

CHAPTER 5

SPECIES OF CONCERN

In this chapter, we identify and describe the population status and habitat requirements of 11 species of concern to be addressed in the habitat assessment and conservation plan components of this document. For these purposes, we define species of concern as declining or potentially declining sagebrush-dependent vertebrates without existing conservation, recovery, or management plans.

Our species of concern selection process was to 1) identify species associated with sagebrush in the assessment area, 2) eliminate those species for which conservation planning or management exists or is underway, 3) determine which remaining species are experiencing population decline or potential decline, and 4) select from the remaining species those whose habitat can be evaluated meaningfully on a regional scale.

Descriptions of species of concern, their population status, and habitat requirements were derived from literature review and expert knowledge. We provide summary descriptions in this chapter's text and tables, and detailed species profiles in the [Appendix](#). In [Chapter 6](#), we delineate species ranges within the assessment area and estimate current sagebrush habitat within each species' range. In [Chapter 7](#), we group the species of concern for planning purposes. We propose conservation strategies for those groups in [Chapter 8](#).

Selection of Species of Concern

Methods

We began the selection process by compiling a master list of vertebrate species occurring in the assessment area and to some degree associated with or dependent upon sagebrush ([Figure 5-1](#), Step 1). We relied primarily on species range and habitat descriptions published in *Mammals of Colorado* (Fitzgerald et al. 1994), *Amphibians and Reptiles in Colorado* (Hammerson 1999), *Birds of Western Colorado Plateau and Mesa Country* (Righter et al. 2004), *Colorado Birds: A Reference to their Habitat and Distribution* (Andrews and Righter 1992) and *Birds of North America* species accounts (Poole and Gill). We also relied heavily on habitat occurrence records in the *Colorado Breeding Bird Atlas* (Kingery 1998), on density data provided by Rocky Mountain Bird Observatory's Monitoring Colorado's Birds (MCB) program (T. Leukering, pers. comm.), and on CDOW staff knowledge.

We reviewed the master list and identified species whose populations are known or generally perceived to be stable ([Figure 5-1](#), Step 2). For the population status of mammals and herptiles, we relied on the expert opinions in *Mammals of Colorado* (Fitzgerald et al. 1994), *Amphibians and Reptiles in Colorado* (Hammerson 1999), and to a lesser extent, natural heritage rankings for states and provinces in western North America (NatureServe 2004). For the population status of birds, we examined North American Breeding Bird Survey (BBS) data (Sauer et al. 2004) and species accounts published by *Birds of North America, Inc.* (Poole and Gill). Where BBS data proved statistically unreliable for Colorado, we relied on statistically reliable trend results for larger BBS regions encompassing Colorado, and upon a recent spatial analysis of BBS data by Dobkin and Sauder (2004). Current Colorado trends tracked by MCB are as yet uncertain (T. Leukering, pers. comm.). Large mammals were eliminated from consideration during this step based on CDOW direction.

From the remaining species (those we determined to be in decline or potentially in decline), we eliminated those for which conservation planning exists or is underway in the assessment area

(Figure 5-1, Step 3). We then identified remaining species known only from a few historic occurrences or localized populations in the assessment area, as well as species with distributions closely tied to fine-scale habitat requirements, such as cliff faces for nesting (Figure 5-1, Steps 4 and 5). Species with strong ties to fine-scale habitat features and those with localized populations or ranges less than 100,000 ha are more appropriately addressed at the local planning level (Wisdom et al. 2003a; Wisdom et al. 2003b). Finally, in the interest of prioritizing sagebrush habitat assessment and planning efforts, we eliminated species determined to have only weak ties to sagebrush (<10 percent estimated breeding occurrences in sagebrush) in the assessment area (Figure 5-1, Step 6). Each of the species identified during Steps 2 through 6 was excluded from further assessment. CDOW staff provided input during the selection process and approved the final list of species of concern (Figure 5-1, Step 7).

Results

With the concurrence of CDOW staff we identified 73 sagebrush-associated vertebrates in the assessment area (Table 5-1), including 21 birds, 11 herptiles, and 41 mammals. Table 5-1 summarizes the results of the species selection filter process (Figure 5-1). Thirty of the master list species are known or believed to have stable populations in the assessment area and were eliminated from further consideration, including large mammals (“commodity species”) that are relatively intensively managed by CDOW. Of the 43 species known to be in decline or potentially in decline, 14 were eliminated from our assessment because they are addressed in existing conservation or recovery plans (Tables 5-1 and 5-2). Of the 29 remaining species, 5 rare or local species were eliminated, along with 2 others with strong ties to fine-scale habitat features (Tables 5-1 and 5-3). An additional 11 species determined to be only weakly associated with sagebrush were also eliminated, leaving 11 vertebrates (8 birds and 3 mammals) suitable for coarse-scale habitat assessment and regional conservation planning in the assessment area: sage sparrow, Brewer’s sparrow, sage thrasher, sagebrush vole, vesper sparrow, green-tailed towhee, Merriam’s shrew, kit fox, black-throated sparrow, lark sparrow, and northern harrier. These 11 vertebrates are hereafter referred to as “species of concern” in this assessment.

Discussion

Of the 62 sagebrush-associated species eliminated from our assessment, only greater sage-grouse and Gunnison sage-grouse are sagebrush obligates. Conservation plans are in place for both grouse species at the regional level (Table 5-2).

Kit fox are rare in the assessment area and may be extirpated from Colorado (T. Beck, pers. comm.). Although our species of concern selection criteria specifically excludes rare species from regional analysis, we include kit fox in our assessment and conservation strategy 1) because of its legal status of endangered in the state of Colorado and 2) because sagebrush habitat in kit fox estimated historic range can be mapped at the regional level.

The ranges of vesper sparrow, lark sparrow, and northern harrier extend well east of the Rocky Mountains. Populations occurring west of the Rockies in shrubsteppe habitats are of great importance for these species, because they are experiencing significant population declines in the eastern United States (Sauer et al. 2004) where farmlands are transitioning to forests and residential or urban development.

Species of Concern Descriptions

We provide detailed profiles of each of the 11 species of concern in the Appendix. Tables 5-4 and 5-5 summarize key biology / habitat characteristics, and the population / conservation status of each species in the assessment area, respectively.

The 11 species of concern fall into the following general categories: 1) sagebrush obligate species, 2) sagebrush/montane shrubland species, 3) sagebrush/semi-desert shrubland species, and 4) habitat generalists. These categories are based on the literature (Colorado occurrence data, published species habitat descriptions, and research in sagebrush regions elsewhere in western North America) and help illustrate the degree to which each species is dependent upon sagebrush habitat in the assessment area. We delineate species ranges and estimate the availability of sagebrush and non-sagebrush habitats in the assessment area for each species in [Chapter 6](#).

Significant gaps exist in our knowledge of the biology, ecology, population status, and responses to threats of each species of concern (see individual species profiles in the [Appendix](#)). The majority of information for each species is derived from studies made outside of Colorado. The best known species are the sagebrush-obligate passerine birds: sage sparrow, Brewer's sparrow, and sage thrasher. Lark sparrow, vesper sparrow, black-throated sparrow, and northern harrier are relatively poorly studied in sagebrush habitats, but well studied in other habitat types. Green-tailed towhee is the least-known passerine bird of the species of concern. Colorado's kit fox population was studied intensively in western Colorado from 1992 to 1996, with follow-up work in 1998 and 2000. Census work has lapsed since that time. Almost nothing is known about the population status, biology, or ecology of sagebrush vole or Merriam's shrew in Colorado, and very little is known about them in other parts of their range.

Threats to Species of Concern

We outline threats to each species in the individual species profiles in the [Appendix](#) and briefly discuss threats and the interactions among threats common to species of concern here. In [Chapter 6](#), we estimate selected risks to sagebrush habitat within each species' range in the assessment area.

The most serious long-term threat to all species of concern in the assessment area, especially to the sagebrush obligates, is habitat loss (Dobkin and Sauder 2004; Knick and Rotenberry 1995). The mechanisms of sagebrush loss are various, and include residential and urban development; energy development; agricultural conversion; range improvement programs that prescribe reduction or eradication of sagebrush; and encroachment by pinyon-juniper woodlands due to climate change or changes to natural disturbance regimes (see [Chapter 2](#)). Loss of sagebrush habitat leaves remaining sagebrush fragmented or perforated, rendering it less suitable for sage sparrow, Brewer's sparrow, and sage thrasher—area-sensitive species whose probability of habitat occupancy generally increases with sagebrush patch size (Knick and Rotenberry 1995). Sagebrush habitat fragmentation can potentially result in isolated populations of sagebrush vole, Merriam's shrew, or kit fox if they become separated by unsuitable or dangerous habitats across which they cannot successfully disperse. For the other species of concern, which are less area-sensitive, less dependent on undisturbed sagebrush habitats, or more tolerant of ecotones or edges, sagebrush fragmentation may cause less impact if other suitable habitats are available.

With residential, agricultural, and energy development come a host of related threats. Species of concern occupying habitat near such developments are potentially at increased risk of 1) predation or disturbance by domestic dogs or cats; 2) predation by generalist species often associated with human activity such as American crows, common ravens, black-billed magpies, and red foxes; 3) predation by raptors using man-made structures such as fences or power transmission lines for hunting perches; 4) mortality from vehicle collisions or shooting; 5) competition with and disease transmission from other canids (in the case of kit fox); 6) brood parasitism by cowbirds (in the case of passerine birds); 7) disturbance by recreationists; and 8) increased spread of invasive plants.

Livestock grazing and management of sagebrush shrublands to maximize livestock forage are potentially major threats to sagebrush-dependent wildlife (Bock et al. 1993; Saab et al. 1995; Welch and Criddle 2003). The degree of threat depends on a complex array of variables such as timing, intensity, duration, and season of grazing; grazing rotation schedules; plant community composition; and drought and other climatic factors. Livestock can trample nests of breeding passerines, northern harriers, sagebrush voles, or Merriam's shrews, directly affecting reproductive success. Livestock may attract cowbirds that parasitize passerine nests. Livestock trample biological soil crusts in sagebrush habitats, which are slow to recover and play an important role in the germination of native grass and forb seeds. Livestock selectively graze grasses and forbs that may be necessary cover or forage for species of concern. In the long-term, selective removal of plant components by livestock may result in floristic and physiognomic shifts in sagebrush shrublands that benefit some species of concern but not others.

Management of sagebrush rangelands for livestock has historically involved burning, mechanical, or herbicide treatments to eradicate or thin sagebrush. Such treatments, when they involve total removal or excessive reduction of sagebrush cover, are detrimental in the long-term, especially for sagebrush obligates. Treatments leaving at least some sagebrush canopy may favor some of the species of concern, such as vesper sparrow, lark sparrow, and black-throated sparrow. Subsequent seeding of treated areas with non-native grasses to provide livestock forage can result in plant species composition and ground cover density unsuited to foraging needs of several of the species of concern.

Sagebrush habitat degradation is a significant threat to the species of concern (Best 1972; Braun et al. 1976; Dobkin and Sauder 2004; Knick et al. 2003; Knick and Rotenberry 2000; Petersen and Best 1987). Invasion of the shrubland understory by non-native annual grasses and forbs can be facilitated by residential or energy development, agricultural conversions, grazing, and improper range management practices. Several of the species of concern are found in lower abundances in sagebrush habitats with annual weed understories, and ground cover densities of annual weed understories may be unsuited to foraging activities of several of the species of concern. Annual weed understories, especially cheatgrass, can provide dry fuel that accelerates fire-return intervals in sagebrush, eventually resulting in conversion of sagebrush shrublands to cheatgrass monocultures.

Other threats to the species of concern are disease (West Nile virus in birds, bubonic plague in the sagebrush vole, and rabies or distemper in kit fox). Unknown threats to migratory birds on winter ranges and migration routes likely influence breeding populations.

Assumptions and Limitations

- Species of concern addressed in this assessment are limited to vertebrates whose large ranges and macro-habitat requirements are suited to regional-scale assessment, planning, and management efforts. This does not imply that local endemic or rare vertebrates and many species of native plants and invertebrates associated with sagebrush ecosystems do not deserve conservation attention. The conservation needs of such species are more appropriately addressed by local-level evaluation and management (Wisdom et al. 2003a).
- Our species selections were based on limited knowledge of habitat preferences and requirements, ranges, and population trends for Colorado vertebrates. For mammals and herptiles, our decisions about sagebrush association (Step 1 in the species selection process) and population trends (Step 2) were derived mostly from published qualitative descriptions of habitat use and expert knowledge; almost no published quantitative occurrence data are

available for the assessment area that are useful for deriving degree of sagebrush association or population trends.

- Bird occurrence data for Colorado must be used cautiously as indicators of species association with sagebrush. The bird or habitat identification skills of field workers participating in Colorado BBA varied greatly, and remote or difficult-to-access patches of sagebrush were more likely to be undersampled than patches near roads or trails, affecting the estimated species distribution over the full range of habitat types and conditions. With regard to habitat association, we considered Colorado BBA occurrence data together with published species accounts, our own expertise, and the knowledge of CDOW staff, to make subjective determinations about habitat associations and the strengths of those associations.
- BBS trend estimates for sagebrush passerines are problematic. For instance, although approximately 14 percent of the land cover in the assessment area is sagebrush, only 7 percent of BBS routes in the assessment area occurred in sagebrush habitats between 1995 and 2001 (Knick et al. 2003). Nor can BBS quantify its biases in the detectability of birds. Basing counts of breeding passerine birds on presence of singing males is problematic because the relationship between singing birds and population parameters has not been established. Males who do not pair successfully may be incorrectly considered mated, and singing frequency may vary during the breeding period, further confounding population trend estimates or conclusions about habitat associations (Knick et al. 2003).

Key Findings

- A total of 73 sagebrush-associated vertebrates occur in the assessment area, 30 of which are known or believed to have stable populations. Of the 43 declining or potentially declining vertebrates, 14 are addressed by other conservation planning efforts, 11 are only weakly associated with sagebrush in the assessment area, and 7 are better suited to local-scale evaluation and management efforts. The remaining 11 species are the focus of our assessment.
- We selected 11 declining or potentially declining sagebrush-associated vertebrates (species of concern) appropriate for regional assessment in western and central Colorado, consisting of 3 mammals and 8 birds: sagebrush vole, Merriam's shrew, kit fox, sage sparrow, Brewer's sparrow, sage thrasher, vesper sparrow, green-tailed towhee, lark sparrow, black-throated sparrow, and northern harrier. Four of these vertebrates (sage sparrow, Brewer's sparrow, sage thrasher, sagebrush vole) are considered sagebrush obligates.
- Significant knowledge gaps exist concerning population trends, biology, and ecology of all 11 species of concern in the assessment area. The majority of knowledge for each species of concern is derived from studies made outside Colorado, and in some cases, non-sagebrush habitats.
- The most serious long-term threat to all species of concern in the assessment area, especially to the sagebrush obligates, is habitat loss. Habitat fragmentation, habitat degradation, and grazing have mixed effects on the species of concern.

Recommendations

- Assess the ability of MCB to adequately detect and monitor bird populations with statistical confidence. As necessary, augment MCB monitoring in sagebrush habitats to increase detection confidence to acceptable levels, or design and implement an appropriate alternative population monitoring methodology.

- Investigate appropriate census techniques and initiate periodic census of Merriam's shrew, sagebrush vole, and kit fox populations in the assessment area.
- Species of concern densities do not necessarily imply preferences for habitat conditions or correlation with reproductive success (Martin 1998). Population trend monitoring should be coupled with investigation of reproductive success (including brood parasitism and predation) over a spectrum of habitat conditions, rangeland management regimes, grazing programs, and geographic areas in Colorado.
- Initiate long-term investigation of the interaction of local-level and landscape-level variables in the population dynamics of the species of concern (information is needed regarding landscape-scale patterns of habitat use, effects of habitat fragmentation, and patch size and habitat connectivity requirements of each species of concern).

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Table 5-1. Master list of Colorado's sagebrush-associated vertebrates and summarized results of species of concern selection filter application.

Common Name	Scientific Name	Stable or likely stable population or is a large mammal (Step 2)	Declining or potentially declining but conservation or recovery plan exists (Step 3)	CDOW interest, but small range, local, or rare (Step 4)	CDOW interest, but strong fine-scale habitat affinity (Step 5)	CDOW interest, but weak association with sagebrush (Step 6)	Final list approved by CDOW (Step 7)
Birds							
Black-throated sparrow	<i>Amphispiza bilineata</i>						x
Brewer's sparrow	<i>Spizella breweri</i>						x
Burrowing owl	<i>Athene cunicularia</i>				x		
Columbian sharp-tailed grouse	<i>Tympanuchus phasianellus</i>		x				
Ferruginous hawk	<i>Buteo regalis</i>					x	
Golden eagle	<i>Aquila chrysaetos</i>	x					
Gray flycatcher	<i>Empidonax wrightii</i>	x					
Greater sage-grouse	<i>Centrocercus urophasianus</i>		x				
Green-tailed towhee	<i>Pipilo chlorurus</i>						x
Gunnison sage-grouse	<i>Centrocercus minimus</i>		x				
Lark sparrow	<i>Chondestes grammacus</i>						x
Loggerhead shrike	<i>Lanius ludovicianus</i>					x	
Long-billed curlew	<i>Numenius americanus</i>					x	
Northern harrier	<i>Circus cyaneus</i>						x
Prairie falcon	<i>Falco mexicanus</i>				x		
Sage sparrow	<i>Amphispiza belli</i>						x
Sage thrasher	<i>Oreoscoptes montanus</i>						x
Short-eared owl	<i>Asio flammeus</i>					x	
Spotted towhee	<i>Pipilo maculatus</i>					x	
Swainson's hawk	<i>Buteo swainsoni</i>					x	
Vesper sparrow	<i>Poocetes gramineus</i>						x
Herptiles							
Collared lizard	<i>Crotaphytus collaris</i>	x					
Gopher snake	<i>Pituophis catenifer</i>	x					
Great Basin spadefoot	<i>Spea intermontana</i>	x					
Longnose leopard lizard	<i>Gambelia wislizenii</i>			x			

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Midget faded rattlesnake	<i>Crotalus viridis concolor</i>			x			
Plateau striped whiptail	<i>Aspidoscelis [Cnemidophorus] velox</i>	x					
Sagebrush lizard	<i>Sceloporus graciosus</i>	x					
Short-horned lizard	<i>Phrynosoma hernandesi</i>					x	
Southwestern black-headed snake	<i>Tantilla hobartsmithi</i>					x	
Striped whipsnake	<i>Masticophis taeniatus</i>	x					
Western whiptail	<i>Aspidoscelis [Cnemidophorus] tigris</i>	x					
Mammals							
American badger	<i>Taxidea taxus</i>	x					
American elk	<i>Cervus elaphus</i>	x					
Big free-tailed bat	<i>Nyctinomops macrotis</i>		x				
Black-footed ferret	<i>Mustela nigripes</i>		x				
Black-tailed jackrabbit	<i>Lepus californicus</i>	x					
Bobcat	<i>Lynx rufus</i>	x					
Botta's pocket gopher	<i>Thomomys bottae rubidus</i>			x			
Brazilian free-tailed bat	<i>Tadarida brasiliensis</i>		x				
Canyon mouse	<i>Peromyscus crinitus</i>	x					
Common porcupine	<i>Erethizon dorsatum</i>	x					
Coyote	<i>Canis latrans</i>	x					
Desert cottontail	<i>Sylvilagus audubonii</i>	x					
Desert shrew	<i>Notiosorex crawfordi</i>	x					
Golden mantled ground squirrel	<i>Spermophilus lateralis</i>	x					
Gray fox	<i>Urocyon cinereoargenteus</i>	x					
Great Basin pocket mouse	<i>Perognathus parvus</i>			x			
Gunnison's prairie dog	<i>Cynomys gunnisoni</i>		x				
Kit fox	<i>Vulpes macrotis</i>						x
Least chipmunk	<i>Tamias minimus</i>	x					

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Long-eared myotis	<i>Myotis evotis</i>		x				
Long-tailed weasel	<i>Mustela frenata</i>	x					
Merriam's shrew	<i>Sorex merriami</i>						x
Mountain lion	<i>Felis concolor</i>	x					
Mule deer	<i>Odocoileus hemionus</i>	x					
Nuttall's cottontail	<i>Sylvilagus nuttallii</i>	x					
Olive-backed pocket mouse	<i>Perognathus fasciatus</i>					x	
Ord's kangaroo rat	<i>Dipodomys ordii</i>	x					
Pallid bat	<i>Antrozous pallidus</i>		x				
Preble's shrew	<i>Sorex preblei</i>			x			
Pronghorn	<i>Antilocapra americana</i>	x					
Sagebrush vole	<i>Lemmiscus curtatus</i>						x
Spotted bat	<i>Euderma maculatum</i>		x				
Striped skunk	<i>Mephitis mephitis</i>	x					
Townsend's big-eared bat	<i>Corynorhinus townsendii</i>		x				
Western pipistrelle	<i>Pipistrellus hesperus</i>		x				
Western small-footed myotis	<i>Myotis ciliolabrum</i>		x				
Western spotted skunk	<i>Spilogale gracilis</i>	x					
White-tailed antelope squirrel	<i>Ammospermophilus leucurus</i>					x	
White-tailed jackrabbit	<i>Lepus townsendii</i>					x	
White-tailed prairie dog	<i>Cynomys leucurus</i>		x				
Wyoming ground squirrel	<i>Spermophilus elegans</i>	x					
TOTALS		30	14	5	2	11	11

Table 5-2. Colorado's sagebrush-associated declining or potentially declining vertebrates with existing (or in preparation) conservation or recovery plans.

Common Name	Scientific Name	Conservation or Recovery Plan
Big free-tailed bat	<i>Nyctinomops macrotis</i>	Colorado Bat Conservation Plan (Ellison et al. 2004)
Black-footed ferret	<i>Mustela nigripes</i>	USFWS Black-footed Ferret Recovery Plan (USFWS 1988)
Brazilian free-tailed bat	<i>Tadarida brasiliensis</i>	Colorado Bat Conservation Plan (Ellison et al. 2004)
Columbian sharp-tailed grouse	<i>Tympanuchus phasianellus columbiannus</i>	Northwest Colorado Columbian Sharp-tailed Grouse Conservation Plan (Hoffman 2001)
Greater sage-grouse	<i>Centrocercus urophasianus</i>	Colorado Statewide Conservation Plan (2004) and BLM National Sage-grouse Habitat Conservation Strategy (BLM 2004)
Gunnison sage-grouse	<i>Centrocercus minimus</i>	Gunnison Sage-grouse Rangewide Conservation Plan (GSRSC 2005); Colorado statewide plan (in preparation)
Gunnison's prairie dog	<i>Cynomys gunnisonii</i>	Gunnison's Prairie Dog Rangewide Conservation Assessment (in preparation)
Long-eared myotis	<i>Myotis evotis</i>	Colorado Bat Conservation Plan (Ellison et al. 2004)
Pallid bat	<i>Antrozous pallidus</i>	Colorado Bat Conservation Plan (Ellison et al. 2004)
Spotted bat	<i>Euderma maculatum</i>	Colorado Bat Conservation Plan (Ellison et al. 2004)
Townsend's big-eared bat	<i>Corynorhinus townsendii</i>	Colorado Bat Conservation Plan (Ellison et al. 2004)
Western pipistrelle	<i>Pipistrellus hesperus</i>	Colorado Bat Conservation Plan (Ellison et al. 2004)
Western small-footed myotis	<i>Myotis ciliolabrum</i>	Colorado Bat Conservation Plan (Ellison et al. 2004)
White-tailed prairie dog	<i>Cynomys leucurus</i>	White-tailed Prairie Dog Conservation Assessment (2004)

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Table 5-3. Colorado sagebrush-associated declining or potentially declining vertebrates better suited for local assessment and conservation planning efforts.

Common Name	Scientific Name	Rationale for Elimination from Regional Sagebrush Assessment	References
Botta's pocket gopher	<i>Thomomys bottae rubidus</i>	Eliminated from regional assessment based on local endemism; known only from part of Fremont County.	Fitzgerald et al. 1994
Burrowing owl	<i>Athene cunicularia</i>	Species of interest to CDOW. Eliminated from regional sagebrush assessment primarily due to fine-scale habitat requirements and secondarily due to relatively weak association with sagebrush in the assessment area. Habitat in western Colorado is primarily desert grasslands, pastures, and prairie dog colonies. Closely tied with burrowing rodent populations, namely prairie dog colonies, where it prefers to nest and perch. Will also nest in burrows of Wyoming ground squirrels, rock squirrels, and other ground squirrels with sparsely vegetated surroundings.	Righter et al. 2004 Jones 1998a
Great Basin pocket mouse	<i>Perognathus parvus</i>	Eliminated from regional sagebrush assessment based on rarity in the assessment area. Reaches the extreme eastern edge of its range in northwest Colorado. Known from only a few historic occurrences in Brown's Park, Moffat County (west of the Green River).	Fitzgerald et al. 1994
Longnose leopard lizard	<i>Gambelia wislizenii</i>	Species of interest to CDOW. Eliminated from regional sagebrush assessment because only localized populations exist in extreme western Colorado, where populations have likely always been localized in the Grand Valley and parts of Montezuma County. Has probably declined in range and abundance in the Grand Valley during the last century. Inhabits flat or gently sloping xerophytic shrublands with a large percentage of bare ground; most abundant where rodent burrows riddle the ground at the base of shrubs.	Hammerson 1999
Midget faded rattlesnake	<i>Crotalus viridis concolor</i>	Eliminated from regional sagebrush assessment due to localized nature of populations, and secondarily due to relatively weak association with sagebrush. Also requires fine-scale habitat features such as rocky outcrops and rodent burrows for cover, thermoregulation, and hibernation. CDOW species of concern.	Hammerson 1999
Prairie falcon	<i>Falco mexicanus</i>	Species of interest to CDOW. Eliminated from regional sagebrush assessment due to fine-scale nesting habitat requirements. Typically requires cliff faces or rock outcrops for nest sites in open country with good foraging access.	Jones 1998b
Preble's shrew	<i>Sorex preblei</i>	Eliminated from regional sagebrush assessment based on rarity and relatively weak association with sagebrush. Only one record from Colorado—a single specimen in 1966 from oakbrush on the south rim of the Black Canyon of the Gunnison, which resulted in a range extension 500 km east. Elsewhere in its range, associated with semi-arid shrublands, sagebrush openings in alpine forests, grasslands, and alpine tundra.	Fitzgerald et al. 1994

Table 5-3. Colorado sagebrush-associated declining or potentially declining vertebrates better suited for local assessment and conservation planning efforts.

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Table 5-4. Selected characteristics and habitat descriptions of eleven species of concern (categorized by principal habitat associations).

Species	Feeding Guild	Other	Floristic and Structural Characteristics of Breeding Habitat
Sagebrush Obligate Species			
Brewer's sparrow	Shrub canopy-foraging omnivore	Ground nester	Prefers open habitats with low shrub species richness and large shrubs on gentle slopes away from habitat edges (Sedgwick 1987). Rolling or flat shrublands with average canopy height < 1.5 m (Rotenberry et al. 1999). Breeds in extensive areas of sagebrush habitat, with shrubs occurring in tall, clumped, and vigorous stands. Prefers tall sagebrush shrubs for nesting and song perches; low percent grass cover to facilitate foraging on ground. Optimum patch sizes and many other aspects of landscape ecology are unknown. Results of a habitat suitability model indicating that a minimum of 0.46 acres (0.2 ha) of suitable habitat and slope not greater than 30 degrees are needed for successful reproduction (Short 1984) reflect estimated minimum territory size and do not reflect landscape-level characteristics needed for a sustainable population (J.T. Rotenberry, pers. comm.).
Sage sparrow	Ground-foraging omnivore	Shrub nester	Nests principally in large, unbroken stands of big sagebrush on hills and basins (Righter et al. 2004). Semi-open habitats with evenly spaced shrubs 1 to 2 m tall (Martin & Carlson 1998). Abundance positively correlated with % shrub cover, % bare ground, horizontal structural homogeneity, increasing patch size, decreasing disturbance, and decreasing fragmentation (Knick & Rotenberry 1995). Minimum patch size likely larger than 100 ha.
Sage thrasher	Ground-foraging omnivore	Shrub nester	Nests principally in big sagebrush (Righter et al. 2004). Abundances positively correlated with % shrub cover, shrub height, % bare ground, and horizontal heterogeneity (patchiness); negatively correlated with grass cover (Rotenberry & Wiens 1980, Wiens & Rotenberry 1981). More likely to occur in sites with higher sagebrush cover and greater spatial similarity within 1-kilometer radius (Knick & Rotenberry 1995). Thrives where sagebrush shrubs occur in tall, clumped, and vigorous stands. Prefers tall shrubs for nesting or song perches and low percent grass cover to facilitate foraging on ground. In Idaho, Knick and Rotenberry (1995) found the probability of occupancy increased with increasing homogeneity of the surrounding habitat within a 1-kilometer radius, and with greater percent sagebrush cover. Also, positively correlated with shrub patch size, and negatively correlated with disturbance.
Sagebrush vole	Herbivore	Semi-fossorial	Occasionally occurs in grasslands and other habitat types (such as reclaimed surface mine sites) but abundances are generally highest in shrubsteppe with native bunchgrass understories (Dobkin & Sauder 2004). Hall (1928) noted that most known specimens were taken in scattered sagebrush with uniform height of about 2.5 feet and where lower branches were near ground.

Table 5-4. Selected characteristics and habitat descriptions of eleven species of concern (categorized by principal habitat associations).

Species	Feeding Guild	Other	Floristic and Structural Characteristics of Breeding Habitat
Sagebrush/Montane Shrubland Species:			
Green-tailed towhee	Ground-foraging omnivore	Shrub nester	Nests on dry, shrubby hillsides and sagebrush flats, pinyon-juniper with sagebrush-dominated openings, riparian scrub, forest openings (Righter 1998). Low brush cover (0.5 to 1.5 m tall) often interspersed with trees (Dobbs et al. 1998). Uses ecotones between sagebrush and other shrub habitats (Knopf et al. 1990). Nests in brushy areas with open spaces between shrubs. Postdisturbance shrubby second growth is commonly used (Andrews & Righter 1992, Hutto 1995).
Merriam's shrew	Insectivore	Semi-fossorial	Habitat characteristics that influence abundance are poorly understood. Thought to be characteristic of semi-arid situations and more tolerant of dry habitats than any other North American shrew except the desert shrew (Armstrong and Jones 1971). Uses runways of sagebrush vole and other rodents for foraging.
Vesper sparrow	Ground-foraging omnivore	Shrub or ground nester	Breeds in montane meadows, grasslands, and sagebrush shrubsteppe; favors grasslands with a shrub component, particularly big sagebrush (Rotenberry & Wiens 1980). Typically avoids mesic areas or plant communities with tall, dense herbaceous vegetation (Dobkin & Sauder 2004). Positively correlated with short, patchy, herbaceous vegetation and bare ground (Vickery et al. 1994).
Sagebrush/Semi-Desert Shrubland Species			
Black-throated sparrow	Ground-foraging omnivore	Shrub or ground nester	Nests in arid, open areas with widely scattered tall shrubs, including big sagebrush, Utah juniper, greasewood, and blackbrush (Righter et al. 2004). Semi-open arid habitat with evenly spaced shrubs 1 - 3 m in height; Common in desert alluvial fans, canyons, washes, flats, badlands, and desert scrub (Johnson et al. 2002).
Kit fox	Opportunistic carnivore	Semi-fossorial, dens year-round	Prefers open low, shrub stands, probably <20% canopy cover (T. Beck, pers. comm.).
Generalist Species			
Lark sparrow	Ground-foraging omnivore	Ground, shrub, or tree nester	Nests in open grasslands with shrub component, mostly juniper, greasewood, or sagebrush (Righter et al. 2004). Generally prefers structurally open habitats with scattered shrubs or trees; ecotones; sites disturbed by overgrazing, cultivated areas, fallow fields with brushy edges, woodlands with sparse canopy cover (Martin & Parrish 2000) and low to modest cover of grasses and herbaceous plants (Lambeth 1998).

Table 5-4. Selected characteristics and habitat descriptions of eleven species of concern (categorized by principal habitat associations).

Species	Feeding Guild	Other	Floristic and Structural Characteristics of Breeding Habitat
Northern harrier	Carnivore	Ground nester	Nests on ground in patches of tall, dense graminoid vegetation, shrublands, or pasture/croplands; forages in open, treeless country, including sagebrush shrublands (MacWhirter and Bildstein 1996).

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Table 5-5. Conservation status summary of eleven species of concern.

Common Name	Colorado Population Status	Legal Status	CO Natural Heritage Rank	Other Status	Explanation of Colorado Population Status Assignment
Black-throated sparrow	Potentially declining	None	G5/S3	BLM (ID) SC (OR)	Long-term (1966 to 2003) standard BBS trend for Colorado of -4.5% annual decline is statistically insignificant ($P=0.72$); significant survey-wide and western BBS region negative long-term trends are documented (Sauer et al. 2004). No positive long-term trends recorded by BBS in any BBS regions. Alternative (spatial) analysis of BBS data suggested stable trend in Colorado (Dobkin & Sauder 2004), but detection rates were low.
Brewer's sparrow	Declining	None	G5/S4	USFS (Region 2) SC (WY, ID) Watchlist (PIF, Audubon)	Long-term (1966 to 2003) standard BBS trend for Colorado of -3.4% annual decline is statistically significant ($P<0.01$); long-term survey-wide declining trends is also statistically significant (Sauer et al. 2004). Alternative (spatial) analysis of BBS data suggested declines across southern and western Colorado (Dobkin & Sauder 2004). Experts warn that habitat loss and fragmentation are resulting in population declines of this sagebrush obligate rangewide (Knick et al. 2003).
Green-tailed towhee	Potentially declining	None	G5/S5	USFS (Pacific Region)	Long-term (1966 to 2003) standard BBS trend for Colorado of -1% annual decline is statistically insignificant ($P=0.33$); survey-wide, western, and Southern Rockies BBS regions long-term trends are negative but lacking statistical power (Sauer et al. 2004). Few positive long-term trends recorded by BBS in any BBS region. Alternative (spatial) analysis of BBS data suggested mixed trends in Colorado (Dobkin & Sauder 2004).
Kit fox	Declining; possibly extirpated	E - State (CO) E - Federal (CA)	G4/S1	SC (ID)	After 4 consecutive years of study ending in 1996, Fitzgerald (1996) speculated that fewer than 100 kit fox inhabited Colorado, with no evidence that populations were self-sustaining. Follow-up work by Beck (1999, 2000) strongly suggested the already small kit fox population in Colorado had declined sharply and that the species was close to extirpation from the state. No kit fox census has been performed since 2000.
Lark sparrow	Potentially declining	None	G5/S4	None	Long-term (1966 to 2003) standard BBS trend for Colorado of -2.8% annual decline is statistically insignificant ($P=0.06$); significant survey-wide and central BBS region negative long-term trends are documented (Sauer et al. 2004). No statistically powerful positive long-term trends recorded by BBS in any BBS regions. Alternative (spatial) analysis of BBS data suggested mixed trends in Colorado (Dobkin & Sauder 2004).

Table 5-5. Conservation status summary of eleven species of concern.

Common Name	Colorado Population Status	Legal Status	CO Natural Heritage Rank	Other Status	Explanation of Colorado Population Status Assignment
Merriam's shrew	Potentially declining	None	G5/S3	SC (WA)	Long-term population trends of Merriam's shrew in Colorado and rangewide are unknown. A literature review and synthesis by Dobkin & Sauder (2004) suggests Merriam's shrews were present at only 8 of 39 (17 percent) of the locales they were expected occupy in the Great Basin and Columbia Plateau. Although the review did not cover Colorado, it raises concerns about the status, distribution, and habitat requirements of the species throughout its range.
Northern harrier	Potentially declining	E - State (CT, IA, IL, IN, RI, MO, NJ) T - State (MA, TN, NH, NY)	G5/S3	USFS (Region 2) SC (WI, VT)	Long-term (1966 to 2003) standard BBS trend for Colorado of -1.7% annual decline is statistically insignificant ($P=0.54$); survey-wide and western BBS region long-term trends are negative and statistically significant (Sauer et al. 2004).
Sage sparrow	Potentially declining	None	G5/S3	SC (WA, OR) Watchlist (PIF)	Long-term (1966 to 2003) standard BBS trend for Colorado of 1.3% annual gain is statistically insignificant ($P=0.82$); long-term survey-wide, Wyoming Basin, Great Basin, and western BBS region trends are mixed and lack statistical power (Sauer et al. 2004). Alternative (spatial) analysis of BBS data suggested declines in shrubsteppe ecoregions rangewide and mixed trends in Colorado (Dobkin & Sauder 2004). Experts warn that habitat loss and fragmentation are resulting in population declines of this sagebrush obligate rangewide (Knick et al. 2003).
Sage thrasher	Potentially declining	None	G5/S5	BLM (WY) SC (WA)	Long-term (1966 to 2003) standard BBS trend for Colorado of 0.1% annual gain is statistically insignificant ($P=0.96$); long-term survey-wide, Wyoming Basin, and western BBS regions trends are mixed and lack statistical power. BBS Basin and Range region reported statistically significant negative trend (Sauer et al. 2004). Alternative (spatial) analysis of BBS data suggested declines in shrubsteppe ecoregions rangewide and mixed trends in Colorado (Dobkin & Sauder 2004). Experts warn that habitat loss and fragmentation are resulting in population declines of this sagebrush obligate rangewide (Knick et al. 2003).

Table 5-5. Conservation status summary of eleven species of concern.

Common Name	Colorado Population Status	Legal Status	CO Natural Heritage Rank	Other Status	Explanation of Colorado Population Status Assignment
Sagebrush vole	Potentially declining	None	G5/S1	None	A comprehensive literature review by Dobkin & Sauder (2004) suggests sagebrush voles were absent from many locations they were expected occupy in the Great Basin and Columbia Plateau. Although the review did not cover Colorado, it raises concerns about the status, distribution, and habitat requirements of sagebrush voles throughout their range.
Vesper sparrow	Potentially declining	E - State (CT, KY, NJ, RI) T - State (MA) C - State (WA)	G5/S5	SC (NY, OR)	Long-term (1966 to 2003) standard BBS trend for Colorado of 1% annual gain is statistically insignificant ($P=0.59$); statistically significant survey-wide and eastern BBS region negative long-term trends are documented (Sauer et al. 2004). Alternative (spatial) analysis of BBS data suggested mixed trends in Colorado (Dobkin & Sauder 2004).

Note: Acronyms and Abbreviations are defined in this document's front matter.

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Figure 5-1. Filter for selecting Colorado sagebrush vertebrate species of concern.

