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**Rocky Mountain
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Fort Collins,
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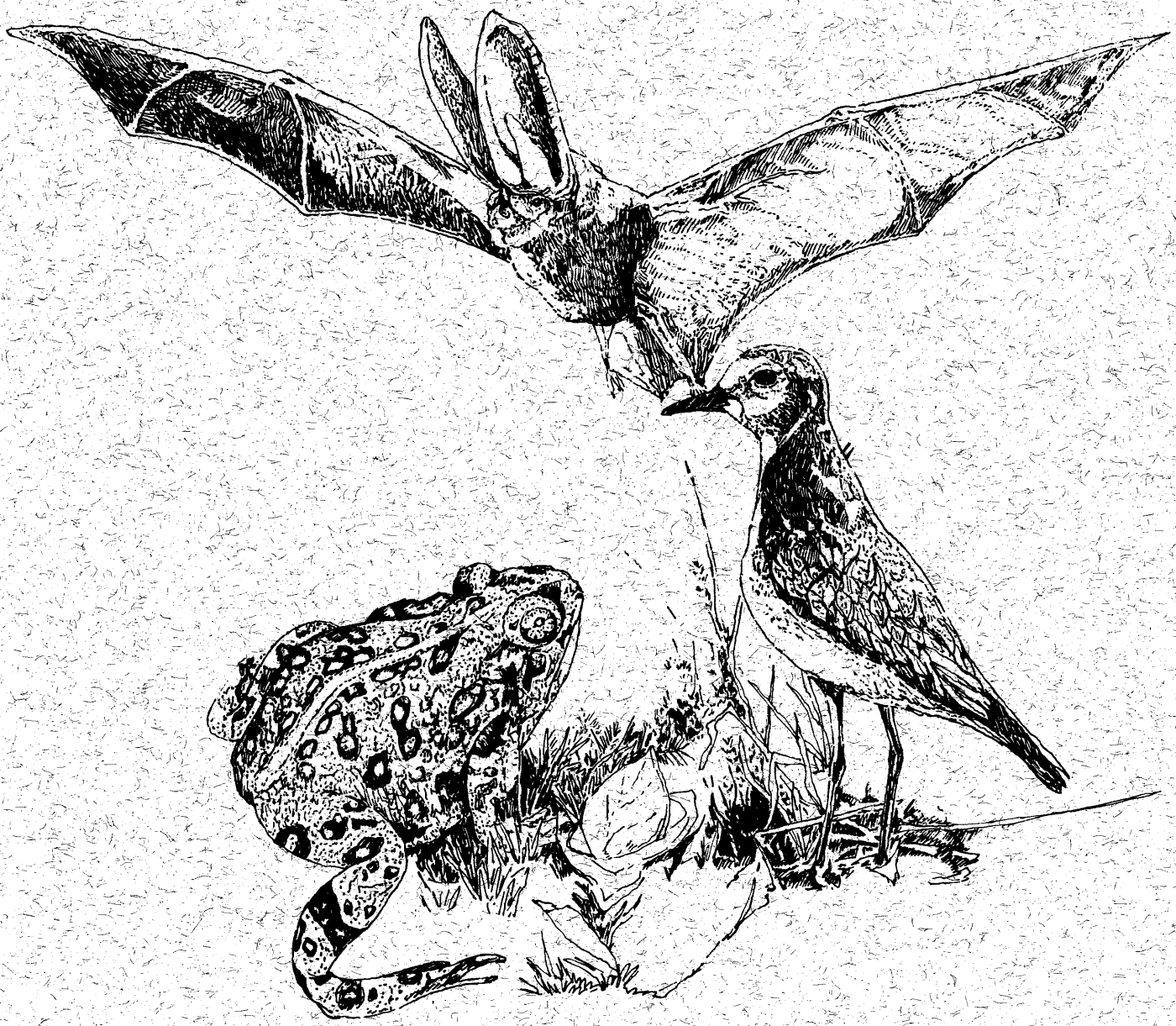
**General Technical
Report RM-215**

# Threatened, Endangered, and Vulnerable Species of Terrestrial Vertebrates in the Rocky Mountain Region

**Deborah M. Finch**



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# Threatened, Endangered, and Vulnerable Species of Terrestrial Vertebrates in the Rocky Mountain Region

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**Abstract**

This report describes the current status of 67 threatened, endangered, and vulnerable wildlife species in the Rocky Mountain Region. Known or potential reasons for population declines and species susceptibility are identified; and distributions, habitats, specialized needs, and perceived threats of individual species are discussed. The report focuses on terrestrial vertebrate species inhabiting National Forests and Grasslands and is designed to assist the U.S. Forest Service in identifying and conserving sensitive species in the Rocky Mountain Region. Sources of information for selecting species were Breeding Bird Survey data; federal lists of endangered and threatened species published by the Office of Endangered Species; The Nature Conservancy's Natural Heritage Program data base; the National Audubon Society's Blue List; lists of species of concern published by the Office of Migratory Bird Management; Forest Service regional lists of sensitive species; and state lists of sensitive species in Wyoming, South Dakota, Colorado, Nebraska, and Kansas. Life history accounts of individual species of amphibians, reptiles, mammals, and birds follow a general analysis of species habitat use and vulnerability among different taxonomic classes.

[1]*Headquarters is in Fort Collins, in cooperation with Colorado State University.*

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# Threatened, Endangered, and Vulnerable Species of Terrestrial Vertebrates in the Rocky Mountain Region

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## INTRODUCTION

Widespread environmental changes caused by the rapid twentieth century growth of human civilization have alarmed ecologists and environmentalists worldwide (Myers 1980, Soule 1986). Of special concern are the impacts of land management practices and resulting habitat alterations on rare species and biological diversity (Soule 1987, Wolf 1987, Wilson 1988). As rates of species extinctions accelerate in the tropics and elsewhere due to deforestation, agricultural conversion, desertification, and other changes associated with human population expansion (Myers 1980, Wilson 1988), scientists, philosophers, and politicians alike have asked and attempted to answer the question, "Why should species and their diversity be preserved?" (Rolston 1985, Norton 1988). Arguments for preserving species center on values involving ethics, scientific study, esthetics, recreation, "critical link" or "keystone" species, medicinal significance, and future economic benefits (Myers 1979, Ehrlich and Ehrlich 1981, Westman 1985, Rolston 1985, Norton 1988). The idea of preserving all species has been weighed against the scheme of reserving samples of habitat in self-sustaining ecosystems (Roberts 1988). If some extinctions are inevitable as several scientists think, then managing ecosystems as well as their components may be the best strategy for saving the largest number of species (Westman 1990).

The establishment of nature reserves along with connecting travel corridors has usually been viewed as the most successful method for protecting natural ecosystems and vulnerable species. Though parks, wilderness, and natural areas provide invaluable refuges for species, they comprise only 7% to 8% of available lands in the United States and far less than that amount elsewhere (Salwasser 1989). Because the geographical extent of reserves is probably insufficient to sustain the variety of species as we currently know it, ecologists are now demanding that the management of multiple-use lands with their crucial reservoirs of biological diversity be innovatively altered to reflect diversity conservation goals (Norse et al. 1986, Wilcove 1988, Rice 1989). Land-managing agencies like the U.S. Forest Service and the Bureau of Land Management can play critical roles in the development and leadership of plans for conserving, restoring, and monitoring biological diversity. Because almost 80% of the nation's wildlife and fish species and 30% of its federally listed endangered and threatened species reside in national forests and national grasslands, the U.S. Forest Service has the unique responsibility of maintaining high vertebrate diversity while meeting other public needs in compliance with the Multiple-Use Sustained-Yield Act of 1960 (Salwasser 1989).

Federal legislation that mandates the protection of species, habitats, and biological diversity is already in place. The Endangered Species Act of 1973 established the conservation of threatened and endangered species and their critical habitats as a national priority. Section 7 (a) (2) mandates the assurance by a federal agency that any of its actions "is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of (its) habitat." The National Forest Management Act of 1976 directs that the National Forest System "where appropriate and to the extent practicable, will preserve and enhance the diversity of plant and animal communities." Additionally, Sec. 219.12 (g) requires the maintenance of viable populations of native vertebrates in national forests. The National Environmental Policy Act of 1969, as amended, guarantees protection of the environment by decreeing overall environmental policy and ensuring the accessibility and dissemination of environmental information. Moreover, new legislation was introduced in 1989 that calls for the conservation of biological diversity on federal lands (Blockstein 1990). If this act is passed, new designs and technologies for managing species assemblages and entire ecosystems can be expected from natural resource agencies.

A major focus in the management of biological diversity is the recovery and conservation of threatened and endangered species. The U.S. Forest Service plays a leading role in managing critical habitats and populations of such species as the grizzly bear (*Ursus horribilis*), the peregrine falcon (*Falco peregrinus*), the red-cockaded woodpecker (*Picoides borealis*), the Puerto Rican parrot (*Amazona vittata*), and the bald eagle (*Haliaeetus leucocephalus*). Though threatened and endangered species are at the forefront of public concern as evidenced by the high number of court cases and legal actions regarding them, they are a symptom of the much larger problem of conserving biological diversity (Scott et al. 1988). The conflicts and costs of restoring threatened and endangered species proliferate as their numbers expand, propelling natural resource agencies into the reactive mode of "crisis management." A more powerful approach is to sustain species while their population levels are still sufficiently high to preclude federal listing. This strategy calls for the evaluation, maintenance, and restoration of populations of sensitive species, i.e., species whose populations are vulnerable to environmental alterations or are declining or pre-

dicted to decline in the foreseeable future. A cost-effective solution to conserving numerous vulnerable species is the management and preservation of intact ecosystems wherein biological diversity is stored (Westman 1990, Blockstein 1990).

The objectives of this report are to describe the current status of threatened, endangered, and sensitive species of terrestrial vertebrates in the Rocky Mountain region; to identify known or potential reasons for population declines and susceptibility of such species; and to outline the distributions, habitats, specialized needs, and perceived threats to these species. Additionally, I identified habitats with high numbers of vulnerable species that are, for that reason, in need of special conservation efforts. I focused on species inhabiting lands managed by the National Forest System, and in particular, lands within the boundaries of the Rocky Mountain Region of the U.S. Forest Service. Summarized information about vulnerable species and their habitats may further enable this region to manage and conserve viable populations and species diversity.

This report is divided into sections that describe sources of information on threatened, endangered, and vulnerable species; criteria used to identify sensitive species; an analysis and summary of information across taxonomic groups; and individual species accounts for amphibians, reptiles, mammals, and birds. Scientific names of species are given in species accounts.

## SOURCES OF INFORMATION

Information about the historical and current distribution and population size of each species was collected from numerous sources, including national, regional, and state lists of endangered, threatened, rare, or managed species, and from the published literature. Both quantitative and qualitative data were used to describe the status of each species. I relied upon qualitative information for some birds, many mammals, and most reptiles and amphibians because quantitative data were lacking. The following sources of information were invaluable in documenting population trends, relative abundance, and current status of species.

### Population Trends

I reviewed reports that summarized Breeding Bird Survey (BBS) data for the periods 1966–85 (Robbins et al. 1986) and 1966–1989 (U.S. Fish and Wildlife Service—unpublished BBS data). This data base was the primary source of information about population trends in bird species. Significant ($P<0.05$) population increases or decreases and trends ($P<0.10$) were reported by state (48) and province (10), U.S. Fish and Wildlife Service (USFWS) Region (6 regions), Breeding Bird Survey Region (3 regions), the continental United States except Alaska (U.S.), and the continent (Canada and conterminous U.S.). USFWS regions, which are larger in area and fewer in number than those of the National Forest System, are labeled: Far West (CA, ID, NV, OR, and WA), Southwest (AZ, NM, OK, and TX), Great Lakes (IL, IN, MI, MN, OH, and WI), Southeast (AR, KY, and NC south to the Gulf coast), Northeast (WV and VA north through NY and New England), and Northern Plains (MT, ND, SD, WY, UT, CO, NE, and KS). BBS regions encompass Canada and the U.S. except Alaska: Eastern (east of the Mississippi River), Central (between the Mississippi River and the Rocky Mountains), and Western (the Rocky Mountains and westward). After comparing trends among BBS and USFWS regions, I focused on population declines reported for each of the five states found in USFS Rocky Mountain Region (Region 2: SD, WY, NE, CO, and KS); and for the Northern Plains Region of the USFWS which overlaps in state composition with the USFS Rocky Mountain Region.

Christmas Bird Counts (CBC) provided winter trend data for some bird species in USFS Region 2. Historical and current reports of harvest records supplied information on long-term population changes in many furbearing mammals and game species. Population data on nongame mammals, rare birds, and reptiles and amphibians were limited. Cited records of collected specimens and published studies of individual populations were the primary sources of trend data for these vertebrates.

### Office of Endangered Species (OES)

The January 1989 list of endangered (E) and threatened (T) species (Department of the Interior 1989a) was used to select federally listed species whose distributions overlapped that of USFS Region 2. The term "endangered" refers to a species that is in danger of extinction throughout all or much of its range. The term "threatened" applies to a species that has a high probability of becoming an endangered species in the foreseeable future. The threatened and endangered classifications given by OES are distinguished by capital letters ("T" and "E") from those officially assigned by a particular state. I obtained OES "candidate" species lists by state and region from the January 1989 Federal Register (USDI 1989b). A Category 1 candidate is a taxa for which substantial information exists to support a proposal to list it as threatened or endangered. A Category 2 candidate means that the population status of the taxa is under investigation. A Category 2 species may eventually be federally listed as a threatened or endangered species, pending further evaluation. Category 3 comprises taxa that were previously being evaluated for listing, but are no longer under consideration because they are extinct (3A), poorly defined taxonomically (3B), or more abundant or widespread than originally thought (3C).

### Natural Heritage Program (NHP)

I reviewed computer printouts from the Nature Conservancy that described the assigned status of each terrestrial vertebrate species contained in the Natural Heritage Program data base. The printouts included the

following NHP rankings for each species by state (SD, WY, NE, CO, KS): S1 = critically imperiled, S2 = imperiled, S3 = rare or uncommon, S4 = apparently secure or stable, and S5 = demonstrably secure. Other assignments were: accidental, exotic, historical occurrence, status uncertain, extirpated, and extinct. A global rank reflecting the status of a species throughout its entire range was assigned by the Washington office of the Nature Conservancy. Global ranks (G1-G5) were identical to state ranks except for the geographical area covered. Species with a status of S1-S3 or G1-G3 were considered to be of management concern at a state or global level, thereby meriting further evaluation.

### National Audubon Society's Blue List

The National Audubon Society publishes periodic Blue Lists that warn of population problems in bird species. The purpose of the Blue List is to identify species that show noncyclical declines in abundance, species that may be jeopardized in the foreseeable future, species whose numbers are so few that monitoring is advocated, and species of concern whose status is uncertain. I reviewed Blue Lists published from 1972 (first issued) to 1986 (last issued) (Tate 1981, 1986; Tate and Tate 1982), noting the species listed, the year of listing, the region of concern, and the status of the species in 1986. As of 1982, three categories were reported: Blue-listed Species—those with populations that are clearly declining in all or a major part of their ranges; Species of Special Concern—previously blue-listed species with populations that may be recovering; and Species of Local Concern—species with presumed population declines that are unconfirmed or of a local nature, or for which there are conflicts of opinion. Editors prepare Blue Lists by compiling results from responding *American Birds* regions (28 possible) in the U.S. Blue List cooperators preferably have at least 10 years of bird experience in a specific area or region. Respondents record the status of each species in a region with respect to declines, increases, or stability of populations.

### Office of Migratory Bird Management (OMBM)

Lists of migratory nongame birds of management concern in the United States were published in 1982 and 1987 by OMBM (OMBM 1982, 1987). I reviewed the 1982 and 1987 lists, noting species of concern for the USFWS Northern Plains region which most closely matched the USFS Rocky Mountain region, reasons for listing a species, information on the population status of each species. A stated purpose for listing nongame birds of national concern was to "address resource management issues at an early stage, thereby preventing species from having to be listed as Threatened or Endangered" which "will be more cost-effective than the full-blown recovery effort required once a species is federally listed" (OMBM 1987). List reports were intended to be used as internal USFWS planning guides for focusing nongame research and management plans over a 5-year period. After compiling status information from a variety of sources, OMBM identified species of concern based on documented or apparent population declines, small or restricted populations, or dependence on limited or vulnerable habitats. Twenty-eight species were listed in 1982, and 30 species were listed in 1987. Species results were summarized by USFWS region, reasons for listing, habitat type, food habits, foraging substrates, migratory status, and reproductive capacity.

### USDA Forest Service Lists of Sensitive Species

A goal of this report is to assist natural resource agencies in the selection of sensitive wildlife species for management plans. USFS Rocky Mountain Region (R2), which is in the process of preparing an official list of sensitive species, should find this document useful. For the purposes of comparing criteria and species, I evaluated sensitive species lists formulated by three adjacent USFS Regions: Northern Region (R1), Southwestern Region (R3), and Intermountain Region (R4). Sensitive species as defined in Title 2600 (Chapter 2670.5) of the USFS manual (1986) are those whose population viabilities may be a concern due to Forest Service management, as verified by "significant current or predicted downward trends in population numbers or density," or "significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution." Selected sensitive species must be approved by the Regional Forester. The Northern Region (R1: MT, northern ID, ND, and northwestern SD) has an official 1989 list of 23 sensitive vertebrate species. The R1 document, "Caring for our Natural Community" describes the habitats, distribution, and conservation management of threatened, endangered, and sensitive species on R1 national forests and grasslands (Reel et al. 1989). The Southeastern Region (R3: Arizona and New Mexico) has an approved 1988 list of sensitive vertebrates containing 237 species. The Intermountain Region (R4: southern Idaho, Nevada, Utah, and western Wyoming) is updating its lists and sent me a new draft list of 44 sensitive vertebrate species. In developing a list for R2, I started with lists for R1, R3, R4 and eliminated species that were absent, common with stable populations, or peripheral (unless rare or declining throughout range) in R2.

### State Lists

I reviewed species lists furnished by state wildlife agencies in Wyoming, South Dakota, Colorado, Nebraska, and Kansas. Because designations for sensitive species varied greatly by state, each rating system is described separately. State-threatened and state-endangered species are denoted "t" and "e," respectively.

#### Wyoming

As of 1990, the Wyoming legislature has not passed a state endangered species act. Nongame species that are

protected in Wyoming are described in "Regulations for Nongame Wildlife" (Wyoming Game and Fish Commission 1987). Wyoming Game and Fish Department (WGFD) devised a rating system for wildlife according to species vulnerability to extirpation or significant population declines (Oakleaf 1985, WGFD 1987). Only nongame species and protected game or furbearer species with historical or breeding populations in Wyoming were ranked. A total of 60 species needing special management in Wyoming were identified. Priority I (PI) species are those that "need immediate attention and active management to ensure that extirpation or a significant decline in the breeding population in Wyoming does not occur" (WGFD 1987). Eight species, all wetland birds, are Priority I. Priority II (PII) species are those in "need of additional study to determine whether intensive management is warranted or whether low level management such as monitoring population trends would suffice. Twelve species (4 mammals, 8 birds) were assigned a Priority II status. Priority III (PIII) species are those that do not warrant intensive management programs but whose needs should be accommodated in resource management planning (40 species: 11 birds, 29 mammals). No amphibians or reptiles were identified as priority species. WGFD has initiated strategic plans and special investigations for P1 and PII species (WGFD 1989).

### South Dakota

The South Dakota Department of Game, Fish and Parks (SDDGFP) officially classifies selected species as state endangered or state threatened (Wentz 1979). It also recognizes and updates the list of rare animals and plants of South Dakota reported by Houtcouper et al. (1985). This list identifies rare and sensitive species based on state NHP ranks, and federal and state lists. A category describing aspects of geographical distribution, population dynamics, or behavioral attributes is used in conjunction with Natural Heritage Program codes. These categories are: peripheral—a species at the edge of its natural range in South Dakota; disjunct—a species with isolated or discontinuous population(s) in South Dakota; and endemic—a species that occurs mostly or entirely in the state or in the northern Great Plains region. Habitat affinities, occurrence records, population dynamics, distribution, threats, and management needs are also summarized (Houtcouper et al. 1985).

### Colorado

Colorado legislature passed the Colorado Nongame and Endangered Species Conservation Act in 1975. Selected species are officially listed as state endangered, state threatened, or of state special concern. At my request, Colorado Division of Wildlife (CDOW) sent me its working list of Colorado's rare animals. The list contained status designations of nongame species ranked by OES, CDOW, and NHP.

### Nebraska

Nebraska Game and Parks Commission (NGPC) has operated a nongame species program since 1971. This program was expanded to include endangered species after the Nebraska legislature passed the Nongame and Endangered Species Conservation Act in 1975. The NGPC and Nebraska Natural Heritage Program collaborate closely in the development and updating of state lists of species. Three classifications are recognized: global and state NHP ranks, federal lists, and state status ranks. State ranks are: SEN—state endangered (protected), STH—state threatened (protected), SNC—state need of conservation, and SSP—state special concern.

### Kansas

Kansas legislature passed the Kansas Nongame and Endangered Species Conservation Act in 1975. In 1980 (effective 1981), Kansas Game and Fish Commission authorized a state threatened and endangered species list (Kansas Administrative Regulation 115-15-1), a list of species in state need of conservation (Regulation 115-15-2), and provisions for special action permits that limit impacts to habitats of state threatened and endangered species (Regulation 115-15-3). At my request, Kansas Department of Wildlife and Parks provided lists of vertebrate species that are state threatened (28 species), state endangered (15 species), and in state need of conversation (47 species).

## State Animal Atlases, Distribution Guides, Published Literature

I relied on published literature, unpublished reports, and the personal communications of acknowledged experts to assess relative abundance, reproductive status, population distribution, specialized needs, and habitat use of species by state and region. To determine current and historic distributions of species, I reviewed numerous state and regional guides and published range maps (e.g., Smith et al. 1965, Turner 1974, Lane and Holt 1979, Baxter and Stone 1980, Hammerson 1982, Clark and Stromberg 1987, Zeveloff and Collett 1988). In addition, many state wildlife agencies provided specific information on animal localities. Kansas Department of Wildlife and Parks furnished a report on occurrences and densities of nongame species (Ports 1979) and state distributional maps of threatened and endangered species. South Dakota sent me a publication that summarized state occurrences of threatened, endangered, and rare animals (Houtcouper et al. 1985). Wyoming and Colorado have state atlases that document animal occurrence by "latilong" or area blocks delineated by latitude and longitude. State atlases give locations of rare species and information on seasonal status, abundance, habitat, and life form. Atlases were available for birds and mammals in Wyoming (Findholt et al. 1981, Oakleaf et al. 1982) and Colorado (Bissell 1982, Kingery 1988), and for rep-

tiles and amphibians in Colorado (Hammerson and Langlois 1981).

## CRITERIA USED FOR IDENTIFYING SENSITIVE SPECIES

Candidates were selected as sensitive species if: 1) they were previously identified on one or more national or regional lists (birds primarily), or by a majority of state lists (see List Criteria below); or 2) they currently experience two or more of the following: low relative abundance, declining numbers, isolated or disjunct populations, endemic or restricted distributions, unique or limited habitats, specialized habitat requirements, or habitat or population disturbance due to human or natural impacts (see Habitat and Distribution Criteria below); and 3) they are known or suspected to reside or migrate within the boundaries of USFS Region 2 (fig. 1). The final list excludes species that are: peripheral to the region but common in adjacent states; not likely to be found on national forests, national grasslands, or other public lands managed by USFS Region 2; introduced from other areas, states, or regions, or exotic to North America; or game species that are protected by law unless current management strategies are deemed inadequate to restore populations. Three federally listed endangered species found in the five-state region are not described in this document because they are not known to occupy Forest Service lands in Region 2: the Wyoming toad (*Bufo hemiaphrys baxteri*), the piping plover (*Charadrius melodus*), and the least tern (*Sterna antellarum*).

### List Criteria

1. Current OES status as threatened or endangered for nation or Rocky Mountain Region. Species that are federally listed are automatically selected as sensitive species.
2. Long-term population declines based on BBS or CBC trends for a majority of states or entire region (birds only); decline in historical range or decline in numbers based on published accounts, unpublished reports, and professional evaluations by species experts.
3. State lists: endangered/threatened/special concern/priority/other for one or more states in USFS Region 2.
4. Current OES candidate status for one or more states or entire region.
5. Current Blue List status (birds only) for a majority of states or entire region.
6. OMBM 1982 or 1987 list (migratory birds only) for corresponding regions.
7. Natural Heritage Program status of critically imperiled, imperiled, or rare in a majority of states.
8. Listed as a rare or uncommon year-round or seasonal resident in a majority of state animal atlases, state or regional field guides, or published accounts of distributions.

### Habitat and Distribution Criteria

1. Species with small, reproductively isolated populations, disjunct distributions, or limited ability to disperse to new areas.

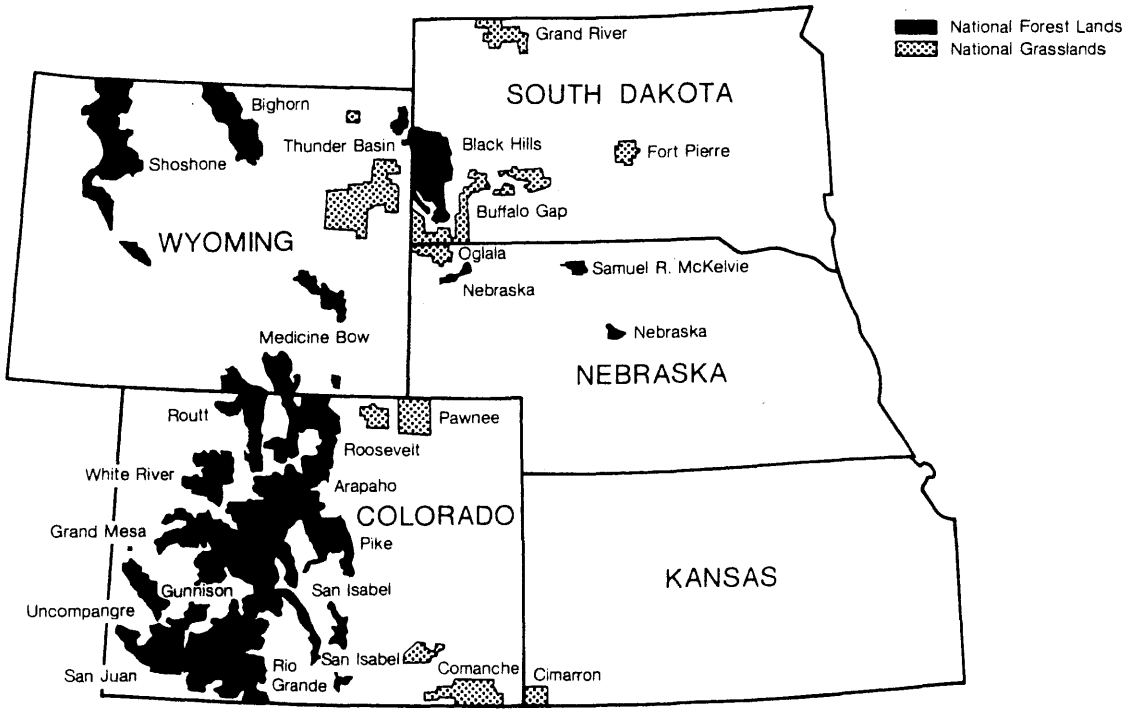


**Figure 1. National Forests and National Grasslands of the U.S. Forest Service, Rocky Mountain Region (R2).**

2. Species that are dependent on specific habitat features (e.g., tree cavities, specialized den sites, old-growth forest) for breeding, feeding, or survival.
3. Species that are restricted to one or a few habitats.
4. Species that are obligated to habitats that are uncommon or rare, or declining in abundance.
5. Species that reside in habitats that are vulnerable to, or slow to recover from, disturbance.
6. Species whose productivity or population levels have been, or are suspected to be, impacted by human activities, specific land management practices, or natural catastrophic events.

## SUMMARY OF INFORMATION

Based on listed criteria, I selected 67 wildlife species and subspecies of management concern in the Rocky Mountains and western Great Plains. Of these taxa, 34 were birds (table 1), 22 were mammals (table 2), 6 were reptiles (table 3), and 5 were amphibians (table 3).

### Reasons for Listing

The most common reason for listing a species was its rarity (47 species: 70% of 67), followed by apparent declines in abundance (39: 58%), suspected impacts by man (38: 57%), population isolation or segregation (37: 55%), limited or vulnerable habitats (33: 49%), specialized requirements (33: 49%), and limited ability to disperse (14: 21%) (tables 1, 2, and 3). Rarity was the most frequent reason for listing birds (68% of 34 species), mammals (77% of 22), and herptiles (64% of 11). Based on the number of species listed per factor, factors varied in degree of importance in birds ($X^2 = 16.4$, $P<0.025$), but not in mammals ($X^2 = 8.9$, $P>0.10$) or herptiles ($X^2 = 8.1$, $P>0.10$). When taxonomic classes were com-

Table 1. List of bird species of regional concern, habitat formations used by each species, and principle reasons for listing

| Bird species | Habitat formations[1] | Rarity | Range/ population declines | Isolated/ disjunct populations | Limited dispersal | Special needs | Limited/ vulnerable habitats | Impacted by human activities |
|---|---|---|---|---|---|---|---|---|
| American bittern | 2 | X | X | X | X | | X | |
| Bald eagle | 2,3,5,8,10–12 | X | X | X | | X | X | X |
| Baird's sparrow | 1 | X | X | X | | | | X |
| Black-backed woodpecker | 12,13 | X | | | | X | X | |
| Black tern | 2,3 | | X | | | | X | |
| Boreal owl | 13 | X | | X | | X | | |
| Columbian sharp-tailed grouse | 4,6,7,8 | X | X | X | X | | | X |
| Common loon | 2,3,8 | | X | | | | X | X |
| Ferruginous hawk | 1,4 | | X | | | X | | X |
| Flammulated owl | 10,11,14 | X | | X | | X | X | X |
| Greater prairie chicken | 1,4,6 | X | X | X | X | | X | X |
| Greater sandhill crane | 1,2,3,8 | | X | X | | | X | X |
| Harlequin duck | 8 | X | | | | X | X | |
| Lark bunting | 1,4,6 | | X | | | | X | X |
| Lesser prairie chicken | 1 | X | X | X | X | | | X |
| Loggerhead shrike | 1,3–7,10 | | X | | | X | X | |
| Long-billed curlew | 1,4,6 | | X | | | | | X |
| Mexican spotted owl | 5,10,11 | X | | X | | X | | |
| Mountain plover | 1,6 | | X | | | | X | X |
| Northern goshawk | 5,10–15 | X | | | | X | | X |
| Northern harrier | 1,2,3,4 | | X | | | X | X | X |
| Olive-sided flycatcher | 8,10–14 | | X | | | X | | |
| Osprey | 2,3,8,10,11 | X | X | X | | | X | X |
| Peregrine falcon | 1–15 | X | X | X | | X | | X |
| Purple martin | 3,14 | X | | X | | X | | X |
| Southwestern willow flycatcher | 3,8 | X | X | | | X | | |
| Snowy plover | 2 | X | X | X | | | X | X |
| Three-toed woodpecker | 10,11,12,13 | X | | | | X | | |
| Trumpeter swan | 2,3 | X | | X | | | X | X |
| Upland sandpiper | 1 | X | | | | | | X |
| Western burrowing owl | 1,4,5 | | X | | | X | | X |
| White-faced ibis | 2,3 | X | | X | | | X | |
| Whooping crane | 1,2,3 | X | X | X | | | X | X |
| Yellow-billed cuckoo | 2,3 | X | X | | | | X | |

[1]*Habitat formations based on Johnston (1987): 1 plains grassland; 2 lowland wetlands; 3 deciduous riparian woodlands; 4 foothill and mountain grasslands; 5 pinyon-juniper woodlands; 6 cold desert shrublands; 7 deciduous green shrublands (Gambel's oak); 8 mountain riparian; 9 rocky slopes, screes, cliffs, caves; 10 ponderosa pine; 11 Douglas fir; 12 lodgepole pine; 13 subalpine spruce-fir; 14 aspen; and 15 alpine.*

Table 2.—List of mammal species of regional concern, habitat formations used by each species, and principle reasons for listing

| Mammal species | Habitat formations[1] | Rarity | Range/ density declines | Isolated/ disjunct populations | Limited dispersal | Special habitat needs | Limited/ vulnerable habitats | Impacted by human activities |
|---|---|---|---|---|---|---|---|---|
| Abert's squirrel | 5,10 | | | X | | X | X | X |
| Allen's thirteen-lined ground squirrel | 1,4 | X | X | X | X | | | |
| Bison | 1,4,6,8 | | X | X | | | | X |
| Black-footed ferret | 1,4,6 | X | X | X | X | X | X | X |
| Dwarf shrew | 1,2,5,9,14 | X | | X | X | | | |
| Fisher | 11,12,13 | X | X | | | X | X | X |
| Fringed myotis | 4,5,9,10,13 | X | | X | | X | | |
| Gray wolf | Formerly 1–15 | X | X | | | | | X |
| Grizzly bear | 3,4,6-8,12–15 | X | X | X | | | | X |
| Least weasel | 1,4 | X | | X | X | | | |
| Lynx | 8,9,12,13 | X | | X | | X | | |
| Marten | 3,11–14 | | | | | X | X | |
| Meadow jumping mouse | 2,3 | X | | X | X | X | X | X |
| Prairie dog | 1,4,5,6,7 | | X | X | | | | X |
| Pygmy shrew | 8,12,13,15 | X | | | | X | | |
| Ringtail | 2,3,4,5,6 | X | | X | | X | X | |
| River otter | 2,3,8 | X | X | | | X | X | X |
| Rocky Mountain bighorn sheep | 8,9,15 | | X | X | X | X | X | |
| Spotted bat | 1,2,3,5,10,11 | X | | X | | X | | |
| Swift fox | 1 | X | X | | | | | X |
| Townsend's big-eared bat | 5,7,9,10,11 | X | | X | | X | | X |
| Wolverine | 12,13,15 | X | X | | | | X | X |

[1]*Habitat formations based on Johnston (1987): 1 plains grassland; 2 lowland wetlands; 3 deciduous riparian woodlands; 4 foothill and mountain grasslands; 5 pinyon-juniper woodlands; 6 cold desert shrublands; 7 deciduous green shrublands (Gambel's oak); 8 mountain riparian; 9 rocky slopes, screes, cliffs, caves; 10 ponderosa pine; 11 Douglas fir; 12 lodgepole pine; 13 subalpine spruce-fir; 14 aspen; and 15 alpine.*

Table 3.—List of reptile and amphibian species of regional concern, habitat formations used by each species, and principle reasons for listing

| Herptile species | Habitat formations[1] | Rarity | Range/ density declines | Isolated/ disjunct populations | Limited dispersal | Special needs | Limited/ vulnerable habitats | Impacted by human activities |
|---|---|---|---|---|---|---|---|---|
| Black Hills red-bellied snake | 3,4,5,8,10 | X | | X | | | | |
| Couch's spadefoot toad | 1,2 | X | | X | X | X | X | |
| Green toad | 1,2 | X | | X | X | X | X | |
| Massasagua | 1,2 | | X | | | | | X |
| Northern leopard frog | 2,3,8,10–14 | | X | | | | | X |
| Smooth green snake | 2–5,7,8,10,14 | X | | X | | | | |
| Texas horned lizard | 1 | | X | | | X | | X |
| Texas longnosed snake | 1 (sandhills) | X | | | | | | |
| Western boreal toad | 4,8,13 | | X | | | | X | X |
| Wood frog | 8,13,14 | X | | X | X | X | X | |
| Yellow mud turtle | 2,3 | X | | | X | | X | |

[1]*Habitat formations based on Johnston (1987): 1 plains grassland; 2 lowland wetlands; 3 deciduous riparian woodlands; 4 foothill and mountain grasslands; 5 pinyon-juniper woodlands; 6 cold desert shrublands; 7 deciduous green shrublands (Gambel's oak); 8 mountain riparian; 9 rocky slopes, screes, cliffs, caves; 10 ponderosa pine; 11 Douglas fir; 12 lodgepole pine; 13 subalpine spruce-fir; 14 aspen; and 15 alpine.*

pared, reasons other than rarity tended to be listed less often for herptile species than for mammals or birds. This discrepancy may in part be due to incomplete information about the current status and distribution of reptiles and amphibians in the Rocky Mountain Region. Population isolation and separation seemed to influence more mammal species (68%) than bird species (50%). Likewise, limited dispersal was listed for 27% of mammal species and only 12% of birds. Presumably, flight capability permits greater mobility and migration in birds

than in ground-restricted mammals which may explain why bird species had fewer dispersal or isolation problems than mammals.

### Habitat Use

To determine if numbers of sensitive species varied among vegetation types, I first pooled species occurrences in 15 habitat formations (tables 1, 2, and 3) into five broad (nonexclusive) habitat categories. Specified in descending order of magnitude, 55% of the listed species occupied wetland and riparian habitats; 49% used plains and upland grasslands; 42% inhabited mountain coniferous and deciduous forests; 39% used foothill shrublands and woodlands; and 20% used specialized habitats like talus slopes, caves, and alpine. Wetlands and riparian habitats contained a majority of bird taxa (51%), mammal taxa (54%), and amphibian species (100%), whereas grasslands accommodated the majority of reptile taxa (83%).

Total numbers of vulnerable species varied by habitat formation ($X^2$ = 40.2, df = 14, $P<0.001$) with more species generally found in lowland habitats (grasslands, wetlands, riparian woodlands) than in foothill shrublands, mountain forests, or alpine areas (fig. 2). Variation in species densities among habitats was due to changes in numbers of bird species ($X^2$ = 34.8, $P<0.001$) and to a lesser extent, herptile species ($X^2$ = 21.5, $P<0.1$), but not to differences in numbers of mammal species ($X^2$ = 7.0, $P>0.95$).

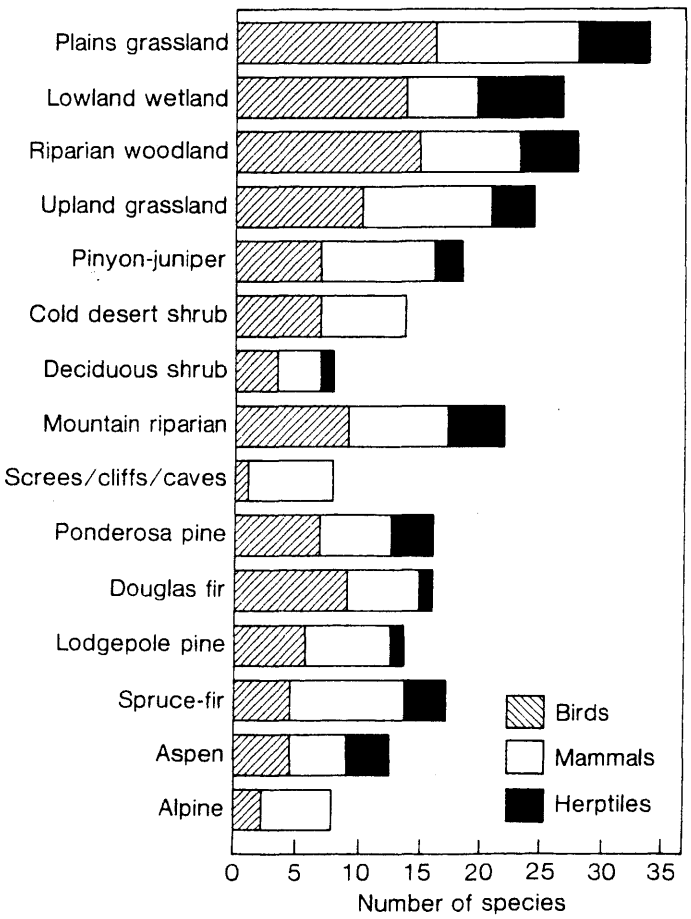


**Figure 2. Number of vulnerable bird, mammal, and herptile species found in 15 habitat formations in the Rocky Mountains and western Great Plains. See Tables 1, 2, and 3 for further descriptions of habitats and species habitat use.**

### List Information

All four vertebrate classes are listed by NHP, OES, USFS, and state agencies. Because of information gaps in species rankings by state, I described NHP results in individual species accounts. Five of the selected taxa were federally listed as Endangered (bald eagle, peregrine falcon, whooping crane, black-footed ferret, and gray wolf); one was listed as threatened (grizzly bear); and 20 (30% of 67 species) were Category 2 candidates (tables 4, 5 and 6). Lack of current information on Great Plains distributions and status of two additional federally listed species, piping plover (T) and least tern (E), temporarily precludes their evaluation and possible listing. In addition, the federally listed Wyoming toad (E) is not included because it does not occur on Forest Service lands. Of the C2 Candidates, 9 were birds (29% of 31 bird species), 8 were mammals (42% of 19), 1 was an amphibian (20% of 5), and 2 were reptiles (33% of 6). Excluding T and E species, 62% of the 61 remaining species were identified as sensitive by one or more adjacent USFS regions. Thus, a total of 71% of the selected bird species, 73% mammal species, and 36% herptile species were recorded on one or more USFS lists. Pooled state lists contained 63% of all nominated species, and 59% of the bird species, 82% of the mammals and 36% of the herptiles.

Bird species of concern were identified by a wider variety of information sources than those available for other taxa. According to BBS trends, populations of at least 57 bird species significantly declined in the U.S. during the period 1966 to 1985 (OMBM 1987). I identified 9 species of management concern whose populations had declined during the period 1977 to 1989 across the North American continent or the U.S., or within the Central or Western BBS regions (Sam Droege, USFWS, unpublished Breeding Bird Survey summaries, 1990) (table 4). In addition, in 1986, 7 of the species chosen here were blue-listed, 7 were species of special concern, and 3 were species of local concern (table 4). Three additional species listed in Table 4 were identified by the National Audubon Society in earlier years. In 1987, OMBM reported 30 migratory bird species of management concern in the U.S., 11 of which are identified in this report; also included here are 3 additional species listed by OMBM in 1982.

To determine the relationships among sources of information from which species of concern were selected, I computed percent overlap in composition of selected species between pairs of lists. For simplification, species distinguished in different years, categories, or regions were pooled by Blue List (BL + SC + LC/to 1986), OES list (C2 + C3), OMBM list (1982 + 1987), USFS list (S + W/R1 + R3 + R4), and state list (WY

Table 4.—Summary of information from national, regional, and state lists for bird species[1]

| Bird species | BBS trend[2] | OES list 1989[3] | OMBM list 82/87[4] | Blue List 72–86[5] | USFS lists[6] | State Lists[7] | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | WY | SD | CO | NE | KS |
| American bittern | US | | 82/87 | BL86 | S-R3 | PII | | | | |
| Baird's sparrow | CO | | 82/87 | LC82 | S-R3 | | | | | |
| Bald eagle | W-ns | E | NA | NA | E | | e | e | e | e |
| Black-backed woodpecker | id | | | | | PIII | | | | |
| Black tern | E,C,US | | 82/87 | BL86 | | PII | | | | |
| Boreal owl | id | | | | S-R1/R3/R4 | | | | | |
| Columbian sharp-tailed grouse | W | C2 | | SC86 | S-R4 | | | | | |
| Common loon | W-* | | 82/87 | LC86 | S-R1/R2/R4 | PI | | | | |
| Ferruginous hawk | W-ns | C2 | 82 | SC86 | S-R1/R3/R4 | PII | | | SSP | SNC |
| Flammulated owl | id | | | | S-R3/R4 | | | | | |
| Greater prairie chicken | id | | | | S-R1 | | | e | | |
| Greater sandhill crane | W-ns | | | | | | | e | | |
| Harlequin duck | id | | | | S-R1/R4 | | | | | |
| Lark bunting | C,US,CO | | | SC82 | | | | | | |
| Lesser prairie chicken | id | | | | | | | t | EX | |
| Loggerhead shrike | E,C,W,US,CO | C2(SS) | 82/87 | BL86 | | | | | | |
| Long-billed curlew | W-* | C2 | 82 | SC86 | S-R3 | PIII | | | | SNC |
| Mexican spotted owl | id | C2 | 82/87 | BL86 | S-R3/R4 | | | | | |
| Mountain plover | id | C2 | | | S-R3/R4 | | EX | t | SNC | |
| Northern goshawk | W-ns | | | | S-R3 | | | | | |
| Northern harrier | C,US | | 82/87 | BL86 | | | | | | |
| Olive-sided flycatcher | W,US,CO | | 87 | | | | | | | |
| Osprey | W-ns | | | LC86 | S-R3 | | t | | | |
| Peregrine falcon | id | E | NA | NA | E | | e | e | e | e |
| Purple martin | W-ns | | | SC86 | | | | | | |
| Snowy plover | id | C2 | 82/87 | SC86 | S-R3 | | | | | t |
| Southwestern willow flycatcher | id | C2(SS) | | SC86 | S-R3/R4 | | | | | |
| Three-toed woodpecker | W-ns | | | | S-R4 | | | | | |
| Trumpeter swan | id | | 82/87 | LC86 | S-R1 | PI | | | | |
| Upland sandpiper | W-ns | | 82 | BL86 | S-R3 | PII | | | | |
| Western burrowing owl | W-ns | | | SC86 | | PII | | | | |
| White-faced ibis | W-* | C2 | 82/87 | BL79 | S-R3 | PI | | | | t |
| Whooping crane | id | E | NA | NA | E | | e | e | e | e |
| Yellow-billed cuckoo | E,C,US,CO | C3b | | BL86 | S-R3 | PII | | | | |

[1]*See text for information on species lists. NA = not applicable for federally listed threatened or endangered species.*

[2]*Population declines ($P<0.10$) from 1966 to 1989 in different Breeding Bird Survey (BBS) regions are marked: W = Western, C = Central, E = Eastern, US = United States, CO = Continent. In the West only, W-* = significant increase and W-ns = insignificant trend. id = insufficient data.*

[3]Designations are: E = *Endangered, C2 = Category 2 candidate, C3b = Category 3B candidate, SS = listed subspecies found in USFS Region 2.*

[4]*The 1982 and/or 1987 OMBM lists of migratory birds of management concern are cited.*

[5]*Blue List categories (BL = blue-listed, SP = special concern, LC = local concern) are given for the most recently cited year (to 1986).*

[6]*USFS classifications are given for R1, R2, R3, and R4: S = sensitive species, E = federally endangered status.*

[7]*Wyoming: PI-PIII = Priority I to Priority III. Other states: e = state endangered, t = state threatened, SNC = state need of conservation, SSP = state special concern. EX = extinct in state.*

+ SD + CO + NE + KS). The composition of bird species selected in this report overlapped broadly among lists (table 7). The Blue List and the OMBM list shared the greatest percentage (76%) of bird species, followed by high overlap between USFS lists and the OES list (65%) and the Blue List and state lists (65%). The BBS record of declines generally shared fewest bird species with different lists (e.g., state: 21%; USFS: 24%; and OES: 27%). State lists overlapped 76% with USFS lists in mammal species, but only 29% in herptile species. The OES list shared 74% of its mammals and 57% herptiles with USFS lists, and 69% mammals and no herptiles with state lists.

## Threats to Species

Numerous published papers, internal agency reports, and field guides describe real or perceived threats to species. Threats to populations vary extensively among species because of differences in habitat and food requirements; exposure, desirability, and response to humans; and susceptibility to weather, disease, parasitism, predation, and pesticides. Some species may be threatened by a greater variety of problems than other species, and some environmental hazards may impact more species than others. I reviewed various threats to mammals and birds based on the published literature and commu-

Table 5.—Summary of information from national, regional, and state lists for mammal species[1]

| Mammal species | OES List 1989[2] | USFS Lists[3] | State Lists[4] WY | SD | CO | NE | KS |
|---|---|---|---|---|---|---|---|
| Abert's squirrel | | | PIII | | | | |
| Allen's thirteen-lined ground squirrel | C2(SS) | | ed | | | | |
| Bison | | | | | | | |
| Black-footed ferret | E | E | | e | e | e | e |
| Dwarf shrew | | | PII | | | | |
| Fisher | | S-R1/R4 | PIII | | | | |
| Fringed myotis | | | PIII | ed | | | |
| Gray wolf | E | E | | e | e | e | e |
| Grizzly bear | T | T | | t | t | t | t |
| Least weasel | | | PIII | | | | |
| Lynx | C2 | S-R4 | PIII | | e | | |
| Marten | | S-R3 | | | | | |
| Meadow jumping mouse | C2(SS) | S-R3 | PII | | | | |
| Prairie dog | | S-R3 | | | | | |
| Pygmy shrew | | S-R4 | PII | | | | |
| Ringtail | | S-R3 | PIII | | | | |
| River otter | C2(SS) | S-R3 | PIII | t | e | | |
| Rocky Mountain bighorn sheep | | S-R1/R3 | | | | | |
| Spotted bat | C2 | S-R1/R3/R4 | PIII | | | | |
| Swift fox | C2 | S-R3 | | t | | e | |
| Townsend's big-eared bat | C2 | S-R1/R3/R4 | PIII | SNC | | | |
| Wolverine | C2 | S-R1/R4 | PIII | EX | e | EX | |

[1]*See text for information on species lists.*
[2]*Designations are: E = endangered, T = threatened, C2 = Category 2 candidate, SS = listed subspecies found in USFS Region 2.*
[3]*USFS classifications are given for R1, R3, and R4: S = sensitive species, T = federally threatened status, and E = federally endangered status.*
[4]*Wyoming: PI-PIII = Priority I to Priority III status. Other states: e = state endangered, t = state threatened, SNC = state need of conservation, SSP = state special concern. General: ed = endemic population, EX = extinct.*

Table 6. Summary of information from national, regional, and state lists for reptile and amphibian species[1]

| Species | OES List 1989[2] | USFS Lists[3] | State Lists & NHP status[4] WY | SD | CO | NE | KS |
|---|---|---|---|---|---|---|---|
| Black Hills red-bellied snake | | | R-p | I-ed | — | — | — |
| Couch's spadefoot toad | | | — | — | CI | un | un |
| Green toad | | | — | — | CI | un | t |
| Massasagua | | S-R3 | — | — | I | CI | un |
| Northern leopard frog | | | — | — | SC | — | — |
| Smooth green snake | | | R-d | I-p-d | un | CI | d |
| Texas horned lizard | C2 | S-R3 | — | — | un | — | un |
| Texas longnosed snake | | S-R3 | — | — | p-un-w | — | t-CI |
| Western boreal toad | C2 | S-R3/R4 | R | — | U | — | — |
| Wood frog | | | I-d | — | t-CI-u | — | — |
| Yellow mud turtle | C2 | | — | — | I-p-w | R | un |

[1]*See text for information on species lists.*
[2]*C2 = Category 2 candidate listed by OES.*
[3]*USFS classifications are given for R1, R3, and R4: S = sensitive species.*
[4]*State programs: t = state threatened, SC = special concern. Colorado: w = working list of rare animals. Natural Heritage Program: CI = critically imperiled, I = imperiled, R = rare, U = uncertain. Population status: p = peripheral, d = disjunct, i = isolated, ed = endemic, un = undetermined, — = absent.*

Table 7. Percent overlap and number of species shared (in parentheses) among various lists of bird species of special concern in the Rocky Mountains and western Great Plains[1]

| | BBS trend[2] | OES list | OMBM list | Blue list | USFS lists | State lists |
|---|---|---|---|---|---|---|
| BBS trend | 100 | 27 | 52 | 55 | 24 | 21 |
| OES list | (3) | 100 | 50 | 60 | 65 | 48 |
| OMBM list | (6) | (6) | 100 | 76 | 57 | 52 |
| Blue List | (8) | (9) | (13) | 100 | 34 | 65 |
| USFS lists | (4) | (12) | (10) | (14) | 100 | 36 |
| State lists | (3) | (8) | (8) | (12) | (16) | 100 |

[1]*Overlap is computed from species cited in this report, not from all species on lists. Percent overlap = Number of cited species common to two different lists X 2/number of cited species on first list + number of species on second list.*

[2]*Only species with declining BBS trends in the West or across the U.S or North American continent were considered.*

nications with acknowledged experts. Lack of information precluded a review of hazards to reptiles and amphibians.

Loss of specialized habitat, prey, or nest sites was perceived as the worst threat, noted for 33 of the selected mammal and bird species (tables 8 and 9). I defined specialized habitats (e.g., wetlands and riparian woodlands) as those that are extremely limited in distribution or that are used exclusively or primarily by a particular species (e.g., American bittern, black tern, common loon, snowy plover, willow flycatcher, trumpeter swan, white-faced ibis, meadow jumping mouse, river otter, and pygmy shrew). Burns, talus slopes, old-growth forests, or large areas of wilderness are other examples of specialized habitats that certain species apparently require or prefer (e.g., all listed woodpeckers, boreal owl, flammulated owl, spotted owl, goshawk, Abert's squirrel, dwarf shrew, fisher, wolverine, lynx, and bighorn sheep). Animals that specialize on only one or a few prey sources or that forage on prey in limited habitats include bald eagle, osprey, yellow-billed cuckoo, Abert's squirrel, black-footed ferret, lynx, and river otter. Reductions or low availability of suitable nest or den sites may limit the abundance of some species (e.g., all listed owls and woodpeckers, ferruginous hawk, harlequin duck, loggerhead shrike, fisher, and all listed bats).

Habitat loss is caused by numerous human activities. One land management practice perceived as a threat to 23 species was agricultural conversion. In the Rocky Mountains and Great Plains, habitat conversion to monotypic croplands involves draining of wetlands and destruction of native prairie, shrublands, and riparian woods. Another habitat alteration of potential impact to 15 species was habitat fragmentation, or the division of large contiguous blocks of habitat into smaller disconnected pieces. Fragmented habitats result from clearcutting of forests, agricultural conversion, mining, and energy and urban development. Habitat fragmentation can result in barriers to small mammal and herptile dispersal; reproductive and genetic isolation of populations; local extinctions of sedentary, vulnerable, or rare species; loss of species with large home ranges; and heightened rates of nest predation, competition, or cowbird parasitism due to increased access created by new edge habitats (Harris 1984, Wilcove 1988). Timber harvesting itself was listed as an actual or potential hazard to 13 selected species. Besides fragmenting habitats, logging can result in direct disturbance to animals; losses of nest, den, rest, and perch sites from removal of snags and downed woody debris; reduced prey densities; and reduced habitat heterogeneity in clearcut stands (Rice 1989). Habitats and populations of 14 species may be jeopardized by management practices and problems associated with the livestock industry, including livestock overgrazing; soil compaction, trampling of nests, dens, burrows, and rest sites; reduced habitat quality of streams; and rodent control programs on grazing lands. A final land management practice, fire suppression, was listed for 7 species. Fire control reduces the availability of burns to fire-adapted wildlife and alters the overall composition and diversity of species and habitats.

Many human practices have threatened populations directly rather than through effects on habitats. Unregulated trapping and hunting historically impacted populations of 18 listed furbearer and game species. In some regions, management protection and reintroductions have restored populations of overharvested species. Population declines in 14 species of hawk, ground squirrel, and furbearing mammals are related to pest and predator control programs. Pesticides used in animal and insect control programs inadvertently impacted 12 nontarget species (i.e., species for which the pesticide was not intended), mostly predators of fish and small mammals. An additional 12 species are thought to be affected by human encroachment into wildlife habitats or direct human disturbance at breeding colonies, solitary nest sites, and roost cavities or caves. Cowbird parasitism or nest site competition with European starlings (*Sturnus vulgaris*) was mentioned as possible causes of declines in four songbird species; and diseases like bubonic plague, canine distemper, brucellosis, and lungworm are known to devastate populations of prairie dogs, black-footed ferret, bison, and bighorn sheep.

## Implications

Based on this summary, a number of mana' needs can be identified.

Table 8. Factors that have historically limited, or may currently jeopardize, populations of selected bird species[1]

| Bird species | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| American bittern | X | | | | X | | | | | | X | | |
| Baird's sparrow | X | | X | | | | | | | X | | X | X |
| Bald eagle | | | X | | X | X | | X | | | X | | |
| Black-backed woodpecker | | X | | X | | | | | | | X | | |
| Black tern | X | | | | | | | | | | X | X | |
| Boreal owl | | X | | | | | | | | | X | X | X |
| Columbian sharp-tailed grouse | X | | | | | | X | | | | | | |
| Common loon | X | | | | X | | | | | | X | | |
| Ferruginous hawk | X | | | | | X | | X | X | | X | | |
| Flammulated owl | | X | | X | | | | | | | X | X | |
| Greater prairie chicken | X | | | | | | X | | X | | | X | |
| Greater sandhill crane | X | | | | | X | X | X | | | X | | |
| Harlequin duck | | | | | | | | | | | X | | X |
| Lark bunting | X | | X | | | | | | | | | X | X |
| Lesser prairie chicken | X | | | | | | X | | X | | | X | |
| Loggerhead shrike | X | | | | X | | | | | | X | | |
| Long-billed curlew | X | | X | | | | X | | X | | | | |
| Mexican spotted owl | | X | | X | | | | | | | X | X | X |
| Mountain plover | X | | | | | | X | | X | | | | |
| Northern goshawk | | X | X | | X | | | X | | | X | | |
| Northern harrier | X | | X | | X | | | X | | | X | | |
| Olive-sided flycatcher | | X | | X | | | | | | | X | | X |
| Osprey | | | | | X | X | | X | | | X | | |
| Peregrine falcon | | | | | X | X | X | X | | | | | |
| Purple martin | | X | | | | | | | | X | X | | X |
| Snowy plover | X | | | | | | | | | | X | | |
| Southwestern willow flycatcher | | | X | | | | | | | X | X | | |
| Three-toed woodpecker | | X | | X | | | | | | | | | |
| Trumpeter swan | X | | | | | | X | | | | | X | |
| Upland sandpiper | X | | | | | | X | | X | | | X | |
| Western burrowing owl | X | | X | | X | | | | X | | X | | |
| White-faced ibis | X | | | | X | | | X | | | X | | |
| Whooping crane | X | | | | | | X | X | | | X | | |
| Yellow-billed cuckoo | | | | | | | | | | | X | X | X |

[1]*Column headings are listed in order as follows: 1 Agricultural conversion; 2 Timber harvesting; 3 Livestock industry, overgrazing; 4 Fire suppression; 5 Accidental pesticide poisoning; 6 Pest and predator control; 7 Overharvest (trapping, hunting); 8 Human disturbance; 9 Mining, energy development; 10 Competition, brood parasitism; 11 Loss of specialized habitat, prey, or nest sites; 12 Habitat fragmentation; 13 Causes unclear.*

1. The status and distribution of vertebrate species cannot be adequately assessed without thorough, long-term inventories of populations. Records of widespread population declines are clear warnings that a species is in trouble, yet birds are the only taxa regularly surveyed by nationwide and regional networks. Moreover, bird counts like Breeding Bird Surveys and Christmas Bird Counts are inadequate for determining trends in many species like raptors, shorebirds, and waders. Existing data bases need to be refined for such groups (OMBM 1987). Evaluating the status of rare, inaccessible, secretive, or highly mobile species requires the development of new and improved methods for monitoring populations. In addition, the establishment of national and regional data bases that yield information on population changes in nongame mammals, reptiles, and amphibians is highly recommended.
2. Lists of bird species of special concern overlapped least in species composition with BBS indices (table 7). This suggests that population trend data are insufficiently evaluated by many agencies that list sensitive species. For example, most state agencies and all USFS regions cited in this report failed to list black tern and loggerhead shrike whose populations are clearly in decline based on available BBS data. I encourage agencies to take better advantage of data bases like BBS and CBC.
3. Maintaining wildlife habitats without monitoring population levels of animals is a common approach to managing vertebrate species. However, it is a mistake to assume that a sensitive species persists in an area because its habitat has been sustained. Factors other than loss or deterioration of habitat may cause its local extinction. Once a sensitive species is lost from an area, its rarity, isolation, restricted dispersal,

Table 9. Factors that have historically limited, or may currently jeopardize, populations of selected mammal species[1]

| Species | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Abert's squirrel | | X | | X | | | | | | | X | X | |
| Allen's thirteen-lined ground squirrel | | | | | | X | | | | | | | X |
| Bison | | | X | | | | X | | | X | | | |
| Black-footed ferret | X | | | | X | | | | X | X | X | X | |
| Dwarf shrew | | | | | | | | | | | X | | X |
| Fisher | | X | | | | | X | | | | | | X |
| Fringed myotis | | | | | | | | | | | X | | X |
| Gray wolf | | | X | | | X | | X | | | | | |
| Grizzly bear | | | X | | | X | | X | | | | | |
| Least weasel | | | | | | | | | | | | | X |
| Lynx | | X | | | | X | X | | | | | | |
| Marten | | X | | | | | X | | | | | X | |
| Meadow jumping mouse | | | X | | | | | | | | | | X |
| Prairie dog | X | | X | | | X | | | X | X | | X | |
| Pygmy shrew | | | | | | | | | | | X | | X |
| Ringtail | | | | | | | | | | | X | | X |
| River otter | | | | | | X | X | | | | X | | |
| Rocky Mtn. bighorn sheep | | | | | | X | X | | | X | X | | |
| Spotted bat | | | | | | | | | | | | | X |
| Swift fox | X | | | X | X | X | X | | | | | | |
| Townsend's big-eared bat | | | | | | | | X | | | X | | X |
| Wolverine | | X | | | | X | X | | | | | X | |

[1]*Column headings are listed in order as follows: 1 Agricultural conversion; 2 Timber harvesting; 3 Livestock industry, overgrazing; 4 Fire suppression; 5 Accidental pesticide poisoning; 6 Pest and predator control; 7 Overharvest (trapping, hunting); 8 Human disturbance; 9 Mining, energy development; 10 Disease; 11 Loss of specialized habitat, prey, or nest sites; 12 Habitat fragmentation; 13 Causes unclear.*

or vulnerability may inhibit its ability to recolonize the area even when its preferred habitat is available. The importance of monitoring populations of vulnerable species as well as their habitats cannot be overemphasized.

4. To assess and restore populations of sensitive species, management plans that specify scheduled, periodic surveys, recovery actions, and a long-term commitment to population monitoring are required. If the costs of monitoring and restoring populations limit the number of species selected, then species in most critical need should be of highest priority. These will be the first to disappear from an area and the first to be listed as threatened or endangered.
5. Information on population sizes and distributions of reptiles, amphibians, bats, small mammals, and some birds is insufficient to properly evaluate their status. These taxa are not viewed as charismatic, and therefore apparently in less need of study, protection, or restoration than species like large furbearers, raptors, and game. Unfortunately, this human value judgement no longer applies once a species is federally listed. To prevent species extinctions and conserve biological diversity, sensitive species should be managed and inventoried regardless of their popular appeal, size and appearance, or economic value.
6. Some species on my list are so scarce, wide-ranging, or irregular in occurrence that their numbers cannot be easily monitored. Rocky Mountain populations of the fisher, lynx, wolverine, and spotted bat fit this description. Managing these species may simply involve keeping a record of occurrences, and protecting habitats and individuals at regular occurrence sites. I recommend that these species be officially listed as sensitive in the Rocky Mountain Region, but not to the exclusion of other species whose numbers can be readily monitored and for which a recovery plan can be developed. If a list is limited to only a handful of species, most of which are difficult (if not impossible) to survey, then preparation of the list may have been a wasted effort.
7. Lists of sensitive species should be updated regularly based on survey data, literature review, other list sources, and new information. Some species may be classified as permanently sensitive (e.g., those confined to limited habitats) while others may be of temporary concern (e.g., those recovering from overharvest or accidental poisoning).
8. Research focusing on the effects of land management practices on populations of sensitive species and overall biological diversity is encouraged. Research is needed at local, landscape, and regional levels in response to management practices that impact species at different spatial scales. Small-scale studies are unlikely to generate satisfactory solutions to large-scale problems like habitat fragmentation.
9. Research that evaluates the status of sensitive species is recommended. Furthermore, some vulnerable species may be overlooked and unlisted because

their status is undetermined. Thorough literature reviews may provide additional data on the current and historic distributions of species.

10. Some habitats contain higher numbers of vulnerable species than others. In this report, the following habitats each supported >15 sensitive species: plains grasslands, lowland wetlands, deciduous riparian woodlands, foothill/mountain grasslands, foothill/mountain riparian, pinyon-juniper, ponderosa pine, and desert shrub. Such habitats are in need of special protection, particularly if they are limited in geographical extent, declining in distribution, disconnected from ecosystems with similar species composition, or vulnerable to human disturbance. On multiple-use lands, a few methods for conserving species-rich habitats include establishing wilderness and natural areas, protecting habitat corridors between such reserves, restoring damaged habitats, locally removing or mitigating detrimental management practices, closing roads during peak periods of species vulnerability, and eliminating roads altogether. Because natural resource agencies practice most of these techniques already, expanding their emphasis from protection or restoration of scenic areas to preservation of biologically diverse ecosystems should be straightforward.

## SPECIES ACCOUNTS

### Amphibians

#### Couch's Spadefoot Toad

Couch's spadefoot toad (*Scaphiopus couchii*) ranges from southwestern Oklahoma through central Texas, central New Mexico, Arizona, and southeastern California. The southern extent of the range is from the tip of Baja California to southern San Luis Potosi, Mexico (Stebbins 1966). It is found on private and public land, including the northern half of Comanche National Grassland, in southern Otero County, Colorado. Available information indicates that the population in southeastern Colorado is disjunct, occurring about 100 miles from the nearest known population in Texas, and that it represents the toads' most northern occurrence (Hammerson 1986). Habitat for Couch's spadefoot toad is short grass plains, creosote bush deserts, and other dryland vegetation. Spadefoots breed in spring and summer after heavy rains with breeding aggregates observed in rain puddles, slow moving streams, and irrigation ditches (Stebbins 1966). Dry periods are spent underground in the burrows of gophers, squirrels, kangaroo rats or in self-made burrows (Hammerson 1986). Generally, the toads cannot be observed unless heavy rain has recently fallen, even in areas where they are known to exist (Hammerson 1986). The population in southeastern Colorado may be adequately protected as long as no major changes in land use (present land use is livestock grazing) occur. The continued existence of stock ponds in spadefoot habitats will benefit the Colorado population. The Natural Heritage status of Couch's spadefoot in Colorado is critically imperiled. Possible threats to the toad include heavy collecting from breeding aggregations, major changes in land use activities, and pesticide contamination (Hammerson pers. comm., 1990).

#### Western Boreal Toad

The western boreal toad (*Bufo boreas*) ranges from southeastern Alaska south through the Rocky Mountains to northern New Mexico, and west to northern California (Stebbins 1966). West of the Rocky Mountains, this toad can be found in grasslands and dry habitats to sea level (Stebbins 1966); but in Colorado and Wyoming, it lives near springs, streams, ponds and lakes in foothill woodlands, mountain meadows, and moist subalpine forest to 3,200 m (Campbell 1970a, Baxter and Stone 1980). During the day, it buries itself in loose soil or in gopher or squirrel burrows near water; but at night, it ranges away from water, feeding primarily on ants (Campbell 1970b). Egg strings are laid in shallow water (Black and Brunson 1971). For unknown reason, populations of the boreal race have recently declined or disappeared throughout its range (Bruce Bury, USFWS, pers. comm., 1990). Primary threats include disturbance, degradation, and loss of wetland habitats; conversion of small ponds into larger reservoirs by damming; and trout introduction and predation on toad larvae (Hammerson pers. comm., 1990). In addition, impacts by livestock, timber management practices, human recreation, and water pollution may potentially jeopardize toad populations. The western boreal toad is listed as a Category 2 candidate by OES and as a sensitive species by USFS R3 and R4. Its Natural Heritage status is rare in Wyoming and uncertain in Colorado. Due to its declining abundance, its dependence on restricted, vulnerable habitats, and the susceptibility of its larvae to predation by exotic trout, the western boreal toad merits a sensitive species status.

#### Green Toad

This toad (*Bufo debilis*) ranges from western Texas to southeastern Arizona, north to Colorado, and as far south as Zacatecas, Mexico (Stebbins 1966). Its range is small and disjunct (Hammerson 1986), with individuals reported from a few localities in western Kansas (Collins 1982) and southern Otero County, Colorado including several sightings during the 1960's through the 1980's in Comanche National Grassland (Hammerson pers. comm., 1990). Recent records from Bent and Baca counties, Colorado indicate that this species may be more widespread than currently thought (Hammerson pers. comm., 1990). The green toad inhabits semi-arid plains, valleys and foothills and is usually not found on steep slopes or in rocky areas. This toad is difficult to observe because it is nocturnal and primarily active only after heavy rains. The green toad breeds in slow moving streams, rain puddles, and occasionally in irrigation

ditches and reservoirs (Stebbins 1966). Grass around the edge of the pools is sought as a spawning area (Hammerson 1986). Maintenance or construction of depressions that hold water after heavy rains would benefit green toad populations. Present land use, i.e., cattle grazing, may be compatible with the continued existence of Colorado's population (Hammerson pers. comm., 1990). The green toad has a Natural Heritage listing of critically imperiled in Colorado. The western green toad (*B.d. insidior*) is listed as threatened in Kansas. Possible threats to the toad are large-scale collecting from breeding aggregations and pesticide use (Hammerson pers. comm., 1990).

### Northern Leopard Frog

The northern leopard frog (*Rana pipiens*) is distributed widely across the United States, Mexico and Canada. There are scattered, isolated populations in the southwest portion of its range (Stebbins 1966). In Wyoming, leopard frogs are commonly found at elevations below 10,000 ft (3000 m) except in Park and Teton counties, and Yellowstone National Park. Preferred habitats include cattail marshes, beaver ponds, and other permanent water sources with aquatic vegetation. Rarely are they found near ephemeral ponds. Breeding is opportunistic and can occur at any time of the year following heavy rainfall. Near Laramie, Wyoming, the frogs emerge from winter burrows around mid-April, when the water reaches a temperature of about 50° F (Baxter and Stone 1980). Plains and montane populations of leopard frogs have recently declined in the southern Rocky Mountains (Hammerson 1982, Corn et al. 1989), and some Colorado populations have become extinct (Corn and Fogleman 1984). The northern leopard frog is a species of special concern in Colorado (Corn et al. 1989). Threats to local populations include changes in wetlands, especially the alteration of marshy ponds to reservoirs; stocking of predatory fish; natural local extinctions as ponds dry up during years of low precipitation (exacerbated by nonnatural threats) (Hammerson pers. comm., 1990); and predation and competition by introduced bullfrogs (*Rana catesbeiana*) (Hammerson 1982).

### Wood Frog

Though widespread from Alaska east through Canada and northeastern United States (Martof and Humphries 1959), the wood frog (*Rana sylvatica*) has a disjunct and extremely limited distribution in the Rocky Mountains. It occurs in small, isolated populations in the Medicine Bow Mountains of Colorado and Wyoming, in the Rabbit Ears and Park Ranges of Colorado, and in the Big Horn Mountains of Wyoming (Bagdonas and Pettus 1976, Dunlap 1977, Haynes and Aird 1981, Hammerson 1986). Wood frogs inhabit small marshy ponds that often dry up, slowly moving streams, and inactive beaver ponds in the montane zone to 3,050 m (Baxter and Stone 1980). Egg masses are laid in cool waters, typically along northern, sunlit shores (Haynes and Aird 1981). Reproduction of wood frogs is not successful in ponds inhabited by trout (Hammerson 1986). Rocky Mountain populations of the wood frog are thought to be relicts from a distribution that was historically more widespread before glaciation. The wood frog is considered rare in Wyoming (Baxter and Stone 1980) and is officially listed as threatened in Colorado. Its Natural Heritage status is critically imperiled in Colorado and imperiled in Wyoming. This species deserves special protection in the central Rocky Mountains due to its rarity and reproductive isolation, breeding failure in trout waters, and limited availability and use of habitats.

## Reptiles

### Yellow Mud Turtle

The distribution of the yellow mud turtle (*Kinosternon flavescens*) extends from northern Nebraska south to Texas, eastern and southern New Mexico, and southeastern Arizona to northern Mexico (Behler and King 1979). It inhabits permanent and intermittent streams, quiet ponds, rain pools, irrigation ditches, and swampy fields in grasslands and sand dunes of extreme eastern Colorado (Hammerson 1986). In Kansas and Nebraska, the yellow mud turtle occupies still or slow-moving water with mud or sandy bottoms in grasslands and sandhills. Females become sexually mature at 5–8 years, laying one clutch of 2–4 hard-shelled eggs in the summer. Most of its time is spent in the water, but it can sometimes be observed basking in the sun or traveling between bodies of water. There are conflicting data on whether or not this species has undergone a population decline in the eastern part of its range (Bickham et al. 1984). The yellow mud turtle may be threatened by loss and deterioration of wetland habitats within its limited range; but in some areas, populations may have benefited from the construction of small reservoirs for cattle (Iverson 1989). The yellow mud turtle is listed as a Category 2 candidate species by OES. Its Natural Heritage status is imperiled in Colorado, rare in Nebraska and uncertain in Kansas. Colorado includes this turtle on its Working List of Rare Animals. Its populations may be in need of protection based on its scarcity, specialized habitat needs, restriction to vulnerable habitats, and apparent population declines.

### Texas Horned Lizard

The Texas horned lizard (*Phrynosoma cornutum*) is found at elevations to 1,800 m in Kansas and southeastern Colorado south through Texas and Mexico, and west to southeastern Arizona (Stebbins 1966, Behler and King 1979). This lizard occupies arid and semi-arid open country with loose soil supporting bunchgrass, cactus, juniper, mesquite, or acacia. In Colorado, it inhabits shortgrass prairie, particularly with

large patches of bare ground (Hammerson and Langlois 1981, Hammerson 1982). It buries itself in sand or soil, or seeks cover under bushes, in burrows of other animals, or among rocks. A clutch of 14 to 37 eggs is laid in a burrow dug by the female. The Texas horned lizard feeds almost exclusively on ants. In response to reports of possible population declines in eastern Texas and Oklahoma, OES listed this lizard as a Category 2 candidate. USFS R3 lists it as a sensitive species.

**Smooth Green Snake**

The western race of the smooth green snake (*Opheadrys vernalis blanchardi*) is found from northwestern Indiana northwest to southern Manitoba, and west in scattered, isolated populations to Utah (Stebbins 1966). In the West, the eastern race (*O. v. vernalis*) occurs as an isolated, relict population in the Black Hills of Wyoming and South Dakota (Smith 1963b, Baxter and Stone 1980). In Colorado and Wyoming, the smooth green snake inhabits grassy marshes, damp meadows, riparian habitats, and forest edges of the foothills and mountains below 3,050 m (Hammerson and Langlois 1981, Baxter and Stone 1980, Hammerson 1986). This small, diurnal snake is effectively camouflaged in grass and green shrubs as it forages for insects and spiders. It lays 3 to 11 eggs, sometimes in communal nests (Behler and King 1979). The smooth green snake is regarded as rare in Wyoming (Baxter and Stone 1980) and has a Natural Heritage status of critically imperiled in Nebraska, imperiled in South Dakota, and rare in Wyoming. Because of its low abundance, use of vulnerable wetland habitats, and isolated western populations, the smooth green snake is worthy of management protection.

**Black Hills Red-bellied Snake**

The Black Hills red-bellied snake (*Storeria occipitomaculata pahasapae*) is an isolated race found only in the Black Hills of western South Dakota and eastern Wyoming (Smith 1963a, Baxter and Stone 1980). This small, slender snake inhabits the wooded hillsides, woodland edges, and moist open forests of the Black Hills. Due to its secretive nature, it is mostly detected under rocks and logs, or near human settlements. The red-bellied snake feeds on slugs, earthworms, and insects (Behler and King 1979) and bears 1 to 13 live young. The Black Hills race is rare and peripheral to Wyoming (Baxter and Stone 1980) and has a Natural Heritage status of imperiled in South Dakota and rare in Wyoming. The northern race (*S. o. occipitomaculata*) is state-threatened in South Dakota and critically imperiled in Nebraska. Because of its highly disjunct distribution and genetic isolation, the red-bellied snake merits a special management status in the Rocky Mountain Region.

**Texas Longnosed Snake**

The Texas longnosed snake (*Rhinocheilus lecontei tessellatus*) ranges from southwestern Kansas and southeastern Colorado south through Texas and New Mexico to central Mexico (Behler and King 1979). The longnosed snake resides below 1,525 m in plains grasslands and sandhills in southeastern Colorado, ranging north to the Arkansas River (Hammerson 1986). Rocky canyons and open prairies with sandy soils supply suitable habitats for the longnosed snake in southeastern Kansas (Kansas Department of Wildlife and Parks 1989). Its probable range includes Cimarron and Comanche National Grasslands. Lizards and their eggs, small snakes, small rodents, and occasionally insects comprise its diet. This burrowing snake is active at night and hides in underground burrows or rocks during the day. Females lay 4–9 eggs in underground nests in June to August. The Texas longnosed snake is a sensitive species in USFS R3; is a state-threatened species in Kansas; and is included on Colorado's Working List of Rare Animals. Its Natural Heritage rank is critically imperiled in Kansas and uncertain in Colorado. Due to its scarcity, its imperiled status through much of its range, and its limited distribution, the longnosed snake merits special concern in the Rocky Mountain Region.

**Massasagua**

This small rattlesnake (*Sistrurus catenatus*) ranges from central New York and southern Ontario to southeastern Arizona and the Gulf Coast of Texas (Stebbins 1966). The southeastern Colorado population is restricted in distribution and is disjunct from the nearest populations in Kansas, New Mexico, and Oklahoma (Hammerson pers. comm., 1990). The range of the Colorado population includes the northern half of Comanche National Grassland in the vicinity of Timpas, Otero County. In the western portion of its range, Massasaugas are most abundant on prairie wetlands, but they can also be found on dry shortgrass plains. The active period of the year in Colorado is from April through October. During the spring and fall, massasuagas are active during the day; but during the summer they are active in early evening. Limited information suggests that it breeds in the fall and bears 2–19 live young (Hammerson 1986). Herpetologists have become concerned about the wide-range status of the species, noting declines in massasauga populations in some areas (Hammerson pers. comm., 1990; Corn pers. comm., 1990). Its Natural Heritage status is critically imperiled in Colorado and imperiled in Kansas. R-3 lists the massasauga as a sensitive species. The eastern massasauga (*S. c. catenatus*) is listed as a Catagory 2 candidate by OES. Threats to massasauga populations are agricultural practices, the conversion of shortgrass prairie to croplands, and persecution by humans (Corn pers. comm., 1990).

## Mammals

**Dwarf Shrew**

The range of the dwarf shrew (*Sorex nanus*) is limited to eastern Utah, Wyoming, and western Colorado

(Armstrong 1972). Once occurring in Kansas and New Mexico, its distribution evidently shrank with the recession of glaciers. This shrew typically occurs as isolated, relict populations in alpine and subalpine zones, in association with rock slides and talus slopes (Brown 1967, Clark and Stromberg 1987). It is less commonly found at lower elevations in sedge marshes, alkaline sage flats, shortgrass prairie, and pinyon-juniper (Clark and Stromberg 1987, Zeveloff and Collett 1988). Fewer than 25 specimens are known from Wyoming (Clark and Stromberg 1987). The dwarf shrew is classified as rare in Colorado, Montana, and Utah; is a Priority II species in Wyoming; and has a Natural Heritage status of critically imperiled and endemic in South Dakota (known only from southwestern SD), and imperiled in Wyoming. This species warrants special concern due to its rarity, reproductive isolation, obscure natural history, and selection of scarce, montane habitats.

**Pygmy Shrew**

The Rocky Mountain range of the pygmy shrew (*Sorex hoyi montanus*) is highly restricted, extending from the Medicine Bow Mountains in Wyoming, south to central Colorado (Armstrong 1972). It also occurs locally in the Black Hills of South Dakota. The isolation of the Rocky Mountain populations from Northwest pygmy shrews is attributed to the effects of recent glaciation (Clark and Stromberg 1987). Pygmy shrews in Colorado and Wyoming occupy damp spruce-fir and lodgepole pine forests, sphagnum bogs, moist meadows, and other wet areas at high elevations (Spencer and Pettus 1966, Clark and Stromberg 1987). As of 1987, only eight specimens were known from Wyoming. The pygmy shrew is listed as a Priority II species in Wyoming; and has a Natural Heritage status of critically imperiled in Colorado, Wyoming, and South Dakota (endemic). The northeastern (*M. h. thompsoni*) and southern (*M. h. winnemana*) races are listed as Category 2 candidates by OES. USFS R4 lists the pygmy shrew as a sensitive species. A special management status is advocated for the Rocky Mountain pygmy shrew, based on its scarcity, disjunct distribution, enigmatic lifestyle, and habitat preferences.

**Townsend's Big-eared Bat**

The Townsend's big-eared bat (*Plecotus townsendii*) ranges throughout western North America south to central Mexico. This bat occupies a diversity of habitats, including desert shrublands, pinyon-juniper woodlands, and high-elevation coniferous forests (Jones et al. 1983). Caves and abandoned mine shafts are used by large congregations of bats as day and hibernation roosts (Kunz and Martin 1982). Females form separate maternity colonies in warm sections of caves. Fertilization is delayed after copulation in winter, and females give birth to one young in late spring or summer (Pearson et al. 1952). The big-eared bat specializes on moths as prey, detecting them by echolocation, and capturing them in flight. Populations of this species are threatened by habitat loss, vandalism, and disturbance by cave explorers at maternity and hibernation roosts (Clark and Stromberg 1987). Human disturbance can cause permanent abandonment of roost sites (Kunz and Martin 1982, Reel et al. 1989). Townsend's big-eared bat is listed as a C2 candidate by OES; as a sensitive species by USFS R1, R3, and R4; as a species in need of conservation in Kansas; and as a Priority III species in Wyoming. Because of its extreme sensitivity to human disturbance, vandalism of roost caves by recreationists, and its low reproductive rate, the Townsend's big-eared bat is a species that requires special protection.

**Spotted Bat**

The spotted bat (*Euderma maculatum*) ranges from Mexico through the western states to the southern border of British Columbia. Its distribution is very patchy, and its habitat preferences are known primarily from collected specimens (Clark and Dorn 1981, but see Leonard and Fenton 1983). Spotted bats are frequently reported near cliffs over perennial water, but individuals range from low deserts to evergreen forests. From 1891 to 1965, only 35 specimens were known from its entire range (Mickey 1961, Clark and Stromberg 1987). Spotted bat is a Category 2 candidate species listed by OES and has a Natural Heritage status of critically imperiled in Wyoming and uncertain in Colorado. It is listed as a protected, Priority III species in Wyoming; as state-endangered in Utah; and as a sensitive species in USFS Regions 1, 3, and 4. Scattered specimens have been collected in Colorado, Wyoming, Montana, Nevada, and Utah (Clark and Stromberg 1987). A status report was prepared for the Office of Endangered Species because of the bat's rarity and irregular temporal and spatial distribution (O'Farrell 1981).

**Fringed Myotis**

The fringed myotis (*Myotis thysanodes*) ranges from British Columbia through the western states, skirting much of Wyoming, to southern Mexico. This bat inhabits mid-elevation grasslands, deserts, and oak and pinyon woodlands; but it has also been detected in high-elevation spruce-fir forests (Zeveloff and Collett 1988). In Colorado, fringed bats are reported to breed in caves and winter in pinyon-juniper and ponderosa pine habitats (Kingery 1988). They occur as isolated populations in the Black Hills south to Laramie, Wyoming (Boyce 1980, Clark and Stromberg 1987). Fringed bats typically forage for insects over watercourses, but additionally feed on beetles. This species migrates and is also known to hibernate in caves (e.g, the Black Hills of South Dakota). Threats include human disturbance at roost sites, cave destruction, and habitat loss. The fringed myotis is listed as rare in Colorado and Montana and as a Priority III species in Wyoming. It has a Natural Heritage status of critically imperiled in Nebraska and Wyoming, and rare and endemic in South Dakota.

### Abert's Squirrel

The Abert's Squirrel (*Sciurus aberti*) has a fragmented distribution throughout Mexico and the Southwest because it occurs largely in ponderosa pine forests which have a discontinuous distribution (Zeveloff and Collett 1988, States et al. 1988). One of the largest intact areas they inhabit is in southwestern Colorado. A limited population occupying yellow pine-juniper-grassland along the Colorado-Wyoming border extends into southeastern Wyoming near Harriman (Clark and Stromberg 1987). Abert's squirrels depend on ponderosa pine for food and shelter (Keith 1965), preferring mature trees (Patton and Green 1970). Because this squirrel is regionally endemic and habitat-specific (Bailey 1971), habitat losses due to timber harvesting jeopardize populations (Patton 1975) and, therefore, declines in squirrel populations are suspected. The Abert's squirrel is a Priority III species in Wyoming.

### Allen's Thirteen-lined Ground Squirrel

Though the thirteen-lined ground squirrel (*Spermophilus tridecemlineatus*) is found throughout most of the central United States, Allen's race (*S. t. monticola*) occurs only in the Big Horn Basin of Wyoming. An inhabitant of grasslands, the species as a whole is solitary in habit but appears to form groups due to its clumped use of habitat patches (Clark and Stromberg 1987). Densities naturally vary from 0.25 squirrels/ha to 18/ha (Clark 1981, Clark and Stromberg 1987). Because of its isolated population, uncertain status, and probable declines in abundance, Allen's race is listed by OES as a Category 2 candidate. Clark and Stromberg (1987) refer to Allen's squirrel as rare, possibly extirpated, due to consumption of poisoned grain repeatedly dispensed by humans. This subspecies has a Natural Heritage status of critically imperiled in Wyoming.

### Prairie Dog

Prairie dogs (*Cynomys* spp.) live in colonies in shortgrass and midgrass prairies and grass-shrub habitats of the Great Plains and intermontane basins of the Rocky Mountains and Southwest (Jones et al. 1983). Prairie dog populations have declined since the settlement period due to poisoning and loss of habitat. Colonies have been reduced from an estimated 280 million ha (Merriam 1902) in the late 1800's, to 40 million ha in 1920 (Nelson 1919, Bell 1921), and to less than 0.6 million acres by 1971 (Cain 1972). Diseases such as plague have been known to devastate prairie dog colonies. The black-tailed prairie dog (*C. ludovicianus*) is listed as a sensitive species by USFS R3 because of its population declines in the Southwest. An uncommon species, Gunnison's prairie dog (*C. gunnisoni*), occurs in the Four Corners region of Utah, Colorado, Arizona, and New Mexico. This species inhabits open meadows and brushlands of high mountain valleys and plateaus (Slobodchikoff et al. 1988). Gunnison's prairie dog colonies are more loosely organized and have lower densities than those of other prairie dog species. Occurrences of many vertebrate species depend on the habitat occupancy patterns of prairie dogs (Campbell and Clark 1981, Clark et al. 1982). Population declines in prairie dogs may serve as warnings of probable population changes in associated species. Prairie dog control programs and destruction of prairie dog habitat negatively impact several affiliated animals. Because so many species affiliated with prairie dog colonies are inadvertently impacted by prairie dog control programs, a special management status is advocated for the prairie dog. This special status should be assigned to conserve prairie dog colonies in localities inhabited by associated sensitive species. For example, critical-link species are those that play pivotal roles in the functioning of ecoystems, and whose decline or loss would cause ecosystem relationships to deteriorate or change (Westman 1985). Critical-link species that significantly influence the distribution, abundance, and/or diversity of other species are known as keystone species (Paine 1980). The prairie dog qualifies as a keystone species.

### Meadow Jumping Mouse

The meadow jumping mouse (*Zapus hudsonius*) ranges across Alaska and Canada, the northeastern United States, and the Great Plains, to the eastern foothills of the Rocky Mountains (Jones et al. 1983). These mice are usually found in marshes, moist meadows, and riparian habitats in open prairie. Though this jumping mouse breeds in northcentral Colorado, its abundance is undetermined (Bissell 1982). In Wyoming, it breeds in the Black Hills and in the Laramie Range and is listed as a rare, Priority II species. It is listed as a sensitive species in USFS R3. The subspecies, *Z. h. preblei* Krutzdch, which occurs in the eastern foothills of Wyoming's Laramie range (Clark and Stromberg 1987), is a Category 2 candidate subspecies listed by OES. Its Natural Heritage status is critically imperiled in Wyoming and uncertain in Colorado. The meadow jumping mouse apparently requires relatively dense vegetation for population persistence, and its scarcity may be related to livestock overgrazing in streamside habitats (Clark and Stromberg 1987). Periodic severe flooding may also contribute to its rarity.

### Gray Wolf

Originally, the gray wolf (*Canis lupus*) occupied most habitat types on the entire North American continent, but its current distribution in North America is largely confined to Canada and Alaska with a few remnant populations found along the Canada-United States border (Carbyn 1987). By about 1900 the wolf had disappeared from the eastern half of the United States except for the upper Great Lakes Region and by about 1930, most wolf populations in the West had disappeared (Young 1944). Wolves were poisoned, trapped,

and shot wherever humans settled to reduce predation on game and livestock. The gray wolf is extinct in the USFS Rocky Mountain Region.

### Swift Fox

The historic range of the swift fox (*Vulpes velox*) extended from the Canadian prairie south across Montana and the Dakotas through the Great Plains states to northwestern Texas and eastern New Mexico (Scott-Brown et al. 1987). Prairie settlement led to a sharp decrease in numbers of swift fox and by the 1930's, the species was virtually extinct in the northern and eastern part of its range (Hoffmann et al. 1969, Hillman and Sharps 1978, Stromberg and Boyce 1986). Swift foxes died in thousands due to inadvertent poisoning from strychnine-laced baits placed by professional "wolfers" and ranchers (Young 1944, Russell and Scotter 1984). Other factors implicated in the decline of this fox have been intense trapping pressure, destruction of prairie habitat, rodent control programs, indiscriminant hunting, and capture by dogs (Scott-Brown et al. 1987). This fox can be found in national grasslands of the Rocky Mountain states (Loy 1981). The swift fox is a candidate T & E species (Category 2) listed by OES; and has a Natural Heritage status of critically imperiled in South Dakota and Wyoming, and imperiled in Nebraska. It is state-listed as endangered in Nebraska and threatened in South Dakota. USFS R3 identified the swift fox as a sensitive species.

### Grizzly Bear

The grizzly bear (*Ursus arctos horribilis*) was once abundant along major drainages across the Great Plains, but was steadily exterminated from most of its former range in the United States because of risks to livestock and humans (Cumbaa and Sciescenti 1978, Jonkel 1985). The grizzly bear was listed as threatened under the U.S. Endangered Species Act in 1975. Its current distribution and population size in the 48 conterminous states is less than 1% of its historic status (Jonkel 1987). In the USFS Rocky Mountain Region, it now occurs only in the Greater Yellowstone ecosystem. Current hazards to the grizzly are habitat loss and competition with humans for space and food (Jonkel 1987).

### Ringtail

Ringtails (*Bassariscus astutus*) range throughout Mexico, the southwestern United States, Texas, and Utah (Richards 1976). In the Rocky Mountain Region, they are found in western Colorado and southern Wyoming, typically below 2,440 m (Rutherford 1954, Richards 1981). Ringtails reach the northernmost edge of their range in Wyoming, occurring only in the lower Green River Basin and along the North Platte River south of Seminoe Reservoir (Clark and Stromberg 1987). Seldom far from a perennial water source, ringtails inhabit talus cl rocky canyons, chapparal, scrub oak, pinyon-junip riparian woodlands, and occasionally evergreen fores (Zeveloff and Collett 1988). Dens are made in cliffs, rock outcrops, hollow trees, logs, buildings, and burrows of other animals. Ringtails are omnivorous, nocturnal, and rarely seen (Toweill and Teer 1977). Their habitat requirements are not well understood, but open water and denning cavities are critical features (Richards 1976, Towry 1984). The ringtail is listed as a sensitive species in USFS R3. It is rare in Wyoming and has a Priority III status; Clark and Stromberg (1987) urge full protection. Its status in Colorado is undetermined (Bissell 1982).

### Wolverine

Wolverines (*Gulo gulo luscus*) have historically occurred throughout Canada and Alaska, the northwestern United States, the Pacific coast, the Rocky Mountains, and the Dakotas. The wolverine is a true wilderness species, inhabiting high mountain forests of dense conifers, and further north, tundra (Hornocker and Hash 1981). The natural history of the wolverine largely remains an enigma because of its solitary, secretive habits and scarcity. Wolverines prey upon a variety of mammals, including those much larger than themselves like moose and elk. Their predatory ferocity is legendary, but they also scavenge for carrion and supplement their diet with roots and berries (Zeveloff and Collett 1988). Wilderness areas of sufficiently large size to support wide-ranging individuals are important for the maintenance of viable wolverine populations. Close to 100 wolverine records for Wyoming have been published since 1872, mostly from the northwestern and midwestern parts of the state (Long 1965, Zeveloff and Collett 1988). Colorado reports are primarily from the Front Range of the Rockies (Bissell 1982). The Natural Heritage status of the wolverine is extinct in South Dakota and Nebraska, and critically imperiled in Colorado and Wyoming. Wyoming lists the wolverine as a protected Priority III species, and Colorado lists it as an endangered species. The wolverine is recorded as a sensitive species by USFS Regions 1 and 4 and as a Category 2 candidate species on the OES list. A sensitive species status is warranted for the wolverine based on its extreme rarity in the central Rockies, its need for large wilderness areas, contraction of its historic range, and loss of suitable pristine habitats.

### Marten

Martens (*Martes americana*) are currently found throughout Canada south through the Rocky Mountain and Pacific states. They prefer late successional stands of mesic, conifer-dominated forest (Taylor and Aubrey 1982, Raine 1983, Spencer et al. 1983). As a result of land clearance, marten habitat was lost, and the marten was eliminated throughout its southern primordial range (Hagmeir 1956, Strickland and Douglas 1987). Where adequate habitat persisted, overtrapping has caused local

extinctions. Marten have been reintroduced into several areas of suitable habitat, and much of their prior range has been restored (Strickland and Douglas 1987). Snags, woody debris, brush, and rock slides are important habitat components because they are used as den sites (Martin and Barrett 1983). Marten are sensitive to changes in habitat, including those resulting from timber harvesting, snag removal, and firewood collection (Yeager 1950, Soutiere 1979, Martin and Barrett 1983, Bissonette et al. 1989). Marten is included on the USFS R3 sensitive species list.

### Fisher

Fishers (*Martes pennanti*) have historically occurred in closed coniferous and mixed forests across southern Canada and the northern United States south through the mountains of the Pacific, Rocky Mountain, and New England states. By the early 1900's, trapping, strychnine baits, and removal of forests through logging, fire, and settlement had reduced or eliminated the fisher from much of its southern range (Rand 1944). However, protection, habitat improvement, and reintroductions have restored viable fisher populations in many areas, and fisher harvests have increased over the last 30 years across North America (Douglas and Strickland 1987). Because fishers select wet deciduous-conifer forests with large overstory trees (Allen 1983) and closed overhead cover (Powell 1982), quality of fisher habitat may be seriously reduced by disturbances like logging or fire (Kelly 1977). Fishers also require suitable maternal den sites which are typically located in high cavities of large trees, and sometimes in downfall or rock crevices (Powell 1982). Fishers are very rare in the USFS Rocky Mountain Region and only a few records are known from northwestern Wyoming and the Bighorn Mountains (Clark and Stromberg 1987). The fisher is protected in Wyoming where it is recorded as a Priority III species. Its Natural Heritage status is critically imperiled in Wyoming and Colorado. USFS Regions 1 and 4 list the fisher as a sensitive species. The fisher is a species of special concern in the central Rockies because of its extreme rarity, dependence on old-growth forests and suitable den sites, and potential vulnerability to habitat disturbance.

### Least Weasel

Least weasel (*Mustela nivalis*), the smallest living carnivore, is found from Alaska and Canada south to the Appalachian Mountains and Kansas (Clark and Stromberg 1987). Preferred habitats are meadows, grasslands, sagebrush, and open woods. A single specimen, possibly from a relict population, was collected in Wyoming west of Sheridan along the eastern side of the Bighorn Mountains (Stromberg et al. 1981). This mysterious population is segregated from weasels in South Dakota, Nebraska, and Kansas, and its status requires further investigation. Least weasel is listed as a Priority III species in Wyoming. Its Natural Heritage status in Wyoming is critically imperiled. Because the Wyoming population is small and local, reproductively isolated, and unique in the Rocky Mountain Region, it deserves special conservation efforts.

### Black-footed Ferret

The black-footed ferret (*Mustela nigripes*) has been observed primarily in or near prairie dog colonies (Cahalane 1954), and its historical distribution corresponded to the range of this rodent (Hall 1981). The ferret specializes on the prairie dog as a prey source, and elimination of the ferret is related to reduction and loss of prairie dog colonies (Fagerstone 1987). The black-footed ferret is the rarest mammal in North America, and no current populations are known to exist. It is federally listed as an endangered species, and its Natural Heritage Global Rank is critically imperiled. A remnant population reported in 1981 near the town of Meeteetse in northwestern Wyoming (Forrest et al. 1985) was removed for captive breeding and reintroduction.

### River Otter

Historically, river otters (*Lutra canadensis*) inhabited aquatic ecosystems throughout the United States and Canada, but they have been extirpated or reduced in many areas due to human encroachment, habitat destruction, and overharvest (Rudd et al. 1986, Melquist and Dronkert 1987). Populations of this fish-eating furbearer have been widely protected in the 20th century and have increased in some areas. Recent harvests have also been declining (Deems and Pursley 1983). The river otter is officially listed as endangered in Colorado and threatened in South Dakota. USFS R3 lists it as a sensitive species. Its Natural Heritage status is critically imperiled in South Dakota and Colorado, and rare in Wyoming. A subspecies (*L. c. sonorae*) in the Southwest that also occurs in Colorado is a Category 2 candidate listed by OES. In Wyoming, otters are most abundant in Yellowstone National Park and along the Snake River and its tributaries (Clark and Stromberg 1987), but they are also present in sparse numbers along most major drainages throughout the state (Rudd et al. 1986). The otter is protected in Wyoming where it is identified as a Priority III species (Toweill and Tabor 1982, Rudd et al. 1986). Surface mining, and oil and gas development may seriously impact otter populations through effects on water quality, habitat suitability, and prey availability (Rudd et al. 1986).

### Lynx

More common in the North, the North American lynx (*Felis lynx canadensis*) ranges into the Rocky Mountains of Wyoming, Colorado, and Utah (Long 1965, Zeveloff and Collett 1988). The lynx formerly occurred through-

out Alaska, Canada, and the northern half of the United States; but its southern primordial range has contracted due to hunting, predator control, and loss of wilderness forests (Torres et al. 1978, McCord and Cardoza 1984). Lynx roam widely through large, interior tracts of subalpine, coniferous forest (Towry 1984), preferring areas with dense trees, intermittent bogs, rocky outcrops, small clearings, brushy undergrowth, and deep snow in winter. Causes of mortality include killing by humans and scarcity of prey. Abundance, reproduction, survival, and demography of lynx are highly dependent on the availability of its most common prey, the snowshoe hare (Brand et al. 1976, Brand and Keith 1979). The temporal relationship between fluctuations in hare abundance and the lag response of lynx populations has long been considered a classic predator-prey cycle. Lynx are mostly solitary, with home ranges that vary in size from 10 to 240 $km^2$ (Clark and Stromberg 1987). This handsome cat is protected in most states. In a review of historical and current sightings, 262 records of lynx in Wyoming and adjacent areas were accumulated for the period 1856–1986 (Reeve et al. 1986). Lynx were primarily recorded in spruce-fir and lodgepole pine above 2,500 m elevation in northwestern Wyoming, the Wyoming and Salt River ranges, the Wind River and Absaroka ranges, the Bighorn Mountains, and the Black Hills. The lynx is a Category 2 candidate listed by OES, and its Natural Heritage status is critically imperiled in Colorado and South Dakota, imperiled in Wyoming, and accidental in Nebraska and Kansas. The lynx is officially designated as endangered in Colorado, a Priority III species in Wyoming, and a sensitive species in USFS R4. Due to its extreme scarcity in the central Rockies, its need for large wilderness areas, its dependence on a principle prey source, and its rare beauty, the lynx stands out as a species that merits continued protection and special management care.

### Rocky Mountain Bighorn Sheep

Rocky Mountain bighorn sheep (*Ovis canadensis canadensis*) are found in high mountain meadows above timberline in the Rocky Mountains of Canada and from southern Idaho through western Wyoming, Colorado, and northeastern Utah (Zeveloff and Collett 1988). Historically, they have descended in winter to lower foothills and river valleys (Clark and Stromberg 1987). Overhunting and diseases introduced from domestic sheep resulted in the extinction of the Audubon's subspecies (*O. c. auduboni*) and loss of the Rocky Mountain bighorn from much of its prior range (Honess and Frost 1942). Bighorns are recovering in some areas due to protection, while other populations have been reintroduced. The bighorn sheep is listed as a sensitive species by USFS Regions 1 and 3. Continued monitoring and periodic harvest protection of bighorn sheep are recommended because many populations are reproductively isolated and susceptible to disease, making them vulnerable to local declines and extinctions.

### Bison

Historically, the bison (*Bison bison*) occupied short and tall grass prairies, montane meadows, desert grasslands, and shrub-grass habitats from northwestern Canada to Florida over most of the United States. Bison numbers before European settlement were estimated at 60 million (Clark and Stromberg 1987). By 1890, less than a thousand individuals were left. Bison were an easy target for settlers, army posts, and railroad crews. Bison annihilation was part of a government policy to suppress Indian tribes dependent on them for food, clothing, and shelter (Zeveloff and Collett 1988). In the U.S. today, wild bison are found only in Yellowstone and Grand Teton National Parks. Problems for bison include brucellosis and intolerance of wild populations by the ranching community.

## Birds

### Common Loon

The common loon (*Gavia immer*) breeds in Alaska, Canada, northern United States, Greenland, and Iceland. It winters along North American coasts and on inland lakes and streams. Common loons are confirmed breeders in Wyoming (Yellowstone area), North Dakota, Montana, and Idaho and are summer residents (breeding not confirmed) in South Dakota, Colorado, and Utah (Ritter 1989). Loons in Montana and Wyoming nest on forest lakes that are >4 ha (Skaar 1987, Ritter 1989), apparently to assure an adequate prey base of fish, enough water to circumvent lake desiccation, and a lengthy takeoff stretch (Ritter 1989). Lakes with clear water or shallow depth are important for pursuing and capturing prey (McIntyre 1975). A shift northward in the southern boundary of loon distribution has provoked national concern for this species (Sutcliffe 1979, McIntyre 1986). BBS data indicate a significant decline in the Central region though no overall change in the U.S. Many threats to the loon have been reported, including human disturbance at breeding sites (Vermeer 1973a, Ream 1976, Titus and VanDruff 1981), poisoning by mercury and other toxicants (Ream 1976, Fox et al. 1980, Haseltine et al. 1983, Frank et al. 1983), acid rain damage to lake ecosystems (Alvo 1986), shoreline development (Heimberger et al. 1983), flooding and lake drawdown (Sutcliffe 1979, Fair 1979), predation (McIntyre 1975, Fox et al. 1980), and commercial fishing (Vermeer 1973b, McIntyre 1986). The common loon is cited on the USFS R1 and R4 sensitive species lists and on the OMBM 1982 and 1987 lists. It was blue-listed in 1981 and 1982 and was of local concern in 1986. In Wyoming, it is listed as a Priority I species with a Natural Heritage status of rare. Because of its restricted habitat use, its apparent population declines and range shift, its high profile, and numerous documented threats, the common loon warrants a sensitive species status in the Rocky Mountain Region.

### American Bittern

The American bittern (*Botaurus lentiginosus*) has a patchy distribution, nesting in freshwater tules, marshes, and reedy ponds throughout North America. It is elusive and difficult to observe and count. Based on Breeding Bird Surveys from 1966 to 1985, bittern populations have declined in the Midwest and Northeast but appear stable in the East and West. Trends were negative in North and South Dakota, but survey sample sizes in Colorado, Wyoming, Nebraska, and Kansas were insufficient for trend analysis. Brown and Dinsmore (1986) failed to record American bitterns in marshes $<11$ ha in size, suggesting that bitterns are area-dependent. OMBM listed American bittern as a migratory species of management concern in 1982 and 1987 because of its patchy distribution and dependence on vulnerable wetland habitats. American bittern has been blue-listed each year since 1976. It is a rare species in Colorado and a Priority II species in Wyoming. It is listed as a sensitive species in R3.

### White-faced Ibis

The white-faced ibis (*Plegadis chihi*) nests in large freshwater marshes of the West, from California east to southern Idaho and Wyoming. Nesting colonies are located in shrubs and low trees or in dense standing reeds and tules near or in marshes. Ibises feed on crayfish, frogs, grasshoppers, and other invertebrates in shallow ponds, marshes, irrigated lands, and wet meadows. Populations of white-faced ibis may be affected by trophic concentration of pesticide residues (Capen 1977). At least 25,000 birds are estimated for the Great Basin/Rocky Mountains (Voeks and English 1981). Though this population appears stable, protection is recommended because of the restricted number of breeding locations, the exposure of breeding colonies to fluctuating water levels, the risk of pesticide poisoning, and the bird's dependence on disappearing wetland habitats (Capen 1977, OMBM 1987). The white-faced ibis is an OES Category 2 candidate species; was included on OMBM lists in 1982 and 1987; was blue-listed 1972–1979; is state-listed as threatened in Kansas (occurs in Cimarron National Grassland); is a Priority I species in Wyoming; is a sensitive species in USFS R3; and has a Natural Heritage status of critically imperiled in Nebraska and Wyoming, uncertain in Colorado, and rare in South Dakota.

### Trumpeter Swan

The trumpeter swan (*Olor buccinator*) was thought to be numerous in the 19th century, breeding throughout Canada and the northern United States from Washington through the plains states to Ohio and south to Illinois (Johnsgard 1975, Bellrose 1976). It was extirpated from much of its former range due to overhunting, and loss of wetland and aquatic habitats. The Pacific coast and interior populations increased 223% and 226%, respectively, from 1968 to 1985 (USFWS et al. 1986). In contrast, the Rocky Mountain population increased only 57% during the same period. A colony of nonmigratory trumpeter swans breeds and winters at Red Rock Lakes Refuge west of Yellowstone National Park, and some live in the park (Hansen 1973). The tri-state subpopulation of Idaho, Montana, and Wyoming has ranged from a high of 585 birds in 1968 to lows of 485 in 1980 and 507 in 1985. The trumpeter swan was listed by OMBM in 1982 and 1987 because of concern for the small size and restricted range of this tri-state subpopulation. This swan is a Priority I species in Wyoming, and has a Natural Heritage status of imperiled in Nebraska and critically imperiled in Wyoming. The Blue List of 1986 gives the tri-state population a local concern status. The trumpeter swan is listed as a sensitive species by USFS R1 and R4. Management plans have been developed for the Rocky Mountain population (USFWS 1985b) and the overall North American population (USFWS et al. 1986).

### Harlequin Duck

The breeding range of the harlequin duck (*Histrionicus histrionicus*) includes the coasts of Greenland, Iceland and Baffin Island, and in the West, the Aleutians and Alaska south through the mountains of the Pacific states to California and Wyoming. The harlequin duck is classified as uncommon in Wyoming and accidental in Colorado and South Dakota (Kingery 1988, Oakleaf et al. 1982). In Wyoming, its nesting distribution is limited to Yellowstone and Grand Teton National Parks and neighboring forests. During the breeding season, it is found in swift freshwater near boulders, in turbulent mountain streams, and along arctic coasts (Wallen and Groves 1988). It winters in rough surf along rocky seashores. This duck nests on the ground among boulders or in tree or cliff cavities near streams (Kuchel 1977). Because of its shy, solitary nature and penchant for rough, inaccessible streams, assessing the status of the harlequin duck is difficult. It is counted as a sensitive species by USFS Regions 1 and 4, and its Natural Heritage status is imperiled in Wyoming. Protection is recommended for this species based on its restricted distribution in the Rocky Mountains, its dependence on limited stream habitats, its use of cavities, and its obscure status.

### Osprey

The osprey (*Pandion haliaetus*) is a cosmopolitan species, historically breeding along seacoasts, lakes, and streams throughout woodlands and forests of North America. Ospreys construct large, bulky nests in broken-topped trees and snags, and on artificial platforms. Snags or dead-top trees near water are preferred perching, hunting, and resting sites. Ospreys, which feed almost exclusively on fish, suffered severe population declines after World War II due to consumption of fish contami-

nated from chlorinated hydrocarbons (Henny 1975). Decreased nesting success has resulted from egg-shell thinning, embryo mortality, and adult fatalities. Though osprey range expansion and population increases have been registered since 1981 (Henny and Anthony 1989), pesticide residues continue to inhibit their productivity. Shoreline human disturbance in areas of heavy recreational use also results in reduced nesting occurrence and reproductive success of ospreys (Swenson 1979). As of 1984, only seven nesting pairs were recorded in four isolated areas of Colorado (Towry 1984). Osprey nesting has been documented in 10 Wyoming "latilongs," mostly in the western, southcentral, and northeastern parts of the state (Oakleaf et al. 1982). Osprey is state-listed as threatened in South Dakota (historical breeding records only). It's listed as a sensitive species in USFS R3. It was blue-listed 1972–1981, of Special Concern in 1982, and of local concern throughout its range in 1986.

### Bald Eagle

Bald eagles (*Haliaeetus leucocephalus*) historically nested throughout coniferous and deciduous forests of North America, with high concentrations along rivers and streams. The species now breeds primarily in Alaska, parts of northern and eastern Canada, northern United States, and Florida. Populations of this fish-eating raptor were severely impacted by shooting, habitat destruction, and organochlorine pesticides after World War II. The bald eagle is federally listed as endangered throughout most of the conterminous United States, including all Intermountain, Rocky Mountain, and Great Plains states. Approximately 650 bald eagles currently nest in the western United States, and about 4,500 to 6,000 winter in the West (Henny and Anthony 1989). In Wyoming, the number of eagle nesting attempts increased from 20 in 1978 to 42 in 1988 (Wyoming Game and Fish Dept. 1989). Wyoming nesting pairs are most abundant in the Greater Yellowstone ecosystem, and a Bald Eagle Working Team was created to coordinate management and data collection for this population (GYE Bald Eagle Working Team 1983). Pesticide residues continue to inhibit productivity of bald eagles, and habitat deterioration, human disturbance, and lead poisoning are serious threats (Henny and Anthony 1989).

### Northern Harrier

The northern harrier (*Circus cyaneus*) breeds from coast to coast, ranging from the southern tundra to brackish and freshwater wetlands in southwestern deserts and shrubsteppe (Clark and Wheeler 1987). Grass nests are built directly on the ground in marshes and wet meadows where they are exposed to the risks of predation, livestock trampling, and human disturbance (Martin 1989). Flooding, heavy precipitation, livestock grazing, and agricultural practices have also directly affected nesting success of harriers (Martin 1989). Harriers forage for small mammals, preferably microtines, wetlands, meadows, and fields. Nomadic predatory behavior, fluctuations in vole abundance, and periodic droughts confound interpretations of harrier population levels (Martin 1989). Breeding Bird Surveys indicate significant population declines in the central region, negative trends in the U.S. and the eastern region, and no changes in the western region and Rocky Mountains/Great Plains. But at a finer scale, Breeding Bird Surveys indicate that the Colorado population declined at a rate of 5.2%/yr during the period, 1966–1989. The northern harrier has been blue-listed every year since 1972 and is registered on the OMBM 1982 and 1987 lists of migratory bird species of management concern. Populations have apparently been negatively impacted by shortages of suitable nesting habitat, extensive draining of wetlands, and monotypic farming (Lokemoen and Deubbert 1976, Tate and Tate 1982).

### Northern Goshawk

In western North America, the northern goshawk (*Accipiter gentilis*) inhabits montane stands of coniferous, deciduous, and mixed trees, preferring tall, old-growth forests during the breeding season (Shuster 1976, Reynolds 1989). Goshawks are rare in South Dakota where breeding is disjunct, restricted to the Black Hills and Slim Buttes (Houtcooper et al. 1985). Goshawks apparently prefer to nest within 1/4 mile of water in forest blocks >80 ha in size which contain small openings (Reynolds 1983, Kennedy 1988). Nesting birds are intolerant of human disturbance and defend large areas around nest trees. Goshawks select large, older trees for nest sites, and sites are often reused from year to year (Schuster 1980, Crocker-Bedford and Chaney 1988). Habitat loss is believed responsible for declines in numbers of nesting pairs in some states (Herron et al. 1985, Bloom et al. 1986). Breeding Bird Surveys show that the total U.S. population of goshawks significantly declined in the last 10 years (1980–1989), but the western population is stable. The Apache northern goshawk (*A. g. apache*) found in New Mexico, Arizona, and Mexico is a Category 2 candidate listed by OES. Goshawk is listed as a sensitive species by USFS R3. Goshawk populations are threatened by human disturbance, poaching, pesticides, loss of suitable nest trees, and loss of nesting and foraging habitats due to timber harvesting and livestock grazing (Lucas and Oakleaf 1975, Reynolds 1983, Kennedy 1988). A sensitive species status is recommended for this hawk based on its vulnerability to disturbance, its dependence on large stands of old-growth forest, and the potential for fragmentation of goshawk habitat due to timber harvesting.

### Ferruginous Hawk

The ferruginous hawk (*Buteo regalis*) breeds from the Canadian prairie provinces south to Oregon, Nevada,

Arizona, and Oklahoma. It nests in trees and bushes, and on ledges, large rocks, riverbanks, and hillsides. This hawk depends on native grasslands where nest sites are scarce, and as a consequence, individuals reuse nest sites until nests are sometimes over 3 meters in height. Nest sites are considered vulnerable to human disturbance and future loss (Evans 1982), although impacts may be of a local nature. The ferruginous hawk feeds primarily on prairie dogs, ground squirrels, and less regularly on locusts, birds, and Jerusalem crickets. Because grasslands are being converted to monotypic rowcrops throughout its breeding range, the ferruginous hawk may be impacted by habitat loss (Howard and Wolfe 1976, Lokemoen and Duebbert 1976, Gilmer and Stewart 1983). Though declines in ferruginous hawks have been reported for Saskatchewan and Alberta (USFWS and Raptor Research Foundation 1985), population trends in the United States are inconsistent (OMBM 1987). The ferruginous hawk is listed by OES as a Category 2 candidate species throughout its range and was entered on the 1982 (but not 1987) OMBM list of migratory bird species of management concern. It was blue-listed 1972–1981, and of special concern 1982–1986. Its Natural Heritage status is imperiled in Nebraska, common in South Dakota, and uncertain in Colorado and Wyoming. State designations are: Priority III species in Wyoming, of special concern in Nebraska, state need of conservation in Kansas, and uncommon in South Dakota. The ferruginous hawk is listed as a sensitive species by USFS R1, R3, and R4.

### Peregrine Falcon

The peregrine falcon (*Falco peregrinus*) is cosmopolitan, ranging from coast to coast in North America, but now rare in the western United States and absent from the East. It nests in cliff recesses in open country, mountain parklands, or along seacoasts, and also on building ledges in large cities. A wide variety of habitats are used for foraging, including riparian woodlands, coniferous and deciduous forests, shrublands, and prairies. Pesticide accumulation drove the peregrine to the verge of extinction, and by 1965, fewer than 20 pairs were known west of the Great Plains. The peregrine falcon was federally listed as an endangered species in 1970, and again in 1984. Supporting Bond's (1946) original appraisal, Platt and Enderson (1987) estimated that 600–800 pairs of peregrine falcons nested in the western United States prior to widespread declines. Since 1974, experimental releases of young, primarily through hacking and captive breeding, have increased peregrine numbers in the West; and in 1987, the known number of pairs was nearly 200 (Platt and Enderson 1987). In Colorado, 7 of 28 historical territories were occupied in 1976 (USFWS 1984), whereas 11 of 28 were used in 1987 (Platt and Enderson 1987). About 59 historical sites were known for Wyoming, Montana, and Idaho combined (USFWS 1984), of which 8 were used in 1987 (Platt and Enderson 1987). Factors that may continue to endanger peregrine populations include pesticide poisoning on the wintering grounds, low breeding densities and reproductive isolation, lack of gene flow between populations, and reduced availability of foraging habitats and avian prey. The Natural Heritage status of the peregrine is globally rare; critically imperiled in Colorado, Wyoming, and South Dakota; and rare in Nebraska.

### Columbian Sharp-tailed Grouse

The Columbian sharp-tailed grouse (*Pedioecetes phasianellus columbianus*) historically occurred not only in grasslands but also in sagebrush semi-desert and brushy mountain habitats from British Columbia and western Montana south through California, and east through Nevada, Utah, Colorado, and Wyoming (Johnsgard 1973). It has been reduced to remnant populations throughout its former range due to unregulated hunting (Hart et al. 1950), agriculture, energy development, and habitat fragmentation; and is now extinct, rare, or uncommon in all western states (Hart et al. 1950, Hamerstrom and Hamerstrom 1961).

Fragmented populations of the Columbian sharp-tailed grouse breed in mountain shrub communities of western Colorado and the Baggs-Savery and Sierre Madre region of southcentral Wyoming (Rogers 1969, Oakleaf et al. 1982, Oedekoven 1985). In Colorado, broods are reared in grass-forb meadows, and the quality of brood-rearing habitat can be drastically reduced by heavy livestock grazing (Towry 1984). Brood habitat in Wyoming shrublands was characterized by greater forb and grass cover and higher frequency of snowberry than adjacent habitats (Oedekoven 1985). This Columbian subspecies is listed as a Category 2 candidate by OES. The full species was blue-listed in 1972, and again, in 1978–1982, and was of special concern to birders and hunters in 1986. USFS R4 lists the Columbian sharp-tail as a sensitive species. Its Natural Heritage status is critically imperiled in Wyoming. Because the Columbian sharp-tailed grouse is scarce, reproductively-isolated, and exposed to herbicidal rangeland treatment and agricultural practices, a sensitive species status is recommended.

### Prairie Chicken

Prairie chickens historically ranged in great numbers in shortgrass, midgrass and tallgrass prairies, and shrub-steppes from the northeastern states to the prairie provinces of Canada, south through the northern Mississippi Valley, and west to Colorado (Johnsgard 1973). Excessive hunting, habitat destruction, and agricultural conversion have eliminated prairie chickens from most of their former range (Johnsgard and Wood 1968). The greater prairie chicken (*Tympanachus cupido*) now occurs locally in virgin grasslands of Minnesota, North and South Dakota, Nebraska, northeastern Colorado, and Kansas (Hamerstrom and Hamerstrom 1961, Buhnerkemper et al. 1984, Bjugstad 1988), while the lesser prairie chicken (*T. pallidicinctus*) occurs primarily in

Texas with small populations in New Mexico, Oklahoma, Kansas, and southeastern Colorado (Copelin 1963). Lesser prairie chicken is state-listed as threatened in Colorado and extinct in Nebraska, and greater prairie chicken is listed as endangered in Colorado. USFS R1 lists the greater prairie chicken as a sensitive species on the Sheyenne National Grassland.

### Greater Sandhill Crane

In the West, the greater sandhill crane (*Grus canadensis tabida*) breeds from the Arctic coast south in scattered populations to northeast California and west to northern Colorado. Its wintering grounds are in the Southwest. In Colorado, an isolated population of the greater sandhill crane breeds in willow bottoms and aspen forest in California Park, Routt National Forest (Bailey and Niedrach 1965). This crane nests locally in marshes, mountain meadows, and riparian habitats in western Wyoming. Sandhill cranes commonly forage for frogs, rodents and insects in wetlands and prairies, and during migration, they feed on spilled grains in harvested grainfields. A clutch of two eggs is laid on a hay-like mound. Greater sandhill crane is state-listed as an endangered species in Colorado. Its Colorado Natural Heritage status is uncertain. Loss of wetland and native prairie habitats have resulted in declines of sandhill crane populations in the United States (Udvardy 1977). Current threats include habitat conversion to monotypic croplands, poaching and overhunting, and nest site disturbance.

### Whooping Crane

The whooping crane (*Grus americana*) formerly bred in Alberta, Saskatchewan, Manitoba, North Dakota, and Iowa, and also in Louisiana. Migrating cranes were observed in thousands in the early 1800's, with their main travel route along the Mississippi Valley (Nuttall 1834). Overhunting and conversion of wetlands and prairies to croplands contributed to their drastic decline. This crane has been a federally listed endangered species since 1967, and over 100 cranes currently survive in nature. A small wild population of about 80 cranes breeds in freshwater marshes of Wood Buffalo National Park, Alberta and winters in Aransas National Wildlife Refuge on the Texas Gulf coast. Aransas whoopers migrate in nearly a straight line through east-central Kansas and central Nebraska, often resting on the Platte River, before continuing northward (Aronson and Ellis 1979). Whoopers were introduced in 1975 to Grays Lake National Wildlife Refuge in southeast Idaho. Since 1978, 29 different individuals from this reintroduction effort have been observed in Wyoming; but as of 1988, only 16 Grays Lake survivors were known (Wyoming Game and Fish Dept. 1989). The Grays Lake Program was abandoned because of poor success. Whooping crane movement and habitat use in Wyoming have been monitored since 1982 (Lockman et al. 1986). Whooping cranes are slowly increasing in numbers due to protection, intensive management, and captive breeding and reintroduction programs.

### Mountain Plover

In the 1800's, the breeding distribution of the mountain plover (*Charardrius montanus*) was thought to extend from southern Canada south into Mexico, and west from the Dakotas, Kansas, and Missouri to the Pacific Coast (Coues 1874, Laun 1957). It nests almost exclusively in short grass prairie (Graul and Webster 1976, Parrish 1988), often in association with prairie dogs (Knowles et al. 1982, Olson and Edge 1985). Declines in mountain plover populations were noted through the early 1900's (Cooke 1915, Laun 1957). By the mid 1950's, the mountain plover was restricted primarily to southern Montana, Wyoming, and Colorado (Laun 1957). Excessive hunting, and loss of native prairie to agriculture apparently caused contraction of its breeding range by 50% (Graul and Webster 1976). The mountain plover is listed by the U.S. Fish and Wildlife Service as a species of high federal interest (Armbruster 1983, Dinsmore 1983) whose survival may be jeopardized by habitat loss from practices like mining and rangeland conversion (Sleeper et al. 1980). It is listed by OES as a Category 2 candidate species; state-listed as threatened in Nebraska, and in state need of conservation in Kansas; is listed as a sensitive species in USFS R3 and R4; and ranked by the Natural Heritage Program as extinct in South Dakota, critically imperiled in Nebraska, imperiled in Colorado, and apparently secure in Wyoming.

### Snowy Plover

The snowy plover (*Charadrius alexandrinus*) is a cosmopolitan species with a decided preference for sandy or alkaline beaches, flats, and shores. It breeds locally in almost every western state where suitable habitat is available. The western snowy plover (*C. a. nivosus*) is state-listed as endangered, threatened, or rare in nine states and is an OES Category 2 candidate in the Great Basin, Rocky Mountains, and Great Plains regions. It has a Natural Heritage status of critically imperiled, imperiled, or rare in eight western states, but its status is uncertain in Colorado where it breeds locally. The snowy plover is state-listed as threatened in Kansas (recorded in Cimarron National Grassland). This plover was blue-listed 1972–1982, and was of special concern in 1986. It is identified as a sensitive species in USFS R3. OMBM listed it in 1982 and 1987 as a migratory species of management concern due to apparent population declines, limited distribution, and known or predicted habitat destruction (Wilson 1980). The U.S. Fish and Wildlife Service has prepared a management plan for the western race (USFWS 1985c).

### Upland Sandpiper

The upland sandpiper (*Bartramia longicauda*) breeds from Alaska through the Canadian prairie and the north-

ern United States south to Oklahoma and Texas. Formerly called the upland plover, this species inhabits native prairies, open grasslands, upland clearings, hayfields, and wet meadows, and avoids tall grass and shrubsteppe grasslands (Johnsgard 1981). Rarely wading in water, this large, unusual sandpiper is most often observed perched on fenceposts or boulders, or in song flight over the prairie (Higgins and Kirsch 1975). Breeding Bird Surveys from 1966 to 1985 indicated stable or increasing populations in the western, central, and southeastern regions, but declining trends in the Midwest and Northeast. Eastern populations have decreased from historic levels due to hunting and loss or succession of old-field habitat (Osborne and Peterson 1984, Tate 1986), and the species is now listed as endangered, threatened, or of special concern in 15 midwestern and eastern states. The upland sandpiper has been blue-listed every year since 1975. It is listed as rare in Colorado and as a rare, Priority II species in Wyoming. It was included on the 1982 OMBM list, and on the USFS R3 sensitive species list. Despite the apparent stability of western populations, the upland sandpiper is of local concern in Colorado and Wyoming because of its rarity, reductions in native prairie habitats, and suspected population declines.

### Long-billed Curlew

Before 1870, the long-billed curlew (*Numenius americanus*) nested in relatively high abundance in prairie-like habitats across North America (Palmer 1967, Johnsgard 1981). On western grasslands, early explorers reported curlews nesting in hundreds from Montana to Texas (Audubon 1960, Coues 1874, Stewart 1975). Hunting, agriculture, and livestock grazing have caused curlews to decline in abundance in the West, and to disappear altogether in the East (Cochrane 1983). Declines in Wyoming and Colorado have recently been reported (McCallum et al. 1977, Cochrane and Oakleaf 1982, OMBM 1987). Breeding Bird Surveys indicate a 15.0%/yr. population decline in long-billed curlew in Colorado from 1966 to 1989. The long-billed curlew is a Category 2 candidate on the OES list; was blue-listed 1981–82 and of Special concern in 1986; was on the OMBM 1982 list; has a Natural Heritage status of critically imperiled, imperiled, or rare in South Dakota, Nebraska, Colorado, Kansas, and Wyoming; is a Priority III species in Wyoming; is a species in state need of conservation in Kansas; and is on the USFS R3 sensitive species list.

### Black Tern

The black tern (*Chlidonius niger*) is found throughout temperate North America and Eurasia, breeding in Canadian prairie wetlands, taiga bogs, and marshes in the northcentral, central, and western United States. It nests locally in Colorado, Wyoming, South Dakota, Nebraska, and Kansas. Black terns may be area-limited as they were absent from Iowa marshes $< 5$ ha and were most common in wetlands $> 20$ ha (Brown and Dinsmore 1986). Though populations of the black tern are in greatest jeopardy in the New England states, Breeding Bird Surveys denote significant declines in the Rocky Mountains/Great Plains, the central and western regions, the U.S., and the entire continent. An annual rate of decline of 8.1% for the total U.S. population was among the highest for any species counted (Robbins et al. 1986, OMBM 1987). This tern has been blue-listed since 1978, is a Priority II species in Wyoming, and has a Natural Heritage status of rare in Nebraska and imperiled in Wyoming. Black tern was listed by OMBM in 1982 and 1987 as a species of management concern because of indisputable confirmation of widespread declines, fragmented distribution, and dependence on limited wetland habitats.

### Yellow-billed Cuckoo

The yellow-billed cuckoo (*Coccyzus americanus* is an uncommon summer resident from California and Arizona east to the Rockies; but it is widespread in the Midwest and East from southern Canada to the Caribbean. It winters in South America. Many field guides list this cuckoo as absent from the Rocky Mountain Region, but in reality, it is an uncommon local breeder at lower elevations in Wyoming and Colorado (Kingery 1988, Oakleaf et al. 1982). The western race of the yellow-billed cuckoo (*C. a. occidentalis*) is associated with lowland deciduous woodlands, willow and alder thickets, second-growth woods, deserted farmlands, and orchards (Johnsgard 1986). Nests are loose twig structures built in trees, shrubs, and vines (Preble 1957). Populations fluctuate substantially in response to fluctuations in caterpillar abundance. Declines resulting from loss or disturbance of riparian habitat have been consistently reported in the West (Tate 1981, 1986; Tate and Tate 1982). According to Breeding Bird Surveys, populations of yellow-billed cuckoo significantly declined across the U.S. and the North American continent, including the central plains states, from 1966 to 1989, and more recently, from 1980 to 1989 (Sam Droege, UWFWS, unpublished data, 1990). In response to widespread concerns about the western race, this species was blue-listed 1972–1981, and again in 1986, and was of special concern in 1982. The western race is listed by OES as a Category 3B candidate. The yellow-billed cuckoo is on the USFS R3 sensitive species list and is designated as a Priority II species in Wyoming. This species merits special attention because of its rarity, its apparent population declines and fluctuations, its local distribution in the Rocky Mountain Region, and its preference for disappearing riparian habitats.

### Flammulated Owl

The flammulated owl (*Otus flammeolus*) occurs locally in montane forests in western North America from Central America to British Columbia. In the Rocky

Mountains, flammulated owls are associated with the dry pine belt, foraging primarily in late successional stands of ponderosa pine that are pure or mixed with oak, pinyon pine, true fir, Douglas fir, or aspen (Reynolds and Linkhart 1987, Reynolds et al. 1989). Although the flammulated owl has a wide distribution, little is known of its population status. Threats to owl populations include loss of cavity nest sites from removal of snags during tree harvests and firewood collection, reduction of insect food supplies due to forest cutting or aerial spraying of insecticides, and loss of foraging habitat (Reynolds et al. 1989). Because of its association with mature and old-growth ponderosa pine, declines in owl populations due to harvests of these forests are strongly suspected (Reynolds et al. 1989). The flammulated owl is listed as a sensitive species by USFS R3 and R4. It is rare to uncommon in Colorado (Kingery 1988); a potential breeder in Wyoming (Johnsgard 1986) (but no nesting records as of 1990); and absent from Nebraska, Kansas and possibly South Dakota. As the flammulated owl has a discontinuous distribution, with populations that are potentially susceptible to timber management practices, its listing as a sensitive species is recommended.

### Mexican Spotted Owl

Mexican spotted owl (*Strix occidentalis lucida*) is found at scattered locations in canyons and mountains of Arizona, New Mexico, and southern Colorado and Utah (Ganey 1988, Ganey et al. 1988, Reynolds 1989). It reaches the northern edge of its range in the southern forests of USFS Region 2, increasing in abundance further south. The Mexican spotted owl is most common along canyons and steep slopes in old-growth mixed conifer or broad-leaved forests, but is also sometimes found in oak or spruce-fir forests (Ganey 1988, Pederson 1989). A dozen or more records of the southern subspecies have been reported in Colorado over the past 100 years (Bailey and Niedrach 1965). In 1989, spotted owl surveys revealed six owls in southern Colorado forests (Reynolds 1989). Because the Mexican spotted owl is uncommon to rare, local in distribution, and relatively habitat-specific, effects of timber management practices are likely to jeopardize its populations (Ganey 1988, Pederson 1989). The spotted owl has been blue-listed since 1980 and is listed by OES as a Category 2 candidate. The Mexican spotted owl has been proposed for federal listing and is identified as a sensitive subspecies by USFS R3 and R4. The spotted owl was included on the 1982 and 1987 OMBM lists on the basis of small population size, apparently declining populations, competition with the newly sympatric barred owl, restricted range, and fragmentation of old-growth forests due to logging (Forsman and Meslow 1986).

### Western Burrowing Owl

The western burrowing owl (*Athene cunicularia hypugea*) breeds in prairie, desert, sagebrush, and pinyon-juniper habitats of western North America. also be found in disturbed open areas like road cut airports. Declines in owl populations and curren regularities in its distribution are attributed to loss of bu row nest sites resulting from eradication of colonia burrowing rodents, particularly prairie dogs (Evans 1982, Butts 1973, Thompson 1984). Burrowing owl is a Priority II species in Wyoming. It was blue-listed 1972–1981, and of special concern in 1982 and 1986. Its Natural Heritage status is rare in Wyoming. A sensitive species status is recommended for the western burrowing owl due to its dependence on rodent burrows, loss of burrow nest sites resulting from rodent control programs, and apparent declines in abundance.

### Boreal Owl

The circumpolar distribution of the boreal owl (*Aegolius funereus*) extends from Alaska east to Newfoundland, south through the Rocky Mountains, and across Eurasia (where it is known as Tengmalms's owl). Once thought to be accidental or a winter migrant in the United States, nesting populations of this docile owl have recently been found in Minnesota, Washington, and as far south in the Rockies as northern New Mexico (Hayward et al. 1987, Ryder et al. 1987, Reynolds et al. 1989). Breeding records are reported for Montana, Idaho, Wyoming, and Colorado (Hayward and Garton 1983, Palmer and Ryder 1984, Reynolds et al. 1989). The boreal owl is associated with relatively inaccessible tracts of high-elevation coniferous forest, especially mature to old-growth spruce and fir (Reynolds et al. 1989). Populations of this mouser fluctuate greatly from year to year in relation to vole cycles (Lofgren et al. 1986, Korpimaki 1987). Because the boreal owl is dependent on the availability of nest cavities and prey, shortages of nest sites or small mammals may limit owl abundance. Factors that potentially threaten boreal owl populations include extraction of snags during tree harvests or for firewood, decreased abundance of mice due to timber cutting or natural causes, and loss of old-growth forests due to clearcutting (Reynolds et al. 1989). As breeding populations in the United States have only recently been discovered, this owl has yet to be listed as a species of management concern by most agencies. Nevertheless, USFS Regions 1, 3, and 4 list the boreal owl as a sensitive species. Natural Heritage ranks have not been assigned in most states, though a critically imperiled status was recently (2/90) proposed for the boreal owl in Wyoming (Chris Garber pers. comm., 1990). Its dependency on nest cavities, cyclic rodent supplies, and old-growth forests, plus its restricted breeding locations and small remote populations intimate that the boreal owl is a sensitive species in the Rocky Mountains.

### Black-backed Woodpecker

The black-backed woodpecker (*Picoides arcticus*) is a year-round resident in boreal forests across Canada, ex-

tending south through the Pacific states into the Sierra Nevadas and also into Idaho and Montana (Bock and Bock 1974). Though absent in Kansas, Nebraska, and possibly Colorado, this uncommon woodpecker breeds locally in northeastern Wyoming (Greater Yellowstone Ecosystem) (Taylor and Barmore 1980), and also in the Black Hills of South Dakota probably south to Wyoming (Johnsgard 1986). The black-backed woodpecker inhabits high-elevation coniferous forests in the Rocky Mountains, and like the three-toed woodpecker, appears to be a fire-adapted species. Taylor and Barmore (1980) reported that this woodpecker was absent in the Yellowstone area before fire, then appeared for a few years in burned forests of spruce-fir or lodgepole pine. By flaking away bark on dead conifers in search of insects and larvae, it reveals its presence in forests. Territory sizes are probably as large as the northern three-toed woodpecker, and average d.b.h of nest trees is estimated at 38 cm diameter at breast height (Bull 1978, Evans and Conner 1979). Little population information is available for this woodpecker because it occupies rugged country where observers are few; it is uncommon throughout its range; and it is a quiet, unobtrusive bird. It is a Priority III species in Wyoming. Its Natural Heritage status is imperiled in Wyoming. Due to its rarity in the central Rockies, its restricted breeding locations, its preference for burned forests in a time of fire suppression, its eruptive populations, and lack of population information, the black-backed woodpecker warrants special attention.

### Three-toed Woodpecker

The year-round range of the three-toed woodpecker (*Picoides tridactylus*) extends from Alaska across the Canadian taiga belt to Newfoundland, south to Oregon, and southeast through the Rocky Mountains to Arizona and New Mexico (Bock and Bock 1974). This species is also a northern resident of the Old World. An uncommon, inconspicuous woodpecker of coniferous forests, it can be found in woodland muskegs and open or dense stands of pine, spruce, and fir. After a forest fire, its numbers swell for 3 to 5 years in burned stands, then decline to pre-fire population levels (Koplin 1969, Taylor and Barmore 1980). The three-toed woodpecker scales bark off fire-killed trees to expose its most common prey, bark-boring beetles. During spruce beetle epidemics, the predatory impact of three-toed woodpeckers on larval beetles is much greater than during endemic beetle periods because of the dramatic rise in woodpecker numbers (Koplin and Baldwin 1970, Koplin 1972). The numerical response of three-toed woodpeckers to beetle infestations exceeds those of other sympatric woodpecker species (Koplin 1972). Nest holes excavated by three-toed woodpeckers are used by a wide variety of secondary cavity-nesting birds long after the woodpeckers have left the area. During favorable conditions, these woodpeckers nest in loose colonies. In Colorado, they prefer to nest in spruce-fir forests and forage on mature and old-growth trees (Towry 1984). In Wyoming forests fragmented by clearcuts, this woodpecker was found only in large, unbroken stands of mature spruce-fir and lodgepole pine (Keller 1987). Territories are large, averaging about 30 ha in size (Evans and Conner 1979). To estimate maximum population levels of this woodpecker, Evans and Conner (1979) calculated snag characteristics to be 20–40 cm d.b.h., 6–12 m in height, and 42–52 snags/40 ha. The three-toed woodpecker nests in low densities in Colorado (Kingery 1988, Towry 1984) and Wyoming (Oakleaf et al. 1982). Its Natural Heritage status is rare in Wyoming and South Dakota (restricted to Black Hills). It is listed as a sensitive species by USFS R4. The three-toed woodpecker merits special concern due to its scarcity, its dependence on snags, its preference for burned forests in an age of fire control, and its selection of large stands of old-growth conifer that are susceptible to commercial cutting.

### Olive-sided Flycatcher

A long-distance migrant, the olive-sided flycatcher (*Contopus borealis*) breeds in Alaska, across Canada, and in the western and northeastern United States (Udvardy 1977) and winters in northern South America. It can be distinguished from similar bird species by its larger size, proportionately smaller tail, and the white patches on either side of its rump. Its song is a clear and distinctive, "quick-three-beers" (Johnsgard 1986). The olive-sided flycatcher is associated with montane coniferous forests, and its territories typically contain tall conifers and bogs or meadows. It is most often observed perching, singing, or flycatching for insects at or near the tops of tall trees and snags, and its affinity for unusually large trees may be a factor limiting its abundance or distribution. Loss of tall perch snags due to stand conversion may negatively affect flycatcher populations. Analyses of stomach contents reveal that its primary prey are winged insects (Udvardy 1977). Nests are usually 5 to 15 meters in height, well-hidden in conifer branches (Johnsgard 1986). According to analyses of Breeding Bird Surveys, olive-sided flycatcher populations have precipitously declined in the West, the U.S., and across the North American continent during the period, 1966–1989, and in the East during the past decade (1980–1989). Due to its widespread decline, this flycatcher is included as a species of management concern on the OMBM 1987 list. Possible threats to olive-sided flycatchers include destruction of tropical wintering habitats (Marshall 1988), loss of suitable perch sites (tall, old trees), stand conversion to younger seral stages, fire suppression, and pesticides.

### Southwestern Willow Flycatcher

The willow flycatcher (*Empidonax traillii*), formerly known as Traill's flycatcher, breeds from southern British Columbia east to Maine, and south to California, Arkansas, and Virginia (Udvardy 1977). It winters in southern Central America and western South America.

Of special concern in the Rocky Mountain Region is the southwestern race (*E. t. extimus*) which breeds in Arizona (virtually extirpated), Colorado, New Mexico, and Mexico. The willow flycatcher builds its nest in shrubs and small trees in willow thickets, shrubby mountain meadows, and deciduous woodlands along streams, lakes, and bogs (King 1955, Holcomb 1972). Studies in Oregon and Utah indicate that willow flycatchers occurred most frequently in areas with high abundance and volume of shrubs (Whitmore 1975, Taylor 1984). In foothill riparian woodlands of southeastern Wyoming, the willow flycatcher was classified as a habitat specialist because of its restricted habitat use (Finch 1989). Since 1968, Breeding Bird Surveys have indicated sharp declines in flycatcher populations in many western states, especially California. Destruction of riparian habitat and nest parasitism by the brown-headed cowbird are cited most often as reasons for flycatcher declines (Sharp 1987). The willow flycatcher is included on the USFS R3 and R4 Sensitive Species Lists. It was blue-listed 1980–1982 and of special concern in 1986. The southwestern race which has vanished from much of its prior range is listed as an OES Category 2 candidate. Due to its population declines, loss of riparian habitat, specialization in habitat use, and exposure to cowbird parasitism, the willow flycatcher, especially the southwestern race, merits a special listing.

### Purple Martin

The purple martin (*Progne subis*) breeds from southern Canada to northern Mexico, but populations are small and scattered in the Great Basin and Rocky Mountain states. It winters in South America. Though common in the East, it is scarce and evidently declining in the West, possibly because of nest-site competition with starlings (Udvardy 1977, National Geographic Society 1987). Western martins inhabit deciduous riparian woodlands, aspen stands, open coniferous forests, burns with snags, woodland edges, and urban areas (Richmond 1953, Udvardy 1977, Svobada et al. 1980). Unlike eastern martins that nest communally in multiple-compartment houses (Allen and Nice 1952, Finley 1971, Erskine 1979), western populations typically nest in tree holes excavated by woodpeckers, eaves of buildings, or natural tree hollows (Richmond 1953, Svoboda et al. 1980). In southwestern and west-central Colorado, purple martins reside locally in pure forests of mature aspen, nesting alone or in loose colonies (one nest per tree) in woodpecker cavities (Svoboda et al. 1980; Reynolds pers. comm., 1990). Ranging from 4 to 13 m in height, nest holes were selected in large aspens typically adjacent to forest openings or parklands (Reynolds pers. comm., 1990). The purple martin may be peripheral to Wyoming, but its status is still undetermined (Oakleaf et al. 1982). Its Wyoming Natural Heritage status was recently proposed as critically imperiled (Chris Garber pers. comm., 1990). In response to reports of widespread declines, the purple martin was blue-listed 1975–1981 and of special concern 1982–1986. Due to its general scarcity in the West, its small, disjunct populations in the Rocky Mountains, its dependence on woodpecker cavities or nest boxes, its restricted breeding localities in Colorado, and its apparent population declines, the purple martin classifies as a sensitive species.

### Loggerhead Shrike

The loggerhead shrike (*Lanius ludovicianus*) is an uncommon summer resident of the western, central, and southeastern United States, observed primarily in open habitats with scattered perching sites. In the Rocky Mountains, it ranges altitudinally from agricultural lands on the prairies to montane meadows, nesting in sagebrush areas, desert scrub, pinyon-juniper woodlands, and woodland edges (Johnsgard 1986). Open country interspersed with improved pastures, grasslands, and hayfields is primary shrike habitat throughout its range (Brooks and Temple 1990), including Colorado (Porter et al. 1975). Breeding bird surveys from 1966 to 1987 indicate sharp population declines in loggerhead shrikes throughout the western, central, and eastern United States (Robbins et al. 1986). Christmas bird counts also indicate widespread negative trends (Morrison 1981). Declines are attributed to the consumption of contaminated prey (large insects and small mammals), the loss of nesting sites such as hedgerows and thorn trees, and the loss of pastureland feeding habitat (Robbins et al. 1986). The loggerhead shrike was entered on the 1982 and 1987 OMBM lists and has been blue-listed since 1972. The migrant loggerhead shrike (*L. l. nigrans*), a subspecies that occurs in Nebraska and Kansas, is listed as a Category 2 candidate by OES.

### Lark Bunting

Colorado's state bird, the lark bunting (*Calamospiza melanocorys*), breeds in short grass and mixed grass prairies and shrubsteppe habitats of southern Canada, the Rocky Mountains, and the Great Plains (Finch et al. 1987). Nests are built in a ground scrape, usually adjacent to tall grasses or a small shrub. Lark buntings are gregarious, with male flocks observed during the summer months. Local population levels vary greatly from year to year, possibly in response to fluctuations in abundance of grasshoppers, a preferred prey item. Loss of habitat from agricultural conversion and fragmentation of tall grass prairie has caused the breeding range of the lark bunting to shrink westward, and buntings are now extinct in the midwestern states (Roberts 1936, Baumgarten 1968). In addition, heavy summer grazing is detrimental to lark buntings occupying arid, short grass areas (Finch et al. 1987). Breeding Bird Surveys from 1966 to 1985 indicated significant declines in bunting populations throughout its range (Robbins et al. 1986). Christmas Bird Counts corroborated these trends (Tate and Tate 1982). The 1982 Blue List identified the lark bunting as a species of special concern. Due to population declines, sizeable annual fluctuations in local abun-

dances, loss of habitat (especially tall grass prairie), grasshopper control practices, and contraction of breeding range, the lark bunting merits consideration as a sensitive species.

### Baird's Sparrow

Baird's sparrow (*Ammodramus bairdii*) has a restricted breeding range, occurring only in the northern Great Plains states of Montana, North Dakota, South Dakota, Alberta, Manitoba, and Saskatchewan. Baird's sparrow is suspected to nest in Wyoming (Oakleaf et al. 1982). Breeding densities are highest in North Dakota (OMBM 1987). In USFS Region 2, Baird's sparrow breeds in Grand River National Grassland, South Dakota. The ground nest of the Baird's sparrow is concealed in tall grass in prairie habitats. Breeding Bird Surveys indicated significant declines from 1966 to 1985 in sparrow densities in five of the six states and over the entire continent. Trends were negative in the Rocky Mountains/Great Plains region, the Central region, and the U.S. The species may be susceptible to habitat alterations brought about by agriculture and plowing of native prairie (Owens and Myers 1973, Kantrud 1981). Baird's sparrow was blue-listed in 1981 and was a local problem species in 1982. It has a Natural Heritage status of imperiled in South Dakota and critically imperiled in Wyoming. It is listed as a sensitive species in USFS R3. Because of its limited range and its population declines, the Baird's sparrow was included on the OMBM 1982 and 1987 lists of migratory bird species of management concern.

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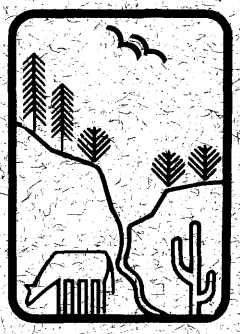
This report describes the current status of 67 threatened, endangered, and vulnerable wildlife species in the Rocky Mountain Region of the U.S. Forest Service. Known or potential reasons for population declines and species susceptibility are identified; and distributions, habitats, specialized needs, and perceived threats of individual species are discussed.

**Keywords:** Threatened and endangered species, sensitive species, Rocky Mountain region, U.S. Forest Service, population trends, habitat use, birds, mammals, reptiles, amphibians

Rocky Mountains



Southwest

Great Plains

U.S. Department of Agriculture
Forest Service

# Rocky Mountain Forest and Range Experiment Station

The Rocky Mountain Station is one of eight regional experiment stations, plus the Forest Products Laboratory and the Washington Office Staff, that make up the Forest Service research organization.

## RESEARCH FOCUS

Research programs at the Rocky Mountain Station are coordinated with area universities and with other institutions. Many studies are conducted on a cooperative basis to accelerate solutions to problems involving range, water, wildlife and fish habitat, human and community development, timber, recreation, protection, and multiresource evaluation.

## RESEARCH LOCATIONS

Research Work Units of the Rocky Mountain Station are operated in cooperation with universities in the following cities:

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Flagstaff, Arizona
Fort Collins, Colorado*
Laramie, Wyoming
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*Station Headquarters: 240 W. Prospect St., Fort Collins, CO 80526