# Chapter 14:

# Ecological & Biological Diversity of the Carson National Forest,

# In

# Ecological and Biological Diversity of National Forests in Region 3

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## Table of Contents

## List of Tables

## List of Figures

## Introduction

The Carson National Forest is one of 11 National Forests within U.S. Forest Service (USFS) Southwestern Region (Region 3), located in north-central New Mexico. This Forest encompasses approximately 1,486,000 acres, which comprises approximately 9.4% of the total area of Region 3 Forest lands. Elevation on the Carson ranges from approximately 6,000 ft. to 13,161 ft. at Wheeler Peak, the highest peak in New Mexico.

The Carson National Forest exhibits an impressive diversity of vegetation systems, as a result of its geographic location and elevational gradients. These vegetation systems provide habitat for myriad plant and animal species, including federally listed endangered and threatened species and other species of management concern. The Carson also manages large proportions of several vegetation systems relative to other Region 3 National Forests and other major landowners throughout Arizona and New Mexico. Consequently, there are several opportunities for conservation efforts on the Carson National Forest to sustain ecological integrity and biological diversity.

The goal of this chapter is to synthesize information from existing regional-scale assessments to identify important ecological and biological values that occur on the Carson National Forest and highlight information that may be pertinent to

## Results

*I. Potential Natural Vegetation Types within the Carson National Forest*

Information from the Southwest Regional Gap Analysis Project (SWReGAP; USGS National Gap Analysis Program 2004) was used to characterize the distribution of potential natural vegetation types (PNVTs) on the Carson National Forest. PNVTs represent the climax vegetation type that would dominate a site under natural disturbance regimes and biological processes. PNVTs were used to summarize vegetation for this analysis because they are the basis for the characterizations of historic range of variability and vegetation models being developed in preparation for the forest planning process.

For this analysis, the extent and proportion of each PNVT on the Carson were summarized, as well as the proportion of each PNVT on the Carson relative to its occurrence within all Region 3 Forests. More detailed information on the data and methods used in this analysis can be found in Chapter 2, and comparisons of PNVTs on the Carson to other Region 3 Forests and landowners in the Southwest is available in Chapter 3.

Twenty-one PNVTs were identified on the Carson National Forest (Figure 14-1; see Appendices 2-A and 2-B, respectively, for detailed descriptions of each PNVT and the cross-walk of SWReGAP land cover types to PNVTs). However, six PNVTs comprise approximately 86.5% of the total area of the Carson National Forest. These six PNVTs include: ponderosa pine forest (27.5%), pinyon-juniper woodland (18.7%), mixed conifer forest (12.8%), spruce-fir forest (11.8%), aspen forest and woodland (8.0%), and sub-alpine grassland (7.7%). The other 15 PNVTs on the Carson make-up the remaining 13.5% of the Forest. For a complete list of all 21 PNVTs found on the Carson National Forest, and the percentage of cover of each, refer to Table 14-1.

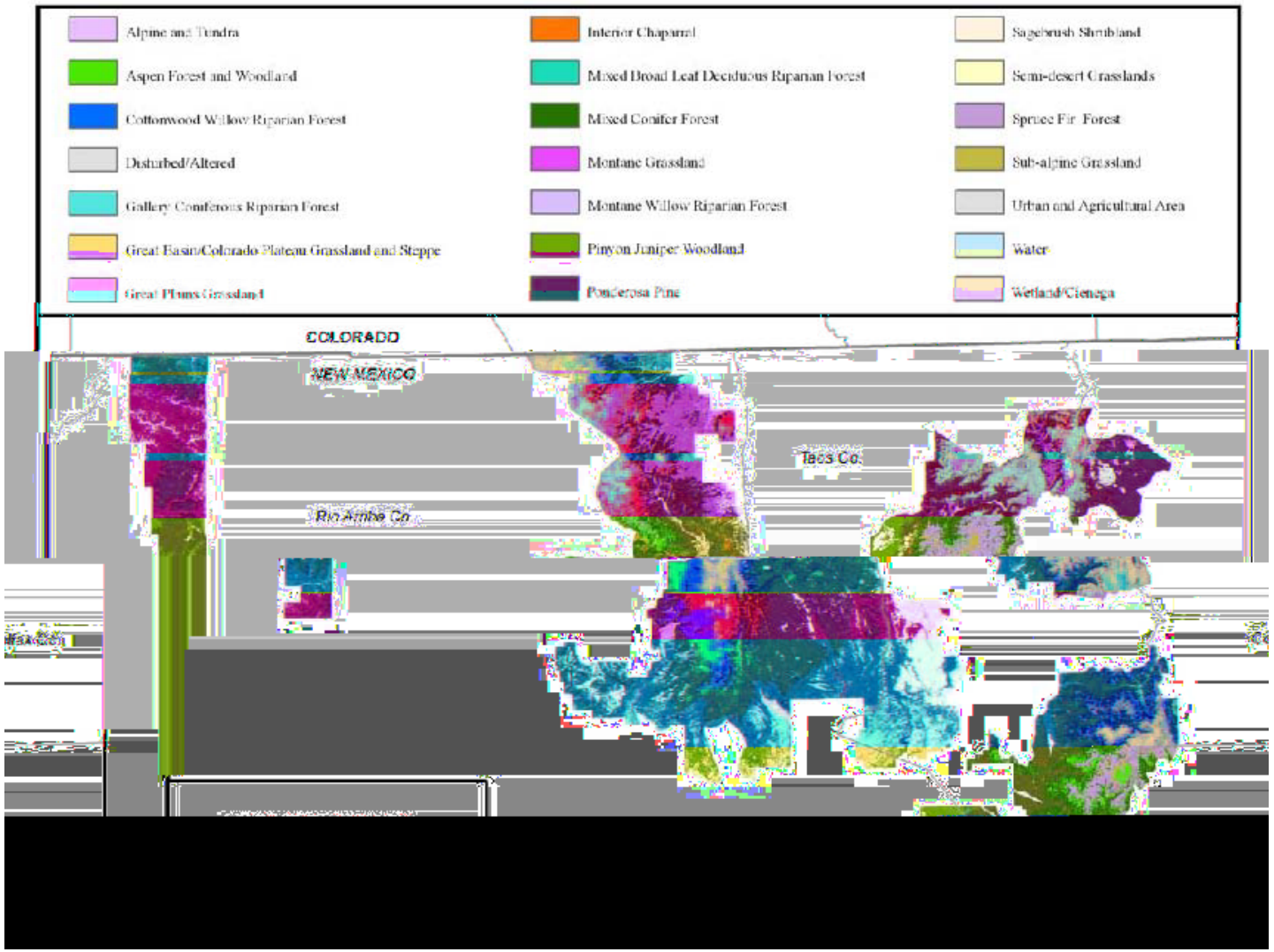


**Figure 14-1.** Distribution of potential natural vegetation types on the Carson National Forest. Map was created using data from the Southwest Regional Gap Analysis Project (SWReGAP; U.S. Geological Survey National Gap Analysis Program. 2004). SWReGAP vegetation types were aggregated and converted to potential natural vegetation types. See Chapter 2 for more information regarding methods used. SWReGAP data have not been accuracy tested and are based on satellite imagery. Therefore, SWReGAP may not be appropriate at fine spatial scales.

**Table 14-1.** Approximate area (in acres) and percent of total area of each potential natural vegetation type on the Carson National Forest. Areas were calculated using data from the Southwest Regional Gap Analysis Project (SWReGAP). SWReGAP land cover types were aggregated and converted to potential natural vegetation types. See Chapter 2 for more details on methods utilized.

| Potential Natural Vegetation Type | Total Area (acres) | Percent of Total Area (%) |
|---|---|---|
| Alpine/ Tundra | 300 | <0.1 |
| Aspen Forest and Woodland | 118,400 | **8.0** |
| Cottonwood Willow Riparian Forest | 300 | <0.1 |
| Disturbed/Altered (quarries and mines) | 3,800 | 0.3 |
| Gallery Coniferous Riparian Forest | 100 | <0.1 |
| Great Basin/ Colorado Plateau Grassland and Steppe | 51,200 | 3.4 |
| Great Plains Grassland | 25,000 | 1.7 |
| Interior Chaparral | 32,800 | 2.2 |
| Mixed Broadleaf Deciduous Riparian Forest | 2,300 | 0.2 |
| Mixed Conifer Forest | 189,500 | **12.8** |
| Montane Grassland | 16,600 | 1.1 |
| Montane Willow Riparian Forest | 2,000 | 0.1 |
| Pinyon-juniper Woodland | 278,200 | **18.7** |
| Ponderosa Pine | 408,000 | **27.5** |
| Sagebrush Shrubland | 58,000 | 3.9 |
| Semi-desert Grassland | 200 | <0.1 |
| Spruce-fir Forest | 174,900 | **11.8** |
| Sub-alpine Grasslands | 113,900 | **7.7** |
| Urban and Agricultural Area | 2,900 | 0.2 |
| Water (open water) | 200 | <0.1 |
| Wetlands/ Cienega | 7,400 | 0.5 |
| Total | 1,486,000 | |

*Potential Natural Vegetation Types relative to all Region 3 Forests*

The Carson National Forest is responsible for managing the largest proportions of six PNVTs relative to all other Region 3 National Forests, including gallery coniferous riparian forest (100%), montane grassland (96.5%), wetland/cienega (84.1%), spruce-fir forest (49.3%), subalpine grassland (36.6%), and aspen forest and woodland (35.2%). The Carson National Forest also manages large percentages of sagebrush shrubland (43.1%) and alpine/tundra (20.0%) relative to all Region 3 National Forests (Figure 14-2).

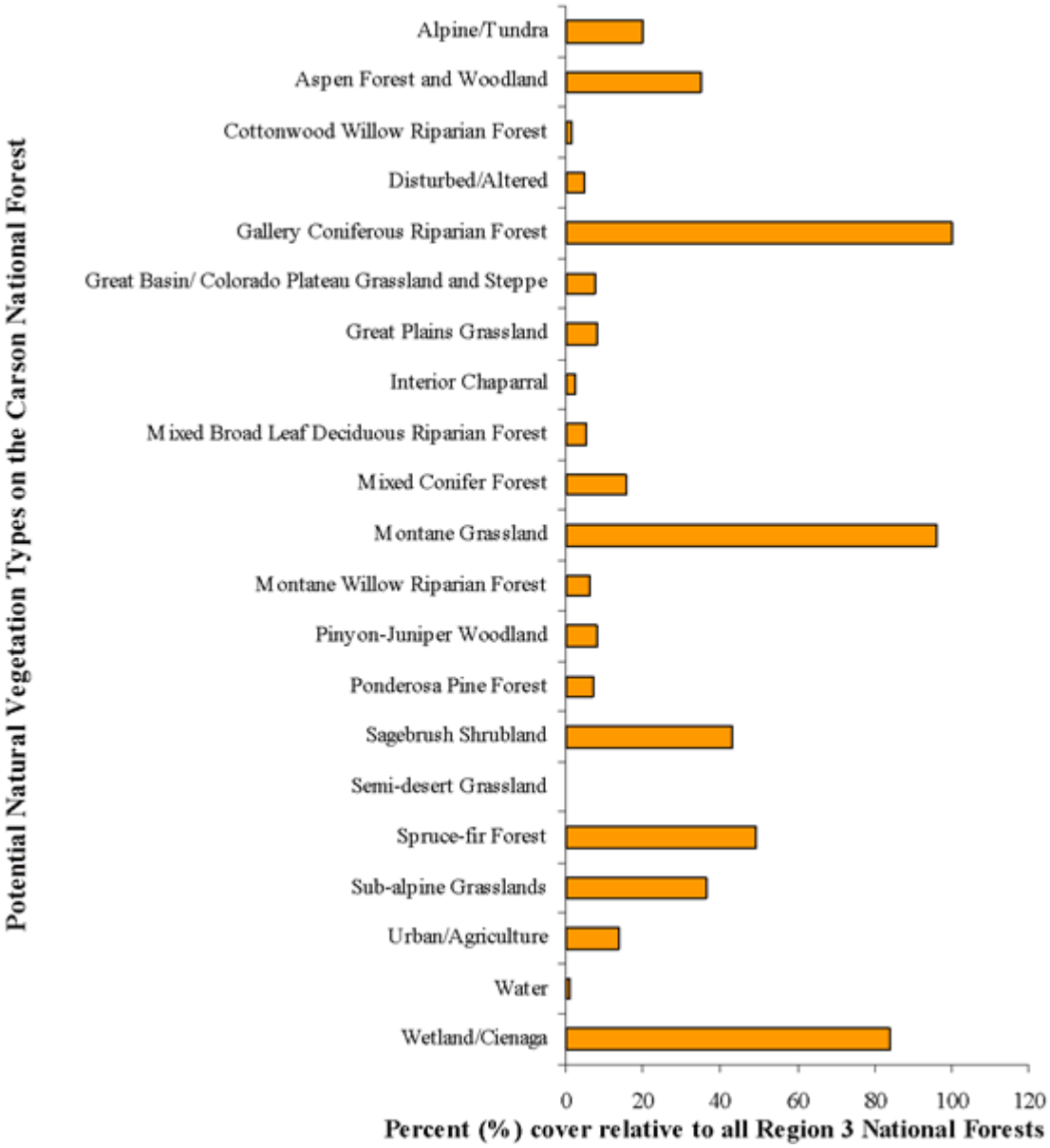


**Figure 14-2.** Percent area of cover of each potential natural vegetation type that occurs on the Carson National Forest in relation to all Region 3 National Forests combined. Analysis was conducted using data from the Southwest Regional Gap Analysis Project (SWReGAP). See Chapter 2 for information regarding the limitations of SWReGAP.

*Potential Natural Vegetation Types across all landowners in the Southwest*

The Carson National Forest also manages significant proportions of particular PNVTs across all major landowners in the Southwest. For example, 45.6% of montane grasslands, 30.2% of spruce-fir forests, 22.7% of aspen forest and woodlands, and 18.8% of sub-alpine grasslands found throughout Arizona and New Mexico occur on the Carson National Forest. For more information regarding the proportions of PNVTs the Carson National Forest manages relative to other landowners in the Southwest, refer to Chapter 3.

*II. Plant and Animal Species Richness*

*Species Richness*

The R3 Species Database (described in detail in Chapter 2) was used to summarize the conservation status of species that exist on the Carson National Forest, and to identify species that might potentially be considered as species-of-interest and species-of-concern as defined in the USFS planning directives. The R3 Species Database was synthesized from multiple datasets and provides updated and consistent attributes for species that occur on Region 3 Forests, including: taxonomy, NatureServe conservation status rankings, state and federal endangered species listings, and other pertinent conservation status rankings. The database includes all known terrestrial and aquatic vertebrate species, and plant and invertebrate species that may be of conservation concern. Non-native aquatic vertebrate species were not included in these analyses. The complete list of species used in this analysis and their conservation status attributes is provided in Appendix 14-A.

According to the R3 Species Database, 416 species of plants and animal occur on the Carson National Forest (Figure 14-3; a complete list is provided in Appendix 14-A). This number is likely conservative in terms of overall species diversity as it may not account for all vertebrate species that may occur in this area, and is not comprehensive for plants and invertebrates. It is also important to note that the number and type of species inhabiting the Carson National Forest likely changes over time.

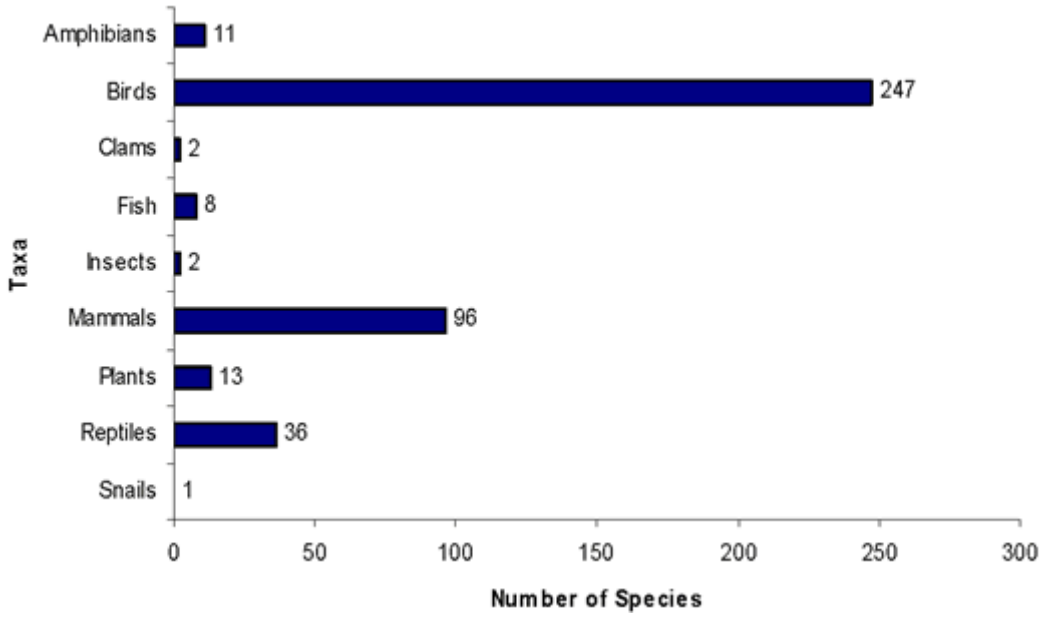


**Figure 14-3.** Number of species, by taxon, that inhabit the Carson National Forest according to the R3 Species Database. The R3 Species Database includes all known terrestrial vertebrates and native fishes, but only invertebrates and plants of management concern. Because of the limitations of the R3 Species Database (see Chapter 2 for complete description of the database), the numbers reported in these results are conservative.

*Threatened and Endangered Species Listings*

Federal listing under the Endangered Species Act — Three species that inhabit the Carson National Forest are listed by the U.S. Fish and Wildlife Service as endangered or threatened under the Endangered Species Act of 1973: Southwest Willow Flycatcher, Bald Eagle, and Mexican Spotted Owl. One candidate species, the Western Yellow-Billed Cuckoo, also occurs on the Forest. Species are listed as candidate species when there is sufficient information to support a proposal for the endangered or threatened status. Refer to Appendix A for a list of threatened, endangered, and candidate species.

New Mexico state conservation status — Forteen species of special state conservation status designated by the New Mexico Game and Fish Department occur on the Carson National Forest. Refer to Appendix 14-A for a complete list of those species. Currently, there are three animal species designated by the state as endangered and 11 animal species that are listed as threatened on the Forest. Birds comprise half (50%) of all species with state conservation status on the Forest.

*NatureServe Conservation Status Rankings*

Global conservation status rankings (G-ranks) — Twenty-five species (6.2%) were ranked with a global conservation status of G1, G2, G3, T1, T2 or T3, indicating conservation concern across their range (Table 14-2). Results indicate 377 species (92.9%) were ranked as G4/T4 or G5/T5 species (Table 14-2). These are species whose populations are considered 'apparently secure' or 'secure', respectively. The remaining four species were considered not rankable by NatureServe. Ten species (2.4%) of 416 were not included in this analysis because they were not assigned a NatureServe global conservation rank.

**Table 14-2.** Number of species, by taxon, that inhabit the Carson National Forest with the various global rankings assigned by NatureServe. Ten species are not included in this table because they do not have an assigned global rank. G1 = critically imperiled; G2 = imperiled; G3 = vulnerable; G4 = apparently secure; G5 = secure; GNA = not applicable; T = infraspecific taxon (subspecies or varieties), TNR = unranked/not yet assessed; TU = unrankable.

| Global Ranking | Amphibian | Bird | Clam | Fish | Insect | Mammal | Plant | Reptile | Snail | **Total** |
|---|---|---|---|---|---|---|---|---|---|---|
| G1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| G2 | 0 | 1 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | **8** |
| G3 | 0 | 1 | 0 | 1 | 1 | 2 | 3 | 0 | 0 | **8** |
| G4 | 0 | 16 | 0 | 0 | 0 | 6 | 1 | 1 | 0 | **24** |

National conservation status rankings (N-ranks) — Twenty-seven species (6.6%) were ranked with a national conservation status of N1, N2, or N3, indicating conservation concern at the national level (Table 14-3). Three hundred seventy species on the Forest (91.1%) were ranked as N4 or N5 species, whose populations are considered 'apparently secure' or 'secure', respectively. The remaining nine species (2.2%) were considered not rankable by NatureServe. The same suite of species was used in this analysis as in the global rankings.

**Table 14-3.** Number of species, by taxon, that inhabit the Carson National Forest with national rankings assigned by NatureServe. Ten species are not included because they do not have an assigned rank. N1 = critically imperiled; N2 = imperiled; N3 = vulnerable; N4 = apparently secure; N5 = secure; NNA = not applicable; NNR = not ranked.

| National Ranking | Amphibian | Bird | Clam | Fish | Insect | Mammal | Plant | Reptile | Snail | **Total** |
|---|---|---|---|---|---|---|---|---|---|---|
| N1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | **4** |
| N2 | 0 | 1 | 0 | 1 | 1 | 1 | 7 | 0 | 0 | **11** |
| N3 | 0 | 4 | 0 | 1 | 0 | 4 | 3 | 0 | 0 | **12** |
| N4 | 1 | 26 | 0 | 0 | 0 | 7 | 2 | 2 | 0 | **38** |
| N5 | 10 | 210 | 1 | 6 | 0 | 71 | 0 | 33 | 1 | **332** |
| NNA | 0 | 3 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | **4** |
| NNR | 0 | 1 | 0 | 0 | 0 | 2 | 1 | 1 | 0 | **5** |

Subnational conservation status rankings (S-ranks) — Of the 416 species analyzed for the Carson National Forest, 387 (93.0%) had assigned subnational conservation status ranks (Sranks) in the state of New Mexico (Table 14-4). Of these, 281 (69.2%) were considered secure or apparently secure (S5 and S4, respectively). Ninety-four species (23.2%) had rankings that merit conservation concern on a state or more local scale (S1, S2, S3). One species on the Carson is presumed extirpated (SX) in New Mexico by its Natural Heritage ranking, Southwestern River otter, and three species are considered possibly extirpated (SH) in New Mexico: boreal toad, river otter, and greater sage-grouse. The remaining 12 species (3.0%) were not ranked. See Appendix 14-A for the complete list of species with their associated S-ranks.

**Table 14-4.** Number of species, per taxon, currently inhabiting the Carson National Forest that are assigned to the various subnational rankings by New Mexico Natural Heritage. Twenty-eight of the 415 species were not assigned a subnational conservation rank by New Mexico Natural Heritage, and therefore are not included in this analysis. S1 = critically imperiled; S2 = imperiled; S3 = vulnerable; S4 = apparently secure; S5 = secure; SH = possibly extirpated; SX = presumed extirpated; SNA = not applicable; SNR = not ranked.

| Subnational Ranking | Amphibian | Bird | Clam | Fish | Insect | Mammal | Plant | Reptile | Snail | **Total** |
|---|---|---|---|---|---|---|---|---|---|---|
| S1 | 1 | 12 | 2 | 0 | 1 | 1 | 1 | 0 | 1 | **19** |
| S2 | 0 | 16 | 0 | 1 | 0 | 7 | 5 | 0 | 0 | **29** |
| S3 | 0 | 20 | 0 | 2 | 0 | 17 | 5 | 2 | 0 | **46** |
| S4 | 2 | 100 | 0 | 2 | 0 | 22 | 1 | 10 | 0 | **137** |
| S5 | 6 | 87 | 0 | 1 | 0 | 28 | 0 | 22 | 0 | **144** |
| SH | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | **3** |
| SNA | 1 | 3 | 0 | 2 | 0 | 1 | 0 | 0 | 0 | **7** |
| SNR | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | **2** |
| SX | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | **1** |

*Other Conservation Rankings*

Birds of Conservation Concern —According to the R3 Species Database, the Carson National Forest, is home to at least 247 birds, of which 19 (7.7%) are listed on the U.S. Fish and Wildlife Service Bird of Conservation Concern National Priority List (Table 14-5). In all, the U.S. Fish and Wildlife Service lists 131 species of Birds of Conservation Concern, and 14.5% of these inhabit the Carson National Forest. Two of these species also are listed as threatened by the state of New Mexico, which include the American peregrine falcon and gray vireo.

Partners in Flight Watch List — Of the 100 birds species currently on the Partners in Flight Watch List, 23 (23%) can be found on the Carson National Forest (Table 14-5). This comprises 9.3% of the known 247 bird species that inhabit the Forest. One species, the gray vireo, also is listed as threatened by the state of New Mexico. Six species occur on both the Watch List and the U.S. Fish and Wildlife Service Birds of Conservation Concern list, and are highlighted in bold in Table 14-6.

**Table 14-5.** Bird species on the Partners in Flight Watch list and/or the U.S. Fish and Wildlife Service Birds of Conservation Concern list that inhabit the Carson National Forest.Table 14-5. Bird species on the Partners in Flight Watch list and/or the U.S. Fish and Wildlife Service Birds of Conservation Concern list that inhabit the Carson National Forest.

**Diurnal Raptors**
- Swainson's Hawk (P)
- American Peregrine Falcon* (CC)
- Ferruginous Hawk (CC)
- Northern Harrier (CC)

**Shorebirds**
- Long-Billed Curlew (CC)
- Mountain Plover (CC)
- Wilson's Phalarope (CC)

**Cuckoos and Allies**
- Western Yellow-Billed Cuckoo (CC)

**Upland Game Birds**
- Blue Grouse (P)
- Scaled Quail (P)
- Greater Sage-Grouse (P)

**Pigeons and Doves**
- Band-Tailed Pigeon (P)

**Owls**
- Burrowing Owl (CC)
- **Flammulated Owl**
- Short-Eared Owl (P)

**Goatsuckers and Swifts**
- White-Throated Swift (P)

**Hummingbirds**
- Calliope Hummingbird (P)
- Rufous Hummingbird (P)

**Woodpeckers**
- **Lewis's Woodpecker**
- **Red-Headed Woodpecker**

**Flycatchers**
- Olive-Sided Flycatcher (P)
- Willow Flycatcher (P)

**Shrikes and Vireos**
- **Gray Vireo***
- Loggerhead Shrike (CC)

**Jays, Crows, and Allies**
- Pinyon Jay (P)

**Mimids - Catbirds, Mockingbirds, Thrashers**
- **Bendire's Thrasher**

**Wood Warblers**
- Black-Throated Gray Warbler (CC)
- **Grace's Warbler**
- Hermit Warbler (P)
- Virginia's Warbler (P)

**Emberizine Sparrows and Allies**
- Brewer's Sparrow (P)
- Cassin’s Sparrow (CC)
- Harris's Sparrow (P)
- Lark Bunting (CC)
- Sage Sparrow (CC)

**Finches and Old World Sparrows**
- Black Rosy Finch (P)

(P) Bird species on the Partners in Flight Watch list
(CC) USFWS Bird of Conservation Concern
* New Mexico Department of Game and Fish Threatened Species
**Species in bold** appear on both lists

*Potential Species Lists for Forest Planning*

The R3 Species Database was used to identify species that might potentially be considered as species-of-concern and species-of-interest as defined in the USFS planning directives. For the purposes of this analysis, the definitions used to categorize species were similar, but not identical, to the definitions provided in the directives.

1. Threatened and Endangered Species:
   a. Listed as a threatened or endangered species under the Federal Endangered Species Act

2. Species-of-concern were defined as species that fall in one or more of the following categories:
   a. NatureServe G/T-rank of 1, 2 or 3
   b. Proposed or candidate species under the Federal Endangered Species Act
   c. Recently (<5 years) de-listed under the Federal Endangered Species Act
   d. Has been petitioned for federal listing and for which a positive "90-day finding" has been made

3. Species-of-interest were defined as species that fall in one or more of the following categories:
   a. NatureServe N-rank of N1/N2, or S-rank of S1/S2 in New Mexico Listed as threatened or endangered species with state status in New Mexico
   b. Identified a priority species in the New Mexico Comprehensive Wildlife Conservation Strategy
   c. On the U.S. Fish and Wildlife Service Birds of Conservation Concern National Priority List

In particular, the directives provide further criteria that can be used in considering species-ofinterest, such as trends, rarity, ranges, and public interest. However, this information was not available in the R3 Species Database and is beyond the scope of this analysis.

Threatened and Endangered Species – Three species occur on the Forest are listed by the U.S. Fish and Wildlife Service as endangered or threatened under the Endangered Species Act (Table 14-6).

**Table 14-6.** Species listed as endangered or threatened under the Federal Endangered Species Act of 1973 that inhabit the Carson National Forest. The table includes common names that are recognized by NatureServe.

| Taxa | Endangered | Threatened |
|---|---|---|
| Bird | Southwestern Willow Flycatcher | Bald Eagle<br>Mexican Spotted Owl |

*Potential species-of-concern* — The Carson National Forest is home to at least 23 potential species-of-concern across six distinct taxonomic groups (Table 14-7). Plants comprise the largest proportion of potential species-of-concern, approximately 43%; birds and mammals each represent 17.4%; fish and insects each comprise 8.7%, and clams, 4.3% (Figure 14-5). One candidate species for federal listing inhabits the Carson National Forest, western yellow-billed cuckoo (*Coccyzus americanus occidentalis*), and is included in the list of potential species-ofconcern. The R3 Species Database, which may not be comprehensive for the Carson National Forest, was used to derive these results. Therefore, it is feasible that some species may be absent from these results.

**Table 14-7.** Potential species-of-concern on the Carson National Forest. Species with NatureServe G/T-ranks of 1, 2 or 3, listed as candidate or proposed species under the Federal Endangered Species Act, or having been recently (<5 years) de-listed were identified as potential species-of-concern.

| Taxa Scientific Name | Common Name | G/T rank | ESA status | Recently delisted |
|---|---|---|---|---|
| Birds | | | | |
| *Charadrius montanus* | Mountain Plover | G2 | | |
| *Coccyzus americanus occidentalis* | Western Yellow-Billed Cuckoo | T2 | Candidate | |
| *Falco peregrinus anatum* | American Peregrine Falcon | T3 | | Yes |
| *Pelecanus erythrorhynchos* | American White Pelican | G3 | | |
| Clams | | | | |
| *Pisidium sanguinichristi* | Sangre De Cristo Peaclam | G1 | | |
| Fish | | | | |
| *Gila pandora* | Rio Grande Chub | G3 | | |
| *Oncorhynchus clarki virginalis* | Rio Grande Cutthroat Trout | T3 | | |
| Insects | | | | |
| *Ameletus falsus* | False Ameletus Mayfly | G3 | | |
| *Speyeria nokomis nokomis* | Nokomis Fritillary | T1 | | |
| Mammals | | | | |
| *Lontra canadensis sonora* | Southwestern River Otter | T1 | | |
| *Myotis leibii* | Eastern Small-footed Myotis | G3 | | |
| *Myotis occultus* | Occult Little Brn. Myotis Bat | G3 | | |
| *Zapus hudsonius luteus* | New Mexican Jumping Mouse | T2 | | |
| Plants | | | | |
| Abronia bigelovii | Galisteo Verbena | G3 | | |
| Astragalus micromerius | Chaco Milkvetch | G2 | | |
| Astragalus ripleyi | Ripley Milkvetch | G3 | | |
| Delphinium alpestre | Colorado Larkspur | G2 | | |
| Delphinium robustum | Wahatoya Creek Larkspur | G2 | | |
| Erigeron subglaber | Hairless Fleabane | G3 | | |
| Herrickia horrida | Horrid Herrickia | G2 | | |
| Mentzelia conspicua | Conspicuous Blazing Star | G2 | | |
| Salix arizonica | Arizona Willow | G2 | | |
| Tonestus microcephalus | Small-head Golden-weed | G2 | | |

Among both potential species-of-concern and ESA listed threatened and endangered species, plants continue to comprise the largest proportion of species (approximately 38.0%); birds (27.0%) and mammals (15.4%) follow make up the next largest proportions (Figure 14-4).

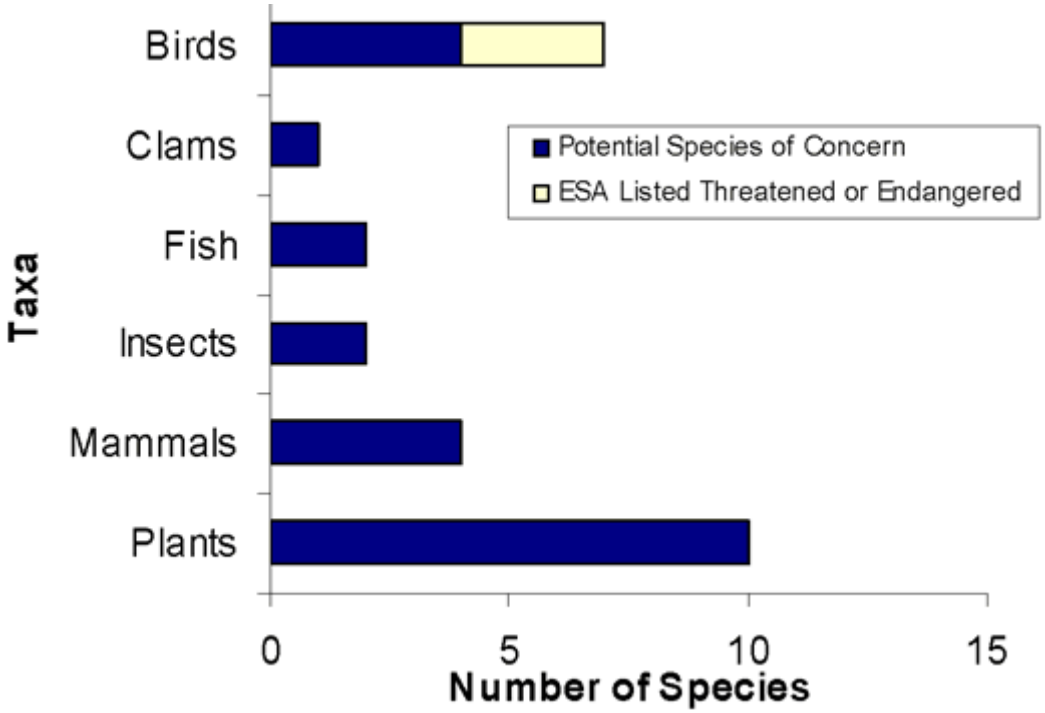


**Figure 14-4.** Number of potential species-of-concern (in blue) and federally listed endangered and threatened species (yellow), by taxon, that currently inhabit the Carson National Forest. According to the published Forest Service draft directives (70 Fed. Reg. 14637), species are considered potential species-of-concern if they have a NatureServe global conservation rank of G1, G2, G3, T1, T2, or T3 and are not listed as federally endangered or threatened species. Candidate or proposed species for federal listing may be considered for species-of-concern status.

*Potential species-of-interest* —At least 79 potential species-of-interest representing six taxonomic groups occur on the Carson National Forest (Figure 14-5). Birds make up the largest proportion (approximately 67.1%) of potential species-of-interest. Mammals comprise 20.3% of the total, while amphibians make up approximately 6.3%, and reptiles comprise 3.8%. Clams and snails comprise 1.3% each of all potential species-of-interest on the Carson National Forest. The species used in this analysis for Carson National Forest are listed in Appendix 14-A and those determined as potential species-of-interest are identified.

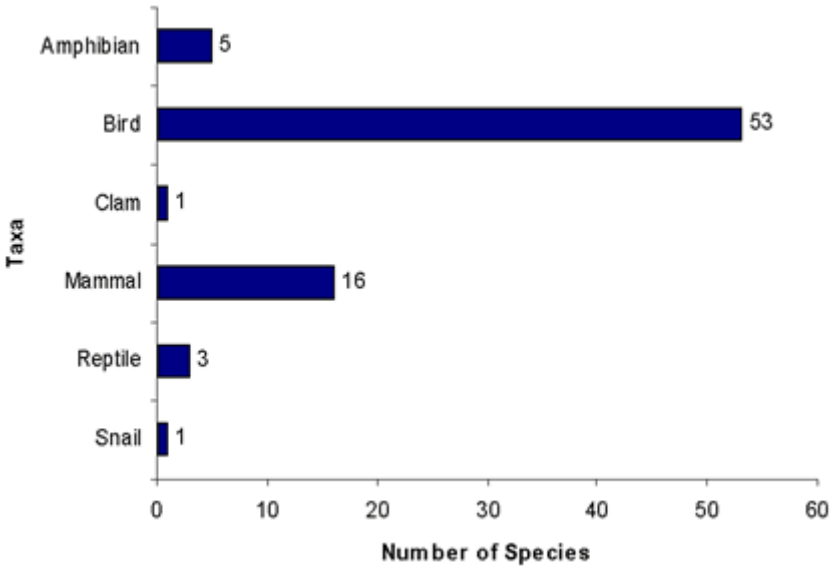


**Figure 14-5.** The number of potential species-of-interest, by taxa, that currently inhabit the Carson National Forest. Species were considered potential species-of-interest if they fell into one or more of the following categories: state listed threatened or endangered species (NM); listed as a species of concern or priority species in the NM State Comprehensive Wildlife Conservation Strategies; on the U.S. Fish and Wildlife Service Birds of Conservation Concern National Priority list; or NatureServe national or subnational conservation rank of N1, N2, S1, or S2. These are the criteria listed in the published Forest Service draft directives (70 Fed. Reg. 14637) for determining species-of-interest. Species that were federally endangered or threatened, or that were determined to be potential species-of concern were not included as potential species-of-interest.

*Summary* – Approximately one-quarter (25.2%) of all species on the Carson National Forest were identified as falling within categories defined by the USFS planning directives (Table 148). While only 5.5% were identified as potential species-of-concern, approximately 19.0% were identified as potential species-of-interest. Notably, almost half (45.5%) of all amphibians that inhabit the Carson National Forest are identified as potential species-of-interest. Also, over three-quarters (76.9%) of all plants that occur on the Carson are either federally listed as threatened or endangered or are identified as potential species-of-concern.

In addition to the criteria used to define these categories, the R3 Species Database includes additional conservation status information, such as species listed on the Region 3 Sensitive Species List and animals on the state Comprehensive Wildlife Conservation Strategy list. All of the species on the Region 3 Sensitive Species List that inhabit Carson National Forest were captured within the categories defined by the directives.

**Table 14-8.** Number of species identified as endangered or threatened, species-of-concern, species-of-interest, or no category for the Carson National Forest based on information in the R3 Species Database.

| | Endangered and Threatened | | Potential Species of Concern | | Potential Species of Interest | | No Category | | |
|---|---|---|---|---|---|---|---|---|---|
| Taxa | # | % | # | % | # | % | # | % | Total |
| Amphibian | 0 | 0.0 | 0 | 0.0 | 5 | 45.5 | 6 | 54.5 | 11 |
| Bird | 3 | 1.2 | 4 | 1.6 | 53 | 21.5 | 187 | 75.7 | 247 |
| Clam | 0 | 0.0 | 1 | 50.0 | 1 | 50.0 | 0 | 0.0 | 2 |
| Fish | 0 | 0.0 | 2 | 25.0 | 0 | 0.0 | 6 | 75.0 | 8 |
| Insect | 0 | 0.0 | 2 | 100.0 | 0 | 0.0 | 0 | 0.0 | 2 |
| Mammal | 0 | 0.0 | 4 | 4.2 | 16 | 16.7 | 76 | 79.2 | 96 |
| Plant | 0 | 0.0 | 10 | 76.9 | 0 | 0.0 | 3 | 23.1 | 13 |
| Reptile | 0 | 0.0 | 0 | 0.0 | 3 | 8.3 | 33 | 91.7 | 36 |
| Snail | 0 | 0.0 | 0 | 0.0 | 1 | 100.0 | 0 | 0.0 | 1 |
| Total | 3 | 0.7 | 23 | 5.5 | 79 | 19.0 | 311 | 74.8 | 416 |

*III. Ecoregional Assessment Conservation Areas and Conservation Targets*

Ecoregional assessments are science-based efforts to identify the minimum set of areas (conservation areas) on the landscape necessary to maintain the biological diversity of the ecoregion. The ecoregional assessment process includes the identification of conservation targets (including species, ecological systems, and important biological features) that represent the biological diversity within the ecoregion. Conservation goals (including distribution, size and minimum number of viable occurrences) are established for each conservation target within the ecoregion. An iterative process is used to identify a suite of conservation areas that most efficiently meets the conservation goals for all conservation targets within the ecoregion. A more detailed explanation of the ecoregional assessment process is provided in Chapter 2. For this report, the results of these ecoregional analyses were used to identify the extent and distribution of overlap between conservation areas and ranger districts, roadless areas, and wilderness areas on the Carson National Forest. The conservation targets associated with each overlapping conservation area are also identified.

Fifteen individual conservation areas from ecoregional assessments overlap the Carson National Forest (Figure 14-6, Table 14-9), totaling 815,100 acres, or 51.3% of the Forest. Conservation area overlap on individual districts ranged from 17.0% on the Jicarilla District to 94.1% on the El Rito Ranger District (Table 14-10). Overall, 20.5% of the total area of these fifteen conservation areas overlaps the Carson National Forest. For many of the conservation areas, a large proportion of the conservation area overlaps the Carson, (Table 14-9), demonstrating the Carson has the primary responsibility for managing these areas to sustain the biodiversity within them.

Relatively small proportions of the Carson National Forest overlapped by conservation areas are designated wilderness areas (7.9%) or inventoried roadless area (7.3%), while approximately 85% of overlap areas do not have these designations (Table 14-12). While approximately three-quarters of wilderness areas are overlapped, smaller proportions of inventoried roadless areas (56.3%) and areas without these designations (49.5%) on the forest are overlapped by conservation areas.

Conservation targets were summarized for all fifteen conservation areas that overlap the Carson National Forest. A total of 112 conservation targets occur within these conservation areas (Figure 14-7). Of these, 49 (43.8%) are coarse filter targets (ecological systems, communities or features), while 63 (56.3%) are individual species. Fifty (44.6%) of these targets are associated with riparian and aquatic systems, while 62 (55.4%) are associated with terrestrial habitats (Table 14-11). A complete listing of all conservation targets by taxonomic group for the Carson is provided in Appendix 14-B and conservation targets for each conservation area are provided in Appendix 14-C.


**Figure 14-6.** Conservation areas (N=15) that overlap six ranger districts on the Carson National Forest in New Mexico. 14-22

**Table 14-9.** Conservation areas (N=15) that overlap six ranger districts on the Carson National Forest in New Mexico.

| Conservation Area | Ranger Districts[A] | Overlap (Acres) | % of Conservation Area |
|---|---|---|---|
| Agua Caliente | CR,TP | 400 | 2.2 |
| Carracas Mesa/Navajo Reservoir | J | 22,600 | 47.0 |
| Conejos River | TP | 29,200 | 44.7 |
| Coyote Creek | CR,Q | 15,500 | 12.7 |
| Culebra Range | Q | 59,500 | 12.9 |
| Ojo Caliente | CR,C,ER,TP | 386,800 | 71.2 |
| Punche Valley | ER,TP | 81,500 | 17.2 |
| Questa | Q | 11,500 | 77.7 |
| Rio Chama | C,ER | 33,900 | 6.5 |
| Rio Grande Gorge | Q | <100 | 0.4 |
| Rio Hondo | Q | 40,900 | 91.9 |
| San Juan River (Carracas) | J | 4,200 | 28.4 |
| Southern Sangre De Cristo Mountains | CR | 71,300 | 18.5 |
| Taos Pueblo | CR | 100 | 0.7 |
| Vermejo Park/Upper Purgatoire | Q | 57,600 | 4.7 |

[A] CR=Camino Real, C=Canjillon, ER=El Rito, J=Jicarilla, Q=Questa, TP=Tres Piedras

**Table 14-10.** Extent of overlap between ecoregional conservation areas and six ranger districts on the Carson National Forest in New Mexico.

| District | Number of Conservation Areas | Overlap (Acres) | Percent of District |
|---|---|---|---|
| Camino Real | 5 | 88,100 | 26.4 |
| Canjillon | 2 | 30,200 | 20.0 |
| El Rito | 3 | 264,100 | 94.1 |
| Jicarilla | 2 | 26,800 | 17.0 |
| Questa | 6 | 170,000 | 61.5 |
| Tres Piedras | 4 | 235,900 | 60.8 |
| Carson N.F Total | 15[A] | 815,100 | 51.3% |

[A] Several conservation areas overlap more than one ranger district.

**Table 14-11.** Number of conservation targets associated with aquatic/riparian and terrestrial habitats for 15 conservation areas that overlap the Carson National Forest in New Mexico.

| Conservation Area | Habitat | | Total |
|---|---|---|---|
| | Aquatic/ Riparian | Terrestrial | |
| Agua Caliente | 6 | 3 | 9 |
| Carracas Mesa/Navajo Reservoir | 6 | 5 | 11 |
| Conejos River | 5 | 9 | 14 |
| Coyote Creek | 3 | 8 | 11 |
| Culebra Range | 10 | 20 | 30 |
| Ojo Caliente | 13 | 10 | 23 |
| Punche Valley | 11 | 19 | 30 |
| Questa | 2 | 4 | 6 |
| Rio Chama | 21 | 12 | 33 |
| Rio Grande Gorge | 1 | 2 | 3 |
| Rio Hondo | 4 | 8 | 12 |
| San Juan River (Carracas) | 3 | 1 | 4 |
| Southern Sangre De Cristo Mountains | 9 | 16 | 25 |
| Taos Pueblo | 4 | 4 | 8 |
| Vermejo Park/Upper Purgatoire | 10 | 25 | 35 |

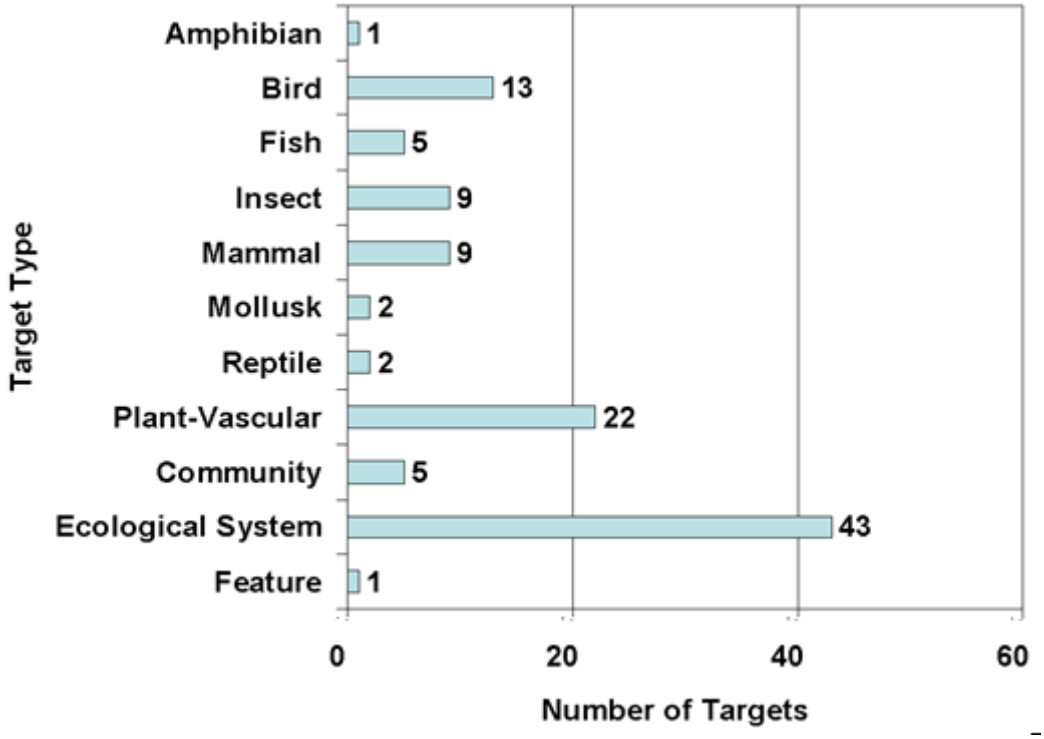


**Figure 14-7.** Number of conservation targets, by type, that occur on 15 conservation areas that overlap the Carson National Forest in New Mexico.

**Table 14-12.** Overlap between conservation areas and areas wilderness areas, and non-wilderness inventoried roadless areas on the Carson National Forest in New Mexico.

| Designation | Acres within Conservation Areas | % of Conservation Areas | % of Designated Areas |
|---|---|---|---|
| Wilderness Areas | 64,600 | 7.9 | 75.3 |
| Roadless Areas | 59,300 | 7.3 | 56.3 |
| No Designation | 691,900 | 84.8 | 49.5 |

## Discussion

*Systems Diversity*

According to Southwest Regional Gap Analysis Project (USGS National Gap Analysis Program 2004), six PNVTs cover a large proportion of the Carson National Forest, which include: ponderosa pine forest, pinyon-juniper woodland, mixed conifer forest, spruce-fir forest, aspen forest and woodland, and sub-alpine grassland. All of these systems are ecologically important and provide critical habitat to a variety of plant and animal species. However, some of these systems, especially ponderosa pine forest, pinyon-juniper woodland, and aspen forest and woodland, face several known threats that are widespread throughout the Southwest.

The threats for these three systems include degradation of ecological processes and destruction of wildlife and plant populations due to catastrophic crown wildfires (especially for ponderosa pine forest; Covington 2001), drastic die-off of trees (especially for pinyon-juniper woodland; Mueller 2005) and low recruitment of new trees (particularly for aspen forest and woodland; Bailey and Whitham 2002). These threats have been attributed to altered fire regimes, insect invasion, drought, and an increase rate of herbivory in aspen systems (Allen and others 2002, Bailey and Whitham 2002, Fule and others 2004, Savage and Mast 2005, Zausen and others 2005). With much research and attention focused on restoring and maintaining the health of such systems in the Southwest, the Santa Fe National Forest has the opportunity to utilize the most recent scientific information and robust methodologies to ensure the health of these systems and the species they support.

The Carson National Forest also manages large percentages of many vegetation systems relative to other Region 3 Forests and other landowners throughout the Southwest, making this a unique Forest for ecosystem diversity. For example, 96.5% and 45.6% of montane grasslands on Region 3 lands and throughout the Southwest, respectively, can be found on the Carson. Furthermore, 84.1% and 10.2% of wetlands/cienegas in Region 3 and throughout the Southwest, respectively, are located on the Santa Fe National Forest. In addition, 100% of gallery coniferous riparian forest on Region 3 lands is on the Carson. Though the Carson manages large proportions of these three systems relative to other land managers in the Southwest, these systems comprise relatively little area on the Forest. Therefore, it is important that the Carson National Forest prioritizes to the management of these systems to ensure their sustainability within the Region and throughout the Southwest.

*Species Richness and Conservation Status*

The R3 Species Database includes conservation status information for 416 species that inhabit the Carson National Forest. Because the database is not comprehensive for plants and invertebrates, this does not represent the overall diversity of the Forest. However, the database does serve as a useful tool for identifying species that might, because of their conservation status, need to be addressed within forest planning. For example, the Carson manages four federally endangered, threatened, candidate or proposed species. Furthermore, the Carson manages 14 species listed by the state as threatened or endangered; 25 species with NatureServe global rankings that warrant conservation concern; 27 species with NatureServe national rankings that warrant conservation concern; and 94 species with NatureServe state rankings that warrant conservation concern. Finally, the R3 Species Database identifies 23 potential species-ofconcern; 79 potential species-of-interest; 23 bird species on the Partners in Flight Watch List; and 19 Birds of Conservation Concern. Approximately one-quarter (25.2%) of all species on the Carson National Forest were identified as falling within categories defined by the USFS planning directives.

As habitat loss and degradation is a major threat for many species of conservation concern, maintaining healthy vegetation systems that support these species should be an important component in sustaining viable species populations on the Carson National Forest. The assessments in this report provide important information on the systems and locations on the Carson that are important for maintaining system and species diversity. For instance, the analysis of PNVTs highlighted the important vegetation systems that occur on the Carson, which include: gallery coniferous riparian forest, montane grassland, wetland/cienega , spruce-fir forest, sub-alpine grassland, and aspen forest and woodland. In addition, conservation areas, identified through ecoregional assessments, identify and delineate areas on the landscape that provide the greatest opportunity for sustaining these systems and species.

The Carson National Forest has significant areas of overlap with ecoregional conservation areas. All of the ranger districts on the Carson are overlapped by several conservation areas. These conservation areas include 112 conservation targets, including 63 individual species. The specific locations where conservation areas overlap the Carson National Forest highlight important places for the conservation of ecosystem and species diversity on the Forest and within the region. These areas of overlap represent the most viable locations on the Carson for sustaining this suite of species, ecological systems, and biological processes that are represented by the conservation targets associated with each conservation area that overlaps the Carson National Forest.

*Relevance to Forest Planning*

This analysis of existing regional assessment information identifies important biological and ecological characteristics of the Carson National Forest. This information serves as an important baseline for addressing the ecological sustainability component of the forest plan process under the new National Forest Management Act planning regulations, both in terms of ecosystem and

species diversity. It may also be useful in understanding the current condition of ecological resources on the Carson, identifying ecological characteristics that may be useful in defining desired future conditions, and identifying areas where changes in management may be necessary to sustain biodiversity. For example, the analysis of ecosystem data demonstrates the variety of systems that occur on the Carson, and identifies systems (and their associated species diversity) for which the Carson has disproportionate responsibility within the context of Region 3, such as gallery coniferous riparian forest, montane grassland, wetland/cienega, and spruce-fir forest.

Ecoregional assessments provide a strategic, regional perspective on maintaining biodiversity at large scales that may be useful in forest planning. The suite of conservation areas identified in the ecoregional assessments represents the minimum area on the landscape needed to maintain the region's biodiversity and may serve as priority areas for considering the impacts of management on ecological sustainability. Used within a forest planning context, consideration of conservation areas incorporates, by default, a regional perspective on ecological sustainability and demonstrates consideration of sustainability issues at scales beyond Forest boundaries.

Within the forest planning framework, it may be useful to evaluate currently allowed land uses and activities within conservation areas and determine associated impacts to biodiversity. As an example, a synthesis of conservation area overlap with designated wilderness and inventoried roadless areas on the Carson demonstrates the variety of current management emphases and activities that occur within conservation areas. The largest proportion (84.8%) of conservation areas that overlap the Carson National Forest are not designated wilderness areas or inventoried roadless areas. For forest planning purposes, it may be useful to determine the compatibility of current forest structure and ecological processes within these overlap areas with Forest biodiversity goals, and identify management actions that may be needed to achieve sustainability. It is apparent that achieving biodiversity sustainability on the Carson must be accomplished within the varied uses and activities that occur on the Forest. Regardless of the types of land use considered, conservation areas provide a means to prioritize consideration of areas based on their importance to biodiversity sustainability.

While the above example focused on wilderness and roadless areas, it is important to note that conservation areas do not imply the need for special protections or blanket restriction of activities. Rather, conservation areas can be viewed as priority areas, based on the large scale perspective of ecoregional assessments, for assessing the impacts of ongoing or planned uses and activities in regards to their compatibility with sustaining biodiversity at regional scales. To aid in these planning efforts, each conservation area has associated with it a suite of conservation targets (species, vegetation communities, and ecological systems, and features) that are representative of the biodiversity in that area. Evaluation of the environmental and ecological needs of these conservation targets, including both the habitats and ecological processes that support them, as well as identifying threats to their sustainability can be used to assess the compatibility of ongoing or planned activities in these areas.

For example, the Rio Honda conservation area encompasses 44,500 acres, of which 40,900 (91.9%) overlaps the Questa Ranger Districts of the Carson National Forest. Twelve conservation targets, including six individual species and six ecological systems (see Appendix 14-C), are associated with the Rio Honda conservation area. These targets associated with the

conservation area can be used as a tool to assess the compatibility of current or planned activities within the conservation area with sustainability goals. For example, it may be useful to evaluate current conditions of the forest communities within this conservation area relative to the historic range of variability and, if desired, identify potential changes in management that may move these systems to within historic ranges. Similarly, by identifying the ecological needs of species conservation targets and threats to their sustainability, the compatibility of current and future activities can be assessed. It may be useful to evaluate management prescriptions within the conservation area and if necessary, identify changes in allowed activities or uses that may reduce or mitigate these threats.

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