SWAP Element 2: Habitats

This chapter presents updated information on the distribution and condition of key habitats in Colorado. The habitat component of Colorado's 2006 SWAP considered 41 land cover types from the Colorado GAP Analysis (Schrupp et al. 2000). Since then, the Southwest Regional GAP project (SWReGAP, USGS 2004) has produced updated land cover mapping using the U.S. National Vegetation Classification (NVC) names for terrestrial ecological systems. In the strictest sense, ecological systems are not equivalent to habitat types for wildlife. Ecological systems as defined in the NVC include both dynamic ecological processes and biogeophysical characteristics, in addition to the component species. However, the ecological systems as currently classified and mapped are closely aligned with the ways in which Colorado's wildlife managers and conservation professionals think of, and manage for, habitats. Thus, for the purposes of the SWAP, references to the NVC systems should be interpreted as wildlife habitat in the general sense.

Fifty-seven terrestrial ecological systems or altered land cover types mapped for SWReGAP have been categorized into 23 habitat types, and nine aquatic habitats and two additional "Other" habitat categories were defined (Table 1). Though nomenclature is slightly different in some cases, the revised habitat categories presented in this document are consistent with those defined in the 2006 SWAP with the following exceptions:

- Douglas Fir and White Fir, formerly stand-alone habitat categories, have been included in the Mixed Conifer category;
- Limber Pine and Bristlecone Pine have been combined into Subalpine Limber and Bristlecone;

- Tallgrass Prairie and Midgrass Prairie have been combined into Mixedgrass and Tallgrass Prairies;
- Sand Dune Complex (Grassland) and Sand Dune Complex (Shrubland) have been combined into the Sandsage category, and a separate Sand Dunes category has been added to distinguish sandy prairie habitats from true sand dune habitats;
- Meadow Tundra and Shrub Tundra, formerly stand-alone categories, have been combined under Alpine;
- Exposed Rock has been split into Alpine (high elevation bedrock, screen, ice fields and fellfields) and Cliffs & Canyons (cliffs, canyons, outcrops, and tablelands of Rocky Mountains, Western Great Plains, and Intermountain Basins)
- a Riparian Woodlands and Shrublands category has been added to better distinguish terrestrial stream-side habitats from aquatic habitats.

A widely-accepted, broad-scale classification comparable to the NVC does not currently exist for aquatic habitats. For the 2006 SWAP, we defined aquatic habitat categories that had meaning for wildlife managers and stakeholders. For this iteration of the SWAP, we have revised the original aquatic habitat categories to more explicitly relate aquatic habitats to associated physiographic regions. Watershed characteristics such as elevation, vegetation and geology strongly influence key aspects of aquatic habitat such as gradient, temperature, and turbidity, which in turn shape aquatic species distributions within the state. Changes to aquatic habitat categories are:

- West Slope Rivers and West Slope Streams have been re-categorized as Colorado Plateau – Wyoming Basins Rivers and Streams;
- Rio Grande Valley Rivers and Streams have been added as unique habitat categories;
- Lakes and Open Water categories have been revised to distinguish natural lakes (still the Lakes category) from other types of open water and associated habitats (now split into the Reservoirs & Shorelines and Hot Springs categories).

50 **Table 1. SWAP habitats and SWReGAP mapping equivalents.**

HABITAT	SWReGAP CODE	SWReGAP ECOLOGICAL SYSTEM
Forest and Woodland Habitats		
Aspen	S023	Rocky Mountain Aspen Forest and Woodland
Lodgepole	S031	Rocky Mountain Lodgepole Pine Forest
Mixed Conifer	S032	Rocky Mountain Montane Dry-Mesic Mixed Conifer Forest and Woodland
Mixed Conifer	S034	Rocky Mountain Montane Mesic Mixed Conifer Forest and Woodland
Mixed Conifer	S042	Intermountain Basins Aspen Mixed Conifer Forest and Woodland
Pinyon-Juniper	S038	Southern Rocky Mountain Pinyon-Juniper Woodland
Pinyon-Juniper	S039	Colorado Plateau Pinyon Juniper Woodland
Pinyon-Juniper	S052	Colorado Plateau Pinyon-Juniper Shrubland
Pinyon-Juniper	S074	Southern Rocky Mountain Juniper Woodland and Savanna
Pinyon-Juniper	S075	Intermountain Basins Juniper Savanna
Pinyon-Juniper	S125	Rocky Mountain Foothill Limber Pine-Juniper Woodland
Ponderosa Pine	S036	Rocky Mountain Ponderosa Pine Woodland
Spruce-Fir	S028	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland
Spruce-Fir	S030	Rocky Mountain Subalpine Mesic Spruce Fir Forest and Woodland
Subalpine Limber/Bristlecone	S025	Rocky Mountain Subalpine Montaine Limber Bristlecone Pine Woodland
Shrubland Habitats		
Desert Shrub	S014	Intermountain Basins Wash
Desert Shrub	S059	Colorado Plateau Blackbrush-Mormon-tea Shrubland
Desert Shrub	S065	Intermountain Basins Mixed Salt Desert Shrub
Desert Shrub	S079	Intermountain Basins Semi-desert Shrub Steppe
Desert Shrub	S090	Intermountain Basins Semi-Desert Grassland
Greasewood	S096	Intermountain Basins Greasewood Flat
Oak & Mixed Mountain Shrub	S046	Rocky Mountain Gambel Oak-Mixed Montane Shrubland
Sagebrush	S054	Intermountain Basin Big Sagebrush Shrubland
Sagebrush	S056	Colorado Plateau Mixed Low Sagebrush Shrubland
Sagebrush	S071	Intermountain Basins Montane Sagebrush Steppe
Sagebrush	S128	Wyoming Basins Low Sagebrush Shrubland
Saltbush	S011	Intermountain Basins Shale Badland
Saltbush	S045	Intermountain Basins Mat Saltbrush Shrubland
Sandsage	S048	Western Great Plains Sandhill Shrubland
Sandsage	S089	Western Great Plains Sandhill Prairie
Upland Shrub	S047	Rocky Mountain Lower Montane Foothill Shrubland
Upland Shrub	S050	Intermountain Basins Mountain Mahogany Woodland and Shrubland

HABITAT	SWReGAP CODE	SWReGAP ECOLOGICAL SYSTEM
Grassland Habitats		
Foothill & Mountain Grasslands	S085	Southern Rocky Mountain Montane Subalpine Grassland
Foothill & Mountain Grasslands	S086	Western Great Plains Foothill and Piedmont Grassland
Mixed & Tallgrass Prairies	S087	Central Mixedgrass Prairie
Mixed & Tallgrass Prairies	S132	Western Great Plains Tallgrass Prairie
Shortgrass Prairie	S088	Western Great Plains Shortgrass Prairie
Riparian and Wetland Habitats		
Playas	S015	Intermountain Basins Playa
Riparian Woodlands & Shrublands	S091	Rocky Mountain Subalpine Montane Riparian Shrubland
Riparian Woodlands & Shrublands	S092	Rocky Mountain Subalpine Montane Riparian Woodland
Riparian Woodlands & Shrublands	S093	Rocky Mountain Lower Montane Riparian Woodland and Shrubland
Riparian Woodlands & Shrublands	S095	Western Great Plains Riparian Woodland and Shrubland
Wetlands	S083	Rocky Mountain Subalpine Mesic Meadow
Wetlands	S091	Rocky Mountain Subalpine Montane Riparian Shrubland
Wetlands	S100	North American Arid West Emergent Marsh
Wetlands	S102	Rocky Mountain Alpine-Montane Wet Meadow
Wetlands	S120	Western Great Plains Floodplain Herbaceous Wetland
Aquatic Habitats		
Colorado Plateau-Wyoming Basins Rivers		no ReGAP equivalent
Colorado Plateau-Wyoming Basins Rivers Streams		no ReGAP equivalent
Eastern Plains Rivers		no ReGAP equivalent
Eastern Plains Streams		no ReGAP equivalent
Lakes		no ReGAP equivalent
Mountain Streams		no ReGAP equivalent
Rio Grande Valley Rivers		no ReGAP equivalent
Rio Grande Valley Streams		no ReGAP equivalent
Transition Streams		no ReGAP equivalent
Other Habitats		
Alpine	S001	North American Alpine Ice Field
Alpine	S002	Rocky Mountain Alpine Bedrock and Scree
Alpine	S004	Rocky Mountain Alpine Fell-Field

HABITAT	SWReGAP CODE	SWReGAP ECOLOGICAL SYSTEM
Alpine	S081	Rocky Mountain Dry Tundra
Cliffs & Canyons	S006	Rocky Mountain Cliff Canyon and Massive Bedrock
Cliffs & Canyons	S008	Western Great Plains Cliff and Outcrop
Cliffs & Canyons	S009	Intermountain Basins Cliff and Canyon
Cliffs & Canyons	S010	Colorado Plateau Mixed Bedrock Canyon and Tableland
Hot Springs		no ReGAP equivalent
Reservoirs & Shorelines		no ReGAP equivalent
Sand Dunes	S012	Intermountain Basins Active and Stabilized Dune
Agriculture	N80	Agriculture

Distribution and Condition of Habitats

Figure 1 shows the distribution of terrestrial habitats in Colorado. Figure 2 shows the distribution of aquatic habitats in Colorado. Some habitats that occur in small patches are not detectable when displayed on a letter-size statewide map. These include many lakes, wetlands, playas, and hot springs, as well as some riparian areas. Where data were available for these small-patch habitats, habitat features have been enhanced for readability in Figure 1. Finer scale mapping of wetlands in Colorado has been developed through a partnership between the U.S. Fish and Wildlife's National Wetland Inventory Program, U.S. Environmental Protection Program, the Colorado Natural Heritage Program, and Colorado Parks and Wildlife[1]. Playas have been mapped by Playa Lakes Joint Venture and Rocky Mountain Bird Observatory.

Brief descriptions of each habitat follow. Portions of habitat summaries have been excerpted, with permission, from Rondeau et al. 2011, CNHP 2007, and NatureServe 2014, with modifications where necessary to accurately reflect revised SWAP habitat categories. Information related to general habitat condition has been summarized from these and other sources (e.g.,

[1] For the most recent data available, contact Gabrielle Smith, CNHP Wetland Mapping Specialist, gabrielle.ann.smith@colostate.edu.

Colorado's 2013 Forest Health Report), and from ecosystem experts at the Colorado Natural Heritage Program.

Though known threats to habitats are noted briefly in the context of habitat condition, these issues will be addressed in a more in-depth fashion under SWAP Element 3 – Threats. This review draft contains references to a SWAP climate change vulnerability assessment. We are in the process of preparing a document that explains the methods and results of the assessment, which will be circulated to SWAP stakeholders for review in the coming months.

Tables 2 – 36 list the SGCN that are associated with each habitat type. SGCN for which the habitat is a primary habitat are marked. For the purposes of this SWAP, "primary habitat" refers to the habitat(s) in which a species is most typically found, or that is crucial to the completion of one or more phases of the species' life cycle. Species which were historically present in Colorado, but which no longer occur in wild populations here, are noted in the following tables with an asterisk "*".

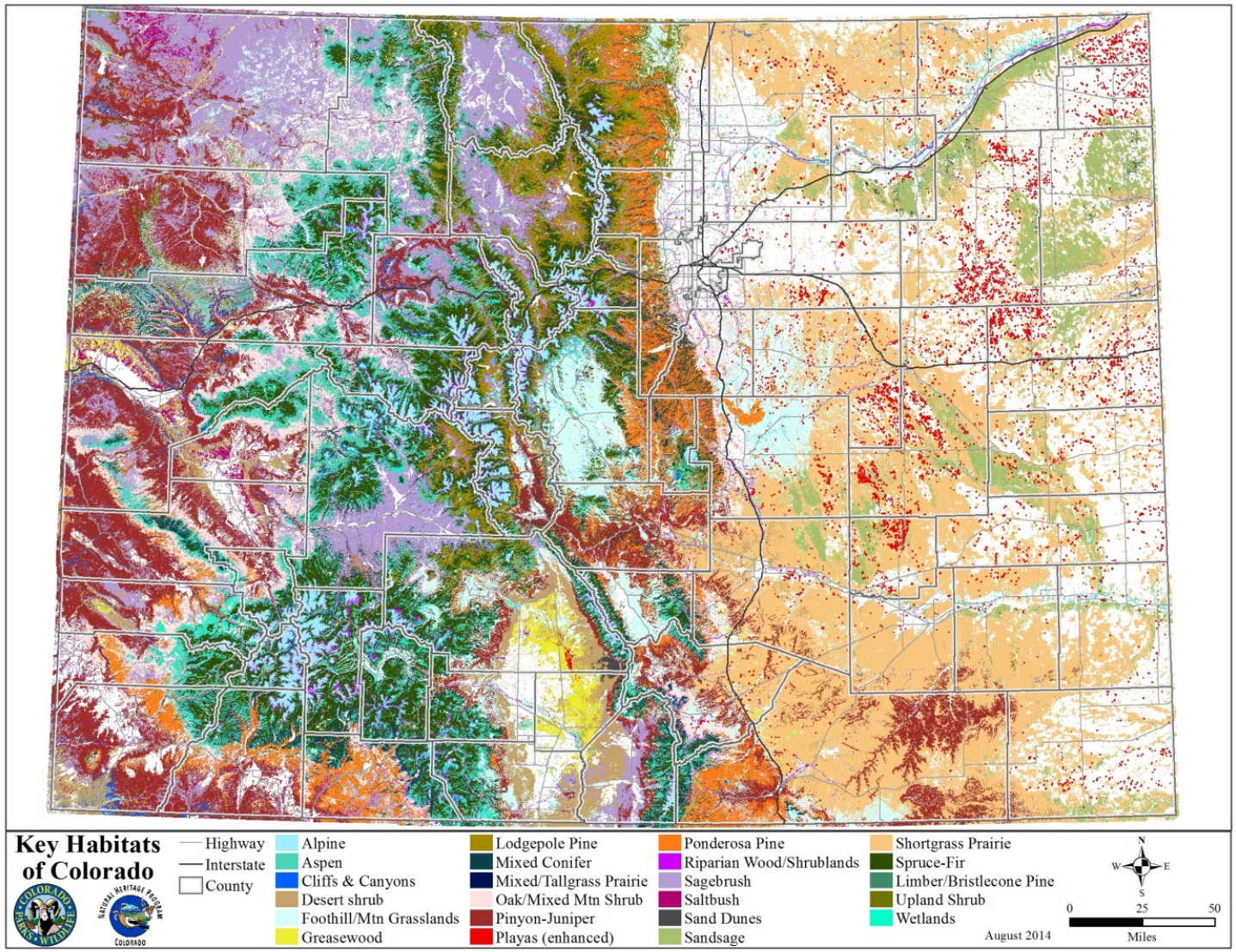

Figure 1. Distribution of key terrestrial habitats in Colorado.

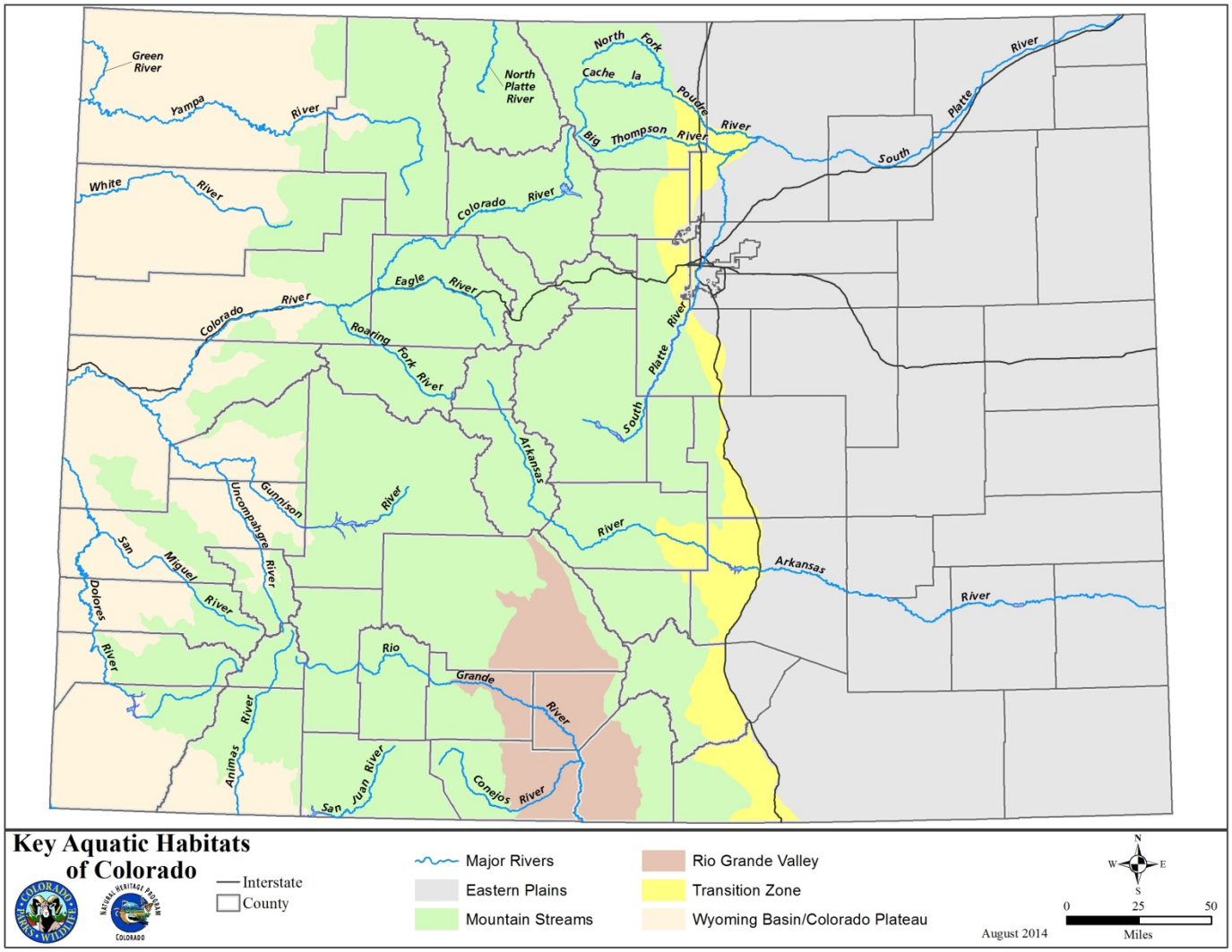

Figure 2. Distribution of key aquatic habitats.

FOREST AND WOODLAND HABITATS

Aspen

Aspen supports 23 SGCN (Table 2). In Colorado, aspen forests are quite common on the western slope, with smaller stands represented on the east slope. These forests cover more than three and a half million acres in Colorado, including one patch of more than a half million acres on the edges of the White River Plateau and Flat Tops. These are upland forests and woodlands dominated by quaking aspen (*Populus tremuloides*), ranging in elevation from about 7,500 to 10,500 feet. Aspen forests and woodlands usually contain a mosaic of many plant associations and may be surrounded by a diverse array of other ecological systems, including grasslands, wetlands, and coniferous forests.

Primary threats to aspen forests in Colorado include fire suppression, excessive browsing (especially by elk), and Sudden Aspen Decline (SAD), which is especially troublesome in the southwestern portion of the state (CSFS 2010). The cause(s) of SAD are unclear and research to identify stressors is on-going. Currently, SAD is not widely distributed across the state, but there is potential for this condition to pose a more significant threat to our aspen forests in the future if the underlying causes are exacerbated by changing climatic conditions. Aspens have increased susceptibility to episodic decline at lower elevations, under warm and dry conditions (Worrall et al. 2008). SAD appears to be related to drought stress, and is typically greatest on the hotter and drier slopes, which are usually at the lowest elevations of a stand (Rehfeldt et al. 2009). Stands may undergo thinning, but then recover. Increasing drought with climate change is believed to be the primary vulnerability of this ecosystem (Worrall et al. 2013), and substantial loss of aspen can potentially be expected. However, from a statewide perspective, aspen forests are in generally good condition overall and threats are comparatively low.

Table 2. SGCN in Aspen habitats.

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
1	Amphibians	Boreal toad (Southern Rocky Mountain Population)	*Anaxyrus boreas boreas*	
1	Birds	Golden eagle	*Aquila chrysaetos*	
1	Mammals	Fringed myotis	*Myotis thysanodes*	
1	Mammals	Little brown bat	*Myotis lucifugus*	
1	Mammals	Spotted bat	*Euderma maculatum*	
1	Mammals	Townsend's big-eared bat ssp.	*Corynorhinus townsendii pallescens*	
1	Mammals	Wolverine	*Gulo gulo*	
2	Amphibians	Wood Frog	*Lithobates sylvatica*	
2	Birds	Band-tailed pigeon	*Patagioenas fasciata*	
2	Birds	Boreal owl	*Aegolius funereus*	
2	Birds	Cassin's finch	*Peucaea cassinii*	x
2	Birds	Flammulated owl	*Otus flammeolus*	x
2	Birds	Lazuli bunting	*Passerina amoena*	
2	Birds	Northern goshawk	*Accipiter gentilis*	x
2	Birds	Olive-sided flycatcher	*Contopus cooperi*	x
2	Birds	Purple martin	*Progne subis*	x
2	Birds	Pygmy nuthatch	*Sitta pygmaea*	
2	Birds	Virginia's warbler	*Vermivora virginiae*	
2	Insects	Xanthus skipper	*Pyrgus xanthus*	
2	Mammals	Dwarf shrew	*Sorex nanus*	x
2	Mammals	Gray wolf - two subspecies (Northern and Mexican)*	*Canis lupus*	x
2	Mammals	Grizzly bear*	*Ursus arctos*	x
2	Mammals	Hoary bat	*Lasiurus cinereus*	x

Lodgepole

Lodgepole forests, which cover more than two million acres in Colorado, support 20 SGCN (Table 3). In Colorado, lodgepole is widespread between 8,000-10,000 feet in elevation, on gentle to steep slopes of the Rocky Mountains in the northern part of the state. Stands may be pure lodgepole pine (*Pinus contorta*), or mixed with other conifer species. Following stand-replacing fires, lodgepole pine rapidly colonizes and develops into dense, even-aged stands (sometimes referred to as "dog hair" stands). Lodgepole pine forests typically have shrub, grass, or barren understories, sometimes intermingled with aspen. Shrub and groundcover layers are often sparse

in lodgepole pine forests. Diversity of plant species is also low, perhaps as a result of the uniform age and dense canopy of many stands.

Although these forests are common across Colorado, most have experienced widespread damage from a severe outbreak of mountain pine beetle (*Dendroctonus ponderosae*). The pine beetle is a native species, and periodic outbreaks of this insect are part of the natural cycle that maintains our mountain forests. After killing more than two million acres of lodgepole forests over the past decade, this recent outbreak is finally beginning to subside, primarily due to the fact that most susceptible host trees have been killed (CSFS 2013, CSFS 2010). Regeneration has been rapid in beetle-kill areas. Although there has been widespread mortality, and remaining lodgepole forests have been "re-set" to an early seral stage, this situation is part of the natural life cycle of a forest – thus, current condition cannot really be considered "bad."

Preliminary results of our climate change vulnerability assessment suggest that lodgepole may be moderately vulnerable through mid-century. Warming temperatures favor the growth of lodgepole pine, at least under conditions of increased precipitation, which may occur in some portions of the state. Warmer winters with drought are likely to increase mountain pine beetle outbreaks, but mortality is already widespread. Lodgepole habitat may be fairly resilient to climate change, and likely to persist, even if in an altered form.

Table 3. SGCN in Lodgepole habitats.

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
1	Amphibians	Boreal toad (Southern Rocky Mountain Population)	*Anaxyrus boreas boreas*	
1	Birds	Golden eagle	*Aquila chrysaetos*	
1	Mammals	Fringed myotis	*Myotis thysanodes*	
1	Mammals	Little brown bat	*Myotis lucifugus*	
1	Mammals	Lynx	*Lynx canadensis*	x
1	Mammals	Wolverine	*Gulo gulo*	

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
2	Amphibians	Wood frog	*Lithobates sylvatica*	
2	Birds	Band-tailed pigeon	*Patagioenas fasciata*	
2	Birds	Boreal owl	*Aegolius funereus*	x
2	Birds	Cassin's finch	*Peucaea cassinii*	x
2	Birds	Northern goshawk	*Accipiter gentilis*	x
2	Birds	Olive-sided flycatcher	*Contopus cooperi*	x
2	Birds	Pygmy nuthatch	*Sitta pygmaea*	
2	Insects	Lusk's pinemoth	*Coloradia luski*	
2	Insects	Rocky Mountain agapema	*Agapema homogena*	
2	Mammals	American marten	*Martes americana*	x
2	Mammals	Dwarf shrew	*Sorex nanus*	x
2	Mammals	Gray wolf - two subspecies (Northern and Mexican)*	*Canis lupus*	x
2	Mammals	Grizzly bear*	*Ursus arctos*	x
2	Mammals	Red-backed vole	*Clethrionomys gapperi*	x

Mixed Conifer

Mixed conifer supports 27 SGCN (Table 4). Mixed conifer forests occur at elevations ranging from 4,000 to 10,800 feet, and covers more than 850,000 acres in Colorado. Douglas-fir (*Pseudotsuga menziesii*) and white fir (*Abies concolor*) are the most common dominant trees, but as many as seven different conifer species may be present. Douglas-fir stands are characteristic of drier sites, often mixed with ponderosa pine (*Pinus ponderosa*). More mesic stands are found in cool ravines and on north-facing slopes, and are likely to be dominated by white fir with blue spruce (*Picea pungens*) or quaking aspen (*Populus tremuloides*) stands. Natural fire processes in this ecological system are highly variable in both return interval and severity, with fire cycles ranging from 20 to more than 150 years. Stands in the Front Range are vulnerable to the impacts of housing development, and some are in degraded condition (i.e., denser, more dead fuel) as a result of fire suppression (CSFS 2010). However, many of these habitats are generally in good condition, with minimal threats.

Table 4. SGCN in Mixed Conifer habitats.

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
1	Amphibians	Boreal toad (Southern Rocky Mountain Population)	*Anaxyrus boreas boreas*	
1	Amphibians	Northern leopard frog	*Lithobates pipiens*	
1	Birds	Golden eagle	*Aquila chrysaetos*	
1	Mammals	Fringed myotis	*Myotis thysanodes*	x
1	Mammals	Little brown bat	*Myotis lucifugus*	x
1	Mammals	Lynx	*Lynx canadensis*	x
1	Mammals	Spotted bat	*Euderma maculatum*	
1	Mammals	Townsend's big-eared bat ssp.	*Corynorhinus townsendii pallescens*	x
1	Mammals	Wolverine	*Gulo gulo*	
2	Amphibians	Wood frog	*Lithobates sylvatica*	
2	Birds	Band-tailed pigeon	*Patagioenas fasciata*	x
2	Birds	Cassin's finch	*Peucaea cassinii*	x
2	Birds	Flammulated owl	*Otus flammeolus*	
2	Birds	Mexican spotted owl	*Strix occidentalis lucida*	x
2	Birds	Northern goshawk	*Accipiter gentilis*	x
2	Birds	Olive-sided flycatcher	*Contopus cooperi*	x
2	Birds	Pygmy nuthatch	*Sitta pygmaea*	
2	Birds	Virginia's warbler	*Oreothlypis virginiae*	x
2	Insects	Lusk's pinemoth	*Coloradia luski*	
2	Insects	Rocky Mountain agapema	*Agapema homogena*	
2	Insects	Xanthus skipper	*Pyrgus xanthus*	
2	Mammals	Allen's big-eared bat	*Idionycteris phyllotis*	
2	Mammals	Dwarf shrew	*Sorex nanus*	x
2	Mammals	Gray wolf - two subspecies (Northern and Mexican)*	*Canis lupus*	x
2	Mammals	Grizzly bear*	*Ursus arctos*	x
2	Mammals	Hoary bat	*Lasiurus cinereus*	x
2	Mammals	Red-backed vole	*Clethrionomys gapperi*	x

Pinyon-Juniper

Pinyon-juniper, which covers almost 7 million acres in Colorado, supports 44 SGCN (Table 5). Pinyon-juniper habitat includes juniper (*Juniperus* spp.) savannas and woodlands, woodlands and shrublands co-dominated by pinyon pine (*Pinus edulis*) and juniper, and some stands of juniper mixed with limber pine (*Pinus flexilis*) at lower elevations. Various forms of pinyon-juniper occur on mesas, dry mountains, and foothills across the western slope as well as in south-

central and southeastern Colorado. The understory is highly variable, and may be shrubby, grassy, sparsely vegetated, or rocky. Elevation ranges from 4,900 - 9,000 feet. In the canyons and tablelands of the southern Great Plains, juniper woodlands form extensive cover at some distance from the mountain front, at elevations from 4,100 to 6,200 feet.

Pinyon-juniper is influenced by climate, grazing, fires, tree harvest, and insect-pathogen outbreaks. Since the late 1800s, many of these woodlands have been significantly altered by changes in fire frequency, grazing patterns, and climate cycles. In this habitat, fire acts to open stands, increase diversity and productivity in understory species, and create a mosaic of stands of different sizes and ages across the landscape while maintaining the boundary between woodlands and adjacent shrubs or grasslands. Altered fire regimes, drought, overgrazing, and tree cutting can affect stand quality and the potential encroachment of trees into adjacent habitats.

Pinyon-juniper has declined in both extent and quality compared to historic norms, although a number of very large patches remains. Threats include urban development, recreation (especially motorized recreation), invasive species (most notably an increase in cheatgrass (*Bromus tectorum*) in the understory, which has led to increasing fire ignitions), and energy development. In general, Colorado's juniper woodlands have been little impacted by human activities. However, the extent of juniper woodlands has historically been limited by fire, which kills juniper trees. Fire suppression and drought may have caused an expansion of juniper woodlands in some areas of southeast Colorado, where most of the junipers not associated with rimrock are young trees (<100 years old).

Pinyon-juniper habitats across Colorado are in generally good condition, and are excellent in some places. Some patches can be in poor condition in areas where incompatible grazing has reduced native bunch grasses and invasive species such as cheatgrass have become established.

Oil and gas development, and chaining to improve livestock forage, have degraded the condition of some stands. Climate change may result in additional degradation of this habitat type, especially via an increase in frequency and/or severity of wildfire. In some previously burned areas, pinyon-juniper is not regenerating. For example, roughly 50% of Mesa Verde National Park burned in the early 1990s. At this time, there is still no sign of pinyon-juniper regeneration. Instead, burned areas have been invaded by cheatgrass and smooth brome (*Bromus inermis*). Preliminary results of our climate change vulnerability assessment suggest that pinyon-juniper may be moderately vulnerable to climate change through mid-century. The pinyon-juniper habitat has large ecological amplitude; warmer conditions may allow expansion, as has already occurred in the past centuries, as long as there are periodic cooler, wetter years for recruitment. Increased drought may drive fires and insect outbreaks, from which these woodlands would be slow to recover.

Table 5. SGCN in Pinyon-Juniper habitats.

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
1	Birds	Golden eagle	*Aquila chrysaetos*	
1	Mammals	Fringed myotis	*Myotis thysanodes*	x
1	Mammals	Little brown bat	*Myotis lucifugus*	
1	Mammals	Spotted bat	*Euderma maculatum*	
1	Mammals	Townsend's big-eared bat ssp.	*Corynorhinus townsendii pallescens*	x
2	Amphibians	Great Basin spadefoot	*Spea intermontana*	x
2	Birds	American peregrine falcon	*Falco peregrinus anatum*	
2	Birds	Band-tailed pigeon	*Patagioenas fasciata*	x
2	Birds	Boreal owl	*Aegolius funereus*	
2	Birds	Cassin's finch	*Peucaea cassinii*	x
2	Birds	Curve-billed thrasher	*Toxostoma curvirostre*	
2	Birds	Ferruginous hawk	*Buteo regalis*	
2	Birds	Gray vireo	*Vireo vicinior*	x
2	Birds	Juniper titmouse	*Baeolophus ridgwayi*	x
2	Birds	Lazuli bunting	*Passerina amoena*	x
2	Birds	Lewis's woodpecker	*Melanerpes lewis*	x
2	Birds	Mexican spotted owl	*Strix occidentalis lucida*	x
2	Birds	Northern goshawk	*Accipiter gentilis*	x
2	Birds	Olive-sided flycatcher	*Contopus cooperi*	x

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
2	Birds	Pinyon jay	*Gymnorhinus cyanocephalus*	x
2	Birds	Prairie falcon	*Falco mexicanus*	
2	Birds	Pygmy nuthatch	*Sitta pygmaea*	
2	Birds	Vesper sparrow	*Pooecetes gramineus*	
2	Birds	Virginia's warbler	*Oreothlypis virginiae*	x
2	Insects	Comstock's hairstreak	*Callophrys comstocki*	x
2	Insects	Early elfin	*Incisalia fotis*	
2	Insects	Moss's elfin	*Callophrys mossii schryveri*	x
2	Insects	Spalding's blue	*Euphilotes spaldingi*	x
2	Insects	Xanthus skipper	*Pyrgus xanthus*	
2	Mammals	Allen's big-eared bat	*Idionycteris phyllotis*	x
2	Mammals	Big free-tailed bat	*Nyctinomops macrotis*	x
2	Mammals	Botta's pocket gopher (rubidus ssp)	*Thomomys bottae rubidus*	
2	Mammals	Common hog-nosed skunk	*Conepatus leuconotus*	x
2	Mammals	Dwarf shrew	*Sorex nanus*	
2	Mammals	Gray wolf - two subspecies (Northern and Mexican)*	*Canis lupus*	x
2	Mammals	Hoary bat	*Lasiurus cinereus*	x
2	Reptiles	Blacknecked garter snake	*Thamnophis cyrtopsis*	
2	Reptiles	Longnose leopard lizard	*Gambelia wislizenii*	x
2	Reptiles	Midget faded rattlesnake	*Crotalus oreganus concolor*	x
2	Reptiles	New Mexico threadsnake	*Rena dissecta*	x
2	Reptiles	Night snake	*Hypsiglena chlorophaea*	x
2	Reptiles	Roundtail horned lizard	*Phrynosoma modestum*	x
2	Reptiles	Southwestern black-headed snake	*Tantilla horbartsmithi*	x
2	Reptiles	Utah milksnake	*Lampropeltis triangulum taylori*	x

Ponderosa Pine

Ponderosa pine supports 31 SGCN (Table 6). In Colorado, ponderosa pine (*Pinus ponderosa*) woodlands cover about 3.2 million acres in Colorado. They occur between about 6,000 and 9,000 feet, often at the lower treeline transition between grassland or shrubland and the more mesic coniferous forests above. These woodlands are especially prevalent along the eastern edge of the Rocky Mountains, and on the southern flank of the San Juan Mountains. Healthy ponderosa pine forests often consist of open and park-like stands of mature trees, with an understory of predominantly fire-tolerant grasses and forbs. Fire is the most significant ecological process

maintaining this ecological system; frequent, low-intensity ground fires are typical. Older trees drop their lower branches and develop thick, insulating bark as they age, which protects them from ground fires. In stands where the natural fire regime occurs, shrubs, understory trees and downed logs are uncommon. When fires are not allowed to burn, young trees continue to grow, and places that were once open savannas and woodlands become dense forests. Increased density of trees allows fires to reach the forest canopy, spread rapidly, and burn large areas.

In southwestern Colorado, the overall condition of ponderosa pine is generally good. On the Front Range, many stands have been lost to urban development, and many of the remaining stands are in degraded condition. The likelihood of future threats (primarily development and fire suppression) is high. Preliminary results from our climate change vulnerability assessment suggest that ponderosa pine may be moderately vulnerable through mid-century. Increased drought may drive fires and insect outbreaks, and relative proportions of component species in ponderosa stands may change. This habitat is well adapted to warm, dry conditions if precipitation is not reduced too much, and may be able to expand into higher elevations.

Table 6. SGCN in Ponderosa Pine habitats.

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
1	Birds	Golden eagle	*Aquila chrysaetos*	
1	Mammals	Fringed myotis	*Myotis thysanodes*	
1	Mammals	Little brown bat	*Myotis lucifugus*	x
1	Mammals	Spotted bat	*Euderma maculatum*	
1	Mammals	Townsend's big-eared bat ssp.	*Corynorhinus townsendii pallescens*	x
2	Birds	American peregrine falcon	*Falco peregrinus anatum*	
2	Birds	Band-tailed pigeon	*Patagioenas fasciata*	x
2	Birds	Boreal owl	*Aegolius funereus*	
2	Birds	Cassin's finch	*Peucaea cassinii*	x
2	Birds	Flammulated owl	*Otus flammeolus*	x
2	Birds	Grace's warbler	*Setophaga graciae*	x
2	Birds	Lewis's woodpecker	*Melanerpes lewis*	x
2	Birds	Mexican spotted owl	*Strix occidentalis lucida*	x
2	Birds	Northern goshawk	*Accipiter gentilis*	x

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
2	Birds	Olive-sided flycatcher	*Contopus cooperi*	x
2	Birds	Pinyon jay	*Gymnorhinus cyanocephalus*	x
2	Birds	Vesper sparrow	*Pooecetes gramineus*	
2	Birds	Virginia's warbler	*Oreothlypis virginiae*	x
2	Insects	Early elfin	*Incisalia fotis*	x
2	Insects	Lusk's pinemoth	*Coloradia luski*	x
2	Insects	Moss's elfin	*Callophrys mossii schryveri*	x
2	Insects	Pawnee montane skipper	*Hesperia leonardus montana*	x
2	Insects	Rocky Mountain agapema	*Agapema homogena*	
2	Insects	Spalding's blue	*Euphilotes spaldingi*	
2	Insects	Xanthus skipper	*Pyrgus xanthus*	
2	Mammals	Abert's squirrel	*Sciurus aberti*	x
2	Mammals	Allen's big-eared bat	*Idionycteris phyllotis*	x
2	Mammals	Dwarf shrew	*Sorex nanus*	x
2	Mammals	Gray wolf - two subspecies (Northern and Mexican)*	*Canis lupus*	x
2	Mammals	Grizzly bear*	*Ursus arctos*	x
2	Mammals	Hoary bat	*Lasiurus cinereus*	x

Spruce-Fir

Spruce-fir forests support 19 SGCN (Table 7). Spruce-fir forests cover about 5% of Colorado's landscape, forming the matrix vegetation of the sub-alpine zone at elevations of 9,500 to 11,500 feet. They are characterized by dense stands of Engelmann spruce (*Picea engelmannii*) and subalpine fir (*Abies lasiocarpa*). This is one of the few Colorado forest types that is not fire-adapted - the typical fire return frequency is around 400 years. Areas with spruce-fir forest typically receive precipitation in the form of snowfall and frequent summer showers. When periods of drought occur, however, the stressed trees become susceptible to spruce-bud worm (*Choristoneura freemani*) and spruce beetle (*Dendroctonus rufipennis*) outbreaks, which can kill entire hillsides of trees in one summer. In the early 20th century, much of Colorado's old-growth spruce fir was cut for timber. Although much spruce-fir is now made up of younger trees, it is still possible to find very old, widely-spaced trees with yellow bark, as well as snags and downed trees that create perfect habitat for cavity-nesting birds and pine martens.

In 2013, spruce beetle infestations were identified on 398,000 acres, the majority of which are in the southwestern mountain ranges (Colorado State Forest Service 2013). However, from a statewide perspective, spruce-fir forests are generally healthy and intact. Although this habitat is heavily used for recreation and other human activities, overall threats are relatively low at this time. Global climate change may have significant impacts on spruce-fir in the future. Preliminary results of our climate change vulnerability assessment suggest that spruce-fir is moderately vulnerable until mid-century. Under warmer conditions, spruce-fir is likely to expand into alpine areas, but the response would be slow. The lower distributional limit of this habitat is likely to move higher under warmer, drier conditions. Change in species composition may occur in some areas. The vulnerability of this habitat might be higher if the analysis timeframe were further out than mid-century.

Table 7. SGCN in Spruce-Fir habitats.

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
1	Amphibians	Boreal toad (Southern Rocky Mountain Population)	*Anaxyrus boreas boreas*	
1	Birds	Golden eagle	*Aquila chrysaetos*	
1	Mammals	Fringed myotis	*Myotis thysanodes*	
1	Mammals	Lynx	*Lynx canadensis*	x
1	Mammals	Townsend's big-eared bat ssp.	*Corynorhinus townsendii pallescens*	
2	Amphibians	Wood frog	*Lithobates sylvatica*	
2	Birds	Band-tailed pigeon	*Patagioenas fasciata*	
2	Birds	Boreal owl	*Aegolius funereus*	x
2	Birds	Cassin's finch	*Peucaea cassinii*	x
2	Birds	Flammulated owl	*Otus flammeolus*	
2	Birds	Olive-sided flycatcher	*Contopus cooperi*	x
2	Birds	Pygmy nuthatch	*Sitta pygmaea*	
2	Mammals	American marten	*Martes americana*	x
2	Mammals	Dwarf shrew	*Sorex nanus*	x
2	Mammals	Gray wolf - two subspecies (Northern and Mexican)*	*Canis lupus*	x
2	Mammals	Grizzly bear*	*Ursus arctos*	x
2	Mammals	Hoary bat	*Lasiurus cinereus*	x
2	Mammals	Pygmy shrew	*Sorex hoyi montanus*	x
2	Mammals	Snowshoe hare	*Lepus americanus*	x

Subalpine Limber and Bristlecone Pine

Limber and bristlecone pine forests and woodlands support 12 SGCN (Table 8). This habitat occurs throughout the Rocky Mountains on dry, rocky ridges and slopes. Although it can be found near upper treeline above spruce-fir forests, it also occurs at lower elevations. These are typically woodlands of xeric, high elevation sites, but may also extend down to the lower montane, particularly along the Front Range. Limber pine (*Pinus flexilis*) and bristlecone pine (*Pinus aristata*) do not necessarily occur together, but the two species occupy a similar ecological niche. Where the two co-occur, limber pine is often confined to the lower portion of its potential habitat. Bristlecone pine is more-or-less endemic to the Southern Rocky Mountian ecoregion, reaching its northernmost station in Gilpin County, Colorado. Limber pine is more widely distributed and also occurs in mixed conifer systems. It largely replaces bristlecone pine north of I-70.

This habitat occurs in harsh sites that are exposed to desiccating winds with rocky substrates and a short growing season that limit plant growth. Higher elevation occurrences are found well into the subalpine – alpine transition on wind-blasted, mostly south to west-facing slopes and exposed ridges. Bristlecone forests are typically found on steep, south-facing slopes from 8,850 to 12,140 feet. Limber pine woodlands occupy similar habitats, but may occur at lower elevations than bristlecone. Both bristlecone and limber pine are slow-growing, long-lived species in which individuals may live for 1,000 or more years. Fire is an important source of disturbance that facilitates stand regeneration in this system. Older woodlands are often broadly even-aged stands where seedlings are nearly absent, while areas that have recently burned may have abundant seedlings. Bristlecone is somewhat more tolerant of fire than is limber pine, but both species appear to depend on fire for regeneration. Regeneration of limber pine on burned areas is largely due to the germination of seeds cached by Clark's nutcrackers (*Nucifraga columbiana*).

Table 8. SGCN in Subalpine Limber or Bristlecone Pine habitats.

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
1	Birds	Golden eagle	*Aquila chrysaetos*	
1	Mammals	Wolverine	*Gulo gulo*	
2	Birds	Band-tailed pigeon	*Patagioenas fasciata*	
2	Birds	Boreal owl	*Aegolius funereus*	
2	Birds	Cassin's finch	*Peucaea cassinii*	x
2	Birds	Flammulated owl	*Otus flammeolus*	
2	Birds	Olive-sided flycatcher	*Contopus cooperi*	x
2	Birds	Pinyon jay	*Gymnorhinus cyanocephalus*	x
2	Birds	Virginia's warbler	*Vermivora virginiae*	
2	Mammals	Dwarf shrew	*Sorex nanus*	
2	Mammals	Gray wolf - two subspecies (Northern and Mexican)*	*Canis lupus*	
2	Mammals	Grizzly bear*	*Ursus arctos*	

SHRUBLAND HABITATS

Desert Shrub

Desert Shrub supports 40 SGCN (Table 9). In Colorado, these semi-arid shrubby grasslands, sometimes referred to as shrub steppes, are found between 7,500 and 9,500 feet in elevation, on windswept mesas, valley floors, gentle slopes, and on shoulders of ridges. Our shrub-steppes are grass-dominated areas with an open shrub layer. Typical grass species include blue grama (*Bouteloua gracilis*), needle-and-thread (*Hesperostipa comata*), galleta (*Pleuraphis jamesii*), saltgrass (*Distichlis spicata*), Indian rice grass (*Acnatherum hymenoides*), and alkali sacaton (*Sporobolus airoides*). Historically, the shrub layer was dominated by winterfat (*Krascheninnikovia lanata*), but this species has decreased under grazing pressure in many areas. Winterfat has been replaced by rabbitbrush (*Ericameria* and *Chrysothamnus*) species and other woody shrubs. In Colorado, this ecological system does not form extensive stands except in the San Luis Valley. Pinyon-juniper woodlands and sagebrush shrublands commonly occur adjacent

299 to this ecological system at the upper elevations. Shrub steppe covers more than 750,000 acres in
300 Colorado. Historically, it probably accounted for well over a million acres, but many areas were
301 converted to agricultural use. Remaining stands are generally in good condition, except for
302 altered species composition in areas where grazing has reduced or eliminated some native bunch
303 grasses. Solar energy development in the San Luis Valley and continued alteration by grazing are
304 the primary potential threats to this ecological system. Thus far, solar energy development has
305 mostly occurred on land that was previously converted to cropland, so this activity does not yet
306 necessarily constitute additional loss.
307

308 **Table 9. SGCN in Desert Shrub habitats.**

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
1	Birds	Burrowing owl	*Athene cunicularia*	x
1	Birds	Golden eagle	*Aquila chrysaetos*	
1	Birds	Mountain plover	*Charadrius montanus*	
1	Mammals	Black-footed ferret	*Mustela nigripes*	
1	Mammals	Fringed myotis	*Myotis thysanodes*	
1	Mammals	Gunnison's prairie dog	*Cynomys gunnisoni*	
1	Mammals	Spotted bat	*Euderma maculatum*	
1	Mammals	Townsend's big-eared bat ssp.	*Corynorhinus townsendii pallescens*	
1	Mammals	White-tailed prairie dog	*Cynomys leucurus*	x
2	Amphibians	Great Basin spadefoot	*Spea intermontana*	x
2	Birds	Brewer's sparrow	*Spizella breweri*	
2	Birds	Ferruginous hawk	*Buteo regalis*	
2	Birds	Lark bunting	*Calamospiza melanocorys*	x
2	Birds	Loggerhead shrike	*Lanius ludovicianus*	x
2	Birds	Northern harrier	*Circus cyaneus*	
2	Birds	Prairie falcon	*Falco mexicanus*	
2	Birds	Swainson's hawk	*Buteo swainsoni*	x
2	Birds	Vesper sparrow	*Pooecetes gramineus*	
2	Insects	A Buckmoth	*Hemileuca neumoegeni*	x
2	Insects	American bumble bee	*Bombus pensylvanicus*	x
2	Insects	Comstock's hairstreak	*Callophrys comstocki*	x
2	Insects	Desert buckwheat blue	*Euphilotes rita emmeli*	x
2	Insects	Early elfin	*Incisalia fotis*	
2	Insects	Morrison bumble bee	*Bombus morrisoni*	x
2	Insects	Southern plains bumble bee	*Bombus fraternus*	x
2	Insects	Suckley cuckoo bumble bee	*Bombus suckleyi*	x

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
2	Insects	Western bumble bee	*Bombus occidentalis*	x
2	Insects	Yellow bumble bee	*Bombus fervidus*	x
2	Mammals	Arizona myotis	*Myotis occultus*	
2	Mammals	Big free-tailed bat	*Nyctinomops macrotis*	x
2	Mammals	Common hog-nosed skunk	*Conepatus leuconotus*	
2	Mammals	Kit fox	*Vulpes macrotis*	x
2	Mammals	White-tailed jackrabbit	*Lepus townsendii*	
2	Reptiles	Blacknecked garter snake	*Thamnophis cyrtopsis*	
2	Reptiles	California kingsnake	*Lampropeltis californiae*	x
2	Reptiles	Desert spiny lizard	*Sceloporus magister*	x
2	Reptiles	Longnose leopard lizard	*Gambelia wislizenii*	x
2	Reptiles	Midget faded rattlesnake	*Crotalus oreganus concolor*	x
2	Reptiles	Night snake	*Hypsiglena chlorophaea*	x
2	Reptiles	Southwestern black-headed snake	*Tantilla horbartsmithi*	x

Greasewood

Greasewood supports 17 SGCN (Table 10). Shrublands dominated by black greasewood (*Sarcobatus vermiculatus*) accounts for less than 450,000 acres in Colorado, where they are typically found near drainages on stream terraces and flats, on alluvial fans along streams or arroyos, or as rings around playas. In eastern Colorado, greasewood stands are primarily in the southwestern portion of the plains. Large acreages are also found in the lower elevations of Colorado's western valleys and throughout much of the San Luis Valley. Greasewood flats usually have saline soils, a shallow water table and flood intermittently, but remain dry for most of the growing season. Because greasewood flats are tightly associated with saline soils and groundwater that is near the surface, groundwater recharge rather than surface water flow is critical for maintaining these shrublands. Elevations range from about 4,000 to 7,700 feet. These open to moderately dense shrublands are dominated by black greasewood, often with rabbitbrush (*Ericameria* and *Chrysothamnus* spp.), four-wing saltbush (*Atripelx canescens*), and alkali sacaton grass (*Sporobolus airoides*). Threats to greasewood include groundwater pumping, conversion to

cropland, and energy development. However, the condition of greasewood habitats in Colorado remains generally good.

Table 10. SGCN in Greasewood habitats.

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
1	Birds	Golden eagle	*Aquila chrysaetos*	
1	Mammals	Gunnison's prairie dog	*Cynomys gunnisoni*	
1	Reptiles	Colorado checkered whiptail	*Aspidoscelis neotesselata*	x
2	Birds	Brewer's sparrow	*Spizella breweri*	
2	Birds	Ferruginous hawk	*Buteo regalis*	
2	Birds	Loggerhead shrike	*Lanius ludovicianus*	x
2	Birds	Northern harrier	*Circus cyaneus*	
2	Birds	Prairie falcon	*Falco mexicanus*	
2	Birds	Sage sparrow	*Amphispiza belli*	x
2	Birds	Vesper sparrow	*Pooecetes gramineus*	
2	Mammals	Common hog-nosed skunk	*Conepatus leuconotus*	
2	Mammals	Kit fox	*Vulpes macrotis*	x
2	Mammals	White-tailed jackrabbit	*Lepus townsendii*	
2	Reptiles	Longnose leopard lizard	*Gambelia wislizenii*	x
2	Reptiles	Midget faded rattlesnake	*Crotalus oreganus concolor*	
2	Reptiles	Night snake	*Hypsiglena chlorophaea*	x
2	Reptiles	Southwestern black-headed snake	*Tantilla horbartsmithi*	x

Oak and Mixed Mountain Shrub

Oak and mixed mountain shrublands, which account for about 2.7 million acres in Colorado, support 32 SGCN (Table 11). Oak and mixed mountain shrublands generally occur at elevations from approximately 6,500 to 9,500 feet, where they are often adjacent to lower elevation pinyon-juniper woodlands. Gambel's oak (*Quercus gambelii*) is typically dominant, but very often mixed with other montane shrubs such as serviceberry (*Amelanchier* spp.), mountain mahogany (*Cercocarpus montanus*), antelope bitterbrush (*Purshia tridentata*), big sagebrush (*Artemisia tridentata*), chokecherry (*Prunus virginiana*), and snowberry (*Symphoricarpos* spp.). These shrublands intergrade with foothills shrublands (roughly equivalent to the Upland Shrub habitat

category) because both types are often found on poor, dry soils. In Colorado, oak and mixed mountain shrublands are most common on the western slope, where they form extensive bands on the lower mountain slopes, plateaus, and dry foothills. In eastern Colorado, these shrublands are also found at the mountain front as far north as the Palmer Divide. They may form dense thickets, or occur as open shrublands with an herbaceous understory. Although this is a shrub-dominated ecological system, some trees may be present. Fire typically plays an important role in oak and mixed mountain shrublands, causing shrub die-back in some areas, promoting stump sprouting of shrubs in other areas, and controlling the invasion of trees into the shrublands.

Where oak and mixed mountain shrublands occur near the wildland-urban interface, they are often in degraded condition due to effects from fire suppression. Ongoing impacts include housing development and oil and gas development. However, oak and mixed mountain shrublands are in generally good condition from a statewide perspective. Preliminary results from our climate change vulnerability assessment suggest that oak and mixed mountain shrub habitats have low vulnerability in Colorado. Warmer temperatures may increase seedling survival.

Table 11. SGCN in Oak and Mixed Mountain Shrub habitats.

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
1	Birds	Columbian sharp-tailed grouse	*Tympanuchus phasianellus columbianus*	x
1	Birds	Golden eagle	*Aquila chrysaetos*	
1	Birds	Plains sharp-tailed grouse	*Tympanuchus phasianellus jamesii*	x
1	Mammals	Fringed myotis	*Myotis thysanodes*	x
1	Mammals	Gunnison's prairie dog	*Cynomys gunnisoni*	
1	Mammals	Townsend's big-eared bat ssp.	*Corynorhinus townsendii pallescens*	
2	Birds	Band-tailed pigeon	*Patagioenas fasciata*	x
2	Birds	Grace's warbler	*Setophaga graciae*	x
2	Birds	Lazuli bunting	*Passerina amoena*	x
2	Birds	Rufous hummingbird	*Selasphorus rufus*	x
2	Birds	Swainson's hawk	*Buteo swainsoni*	x

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
2	Birds	Virginia's warbler	*Oreothlypis virginiae*	x
2	Insects	American bumble bee	*Bombus pensylvanicus*	x
2	Insects	Early elfin	*Incisalia fotis*	x
2	Insects	Morrison bumble bee	*Bombus morrisoni*	x
2	Insects	Northern hairstreak	*Eurystrymon favonius ontario*	x
2	Insects	Oslar's oakworm moth	*Anisota oslari*	x
2	Insects	Ottoe skipper	*Hesperia ottoe*	
2	Insects	Southern plains bumble bee	*Bombus fraternus*	x
2	Insects	Spalding's blue	*Euphilotes spaldingi*	
2	Insects	Suckley cuckoo bumble bee	*Bombus suckleyi*	x
2	Insects	Western bumble bee	*Bombus occidentalis*	x
2	Insects	Yellow bumble bee	*Bombus fervidus*	x
2	Mammals	Allen's big-eared bat	*Idionycteris phyllotis*	x
2	Mammals	Arizona myotis	*Myotis occultus*	
2	Mammals	Common hog-nosed skunk	*Conepatus leuconotus*	
2	Mammals	Gray wolf - two subspecies (Northern and Mexican)*	*Canis lupus*	x
2	Mammals	Grizzly bear*	*Ursus arctos*	x
2	Mammals	Preble's shrew	*Sorex preblei*	x
2	Mammals	White-tailed jackrabbit	*Lepus townsendii*	
2	Reptiles	Blacknecked garter snake	*Thamnophis cyrtopsis*	
2	Reptiles	Utah milksnake	*Lampropeltis triangulum taylori*	x

Sagebrush

Sagebrush supports 44 SGCN (Table 12). Sagebrush in Colorado includes big sagebrush (*Artemisia tridentata* ssp. *tridentata*) shrublands and montane sagebrush steppe. These shrublands occur throughout much of the western United States. Although they can be found on Colorado's east slope, the largest occurrences are on the western slope. North Park, Middle Park, and the upper Gunnison Basin have extensive stands of sagebrush shrublands, as do Moffat and northwest Rio Blanco counties. Big sagebrush shrublands are characterized by dense stands of taller sagebrush species with a significant herbaceous understory, and are generally found at elevations from 5,000 to 7,500 feet. Big sagebrush shrublands are typically found in broad basins between mountain ranges, on plains and foothills. Montane sagebrush steppe shrublands are

dominated by the shorter sagebrush *Artemisia tridentata* ssp. *vaseyana*, and are usually found at elevations from 7,000 to 10,000 feet. Montane sagebrush steppe primarily occurs on ridges, near flat ridgetops, and mountain slopes.

Many of Colorado's sagebrush shrublands are vulnerable to changes induced by domestic livestock grazing. Prolonged use can cause a decrease in the abundance of native grasses and forbs in the understory, and an increase in shrubs and non-native grasses such as Kentucky bluegrass (*Poa pratensis*). Trampling from livestock grazing significantly decreases the survival of sagebrush and grass seedlings. Over the past century the condition of much of Colorado's sagebrush shrubland has been degraded due to fire suppression and heavy livestock grazing. Although many livestock operations are now more sensitive in their treatment of sagebrush shrublands than they once were, recovery in these ecological systems is slow. Furthermore, many remaining sagebrush patches are now being fragmented by fast-paced and widespread energy development.

Preliminary results from our climate change vulnerability assessment suggest that Sagebrush is not particularly vulnerable in Colorado. Seasonal timing of precipitation is important for sagebrush habitats. Summer moisture stress may be limiting if winter precipitation is low, and increased drought may increase fire frequency/severity, eliminating sagebrush in some lower elevation areas. However, the habitat is not expected to be limited by lack of cooler habitat, since it can move to adjacent higher elevations. Note that while the sagebrush habitat within Colorado does not appear to be particularly vulnerable to climate change, some sagebrush obligate species – most notably the Gunnison sage-grouse – are thought to be extremely vulnerable (Neely et al. 2011).

392 **Table 12. SGCN in Sagebrush habitats.**

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
1	Birds	Brown-capped rosy-finch	*Leucosticte australis*	
1	Birds	Burrowing owl	*Athene cunicularia hypugaea*	
1	Birds	Columbian sharp-tailed grouse	*Tympanuchus phasianellus columbianus*	x
1	Birds	Golden eagle	*Aquila chrysaetos*	x
1	Birds	Greater sage-grouse	*Centrocercus urophasianus*	x
1	Birds	Gunnison sage-grouse	*Centrocercus minimus*	x
1	Mammals	Black-footed ferret	*Mustela nigripes*	
1	Mammals	Fringed myotis	*Myotis thysanodes*	
1	Mammals	Gunnison's prairie dog	*Cynomys gunnisoni*	
1	Mammals	Townsend's big-eared bat ssp.	*Corynorhinus townsendii pallescens*	
1	Mammals	White-tailed prairie dog	*Cynomys leucurus*	
2	Amphibians	Great Basin spadefoot	*Spea intermontana*	x
2	Birds	Black rosy-finch	*Leucosticte atrata*	
2	Birds	Brewer's sparrow	*Spizella breweri*	x
2	Birds	Cassin's sparrow	*Aimophila cassinii*	
2	Birds	Ferruginous hawk	*Buteo regalis*	
2	Birds	Lark bunting	*Calamospiza melanocorys*	
2	Birds	Lazuli bunting	*Passerina amoena*	x
2	Birds	Loggerhead shrike	*Lanius ludovicianus*	x
2	Birds	Northern harrier	*Circus cyaneus*	x
2	Birds	Prairie falcon	*Falco mexicanus*	
2	Birds	Sage sparrow	*Amphispiza belli*	x
2	Birds	Short-eared owl	*Asio flammeus*	x
2	Birds	Swainson's hawk	*Buteo swainsoni*	x
2	Insects	American bumble bee	*Bombus pensylvanicus*	x
2	Insects	Comstock's hairstreak	*Callophrys comstocki*	
2	Insects	Morrison bumble bee	*Bombus morrisoni*	x
2	Insects	Southern plains bumble bee	*Bombus fraternus*	x
2	Insects	Suckley cuckoo bumble bee	*Bombus suckleyi*	x
2	Insects	Western bumble bee	*Bombus occidentalis*	x
2	Insects	Yellow bumble bee	*Bombus fervidus*	x
2	Mammals	Allen's big-eared bat	*Idionycteris phyllotis*	
2	Mammals	Arizona myotis	*Myotis occultus*	
2	Mammals	Gray wolf - two subspecies (Northern and Mexican)*	*Canis lupus*	
2	Mammals	Kit fox	*Vulpes macrotis*	x
2	Mammals	Preble's shrew	*Sorex preblei*	
2	Mammals	Pygmy rabbit	*Brachylagus idahoensis*	x
2	Mammals	Sagebrush vole	*Lemmiscus curtatus*	x
2	Mammals	White-tailed jackrabbit	*Lepus townsendii*	
2	Reptiles	Longnose leopard lizard	*Gambelia wislizenii*	x
2	Reptiles	Long-nosed snake	*Rhinocheilus lecontei*	

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
2	Reptiles	Midget faded rattlesnake	*Crotalus oreganus concolor*	
2	Reptiles	Night snake	*Hypsiglena chlorophaea*	
2	Reptiles	Southwestern black-headed snake	*Tantilla horbartsmithi*	x

Saltbush

Saltbush supports 15 SGCN (Table 13). Saltbush includes salt desert scrub, mat saltbush shrublands, and shale badlands. All of these ecological system types are typically dominated by saltbush (*Atriplex*) species or other shrubs tolerant of saline or alkaline soils. These sparse to moderately dense low-growing shrublands are widespread at lower elevations (generally from 4,500 to 7,000 feet) in Colorado's western valleys, and are also found in more limited distribution in the southern part of the eastern plains. In mixed salt desert scrub, the shrub layer may include winterfat (*Krascheninnikovia lanata*), wolfberry (*Lycium*), horsebrush (*Tetradymia canescens*), and various sagebrush (*Artemisia*) species. Grasses and forbs are generally sparse, and dominated by species tolerant of the harsh soils. Some areas are essentially barren, or very sparsely vegetated. Saltbush covers more than 750,000 acres in Colorado. Perhaps a quarter of the historic acreage of saltbush shrublands has been converted to agricultural use, especially in valley bottoms where irrigation is available. Remaining occurrences appear to be in good condition. Impacts and fragmentation from energy development are the most current threats to this habitat.

Table 13. SGCN in Saltbush habitats.

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
1	Birds	Burrowing owl	*Athene cunicularia hypugaea*	
1	Birds	Golden eagle	*Aquila chrysaetos*	
1	Birds	Mountain plover	*Charadrius montanus*	
2	Birds	Brewer's sparrow	*Spizella breweri*	
2	Birds	Ferruginous hawk	*Buteo regalis*	
2	Birds	Loggerhead shrike	*Lanius ludovicianus*	x
2	Birds	Northern harrier	*Circus cyaneus*	

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
2	Birds	Prairie falcon	*Falco mexicanus*	
2	Birds	Swainson's hawk	*Buteo swainsoni*	x
2	Mammals	Common hog-nosed skunk	*Conepatus leuconotus*	
2	Mammals	Kit fox	*Vulpes macrotis*	x
2	Mammals	White-tailed jackrabbit	*Lepus townsendii*	
2	Reptiles	Longnose leopard lizard	*Gambelia wislizenii*	x
2	Reptiles	Midget faded rattlesnake	*Crotalus oreganus concolor*	
2	Reptiles	Southwestern black-headed snake	*Tantilla horbartsmithi*	x

Sandsage

Sandsage supports 21 SGCN (Table 14). Sandsage shrublands dominate sandy areas on Colorado's eastern plains, where they often intermingle with shortgrass prairie to form a locally patchy sandsage-shortgrass matrix. Sandsage is characterized by sand sagebrush (*Artemisia filifolia*) with an understory of tall, mid- or short grasses and scattered forbs. Yucca (*Yucca glauca*) and snakeweed (*Gutierrezia sarothrae*) are common in some areas. Fire and grazing are the most important dynamic processes for sandsage, although drought stress can impact this ecological system significantly in some areas. Sandsage covers nearly two million acres in Colorado. These sandy-soiled habitats have frequently been passed over while neighboring grasslands are converted to agriculture, but about 20% of historic acreage has been lost. Remaining tracts are generally in good condition. Sandsage is vulnerable to adverse impacts from energy development (including wind, oil, and gas).

Preliminary results from our climate change vulnerability assessment suggest that sandsage is moderately vulnerable through mid-century. This habitat is not vulnerable on sandy soils, and may be able to expand into adjacent areas under warmer, drier conditions. However, overall condition and composition of these shrublands may change.

Table 14. SGCN in Sandsage habitats.

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
1	Birds	Golden eagle	*Aquila chrysaetos*	
1	Birds	Lesser prairie-chicken	*Tympanuchus pallidicinctus*	x
1	Birds	Plains sharp-tailed grouse	*Tympanuchus phasianellus jamesii*	
2	Birds	Brewer's sparrow	*Spizella breweri*	
2	Birds	Cassin's sparrow	*Aimophila cassinii*	x
2	Birds	Ferruginous hawk	*Buteo regalis*	
2	Birds	Greater prairie-chicken	*Tympanuchus cupido*	x
2	Birds	Loggerhead shrike	*Lanius ludovicianus*	x
2	Birds	Long-billed curlew	*Numenius americanus*	
2	Birds	Northern harrier	*Circus cyaneus*	
2	Birds	Prairie falcon	*Falco mexicanus*	
2	Birds	Short-eared owl	*Asio flammeus*	x
2	Birds	Swainson's hawk	*Buteo swainsoni*	x
2	Birds	Upland sandpiper	*Bartramia longicauda*	
2	Birds	Vesper sparrow	*Pooecetes gramineus*	
2	Mammals	Black-tailed prairie dog	*Cynomys ludovicianus*	
2	Mammals	Common hog-nosed skunk	*Conepatus leuconotus*	
2	Mammals	White-tailed jackrabbit	*Lepus townsendii*	
2	Reptiles	Long-nosed snake	*Rhinocheilus lecontei*	x
2	Reptiles	Utah milksnake	*Lampropeltis triangulum taylori*	x
2	Reptiles	Yellow mud turtle	*Kinosternon flavescens*	x

Upland Shrub

Upland shrub habitats, which cover less than 400,000 acres in Colorado, support 27 SGCN (Table 15). Upland shrub habitats are found in dry, upland areas where oak is not present. This habitat is found in the Rocky Mountain foothills, ridges, canyons and lower mountain slopes, and on outcrops, mesas, and canyon slopes of the eastern plains. In general, mixed shrublands without oak are most common in the northern Front Range, as well as on drier foothills and prairie hills. Upland shrub occurs at elevations between 4,900-9,500 feet. Scattered trees may be present, but the vegetation is dominated by shrubs such as mountain mahogany (*Cercocarpus montanus*), antelope bitterbrush (*Purshia tridentata*), skunkbush sumac (*Rhus trilobata*), or currant species (*Ribes* spp.). The dominant shrub species are generally well adapted to poor soils,

441 dry sites, and disturbance by fire. Fire suppression may have allowed an invasion of trees into
442 some of these shrublands, but in many cases sites are too xeric for tree growth. Threats to upland
443 shrub include fragmentation by roads and development. These disturbances provide an
444 unnatural fire break as well as a conduit for weed invasion.

445

446 Condition of Upland Shrub habitats is generally good across Colorado, with fair patches in some
447 areas. The shrub layer is good to excellent, but the understory layer is generally fair to poor. This
448 habitat is vulnerable to weed invasions. Where invasive species such as leafy spurge (*Euphorbia*
449 *esula*) and cheatgrass (*Bromus tectorum*) have established, understories are highly altered.

450

451 **Table 15. SGCN in Upland Shrub habitats.**

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
1	Birds	Columbian sharp-tailed grouse	*Tympanuchus phasianellus columbianus*	
1	Birds	Golden eagle	*Aquila chrysaetos*	
1	Mammals	Fringed myotis	*Myotis thysanodes*	
1	Mammals	Spotted bat	*Euderma maculatum*	
1	Mammals	Townsend's big-eared bat ssp.	*Corynorhinus townsendii pallescens*	
2	Birds	Band-tailed pigeon	*Patagioenas fasciata*	
2	Birds	Cassin's sparrow	*Aimophila cassinii*	
2	Birds	Ferruginous hawk	*Buteo regalis*	
2	Birds	Lazuli bunting	*Passerina amoena*	x
2	Birds	Rufous hummingbird	*Selasphorus rufus*	x
2	Birds	Short-eared owl	*Asio flammeus*	x
2	Birds	Swainson's hawk	*Buteo swainsoni*	x
2	Birds	Virginia's warbler	*Oreothlypis virginiae*	x
2	Insects	American bumble bee	*Bombus pensylvanicus*	x
2	Insects	Early elfin	*Incisalia fotis*	x
2	Insects	Morrison bumble bee	*Bombus morrisoni*	x
2	Insects	Moss's elfin	*Callophrys mossii schryveri*	x
2	Insects	Mottled duskywing	*Erynnis martialis*	x
2	Insects	Rocky Mountain agapema	*Agapema homogena*	x
2	Insects	Southern plains bumble bee	*Bombus fraternus*	x
2	Insects	Suckley cuckoo bumble bee	*Bombus suckleyi*	x
2	Insects	Western bumble bee	*Bombus occidentalis*	x

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
2	Insects	Yellow bumble bee	*Bombus fervidus*	x
2	Mammals	Common hog-nosed skunk	*Conepatus leuconotus*	x
2	Mammals	Gray wolf - two subspecies (Northern and Mexican)*	*Canis lupus*	x
2	Mammals	Grizzly bear*	*Ursus arctos*	x
2	Mammals	White-tailed jackrabbit	*Lepus townsendii*	

GRASSLAND HABITATS

Foothill and Mountain Grasslands

Foothill and mountain grasslands support 45 SGCN (Table 16). This habitat type includes three non-shortgrass prairie grassland types: Western Great Plains Foothill and Piedmont Grassland, Southern Rocky Mountain Montane-Subalpine Grassland, and Inter-Mountain Basins Semi-Desert Grassland. Together these grasslands cover about three million acres in Colorado. Foothill and piedmont grasslands are found at the extreme western edge of the Great Plains, where increasing elevation and precipitation facilitate the development of mixed to tallgrass associations on certain soils. These grasslands typically occur at elevations between 5,250 and 7,200 feet. Typical species include big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), needle-and-thread (*Hesperotipa comata*), and prairie sandreed (*Calamovilfa longifolia*).

Montane-subalpine grasslands in the Colorado Rockies are found at elevations of 7,200-10,000 feet, intermixed with stands of spruce-fir (*Picea engelmannii-Abies lasiocarpa*), lodgepole pine (*Pinus contorta*), ponderosa pine (*Pinus ponderosa*), and aspen (*Populus tremuloides*), or as the matrix community in the large intermountain basin of South Park. Typical dominant grass species include fescue (*Festuca* spp.), muhly (*Muhlenbergia* spp.), oatgrass (*Danthonia* spp.), and others. Lower elevation montane grasslands are more xeric, while upper montane or subalpine

grasslands are more mesic. Grasses of the foothills and piedmont may be included in lower elevation occurrences. Trees and shrubs are generally sparse or absent, but occasional individuals from the surrounding communities may occur.

Colorado's semi-desert grasslands are found primarily on dry plains and mesas of the western slope at elevations of 4,750-7,600 feet. These grasslands are typically dominated by drought-resistant perennial bunch grasses such as bluebunch wheatgrass (*Pseudoroegneria spicata*), blue grama (*Bouteloua gracilis*), galleta grass (*Pleuraphis jamesii*), and needle-and-thread (*Hesperostipa comata*), and may include scattered shrubs.

Current impacts from human activity other than domestic livestock grazing are low, especially in the montane grasslands. Condition of these grasslands is good to excellent. A significant portion of historic occurrences of lower elevation foothill and piedmont grasslands on the eastern slope have been lost through conversion to cropland or other uses. Remaining patches are in fair condition. Impacts include weeds, fragmentation, and incompatible grazing. Low elevation grasslands on the western slope are generally fair, but are poor in some areas where native grasses have been replaced by invasive species such as cheatgrass (*Bromus tectorum*).

Table 16. SGCN in Foothills and Mountain Grassland habitats.

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
1	Birds	Columbian sharp-tailed grouse	*Tympanuchus phasianellus columbianus*	
1	Birds	Golden eagle	*Aquila chrysaetos*	x
1	Birds	Greater sandhill crane	*Grus canadensis tabida*	
1	Birds	Mountain plover	*Charadrius montanus*	
1	Birds	Plains sharp-tailed grouse	*Tympanuchus phasianellus jamesii*	x
1	Mammals	Black-footed ferret	*Mustela nigripes*	
1	Mammals	Fringed myotis	*Myotis thysanodes*	
1	Mammals	Gunnison's prairie dog	*Cynomys gunnisoni*	x
1	Mammals	Olive-backed pocket mouse	*Perognathus fasciatus*	x
1	Mammals	Townsend's big-eared bat ssp.	*Corynorhinus townsendii pallescens*	

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
1	Mammals	White-tailed prairie dog	*Cynomys leucurus*	x
2	Birds	Bald eagle	*Haliaeetus leucocephalus*	
2	Birds	Bobolink	*Colinus virginianus*	x
2	Birds	Ferruginous hawk	*Buteo regalis*	x
2	Birds	Lark bunting	*Calamospiza melanocorys*	
2	Birds	Loggerhead shrike	*Lanius ludovicianus*	x
2	Birds	Northern harrier	*Circus cyaneus*	x
2	Birds	Prairie falcon	*Falco mexicanus*	
2	Birds	Rufous hummingbird	*Selasphorus rufus*	x
2	Birds	Short-eared owl	*Asio flammeus*	x
2	Birds	Swainson's hawk	*Buteo swainsoni*	x
2	Insects	American bumble bee	*Bombus pensylvanicus*	x
2	Insects	Arogos skipper	*Atrytone arogos*	x
2	Insects	Colorado blue	*Euphilotes rita coloradensis*	x
2	Insects	Morrison bumble bee	*Bombus morrisoni*	x
2	Insects	Mottled duskywing	*Erynnis martialis*	
2	Insects	Pawnee montane skipper	*Hesperia leonardus montana*	
2	Insects	Regal fritillary	*Speyeria idalia*	
2	Insects	Rhesus skipper	*Polites rhesus*	
2	Insects	Southern plains bumble bee	*Bombus fraternus*	x
2	Insects	Suckley cuckoo bumble bee	*Bombus suckleyi*	x
2	Insects	Western bumble bee	*Bombus occidentalis*	x
2	Insects	Xanthus skipper	*Pyrgus xanthus*	x
2	Insects	Yellow bumble bee	*Bombus fervidus*	x
2	Insects	Yellow-banded day sphinx	*Proserpinus flavofasciata*	x
2	Mammals	Arizona myotis	*Myotis occultus*	
2	Mammals	Bighorn sheep	*Ovis canadensis*	
2	Mammals	Bison	*Bison bison*	x
2	Mammals	Botta's pocket gopher (rubidus ssp)	*Thomomys bottae rubidus*	x
2	Mammals	Common hog-nosed skunk	*Conepatus leuconotus*	
2	Mammals	Gray wolf - two subspecies (Northern and Mexican)*	*Canis lupus*	
2	Mammals	Grizzly bear*	*Ursus arctos*	x
2	Mammals	Northern pocket gopher (macrotis ssp)	*Thomomys talpoides macrotis*	x
2	Mammals	Preble's shrew	*Sorex preblei*	
2	Mammals	White-tailed jackrabbit	*Lepus townsendii*	x

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Mixed and Tallgrass Prairies

Mixed-grass and tallgrass prairies support 41 SGCN (Table 17). Mixedgrass and tallgrass prairie habitats are limited in Colorado, and most commonly occur as small patches interspersed among shortgrass prairie and sandsage. Due to its position on the periphery of the range of the mixedgrass prairie, Colorado has probably never supported extensive tracts of this type. Historically, foothills valleys and swales (now frequently filled with reservoirs or houses) would have supported tallgrass communities in Colorado. Now tallgrass prairie only occurs in small, scattered patches where moist soils are present, such as upland terraces above floodplains. Fire, grazing, and drought are the primary ecological processes. The diversity within this habitat likely reflects both the short- and long-term responses of the vegetation to these often concurrent disturbance regimes. Fire suppression and overgrazing can lead to the invasion by woody species such as juniper and ponderosa pine. Conversion to agriculture likewise has probably decreased the range of these habitats within the state. Remaining patches are in good condition overall. Ongoing wind energy development may have some impact.

Table 17. SGCN in Mixed-grass or Tallgrass Prairie habitats.

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
1	Birds	Burrowing owl	*Athene cunicularia*	x
1	Birds	Golden eagle	*Aquila chrysaetos*	x
1	Birds	Lesser prairie-chicken	*Tympanuchus pallidicinctus*	x
1	Birds	Mountain plover	*Charadrius montanus*	
1	Birds	Plains sharp-tailed grouse	*Tympanuchus phasianellus jamesii*	x
1	Mammals	Black-footed ferret	*Mustela nigripes*	
1	Mammals	Olive-backed pocket mouse	*Perognathus fasciatus*	x
1	Reptiles	Massasauga	*Sistrurus catenatus*	x
2	Birds	Bald eagle	*Haliaeetus leucocephalus*	
2	Birds	Bobolink	*Colinus virginianus*	x
2	Birds	Cassin's sparrow	*Aimophila cassinii*	x
2	Birds	Chestnut-collared longspur	*Calcarius ornatus*	x
2	Birds	Ferruginous hawk	*Buteo regalis*	x
2	Birds	Greater prairie-chicken	*Tympanuchus cupido*	x
2	Birds	Lark bunting	*Calamospiza melanocorys*	x
2	Birds	Loggerhead shrike	*Lanius ludovicianus*	x

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
2	Birds	Long-billed curlew	*Numenius americanus*	
2	Birds	McCown's longspur	*Rhynchophanes mccownii*	x
2	Birds	Northern harrier	*Circus cyaneus*	x
2	Birds	Prairie falcon	*Falco mexicanus*	
2	Birds	Short-eared owl	*Asio flammeus*	x
2	Birds	Swainson's hawk	*Buteo swainsoni*	x
2	Birds	Upland sandpiper	*Bartramia longicauda*	x
2	Birds	Vesper sparrow	*Pooecetes gramineus*	
2	Insects	American bumble bee	*Bombus pensylvanicus*	x
2	Insects	Arogos skipper	*Atrytone arogos*	
2	Insects	Comstock's hairstreak	*Callophrys comstocki*	
2	Insects	Morrison bumble bee	*Bombus morrisoni*	x
2	Insects	Ottoe skipper	*Hesperia ottoe*	x
2	Insects	Regal fritillary	*Speyeria idalia*	x
2	Insects	Rhesus skipper	*Polites rhesus*	x
2	Insects	Southern plains bumble bee	*Bombus fraternus*	x
2	Insects	Suckley cuckoo bumble bee	*Bombus suckleyi*	x
2	Insects	Western bumble bee	*Bombus occidentalis*	x
2	Insects	Yellow bumble bee	*Bombus fervidus*	x
2	Mammals	Black-tailed prairie dog	*Cynomys ludovicianus*	
2	Mammals	Northern pocket gopher (macrotis ssp)	*Thomomys talpoides macrotis*	x
2	Mammals	Swift fox	*Vulpes velox*	x
2	Mammals	White-tailed jackrabbit	*Lepus townsendii*	x
2	Reptiles	Calfornia kingsnake	*Lampropeltis californiae*	
2	Reptiles	Texas horned lizard	*Phrynosoma cornutum*	x

Shortgrass Prairie

Shortgrass prairie supports 52 SGCN (Table 18). Shortgrass prairie, characterized by blue grama (*Bouteloua gracilis*), buffalo grass (*Bouteloua dactyloides*), and other short to mid-height species, once covered most of Colorado east of the mountain front, at elevations below 6,000 feet. Today, nearly 50% of our historic shortgrass prairie has been converted to tilled agriculture or other uses - the largest loss of any of Colorado's habitats. In the early 1800s, the shortgrass prairie was home to massive herds of free-ranging bison and pronghorn, as well as huge prairie dog colonies, deer, elk, and top predators such as the gray wolf and grizzly bear. Pronghorn and prairie dogs still

inhabit Colorado's prairies in reduced numbers, and the former top predators have been replaced by coyotes. Large-scale ecological processes such as drought, fire, and grazing by large animals exert strong influences on shortgrass. The short grass species that dominate this ecological system are tolerant of drought and grazing. Ongoing impacts include renewable and non-renewable energy production (wind, solar, geothermal, oil and gas, and biofuels) and continuing expansion of urban and exurban communities, especially along the Front Range. The continued presence of shortgrass prairie in our state may also be threatened by changing climate. Preliminary results from our climate change vulnerability assessment indicate that shortgrass prairie is highly vulnerable. Soil moisture is a key driver for this habitat; change in precipitation seasonality, amount, or pattern will affect soil moisture. Although these grasslands are adapted to warm, dry conditions, increasing warmer and drier conditions are likely to favor increasing growth of shrubby species (e.g., cholla [*Cylindropuntia imbricata*], snakeweed [*Gutierrezia sarothrae]*), especially in areas that are disturbed. Increased frequency of large precipitation events would favor this habitat, while a trend toward smaller events would not. However, evidence for this effect is mixed.

Table 18. SGCN in Shortgrass Prairie habitats.

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
1	Birds	Burrowing owl	*Athene cunicularia*	x
1	Birds	Golden eagle	*Aquila chrysaetos*	x
1	Birds	Mountain plover	*Charadrius montanus*	x
1	Birds	Plains sharp-tailed grouse	*Tympanuchus phasianellus jamesii*	
1	Mammals	Black-footed ferret	*Mustela nigripes*	x
1	Mammals	Olive-backed pocket mouse	*Perognathus fasciatus*	x
1	Reptiles	Colorado checkered whiptail	*Aspidoscelis neotesselata*	
1	Reptiles	Massasauga	*Sistrurus catenatus*	x
2	Amphibians	Couch's spadefoot	*Scaphiopus couchii*	x
2	Amphibians	Green toad	*Anaxyrus debilis*	
2	Birds	American bittern	*Botaurus lentiginosus*	
2	Birds	Bald eagle	*Haliaeetus leucocephalus*	
2	Birds	Cassin's sparrow	*Aimophila cassinii*	x
2	Birds	Chestnut-collared longspur	*Calcarius ornatus*	x

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
2	Birds	Ferruginous hawk	*Buteo regalis*	x
2	Birds	Grasshopper sparrow	*Ammodramus savannarum*	x
2	Birds	Greater prairie-chicken	*Tympanuchus cupido*	x
2	Birds	Lark bunting	*Calamospiza melanocorys*	x
2	Birds	Loggerhead shrike	*Lanius ludovicianus*	x
2	Birds	Long-billed curlew	*Numenius americanus*	x
2	Birds	McCown's longspur	*Rhynchophanes mccownii*	x
2	Birds	Northern harrier	*Circus cyaneus*	x
2	Birds	Prairie falcon	*Falco mexicanus*	
2	Birds	Short-eared owl	*Asio flammeus*	x
2	Birds	Swainson's hawk	*Buteo swainsoni*	x
2	Insects	American bumble bee	*Bombus pensylvanicus*	x
2	Insects	Colorado blue	*Euphilotes rita coloradensis*	x
2	Insects	Monarch butterfly	*Danaus plexippus*	x
2	Insects	Morrison bumble bee	*Bombus morrisoni*	x
2	Insects	Northern hairstreak	*Eurystrymon favonius Ontario*	
2	Insects	Regal fritillary	*Speyeria idalia*	x
2	Insects	Rhesus skipper	*Polites rhesus*	x
2	Insects	Sandia hairstreak	*Callophrys mcfarlandi*	x
2	Insects	Southern plains bumble bee	*Bombus fraternus*	x
2	Insects	Suckley cuckoo bumble bee	*Bombus suckleyi*	x
2	Insects	Two-spotted skipper	*Euphyes bimacula*	
2	Insects	Western bumble bee	*Bombus occidentalis*	x
2	Insects	Wiest's sphinx moth	*Euproserpinus wiesti*	
2	Insects	Yellow bumble bee	*Bombus fervidus*	x
2	Mammals	Bison	*Bison bison*	x
2	Mammals	Black-tailed prairie dog	*Cynomys ludovicianus*	x
2	Mammals	Northern pocket gopher (macrotis ssp)	*Thomomys talpoides macrotis*	x
2	Mammals	Swift fox	*Vulpes velox*	x
2	Mammals	White-tailed jackrabbit	*Lepus townsendii*	x
2	Reptiles	Blacknecked garter snake	*Thamnophis cyrtopsis*	
2	Reptiles	Long-nosed snake	*Rhinocheilus lecontei*	x
2	Reptiles	New Mexico threadsnake	*Rena dissecta*	x
2	Reptiles	Night snake	*Hypsiglena chlorophaea*	
2	Reptiles	Roundtail horned lizard	*Phrynosoma modestum*	x
2	Reptiles	Texas horned lizard	*Phrynosoma cornutum*	x
2	Reptiles	Utah milksnake	*Lampropeltis triangulum taylori*	x
2	Reptiles	Yellow mud turtle	*Kinosternon flavescens*	

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RIPARIAN AND WETLAND HABITATS

Playas

Playas support 20 SGCN (Table 19). Playas are shallow, temporary wetlands that occur throughout the shortgrass prairie on Colorado's eastern plains, as well as in limited distribution on the western slope. They are ephemeral in nature, filling with water only after heavy rainfall. As would be expected of wet habitats in a dry environment, playas are very important habitat components for many species that inhabit or migrate through Colorado. Playas are threatened by conversion of native habitat to urban and/or agricultural uses, as well as indirect effects of such development (for example, road construction, sedimentation, pollution and runoff, deliberate filling). The current condition of playas is variable, but is generally fair to poor.

Table 19. SGCN in Playa habitats.

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
1	Birds	Burrowing owl	*Athene cunicularia hypugaea*	
1	Birds	Golden eagle	*Aquila chrysaetos*	
1	Reptiles	Colorado checkered whiptail	*Aspidoscelis neotesselata*	x
2	Birds	American peregrine falcon	*Falco peregrinus anatum*	
2	Birds	American white pelican	*Pelecanus erythrorhynchos*	
2	Birds	Bald eagle	*Haliaeetus leucocephalus*	
2	Birds	Eared grebe	*Podiceps nigricollis*	
2	Birds	Forster's tern	*Sterna forsteri*	
2	Birds	Lark bunting	*Calamospiza melanocorys*	
2	Birds	Least tern	*Sterna antillarum*	x
2	Birds	Lesser scaup	*Aythya affinis*	
2	Birds	Long-billed curlew	*Numenius americanus*	x
2	Birds	McCown's longspur	*Rhynchophanes mccownii*	
2	Birds	Northern harrier	*Circus cyaneus*	x
2	Birds	Piping plover	*Charadrius melodus*	x
2	Birds	Prairie falcon	*Falco mexicanus*	
2	Birds	Swainson's hawk	*Buteo swainsoni*	x
2	Birds	Western snowy plover	*Charadrius alexandrinus nivosus*	x
2	Birds	White-faced ibis	*Plegadis chihi*	x
2	Reptiles	California kingsnake	*Lampropeltis californiae*	

Riparian Woodlands and Shrublands

Riparian woodlands and shrublands support 26 SGCN (Table 20). Riparian woodlands and shrublands occur throughout Colorado. At montane to subalpine elevations, riparian shrublands may occur as narrow bands of shrubs lining streambanks and alluvial terraces, or as extensive willow carrs in broad floodplains and subalpine valleys. They can also be found around seeps, fens, and isolated springs on hillslopes away from valley bottoms. Dominant shrubs within this elevation zone include alder (*Alnus tenuifolia*), birch (*Betula occidentalis*), dogwood (*Cornus sericea*), and willow (*Salix*) species. Generally the upland communities surrounding these riparian systems are either conifer or aspen forests. Many higher elevation riparian shrublands are associated with beaver (*Castor canadensis*) activity, which can be important for maintaining the health of the riparian ecosystem (historically this would have been true for lower elevation streams as well). Beaver dams abate channel down cutting, bank erosion, and downstream movement of sediment. Beaver dams raise the water table across the floodplain and provide year-round saturated soils. Plant establishment and sediment build-up behind beaver dams raises the channel bed and creates a wetland environment.

Montane to subalpine riparian woodlands are comprised of seasonally flooded forests and woodlands throughout the Rocky Mountains. They include the conifer and aspen woodlands that line montane streams. They are most often confined to specific riparian environments, occurring on floodplains or terraces of rivers and streams or in V-shaped, narrow valleys and canyons (where there is cold-air drainage). Less frequently, high elevation riparian woodlands are found in moderate to wide valley bottoms, on large floodplains along broad, meandering rivers, and on pond or lake margins. Riparian woodlands are tolerant of periodic flooding and high water tables. Snowmelt moisture in this system may create shallow water tables or seeps for a portion of the growing season.

At lower elevations on the western slope, riparian woodlands and shrublands are found within the flood zone of rivers, on islands, sand or cobble bars, and immediate streambanks. They often occur as a mosaic of multiple communities that are tree-dominated with a diverse shrub component. Forests are typically dominated by cottonwood (*Populus angustifolia*, *P. deltoides*) and willow (*Salix* spp.), but may include maple (*Acer glabrum*), Douglas fir (*Pseudotsuga menziesii*), spruce (*Picea* spp.), and juniper (*Juniperus* spp.). Shrublands are primarily dominated by willow, alder, and birch. Lower elevation riparian woodlands and shrublands are dependent on a natural hydrologic regime, especially annual to episodic flooding. These woodlands and shrublands grow within a continually changing alluvial environment due to the ebb and flow of the river, and riparian vegetation is constantly being "re-set" by flooding disturbance. In some areas, Russian olive (*Elaeagnus angustifolia)*, tamarisk (*Tamarix* spp.), and other exotic species are common.

On the eastern plains, riparian woodlands and shrublands are generally dominated by plains cottonwood (*Populus deltoides*) and willow species, but also occur as a mosaic of multiple communities interspersed with herbaceous patches. They are found along small, medium and large streams on the plains, including the wide floodplains of the South Platte and Arkansas Rivers. Hydrologically, smaller rivers tend to have greater seasonal variation in water levels with less developed floodplain than the larger rivers, and can dry down completely for some portion of the year. Plains riparian areas are often subjected to heavy grazing and/or agriculture and can be heavily degraded. Tamarisk and less desirable grasses and forbs have invaded degraded examples throughout eastern Colorado. Groundwater depletion and lack of fire have created additional species changes.

Riparian woodlands and shrublands at higher elevations are in good to excellent condition. At lower elevations, however, conditions are only fair overall and can be poor in areas subjected to

intense grazing, agricultural use, urban development, and/or hydrological alteration. Many of these communities have degraded understories, with weedy herbaceous layers and Russian olive and tamarisk invading the shrub layers. Cottonwood die-offs related to prolonged, intense drought and hydrological alterations have affected some stands.

Table 20. SGCN in Riparian Woodland and Shrubland habitats.

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
1	Amphibians	Boreal toad (Southern Rocky Mountain Population)	*Anaxyrus boreas boreas*	x
1	Amphibians	Northern leopard frog	*Lithobates pipiens*	x
1	Birds	Southwestern willow flycatcher	*Empidonax traillii extimus*	x
1	Birds	Western yellow-billed cuckoo	*Coccyzus americanus occidentalis*	x
1	Mammals	Little brown bat	*Myotis lucifugus*	
1	Mammals	Meadow jumping mouse (both subspecies)	*Zapus hudsonius luteus and Z. h. preblei*	x
2	Amphibians	Plains leopard frog	*Lithobates blairi*	x
2	Amphibians	Wood frog	*Lithobates sylvatica*	x
2	Birds	Bald eagle	*Haliaeetus leucocephalus*	x
2	Birds	Bell's vireo	*Vireo bellii*	x
2	Birds	Harris's sparrow	*Zonotrichia querula*	x
2	Birds	Lazuli bunting	*Passerina amoena*	x
2	Birds	Lewis's woodpecker	*Melanerpes lewis*	x
2	Birds	Veery	*Catharus fuscescens*	x
2	Insects	American bumble bee	*Bombus pensylvanicus*	x
2	Insects	Early elfin	*Incisalia fotis*	x
2	Insects	Great Basin silverspot butterfly	*Speyeria nokomis nokomis*	x
2	Insects	Morrison bumble bee	*Bombus morrisoni*	x
2	Insects	Nelson's snowfly	*Capnia nelsoni*	x
2	Insects	Southern plains bumble bee	*Bombus fraternus*	x
2	Insects	Suckley cuckoo bumble bee	*Bombus suckleyi*	x
2	Insects	Western bumble bee	*Bombus occidentalis*	x
2	Insects	Yellow bumble bee	*Bombus fervidus*	x
2	Mammals	Hoary bat	*Lasiurus cinereus*	x
2	Mammals	Snowshoe hare	*Lepus americanus*	x
2	Reptiles	Common garter snake	*Thamnophis sirtalis*	x

Wetlands

Non-riparian wetlands support 47 SGCN (Table 21). In Colorado, non-riparian wetland habitats include moist to wet meadows, emergent marshes, fens, and seeps and springs.

Meadows occur throughout Colorado, but most natural wet meadows are found within the montane to subalpine zone. Natural wet meadows are tightly associated with snowmelt or subsurface groundwater discharge and typically not subjected to high disturbance events such as flooding. Within mountain valleys and at lower elevations, extensive acres of wet meadows are also linked to irrigation practices, including flood irrigation and seepage from irrigation ditches. Natural wet meadows are dominated by native sedges and grasses, while those influenced by irrigation may be dominated by non-native pasture grasses.

Emergent marshes are wetlands that experience frequent or prolonged ponding. Marshes occur in depressions and kettle ponds, as fringes around lakes, along streams and rivers, and behind many types of impoundments. They can be found at all elevations, but are more common at mid to lower elevations. Standing water restricts the dominant species to robust wetland plants, such as cattail (*Typha*), bulrush (*Scirpus* and Schoenoplectus spp.), and large sedges (*Carex* spp.). At lower elevations, marshes can become densely vegetated if they are not periodically flushed by floodwater or mechanical thinning.

Fens are wetlands with thick organic soils that are supported by stable groundwater discharge. Fens are typically found within the montane to subalpine zone, generally above 7,000 ft., and can form along the edges of valley bottoms, at breaks in slope, around hillslope seeps, in shallow basins or anywhere where sufficient ground water emerges to perennially saturate soils. Fens are considered “old growth” wetlands, as the accumulation of thick organic soils can take thousands

of years. Fen vegetation is generally characterized by a dense cover of sedges and moss, often intermixed with forbs and short to dwarf shrubs such as willow and bog birch (*Betula nana*).

Seeps and springs include small wetlands that are hydrologically supported by groundwater discharge. They are found throughout Colorado and can be a component of the previously described wetland types, but are most notable within the cliff and canyon country of the Colorado Plateau and the Lower Arkansas basin.

Montane to subalpine wetlands are in generally good condition. The condition of lower elevation wetlands is more variable, however. Intensive water management has greatly altered the flooding regime of many marshes and grazing of both domestic and wild animals can degrade meadows.

Table 21. SGCN that inhabit Wetlands habitats.

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
1	Amphibians	Boreal toad (Southern Rocky Mountain Population)	*Anaxyrus boreas boreas*	x
1	Amphibians	Northern leopard frog	*Lithobates pipiens*	x
1	Birds	Golden eagle	*Aquila chrysaetos*	
1	Birds	Greater sage-grouse	*Centrocercus urophasianus*	
1	Birds	Greater sandhill crane	*Grus canadensis tabida*	x
1	Birds	Gunnison sage-grouse	*Centrocercus minimus*	x
1	Birds	Piping plover	*Charadrius melodus*	
1	Mammals	River otter	*Lontra canadensis*	
2	Amphibians	Couch's spadefoot	*Scaphiopus couchii*	x
2	Amphibians	Great Plains narrowmouth toad	*Gastrophryne olivacea*	x
2	Amphibians	Northern cricket frog	*Acris crepitans*	
2	Amphibians	Plains leopard frog	*Lithobates blairi*	x
2	Amphibians	Wood frog	*Lithobates sylvatica*	x
2	Birds	American bittern	*Botaurus lentiginosus*	x
2	Birds	American peregrine falcon	*Falco peregrinus anatum*	
2	Birds	Bald eagle	*Haliaeetus leucocephalus*	
2	Birds	Barrow's goldeneye	*Bucephala islandica*	x
2	Birds	Black tern	*Chlidonias niger*	x
2	Birds	Harris's sparrow	*Zonotrichia querula*	x
2	Birds	Long-billed curlew	*Numenius americanus*	

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
2	Birds	Northern harrier	*Circus cyaneus*	x
2	Birds	Prairie falcon	*Falco mexicanus*	
2	Birds	Short-eared owl	*Asio flammeus*	x
2	Birds	White-faced ibis	*Plegadis chihi*	x
2	Birds	Whooping crane	*Grus americana*	x
2	Insects	American bumble bee	*Bombus pensylvanicus*	x
2	Insects	Dot-winged baskettail	*Epitheca petechialis*	x
2	Insects	Great Basin silverspot butterfly	*Speyeria nokomis nokomis*	x
2	Insects	Hoary skimmer	*Libellula nodisticta*	x
2	Insects	Hudsonian emerald	*Somatochlora hudsonica*	x
2	Insects	Monarch butterfly	*Danaus plexippus*	x
2	Insects	Morrison bumble bee	*Bombus morrisoni*	x
2	Insects	Red-veined meadowfly	*Sympetrum madidum*	x
2	Insects	Regal fritillary	*Speyeria idalia*	
2	Insects	Southern plains bumble bee	*Bombus fraternus*	x
2	Insects	Suckley cuckoo bumble bee	*Bombus suckleyi*	x
2	Insects	Susan's purse-making caddisfly	*Ochrotrichia susanae*	x
2	Insects	Two-spotted skipper	*Euphyes bimacula*	x
2	Insects	Western bumble bee	*Bombus occidentalis*	x
2	Insects	Yellow bumble bee	*Bombus fervidus*	x
2	Mammals	Pygmy shrew	*Sorex hoyi montanus*	x
2	Mammals	Snowshoe hare	*Lepus americanus*	x
2	Mollusks	Cockerell	*Promenetus umbillicatellus*	
2	Mollusks	Sharp sprite	*Promenetus exacuous*	
2	Reptiles	Common garter snake	*Thamnophis sirtalis*	x
2	Reptiles	Yellow mud turtle	*Kinosternon flavescens*	

AQUATIC HABITATS

Colorado Plateau - Wyoming Basins Rivers

Colorado Plateau – Wyoming Basins Rivers support 33 SGCN (Table 22). This habitat includes the big rivers within the Colorado Plateau and Wyoming Basin ecoregions of Colorado's western slope: the Colorado, Gunnison, Green, Yampa, White, Dolores, San Juan and Animas. Larger-order rivers contain habitat features that are unavailable in smaller streams, particularly deep pools and runs, and large backwaters and inundated floodplain areas during high water. As a

result, they comprise the core habitat for several big-river fish species, though these species are also occasionally found in smaller streams. Condition of this habitat type varies but is moderately or highly impacted for most of these rivers. Dams and diversions have altered the natural hydrograph to varying degrees. In most of these rivers snowmelt-driven peak flows are greatly reduced, as are base flows in many cases. Peak flow timing may be altered such that these flows no longer coincide with the life-history requirements of big river fish species. Extensive flow management efforts are being made to redress that situation in some rivers. Additionally, dams and diversion structures function as barriers preventing upstream movement of fishes (though fish passage structures have been constructed at some). A number of these species are highly migratory and require many miles of unfragmented habitat in order to move between spawning and rearing, foraging, and overwintering areas. These changes, combined with channelization and bank hardening, impacts from energy development, bank stabilization by non-native vegetation (tamarisk, Russian olive), and other anthropogenic stressors, have degraded the condition of associated riparian habitats as well.

Table 22. SGCN in Colorado Plateau - Wyoming Basins Rivers habitats.

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
1	Amphibians	Northern leopard frog	*Lithobates pipiens*	x
1	Birds	Golden eagle	*Aquila chrysaetos*	
1	Birds	Greater sandhill crane	*Grus canadensis tabida*	
1	Fish	Bluehead sucker	*Catostomus discobolus*	x
1	Fish	Bonytail chub	*Gila elegans*	x
1	Fish	Colorado pikeminnow	*Ptychocheilus lucius*	x
1	Fish	Flannelmouth sucker	*Catostomus latipinnis*	x
1	Fish	Humpback chub	*Gila cypha*	x
1	Fish	Mountain sucker	*Catostomus platytrhinchus*	x
1	Fish	Razorback sucker	*Xyrauchen texanus*	x
1	Fish	Roundtail chub	*Gila robusta*	x
1	Mammals	Fringed myotis	*Myotis thysanodes*	
1	Mammals	River otter	*Lontra canadensis*	x
1	Mammals	Spotted bat	*Euderma maculatum*	
1	Mammals	Townsend's big-eared bat ssp.	*Corynorhinus townsendii pallescens*	
2	Amphibians	Canyon tree frog	*Hyla arenicolor*	x

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
2	Birds	American peregrine falcon	*Falco peregrinus anatum*	
2	Birds	American white pelican	*Pelecanus erythrorhynchos*	
2	Birds	Barrow's goldeneye	*Bucephala islandica*	
2	Birds	Lazuli bunting	*Passerina amoena*	
2	Birds	Lesser scaup	*Aythya affinis*	
2	Birds	Prairie falcon	*Falco mexicanus*	
2	Birds	Purple martin	*Progne subis hesperia*	
2	Birds	Snowy egret	*Egretta thula*	
2	Birds	White-faced ibis	*Plegadis chihi*	x
2	Insects	Brimstone clubtail	*Stylurus intricatus*	x
2	Insects	Mayfly, spp.	*Ametropus neavei*	x
2	Mammals	Allen's big-eared bat	*Idionycteris phyllotis*	
2	Mammals	Arizona myotis	*Myotis occultus*	
2	Mollusks	Cloche ancylid	*Ferrissia walkeri*	
2	Mollusks	Fragil ancylid	*Ferrissia fragilis*	
2	Mollusks	Sharp sprite	*Promenetus exacuous*	
2	Reptiles	Blacknecked garter snake	*Thamnophis cyrtopsis*	x

Colorado Plateau – Wyoming Basins Streams

Colorado Plateau – Wyoming Basins Streams support 28 SGCN (Table 23). This habitat includes tributaries to the big river systems within the Colorado Plateau and Wyoming Basins ecoregions of Colorado's western slope. Condition varies widely, with some streams in excellent condition, but a majority are moderately or severely impacted. Dams and, especially, diversions have altered the natural hydrograph and fragmented habitat, to the extent of entirely dewatering some stream reaches. Other anthropogenic impacts include gravel mining and grazing within the riparian corridor, channelization and bank hardening, impacts from energy development, and encroachment of non-native vegetation (tamarisk, Russian olive), all of which have the potential to degrade water quality and the condition of associated riparian habitats.

685 **Table 23. SGCN in Colorado Plateau - Wyoming Basins Streams habitat.**

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
1	Amphibians	Northern leopard frog	*Lithobates pipiens*	x
1	Birds	Golden eagle	*Aquila chrysaetos*	
1	Birds	Greater sage-grouse	*Centrocercus urophasianus*	
1	Fish	Bluehead sucker	*Catostomus discobolus*	x
1	Fish	Colorado River cutthroat trout	*Oncorhynchus clarki pleuriticus*	
1	Fish	Flannelmouth sucker	*Catostomus latipinnis*	x
1	Fish	Mountain sucker	*Catostomus platytrhinchus*	x
1	Fish	Roundtail chub	*Gila robusta*	
1	Mammals	Fringed myotis	*Myotis thysanodes*	
1	Mammals	River otter	*Lontra canadensis*	
1	Mammals	Spotted bat	*Euderma maculatum*	
1	Mammals	Townsend's big-eared bat ssp.	*Corynorhinus townsendii pallescens*	
2	Amphibians	Canyon tree frog	*Hyla arenicolor*	x
2	Birds	American peregrine falcon	*Falco peregrinus anatum*	
2	Birds	Bald eagle	*Haliaeetus leucocephalus*	x
2	Birds	Barrow's goldeneye	*Bucephala islandica*	
2	Birds	Black swift	*Cypseloides niger*	x
2	Birds	Lazuli bunting	*Passerina amoena*	
2	Birds	Lewis's woodpecker	*Melanerpes lewis*	x
2	Birds	Northern harrier	*Circus cyaneus*	x
2	Birds	Prairie falcon	*Falco mexicanus*	
2	Birds	Snowy egret	*Egretta thula*	
2	Birds	Swainson's hawk	*Buteo swainsoni*	x
2	Insects	Great Basin silverspot butterfly	*Speyeria nokomis nokomis*	
2	Insects	Hoary skimmer	*Libellula nodisticta*	x
2	Mammals	Allen's big-eared bat	*Idionycteris phyllotis*	
2	Mammals	Arizona myotis	*Myotis occultus*	
2	Reptiles	Blacknecked garter snake	*Thamnophis cyrtopsis*	x

686

687 ## Eastern Plains Rivers

688 Eastern Plains Rivers support 38 SGCN (Table 24). This habitat includes the mainstem South
689 Platte and Arkansas Rivers, and the lower portions of major tributaries such as the Cache la
690 Poudre River and St. Vrain Creek. These larger-order rivers contain habitat features generally
691 not found in smaller plains streams, including occasional deep pools, secondary channels and
692 backwaters, and inundated floodplain areas during high water. As a result they comprise the core

habitat for several plains fishes, though these species are also sometimes found in smaller tributaries. Condition is heavily impacted in terms of both water quality and water quantity. Dams and numerous large diversions have greatly altered the timing and magnitude of both peak and base flows, as well as other components of the natural hydrograph. In many reaches, treated municipal waste water and/or irrigation return flows maintain base flows at higher levels than pre-alteration. A plethora of stressors from extensive urban and exurban development, and from agriculture, degrade both water quality and the condition of associated riparian habitats.

Table 24. SGCN in Eastern Plains Rivers habitats.

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
1	Amphibians	Northern leopard frog	*Lithobates pipiens*	x
1	Birds	Golden eagle	*Aquila chrysaetos*	
1	Fish	Arkansas darter	*Etheostoma cragini*	
1	Fish	Brassy minnow	*Hybognathus hankinsoni*	
1	Fish	Flathead chub	*Platygobio gracilus*	x
1	Fish	Orangespotted sunfish	*Lepomis humilis*	x
1	Fish	Orangethroat darter	*Etheostoma spectabile*	
1	Fish	Plains minnow	*Hybognathus placitus*	x
1	Fish	Plains topminnow	*Fundulus sciadicus*	x
1	Fish	Stonecat	*Noturus flavus*	
1	Fish	Suckermouth minnow	*Phenacobius mirabilis*	x
1	Mammals	Little brown bat	*Myotis lucifugus*	
1	Mammals	Meadow jumping mouse (both subspecies)	*Zapus hudsonius luteus and Z. h. preblei*	
1	Mammals	River otter	*Lontra canadensis*	x
2	Amphibians	Northern cricket frog	*Acris crepitans*	x
2	Amphibians	Plains leopard frog	*Lithobates blairi*	x
2	Birds	American peregrine falcon	*Falco peregrinus anatum*	
2	Birds	American white pelican	*Pelecanus erythrorhynchos*	
2	Birds	Bald eagle	*Haliaeetus leucocephalus*	x
2	Birds	Curve-billed thrasher	*Toxostoma curvirostre*	
2	Birds	Forster's tern	*Sterna forsteri*	
2	Birds	Lazuli bunting	*Passerina amoena*	
2	Birds	Lesser scaup	*Aythya affinis*	
2	Birds	Lewis's woodpecker	*Melanerpes lewis*	x
2	Birds	Long-billed curlew	*Numenius americanus*	
2	Birds	Northern bobwhite	*Colinus virginianus*	x
2	Birds	Northern harrier	*Circus cyaneus*	x

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
2	Birds	Prairie falcon	*Falco mexicanus*	
2	Birds	Snowy egret	*Egretta thula*	
2	Fish	Iowa darter	*Etheostoma exile*	x
2	Insects	Paiute dancer	*Argia alberta*	x
2	Insects	Plains snowfly	*Mesocapnia frisoni*	
2	Insects	Stripe-winged baskettail	*Tetragoneuria petechialis*	
2	Mammals	Arizona myotis	*Myotis occultus*	
2	Mollusks	Fragil ancylid	*Ferrissia fragilis*	x
2	Reptiles	Blacknecked garter snake	*Thamnophis cyrtopsis*	x
2	Reptiles	Common garter snake	*Thamnophis sirtalis*	x
2	Reptiles	Long-nosed snake	*Rhinocheilus lecontei*	

Eastern Plains Streams

Eastern Plains Streams support 46 SGCN (Table 25). This habitat includes the tributaries to the big rivers of Colorado's eastern plains, and the Republican River and its tributaries. Most of these streams rise on the plains and thus have a hydrograph and temperature regime distinct from streams originating in the mountains. Streams in this region are of a diverse character. Many rise from springs and flow consistently in headwaters areas but subside into intermittency further downstream, only becoming more perennial again when they reach the alluvium of the mainstem. These systems only fully connect during flood events. Some plains fishes appear to be specifically adapted to this flashiness and utilize periods of connectivity to redistribute and re-colonize habitat patches. Streams in the Republican basin tend to be more historically perennial, as are a few larger tributaries such as the Purgatoire and St. Charles Rivers. Diversions and habitat degradation threaten all these streams to varying degrees. A more pressing threat throughout most of the region is drying and fragmentation due to groundwater irrigation depleting underlying aquifers. This threat is particularly dire in the Republican Basin, but is imminent throughout the Eastern plains.

719 **Table 25. SGCN in Eastern Plains Streams habitats.**

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
1	Amphibians	Northern leopard frog	*Lithobates pipiens*	x
1	Birds	Golden eagle	*Aquila chrysaetos*	
1	Fish	Arkansas darter	*Etheostoma cragini*	x
1	Fish	Brassy minnow	*Hybognathus hankinsoni*	x
1	Fish	Flathead chub	*Platygobio gracilus*	x
1	Fish	Orangespotted sunfish	*Lepomis humilis*	x
1	Fish	Orangethroat darter	*Etheostoma spectabile*	x
1	Fish	Plains minnow	*Hybognathus placitus*	
1	Fish	Plains topminnow	*Fundulus sciadicus*	x
1	Fish	Southern redbelly dace	*Chrosomus erythrogaster*	
1	Fish	Stonecat	*Noturus flavus*	x
1	Fish	Suckermouth minnow	*Phenacobius mirabilis*	x
1	Mammals	Little brown bat	*Myotis lucifugus*	
1	Mammals	Meadow jumping mouse (both subspecies)	*Zapus hudsonius luteus and Z. h. preblei*	x
1	Mammals	River otter	*Lontra canadensis*	
2	Amphibians	Great Plains narrowmouth toad	*Gastrophryne olivacea*	x
2	Amphibians	Green toad	*Anaxyrus debilis*	x
2	Amphibians	Northern cricket frog	*Acris crepitans*	x
2	Amphibians	Plains leopard frog	*Lithobates blairi*	x
2	Birds	American peregrine falcon	*Falco peregrinus anatum*	
2	Birds	Bald eagle	*Haliaeetus leucocephalus*	x
2	Birds	Curve-billed thrasher	*Toxostoma curvirostre*	
2	Birds	Harris's sparrow	*Zonotrichia querula*	x
2	Birds	Lazuli bunting	*Passerina amoena*	
2	Birds	Lewis's woodpecker	*Melanerpes lewis*	x
2	Birds	Long-billed curlew	*Numenius americanus*	
2	Birds	Northern harrier	*Circus cyaneus*	x
2	Birds	Prairie falcon	*Falco mexicanus*	
2	Birds	Snowy egret	*Egretta thula*	
2	Birds	Swainson's hawk	*Buteo swainsoni*	x
2	Fish	Iowa darter	*Etheostoma exile*	x
2	Insects	Hoary skimmer	*Libellula nodisticta*	x
2	Insects	Lemon-faced emerald	*Somatochlora ensigera*	x
2	Insects	Paiute dancer	*Argia alberta*	x
2	Insects	Plains snowfly	*Mesocapnia frisoni*	
2	Insects	Stripe-winged baskettail	*Tetragoneuria petechialis*	
2	Insects	Two-spotted skipper	*Euphyes bimacula*	x
2	Mammals	Arizona myotis	*Myotis occultus*	
2	Mollusks	Cylindrical papershell	*Anodontoides ferussacianus*	x
2	Mollusks	Fragil ancylid	*Ferrissia fragilis*	x
2	Mollusks	Pondhorn	*Uniomerus tetralasmus*	x

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
2	Reptiles	Blacknecked garter snake	*Thamnophis cyrtopsis*	x
2	Reptiles	Common garter snake	*Thamnophis sirtalis*	x
2	Reptiles	New Mexico threadsnake	*Rena dissecta*	
2	Reptiles	Night snake	*Hypsiglena chlorophaea*	
2	Reptiles	Yellow mud turtle	*Kinosternon flavescens*	x

720

721 ## Lakes

722 Lakes support 25 SGCN (Table 26). This habitat type includes only natural lakes, the majority of
723 which occur in the subalpine and montane zones. Very few lower-elevation natural lakes exist
724 within Colorado; most of these are oxbow lakes, former river channels that became isolated, and
725 are quite small. Because this habitat type occurs mostly at high elevations where human impacts
726 and natural disturbances are limited, its condition is generally excellent.

727

728 **Table 26. SGCN in Lakes habitats.**

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
1	Amphibians	Boreal toad (Southern Rocky Mountain Population)	*Anaxyrus boreas boreas*	x
1	Amphibians	Northern leopard frog	*Lithobates pipiens*	x
1	Fish	Colorado River cutthroat trout	*Oncorhynchus clarki pleuriticus*	x
1	Fish	Flannelmouth sucker	*Catostomus latipinnis*	
1	Fish	Greenback cutthroat trout	*Oncorhynchus clarki stomias*	x
1	Fish	Northern redbelly dace	*Chrosomus eos*	
1	Fish	Orangespotted sunfish	*Lepomis humilis*	
1	Fish	Rio Grande chub	*Gila pandora*	
1	Fish	Rio Grande cutthroat trout	*Oncorhynchus clarki virginalis*	x
1	Fish	Southern redbelly dace	*Chrosomus erythrogaster*	
2	Amphibians	Wood frog	*Lithobates sylvatica*	x
2	Birds	Barrow's goldeneye	*Bucephala islandica*	x
2	Birds	White-faced ibis	*Plegadis chihi*	x
2	Fish	Lake chub	*Couesius plumbeus*	x
2	Insects	Hoary skimmer	*Libellula nodisticta*	x
2	Insects	Red-veined meadowfly	*Sympetrum madidum*	x
2	Mollusks	Banded physa	*Physella vinosa*	x

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
2	Mollusks	Cloche ancylid	*Ferrissia walkeri*	x
2	Mollusks	Cockerell	*Promenetus umbillicatellus*	x
2	Mollusks	Cylindrical papershell	*Anodontoides ferussacianus*	x
2	Mollusks	Fragil ancylid	*Ferrissia fragilis*	
2	Mollusks	Pondhorn	*Uniomerus tetralasmus*	x
2	Mollusks	Rocky Mountain capshell	*Acroloxus coloradensis*	x
2	Mollusks	Sharp sprite	*Promenetus exacuous*	x
2	Reptiles	Yellow mud turtle	*Kinosternon flavescens*	x

729

730 ## Mountain Streams

731 Mountain streams support 29 SGCN (Table 27). Mountain stream habitat includes high
732 elevation streams on both sides of the Continental Divide. These streams are characterized by
733 high gradient, cold temperatures, and a snowmelt-dominated hydrograph. Though few
734 waterways in Colorado have escaped some level of disturbance, mountain streams remain in
735 good condition overall.

736

737 **Table 27. SGCN in Mountain Stream habitats.**

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
1	Amphibians	Boreal toad (Southern Rocky Mountain Population)	*Anaxyrus boreas boreas*	x
1	Amphibians	Northern leopard frog	*Lithobates pipiens*	x
1	Birds	Golden eagle	*Aquila chrysaetos*	
1	Birds	Greater sandhill crane	*Grus canadensis tabida*	
1	Fish	Colorado River cutthroat trout	*Oncorhynchus clarki pleuriticus*	x
1	Fish	Greenback cutthroat trout	*Oncorhynchus clarki stomias*	x
1	Fish	Mountain sucker	*Catostomus platytrhinchus*	
1	Fish	Rio Grande chub	*Gila pandora*	
1	Fish	Rio Grande cutthroat trout	*Oncorhynchus clarki virginalis*	x
1	Fish	Rio Grande sucker	*Catostomus plebeius*	x
1	Mammals	Fringed myotis	*Myotis thysanodes*	
1	Mammals	Little brown bat	*Myotis lucifugus*	
1	Mammals	Meadow jumping mouse (both subspecies)	*Zapus hudsonius luteus and Z. h. preblei*	x
1	Mammals	River otter	*Lontra canadensis*	x

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
1	Mammals	Townsend's big-eared bat ssp.	*Corynorhinus townsendii pallescens*	
2	Amphibians	Wood frog	*Lithobates sylvatica*	x
2	Birds	American peregrine falcon	*Falco peregrinus anatum*	
2	Birds	Bald eagle	*Haliaeetus leucocephalus*	
2	Birds	Barrow's goldeneye	*Bucephala islandica*	
2	Birds	Black swift	*Cypseloides niger*	x
2	Birds	Lazuli bunting	*Passerina amoena*	
2	Birds	Prairie falcon	*Falco mexicanus*	
2	Birds	Purple martin	*Progne subis hesperia*	
2	Insects	Arapahoe snowfly	*Capnia arapahoe*	x
2	Mammals	Arizona myotis	*Myotis occultus*	
2	Mammals	Grizzly bear*	*Ursus arctos*	
2	Mollusks	Cockerell	*Promenetus umbillicatellus*	
2	Mollusks	Rocky Mountain capshell	*Acroloxus coloradensis*	
2	Mollusks	Sharp sprite	*Promenetus exacuous*	

Rio Grande Valley Rivers

Rio Grande Valley Rivers support two Tier 1 SGCN (Table 28). This habitat consists of the mainstem Rio Grande and the Conejos River. The high elevation and distinct climate of this watershed differentiate it from other east slope drainages. Within the watershed, these larger-order rivers contain habitat features infrequently found in the tributaries, particularly deep pools and runs. Historically the Rio Grande and Conejos are known or believed to have been primary habitat for several endemic species. However due to hydrologic and biological alteration the endemics that persist are today found mostly in the smaller tributaries.

Table 28. SGCN in Rio Grande Valley Rivers habitats.

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
1	Fish	Rio Grande chub	*Gila pandora*	x
1	Fish	Rio Grande sucker	*Catostomus plebeius*	x

Rio Grande Valley Streams

Rio Grande Valley Streams support two Tier 1 SGCN (Table 29). This habitat includes the tributaries to the Rio Grande and Conejos River, plus closed-basin streams associated with the Great Sand Dunes. Condition of these streams varies but most are low to moderately impacted. Diversions, mainly for agricultural use, have altered the natural hydrograph and fragmented streams to varying degrees, in some cases entirely dewatering stream reaches. The closed-basin streams remain less disturbed, although some are threatened by drying of the aquifer.

Table 29. SGCN in Rio Grande Valley Streams habitats.

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
1	Fish	Rio Grande chub	*Gila pandora*	x
1	Fish	Rio Grande sucker	*Catostomus plebeius*	x

Transition Zone Streams

Transition zone streams support 34 SGCN (Table 30). The abrupt transition from mountains to plains along the Front Range and east slope give rise to this habitat. At this juncture streams rapidly lose gradient, increase in sinuosity and acquire other characteristics of plains streams, but continue to have a snowmelt-driven hydrograph, colder temperatures and coarser cobble-gravel substrate, reflective of their origin in the mountains, for some distance downstream. These relatively short reaches of intermediate character comprise the sole habitat within Colorado for several "glacial relict" SGCN—species adapted to lower-gradient waters that are cooler than most Colorado plains streams—which are believed to have been "stranded" in this zone as glaciers receded. Because most Front Range cities were established along rivers at the base of the mountains, the transition zone is heavily impacted by many effects of urban development, and is among the most imperiled of aquatic habitats in Colorado. Additionally, it is likely especially

772 vulnerable to climate change, with the prospect of species being "pinched" between warmer
773 water downstream and unfavorable gradient upstream.
774
775 **Table 30. SGCN in Transition Zone Stream habitats.**

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
1	Amphibians	Northern leopard frog	*Lithobates pipiens*	x
1	Birds	Golden eagle	*Aquila chrysaetos*	
1	Fish	Arkansas darter	*Etheostoma cragini*	
1	Fish	Brassy minnow	*Hybognathus hankinsoni*	x
1	Fish	Common shiner	*Luxilus cornutus*	x
1	Fish	Flathead chub	*Platygobio gracilus*	x
1	Fish	Northern redbelly dace	*Chrosomus eos*	x
1	Fish	Orangespotted sunfish	*Lepomis humilis*	
1	Fish	Orangethroat darter	*Etheostoma spectabile*	
1	Fish	Plains topminnow	*Fundulus sciadicus*	x
1	Fish	Southern redbelly dace	*Chrosomus erythrogaster*	x
1	Fish	Stonecat	*Noturus flavus*	x
1	Fish	Suckermouth minnow	*Phenacobius mirabilis*	
1	Mammals	Fringed myotis	*Myotis thysanodes*	
1	Mammals	Little brown bat	*Myotis lucifugus*	
1	Mammals	Meadow jumping mouse (both subspecies)	*Zapus hudsonius luteus and Z. h. preblei*	
1	Mammals	River otter	*Lontra canadensis*	
1	Mammals	Townsend's big-eared bat ssp.	*Corynorhinus townsendii pallescens*	
2	Birds	American peregrine falcon	*Falco peregrinus anatum*	
2	Birds	Bald eagle	*Haliaeetus leucocephalus*	x
2	Birds	Lazuli bunting	*Passerina amoena*	
2	Birds	Lewis's woodpecker	*Melanerpes lewis*	x
2	Birds	Mexican spotted owl	*Strix occidentalis lucida*	x
2	Birds	Northern harrier	*Circus cyaneus*	x
2	Birds	Prairie falcon	*Falco mexicanus*	
2	Birds	Snowy egret	*Egretta thula*	
2	Birds	Virginia's warbler	*Vermivora virginiae*	
2	Fish	Iowa darter	*Etheostoma exile*	x
2	Insects	Arapahoe snowfly	*Capnia arapahoe*	
2	Insects	Hops feeding azure	*Celastrina humulus*	x
2	Insects	Moss's elfin	*Callophrys mossii schryveri*	
2	Insects	Plains snowfly	*Mesocapnia frisoni*	x
2	Mammals	Arizona myotis	*Myotis occultus*	
2	Mollusks	Banded physa	*Physella vinosa*	x

776

OTHER HABITATS

Alpine

Alpine habitats, which cover over 1.5 million acres in Colorado, support 18 SGCN (Table 31). Alpine includes high-elevation dry tundra, fellfield, wet-meadow, and rock and scree communities. Alpine tundra is found at the highest elevations in our state, usually above 11,000 feet. Here the long winters, abundant snowfall, high winds, and short summers create an environment too harsh for permanent human habitation. Vegetation in these areas is controlled by snow retention, wind desiccation, permafrost, and a short growing season.

Old privately-owned mining claims are scattered throughout, but there are very few active mines operating today. In general, alpine tundra in Colorado is currently in excellent condition. The primary threat to this ecological system is global climate change, which could have significant impacts in the future. Preliminary results from our climate change vulnerability assessment suggest that alpine habitats are moderately vulnerable through mid-century. Snowpack patterns are important for this habitat. Thus, if Colorado experiences an increase in winter precipitation, alpine areas may be able to withstand some increase in temperature, at least in the short term, and especially in areas where it is difficult for trees to advance. At a longer time frame, however, alpine is likely to largely disappear from Colorado.

Table 31. SGCN in Alpine Habitats.

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
1	Birds	Brown-capped rosy-finch	*Leucosticte australis*	x
1	Birds	Golden eagle	*Aquila chrysaetos*	
1	Birds	White-tailed ptarmigan	*Lagopus leucura*	x
1	Mammals	Pika	*Ochotona princeps*	x
1	Mammals	Wolverine	*Gulo gulo*	x
2	Birds	Black rosy-finch	*Leucosticte atrata*	x
2	Birds	Prairie falcon	*Falco mexicanus*	

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
2	Birds	Rufous hummingbird	*Selasphorus rufus*	x
2	Insects	American bumble bee	*Bombus pensylvanicus*	x
2	Insects	Morrison bumble bee	*Bombus morrisoni*	x
2	Insects	Southern plains bumble bee	*Bombus fraternus*	x
2	Insects	Suckley cuckoo bumble bee	*Bombus suckleyi*	x
2	Insects	Uncompahgre fritillary	*Boloria improba acrocnema*	x
2	Insects	Western bumble bee	*Bombus occidentalis*	x
2	Insects	Yellow bumble bee	*Bombus fervidus*	x
2	Mammals	American marten	*Martes americana*	x
2	Mammals	Bighorn sheep	*Ovis canadensis*	
2	Mammals	Grizzly bear*	*Ursus arctos*	x

Cliffs and Canyons

Cliffs and canyons support 18 SGCN (Table 32). Mountain cliffs and canyons habitats are found from foothill to subalpine elevations. They include barren and sparsely vegetated landscapes comprised of steep cliff faces, narrow canyons, and open tablelands, as well as the unstable scree and talus slopes that typically occur below cliff faces. Widely scattered trees and shrubs may be present. These highly erodible areas are generally too steep to allow any significant soil development. Erosion by wind, water, and the force of gravity is the primary natural disturbance process in the cliff environment. Cliffs and canyons have a naturally high rate of erosion; infiltration rates are low and runoff high. At cliff faces there is less hydraulic pressure retaining water within the rock, so liquid water is more consistently found than in the surrounding habitat types (Larson et al. 2000). Within the larger cliff habitat, steep slopes, small terraces ledges, overhangs, cracks and crevices often form a mosaic of microhabitat types that appears to be the primary factor contributing to cliff biodiversity (Graham and Knight 2004). Cliffs and bedrock outcrops are relatively free of anthropogenic disturbance, but the canyons where these often occur are rarely without roads. Human disturbance to this system may include road construction and maintenance, recreation (especially climbing), and the effects of mining.

On the eastern plains, this habitat type includes cliffs, outcrops, breaks and barrens, rimrock and erosional remnants of the High Plains escarpment, as well as other isolated buttes and outcrops to the south. Drought and wind erosion are the most common natural dynamics affecting this prairie system. Wind energy development is increasing on prairie cliff/canyon habitats.

In general, condition of cliff and canyon habitats is good. Many cliff and canyon habitats are virtually inaccessible and in excellent condition.

Table 32. SGCN in Cliff and Canyon habitats.

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
1	Birds	Golden eagle	*Aquila chrysaetos*	x
1	Mammals	Fringed myotis	*Myotis thysanodes*	x
1	Mammals	Little brown bat	*Myotis lucifugus*	
1	Mammals	Spotted bat	*Euderma maculatum*	x
1	Mammals	Townsend's big-eared bat ssp.	*Corynorhinus townsendii pallescens*	
1	Reptiles	Colorado checkered whiptail	*Aspidoscelis neotesselata*	x
2	Amphibians	Canyon tree frog	*Hyla arenicolor*	
2	Arachnids	A lampshade spider	*Hypochilus bonneti*	x
2	Birds	American peregrine falcon	*Falco peregrinus anatum*	x
2	Birds	Black swift	*Cypseloides niger*	x
2	Birds	Ferruginous hawk	*Buteo regalis*	
2	Birds	Mexican spotted owl	*Strix occidentalis lucida*	x
2	Birds	Prairie falcon	*Falco mexicanus*	x
2	Insects	Colorado blue	*Euphilotes rita coloradensis*	x
2	Mammals	Allen's big-eared bat	*Idionycteris phyllotis*	
2	Mammals	Big free-tailed bat	*Nyctinomops macrotis*	x
2	Mammals	Bighorn sheep	*Ovis canadensis*	x
2	Reptiles	Midget faded rattlesnake	*Crotalus oreganus concolor*	x

Hot Springs

Hot Springs are the primary habitat for one Tier 2 SGCN (Table 33). These habitats are limited to physical settings that allow groundwater heated by geothermal processes to rise to the surface. Many of Colorado's hot springs have been developed for human recreation. Presumably this has

had deleterious effects on habitat quality, but detailed condition of Colorado's hot springs has not been evaluated.

Table 33. SGCN in Hot Springs habitats.

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
2	Mollusks	Hot Springs physa	*Physa cupreonitens*	x

Reservoirs & Shorelines

This habitat, though man-made, is significant for 13 of Colorado's Tier 2 SGCN, most notably the federally listed Least tern and Piping plover (Table 34).

Table 34. SGCN in Reservoirs & Shorelines habitats.

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
2	Birds	American white pelican	*Pelecanus erythrorhynchos*	x
2	Birds	Least tern	*Sterna antillarum*	x
2	Birds	Piping plover	*Charadrius melodus*	x
2	Birds	Western snowy plover	*Charadrius alexandrinus nivosus*	x
2	Birds	White-faced ibis	*Plegadis chihi*	x
2	Insects	American bumble bee	*Bombus pensylvanicus*	x
2	Insects	Morrison bumble bee	*Bombus morrisoni*	x
2	Insects	Southern plains bumble bee	*Bombus fraternus*	x
2	Insects	Suckley cuckoo bumble bee	*Bombus suckleyi*	x
2	Insects	Western bumble bee	*Bombus occidentalis*	x
2	Insects	Yellow bumble bee	*Bombus fervidus*	x
2	Mollusks	Cloche ancylid	*Ferrissia walkeri*	
2	Mollusks	Fragil ancylid	*Ferrissia fragilis*	

Sand Dunes

Sand Dunes are a primary habitat for three Tier 2 SGCN (Table 35). In Colorado, small sand dunes habitats occur in North Park and Middle Park, but the majority of sand dunes habitat

occurs in the San Luis Valley. These environments are comprised of shifting, coarse-textured substrates and patchy or open grasslands or shrublands. Active and stabilized dune areas include a range of sparsely vegetated plant communities as well as barren or near barren (<5% total plant cover) portions of active sand dunes and sandsheet blowouts, where scattered individuals of early seral species such as blowout grass (*Redfieldia flexuosa*) and lemon scurfpea (*Psoralidium lanceolatum*), and (rarely) Indian ricegrass (*Achnatherum hymenoides*), are the only vegetation. The sandsheet may also include limited areas with woodlands of narrowleaf cottonwood or ponderosa pine on otherwise sandy areas, as well as both shrubby and grassy areas where vegetation is acting to anchor dunes. Shrub dominated plant communities of the sandsheet are shrub steppe or shrublands dominated by rabbitbrush and other shrubs with a typically sparse herbaceous layer dominated by bunchgrasses. In early seral stages, vegetated dunes and sandsheet areas where shrubs are absent may be characterized by an herbaceous layer typically dominated by scurfpea and/or blowout grass, while in late seral stages Indian ricegrass, needle-and-thread or sand muhly (*Muhlenbergia arenicola*) are typical. The condition of most sand dune habitats in Colorado is very good, with the exception of those in North Park, where the dunes are impacted by recreational vehicle use and weeds.

Table 35. SGCN in Sand Dunes habitats.

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
2	Insects	Great Sand Dunes anthicid beetle	*Amblyderus werneri*	x
2	Insects	San Luis Dunes tiger beetle	*Cicindela theatina*	x
2	Insects	Wiest's sphinx moth	*Euproserpinus wiesti*	x

Agriculture

For the purposes of the SWAP, this habitat type is restricted to tilled agriculture, including croplands and orchards. Though rangelands are an important component of our state's

agricultural system, native rangelands are included under relevant grassland and shrubland habitat types. Agricultural fields constitute a man-made environment, but they now serve as important habitat for 39 SGCN (Table 36).

Table 36. SGCN in Agriculture habitats.

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
1	Birds	Burrowing owl	*Athene cunicularia hypugaea*	
1	Birds	Columbian sharp-tailed grouse	*Tympanuchus phasianellus columbianus*	
1	Birds	Greater sage-grouse	*Centrocercus urophasianus*	
1	Birds	Greater sandhill crane	*Grus canadensis tabida*	x
1	Birds	Gunnison sage-grouse	*Centrocercus minimus*	
1	Birds	Lesser prairie-chicken	*Tympanuchus pallidicinctus*	
1	Birds	Mountain plover	*Charadrius montanus*	x
2	Birds	American bittern	*Botaurus lentiginosus*	
2	Birds	Bald eagle	*Haliaeetus leucocephalus*	
2	Birds	Band-tailed pigeon	*Patagioenas fasciata*	
2	Birds	Bobolink	*Colinus virginianus*	x
2	Birds	Brewer's sparrow	*Spizella breweri*	
2	Birds	Cassin's sparrow	*Aimophila cassinii*	
2	Birds	Chestnut-collared longspur	*Calcarius ornatus*	
2	Birds	Curve-billed thrasher	*Toxostoma curvirostre*	
2	Birds	Ferruginous hawk	*Buteo regalis*	
2	Birds	Greater prairie-chicken	*Tympanuchus cupido*	x
2	Birds	Harris's sparrow	*Zonotrichia querula*	x
2	Birds	Lark bunting	*Calamospiza melanocorys*	x
2	Birds	Lewis's woodpecker	*Melanerpes lewis*	
2	Birds	Loggerhead shrike	*Lanius ludovicianus*	x
2	Birds	Long-billed curlew	*Numenius americanus*	
2	Birds	McCown's longspur	*Rhynchophanes mccownii*	
2	Birds	Northern bobwhite	*Colinus virginianus*	x
2	Birds	Northern harrier	*Circus cyaneus*	x
2	Birds	Prairie falcon	*Falco mexicanus*	
2	Birds	Short-eared owl	*Asio flammeus*	
2	Birds	Swainson's hawk	*Buteo swainsoni*	x
2	Birds	Upland sandpiper	*Bartramia longicauda*	
2	Birds	White-faced ibis	*Plegadis chihi*	x
2	Birds	Whooping crane	*Grus americana*	x
2	Insects	American bumble bee	*Bombus pensylvanicus*	x
2	Insects	Monarch butterfly	*Danaus plexippus*	x
2	Insects	Morrison bumble bee	*Bombus morrisoni*	x

SGCN Tier	Taxonomic Group	Common Name	*Scientific Name*	Primary Habitat
2	Insects	Southern plains bumble bee	*Bombus fraternus*	x
2	Insects	Suckley cuckoo bumble bee	*Bombus suckleyi*	x
2	Insects	Western bumble bee	*Bombus occidentalis*	x
2	Insects	Yellow bumble bee	*Bombus fervidus*	x
2	Mammals	Swift fox	*Vulpes velox*	x

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Literature Cited

Cariveau, A.B. and D. Pavlacky. 2008. Assessment and conservation of playas in Eastern Colorado. Rocky Mountain Bird Observatory, Fort Collins, CO. Available at: http://rmbo.org/v3/Portals/0/RMBOColoradoPlayaFinalReport2008.pdf

Colorado Natural Heritage Program [CNHP]. 2005-2007. Ecological systems of Colorado. Descriptions and rank specifications. Colorado Natural Heritage Program, Colorado State University, Fort Collins, CO.

Colorado State Forest Service. 2010. Colorado statewide forest resource assessment. A foundation for strategic discussion and implementation of forest management in Colorado. Colorado State University, Fort Collins, CO.

Colorado State Forest Service. 2013. 2013 report on the health of Colorado's forests – caring for Colorado's Forests: today's challenges, tomorrow's opportunities. Colorado State University, Fort Collins, CO.

Graham, L. and R.L. Knight. 2004. Multi-scale comparisons of cliff vegetation in Colorado. Plant Ecology 170:223-234.

Larson, D.W., U. Matthes, and P.E. Kelly. 2000. Cliff Ecology: Pattern and Process in Cliff Ecosystems. Cambridge University Press. 340 pp

NatureServe. 2014. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1, NatureServe, Arlington, VA. http://explorer.natureserve.org. Accessed August, 2014

Neely, B., R. Rondeau, J. Sanderson, C. Pague, B. Kuhn, J. Siemers, L. Grunau, J. Robertson, P. McCarthy, J. Barsugli, T. Schulz, and C. Knapp. Editors. Gunnison Basin: Vulnerability Assessment for the Gunnison Climate Working Group by The Nature Conservancy, Colorado Natural Heritage Program, Western Water Assessment, University of Colorado, Boulder, and University of Alaska, Fairbanks. Project of the Southwest Climate Change Initiative.

Rehfeldt, G.E., D.E. Ferguson, and N.L. Crookston. 2009. Aspen, climate, and sudden decline in western USA. Forest Ecology and Management 258: 2353–2364.

Rondeau, R., K. Decker, J. Handwerk, J. Siemers, L. Grunau, and C. Pague. 2011. The state of Colorado's biodiversity 2011. Prepared for The Nature Conservancy, Colorado Natural Heritage Program, Colorado State University, Fort Collins, CO.

USGS National Gap Analysis Program. 2004. Provisional Digital Land Cover Map for the Southwestern United States. Version 1.0. RS/GIS Laboratory, College of Natural Resources, Utah State University.

Worrall J.J., L. Egeland, T. Eager, R. Mask, E. Johnson, et al. 2008. Rapid mortality of *Populus tremuloides* in southwestern Colorado, USA. Forest Ecology and Management 255(3-4): 686-696. http://dx.doi.org/10.1016/j.foreco.2007.09.071.

Worrall, J.J., G.E. Rehfeldt, A. Hamann, E.H. Hogg, S.B. Marchetti, M. Michaelian, and L.K. Gray. 2013. Recent declines of *Populus tremuloides* in North America linked to climate. Forest Ecology and Management 229:35-51.