15	Brush Creek Dixie	Annual Grass	Moderate	Increased fire potential.
09R-16	Brown's Field	Annual Grass	High	Increased fire potential.
09R-18	Brotherson Chaining	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
09R-24	Raven Ridge	Annual Grass	Low	Increased fire potential.
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
09R-26	Simplot	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
		Annual Grass	Low	Increased fire potential.

Table 2.11: Assessment of the potential limiting factors and/or threats and level of threat to study sites for WMU 9, South Slope. All assessments are based off of the most current sample date for each study site.

Discussion and Recommendations

Mountain (Sagebrush)

These high elevation mountain ecological sites support sagebrush communities and are generally considered to be in poor to good condition for deer winter range habitat on the South Slope management unit. These communities support shrub populations that provide valuable browse in moderate to severe winters. While generally in good condition, introduced perennial grasses can be present in the herbaceous understories. Although providing valuable forage, these grass species can often be aggressive at higher elevations and can reduce the prevalence and abundance of other more desirable native grass and forb species. In addition, some of these sites appear to be prone to encroachment from pinyon-juniper trees that can reduce understory shrub and herbaceous health if not addressed. These sites are also prone to invasion from annual grasses, namely cheatgrass. Increases in cheatgrass can increase fuel loads and exacerbate the risk of wildfire.

It is recommended that when necessary and where appropriate, work to reduce pinyon-juniper encroachment (e.g. bullhog, chaining, lop and scatter, etc.) should begin or continue in these communities. Care should be taken in selecting treatment methods that will not increase annual grass cover. When reseeding is necessary to restore herbaceous species, care should be taken in species selection, and preference should be given to native grass species when possible.

Mountain (Browse)

These high elevation mountain ecological sites support mixed mountain brush communities and are generally considered to be in good condition for deer winter range habitat on the South Slope management unit. These communities support robust shrub populations that provide valuable browse in mild and moderate winters. While in generally good condition, introduced perennial grasses are often present in the herbaceous understory. Although providing valuable forage, these grass species can often be aggressive at higher elevations and can reduce the prevalence and abundance of other more desirable native grass and forb species. Cheatgrass is present in most of these communities. Increases in cheatgrass can increase fuel loads thereby increasing the threat of wildfire. Finally, the noxious weed gypsyflower was recorded on the Gooseberry Spring site, but in small amounts. Noxious weeds are often aggressive and can reduce the amount of desirable grass and forb species.

It is recommended that monitoring of these communities continue. Treatments to reduce annual grass may be necessary on some sites. When reseeding is necessary to restore herbaceous species, care should be taken in species selection, and preference should be given to native grass species when possible.

Upland (Sagebrush)

These mid elevation upland ecological sites support sagebrush communities and are considered to be in poor to good condition for deer winter range habitat on this management unit. These communities support robust shrub populations that provide valuable browse in mild and moderate winters. The herbaceous understories are in generally good condition, but introduced perennial grasses dominate the Little Mountain site. Although providing valuable forage, these grass species can often be aggressive and can reduce the prevalence and abundance of other more desirable native grass and forb species. In addition, Utah juniper is encroaching on the Little Mountain study site, which may reduce understory shrub and herbaceous health as trees age.

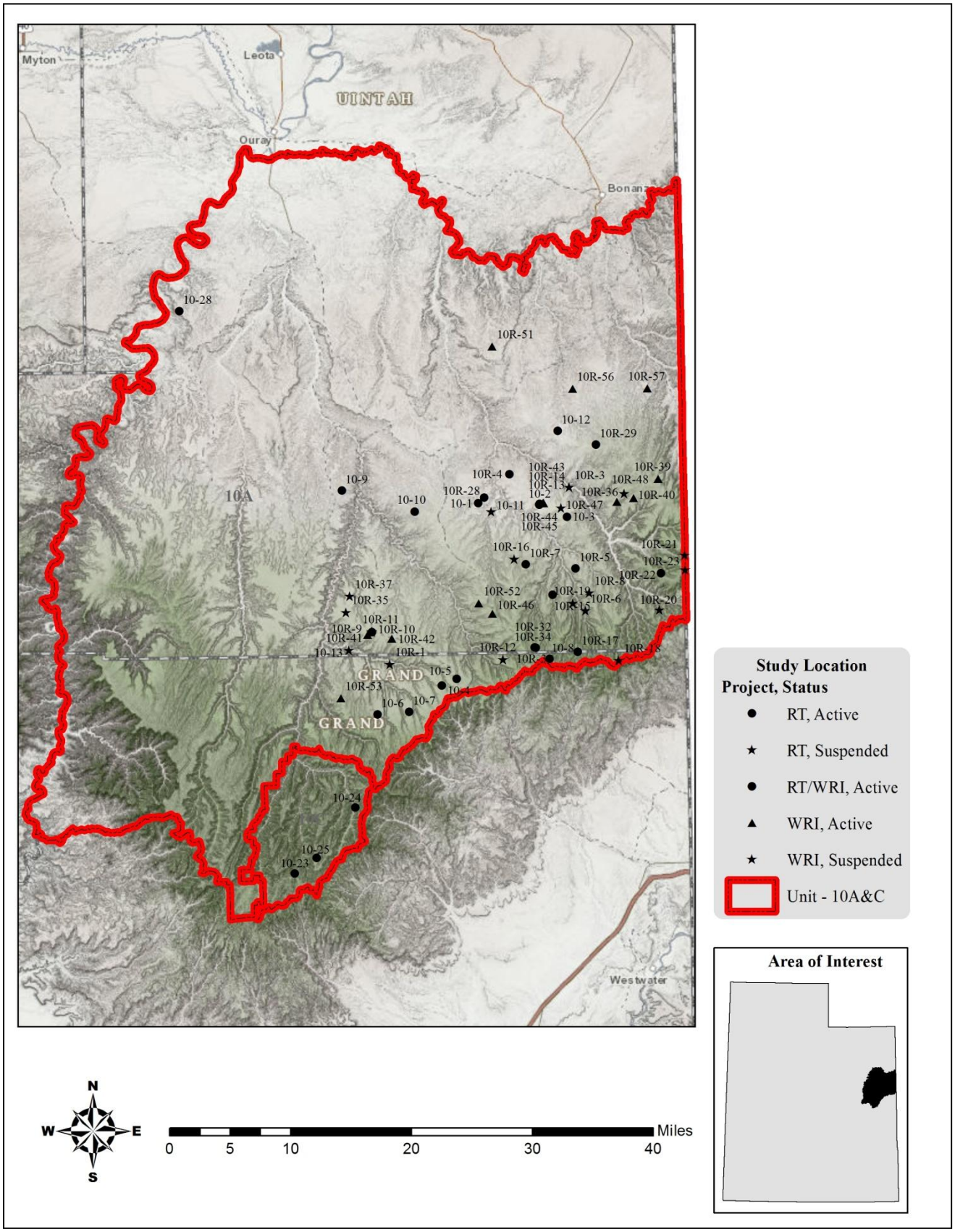
It is recommended that when and where necessary, work to reduce pinyon-juniper encroachment (e.g. bullhog, chaining, lop and scatter, etc.) should begin in these communities. When reseeding is necessary to restore herbaceous species, care should be taken in species selection, and preference should be given to native grass species when possible.

Semidesert (Sagebrush)

These lower elevation semidesert ecological sites which support sagebrush communities are generally considered to be in very poor to fair condition for deer winter range habitat on the South Slope management unit. These communities support shrub populations that provide valuable browse in moderate to severe winters. These communities have the potential to experience encroachment from juniper trees that can reduce understory shrub and herbaceous cover if not addressed. In addition, these communities are susceptible to invasion from annual grasses, primarily cheatgrass. Increased amounts of cheatgrass can increase fuel loads and increase the threat of wildfire within these communities.

It is recommended that work to reduce juniper encroachment (e.g. bullhog, chaining, lop and scatter, etc.) should continue in these communities. Care should be taken in selecting treatment methods that will not increase annual grass cover. If a treatment to rejuvenate sagebrush occurs, care should again be taken in selecting treatment methods that will not increase annual grass loads. Treatments to reduce annual grass may be necessary on some sites.

3. WILDLIFE MANAGEMENT UNIT 10A & C – NORTH BOOK CLIFFS



WILDLIFE MANAGEMENT UNIT 10AC – NORTH BOOK CLIFFS

Boundary Description

Uintah and Grand Counties - Boundary begins at the Utah-Colorado state line and the White River; south along this state line to the summit and drainage divide of the Book Cliffs; west along this summit and drainage divide to the Uintah and Ouray Indian Reservation boundary (Hells Hole/head of Sego Canyon); west along this boundary to the Green River; north along the Green River to the White River; east along this river to the Utah-Colorado state line.

Management Unit Description

Geography

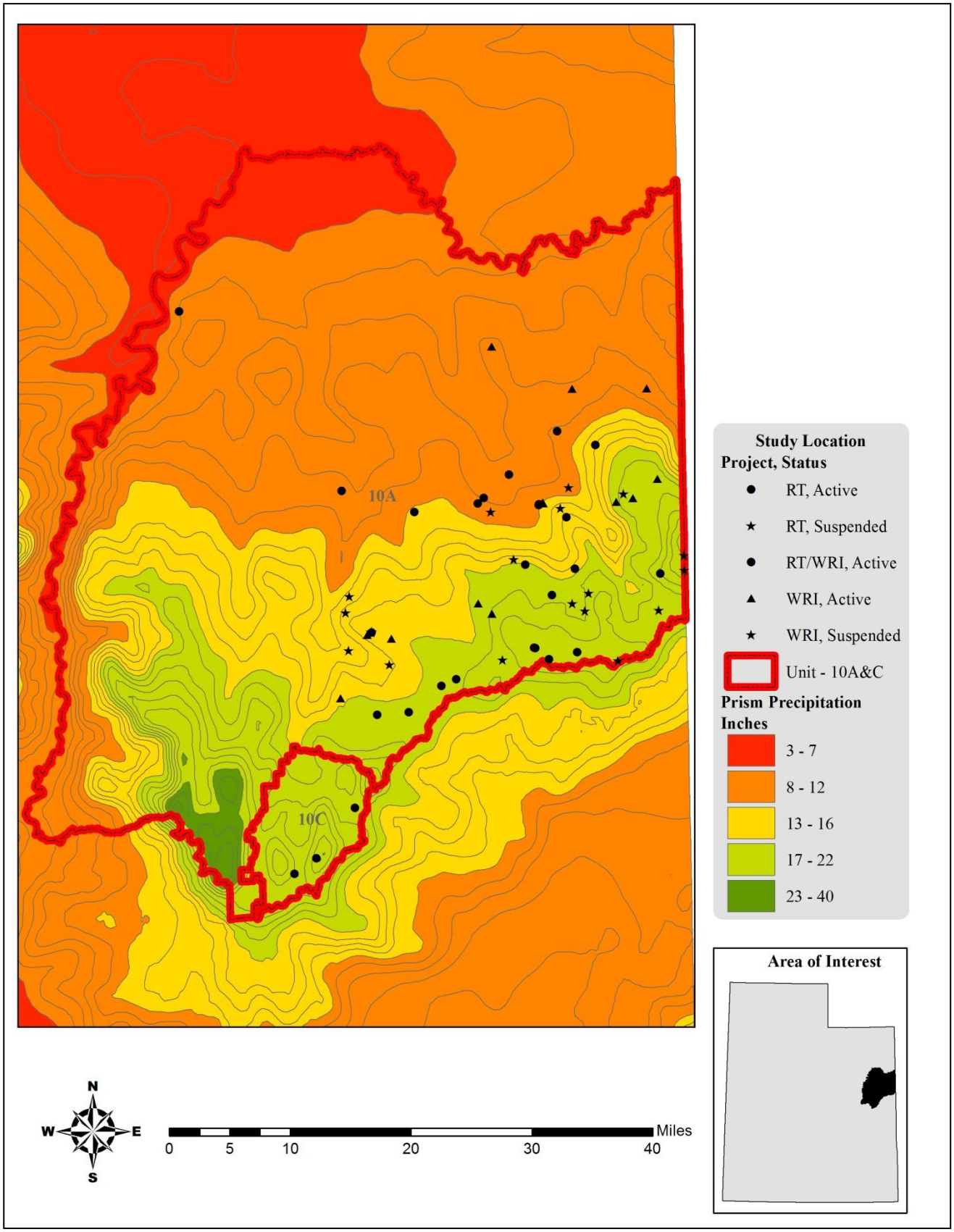
The maximum elevation in the North Book Cliffs unit is just less than 9,500 feet at Roan Peaks. The unit is bordered by Desolation Canyon and the Green River to the west and the White River to the north. Major drainages include Hill Creek, Willow Creek, and Bitter Creek. The southern and western portions of the management unit contain many canyons. The communities of Ouray and Bonanza are located just outside of the northern unit boundary.

Climate Data

The 30 year (1981-2010) annual precipitation PRISM model shows precipitation ranges on the unit from 7 inches along portions bottomlands of the Green River to 25 inches along the 10AC-10B unit boundary line near Hill Creek and Roan Peaks. All of the Range Trend and WRI monitoring studies on the unit occur within 8-22 inches of precipitation (Map 3.1) (PRISM Climate Group, Oregon State University).

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 (Divisions 6 and 7). The mean annual PDSI of the Uinta Basin division displayed years of moderate to extreme drought from 1989-1991, 2000, 2002-2003, and 2012-2015. The mean annual PDSI displayed moderate to extreme wet years from 1982-1985, 1993, 1997-1998, and 2005. The mean spring (March-May) PDSI displayed years of moderate to extreme drought in 1989-1992, 2002-2004, and 2012-2015. Moderate to extremely wet years for this time period were displayed in 1983-1985, 1993, 1995, 1998, 2005, and 2011 (Figure 3.1a). The mean fall (Sept.-Nov.) PDSI displayed years of moderate to extreme drought in 1989-1990, 2001-2003, 2007, and 2012; moderately to extremely wet years were displayed in 1982-1986, 1993, and 1997-1998 (Figure 3.1b).

The mean annual PDSI of the Southeast division displayed years of moderate to extreme drought from 1989-1990, 2002-2003, 2009, and 2012. The mean annual PDSI displayed moderately to extremely wet years from 1983-1985 and 2005 (Figure 3.2a). The mean spring (March-May) PDSI displayed moderate to extreme drought in 1989-1991, 1996, 2002-2004, and 2012-2013; moderately to extremely wet years were displayed in 1983-1985, 1993, and 2005. The mean fall (Sept.-Nov.) PDSI displayed years of moderate to extreme drought in 1989-1990, 2002-2003, 2009, and 2012; moderately to extremely wet years were displayed in 1983-1985, 1997, and 2013 (Figure 3.2b) (Time Series Data, 2016).



Map 3.1: The 1981-2010 PRISM Precipitation Model for WMU 10AC, North Book Cliffs (PRISM Climate Group, Oregon State University, 2016).

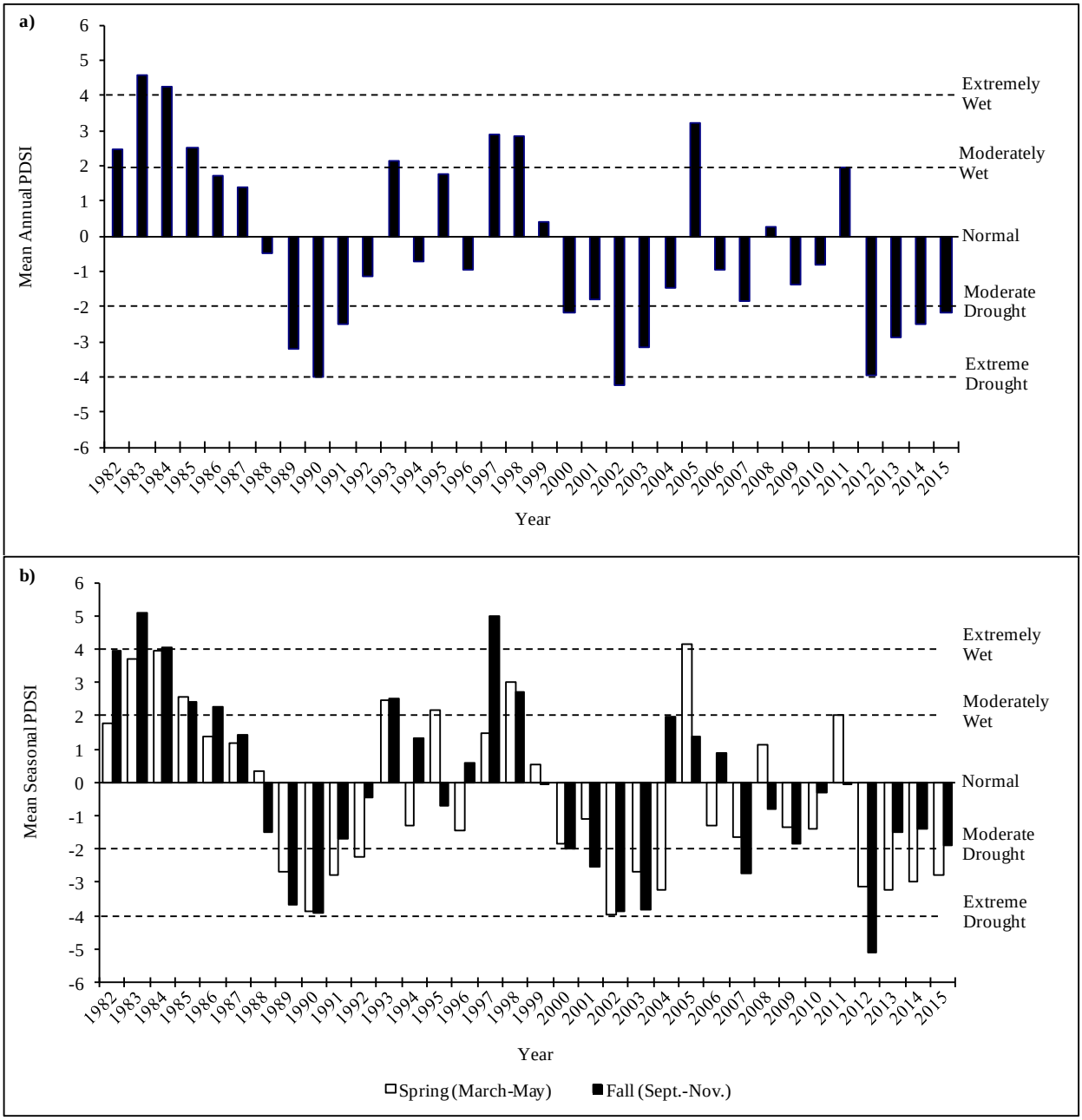


Figure 3.1: The 1982-2015 Palmer Drought Severity Index (PDSI) for the Uinta Basin division (Division 6). The PDSI is based on climate data gathered from 1895 to 2014. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet and negative deviations indicate drought. Classification of the scale is ≥4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to2.9 = 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 -.9 = Incipient Dry Spell, -1.0 to -1.9 = Mild Drought, -2.0 to -2.9 = Moderate Drought, -3.0 to -3.9 = Severe Drought and ≤-4.0 = Extreme Drought (Time Series Data 2014). a) Mean annual PDSI. b) Mean spring (March-May) and fall (Sept.-Nov.) (Time Series Data, 2016).

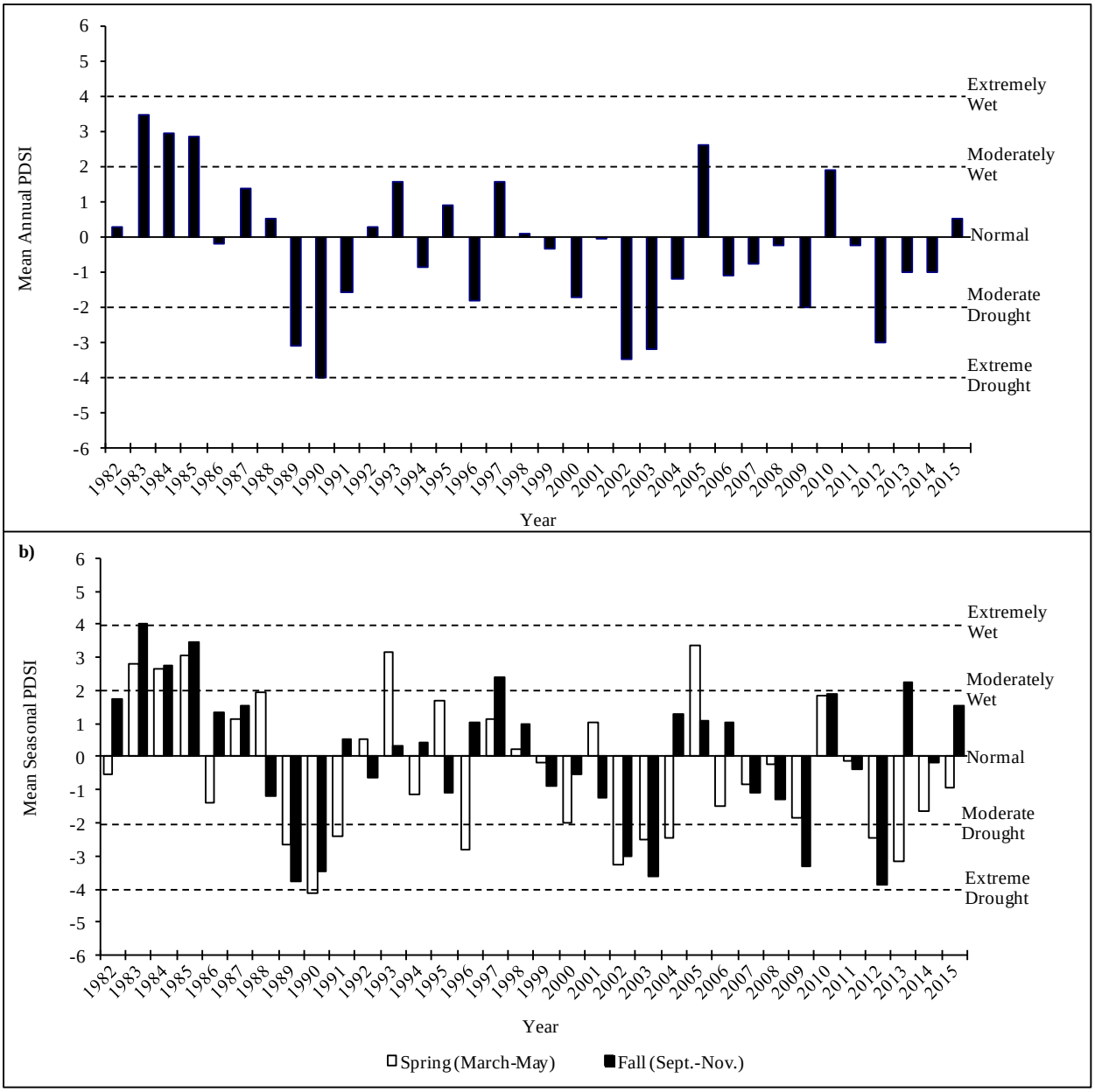
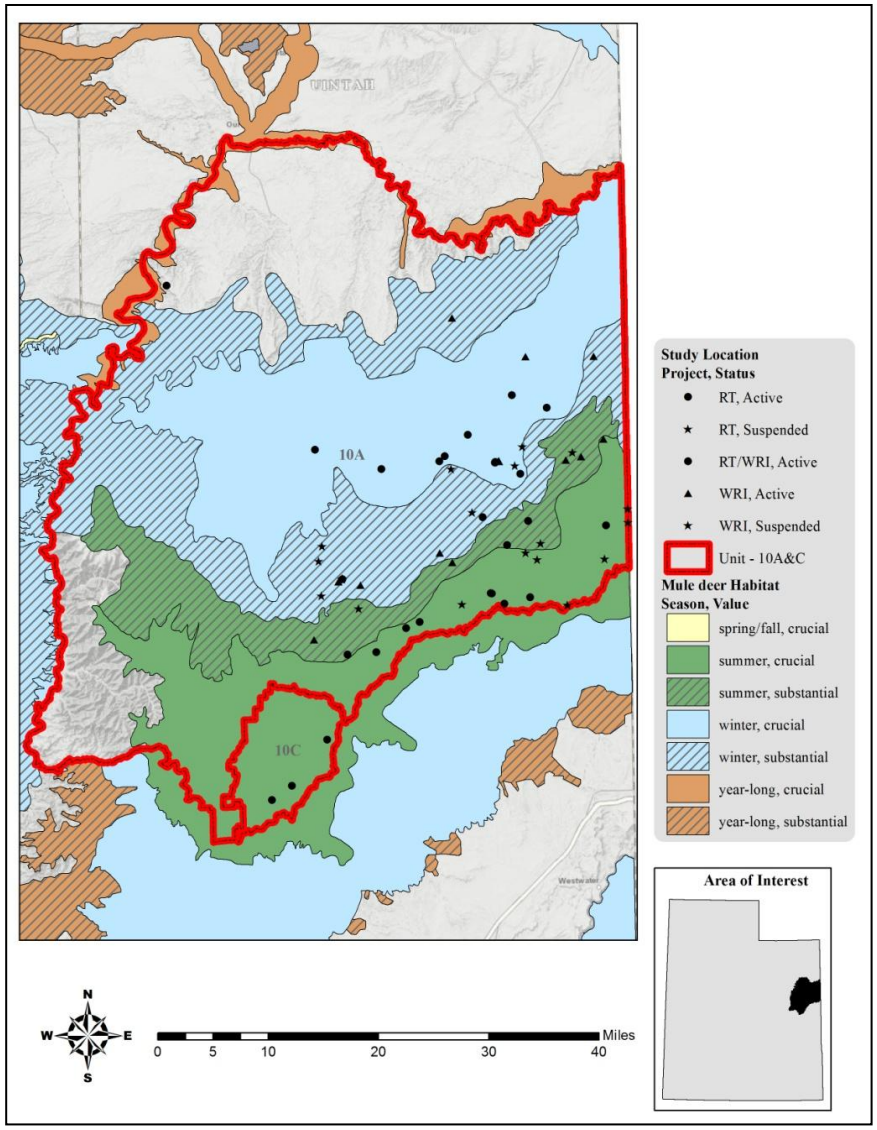


Figure 3.2: The 1982-2015 Palmer Drought Severity Index (PDSI) for the Southeast division (Division 7). The PDSI is based on climate data gathered from 1895 to 2014. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet and negative deviations indicate drought. Classification of the scale is ≥4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to2.9 = 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 -.9 = Incipient Dry Spell, -1.0 to -1.9 = Mild Drought, -2.0 to -2.9 = Moderate Drought, -3.0 to -3.9 = Severe Drought and ≤-4.0 = Extreme Drought (Time Series Data 2014). a) Mean annual PDSI. b) Mean spring (March-May) and fall (Sept.-Nov.) (Time Series Data, 2016).

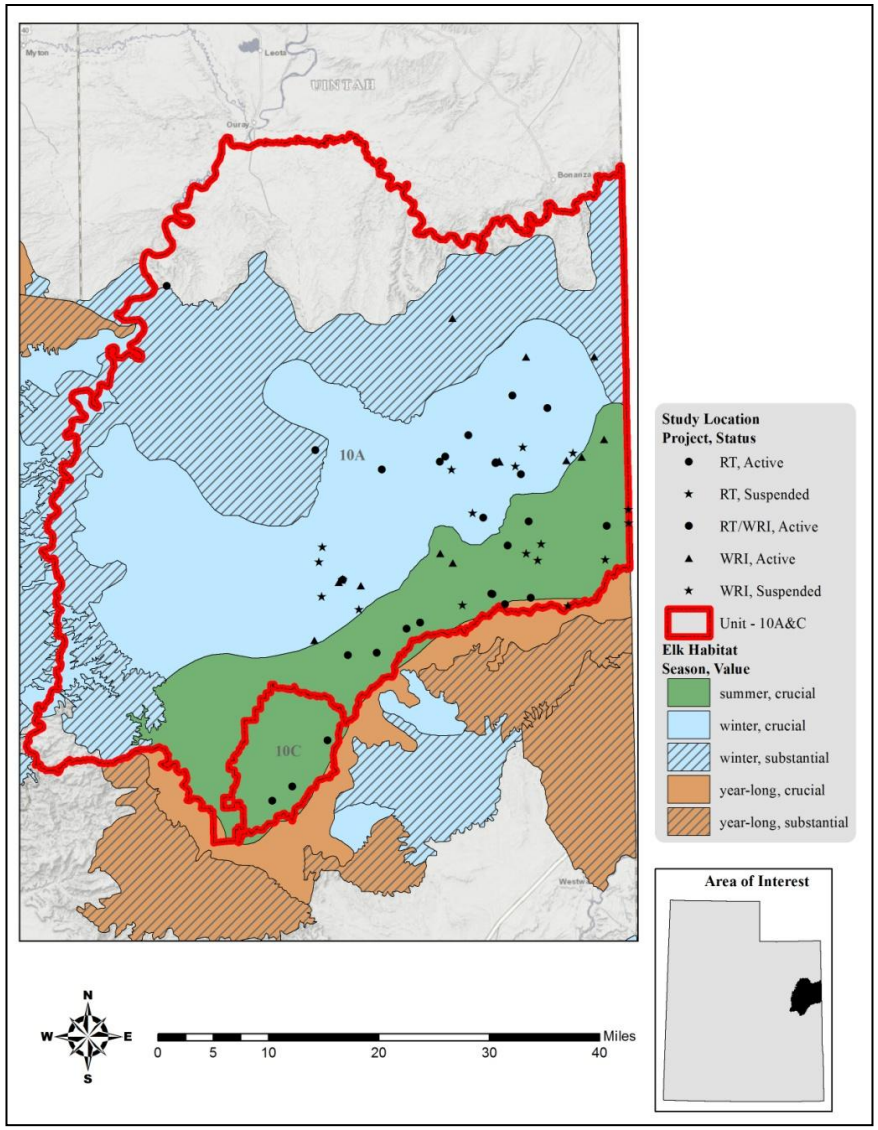
Big Game Habitat

Total mule deer range in this wildlife management unit is estimated at almost 1.2 million acres with 32,683 acres classified as year-long range, 737,129 acres classified as winter range, and 406,007 acres of this classified as summer range (Map 3.2, Table 3.1). Total elk range is estimated at over 1.2 million acres with 7,512 acres classified as year-long range, 917,486 acres of this classified as winter range, and 300,885 acres classified as summer range (Map 3.3, Table 3.1). 55% of mule deer year-long range is managed by the Bureau of Land Management (BLM), 29% is tribal land, private landowners and Fire and State Lands (SL&F) each own 6%, and 4% is administrated by the Utah School and Institutional Trust Lands Administration (SITLA). Much of the summer range (40%) is located on tribal land, 31% is managed by SITLA, 26% is administrated by the BLM, 2% is owned by the Utah Division of Wildlife Resources (UDWR), and 1% is on land belonging to private landowners. Half (50%) of the winter range is on land administrated by the BLM, 29% is on tribal land, 11% is administrated by SITLA, 8% is owned by private landowners, and 2% is managed by the UDWR (Map 3.2, Map 3.7, Table 3.2).

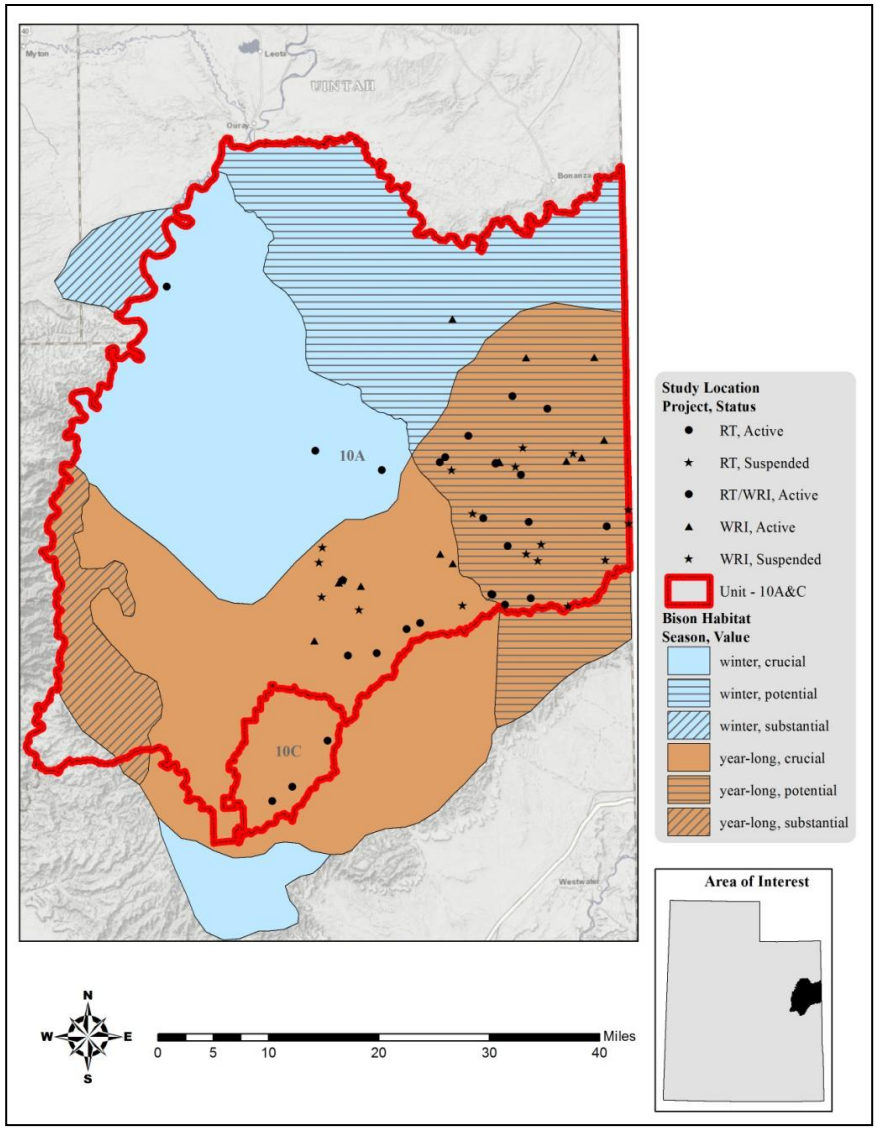
Areas such as Lower McCook Ridge, Big Park, the Crows Roost, Sunday School Canyon, Indian Ridge, and Atchee Ridge all support concentrations of wintering deer. Elk utilize many of the same areas, especially McCook Ridge. The winter range is composed of several main vegetation types including pinyon-juniper, salt desert shrub, and Wyoming big sagebrush. Vegetation composition on the summer range is principally sagebrush/grass and mountain brush, with isolated patches of conifer and aspen.



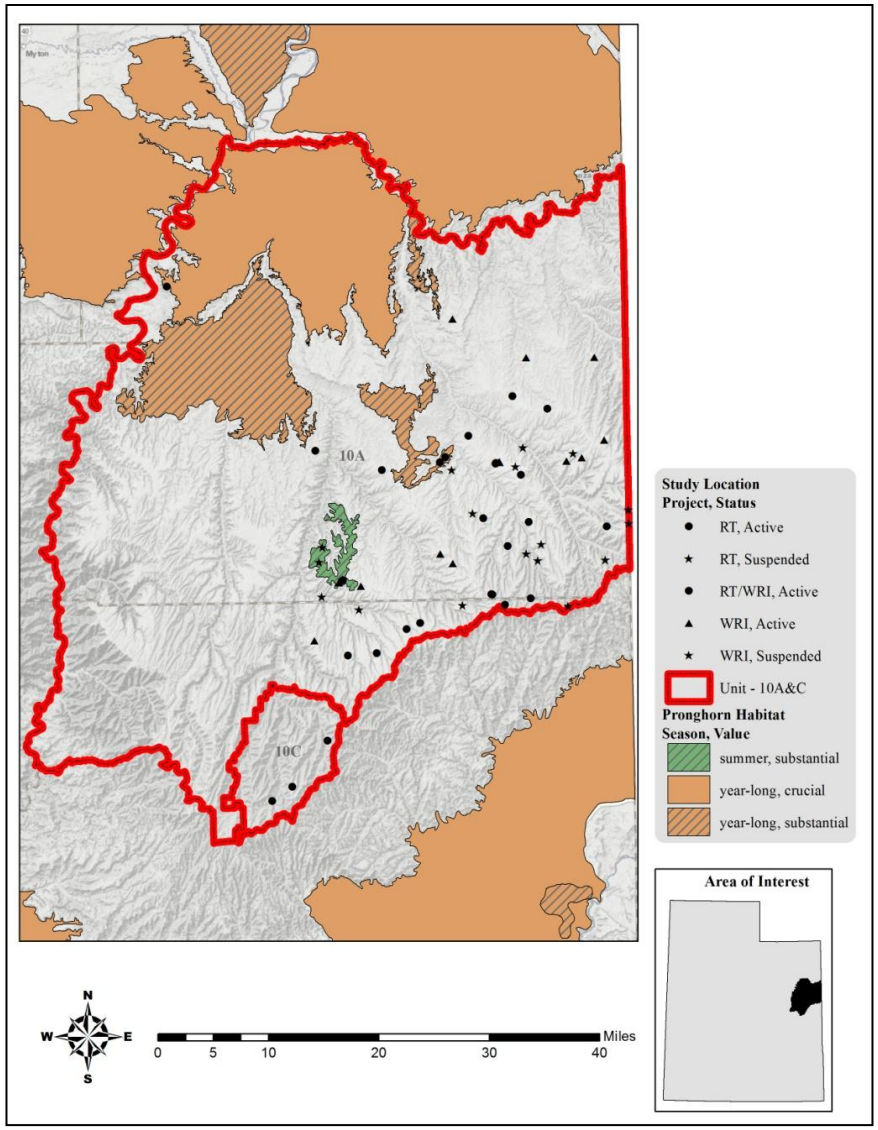
Map 3.2: Estimated mule deer habitat by season and value for WMU 10AC, North Book Cliffs.



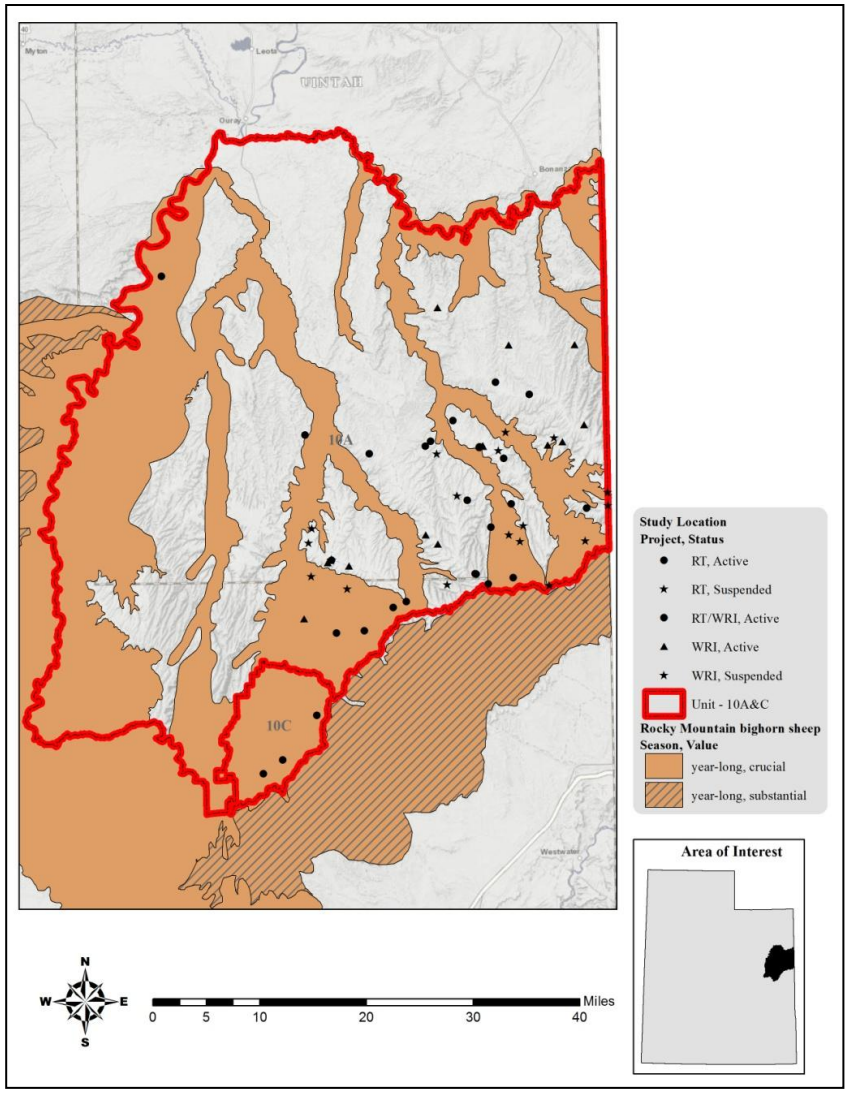
Map 3.3: Estimated elk habitat by season and value for WMU 10AC, North Book Cliffs.



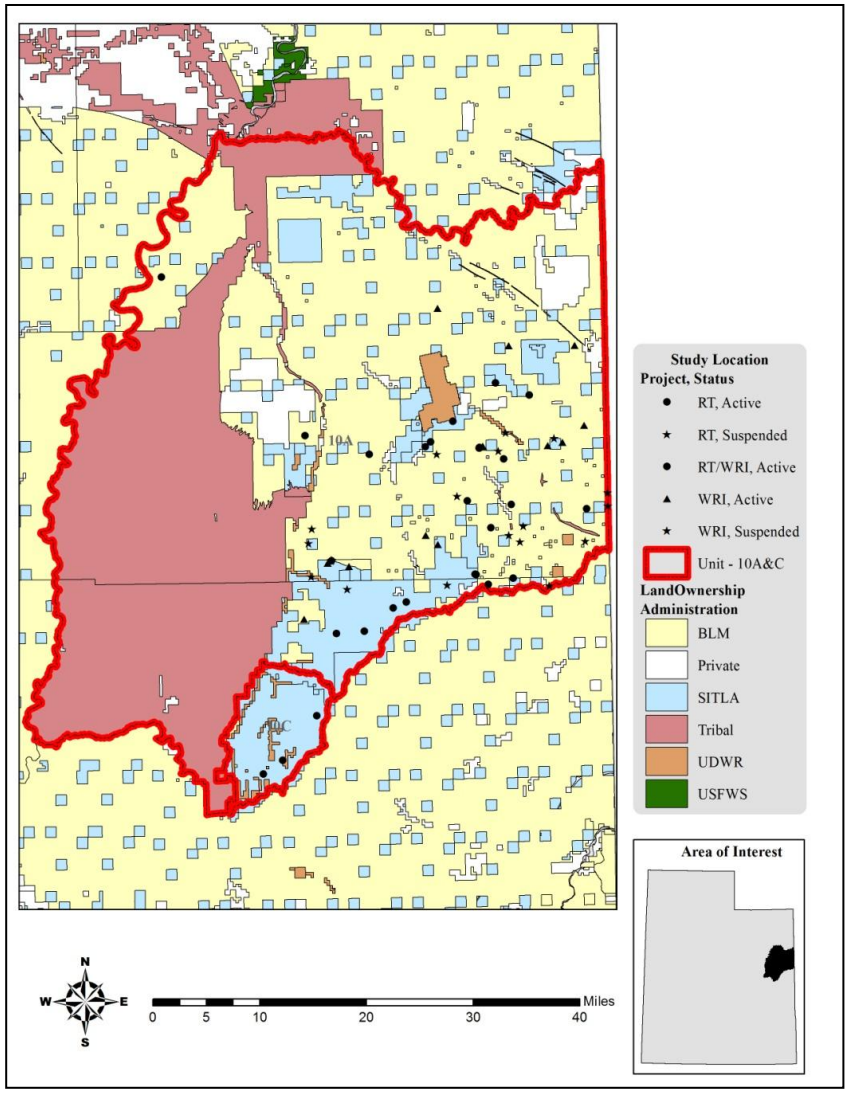
Map 3.4: Estimated bison habitat by season and value for WMU 10AC, North Book Cliffs.



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



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



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

	Year Long Range		Summer Range		Winter Range	
	Area (acres)	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
Mule Deer	32,683	3%	406,007	34%	737,129	63%
Elk	7,512	<1%	300,885	25%	917,486	75%
Bison	722,041	50%	0	0%	722,193	50%
RMBS	720,142	100%	0	0%	0	0%

Table 3.1: Estimated mule deer, elk, bison, and Rocky Mountain bighorn sheep (RMBS) habitat acreage by season for WMU 10AC, North Book Cliffs.

	Year Long Range		Summer Range		Winter Range	
Ownership	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
BLM	18,071	55%	106,247	26%	366,466	50%
Private	1,962	6%	4,085	1%	57,055	8%
SITLA	1,240	4%	126,075	31%	82,039	11%
Tribal	9,533	29%	160,874	40%	216,693	29%
UDWR	0	0%	8,726	2%	14,876	2%
SL&F	1,877	6%	0	0%	0	0%
Total	32,683	**100%**	406,007	**100%**	737,129	**100%**

Table 3.2: Estimated mule deer habitat acreage by season and ownership for WMU 10AC, North Book Cliffs.

	Year Long Range		Summer Range		Winter Range	
Ownership	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
BLM	3,837	51%	101,410	34%	376,661	41%
Private	390	5%	3,904	1%	50,538	6%
SITLA	1,760	23%	117,844	39%	88,590	10%
Tribal	1,524	20%	69,408	23%	386,402	42%
UDWR	0	0%	8,318	3%	15,284	2%
SL&F	0	0%	0	0%	11	<1%
Total	7,512	**100%**	300,885	**100%**	917,486	**100%**

Table 3.3: Estimated elk habitat acreage by season and ownership for WMU 10AC, North Book Cliffs.

	Year Long Range		Winter Range	
Ownership	*Area (acres)*	*%*	*Area (acres)*	*%*
BLM	263,990	37%	350,375	49%
Private	15,606	2%	48,480	7%
SITLA	172,806	24%	69,089	10%
Tribal	250,935	35%	248,050	34%
UDWR	18,704	3%	4,898	1%
SL&F	0	0%	1,302	<1%
Total	722,041	**100%**	722,193	**100%**

Table 3.4: Estimated bison habitat acreage by season and ownership for WMU 10AC, North Book Cliffs.

	Year Long Range	
Ownership	*Area (acres)*	*%*
BLM	222,526	55%
Private	24,356	6%
SITLA	132,695	4%
Tribal	320,178	29%
UDWR	19,034	0%
SL&F	1,353	6%
Total	720,142	**100%**

Table 3.5: Estimated Rocky Mountain bighorn sheep habitat by season and ownership for WMU 10AC, North Book Cliffs.

Group	Existing Vegetation Type	Acres	% of Total	Group % of Total
Conifer	Colorado Plateau Pinyon-Juniper Woodland	448,211	30.54%	
	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	33,406	2.28%	
	Conifer-Hardwood	10,533	0.72%	
	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	9,042	0.62%	
	Southern Rocky Mountain Ponderosa Pine Woodland	6,112	0.42%	
	Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland	4,436	0.30%	
	Other Conifer	1,247	0.08%	34.96%
Exotic Herbaceous	Introduced Upland Vegetation-Annual Grassland	57,714	3.93%	3.93%
Exotic Tree-Shrub	Introduced Riparian Shrubland	3,459	0.24%	
	Introduced Riparian Forest and Woodland	45	0.00%	0.24%
Grassland	Inter-Mountain Basins Semi-Desert Grassland	14,877	1.01%	
	Southern Rocky Mountain Montane-Subalpine Grassland	9,138	0.62%	
	Rocky Mountain Subalpine-Montane Mesic Meadow	748	0.05%	1.69%
Shrubland	Inter-Mountain Basins Big Sagebrush Shrubland	339,722	23.15%	
	Inter-Mountain Basins Mixed Salt Desert Scrub	178,676	12.18%	
	Colorado Plateau Mixed Low Sagebrush Shrubland	88,120	6.00%	
	Quercus gambelii Shrubland Alliance	44,112	3.01%	
	Artemisia tridentata ssp. vaseyana Shrubland Alliance	15,903	1.08%	
	Inter-Mountain Basins Greasewood Flat	12,826	0.87%	
	Inter-Mountain Basins Mat Saltbush Shrubland	11,717	0.80%	
	Rocky Mountain Lower Montane-Foothill Shrubland	2,189	0.15%	
	Arctostaphylos patula Shrubland Alliance	1,924	0.13%	
	Grayia spinosa Shrubland Alliance	1,782	0.12%	
	Coleogyne ramosissima Shrubland Alliance	1,311	0.09%	
	Inter-Mountain Basins Montane Sagebrush Steppe	1,238	0.08%	
	Other Shrubland	2,117	0.14%	47.81%
Other	Sparsely Vegetated	65,074	4.43%	
	Barren	62,291	4.24%	
	Hardwood	14,884	1.01%	
	Riparian	10,963	0.75%	
	Open Water	6,298	0.43%	
	Developed	6,017	0.41%	
	Agricultural	1,313	0.09%	
	Other	93	0.01%	11.38%
Total		1,467,540	100.00%	

Table 3.6: Landfire existing vegetation coverage (LANDFIRE: LANDFIRE 1.3.0, 2014) for WMU 10AC, North Book Cliffs.

Limiting Factors to Big Game Habitat

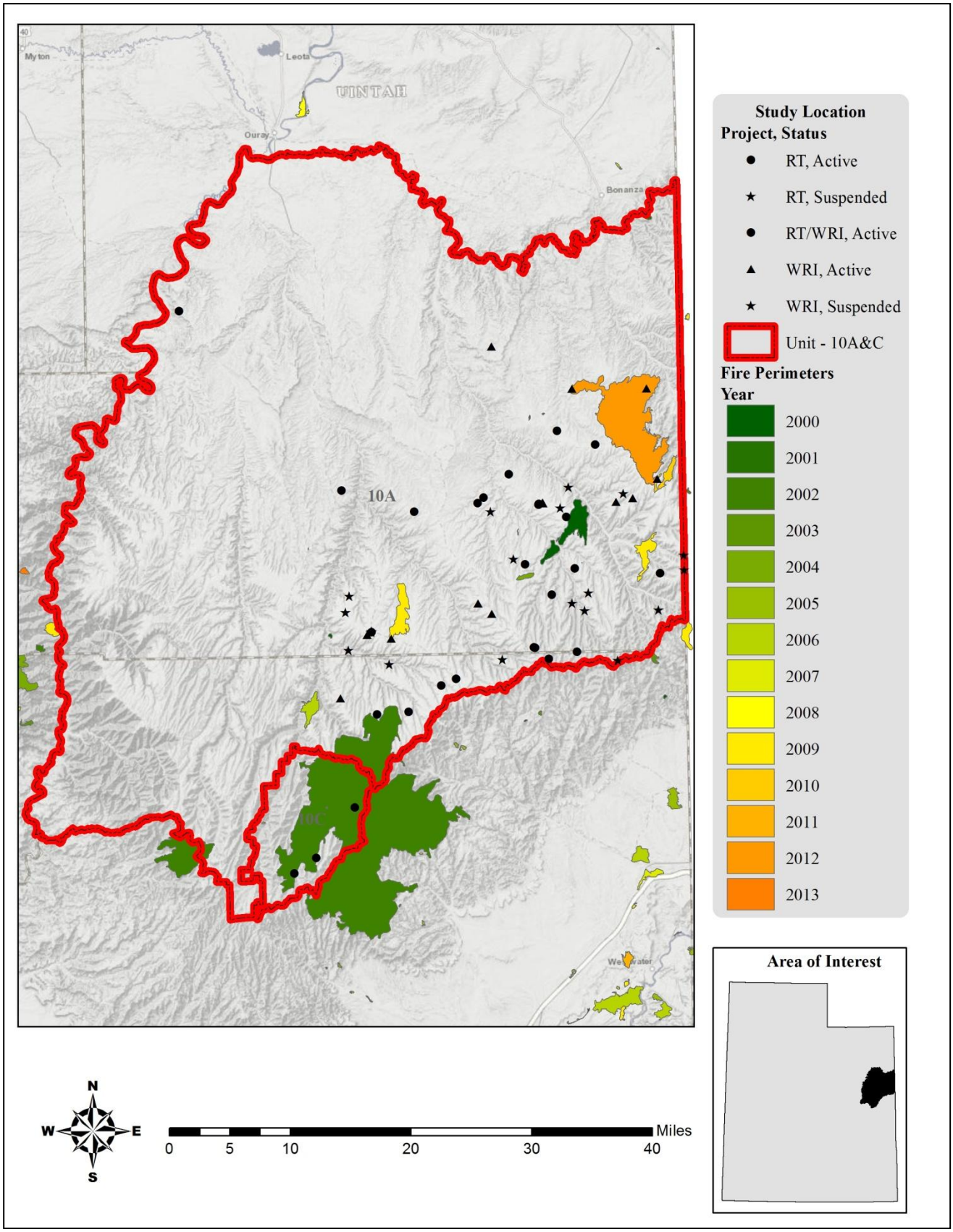
The consensus is that the quantity and quality of the summer range are the most limiting factors on this unit. Cooperation between federal, state, local, and tribal governments and private landowners could help maintain and protect ranges from further loss and degradation through agreements with land management agencies, the use of conservation easements and the like on private lands, planning and evaluating resource use and developments that might affect habitat quality, and developing specific vegetation objectives to maintain the quality of important deer use areas. In addition, forage production could be maintained or improved through range improvements such as reseedings, controlled burns, water developments, tree removal, etc.

Other management concerns on Unit 10AC principally revolve around drought impacts on winter range browse species, cattle grazing outside of recognized grazing plan utilization levels and seasons, and the increasing demands for oil and gas development with its associated habitat fragmentation. There is also the

possibility that at some later date oil shale and tar sands will be developed.

Encroachment by pinyon-juniper woodland communities also poses a substantial threat to important sagebrush rangelands. According to the Landfire Existing Vegetation Coverage models, nearly 31% of the North Book Cliffs unit is constituted of pinyon and juniper woodlands (Table 3.6). Encroachment of these woodlands into sagebrush communities has been shown to decrease browse and herbaceous cover, decreasing available forage for wildlife (Miller, Svejcar, & Rose, 2000).

Finally, deer fences and crossings limiting range are a concern, but cooperation with the Utah Department of Transportation in construction of highway fences, passage structures, warning signs, etc. will continue in order to ensure proper access to habitat as well as deer and human safety.

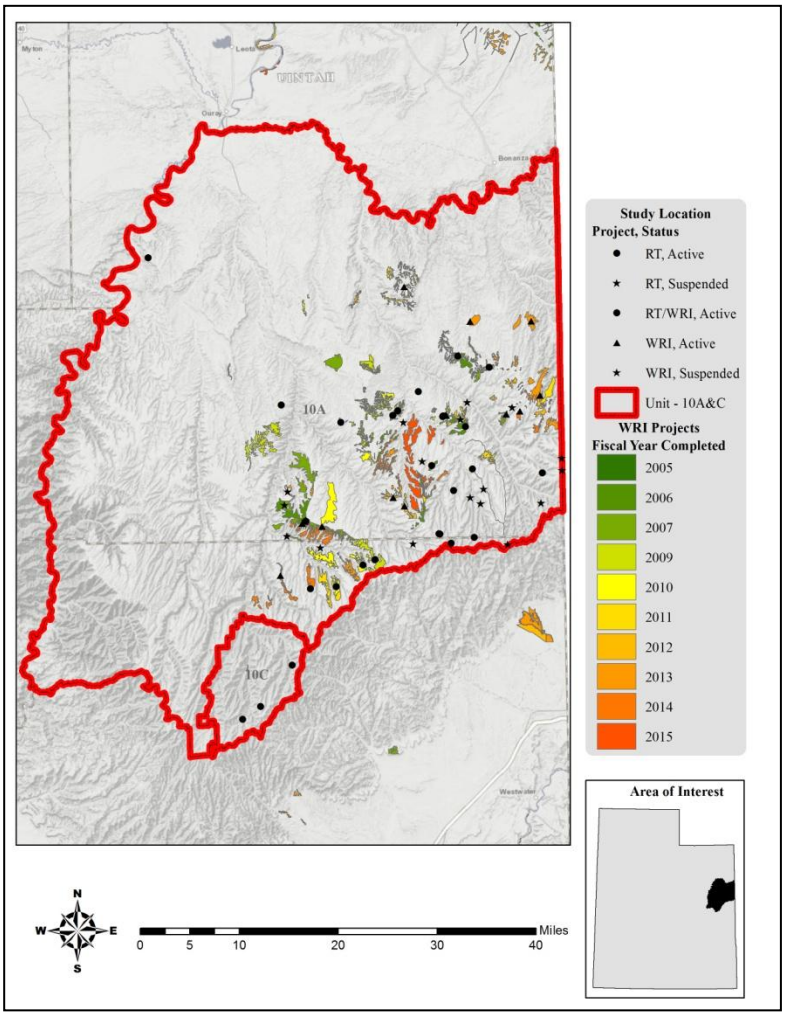


Map 3.8: Land coverage of fires by year from 2000-2013 for WMU 10AC, North Book Cliffs.

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 48,696 acres of land have been treated within the North Book Cliffs unit since the WRI was implemented in 2004 (Map 3.9). Treatments frequently overlap one another bringing the total treatment acres to 53,536 acres for this unit (Table 3.7). Other treatments have occurred outside of the WRI through independent agencies and landowners, but the WRI comprises the majority of work done on deer winter ranges throughout the state of Utah.

Vegetation removal via hand crew is the most common management practice in this unit. Bullhog work to reduce pinyon-juniper cover is also very common. Other management practices include seeding of grasses, forbs, and shrubs to augment desirable plant species, use of harrows and mechanical tree-cutters for pinyon-juniper reduction, and herbicide application to manage weeds (Table 3.7).



Map 3.9: WRI treatments by fiscal year completed for WMU 10AC, North Book Cliffs.

Treatment Action	Acres
Vegetation Removal/Hand Crew	27,744
Bullhog	12,635
Seeding (Primary)	10,027
Seeding (Secondary/Shrub)	2,058
Chain Harrow	670
Herbicide Application	191
Skid-Steer Mounted Tree Cutter	182
Stream Corridor/Channel Improvements	30
Total Land Area Treated	48,696
Total Treatment Acres	53,536

Table 3.7: WRI treatment action size (acres) for WMU 10AC, North Book Cliffs.

*Does not include overlapping treatments.

Range Trend Studies

Range Trend studies have been sampled within WMU 10A & C on a regular basis since 1982, with studies being added or suspended as was deemed necessary (Table 3.8). Due to changes in sampling methodologies, only data sampled 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 and are sampled on a regular basis following treatment. Due to the long-term nature of the studies, many of the Range Trend and WRI study sites have had some sort of disturbance or treatment prior to or since study establishment (Table 3.9)

Range Trend studies are summarized in this report by ecological site. Range Trend and WRI studies that have had a disturbance or treatment during the reported sample period are summarized in this report by the disturbance or treatment type and are summarized by region.

Study #	Study Name	Project	Status	Year(s) Sampled	Ecological Site Description
10-1	Indian Ridge	RT	Active	‘82 ‘88, ‘95, ‘00, ‘05, ‘10, ‘15	Upland Silt Loam (Fourwing Saltbush-Winterfat)
10-2	McCook Ridge Exclosure	RT	Active	‘82, ‘88, ‘95, ‘97, ‘00, ‘05, ‘10, ‘15	Upland Loam (Wyoming Big Sagebrush)
10-3	McCook Ridge Chaining	RT/WRI	Active	‘82, ‘88, ‘95, ‘00, ‘05, ‘10, ‘15	Mountain Loam (Mountain Big Sagebrush)
10-4	Wirefence Point	RT	Active	‘82, ‘88, ‘95, ‘97, ‘00, ‘05, ‘10, ‘15	Mountain Loam (Mountain Big Sagebrush)
10-5	Willow Flat	RT	Active	‘82, ‘88, ‘95, ‘00, ‘05, ‘10, ‘15	Mountain Loam (Mountain Big Sagebrush)
10-6	Little Jim Canyon	RT/WRI	Active	‘82, ‘88, ‘95, ‘00, ‘12, ‘15	Mountain Stony Loam (Browse)
10-7	Cherry Mesa	RT	Active	‘88, ‘95, ‘97, ‘00, ‘05, ‘10, ‘15	Mountain Stony Loam (Mountain Big Sagebrush)
10-8	Black Horse	RT	Active	88, ‘95, ‘00, ‘05, ‘10, ‘15	Mountain Stony Loam (Browse)
10-9	Agency Draw	RT	Active	‘88, ‘95, ‘00, ‘05, ‘10, ‘15	Semidesert Loam (Wyoming Big Sagebrush)
10-10	Sunday School	RT	Active	‘88, ‘95, ‘00, ‘05, ‘10, ‘15	Upland Silt Loam (Fourwing Saltbush-Winterfat)
10-11	Park Ridge	RT	Active	‘88, ‘95, ‘00	Not Verified
10-12	Wolf Den	TR	Active	‘88, ‘95, ‘00, ‘05, ‘10, ‘15	Upland Loam (Mountain Big Sagebrush)
10-13	Moon Ridge Burn	RT	Suspended	‘95, ‘97, ‘00	Not Verified
10-23	Bogart- She	RT	Suspended	‘95, ‘15	Mountain Loamy Bottom (Basin Wildrye)
10-24	Turner Canyon	RT	Suspended	‘95, ‘00, ‘15	Mountain Loamy Bottom (Basin Wildrye)
10-25	Little Ridge	RT	Suspended	‘95, ‘15	High Mountain Loam (Aspen)
10-28	Wild Horse Bench	RT	Active	10, ‘15	Desert Shallow Loam (Black Sagebrush)
10R-1	Upper Meadow Creek	RT	Suspended	‘97	Not Verified
10R-2	Lone Spring	RT	Suspended	‘97, ‘00	Not Verified
10R-3	Burnt Timber	RT	Suspended	‘97, ‘00	Not Verified
10R-4	Two Water WMA	RT	Active	‘97, ‘00, ‘05, ‘10, ‘15	Semidesert Shallow Loam (Black Sagebrush)
10R-5	Lower Tom Patterson Point	RT	Active	‘97, ‘00, ‘05, ‘10, ‘15	Mountain Loam (Mountain Big Sagebrush)
10R-6	Sweet Water Canyon	RT	Suspended	‘97, ‘00	Not Verified
10R-7	Monument Ridge	RT	Active	‘97, ‘00, ‘05, ‘10, ‘15	Mountain Stony Loam (Mountain Big Sagebrush)
10R-8	Upper Tom Patterson Point	RT	Suspended	‘97, ‘00	Not Verified
10R-9	Winter Ridge Exlosure Out	RT	Active	‘97, ‘00, ‘05, ‘10, ‘15	Upland Loam (Bonneville Big Sagebrush)
10R-10	Winter Ridge Livestock Exclosure	RT	Suspended	‘97, ‘00, ‘05, ‘15	Upland Loam (Bonneville Big Sagebrush)
10R-11	Winter Ridge Total Exclosure	RT	Suspended	‘97, ‘00, ‘05, ‘15	Upland Loam (Bonneville Big Sagebrush)
10R-12	Horse Ridge	RT	Suspended	‘97, ‘00, ‘05	Not Verified
10R-13	McCook Ridge Livestock Exclosure	RT	Active	‘97, ‘00, ‘05, ‘10	Upland Loam (Wyoming Big Sagebrush)
10R-14	McCook Ridge Total Exclosure	RT	Active	‘97, ‘00, ‘05, ‘10	Upland Loam (Wyoming Big Sagebrush)
10R-15	Saddle Horse	RT	Active	‘98, ‘00, ‘05, ‘10, ‘15	Mountain Stony Loam (Browse)
10R-16	Monument Ridge #2	RT	Suspended	‘98	Not Verified

Study #	Study Name	Project	Status	Year(s) Sampled	Ecological Site Description
10R-17	Railroad Canyon	RT	Active	‘98, ‘00, ‘10, ‘15	Mountain Loam (Mountain Big Sagebrush)
10R-18	Chipeta Canyon	RT	Suspended	‘98	Not Verified
10R-19	Lower South Canyon	RT	Suspended	‘98, ‘00	Not Verified
10R-20	Dick Canyon	RT	Suspended	‘98, ‘00	Not Verified
10R-21	Rathole Canyon	RT	Suspended	‘98	Not Verified
10R-22	Rathole Ridge	RT	Active	‘98, ‘00, ‘05, ‘10, ‘15	Mountain Loam (Mountain Big Sagebrush)
10R-23	South Rathole	RT	Suspended	‘98, ‘00	Not Verified
10R-24	Upper Tent Canyon	RT	Suspended	‘98, ‘00	Not Verified
10R-28	Indian Ridge 2	RT/WRI	Active	‘99,’11	Upland Silt Loam (Fourwing Saltbush-Winterfat)
10R-29	Massey Junction	RT	Active	‘99, ‘05, ‘10, ‘15	Upland Silt Loam (Fourwing Saltbush-Winterfat)
10R-32	PR Spring Total Exclosure	RT	Active	‘02, ‘05, ‘10, ‘15	Mountain Loam (Browse)
10R-33	PR Spring Livestock Exclosure	RT	Active	‘02, ‘05, ‘10, ‘15	Mountain Loam (Browse)
10R-34	PR Spring Exclosure Outside	RT	Active	‘02, ‘05, ‘10	Mountain Loam (Browse)
10R-35	Winter Ridge Dixie	WRI	Suspended	05	Not Verified
10R-36	Indian Springs Bullhog	WRI	Active	‘06, ‘09, ‘10, ‘14	Upland Shallow Loam (Black Sagebrush)
10R-37	Winter Ridge Dixie 2	WRI	Suspended	06	Not Verified
10R-39	Indian Springs Bullhog 2	WRI	Active	‘07, ‘11, ‘14	Upland Stony Loam (Browse)
10R-40	Indian Springs Bullhog 3	WRI	Active	‘07, ‘11, ‘14	Upland Stony Loam (Browse)
10R-41	Winter Ridge Bullhog	WRI	Active	07,10,13	Mountain Loam (Mountain Big Sagebrush)
10R-42	Winter Ridge Bullhog 2	WRI	Active	07,10,13	Mountain Loam (Mountain Big Sagebrush)
10R-43	McCook Ridge Plateau Exclosure North	WRI	Active	08,10,13	Mountian Loam (Mountain Big Sagebrush)
10R-44	McCook Ridge Plateau Exclosure South	WRI	Active	08,10,13	Mountian Loam (Mountain Big Sagebrush)
10R-45	McCook Ridge Plateau Exclosure Outside	WRI	Active	08,10,13	Mountian Loam (Mountain Big Sagebrush)
10R-46	Seep Ridge Chaining	WRI	Active	‘08, ‘14	Mountain Loam (Mountain Big Sagebrush)
10R-47	MCCook Ridge Reference	WRI	Suspended	09	Upland Loam (Wyoming Big Sagebrush)
10R-48	Indian Springs Reference	WRI	Suspended	09	Not Verified
10R-51	Archy Bench	WRI	Active	‘11, ‘14	Semidesert Loam (Wyoming Big Sagebrush)
10R-52	Seep Ridge Bullhog	WRI	Active	‘11, ‘14	Mountain Shallow Loam (Mountain Big Sagebrush)
10R-53	Moon Ridge	WRI	Active	‘11, ‘14	Mountain Loam (Mountain Big Sagebrush)

Table 3.8: Range trend and WRI project studies monitoring history and ecological site potential for WMU 10AC, North Book Cliffs.

Study #	Study Name	Type	Disturbance Name (if available)	Date	Size (acres)	WRI Project #
10-1	Indian Ridge	Lop and Scatter	Indian Ridge Lop and Scatter	June	1,001	1079
		Herbicide Plateau	Indian Ridge Sagebrush	September 2011	218	1952
		Rangeland Drill	Indian Ridge Sagebrush	October 2011	218	1952
10-3	McCook Ridge Chaining	Chain Unknown		1960s		
		Seed Unknown		1960s		
		Bullhog	McCook Ridge PJ Removal	April 2005	520	260
10-4	Wirefence Point	Herbicide - Unknown		1980s		
		Lop and Scatter	Three Pines Lop and Scatter	Fall 2008	1,943	107
10-5	Willow Flat	Herbicide		Pre 1982		
		Herbicide – Tebuthiuron		2005		
		Lop and Scatter	Cedar Camp Lop and Scatter	May 2010	2,042	1337
10-6	Little Jim Canyon	Bullhog	Little Jim Bullhog	July 2013	670	2219
10-7	Cherry Mesa	Chain Unknown		Historic		
		Bullhog	Cherry Mesa Bullhog	July 2009	576	1106
10-24	Turner Canyon	Wildfire	Diamond Creek	2002	88,421	
10R-7	Monument Ridge	Chaining Unknown		1960s		
		Seeding Unknown		1960s		

Study #	Study Name	Type	Disturbance Name (if available)	Date	Size (acres)	WRI Project #
		Wildfire		1980s		
		Lop and Scatter	Monument Ridge PJ Removal	August	1,004	22
10R-9	Winter Ridge Exclosure Out	Lop and Scatter	Wolf Point Lop and Scatter	April	811	259
10R-15	Saddle Horse	Chaining Unknown		1960s		
		Seeding Unknown		1960s		
		Wildfire		2000-2004		
10R-17	Railroad Canyon	Prescribed Fire		Fall 1998		
10R-22	Rathole Ridge	Prescribed Fire		Fall 1998		
10R-28	Indian Ridge 2	Wildfire		Prior to 1999		
		Lop and Scatter	Indian Ridge Lop and Scatter	June 2009		1079
		Rangeland Drill	Indian Ridge Sagebrush	September 2011	224	1952
		Herbicide – Plateau	Indian Ridge Sagebrush	October 2011	224	1952
10R-36	Indian Springs Bullhog	Aerial Before	Indian Ridge Bullhog	December 2006	320	362
		Bullhog	Indian Ridge Bullhog	February 2007	320	362
10R-39	Indian Springs Bullhog 2	Bullhog	Indian Spring Ridge Bullhog	2009		
		Wildfire		2010	955	
		Aerial After	Augusi Canyon Fire Rehabilitation	November 2010	955	1885
10R-40	Indian Springs Bullhog 3	Bullhog	Indian Spring Bullhog Phase 2	June 2009	350	677
10R-41	Winter Ridge Bullhog	Bullhog	Winter Ridge Bullhog	January 2009	474	685
10R-42	Winter Ridge Bullhog 2	Bullhog	Winter Ridge Bullhog	January 2009	474	685
10R-43	McCook Ridge Plateau Exclosure North	Rangeland Drill	McCook Ridge Cheatgrass Control	September 2008	400	1109
		Herbicide-Plateau	McCook Ridge Cheatgrass Control	October 2008	400	1109
10R-44	McCook Ridge Plateau Exclosure South	Rangeland Drill	McCook Ridge Cheatgrass Control	September 2008	400	1109
		Herbicide-Plateau	McCook Ridge Cheatgrass Control	October 2008	400	1109
10R-45	McCook Ridge Plateau Exclosure Outside	Rangeland Drill	McCook Ridge Cheatgrass Control	September 2008	400	1109
		Herbicide-Plateau	McCook Ridge Cheatgrass Control	October 2008	400	1109
10R-46	Seep Ridge Chaining	2-Way Ely Chain	Seep Ridge Chaining	October 2010	321	1951
		Aerial Before	Seep Ridge Chaining	October 2010	321	1951
		Dribbler	Seep Ridge Chaining	October 2010	321	1951
		Aerial After	Seep Ridge Chaining	December 2010	321	1951
10R-50	Bitter Creek	Herbicide-Plateau	Bitter Creek Restoration Phase 2	September 2012	2,250	2161
		Rangeland Drill	Bitter Creek Restoration Phase 2	October 2012	1,580	2161
10R-51	Archy Bench	Lop and Scatter		Prior to 2011		
		Aerial Before	Archy Bench Sagebrush Restoration	October 2011	607	2050
		1-Way Ely Chain	Archy Bench Sagebrush Restoration	October 2011	607	2050
		Herbicide	Archy Bench Sagebrush Restoration	October 2011	607	2050
10R-52	Seep Ridge Bullhog	Aerial Before	Seep Ridge Bullhog Phase 2	Fall 2011	390	1950
		Bullhog	Seep Ridge Bullhog Phase 2	Fall 2011	390	1950
		Aerial After	Seep Ridge Bullhog Phase 2	Fall 2011	390	1950
10R-53	Moon Ridge	Aerial Before	Moon Ridge Chaining	Fall 2012	1,165	2218
		2-Way Ely Chain	Moon Ridge Chaining	Fall 2012	1,165	2218
		Dribbler	Moon Ridge Chaining	Fall 2012	1,165	2218
		Aerial After	Moon Ridge Chaining	Fall 2012	1,165	2218
10R-54	Bitter Creek Herbicide	Plateau	Bitter Creek Restoration Phase 2	September 2012	2,250	2161
		Rangeland Drill	Bitter Creek Restoration Phase 2	October 2012	1,580	2161
10R-55	Bitter Creek Herbicide	Aerial Before	South Book Cliffs Vegetation Phase 2	Fall 2013	512	2593
		Bullhog	South Book Cliffs Vegetation Phase 2	Fall 2013	512	2593
		Herbicide-Plateau	South Book Cliffs Vegetation Phase 2	Fall 2013	512	2593

Study #	Study Name	Type	Disturbance Name (if available)	Date	Size (acres)	WRI Project #
10R-56	Center Fork	Wildfire	Wolf Den	2012		19865
		Aerial	Wolf Den Fire Rainbow	December 2012	526	2517
10R-57	Rector Rridge	Wildfire	Wolf Den	2012	19,865	
		Aerial	Wolf Den–Rector Ridge Fire Rehabilitation	December 2012	2,229	2453
10R-58	Dry Canyon	Aerial	South Book Cliffs Vegetation Improvement (Hay) Phase 2	December 2015	322	3330
		Aerial	South Book Cliffs Vegetation Improvement (Hay) Phase 2	March 2016	322	3330
		Bullhog	South Book Cliffs Vegetation Improvement (Hay) Phase 2	March 2016	322	3330

Table 3.9: Range trend and WRI studies known disturbance history for WMU 10AC, North Book Cliffs.

Study Trend Summary (Range Trend)

High Mountain (Aspen)

There is one study [Little Ridge (10-25)] classified as a High Mountain (Aspen) ecological site. This site is located adjacent to Little Creek on the southern portion of Little Creek Ridge.

Shrubs/Trees: The primary browse species is mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), though it contributes little cover. There are a few other low cover browse species present on the site. The trend for shrub cover will not be discussed here as data for line-intercept cover is only available for the most recent sample year (Figure 3.3). Average sagebrush demographics indicate that the number of young plants was greater than that of mature individuals in 1995. Recruitment of young plants has remained stable, and the population is currently a mixture of young and mature plants (Figure 3.9).

Quaking aspen (*Populus tremuloides*) is the only tree recorded on this site with a density of 41 trees/acre and a good amount of cover (Figure 3.5, Figure 3.7). Again, the trends for tree cover and density will not be discussed here as that data is only available for the most recent sample year.

Herbaceous Understory: This study site has an abundant herbaceous component dominated by perennial grasses, the cover of which has nearly doubled since the 1995 sample year. A variety of native perennial grass species are present, but the introduced species Kentucky bluegrass (*Poa pratensis*) dominates this site. There are no annual grasses found on this site.

In addition, a diverse number of perennial forbs provide cover, which has increased from 12% in 1995 to just over 18% in 2015. Annual forbs have decreased from nearly 2% in 1995 to 1% in 2015 (Figure 3.11).

Occupancy: Pellet group transect data indicates that elk and cattle/bison primarily use this site. Abundance of elk pellet groups was 21.5 days use/acre and abundance for cattle/bison was less than 1 days use/acre in 2015 (Figure 3.13).

Mountain (Sagebrush)

There are eight studies [McCook Ridge Chaining (10-3), Wirefence Point (10-4), Willow Flat (10-5), Cherry Mesa (10-7), Lower Tom Patterson Point (10R-5), Monument Ridge (10R-7), Railroad Canyon (10R-17), and Rathole Ridge (10R-22)] that are classified as Mountain (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. 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 Rat Hole Ridge in the southeast portion.

Shrubs/Trees: The primary browse on these studies is mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*). Other browse species are present in many of these communities, but contribute less cover. Sagebrush cover increased from under 8% in 2010 to just over 11% in 2015, but has exhibited a largely stable trend overall. Other preferred browse has increased slightly over time, while other shrubs have nearly doubled in cover since the 2010 sample year (Figure 3.3). Average sagebrush demographics indicate that mature plants comprise most of the population, and that overall density has decreased over time. Although overall recruitment of young plants has decreased from 1,800 plants/acre in 1995, it has been increasing steadily since the 2005 sample year (Figure 3.9).

Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis)* on these sites have decreased over time, and a majority of the current cover and density can be attributed to juniper. Although not currently at risk, these sites have the potential for a decrease in valuable browse and forage species should the amount of juniper increase in the future (Figure 3.5, Figure 3.7).

Herbaceous Understory: Herbaceous understories have, on average, increased in abundance throughout the study years, and are mainly dominated by perennial grasses. Although native grasses are generally plentiful, 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 contribute extremely little cover. Forbs on these study sites are generally very diverse. Perennial forbs have exhibited a fluctuating but slightly decreasing overall trend, and currently contribute little cover. Annual forbs have remained rare throughout the study years.

Occupancy: Average pellet transect data indicates that elk and cattle/bison primarily use these study sites and that occupancy fluctuates over time. Mean abundance of elk pellet groups has ranged from 23 days use/acre in 2010 to 48 days use/acre in 2005. Mean abundance of cattle/bison pellet groups has ranged from 4.5 days use/acre in 2000-2002 to 14.5 days use/acre in 2010. Mean abundance of deer pellet groups has ranged from 5.5 days use/acre in 2015 to 29 days use/acre in 2010 (Figure 3.13).

Mountain (Browse)

There are six studies [Little Jim Canyon (10-6), Black Horse (10-8), Saddle Horse (10R-15), PR Spring Total Exclosure (10R-32), PR Spring Livestock Exclosure (10R-33), and PR Spring Exclosure Outside (10R-34)] which are classified as Mountain (Browse) ecological sites. The Little Jim Canyon study is located near the southern portion of Little Jim Canyon. Black Horse is found on top of Black Horse Ridge south of the Uintah-Grand County border. The Saddle Horse study is situated south of Saddle Horse Point. Finally, the PR Spring Total Exclosure, PR Spring Livestock Exclosure, and PR Spring Exclosure Outside studies are located near the southern portion of PR Canyon, just north of PR Spring.

Shrubs/Trees: The dominant browse component of these sites is generally a mixture of preferred browse including mountain snowberry (*Symphoricarpos oreophilus*), alderleaf mountain mahogany (*Cercocarpus montanus*), Utah serviceberry (*Amalanchier utahensis*), and Gambel oak (*Quercus gambellii*); other browse species are often present in lower amounts. However, mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) provides the most cover on the Saddle Horse, PR Spring Total Exclosure, PR Spring Livestock Exclosure, and PR Spring Exclosure Outside study sites. Sagebrush cover has varied throughout the study years, ranging from 4% in 2012 (only one study site of this ecological type was sampled that year) to nearly 18% in 2010, but the overall trend is largely stable (Figure 3.3). Sagebrush density has also fluctuated over time, but has exhibited a generally increasing trend. Average sagebrush demographics indicate that mature plants have consistently constituted the largest portion of the population, with decadent individuals present to a lesser extent. Recruitment of young plants has remained generally low, ranging from 43 plants/acre in 2012

(again, only one study site of this ecological type was sampled that year) to 681 plants/acre in 1997-1999 (Figure 3.9).

Utah juniper (*Juniperus osteosperma*), twoneedle pinyon (*Pinus edulis*), and other conifers are present on some study sites. However, the Saddle Horse study is driving the average cover and density trends, both of which increased from 2000-2002 to 2012 and decreased in the 2015 sample year (Figure 3.5, Figure 3.7).

Herbaceous: Herbaceous cover on these sites has fluctuated throughout the study years, but has overall slightly increased. Perennial grasses have consistently been the largest herbaceous component. Introduced species such as Kentucky bluegrass (*Poa pratensis*) contribute some cover on many sites, but many native species are often present as well. The invasive annual grass species cheatgrass (*Bromus tectorum*) is present on the Little Jim Canyon and Saddle Horse studies in small amounts. These sites are host to a variety of perennial forbs, the amount of which has fluctuated but overall remained rather stable. Annual forbs have remained rare over time (Figure 3.11).

Occupancy: Average pellet transect data indicates that these sites are mainly used by elk and deer and that use varies over time. Mean abundance of elk pellet groups has ranged from 8 days use/acre in 2005 to 19 days use/acre in 2015. Mean abundance of deer pellet groups has ranged from 18 days use/acre in 2015 to 43 days use/acre in 2005. Cattle/bison pellet groups have had a mean abundance ranging from 5 days use/acre in 2000-2002 to 9 days use/acre in 2005 (Figure 3.13).

Mountain (Basin Wildrye)

There are two studies [Bogart-She (10-23) and Turner Canyon (10-24)] that 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.

Shrubs/Trees: Browse and shrubs in general on these sites are limited: the Bogart-She study has no shrub cover and the Turner Canyon study had only 0.5% line-intercept cover of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) in 2015 (Figure 3.3). Average sagebrush demographics show that the population has been composed entirely of either mature or decadent individuals in the past and that density has decreased over time, ranging from 20 plants/acre in 1995 and 2000-2002 to 0 plants/acre in 2015 (Figure 3.9).

While line-intercept cover for trees is absent for both sites, Bogart-She had a small amount of quadrat cover recorded for Engelmann spruce (*Picea engelmannii*) and a density of 80 plants/acre for quaking aspen (*Populus tremuloides*) in 2015 (Figure 3.5, Figure 3.7).

Herbaceous Understory: Both study sites have a plentiful herbaceous understory that has increased over time and is largely composed of perennial grasses. Although the introduced perennial grass species Kentucky bluegrass (*Poa pratensis*) is the dominant herbaceous component, native grasses do contribute a considerable amount of cover on both sites. The invasive annual grass species cheatgrass (*Bromus tectorum*) is present on the Turner Canyon site, but in low amounts. Perennial forbs are rich in diversity and have overall increased in cover over time. Annual forbs have remained rare over the study years (Figure 3.11).

Occupancy: According to average pellet transect data, these sites are primarily utilized by elk and cattle/bison and use fluctuates from year to year. Elk pellet groups have had a mean abundance ranging from 9 days use/acre in 2000-2002 to 11 days use/acre in 2015. Mean abundance of pellet groups for deer has ranged from 0 days use/acre in 2000-2002 to 3 days use/acre in 2015. Finally, mean abundance of cattle/bison pellet groups has ranged from 2 days use/acre in 2000-2002 to 14 days use/acre in 2015 (Figure 3.13).

Upland (Sagebrush)

There are five studies [McCook Ridge Exclosure (10-2), Wolf Den (10-12), Winter Ridge Exclosure Out (10R-9), Winter Ridge Livestock Exclosure (10R-10), and Winter Ridge Total Exclosure (10R-11)] classified as Upland (Sagebrush) ecological sites. The McCook Ridge Exclosure study is located on McCook Ridge near Slick Rock Canyon. Wolf Den is situated in Big Park, north of Nelson Canyon. The Winter Ridge Exclosure Out, Winter Ridge Livestock Exclosure, and Winter Ridge Total Exclosure studies are found just southwest of Trail Canyon on Winter Ridge.

Shrubs/Trees: The primary browse species on these sites is mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), save for McCook Ridge Exclosure which is dominated by Wyoming big sagebrush (*A. tridentata* ssp. *wyomingensis*). Other browse species contributing less cover are often present. Sagebrush cover has remained stable over the study years, that of preferred browse has increased, and cover of other shrubs has decreased overall (Figure 3.4). Sagebrush demographics indicate that mature individuals have consistently been the largest age group within the population, though decadent individuals are present. Recruitment of young plants has varied from year to year (Figure 3.10).

Encroachment by Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) is occurring on these study sites, but not in any significant amount. Cover of juniper has ranged from 0% in 2010 to 0.2% in 2005, and cover of pinyon has ranged from 0% in 2005 to 0.1% in 2010 (Figure 3.6).

Herbaceous Understory: Except for the Wolf Den study which has little herbaceous cover, these studies have moderately abundant herbaceous understories which have remained largely stable since the studies began. Native perennial grasses contribute most of the herbaceous cover on most sites; the exception to this is the McCook Ridge Exclosure study which is dominated by the invasive annual grass cheatgrass (*Bromus tectorum*). Cheatgrass is also present on the Wolf Den study, but in low amounts. Perennial forb cover is low, but has increased over the study years. Annual forbs remain rare (Figure 3.12).

Occupancy: Mean pellet transect data shows that these study sites are mainly occupied by elk and deer and that use has fluctuated over time. Mean abundance of elk pellet groups has ranged from 10 days use/acre in 2010 to 38 days use/acre in 2005. Deer pellet groups have had a mean abundance as low as 16 days use/acre in 2015 and as high as 74 days use/acre in 2005. Cattle/bison pellet groups have had a mean abundance ranging from 1 days use/acre in 2010 to 9 days use/acre in 2015. Finally, mean abundance of horse pellet groups has ranged from 0 days use/acre in 2000-2002 to 5 days use/acre in 2015 (Figure 3.14).

Upland (Fourwing Saltbush)

Four sites [Indian Ridge (10-1), Sunday School (10-10), Indian Ridge 2 (10R-28), and Massey Junction (10R-29)] are classified as Upland (Fourwing Saltbush) ecological sites. The Indian Ridge and Indian Ridge 2 studies are located on top of Indian 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.

Shrubs/Trees: The primary browse component varies from site to site: prairie sagewort (*Artemisia frigida*) is dominant on the Sunday School and Massey Junction studies, while fourwing saltbush (*Atriplex canescens*) is the most abundant browse species on the Indian Ridge and Indian Ridge 2 studies. Other browse species are often present, but contribute less cover. The average covers of sagebrush, preferred browse, and other shrubs have fluctuated from year to year, but have generally increased overall (Figure 3.4). Mature sagebrush plants have generally comprised most of the population, though decadent individuals are present as well. Recruitment of young plants has varied from year to year (Figure 3.10).

Trees are not present on any of these sites and are therefore not discussed here (Figure 3.6, Figure 3.8)

Herbaceous Understory: Although the herbaceous understory of these sites are plentiful, they have been mainly comprised of the invasive annual grass species cheatgrass (*Bromus tectorum*) in all study years. Native perennial grasses have contributed relatively little cover, but have generally increased over time. Perennial forbs have remained rare since the beginning of the study, and although annual forb cover has fluctuated from year to year, it has generally decreased over time (Figure 3.12).

Occupancy: Average pellet transect data shows that overall occupancy has decreased since 2010 and that elk and deer primarily use these sites. Mean abundance of elk pellet groups has ranged from 12 days use/acre in 2010 to 24 days use/acre in 2000-2002. Mean abundance of deer pellet groups has ranged from 15 days use/acre in 2000-2002 to 29 days use/acre in 2010. Cattle/bison pellet groups have had a mean abundance ranging from 9 days use/acre in 2015 to 21 days use/acre in 2000-2002. Finally, mean abundance of horse pellet groups has ranged from 0 days use/acre in 2005 to 6 days use/acre in 2015 (Figure 3.14).

Semidesert (Sagebrush)

There are two studies [Agency Draw (10-9) and Two Water WMA (10R-4)] that are classified as Semidesert (Sagebrush) ecological sites. Agency Draw is located southeast of Agency Draw Oil Field and west of Willow Creek. The Two Water WMA study is found on the northern slopes of McCook Ridge above Reservoir Canyon.

Shrubs/Trees: Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) is the dominant browse species on the Agency Draw study, while black sagebrush (*A. nova*) dominates the Two Water WMA study site. Other browse species are present on both sites, but provide less cover. Average sagebrush cover has increased throughout the study years and that of other preferred browse has slightly decreased (Figure 3.4). Mature plants have consistently constituted a major portion of the sagebrush populations and decadent individuals have been present to a lesser extent. Recruitment of young plants has fluctuated over time; the high amount of young plants in 1997-1999 could be due to the fact that only one site of this ecological type was sampled that year. Overall density has been steadily decreasing since the 1997-1999 sample years (Figure 3.10).

Encroachment of twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) is occurring on the Agency Draw study site, but both cover and density have remained low over the study years (Figure 3.6, Figure 3.8).

Herbaceous Understory: Herbaceous cover is moderately abundant on both sites, though the composition differs. The Agency Draw study has remained dominated by the invasive annual grass species cheatgrass (*Bromus tectorum*) with perennial grasses contributing little cover. In contrast, the Two Water WMA study has remained dominated by native perennial grasses throughout the study years. Perennial forbs on both sites are diverse in composition and, although rare, have generally increased in cover since the 2000-2002 sample years. Annual forb cover has fluctuated, but has remained low on average (Figure 3.12).

Occupancy: Average pellet transect data indicates that deer primarily use this site and that overall occupancy has steadily decreased over the study years. Mean abundance of elk pellet groups has ranged from 0.4 days use/acre in 2010 to 28.5 days use/acre in 2005. Deer pellet groups have had a mean abundance ranging from 20 days use/acre in 2015 to 54 days use/acre in 2000-2002. Cattle/bison pellet groups have had a mean abundance ranging from 0 days use/acre in 2000-2002 to 1.5 days use/acre in 2005. Finally, mean abundance of horse pellet groups has ranged from 6 days use/acre in 2015 to 12 days use/acre in 2005 (Figure 3.14).

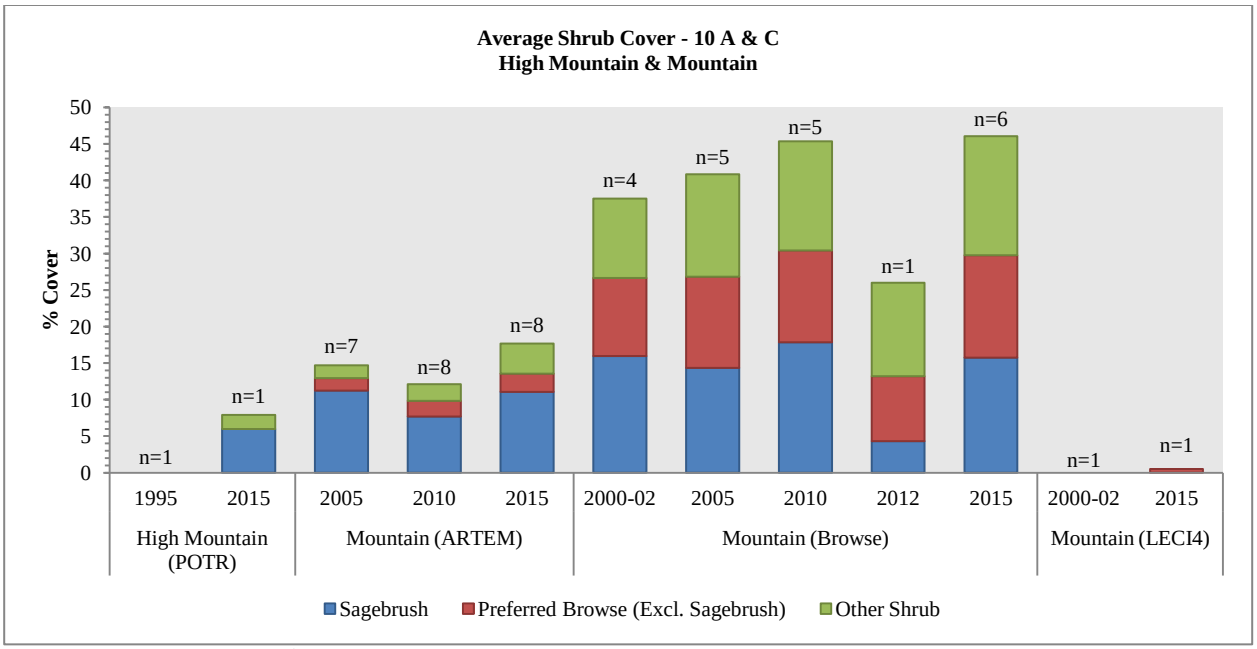


Figure 3.3: Average shrub cover for High Mountain (POTR), Mountain (ARTEM), Mountain (Browse), and Mountain (LECI4) study sites in WMU 10AC, North Book Cliffs.

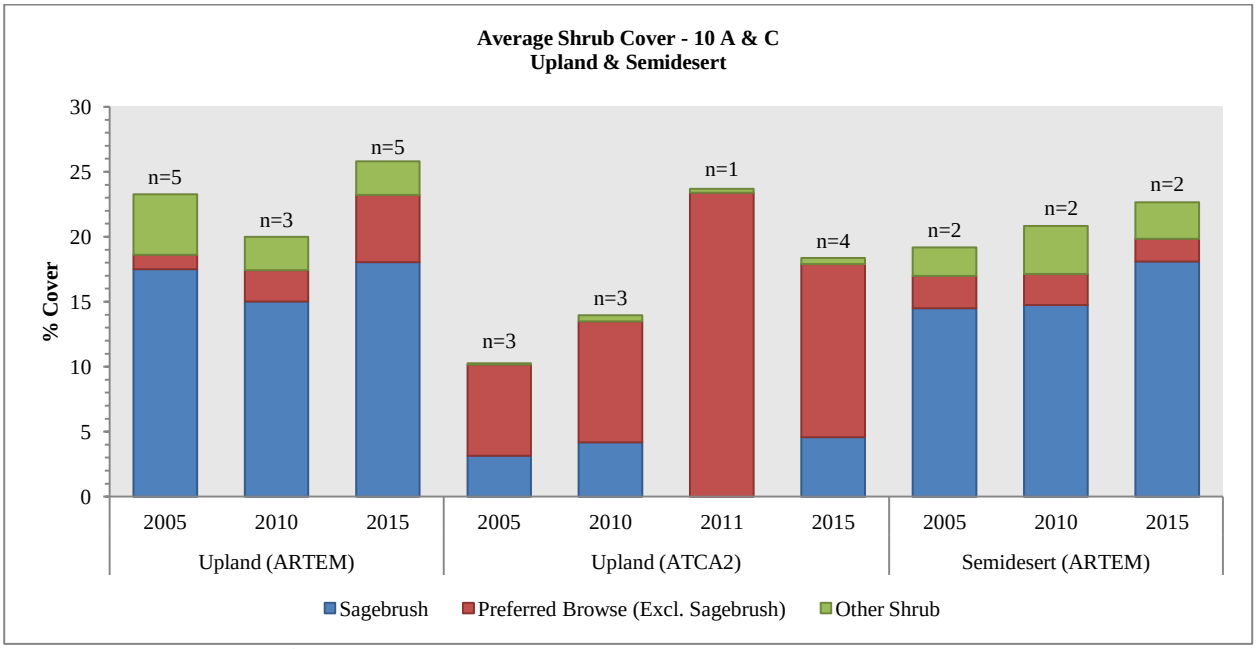


Figure 3.4: Average shrub cover for Upland (ARTEM), Upland (ATCA2), and Semidesert (ARTEM) study sites in WMU 10AC, North Book Cliffs.

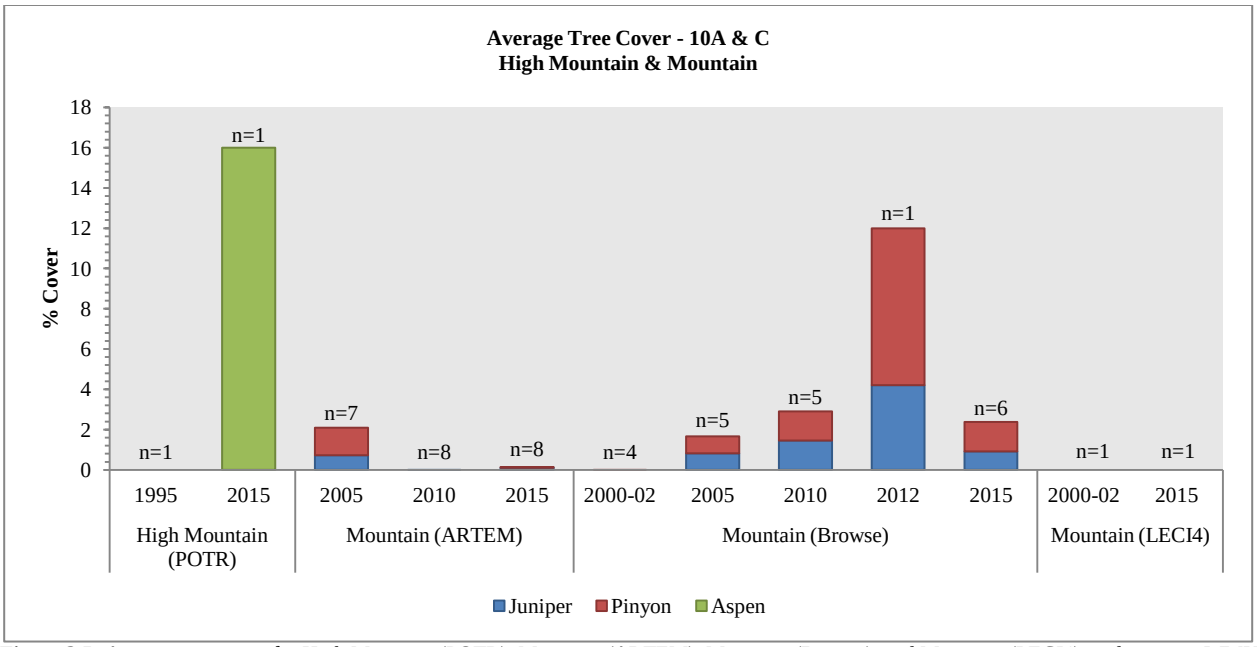


Figure 3.5: Average tree cover for High Mountain (POTR), Mountain (ARTEM), Mountain (Browse), and Mountain (LECI4) study sites in WMU 10AC, North Book Cliffs.

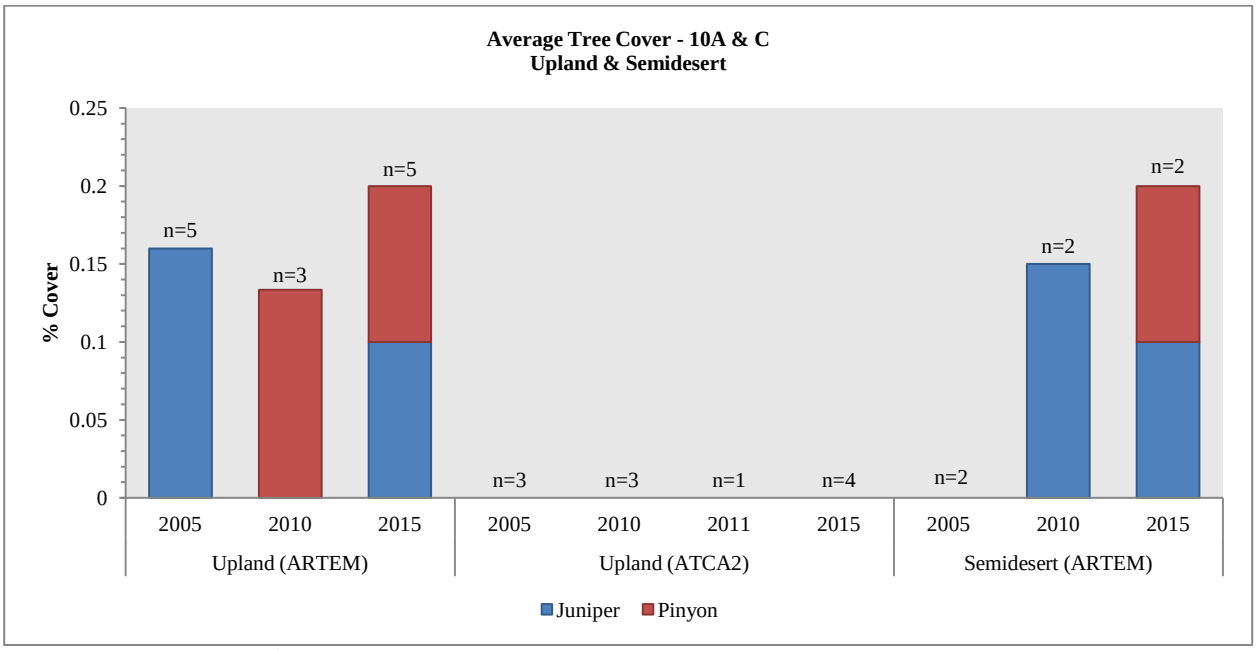


Figure 3.6: Average tree cover for Upland (ARTEM), Upland (ATCA2), and Semidesert (ARTEM) study sites in WMU 10AC, North Book Cliffs.

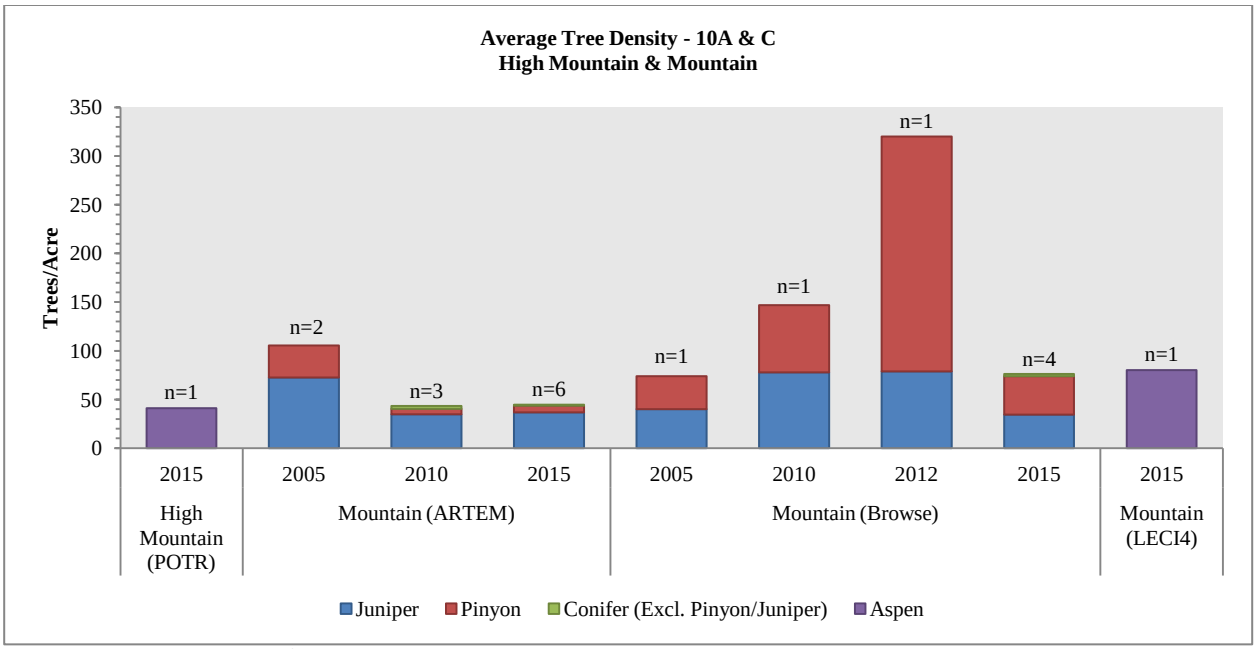


Figure 3.7: Average tree density for High Mountain (POTR), Mountain (ARTEM), Mountain (Browse), and Mountain (LECI4) study sites in WMU 10AC, North Book Cliffs.

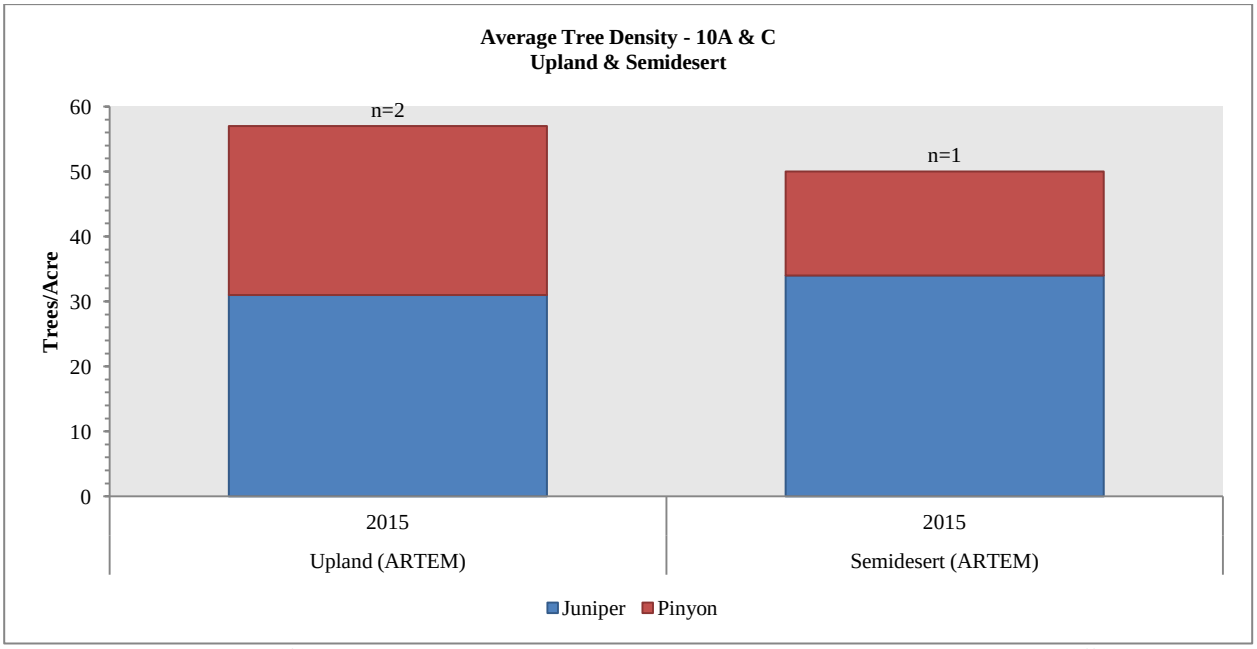


Figure 3.8: Average tree density for Upland (ARTEM) and Semidesert (ARTEM) study sites in WMU 10AC, North Book Cliffs.

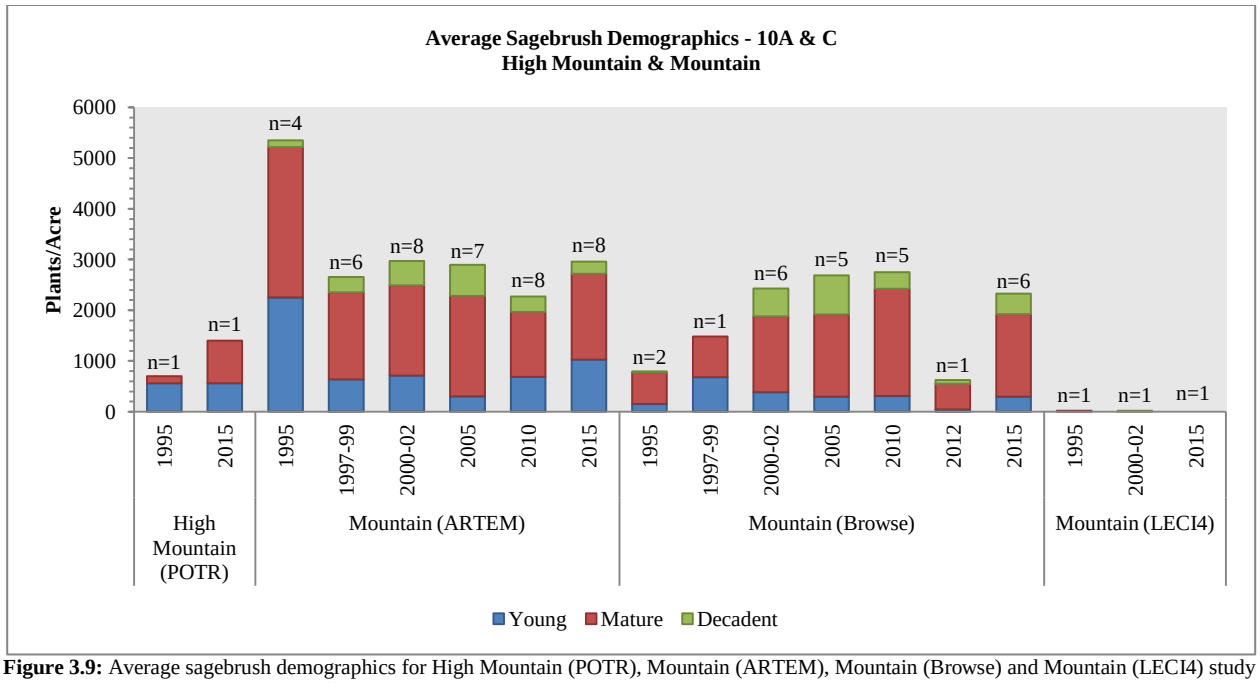


Figure 3.9: Average sagebrush demographics for High Mountain (POTR), Mountain (ARTEM), Mountain (Browse) and Mountain (LECI4) study sites in WMU 10AC, North Book Cliffs.

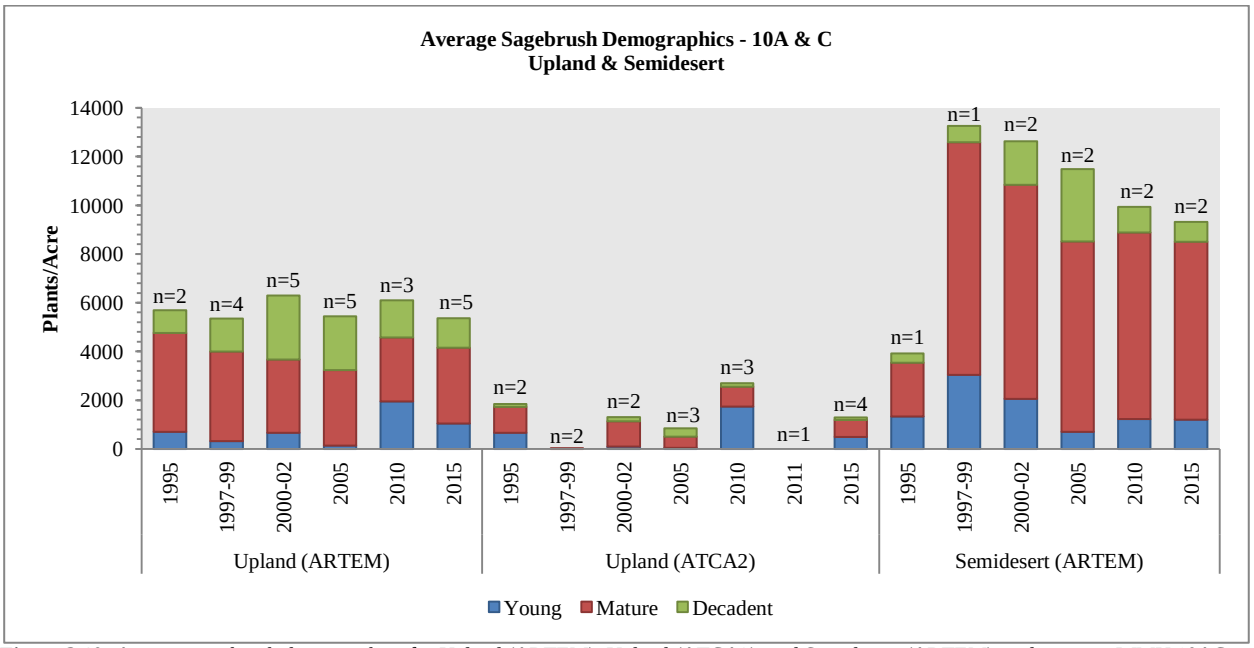


Figure 3.10: Average sagebrush demographics for Upland (ARTEM), Upland (ATCA2), and Semidesert (ARTEM) study sites in WMU 10AC, North Book Cliffs.

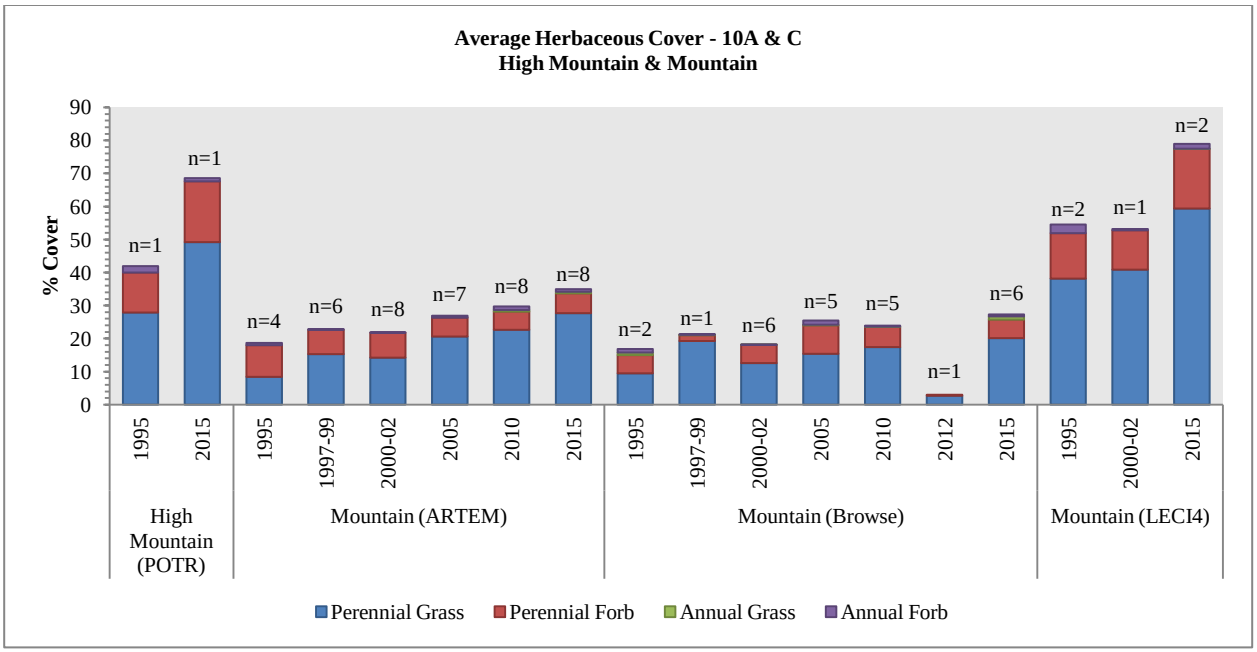


Figure 3.11: Average herbaceous cover for High Mountain (POTR), Mountain (ARTEM), Mountain (Browse), and Mountain (LECI4) study sites in WMU 10AC, North Book Cliffs.

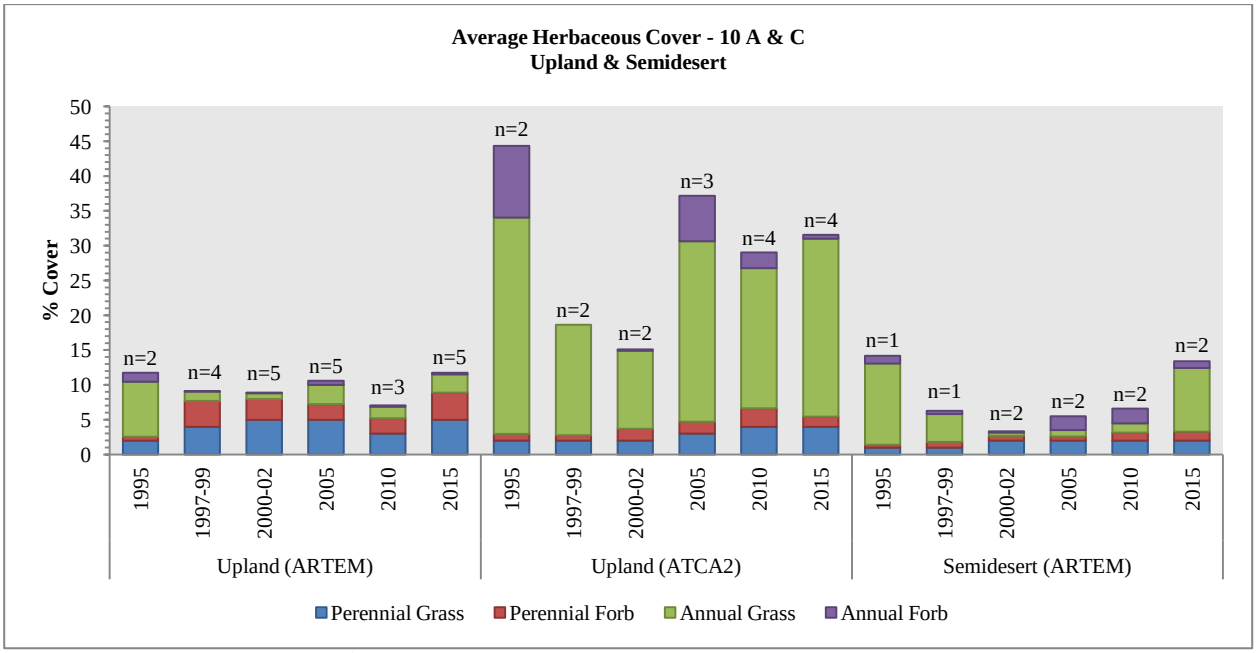


Figure 3.12: Average herbaceous cover for Upland (ARTEM), Upland (ATCA2), and Semidesert (ARTEM) study sites in WMU 10AC, North Book Cliffs.

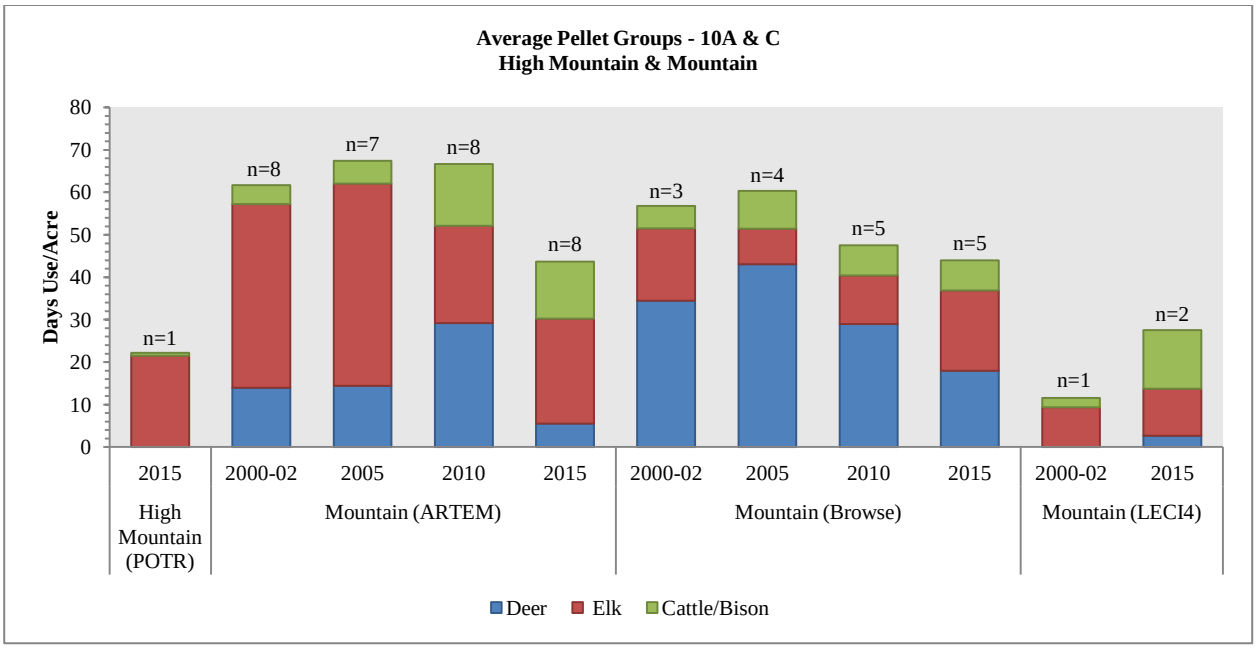


Figure 3.13: Average pellet transect data for High Mountain (POTR), Mountain (ARTEM), Mountain (Browse), and Mountain (LECI4) study sites in WMU 10AC, North Book Cliffs.

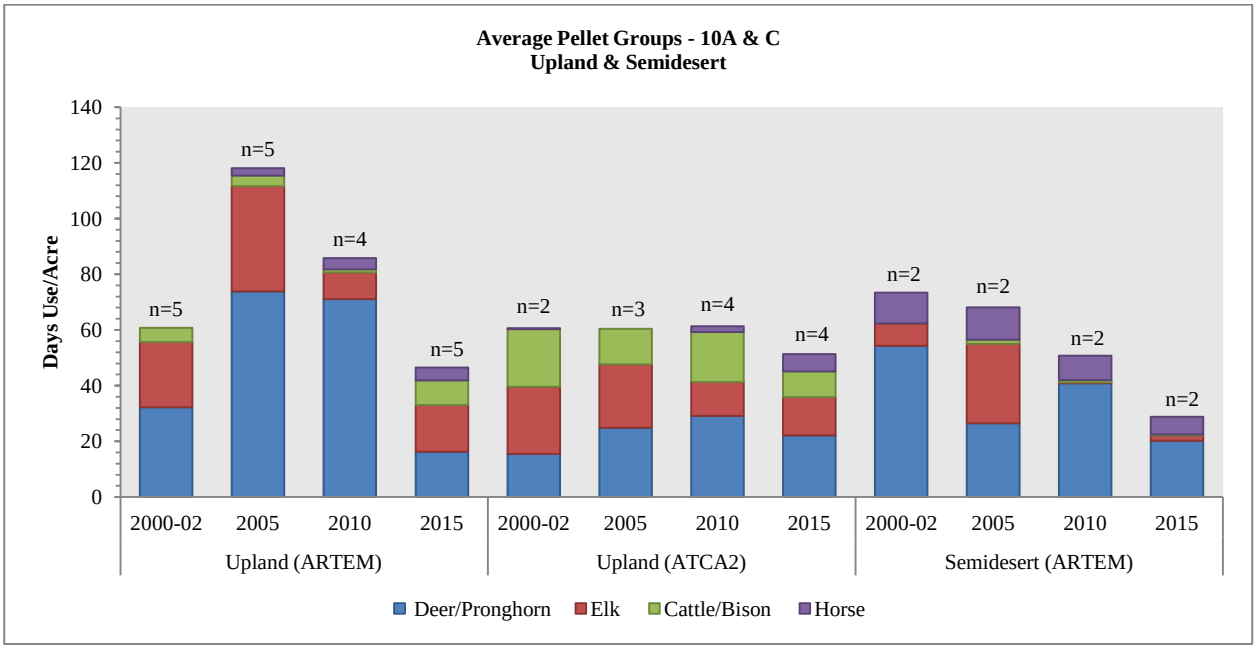
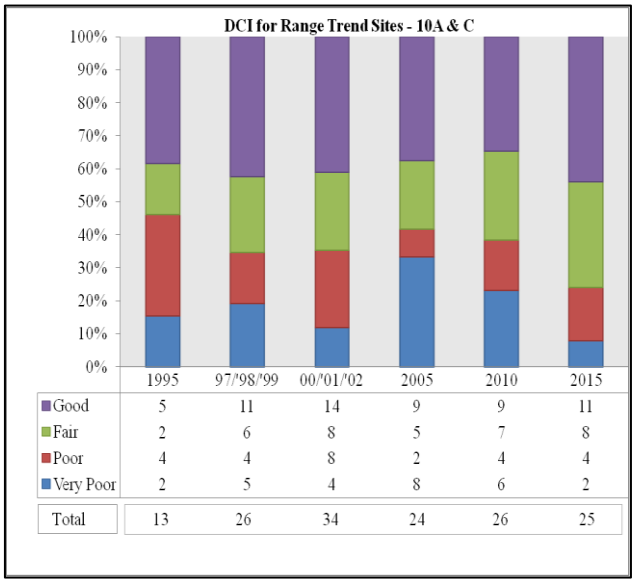


Figure 3.14: Average pellet transect data for Upland (ARTEM), Upland (ATCA2), and Semidesert (ARTEM) study sites in WMU 10AC, North Book Cliffs.

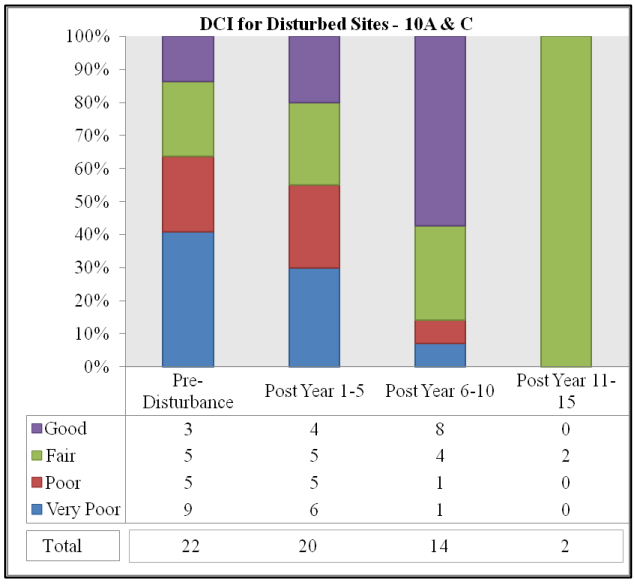
Deer Winter Range Condition Assessment

The condition of deer winter range within the North Book Cliffs management unit has improved on the sites sampled since 1995 with a majority being classified as fair to good in most sample years. The range trend sites sampled within the unit are considered to be in very poor to good condition as of the 2015 sampling year (Map 3.14, Figure 3.15). Indian Ridge has remained in very poor condition due to a large amount of annual grass, and Monument Ridge has remained in very poor condition because of a lack of browse cover and sagebrush diversity. Lower McCook Ridge Exclosure, Lower McCook Ridge Chaining, Little Jim Canyon, Agency Draw, Wolf Den, Winter Ridge Total Exclosure, Nash Wash #2, Indian Ridge #2, and Massey Junction are in poor to fair condition. Sunday School, Two Water WMA, Winter Ridge Exclosure Out, and Winter Ridge Livestock Exclosure are in good condition. The treated study sites range from very poor to good (Figure 3.16). In general, the treated sites have improved as time since treatment increases. Center Fork, Rector Ridge, and Dry Canyon were sampled pretreatment and are in very poor condition. Winter Ridge Bullhog has remained in very poor condition and Seep Ridge Bullhog went from poor to very poor. Archy Bench went from fair to poor, Winter Ridge Bullhog #2 went from very poor to fair, and McCook Ridge Plateau Exclosure Outside went from good to fair. Finally, McCook Ridge Plateau Exclosure South remained in fair condition while McCook Ridge Plateau Exclosure North remained in good condition (Map 3.14, Figure 3.16). It is possible given more time and continual monitoring that these sites will continue to improve.



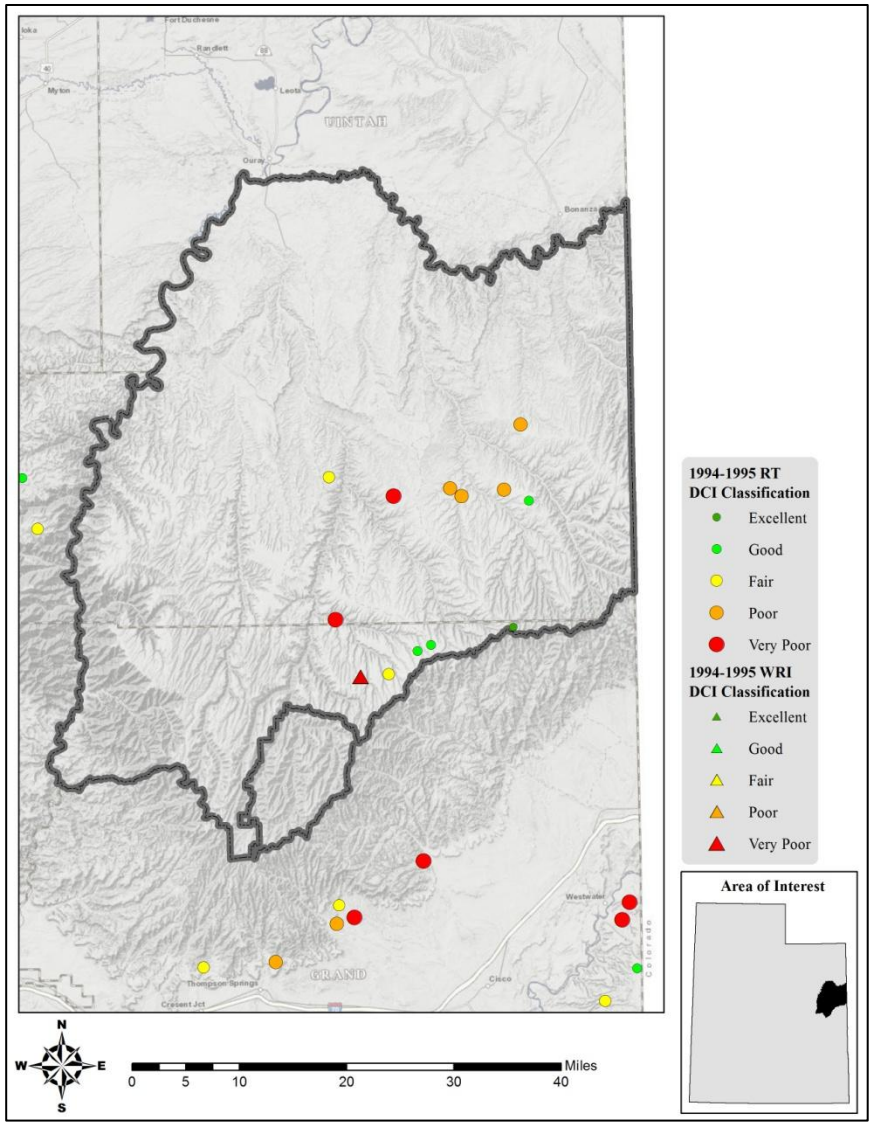
	1995	97/'98/'99	00/'01/'02	2005	2010	2015
Good	5	11	14	9	9	11
Fair	2	6	8	5	7	8
Poor	4	4	8	2	4	4
Very Poor	2	5	4	8	6	2
Total	13	26	34	24	26	25

Figure 3.15: Deer winter range Desirable Components Index (DCI) summary by year of Range Trend sites for WMU 10AC, North Book Cliffs.

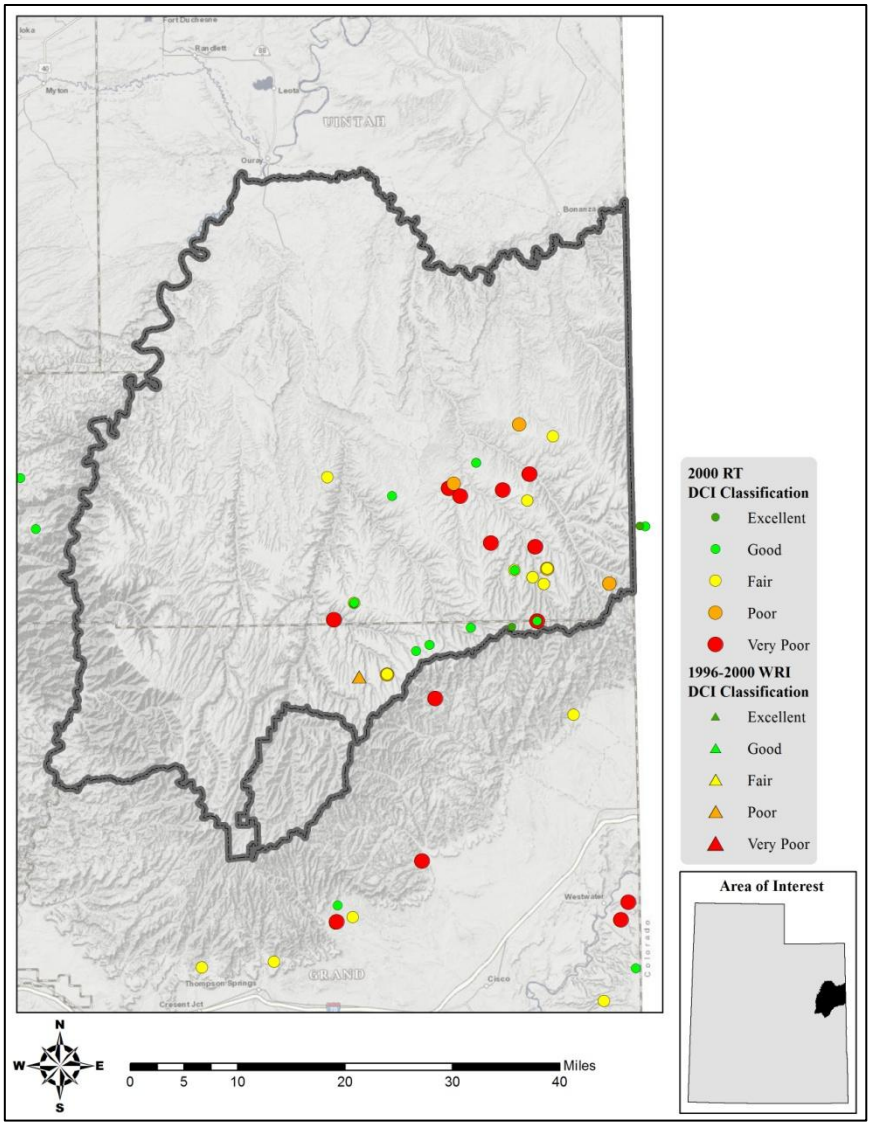


	Pre-Disturbance	Post Year 1-5	Post Year 6-10	Post Year 11-15
Good	3	4	8	0
Fair	5	5	4	2
Poor	5	5	1	0
Very Poor	9	6	1	0
Total	22	20	14	2

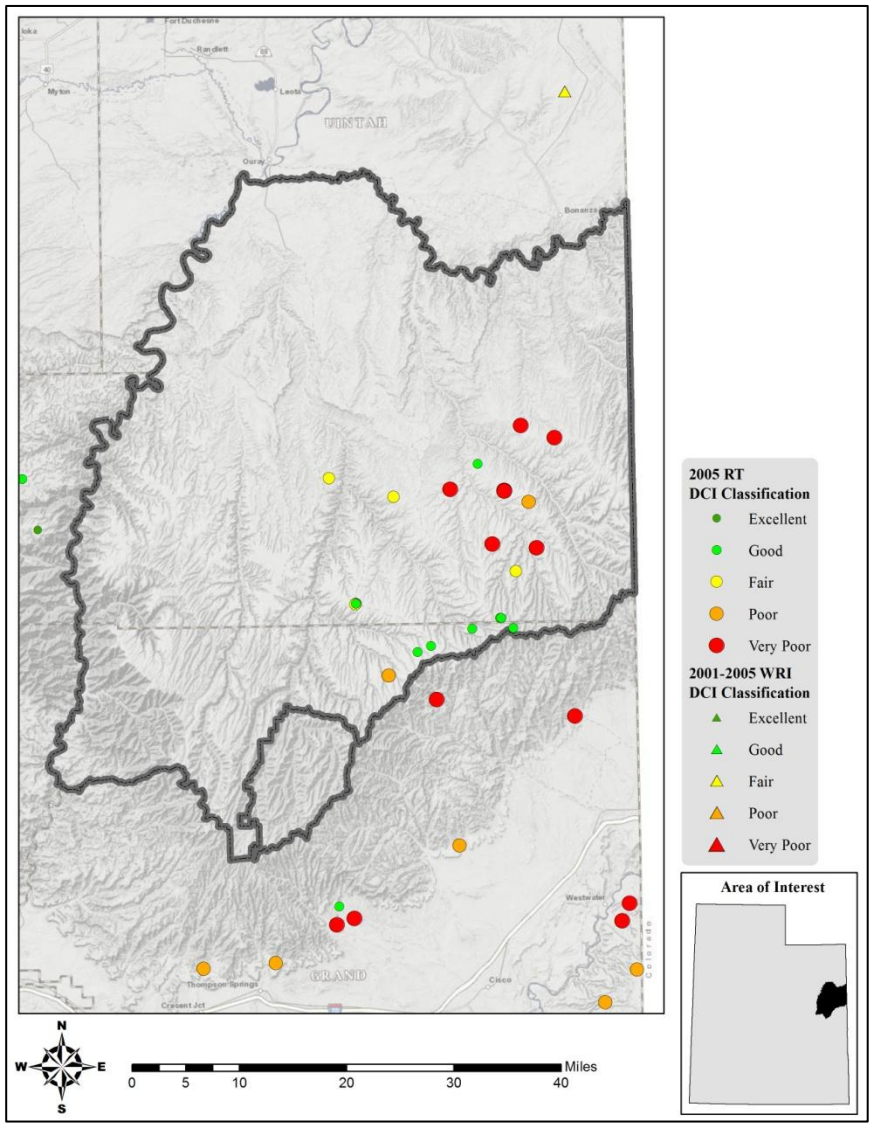
Figure 3.16: Deer winter range Desirable Components Index (DCI) summary by year of treated/disturbed sites for WMU 10AC, North Book Cliffs.



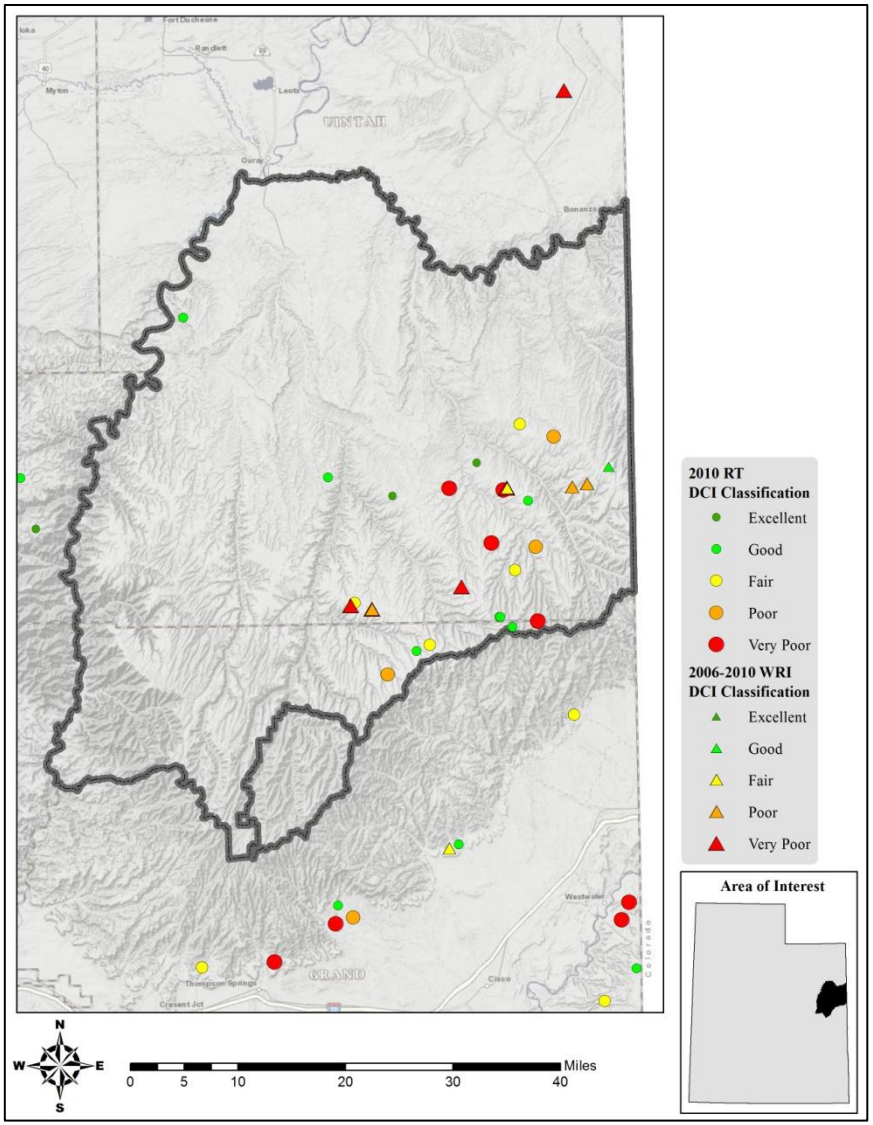
Map 3.10: 1994-95 Desirable Components Index (DCI) ranking distribution by study site for WMU 10AC, North Book Cliffs.



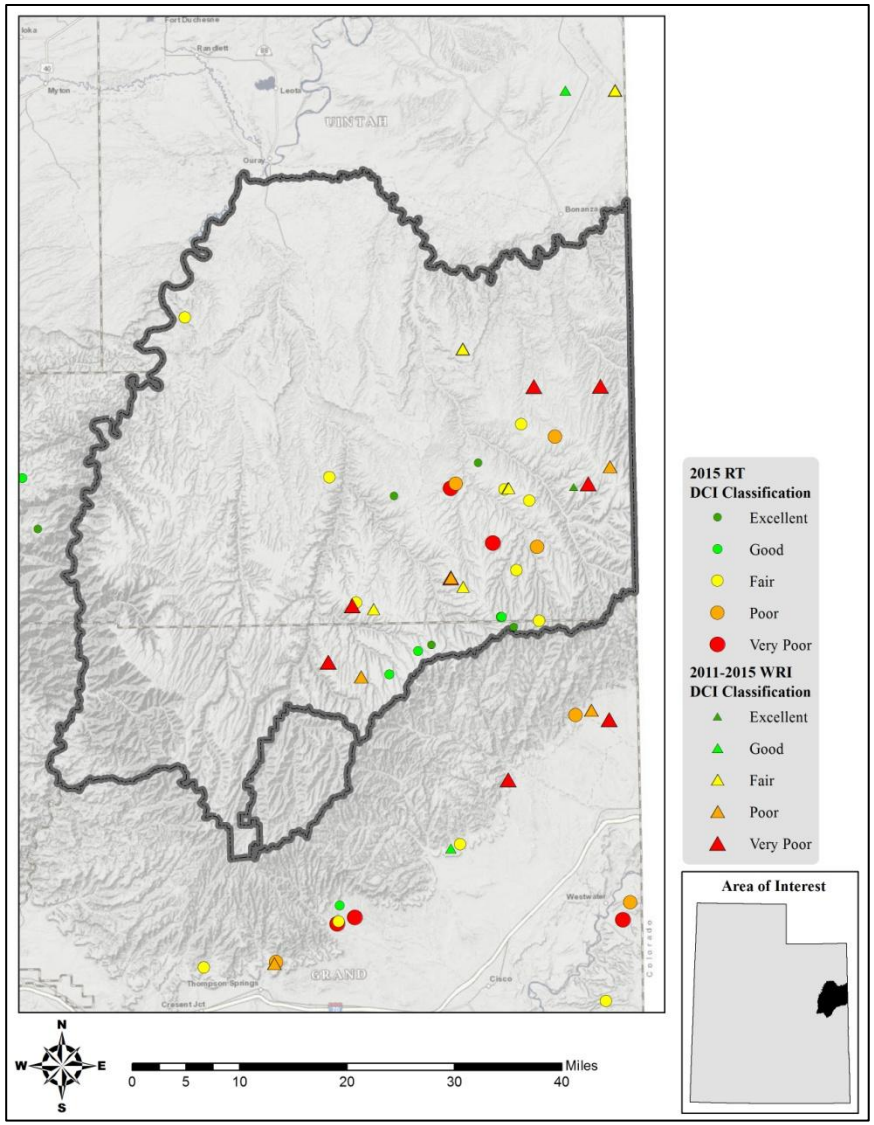
Map 3.11: 2000 Desirable Components Index (DCI) ranking distribution by study site for WMU 10AC, North Book Cliffs.



Map 3.12: 2005 Desirable Components Index (DCI) ranking distribution by study site for WMU 10AC, North Book Cliffs.



Map 3.13: 2010 Desirable Components Index (DCI) ranking distribution by study site for WMU 10AC, North Book Cliffs.



Map 3.14: 2015 Desirable Components Index (DCI) ranking distribution by study site for WMU 10AC, North Book Cliffs.

Study #	Study Name	Limiting Factor and/or Threat	Level of Threat	Potential Impact
10-1	Indian Ridge	Annual Grass	High	Increased fire potential.
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
10-2	McCook Ridge Exclosure	Annual Grass	High	Increased fire potential.
10-3	McCook Ridge Chaining	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species.
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
10-4	Wirefence Point	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
10-5	Willow Flat	Annual Grass	Low	Increased fire potential.
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
15-6	Little Jim Canyon	Annual Grass	Low	Increased fire potential.
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
10-7	Cherry Mesa	Annual Grass	Low	Increased fire potential.
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
10-8	Black Horse	Not Identified		
10-9	Agency Draw	Annual Grass	Moderate	Increased fire potential.
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
10-10	Sunday School	Annual Grass	Low	Increased fire potential.
10-12	Wolf Den	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
10-28	Wild Horse Bench	Annual Grass	Low	Increased fire potential.
10R-4	Two Water WMA	Annual Grass	Low	Increased fire potential.
10R-5	Lower Tom Patterson Point	Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species.
10R-7	Monument Ridge	Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species.
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
10R-9	Winter Ridge Exlosure Out	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
10R-13	McCook Ridge Livestock Exclosure	Annual Grass	Moderate	Increased fire potential.
10R-14	McCook Ridge Total Exclosure	Annual Grass	High	Increased fire potential.
10R-15	Saddle Horse	PJ Encroachment	Moderate	Reduced understory shrub and herbaceous vigor.
		Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species.
10R-17	Railroad Canyon	Introduced Perennial Grass	Moderate	Reduced diversity of desirable grass and forb species.
		Annual Grass	Low	Increased fire potential.
10R-22	Rathole Ridge	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
10R-28	Indian Ridge 2	Annual Grass	High	Increased fire potential.
10R-29	Massey Junction	Annual Grass	High	Increased fire potential.
10R-32	PR Spring Total Exclosure	None Identified		
10R-33	PR Spring Livestock Exclosure	None Identified		
10R-34	PR Spring Exclosure Outside	None Identified		
10R-36	Indian Springs Bullhog	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
10R-39	Indian Springs Bullhog 2	None Identified		
10R-40	Indian Springs Bullhog 3	Annual Grass	Low	Increased fire potential.
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
10R-41	Winter Ridge Bullhog	PJ Encroachment	Low	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	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
10R-44	McCook Ridge Plateau Exclosure South	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
		Annual Grass	Low	Increased fire potential.
10R-45	McCook Ridge Plateau Exclosure Outside	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
		Annual Grass	Low	Increased fire potential.
10R-46	Seep Ridge Chaining	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
10R-51	Archy Bench	Annual Grass	High	Increased fire potential.
10R-52	Seep Ridge Bullhog	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
10R-53	Moon Ridge	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.

Table 3.10: Assessment of the potential limiting factors and/or threats and level of threat to study sites for WMU 10AC, North Book Cliffs. All assessments are based off of the most current sample date for each study site.

Discussion and Recommendations

High Mountain (Aspen)

This high elevation mountain ecological site supports an aspen community and is generally considered to be in good condition for deer and elk summer range habitat on the North Book Cliffs management unit. This community supports a diverse herbaceous understory that provides valuable forage during the summer months. Although generally good, the herbaceous understory is dominated by introduced perennial grasses. These grass species provide valuable forage, but can be aggressive at higher elevations and can reduce the prevalence and abundance of other more desirable native grass and forb species.

It is recommended that monitoring of this community continue. When reseeding is necessary to restore herbaceous species, care should be taken in species selection and preference should be given to native grass species when possible.

Mountain (Sagebrush)

These higher elevation mountain ecological sites which support sagebrush are generally considered to be in good condition for deer summer range habitat on this unit, with the exception of the McCook Ridge Chaining and Monument Ridge studies which are winter range habitat. These communities support robust shrub populations that provide valuable browse for wildlife. Although generally good, the herbaceous understories can be dominated by introduced perennial grasses. These grass species provide valuable forage, but can often be aggressive at higher elevations and can reduce the prevalence and abundance of other more desirable native grass and forb species.

When reseeding is necessary to restore herbaceous species, care should be taken in species selection and preference should be given to native grass species when possible.

Mountain (Browse)

These high elevation mountain browse communities are generally considered to be in good condition for deer summer range habitat on the unit. These communities support shrub populations that provide valuable browse for wildlife. Although generally good, the herbaceous understories can be dominated by introduced perennial grasses. These grass species provide valuable forage, but can often be aggressive at higher elevations and can reduce the prevalence and abundance of other more desirable native grass and forb species. In addition, some of these sites can potentially be prone to encroachment from pinyon and juniper trees which can reduce understory shrub and herbaceous health if not addressed.

It is recommended that when necessary, work to prevent and/or reduce pinyon-juniper encroachment (e.g. bullhog, chaining, lop and scatter, etc.) should begin in some of these communities. When reseeding is necessary to restore herbaceous species, care should be taken in species selection and preference should be given to native grass species when possible.

Mountain (Basin Wildrye)

These high elevation mountain basin wildrye communities are generally considered to be in fair condition for deer summer range habitat on the North Book Cliffs unit. These communities support plentiful herbaceous understories that provide valuable forage during the summer months. Introduced perennial grasses are the dominant herbaceous component on these study sites. While providing valuable forage, these grass species can

often be aggressive at higher elevations and can reduce the prevalence and abundance of other more desirable native grass and forb species.

It is recommended that monitoring of these communities continue. If reseeding is necessary to restore herbaceous species, care should be taken in species selection and preference should be given to native grass species when possible.

Upland (Sagebrush)

The mid elevation upland sagebrush communities are generally considered to be in fair to good condition for deer winter range habitat on the unit. These communities support robust shrub populations that provide valuable browse in mild and moderate winters. Annual grass, primarily cheatgrass, is an issue on one of these sites. Increased amounts of cheatgrass can increase fuel loads and increase the threat of wildfire in the affected communities. Although not currently an issue, these communities have the potential for pinyon-juniper encroachment which can reduce understory shrub and herbaceous health if not addressed.

Although pinyon and juniper populations are small in these communities, it is recommended that work to prevent further pinyon-juniper encroachment (e.g. bullhog, chaining, lop and scatter, etc.) should begin. Treatments to reduce annual grass may be necessary on some sites.

Upland (Fourwing Saltbush)

These mid elevation upland fourwing saltbush communities are considered to be in very poor to poor condition for deer winter range habitat on the unit; however, there is one site that is in excellent condition. These communities often support shrub populations that include fourwing saltbush, prairie sagewort, and winterfat (among others): these species provide valuable browse in mild and moderate winters. The herbaceous understories of these communities are often dominated by annual grasses, primarily cheatgrass. Increased amounts of cheatgrass can increase fuel loads and increase the threat of wildfire. If wildfire occurs within these communities, they lose most of their value as deer winter range and reestablishment of valuable browse species is typically slow.

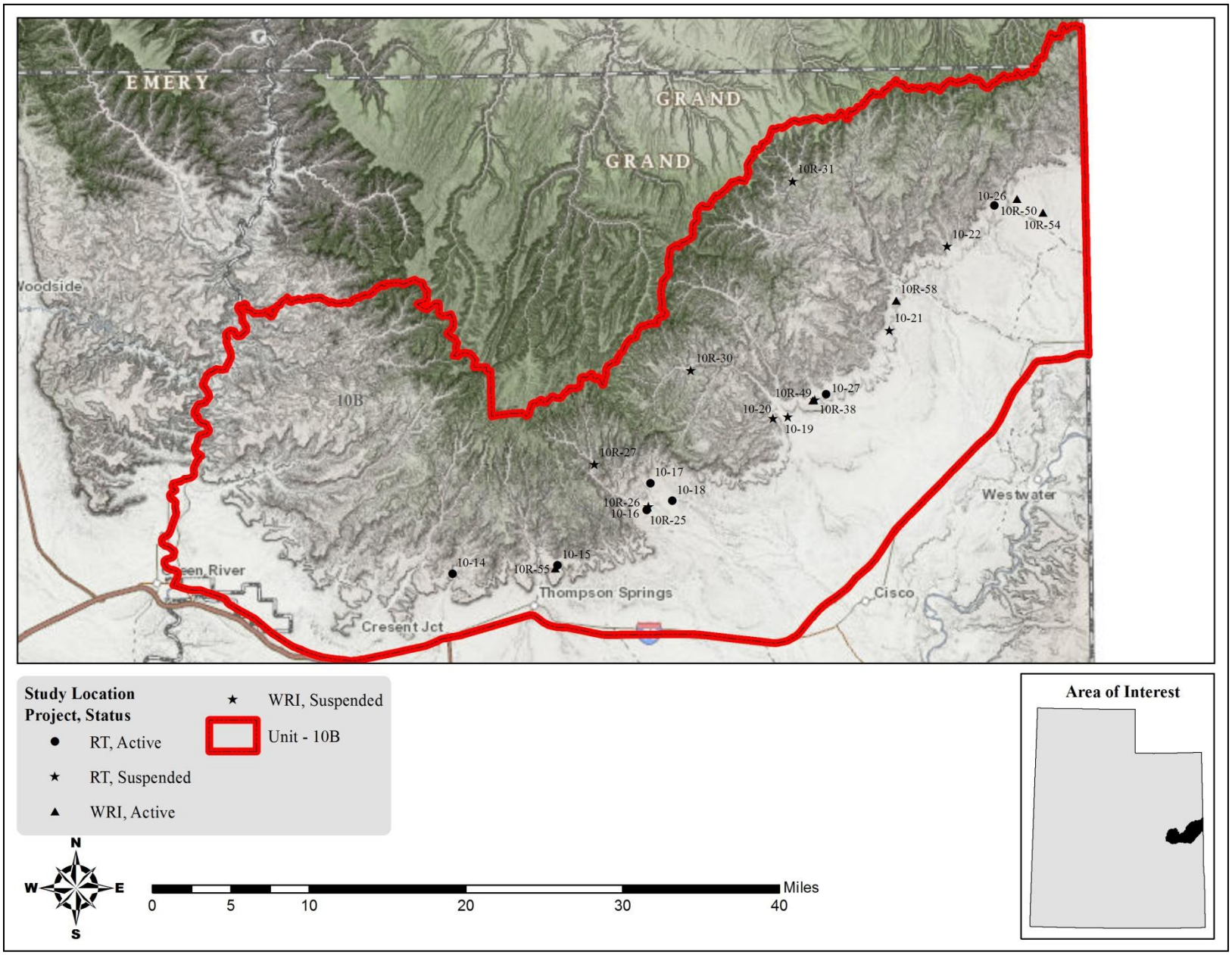
Treatments to reduce annual grass may be necessary on many of these sites. Work to diminish fuel loads and create fire breaks may be necessary to reduce the risk of catastrophic wildfire. If reseeding is necessary to restore herbaceous species, care should be taken in species selection and preference should be given to native grass species when possible.

Semidesert (Sagebrush)

These lower elevation semidesert sagebrush communities are considered to be in fair to good condition for deer winter range on the North Book Cliffs unit. These communities support sagebrush populations that provide valuable browse in mild to moderate winters. Annual grasses, primarily cheatgrass, can invade some study sites, increasing fuel loads and increasing the risk of wildfire. If wildfire occurs within these communities, they lose much of their value as deer winter range and valuable browse species are typically slow to reestablish.

Although some of these sites have pinyon and juniper populations that are small, it is recommended that work to prevent and/or reduce encroachment should begin. Treatments to reduce annual grass may also be necessary on some sites.

4. WILDLIFE MANAGEMENT UNIT 10B – SOUTH BOOK CLIFFS



WILDLIFE MANAGEMENT UNIT 10B – SOUTH BOOK CLIFFS

Boundary Description

Grand County - Boundary begins at the Utah-Colorado state line and the summit and drainage divide of the Book Cliffs; west along this summit and drainage divide to Diamond Ridge; southwest along Diamond Ridge and the Book Cliffs summit (north-south drainage divide) to the Uintah and Ouray Indian Reservation boundary (Hells Hole/head of Sego Canyon); west along this boundary to the Green River; south along the Green River to Swasey boat ramp and Hastings Road; south along Hastings Road to SR-19; south and east along SR-19 to exit 164 of I-70; east along I-70 to the Utah Colorado state line; north along this state line to the summit and drainage divide of the Book Cliffs.

Management Unit Description

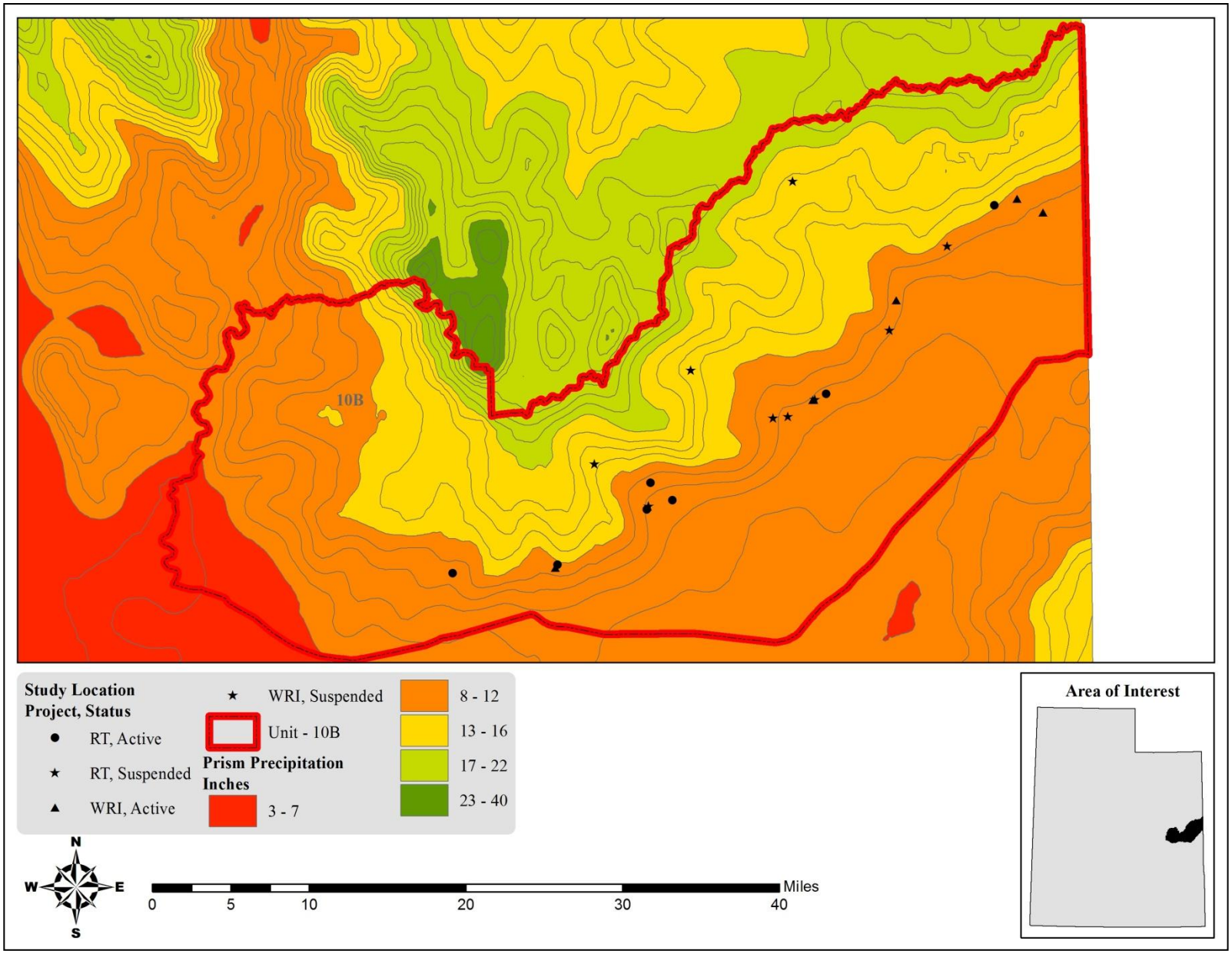
Geography

The maximum elevation in the South Book Cliffs unit is just over 9,000 feet. Terrain in higher elevations is typically steep and rough. Desolation and Gray Canyons fall partially within the westernmost portions of unit 10B, and numerous other canyons are located throughout. Parts of the city of Green River and the small town of Thompson Springs are within the boundaries of this unit. Pictographs and petroglyphs can also be found in this management unit.

Climate Data

The 30-year (1981-2010) annual precipitation PRISM model shows precipitation ranges from 6 inches in the most western portion of the unit to 22 inches along the unit 10AC-10B boundary line near Hill Creek and Roan Peaks. All of the Range Trend and WRI monitoring studies on the unit occur within the 10-15 inch precipitation zone (Map 4.1) (PRISM Climate Group, Oregon State University).

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 displayed years of moderate to extreme drought from 1989-1990, 2002-2003, 2009, and 2012. The mean annual PDSI displayed moderately to extremely wet years from 1983-1985 and 2005 (Figure 4.1a). The mean spring (March-May) PDSI displayed moderate to extreme drought in 1989-1991, 1996, 2002-2004, and 2012-2013; moderately to extremely wet years were displayed in 1983-1985, 1993, and 2005. The mean fall (Sept.-Nov.) PDSI displayed years of moderate to extreme drought in 1989-1990, 2002-2003, 2009, and 2012; moderately to extremely wet years were displayed in 1983-1985, 1997, and 2013 (Figure 4.1b) (Time Series Data, 2016).



Map 4.1: The 1981-2010 PRISM Precipitation Model for WMU 10B, South Book Cliffs (PRISM Climate Group, Oregon State University, 2016).

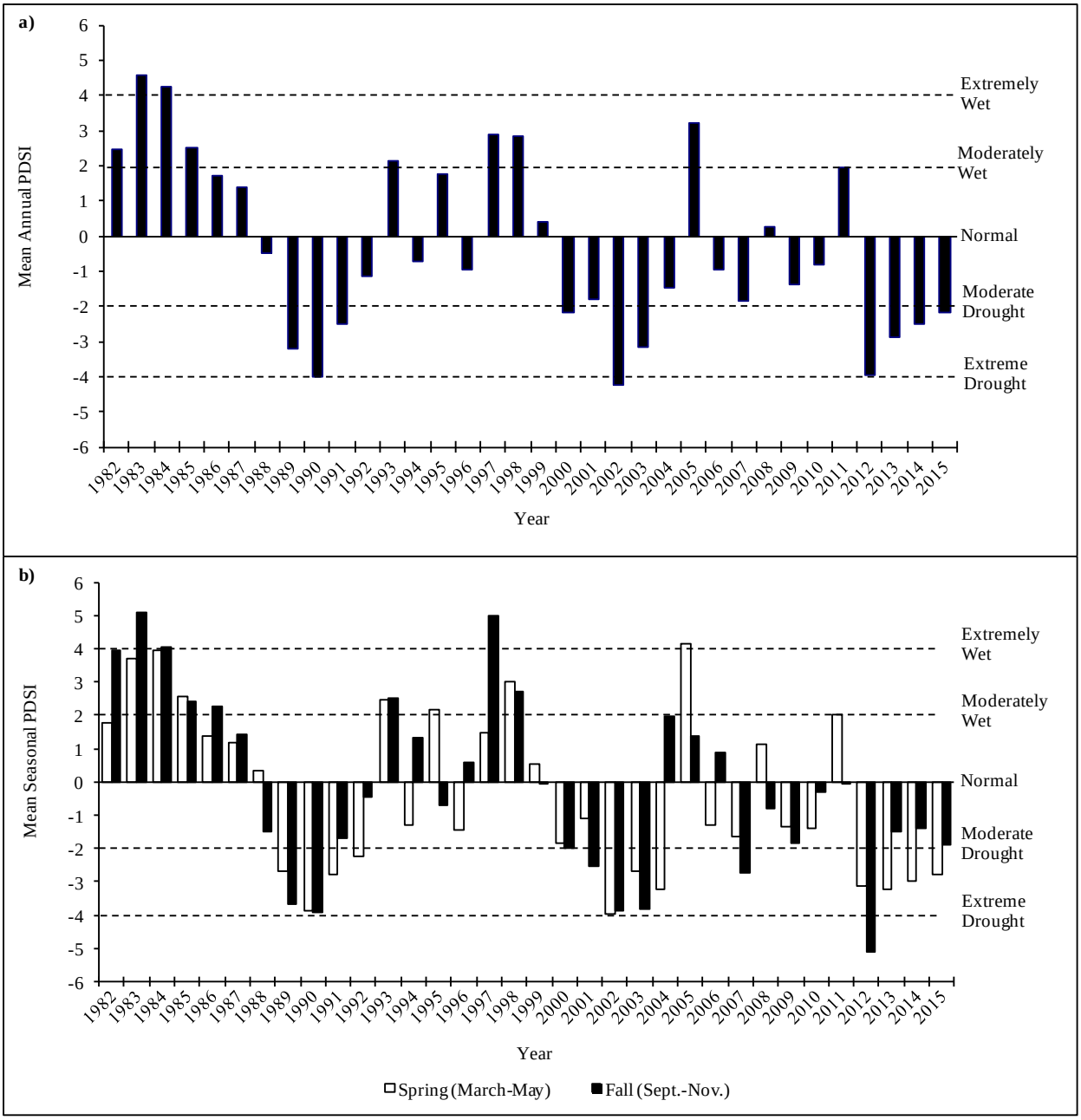


Figure 4.1: The 1982-2015 Palmer Drought Severity Index (PDSI) for the Southeast division (Division 7). The PDSI is based on climate data gathered from 1895 to 2014. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet and negative deviations indicate drought. Classification of the scale is ≥4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to2.9 = 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 -.9 = Incipient Dry Spell, -1.0 to -1.9 = Mild Drought, -2.0 to -2.9 = Moderate Drought, -3.0 to -3.9 = Severe Drought and ≤-4.0 = Extreme Drought (Time Series Data 2014). a) Mean annual PDSI. b) Mean spring (March-May) and fall (Sept.-Nov.) (Time Series Data, 2016).

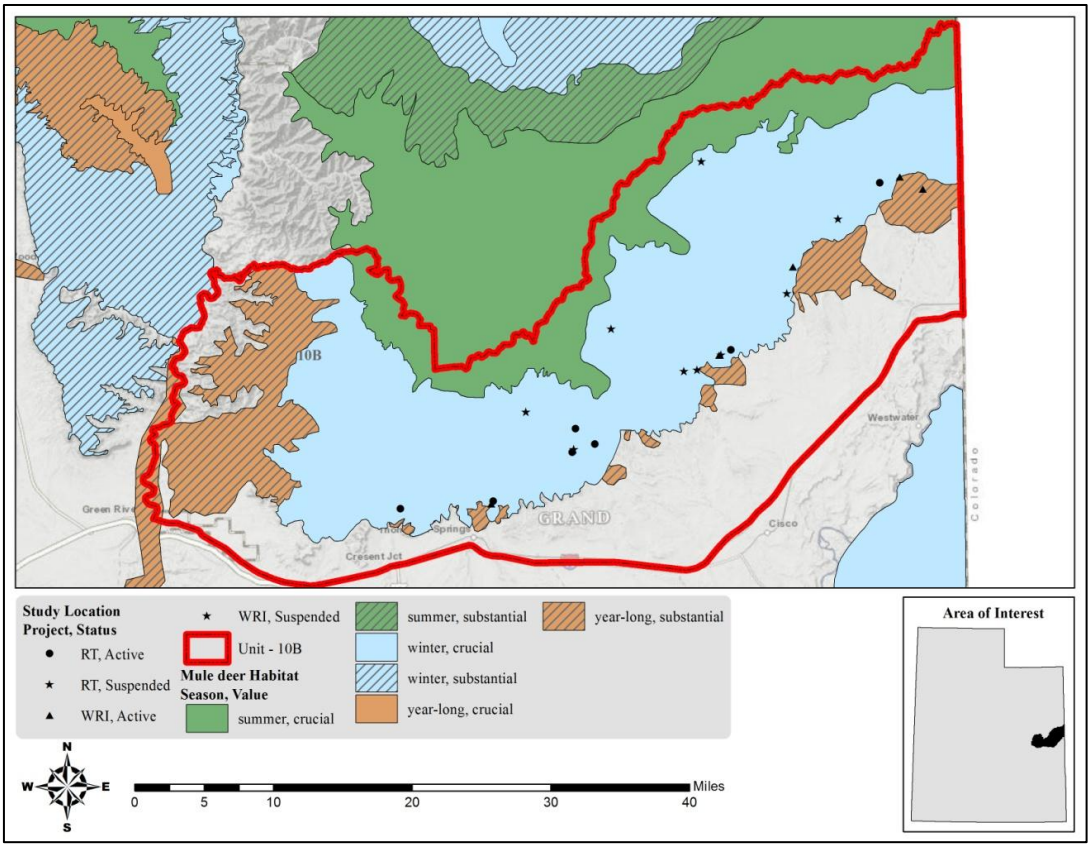
Big Game Habitat

In total, mule deer range in the South Book Cliffs management unit is estimated at nearly 574,000 acres with 105,436 acres classified as year-long range, 364,508 acres of this classified as winter range, and 103,933 acres classified as summer range (Table 4.1). A majority (75%) of year-long mule deer range is managed by the Bureau of Land Management (BLM). 13% is privately owned, 11% is administrated by the Utah School and

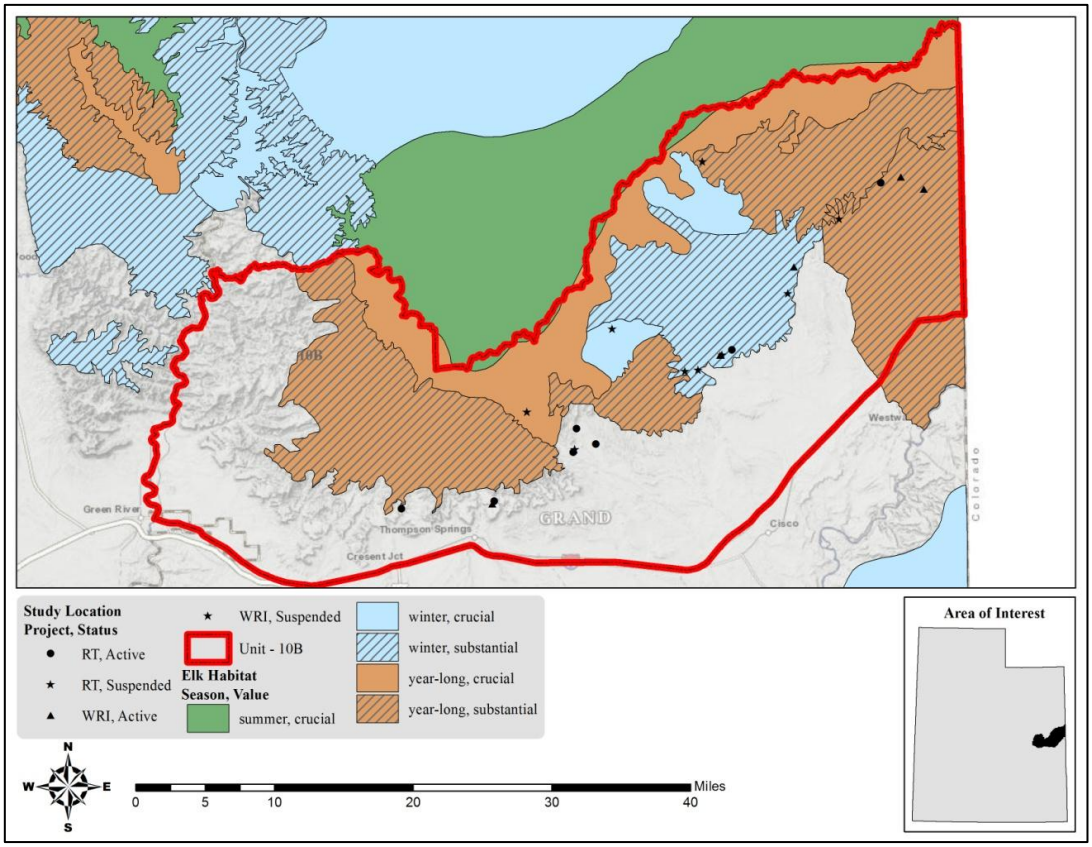
Institutional Trust Lands Administration (SITLA), and the remainder (1%) is managed by Fire and State Lands (SL&F). The BLM also owns a majority (82%) of the summer range, 16% is managed by SITLA, 1% belongs to private landowners, and the remainder is tribal or Utah Division of Wildlife Resources (UDWR)-managed land. Finally, the BLM also manages 86% of the winter range, SITLA owns 11%, 3% is privately owned, and less than 1% is managed by the UDWR (Map 4.2, Map 4.7, Table 4.2).

With a maximum elevation of just over 9,000 feet, the unit contains only small amounts of fawning areas and summer range, with few deer residing in the unit year-round. However, many deer that spend the summer on higher ranges in the northern portion (Unit 10AC) migrate annually to winter ranges in the southern portion (Unit 10B) of the unit. Terrain between the higher summer ranges and lower winter ranges in the south is steep and rugged, and is used primarily as a travel corridor with limited migration occurring over a short period of time.

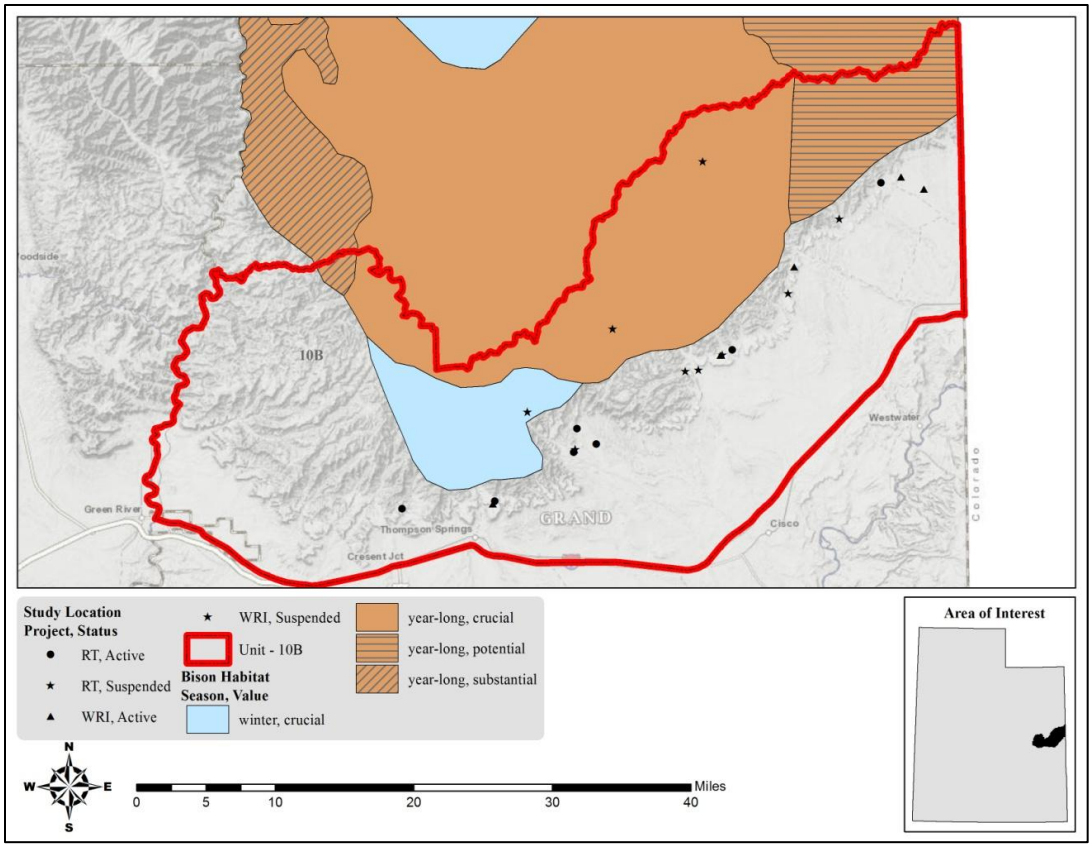
The upper limits of the normal winter range are found normally between 8,000 and 8,500 feet, depending on the slope and exposure. During severe winters the upper limits are usually lowered to about 7,000 feet. The lower limits of the winter range are bordered by the salt desert type at approximately 5,000 feet. There are concentrations of wintering deer at Horse Pasture, Nash Wash, Cottonwood Ranch, and the Pear Park area.



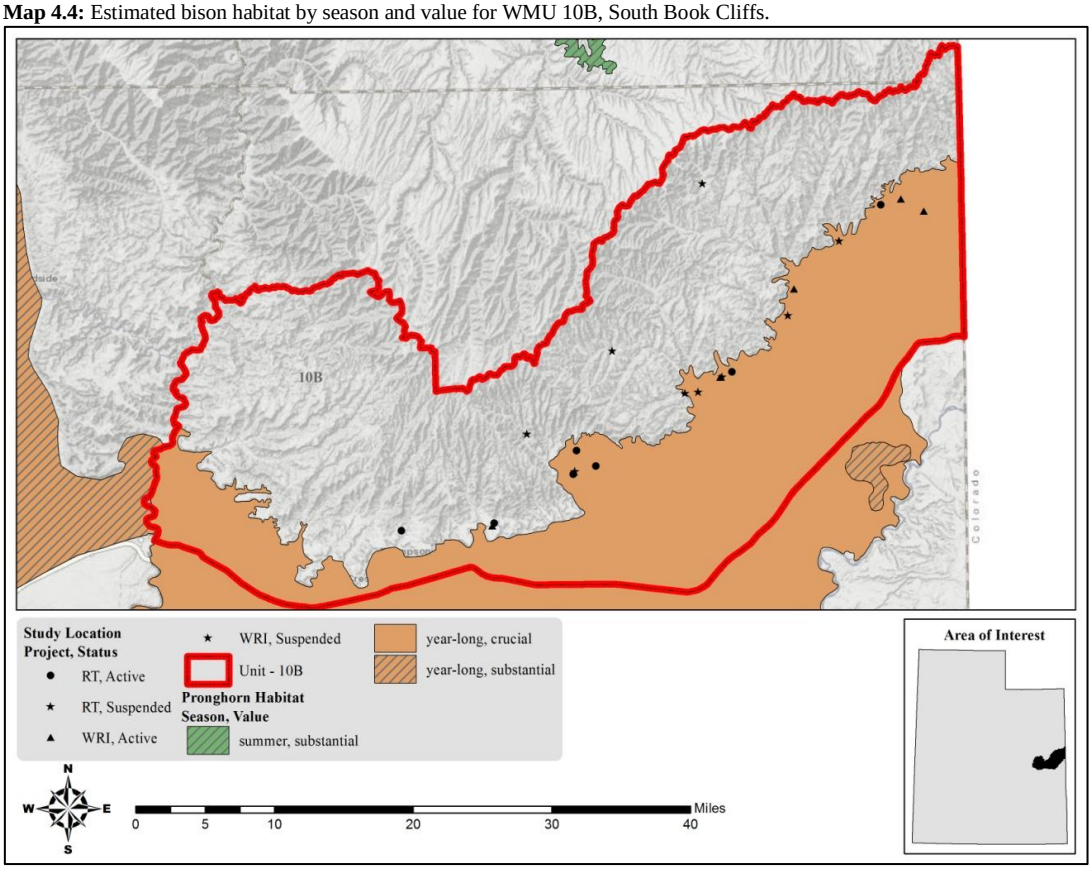
Map 4.2: Estimated mule deer habitat by season and value for WMU 10B, South Book Cliffs.



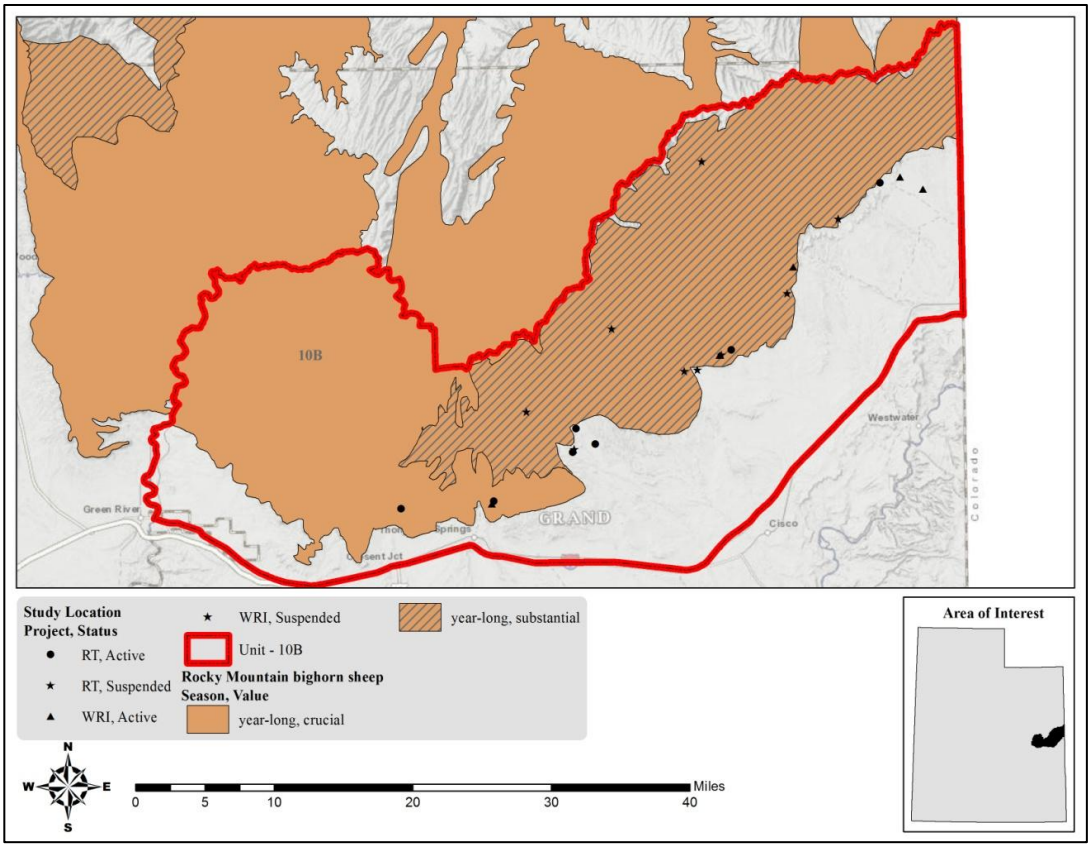
Map 4.3: Estimated elk habitat by season and value for WMU 10B, South Book Cliffs



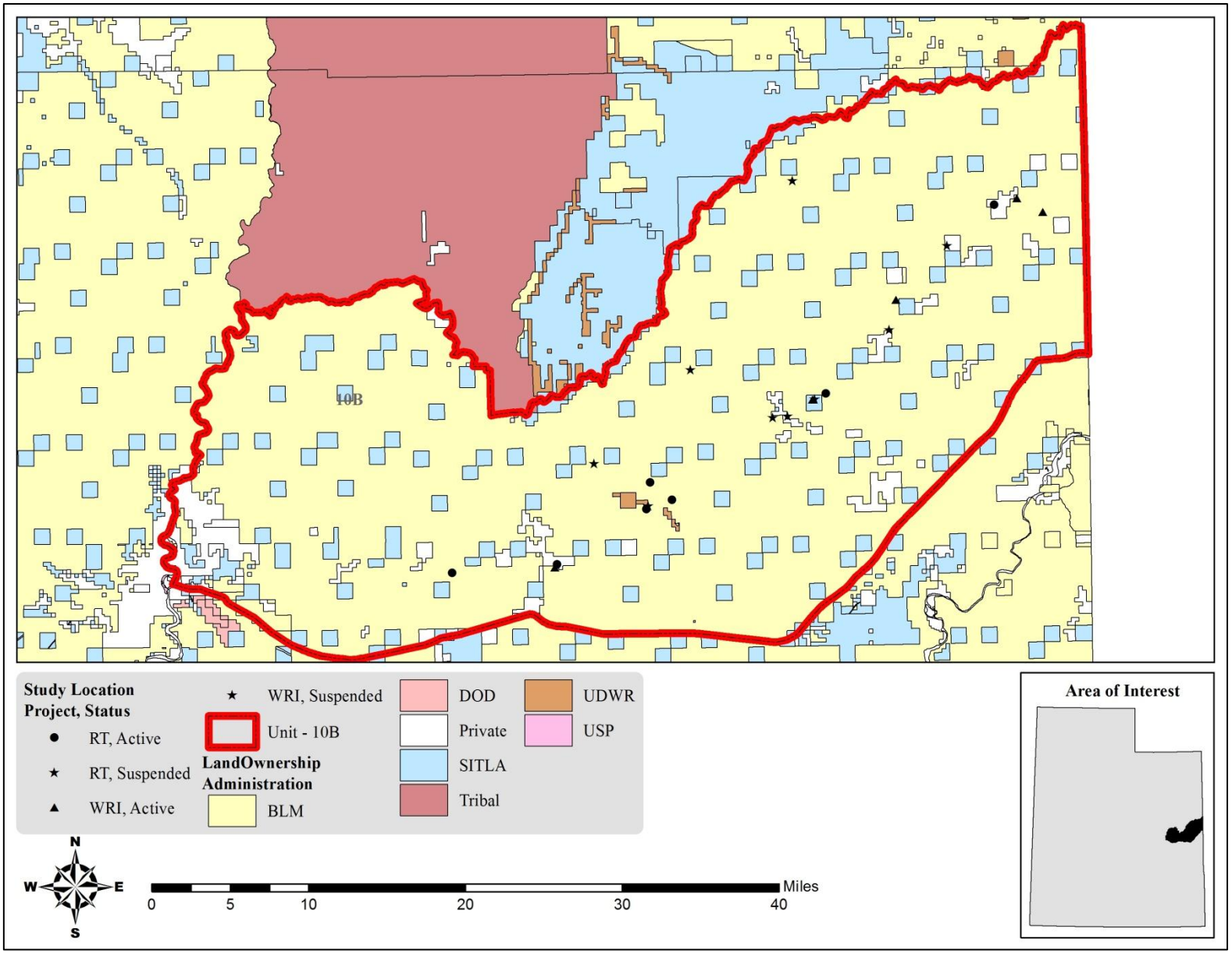
Map 4.4: Estimated bison habitat by season and value for WMU 10B, South Book Cliffs.



Map 4.5: Estimated pronghorn habitat by season and value for WMU 10B, South Book Cliffs.



Map 4.6: Estimated Rocky Mountain bighorn sheep habitat by season and value for WMU 10B, South Book Cliffs.



Map 4.7: Land ownership for WMU 10B, South Book Cliffs.

	Year Long Range		Summer Range		Winter Range	
	Area (acres)	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
Mule Deer	105,436	18%	103,933	18%	364,508	64%
Elk	373,757	78%	7,572	2%	98,579	20%
Pronghorn	319,409	100%	0	0%	0	0%
Bison	54,046	19%	0	0%	234,854	81%
RMBS	852,649	100%	0	0%	0	0%

Table 4.1: Estimated mule deer, elk, pronghorn, bison, and Rocky Mountain bighorn sheep habitat acreage by season for WMU 10B, South Book Cliffs.

	Year Long Range		Summer Range		Winter Range	
Ownership	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
BLM	79,100	75%	85,270	82%	313,469	86%
Private	14,199	13%	1,246	1%	11,769	3%
SITLA	11,241	11%	16,996	16%	38,093	11%
Tribal	0	0%	280	0%	0	0%
UDWR	0	0%	140	0%	1,176	<1%
SL&F	897	1%	0	0%	0	0%
Total	105,436	**100%**	103,933	**100%**	364,508	**100%**

Table 4.2: Estimated mule deer habitat acreage by season and ownership for WMU 10B, South Book Cliffs.

	Year Long Range		Summer Range		Winter Range	
Ownership	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
BLM	323,315	87%	2,224	29%	84,651	86%
Private	8,792	2%	25	<1%	2,992	3%
SITLA	41,112	11%	4,964	66%	10,936	11%
Tribal	61	<1%	219	3%	1	<1%
UDWR	360	<1%	139	2%	0	0%
UDOT	118	<1%	0	<1%	0	0%
Total	373,757	**100%**	7,572	**100%**	98579	**100%**

Table 4.3: Estimated elk habitat acreage by season and ownership for WMU 10B, South Book Cliffs.

	Year Long Range	
Ownership	*Area (acres)*	*%*
BLM	255,665	80%
Private	28,010	9%
SITLA	34,183	11%
SL&F	350	<1%
UDWR	989	<1%
UDOT	211	<1%
Total	319,409	**100%**

Table 4.4: Estimated pronghorn habitat acreage by season and ownership for WMU 10B, South Book Cliffs.

	Year Long Range		Winter Range	
Ownership	*Area (acres)*	*%*	*Area (acres)*	*%*
BLM	202,312	86%	46,936	87%
Private	1,251	1%	1,580	3%
SITLA	30,871	13%	5,531	10%
Tribal	280	<1%	0	0%
UDWR	140	<1%	0	0%
Total	234,854	**100%**	54,046	**100%**

Table 4.5: Estimated bison habitat acreage by season and ownership for WMU 10B, South Book Cliffs.

	Year Long Range	
Ownership	*Area (acres)*	*%*
BLM	450,286	87%
Private	10,594	2%
SITLA	58,487	11%
Tribal	283	<1%
UDWR	725	<1%
SL&F	87	<1%
Total	520,463	**100%**

Table 4.6: Estimated Rocky Mountain bighorn sheep habitat acreage by season and ownership for WMU 10B, South Book Cliffs.

Group	Existing Vegetation Type	Acres	% of Total	Group % of Total
Conifer	Colorado Plateau Pinyon-Juniper Woodland	238,252	28.90%	
	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	10,765	1.31%	
	Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland	2,371	0.29%	
	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	1,291	0.16%	
	Southern Rocky Mountain Ponderosa Pine Woodland	1,231	0.15%	
	Conifer-Hardwood	1,106	0.13%	
	Other Conifer	96	0.01%	30.94%
Exotic Herbaceous	Introduced Upland Vegetation-Annual Grassland	67,308	8.16%	8.16%
Exotic Tree-Shrub	Introduced Riparian Shrubland	2,907	0.35%	
	Introduced Riparian Forest and Woodland	7	0.00%	0.35%
Grassland	Inter-Mountain Basins Semi-Desert Grassland	24,568	2.98%	
	Southern Rocky Mountain Montane-Subalpine Grassland	2,998	0.36%	
	Rocky Mountain Subalpine-Montane Mesic Meadow	49	0.01%	3.35%
Shrubland	Inter-Mountain Basins Mat Saltbush Shrubland	126,438	15.34%	
	Inter-Mountain Basins Big Sagebrush Shrubland	104,504	12.67%	
	Inter-Mountain Basins Mixed Salt Desert Scrub	68,075	8.26%	
	Coleogyne ramosissima Shrubland Alliance	41,286	5.01%	
	Inter-Mountain Basins Greasewood Flat	13,289	1.61%	
	Quercus gambelii Shrubland Alliance	10,540	1.28%	
	Inter-Mountain Basins Semi-Desert Shrub-Steppe	4,192	0.51%	
	Great Basin Semi-Desert Chaparral	2,562	0.31%	
	Colorado Plateau Mixed Low Sagebrush Shrubland	1,763	0.21%	
	Other Shrubland	2,342	0.28%	45.48%
Other	Sparsely Vegetated	52,476	6.36%	
	Barren	25,467	3.09%	
	Riparian	10,414	1.26%	
	Developed	3,757	0.46%	
	Agricultural	2,320	0.28%	
	Open Water	1,359	0.16%	
	Hardwood	754	0.09%	11.71%
Total		824,489	100.00%	

Table 4.7: Landfire existing vegetation coverage (LANDFIRE: LANDFIRE 1.3.0, 2014) for WMU 10B, South Book Cliffs.

Limiting Factors to Big Game Habitat

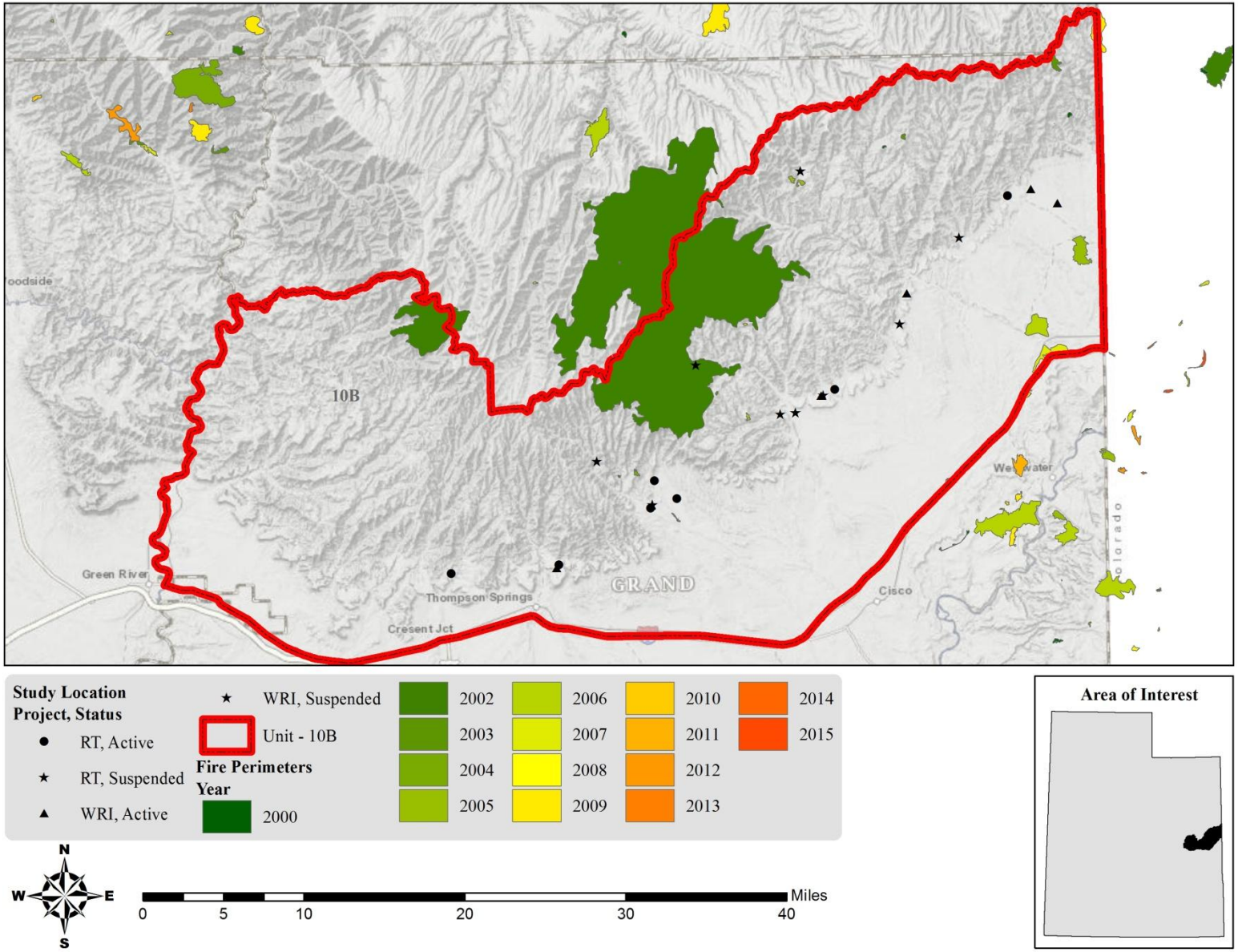
Due to the steep, rough terrain at the upper elevations of the winter range, lower areas have been historically overused by livestock and game for a long period of time. Pictographs and petroglyphs found in the unit indicate the historical presence of bighorn sheep, deer, bison, and elk in the area before settlement by Europeans. Large herds of cattle and sheep were brought into the area around Moab in the mid-1870s and the 1890s. During this time, livestock use on the South Book Cliffs was limited to the stock of local settlers. This changed in the 1920s when Colorado sheepmen began wintering large herds on the South Book Cliffs. During this period, as many as 200,000 sheep were using the range each winter (Carter 1983). Feral horses are also found in the Winter Ridge and Hill Creek areas. In cooperation with local ranchers, the BLM was working on fences, water developments, and other improvements to encourage more uniform use of the range by livestock (Carter 1983).

The quantity and quality of the summer range are also major limiting factors on this unit. Cooperation between federal, state, local, and tribal governments and private landowners could help maintain and protect ranges from further loss and degradation through agreements with land management agencies, the use of conservation easements and the like on private lands, planning and evaluating resource use and developments that might affect habitat quality, and developing specific vegetation objectives to maintain the quality of important deer use areas. In addition, forage production could be maintained or improved through direct range improvements such as reseedings, controlled burns, water developments, tree removal, etc.

According to the current Landfire, Existing Vegetation Coverage Models, 29% of this unit is comprised of pinyon-juniper woodlands. Encroachment of these woodlands into sagebrush communities has been shown to decrease browse and herbaceous cover, decreasing available forage for wildlife (Miller, Svejcar, & Rose, 2000). Furthermore, 8% of the unit is comprised of annual grasslands (Table 4.7). The invasive annual grass

species cheatgrass (*Bromus tectorum*) is present on many sites in this unit and has the potential to increase fuel loads and the risk of catastrophic fire (Balch, J. K., D'Antonio, B. A., & Gómez-Dans, C. M., 2013)

Other management concerns on Unit 10B include drought impacts on winter range browse species and the increasing demands for oil and gas development with its associated habitat fragmentation. There is also the possibility that at some later date oil shale and tar sands will be developed. In addition, deer fences and crossings limiting range are always a concern. However, cooperation with the Utah Department of Transportation in construction of highway fences, passage structures, warning signs, etc. will continue in order to ensure proper access to habitat as well as deer and human safety.



Map 4.8: Land coverage of fires by year from 2000-2015 for WMU 10B, South Book Cliffs.

Treatments/Restoration Work

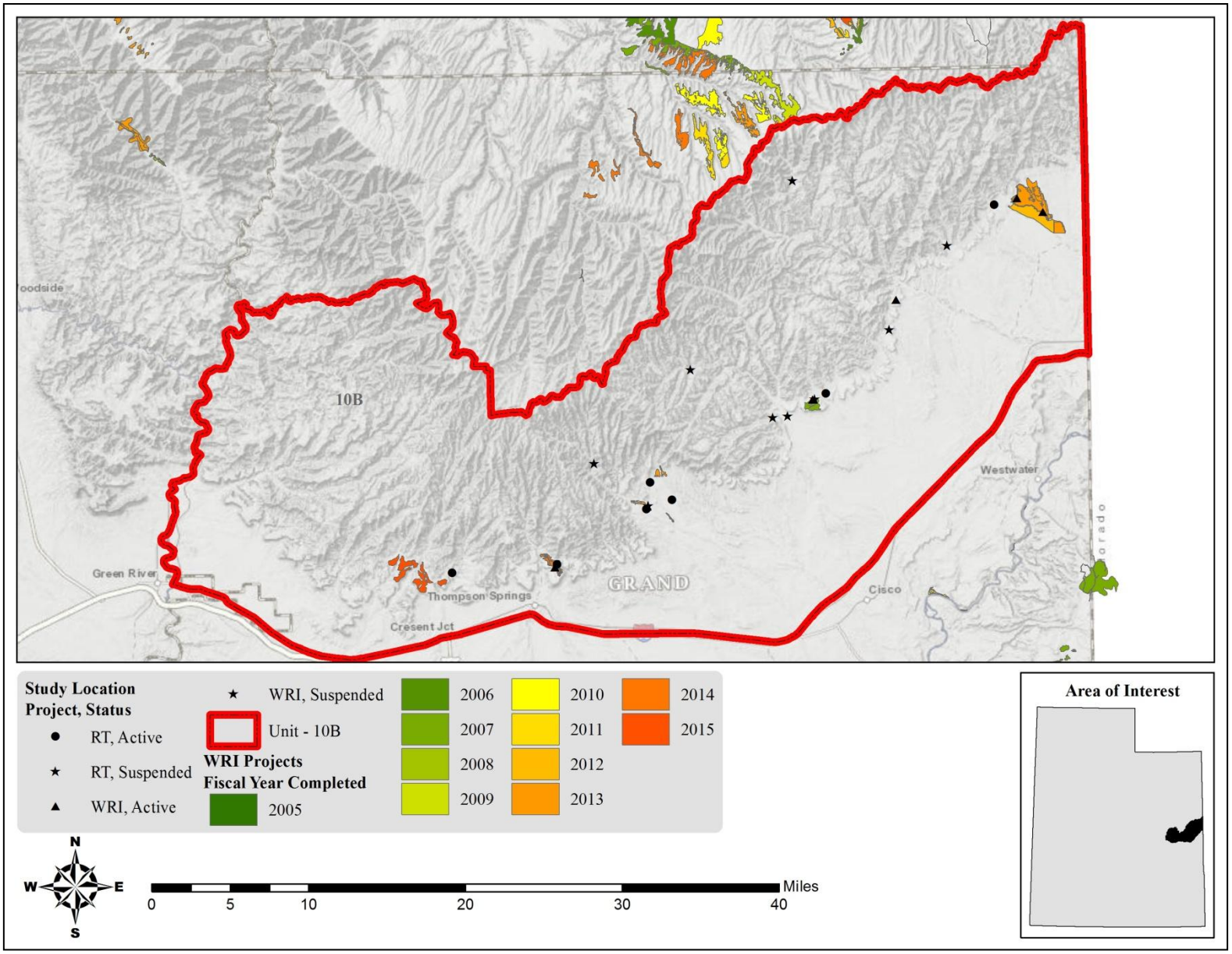
There has been an active effort to address many of the limitations on this unit through the Watershed Restoration Initiative (WRI). A total of 5,524 acres of land have been treated within the South Book Cliffs unit since the WRI was implemented in 2004 (Map 4.9). Treatments frequently overlap one another bringing the total treatment acres to 5,706 acres for this unit (Table 4.8). Other treatments have occurred outside of the WRI through independent agencies and landowners, but the WRI comprises the majority of work done on deer winter ranges throughout the state of Utah.

Seeding to supplement the herbaceous understory is the most common management practice. Vegetation removal via hand crew and herbicide application to control weeds is also common. Other management practices include seeding to amplify the shrub understory, prescribed fires, and bullhog use to remove pinyon and Utah juniper (Table 4.8).

Treatment Action	**Acres**
Seeding (Primary)	3,862
Vegetation Removal/Hand Crew	769
Herbicide Application	694
Seeding (Secondary/Shrub)	335
Forestry Practices	26
Prescribed Fire	12
Bullhog	8
***Total Land Area Treated**	5,524
Total Treatment Acres	5,706

Table 4.8: WRI treatment action size (acres) for WMU 10B, South Book Cliffs.

*Does not include overlapping treatments.



Map 4.9: WRI treatments by fiscal year completed for WMU 10B, South Book Cliffs.

Range Trend Studies

Range Trend studies have been sampled within WMU 10B on a regular basis since 1986, with studies being added or suspended as was deemed necessary (Table 4.9). Due to changes in sampling methodologies, only data sampled 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 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 4.10).

Range Trend studies are summarized in this report by ecological site. Range Trend and WRI studies that have had a disturbance or treatment during the reported sample period are summarized in this report by the disturbance or treatment type and are summarized by region.

Study #	Study Name	Project	Status	Year(s) Sampled	Ecological Site Description
10-14	East Floy Bench	RT	Active	‘86, ‘95, ‘00, ‘05, ‘10, ‘15	Semidesert Loam (Wyoming Big Sagebrush)
10-15	East Thompson Bench	RT	Active	‘86, ‘95, ‘00, ‘05, ‘10, ‘15	Semidesert Loam (Wyoming Big Sagebrush)
10-16	West Horse Pasture	RT	Active	‘86, ‘95, ‘00, ‘05, ‘10, ‘15	Semidesert Loam (Wyoming Big Sagebrush)
10-17	East Calf Canyon	RT	Active	‘86, ‘95, ‘00, ‘05, ‘10, ‘15	Semidesert Loam (Wyoming Big Sagebrush)
10-18	East Horse Pasture	RT	Active	‘86, ‘95, ‘00, ‘05, ‘10, ‘15	Semidesert Loam (Wyoming Big Sagebrush)
10-19	Lower Cottonwood	RT	Suspended	‘86, ‘95	Not Verified
10-20	Upper Cottonwood	RT	Suspended	‘86, ‘95, ‘00	Not Verified
10-21	East Sulfur Bench	RT	Suspended	‘86, ‘95	Not Verified
10-22	Bryson Draw	RT	Suspended	‘86, ‘95	Not Verified
10-26	Bitter Creek	RT	Active	‘00, ‘05, ‘10, ‘15	Semidesert Loam (Wyoming Big Sagebrush)
10-27	Long Canyon	RT	Active	‘05, ‘10, ‘15	Semidesert Loam (Wyoming Big Sagebrush)
10R-25	Nash Wash #1	RT	Suspended	‘98	Not Verified
10R-26	Nash Wash #2	RT	Active	‘98, ‘15	Semidesert Sandy loam (Four-Wing Saltbush)
10R-27	Nash Wash Burn	RT	Suspended	‘99	Not Verified
10R-31	Hay Canyon Burn	RT	Suspended	‘99, ‘01	Not Verified
10R-38	Long Canyon Chaining (Reference)	WRI	Suspended	‘06	Not Verified
10R-49	Long Canyon Bench Chaining	WRI	Active	‘10, ‘13	Semidesert Loam (Wyoming Big Sagebrush)
10R-50	Bitter Creek	WRI	Active	‘11, ‘15	Semidesert Loam (Wyoming Big Sagebrush)
10R-54	Bitter Creek Herbicide	WRI	Active	‘12, ‘15	Semidesert Shallow Loam (Wyoming Big Sagebrush)
10R-55	South Book Cliffs	WRI	Active	‘13	Semidesert Loam (Wyoming Big Sagebrush)
10R-58	Dry Canyon	WRI	Active	‘15	Semidesert Shallow Loam (Wyoming Big Sagebrush)

Table 4.9: Range trend and WRI project studies monitoring history and ecological site potential for WMU 10B, South Book Cliffs.

Study #	Study Name	Type	Disturbance Name (if available)	Date	Size (acres)	WRI Project #
10-15	East Thompson Bench	Aerial Before	South Book Cliffs Vegetation Improvement Phase 1	October 2013		2593
		Bullhog	South Book Cliffs Vegetation Improvement Phase 1	December 2013		2593
10-16	West Horse Pasture	Wildfire		2005-2009		
		Herbicide-Plateau	Nash Wash WMA Wildfire Rehab	November 2012	115	2480
		Rangeland Drill	Nash Wash WMA Wildfire Rehab	November 2012	81	2480
10R-50	Bitter Creek	Herbicide-Plateau	Bitter Creek Restoration Phase 2	September 2012	2,250	2161
		Rangeland Drill	Bitter Creek Restoration Phase 2	October 2012	1,580	2161
10R-54	Bitter Creek Herbicide	Herbicide-Plateau	Bitter Creek Restoration Phase 2	September 2012	2,250	2161
		Rangeland Drill	Bitter Creek Restoration Phase 2	October 2012	1,580	2161
10R-55	South Book Cliffs	Herbicide-Plateau	South Book Cliffs Vegetation Phase 1	Fall 2013	512	2593
		Aerial Before	South Book Cliffs Vegetation Phase 1	Fall 2013	512	2593
		Bullhog	South Book Cliffs Vegetation Phase 1	Fall 2013	512	2593

Table 4.10: Range trend and WRI studies known disturbance history for WMU 10B, South Book Cliffs.

Study Trend Summary (Range Trend)

Semidesert (Sagebrush)

There are seven study sites [East Thompson Bench (10-15), West Horse Pasture (10-16), East Calf Canyon (10-17), East Horse Pasture (10-18), Bitter Creek (10-26), and Long Canyon (10-27)] classified as Semidesert (Sagebrush) ecological sites. 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. Bitter Creek is found at the base of the Book Cliffs just north of the Stateline Gas Field. Finally, Long Canyon is situated at the base of the Book Cliffs, just east of Long Canyon.

Shrubs/Trees: The most dominant browse within these communities is Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*); additional browse species are rare, but can be found on some sites. Average sagebrush cover is generally good, but the East Thompson Bench and West Horse Pasture studies had much less cover than other studies in 2015 (Figure 4.2). Average sagebrush demographics indicate that mature plants have comprised a majority of the population in all sample years except 2005, when decadent plants were the majority. Recruitment of young plants has varied slightly from year to year, but there has been a general increase overall (Figure 4.5).

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 which could be attributed to pinyon and juniper reduction projects that have taken place on select sites (Figure 4.3, Figure 4.4). It is important to note, however, that the average tree cover and density for the 2015 sample year may be slightly higher than depicted: the site report states that the East Horse Pasture study was being encroached by juniper, but no trees were sampled in 2015:

Herbaceous Understory: The amount of overall herbaceous cover has varied from year to year on these sites. The composition has remained consistent with annual grasses, cheatgrass (*Bromus tectorum*), contributing a majority of the herbaceous cover; cheatgrass increases the risk of fire and threatens the resiliency of these sites. Native perennial grass species have been present in lesser amounts over the years, except in 2000 when they were the dominant herbaceous component. Although low, perennial grass cover has exhibited an overall increasing trend over time. Perennial forbs remain rare on these sites, and cover of annual forbs has fluctuated over the sample years (Figure 4.6)

Occupancy: Pellet group transect data indicates that animal occupancy fluctuates from year to year on these studies and that deer have primarily used these sites. Deer pellet groups have had a mean abundance ranging from 30 days use/acre in 2000 to 52 days use/acre in 2010. Elk use has fluctuated over time and has been as low as 3 days use/acre in 2015 and as high as 16 days use/acre in 2000. Finally, mean abundance of cattle pellet groups has ranged from 5 days use/acre in 2000 to 15 days use/acre in 2010 (Figure 4.7).

Semidesert (Fourwing Saltbush)

One site [Nash Wash #2 (10R-26)] has been classified as a Semidesert (Fourwing Saltbush) ecological site. Nash Wash #2 is located just west of Cunningham Ranch and north of the West Horse Pasture study.

Shrubs/Trees: The primary browse species on this site is fourwing saltbush (*Atriplex canescens*) which provides good cover, although other preferred browse species are present in low amounts (Figure 4.2). No sagebrush or trees are found on this site and demographics and encroachment are therefore not discussed in this section.

Herbaceous: This site has remained dominated by annual grass, primarily cheatgrass (*Bromus tectorum*), although the introduced species annual wheatgrass (*Eremopyrum triticeum*) does contribute notable cover. Perennial grasses are extremely limited on this site, with only foxtail barley (*Hordeum jubatum*) being sampled in 2015. Perennial forbs are not present on this site. Annual forb cover has fluctuated with a high of 10% in 1998 and a low of 1% in 2015 (Figure 4.6).

Occupancy: Pellet transect data indicates that this site is mainly utilized by deer and that use has decreased over time. Deer pellet groups had a mean abundance of 36 days use/acre in 2015 and 55 days use/acre in 1998. The mean abundance of elk pellet groups was 0 days use/acre in 1998 and 4 days use/acre in 2015, and the mean abundance of cattle/bison pellet groups was 0 days use/acre in 1998 and 4.4 days use/acre in 2015 (Figure 4.7).

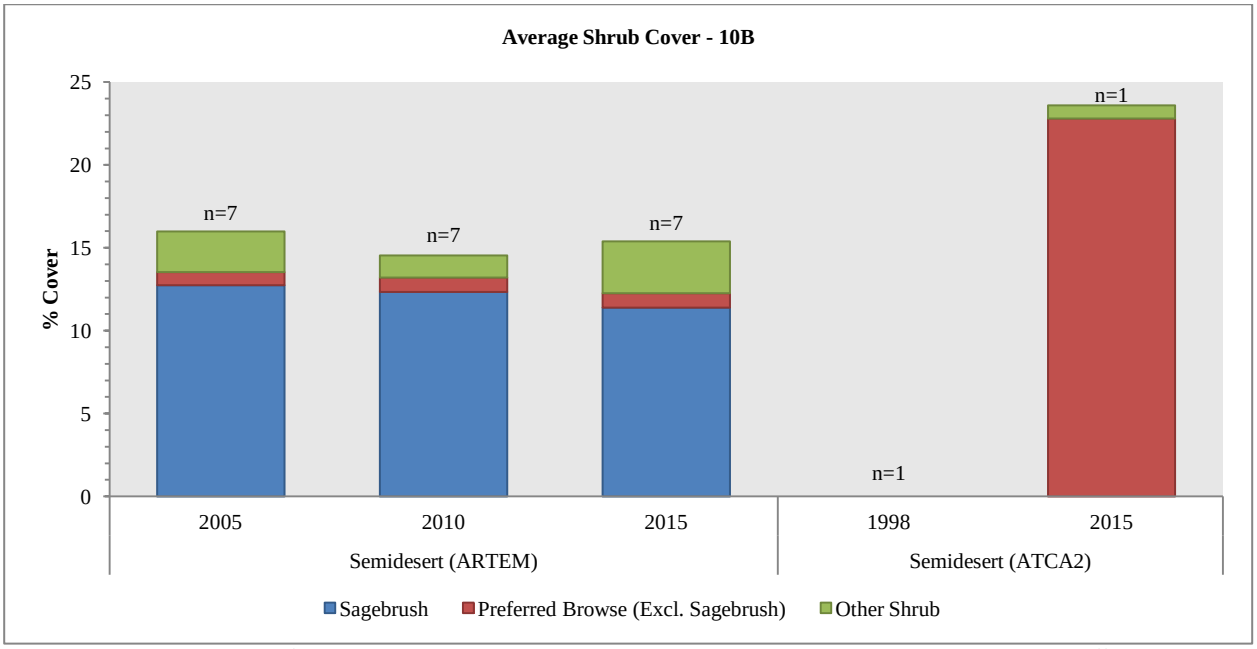


Figure 4.2: Average shrub cover for Semidesert (ARTEM) and Semidesert (ATCA2) study sites in WMU 10B, South Book Cliffs.

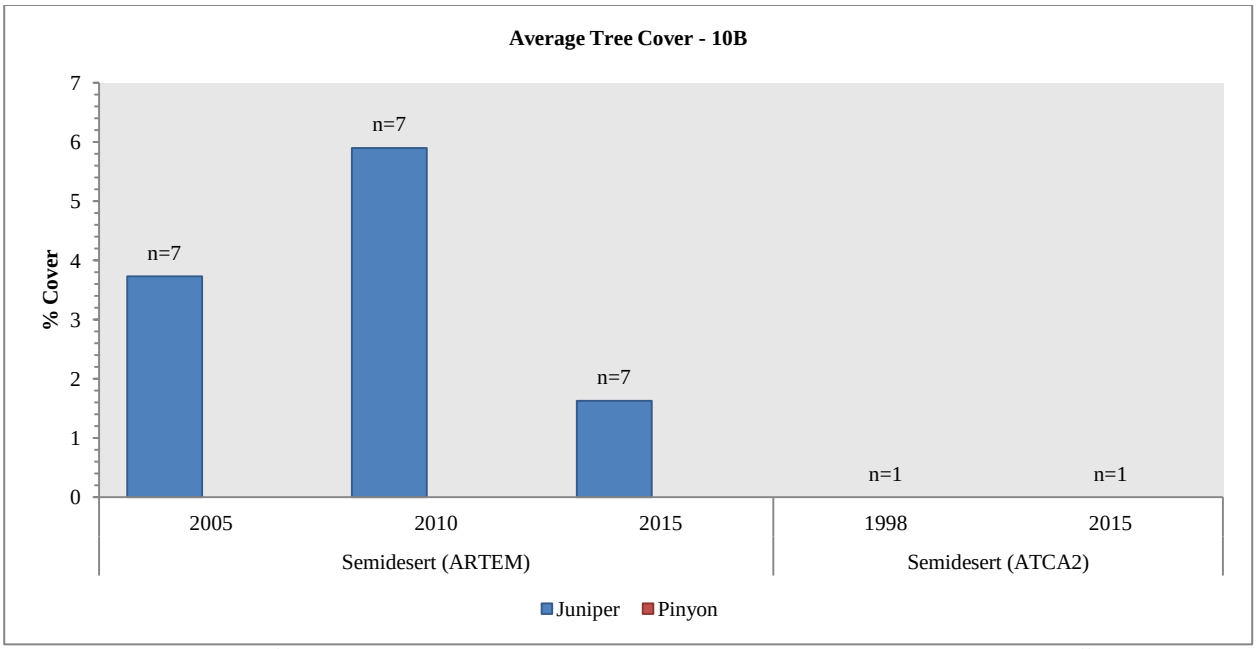


Figure 4.3: Average tree cover for Semidesert (ARTEM) and Semidesert (ATCA2) study sites in WMU 10B, South Book Cliffs.

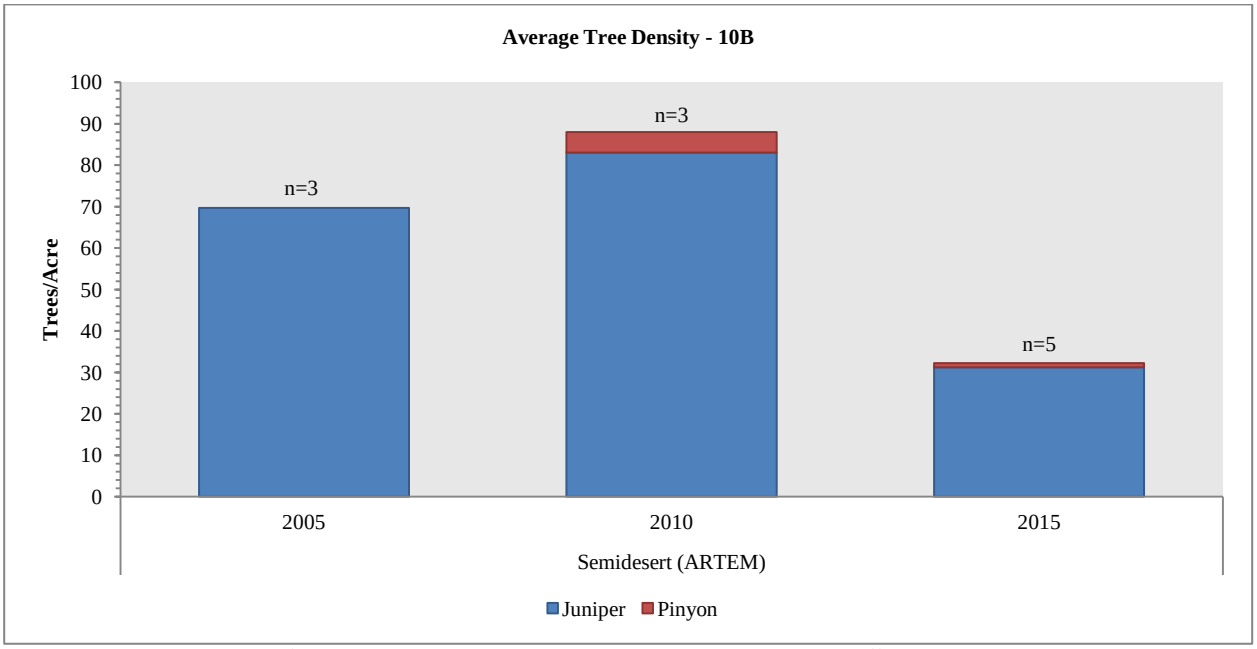


Figure 4.4: Average tree density for Semidesert (ARTEM) study sites in WMU 10B, South Book Cliffs.

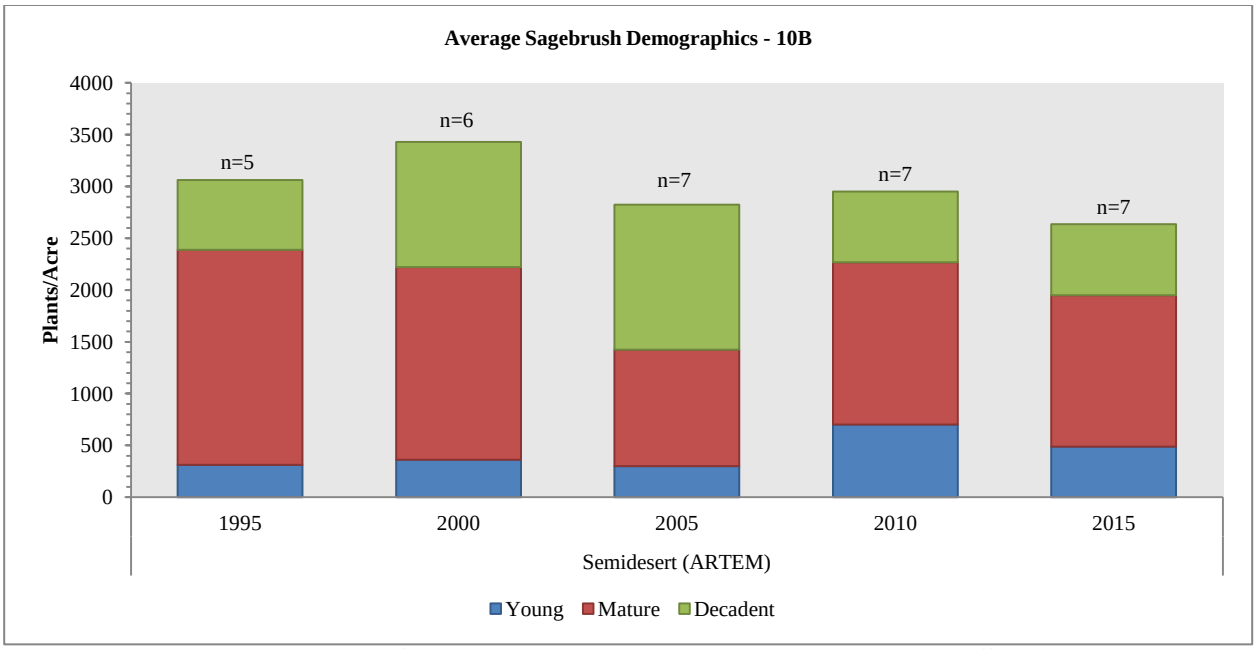


Figure 4.5: Average sagebrush demographics for Semidesert (ARTEM) study sites in WMU 10B, South Book Cliffs.

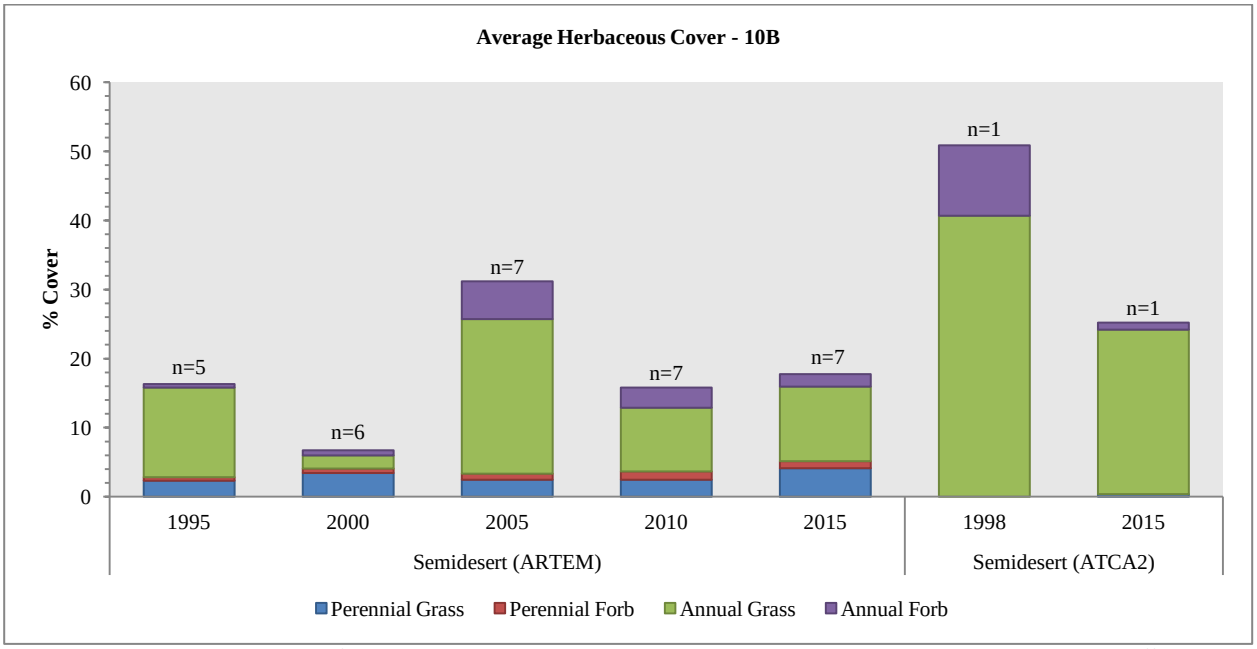


Figure 4.6: Average herbaceous cover for Semidesert (ARTEM) and Semidesert (ATCA2) study sites in WMU 10B, South Book Cliffs.

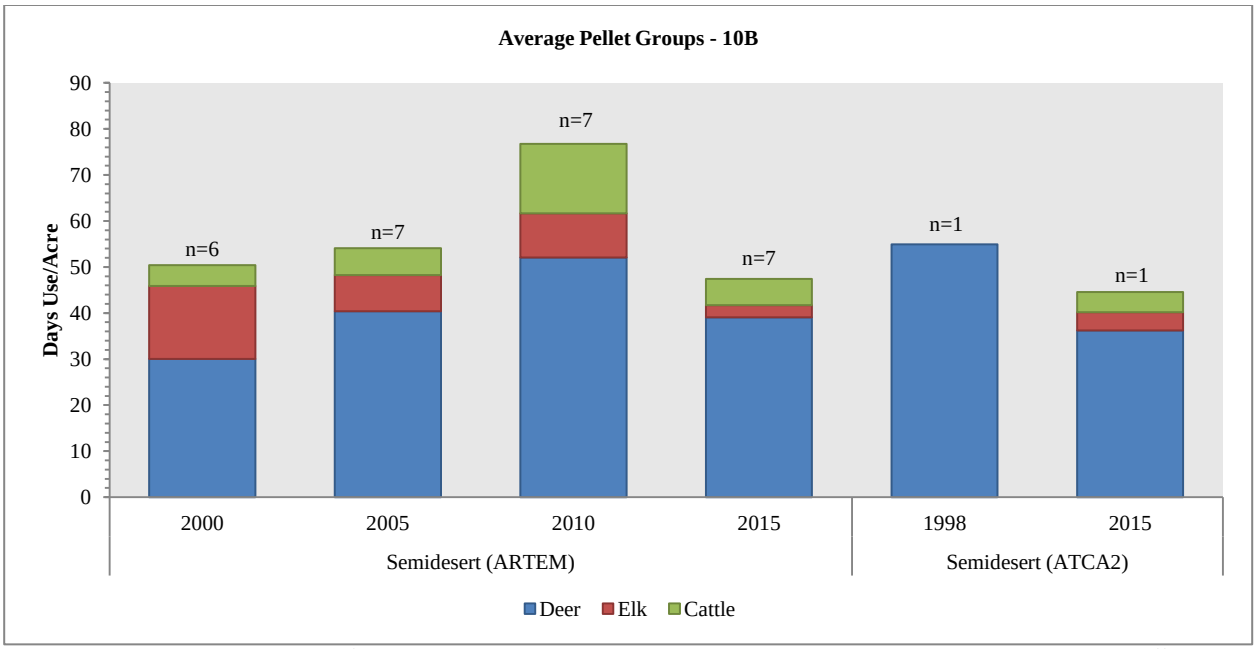
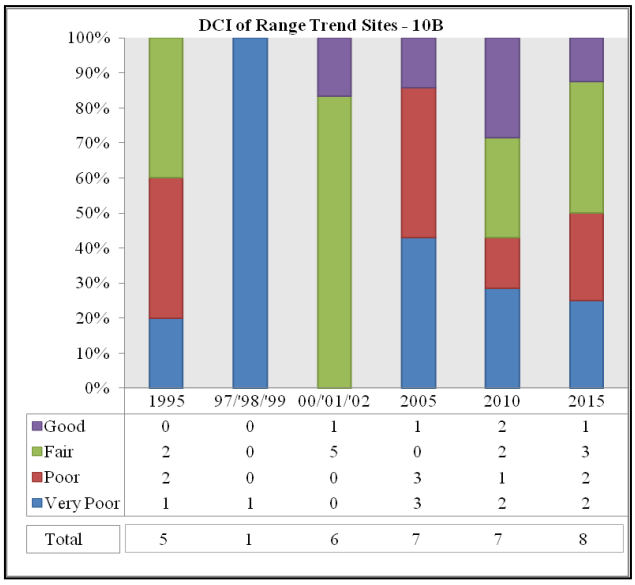


Figure 4.7: Average pellet transect data for Semidesert (ARTEM) and Semidesert (ATCA2) study sites in WMU 10B, South Book Cliffs.

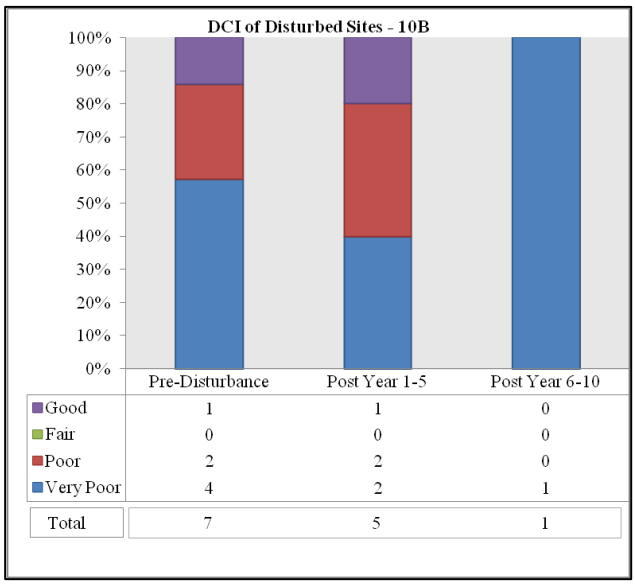
Deer Winter Range Condition Assessment

The condition of deer winter range within the South Book Cliffs management unit has fluctuated on the sites sampled since 1995. The Range Trend sites sampled within the unit are considered to be in very poor to good condition based on the most current sample data (Map 4.15, Figure 4.8). The East Horse Pasture and West Horse Pasture studies are in poor condition, lacking recruitment of young sagebrush plants and having a high amount of annual grass present. East Floy Bench, East Thompson Bench, Bitter Creek, Long Canyon, and Nash Wash #2 ranged from poor to fair, and East Calf Canyon remained in good condition. The treated study sites range from very poor to good condition, with none in fair condition (Map 4.15, Figure 4.9). The East Thompson Bench and West Horse Pasture studies are also considered to be Range Trend sites and are therefore discussed above. Dry Canyon was sampled prior to treatment and was in very poor condition. South Book Cliffs was also sampled pretreatment and was in poor condition, Bitter Creek Herbicide remained very poor, Bitter Creek stayed in poor condition, and Long Canyon Bench Chaining remained in good condition.



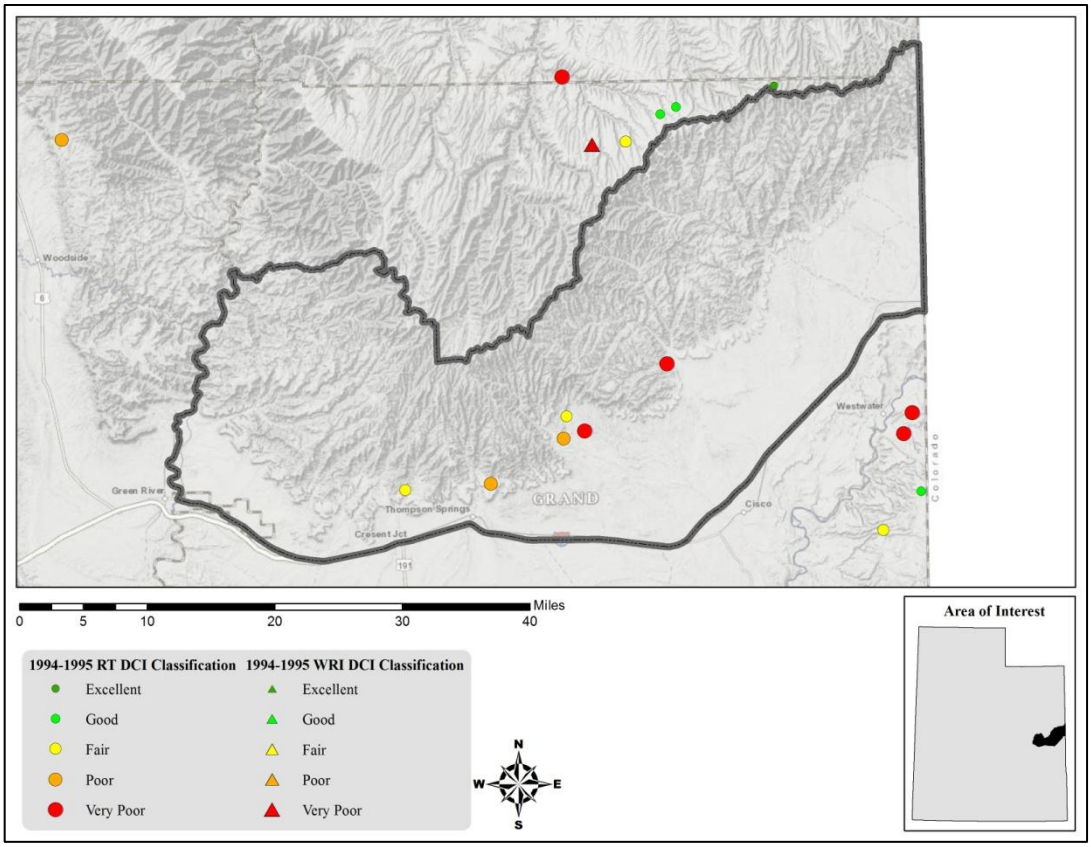
	1995	97/'98/'99	00/'01/'02	2005	2010	2015
Good	0	0	1	1	2	1
Fair	2	0	5	0	2	3
Poor	2	0	0	3	1	2
Very Poor	1	1	0	3	2	2
Total	5	1	6	7	7	8

Figure 4.8: Deer winter range Desirable Components Index (DCI) summary by year of Range Trend sites in WMU 10B, South Book Cliffs.

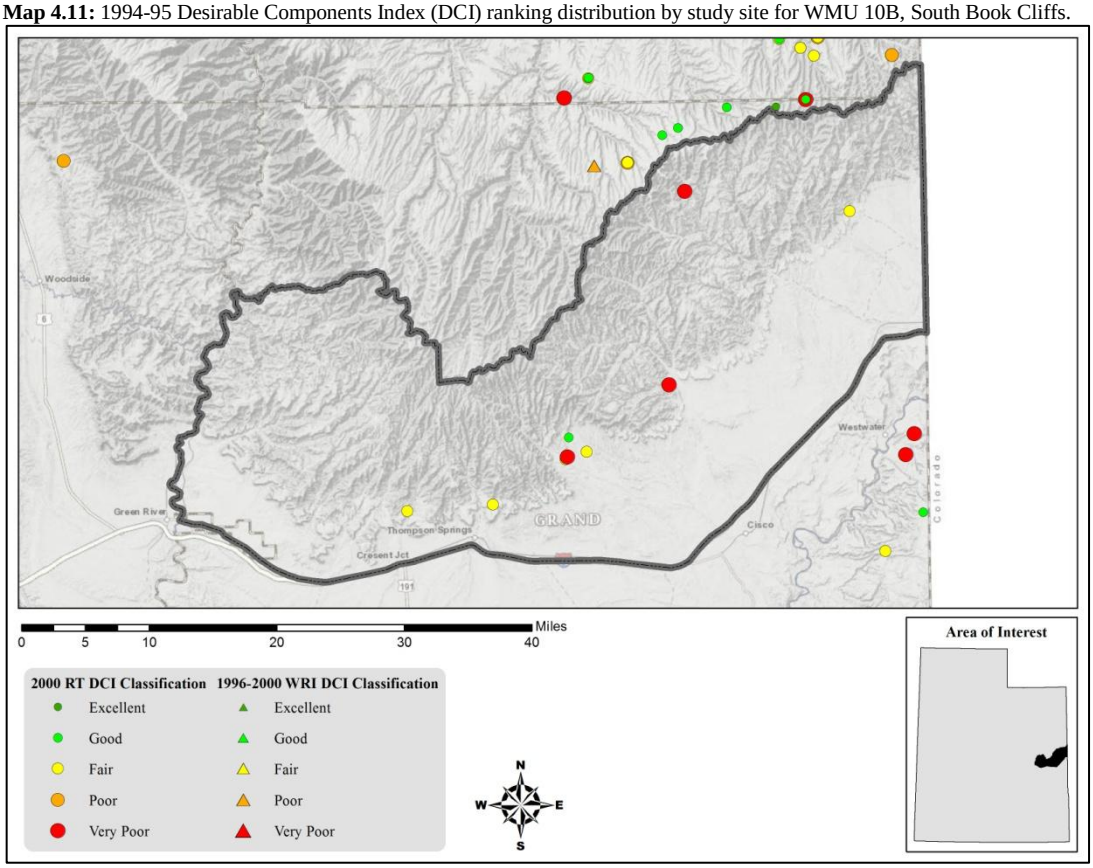


	Pre-Disturbance	Post Year 1-5	Post Year 6-10
Good	1	1	0
Fair	0	0	0
Poor	2	2	0
Very Poor	4	2	1
Total	7	5	1

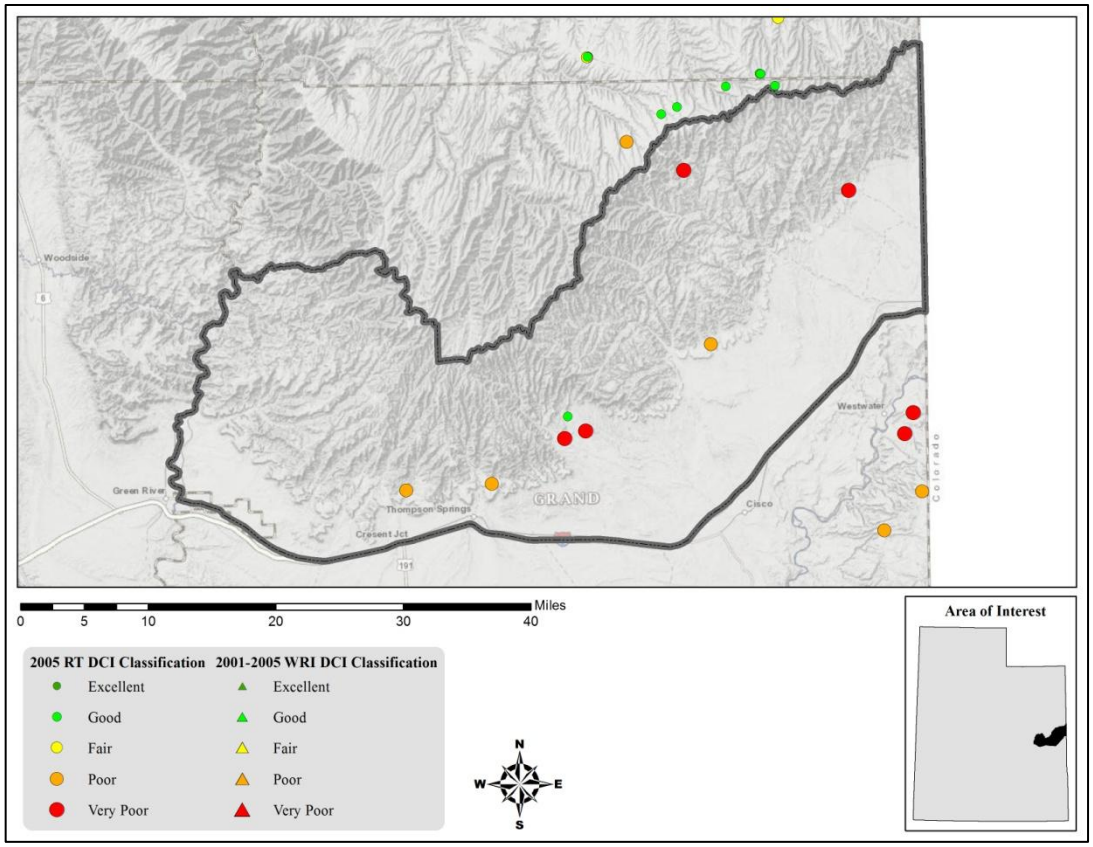
Figure 4.9: Deer winter range Desirable Components Index (DCI) summary by year of disturbed sites for WMU 10B, South Book Cliffs.



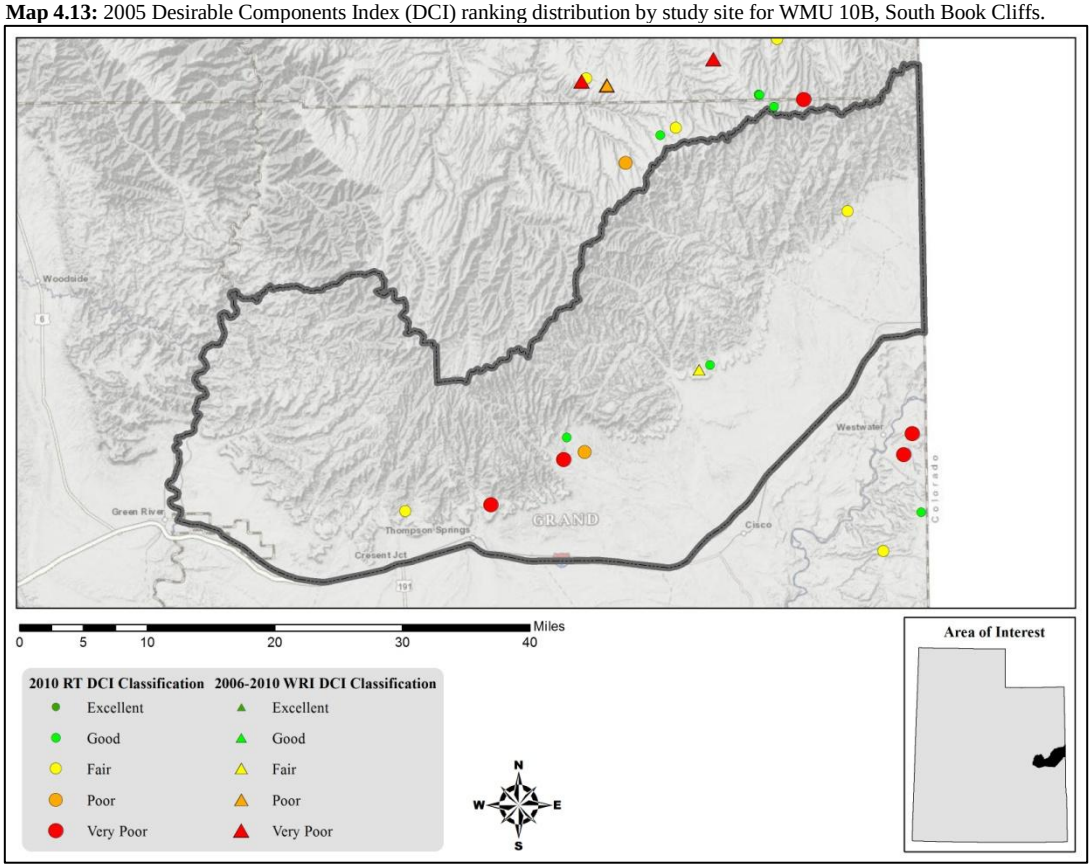
Map 4.11: 1994-95 Desirable Components Index (DCI) ranking distribution by study site for WMU 10B, South Book Cliffs.



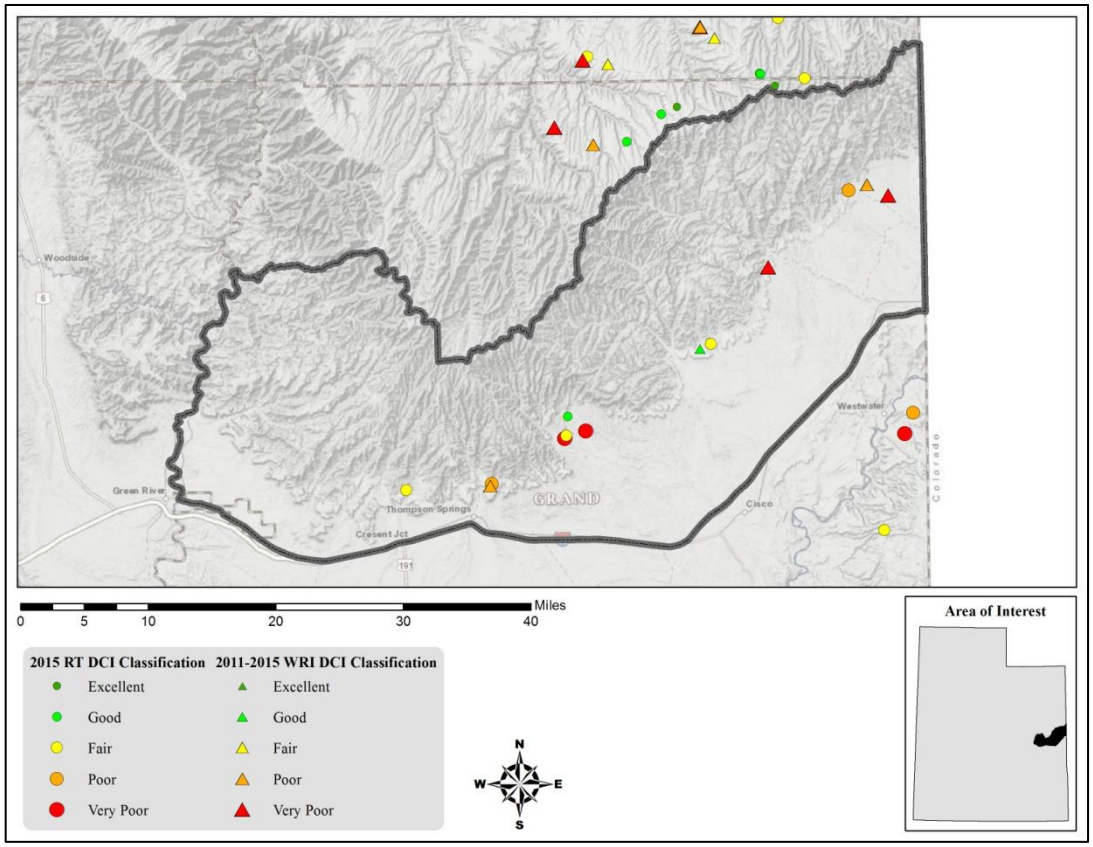
Map 4.12: 2000 Desirable Components Index (DCI) ranking distribution by study site for WMU 10B, South Book Cliffs.



Map 4.13: 2005 Desirable Components Index (DCI) ranking distribution by study site for WMU 10B, South Book Cliffs.



Map 4.14: 2010 Desirable Components Index (DCI) ranking distribution by study site for WMU 10B, South Book Cliffs.



Map 4.15: 2015 Desirable Components Index (DCI) ranking distribution by study site for WMU 10B, South Book Cliffs.

Study #	Study Name	Limiting Factor and/or Threat	Level of Threat	Potential Impact
10-14	East Floy Bench	Annual Grass	High	Increased fire potential.
10-15	East Thompson Bench	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
10-16	West Horse Pasture	Annual Grass	Moderate	Increased fire potential.
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
10-17	East Calf Canyon	Annual Grass	Low	Increased fire potential.
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
10-18	East Horse Pasture	Annual Grass	High	Increased fire potential.
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
10-26	Bitter Creek	Annual Grass	High	Increased fire potential.
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
10-27	Long Canyon	Annual Grass	Low	Increased fire potential.
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
10R-26	Nash Wash #2	Annual Grass	High	Increased fire potential.
		Introduced Annual Forbs	Low	Reduced diversity of desirable grass and forb species.
10R-49	Long Canyon Bench Chaining	Annual Grass	Low	Increased fire potential.
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
10R-50	Bitter Creek	Annual Grass	Moderate	Increased fire potential.
		Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species.
10R-54	Bitter Creek Herbicide	Annual Grass	High	Increased fire potential.
10R-55	South Book Cliffs	Annual Grass	Moderate	Increased fire potential.
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.

Table 4.11: Assessment of the potential limiting factors and/or threats and level of threat to study sites for WMU 10B, South Book Cliffs. All assessments are based off of the most current sample date for each study site.

Discussion and Recommendations

Semidesert (Sagebrush)

These lower elevation semidesert sagebrush sites support Wyoming big sagebrush communities. Aside from East Calf Canyon, which is in good condition, these sites are generally considered to be in very poor to fair condition for deer wintering range habitat on the South Book Cliffs management unit. The invasive annual grass species cheatgrass dominates the herbaceous understory on a majority of these sites; high amounts of cheatgrass can increase fuel loads and exacerbate the risk of wildfire. In addition, many of these study sites are prone to encroachment by pinyon and juniper trees, an event which can reduce shrub and herbaceous understory health if not addressed.

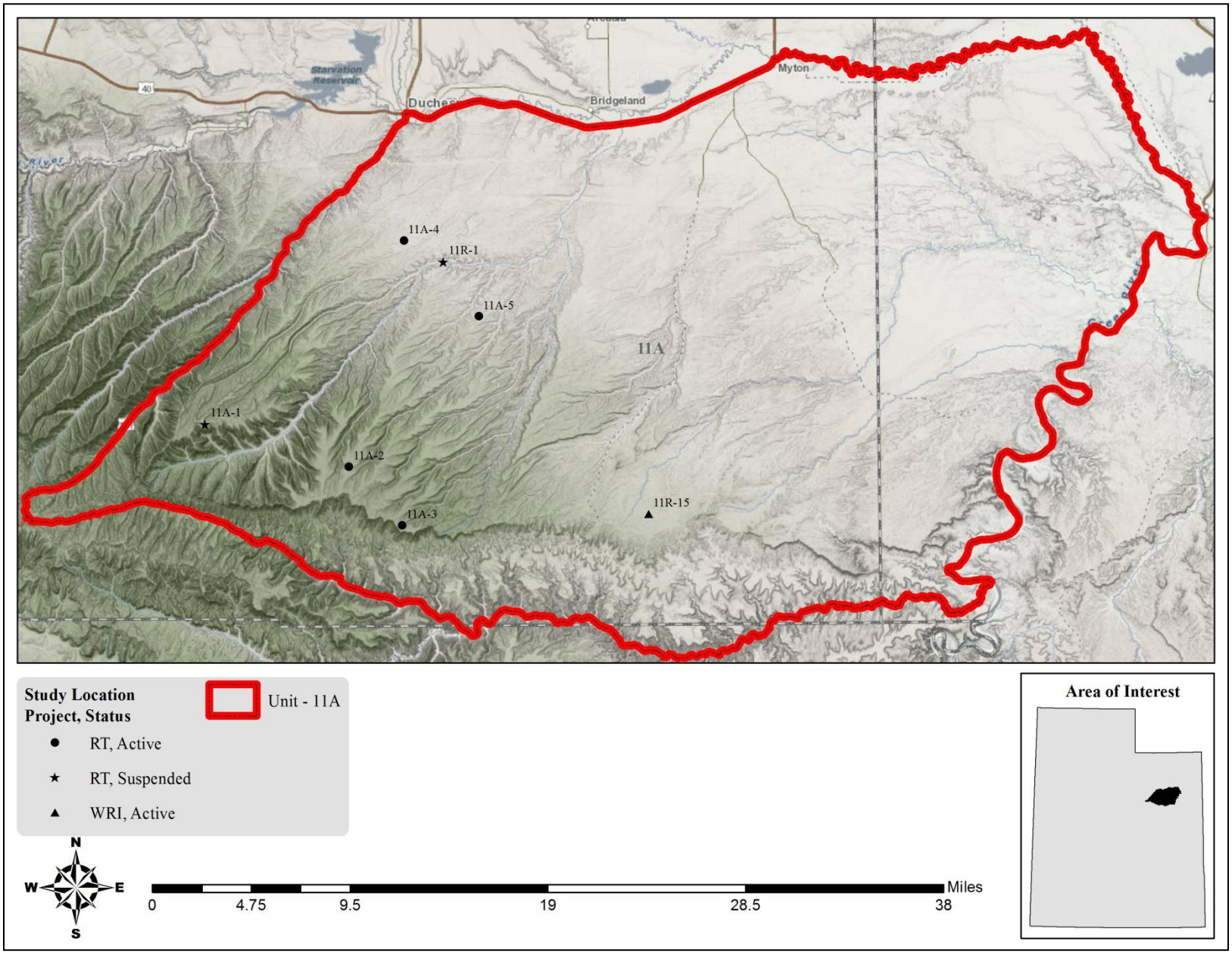
It is recommended that work to monitor and reduce pinyon-juniper encroachment (e.g. bullhog, chaining, lop and scatter, etc.) where necessary should continue in these communities; care should be taken to select methods that will not increase annual grass loads. It is strongly recommended that many sites undergo treatments to reduce annual grass. Should reseeding be necessary to restore herbaceous species, care should be taken in species selection and preference given to native grass and forb species if possible.

Semidesert (Fourwing Saltbush)

This lower elevation semidesert site supports a robust fourwing saltbush community and lower amounts of other browse species: it is considered to be in fair condition for deer wintering range habitat on this management unit. Although the herbaceous understory provides a fair amount of cover, it is dominated by the invasive annual grass species cheatgrass, which can increase fuel loads and the risk of wildfire. In addition, all of the forbs within the understory are annual and the majority of these are introduced species. Encroachment of pinyon and juniper is not a concern with this site.

The implementation of treatments to reduce annual grass loads is strongly recommended for this site. It is also recommended that perennial forbs and grasses be restored, but care must be taken in species selection and preference should be given to native species when possible.

5. WILDLIFE MANAGEMENT UNIT 11A – NINE MILE, ANTHRO



WILDLIFE MANAGEMENT UNIT 11A – NINE MILE, ANTHRO

Boundary Description

> **Duchesne and Uintah Counties** - Boundary begins at Duchesne and Highway US-191; southwest on US-191 to the Argyle Canyon Road; southeast on this road to the Nine Mile Canyon Road; east along this road to its end near Bulls Canyon; south from the end of the road to Nine Mile Creek; east along this creek to the Green River; north along this River to the Duchesne River; northwest along this river to US-40; west on US-40 to Duchesne and beginning point. Excludes all Ute Indian Tribal lands within this boundary

Management Unit Description

Geography

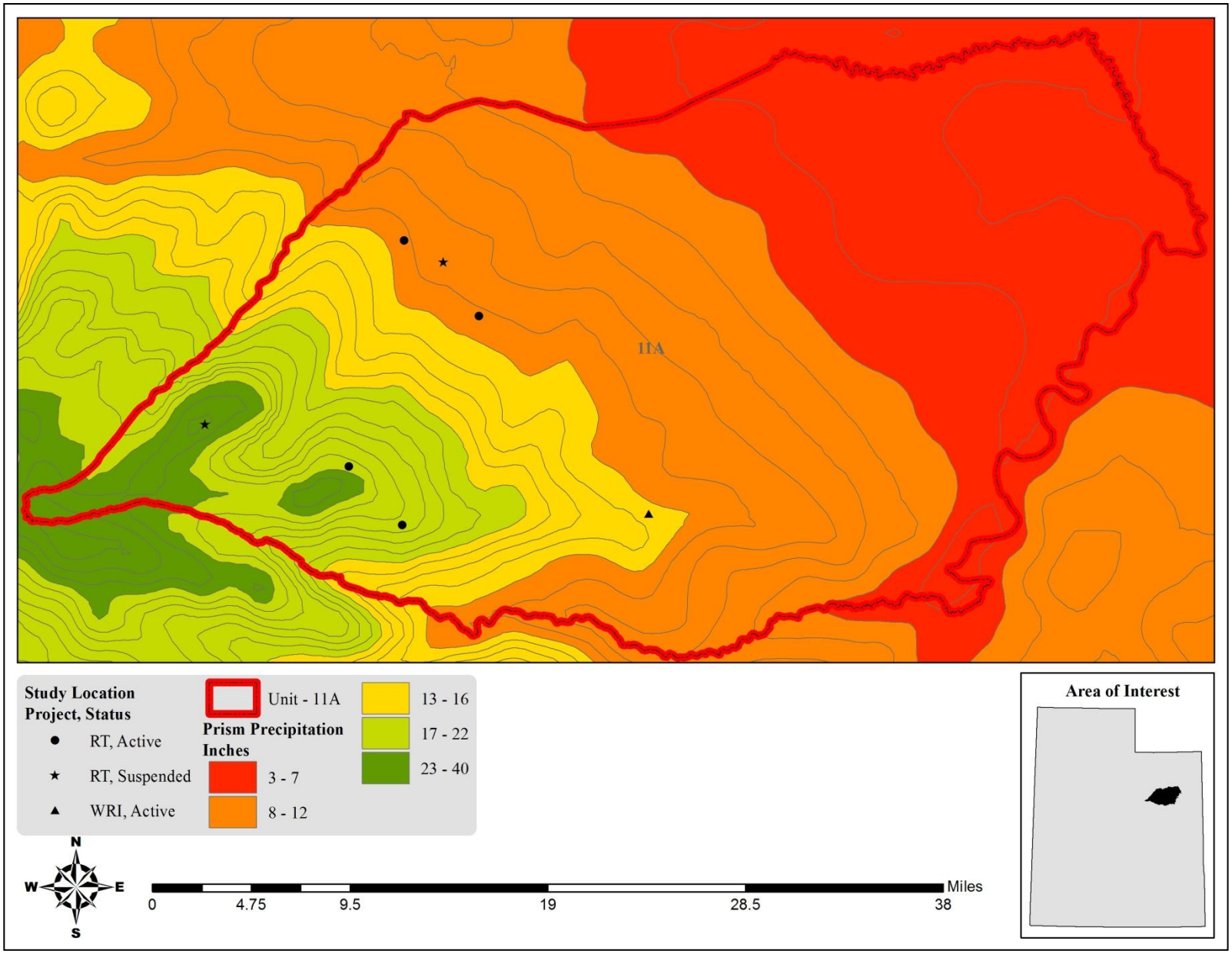
The Nine Mile, Anthro Management Unit is located south of Duchesne and Highway 40, extending south into the Anthro Mountains. Elevation ranges from about 4,600 feet at the Green River to about 9,200 feet along Upper Cottonwood Ridge. This area falls within the Uinta Basin Watershed and major drainages 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 unit and Ouray is just outside of the northeastern boundary.

Climate Data

The 30 year (1981-2010) annual precipitation PRISM model shows precipitation ranges on the unit from 6 inches in the eastern portion to 25 inches in the southwest portion near Argyle Canyon. All of the Range Trend and WRI monitoring studies on the unit occur within 11-24 inches of precipitation (Map 5.1) (PRISM Climate Group, Oregon State University).

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 (Divisions 5 and 6). The mean annual PDSI of the Northern Mountains division displayed years of moderate to extreme drought from 1988-1990, 2000-2003, and 2012-2013. The mean annual PDSI displayed moderately to extremely wet years from 1982-1986, 1995, 1997-1998, 2005, and 2011 (Figure 5.1a). The mean spring (March-May) PDSI displayed years of moderate to extreme drought in 1989-1990, 1992, 2000-2004, and 2012-2014; moderately to extremely wet years were displayed in 1982-1986, 1995-1996, 1998-1999, 2005, and 2011. The mean fall (Sept.-Nov.) PDSI displayed years of moderate to extreme drought in 1982-1986, 1995, 1997-1998; moderately to extremely wet years were displayed in 1982-1986, 1995, and 1997-1998 (Figure 5.1b).

The mean annual PDSI of the Uinta Basin division displayed years of moderate to extreme drought from 1989-1991, 2000, 2002-2003, and 2012-2015. The mean annual PDSI displayed moderately to extremely wet years from 1982-1985, 1993, 1997-1998, and 2005. The mean spring (March-May) PDSI displayed years of moderate to extreme drought in 1989-1992, 2002-2004, and 2012-2015. Moderately to extremely wet years for this time period were displayed in 1983-1985, 1993, 1995, 1998, 2005, and 2011 (Figure 5.2a). The mean fall (Sept.-Nov.) PDSI displayed years of moderate to extreme drought in 1989-1990, 2001-2003, 2007, and 2012; moderately to extremely wet years were displayed in 1982-1986, 1993, and 1997-1998 (Figure 5.2b) (Time Series Data, 2016).



Map 5.1: The 1981-2010 PRISM Precipitation Model for WMU 11A, Nine Mile, Anthro (PRISM Climate Group, Oregon State University, 2016).

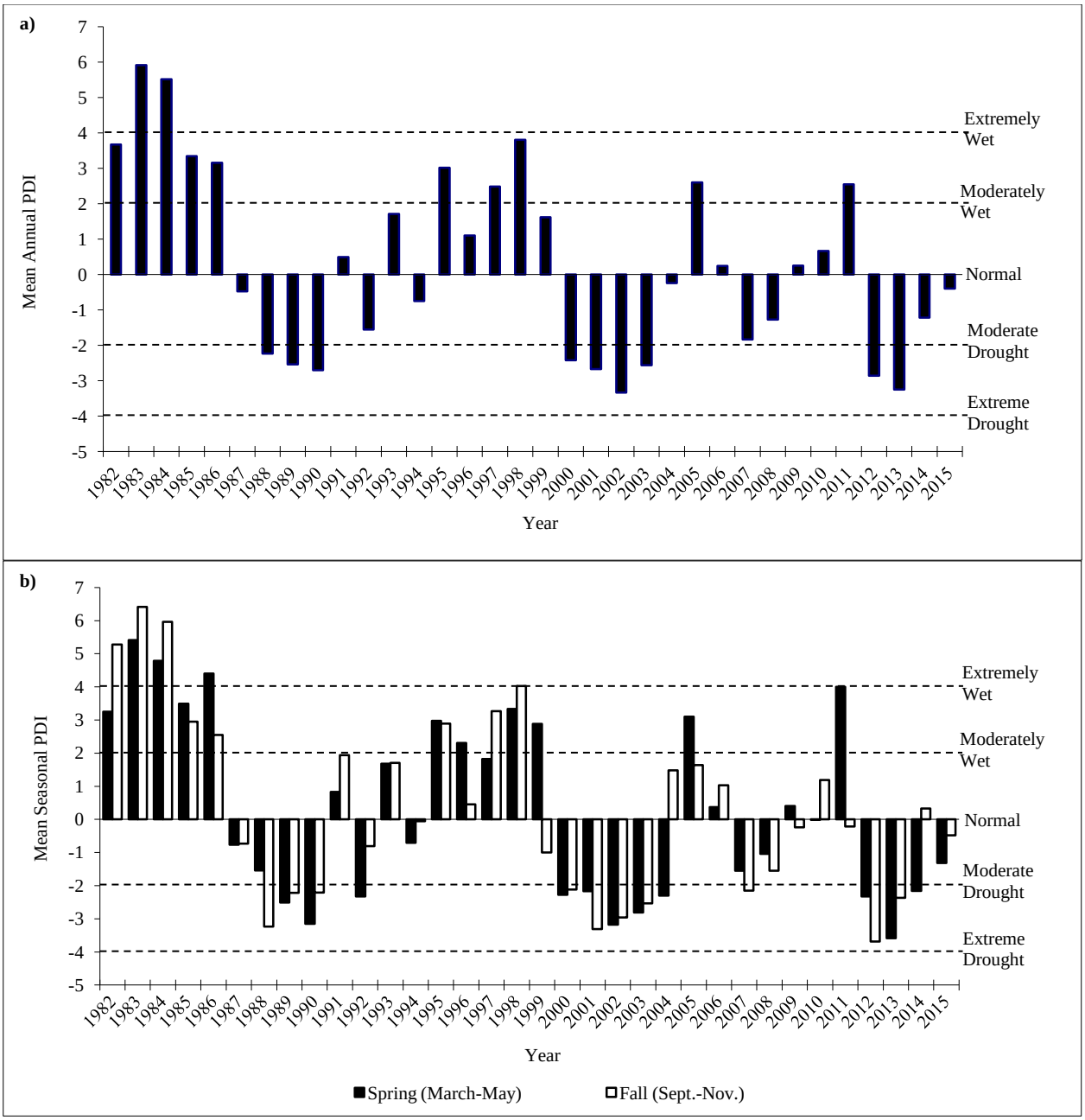


Figure 5.1: The 1982-2015 Palmer Drought Severity Index (PDSI) for the Northern Mountains division (Division 5). The PDSI is based on climate data gathered from 1895 to 2015. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet and negative deviations indicate drought. Classification of the scale is ≥4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to2.9 = 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 -.9 = Incipient Dry Spell, -1.0 to -1.9 = Mild Drought, -2.0 to -2.9 = Moderate Drought, -3.0 to -3.9 = Severe Drought and ≤-4.0 = Extreme Drought (Time Series Data 2014). a) Mean annual PDSI. b) Mean spring (March-May) and fall (Sept.-Nov.).

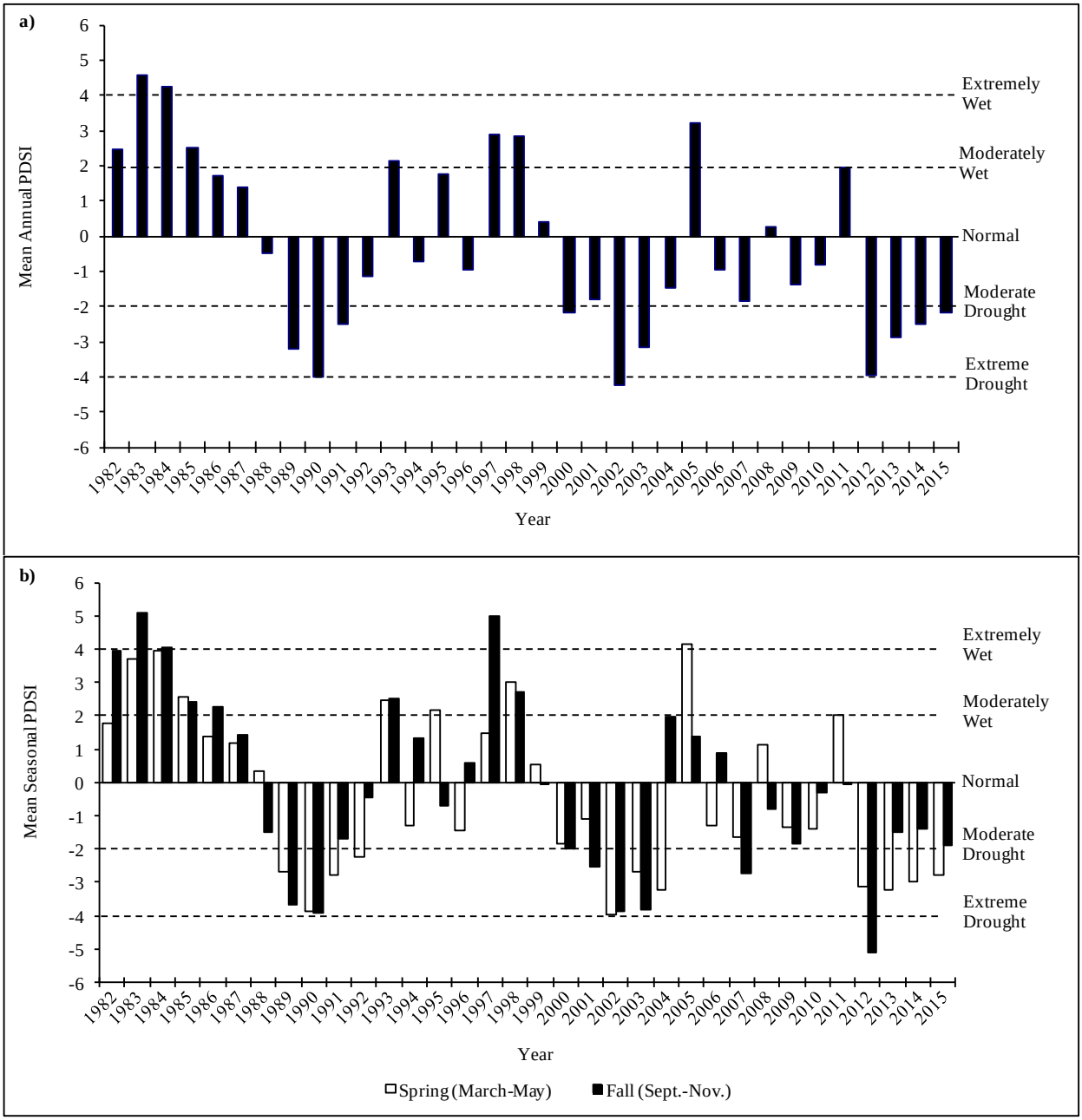
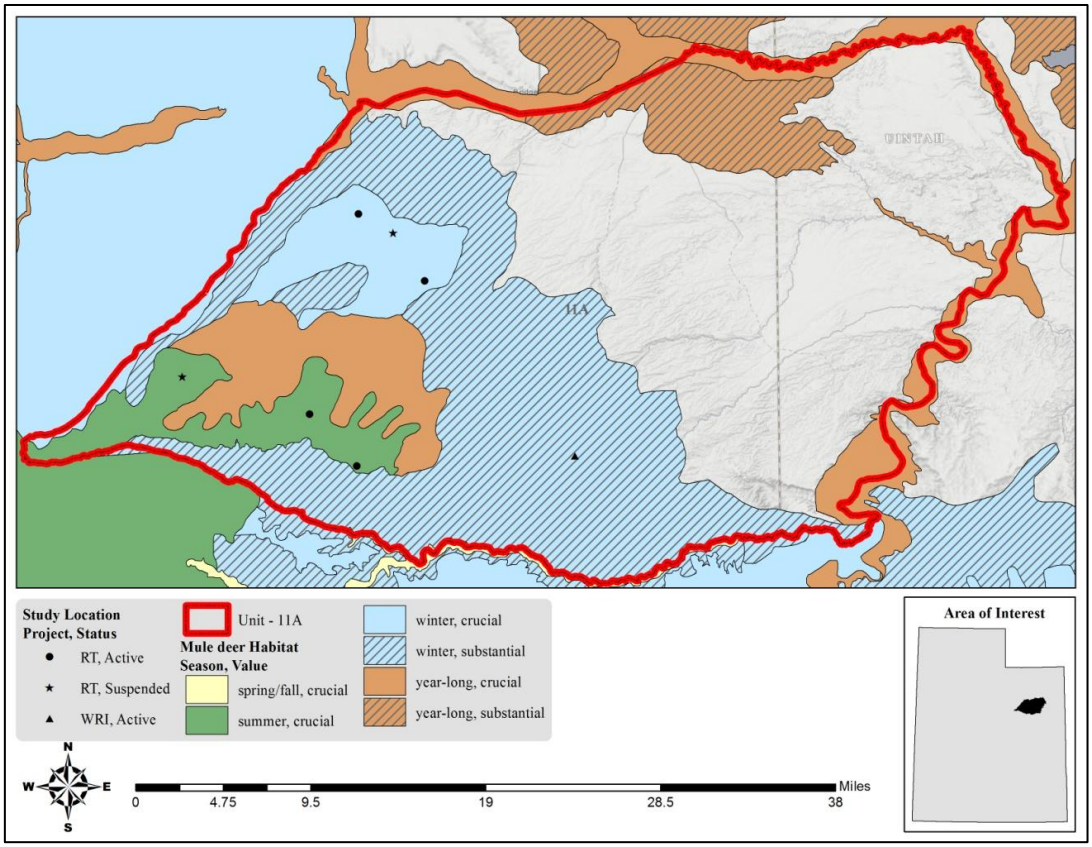


Figure 5.2: The 1982-2015 Palmer Drought Severity Index (PDSI) for the Uinta Basin division (Division 6). The PDSI is based on climate data gathered from 1895 to 2015. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet and negative deviations indicate drought. Classification of the scale is ≥4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to2.9 = 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 -.9 = Incipient Dry Spell, -1.0 to -1.9 = Mild Drought, -2.0 to -2.9 = Moderate Drought, -3.0 to -3.9 = Severe Drought and ≤-4.0 = Extreme Drought (Time Series Data 2014). a) Mean annual PDSI. b) Mean spring (March-May) and fall (Sept.-Nov.).

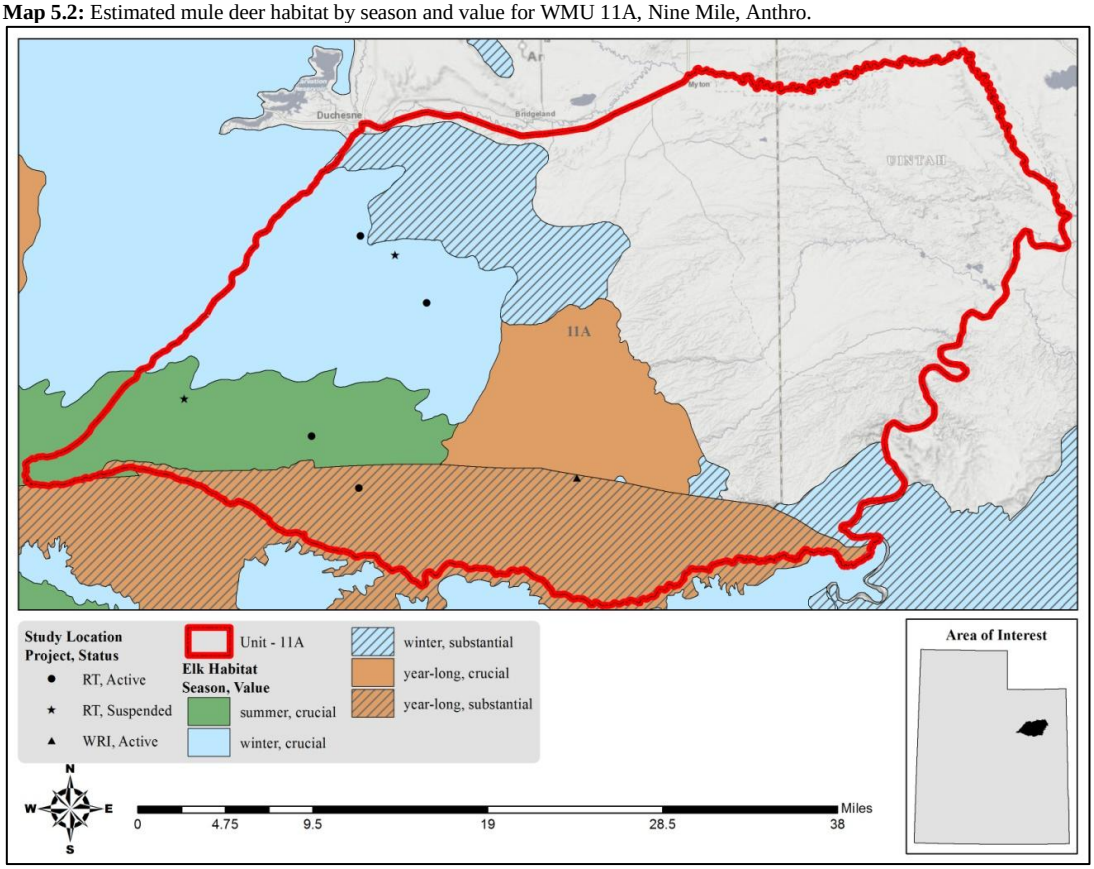
Big Game Habitat

There are an estimated 388,000 acres classified as deer range on Unit 11A with 62% classified as winter range, 9% as summer range, 29% as year-long range, and less than 1% classified as spring/fall range (Table 5.1). The Bureau of Land Management (BLM)-managed lands comprise 45% of the winter range, U.S. Forest Service lands comprise 10%, Utah School and Institutional Trust Lands Administration-owned lands (SITLA) comprise 7%, tribal lands comprise 21%, private lands comprise 13% and the Utah Division of Wildlife Resources (UDWR) administers 3% of the range (Map 5.2, Map 5.5, Table 5.2). There are approximately 376,000 acres that are classified as elk range on Unit 11A with 42% classified as winter range, 16% as summer range and 42% classified as year-long range. Of the elk winter range, 36% is on tribal land, 26% is on private lands, 19% is on Forest Service lands, 13% is on BLM land, 4% is on UDWR lands, and 2% is on land managed by SITLA (Map 5.3, Map 5.5, Table 5.3).

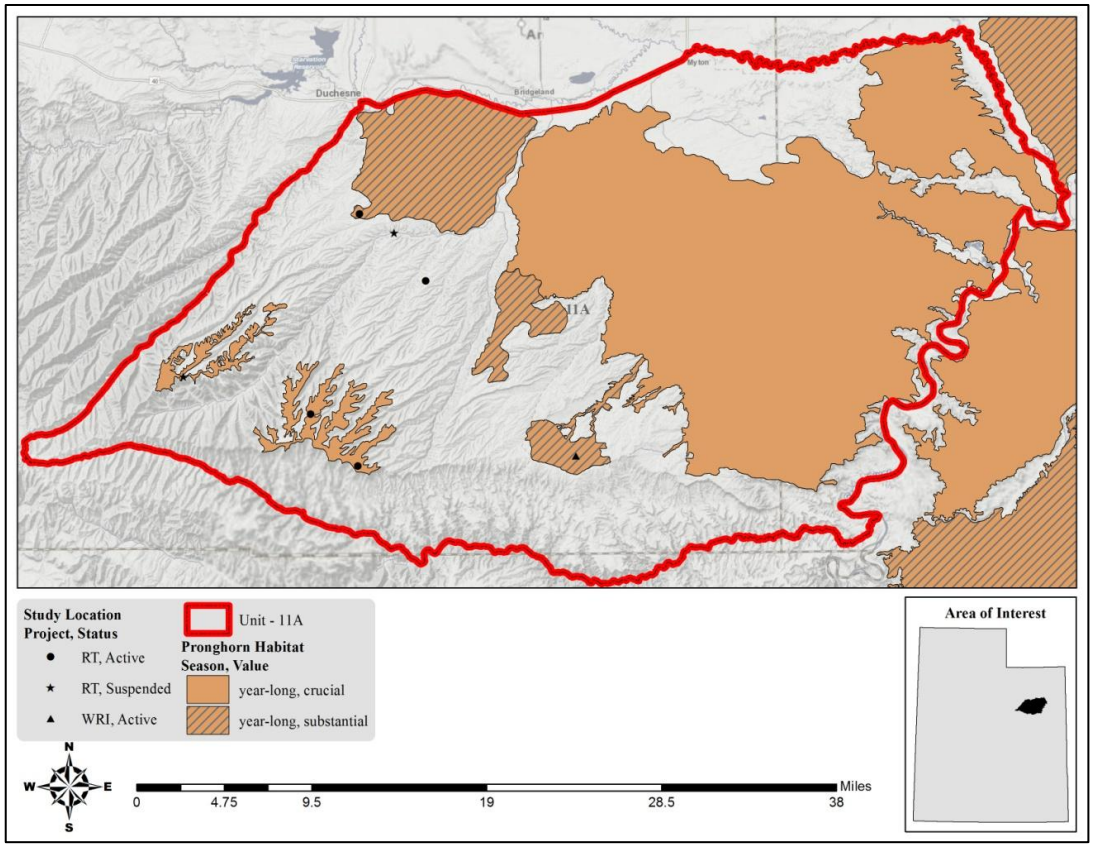
There is a long and gradual northerly slope to the Anthro Mountain terrain which lends itself to an abundance of winter range. The long slopes are covered by pinyon-juniper woodland with natural openings of sagebrush. Grassy openings are often found in the drainages, and some ridge tops are covered with 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.



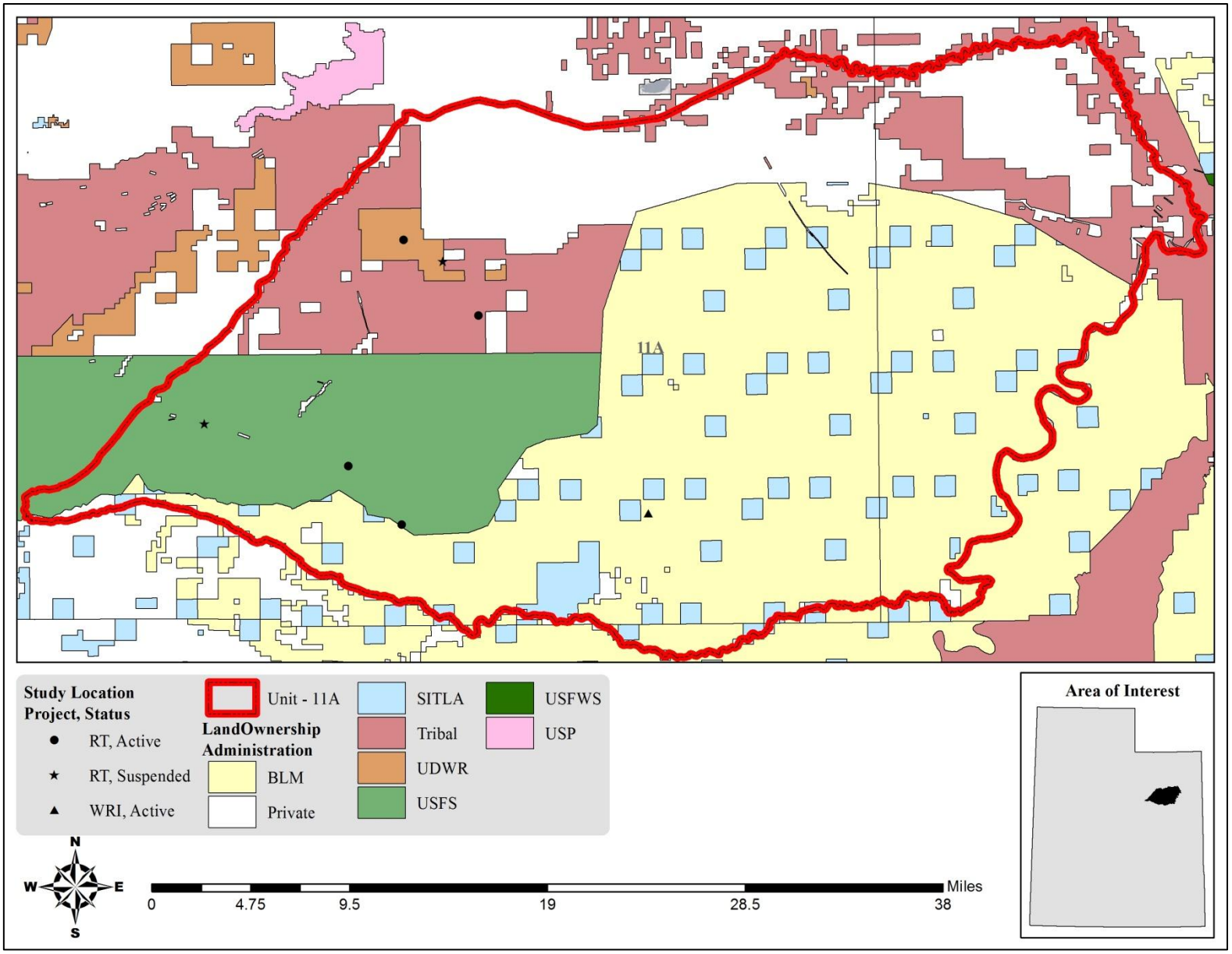
Map 5.2: Estimated mule deer habitat by season and value for WMU 11A, Nine Mile, Anthro.



Map 5.3: Estimated elk habitat by season and value for WMU 11A, Nine Mile, Anthro.



Map 5.4: Estimated pronghorn habitat by season and value for WMU 11A, Nine Mile, Anthro.



Map 5.5: Land ownership for WMU 11A, Nine Mile, Anthro.

	Year Long Range		Summer Range		Winter Range		Spring/Fall	
	Area (acres)	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
Mule Deer	110,074	29%	36,085	9%	241,184	62%	1,323	<1%
Elk	157,838	42%	59,905	16%	158,406	42%	0	0%
Moose	0	0%	0	0%	50,469	100%	0	0%
Pronghorn	301,018	100%	0	0%	0	0%	0	0%
RMBS	88,291	100%	0	0%	0	0%	0	0%

Table 5.1: Estimated mule deer, elk, moose, pronghorn, and Rocky Mountain bighorn sheep (RMBS) habitat acreage by season for WMU 11A, Nine Mile, Anthro.

	Year Long Range		Summer Range		Winter Range		Spring/Fall	
Ownership	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
BLM	13,927	13%	784	2%	109,697	45%	526	40%
Private	35,066	32%	1,450	4%	32,309	13%	693	52%
SITLA	1,028	1%	481	1%	17,386	7%	104	8%
Tribal	17,476	16%	0	0%	50,355	21%	0	0%
UDWR	268	<1%	0	0%	6,749	3%	0	0%
SL&F	651	1%	0	0%	0	0%	0	0%
UDOT	25	<1%	0	0%	0	0%	0	0%
USFS	41,635	38%	33,370	92%	24,687	10%	0	0%
Total	110,074	**100%**	36,085	**100%**	241,184	**100%**	1,323	**100%**

Table 5.2: Estimated mule deer habitat acreage by season and ownership for WMU 11A, Nine Mile, Anthro.

	Year Long Range		Summer Range		Winter Range	
Ownership	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
BLM	120,003	76%	1,049	2%	21,307	13%
Private	5,016	3%	1,455	2%	41,354	26%
SITLA	19,669	13%	225	<1%	2,442	2%
Tribal	748	<1%	0	0%	56,376	36%
UDWR	0	0%	0	0%	6,749	4%
SL&F	0	0%	0	0%	39	0%
UDOT	0	0%	0	0%	25	0%
USFS	12,401	8%	57,176	96%	30,115	19%
Total	157,838	**100%**	59,905	**100%**	158,406	**100%**

Table 5.3: Estimated elk habitat acreage by season and ownership for WMU 11A, Nine Mile, Anthro.

	Winter Range	
Ownership	*Area (acres)*	*%*
BLM	9,725	19%
Private	4,153	8%
SITLA	1,510	3%
Tribal	488	1%
USFS	3,4593	69%
Total	50,469	**100%**

Table 5.4: Estimated moose habitat acreage by season and ownership for WMU 11A, Nine Mile, Anthro.

	Year Long Range	
Ownership	*Area (acres)*	*%*
BLM	161,340	54%
Private	77,655	26%
SITLA	20,446	7%
Tribal	24,827	8%
UDWR	1,027	<1%
SL&F	1	<1%
USFS	15,722	5%
Total	301,018	**100%**

Table 5.5: Estimated pronghorn habitat acreage by season and ownership for WMU 11A, Nine Mile, Anthro.

	Year Long Range	
Ownership	*Area (acres)*	*%*
BLM	56,956	64%
Private	6,853	8%
SITLA	10,169	12%
Tribal	2,058	2%
SL&F	128	<1%
USFS	12,126	14%
Total	88,291	**100%**

Table 5.6: Estimated Rocky Mountain bighorn sheep habitat acreage by season and ownership for WMU 11A, Nine Mile, Anthro.

Group	Existing Vegetation Type	Acres	% of Total	Group % of Total
Conifer	Colorado Plateau Pinyon-Juniper Woodland	127,638	19.44%	
	Conifer-Hardwood	5,482	0.84%	
	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	5,050	0.77%	
	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	3,486	0.53%	
	Other Conifer	2,067	0.31%	21.89%
Exotic Herbaceous	Introduced Upland Vegetation-Annual Grassland	19,258	2.93%	2.93%
Exotic Tree-Shrub	Introduced Riparian Shrubland	1,850	0.28%	
	Introduced Riparian Forest and Woodland	70	0.01%	0.29%
Grassland	Rocky Mountain Subalpine-Montane Mesic Meadow	1,962	0.30%	
	Inter-Mountain Basins Semi-Desert Grassland	1,511	0.23%	
	Other Grassland	371	0.06%	0.59%
Shrubland	Inter-Mountain Basins Mixed Salt Desert Scrub	179,064	27.27%	
	Colorado Plateau Mixed Low Sagebrush Shrubland	94,893	14.45%	
	Inter-Mountain Basins Big Sagebrush Shrubland	77,678	11.83%	
	Inter-Mountain Basins Greasewood Flat	8,345	1.27%	
	Inter-Mountain Basins Mat Saltbush Shrubland	6,477	0.99%	
	Artemisia tridentata ssp. vaseyana Shrubland Alliance	3,227	0.49%	
	Inter-Mountain Basins Montane Sagebrush Steppe	3,165	0.48%	
	Grayia spinosa Shrubland Alliance	1,980	0.30%	
	Rocky Mountain Lower Montane-Foothill Shrubland	1,854	0.28%	
	Other Shrubland	1,581	0.24%	
	Inter-Mountain Basins Semi-Desert Shrub-Steppe	1,546	0.24%	
	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	1,239	0.19%	58.04%
Other	Sparsely Vegetated	18,561	2.83%	
	Riparian	2,786	0.42%	
	Open Water	1,446	0.22%	
	Hardwood	4,576	0.70%	
	Developed	13,232	2.02%	
	Barren	46,450	7.08%	
	Agricultural	19,649	2.99%	
	Other	36	0.01%	16.26%
Total		656,531	100.00%	

Table 5.7: Landfire existing vegetation coverage (LANDFIRE: LANDFIRE 1.3.0, 2014) for WMU 11A, Nine Mile, Anthro.

Limiting Factors to Big Game Habitat

Cattle grazing is the major activity occurring on Forest Service-managed lands within management unit 11A. Oil and gas exploration and drilling, with their associated roads and year-round activity, are the prominent activities taking place on the lower ends of the ridges. Firewood cutting is also an important land use on the Ute Tribal lands.

According to the Landfire Existing Vegetation Coverage model, just over 19% of the Nine Mile, Anthro subunit is pinyon and juniper woodland (Table 5.7); encroachment by these woodland communities poses a significant threat to important rangelands. According to Miller, Svejcar, and Rose (2000), invasion of these woodlands into sagebrush communities has been shown to decrease sagebrush and herbaceous cover, therefore decreasing available forage for wildlife.

Deer fences and crossings limiting range are always a concern, but cooperation with the Utah Department of Transportation in construction of highway fences, passage structures, warning signs, etc. will continue in order to ensure proper access to habitat as well as deer and human safety.

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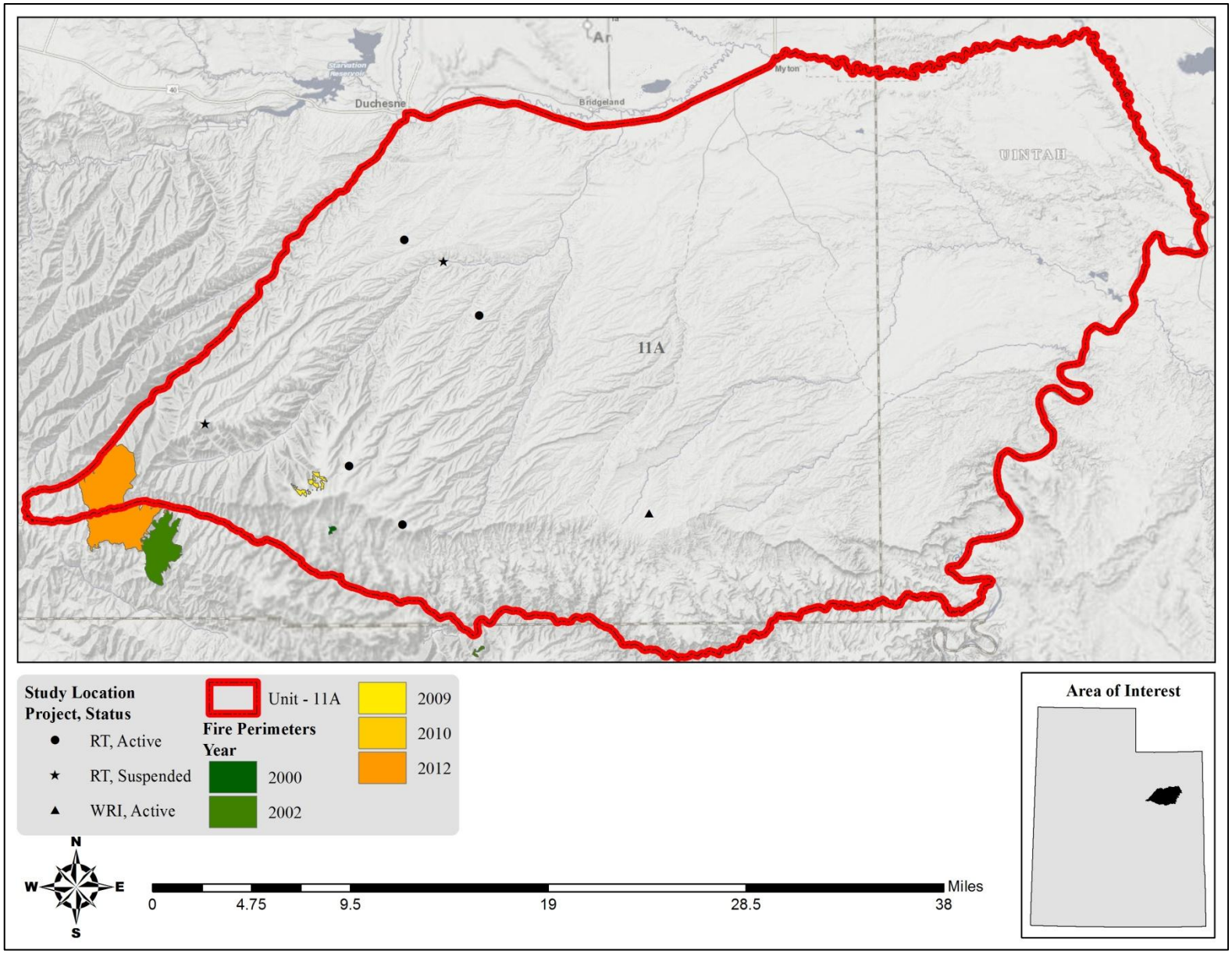


Map 5.6: Land coverage of fires by year from 2000-2012 for WMU 11A, Nine Mile, Anthro.

Treatments/Restoration Work

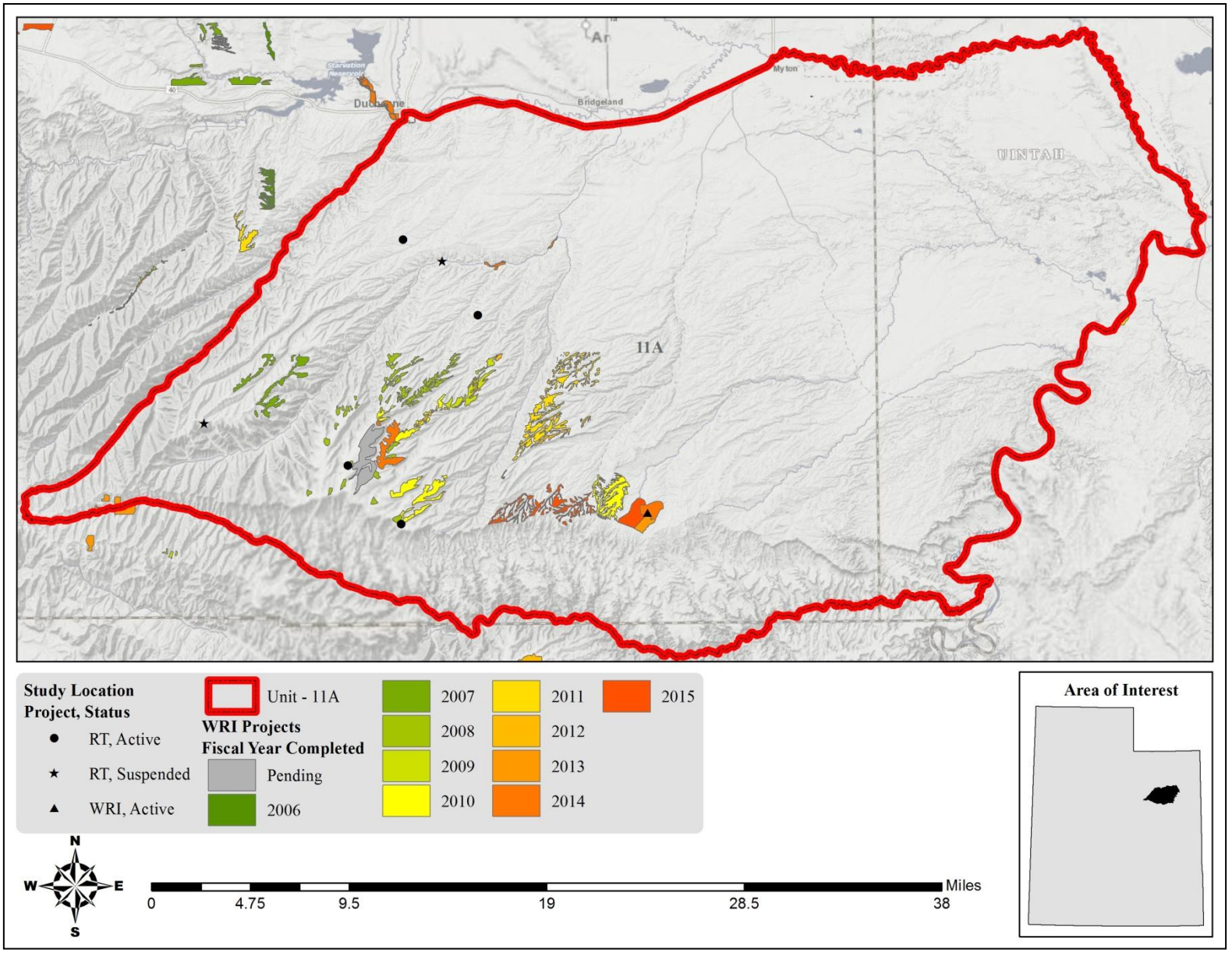
There has been an active effort to address many of the limitations on this unit through the Watershed Restoration Initiative (WRI). A total of 13,023 acres of land have been treated within the Nine Mile, Anthro unit since the WRI was implemented in 2004 (Map 5.7). Treatments frequently overlap one another bringing the total treatment acres to 13,199 acres for this unit (Table 5.8). Other treatments have occurred outside of the WRI through independent agencies and landowners, but the WRI comprises the majority of work done on deer winter ranges throughout the state of Utah.

Vegetation removal via hand crew is the most common management practice. Bullhog use for pinyon pine and Utah Juniper removal is also very common. Other management practices include prescribed fire, seeding to supplement the herbaceous understory, planting and/or transplanting of desirable species, and herbicide application to remove weeds (Table 5.8).

Treatment Action	**Acres**
Vegetation Removal/Hand Crew	11,030
Bullhog	1,243
Prescribed Fire	642
Seeding (Primary)	255
Stream Corridor/Channel Improvements	26
Planting/Transplanting	2
Herbicide Application	1
***Total Land Area Treated**	13,023
Total Treatment Acres	13,199

Table 5.8: WRI treatment action size (acres) for WMU 11A, Nine Mile, Anthro.

*Does not include overlapping treatments.



Map 5.7: WRI treatments by fiscal year completed for WMU 11A, Nine Mile, Anthro.

Range Trend Studies

Range Trend studies have been sampled within WMU 11A on a regular basis since 1982, with studies being added or suspended as was deemed necessary (Table 5.9). Due to changes in sampling methodologies, only data sampled 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 study sites have had some sort of disturbance or treatment prior to or since study establishment (Table 5.10).

Range Trend studies are summarized in this report by ecological site. Range Trend and WRI studies that have had a disturbance or treatment during the reported sample period are summarized in this report by the disturbance or treatment type and are summarized by region.

Study #	Study Name	Project	Status	Year(s) Sampled	Ecological Site Description
11A-1	Upper Cottonwood Ridge	RT	Suspended	'82, '88, '95,	Not Verified
11A-2	Wirefence Canyon	RT	Active	'82, '88, '95, '00, '05, '10, '15	Mountain Stony Loam (Mountain Big Sagebrush)
11A-3	Chokecherry Canyon	RT	Active	'82, '88, '95, '00, '05, '10	High Mountain Loam (Mountain Big Sagebrush)
11A-4	Cottonwood Canyon	RT	Active	'88, '95, '00, '05, '10, '15	Semidesert Silt Loam (Winterfat)
11A-5	Nutter's Canyon	RT	Active	'88, '95, '00, '05, '10, '15	Upland Shallow Loam (Black Sagebrush)
11R-1	Sowers	RT	Suspended	'97	Not Verified

Table 5.9: Range trend and WRI project studies monitoring history and ecological site potential for WMU 11A, Nine Mile, Anthro.

Study #	Study Name	Type	Disturbance Name (if available)	Date	Size (acres)	WRI Project #
11A-2	Wirefence Canyon	Plow Unknown		1958-1959	2,363	
		Seed Unknown		1958-1959	2,363	
11A-3	Chokecherry Canyon	Prescribed Fire		1977	500	
		Prescribed Fire	Anthro-Mountain Prescribed Burn	Fall 2007	642	841
11R-15	Big Wash	Chain Unknown		Historic		
		Bullhog	Anthro Mountain PJ Treatment	Fall 2013	403	2465

Table 5.10: Range trend and WRI studies known disturbance history for WMU 11A, Nine Mile, Anthro.

Study Trend Summary (Range Trend)

High Mountain (Sagebrush)

There is one study site [Chokecherry Canyon (11A-3)] that is classified as a High Mountain (Sagebrush) ecological site. The Chokecherry Canyon site is found on the southwest rim of the West Tavaputs Plateau just above the Badland Cliffs.

Shrubs/Trees: The primary browse species on this site is mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*). Yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *lanceolatus*) is also present and is co-dominant. Shrub line intercept cover has decreased substantially from 2005 to 2010 with a slight recovery in 2015 (Figure 5.3). The sagebrush population on this site is largely composed of mature and young individuals with the exception of the 2005 sample year where mature plants were the dominant component. Decadence within the population has remained low over the sample period. Although recruitment of young plants has been comparable to mature plants in the 2000 and 2010 sample years, overall sagebrush density has decreased since the 2000 sample year (Figure 5.6).

Herbaceous Understory: The herbaceous understory of this study site is plentiful, diverse, and overall in good condition. Perennial grasses have been the largest component in the understory throughout the study years with slender wheatgrass (*Elymus trachycaulus*) as the dominant species driving the herbaceous trend. Annual grasses have not been sampled. A diverse number of perennial forbs provide substantial cover, which has ranged from just over 11% in most sample years to 6% and 8% in 2000 and 2015, respectfully. Annual forb cover has remained low and has never exceeded 1% (Figure 5.7).

Occupancy: Pellet group transect data indicates that total animal occupancy has generally decreased over the sample period with the exception of the 2005 sample year. Deer pellet groups have ranged from 3 days use/acre in 2015 to 39 days use/acre in 2005. The mean abundance of elk pellet groups has decreased with each consecutive sample year, and has ranged as low as 3 days use/acre in 2015 and as high as 85 days use/acre in 2000. Finally, the mean abundance of pellet groups indicates that cattle presence has remained rare to absent since the 2000 sample year (Figure 5.8).

Mountain (Sagebrush)

There is one study site [Wirefence Canyon (11A-2)] classified as a Mountain (Sagebrush) ecological site. The Wirefence Canyon study is found in the southern portion of Wire Fence Canyon near the southwestern rim of the West Tavaputs Plateau.

Shrubs/Trees: The shrub species are co-dominant on this site are mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and yellow rabbitbrush (*Chrysothamnus viscidiflorus* ssp. *lanceolatus*). Overall cover of the preferred species mountain big sagebrush is low, but has generally remained stable since 2005, ranging from just over 5% in 2005 and 2015 to near 4% in 2010. However, density of sagebrush suggests that the population has decreased over the entire sample period since 1995. The majority of the plants in the population are mature, while young and decadent plants make up a lesser portion of the population. However, young plants in the 1995 comprised nearly half of the population at 1,700 plants/acre, but decreased to less than 400 plants/acre in the 2000 sample year; recruitment has remained low since that time period. Mature plants followed a similar decreasing trend with nearly 2,400 plants/acre in the 2000 sample year to under 1,500 plants/acre in 2005 (Figure 5.6). On average, other shrub species contribute less than 7% cover (Figure 5.3).

Herbaceous Understory: The herbaceous understory has generally increased over time with the exception of the 2010 sample year. Perennial grasses have consistently contributed the most herbaceous cover with the introduced species smooth brome (*Bromus inermis*) dominating. Native grasses are diverse in composition, but provide little cover within the community. Perennial forb cover has followed trends similar to those of perennial grass and the community as a whole: cover has remained moderate ranging from nearly 6% cover in

2010 to 13% cover in 2015. Annual grass species have not been sampled in this community and annual forbs have contributed minimal cover since site establishment (Figure 5.7).

Occupancy: Pellet transect data indicates that occupancy has varied over the sample years, but has generally decreased. Mean abundance of elk pellet groups has ranged from 5 days use/acre in 2015 to 18 days use/acre in 2000. Mean abundance of deer/pronghorn pellet groups has ranged from 2 days use/acre in 2000 to 34 days use/acre in 2005. Finally, mean abundance of cattle pellet groups has generally remained high varying from 41 days use/acre in 2005 to 52 days use/acre in 2000; the 2015 sample year is the only uncharacteristic year in which zero cattle pats were sampled on the study (Figure 5.8).

Upland (Sagebrush)

There is one site [Nutter's Canyon (11A-5)] classified as an Upland (Sagebrush) ecological site. Nutter's Canyon is located on the West Tavaputs Plateau just east of Brundage Canyon.

Shrubs/Trees: This study site is dominated by black sagebrush (*Artemisia nova*). Other preferred browse species are present, but provide minimal cover (Figure 5.3). Average sagebrush demographics indicate that the population has been comprised of mainly mature individuals throughout the study years; however, young plants have had considerable densities in 2010 and 2015. Decadent plants made up high proportions of the population in the 2000 and 2005 sample years. Overall, the sagebrush population deceased significantly in 2005, but has recovered as of the 2015 sample year (Figure 5.6).

Low levels of encroachment by Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) are occurring on the Nutter's Canyon study site. Cover of twoneedle pinyon has steadily increased since 2005, but has remained low. The density of juniper on this study site was 4 trees/acre while that of twoneedle pinyon was 21 trees/acre in 2015, all of which were young trees (Figure 5.4, Figure 5.5).

Herbaceous Understory: This study site has a good herbaceous understory which has exhibited an overall increasing trend over the study years. Perennial grasses have consistently been the most dominant component and are mainly comprised of the native species needle and thread (*Hesperostipa comata*). Perennial forbs are moderately diverse, but have provided little cover at 1% or less since site establishment. Annual forbs are similarly rare and provide little cover (Figure 5.7).

Occupancy: Average pellet transect data indicates that occupancy has generally decreased from 2000 to 2015. Mean abundance for elk pellet groups has decreased precipitously since the 2000 sample year, and has ranged from a low of 8 days use/acre in 2015 to a high of 40 days use/acre in 2000. The mean abundance for deer/pronghorn pellet groups has also decreased over the sample years, ranging from 5 days use/acre in 2000 to 41 days use/acre in 2005. Cattle pellet groups have not been observed on the Nutter's Canyon study (Figure 5.8).

Semidesert (Winterfat)

There is one site [Cottonwood Canyon (11A-4)] that is classified as a Semidesert (Winterfat) ecological site. The Cottonwood Canyon study is found on the northwest side of the West Tavaputs Plateau between Coyote Canyon and Cottonwood Canyon.

Shrubs/Trees: Winterfat (*Krascheninnikovia lanata*) is the main browse species with shadscale saltbush (*Atriplex confertifolia*) as a subordinate browse species on the Cottonwood Canyon site. There was a slight decrease in cover of winterfat with it recovering in 2015 (Figure 5.3). Average sagebrush demographics indicate that sagebrush is rare on the study site and that the population is largely composed of mature and decadent individuals (Figure 5.6).

Herbaceous Understory: The herbaceous understory of the Cottonwood Canyon site is generally abundant and stable. However, there was a notable increase in herbaceous cover in 2015, driven by an increase in the perennial grass species needle and thread (*Hesperostipa comata*).This site has been dominated by native perennial grasses during each sample year. The invasive annual species cheatgrass (*Bromus tectorum*) is present on the site, but in insignificant amounts. Cover of both perennial forbs and annual forbs has fluctuated over time, but both have remained relatively rare (Figure 5.7).

Occupancy: Average pellet transect data indicates that occupancy has fluctuated over time, but has exhibited a decreasing trend overall. Mean abundance of elk pellet groups has ranged from under 6 days use/acre in 2015 to 78 days use/acre in 2000. Mean abundance of deer/pronghorn pellet groups has ranged from 1 days use/acre in 2005 to 15 days use/acre in 2000 (Figure 5.8).

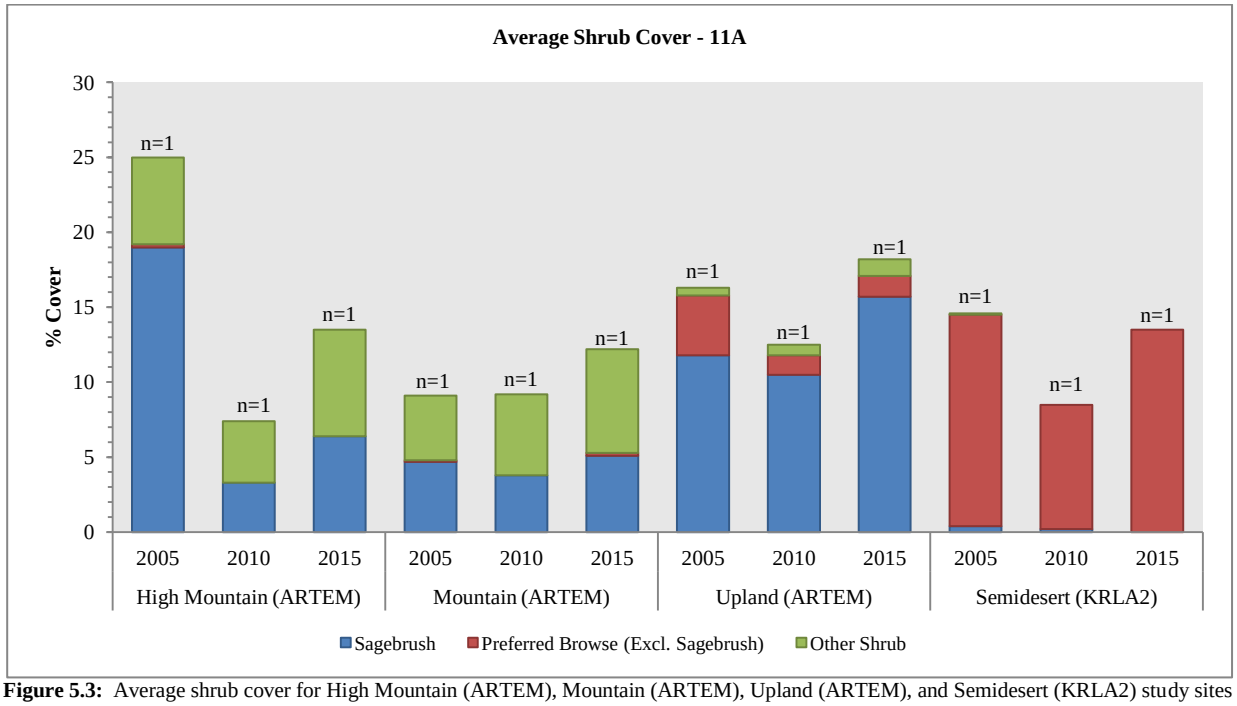


Figure 5.3: Average shrub cover for High Mountain (ARTEM), Mountain (ARTEM), Upland (ARTEM), and Semidesert (KRLA2) study sites in WMU 11A, Nine Mile, Anthro.

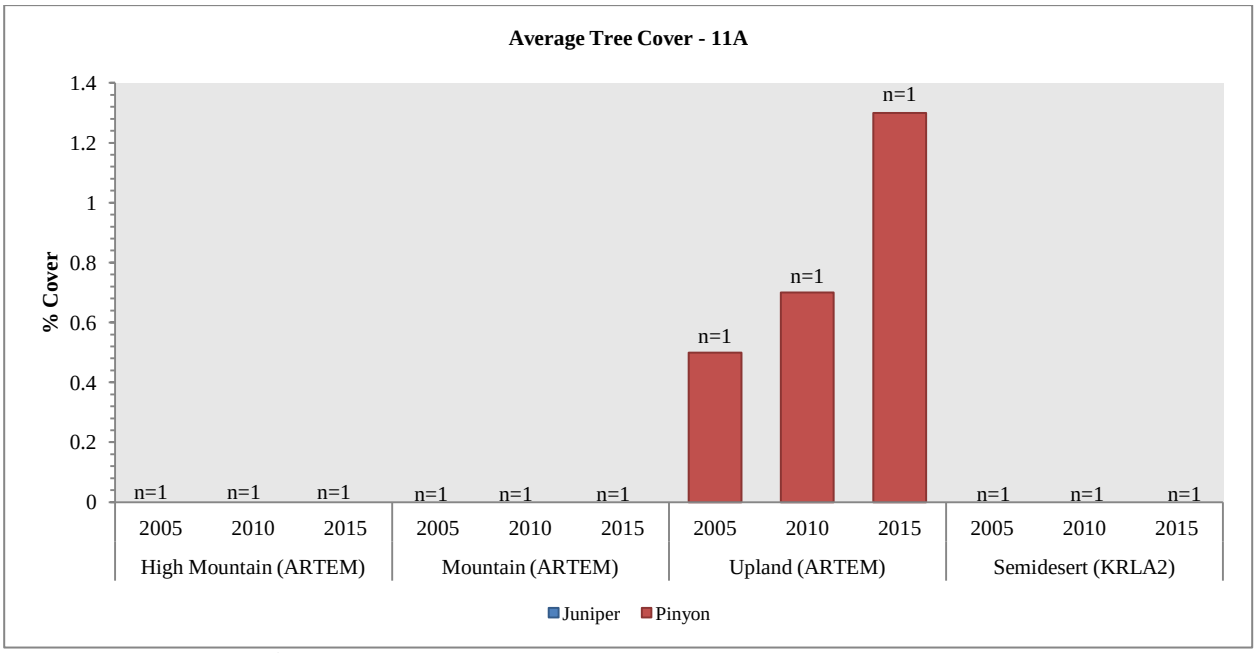


Figure 5.4: Average tree cover for High Mountain (ARTEM), Mountain (ARTEM), Upland (ARTEM), and Semidesert (KRLA2) study sites in WMU 11A, Nine Mile, Anthro.

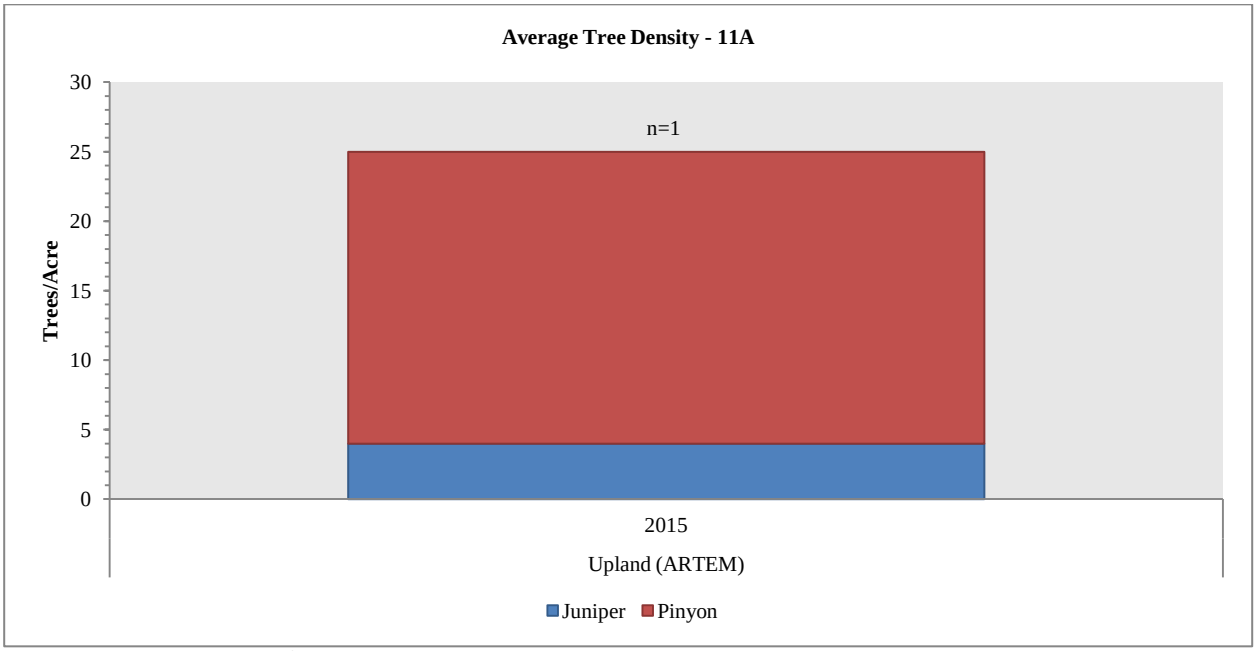


Figure 5.5: Average tree density for Upland (ARTEM) study sites in WMU 11A, Nine Mile, Anthro.

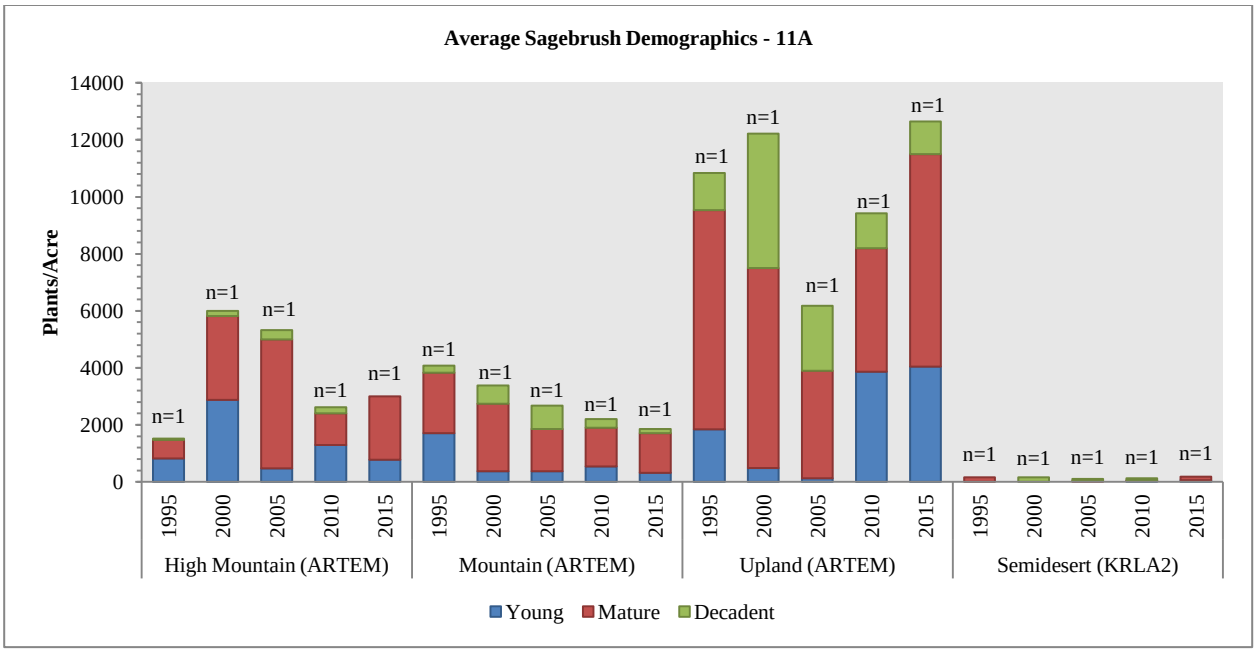


Figure 5.6: Average sagebrush demographics for High Mountain (ARTEM), Mountain (ARTEM), Upland (ARTEM), and Semidesert (KRLA2) study sites in WMU 11A, Nine Mile, Anthro.

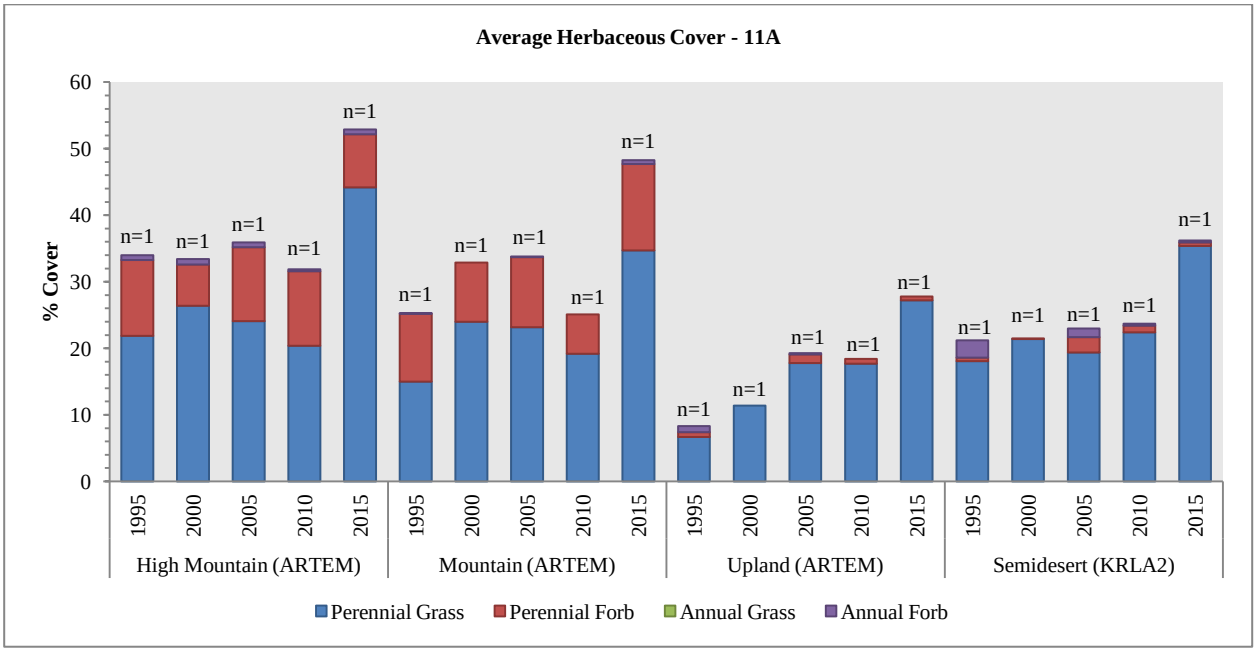


Figure 5.7: Average herbaceous cover for High Mountain (ARTEM), Mountain (ARTEM), Upland (ARTEM), and Semidesert (KRLA2) study sites in WMU 11A, Nine Mile, Anthro.

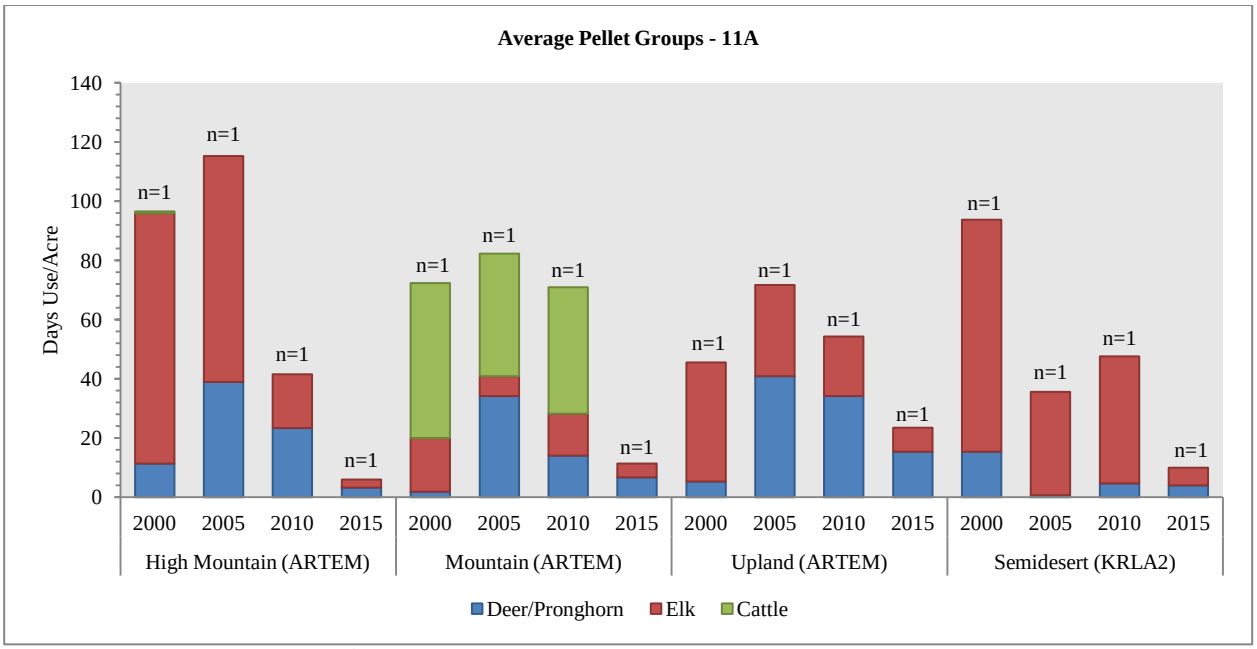
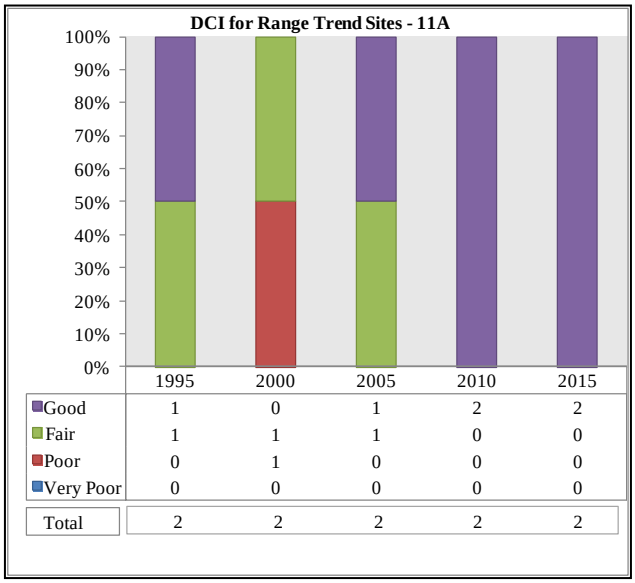


Figure 5.8: Average pellet transect data for High Mountain (ARTEM), Mountain (ARTEM), Upland (ARTEM), and Semidesert (KRLA2) sites in WMU 11A, Nine Mile, Anthro.

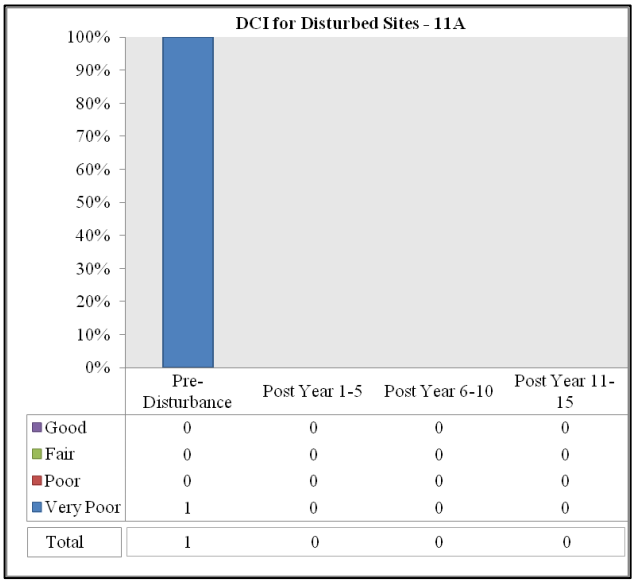
Deer Winter Range Condition Assessment

The condition of deer winter range Nine Mile, Anthro management unit has continually changed on the sites sampled since 1995. All of the Range Trend study sites (Cottonwood Canyon and Nutter's Canyon) are considered to be in good condition as of the 2015 sample year (Map 5.12, Figure 5.9). The single treated study site, Big Wash, was sampled before treatment and is in very poor condition (Map 5.12, Figure 5.10). It is possible given a treatment, more time, and continual monitoring that this site will improve.



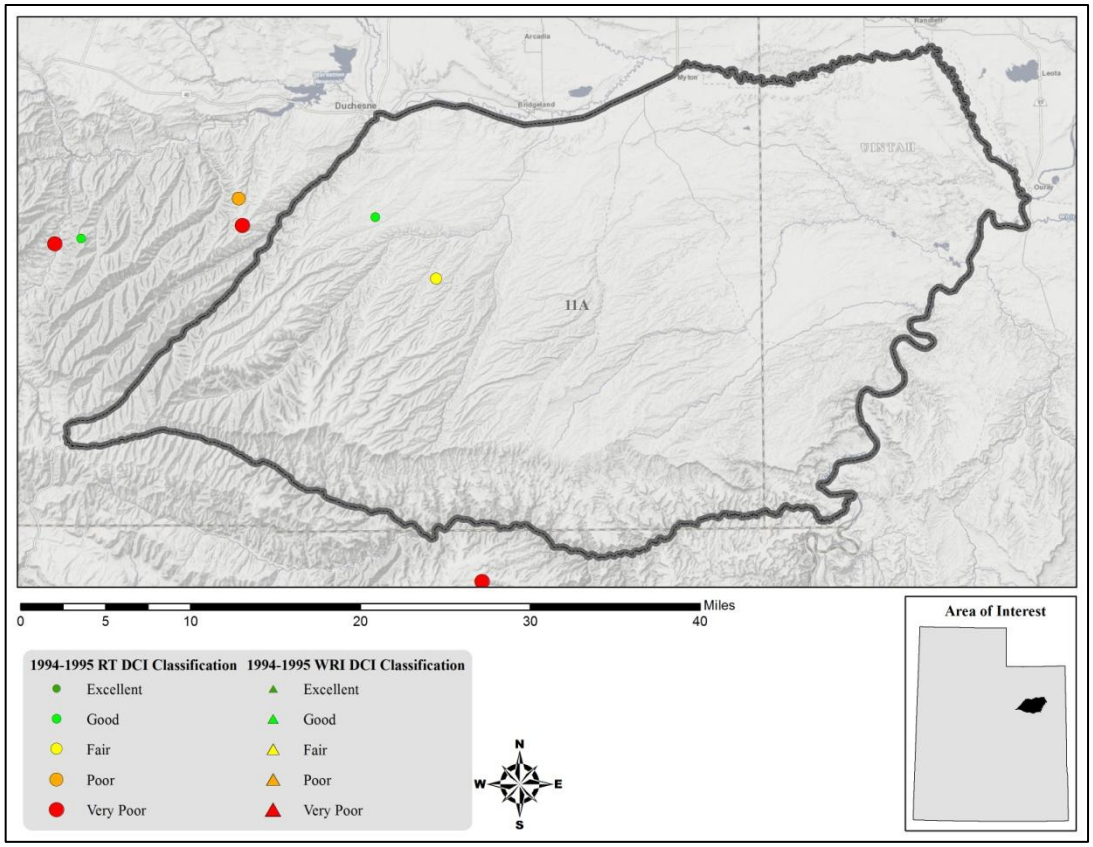
	1995	2000	2005	2010	2015
Good	1	0	1	2	2
Fair	1	1	1	0	0
Poor	0	1	0	0	0
Very Poor	0	0	0	0	0
Total	2	2	2	2	2

Figure 5.9: Deer winter range Desirable Components Index (DCI) summary by year of undisturbed sites for WMU 11A, Nine Mile, Anthro.

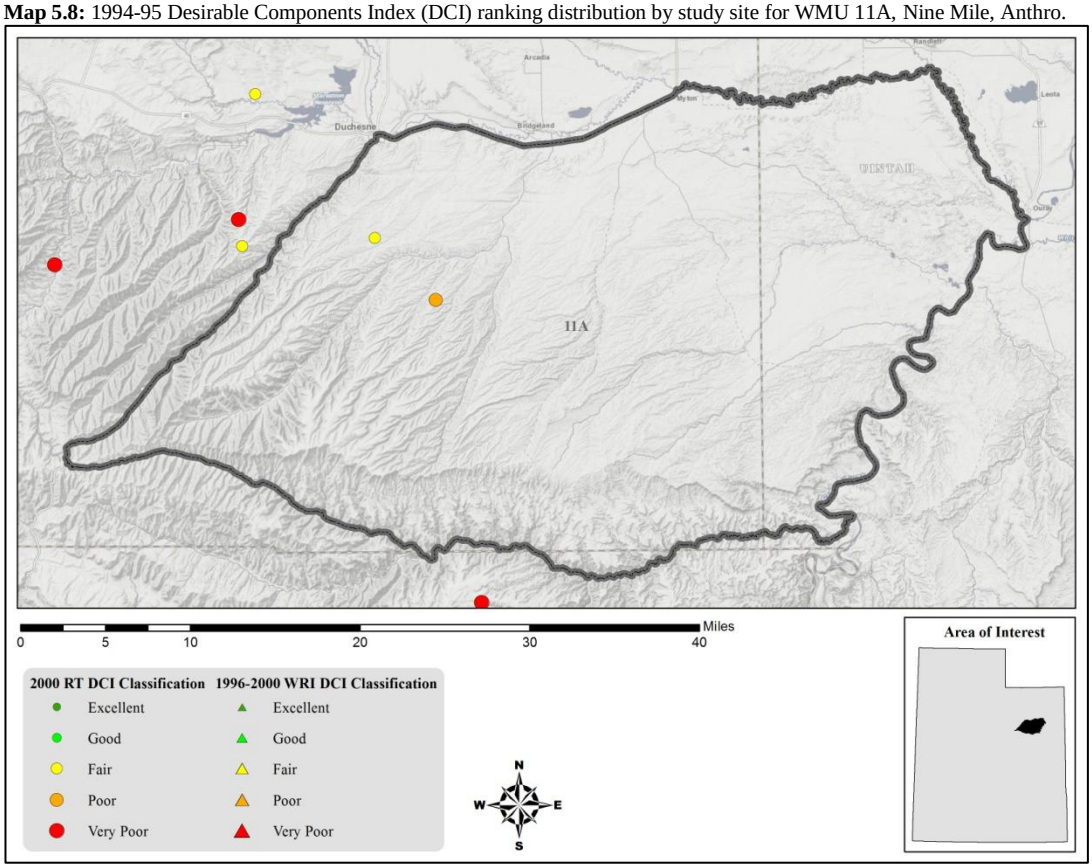


	Pre-Disturbance	Post Year 1-5	Post Year 6-10	Post Year 11-15
Good	0	0	0	0
Fair	0	0	0	0
Poor	0	0	0	0
Very Poor	1	0	0	0
Total	1	0	0	0

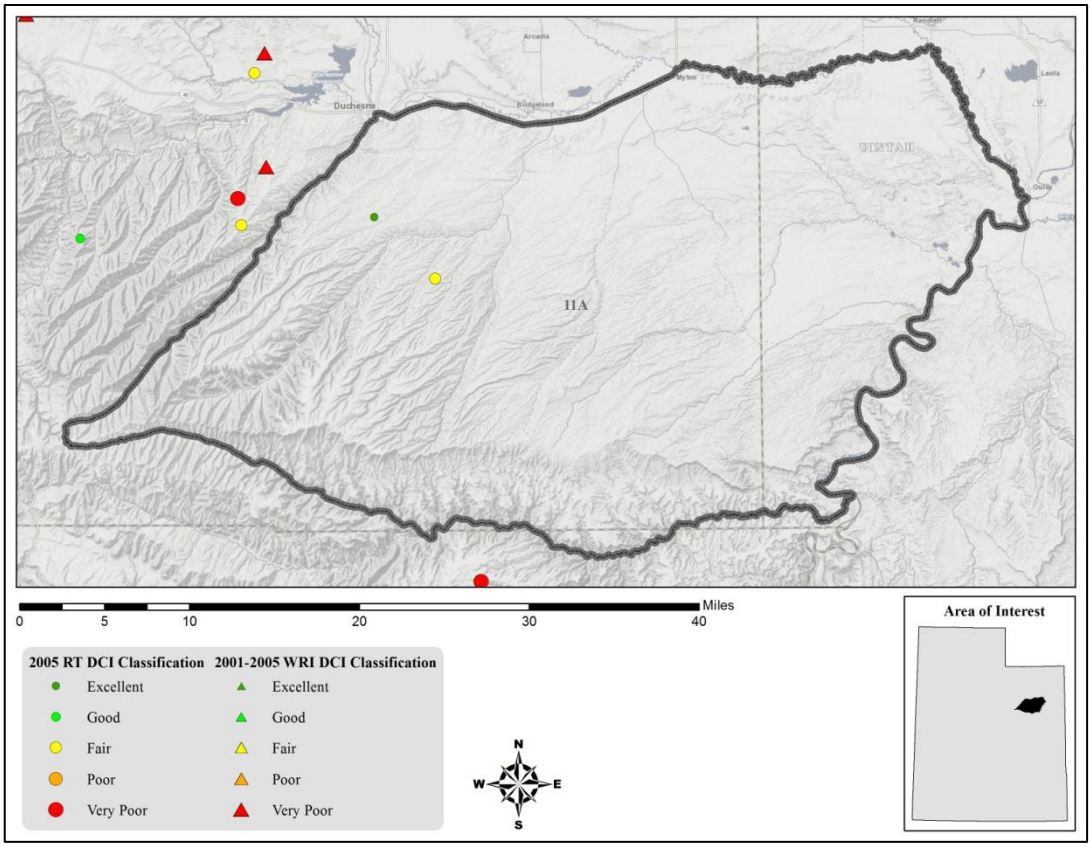
Figure 5.10: Deer winter range Desirable Components Index (DCI) summary by year of treated/disturbed sites for WMU 11A, Nine Mile, Anthro.



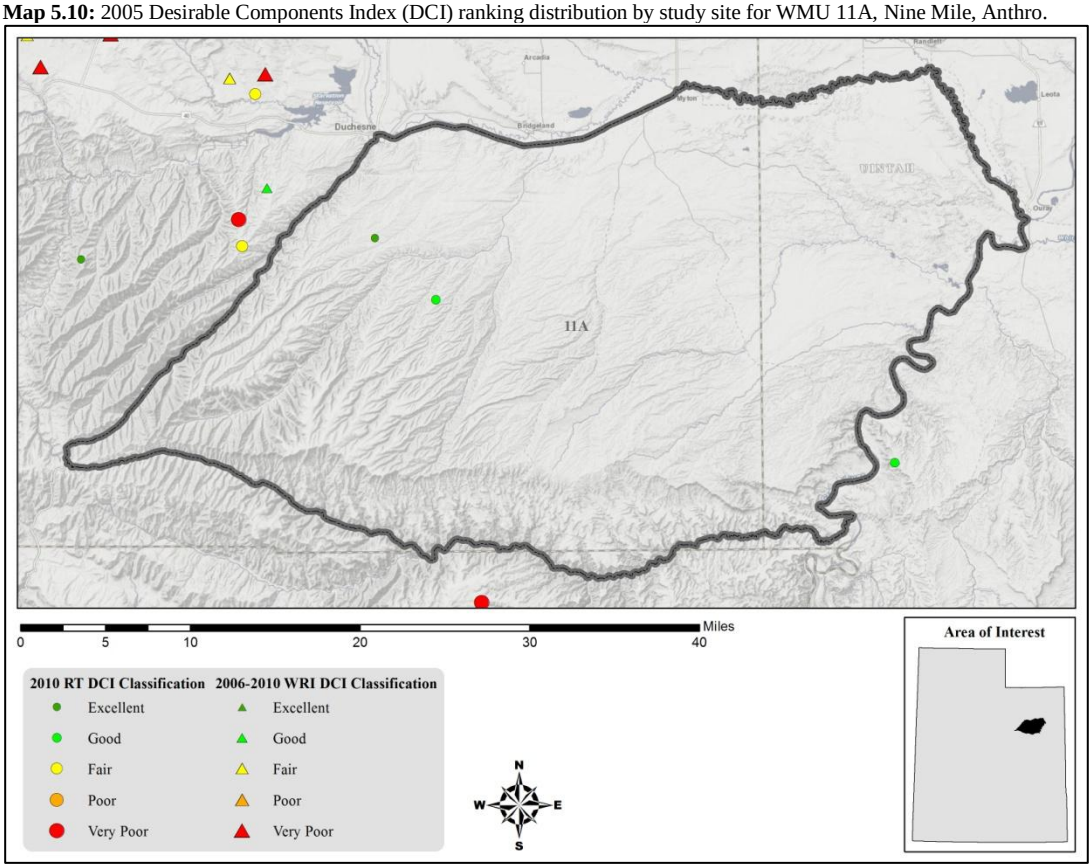
Map 5.8: 1994-95 Desirable Components Index (DCI) ranking distribution by study site for WMU 11A, Nine Mile, Anthro.



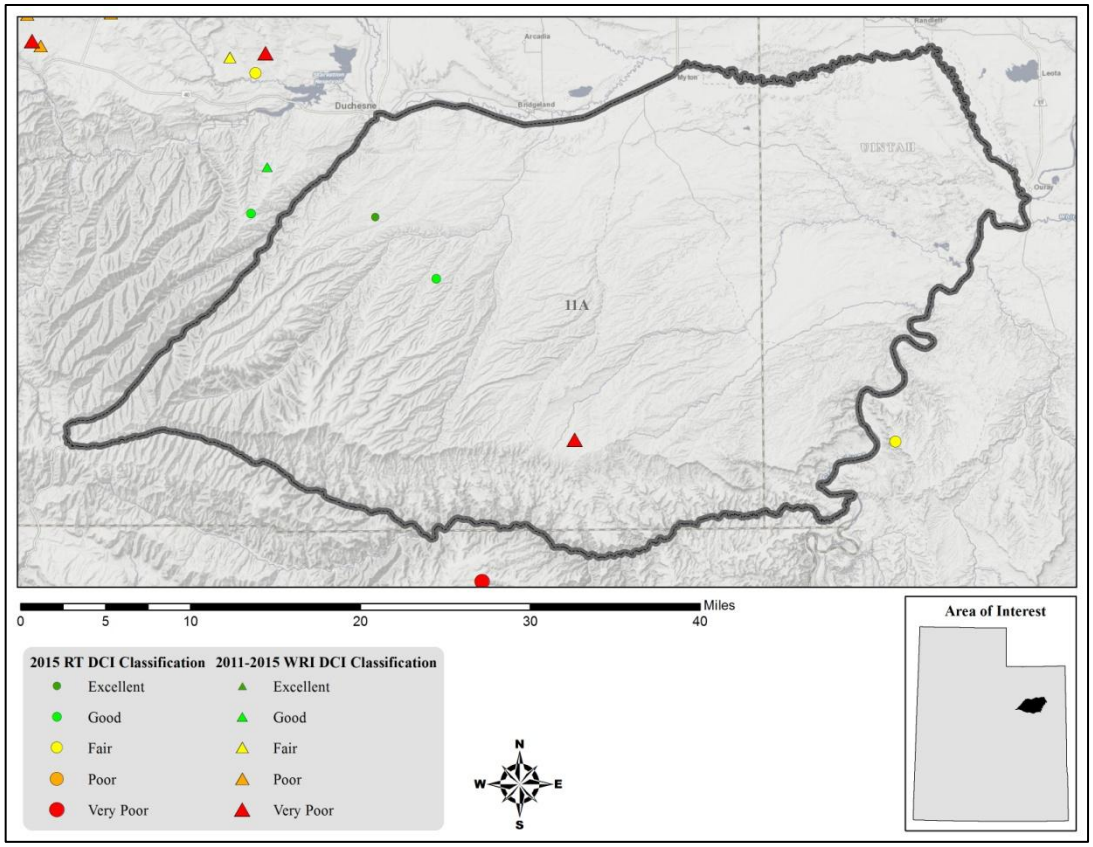
Map 5.9: 2000 Desirable Components Index (DCI) ranking distribution by study site for WMU 11A, Nine Mile, Anthro.



Map 5.10: 2005 Desirable Components Index (DCI) ranking distribution by study site for WMU 11A, Nine Mile, Anthro.



Map 5.11: 2010 Desirable Components Index (DCI) ranking distribution by study site for WMU 11A, Nine Mile, Anthro.



Map 5.12: 2015 Desirable Components Index (DCI) ranking distribution by study site for WMU 11A, Nine Mile, Anthro**.**

Study #	Study Name	Limiting Factor and/or Threat	Level of Threat	Potential Impact
11A-2	Wirefence Canyon	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species.
11A-3	Chokecherry Canyon	None Identified		
11A-4	Cottonwood Canyon	None Identified		
11A-5	Nutter's Canyon	Annual Grass	High	Increased fire potential.

Table 5.11: Assessment of the potential limiting factors and/or threats and level of threat to study sites for WMU 11A Nine Mile, Anthro. All assessments are based off of the most current sample date for each study site.

Discussion and Recommendations

High Mountain (Sagebrush)

This high elevation mountain ecological site supports a sagebrush community and is generally considered to be in good condition for the Nine Mile, Anthro management unit. This site supports a vigorous, mature stand of sagebrush that is crucial to wintering deer populations; however, the stand has the potential to increase in decadence and poor vigor, an event that can lead to reduced community structure and recruitment of young individuals. In addition, this community supports shrub, grass, and forb populations that provide valuable browse and forage in summer and transitional months. Perennial grasses and forbs are found frequently in the understory and are diverse.

It is recommended that when necessary, work to diversify the age structure of the sagebrush populations and promote community diversification (e.g. aerator, disc, harrow, etc.) begin or continue in this community. In higher potential communities, care should be taken when reseeding is necessary to restore herbaceous communities, and species selection and preference should be given to native grass and forbs when possible.

Mountain (Sagebrush)

This high elevation mountain ecological site supports a mountain big sagebrush community and is generally considered to be in moderate condition for big game summer range habitat on the Nine Mile, Anthro unit. This community supports robust grass and forb communities that provide valuable forage in summer and transitional months. While generally in moderate condition, introduced perennial grasses are often present in the herbaceous understory. Although providing valuable forage, these grass species can often be aggressive at higher elevations and can reduce the prevalence and abundance of other more desirable native grass and forb species.

It is recommended that monitoring of this community continue. When reseeding is necessary to restore herbaceous species, care should be taken in species selection, and preference should be given to native grass species when possible.

Upland (Sagebrush)

This mid elevation upland ecological site supports a black sagebrush community that is considered to be in good condition for deer winter range habitat on this management unit. These communities support robust shrub populations that provide valuable browse in mild and moderate winters. The herbaceous understory is in generally good condition with native grasses dominating the site. However, Utah juniper is encroaching on this site, an event which may reduce understory shrub and herbaceous health as the trees age.

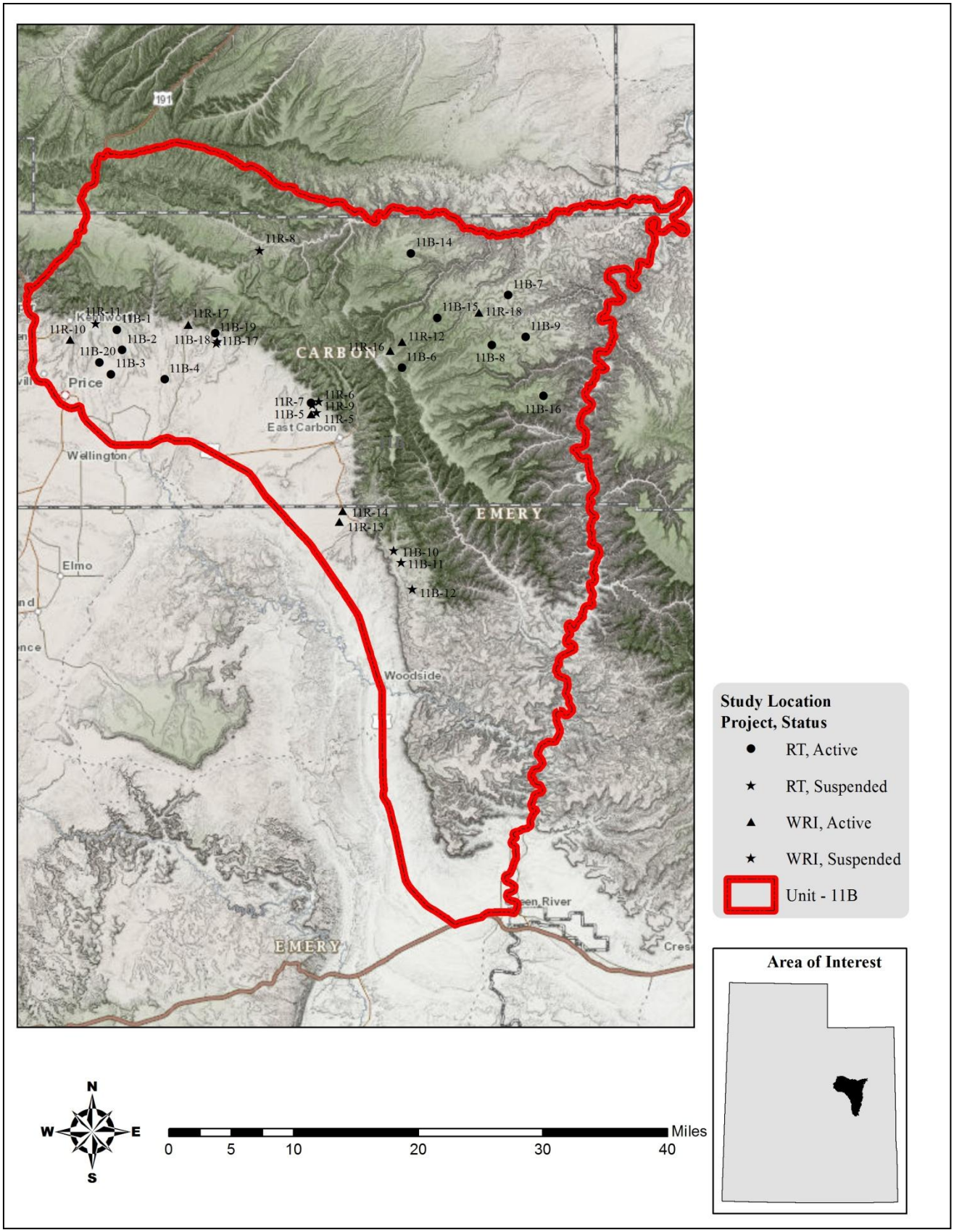
It is recommended that when and where necessary, work to reduce pinyon-juniper encroachment (e.g. bullhog, chaining, lop and scatter, etc.) should begin in these communities. When reseeding is necessary to restore herbaceous species, care should be taken in species selection, and preference should be given to native grass species when possible.

Semidesert (Winterfat)

This lower elevation semidesert ecological site supports a winterfat community that is generally considered to be in good condition for deer winter range habitat on the Nine Mile, Anthro management unit. This site supports shrub and grass communities that provide valuable browse and forage in moderate to severe winters. These communities have the potential to experience encroachment from juniper trees, an event that can reduce understory shrub and herbaceous cover if not addressed. Although no annual grasses have been observed on this site, these communities can be susceptible to invasion from annual grasses, primarily cheatgrass. Increased amounts of cheatgrass can increase fuel loads and increase the threat of wildfire on within these communities.

It is recommended that work to reduce juniper encroachment (e.g. bullhog, chaining, lop and scatter, etc.) should continue in this community. Care should be taken in selecting treatment methods that will not increase annual grass cover. If a treatment to rejuvenate sagebrush occurs, care should again be taken in selecting treatment methods that will not increase annual grass loads. Treatments to reduce annual grass may be necessary on this site.

6. WILDLIFE MANAGEMENT UNIT 11B – NINE MILE, RANGE CREEK



WILDLIFE MANAGEMENT UNIT 11B – NINE MILE, RANGE CREEK

Boundary Description

> **Carbon, Duchesne, and Emery Counties** - Boundary begins at Green River and Interstate 70; then west on I-70 to Highway US-6; northwest on US-6 to US-191; northeast on US-191 to Argyle Canyon road; southeast on Argyle Canyon road to Nine-Mile Canyon road; east on Nine-Mile Canyon road to its end near Bull Canyon; continuing along Nine-Mile Creek to the Green River; south along the Green River to I-70 and beginning point.

Management Unit Description

Geography

The Nine Mile, Range Creek unit 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 on 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 east side, and Pace, Whitmore, and Horse Canyons. Elevation ranges from 4,064 feet at Green River to 10,285 feet on Bruin Point. Communities within the unit include Helper, Price, Wellington, Sunnyside, East Carbon, and Green River.

Climate Data

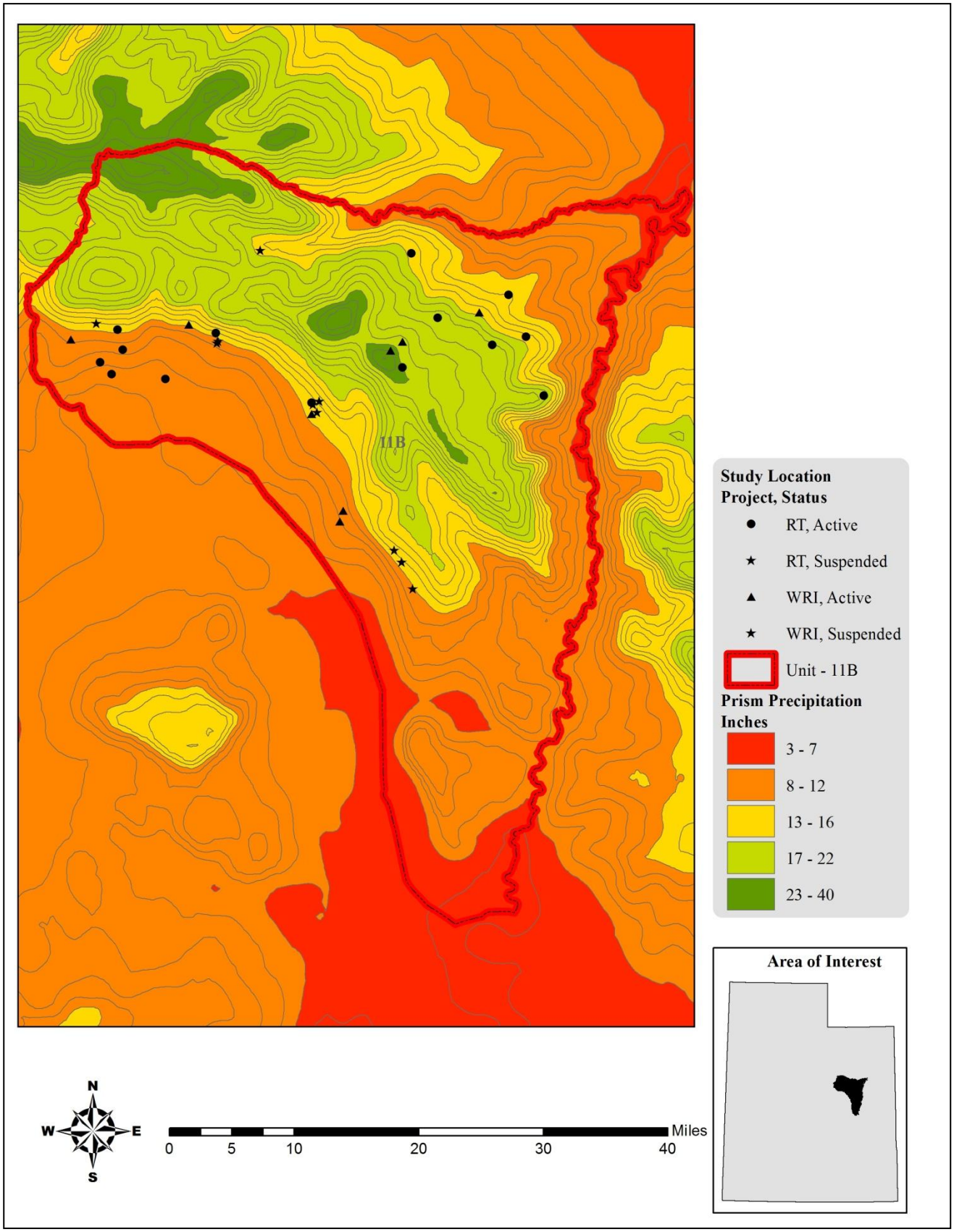
The 30 year (1981-2010) annual precipitation PRISM model shows precipitation ranges on the unit from 7 inches along portions of the Green River to 25 inches along Argyle Ridge. All of the Range Trend and WRI monitoring studies on the unit occur within 9-23 inches of precipitation (Map 6.1) (PRISM Climate Group, Oregon State University).

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, Uinta Basin, and Southeast divisions (Divisions 5, 6, and 7). The mean annual PDSI of the Northern Mountains division displayed years of moderate to extreme drought from 1988-1990, 2000-2003, and 2012-2013. The mean annual PDSI displayed moderately to extremely wet years from 1982-1986, 1995, 1997-1998, 2005, and 2011 (Figure 6.1a). The mean spring (March-May) PDSI displayed years of moderate to extreme drought in 1989-1990, 1992, 2000-2004, and 2012-2014; moderately to extremely wet years were displayed in 1982-1986, 1995-1996, 1998-1999, 2005, and 2011. The mean fall (Sept.-Nov.) PDSI displayed years of moderate to extreme drought in 1982-1986, 1995, 1997-1998; moderately to extremely wet years were displayed in 1982-1986, 1995, and 1997-1998 (Figure 6.1b).

The mean annual PDSI of the Uinta Basin division displayed years of moderate to extreme drought from 1989-1991, 2000, 2002-2003, and 2012-2015. The mean annual PDSI displayed moderately to extremely wet years from 1982-1985, 1993, 1997-1998, and 2005. The mean spring (March-May) PDSI displayed years of moderate to extreme drought in 1989-1992, 2002-2004, and 2012-2015. Moderately to extremely wet years for this time period were displayed in 1983-1985, 1993, 1995, 1998, 2005, and 2011 (Figure 6.2a). The mean fall (Sept.-Nov.) PDSI displayed years of moderate to extreme drought in 1989-1990, 2001-2003, 2007, and 2012; moderately to extremely wet years were displayed in 1982-1986, 1993, and 1997-1998 (Figure 6.2b).

The mean annual PDSI of the Southeast division displayed years of moderate to extreme drought from 1989-1990, 2002-2003, 2009, and 2012. The mean annual PDSI displayed moderately to extremely wet years from 1983-1985 and 2005 (Figure 6.3a). The mean spring (March-May) PDSI displayed moderate to extreme

drought in 1989-1991, 1996, 2002-2004, and 2012-2013; moderately to extremely wet years were displayed in 1983-1985, 1993, and 2005. The mean fall (Sept.-Nov.) PDSI displayed years of moderate to extreme drought in 1989-1990, 2002-2003, 2009, and 2012; moderately to extremely wet years were displayed in 1983-1985, 1997, and 2013 (Figure 6.3b) (Time Series Data, 2016).



Map 6.1: The 1981-2010 PRISM Precipitation Model for WMU 11B, Nine Mile, Range Creek (PRISM Climate Group, Oregon State University, 2016).

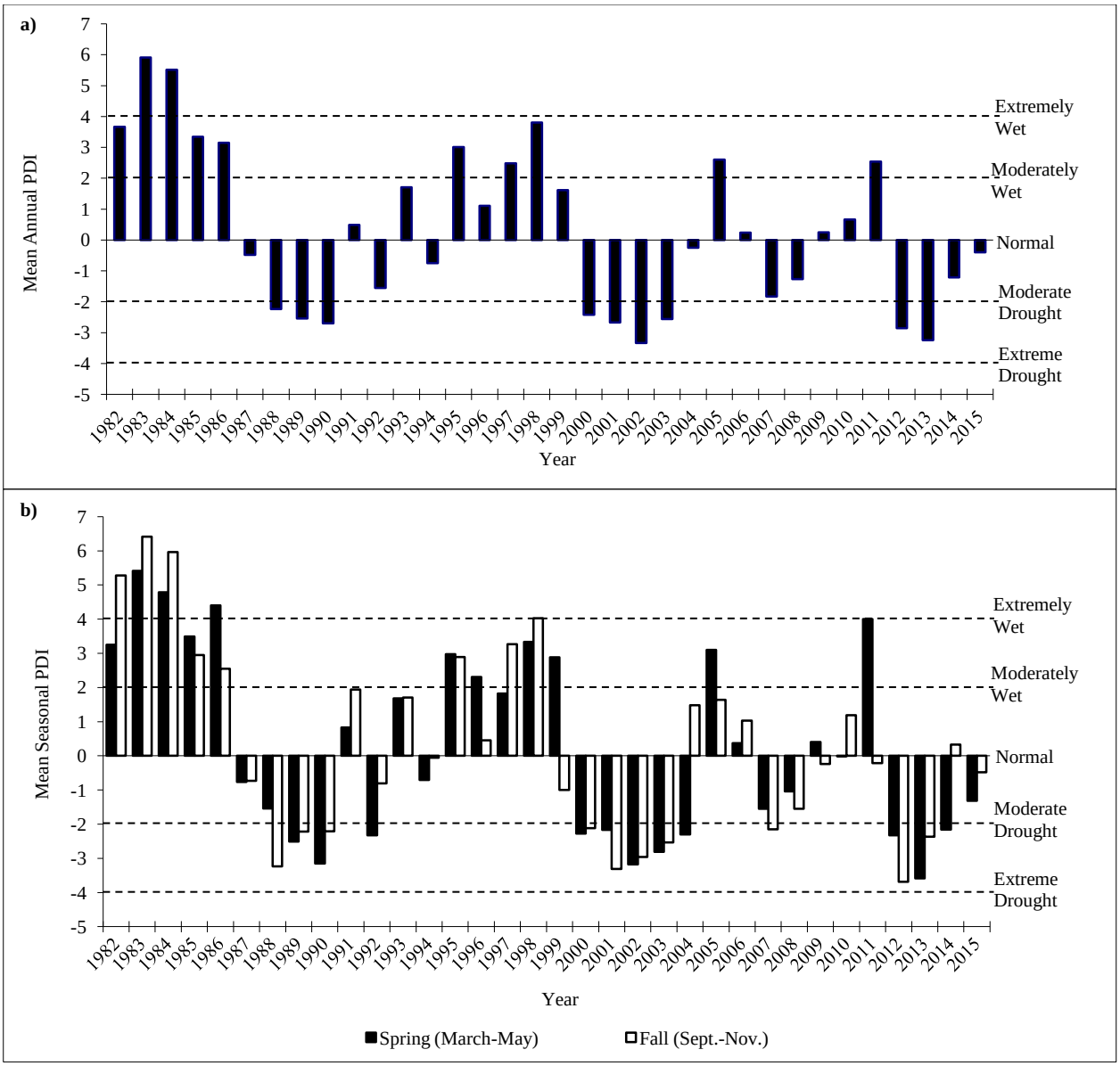


Figure 6.1: The 1982-2015 Palmer Drought Severity Index (PDSI) for the Northern Mountains division (Division 5). The PDSI is based on climate data gathered from 1895 to 2015. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet and negative deviations indicate drought. Classification of the scale is ≥4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to2.9 = 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 -.9 = Incipient Dry Spell, -1.0 to -1.9 = Mild Drought, -2.0 to -2.9 = Moderate Drought, -3.0 to -3.9 = Severe Drought and ≤-4.0 = Extreme Drought (Time Series Data 2014). a) Mean annual PDSI. b) Mean spring (March-May) and fall (Sept.-Nov.).

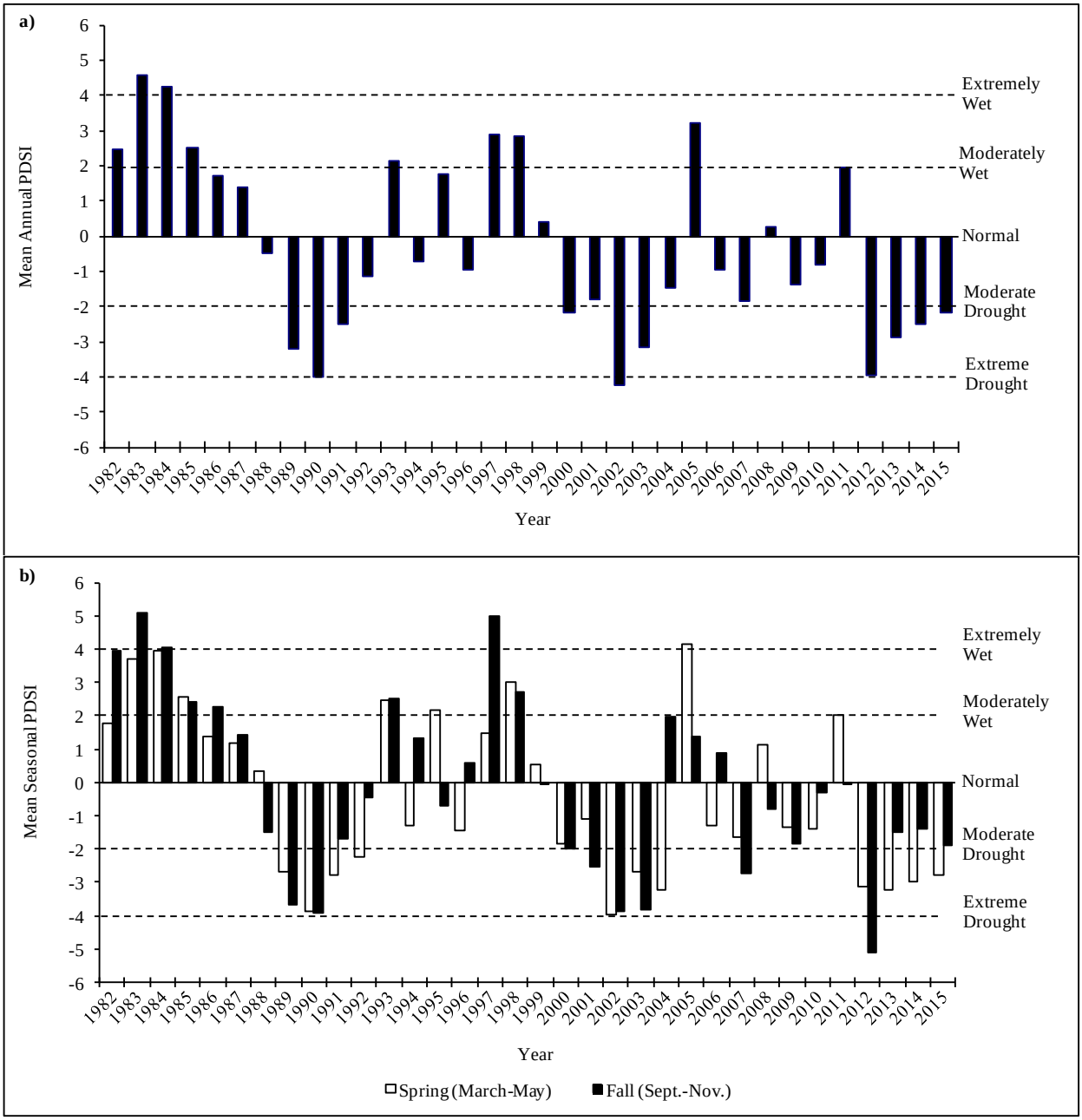


Figure 6.2: The 1982-2015 Palmer Drought Severity Index (PDSI) for the Uinta Basin division (Division 6). The PDSI is based on climate data gathered from 1895 to 2014. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet and negative deviations indicate drought. Classification of the scale is ≥4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to2.9 = 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 -.9 = Incipient Dry Spell, -1.0 to -1.9 = Mild Drought, -2.0 to -2.9 = Moderate Drought, -3.0 to -3.9 = Severe Drought and ≤-4.0 = Extreme Drought (Time Series Data 2014). a) Mean annual PDSI. b) Mean spring (March-May) and fall (Sept.-Nov.) (Time Series Data, 2016).

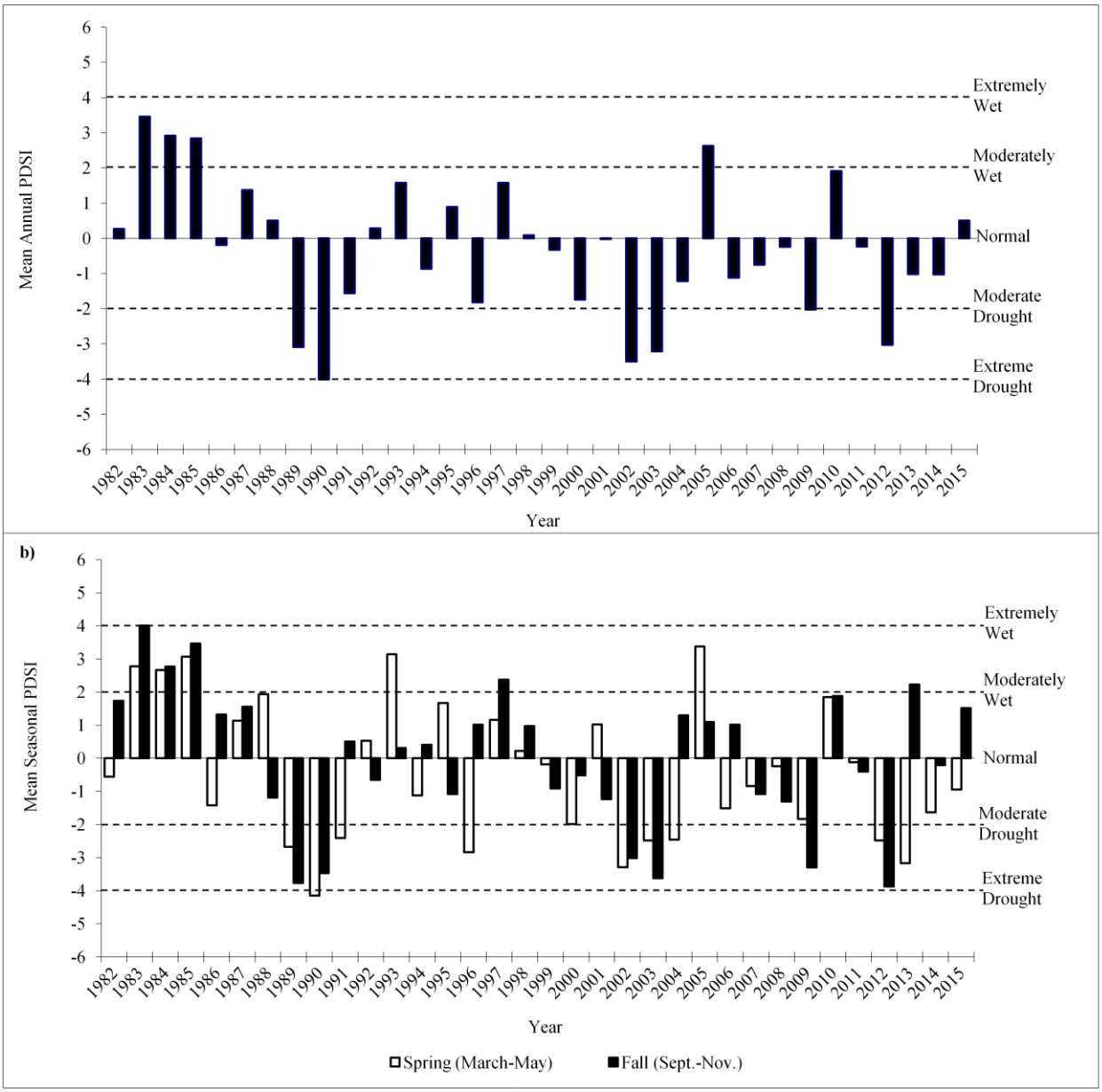
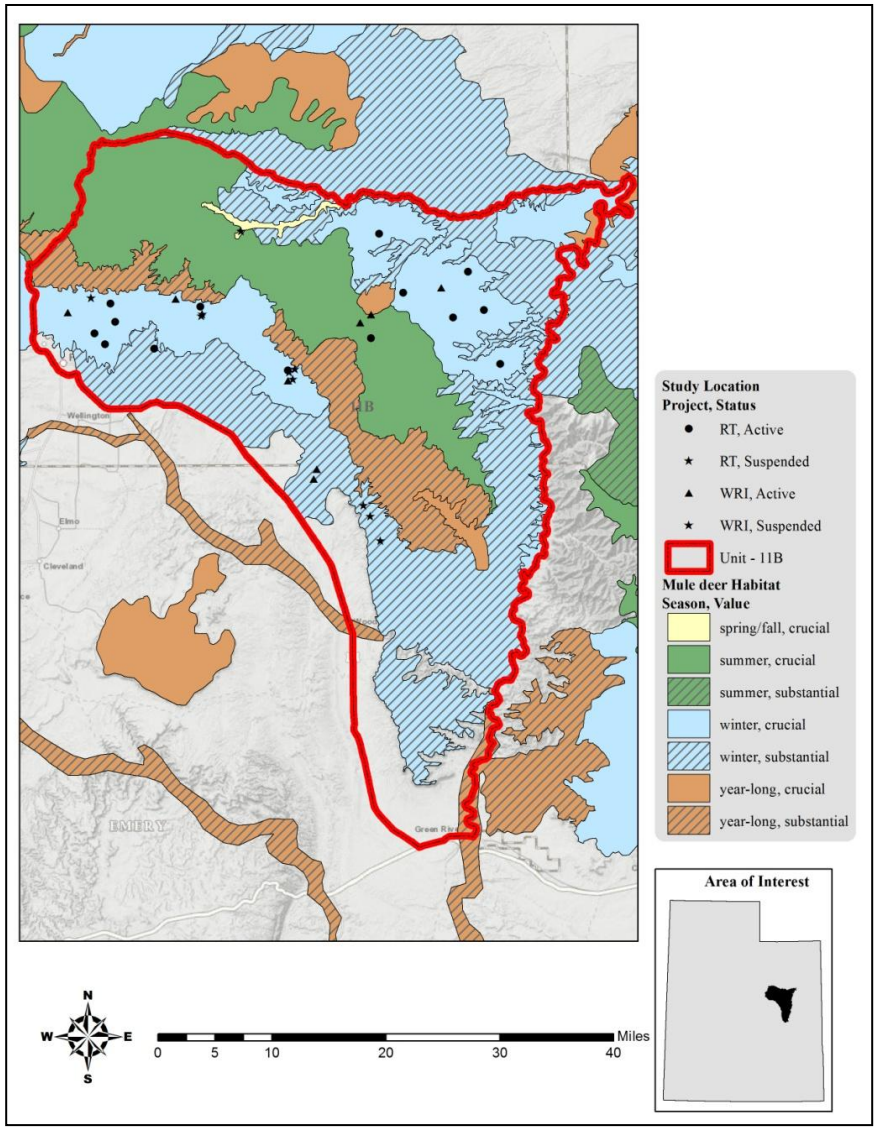


Figure 6.3: The 1982-2015 Palmer Drought Severity Index (PDSI) for the Southeast division (Division 7). The PDSI is based on climate data gathered from 1895 to 2014. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet and negative deviations indicate drought. Classification of the scale is ≥4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to2.9 = 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 -.9 = Incipient Dry Spell, -1.0 to -1.9 = Mild Drought, -2.0 to -2.9 = Moderate Drought, -3.0 to -3.9 = Severe Drought and ≤-4.0 = Extreme Drought (Time Series Data 2014). a) Mean annual PDSI. b) Mean spring (March-May) and fall (Sept.-Nov.) (Time Series Data, 2016).

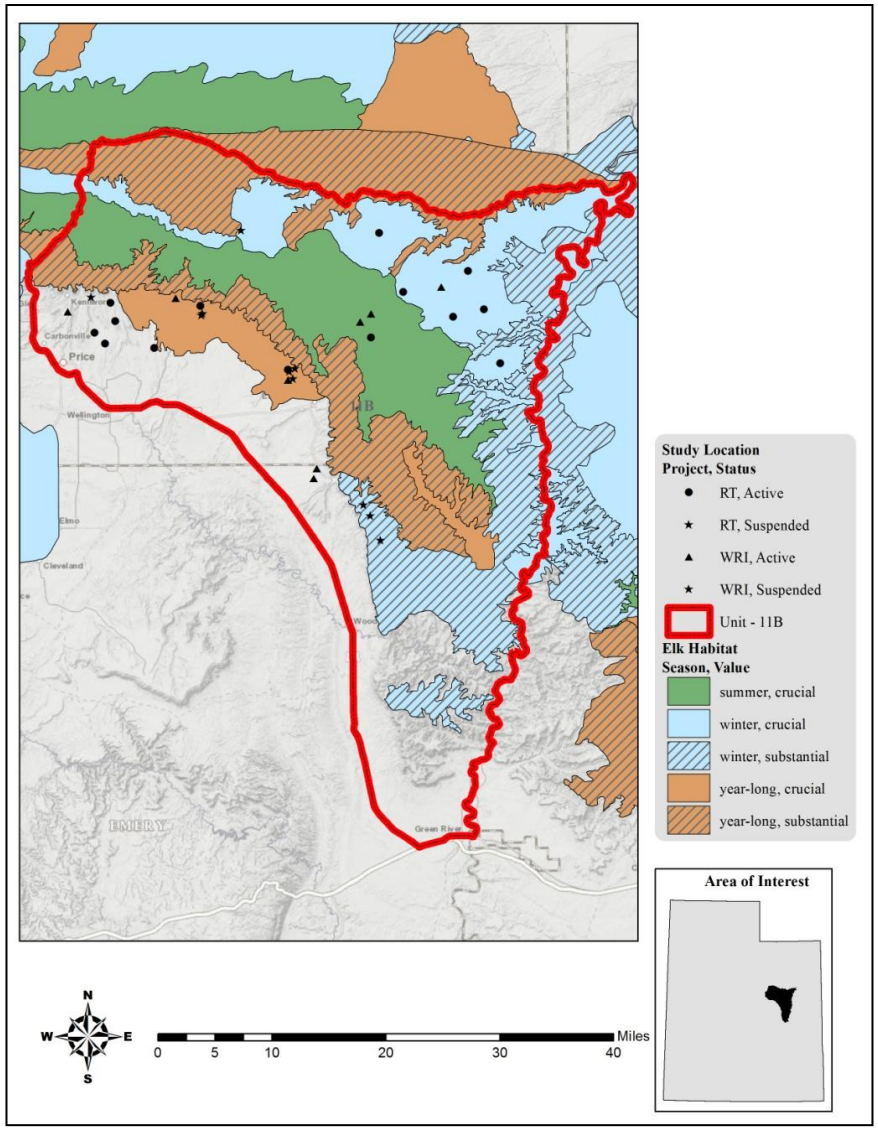
Big Game Habitat

There are an estimated 881,000 acres classified as deer range on Unit 11B with 44% classified as winter range, 24% as summer range, 14% as year-long range, and 1% is classified as spring/fall range. Bureau of Land Management (BLM)-managed land comprises 78% of the winter range, 13% is privately owned, the Utah School and Institutional Trust Lands Administration (SITLA) administrates 9%, and less than 1% is tribal-owned land. (Map 6.2, Map 6.5, Table 6.2). Of the elk winter range, 83% is administered by the BLM, 9% by SITLA, 8% is privately owned, and less than 1% is tribal land (Map 6.3, Map 6.5, Table 6.3). The unit presents several challenges to public land and wildlife managers. A majority of the summer range is on private land and hunting access is therefore limited. Some of the ranches are privately managed for trophy hunting.

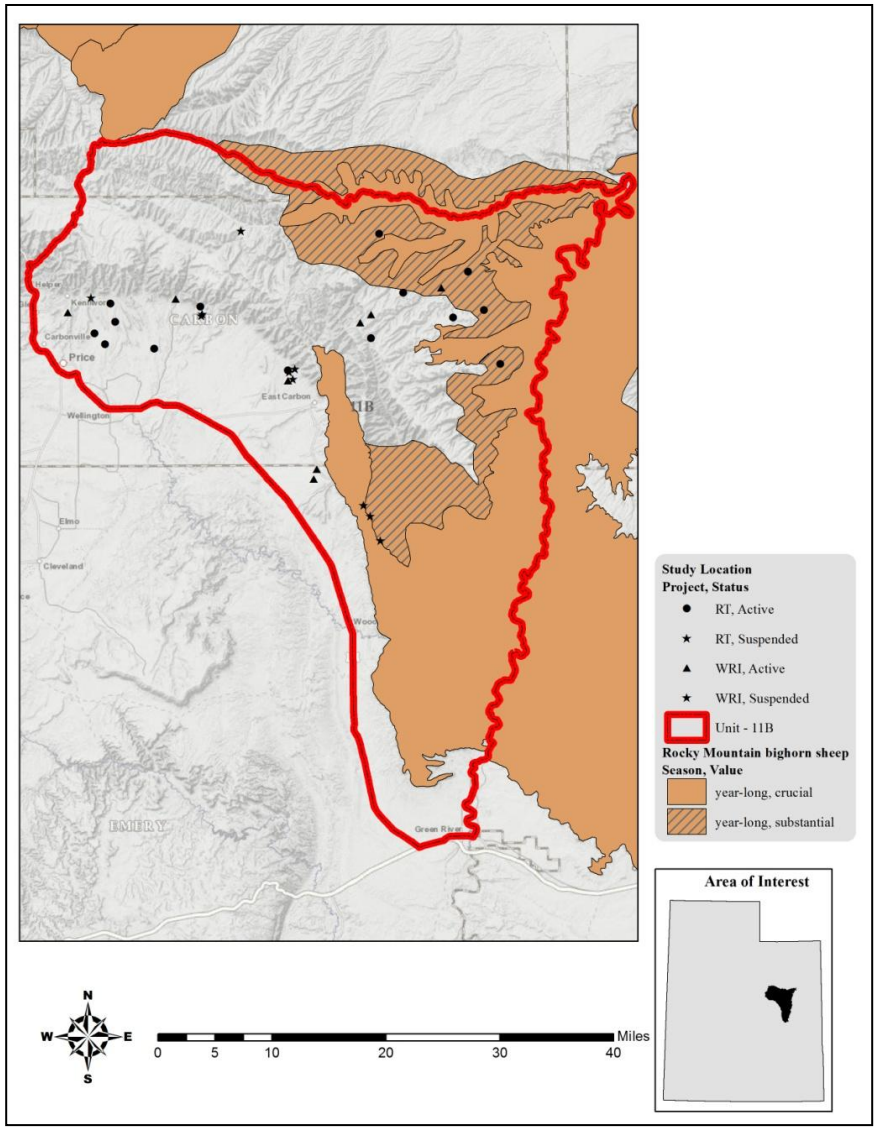
Normal winter range below 8,500 feet also completely encompasses the summer range. Severe winter range is limited to areas below 7,000 feet. On the east side of the unit, steep bare slopes limit use to the ridge tops and canyon bottoms along lower Nine-Mile Creek and the Green River. During severe winters, 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 east to Horse Canyon, 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 include Nine Mile Creek, Rock House Cow Camp area, Argyle Canyon, and Little Park.



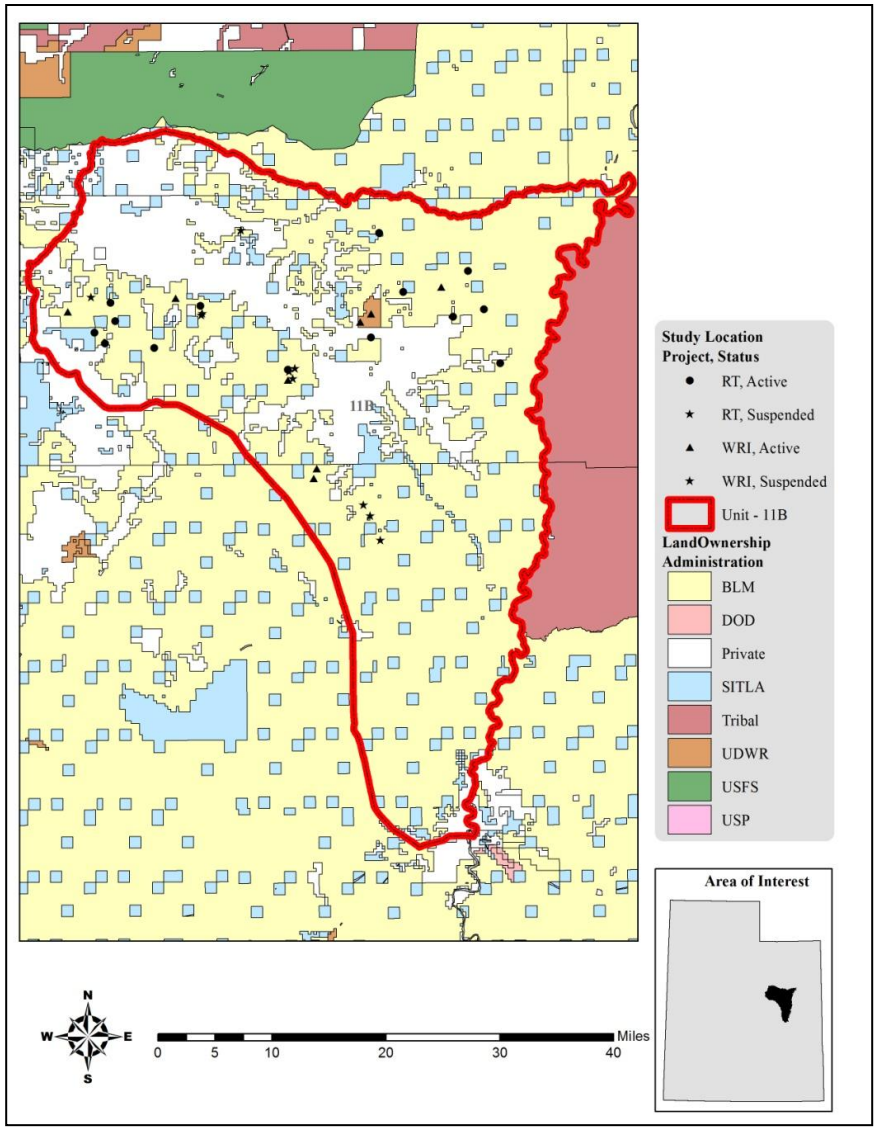
Map 6.2: Estimated mule deer habitat by season and value for WMU 11B, Nine Mile, Range Creek.



Map 6.3: Estimated elk habitat by season and value for WMU 11B, Nine Mile, Range Creek.



Map 6.4: Estimated Rocky Mountain bighorn sheep habitat by season and value for WMU 11B, Nine Mile, Range Creek.



Map 6.5: Land ownership for WMU 11B, Nine Mile, Range Creek.

	Year Long Range		Summer Range		Winter Range		Spring/Fall	
	Area (acres)	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
Mule Deer	121,536	14%	208,937	24%	541,523	61%	9,205	1%
Elk	247,983	35%	160,623	22%	304,038	43%	0	0%
Moose	0	0%	0	0%	132,695	100%	0	0%
Pronghorn	144,181	100%	0	0%	0	0%	0	0%
RMBS	453808	100%	0	0%	0	0%	0	0%

Table 6.1: Estimated mule deer, elk, moose, pronghorn, and Rocky Mountain bighorn sheep habitat acreage by season for WMU 11B, Nine Mile, Range Creek.

	Year Long Range		Summer Range		Winter Range		Spring/Fall	
Ownership	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
BLM	65,086	53%	43,236	21%	421,446	78%	3,019	33%
Private	40,814	34%	148,905	71%	70,635	13%	5,743	62%
SITLA	14,205	12%	15,265	7%	49,426	9%	444	5%
Tribal	0	0%	0	0%	16	<1%	0	0%
UDWR	1,159	1%	1,531	1%	0	0%	0	0%
SL&F	220	<1%	0	0%	0	0%	0	0%
USP	53	<1%	0	0%	0	0%	0	0%
USFS	0	0%	0	0%	0	0%	0	0%
Total	121,536	**100%**	208,937	**100%**	541,523	**100%**	9,205	**100%**

Table 6.2: Estimated mule deer habitat acreage by season and ownership for WMU 11B, Nine Mile, Range Creek.

	Year Long Range		Summer Range		Winter Range	
Ownership	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
BLM	126,753	51%	42,629	26%	253,366	83%
Private	92,911	38%	107,294	67%	24,121	8%
SITLA	28,319	11%	8,010	5%	26,529	9%
Tribal	0	0%	0	0%	22	<1%
UDWR	0	0%	2,689	2%	0	0%
Total	247,983	**100%**	160,623	**100%**	304,038	**100%**

Table 6.3: Estimated elk habitat acreage by season and ownership for WMU 11B, Nine Mile, Range Creek.

	Winter Range	
Ownership	*Area (acres)*	*%*
BLM	29,035	22%
Private	93,037	70%
SITLA	10,623	8%
Total	132,695	**100%**

Table 6.4: Estimated moose habitat acreage by season and ownership for WMU 11B, Nine Mile, Range Creek.

	Year Long Range	
Ownership	*Area (acres)*	*%*
BLM	102,013	71%
Private	26,126	18%
SITLA	15,848	11%
SL&F	161	<1%
UDOT	10	<1%
USP	24	<1%
Total	144,181	**100%**

Table 6.5: Estimated pronghorn habitat acreage by season and ownership for WMU 11B, Nine Mile, Range Creek.

	Year Long Range	
Ownership	*Area (acres)*	*%*
BLM	373,218	82%
Private	36,090	8%
SITLA	44,478	10%
SL&F	1	0%
Tribal	22	0%
Total	453,808	**100%**

Table 6.6: Estimated Rocky Mountain bighorn sheep habitat acreage by season and ownership for WMU 11B, Nine Mile, Range Creek.

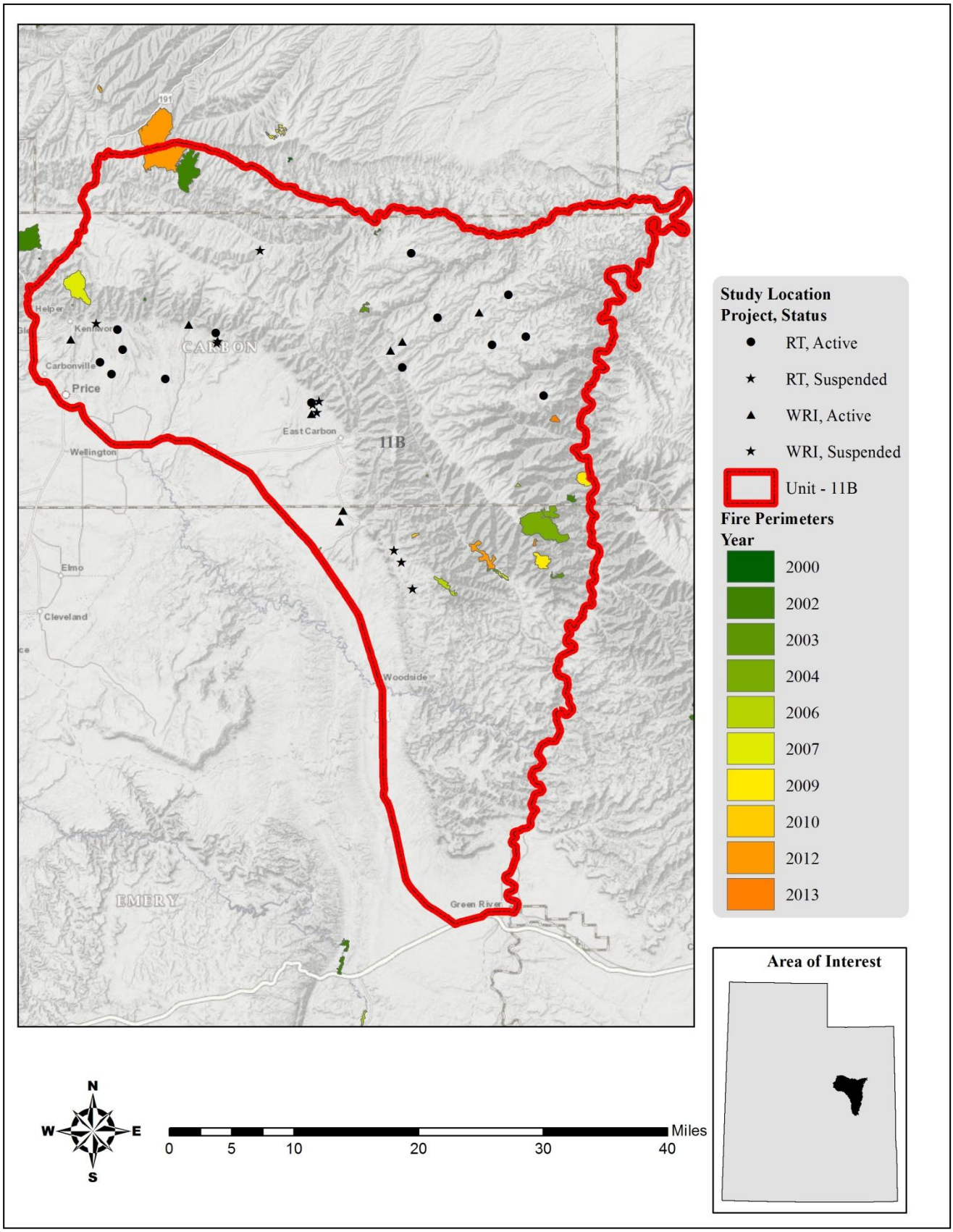
Group	Existing Vegetation Type	Acres	% of Total	Group % of Total
Conifer	Colorado Plateau Pinyon-Juniper Woodland	286,481	29.13%	
	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	46,240	4.70%	
	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	37,943	3.86%	
	Conifer-Hardwood	25,128	2.56%	
	Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland	9,772	0.99%	
	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	8,403	0.85%	
	Southern Rocky Mountain Ponderosa Pine Woodland	1,050	0.11%	
	Other Conifer	1,035	0.11%	42.31%
Exotic Herbaceous	Introduced Upland Vegetation-Annual Grassland	18,920	1.92%	1.92%
Exotic Tree-Shrub	Introduced Riparian Shrubland	1,778	0.18%	
	Introduced Riparian Forest and Woodland	23	0.00%	0.18%
Grassland	Inter-Mountain Basins Semi-Desert Grassland	6,530	0.66%	
	Rocky Mountain Subalpine-Montane Mesic Meadow	4,417	0.45%	
	Southern Rocky Mountain Montane-Subalpine Grassland	3,341	0.34%	
	Other Grassland	101	0.01%	1.46%
Shrubland	Inter-Mountain Basins Big Sagebrush Shrubland	130,679	13.29%	
	Inter-Mountain Basins Mixed Salt Desert Scrub	72,359	7.36%	
	Colorado Plateau Mixed Low Sagebrush Shrubland	43,683	4.44%	
	Inter-Mountain Basins Mat Saltbush Shrubland	38,401	3.91%	
	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	15,970	1.62%	
	Inter-Mountain Basins Montane Sagebrush Steppe	13,643	1.39%	
	Artemisia tridentata ssp. vaseyana Shrubland Alliance	13,331	1.36%	
	Rocky Mountain Lower Montane-Foothill Shrubland	9,761	0.99%	
	Coleogyne ramosissima Shrubland Alliance	7,817	0.79%	
	Inter-Mountain Basins Semi-Desert Shrub-Steppe	7,257	0.74%	
	Inter-Mountain Basins Greasewood Flat	6,808	0.69%	
	Great Basin Semi-Desert Chaparral	3,884	0.39%	
	Other Shrubland	1,405	0.14%	
	Southern Colorado Plateau Sand Shrubland	1,082	0.11%	37.23%
Other	Sparsely Vegetated	51,487	5.24%	
	Hardwood	42,242	4.30%	
	Barren	38,513	3.92%	
	Developed	13,426	1.37%	
	Riparian	11,910	1.21%	
	Agricultural	7,351	0.75%	
	Open Water	619	0.06%	
	Other	541	0.06%	16.89%
Total		983,331	100.00%	

Table 6.7: Landfire existing vegetation coverage (LANDFIRE: LANDFIRE 1.3.0, 2014) for WMU 11B, Nine Mile, Range Creek.

Limiting Factors to Big Game Habitat

Major human activities in the area include mining and grazing. Habitat degradation and loss, public land winter range availability, winter range forage condition, and landowner acceptance limit big game habitat in this unit. Encroachment by pinyon-juniper woodland communities poses a substantial threat to important sagebrush rangelands. According to current Landfire Existing Vegetation Coverage models, 29% of the Nine Mile, Range Creek unit is comprised of pinyon-juniper woodlands (Table 6.7). Encroachment and invasion of these woodlands into sagebrush communities has been shown to decrease sagebrush and herbaceous cover, therefore decreasing available wildlife forage (Miller, Svejcar, & Rose, 2000).

Deer fences and crossings limiting range are also a concern. However, cooperation with the Utah Department of Transportation in construction of highway fences, passage structures, warning signs, etc. will continue in order to ensure proper access to habitat as well as deer and human safety.

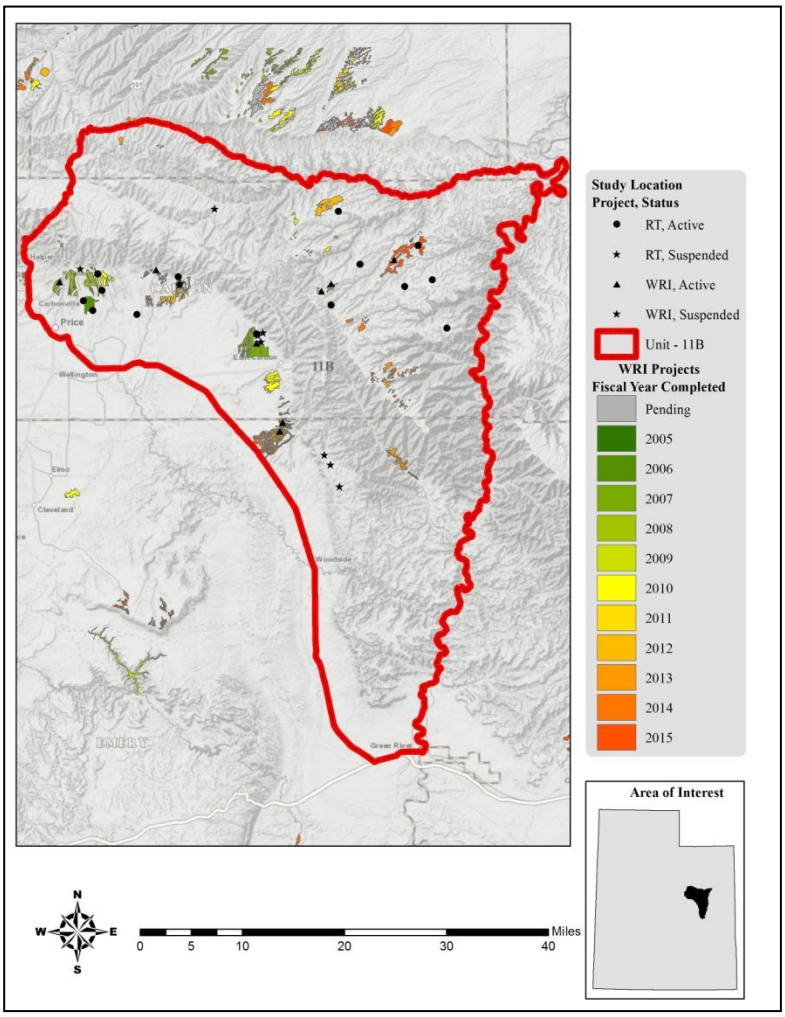


Map 6.6: Land coverage of fires by year from 2000-2013 for WMU 11B, Nine Mile, Range Creek.

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 17,887 acres of land have been treated within the Nine Mile, Range Creek unit since the WRI was implemented in 2004 (Map 6.7). Treatments frequently overlap one another bringing the total treatment acres to 18,340 acres for this unit (Table 6.8). Other treatments have occurred outside of the WRI through independent agencies and landowners, but the WRI comprises the majority of work done on deer winter ranges throughout the state of Utah.

Seeding to supplement the herbaceous understory is the most common management practice in this unit. Vegetation removal via hand crew is also very common. Other management practices include seeding desirable shrub species, bullhog use to remove twoneedle pinyon and Utah juniper, herbicide application to remove weeds, prescribed fire, harrow, and other similar vegetation removal techniques (Table 6.8).



Map 6.7: WRI treatments by fiscal year completed for WMU 11B, Nine Mile, Range Creek.

Treatment Action	Acres
Seeding (Primary)	9271
Vegetation Removal/Hand Crew	3253
Bullhog	2502
Herbicide Application	1521
Seeding (Secondary/Shrub)	867
Prescribed Fire	680
Mowing	107
Bulldozing	66
Harrow	57
Planting/Transplanting	16
Stream Corridor/Channel Improvements	0
Vegetation Improvements	0
***Total Land Area Treated**	17887
Total Treatment Acres	18340

Table 6.8: WRI treatment action size (acres) for WMU 11B, Nine Mile, Range Creek.

*Does not include overlapping treatments.

Range Trend Studies

Range Trend studies have been sampled within WMU 11B on a regular basis since 1986, with studies being added or suspended as was deemed necessary (Table 6.9). Due to changes in sampling methodologies, only data sampled 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 6.10).

Range Trend studies are summarized in this report by ecological site. Range Trend and WRI studies that have had a disturbance or treatment during the reported sample period are summarized in this report by the disturbance or treatment type and are summarized by region.

Study #	Study Name	Project	Status	Year(s) Sampled	Ecological Site Description
11B-1	Deadman	RT	Active	‘86, ‘94, ‘00, ‘05, ‘10, '15	Upland Stony Loam (Pinyon-Utah Juniper)
11B-2	Airport Bench	RT	Active	‘86, ‘94, ‘00, ‘05, ‘10, '15	Semidesert Loam (Wyoming Big Sagebrush)
11B-3	Airport	RT	Suspended	‘86,’94, ‘00, ‘05, ‘10	Not Verified
11B-4	Coal Creek	RT	Active	‘86, ‘94, ‘00, ‘05, ‘10	Semidesert Loam (Wyoming Big Sagebrush)
11B-5	‘B’ Canyon	RT	Active	‘86, ‘94, ‘00, ‘05, ‘10, '15	Upland Shallow Loam (Birchleaf Mountain Mahogany)
11B-6	Upper Cottonwood Ridge	RT	Active	‘86, ‘94, ‘00, ‘10, '15	High Mountain Loam (Aspen)
11B-7	Cottonwood	RT	Active	‘86, ‘94, ‘00, ‘05, ‘10, '15	Upland Loam (Wyoming big sagebrush)
11B-8	Cedar Corral	RT	Active	‘86, ‘94, ‘00, ‘05, ‘10, '15	Mountain Stony Loam (Browse)
11B-9	Cedar Ridge	RT	Active	‘86, ‘94, ‘00, ‘05, ‘10, '15	Mountain Shallow Loam (Black Sagebrush)
11B-10	Upper Little Park Wash	RT	Suspended	‘86, ‘94	Not Verified
11B-11	Little Park Exclosure	RT	Suspended	‘86, ‘94, ‘00	Not Verified
11B-12	Williams Draw	RT	Suspended	‘86, ‘94	Not Verified
11B-14	Prickly Pear	RT	Active	‘94, ‘00, ‘05, ‘10, '15	Upland Loam (Birchleaf Mountain Mahogany)
11B-15	Twin Hollow	RT	Active	‘94, ‘00, ‘05, ‘10, '15	Mountain Loam (Browse)
11B-16	Steer Ridge	RT	Active	‘94, ‘00, ‘05, ‘10, '15	Mountain Shallow Loam (Mountain Big Sagebrush)
11B-17	Dugout Creek Unchained	RT	Suspended	‘97, ‘05	Not Verified
11B-18	Dugout Creek Sagebrush Chaining	RT	Suspended	‘97, ‘05	Not Verified
11B-19	Dugout Creek PJ Chained	RT	Active	‘97, ‘05, ‘10, '15	Upland Stony Loam (Wyoming Big Sagebrush)
11B-20	Deadman Creek	RT	Active	15	Semidesert Loam (Wyoming Big Sagebrush)
11R-5	East Carbon Burn 1	RT	Suspended	‘97	Not Verified
11R-6	East Carbon Burn 2	RT	Suspended	‘97, ‘00, ‘05	Not Verified
11R-7	East Carbon Burn 3	RT	Suspended	‘97, ‘00, ‘05	Not Verified
11R-8	Nine Mile 1	RT	Suspended	‘97	Not Verified
11R-9	East Carbon Bullhog	WRI	Active	‘06, ‘10, ‘14	Upland Shallow Loam (Birchleaf Mountain mahogany)
11R-10	West Coal Creek Bullhog	WRI	Active	07,09,13	Upland Shallow Loam (Pinyon-Utah Juniper)
11R-11	West Coal Creek Reference	WRI	Suspended	09	Not Verified
11R-12	Burnt Cabin Spring	WRI	Active	12	High Mountain Loam (Aspen)
11R-13	Horse Canyon	WRI	Active	12, '15	Semidesert Shallow Loam (Birchleaf Mountain mahogany)
11R-14	Horse Canyon 2	WRI	Active	12	Semidesert loam (Wyoming Big Sagebrush)
11R-15	Big Wash	WRI	Active	13	Mountain Stony Loam (Black Sagebrush)
11R-16	Cold Springs WMA	WRI	Active	13	High Mountain Loam (Aspen)
11R-17	Dugout	WRI	Active	13	Upland Shallow Loam (Birchleaf Mountainmayhogany)
11R-18	Cottonwood Ridge	WRI	Active	15	Mountain Shallow Loam (Black Sagebrush)

Table 6.9: Range trend and WRI project studies monitoring history and ecological site potential for WMU 11B, Nine Mile, Range Creek.

Study #	Study Name	Type	Disturbance Name (if available)	Date	Size (acres)	WRI Project #
11B-1	Deadman	Chain Unknown		1965-1966		
		Seed Unknown		1965-1966		
		Aerial Before	West Coal Creek	December 2007	1,868	847
		Bullhog	West Coal Creek	Spring 2008	1,868	847
11B-2	Airport Bench	Chain Unknown		1965		
		Seed Unknown		1965		
		Prescribed Fire		May 2005		
11B-5	B Canyon	Two-Way Chain Unknown		1966		
		Seed Unknown		1966		
		Wildfire	East Carbon	1996	1,094	
		Chain Unknown		1996		
		Dribbler		1996		
11B-7	Cottonwood	Lop and Scatter	Cottonwood Ridge PJ Removal	2015	1,019	3267
11B-19	Dugout Creek PJ Chained	Chain Unknown		Fall 1996		
		Seed Unknown		Fall 1996		
		Lop and Scatter	Dugout Creek Fuels Reduction and Habitat Restoration Phase 2	2011	162	1935
11R-13	Horse Canyon	Chain Unknown		Historic		
		Aerial Before	Horse Canyon Fuel Reduction and Habitat Restoration	2012	1,173	2238
		Bullhog	Horse Canyon Fuel Reduction and Habitat Restoration	2012	1,173	2238
11R-14	Horse Canyon 2	Lop and Scatter	Horse Canyon Fuel Reduction and Habitat Restoration	2012	447	2238
11R-18	Cottonwood Ridge	Bullhog	Cottonwood Ridge PJ Removal	2015	1,051	3267

Table 6.10: Range trend and WRI studies known disturbance history for WMU 11B, Nine Mile, Range Creek.

Study Trend Summary (Range Trend)

High Mountain (Aspen)

There is one study [Upper Cottonwood Ridge (11B-6)] classified as a High Mountain (*Aspen*) ecological site. This study site is located just west of Cottonwood Ridge above Range Creek.

Shrubs/Trees: Gooseberry currant (*Ribes montigenum*) is the main browse species on this site, although a few other browse species contribute less cover. Average shrub cover is low overall, but covers of sagebrush, preferred browse, and other shrubs have increased each sample year (Figure 6.4). Sagebrush demographic data shows that the community is comprised of mainly young and mature individuals and that density of each age class has increased over time (Figure 6.10).

Conifers including subalpine fir (*Abies lasiocarpa*), blue spruce (*Picea pungens*), and Douglas fir (*Pseudotsuga menziesii*) are the dominant trees on this site with cover and density increasing over time. Quaking aspen (*Populus tremuloides*) contributes a significant amount of cover, but cover has decreased from 17% in 2010 to 11% in 2015 (Figure 6.6, Figure 6.8).

Herbaceous Understory: This study site has a rich and abundant herbaceous component dominated by perennial grasses and forbs. This site supports some native grasses, but has been dominated by the introduced species Kentucky bluegrass (*Poa pratensis*) in all sample years. Perennial grass cover has fluctuated over the years while that of perennial forbs has generally increased. There are no annual grasses found on this site and annual forbs have remained rare (Figure 6.12).

Occupancy: Average pellet transect data indicates that occupancy has decreased over the sample years and that primary occupants have varied. Elk pellet groups have had a mean abundance ranging from less than 1 days use/acre in 2015 to 25.5 days use/acre in 2000. Mean abundance of deer pellet groups has ranged from 0 days

use/acre in 2000 to 36 days use/acre in 2015. Finally, cattle use has been as low as 0 days use/acre in 2000 and as high as 4 days use/acre in 2010 and 2015 (Figure 6.14).

Mountain (Sagebrush)

Two sites [Cedar Ridge (11B-9) and Steer Ridge (11B-16)] are classified as Mountain (Sagebrush) ecological sites. The Cedar Ridge study is located on Cedar Ridge near Cedar Ridge Canyon. Steer Ridge is found on top of Steer Ridge.

Shrubs/Trees: Black sagebrush (*Artemisia nova*) dominates among browse species on the Cedar Ridge study. The Steer Ridge study is dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), although antelope bitterbrush (*Purshia tridentata*) contributes notable cover. Overall shrub cover has increased throughout the sample years. Sagebrush cover has remained generally stable, while that of preferred browse and other shrubs has increased (Figure 6.4). Sagebrush demographics show that the population has been composed of mainly mature individuals in all sample years except 2010, when density of young and mature plants was nearly equal. A small portion of the population has remained comprised of decadent plants. Both recruitment of young plants and overall density has fluctuated from year to year (Figure 6.10).

The Cedar Ridge site has been mildly encroached by Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) to a lesser extent. As no trees are present on the Steer Ridge study site, the trends for both density and cover are being driven by the Cedar Ridge study (Figure 6.6, Figure 6.8).

Herbaceous Understory: Average herbaceous cover has varied from year to year, but has overall shown an increasing trend. Perennial grasses have been the main component in all sample years with needle and thread (*Hesperostipa comata*) being the most prevalent species on both study sites; introduced perennial grasses are not an issue in these communities. The invasive annual grass species cheatgrass (*Bromus tectorum*) is present on both sites, but in very low amounts. Perennial forb cover has generally remained consistent throughout the study years, while annual forbs have remained rare (Figure 6.12).

Occupancy: Overall average occupancy has remained largely stable throughout the sample period, but primary occupants have fluctuated from year to year. Elk pellet groups have had a mean abundance ranging from 28.5 days use/acre in 2015 to 57 days use/acre in 2005. Deer usage has been as low as 10 days use/acre in 2000 and as high as 36 days use/acre in 2015. Mean abundance of cattle pellet groups has ranged from 0 days use/acre in 2000 and 2005 to 2 days use/acre in 2015 (Figure 6.14).

Mountain (Browse)

There are two sites [Cedar Corral (11B-8) and Twin Hollow (11B-15)] that 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: The dominant browse component on these sites is a mixture of species including mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), Utah serviceberry (*Amalanchier utahensis*), alderleaf mountain mahogany (*Cercocarpus montanus*), and mountain snowberry (*Symphoricarpos oreophilus*); other browse species providing less cover are present on both sites. The covers of sagebrush, other preferred browse, and other shrubs have increased each sample year (Figure 6.4). Sagebrush populations have been composed of mainly mature individuals in all sample years. Recruitment of young plants has remained low and overall density has generally been stable (Figure 6.10).

Average tree cover has slightly increased overall since 2005, though density has remained stable: both values can be largely attributed to twoneedle pinyon (*Pinus edulis*) (Figure 6.6, Figure 6.8). These trends are almost exclusively driven by the Cedar Corral study as point-quarter data reveals that trees have not been sampled on the Twin Hollow site since 2000.

Herbaceous Understory: The herbaceous composition on these sites is generally good. Average herbaceous cover has varied from year to year, but overall, it has slightly increased over time. On average, perennial forbs and native grasses have been the dominant component throughout the study years; the Steer Ridge study is driving this trend as perennial grasses do not contribute very much cover on the Cedar Corral site. Both annual grasses and forbs remain rare (Figure 6.12), although the invasive annual grass species cheatgrass (*Bromus tectorum*) was observed on the Cedar Corral study in very low amounts.

Occupancy: Animal occupancy has steadily decreased over the sample years. Elk were the primary occupants of this site in 2000 and 2005, but mean pellet group abundance showed that elk use had decreased to less than 1 days use/acre in 2015. Deer usage has fluctuated over time. Cattle use has increased slightly, but remains low at 4 days use/acre in 2015 (Figure 6.14).

Upland (Sagebrush)

Two sites [Cottonwood (11B-7) and Dugout Creek PJ Chained (11B-19)] are classified as Upland (Sagebrush) ecological sites. Cottonwood is found above Indian Swale on Sage Brush Flat. The Dugout Creek PJ Chained study is located west of Dugout Creek.

Shrubs/Trees: Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) is the browse species with the most cover on the Cottonwood site, which lacks other preferred browse. Wyoming big sagebrush is co-dominant with black sagebrush (*A. nova*) on the Dugout Creek PJ Chained study, where other browse species with less cover are also present. Sagebrush cover is good and has increased overall along with that of other preferred browse and other shrubs (Figure 6.5). Sagebrush density has fluctuated from year to year. The populations have mainly been comprised of mature plants, though decadence was more pronounced in 2000 (Figure 6.11).

Encroachment of twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) is a potential threat on these sites. Although average cover has decreased over time and average density is relatively low, both cover and density could possibly increase in the future (Figure 6.7, Figure 6.9).

Herbaceous Understory: Herbaceous understories vary between studies. The Dugout Creek PJ Chained study is dominated by the annual grass species cheatgrass (*Bromus tectorum*), but the Cottonwood study is primarily dominated by the native perennial species needle and thread (*Hesperostipa comata*). Perennial forb cover has decreased overall on both sample sites and annual forbs have remained rare (Figure 6.13).

Occupancy: Average pellet transect data shows that although elk were initially the primary occupants with a mean pellet group abundance of 23 days use/acre in 2000, these sites have mainly been used by deer in recent sample years as elk usage has steadily decreased over time (Figure 6.15).

Upland (Browse)

There are two studies [‘B’ Canyon (11B-5) and Prickly Pear (11B-14)] classified as Upland (Browse) ecological sites. ‘B’ Canyon is found at the base of West Ridge between B Canyon and Left Fork Canyon, and south of Stone Cabin Gas Field above Prickly Pear Canyon.

Shrubs/Trees: The primary browse on these sites is alderleaf mountain mahogany (*Cercocarpus montanus*) and mormon tea (*Ephedra viridis*). Amount of cover varies between sites, however. Preferred browse makes up less than 1% of the cover on ‘B’ Canyon, while alderleaf mountain mahogany has 6% cover on the Prickly Pear study and is primarily driving the overall average cover trend (Figure 6.5). A population of black sagebrush (*Artemisia nova*) and mountain big sagebrush (*A. tridentata* ssp. *vaseyana*) that was mostly composed of mature plants was present on the ‘B’ Canyon study in 1994, but has not been observed since that time (Figure 6.11).

Average tree cover has increased over time while average density has decreased (Figure 6.7, Figure 6.9). These trends are exclusively driven by the Prickly Pear study as neither twoneedle pinyon (*Pinus edulis*) nor Utah juniper (*Juniperus osteosperma*) have been sampled on the 'B' Canyon site since 1994.

Herbaceous Understory: These studies have a fair herbaceous component; the overall average cover has increased over time and is primarily composed of perennial grasses. Though cover of perennial grasses is high on the 'B' Canyon site, a majority of that cover can be attributed to the introduced species crested wheatgrass (*Agropyron cristatum*). Perennial grasses on the Prickly Pear study are largely native species, but they contributed only 8% cover in 2015. Annual grasses are absent from both studies. Perennial forb cover has remained generally stable overall and annual forbs are extremely rare on both sites (Figure 6.13).

Occupancy: Overall animal use has, on average, decreased over time. Mean abundance of elk pellet groups has ranged from 3 days use/acre in 2015 to 11 days use/acre in 2000 and 2005. Deer pellet groups have had a mean abundance ranging from 4 days use/acre in 2005 to 11 days use/acre in 2010, and mean abundance of cattle pellet groups has ranged from 4 days use/acre in 2015 to 24 days use/acre in 2005 (Figure 6.15).

Upland (Twoneedle Pinyon/Utah Juniper)

One study [Deadman (11B-1)] is classified as an Upland (Twoneedle Pinyon/Utah Juniper) ecological site. This study is located northeast of Price City.

Shrubs/Trees: Although browse in general is very limited on this site, the dominant species are alderleaf mountain mahogany (*Cercocarpus montanus*) and mormon tea (*Ephedra viridis*). Overall shrub cover has increased over time due to an increase in shrub species aside from sagebrush or preferred browse (Figure 6.5). Sagebrush contributes no cover and extremely little density; the population is mainly composed of mature individuals and there has been no recruitment of young plants since the 2005 sample year (Figure 6.11).

Average tree cover decreased sharply between 2005 and 2010 due to a bullhog treatment in 2007/2008. Although cover and density are currently low, Utah juniper (*Juniperus osteosperma*) is beginning to infill the site and may lead to decreased herbaceous and understory health in the future if it is not addressed (Figure 6.7, Figure 6.9).

Herbaceous Understory: The herbaceous understory on this site has fluctuated from year to year, but has generally been in poor condition since the 2005 sample year. Data from the most recent sample year indicates that the herbaceous understory is lacking and is co-dominated by perennial forbs, annual forbs, and annual grass, namely the invasive annual cheatgrass (*Bromus tectorum*). Perennial grasses are present, but most cover is contributed by the introduced species crested wheatgrass (*Agropyron cristatum*) (Figure 6.13).

Occupancy: Overall animal usage of this site has been decreasing since the 2005 sample year and deer are currently the primary occupants. Elk use has ranged from 0 days use/acre in 2000, 2005, and 2015 to 20 days use/acre in 2010. Mean abundance of deer pellet groups has ranged from 14 days use/acre in 2015 to 60 days use/acre in 2005. Finally, cattle pellet groups have had a mean abundance ranging from 1.5 days use/acre in 2005 to 6 days use/acre in 2010 (Figure 6.15).

Semidesert (Sagebrush)

There are three studies [Airport Bench (11B-2), Coal Creek (11B-4), and Deadman Creek (11B-20)] that are classified as Semidesert (Sagebrush) ecological sites. The Airport Bench study is located north of the Vernal Regional Airport. Coal Creek is situated adjacent to Coal Creek, west of Soldier Creek. The Deadman Creek study is found just north of Deadman Creek.

Shrubs/Trees: The most abundant browse species on these sites is Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*); the exception to this is the Airport Bench study, which is dominated by

mormon tea (*Ephedra viridis*) and has very little browse cover in general. A few other browse species are present on these sites, but in much lower amounts. Overall sagebrush cover has increased over the study years (Figure 6.5). Average sagebrush demographics reveal that the population has varied from year to year, but is mainly composed of mature individuals as of the 2015 sample year. Recruitment of young plants has been decreasing since 2000 (Figure 6.11).

Encroachment of twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) is a possible concern on these sites. Although average tree cover remains low, it has increased slightly since 2005.In contrast, juniper density has decreased since the 2010 sample year and pinyon density increased by only 1 tree/acre (Figure 6.7, Figure 6.9).

Herbaceous Understory: The herbaceous understories vary from site to site. Airport Bench has good perennial grass cover, but most of that cover is contributed by the introduced species crested wheatgrass (*Agropyron cristatum*). Annual grasses are present in extremely low amounts and perennial and annual forb cover has decreased throughout the sample years. The herbaceous understory of the Coal Creek study is dominated by a mix of native perennial grasses that contribute moderately low cover. Again, annual grasses are present in extremely low amounts and perennial and annual forbs have remained rare. Finally, the Deadman Creek study has an extremely depauperate understory that is devoid of graminoid cover and dominated by annual forbs. Overall, perennial grasses have been the dominant herbaceous component in all sample years except 2005, when they were co-dominant with annual forbs (Figure 6.13).

Occupancy: Average pellet transect data indicates that animal occupancy has remained rather stable throughout the years and that deer have been the primary occupants in most sample years. Mean abundance of elk pellet groups has ranged from 0 days use/acre in 2000 and 2005 to 16 days use/acre in 2010. Deer usage has been as low as 14 days use/acre in 2010 and as high as 29 days use/acre in 2000. Mean abundance of cattle pellet groups has ranged from less than 1 days use/acre in 2000 to 7 days use/acre in 2015 (Figure 6.15).

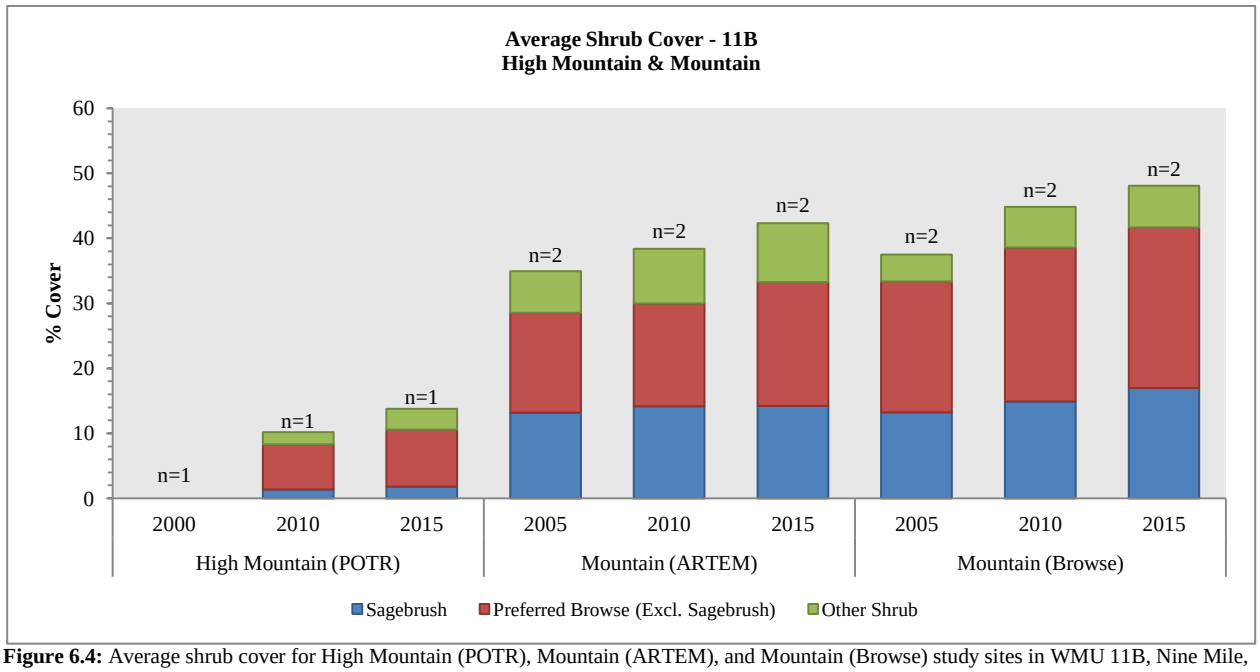


Figure 6.4: Average shrub cover for High Mountain (POTR), Mountain (ARTEM), and Mountain (Browse) study sites in WMU 11B, Nine Mile, Range Creek.

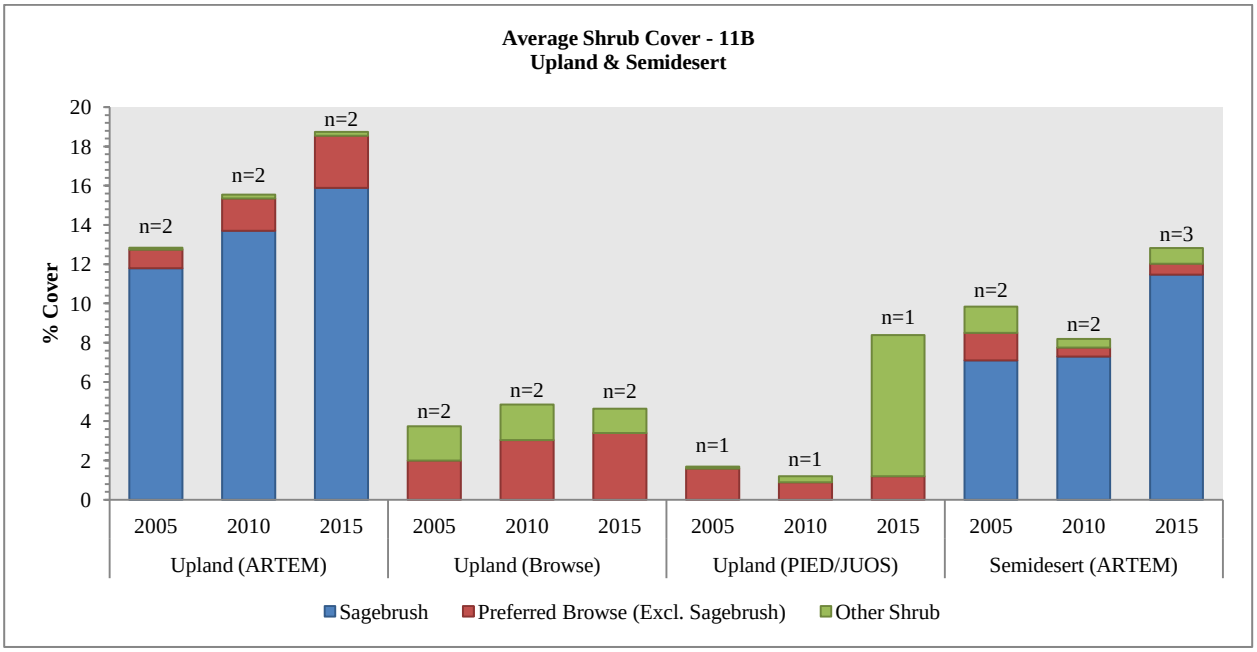


Figure 6.5: Average shrub cover for Upland (ARTEM), Upland (Browse), Upland (PIED/JUOS), and Semidesert (ARTEM) study sites in WMU 11B, Nine Mile, Range Creek.

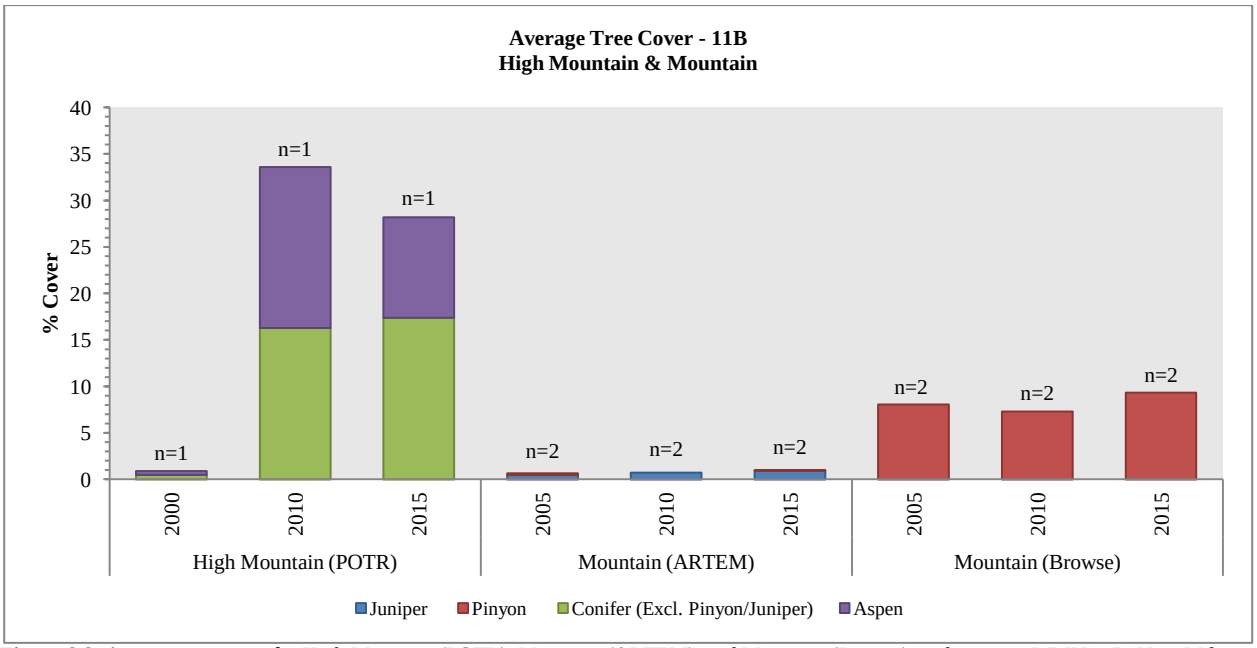


Figure 6.6: Average tree cover for High Mountain (POTR), Mountain (ARTEM), and Mountain (Browse) study sites in WMU 11B, Nine Mile, Range Creek.

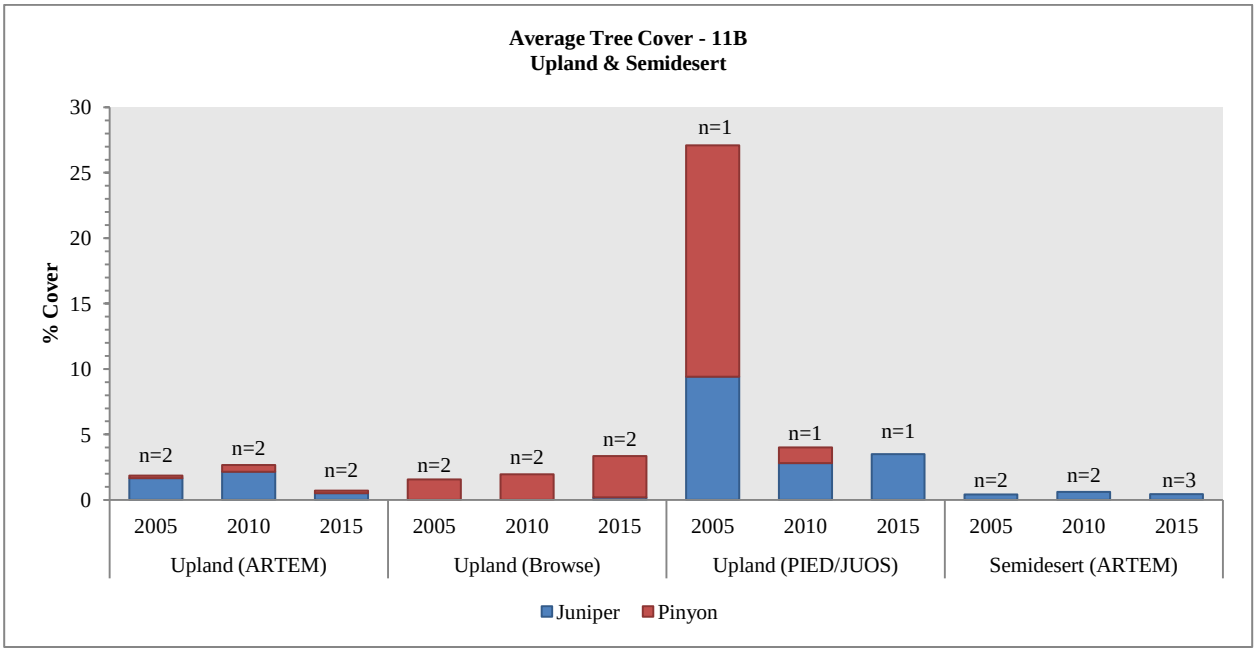


Figure 6.7: Average tree cover for Upland (ARTEM), Upland (Browse), Upland (PIED/JUOS), and Semidesert (ARTEM) study sites in WMU 11B, Nine Mile, Range Creek.

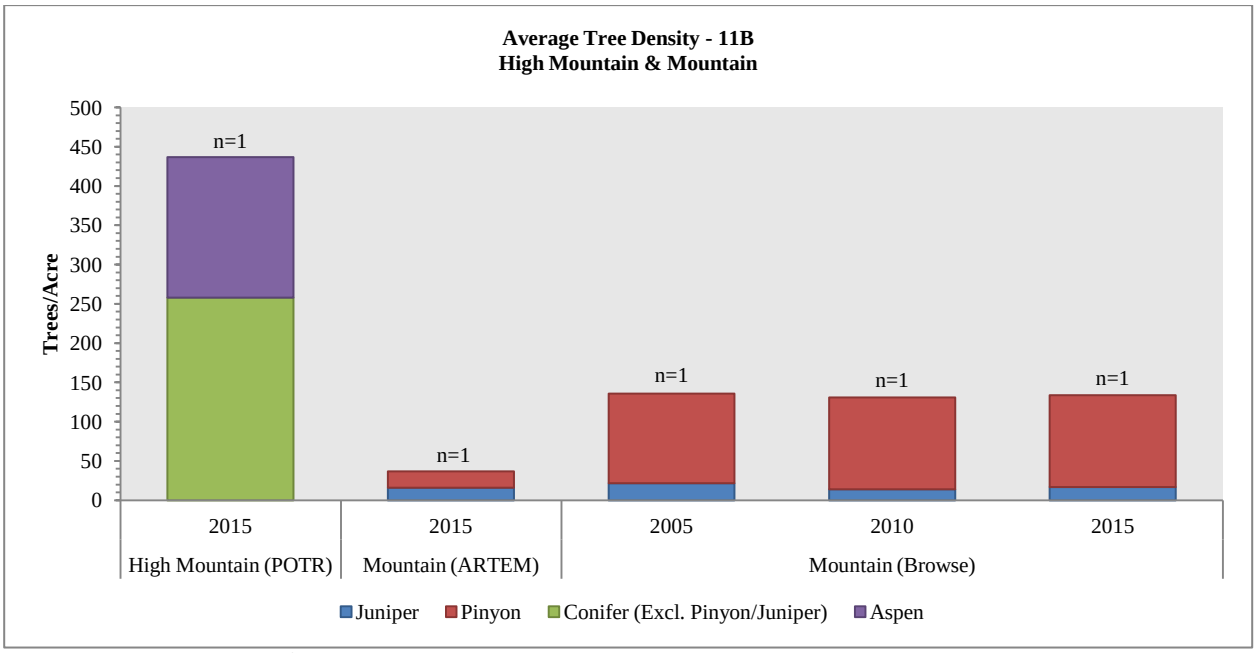


Figure 6.8: Average tree density for High Mountain (POTR), Mountain (ARTEM), and Mountain (Browse) study sites in WMU 11B, Nine Mile, Range Creek.

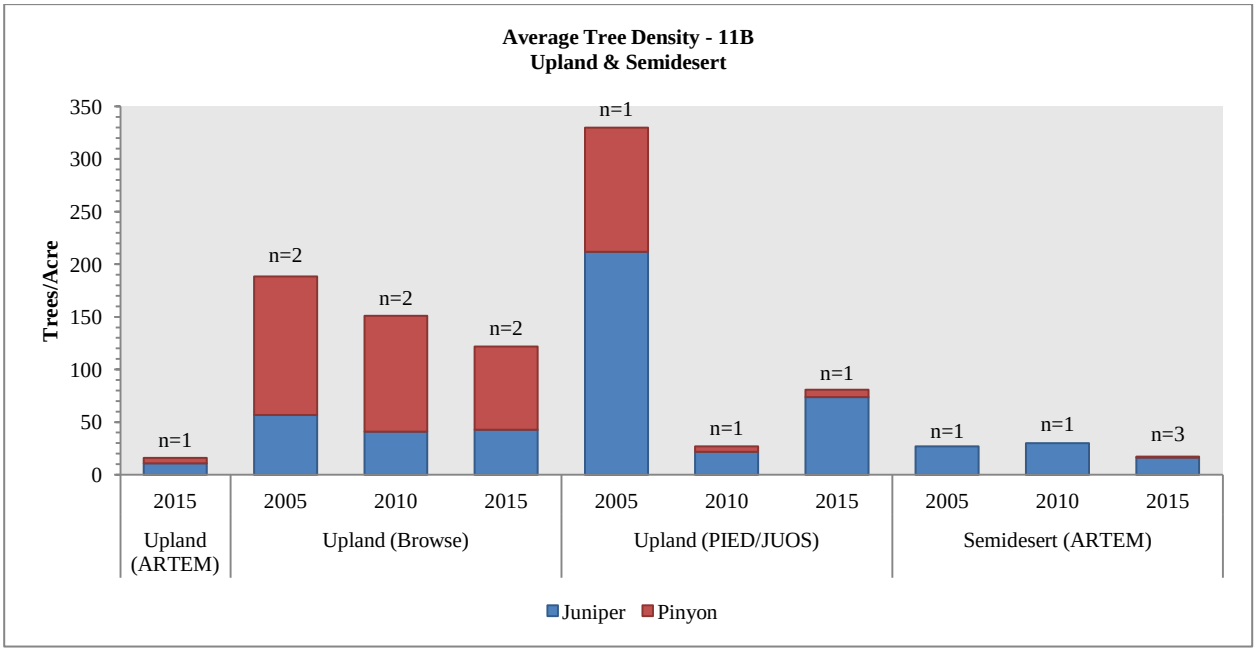


Figure 6.9: Average tree density for Upland (ARTEM), Upland (Browse), Upland (PIED/JUOS), and Semidesert (ARTEM) study sites in WMU 11B, Nine Mile, Range Creek.

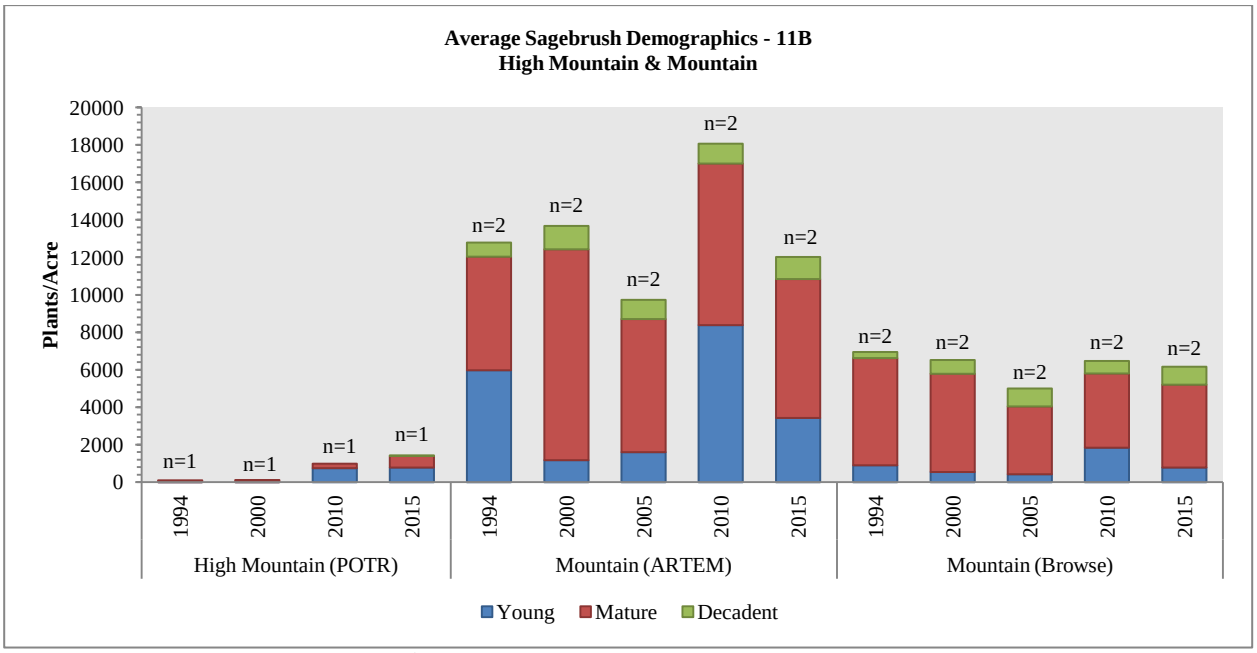


Figure 6.10: Average sagebrush demographics for High Mountain (POTR), Mountain (ARTEM), and Mountain (Browse) study sites in WMU 11B, Nine Mile, Range Creek.

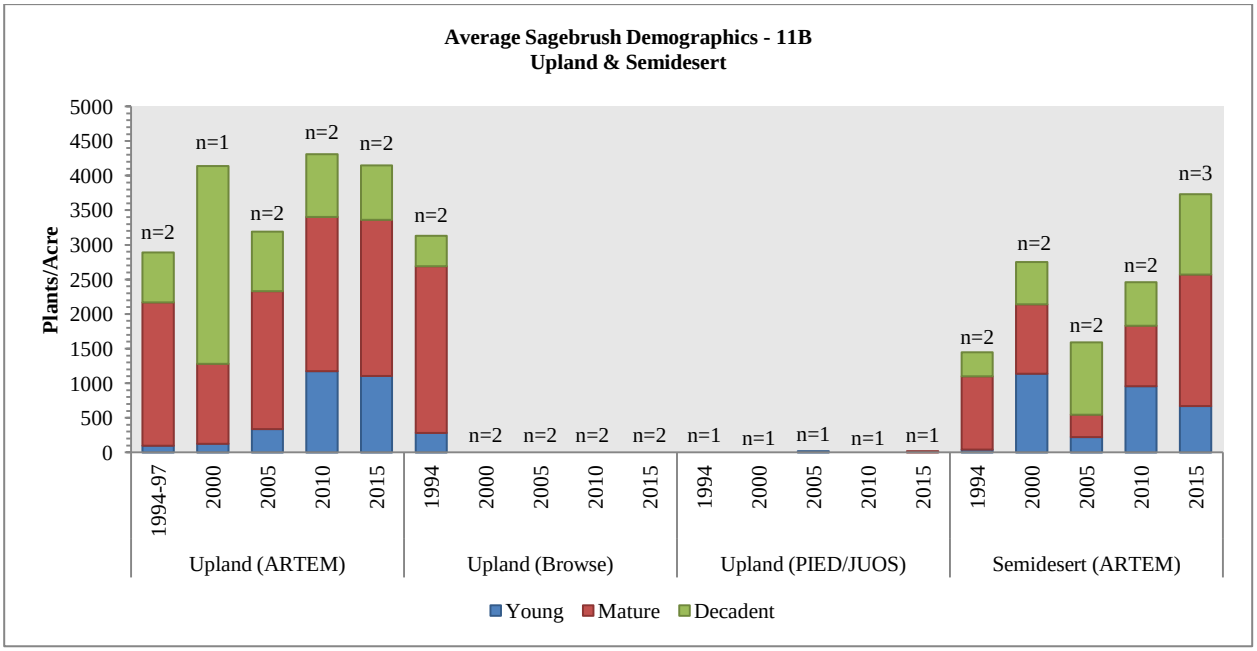


Figure 6.11: Average sagebrush demographics for Upland (ARTEM), Upland (Browse), Upland (PIED/JUOS), and Semidesert (ARTEM) study sites in WMU 11B, Nine Mile, Range Creek.

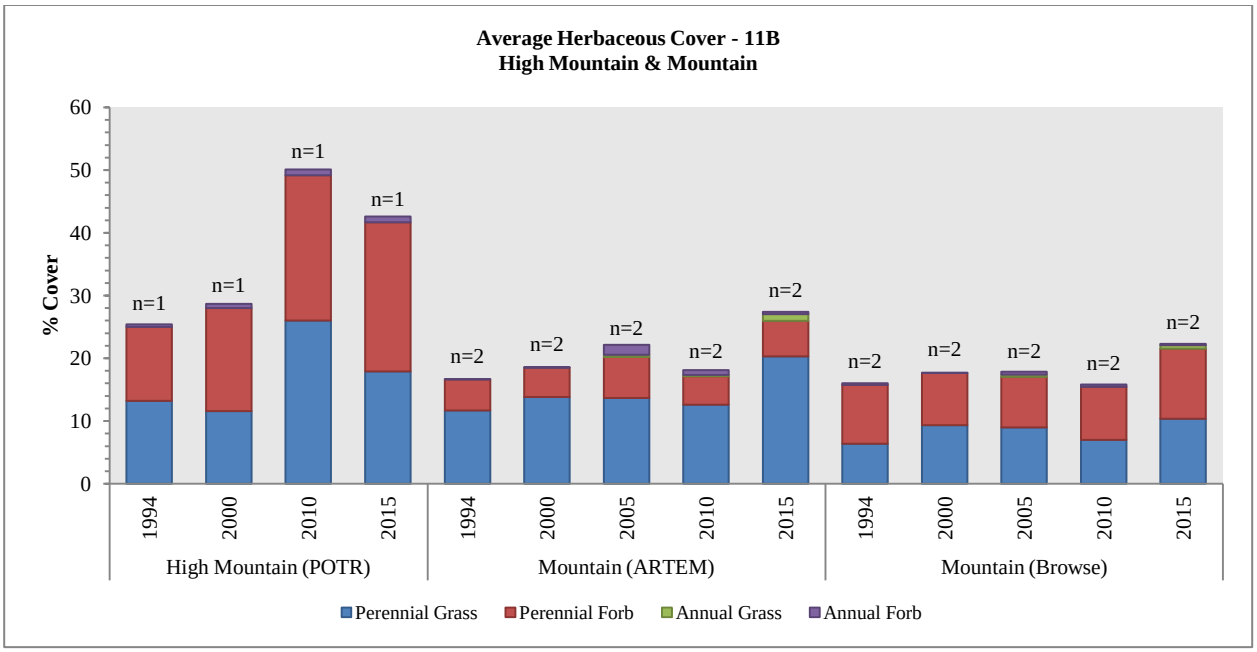


Figure 6.12: Average herbaceous cover for High Mountain (POTR), Mountain (ARTEM), and Mountain (Browse) study sites in WMU 11B, Nine Mile, Range Creek.

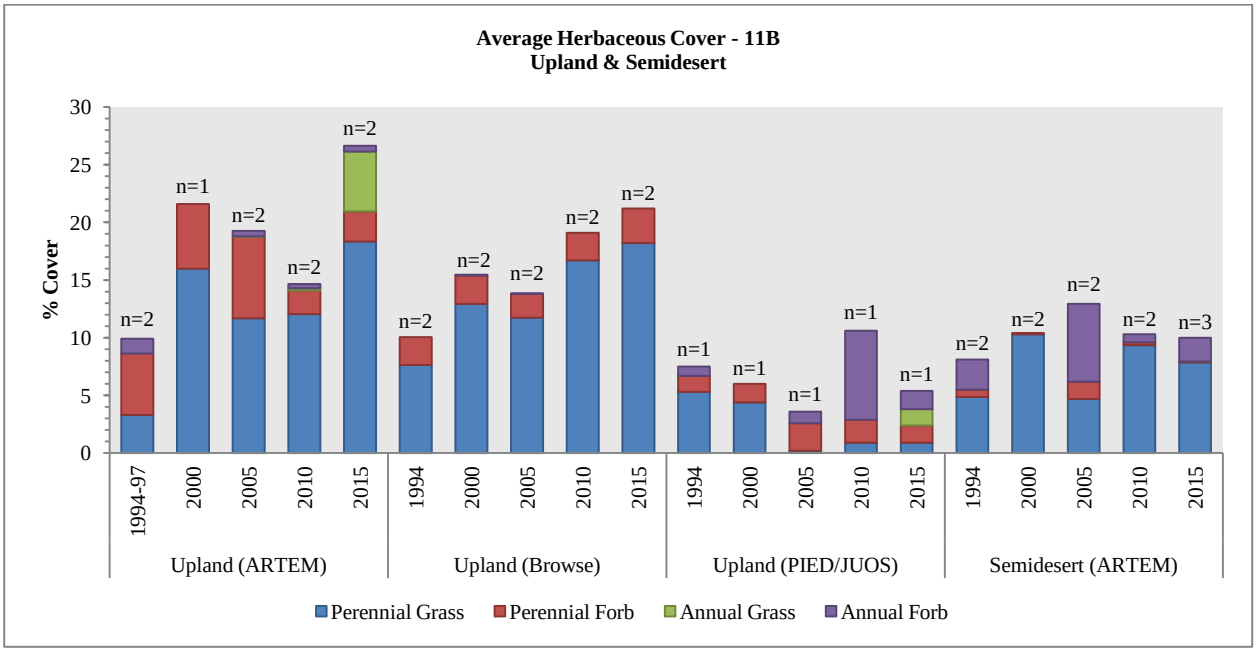


Figure 6.13: Average herbaceous cover for Upland (ARTEM), Upland (Browse), Upland (PIED/JUOS), and Semidesert (ARTEM) study sites in WMU 11B, Nine Mile, Range Creek.

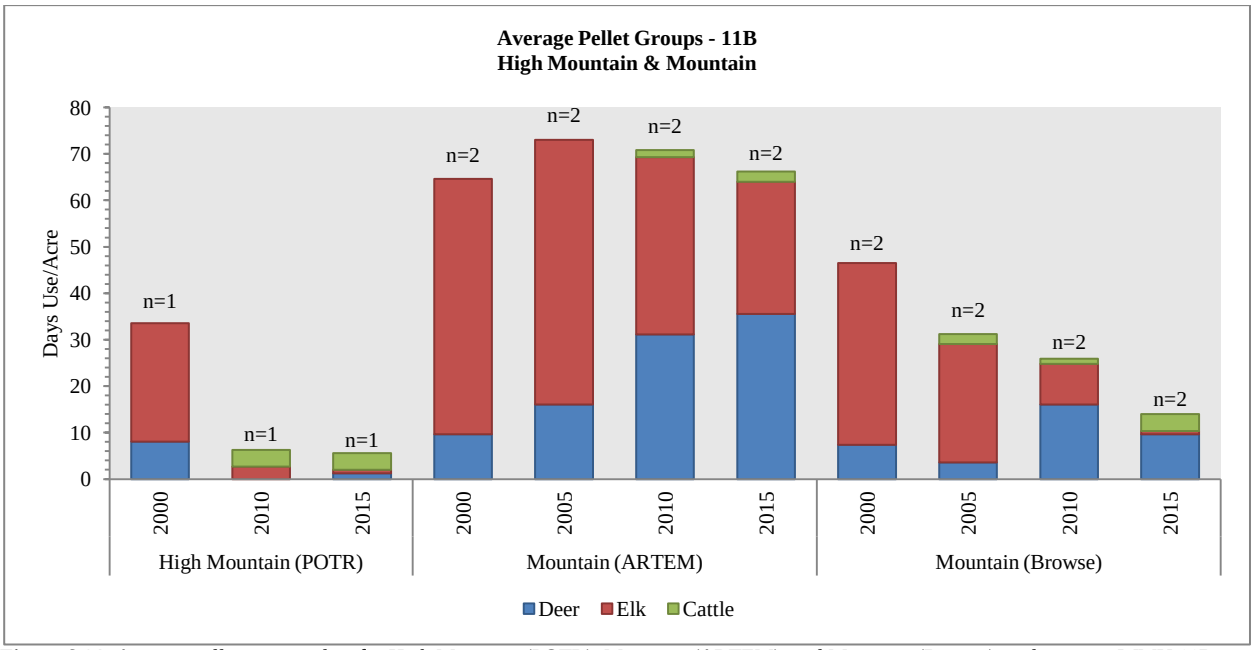


Figure 6.14: Average pellet transect data for High Mountain (POTR), Mountain (ARTEM), and Mountain (Browse) study sites in WMU 11B, Nine Mile, Range Creek.

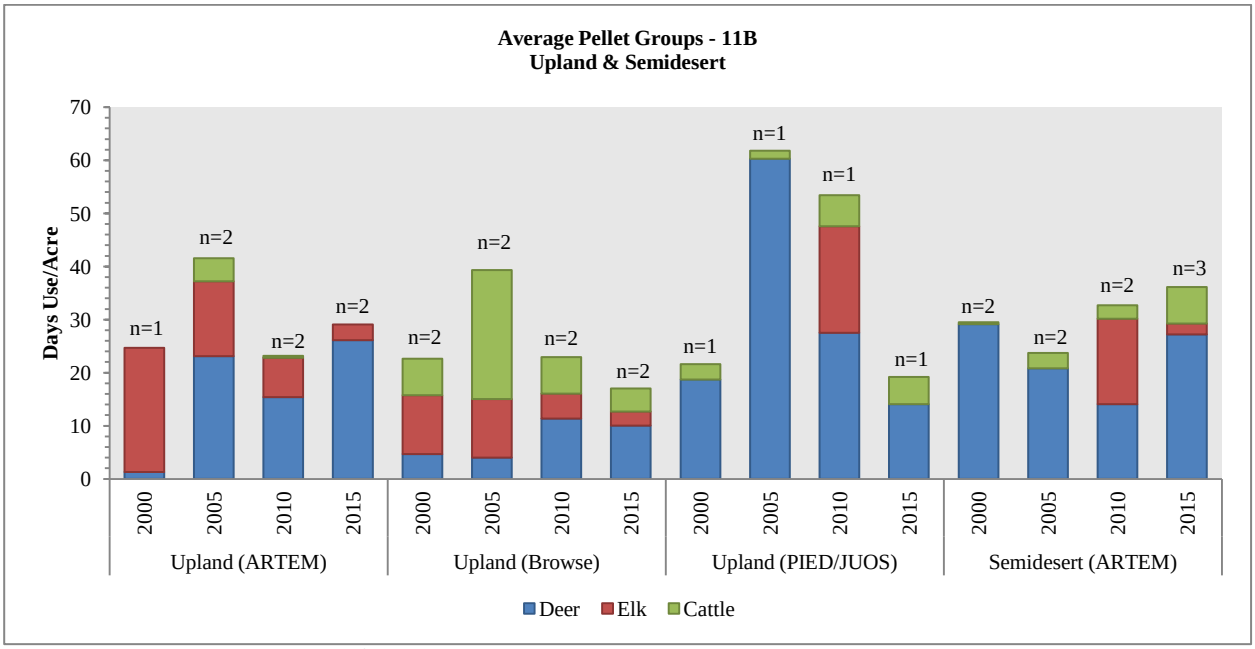
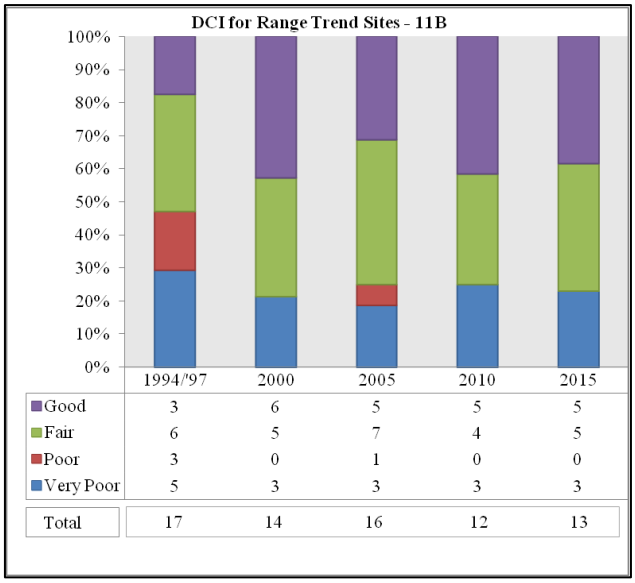


Figure 6.15: Average pellet transect data for Upland (ARTEM), Upland (Browse), Upland (PIED/JUOS), and Semidesert (ARTEM) study sites in WMU 11B, Nine Mile, Range Creek.

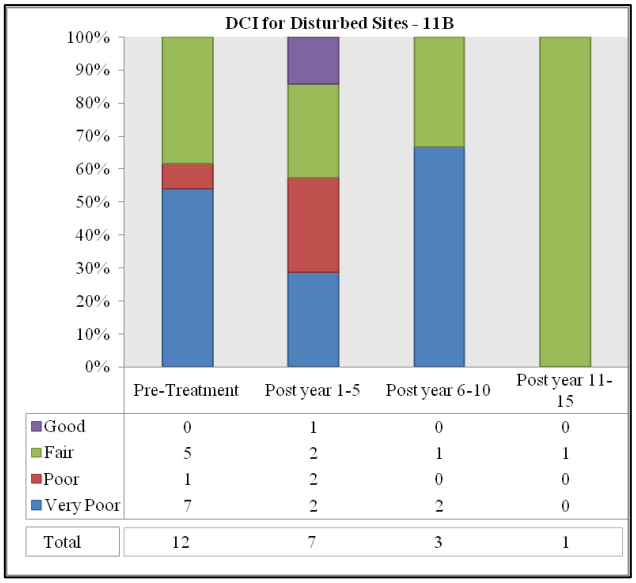
Deer Winter Range Condition Assessment

The condition of deer winter range within the Nine Mile, Range Creek management unit has continually changed on the sites sampled since 1994. The Range Trend sites sampled within the unit are considered to be in very poor to good condition as of the 2015 sample year with no sites in poor condition (Map 6.12, Figure 6.16). Airport, Coal Creek, Cedar Ridge, Twin Hollow, and Steer Ridge remained in good condition. Airport Bench, Cottonwood, Cedar Corral, Dugout Creek PJ Chained, and Deadman Creek are in fair condition. Finally, the Deadman, 'B' Canyon, and Prickly Pear studies are considered to be in very poor condition generally due to the lack of browse cover and sagebrush diversity. The treated study sites range from very poor to good (Figure 6.17). The treated sites have generally improved as time since treatment has increased; the exceptions to this are the East Carbon Bullhog and Horse Canyon studies, which went from poor to very poor, and Deadman, which remained in very poor condition. Cold Springs WMA, Dugout, Cottonwood, and Cottonwood Ridge were all sampled prior to treatment and were in very poor or fair condition. West Coal Creek Bullhog improved from very poor to fair, and Airport Bench and Dugout Creek PJ Chained remained in fair condition (Map 6.12). It is possible given more time and continual monitoring that these sites will continue to improve.



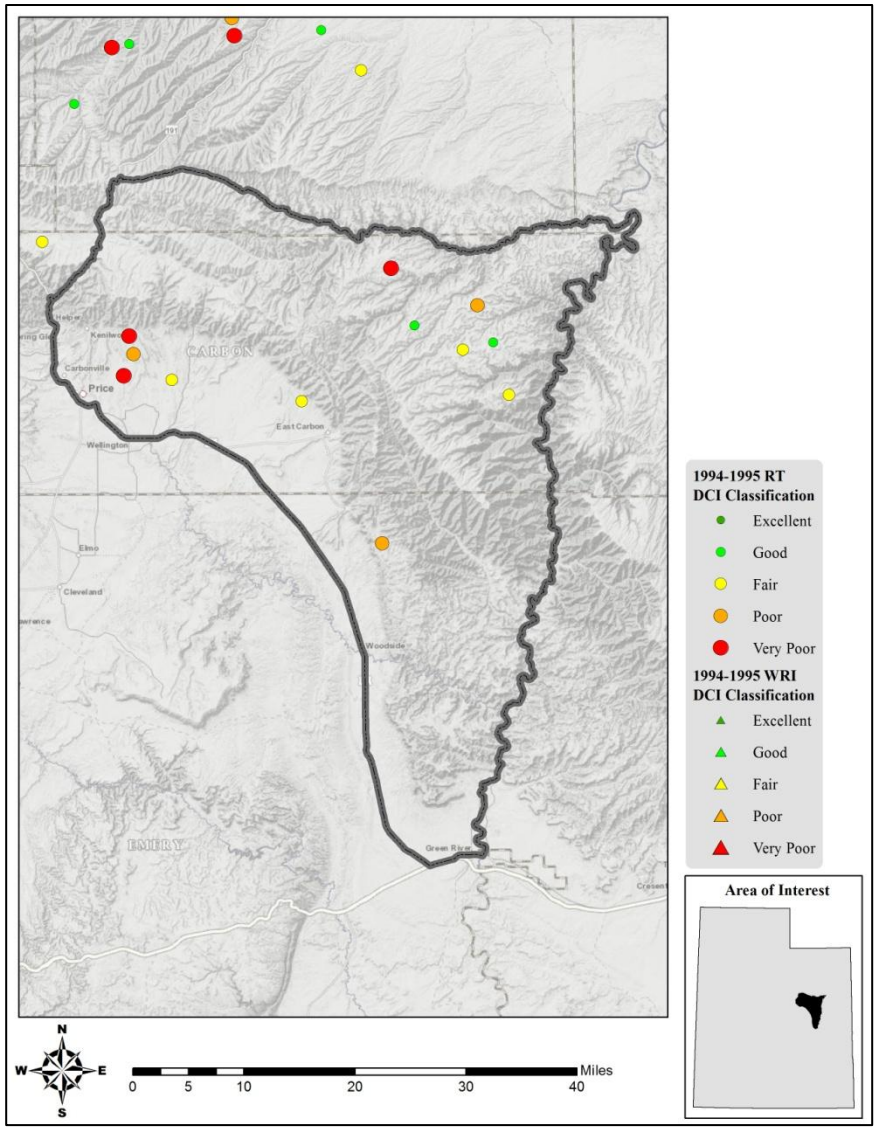
	1994/'97	2000	2005	2010	2015
Good	3	6	5	5	5
Fair	6	5	7	4	5
Poor	3	0	1	0	0
Very Poor	5	3	3	3	3
Total	17	14	16	12	13

Figure 6.16: Deer winter range Desirable Components Index (DCI) summary by year of Range Trend sites for WMU 11B, Nine Mile, Range Creek.

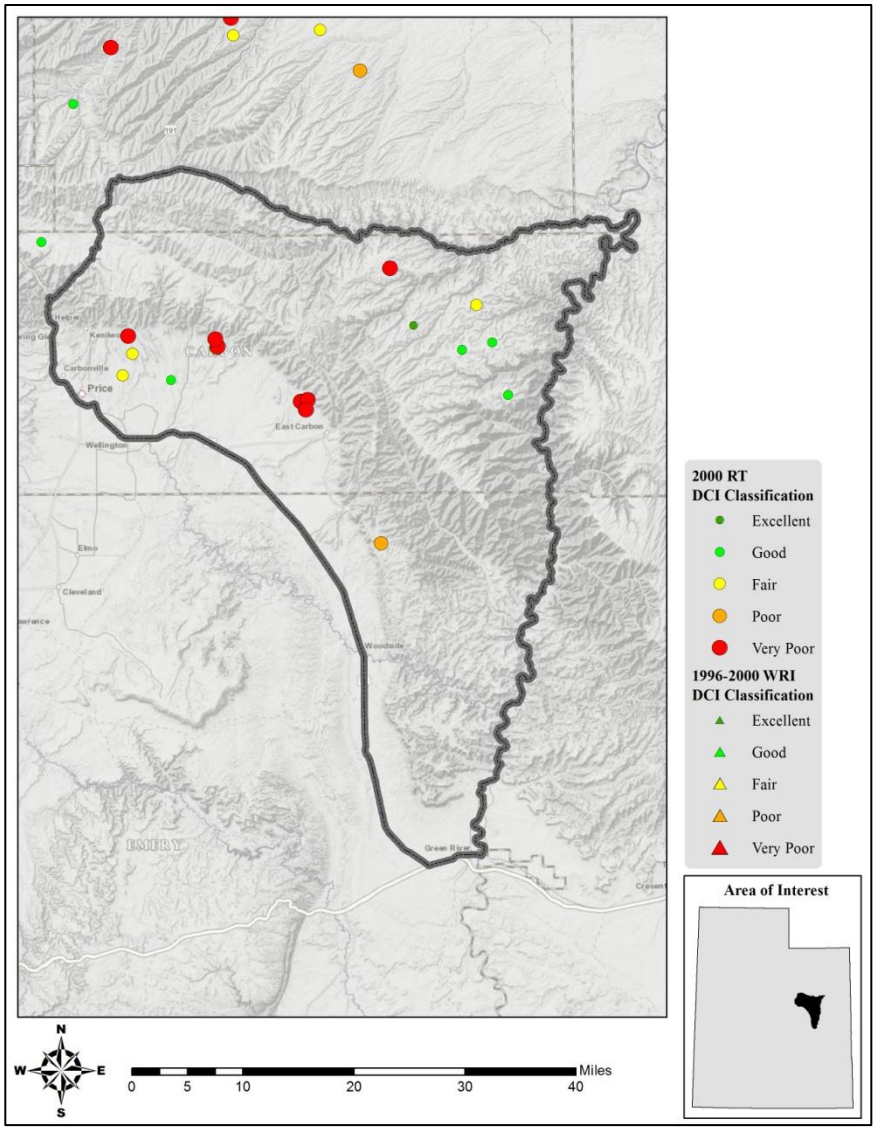


	Pre-Treatment	Post year 1-5	Post year 6-10	Post year 11-15
Good	0	1	0	0
Fair	5	2	1	1
Poor	1	2	0	0
Very Poor	7	2	2	0
Total	12	7	3	1

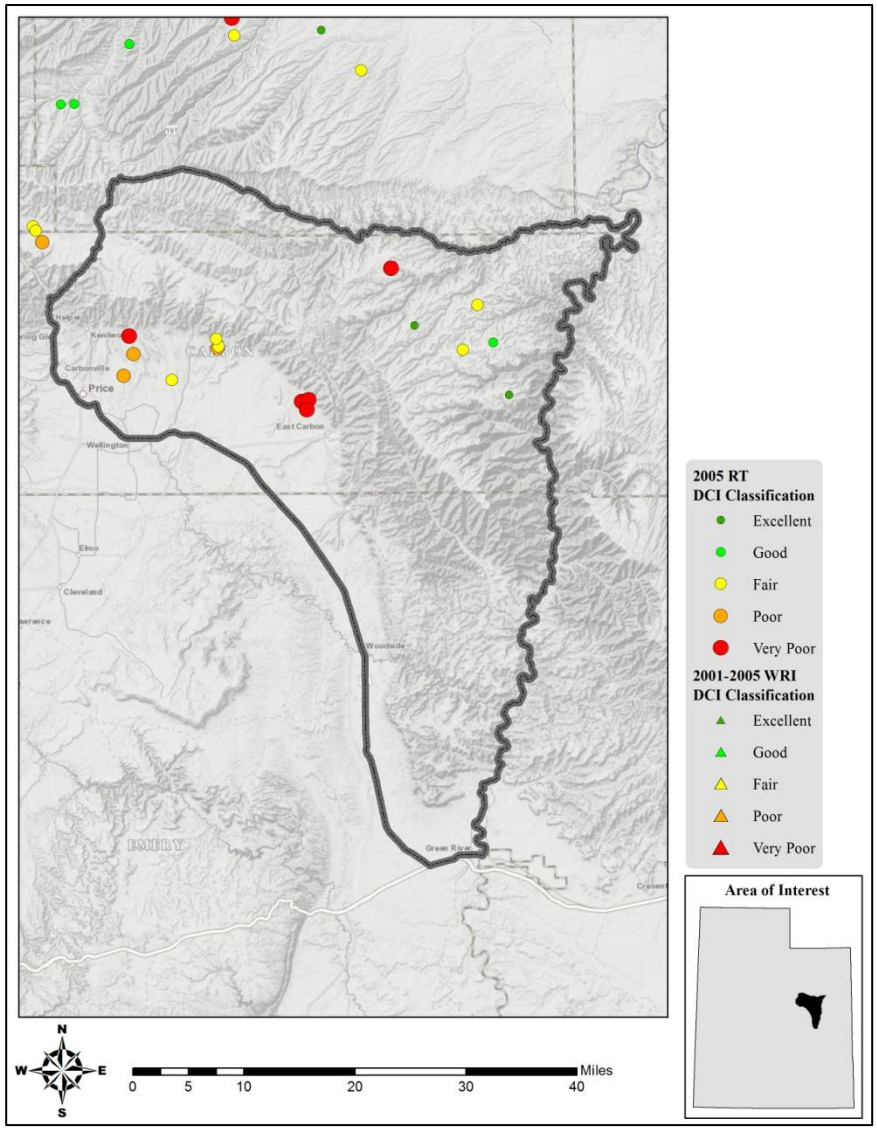
Figure 6.17: Deer winter range Desirable Components Index (DCI) summary by year of treated/disturbed sites for WMU 11B, Nine Mile, Range Creek.



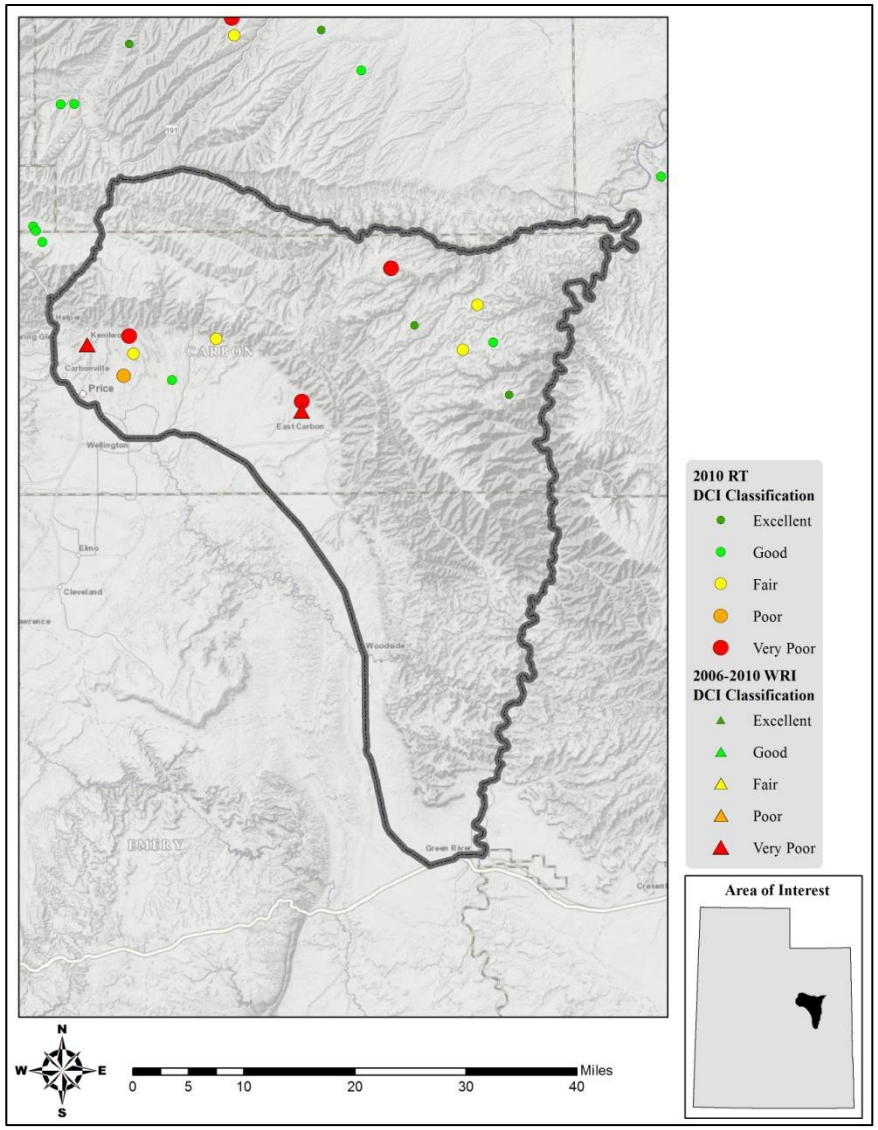
Map 6.8: 1994-95 Desirable Components Index (DCI) ranking distribution by study site for WMU 11B, Nine Mile, Range Creek.



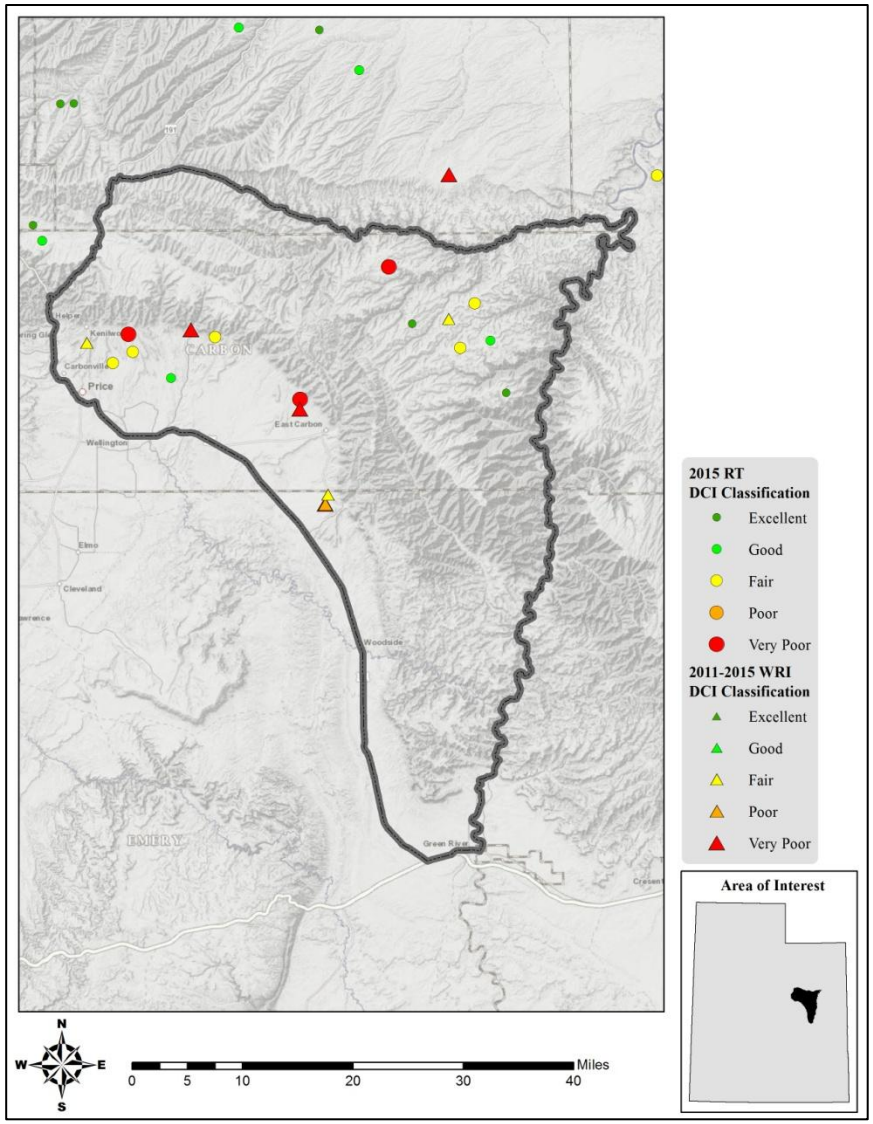
Map 6.9: 2000 Desirable Components Index (DCI) ranking distribution by study site for WMU 11B, Nine Mile, Range Creek.



Map 6.10: 2005 Desirable Components Index (DCI) ranking distribution by study site for WMU 11B, Nine Mile, Range Creek.



Map 6.11:2010 Desirable Components Index (DCI) ranking distribution by study site for WMU 11B, Nine Mile, Range Creek.



Map 6.12: 2015 Desirable Components Index (DCI) ranking distribution by study site for WMU 11B, Nine Mile, Range Creek.

Study #	Study Name	Limiting Factor and/or Threat	Level of Threat	Potential Impact
11B-1	Deadman	Annual Grass	Low	Increased fire potential.
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
11B-2	Airport Bench	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
11B-4	Coal Creek	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
11B-5	'B' Canyon	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species.
11B-6	Upper Cottonwood Ridge	Conifer Encroachment	Low	Reduced understory shrub and herbaceous vigor.
11B-7	Cottonwood	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
11B-8	Cedar Corral	PJ Encroachment	Moderate	Reduced understory shrub and herbaceous vigor.
		Annual Grass	Low	Increased fire potential.
11B-9	Cedar Ridge	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
11B-14	Prickly Pear	PJ Encroachment	Moderate	Reduced understory shrub and herbaceous vigor.
		Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species.
11B-15	Twin Hollow	None Identified		
11B-16	Steer Ridge	Annual Grass	Low	Increased fire potential.
11B-19	Dugout Creek PJ Chained	Annual Grass	Moderate	Increased fire potential.
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
11B-20	Deadman Creek	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
11R-9	East Carbon Bullhog	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
		Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species.
11R-10	West Coal Creek Bullhog	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
11R-12	Burnt Cabin Spring	Conifer Encroachment	High	Reduced understory shrub and herbaceous vigor.
11R-13	Horse Canyon	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
11R-14	Horse Canyon 2	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
11R-15	Big Wash	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
11R-16	Cold Springs WMA	Conifer Encroachment	High	Reduced understory shrub and herbaceous vigor.
11R-17	Dugout	PJ Encroachment	High	Reduced understory shrub and herbaceous vigor.
11R-18	Cottonwood Ridge	PJ Encroachment	High	Reduced understory shrub and herbaceous vigor.

Table 6.11: Assessment of the potential limiting factors and/or threats and level of threat to study sites for WMU 11B, Nine Mile, Range Creek. All assessments are based off of the most current sample date for each study site.

Discussion and Recommendations

High Mountain (Aspen)

This high elevation mountain ecological site supports an aspen community and is generally considered to be in fair condition for deer and elk summer range habitat on the Nine Mile, Range Creek management unit. This community supports a diverse and abundant herbaceous understory that provides valuable forage during the summer months. However, the herbaceous understory is dominated by introduced perennial grass species which can often be aggressive at higher elevations and can reduce the prevalence and abundance of other more desirable native grass and forb species. Conifer encroachment is another concern on this site: these trees may compete with aspen and understory species for resources.

It is recommended that monitoring of this community continue. When reseeding is necessary to restore herbaceous species, care should be taken in species selection and preference should be given to native grass species when possible. Treatment to reduce conifer may be necessary in the future.

Mountain (Sagebrush)

The high elevation mountain ecological sites, which support sagebrush communities, are generally considered to be in good to excellent condition for deer winter range habitat on this unit. The sagebrush communities on these sites provide valuable browse in mild and moderate winters. These communities can be susceptible to invasion from annual grasses, primarily cheatgrass, which can boost fuel loads and increase the threat of wildfire. Some of these ecological sites are also prone to encroachment from pinyon and juniper trees which can reduce understory shrub and herbaceous health if not addressed.

When necessary, it is recommended that work to reduce pinyon-juniper encroachment (e.g. bullhog, chaining, lop and scatter, etc.) should begin in affected communities, although care should be taken to select methods which will not increase annual grass loads.

Mountain (Browse)

The high elevation mountain browse communities are considered to be in fair to excellent condition for deer winter range habitat on the unit. These communities support dense shrub populations that provide browse in moderate to severe winters. Some of these ecological sites can be prone to encroachment from pinyon and juniper trees which can reduce understory shrub and herbaceous health if not addressed.

It is strongly recommended that work to prevent and reduce pinyon and juniper encroachment (e.g. bullhog, chaining, lop and scatter, etc.) should begin in these communities.

Upland (Sagebrush)

The mid elevation upland ecological sites which support sagebrush communities are considered to be in fair condition for deer winter range habitat on the unit. These communities support shrub populations that provide valuable browse in moderate to severe winters. These ecological sites are prone to encroachment from pinyon and juniper trees, an event which can reduce understory shrub and herbaceous health if not addressed. In addition, annual grasses, primarily cheatgrass, have the potential to invade the understories of some of these communities. In high amounts, cheatgrass can increase fuel loads and exacerbate the risk of wildfire.

Although tree cover is currently low on these sites, it is strongly recommended that work to monitor and reduce pinyon-juniper encroachment (e.g. bullhog, chaining, lop and scatter, etc.) should continue. Treatments to reduce annual grass may be necessary on some sites.

Upland (Browse)

These mid elevation upland browse communities are considered to be in very poor condition for deer winter range habitat on the unit. These communities support shrub populations that provide browse in mild to moderate winters. Like the higher elevation mountain potential sites, these sites have introduced perennial grasses present in the herbaceous understories. These grasses have the potential to be aggressive and may reduce the abundance of other native grass and forb species. Encroachment from pinyon and juniper trees has also been an issue within some of these communities; this encroachment can reduce understory shrub and herbaceous health if not addressed.

If reseeding is necessary to restore herbaceous species, care should be taken in species selection and preference should be given to native grass species when possible. Work to reduce and/or prevent pinyon-juniper encroachment (e.g. bullhog, chaining, lop and scatter, etc.) should begin on sites that are affected by tree encroachment.

Upland (Twoneedle Pinyon/Utah Juniper)

This mid elevation twoneedle pinyon/Utah juniper community is considered to be in very poor condition for deer winter range habitat on the unit. This community supports mixed shrub populations that provide browse for wildlife. Annual grasses, mainly cheatgrass, are a potential issue in this community. Although cover is currently low, increased amounts of cheatgrass can increase fuel loads and exacerbate the threat of wildfire. This ecological site is also prone to encroachment from pinyon and juniper trees which can reduce understory shrub and herbaceous health if not addressed.

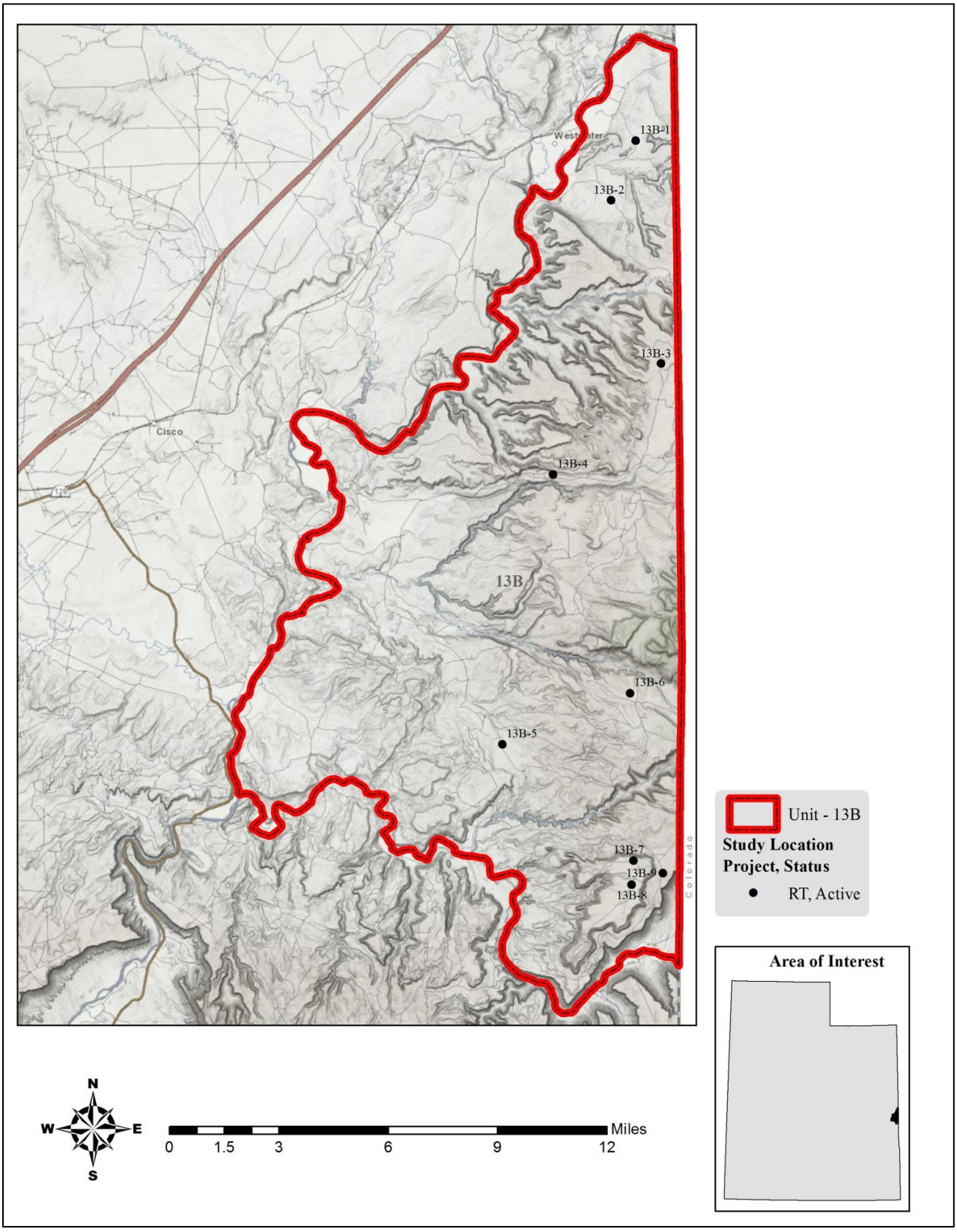
Treatments to reduce annual grass may be necessary if cover increases. It is also recommended that work to reduce pinyon and juniper encroachment (e.g. bullhog, chaining, lop and scatter, etc.) should continue in this community.

Semidesert (Sagebrush)

These low elevation semidesert ecological sites that support sagebrush communities are considered to be in fair to good condition for deer winter range habitat on the Nine Mile, Range Creek management unit. Sagebrush populations on these sites are generally robust, but sagebrush on the Airport Bench study is rather depleted. Introduced perennial grass species which can be aggressive are present on some sites. Although tree cover is low, pinyon and juniper encroachment is occurring in these communities and they are considered to be in Phase I of woodland succession. Invasion from annual grasses, primarily cheatgrass, is an additional threat to the herbaceous undesrtories of these communities. Cover of cheatgrass is currently low, but increased amounts in the future could increase fuel loads and the risk of wildfire in these communities.

It is recommended that efforts to monitor and/or reduce pinyon-juniper encroachment (e.g. bullhog, chaining, lop and scatter, etc.) should begin or continue on these sites. If reseeding is deemed necessary to restore herbaceous species, care should be taken in species selection and preference should be given to native grass species when and where possible.

7. WILDLIFE MANAGEMENT UNIT 13B – DOLORES TRIANGLE



WILDLIFE MANAGEMENT UNIT 13B – DOLORES TRIANGLE

Boundary Description

Grand County - Boundary begins at the Colorado River and Utah-Colorado state line; southwest along the Colorado River to the Dolores River; east along the Dolores River to the State line; north along the state line to the Colorado River and beginning point.

Management Unit Description

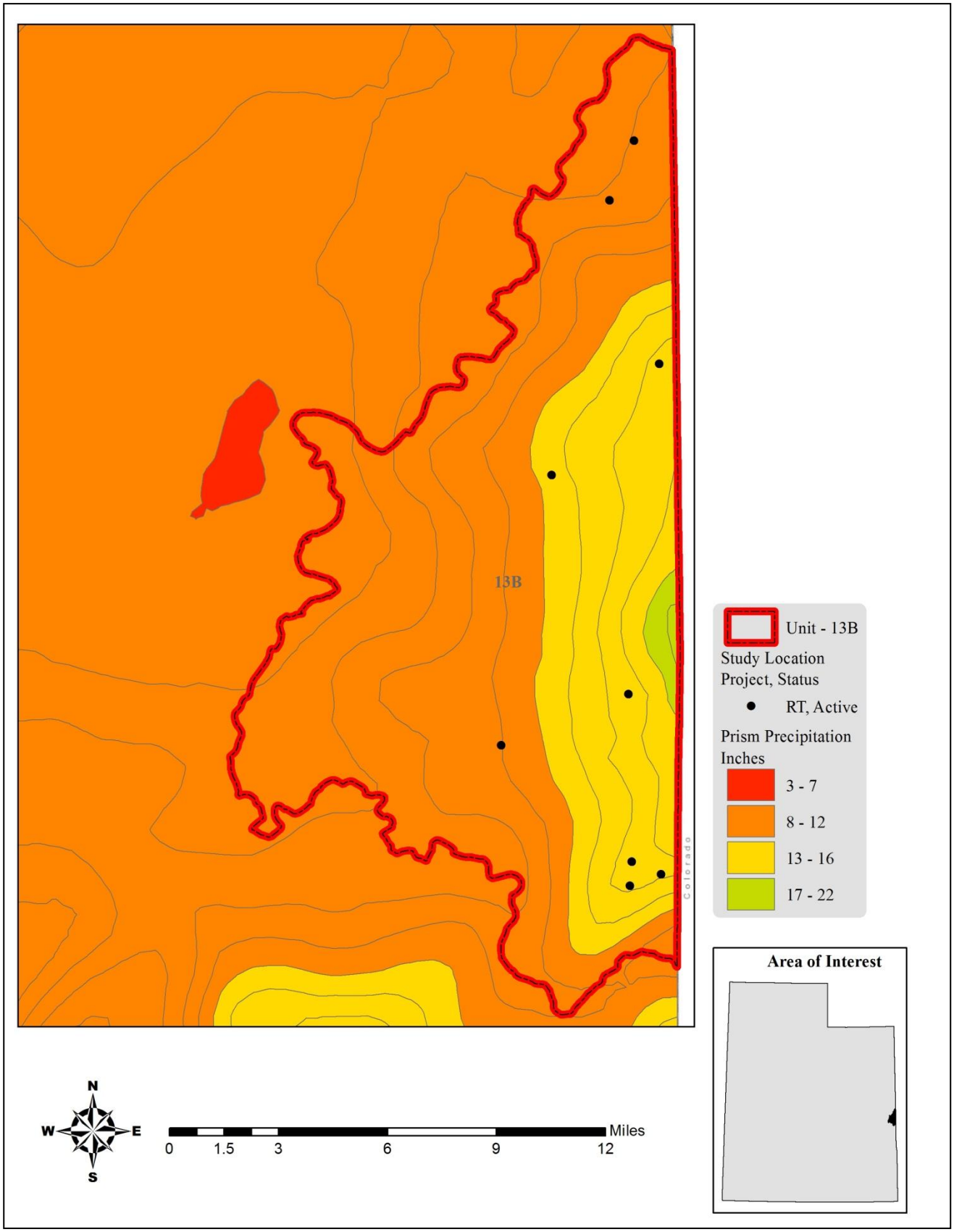
Geography

The Dolores Triangle unit is formed by the Colorado River, the Dolores River, and the Colorado-Utah state line. Topography is varied with relatively flat mesas above 7,000 feet, large rocky rough canyons and broken country at the middle elevations, and low desert along the Colorado River. Four drainages dominate the area. The 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 (1981-2010) annual precipitation PRISM model shows precipitation ranges on the unit from 8 inches in the western portion near Cisco to 18 inches on the mesas above Ryan Creek. All of the Range Trend and WRI monitoring studies on the unit occur within 10-15 inches of precipitation (Map 7.1) (PRISM Climate Group, Oregon State University).

Vegetation trends are dependent upon annual and seasonal precipitation patterns. Palmer Drought Severity Index (PDSI) data for the unit were 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 displayed years of moderate to extreme drought from 1989-1990, 2002-2003, 2009, and 2012. The mean annual PDSI displayed moderately to extremely wet years from 1983-1985 and 2005 (Figure 7.1a). The mean spring (March-May) PDSI displayed moderate to extreme drought in 1989-1991, 1996, 2002-2004, and 2012-2013; moderately to extremely wet years were displayed in 1983-1985, 1993, and 2005. The mean fall (Sept.-Nov.) PDSI displayed years of moderate to extreme drought in 1989-1990, 2002-2003, 2009, and 2012; moderately to extremely wet years were displayed in 1983-1985, 1997, and 2013 (Figure 7.1b) (Time Series Data, 2016).



Map 7.1: The 1981-2010 PRISM Precipitation Model for WMU 13B, Dolores Triangle (PRISM Climate Group, Oregon State University, 2016).

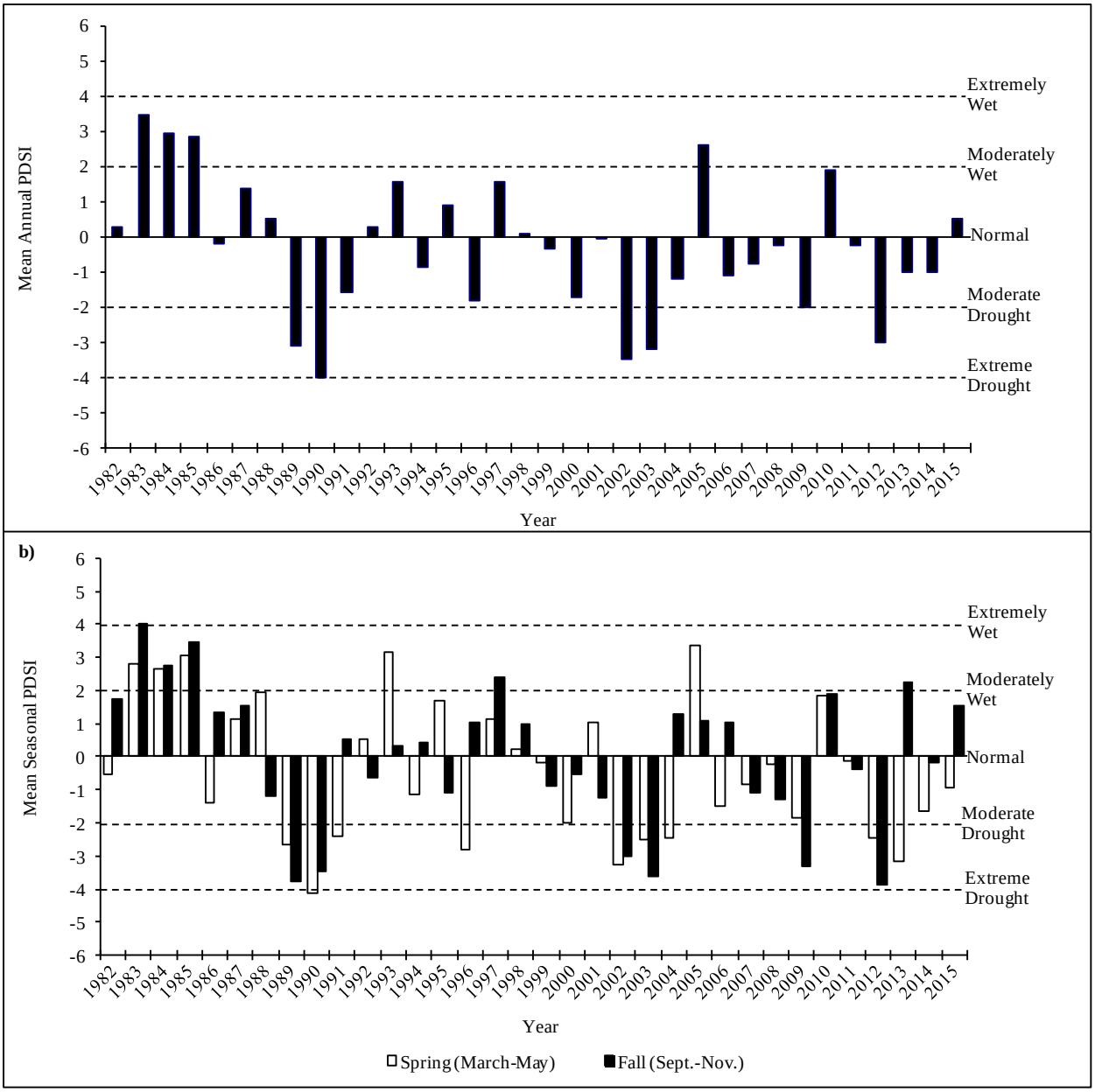


Figure 7.1: The 1982-2015 Palmer Drought Severity Index (PDSI) for the Southeast division (Division 7). The PDSI is based on climate data gathered from 1895 to 2014. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet and negative deviations indicate drought. Classification of the scale is ≥4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to2.9 = 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 -.9 = Incipient Dry Spell, -1.0 to -1.9 = Mild Drought, -2.0 to -2.9 = Moderate Drought, -3.0 to -3.9 = Severe Drought and ≤-4.0 = Extreme Drought (Time Series Data 2014). a) Mean annual PDSI. b) Mean spring (March-May) and fall (Sept.-Nov.) (Time Series Data, 2016).

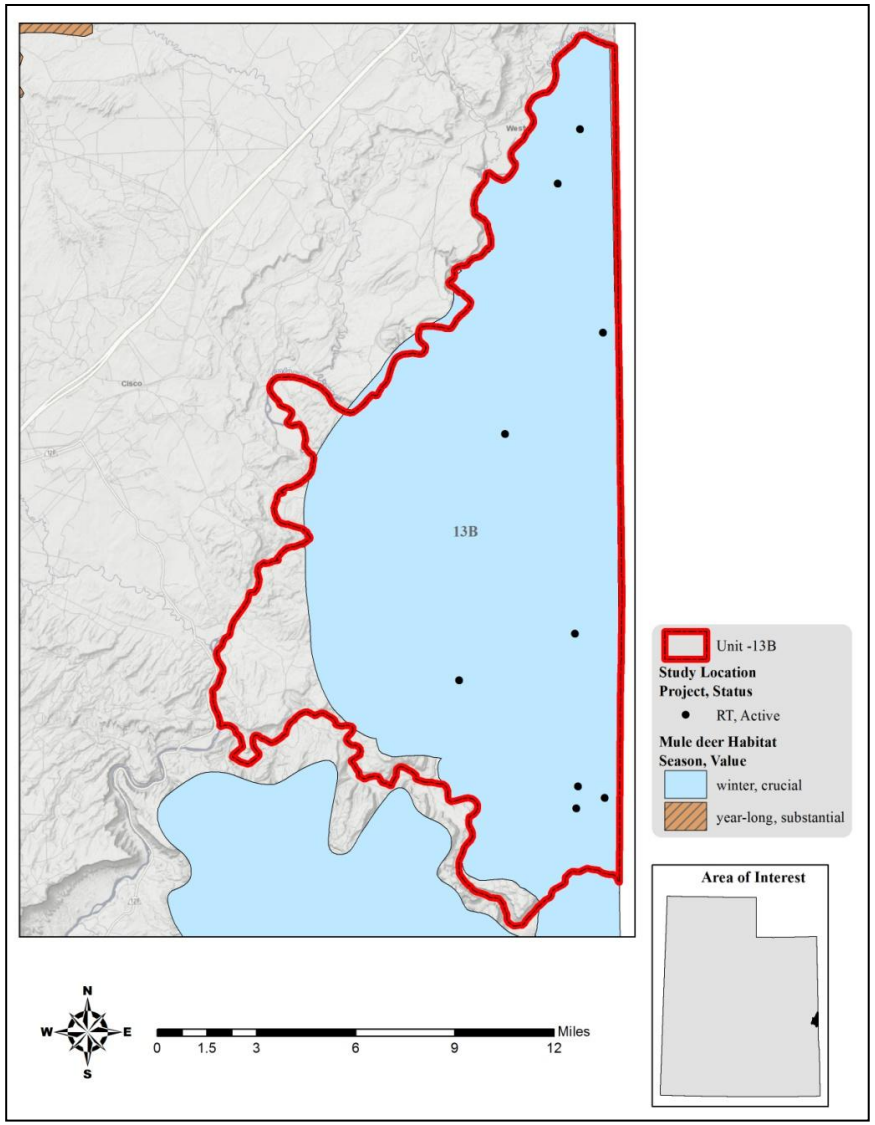
Big Game Habitat

This subunit is comprised of 100,780 acres of deer range and 70,007 acres of elk range, all of which is classified as winter range. For both deer and elk ranges, the Bureau of Land Management (BLM) manages about 87%, Utah State Institutional Trust Lands (SITLA) manages 9%, and the remaining 4% is privately owned (Map 7.2, Map 7.3, Map 7.5, Table 7.2, Table 7.3).

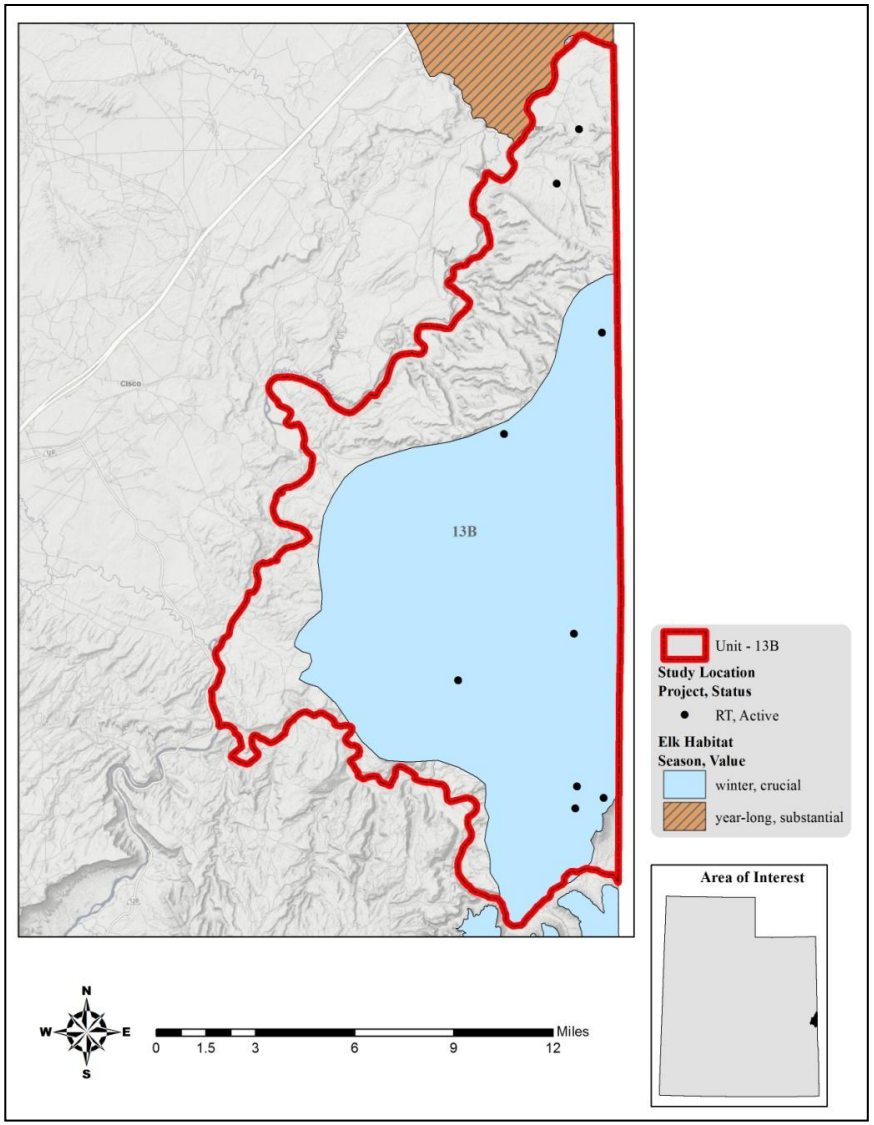
The Dolores Triangle Unit serves as winter range for deer, which spend the remainder of the year in Colorado's Pinon Mesa area. Few deer reside in the unit year-round, and those that do are found along the

Colorado River. Concentrated areas for deer during normal winters are 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.

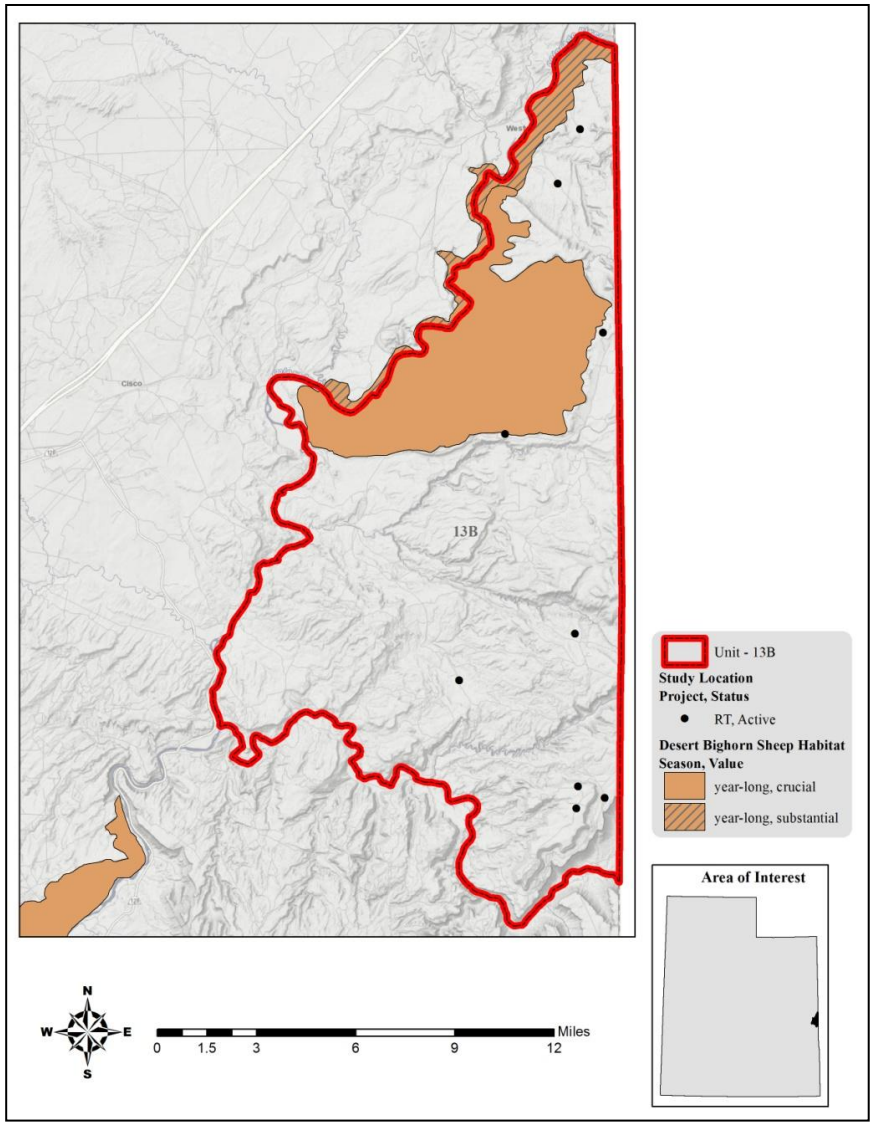
Coles and Pederson (1967) identified and described five vegetation types, which make up the winter range on the unit. The desert shrub type is dominated by blackbrush, which occupies the lower portions of this winter range. This type is most important during severe winters although few desirable forage species are found within it. The grass type is found in the Granite Park and Steamboat Mesa areas. These were once large sagebrush parks, but have undergone a conversion to grasses (much of it cheatgrass) 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. The sagebrush type is found above the desert shrub type, up to and within the pinyon-juniper woodlands. It 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 and black sagebrush 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.



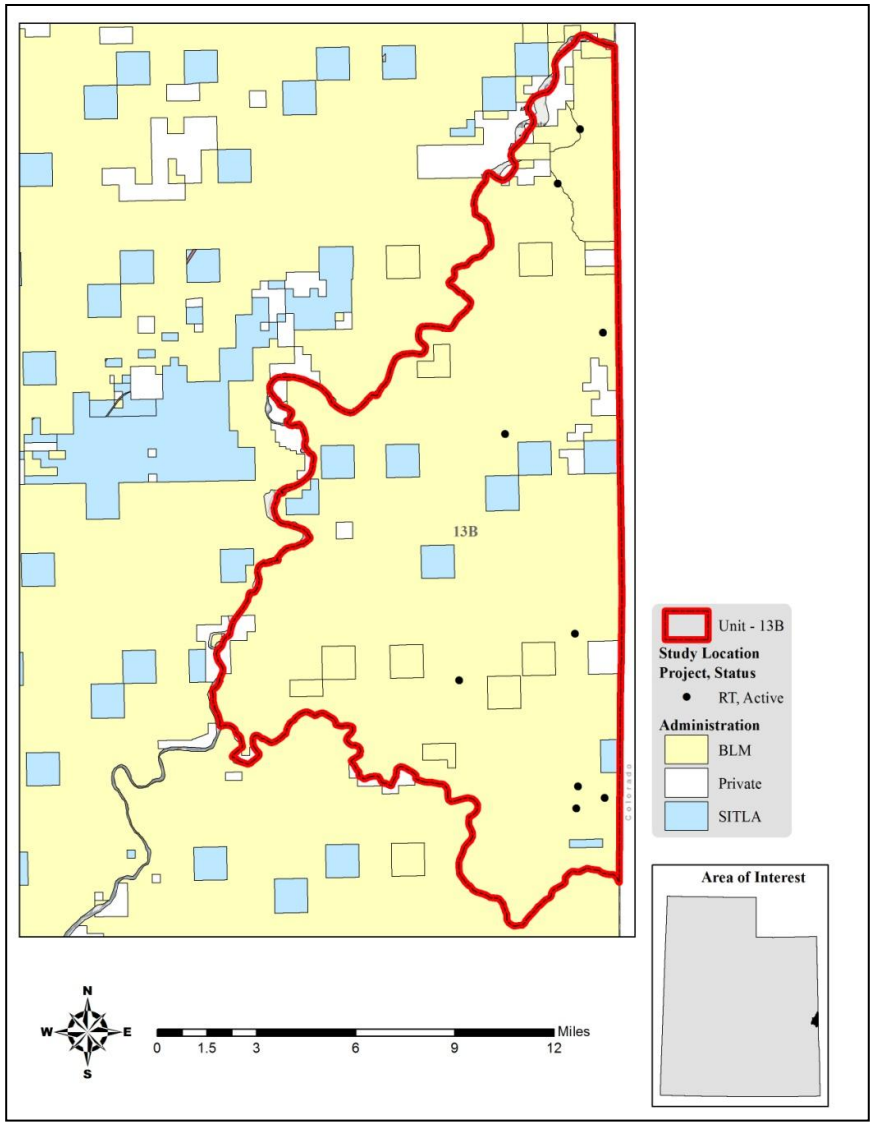
Map 7.2: Estimated mule deer habitat by season and value for WMU 13B, Dolores Triangle.



Map 7.3: Estimated elk habitat by season and value for WMU 13B, Dolores Triangle.



Map 7.4: Estimated desert bighorn sheep habitat by season and value for WMU 13B, Dolores Triangle.



Map 7.5: Land ownership for WMU 13B, Dolores Triangle.

	Year Long Range		Winter Range	
	Area (acres)	*%*	*Area (acres)*	*%*
Mule Deer	0	0%	100,780	100%
Elk	0	0%	70,007	100%
DBS	23,850	100%	0	0%

Table 7.1: Estimated mule deer, elk, and desert bighorn sheep habitat acreage by season for WMU 13B, Dolores Triangle.

	Winter Range	
Ownership	*Area (acres)*	*%*
BLM	92,454	92%
Private	3,263	3%
SITLA	4,648	5%
SL&F	416	<1%
Total	100,780	**100%**

Table 7.2: Estimated mule deer habitat acreage by season and ownership for WMU 13B, Dolores Triangle.

	Winter Range	
Ownership	*Area (acres)*	*%*
BLM	64,424	92%
Private	1,917	3%
SITLA	3,666	5%
Total	70,007	**100%**

Table 7.3: Estimated elk habitat acreage by season and ownership for WMU 13B, Dolores Triangle.

	Year Long Range	
Ownership	*Area (acres)*	*%*
BLM	22,045	93%
Private	1,025	4%
SITLA	295	1%
SL&F	484	2%
Total	23,850	**100%**

Table 7.4: Estimated desert bighorn sheep habitat acreage by season and ownership for WMU 13B, Dolores Triangle.

Group	Existing Vegetation Type	Acres	% of Total	Group % of Total
Conifer	Colorado Plateau Pinyon-Juniper Woodland	25,959	22.35%	
	Other Conifer	83	0.07%	22.43%
Exotic Herbaceous	Introduced Upland Vegetation-Annual Grassland	6,588	5.67%	5.67%
Exotic Tree-Shrub	Introduced Riparian Shrubland	1,653	1.42%	
	Introduced Riparian Forest and Woodland	10	0.01%	1.43%
Grassland	Inter-Mountain Basins Semi-Desert Grassland	2,885	2.48%	2.48%
Shrubland	Coleogyne ramosissima Shrubland Alliance	53,292	45.89%	
	Inter-Mountain Basins Big Sagebrush Shrubland	11,309	9.74%	
	Inter-Mountain Basins Greasewood Flat	2,296	1.98%	
	Inter-Mountain Basins Mixed Salt Desert Scrub	1,168	1.01%	
	Other Shrubland	773	0.67%	59.28%
Other	Barren	3,530	3.04%	
	Sparsely Vegetated	3,201	2.76%	
	Riparian	2,075	1.79%	
	Developed	749	0.65%	
	Open Water	393	0.34%	
	Agricultural	159	0.14%	
	Other	0.4	0.00%	8.71%
Total		116,125	100.00%	

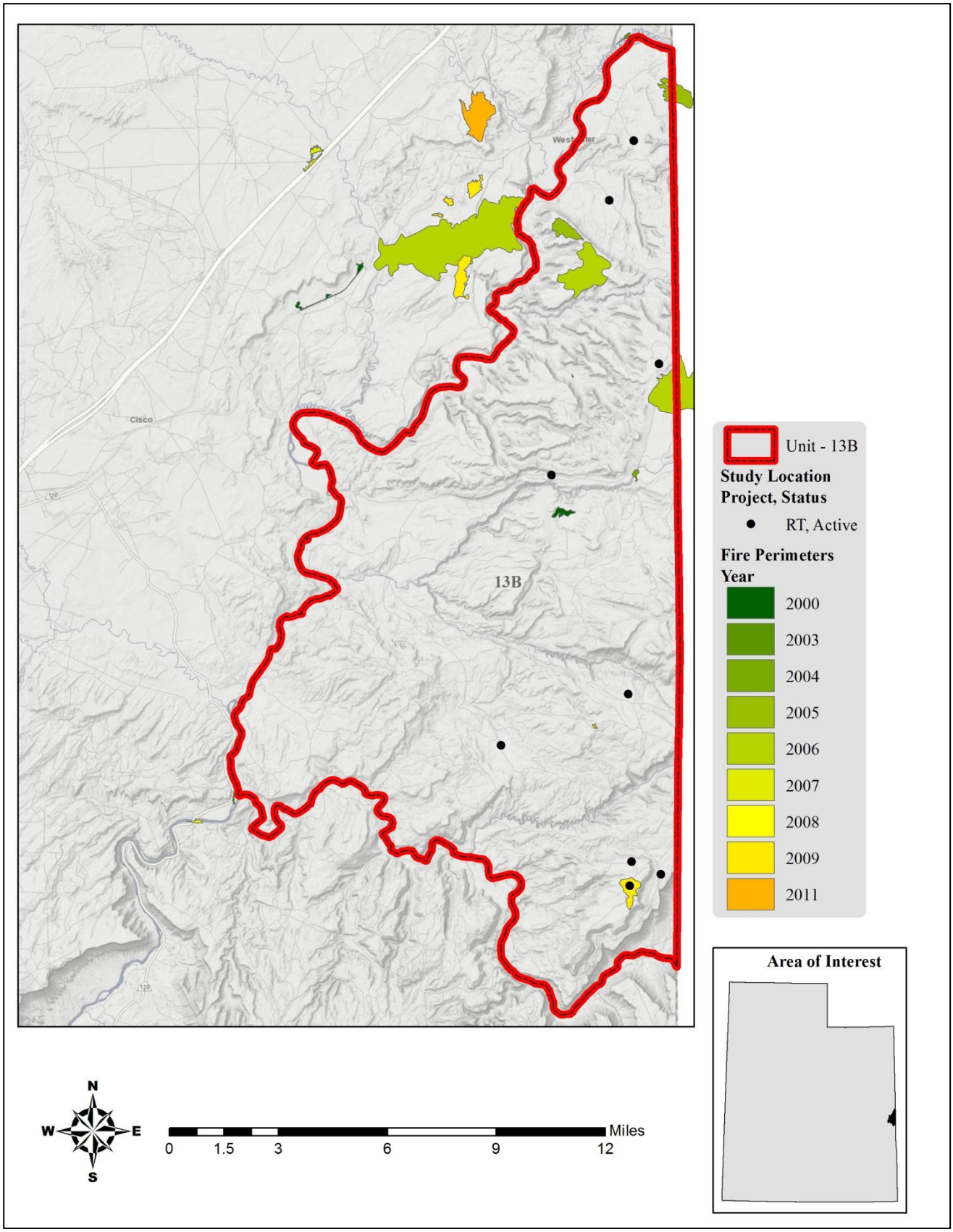
Table 7.5: Landfire existing vegetation coverage (LANDFIRE: LANDFIRE 1.3.0, 2014) for WMU 13B, Dolores Triangle.

Limiting Factors to Big Game Habitat

Livestock grazing is the single most important land use in the area. Winter sheep use began in the early 1900s. Now, most of the AUMs the BLM allocates for livestock use are for cattle, although some winter sheep use still occurs. The evolving dominance of pinyon-juniper along with excessive use by livestock and big game has led to deteriorating range conditions. Both livestock and deer numbers were reduced in the past to help improve the range. Range conditions were in a state of improvement in the mid-1980s, but continued drought has caused deterioration in sagebrush communities.

According to current Landfire Existing Vegetation Coverage models, 22% of the Dolores Triangle unit is comprised of pinyon-juniper woodlands (Table 7.5). Encroachment and invasion of these woodlands into sagebrush communities has been shown to decrease sagebrush and herbaceous cover, therefore decreasing available wildlife forage (Miller, Svejcar, & Rose, 2000).

Continued range monitoring could maintain and protect ranges from loss and degradation. Cooperation between federal, state, and local governments and private landowners could further maintain and preserve crucial habitat through agreements with land management agencies, the use of conservation easements and the like on private lands, planning and evaluating resource use and developments that might affect habitat quality, and developing specific vegetation objectives to maintain the quality of important deer use areas. In addition, forage production could be maintained or improved through direct range improvements such as reseedings, controlled burns, water developments, tree removal, etc.

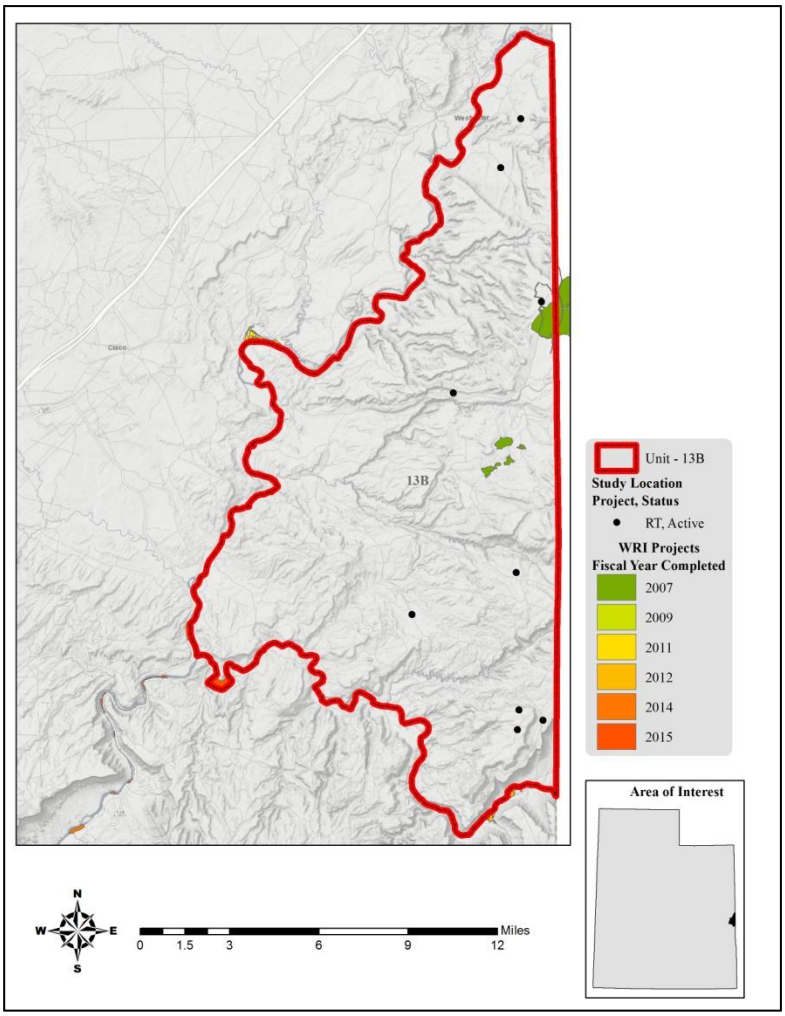


Map 7.6: Land coverage of fires by year from 2000-2011 for WMU 13B, Dolores Triangle.

Treatments/Restoration Work

There has been some effort to address some of the limitations on this unit through the Watershed Restoration Initiative (WRI). A total of 878 acres of land have been treated within the Dolores Triangle unit since the WRI was implemented in 2004 (Map 7.7). Treatments frequently overlap one another bringing the total treatment acres to 1,036 acres for this unit (Table 7.6). Other treatments have occurred outside of the WRI through independent agencies and landowners, but the WRI comprises the majority of work done on deer winter ranges throughout the state of Utah.

Seeding to augment the herbaceous understory is the most common management practice in this unit. Vegetation removal via hand crew is also common. Other management practices include herbicide application to remove weeds, greenstripping, and other vegetation improvement techniques (Table 7.6).



Map 7.7: WRI treatments by fiscal year completed for WMU 13B, Dolores Triangle.

Treatment Action	Acres
Seeding (Primary)	464
Vegetation Removal/Hand Crew	224
Herbicide Application	151
Vegetation Improvements	142
Greenstripping	54
***Total Land Area Treated**	878
Total Treatment Acres	1,036

Table 7.6: WRI treatment action size (acres) for WMU 13B, Dolores Triangle.

*Does not include overlapping treatments.

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 7.7). Due to changes in sampling methodologies, only data sampled 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 7.8).

Range Trend studies are summarized in this report by ecological site. Range Trend and WRI studies that have had a disturbance or treatment during the reported sample period are summarized in this report by the disturbance or treatment type and are summarized by region.

Study #	Study Name	Project	Status	Year(s) Sampled	Ecological Site Description
13B-1	Lower Westwater-Dolores	RT	Active	‘86, ‘95, ‘00, ‘05, ‘10, '15	Semidesert Sandy Loam (Wyoming Big Sagebrush)
13B-2	Upper Westwater-Dolores	RT	Active	‘86, ‘95, ‘00, ‘05, ‘10, '15	Semidesert Sandy Loam (Wyoming Big Sagebrush)
13B-3	Fish Park	RT	Active	‘86, ‘95, ‘00, ‘05, ‘10	Not Identified
13B-4	Red Cliffs	RT	Active	‘86, ‘95, ‘00, ‘05, ‘10, '15	Semidesert Sandy Loam (Blackbrush)
13B-5	Buckhorn Draw	RT	Active	‘86, ‘95, ‘00, ‘05, ‘10, '15	Semidesert Sandy Loam (Blackbrush)
13B-6	Ryan Creek	RT	Active	‘86, ‘95, ‘00, ‘05, ‘10, '15	Upland Shallow Loam (Pinyon-Utah Juniper)
13B-7	Steamboat Mesa North	RT	Active	‘86, ‘95, ‘00, ‘05, ‘10, '15	Upland Loam (Big Sagebrush)
13B-8	Steamboat Mesa South	RT	Active	‘86, ‘95, ‘00, ‘05, ‘10, '15	Upland Loam (Big Sagebrush)
13B-9	Steamboat East Bench	RT	Active	‘86, ‘95, ‘00, ‘05, ‘10, '15	Upland Shallow Loam (Black Sagebrush)

Table 7.7: 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	Size (acres)	WRI Project #
13B-2	Upper Westwater-Delores	Wildfire		1986-1994		
13B-6	Ryan Creek	Chain Unknown		1968	1800	
		Aerial Unknown		1968	1800	
		Herbicide-Tebuthiuron			300	
		Wildfire	Ryan Creek	1989	3947	
13B-7	Steamboat Mesa	Seed Unknown	Steamboat Mesa Allotment Chaining	1968		
		Two-Way Chain Unknown	Steamboat Mesa Allotment Chaining	1968		
13B-8	Steamboat Mesa South	Wildfire	Steamboat Mesa	July 2009	172	
13B-9	Steamboat East Bench	Seed Unknown	Steamboat Mesa Allotment Chaining	1968		
		Two-Way Chain Unknown	Steamboat Mesa Allotment Chaining	1968		

Table 7.8: Range trend and WRI studies known disturbance history for WMU 13B. Dolores Triangle.

Study Trend Summary

Upland (Sagebrush)

There are three studies [Steamboat Mesa North (13B-7), Steamboat Mesa South (13B-8), and Steamboat East Bench (13B-9)] classified as Upland (*Sagebrush*) ecological sites that are found in the Dolores Triangle Management Unit (Table 7.7). 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. The Steamboat East Bench study is found east of and below Steamboat Mesa.

Shrubs/Trees: The browse species that each study has in common is mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), though it contributes little cover. There are a few other low cover browse species

present on these sites. Shrub line intercept cover has consistently decreased from year to year, and overall is low (Figure 7.2). The average height of the few sagebrush plants found on these sites is less than one foot, making them it largely unavailable during moderate to severe winters. Sagebrush demographics show very small populations of sagebrush that lack diversity (Figure 7.5).

Active encroachment by Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) is occurring on both the Steamboat Mesa North and Steamboat East Bench study sites. Cover of juniper and pinyon has varied, but has generally increased. The density of juniper and pinyon on these study sites was 75 trees/acre and 158 trees/acre, respectively, in 2015, all of which were mature or young trees (Figure 7.3, Figure 7.4).

Herbaceous Understory: Herbaceous cover is moderately abundant on these sites, though the composition differs. The Steamboat Mesa North study has remained dominated by the perennial grass species crested wheatgrass (*Agropyron cristatum*) with annual grasses contributing little cover. In contrast, the Steamboat Mesa South study has remained dominated by the invasive annual grass cheatgrass (*Bromus tectorum*) throughout the study years. The Steamboat East Bench study shares species composition with the previously mentioned studies, but no one species dominates the understory. Perennial and annual forb community composition has remained diverse over the sample years with average cover generally increasing over the same period (Figure 7.6).

Occupancy: Pellet group transect data indicates that deer primarily use this area and that animal occupancy has generally decreased over the sample years. Trends in deer occupancy have gone from high to low with mean abundance of deer pellet groups ranging from an average high of 48 days use/acre in 2000 to an average low of 17 days use/acre in 2015 (Figure 7.7).

Upland (Pinyon and Utah Juniper)

There is one study site [Ryan Creek (13B-6)] that is classified as an Upland (Pinyon and Juniper) ecological site. Ryan Creek is located on a rolling flat southwest of Ryan Creek.

Shrubs/Trees: The shrub community on Ryan Creek is limited with rubber rabbitbrush (*Ericameria nauseosa* ssp. *hololeuca*) being the main species; cover has remained stable over the sample years (Figure 7.2). As sagebrush and trees are not present on this site, they will not be discussed in this section.

Herbaceous Understory: This study site has an abundant herbaceous understory. Ryan Creek has been dominated by perennial and annual grasses in all sample years. The introduced perennial grass crested wheatgrass (*Agropyron cristatum*) has been the dominant grass since site establishment with cover generally increasing over the same period. Additionally, the invasive annual grass cheatgrass (*Bromus tectorum*) has varied from low to high abundance over the sampling period and placed the site at an increased risk for fire. Cover of perennial forbs has been variable and has ranged from nearly 1% in 2010 to nearly 5% in 2005, while that of annual forbs has remained low most sample years, except in 2005, when redstem stork's bill (*Erodium cicutarium*) was the dominant component of the herbaceous understory (Figure 7.6).

Occupancy: Pellet transect data indicates that deer currently occupy the Ryan Creek site along with elk and cattle to a lesser extent. The mean abundance of deer pellet groups has ranged from 16 days use/acre in 2015 to 59 days use/acre in 2010. The mean abundance of elk pellet groups has ranged from 1 days use/acre in 2010 to 42 days use/acre in 2015. Pellet group abundance for cattle has ranged from a mean of 3 days use/acre in 2015 to 23 days use/acre in 2010 (Figure 7.7).

Semidesert (Sagebrush)

There are two study sites [Lower Westwater-Dolores (13B-1) and Upper Westwater-Dolores (13B-2)] that are classified as Semidesert (Sagebrush) ecological sites. The Lower Westwater-Delores study is found on the north side of Jones Canyon while the Upper Westwater-Delores 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; basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*) was the only preferred shrub sampled on the Lower Westwater-Dolores study site. Since 1995, demographics of the sagebrush population have been a mixture of mature and decadent individuals with density decreasing sharply in the 2005 sample year. Recruitment of young plants has remained low to absent (Figure 7.5). Pinyon and juniper encroachment is not discussed in this report as it is not occurring at this time.

Herbaceous Understory: The herbaceous understory of these studies is plentiful. However, the herbaceous community is dominated by annual grasses and forbs, mainly cheatgrass (*Bromus tectorum*) and redstem stork's bill (*Erodium cicutarium*). Although total herbaceous cover has fluctuated over the sampling period, combined mean cover for annual grass and forbs have shown an overall increasing trend increasing from a combined mean cover of 20% in 1995 to 31% in 2015. Perennial forbs have remained rare, with cover ranging from 0.5% in 1995 and 2000 to 2% in 2010 (Figure 7.6).

Occupancy: Pellet group transect data indicates that deer and cattle primarily use this area. The mean abundance of deer pellet groups has ranged from 11 days use/acre in 2015 to 44 days use/acre in 2000. The mean abundance of elk pellet groups has ranged from 0.35 days use/acre in 2005 to 6 days use/acre in 2000. Finally, the mean abundance of cattle pellet groups has ranged from 17 days use/acre in 2015 to 45 days use/acre in 2005 (Figure 7.7).

Semidesert (Blackbrush)

There are two study sites [Red Cliffs (13B-4) and Buckhorn Draw (13B-5)] that are classified as Semidesert (Blackbush) 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 understory of Red Cliffs is dominated by blackbrush (*Coleogyne ramosisima*), while that of Buckhorn Draw is dominated by spiny hopsage (*Grayia spinosa*). The other preferred browse species shared by both sites is Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis),* but it provides little cover. Average blackbrush line intercept cover has remained relatively stable and is at nearly 10% as of the 2015 sample year; this average is driven by the Buckhorn Draw study (Figure 7.2). A majority of the blackbrush population has been classified as mature for all sample years, although decadent individuals have remained moderately abundant. Recruitment of young plants has varied, but has generally remained low (Figure 7.5).

Herbaceous Understory: The herbaceous understory of these studies is plentiful. However, the herbaceous community on the Red Cliffs study is dominated by annual grasses and forbs, mainly cheatgrass (*Bromus tectorum*) and redstem stork's bill (*Erodium cicutarium*). The Buckhorn Draw study shares cheatgrass as the dominant species, but perennial grasses are also a prominent component of the 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 from a combined mean cover of 3% in 2000 to 13% in 2015. Perennial forbs have remained rare (Figure 7.6).

Occupancy: Pellet group transect data indicates that deer primarily use this area. The mean abundance of deer pellet groups has ranged from 31 days use/acre in 2015 to 64 days use/acre in 2010. The mean abundance of elk pellet groups has ranged from 1 days use/acre in 2000 to 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 7.7).

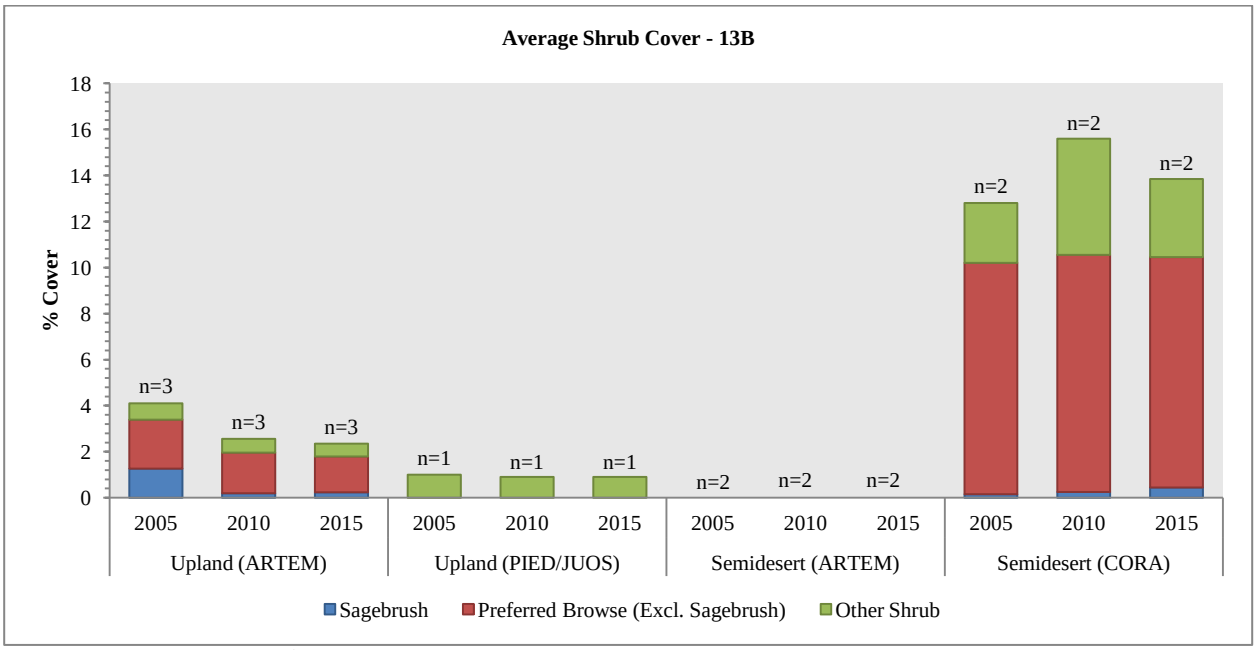


Figure 7.2: Average shrub cover for Upland (ARTEM), Upland (PIED/JUOS), Semidesert (ARTEM), and Semidesert (CORA) study sites in WMU 13B, Dolores Triangle.

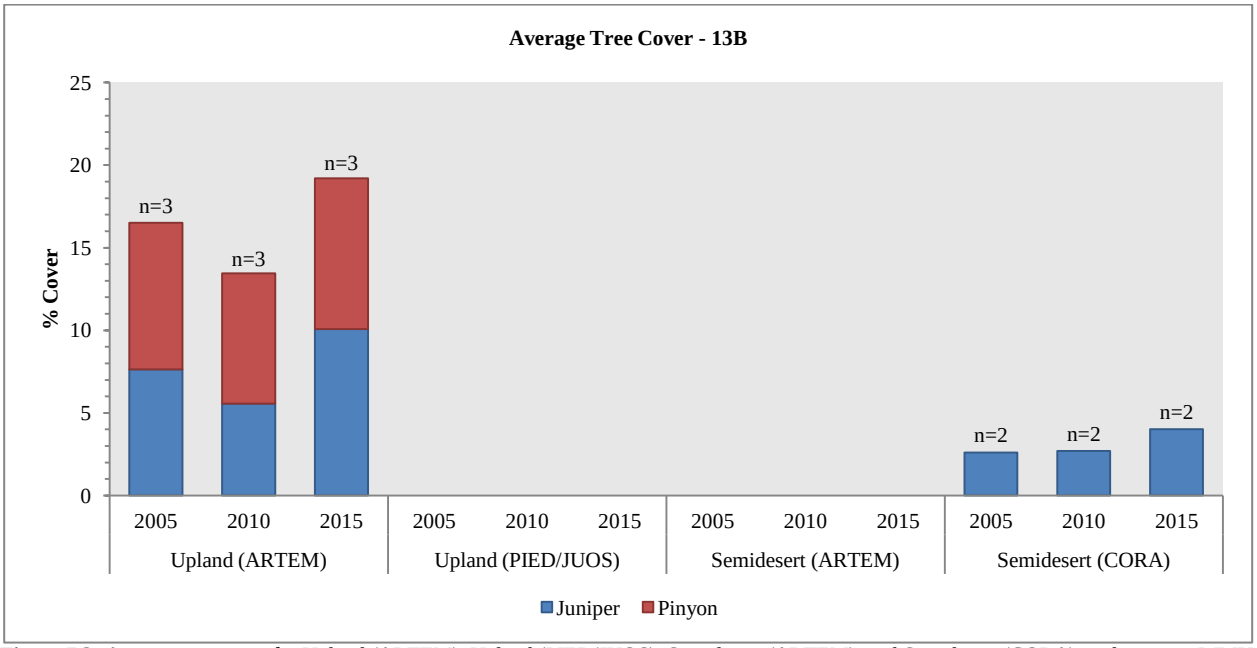


Figure 7.3: Average tree cover for Upland (ARTEM), Upland (PIED/JUOS), Semidesert (ARTEM), and Semidesert (CORA) study sites in WMU 13B, Dolores Triangle.

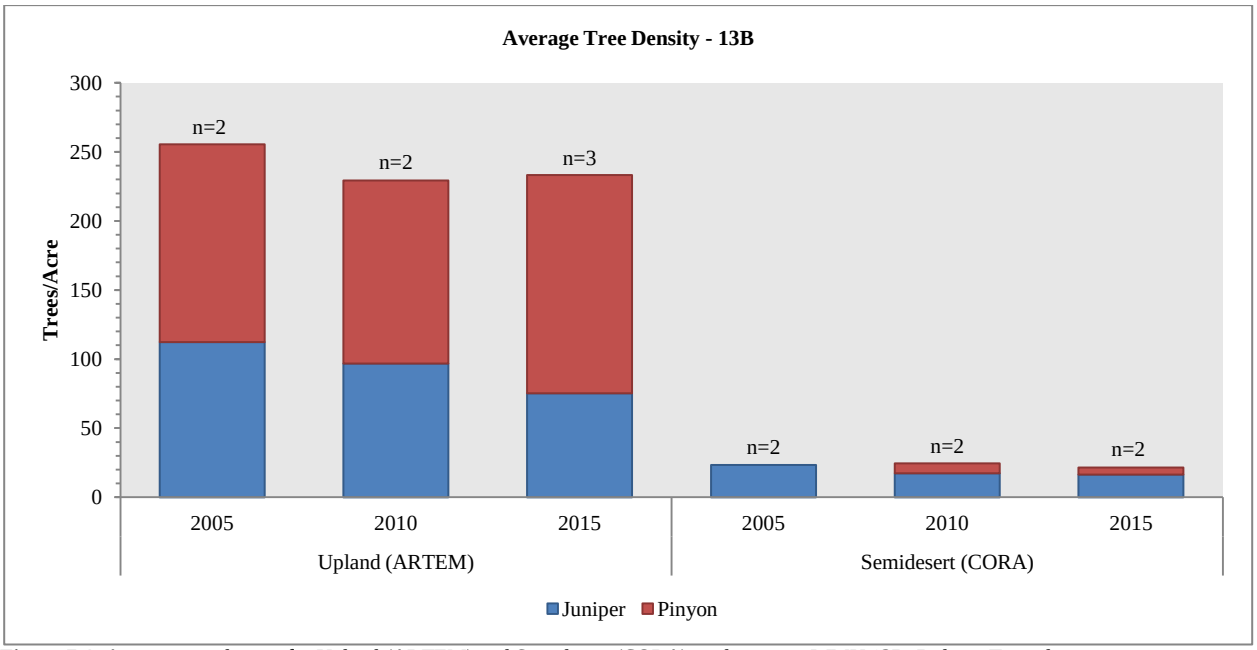


Figure 7.4: Average tree density for Upland (ARTEM) and Semidesert (CORA) study sites in WMU 13B, Dolores Triangle.

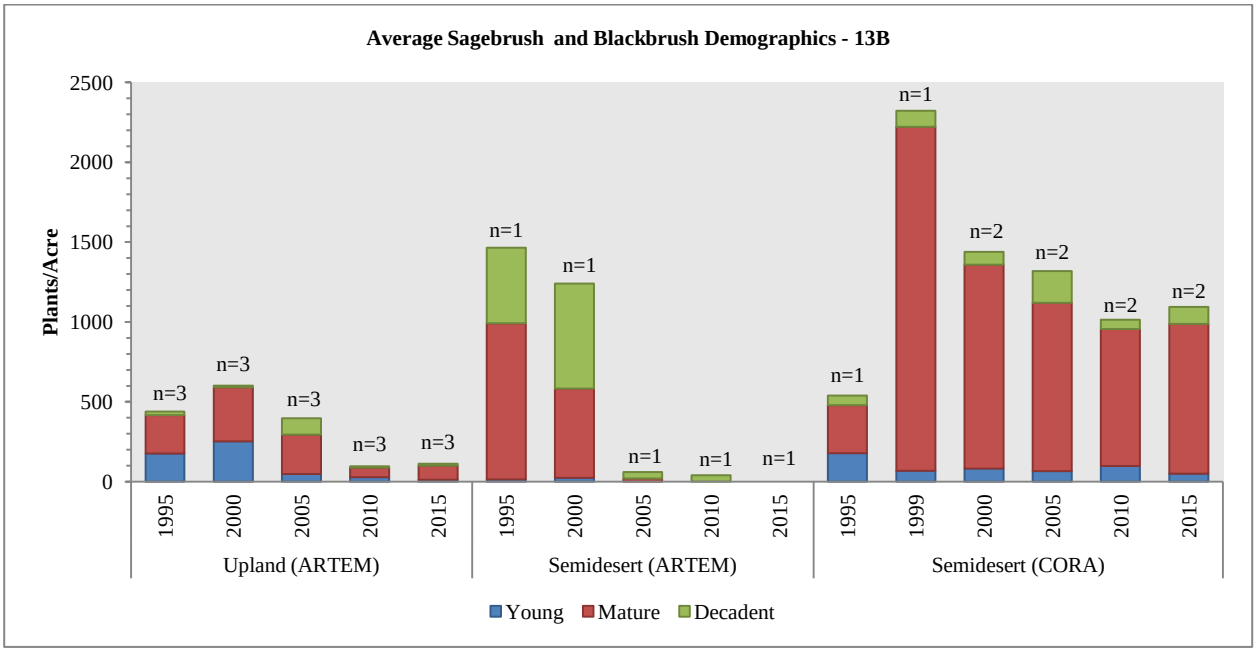


Figure 7.5: Average sagebrush demographics for Upland (ARTEM), Semidesert (ARTEM), and Semidesert (CORA) study sites in WMU 13B, Dolores Triangle.

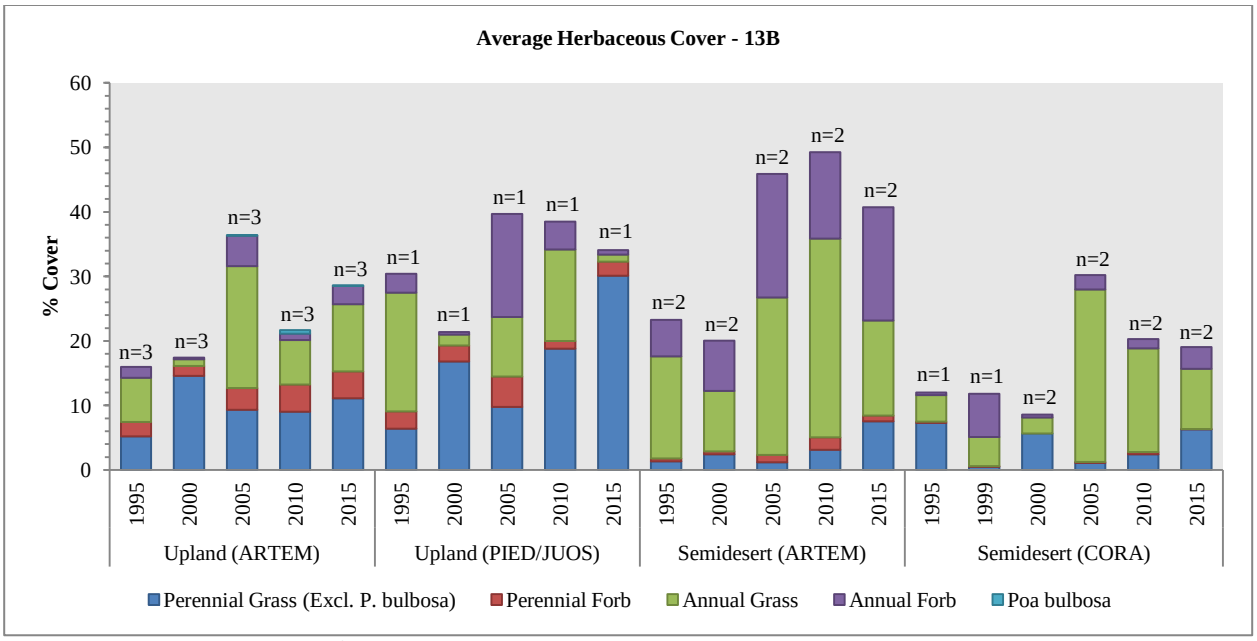


Figure 7.6: Average herbaceous cover for Upland (ARTEM), Upland (PIED/JUOS), Semidesert (ARTEM), and Semidesert (CORA) study sites in WMU 13B, Dolores Triangle.

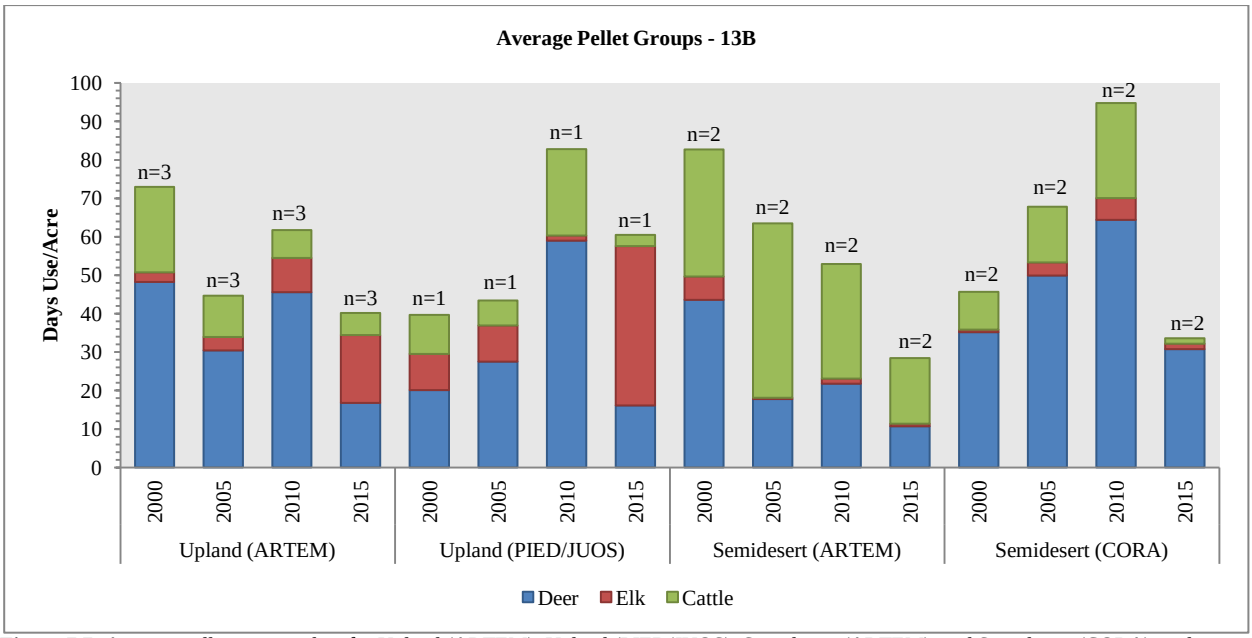


Figure 7.7: Average pellet transect data for Upland (ARTEM), Upland (PIED/JUOS), Semidesert (ARTEM), and Semidesert (CORA) study sites in WMU 13B, Dolores Triangle.

Deer Winter Range Condition Assessment

The condition of deer winter range within the Delores Triangle management unit has remained fairly consistent on the sites sampled since 1995. The range trend sites sampled within the unit are considered to be in very poor to fair condition as of the 2015 sample year (Map 7.12, Figure 7.8). Both the Lower and Upper Westwater-Dolores studies (which were sampled in 1995, 2000, 2005, 2010 and 2015) have remained in very poor condition. The Red Cliffs study has decreased in quality for deer winter range from fair to poor-fair over the sample period mentioned above, while the Buckhorn Draw Study has ranged from very poor to poor. Ryan Creek, Steamboat Mesa North and South, and Steamboat East Bench all have remained very poor in most sampled years. These low DCI scores are driven mainly by the lack of preferred browse cover and high amounts of annual grass cover found on these sites. South Creek Chaining has remained very poor prior to and since the wildfire disturbance in 2009 (Map 7.12, Figure 7.9).

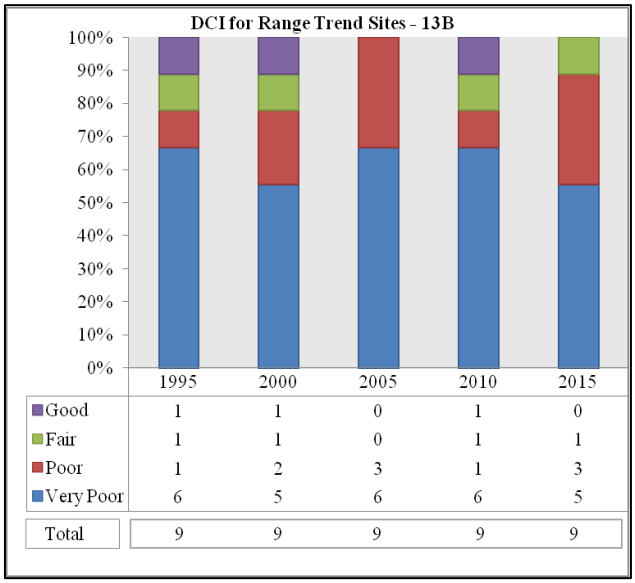


Figure 7.8: Deer winter range Desirable Components Index (DCI) summary by year of undisturbed sites for WMU 13B, Dolores Triangle.

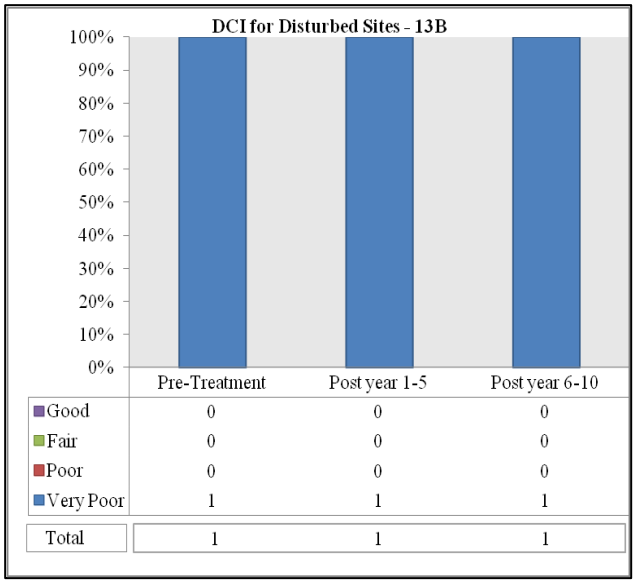
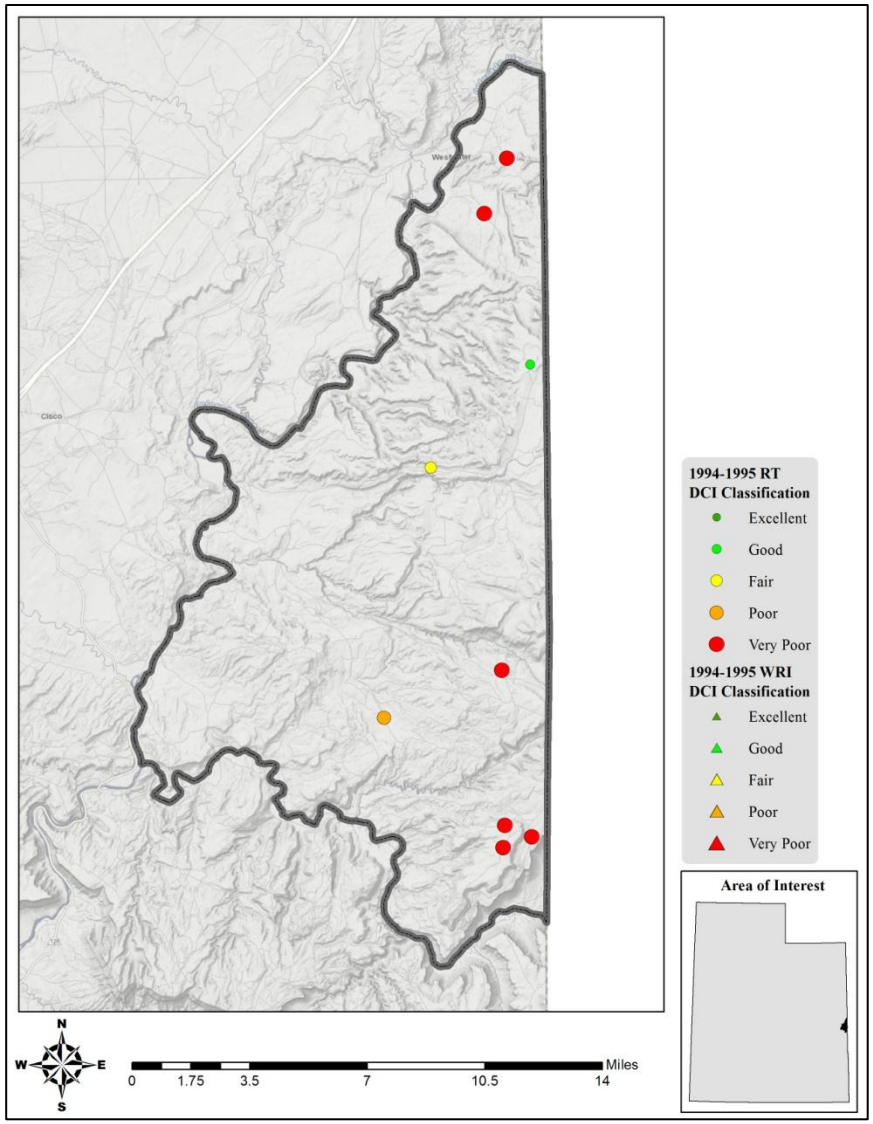
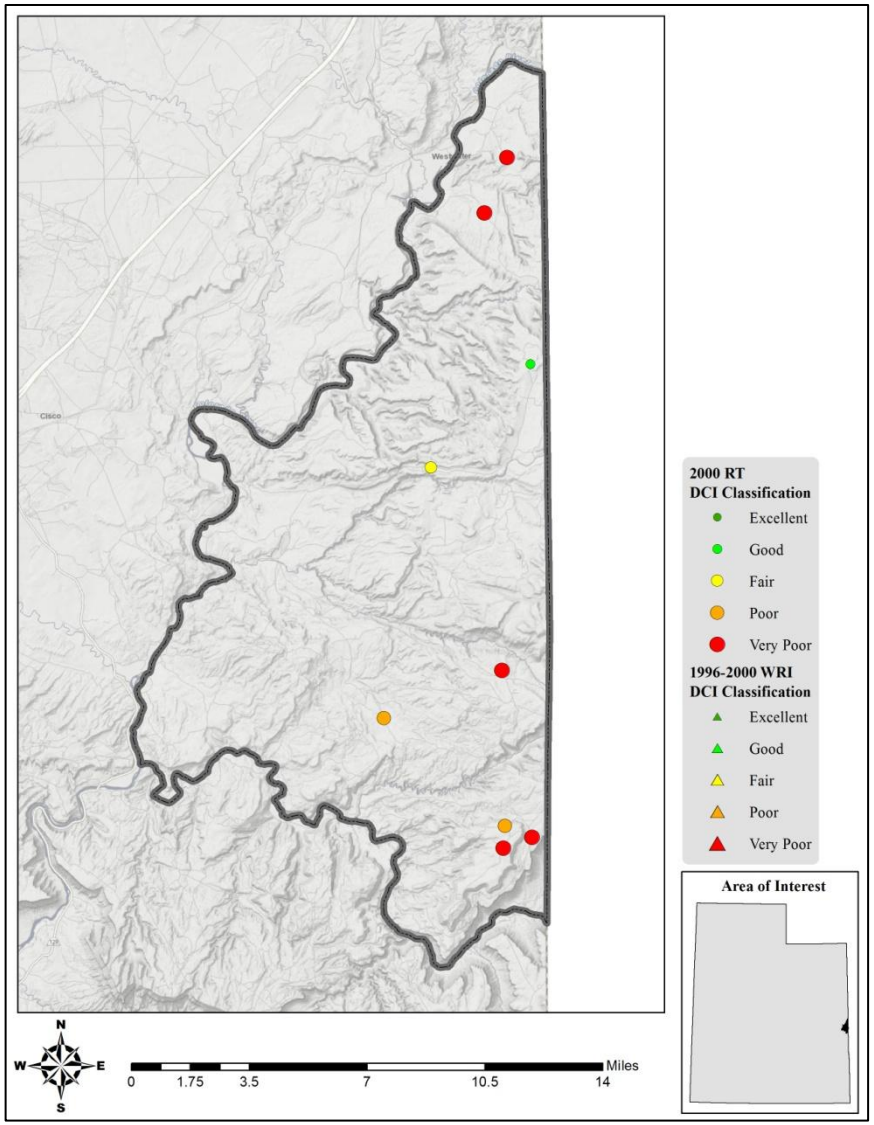


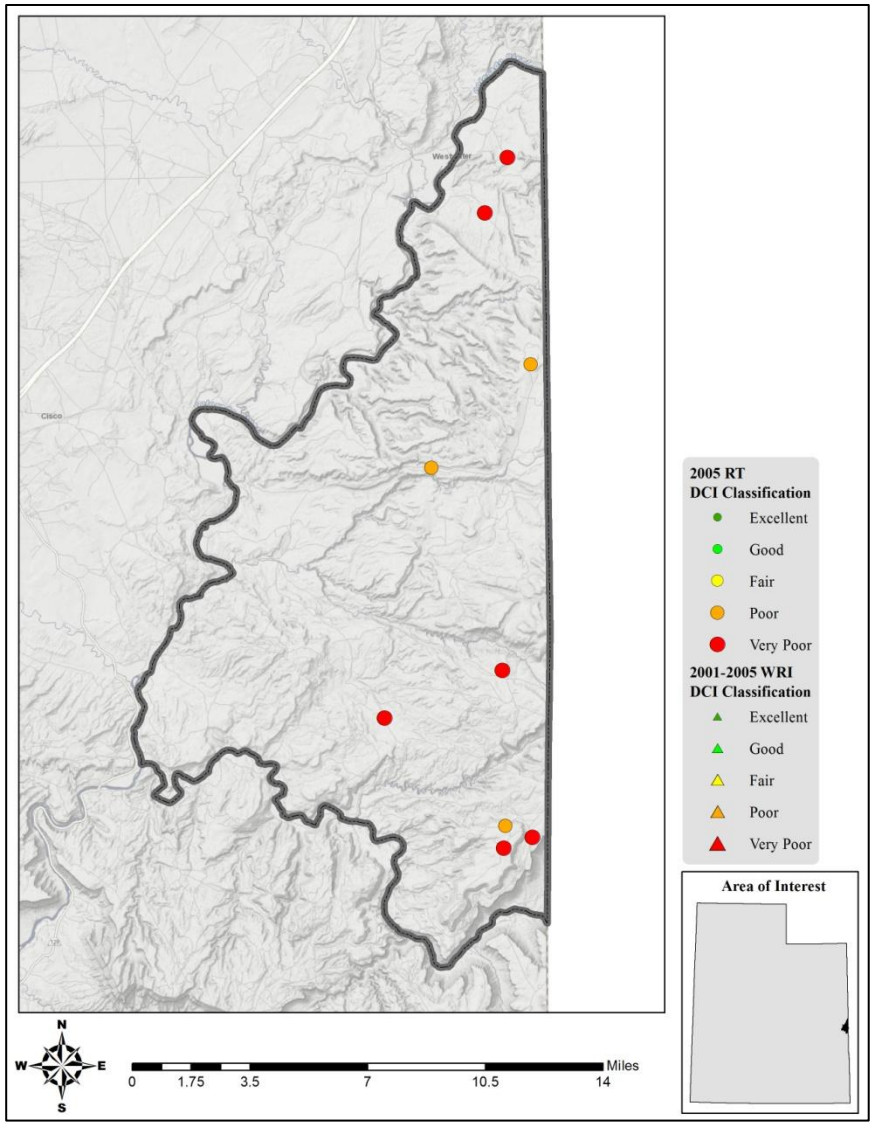
Figure 7.9: Deer winter range Desirable Components Index (DCI) summary by year of treated/disturbed sites for WMU 13B, Dolores Triangle.



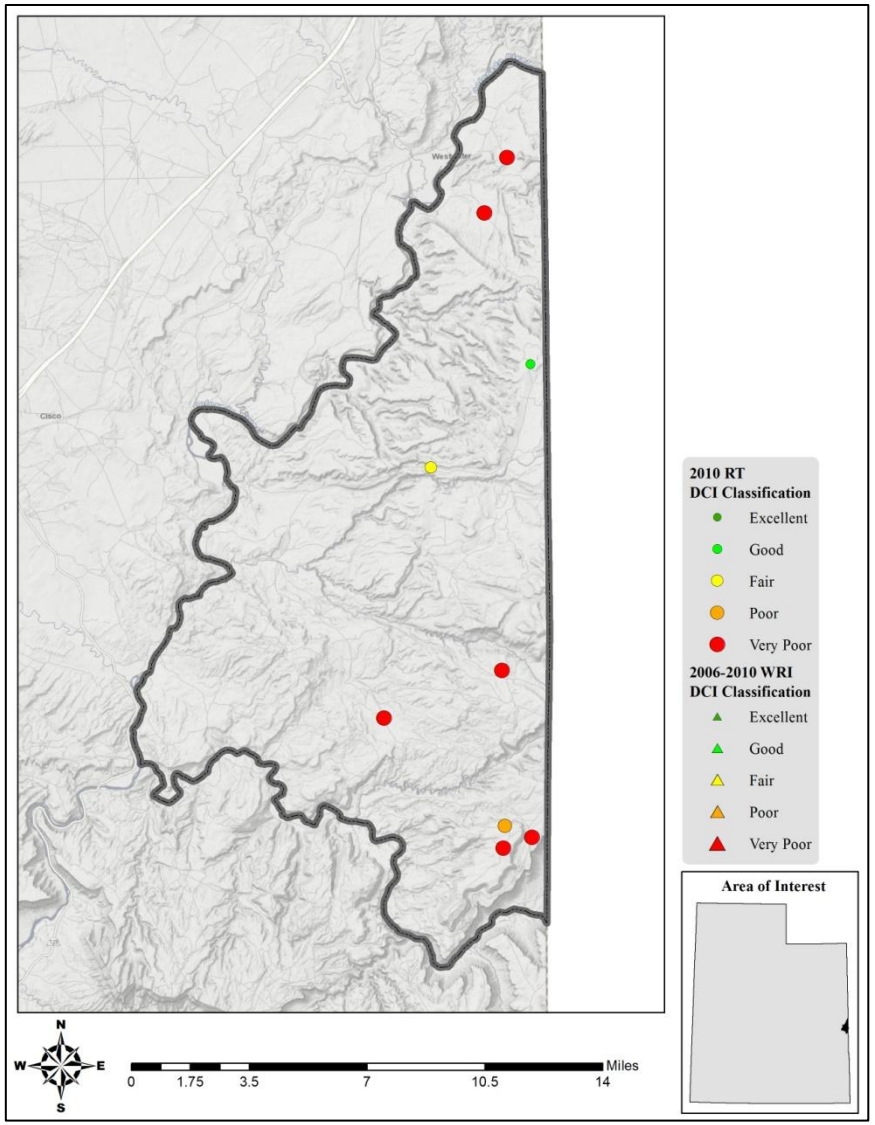
Map 7.8: 1994-95 Desirable Components Index (DCI) ranking distribution by site for WMU 13B, Dolores Triangle.



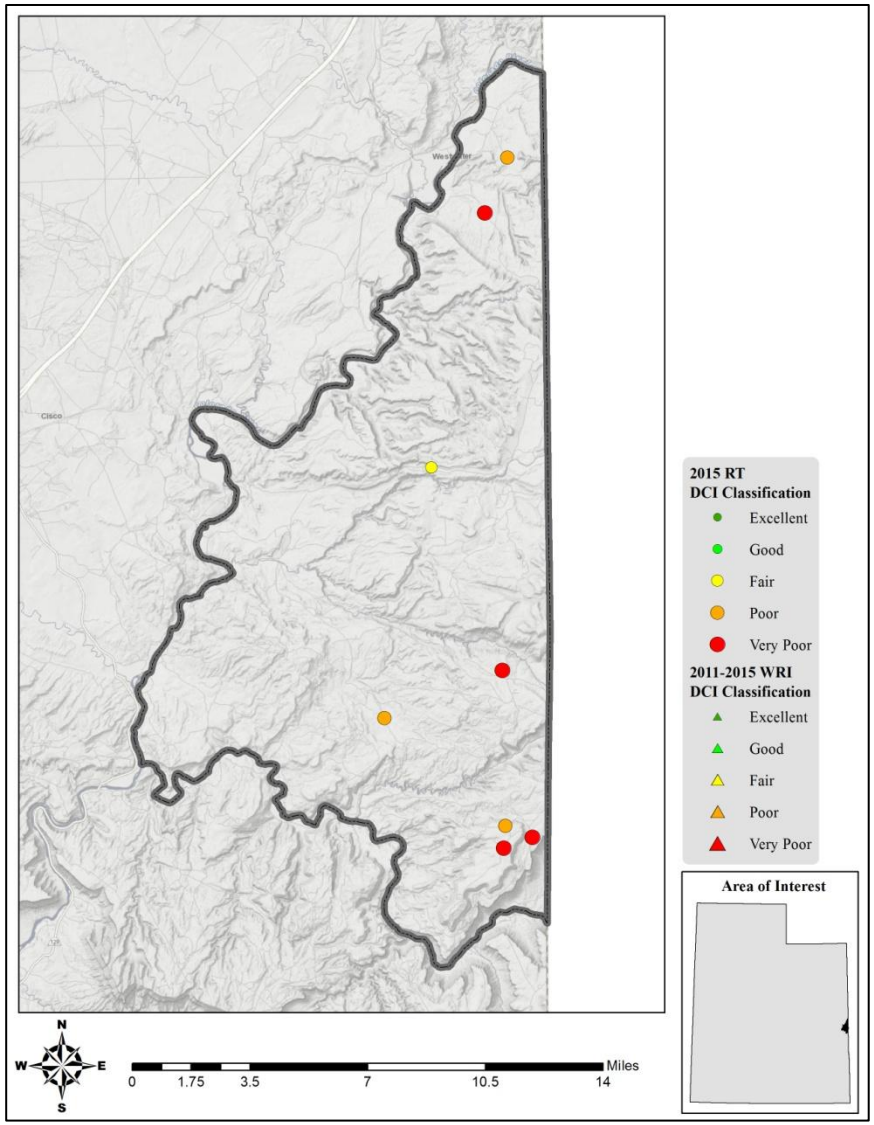
Map 7.9: 2000 Desirable Components Index (DCI) ranking distribution by site for WMU 13B, Dolores Triangle.



Map 7.10: 2005 Desirable Components Index (DCI) ranking distribution by site for WMU 13B, Dolores Triangle.



Map 7.11: 2010 Desirable Components Index (DCI) ranking distribution by site for WMU 13B, Dolores Triangle.



Map 7.12: 2015 Desirable Components Index (DCI) ranking distribution by site for WMU 13B, Dolores Triangle.

Study #	Study Name	Limiting Factor and/or Threat	Level of Threat	Potential Impact
13B-1	Lower Westwater-Dolores	Annual Grass	Moderate	Increased fire potential.
13B-2	Upper Westwater-Dolores	Annual Grass	High	Increased fire potential.
13B-3	Fish Park	Annual Grass	Moderate	Increased fire potential.
13B-4	Red Cliffs	Annual Grass	Moderate	Increased fire potential.
13B-5	Buckhorn Draw	Introduced Perennial Grass	High	Reduced diversity of desirable grass and forb species.
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
13B-6	Ryan Creek	Annual Grass	Moderate	Increased fire potential.
13B-7	Steamboat Mesa North	PJ Encroachment	Moderate	Reduced understory shrub and herbaceous vigor.
		Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species.
13B-8	Steamboat Mesa South	Annual Grass	High	Increased fire potential.
		Introduced Perennial Grass	Low	Reduced diversity of desirable grass and forb species.
13B-9	Steamboat East Bench	PJ Encroachment	High	Reduced understory shrub and herbaceous vigor.
		Annual Grass	Low	Increased fire potential.

Table 7.9: 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 of the most current sample date for each study site.

Discussion and Recommendations

Upland (Sagebrush)

This mid level sagebrush ecological site is generally considered to be in very poor condition for deer winter range habitat on the Dolores Triangle management unit. This community supports an undiversified herbaceous understory of introduced perennial and annual grasses that provide little forage during winter months. This ecological site is also prone to encroachment from pinyon and juniper trees, which can reduce understory shrub and herbaceous health if not addressed. In addition, this community can also be susceptible to invasion from annual grasses, primarily cheatgrass. Increased amounts of cheatgrass can boost fuel loads and increase the threat of wildfire in these communities. Additional care should be taken in selecting treatment methods that will not increase annual grass loads.

It is recommended that monitoring of this community continue. Work to reduce pinyon-juniper encroachment (e.g. bullhog, chaining, lop and scatter, etc.) should also continue in these communities. When reseeding is necessary to restore herbaceous species, care should be taken in species selection and preference should be given to native grass species when possible; the introduced perennial grass crested wheatgrass is often seeded after a treatment and although it provides valuable forage, this and other introduced grass species can often be aggressive at higher elevations and can reduce the diversity and abundance of other more desirable native grass and forb species.

Upland (Pinyon and Juniper)

This mid elevation upland ecological site supports a perennial grass community that is generally considered to be in very poor condition for deer winter range habitat on this unit. The introduced perennial grass crested wheatgrass dominates these sites, and although it provides valuable forage, this and other introduced grass species can often be aggressive at higher elevations and can reduce the diversity and abundance of other more desirable native grass and forb species. In addition, this community can be susceptible to invasion from annual grasses, primarily cheatgrass. Increased amounts of cheatgrass can boost fuel loads and exacerbate the threat of wildfire in these communities. Finally, this ecological site (in the long term) is also prone to encroachment from pinyon and juniper trees. It is recommended that monitoring of this community continue in order to track and mitigate potential threats when necessary.

Semidesert (Sagebrush)

The lower elevation semidesert Wyoming big sagebrush community is generally considered to be in very poor condition for deer winter range habitat on the unit. This community supports annual and perennial grass populations that provide valuable browse in moderate to severe winters. However, this community type is susceptible to invasion from annual grasses, primarily cheatgrass. Increased amounts of cheatgrass can increase fuel loads and increase the threat of wildfire within these communities.

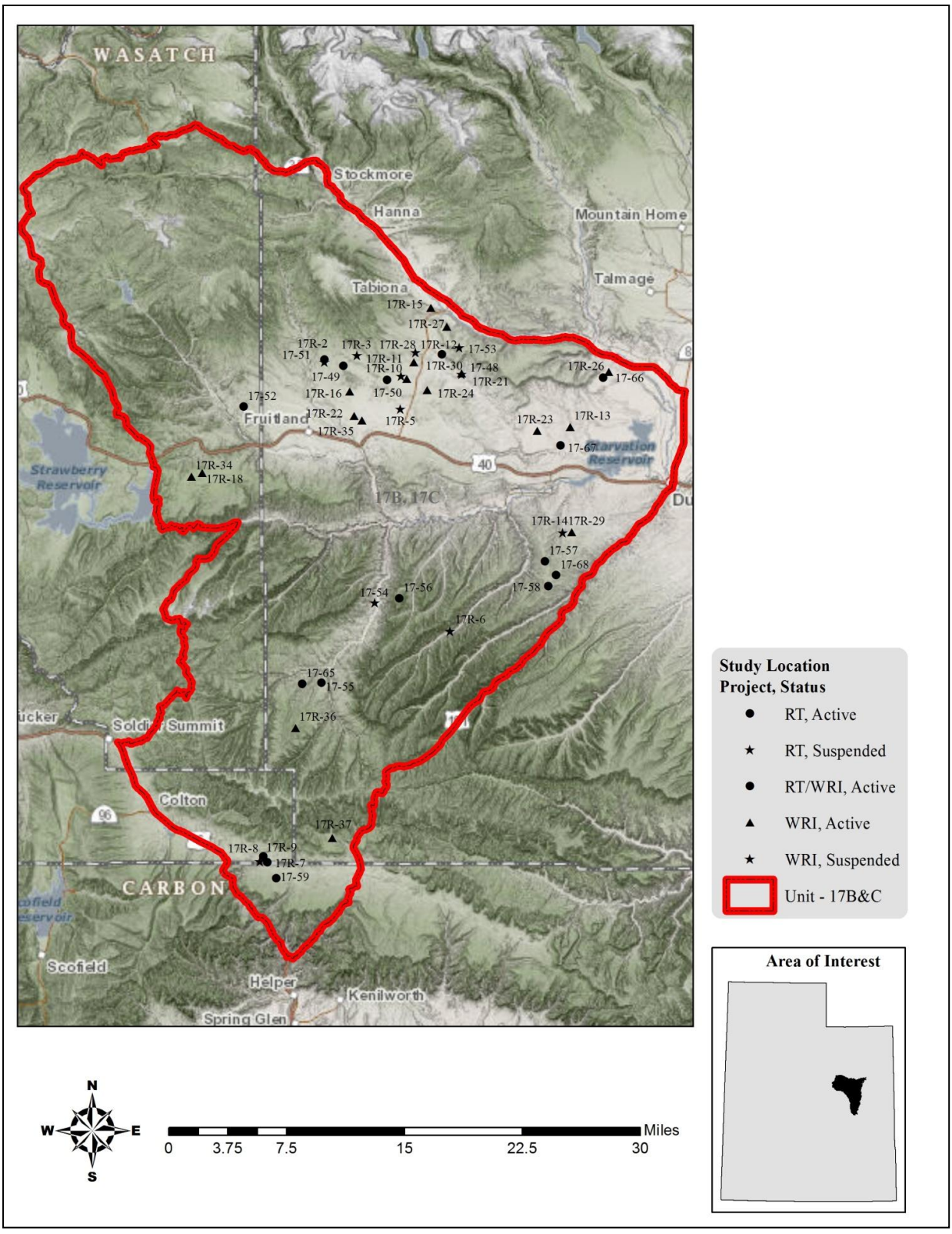
If a treatment to rejuvenate sagebrush occurs, care should be taken in selecting treatment methods that will not increase annual grass loads. Treatments to reduce annual grass may be necessary on some sites.

Semidesert (Blackbrush)

These lower elevation semidesert blackbrush communities are generally considered to be in poor to fair condition for deer winter range habitat on the unit. These communities support shrub populations that provide valuable browse in moderate to severe winters. These study sites can be susceptible to invasion from annual grasses, primarily cheatgrass. Increased amounts of cheatgrass can increase fuel loads and exacerbate the risk of wildfire within these communities. Finally, these ecological sites are also prone to encroachment from pinyon-juniper trees, which can reduce understory shrub and herbaceous health if not addressed.

Treatments to reduce annual grass may be necessary on some sites. In addition, it is recommended that work to reduce pinyon and juniper encroachment (e.g. bullhog, chaining, lop and scatter, etc.) should continue in these communities.

8. WILDLIFE MANAGEMENT UNIT 17BC – WASATCH MOUNTAINS – CURRANT CREEK-AVINTAQUIN



WILDLIFE MANAGEMENT UNIT 17BC – WASATCH MOUNTAINS – CURRANT CREEK-AVINTAQUIN

Boundary Description

> **Wasatch, Summit, Daggett, Uintah, Duchesne counties -** Boundary begins at the junction of Interstate 15 and Interstate 80 in Salt Lake City, then east on I-80 to Highway US-40; south on US-40 to State Route (SR)-32; east on SR-32 to SR-35; southeast on SR-35 to SR-87; south on SR-87 to Duchesne and Highway US-191; south on US-191 to Highway US-6, northeast on US-6 to I-15; north on I-15 to I-80 in Salt Lake City and the beginning point.

Management Unit Description

Geography

Management Unit 17 is divided into six smaller, more manageable subunits. These are Diamond Fork (17A), Timpanogos (17A), Salt Lake (17A), Heber (17A), and Currant Creek-Avintaquin (17B and 17C). The Northeastern Region 2015 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.

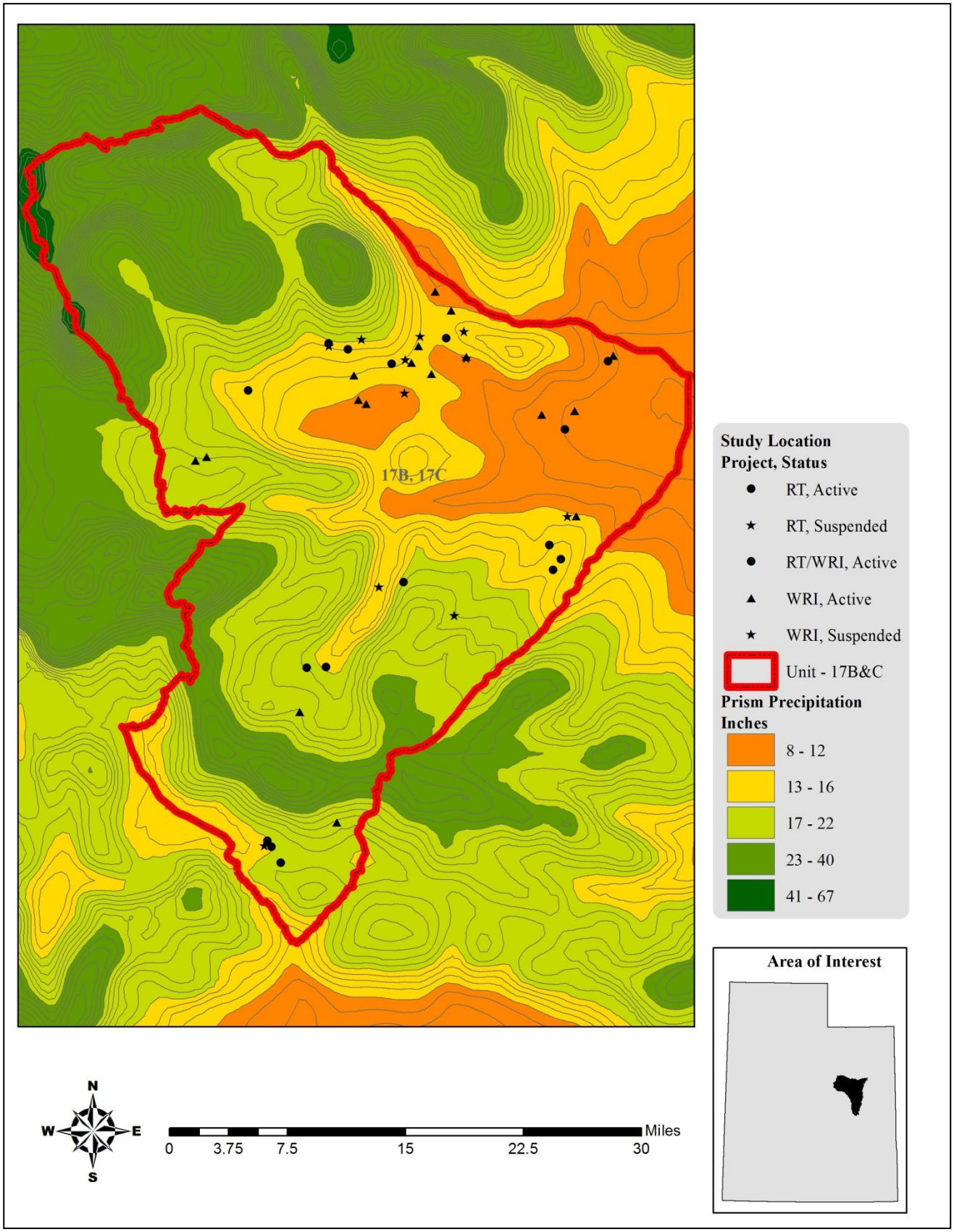
This unit contains Starvation and Currant Creek Reservoirs and portions of Ashley National Forest. Major drainages include the West Fork Duchesne River, Currant Creek, Red Creek, the Strawberry River, and Avintaquin Creek. The town of Fruitland also falls within the boundaries of Unit 17. Elevation of this unit ranges from 5,600 near the city of Duchesne to over 9,000 feet in the Wasatch Mountains.

Climate Data

The 30-year (1981-2010) annual precipitation PRISM model shows that unit precipitation ranges from 8 inches in the eastern portion (north of the city of Duchesne) to 43 inches on the peaks of the Wasatch Mountains. All of the Range Trend and WRI monitoring studies on the unit occur within the 9-20 inch precipitation zone (Map 8.1) (PRISM Climate Group, Oregon State University).

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 (Divisions 5 and 6). The mean annual PDSI of the Northern Mountains division displayed years of moderate to extreme drought from 1988-1990, 2000-2003, and 2012-2013. The mean annual PDSI displayed moderately to extremely wet years from 1982-1986, 1995, 1997-1998, 2005, and 2011 (Figure 8.1a). The mean spring (March-May) PDSI displayed years of moderate to extreme drought in 1989-1990, 1992, 2000-2004, and 2012-2014; moderately to extremely wet years were displayed in 1982-1986, 1995-1996, 1998-1999, 2005, and 2011. The mean fall (Sept.-Nov.) PDSI displayed years of moderate to extreme drought in 1982-1986, 1995, 1997-1998; moderately to extremely wet years were displayed in 1982-1986, 1995, and 1997-1998 (Figure 8.1b).

The mean annual PDSI of the Uinta Basin division displayed years of moderate to extreme drought from 1989-1991, 2000, 2002-2003, and 2012-2015. The mean annual PDSI displayed moderately to extremely wet years from 1982-1985, 1993, 1997-1998, and 2005. The mean spring (March-May) PDSI displayed years of moderate to extreme drought in 1989-1992, 2002-2004, and 2012-2015. Moderately to extremely wet years for this time period were displayed in 1983-1985, 1993, 1995, 1998, 2005, and 2011 (Figure 8.2a). The mean fall (Sept.-Nov.) PDSI displayed years of moderate to extreme drought in 1989-1990, 2001-2003, 2007, and 2012; moderately to extremely wet years were displayed in 1982-1986, 1993, and 1997-1998 (Figure 8.2b) (Time Series Data, 2016).



Map 8.1: The 1981-2010 PRISM Precipitation Model for WMU 17BC, Wasatch Mountains – Currant Creek-Avintaquin (PRISM Climate Group, Oregon State University, 2016).

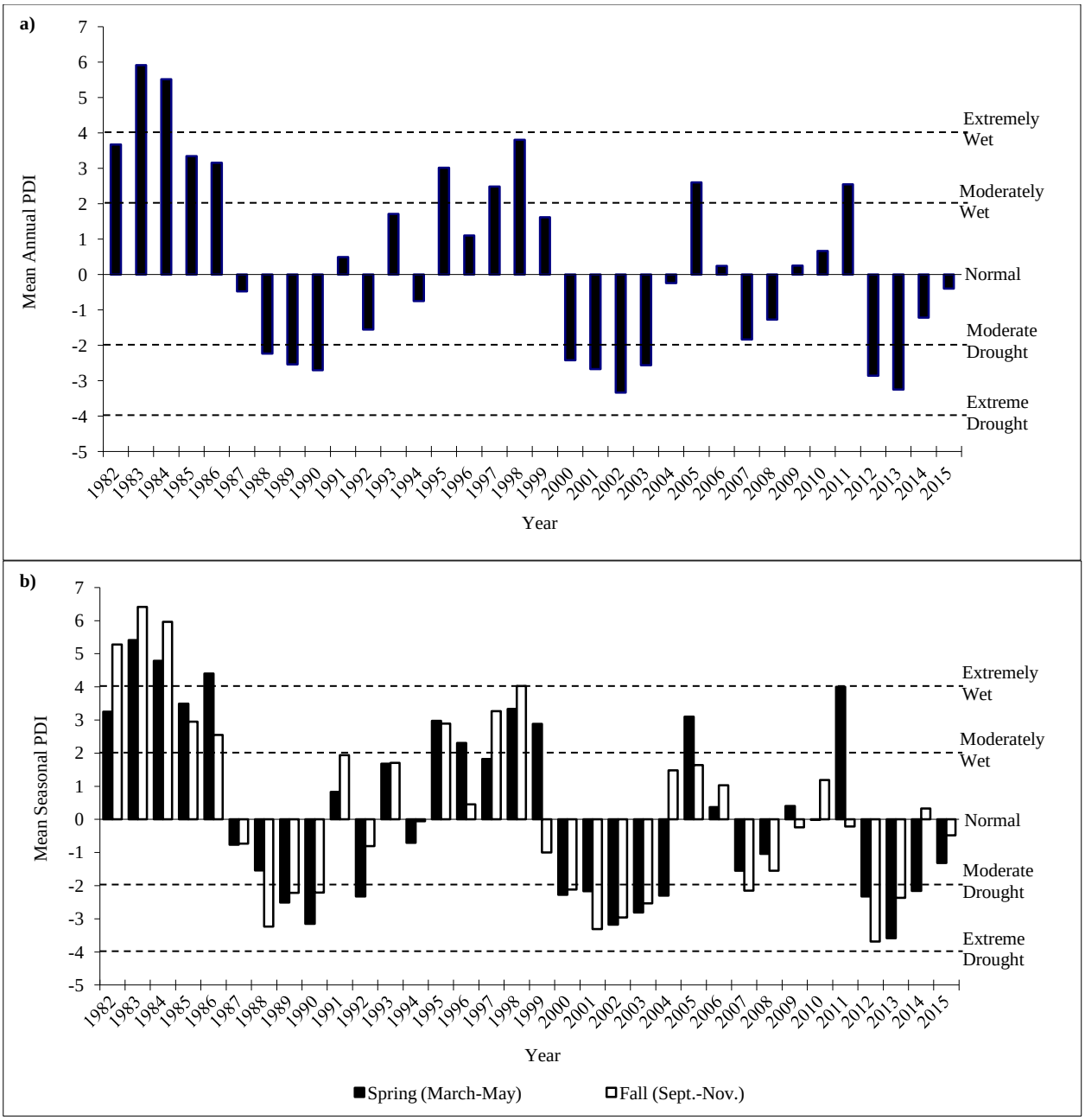


Figure 8.1: The 1982-2015 Palmer Drought Severity Index (PDSI) for the Northern Mountains division (Division 5). The PDSI is based on climate data gathered from 1895 to 2015. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet and negative deviations indicate drought. Classification of the scale is ≥4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to2.9 = 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 -.9 = Incipient Dry Spell, -1.0 to -1.9 = Mild Drought, -2.0 to -2.9 = Moderate Drought, -3.0 to -3.9 = Severe Drought and ≤-4.0 = Extreme Drought (Time Series Data 2014). a) Mean annual PDSI. b) Mean spring (March-May) and fall (Sept.-Nov.).

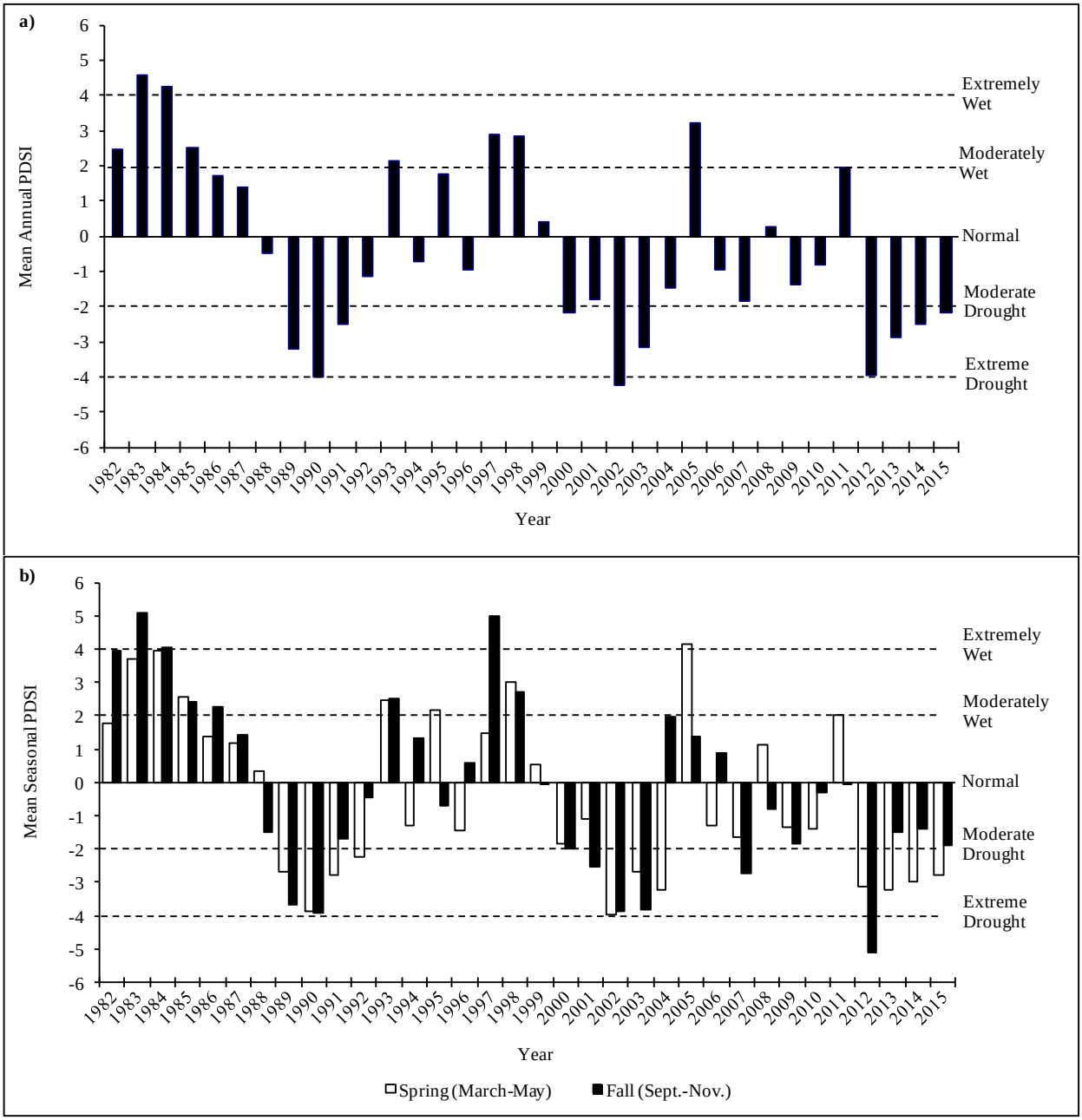


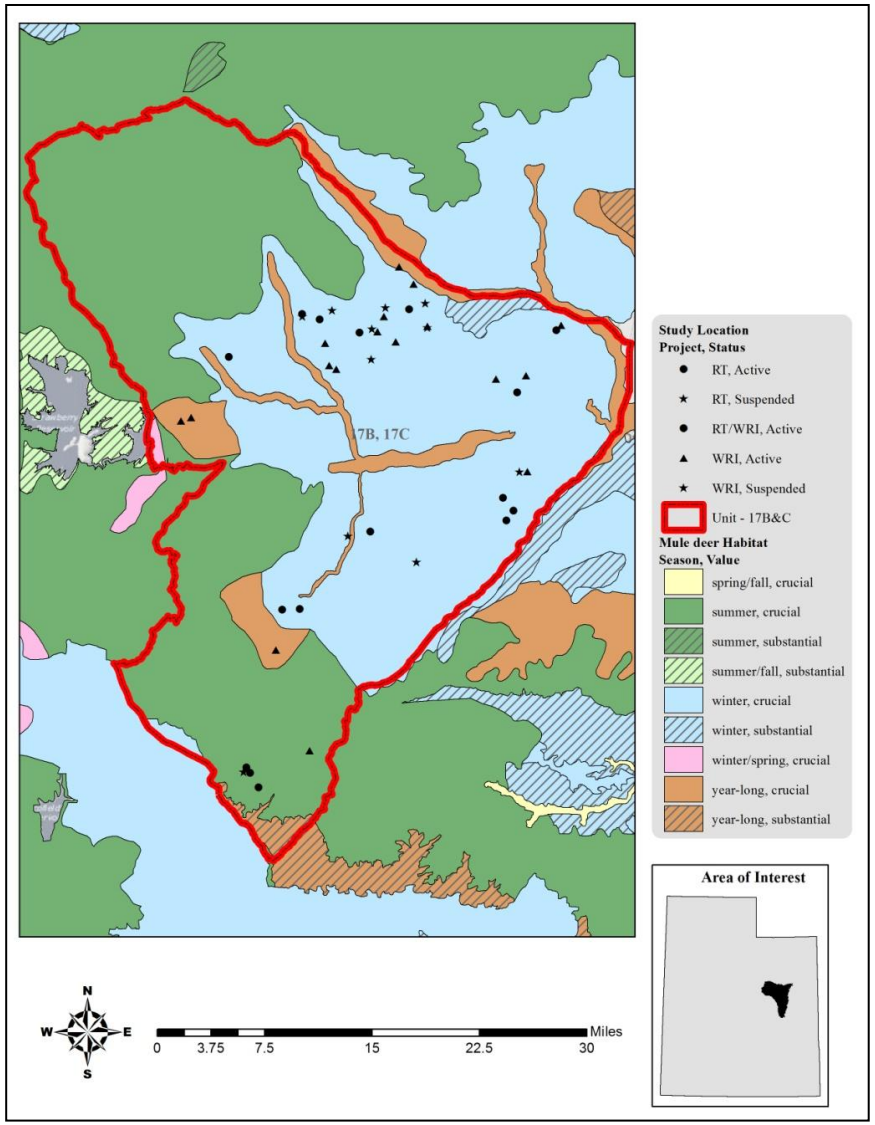
Figure 8.2: The 1982-2015 Palmer Drought Severity Index (PDSI) for the Uinta Basin division (Division 6). The PDSI is based on climate data gathered from 1895 to 2015. The PDSI uses a scale where 0 indicates normal, positive deviations indicate wet and negative deviations indicate drought. Classification of the scale is ≥4.0 = Extremely Wet, 3.0 to 3.9 = Very Wet, 2.0 to2.9 = 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 -.9 = Incipient Dry Spell, -1.0 to -1.9 = Mild Drought, -2.0 to -2.9 = Moderate Drought, -3.0 to -3.9 = Severe Drought and ≤-4.0 = Extreme Drought (Time Series Data 2014). a) Mean annual PDSI. b) Mean spring (March-May) and fall (Sept.-Nov.).

Big Game Habitat

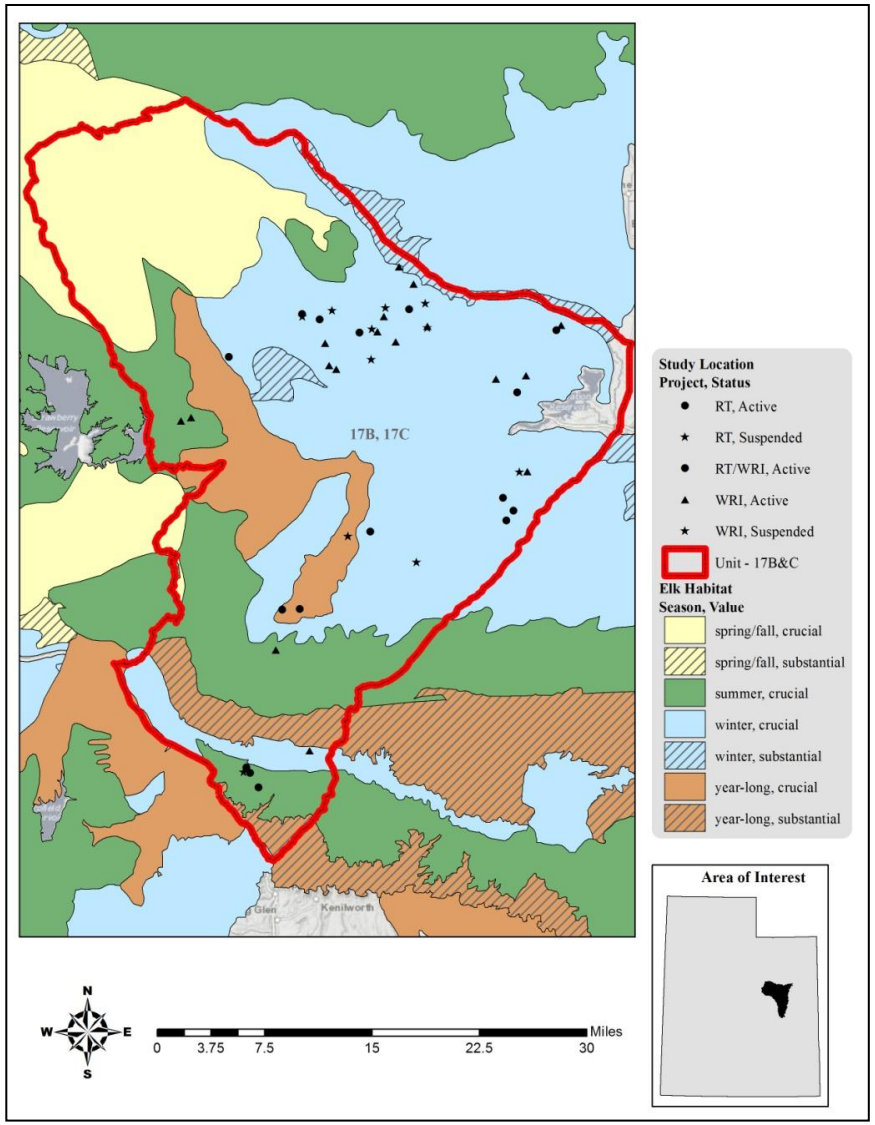
Over 718,000 acres within the Currant Creek-Avintaquin subunits are considered to be deer range with 46% classified as winter range, 45% as summer range, 9% as year-long range, and less than 1% as transitional range, 45% of deer winter range is privately owned, 22% is managed by the Utah Division of Wildlife Resources (UDWR), 21% is tribal land, 9% is administered by the U.S. Forest Service (USFS), 2% is managed by Utah State Parks (USP), 1% is owned by the Utah School and Institutional Trust Lands Administration (SITLA), and less than 1% is administered by the Bureau of Land Management (BLM) (Map 8.2, Map 8.6, Table 8.1, Table 8.2). There are an estimated 706,600 acres of elk range within the Currant Creek-Avintaquin

subunits with 50% classified as winter range, 18% as summer range, 18% as transitional range, and 14% as year-long range. Private landowners administer 51% of the elk wintering range, UDWR 21%, tribal 18%, USFS 7%, SITLA 2%, the BLM 1%, and USP and Utah Department of Transportation (UDOT) less than 1% each (Map 8.3, Map 8.6, Table 8.1, Table 8.3). As most of the winter range in this unit now lies on private land, managing wildlife populations is a challenge.

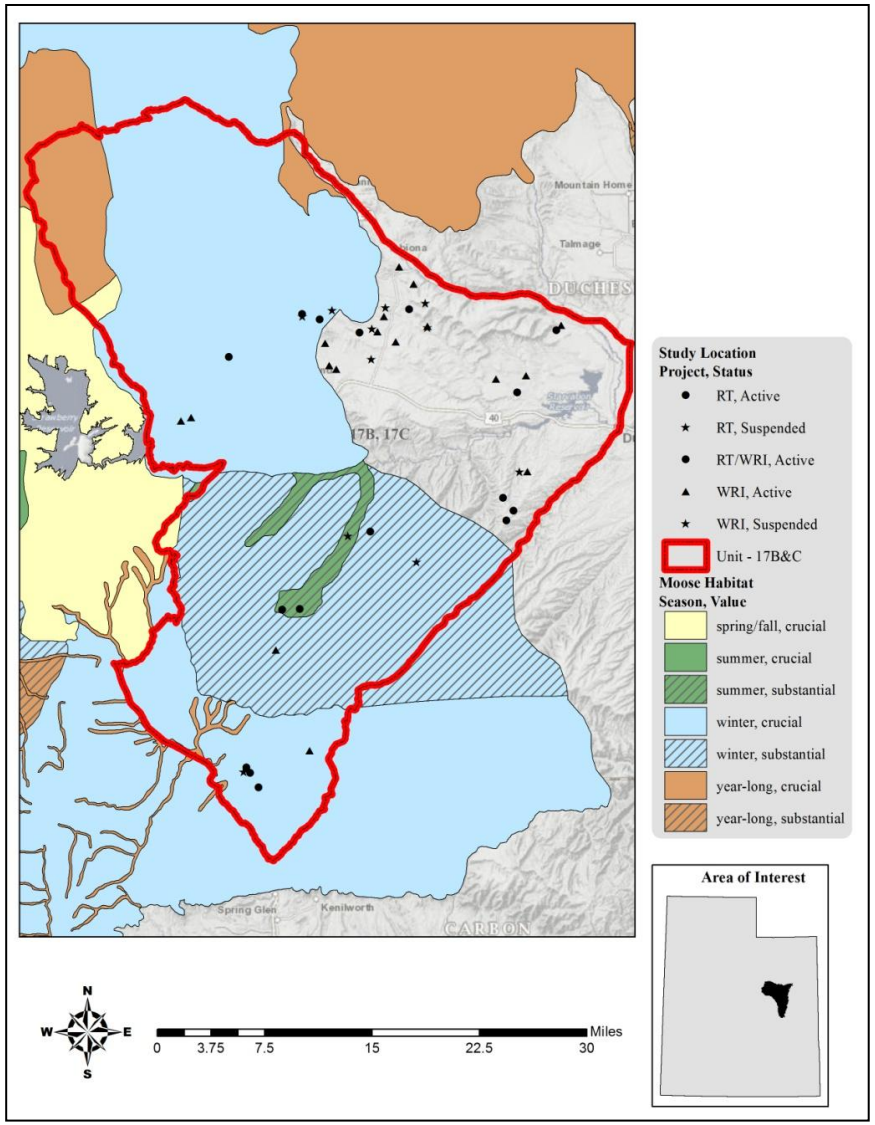
The areas that are considered to be crucial deer winter habitat include the lower foothills on the south and east side of Tabby Mountain, Blacktail Mountain, Grey Wolf Mountain, Santaquin Draw, Beer Springs, Rabbit Gulch, Sink Draw, the lower ends of Little Horse Ridge and Horse Ridge, West Bench, and the lower ridges above the Strawberry River valley.



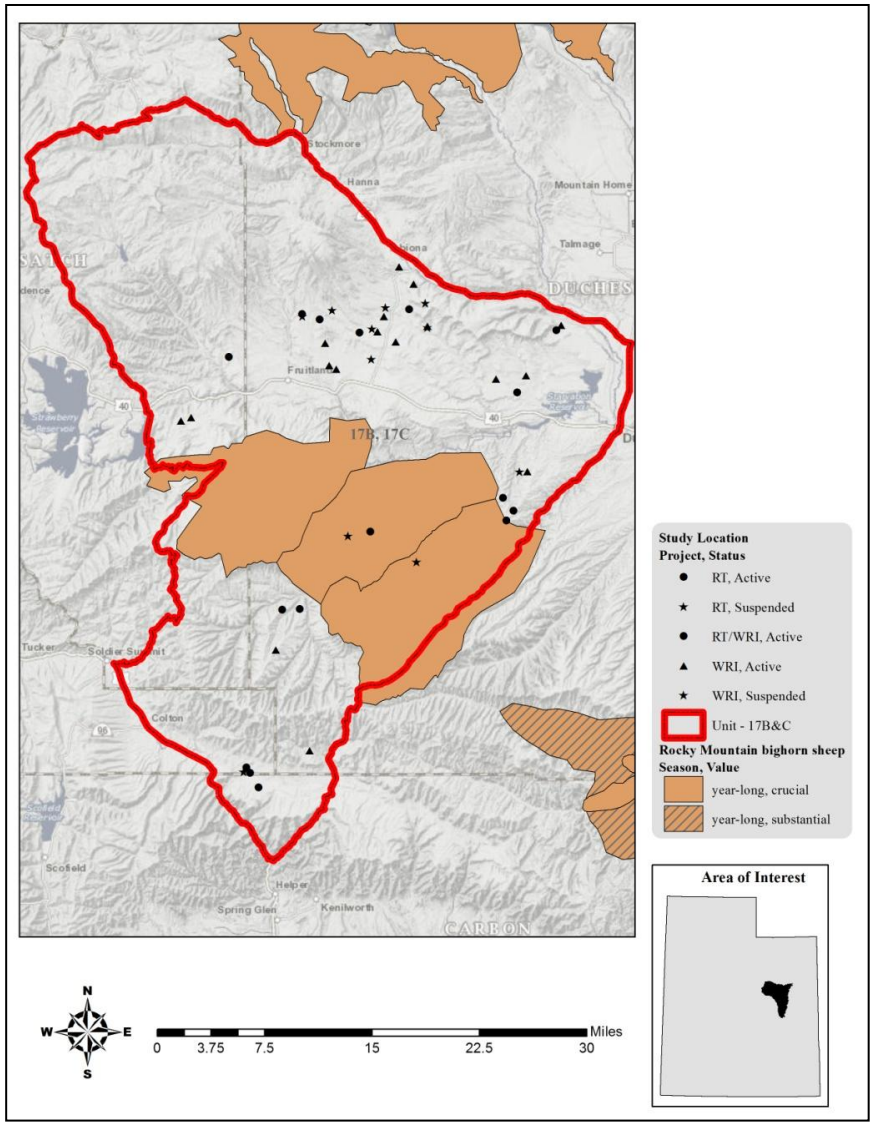
Map 8.2: Estimated mule deer habitat by season and value for WMU 17BC, Wasatch Mountains – Currant Creek-Avintaquin.



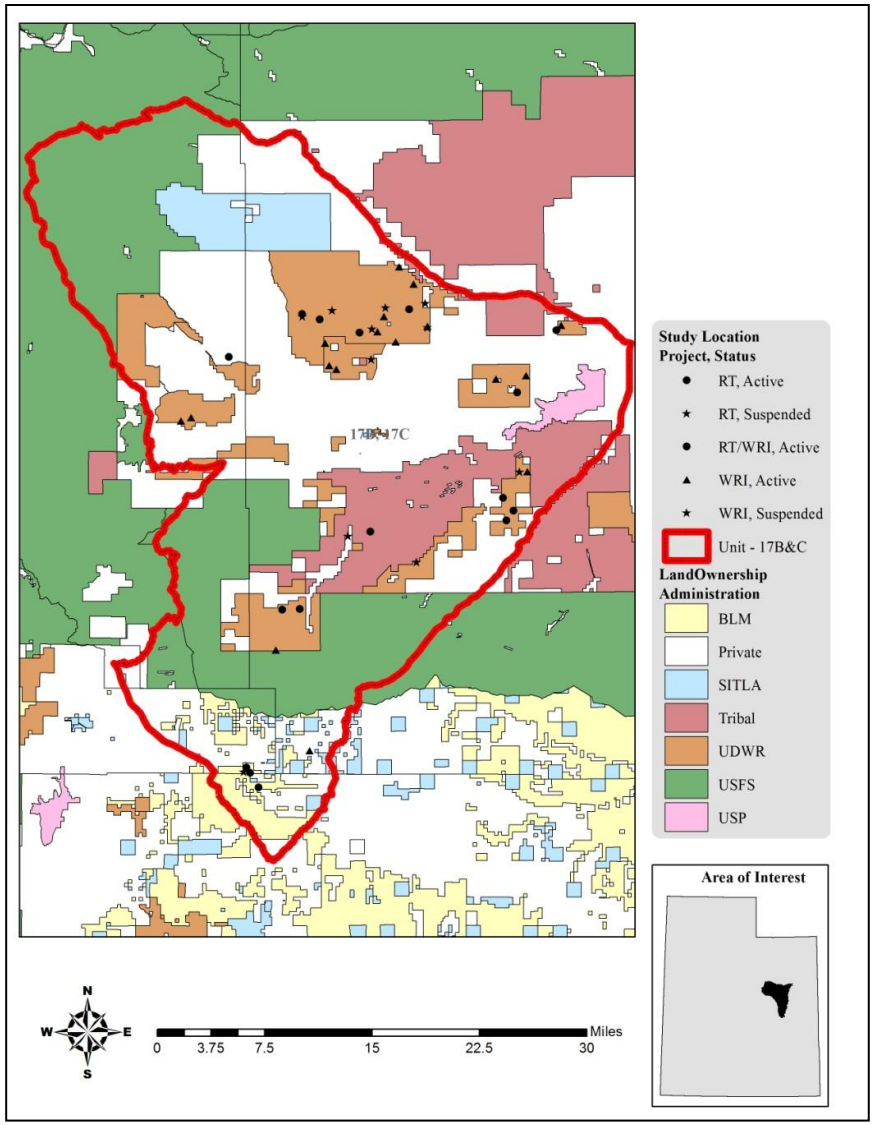
Map 8.3: Estimated elk habitat by season and value for WMU 17BC, Wasatch Mountains – Currant Creek, Avintaquin.



Map 8.4: Estimated moose habitat by season and value for WMU 17BC, Wasatch Mountains – Currant Creek-Avintaquin.



Map 8.5: Estimated Rocky Mountain bighorn sheep habitat by season and value for WMU 17BC Wasatch Mountains – Currant Creek-Avintaquin.



Map 8.6: Land ownership for WMU 17BC, Wasatch Mountains.

	Year Long Range		Summer Range		Winter Range	
	Area (acres)	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
Mule Deer	64,073	9%	321,346	45%	332,791	46%
Elk	97,650	14%	127,768	18%	354,195	50%
Moose	42,285	8%	15,378	3%	478,063	88%
RMBS	15,9835	100%	0	0%	0	0%
	Winter/Spring		**Spring/Fall**		**Summer/Fall**	
	Area (acres)	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
Mule Deer	1,552	<1%	0	0%	429	<1%
Elk	0	0%	127,005	18%	0	0%
Moose	0	0%	4,977	1%	0	0%
RMBS	0	0%	0	0%	0	0%

Table 8.1: Estimated mule deer, elk, moose, and Rocky Mountain bighorn sheep (RMBS) habitat acreage by season for WMU 17BC, Wasatch Mountains – Currant Creek-Avintaquin.

	Year Long Range		Summer Range		Winter Range	
Ownership	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
BLM	4,482	7%	12,919	4%	310	<1%
Private	36,335	57%	96,001	30%	149,881	45%
SITLA	78	<1%	31,732	10%	2,390	1%
Tribal	5,110	8%	417	<1%	68,601	21%
UDWR	16,030	25%	23,301	7%	73,419	22%
UDOT	6	<1%	3	<1%	0	0%
USP	414	1%	0	0%	6,950	2%
USFS	1,617	2%	156,972	49%	31,239	9%
Total	64,073	**100%**	321,346	**100%**	332,791	**100%**
	Winter/Spring		**Summer/Fall**			
Ownership	*Area (acres)*	*%*	*Area (acres)*	*%*		
BLM	0	0%	0	0%		
Private	1,489	96%	199	46%		
SITLA	0	0%	0	0%		
Tribal	0	0%	0	0%		
UDWR	3	<1%	0	0%		
UDOT	0	0%	0	0%		
USP	0	0%	0	0%		
USFS	60	4%	230	54%		
Total	1,552	**100%**	429	**100%**		

Table 8.2: Estimated mule deer habitat acreage by season and ownership for WMU 17BC, Wasatch Mountains – Currant Creek-Avintaquin.

	Year Long Range		Summer Range		Winter Range		Spring/Fall	
Ownership	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
BLM	8,776	9%	6,669	5%	2,266	1%	0	0%
Private	44,647	46%	32,701	25%	181,356	51%	19,870	16%
SITLA	2,458	2%	3,717	3%	6,065	2%	21,960	17%
Tribal	9,107	9%	42	<1%	62,931	18%	0	0%
UDWR	12,315	13%	18,672	15%	75,963	21%	5,803	5%
UDOT	3	<1%	0	0%	6	<1%	0	0%
USP	0	0%	0	0%	1,171	<1%	0	0%
USFS	20,345	21%	65,967	52%	24,436	7%	79,371	62%
Total	97,650	**100%**	127,768	**100%**	354,195	**100%**	127,005	**100%**

Table 8.3: Estimated elk habitat acreage by season and ownership for WMU 17BC, Wasatch Mountains – Currant Creek-Avintaquin.

	Year Long Range		Summer Range		Winter Range		Spring/Fall	
Ownership	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*	*Area (acres)*	*%*
BLM	1,193	3%	0	0%	16,519	3%	0	0%
Private	7,904	19%	5,293	34%	175,450	37%	6	<1%
SITLA	994	2%	0	0%	33,046	7%	0	0%
Tribal	0	0%	4,927	32%	30,865	6%	0	0%
UDWR	0	0%	2,517	17%	71,838	15%	45	1%
UDOT	3	<1%	0	0%	0	0%	0	0%
USFS	32,191	76%	2,641	17%	150,347	32%	4,926	99%
Total	42,285	**100%**	15,378	**100%**	478,063	**100%**	4,977	**100%**

Table 8.4: Estimated moose habitat acreage by season and ownership for WMU 17BC, Wasatch Mountains – Currant Creek-Avintaquin.

	Year Long Range	
Ownership	*Area (acres)*	*%*
Private	42,274	26%
SITLA	139	<1%
Tribal	45,125	28%
UDWR	17,564	11%
USFS	54,733	34%
Total	159,835	**100%**

Table 8.5: Estimated Rocky Mountain bighorn sheep by season and ownership for WMU 17BC, Wasatch Mountains – Currant Creek-Avintaquin.

Group	Existing Vegetation Type	Acres	% of Total	Group % of Total
Conifer	Colorado Plateau Pinyon-Juniper Woodland	193,975	26.88%	
	Conifer-Hardwood	48,552	6.73%	
	Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	24,763	3.43%	
	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	12,672	1.76%	
	Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	10,991	1.52%	
	Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland	2,145	0.30%	
	Rocky Mountain Lodgepole Pine Forest	1,372	0.19%	
	Other Conifer	1,426	0.20%	41.01%
Exotic Herbaceous	Introduced Upland Vegetation-Annual Grassland	4,149	0.57%	0.57%
Exotic Tree-Shrub	Introduced Riparian Shrubland	158	0.02%	
	Introduced Riparian Forest and Woodland	2	0.00%	0.02%
Grassland	Rocky Mountain Subalpine-Montane Mesic Meadow	5,704	0.79%	
	Southern Rocky Mountain Montane-Subalpine Grassland	1,764	0.24%	
	Other Grassland	1,082	0.15%	1.18%
Shrubland	Inter-Mountain Basins Big Sagebrush Shrubland	85,438	11.84%	
	Artemisia tridentata ssp. vaseyana Shrubland Alliance	55,038	7.63%	
	Colorado Plateau Mixed Low Sagebrush Shrubland	26,376	3.66%	
	Inter-Mountain Basins Montane Sagebrush Steppe	16,353	2.27%	
	Quercus gambelii Shrubland Alliance	8,658	1.20%	
	Rocky Mountain Lower Montane-Foothill Shrubland	8,638	1.20%	
	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	7,324	1.01%	
	Inter-Mountain Basins Mixed Salt Desert Scrub	6,594	0.91%	
	Inter-Mountain Basins Big Sagebrush Steppe	1,248	0.17%	
	Other Shrubland	2,401	0.33%	30.22%
Other	Hardwood	112,848	15.64%	
	Barren	38,628	5.35%	
	Developed	12,663	1.75%	
	Sparsely Vegetated	11,752	1.63%	
	Agricultural	8,091	1.12%	
	Riparian	6,908	0.96%	
	Open Water	3,824	0.53%	
	Other	70	0.01%	26.99%
Total		721,609	100.00%	

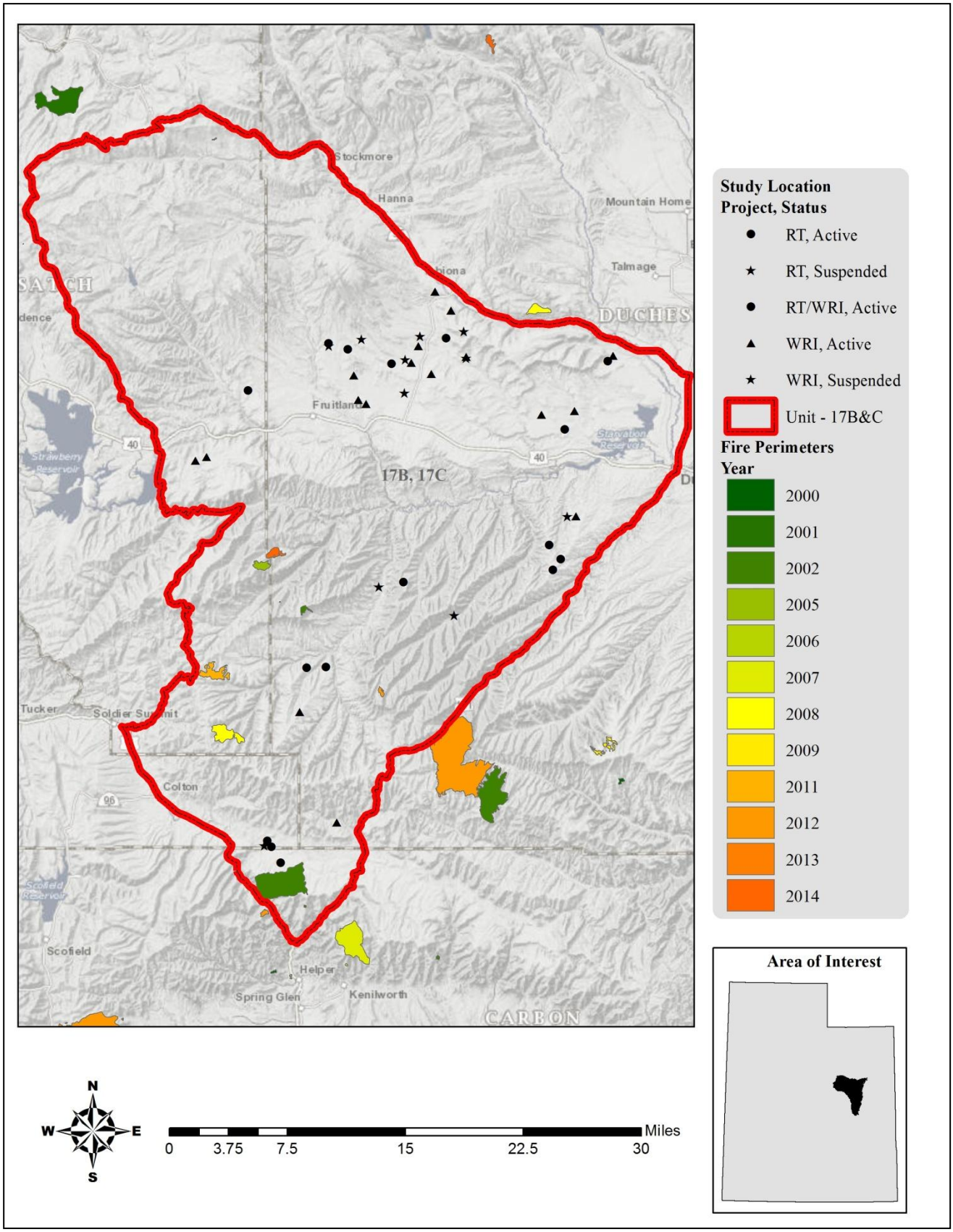
Table 8.6: Landfire existing vegetation coverage (LANDFIRE: LANDFIRE 1.3.0, 2014) for WMU 17BC, Wasatch Mountains – Currant Creek-Avintaquin.

Limiting Factors to Big Game Habitat

Habitat quality and quantity is a limiting factor in this unit. Cooperation between federal, state, local, and tribal governments and private landowners could help maintain and protect ranges from further loss and degradation through agreements with land management agencies, the use of conservation easements and the like on private lands, planning and evaluating resource use and developments that might affect habitat quality, and developing specific vegetation objectives to maintain the quality of important deer use areas. Additional management strategies include reseeding areas dominated by cheatgrass (*Bromus tectorum*) with desirable perennial vegetation, reseeding burned areas, creating fuel breaks and vegetated green strips, and reducing expansion of pinyon and juniper woodlands into sagebrush habitats via lop and scatter or mechanical means such as chaining and bullhog.

According to the Landfire Existing Vegetation Coverage model, nearly 27% of the Currant Creek-Avintaquin subunits is pinyon and juniper woodland (Table 8.6); encroachment by these woodland communities poses a significant threat to important sagebrush rangelands. According to Miller, Svejcar, and Rose (2000), invasion of these woodlands into sagebrush communities has been shown to decrease sagebrush and herbaceous cover, therefore decreasing available forage for wildlife.

Deer fences and crossings limiting range are also a concern, but cooperation with the Utah Department of Transportation in construction of highway fences, passage structures, warning signs, etc. will continue in order to ensure proper access to habitat as well as deer and human safety.

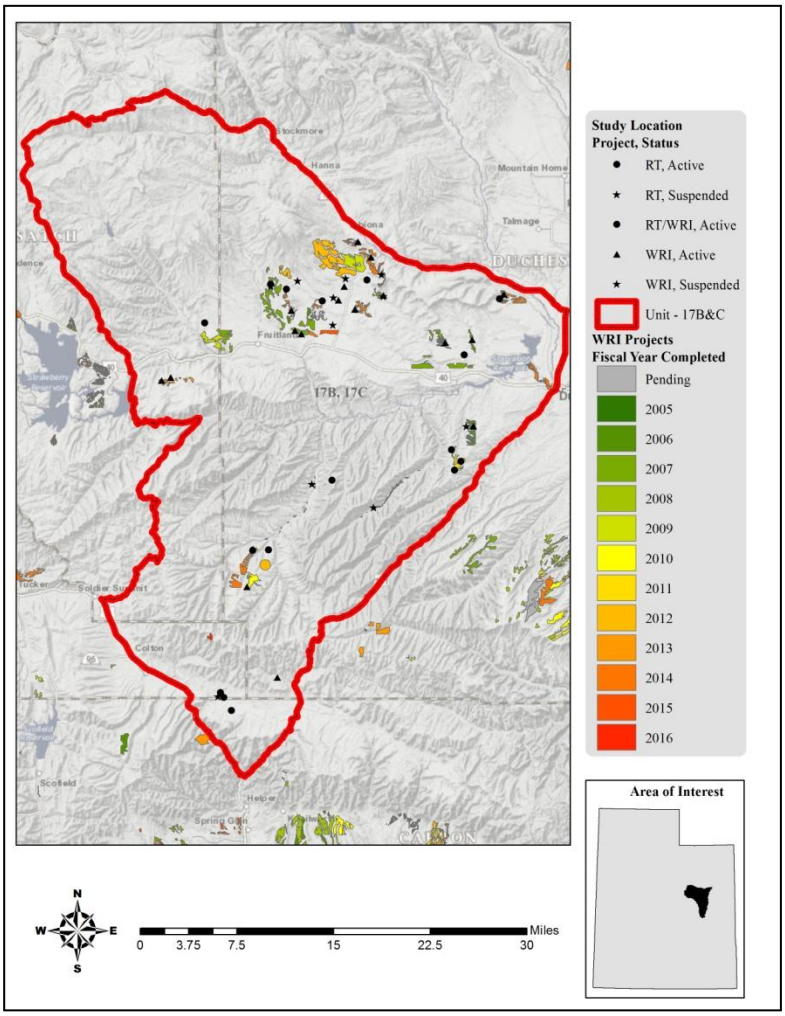


Map 8.7: Land coverage of fires by year from 2000-2014 for WMU 17BC, Wasatch Mountains – Currant Creek-Avintaquin.

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 13,833 acres of land have been treated within the Wasatch Mountains unit since the WRI was implemented in 2004 (Map 8.8). Treatments frequently overlap one another bringing the total treatment acres to 15,685 acres for this unit (Table 8.7). Other treatments have occurred outside of the WRI through independent agencies and landowners, but the WRI comprises the majority of work done on deer winter ranges throughout the state of Utah.

Vegetation removal via hand crew is the most common management practice in this unit. Seeding to augment the herbaceous and shrub understory is also very common. Other management practices include herbicide application to remove weeds, harrow and bullhog use to remove twoneedle pinyon and Utah juniper, and other similar vegetation removal techniques (Table 8.7).



Map 8.8: WRI treatments by fiscal year completed for WMU 17BC, Wasatch Mountains – Currant Creek-Avintaquin.

Treatment Action	Acres
Vegetation Removal/Hand Crew	10,187
Seeding (Primary)	2,280
Seeding (Secondary/Shrub)	2,167
Stream Corridor/Channel Improvements	438
Chain Harrow	244
Herbicide Application	229
Skid-Steer Mounted Tree Cutter	83
Bullhog	43
Bulldozing	14
Vegetation Improvements	0
***Total Land Area Treated**	13,883
Total Treatment Acres	15,685

Table 8.7: WRI treatment action size (acres) for WMU 17BC, Wasatch Mountains – Currant Creek-Avintaquin.
*Does not include overlapping treatments.

Range Trend Studies

Range Trend studies have been sampled within WMU 17 on a regular basis since 1982, with studies added or suspended as was deemed necessary (Table 8.8). Due to changes in sampling methodologies, only data sampled 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 study sites have had some sort of disturbance or treatment prior to or since study establishment (Table 8.9).

Range Trend studies are summarized in this report by ecological site. Range Trend and WRI studies that have had a disturbance or treatment during the reported sample period are summarized in this report by the disturbance or treatment type and are summarized by region.

Study #	Study Name	Project	Status	Year(s) Sampled	Ecological Site Description
17-48	Blacktail Ridge	RT	Suspended	'82, '88, '95	Not Verified
17-49	Grey Wolf Mountain	RT	Active	'82, '88, '95, '00, '05, '10, '15	Upland Loam (Mountain big sagebrush)
17-50	Lower Santaquin Draw	RT	Active	'82, '88, '95, '00, '05, '10, '15	Upland Loam (Mountain big sagebrush)
17-51	Santaquins Cabin	RT	Active	'82, '88, '95, '00, '05, '10, '15	Upland Loam (Mountain big sagebrush)
17-52	Cutoff	RT	Active	'82, '88, '95, '00, '05, '10, '15	Upland Loam (Mountain big sagebrush)
17-53	Two Bar Ranch	RT/WRI	Active	'82, '88, '95, '00, '05,'09, '10	Upland Loam (Mountain big sagebrush)
17-54	Peatross Ranch	RT	Suspended	'82, '88, '95, '00	Not Verified
17-55	Lower Horse Ridge	RT	Active	'82, '88, '95, '00, '05, '10, '15	Upland Loam (Birchleaf Mountainmahogany)
17-56	Sams Canyon	RT	Suspended	'82, '88, '95, '05, '10	Not Verified
17-57	Skitzy Canyon	RT	Suspended	'82, '88, '95, '00, '05, '10	Mountain Loam (Mountain Big Sagebrush)
17-58	Buck Knoll	RT	Suspended	'82, '88, '95, '00, '05, '10	Mountain Loam (Browse)
17-59	Emma Park	RT	Active	'94, '00, '05, '10, '15	Mountain Stony Loam (Mountain Big Sagebrush)
17-65	Little Horse Ridge	RT	Active	'05, '10, '15	Mountain Loam (Browse)
17-66	Sand Wash	RT	Active	'05, '10, '15	Upland Loam (Wyoming Big Sagebrush)
17-67	Rabbit Gulch	RT	Active	'97, '01, '05, '10, '15	Semidesert Loam (Wyoming Big Sagebrush)
17-68	Road Hollow	RT	Active	'15	Mountain Shallow Loam (Mountain Big Sagebrush)
17R-2	Beer Spring	RT	Suspended	'97	Not Verified
17R-3	Santaquin Draw	RT	Suspended	'97	Not Verified
17R-5	Smith Property	RT	Suspended	'97	Not Verified
17R-6	Lake Canyon	RT	Suspended	'97	Not Verified
17R-7	Emma Park Harrow Grazed	RT	Active	'01,'05,'10,'15	Mountain Loam (Mountain Big Sagebrush)
17R-8	Emma Park Harrow Ungrazed	RT	Suspended	'01, '05, '10	Not Verified
17R-9	Emma Park Meadow	RT	Suspended	'01, '05	Not Verified
17R-10	Santaquin Draw	WRI	Suspended	'04	Not Verified
17R-11	Santaquin Greasewood	WRI	Active	'04, '07, '09, '10, '12	Upland Loam (Basin Big Sagebrush)
17R-12	Santaquin Chaining	WRI	Active	'04, '07, '09, '10, '12	Upland Stony Loam (Black Sagebrush)
17R-13	Rabbit Gulch Chaining	WRI	Active	'05, '08, '13	Semidesert Sandy Loam (Four-Wing Saltbush)
17R-14	Skitzy Chaining	WRI	Active	'05, '08, '09, '13, '15	Upland Stony Loam (Black Sagebrush)
17R-15	Golden Stairs Chaining	WRI	Active	'05, '08, '13	Upland Shallow Loam (Wyoming Big Sagebrush)
17R-16	Grey Wolf Chaining	WRI	Active	'05, '08, '13	Upland Loam (Wyoming Big Sagebrush)
17R-18	Wildcat Sage-Grouse	WRI	Active	'05, '12,'15	High Mountain Loam (Silver Sagebrush)
17R-21	Blacktail Chaining	WRI	Active	'06, '09, '10, '13	Upland Loam (Wyoming Big Sagebrush)
17R-22	Allen Smith Reseed	WRI	Active	'06, '10, '15	Upland Loam (Bonneville Big Sagebrush)
17R-23	Rabbit Gulch Interseed	WRI	Active	'06, '10, '13	Semidesert Loam (Wyoming Big Sagebrush)
17R-24	East Santaquin Chaining	WRI	Active	'06, '10, '13	Upland Shallow Loam (Wyoming Big Sagebrush)
17R-26	Two Bar-Sand Wash Chaining	WRI	Active	'07, '10, '13	Upland Shallow Loam (Black Sagebrush)
17R-27	Two Bar-Black Tail Chaining	WRI	Active	'07, '09, '11, '14	Upland Loam (Wyoming Big Sagebrush)
17R-28	Santaquin PJ Reference	WRI	Suspended	'09	Not Verified

Study #	Study Name	Project	Status	Year(s) Sampled	Ecological Site Description
17R-29	Skitzy Reference	WRI	Suspended	‘09	Not Verified
17R-30	Two Bar PJ Reference	WRI	Suspended	‘09	Not Verified
17R-34	Wildcat	WRI	Active	‘12, ‘15	High Mountain Loam (Mountain Big Sagebrush)
17R-35	Tabby Mountain	WRI	Active	‘13	Upland Loam (Wyoming Big Sagebrush)
17R-36	Horse Ridge	WRI	Active	‘15	High Mountain Loam (Aspen)
17R-37	West Fork Willow Creek	WRI	Active	‘15	High Mountain Loam (Aspen)

Table 8.8: Range trend and WRI project studies monitoring history and ecological site potential for WMU 17BC, Wasatch Mountains – Currant Creek-Avintaquin.

Study #	Study Name	Type	Disturbance Name (if available)	Date	Size (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		
		Seed Unknown		Fall 1995		
		Lop and Scatter	Coyote Draw Pinyon and Juniper Thinning	Summer 2006	1,240	328
17-55	Lower Horse Ridge	Bullhog	Horse Ridge Bullhog	2016	759	3293
17-57	Skitzy Canyon	Chain Unknown		1977-1978		
		Seed Unknown		1977-1978		
17-58	Buck Knoll	Chain Unknown		Historic		
		Seed Unknown		Historic		
17-67	Rabbit Gulch	Chain Unknown		Historic		
		Seed Unknown		Historic		
		Lop and Scatter		2004-2005	1,250	1123
17-68	Road Hollow	Lop and Scatter	Skitzy Lop and Scatter	Fall 2010	392	1729
17R-7	Emma Park Harrow	One-Way Dixie		2000		
	Grazed	Seed Unknown		2000		
17R-11	Santaquin Greasewood	One-Way Smooth Chain	Santaquin Greasewood	Fall 2004	380	
		Aerial Before	Santaquin Greasewood	Fall 2004	380	
		Dribbler	Santaquin Greasewood	Fall 2004	380	
		Aerial After	Santaquin Greasewood	Winter 2004	1,755	
17R-12	Santaquin Chaining	Two-Way Ely Chain	Santaquin P-J	Fall 2004	300	
		Aerial Before	Santaquin P-J	Fall 2004	300	
		Aerial After	Santaquin P-J	Winter 2004	1,755	
17R-13	Rabbit Gulch Chaining	Herbicide – Tordon, 2,4-D	Rabbit Gulch WMA Range Rehabilitation	June 2005	167	66
		Two-Way Ely Chain	Rabbit Gulch WMA Range Rehabilitation	January 2006	167	66
		Aerial Before	Rabbit Gulch WMA Range Rehabilitation	January 2006	300	66
		Aerial After	Rabbit Gulch WMA Range Rehabilitation	January 2006	167	66
17R-14	Skitzy Chaining	Two-Way Ely Chain	Skitzy Canyon Range Rehabilitation	November 2005	529	69
		Aerial Before	Skitzy Canyon Range Rehabilitation	November 2005	529	69
		Aerial After	Skitzy Canyon Range Rehabilitation	November 2005	529	69
17R-15	Golden Stairs Chaining	Two-Way Ely Chain	Golden Stairs Range Rehabilitation	Fall 2005	170	52
		Aerial Before	Golden Stairs Range Rehabilitation	September 2005	170	52
		Dribbler	Golden Stairs Range Rehabilitation	November 2005	170	52
		Aerial After	Golden Stairs Range Rehabilitation	December 2005	170	52
17R-16	Grey Wolf Chaining	Two-Way Ely Chain	Grey Wolf Mountain Rehabilitation	Fall 2005	463	93
		Aerial Before	Grey Wolf Mountain Rehabilitation	October 2005	463	93
		Dribbler	Grey Wolf Mountain Rehabilitation	November 2005	463	93
		Aerial After	Grey Wolf Mountain Rehabilitation	February 2006	463	93

Study #	Study Name	Type	Disturbance Name (if available)	Date	Size (acres)	WRI Project #
17R-21	Blacktail Chaining	Two-Way Ely/Smooth Chain	East Santaquin Draw P/J Chaining	Fall 2006	450	367
		Aerial Before	East Santaquin Draw P/J Chaining	Fall 2006	450	367
		Dribbler	East Santaquin Draw P/J Chaining	Fall 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		
		Herbicide – Tebithiuron		Early 2000s		
		Aerial Before	Sink Draw Interseeding	November 2006	546	417
		Intensive Grazing – 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	Spring 2007	130	420
17R-24	East Santaquin Chaining	Two-Way Ely/Smooth Chain	East Santaquin Draw P/J Chaining	Fall 2006	450	367
		Aerial Before	East Santaquin Draw P/J Chaining	Fall 2006	450	367
		Dribbler	East Santaquin Draw P/J Chaining	Fall 2006	450	367
		Aerial After	East Santaquin Draw P/J Chaining	January 2007	450	367
17R-26	Two Bar-Sand Wash Chaining	Two-Way Ely Chain	2-Bar Pinyon and Juniper Thinning	October 2007	978	368
		Dribbler	2-Bar Pinyon and Juniper Thinning	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
17R-27	Two Bar-Black Tail Chaining	Two-Way Ely Chain	2-Bar Pinyon and Juniper Thinning	October 2007	978	368
		Aerial Before	2-Bar Pinyon and Juniper Thinning	October 2007	978	368
		Dribbler	2-Bar Pinyon and Juniper Thinning	October 2007	978	368
		Aerial After	2-Bar Pinyon and Juniper Thinning	January 2008	978	368
17R-34	Wildcat	Two-Way Chain Harrow	Wildcat Harrow	October 2012	244	2309
17R-35	Tabby Mountain	Scalper	Tabby Browse Plots	September 2013	160	2681
17R-36	Horse Ridge	Lop (No Scatter)	Horse Ridge WMA Aspen Enhancement (Proposed)	May-June 2016	245	3323
		Girdling	Horse Ridge WMA Aspen Enhancement (Proposed)	May-June 2016	245	3323
17R-37	West Fork Willow Creek	Ripper	West Fork Willow Creek Aspen Restoration Phase 1 (Proposed)	Fall 2015	41	3222
		Logging/Clear-Cut	West Fork Willow Creek Aspen Restoration Phase 1 (Proposed)	Fall 2015	41	3222

Table 8.9: Range trend and WRI studies known disturbance history for WMU 17BC, Wasatch Mountains – Currant Creek-Avintaquin.

Study Trend Summary (Range Trend)

Mountain (Sagebrush)

Three studies [Emma Park (17-59), Road Hollow (17-68), and Emma Park Harrow Grazed (17R-7)] are classified as Mountain (Sagebrush) ecological sites. The Emma Park and Emma Park Harrow Grazed studies are found in Emma Park while the Road Hollow study is located near the top of Road Hollow.

Shrubs/Trees: The primary browse species on these ecological sites is mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), although black sagebrush (*A. nova*) dominates the Road Hollow site. There are a few other browse species present, but they contribute little cover. Sagebrush cover has increased each sample year, but the cover of other preferred browse and other shrubs have decreased (Figure 8.3). Sagebrush demographics show that the populations on these sites are mainly dominated by mature plants followed by young and decadent individuals. Recruitment of young plants decreased by about 2000 plants/acre between the 2010 and 2015 sample years, but overall recruitment has increased since 1994 (Figure 8.6).

Cover of twoneedle pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) has increased since 2010, but overall remains very low; this increase is due entirely to the addition of the Road Hollow site. Juniper contributes a majority of the average tree density; again, this is due to the Road Hollow study as pinyon and juniper were not present on the other sites (Figure 8.4, Figure 8.5).

Herbaceous Understory: These study sites have a good herbaceous component that has increased through the study years and is dominated by perennial grasses. These grasses are largely native on the Emma Park Harrow Grazed study, but the introduced species Kentucky bluegrass (*Poa pratensis*) and crested wheatgrass (*Agropyron cristatum*) dominate the understories of the Emma Park and Road Hollow studies (respectively). Annual grasses have been recorded on the Emma Park study, but in extremely low amounts.

A diverse number of perennial forbs provide additional cover, although the amount of cover has fluctuated through the study years. Annual forbs have remained rare, consistently contributing less than 1% cover (Figure 8.7)

Occupancy: Pellet group transect data indicates that elk and cattle primarily use this area and that animal use has decreased overall. Elk use has ranged from 5 days use/acre in 2010 to 15 days use/acre in 2005. Mean abundance of deer pellet groups has ranged from 4 days use/acre in 2015 to 12 days use/acre in 2000-2001 and 2010. Finally, cattle pellet groups have had a mean abundance ranging from 9 days use/acre in 2015 to 27 days use/acre in 2010 (Figure 8.8).

Mountain (Browse)

There is one study [Little Horse Ridge (17-65)] that is classified as a Mountain (Browse) ecological site; this study is located on Little Horse Ridge, south of Avintaquin Creek.

Shrubs/Trees: Alderleaf mountain mahogany (*Cercocarpus montanus*) is the dominant browse species on this site, but numerous other preferred browse species provide additional cover. The cover of sagebrush has exhibited a slight increase overall (Figure 8.3). Sagebrush demographics indicate that the population is currently composed of mainly mature and young individuals, although decadent plants are present to a lesser extent. Recruitment of young plants has increased in each sample year (Figure 8.6).

Tree cover has steadily increased each sample year, and although density has fluctuated, it has exhibited an overall increase. This cover and density can be almost exclusively attributed to twoneedle pinyon (*Pinus edulis*) (Figure 8.4, Figure 8.5).

Herbaceous Understory: This study has a good herbaceous understory that is dominated by native perennial grasses. Annual grass species and introduced perennial grass species have not been recorded on this site in any study year. Perennial forbs are fairly diverse and contribute a small amount of additional cover. Annual forbs remain rare (Figure 8.7).

Occupancy: Average pellet transect data shows that deer primarily use this site and that overall animal usage has decreased over the sample years. Elk pellet groups have had a mean abundance ranging from 3 days use/acre in 2005 to 11 days use/acre in 2010. Mean abundance of deer pellet groups has ranged from 20 days use/acre in 2015 to 35 days use/acre in 2015. Mean abundance of cattle pellet groups indicate that cattle had 2 days use/acre in 2005 and have not been present on the site in any other sample year (Figure 8.8).

Upland (Sagebrush)

There are six studies [Grey Wolf Mountain (17-49), Lower Santaquin Draw (17-50), Santaquins Cabin (17-51), Cutoff (17-52), Two Bar Ranch (17-53), and Sand Wash (17-66)] that are classified as Upland (Sagebrush) ecological sites. The Grey Wolf Mountain Study is located on the north 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. Finally, the Sand Wash study site is located on Blacktail Mountain, just west of West Bench.

Shrubs/Trees: Mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) is the dominant browse species on all sites except Two Bar Ranch, on which shadscale saltbush (*Atriplex confertifolia*) dominates, and Sand Wash, which is dominated by Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*). Other browse species are often present on these study sites, although they contribute much less cover. Sagebrush cover has fluctuated little over the sample years (Figure 8.3). Average sagebrush demographics indicate that overall sagebrush density has decreased over time. The sagebrush populations have been mainly composed of mature plants throughout the duration of the study, but decadent and young individuals have been present to a lesser extent. Recruitment of young plants has varied from year to year (Figure 8.6).

Average tree cover has remained relatively stable throughout the duration of the study, with most of the cover being contributed by Utah juniper (*Juniperus osteosperma*). Tree density, however, has decreased overall: this could possibly be partially attributed to the difference in the number of studies sampled each year and the fact that not every site has twoneedle pinyon (*Pinus edulis*) or juniper present (Figure 8.4, Figure 8.5).

Herbaceous Understory: These study sites generally have a plentiful and diverse herbaceous understory that is dominated by perennial grasses. Although native species are usually present, introduced species such as crested wheatgrass (*Agropyron cristatum*) are the dominant component on many sites. Annual grasses such as cheatgrass (*Bromus tectorum*) are present on some sites, but in extremely low amounts. Perennial forb cover has decreased overall, from 5% in 1995 to under 3% in 2015. Annual forbs remain rare, contributing less than 1% cover in most study years (Figure 8.7).

Occupancy: Average pellet transect data shows that deer and elk primarily occupy these sites, with moderate usage from each; overall use has decreased over time (Figure 8.8).

Upland (Browse)

One site [Lower Horse Ridge (17-55)] is classified as an Upland (Browse) ecological site and is located on the northern portion of Horse Ridge, south of Avintaquin Creek.

Shrubs/Trees: This site supports a community of mixed browse species with alderleaf mountain mahogany (*Cercocarpus montanus*) expressing dominance. Average cover of preferred browse has increased over the study years, as have the covers of sagebrush and other shrubs (Figure 8.3). Mature plants make up a majority of the sagebrush population, with lesser amounts of decadent and young individuals present. Recruitment of young plants has fluctuated from year to year, but has decreased overall (Figure 8.6).

Utah juniper (*Juniperus osteosperma*), Rocky Mountain juniper (*J. scopulorum*), and twoneedle pinyon (*Pinus edulis*) are present on this site. Average cover increased significantly from 2010 to 2015, which is likely due to the increase in twoneedle pinyon from 4% cover in 2010 to 9% in 2015. Average tree density, however, has exhibited an overall decrease (Figure 8.4, Figure 8.5).

Herbaceous Understory: This site has a plentiful herbaceous understory that is dominated by native perennial grasses, namely bluebunch wheatgrass (*Pseudoroegneria spicata*). No annual grasses or introduced perennial grass species have been recorded on this site. Perennial forbs are diverse and contribute a moderate amount of additional cover. Annual forbs have remained rare throughout the duration of the study. The noxious weed gypsyflower (*Cynoglossum officinale*) was observed on the site in 2005, but has not been recorded in any other study year (Figure 8.7).

Occupancy: Pellet transect data shows that animal use has varied from year to year and that deer are currently the primary occupants of this site (Figure 8.8).

Semidesert (Sagebrush)

One site [Rabbit Gulch (17-67)] is classified as a Semidesert (Sagebrush) ecological site and is located just north of Rabbit Gulch.

Shrubs/Trees: Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) is the dominant browse species on this site, although other lower cover browse species are present. Sagebrush cover has increased from year to year, while cover of other preferred browse has fluctuated and that of other shrubs has slightly decreased (Figure 8.3). Overall sagebrush density has decreased, and mature individuals make up a majority of the population. Recruitment of young plants has decreased over time (Figure 8.6).

Point-quarter data indicates that the densities of Utah juniper (*Juniperus osteosperma*) and twoneedle pinyon (*Pinus edulis*) are low, with most of the juniper trees being seedlings. There has been no cover recorded for either species (Figure 8.4, Figure 8.5).

Herbaceous Understory: The herbaceous component of this site has increased over time and is dominated by perennial grasses; although many of these grass species are native, the introduced species crested wheatgrass (*Agropyron cristatum*) contributes the most cover. The invasive annual grass species cheatgrass (*Bromus tectorum*) has been observed in the past, but sixweeks fescue (*Vulpia octoflora*) completely comprises the small annual grass component that is currently on this site. Perennial and annual forbs have remained rare (Figure 8.7).

Occupancy: Average pellet transect data shows that deer primarily use this site and that overall animal usage has decreased throughout the duration of the study. Mean abundance of elk pellet groups has ranged from 2 days use/acre in 2015 to 42 days use/acre in 2010. Deer pellet groups have had a mean abundance ranging from 11 days use/acre in 2015 to 93 days use/acre in 2005. Cattle usage has been as low as 0 days use/acre in 2015 and as high as 12 days use/acre in 2005 (Figure 8.8).

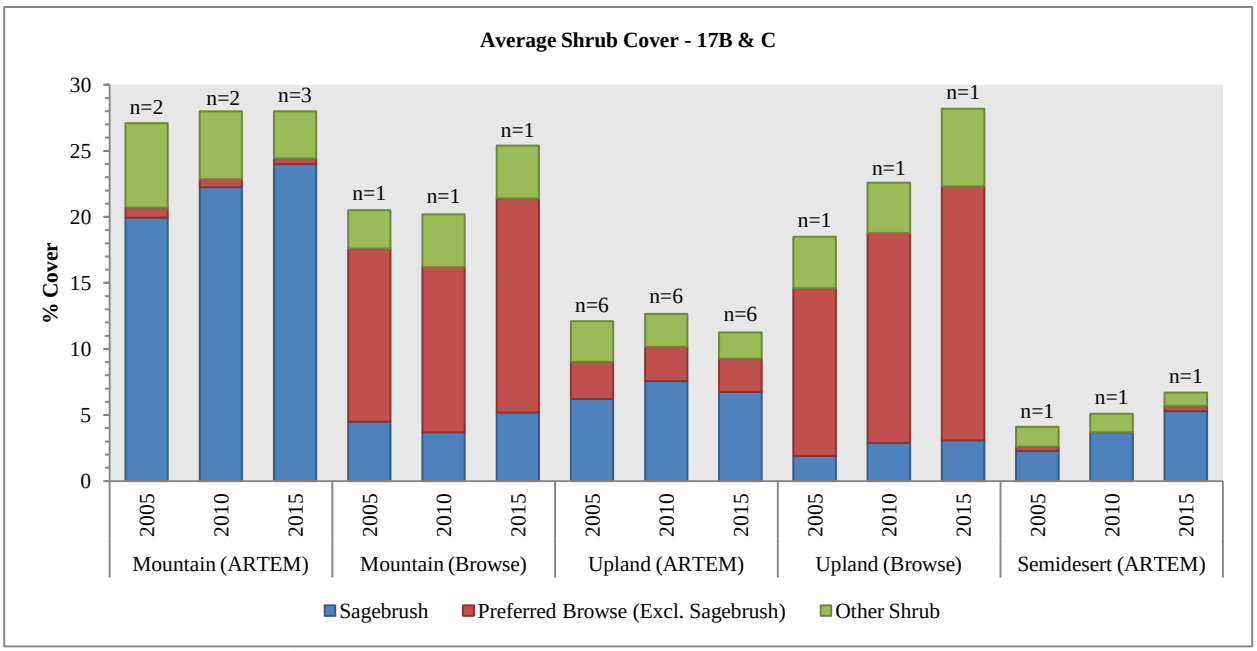


Figure 8.3: Average shrub cover for Mountain (ARTEM), Mountain (Browse), Upland (ARTEM), Upland (Browse), and Semidesert (ARTEM) study sites in WMU 17BC, Wasatch Mountains – Currant Creek-Avintaquin.

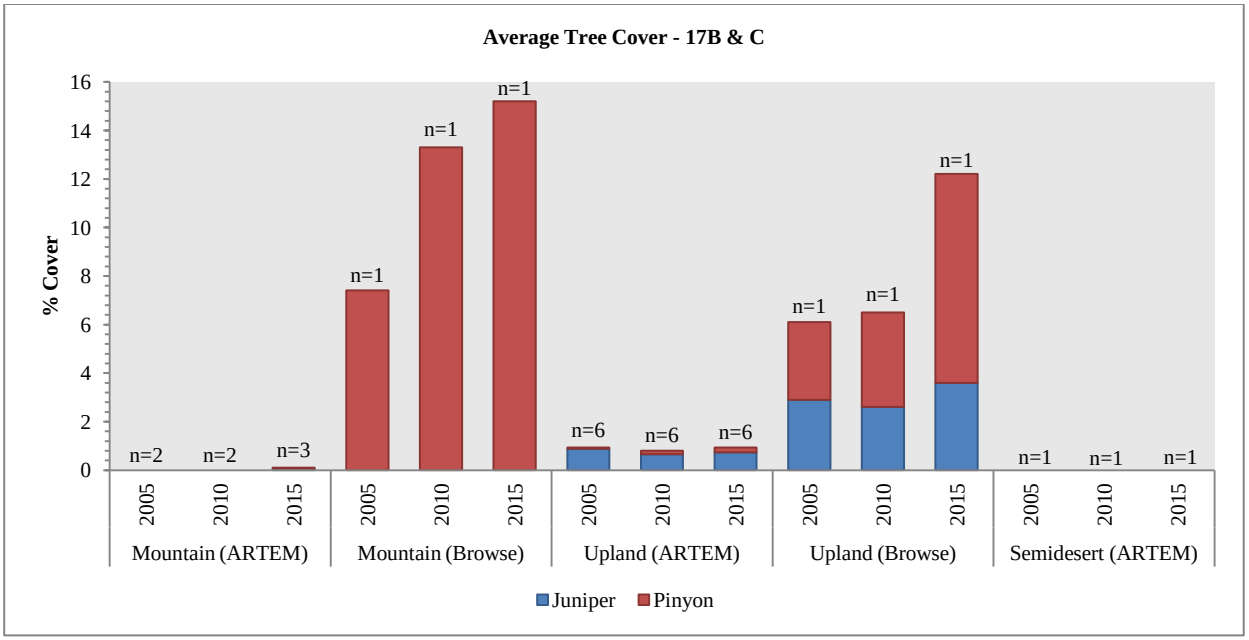


Figure 8.4: Average tree cover for Mountain (ARTEM), Mountain (Browse), Upland (ARTEM), Upland (Browse), and Semidesert (ARTEM) study sites in WMU 17BC, Wasatch Mountains – Currant Creek-Avintaquin.

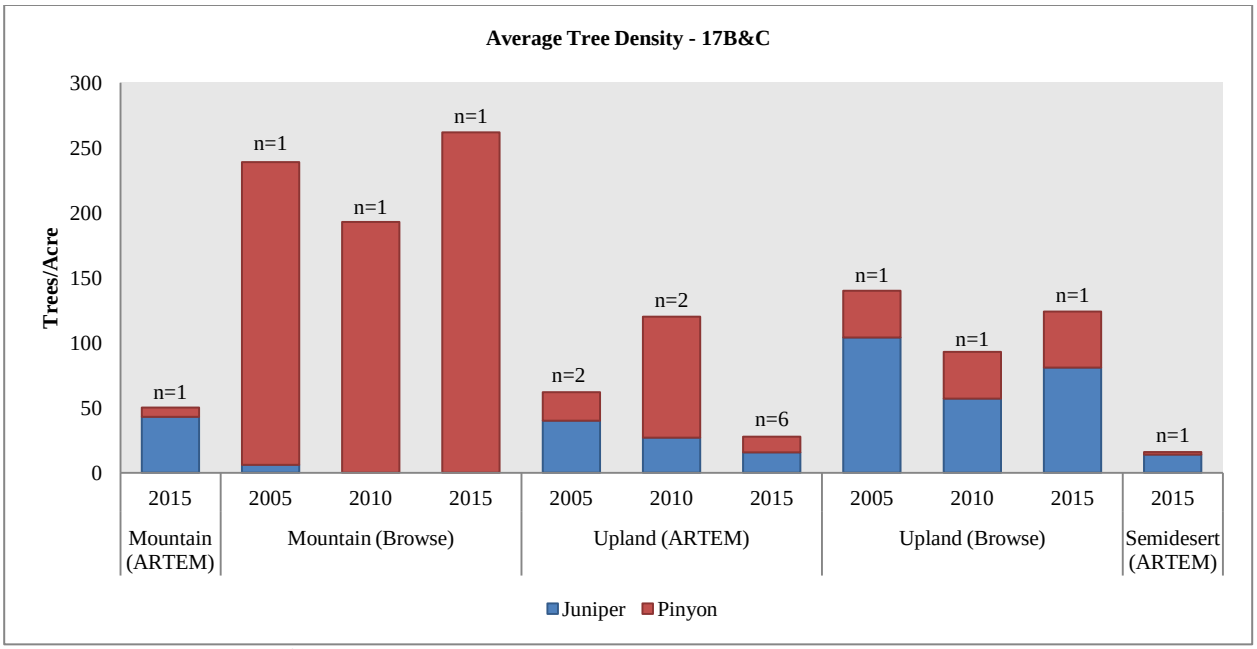


Figure 8.5: Average tree density for Mountain (ARTEM), Mountain (Browse), Upland (ARTEM), Upland (Browse), Semidesert (ARTEM) study sites in WMU 17BC, Wasatch Mountains – Currant Creek-Avintaquin.

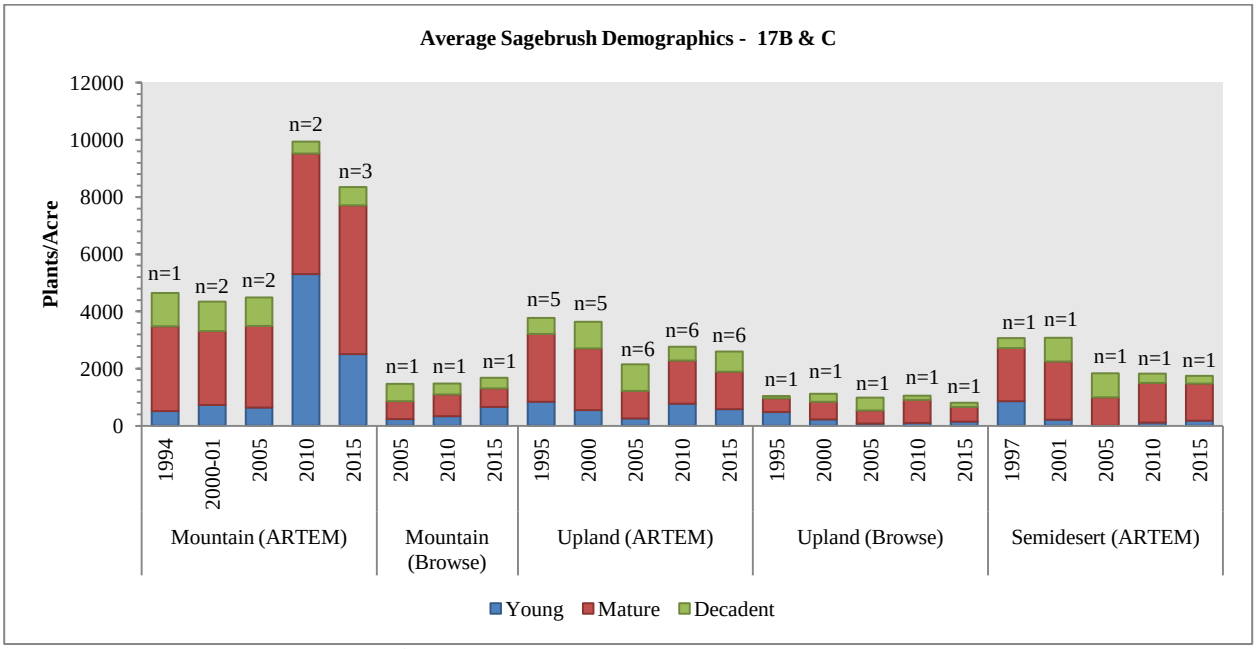


Figure 8.6: Average sagebrush demographics for Mountain (ARTEM), Mountain (Browse), Upland (ARTEM), Upland (Browse), and Semidesert (ARTEM) study sites in WMU 17BC, Wasatch Mountains – Currant Creek-Avintaquin.

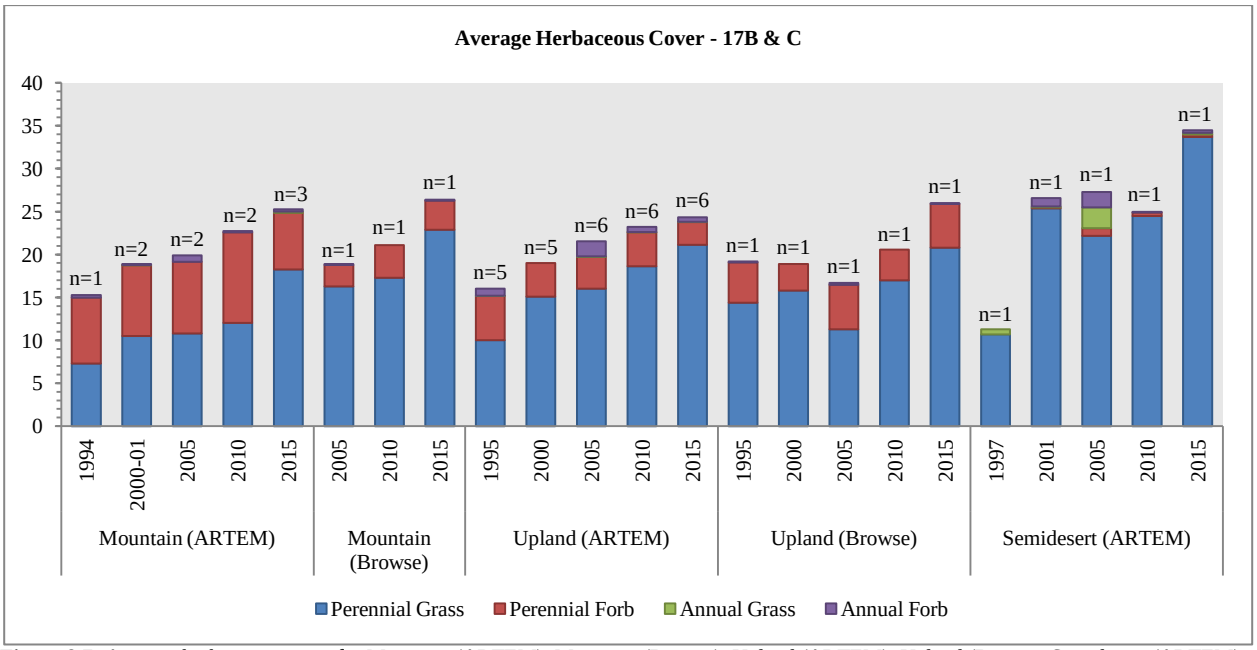


Figure 8.7: Average herbaceous cover for Mountain (ARTEM), Mountain (Browse), Upland (ARTEM), Upland (Browse, Semidesert (ARTEM) study sites in WMU 17BC, Wasatch Mountains – Currant Creek-Avintaquin.

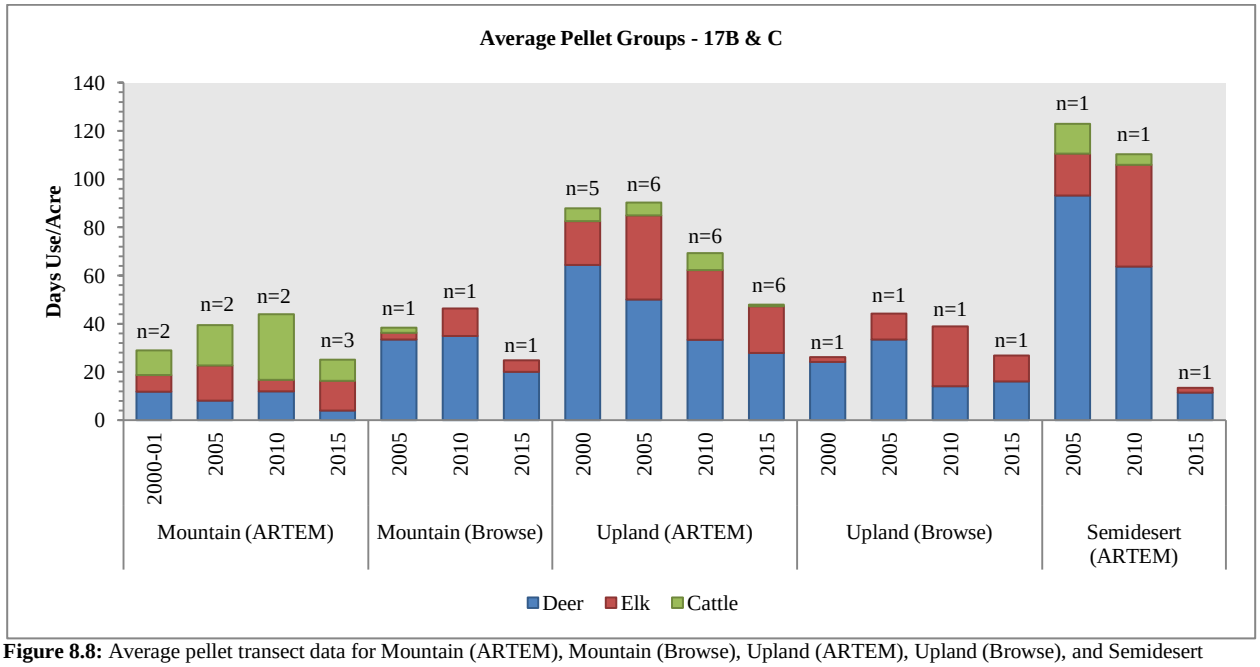


Figure 8.8: Average pellet transect data for Mountain (ARTEM), Mountain (Browse), Upland (ARTEM), Upland (Browse), and Semidesert (ARTEM) study sites in WMU 17BC, Wasatch Mountains – Currant Creek-Avintaquin.

Deer Winter Range Condition Assessment

The condition of deer winter range within the Wasatch Mountains – Currant Creek-Avintaquin management unit has fluctuated on the sites sampled since 1994. The Range Trend sites sampled within the unit are considered to be in very poor to good condition as of the 2015 sampling year (Map 8.13, Figure 8.9). Sand Wash went from poor to very poor due to a decrease in browse and perennial forb cover. Grey Wolf Mountain and Lower Santaquin Draw are in poor condition, Rabbit Gulch is in fair condition, Two Bar Ranch went from good to fair, and Santaquins Cabin, Cutoff, Lower Horse Ridge, Emma Park, Little Horse Ridge, Road Hollow, and Emma Park Harrow Grazed sites are all in good to excellent condition. The treated study sites range from very poor to good (Map 8.13, Figure 8.10). In general the treated sites have improved as time since treatment has increased. Santaquins Cabin, Lower Horse Ridge, Rabbit Gulch, and Road Hollow are also considered to be Range Trend sites and are discussed above. Tabby Mountain was sampled prior to treatment and is considered to be in very poor condition. Rabbit Gulch Chaining and Golden Stairs Chaining remained in very poor condition, Blacktail Chaining went from poor to very poor, Grey Wolf Chaining went from fair to poor, Two Bar-Blacktail Chaining went from good to poor, and Two Bar-Sand Wash Chaining went from very poor to fair. In addition, East Santaquin Chaining remained in poor condition, Santaquin Chaining improved from poor to good, Santaquin Greasewood and Rabbit Gulch Interseed went from good to fair, and Skitzy Chaining improved from good to excellent condition. It is possible given more time and continual monitoring that these sites will continue to improve.

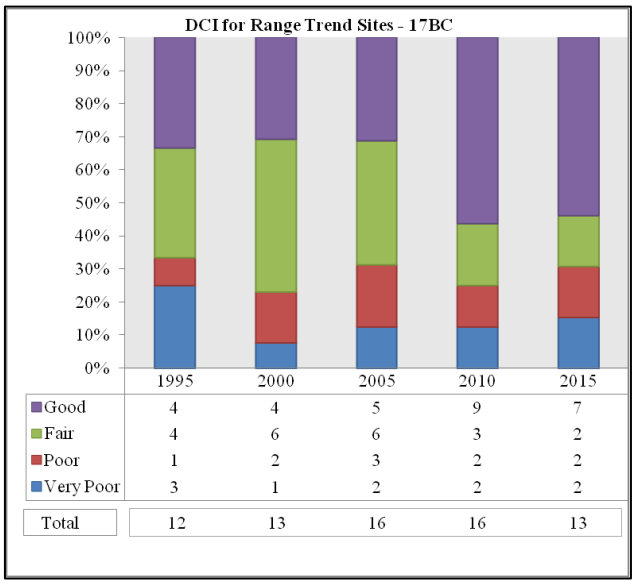


Figure 8.9: Deer winter range Desirable Components Index (DCI) summary by year of Range Trend sites for WMU 17BC, Wasatch Mountains – Currant Creek-Avintaquin.

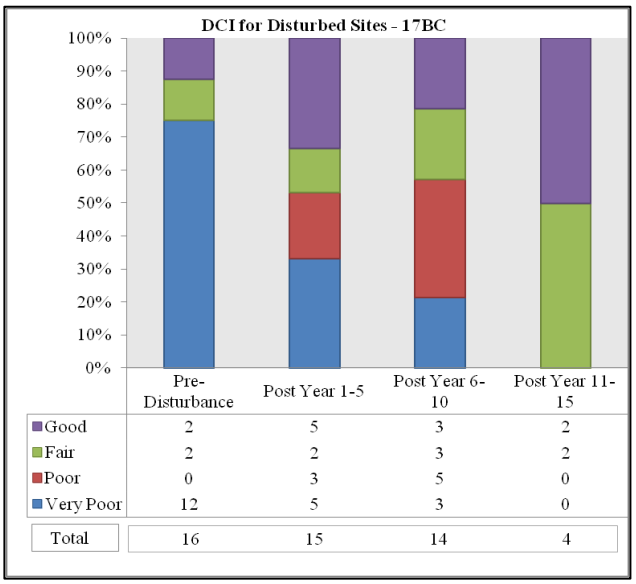
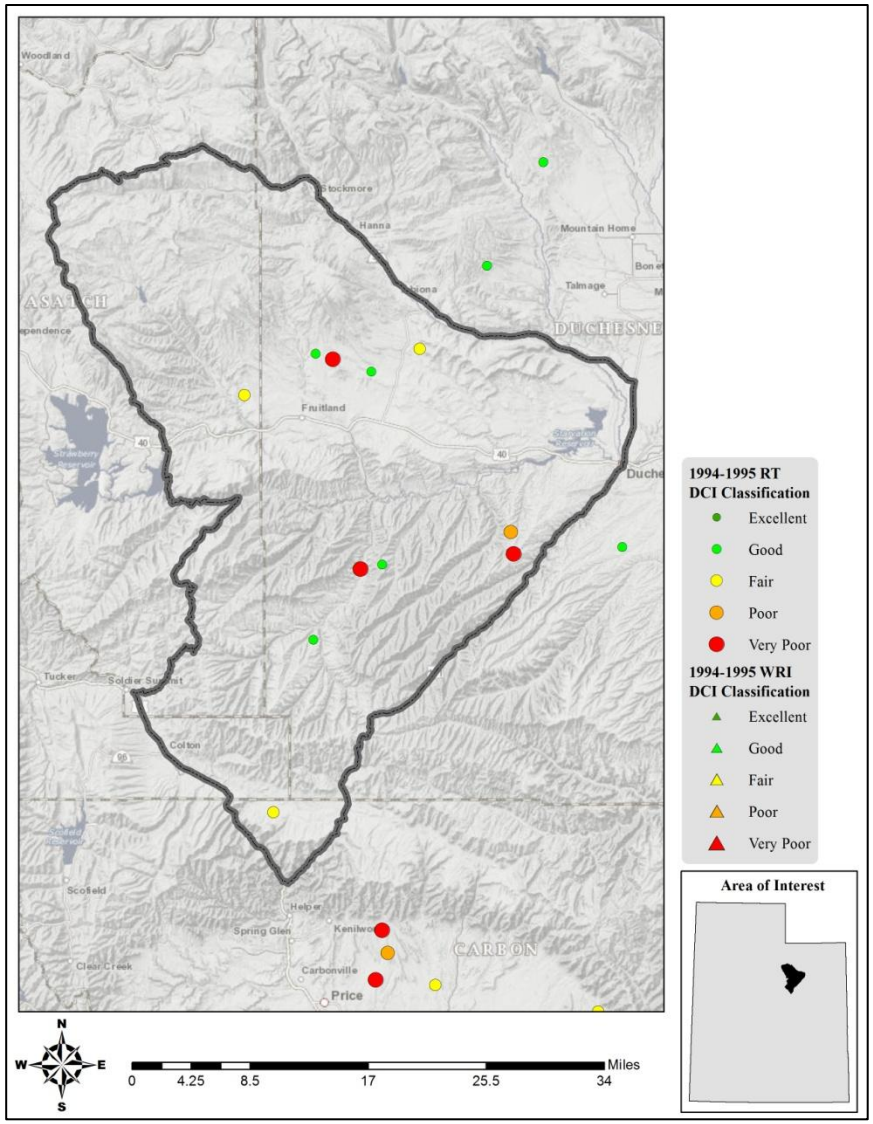
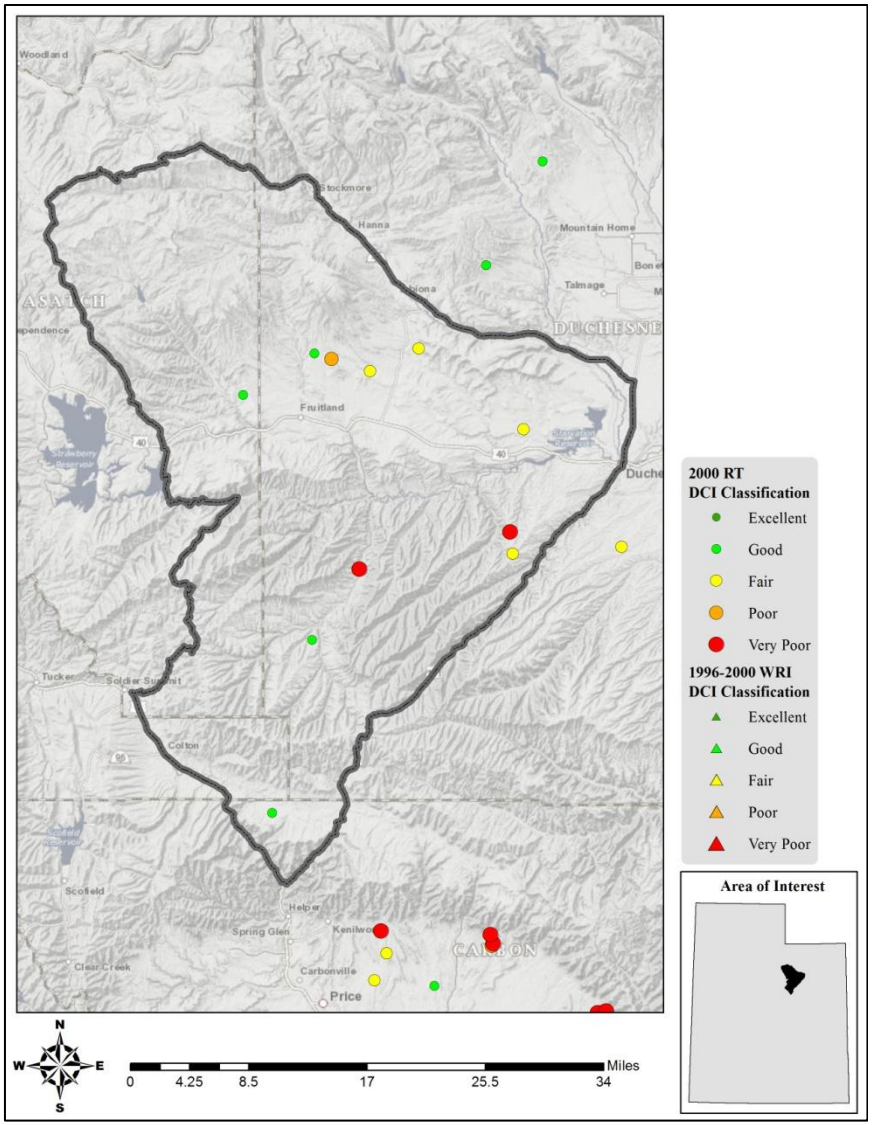


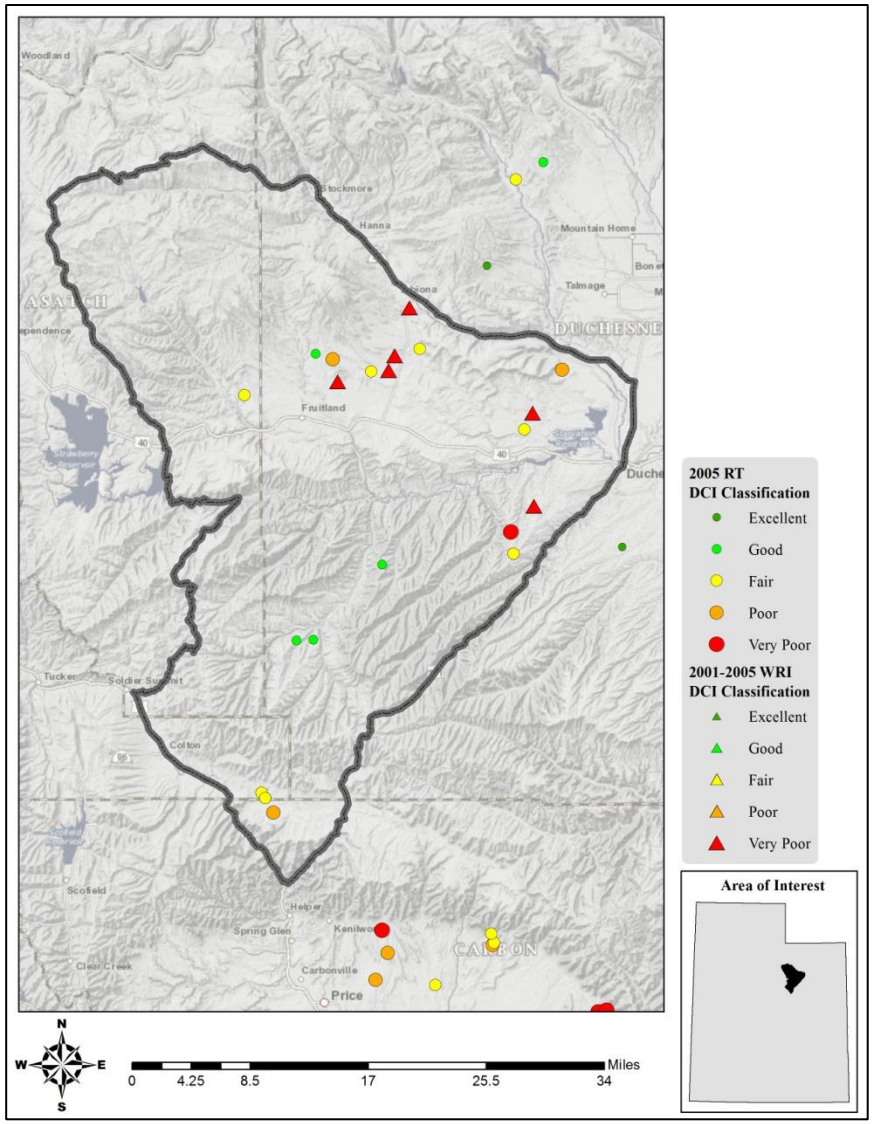
Figure 8.10: Deer winter range Desirable Components Index (DCI) summary by year of treated/disturbed sites for WMU 17BC, Wasatch Mountains – Currant Creek-Avintaquin.



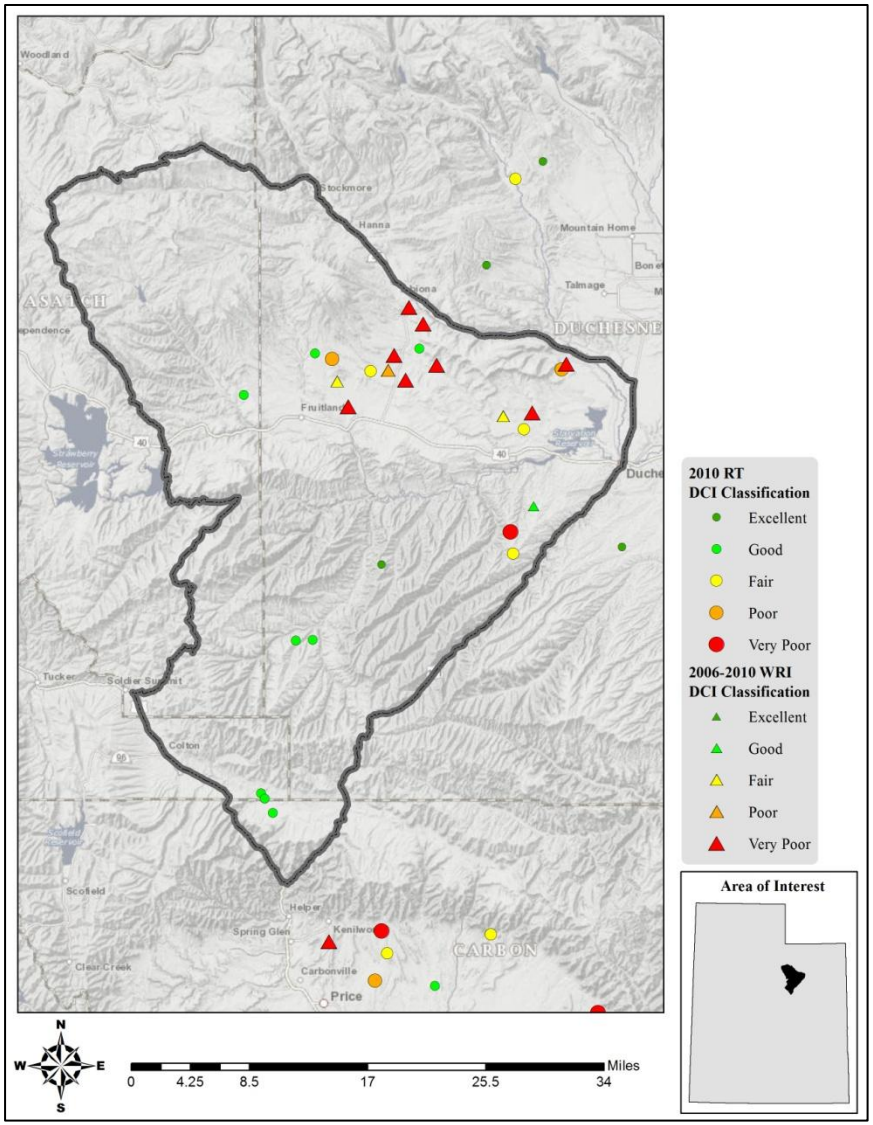
Map 8.9: 1994-95 Desirable Components Index (DCI) ranking distribution by study site for WMU 17BC, Wasatch Mountains – Currant Creek-Avintaquin.



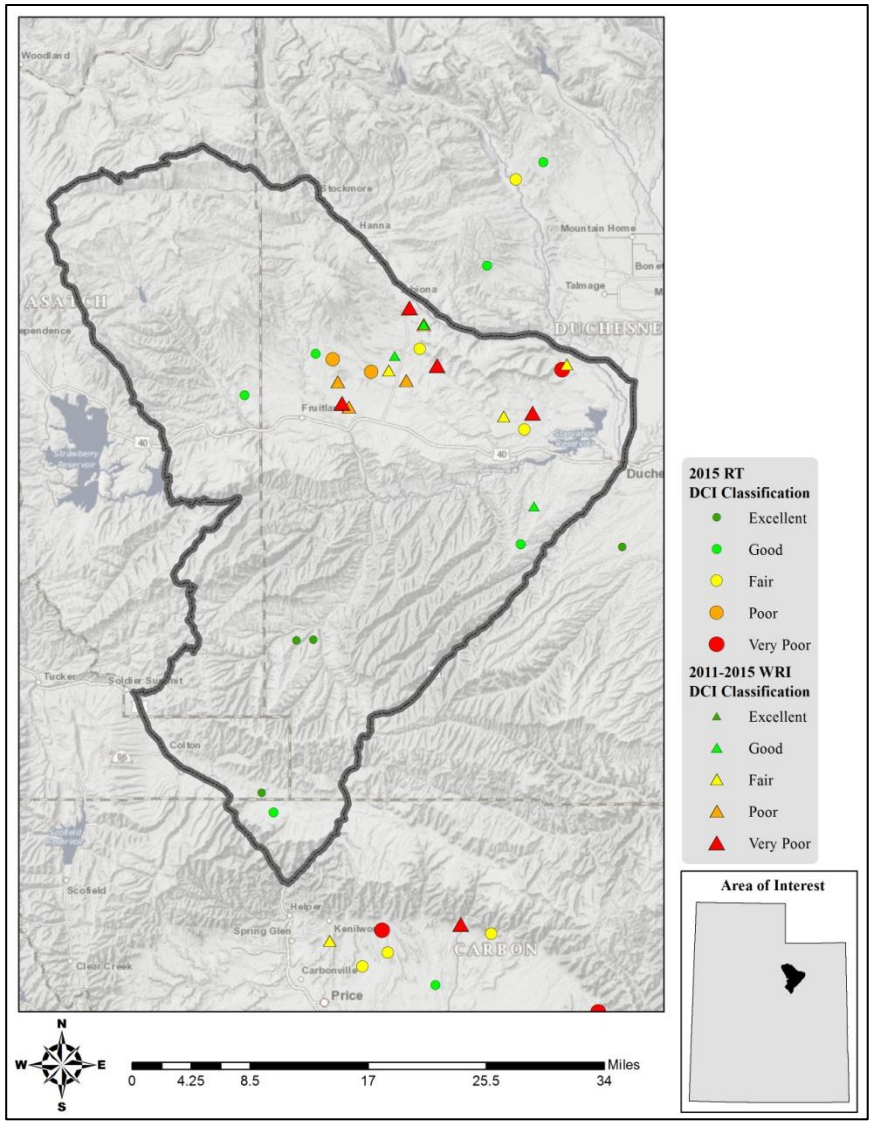
Map 8.10: 2000 Desirable Components Index (DCI) ranking distribution by study site for WMU 17BC, Wasatch Mountains – Currant Creek-Avintaquin.



Map 8.11: 2005 Desirable Components Index (DCI) ranking distribution by study site for WMU 17BC, Wasatch Mountains – Currant Creek-Avintaquin .



Map 8.12: 2010 Desirable Components Index (DCI) ranking distribution by study site for WMU 17BC, Wasatch Mountains – Currant Creek-Avintaquin.



Map 8.13: 2015 Desirable Components Index (DCI) ranking distribution by study site for WMU 17BC, Wasatch Mountains – Currant Creek-Avintaquin.

Study #	Study Name	Limiting Factor and/or Threat	Level of Threat	Potential Impact
17-49	Grey Wolf Mountain	Introduced Perennial Grass	Moderate	Reduced diversity of desirable grass and forb species.
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
17-50	Lower Santaquin Draw	Introduced Perennial Grass	Moderate	Reduced diversity of desirable grass and forb species.
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
17-51	Santaquins Cabin	Introduced Perennial Grass	Moderate	Reduced diversity of desirable grass and forb species.
		PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
17-52	Cutoff	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
17-53	Two Bar Ranch	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
17-55	Lower Horse Ridge	PJ Encroachment	Moderate	Reduced understory shrub and herbaceous vigor.
17-59	Emma Park	None Identified		
17-65	Little Horse Ridge	PJ Encroachment	Moderate	Reduced understory shrub and herbaceous vigor.
17-66	Sand Wash	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
17-67	Rabbit Gulch	Introduced Perennial Grass	Moderate	Reduced diversity of desirable grass and forb species.
17-68	Road Hollow	PJ Encroachment	Low	Reduced understory shrub and herbaceous vigor.
		Introduced Perennial Grass	Moderate	Reduced diversity of desirable grass and forb species.
17R-7	Emma Park Harrow Grazed	None Identified		

Table 8.10: Assessment of the potential limiting factors and/or threats and level of threat to study sites for WMU 17BC, Wasatch Mountains – Currant Creek-Avintaquin. All assessments are based off of the most current sample date for each study site.

Discussion and Recommendations

Mountain (Sagebrush)

These higher elevation mountain ecological sites support sagebrush communities and are generally considered to be in good condition for deer winter range habitat on this unit. These communities support dense, robust shrub populations that provide valuable browse in mild to moderate winters. Introduced perennial grasses such as crested wheatgrass and Kentucky bluegrass are often present in the understory and may be a dominant herbaceous component. While these grass species provide valuable forage, they can often be aggressive at higher elevations and can reduce the prevalence and abundance of other more desirable native grass and forb species.

Although encroachment of pinyon and juniper is limited, it is recommended that work to prevent and reduce these tree species should continue in these communities. If reseeding is necessary to restore herbaceous species, care should be taken in species selection and preference should be given to native grass species when possible. Reseeding of perennial forbs may not be necessary on sites that have high diversity.

Mountain (Browse)

This higher elevation mountain ecological site which supports a browse community is considered to be in excellent condition for deer winter range habitat on this unit. This community supports a robust shrub population that provides valuable browse in moderate to severe winters. This ecological site is prone to encroachment from pinyon and juniper trees which can reduce understory shrub and herbaceous health if not addressed. Annual grasses are not an issue within this community.

It is strongly recommended that work to reduce pinyon and juniper encroachment (e.g. bullhog, chaining, lop and scatter, etc.) should continue in this community.

Upland (Sagebrush)

These mid elevation upland sagebrush communities are generally considered to be in very poor to good condition for deer winter range habitat on the Wasatch Mountains – Currant Creek-Avintaquin unit. These communities support sagebrush populations that provide valuable browse in mild to severe winters. Like the higher elevation mountain potential sites, these sites have introduced perennial grasses present in the

herbaceous understories. These grasses have the potential to be aggressive and may reduce the abundance of other native grass and forb species. Invasion from annual grasses, primarily cheatgrass, is a potential threat to the herbaceous understories of these communities. Cover of cheatgrass is currently low, but increased amounts in the future could increase fuel loads and exacerbate the risk of wildfire in these communities. Although tree cover is low, pinyon and juniper encroachment is occurring in many of these communities, which are considered to be in Phase I of woodland succession: this encroachment can reduce shrub and herbaceous understory health if not addressed.

It is recommended that work to reduce pinyon and juniper encroachment (e.g. bullhog, chaining, lop and scatter, etc.) should continue in these communities. If reseeding is necessary to restore herbaceous species, care should be taken in species selection and preference should be given to native grass species when possible.

Upland (Browse)

This mid elevation upland browse community is considered to be in excellent condition for deer winter range habitat on the unit. This community supports a shrub population that provides valuable browse in moderate to severe winters. This ecological site is prone to encroachment from pinyon and juniper trees which can reduce understory shrub and herbaceous health if not addressed. Annual grasses are not an issue within this community.

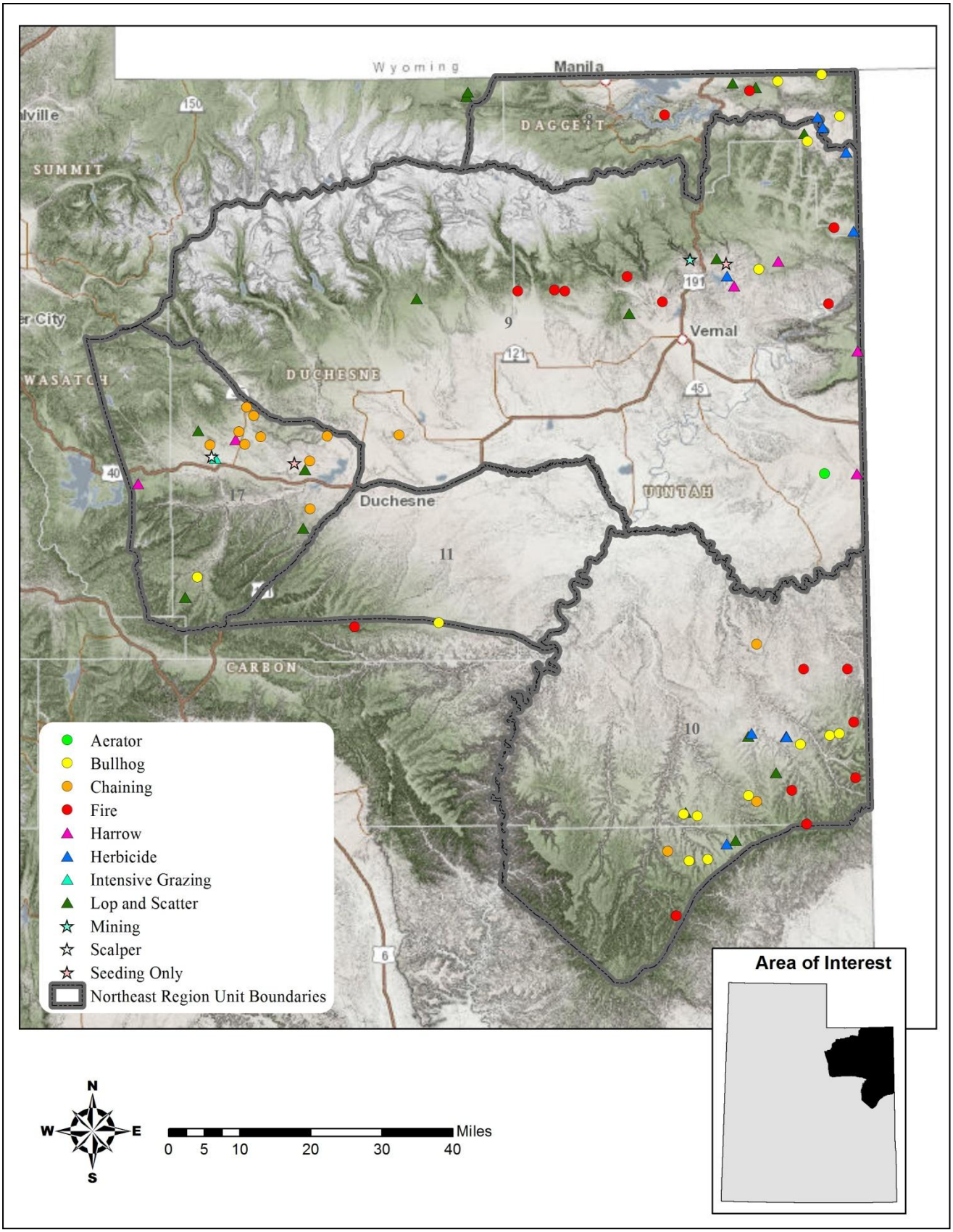
It is recommended that monitoring of this community should continue. Work to reduce pinyon-juniper encroachment (e.g. bullhog, chaining, lop and scatter, etc.) should begin or continue on this ecological site.

Semidesert (Sagebrush)

This lower elevation semidesert sagebrush community is generally considered to be in poor to fair condition for deer winter range habitat on the unit. This community supports a sagebrush population that provides valuable browse in mild to severe winters. The herbaceous understory of this ecological site is dominated by the introduced perennial grass species crested wheatgrass. This and other introduced perennial grass species have the potential to be aggressive and may reduce the abundance of other native grass and forb species. Pinyon and juniper encroachment has been an issue on this site in the past, but density has remained low in the years following a previous reduction treatment.

Continued monitoring of this ecological site is recommended. If reseeding should be necessary to restore herbaceous species, care should be taken in species selection and preference should be given to native grass species if possible.

9. NORTHEASTERN REGION – TREATED OR DISTURBED SUMMARY



Study Trend Summary (Treated/Disturbed Sites)

Lop and Scatter

Of the study sites that have undergone a lop and scatter treatment, one is considered to be a high mountain ecological site [Horse Ridge (17R-36)], seven are classified as mountain ecological types [Widdop Mountain North Slope (08A-2), Telephone Hollow (08A-5), Goslin Mountain (08C-2), North Dry Gulch Ponderosa Thinning (09R-22), Wirefence Point (10-4), Monument Ridge (10R-7), and Road Hollow (17-68)], five are upland types [Antelope Flat (08C-7), Little Mountain (09-27), Indian Ridge (10-1), Winter Ridge Exclosure Out (10R-9), and Santaquins Cabin (17-51)], and three are considered to be semidesert ecological sites [Red Fleet Lop and Scatter (09R-7), Toliver Creek Chaining (09-10), and Rabbit Gulch (17-67)].

The Horse Ridge study is situated on the southern portion of Horse Ridge. Widdop Mountain North Slope and Telephone Hollow are located on the north slope of Widdop Mountain, while the Goslin Mountain site can be found on the south slope, and Wirefence Point is located on the southern portion of Winter Ridge near Wire Fence Canyon. The Monument Ridge study is found on Monument Ridge near Trap Canyon, and the Road Hollow site is located near the top of Road Hollow. The Antelope Flat study is situated in the eastern portion of Antelope Flat near Goslin Mountain. Little Mountain is located northwest of Coal Mine Basin and the city of Vernal, and the Indian Ridge study site can be found on top of Indian Ridge. Winter Ridge Exclosure Out is situated just southwest of Trail Canyon on Winter Ridge, and Santaquins Cabin is located west of Beer Spring. Finally, Red Fleet Lop and Scatter is situated between Pothole Canyon and Constantine Canyon, the Toliver Creek Chaining study is found east of Toliver Creek on the lower slopes of the Uinta Mountains, and the Rabbit Gulch site is located just north of Rabbit Gulch.

Shrubs/Trees: Sagebrush species in general are the dominant browse component on many of these sites. Overall, sagebrush cover has increased in the years following treatment for sites of all ecological types, and populations have been composed of mainly mature individuals. Recruitment of young individuals has shown a generally increasing trend following treatment. Tree cover and density have generally decreased over time for all ecological types.

The exception to these statements is the single high mountain ecological site Horse Ridge (17R-36), which was sampled pre-treatment, has no sagebrush cover, and is dominated by Douglas fir (*Pseudotsuga menziesii*) in the overstory (Figure 9.1, Figure 9.2, Figure 9.3, Figure 9.4).

Herbaceous Understory: Herbaceous cover has generally increased for all ecological types with perennial grasses contributing the most cover. Annual grasses are present on many of the sites with mountain, upland, and semidesert ecological types, but cover has decreased overall as time following treatment increases. Perennial forb cover has shown a general decrease on mountain and semidesert sites, but has slightly increased on sites that are classified as upland. Annual forbs have remained rare (Figure 9.5).

Occupancy: Pellet group transect data indicates that deer/pronghorn are the primary occupants on sites with upland and semidesert potentials, while those classified as mountain ecological sites are mainly occupied by elk. Elk and deer are both primary occupants on the single high mountain ecological site. Abundance of pellet groups has exhibited an overall decrease as time since treatment has increased (Figure 9.6).

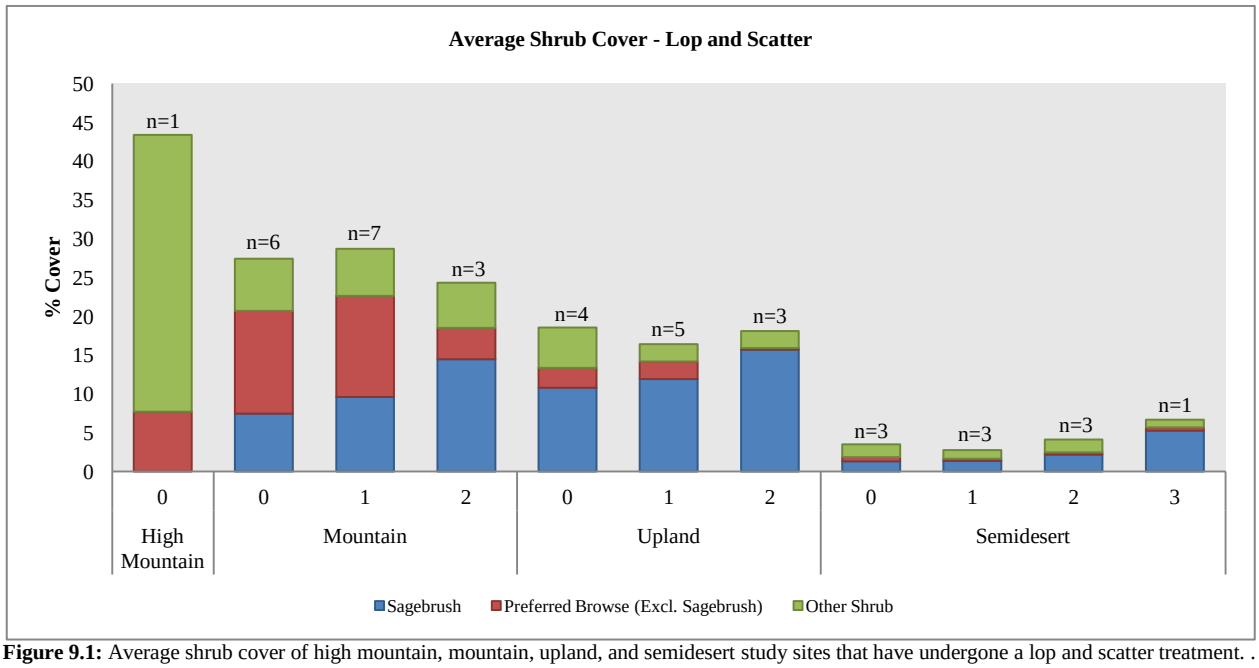


Figure 9.1: Average shrub cover of high mountain, mountain, upland, and semidesert study sites that have undergone a lop and scatter treatment. . 0 = pretreatment; 1 = 1 – 5years post treatment; 2 = 6 – 10 years post treatment; 3 = 11 – 15 years post treatment.

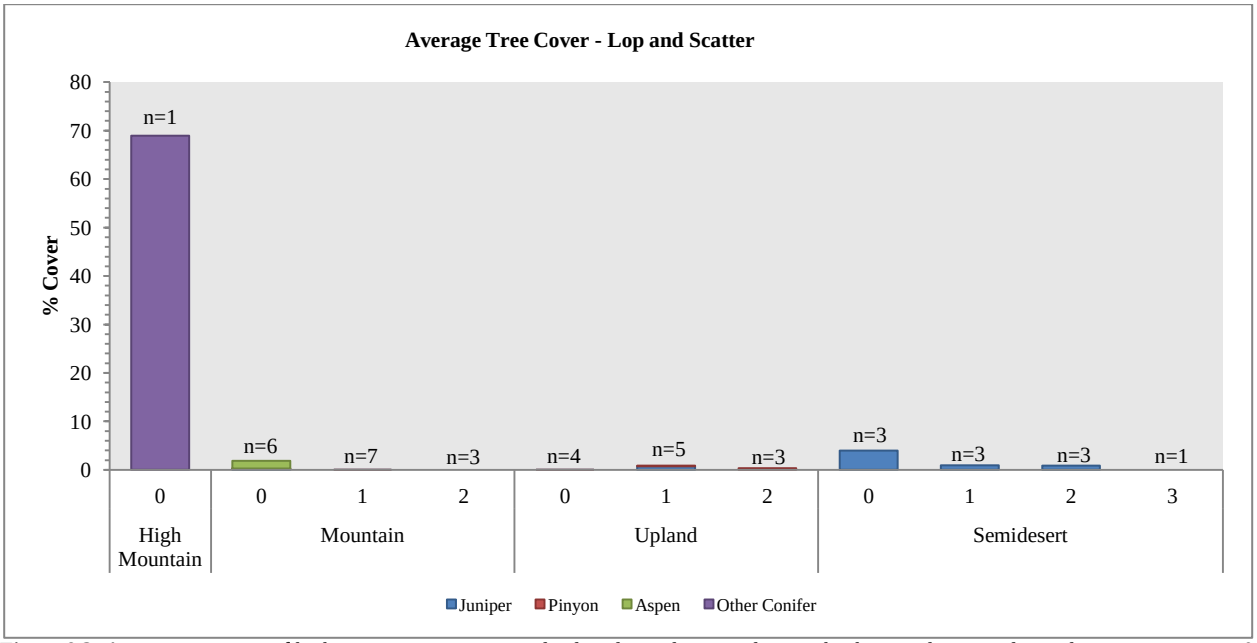


Figure 9.2: Average tree cover of high mountain, mountain, upland, and semidesert study sites that have undergone a lop and scatter treatment. . 0 = pretreatment; 1 = 1 – 5years post treatment; 2 = 6 – 10 years post treatment; 3 = 11 – 15 years post treatment.

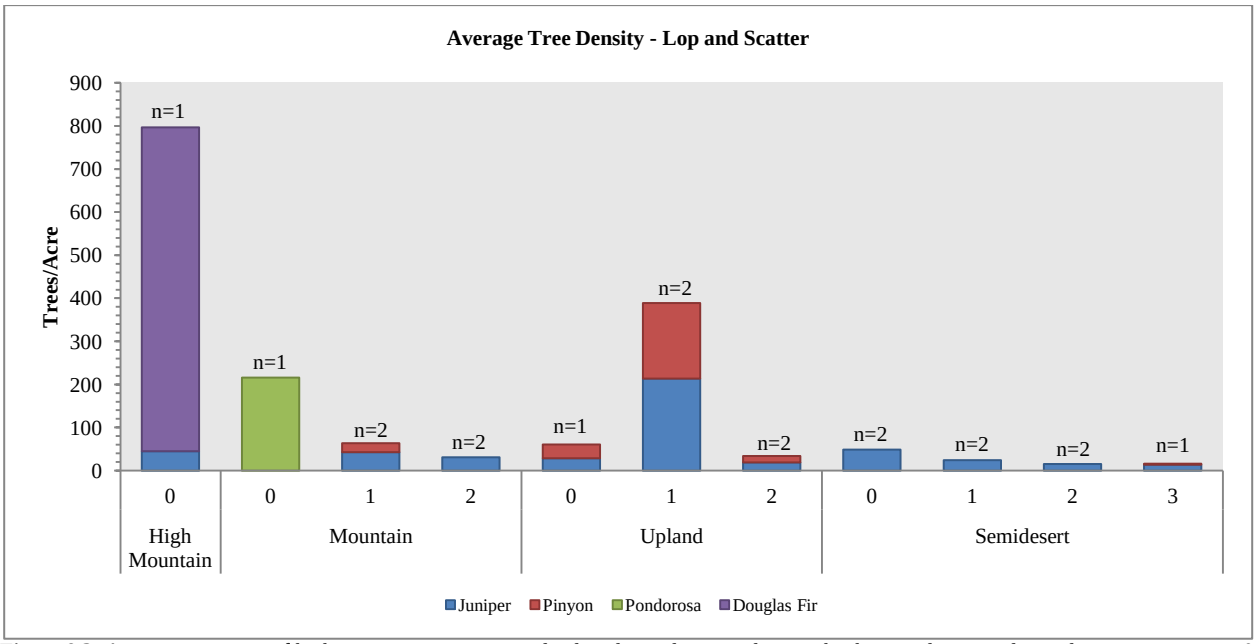


Figure 9.3: Average tree cover of high mountain, mountain, upland, and semidesert study sites that have undergone a lop and scatter treatment. . 0 = pretreatment; 1 = 1 – 5years post treatment; 2 = 6 – 10 years post treatment; 3 = 11 – 15 years post treatment.

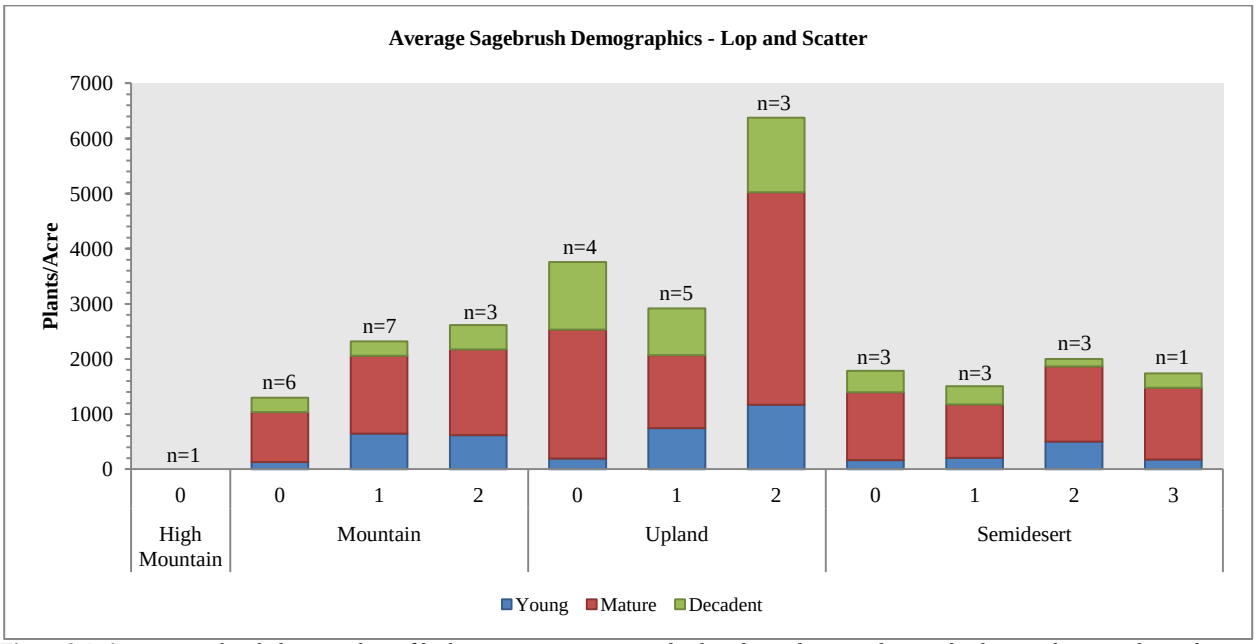


Figure 9.4: Average sagebrush demographics of high mountain, mountain, upland, and semidesert study sites that have undergone a lop and scatter treatment. . 0 = pretreatment; 1 = 1 – 5years post treatment; 2 = 6 – 10 years post treatment; 3 = 11 – 15 years post treatment.

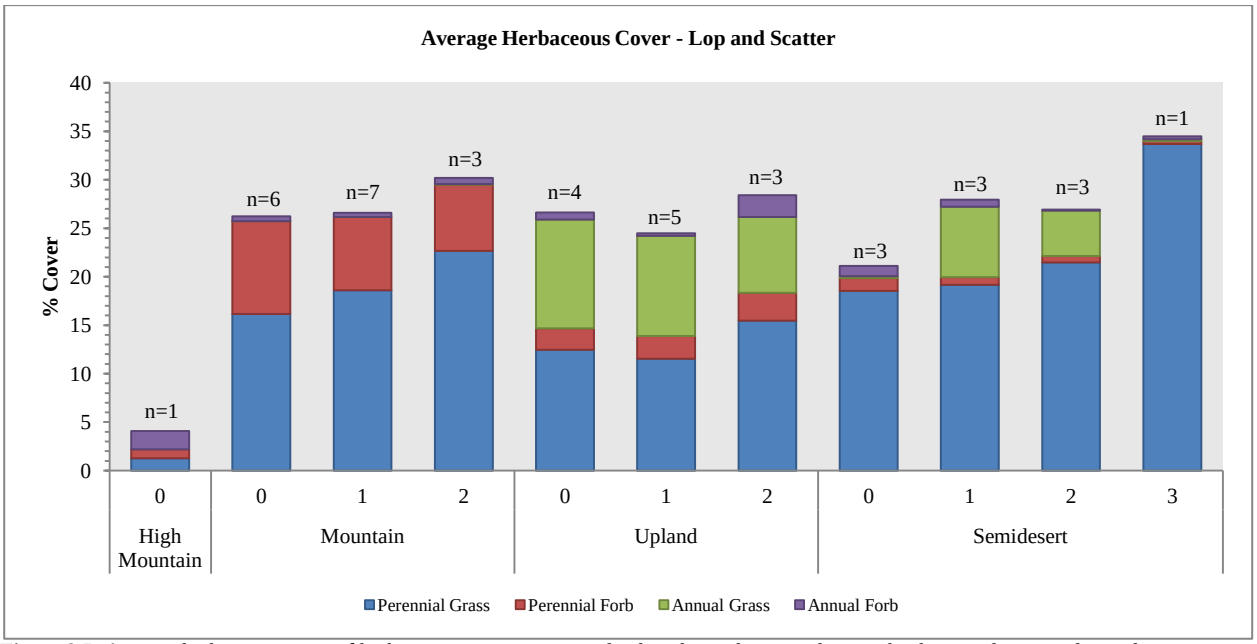


Figure 9.5: Average herbaceous cover of high mountain, mountain, upland, and semidesert study sites that have undergone a lop and scatter treatment. 0 = pretreatment; 1 = 1 – 5 years post treatment; 2 = 6 – 10 years post treatment; 3 = 11 – 15 years post treatment.

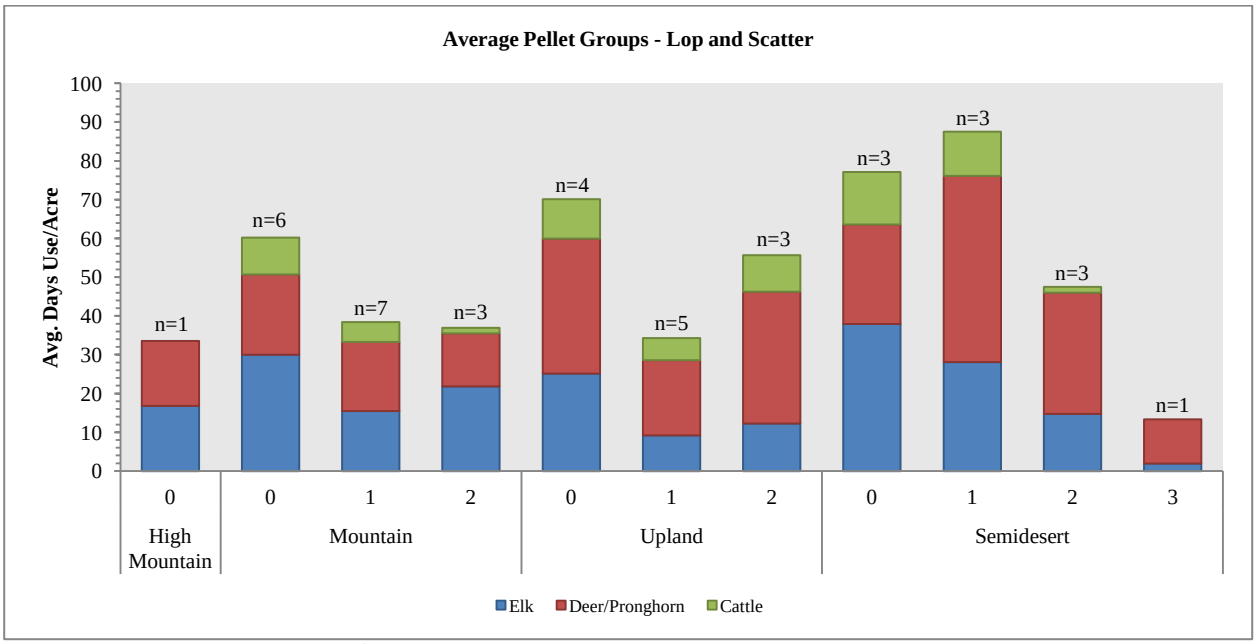


Figure 9.6: Average pellet transect data of mountain, upland, and semidesert study sites that have undergone a lop and scatter treatment. .
0 = pretreatment; 1 = 1 – 5years post treatment; 2 = 6 – 10 years post treatment; 3 = 11 – 15 years post treatment.

Bullhog

Fourteen study sites have been treated with a bullhog during the study period. Of these, six are classified as mountain ecological sites [McCook Ridge Chaining (10-3), Little Jim Canyon (10-6), Cherry Mesa (10-7), Winter Ridge Bullhog (10R-41), Winter Ridge Bullhog 2 (10R-42), and Seep Ridge Bullhog (10R-52)], seven as upland types [Lower Horse Ridge (17-55), Teepee Mountain Bullhog (08R-2), Goslin Mountain Bullhog (08R-3), Diamond Mountain Bullhog (09R-4), Toliver Creek Bullhog (09R-17), Indian Springs Bullhog (10R-36), and Indian Springs Bullhog 3 (10R-40)], and one site as a semidesert ecological type [Birch Creek (08R-5)].

The McCook Ridge Chaining site is located on top of McCook Ridge, just north of Box Elder Canyon while the Little Jim Canyon study is found near the southern portion of Little Jim Canyon. Cherry Mesa is located on top of Cherry Mesa. The Winter Ridge Bullhog and Winter Ridge Bullhog 2 studies are situated on the western portion of Winter Ridge, and the Seep Ridge Bullhog site is found on Seep Ridge north of Jacks Wagon Road Canyon. The Lower Horse Ridge study site is situated on the northern portion of Horse Ridge, south of Avintaquin Creek. Teepee Mountain Bullhog is located on the southern slope of the Teepee Mountains. The Goslin Mountain Bullhog study site is situated on the northern slope of Goslin Mountain, just south of Pigeon Canyon Draw. The Diamond Mountain Bullhog study site is located on the southwestern slope of Diamond Mountain Plateau, while the Toliver Creek Bullhog study is found just south of Browns Park. The Indian Springs Bullhog is located on Indian Springs Ridge west of Dry Burn Canyon, while the Indian Springs Bullhog 3 study is situated east of the canyon. Finally, the Birch Creek study site is found on the southern slope of O-Wi-Yu-Kuts Mountain.

Shrubs/Trees: As the available data is classified as pre-treatment, trends for semidesert ecological sites will not be discussed in this report. Average total shrub cover has shown an overall increasing trend for mountain and upland ecological sites, with various sagebrush species as the dominant browse component. As Figure 9.11 indicates, there was a substantial increase in sagebrush cover from one to five years post-treatment to six to ten years post-treatment for mountain ecological sites. This increase could be attributed to the lower number of sites at six to ten years post treatment, specifically the McCook Ridge Chaining and Cherry Mesa studies: both sites exhibited an increase in sagebrush cover. Sagebrush populations on these ecological sites have been mainly comprised of mature individuals throughout the study period, and recruitment of young plants has increased in the years following treatment.

Average tree cover and density have decreased overall on both mountain and upland ecological sites. However, there was an increase in both density and cover for upland ecological sites from one to five years post-treatment to six to ten years post-treatment. This increasing trend is driven by the Indian Springs Bullhog site, which exhibited a 1.5% increase in tree cover and an increase of 167 trees/acre between samplings (Figure 9.7, Figure 9.8, Figure 9.9, Figure 9.10).

Herbaceous Understory: Average herbaceous cover has increased overall on sites designated as mountain or upland types, with perennial grasses dominating the understory. In addition, the average cover of annual grasses on these sites has increased in the first sample year following treatment and subsequently decreased, resulting in an overall increase. This marked initial increase on upland ecological sites can largely be attributed to the Toliver Creek Bullhog and Indian Springs Bullhog 3 studies, which exhibited individual increases in annual grass cover of 6% and 5.2% (respectively) in the first sample year following treatment. Annual and perennial forbs have remained rare throughout the study period (Figure 9.11).

Occupancy: Pellet group abundance and primary occupancy on mountain and upland ecological sites has fluctuated. Although pellet group abundance on mountain sites at six to ten years post-treatment is nearly equal to pre-treatment abundance, primary occupancy has shifted from deer/pronghorn to deer/pronghorn, elk, and cattle: this could be due to the lower number of sites sampled at six to ten years post-treatment. Mean abundance of total pellet groups on upland ecological sites has decreased from 43 days use/acre before treatment to 17 days use/acre as of the second post-treatment sampling, and primary occupancy has shifted from deer/pronghorn to elk (Figure 9.12).

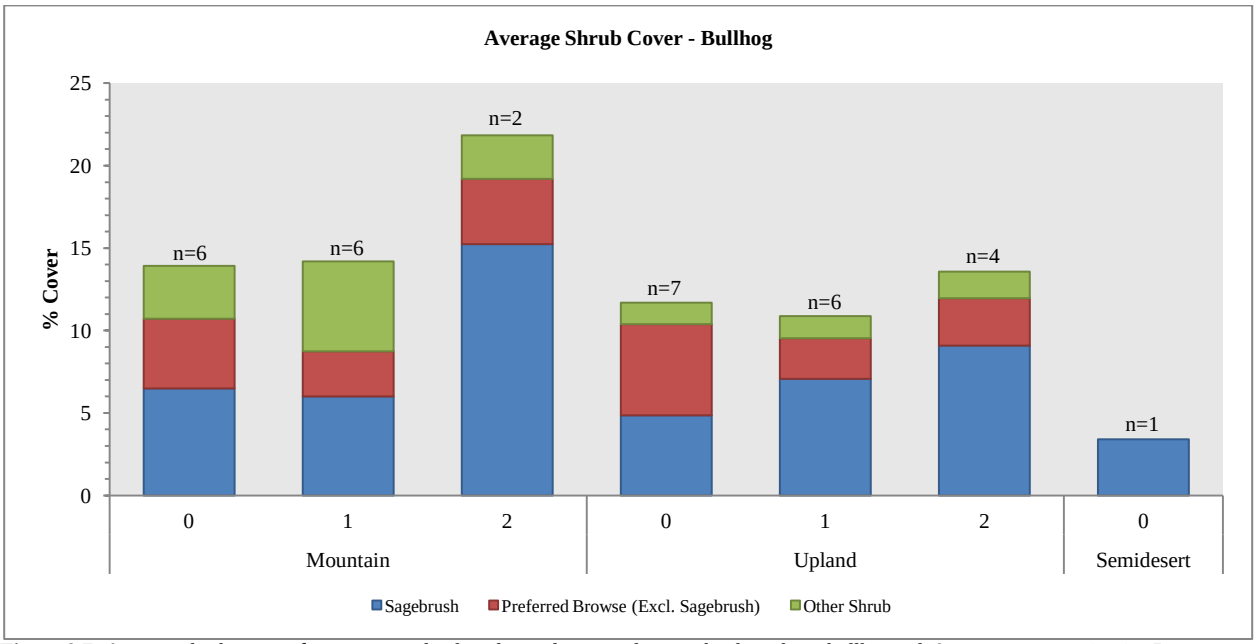


Figure 9.7: Average shrub cover of mountain, upland, and semidesert study sites that have been bullhogged. 0 = pretreatment; 1 = 1 – 5 years post treatment; 2 = 6 – 10 years post treatment.

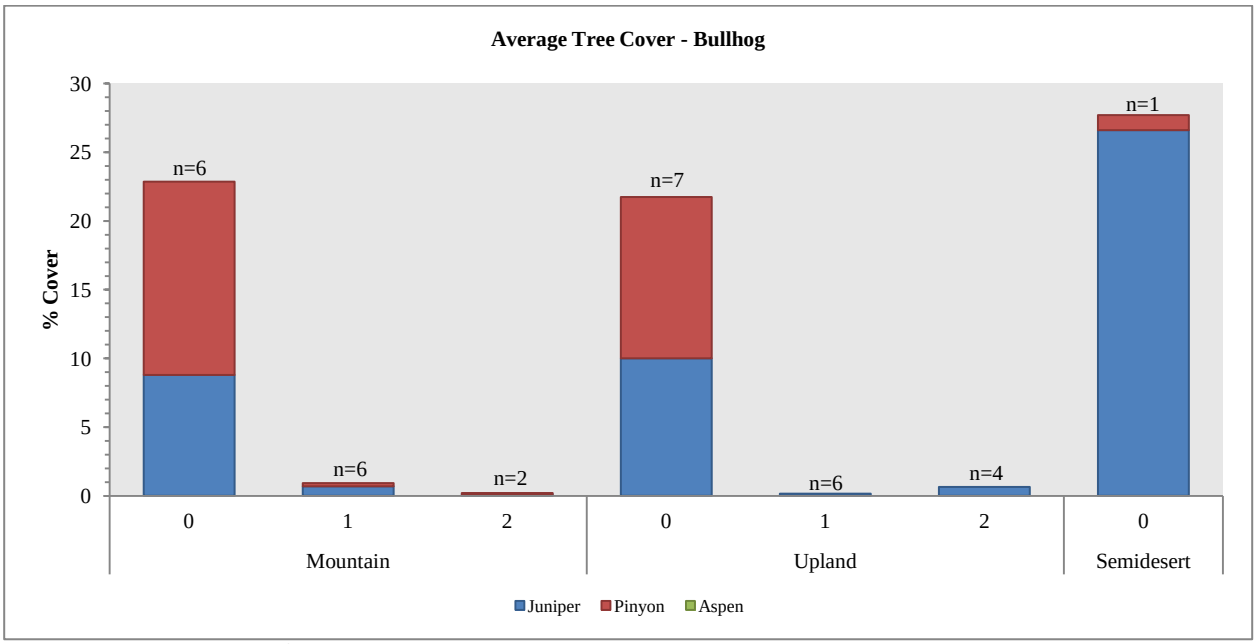


Figure 9.8: Average tree cover of mountain, upland, and semidesert study sites that have been bullhogged. 0 = pretreatment; 1 = 1 – 5 years post treatment; 2 = 6 – 10 years post treatment.

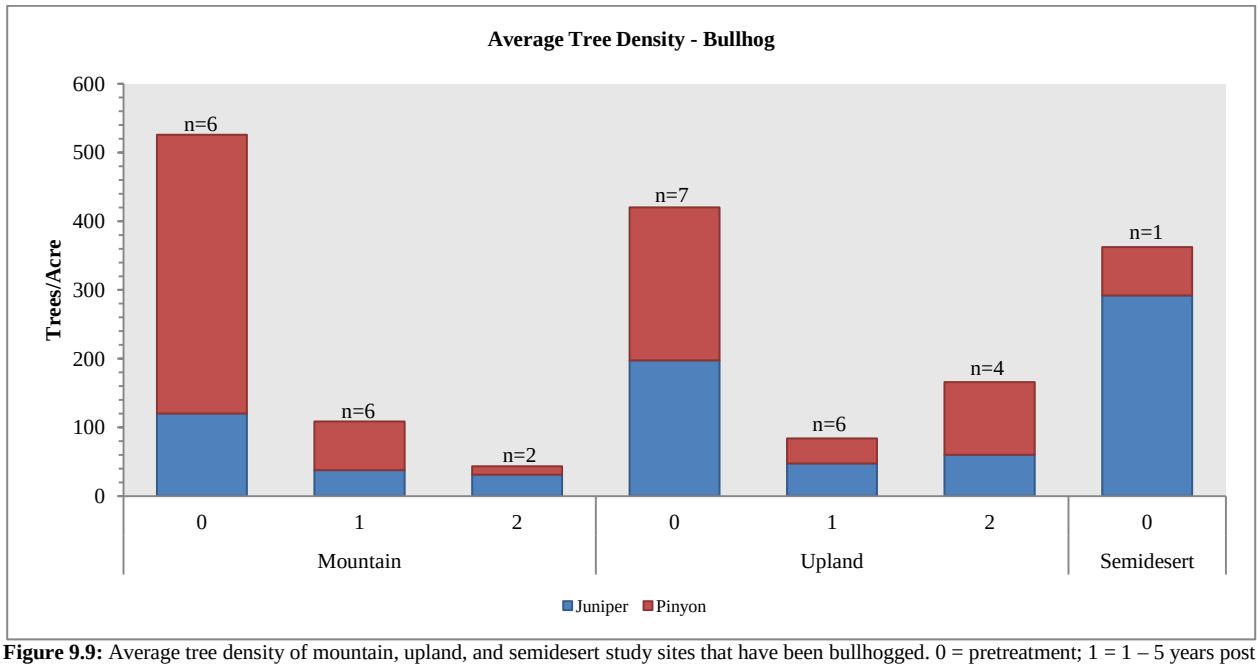


Figure 9.9: Average tree density of mountain, upland, and semidesert study sites that have been bullhogged. 0 = pretreatment; 1 = 1 – 5 years post treatment; 2 = 6 – 10 years post treatment.

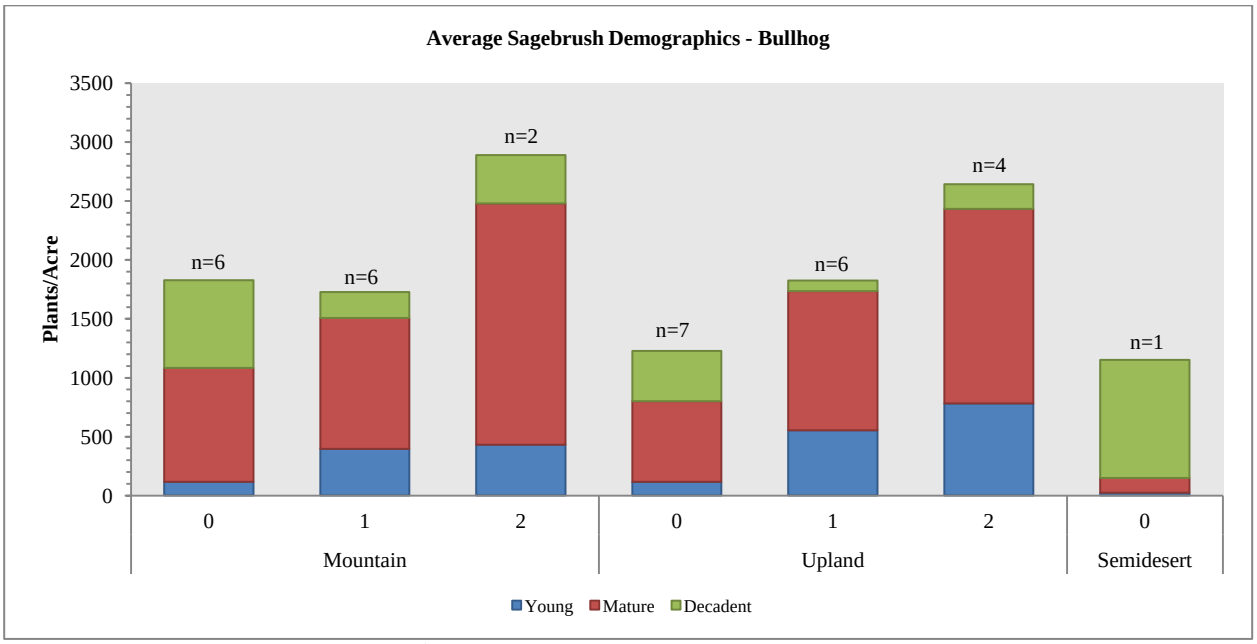


Figure 9.10: Average sagebrush demographics of mountain, upland, and semidesert study sites that have been bullhogged. 0 = pretreatment; 1 = 1 – 5 years post treatment; 2 = 5 – 10 years post treatment.

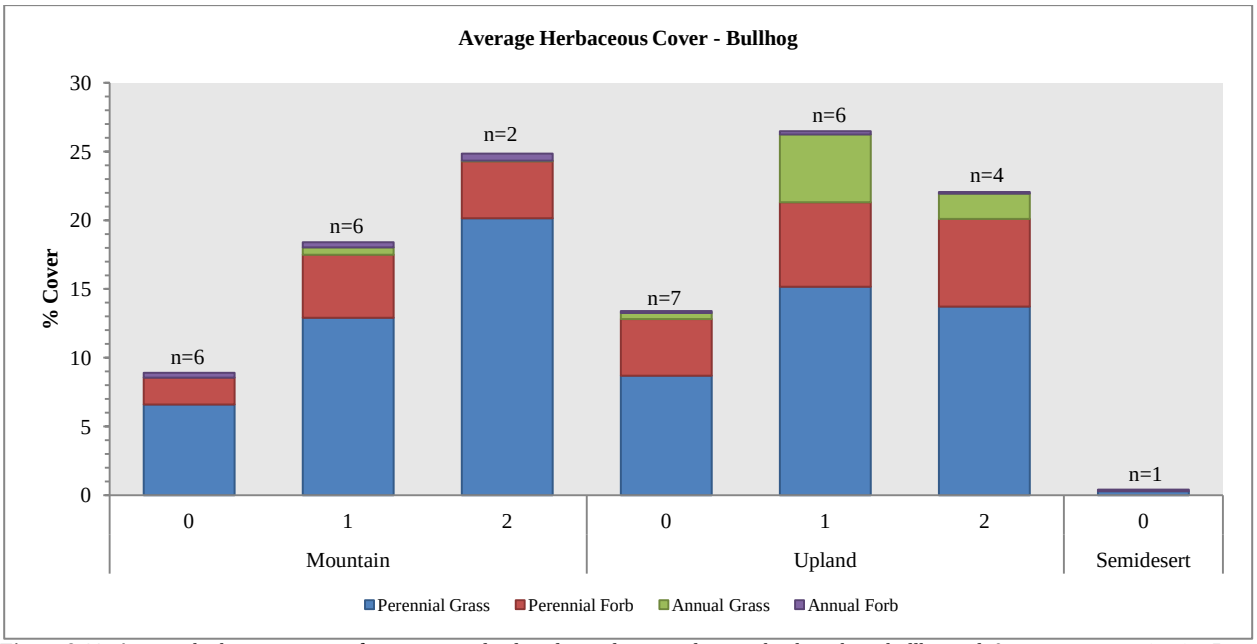


Figure 9.11: Average herbaceous cover of mountain, upland, and semidesert study sites that have been bullhogged. 0 = pretreatment; 1 = 1 – 5 years post treatment; 2 = 6 – 10 years post treatment.

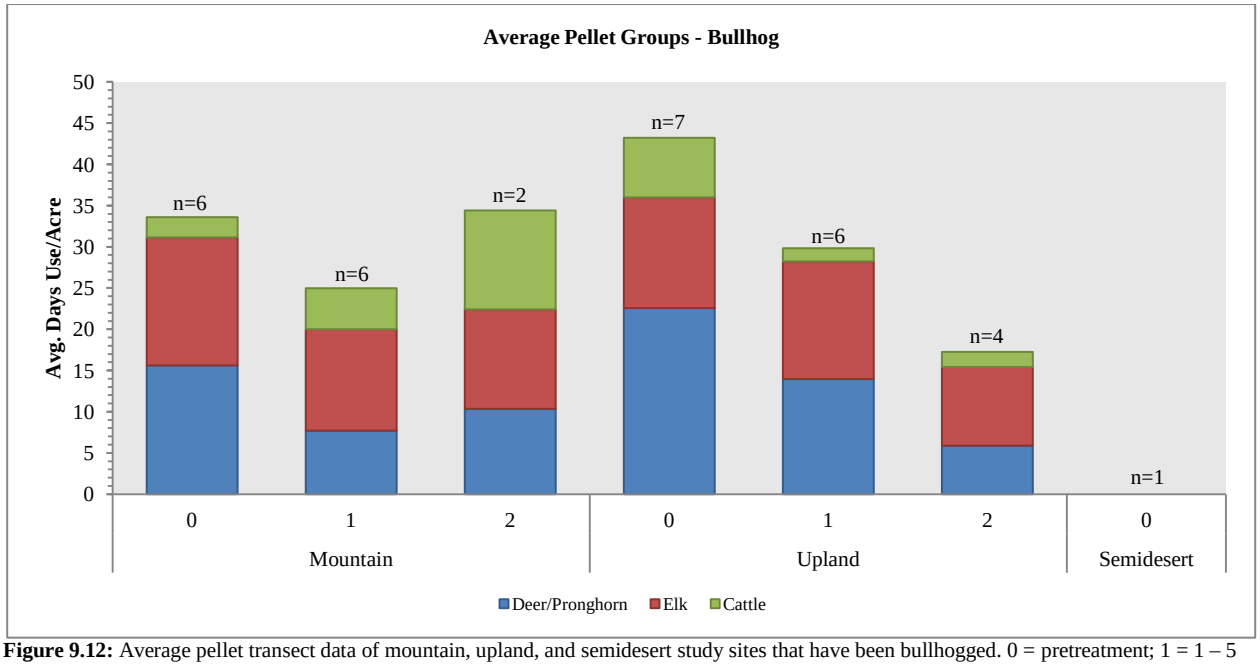


Figure 9.12: Average pellet transect data of mountain, upland, and semidesert study sites that have been bullhogged. 0 = pretreatment; 1 = 1 – 5 years post treatment; 2 = 6 – 10 years post treatment.

Chaining

Fourteen study sites have been chained over the study period. Two of these are classified as mountain ecological sites [Seep Ridge Chaining (10R-46) and Moon Ridge (10R-53)], nine as upland ecological types [Santaquin Greasewood (17R-11), Santaquin Chaining (17R-12), Skitzy Chaining (17R-14), Golden Stairs Chaining (17R-15), Grey Wolf Chaining (17R-16), Blacktail Chaining (17R-21), East Santaquin Chaining (17R-24), Two Bar-Sand Wash Chaining (17R-26), and Two Bar-Black Tail Chaining (17R-27)], and three as

semidesert ecological sites [Brotherson Chaining (09R-18), Archy Bench (10R-51), and Rabbit Gulch Chaining (17R-13)].

The Seep Ridge Chaining study site is located on Seep Ridge just east of Berry Canyon, while the Moon Ridge study is found on the northern portion of Moon Ridge, adjacent to Tenmile Canyon. The Santaquin Greasewood site is situated in the western portion of Santaquin Draw with the Santaquin Chaining study about one mile to the north. Skitzy Chaining is found east of Skitzy Canyon. The Golden Stairs Chaining site is located west of Tabiona and north of Golden Stairs Canyon, while the Grey Wolf Chaining study is situated on the southern slope of Grey Wolf Mountain. Blacktail Chaining is found north of Rabbit Gulch. The East Santaquin Chaining study site is located east of the Santaquin Greasewood site, and the Two Bar-Sand Wash Chaining site is found south of Sand Wash and west of Blacktail Mountain. The Two Bar-Black Tail Chaining study site is situated on the western portion of Blacktail Ridge, south of the Duchesne River. Brotherson Chaining is located on top of a mesa west of Lake Fork River, and the Archy Bench study is found west of West Fork Asphalt Wash. Finally, the Rabbit Gulch Chaining study is located north of Rabbit Gulch.

Shrubs/Trees: Trends in browse cover differ between ecological types. There has been a very slight decrease in sagebrush cover and a slight increase in the cover of other shrub species on sites classified as having a mountain ecological type. Sagebrush populations on these sites have generally transitioned from being dominated by decadent individuals to being dominated by mature plants, and recruitment of young has increased post-treatment. Upland ecological sites have, on average, exhibited an increase in sagebrush and preferred browse cover as time since treatment has increased. Although they were mainly comprised of decadent plants pre-treatment, the sagebrush populations have shifted to ones co-dominated by mature and young individuals as of the second post-treatment sampling. Finally, browse cover on semidesert ecological sites has decreased overall, although there was a slight increase in preferred browse between the first and second post-treatment samplings. The sagebrush populations on these sites have generally been composed of mature plants in all sample years.

Data indicates that average tree cover and density has decreased overall for all three ecological types. Cover and density values on mountain sites have ranged from 53% and 682 trees/acre pre-treatment to 6% and 280 trees/acre in the first post-treatment sampling. Upland sites have ranged from 27% cover and density of 232 trees/acre pre-treatment to 2% and 56 trees/acre as of the second post sampling. Finally on semidesert, tree cover and density values have ranged from 8% and 277 trees/acre pre-treatment to 0.4% and 25.5 trees/acre as of the second post-treatment sampling (Figure 9.13, Figure 9.14, Figure 9.15, Figure 9.16).

Herbaceous Understory: On average, herbaceous cover has fluctuated, but has increased overall for sites of all ecological types. Mountain and upland sites have generally been dominated by perennial grasses in all sample years. Although perennial grass cover has exhibited an overall increase on semidesert ecological sites, these sites have been dominated by annual forbs throughout the study period: this trend is driven by the Rabbit Gulch Chaining site, which had 14.5% annual forb cover pre-treatment, 36% cover at the first post-treatment sampling, and 20% as of the most recent post-treatment sampling. Annual grass cover has remained low for mountain and upland ecological types, and has exhibited an overall decrease on semidesert sites. Perennial forb cover has generally decreased for sites of all ecological types (Figure 9.17).

Occupancy: Data indicates that average pellet group abundance has decreased on study sites of all ecological types. The primary occupants of these study sites have shifted over time. Deer/pronghorn pellet groups were the most abundant on upland and semidesert sites pre-treatment at 49 days use/acre and 38 days use/acre, respectively. Elk are the primary occupants of upland sites, while deer and elk both occupy semidesert sites as of the second post-treatment sampling. Deer pellet group abundance has increased over time on mountain ecological sites while that of elk has decreased (Figure 9.18).

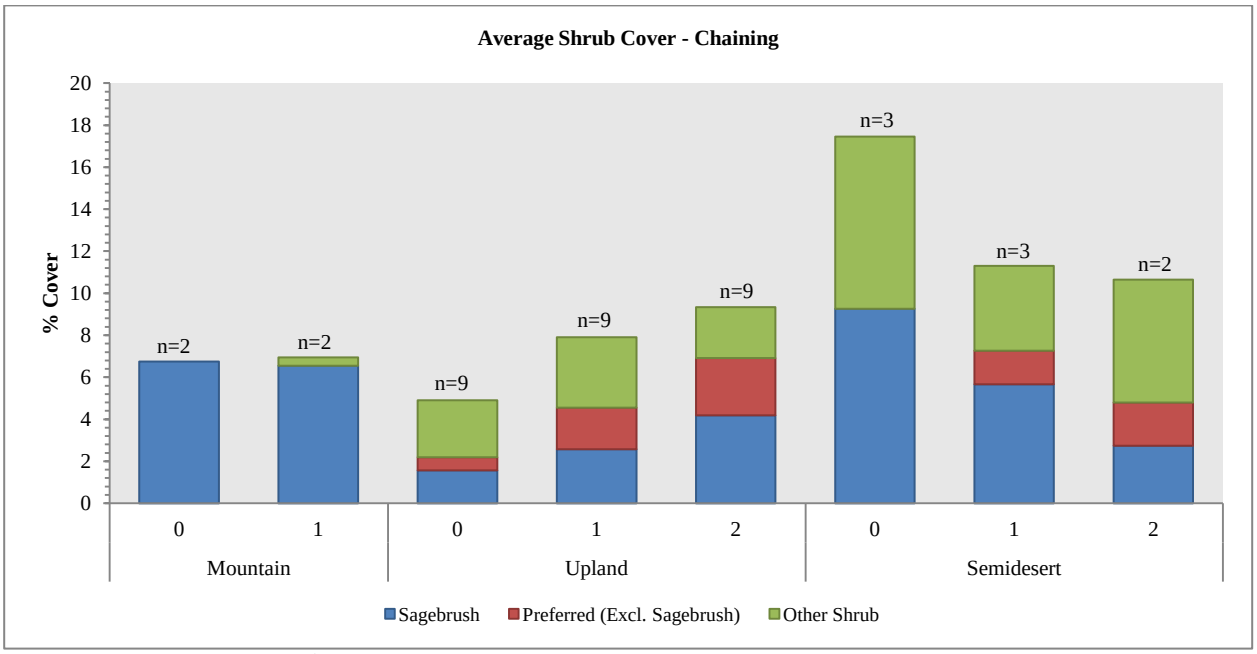


Figure 9.13: Average shrub cover of mountain, upland, and semidesert study sites that have been chained. 0 = pretreatment; 1 = 1 – 5 years post treatment; 2 = 6 – 10 years post treatment.

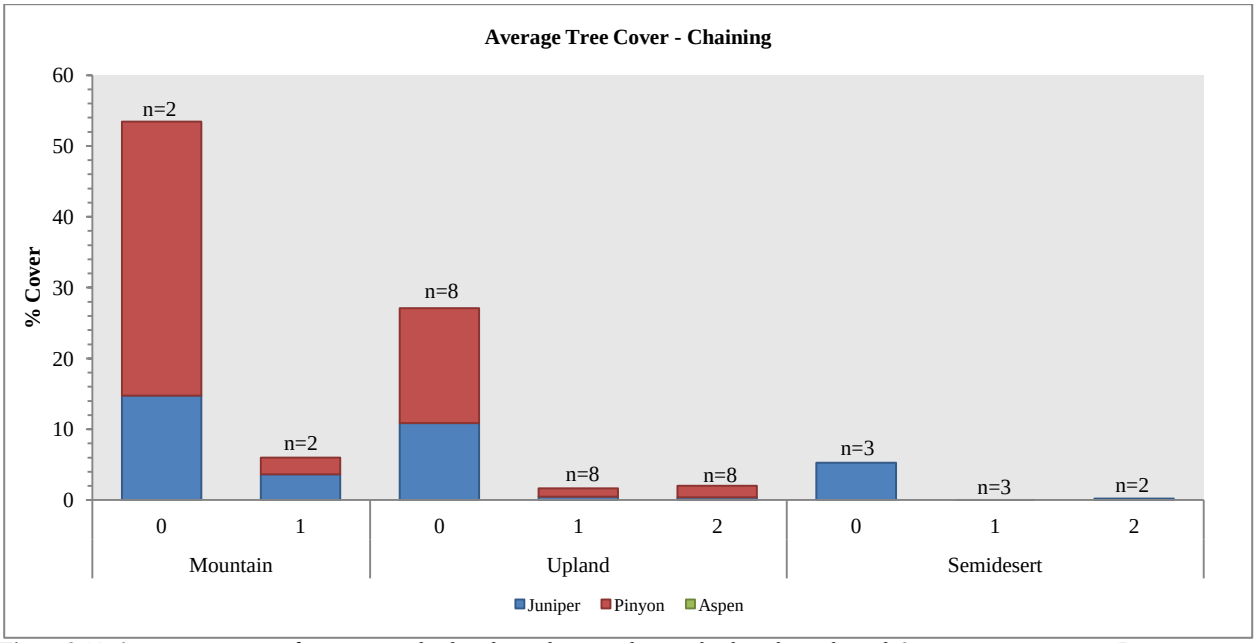


Figure 9.14: Average tree cover of mountain, upland, and semidesert study sites that have been chained. 0 = pretreatment; 1 = 1 – 5 years post treatment; 2 = 6 – 10 years post treatment.

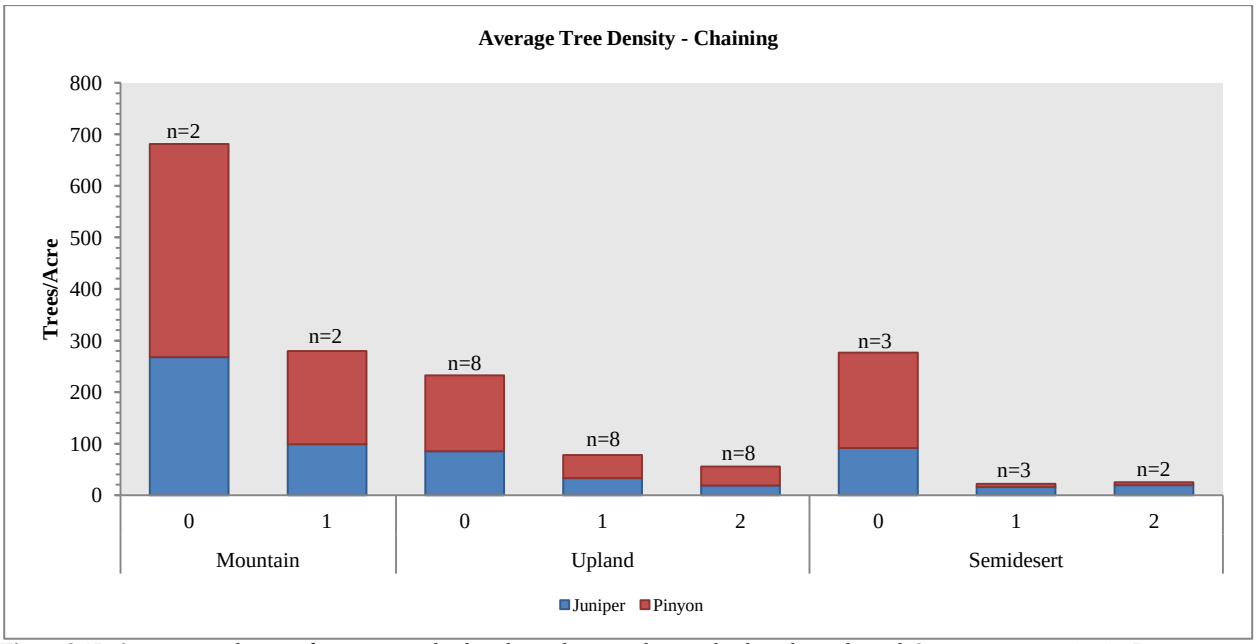


Figure 9.15: Average tree density of mountain, upland, and semidesert study sites that have been chained. 0 = pretreatment; 1 = 1 – 5 years post treatment; 2 = 6 – 10 years post treatment.

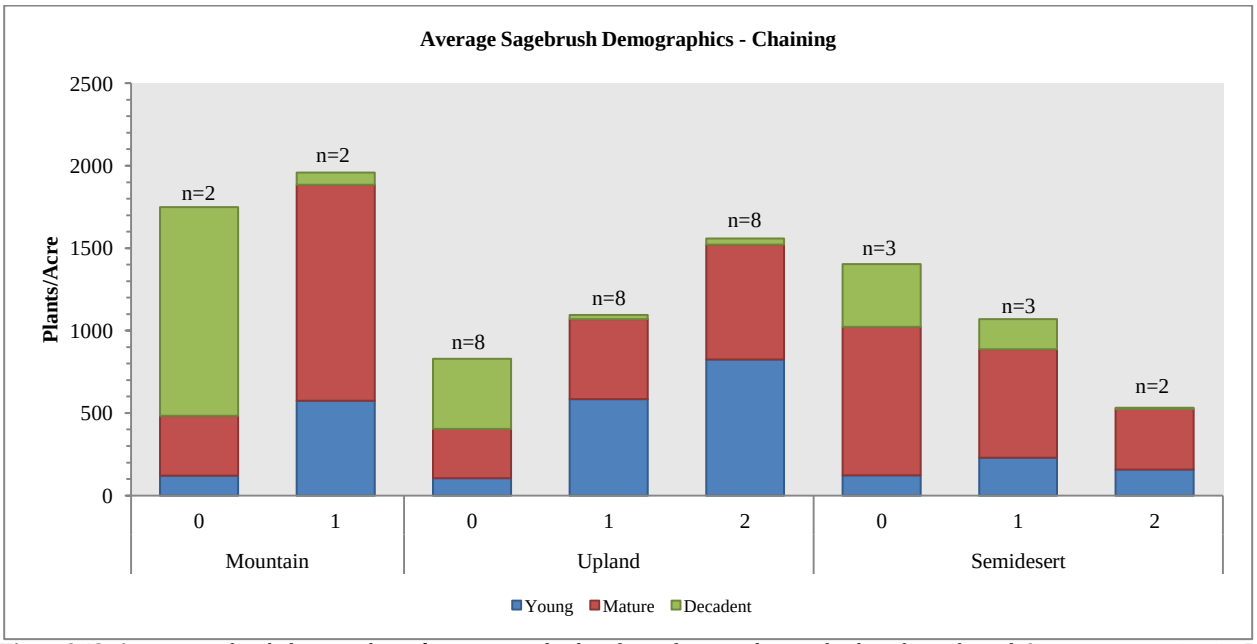


Figure 9.16: Average sagebrush demographics of mountain, upland, and semidesert study sites that have been chained. 0 = pretreatment; 1 = 1 – 5 years post treatment; 2 = 6 – 10 years post treatment.

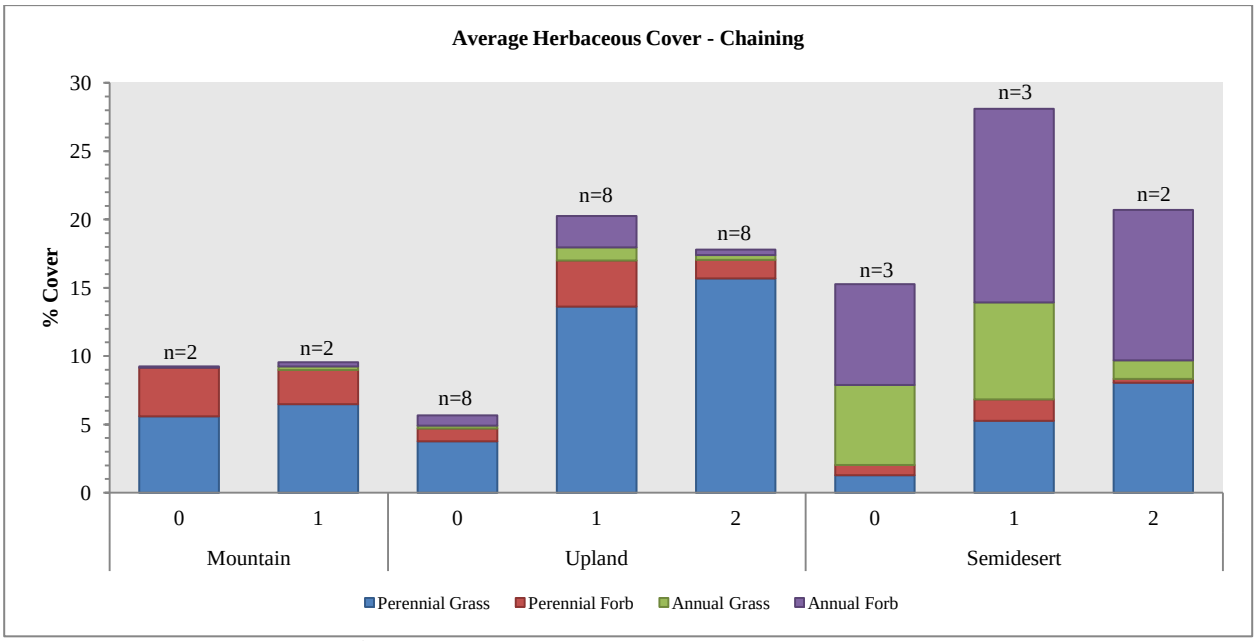


Figure 9.17: Average herbaceous cover of mountain, upland, and semidesert study sites that have been chained. 0 = pretreatment; 1 = 1 – 5 years post treatment; 2 = 6 – 10 years post treatment.

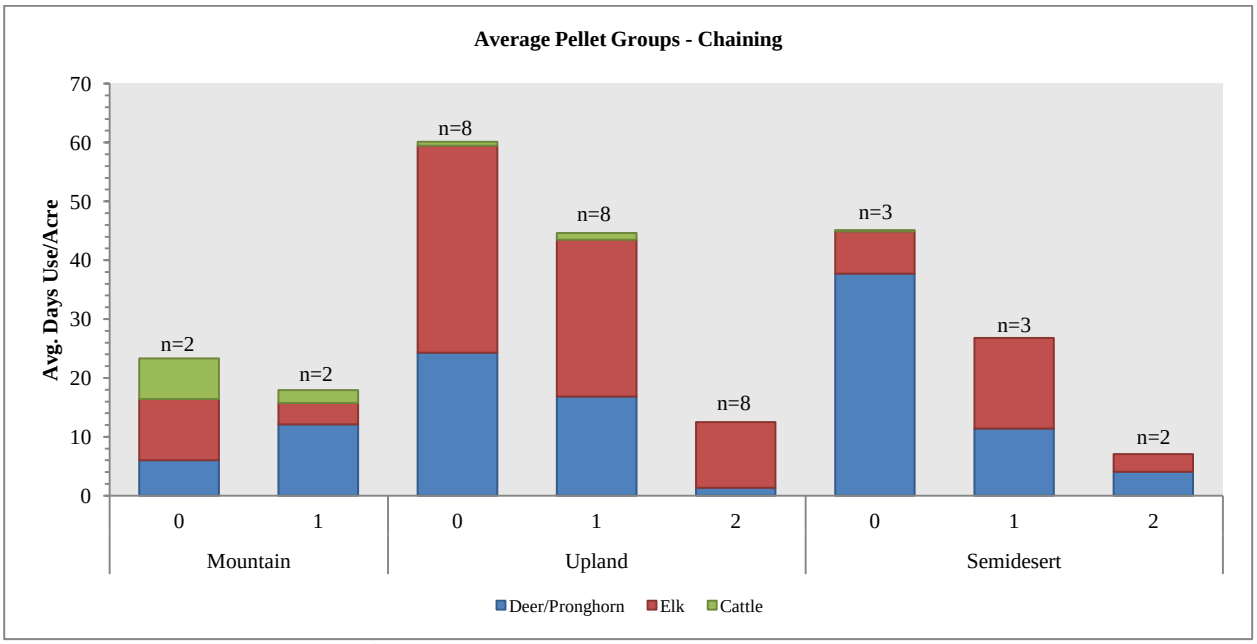


Figure 9.18: Average pellet transect data of mountain, upland, and semidesert study sites that have been chained. 0 = pretreatment; 1 = 1 – 5 years post treatment; 2 = 6 – 10 years post treatment.

Fire

Seventeen study sites have been burned either by a wildfire or a controlled burn. Of these, one is classified as a high mountain ecological sites [Chokecherry Canyon (11A-3)], 11 are considered to be mountain sites [Bear Top Mountain (08C-3), West Goslin (08C-9), Dry Fork Mountain (09-3), Mosby Mountain (09-16), Farm Creek (09-17), Mosby Mountain South (09-19), Pot Creek Chaining (09R-14), Turner Canyon (10-24), Saddle Horse (10R-15), Railroad Canyon (10R-17), and Rathole Ridge (10R-22)], two are classified as upland sites [Indian Springs Bullhog 2 (10R-39) and Rector Ridge (10R-57)], and three are classified as semidesert ecological sites [Red Mountain Allotment (09-1), Island Park (09-5), and Center Fork (10R-56)].

The Chokecherry Canyon site is found on the southwest rim of the West Tavaputs Plateau just above the Badland Cliffs. The Bear Top Mountain study site is located within the Flaming Gorge National Recreation Area north of the Green River, and the West Goslin site is situated on the south face of Goslin Mountain. The Dry Fork Mountain study is located on the south slope of the Uinta Mountains, west of Ashley Gorge. Both the Mosby Mountain and Mosby Mountain South studies are situated on the south slope of Mosby Mountain. The Farm Creek site is found on the southern slope of the Uinta Mountains adjacent to Farm Creek. Pot Creek Chaining is located south of Pot Creek and west of Wild Mountain. Turner Canyon is found west of Diamond Ridge, adjacent to East Willow Creek. The Saddle Horse study is situated south of Saddle Horse Point, and the Railroad Canyon site is located in Railroad Canyon just south of the Uintah-Grand County border. The Rathole Ridge study is situated on top of Rat Hole Ridge in the southeast portion. Indian Springs Bullhog 2 is found north of Atchee Ridge, while the Rector Ridge study site is located on the northern portion of Rector Ridge. Red Mountain Allotment is situated about 2.5 miles west of Steinaker Reservoir. The Island Park study is found in Island Park. Finally, the Center Fork site is located just east of Center Fork Asphalt Wash.

Shrubs/Trees: Average shrub cover differs between ecological types. Sites that are classified as high mountain, upland, and semidesert have exhibited an overall decrease in cover of both sagebrush and other preferred browse species. However, total average cover increased between the first and second post-treatment samples on high mountain and semidesert ecological sites.

Mountain sites have exhibited an initial decrease of shrub cover in the first sample year after treatment followed by an increase in each subsequent sampling. Although data from the most recent sample year indicates sagebrush cover on these sites has not recovered to pretreatment levels, preferred browse, other shrub cover, and total overall cover exceeds the initial average. It is important to note that line-intercept cover was not recorded prior to 2005. As such, average pretreatment shrub cover is based solely on the Farm Creek site and may not be representative of all mountain ecological sites. Sagebrush populations on all ecological sites have, on average, been mainly comprised of mature individuals. Recruitment of young plants has fluctuated on high mountain and mountain sites, but has increased overall from pretreatment levels. In contrast, recruitment of young has decreased on upland and semidesert ecological sites (Figure 9.19, Figure 9.20).

Tree cover and density are lacking on most sites and will therefore not be discussed in this report.

Herbaceous Understory: Average herbaceous cover has fluctuated depending on ecological type. The high mountain site, Chokecherry Canyon, has exhibited an increase in total average cover as of the second post-treatment sampling, and is dominated by perennial grasses. Mountain ecological sites have remained dominated by grasses throughout the study years, but have displayed an increase in annual grass cover and a decrease in perennial forb cover as time since treatment has increased. One should note, however, the difference in n values between pretreatment data and category 6 data (collected 26-30 years post-treatment), and that this trend may not be representative of the ecological type as a whole.

Total herbaceous cover has increased on upland sites as of the first post-treatment sampling. Although initially co-dominated by perennial grasses and forbs, the understories of these sites are now mainly comprised of perennial forbs. This transition is due to the addition of the Rector Ridge site (for which there is no pre-treatment data), which has 32% herbaceous cover of perennial forbs. Annual grasses have consistently contributed the most average herbaceous cover on semidesert study sites, although there was an increase in annual forbs in the first post-treatment sampling: this is due to the inclusion of the Center Fork site, for which annual forb cover is 19% (Figure 9.21).

Occupancy: Average pellet group abundance on high mountain, upland, and semidesert ecological sites has decreased at each post-treatment sampling, and occupants have varied between ecological types. Although elk were the main occupants on the high mountain site prior to it being burned, pellet groups have subsequently decreased to approximately the same level as those of deer. Elk have remained the primary occupants of upland study sites. Semidesert sites were mainly occupied by elk at the initial reading, but have since transitioned to being primarily occupied by deer. Pellet group abundance on mountain sites has fluctuated from

year to year, but was only slightly less than pretreatment levels at the sixth post sampling. Both elk and cattle pellet groups have decreased overall, and those of deer have increased. One should note, however, the difference in n values between pretreatment data and category 6 data (collected 26-30 years post-treatment), and that these trends may not be representative of the ecological type as a whole (Figure 9.22).

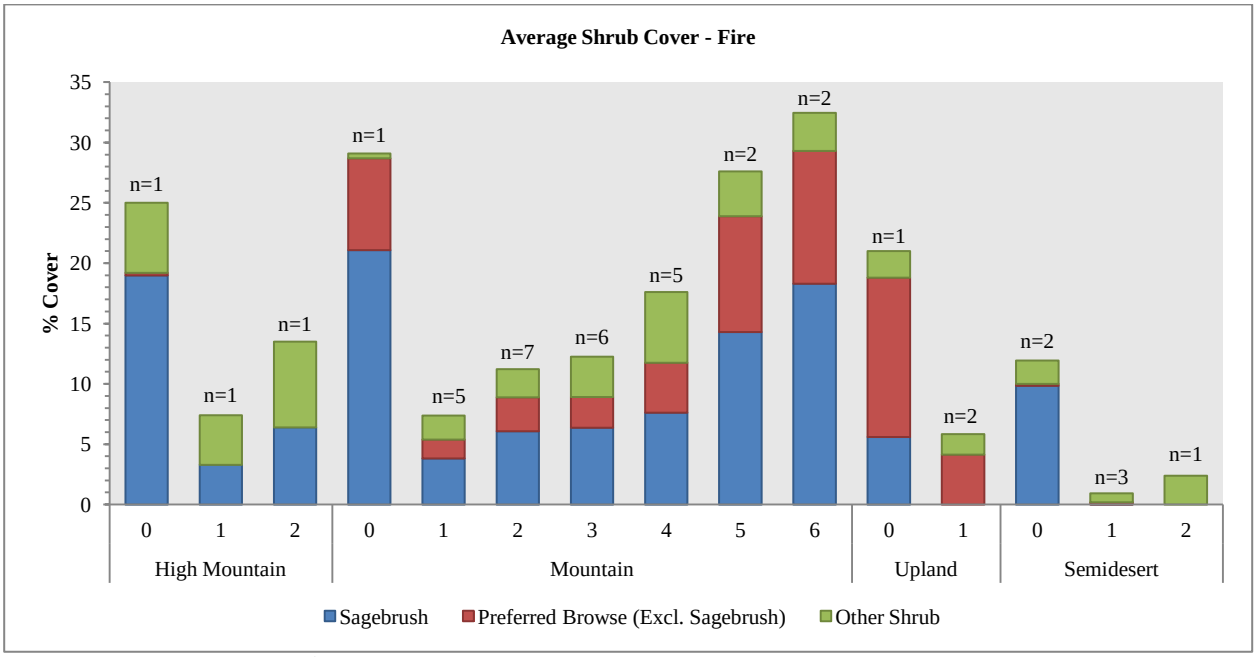


Figure 9.19: Average shrub cover of high mountain, mountain, upland, and semidesert sites that have been burned. 0 = pretreatment; 1 = 1 – 5 years post treatment; 2 = 6 – 10 years post treatment; 3 = 11 – 15 years post treatment, 4 = 16 – 20 years post treatment; 5 = 21 – 25 years post treatment; 6 = 26 – 30 years post treatment.

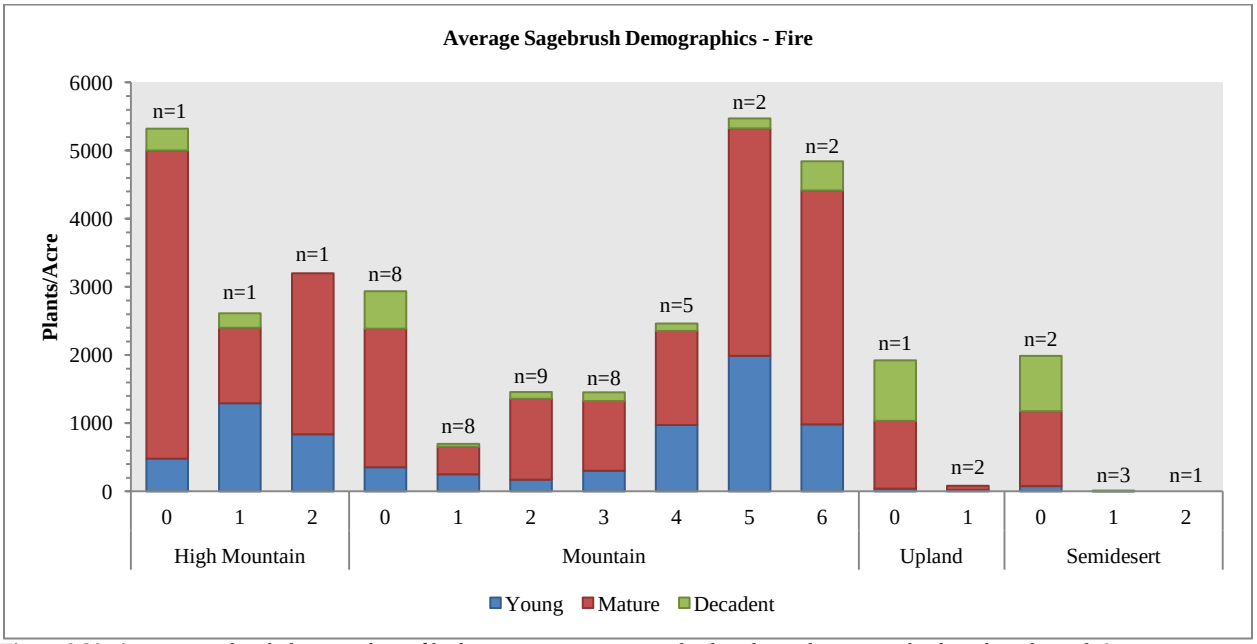


Figure 9.20: Average sagebrush demographics of high mountain, mountain, upland, and semidesert sites that have been burned. 0 = pretreatment; 1 = 1 – 5 years post treatment; 2 = 6 – 10 years post treatment; 3 = 11 – 15 years post treatment, 4 = 16 – 20 years post treatment; 5 = 21 – 25 years post treatment; 6 = 26 – 30 years post treatment.

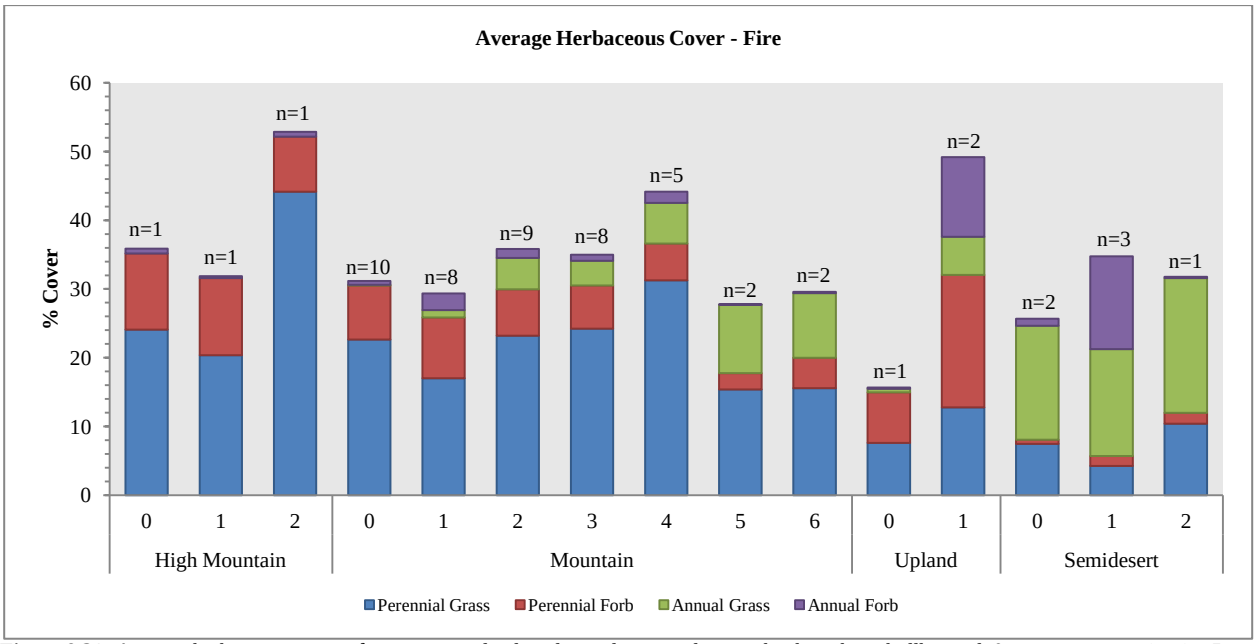


Figure 9.21: Average herbaceous cover of mountain, upland, and semidesert study sites that have been bullhogged. 0 = pretreatment; 1 = 1 – 5 years post treatment; 2 = 6 – 10 years post treatment.

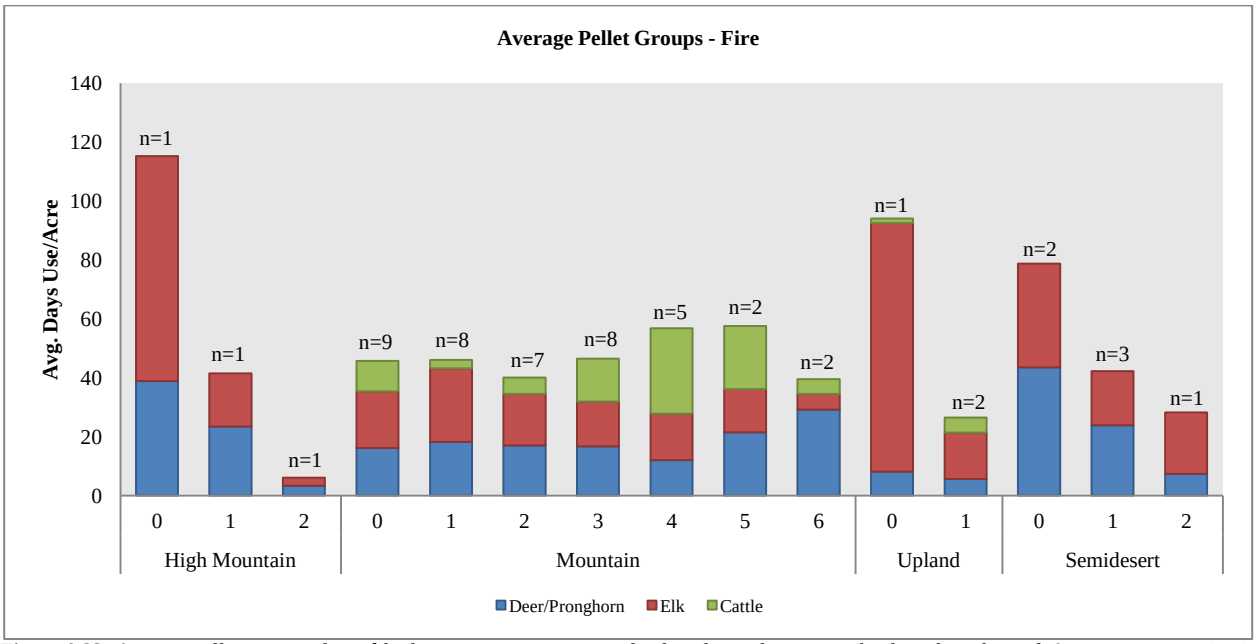


Figure 9.22: Average pellet transect data of high mountain, mountain, upland, and semidesert sites that have been burned. 0 = pretreatment; 1 = 1 – 5 years post treatment; 2 = 6 – 10 years post treatment; 3 = 11 – 15 years post treatment, 4 = 16 – 20 years post treatment; 5 = 21 – 25 years post treatment; 6 = 26 – 30 years post treatment.

Harrow

There are six studies which have been treated with a harrow. Of these, one is classified as a high mountain ecological site [Wildcat (17R-34)], one as a mountain site [West Stuntz (09R-12)], one as an upland ecological site [Davis Draw Sagebrush (09R-25)], and three are classified as semidesert sites [Brush Creek Substation (09-24), Brush Creek Dixie (09R-15), and Raven Ridge (09R-24)].

The Wildcat study is located in the Wildcat State Wildlife Management Area, just over one mile south of Wildcat Canyon, and the West Stuntz site is situated southwest of Stuntz Reservoir. Davis Draw Sagebrush is found on Diamond Mountain Plateau. Brush Creek Substation is situated on a flat above Brush Creek and opposite Donkey Flat, and the Brush Creek Dixie study site is to the south. Finally, the Raven Ridge study is located on the middle section of Raven Ridge.

Shrubs/Trees: In general, sites of all ecological types have undergone an overall decrease in average shrub cover as of the most recent post-treatment sampling. Other preferred browse, when present, has decreased after treatment, while other shrub cover has generally increased. Sagebrush populations of all ecological types have generally remained dominated by mature plants in all sample years, and density of decadent individuals has decreased as time since treatment has increased. Recruitment of young plants has decreased overall on high mountain, mountain, and upland sites, but has increased from pretreatment levels on semidesert study sites.

Herbaceous Understory: Average herbaceous cover varies depending on ecological type. Cover has increased overall on high mountain, upland, and semidesert sites. High mountain and upland sites have remained dominated by perennial grasses in all sample years; perennial forbs increased on the high mountain site and decreased on the upland site. Annual grasses have contributed the most cover on semidesert study sites in the pretreatment and second post-treatment sample years, and annual forbs were co-dominant at the first post-treatment sampling. Perennial forb cover has shown an overall decrease for these sites, but that of perennial grasses has increased with each post-treatment sampling. Average herbaceous cover has decreased overall on the mountain ecological site, but the second post-treatment data does display an increase from the first post-treatment sample year. Perennial forbs contributed the most cover prior to treatment and were co-dominant with perennial grasses at the second post-treatment sampling. Although perennial grass cover did increase initially, it was nearly equal with pretreatment levels during the most recent sample year. Annual grasses and forbs on this site have increased with each post-treatment sample year (Figure 9.25).

Occupancy: Pellet group abundance has fluctuated between ecological types. Abundance has decreased on high mountain and mountain sites, but has increased on upland and semidesert sites. Although they were initially occupied by deer, pellet group abundance of deer and elk on the high mountain site was nearly equal at the first post sampling. Deer and cattle were the primary occupants of the mountain site prior to treatment and at during the first post sample year, but pellet group abundance has since decreased to 0 days use/acre. Upland sites were occupied mainly by deer pretreatment, but elk pellet groups were most abundant during the most recent sample year. Finally, semidesert sites have remained primarily occupied by deer throughout the study years, but abundance of cattle pellets has exhibited an overall increase (Figure 9.26).

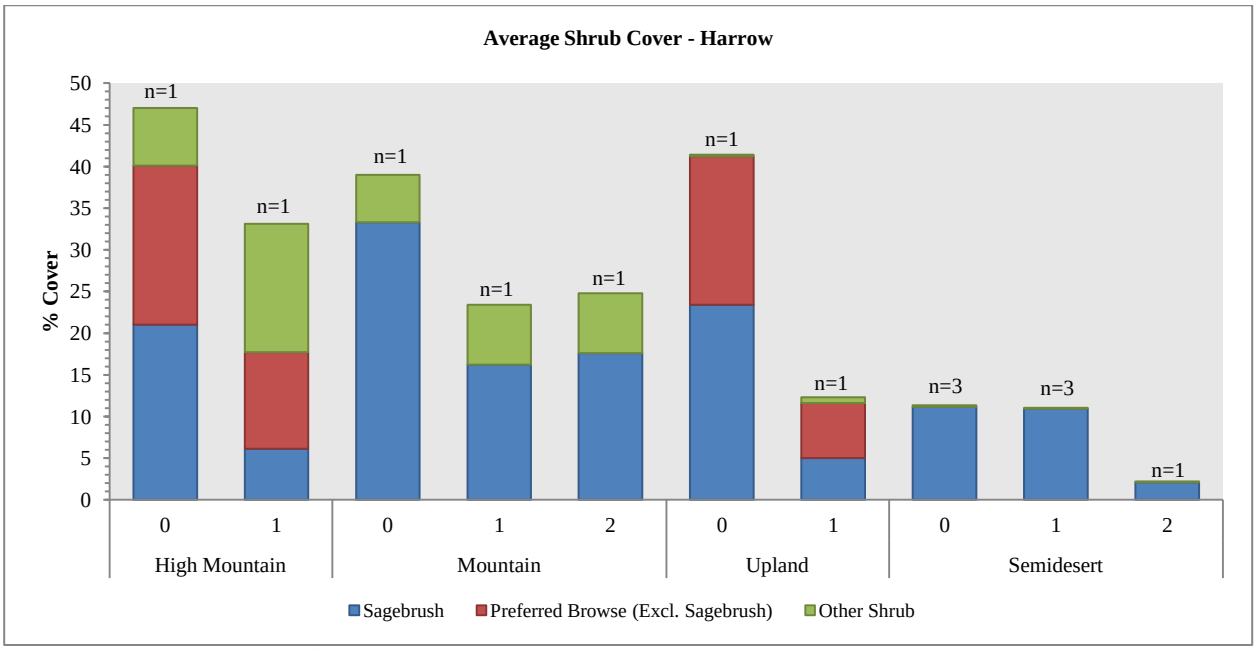


Figure 9.23: Average shrub cover of high mountain, mountain, upland, and semidesert study sites that have been harrowed. 0 = pretreatment; 1 = 1 – 5 years post treatment; 2 = 6 – 10 years post treatment; 3 = 11 – 15 years post treatment.

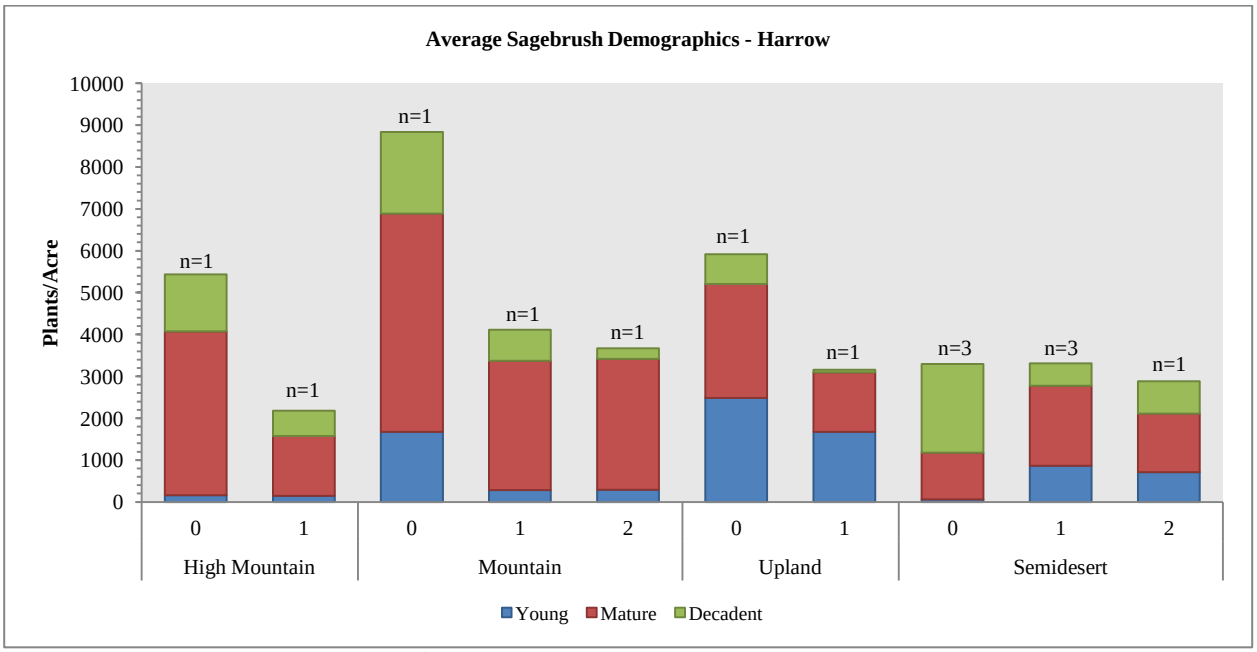


Figure 9.24: Average sagebrush demographics of high mountain, mountain, upland, and semidesert study sites that have been harrowed. 0 = pretreatment, 1 = 1 – 5 years post treatment; 2 = 6 – 10 years post treatment; 3 = 11 – 15 years post treatment.

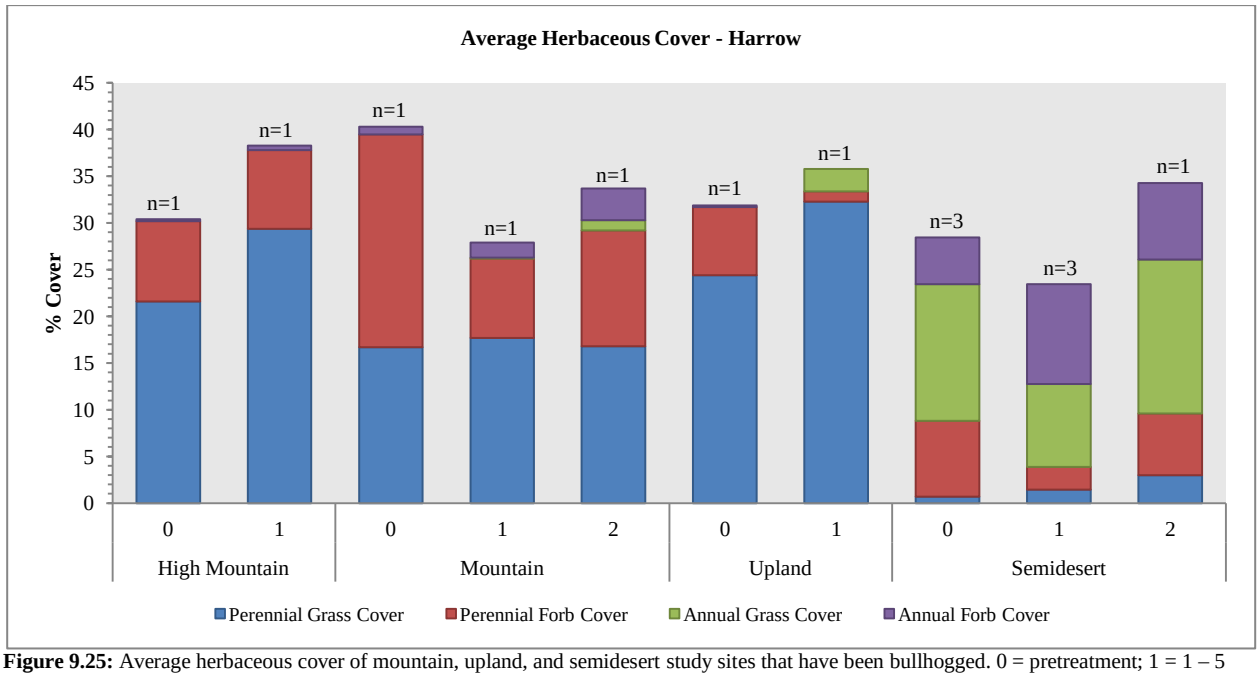


Figure 9.25: Average herbaceous cover of mountain, upland, and semidesert study sites that have been bullhogged. 0 = pretreatment; 1 = 1 – 5 years post treatment; 2 = 6 – 10 years post treatment.

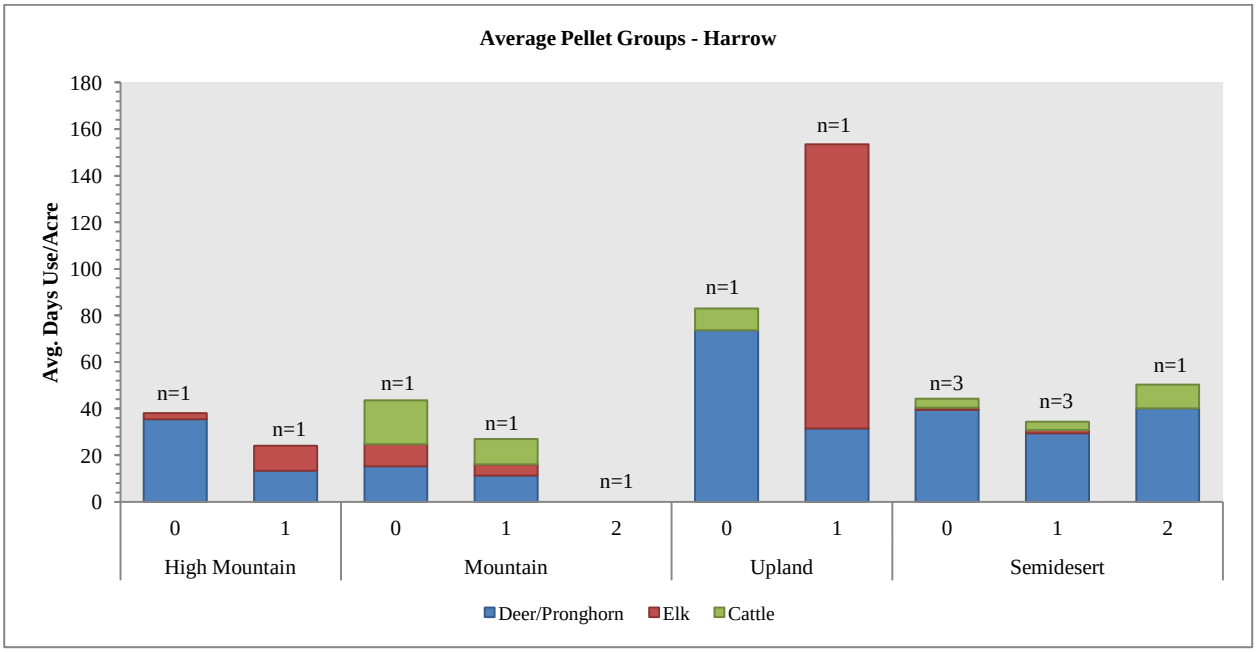


Figure 9.26: Average pellet data transect of high mountain, mountain, upland, and semidesert study sites that have been harrowed. 0 = pretreatment; 1 = 1 – 5 years post treatment; 2 = 6 – 10 years post treatment; 3 = 11 – 15 years post treatment.

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