

CHAPTER 3

STATUS OF SAGEBRUSH IN THE ASSESSMENT AREA

In this chapter we 1) describe the spatial datasets and our modifications used to map current and historic sagebrush, 2) estimate the amount and distribution of current sagebrush and other land cover types, 3) provide a provisional estimate of the amount and distribution of historic sagebrush, and 4) describe the patterns and landscape context of current sagebrush distribution in the assessment area.

Sagebrush (woody species of *Artemisia*) occurs in many vegetation communities in the assessment area. However, the subject of this assessment is areas where vegetation cover is strongly dominated by sagebrush. Hereafter, “sagebrush” refers to relatively pure sagebrush stands, with no more than about 10 percent tree or shrub cover contributed by other woody species.

Historically, sagebrush covered a greater extent of the assessment area than it does today. Early accounts (Cary 1911; Rydberg 1906) described some general locations of sagebrush in Colorado. Beetle (1960) investigated sagebrush taxa in Colorado and reported sagebrush occurring on over 2.5 million ha, although he included areas where sagebrush occurs but is not dominant. Rogers (1964) reported that while some sagebrush remained in virtually all areas where it was previously reported, many areas “could not now be considered the sagebrush type” because of alterations by overgrazing, conversion to dryland and irrigated farming, sagebrush eradication and reseeding, and other factors.

Overgrazing of most Colorado rangelands was apparent by 1875 (Hayden 1878) and probably peaked in the early 1900s (Rogers 1964). Conversion of sagebrush to farmlands began with the influx of settlers in the late 1800s. Sagebrush tended to indicate the deepest soils and was often the first vegetation community to be destroyed for conversion to agricultural uses when new areas were settled (Rogers 1964). Agricultural conversion was particularly extensive near Hayden in Routt County and Dove Creek in Dolores County. Beginning in about the 1950s the USFS, BLM, and SCS began to eradicate sagebrush on public and private lands to increase livestock forage. These efforts damaged or eradicated sagebrush on tens of thousands of hectares (Rogers 1964).

In 1954 SCS mapped sagebrush-dominated areas of Colorado totaling 1.9 million ha in 27 counties (Rogers 1964). This estimate was similar to a slightly earlier USFS estimate of 1.6 million ha of sagebrush shrublands in western Colorado (Hull et al. 1952). Rogers (1964) studied available mapping and concluded that between 2.1 and 2.6 million ha of Colorado were dominated by big sagebrush in 1960. The amount of sagebrush lost to land-use change prior to 1960 is unknown; since that time conversion to agriculture has slowed but losses to reservoirs, energy development, and residential development have accelerated (GSRSC 2005). Oyler-McCance et al. (2001) analyzed aerial photos and reported that 20 percent of the sagebrush-dominated areas of southwestern Colorado had been lost between the 1950s and the 1990s.

Methods

Mapping and Analysis of Current Sagebrush Distribution

We evaluated several regional land cover datasets as potential sources of data for current sagebrush distribution, and selected the Southwest Regional GAP (SW ReGAP; U.S. Geological Survey, <http://fws-nmcfwru.nmsu.edu/SWREGAP/default.htm>) provisional land cover map, November 2004 release. This dataset was the most recent, provided the highest

resolution, and most accurately depicted areas of sagebrush distribution based on our experience.

To map current sagebrush, we included the four SW ReGAP land cover types in the assessment area dominated by woody species of *Artemisia* (see [Table 3-1](#) for detailed descriptions of the four sagebrush cover types). It is sometimes useful for the conservation assessment to distinguish between the SW ReGAP sagebrush land cover types. Because Wyoming basins low sagebrush shrubland and Colorado Plateau mixed low sagebrush shrubland land cover types comprised just 0.2 and 0.3 percent of current sagebrush, these types were combined for analysis with Intermountain Basins big sagebrush shrubland to form a “basins” category representing xeric-adapted sagebrush taxa on more arid sites with generally less than 25 percent herbaceous cover. Intermountain Basins montane sagebrush steppe comprises a “montane” category representing mesic-adapted sagebrush taxa on wetter, cooler sites with typically more than 25 percent herbaceous cover.

For most of the assessment we used the current sagebrush data described above, a raster data set consisting of 30 x 30 m cells. However, for patch size analysis and historic sagebrush prediction we converted the grids (raster data) to polygons (vector data). The resulting 313,938 sagebrush polygons formed a dataset too bulky to analyze with available hardware and software, so we modified the current sagebrush dataset by removing small and isolated patches ([Table 3-2](#)). To remove outliers we devised a nearest-neighbor cell sum analysis that assigned a score to each sagebrush 30 x 30 m cell equal to the number of cells within a surrounding area (24 x 24 cells, equal to 720 x 720 m) that were also sagebrush. Possible scores ranged from 0 to 576. We tested various nearest-neighbor score thresholds and determined that filtering out sagebrush cells with score ≤ 80 was optimal to eliminate small outlying patches while retaining long thin patches and small patches close to larger patches. In the final step, we filtered out all sagebrush patches of fewer than 20 contiguous cells (<1.8 ha). The modified current sagebrush dataset removed 89 percent of the original sagebrush polygons but just 2.9 percent of sagebrush area.

To quantify sagebrush area under various land ownerships, we used GIS to compare current sagebrush with a land ownership dataset (colnst23, downloaded from CDOW Natural Diversity Information System website [<http://www.ndis.nrel.colostate.edu/>] in November 2004, no vintage or data source identified).

Quantifying and Mapping Historic Sagebrush Distribution

To estimate the historic distribution of sagebrush, we reviewed data from Rogers (1964) and sources he cited. We defined “historic sagebrush” as areas where sagebrush occurred prior to modern Euro-American settlement (1700s in the San Luis Valley, and from about 1860 through 1880 elsewhere in the assessment area). We modeled historic sagebrush in GIS using SW ReGAP land cover types. We selected “potential cover types” that could have been sagebrush historically (open water, agriculture, developed, and disturbed land cover types, [Table 3-3](#)). Any of these cover types that occur within 200 meters of the modified current sagebrush dataset (vector data described above) were identified as potential historic sagebrush. We chose 200 m after a series of exploratory analyses showed that using larger numbers tended to include an unacceptably high proportion of areas that probably were not historic sagebrush, based on analysis of topographic maps and SW ReGAP land cover data. The 200 m distance is rather arbitrary, but represents a conservative balance between including too much or too little land as potential historic sagebrush adjacent to existing sagebrush.

We eliminated natural lakes, and some reservoirs that were unlikely to have been in sagebrush. We then created polygons to encompass areas of formerly expansive sagebrush including the Craig area in Moffat County, the Yampa Valley in Routt County, the Meeker area in Rio Blanco

County, North Park in Jackson County, areas around Kremmling and Granby in Grand and Summit counties, the Gunnison Basin in Gunnison County, parts of western Montrose and San Miguel counties, near Dove Creek in Dolores and Montezuma counties, and near San Luis in Costilla County. Within these “inclusion areas,” any “potential cover types” were included in historic sagebrush regardless of their distance from current sagebrush. Finally, within these “inclusion areas” we excluded any “potential cover types” on low floodplains (interpreted on digital 1:24,000 topographic maps) that were likely to have historically been riparian woodlands or meadows.

Results

Sagebrush comprises the second most abundant habitat type in the assessment area, behind upland forests (Table 3-3). Estimated current sagebrush covers 2,199,877 ha, 14 percent of the assessment area (Figure 3-1). The estimated extent of historic sagebrush covers 2,541,776 ha (Figure 3-1). Because of the coarse assumptions on which the historic model is based, this estimate is provisional and should be regarded as qualitative. The model estimates that 341,899 ha of sagebrush (13 percent of the historic area) have been lost to land conversions, primarily agriculture. Principal areas of sagebrush loss include eastern Moffat County, Routt County, Middle Park, Eagle County, the Gunnison Basin, the San Miguel Basin, near Dove Creek in Dolores County, and the San Luis Valley. Probably more than 90 percent of the lost sagebrush area has been permanently converted to agriculture and urban/residential development, and is not readily recoverable.

About 56 percent of current sagebrush occurs on public lands and 44 percent on private lands (Table 3-4, Figure 3-2). BLM (41 percent) controls nearly as much sagebrush as private landowners. USFS and Colorado State Land Board lands comprise most of the rest.

Current sagebrush in the assessment area occurs in a wide range of patch sizes (Table 3-5, Figure 3-3). Over much of its broad range in the assessment area, sagebrush is patchy and fragmented by highly variable terrain, soils, and microclimates, resulting in a mix of sagebrush patches of various sizes within a matrix of other vegetation types as well as human-disturbed areas. About 43 percent of SW ReGAP-mapped sagebrush patches were less than 0.4 ha in size, but these accounted for just 1.1 percent of total sagebrush area.

Most sagebrush in the assessment area occurs in three areas of concentration. The largest sagebrush patch is in northeastern Moffat County. Here over 365,000 ha of sagebrush are contiguous with extensive sagebrush in southern Wyoming and nearly contiguous with at least 300,000 additional ha of sagebrush in northwestern Colorado. North Park (Jackson County) contains the next largest patch in the assessment area, over 125,000 ha that nearly joins other sagebrush in Wyoming and a roughly equal area of sagebrush in North Park and Middle Park (Grand County). The third major concentration of sagebrush occurs in the Gunnison Basin (Gunnison County), where several very large patches nearly adjoin to form a sagebrush area of roughly 250,000 ha. In all of these areas, sagebrush is partially fragmented by natural features, primarily intersecting riparian areas and terrain such as ridges that support other vegetation types. Human disturbance has also partially fragmented or perforated these areas, primarily conversion for agriculture but also urban and residential development, reservoirs, and energy development.

Other concentrations of sagebrush containing patches exceeding 10,000 ha occur in the Yampa headwaters of southern Routt County, the area surrounding Castle Peak in Eagle County, Piñon Mesa in Mesa County, Dry Creek Basin in San Miguel County, and the southeastern edge of the San Luis Valley in Costilla County.

Outside of these concentrations, sagebrush-dominated areas occur at least minimally in every county of the assessment area. Sagebrush patches exceeding 100 ha are absent from the Front Range except the Laramie River drainage in Larimer County, the San Luis Valley except the southeast and northern fringes, and most of the San Juan Mountains. Elsewhere, sagebrush occurs as scattered or clumped patches up to 10,000 ha in size. Throughout the entire assessment area, sagebrush patches of at least 100 ha comprise 1.67 million ha (82 percent of total sagebrush), and patches of at least 1,000 ha comprise 1.40 million ha (69 percent of total sagebrush coverage).

“Montane sagebrush” (typically dominated by mountain big sagebrush and with a more robust herbaceous understory) covers about 960,000 ha, and “basins sagebrush” (typically dominated by Wyoming big sagebrush and other lower species of *Artemisia*, with a less robust herbaceous understory) covers about 1,290,000 ha (Table 3-2, Figure 3-4) in the assessment area.

Discussion

The total area of sagebrush estimated from SW ReGAP land cover data reasonably agrees with earlier estimates of Rogers (1964) and others. Non-systematic ground-truthing of the SW ReGAP sagebrush mapping (described in Assumptions and Limitations below) suggests that SW ReGAP may slightly overestimate the extent of sagebrush, so the current sagebrush estimate in this assessment may similarly over-estimate sagebrush area by perhaps 1 to 5 percent.

The provisional estimate of historic sagebrush is conservative, and may substantially underestimate the historic extent of sagebrush. The estimated loss of 13 percent is less than the 20 percent loss of sagebrush in southwestern Colorado estimated by Oyler-McCance et al. (2001), who also noted that extensive sagebrush loss occurred prior to the earliest aerial photographs (dating from the 1950s), and thus did not account for it in their estimate. Substantial sagebrush losses prior to 1960 noted by Rogers (1964) also suggest that the loss estimated by this assessment is very conservative.

Land ownership patterns of sagebrush in the assessment area indicate that conservation of private land sagebrush is nearly as important as sagebrush on public lands. BLM manages 73 percent of the public land sagebrush in the assessment area, and clearly has the greatest opportunity of any agency for sagebrush conservation.

The wide distribution of sagebrush in the assessment area indicates that opportunities exist in most watersheds for sagebrush conservation. Sagebrush in the assessment area is often extremely patchy, however, which limits habitat suitability for some species requiring large areas of sagebrush. Patch size and arrangement have considerable implications for sagebrush conservation, since sagebrush-dependent species presumably have various thresholds for minimum patch size and patch arrangement affects habitat connectivity and animal dispersal. The largest and best-connected sagebrush areas in the assessment area occur in northwestern Colorado and North Park, and clearly represent the most important sagebrush lands from a regional perspective. However, other concentrations of sagebrush in the assessment area also provide substantial habitat and habitat connectivity for sagebrush-dependent species, and provide the basis for the wide distributions of many sagebrush-dependent species in the assessment area. As a consequence, conservation efforts should consider sagebrush distribution at various scales to effectively conserve sagebrush-dependent species.

Assumptions and Limitations

- The SW ReGAP land cover dataset was created by interpretation of satellite imagery. The dataset was issued by SW ReGAP provisionally for review, and has not been field checked

by SW ReGAP. We conducted non-systematic field checks of sagebrush distribution mapped by SW ReGAP in parts of Mesa, San Miguel, Ouray, Montrose, Delta, Gunnison, Rio Grande, and Conejos counties. Spot checks suggested that sagebrush-dominated areas were usually correctly mapped. However, some other areas that mostly or entirely lack sagebrush including burned pinyon-juniper/oak stands and annual grasslands are sometimes incorrectly mapped as sagebrush. Other areas where sagebrush is subdominant to Gambel oak, pinyon-juniper, or mountain shrub species are also sometimes mapped by SW ReGAP as sagebrush. In addition, some sagebrush has undoubtedly been lost to human land use conversion and fire since the satellite imagery was created (about 1999). Considering interpretation error and time lag bias combined, SW ReGAP probably overestimates the extent of sagebrush-dominated lands in the assessment area, perhaps by 1 to 5 percent.

- Our estimation and mapping of historic sagebrush distribution must be considered strictly provisional based on the following assumptions and limitations. Soil characteristics, along with landform and land cover data, provide the best means to predict the former extent of sagebrush. Because soil data are not available at the precision and scale necessary, we modeled historic sagebrush based mostly on the proximity of disturbed land cover types to current sagebrush, with additional judgments based on personal experience with some areas. Aerial photograph interpretation would have been impractical over the large extent of the assessment area, and would have overlooked sagebrush losses prior to the first available photographs (mid-20th century). The techniques we used provide at best a first approximation of historic sagebrush extent and distribution.

Key Findings

- Current sagebrush covers 2.2 million ha, 14 percent of the assessment area.
- Approximately 13 percent of sagebrush shrublands in the assessment area of has been lost since pre-Euro-American settlement times (a conservative provisional estimate).
- About 44 percent of the sagebrush in the assessment area occurs on private lands, 41 percent on BLM lands, and 7 percent on USFS lands.
- Sagebrush-dominated areas occur throughout the assessment area, with just over half concentrated in northwestern Colorado, North Park-Middle Park, and the Gunnison Basin. Within these areas sagebrush is partially fragmented by natural features and human disturbance.
- Other parts of the assessment area have varying amounts of sagebrush, often highly patchy and fragmented by natural features and human disturbance.
- Effective conservation of sagebrush and sagebrush-dependent species requires consideration of sagebrush patch size and arrangement at various scales.

Recommendations

- If a refined estimate of historic sagebrush distribution is needed, we recommend waiting until statewide 1:24,000-scale digital soils mapping becomes available for Colorado from the NRCS. At small scales, NRCS soil map units could be reclassified with soil depth, texture, and salinity information, and used in concert with key land cover types and precipitation coverages to model historic sagebrush occurrence. Finally, a provisional model of historic sagebrush distribution should be thoroughly field checked and corrected by field observations.
- The current sagebrush distribution presented in this assessment could be improved by field check and correction by ground observation. Burned areas seem particularly subject to

misclassification, and managers with large burned areas should carefully check the sagebrush distribution predicted in this assessment against field observations.

- Private lands and BLM lands account almost equally together for 85 percent of sagebrush-dominated lands in the assessment area. Sagebrush conservation efforts clearly need to emphasize and involve these entities.
- The three largest sagebrush concentrations in the assessment area should be considered the cornerstones of sagebrush conservation. However, smaller concentrations scattered widely account for nearly half of the sagebrush habitat in the assessment area and provide important landscape linkages. These patches also need to be considered for their species-habitat functions as well as ecosystem-level functions.

Literature Cited

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Table 3-1. Descriptions of the SW ReGAP sagebrush cover types mapped in the assessment area and used in this assessment.

Land Cover Type	Description
INTER-MOUNTAIN BASINS BIG SAGEBRUSH STEPPE	<p>This widespread matrix ecological system occurs throughout much of the Columbia Plateau and northern Great Basin and Wyoming, and is found at slightly higher elevations further south. Soils are typically deep and nonsaline often with a microphytic crust. This shrubsteppe is dominated by perennial grasses and forbs (>25% cover) with <i>Artemisia tridentata</i> ssp. <i>tridentata</i>, <i>A. tridentata</i> ssp. <i>xericensis</i>, <i>A. tridentata</i> ssp. <i>wyomingensis</i>, <i>A. tripartita</i> ssp. <i>tripartita</i>, and/or <i>Purshia tridentata</i> dominating or codominating the open to moderately dense (10-40% cover) shrub layer. <i>Atriplex confertifolia</i>, <i>Chrysothamnus viscidiflorus</i>, <i>Ericameria nauseosa</i>, <i>Tetradymia</i> spp., or <i>Artemisia frigida</i> may be common especially in disturbed stands. Associated graminoids include <i>Achnatherum hymenoides</i>, <i>Calamagrostis montanensis</i>, <i>Elymus lanceolatus</i> ssp. <i>lanceolatus</i>, <i>Festuca idahoensis</i>, <i>Festuca campestris</i>, <i>Koeleria macrantha</i>, <i>Poa secunda</i>, and <i>Pseudoroegneria spicata</i>. Common forbs are <i>Phlox hoodii</i>, <i>Arenaria</i> spp., and <i>Astragalus</i> spp. Areas with deeper soils more commonly support <i>A. tridentata</i> ssp. <i>tridentata</i> but have largely been converted for other land uses.</p> <p>Microphytic crust is very important in this ecological system. The natural fire regime of this ecological system likely maintains patchy distribution of shrubs so the general aspect of the vegetation is a grassland. Shrubs may increase following heavy grazing and/or with fire suppression, particularly in moist portions in the northern Columbia Plateau where it forms a landscape mosaic pattern with shallow-soil scabland shrublands.</p>
WYOMING BASINS LOW SAGEBRUSH SHRUBLAND	<p>This ecological system is composed of sagebrush dwarf-shrublands that occur in a variety of dry habitats throughout the basins of central and southern Wyoming. <i>Artemisia tripartita</i> ssp. <i>rupicola</i>-dominated dwarf shrublands typically occur on wind-swept ridges and south and west aspect slopes above 2135 m in central and southeastern Wyoming. Substrates are shallow, fine-textured soils. <i>A. nova</i>-dominated dwarf-shrublands occur on shallow, coarse-textured, calcareous substrates at lower elevations. Other shrubs and dwarf-shrubs present may include <i>Purshia tridentata</i> and other species of <i>Artemisia</i>. Common graminoids include <i>Festuca idahoensis</i>, <i>Koeleria macrantha</i>, <i>Pseudoroegneria spicata</i>, and <i>Poa secunda</i>. Many forbs also occur and may dominate the herbaceous vegetation.</p>
COLORADO PLATEAU MIXED LOW SAGEBRUSH SHRUBLAND	<p>This ecological system occurs in the Colorado Plateau, Tavaputs Plateau and Uinta Basin in canyons, gravelly draws, hilltops, and dry flats at elevations generally below 1800 m. Soils are often rocky, shallow, and alkaline. This type extends across northern New Mexico into the southern Great Plains on limestone hills. It includes open shrublands and steppe dominated by <i>Artemisia nova</i> or <i>A. bigelovii</i> sometimes with <i>A. tridentata</i> ssp. <i>wyomingensis</i> codominant. Semi-arid grasses such as <i>Achnatherum hymenoides</i>, <i>Aristida purpurea</i>, <i>Bouteloua gracilis</i>, <i>Hesperostipa comata</i>, <i>Pleuraphis jamesii</i>, or <i>Poa fendleriana</i> are often present and may form a graminoid layer with over 25% cover.</p>
INTER-MOUNTAIN BASINS MONTANE SAGEBRUSH STEPPE	<p>Sagebrush communities occurring at higher elevations (>2000 m) and composed primarily of mountain sagebrush (<i>Artemisia tridentata</i> ssp. <i>vaseyana</i>) and related taxa such as <i>A. spiciformis</i>, non-riparian <i>A. cana</i> ssp. <i>viscidula</i> and <i>A. arbuscula</i> ssp. <i>arbuscula</i>. Most stands have an abundant perennial herbaceous layer (over 25% cover), but this system also include <i>Artemisia tridentata</i> ssp. <i>vaseyana</i> Shrubland Alliance.</p>

Table 3-2. Area of current sagebrush in the assessment area, unmodified and filtered to remove small and isolated patches.

Sagebrush cover types used in this assessment	SW ReGAP land cover type	Unmodified		Filtered	
		area (ha)	% of total sagebrush	area (ha)	% of total sagebrush
"montane sagebrush"	Intermountain Basins Montane Sagebrush Steppe	850,760	38.2%	760,654	37.6%
"basins sagebrush"	Intermountain Basins Big Sagebrush Shrubland	1,338,219	61.3%	1,254,635	62.0%
	Wyoming Basins Low Sagebrush Steppe	4,329	0.2%	4,205	0.2%
	CO Plateau Mixed Low Sagebrush Shrubland	6,568	0.3%	5,741	0.3%
	Total "basins sagebrush"	1,349,116	61.3%	1,264,581	62.4%
	Total ALL SAGEBRUSH	2,199,877		2,025,235	

Table 3-3. Areas and percentages of land cover types mapped by SW ReGAP in the assessment area.

Code	Land Cover Type	Area (ha)	% of Assessment Area
SAGEBRUSH SHRUBLANDS			
S054	Inter-Mountain Basins Big Sagebrush Shrubland	1,338,219	8.5
S071	Inter-Mountain Basins Montane Sagebrush Steppe	850,760	5.4
S056	Colorado Plateau Mixed Low Sagebrush Shrubland	6,568	<0.1
S128	Wyoming Basins Low Sagebrush Shrubland	4,329	<0.1
	Subtotal	2,199,877	14.0
SEMI-DESERT SHRUBLANDS			
S079	Inter-Mountain Basins Semi-Desert Shrub Steppe	328,159	2.1
S096	Inter-Mountain Basins Greasewood Flat	213,827	1.4
S065	Inter-Mountain Basins Mixed Salt Desert Scrub	195,338	1.2
S045	Inter-Mountain Basins Mat Saltbush Shrubland	101,961	0.7
	Subtotal	839,285	5.4
OTHER UPLAND SHRUBLANDS			
S046	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	910,082	5.8
S047	Rocky Mountain Lower Montane-Foothill Shrubland	218,144	1.4
S059	Colorado Plateau Blackbrush-Mormon-tea Shrubland	9,768	<0.1
S136	Southern Colorado Plateau Sand Shrubland	1,289	<0.1
S048	Western Great Plains Sandhill Shrubland	760	<0.1
S050	Inter-Mountain Basins Mountain Mahogany Woodland and Shrubland	76	<0.1
	Subtotal	1,140,118	7.2
PINYON-JUNIPER			
S039	Colorado Plateau Pinyon-Juniper Woodland	1,513,953	9.7
S038	Southern Rocky Mountain Pinyon-Juniper Woodland	358,218	2.3
S052	Colorado Plateau Pinyon-Juniper Shrubland	176,427	1.1
S075	Inter-Mountain Basins Juniper Savanna	28,132	0.2
S074	Southern Rocky Mountain Juniper Woodland and Savanna	1,700	<0.1
	Subtotal	2,078,430	13.2
UPLAND FOREST			
S023	Rocky Mountain Aspen Forest and Woodland	1,137,102	7.3
S028	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	1,007,824	6.4
S036	Rocky Mountain Ponderosa Pine Woodland	847,795	5.4
S030	Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland	806,862	5.1
S031	Rocky Mountain Lodgepole Pine Forest	694,959	4.4
S034	Rocky Mountain Montane Mesic Mixed Conifer Forest and Woodland	320,395	2.0
S032	Rocky Mountain Montane Dry-Mesic Mixed Conifer Forest and Woodland	278,057	1.8
S042	Inter-Mountain West Aspen-Mixed Conifer Forest and Woodland Complex	190,845	1.2
S025	Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland	36,205	0.2
	Subtotal	5,320,044	33.9

Table 3-3. Areas and percentages of land cover types mapped by SW ReGAP in the assessment area.

Code	Land Cover Type	Area (ha)	% of Assessment Area
GRASSLAND / HERBACEOUS TYPES			
S085	Southern Rocky Mountain Montane-Subalpine Grassland	715,399	4.6
S081	Rocky Mountain Dry Tundra	243,789	1.6
S088	Western Great Plains Shortgrass Prairie	191,546	1.2
S083	Rocky Mountain Subalpine Mesic Meadow	150,054	1.0
S102	Rocky Mountain Alpine-Montane Wet Meadow	131,004	0.8
S086	Western Great Plains Foothill and Piedmont Grassland	105,630	0.7
S090	Inter-Mountain Basins Semi-Desert Grassland	86,002	0.5
	Subtotal	1,623,424	10.4
OTHER NATURAL LAND COVER			
S002	Rocky Mountain Alpine Bedrock and Scree	286,234	1.8
S006	Rocky Mountain Cliff and Canyon	98,433	0.6
S010	Colorado Plateau Mixed Bedrock Canyon and Tableland	66,813	0.4
S004	Rocky Mountain Alpine Fell-Field	58,240	0.4
S011	Inter-Mountain Basins Shale Badland	25,801	0.2
S012	Inter-Mountain Basins Active and Stabilized Dune	12,958	<0.1
S015	Inter-Mountain Basins Playa	4,646	<0.1
N31	Barren Lands, Non-specific	1,112	<0.1
S008	Western Great Plains Cliff and Outcrop	546	<0.1
S009	Inter-Mountain Basins Cliff and Canyon	434	<0.1
S001	North American Alpine Ice Field	205	<0.1
S014	Inter-Mountain Basins Wash	151	<0.1
	Subtotal	555,573	3.4
OPEN WATER			
N11	Open Water	76,868	0.5
	Subtotal	76,868	0.5
RIPARIAN OR WETLAND			
S091	Rocky Mountain Subalpine-Montane Riparian Shrubland	282,353	1.8
S093	Rocky Mountain Lower Montane Riparian Woodland and Shrubland	53,629	0.3
S092	Rocky Mountain Subalpine-Montane Riparian Woodland	19,417	0.1
S095	Western Great Plains Riparian Woodland and Shrubland	17,465	0.1
D04	Invasive Southwest Riparian Woodland and Shrubland	8,695	<0.1
S120	Western Great Plains Floodplain Herbaceous Wetland	4,941	<0.1
S100	North American Arid West Emergent Marsh	3,820	<0.1
	Subtotal	390,321	2.5
AGRICULTURE OR DEVELOPED			
N80	Agriculture	1,126,663	7.2
N22	Developed, Medium - High Intensity	47,083	0.3
N21	Developed, Open Space - Low Intensity	71,501	0.5
	Subtotal	1,245,247	7.9

Table 3-3. Areas and percentages of land cover types mapped by SW ReGAP in the assessment area.

Code	Land Cover Type	Area (ha)	% of Assessment Area
DISTURBED			
D10	Recently Logged Areas	54,205	0.3
D06	Invasive Perennial Grassland	48,907	0.3
D09	Invasive Annual and Biennial Forbland	28,518	0.2
D02	Recently Burned	24,357	0.2
D11	Recently Chained Pinyon-Juniper Areas	23,125	0.1
D08	Invasive Annual Grassland	21,796	0.1
D03	Recently Mined or Quarried	7,486	<0.1
D01	Disturbed, Non-specific	233	<0.1
D07	Invasive Perennial Forbland	72	<0.1
D14	Disturbed, Oil well	36	<0.1
Subtotal		208,735	1.3

Size of Assessment Area 15,677,926

Table 3-4. Ownership of sagebrush-dominated lands in the assessment area.

	Hectares	% Total
Private Lands	975,880	44.4
Federal Lands		
U.S. Bureau of Land Management	891,033	40.5
U.S. Forest Service	156,769	7.1
Other Federal Lands		
National Park Service	17,025	0.8
U.S. Fish & Wildlife Service	6,216	0.3
Bureau of Indian Affairs	23,705	1.1
Department of Defense	5,801	0.3
Other Federal Lands Subtotal	52,746	2.4
State Lands		
State Land Board	99,233	4.5
Other State Lands	23,912	1.1
TOTAL		2,199,573

Land ownership data source:

colnst23 (no vintage or date specified), accessed November 2004 at Colorado Division of Wildlife Natural Diversity Information System website [<http://www.ndis.nrel.colostate.edu/>]

Note:

The minor discrepancy between total area of sagebrush shown on this table and other tables in this chapter is due to small spatial errors introduced in GIS by comparing raster (sagebrush) data with vector (land ownership) data.

Table 3-5. Patch size frequency and area of sagebrush in the assessment area.

Size Category (ha)	Total Sagebrush in Assessment Area (ha)	% of Sagebrush in Assessment Area	Number of Patches
1.8-10	114,604	5.7%	27,386
10-100	239,965	11.8%	9,147
100-1,000	274,212	13.5%	1,020
1,000-10,000	342,710	16.9%	129
10,000-100,000	562,692	27.8%	22
100,000-1,000,000	491,054	24.2%	2
Totals	2,025,237		37,706

Note: These calculations were performed on the "filtered" dataset (see Table 3-2).