Chapter 15:

Ecological & Biological Diversity of the Lincoln National Forest,

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Ecological and Biological Diversity of National Forests in Region 3

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Introduction

The Lincoln National Forest, located in south-central New Mexico, is one of eleven National Forests within the U.S. Forest Service (USFS) Southwestern Region (Region 3). The Lincoln encompasses approximately 1,094,000 acres, and comprises about 2.7% of the total area of Region 3 National Forest lands.

There are four major mountain ranges found on the Lincoln National Forest: the Sacramento, White, Capitan, and Guadalupe Mountains. Elevation on the Lincoln ranges from approximately 4,000 ft. to approximately 11,500 ft. This includes five different life zones ranging from the Chihuahuan Desert life zone at the lower elevations to the sub-alpine forest life zone at the highest elevations. The diversity of vegetation systems provides habitat for numerous plants and animals, some of which are rare or have limited distributions. Such a diversity of plants, animals, and vegetation systems provide many opportunities to sustain biodiversity and ecological integrity on the Lincoln National Forest.

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 Lincoln National Forest and highlight information that may be pertinent to forest planning. Information from three assessments was synthesized for the Forest, including:

- Distribution and extent of potential natural vegetation types (PNVTs)
- Plant and animal species richness and their conservation statuses
- Conservation areas and targets associated with Ecoregional Assessments

These types of information may be useful within the forest planning process for evaluating the suitability of current management activities and land management designations, identifying ecological characteristics that may be considered in developing desired conditions, and identifying species that may need special consideration because of continuing threats to their existence. Detailed descriptions of these datasets and the methods used to analyze them are available in Chapter 2. A summary and analysis of these assessments and comparisons of the Lincoln National Forest to other major landowners in the Southwest (Arizona and New Mexico) and National Forests in Region 3 are provided in Chapter 3.

Results

I. Potential Natural Vegetation Types within the Lincoln 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 Lincoln 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 of their relevance to 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 Lincoln were summarized, as well as the proportion of each PNVT within Region 3 that occurs on the Lincoln. More detailed information on the data and methods used in this analysis can be found in Chapter 2, and comparisons of PNVTs on the Lincoln to other Region 3 Forests and landowners in the Southwest is available in Chapter 3.

Nineteen PNVTs were identified on the Lincoln National Forest (Figure 15-1; see Appendices 2A and 2-B in Chapter 2, respectively, for detailed descriptions of each PNVT and the cross-walk of SWReGAP land cover types to PNVTs). However, four PNVTs comprise approximately 75% of the total area on the Lincoln National Forest. These four PNVTs include: Madrean encinal woodland (30.3%), semi-desert grassland (18.6%), Madrean pine-oak woodland (14.8%) and mixed conifer forest (11.2%). Pinyon-juniper (6.5%), ponderosa pine forest (6.3%) and interior chaparral (4.9%) encompass the next largest proportions of the Forest. The remaining 12 PNVTs cover relatively small percentages of the landscape, and combined cover approximately 7.4% of the Forest (Table 15-1).

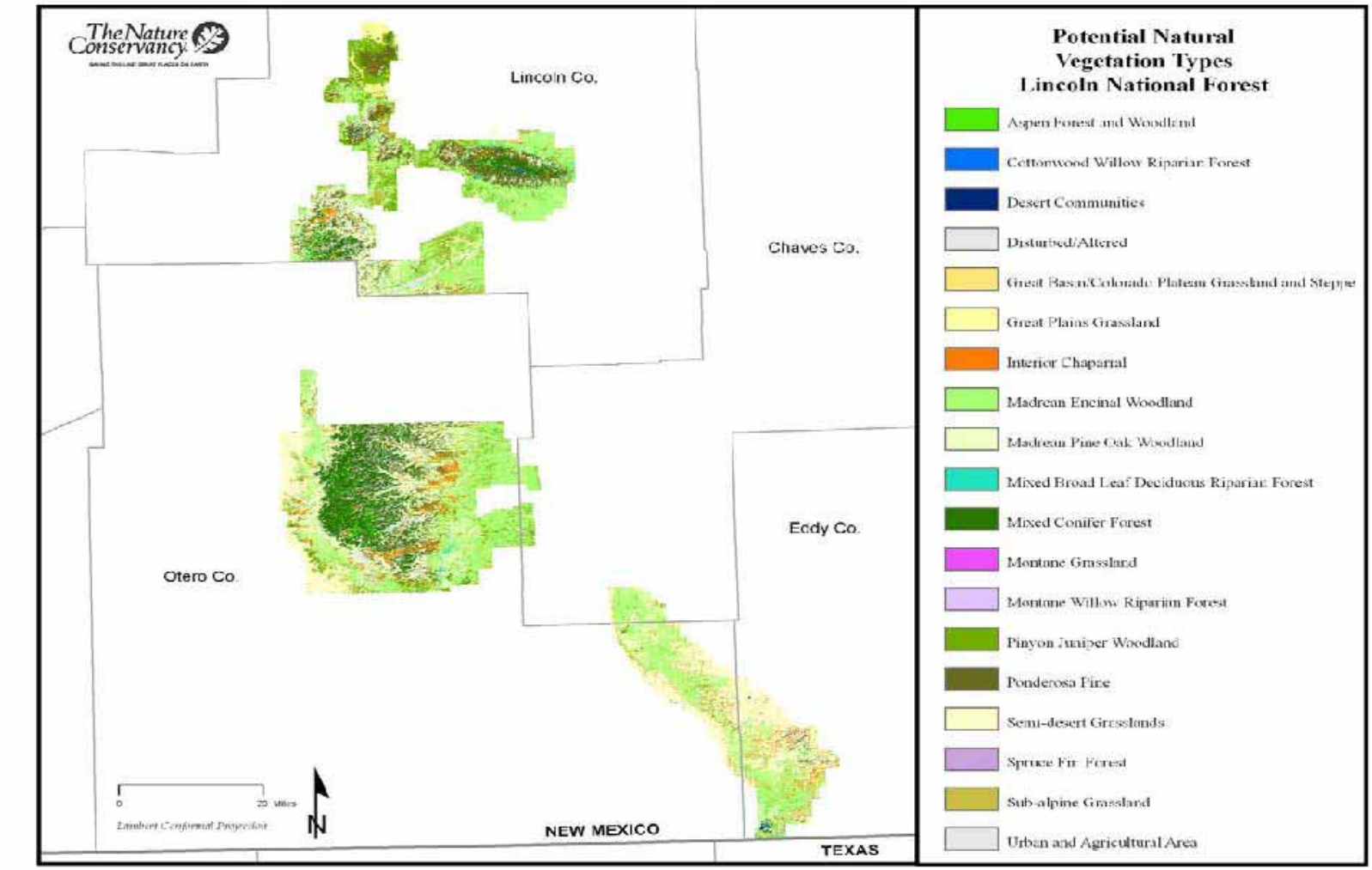

Figure 15-1. Distribution of potential natural vegetation types on the Lincoln National Forest. Map was created using data from the Southwest Regional Gap Analysis Project (SWReGAP; U.S. Geological Survey National Gap Analysis Program. 2004). SWReGAP vegetation types were aggregated and converted to 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 15-1. Approximate area (in acres) and percent of total area of each potential natural vegetation type on the Lincoln 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** (%)
Aspen Forest and Woodland	6,100	0.6
Cottonwood Willow Riparian Forest	1,000	0.1
Desert Communities	3,200	0.3
Disturbed/Altered (quarries and mines)	3,200	0.3
Great Basin/ Colorado Plateau Grassland and Steppe	1,200	0.1
Great Plains Grasslands	19,800	1.8
Interior Chaparral	53,200	4.9
Madrean Encinal Woodland	331,600	**30.3**
Madrean Pine-Oak Woodland	162,200	**14.8**
Mixed Broadleaf Deciduous Riparian Forest	8,900	0.8
Mixed Conifer Forest	123,100	**11.2**
Montane Grassland	100	<0.1
Montane Willow Riparian Forest	5,700	0.5
Pinyon-juniper Woodland	70,800	6.5
Ponderosa Pine	68,500	6.3
Semi-desert Grassland	204,000	**18.6**
Spruce-fir Forest	17,600	1.6
Sub-alpine Grasslands	14,600	1.3
Urban and Agricultural Area	100	<0.1
Total	**1,094,900**	

Potential Natural Vegetation Types relative to all Region 3 Forests

The Lincoln National Forest is responsible for managing large percentages of certain PNVTs relative to all other National Forests in Region 3. For example, 21.0% of mixed broadleaf deciduous riparian forest found in all Region 3 Forests can be found on the Lincoln. Furthermore, the Lincoln manages 19.5% of Madrean pine-oak woodland, 18.3% of montane willow riparian forest, 12.4% of semi-desert grassland and 12.1% of Madrean encinal woodland that occurs within Region 3.

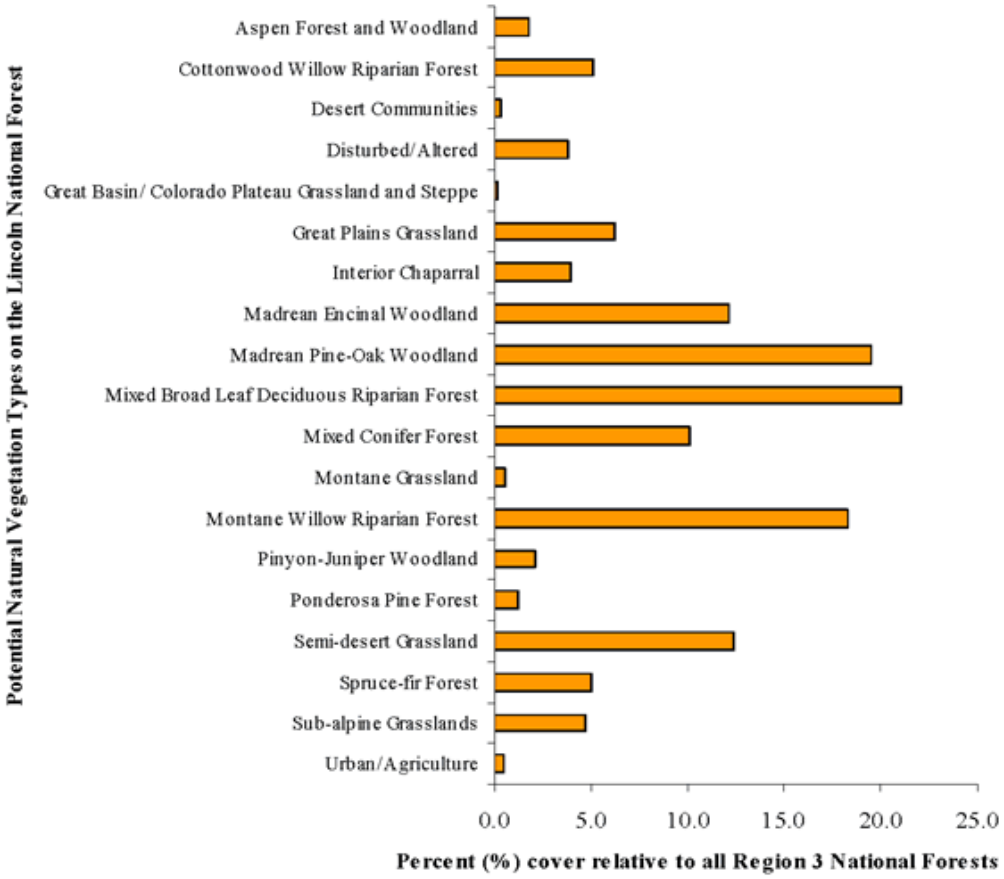

Figure 15-2. Percent area of cover of each potential natural vegetation type that occurs on the Lincoln National Forest in relation to all Region 3 National Forests combined. Analysis was conducted using data from the Southwest Regional Gap Analysis Project (SWReGAP). See Chapter 2 for information regarding the limitations of SWReGAP.

Potential Natural Vegetation Types across all landowners in the Southwest

The Lincoln National Forest also manages for a large proportion (11.4%) of Madrean pine-oak woodland found throughout all landowners of Arizona and New Mexico. Refer to Chapter 3 for more information regarding the proportions of PNVTs the Lincoln National Forest manages relative to other landowners in the Southwest.

II. Plant and Animal 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 Lincoln National Forest, and to identify species that might potentially be considered as species-of-interest and species-of-concern within the USFS forest plan revision process. 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. Nonnative aquatic vertebrate species were not included in these analyses. The complete list of species used in this analysis and their conservation status attributes are provided in Appendix 15-A.

According to the R3 Species Database, 531 species of plants and animal occur on the Lincoln National Forest (Figure 15-3; a complete list is provided in Appendix 15-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 plant and invertebrates. It is also important to note that the number and type of species inhabiting the Lincoln National Forest likely changes over time.

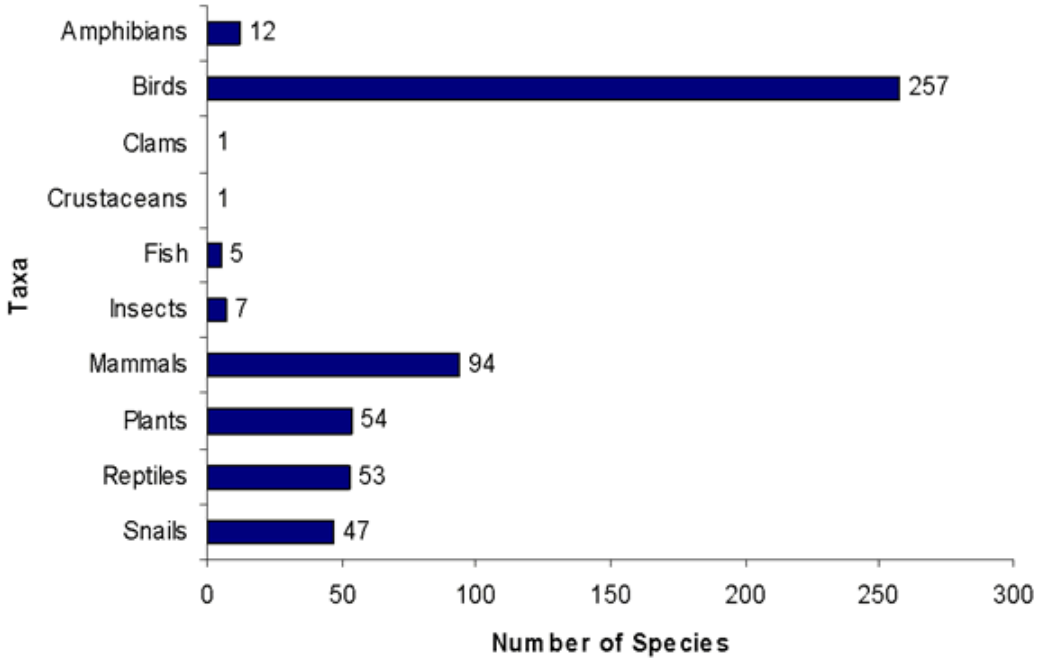

Figure 15-3. Number of species, by taxon, that inhabit the Lincoln National Forest according to the R3 Species Database. The R3 Species Database includes all known terrestrial vertebrates and native fishes, but only invertebrates and plants of management concern. Because of the limitations of the R3 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 — Six species that inhabit the Lincoln National Forest are listed by the U.S. Fish and Wildlife Service as endangered or threatened under the Endangered Species Act of 1973 (Table 15-6). Two candidate species, Western Yellow-Billed Cuckoo and Texas Hornshell, also occur on the Forest. The agency lists species as candidate species when there is sufficient information to support a proposal for the endangered or threatened status. The American peregrine falcon (*Falco peregrinus anatum*) was de-listed in 1999.

New Mexico state conservation status — Twenty-three species that are designated by the New Mexico Game and Fish Department as threatened or endangered occur on the Lincoln National Forest. Refer to Appendix 15-A for a complete list of those species. Currently, there are four animal and seven plant species designated by the state as endangered and 12 animal species that are listed as threatened on the Forest. Birds and plants comprise the largest proportions (30.4% each) of these species.

NatureServe Conservation Status Rankings

Global conservation status rankings (G-ranks) — Seventy-nine species (15.1%) were ranked with a global conservation status of G1, G2, G3, T1, T2 or T3, indicating conservation concern across their range (Table 15-2). Results indicate 440 species (84.3%) were ranked as G4/T4 or G5/T5 species. These are species whose populations are considered 'apparently secure' or 'secure', respectively. Nine species (1.7%) of 531 were not included in this analysis because they were not assigned a NatureServe global conservation rank. The remaining 3 species were considered not rankable, according to NatureServe.

National conservation status rankings (N-ranks) — Eighty species (15.3%) were ranked with a national conservation status of N1, N2, or N3, indicating conservation concern at the national level (Table 15-3). Four hundred twenty-four species on the Forest (81.1%) were ranked as N4 or N5 species, whose populations are considered 'apparently secure' or 'secure', respectively. Eight species were not considered rankable by Natureserve, and 19 species were not assigned a NatureServe national rank.

Subnational conservation status rankings (S-ranks) — Of the 531 species analyzed for the Lincoln National Forest, 505 (95.1%) had assigned subnational conservation status ranks (S-ranks) in the state of New Mexico (Table 15-4). One hundred twenty-one species (24.0%) of these had rankings that merit conservation concern on a state or more local scale (S1, S2, S3). Three hundred thirty-three (66.0%) were considered secure or apparently secure (S5 and S4, respectively). The remaining 51 species (10.1%) were not ranked. See Appendix 15-A for the complete list of species with their associated S-ranks.

Table 15-2. Number of species, by taxon, that inhabit the Lincoln National Forest with the various global rankings assigned by NatureServe. Nine 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; T = infraspecific taxon (subspecies or varieties), TNR = unranked/not yet assessed; TU = unrankable.

Global Ranking	Amphibian	Bird	Clam	Crustacean	Fish	Insect	Mammal	Plant	Reptile	Snail	**Total**
G1	0	0	1	0	0	0	0	1	0	2	**4**
G2	0	0	0	0	0	1	0	11	0	4	**16**
G3	1	0	0	0	3	1	3	20	0	3	**31**
G4	0	13	0	0	0	2	9	10	1	6	**41**
G5	10	235	0	0	1	0	66	0	46	27	**385**
T1	0	0	0	0	0	1	1	2	0	2	**6**
T2	0	1	0	0	0	0	2	8	0	2	**13**
T3	0	2	0	0	1	2	1	1	1	1	**9**
T4	0	2	0	0	0	0	2	0	2	0	**6**
T5	1	1	0	0	0	0	3	0	3	0	**8**
TNR	0	1	0	0	0	0	0	1	0	0	**2**
TU	0	1	0	0	0	0	0	0	0	0	**1**
total	12	256	1	0	5	7	87	54	53	47	**522**

Table 15-3. Number of species, by taxon, that inhabit the Lincoln National Forest with national rankings assigned by NatureServe. Eight 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	Crustacean	Fish	Insect	Mammal	Plant	Reptile	Snail	**Total**
N1	0	0	1	0	0	2	1	3	0	5	**12**
N2	0	0	0	1	2	1	2	17	0	4	**27**
N3	1	5	0	0	2	3	7	17	2	4	**41**
N4	1	26	0	0	0	1	11	7	5	7	**58**
N5	10	220	0	0	1	0	64	0	46	25	**366**
NNA	0	3	0	0	0	0	2	0	0	2	**7**
NNR	0	2	0	0	0	0	0	10	0	0	**12**

Table 15-4. Number of species, per taxon, currently inhabiting the Lincoln National Forest that are assigned to the various subnational rankings by New Mexico Natural Heritage. Twenty-eight of the 542 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; SNA = not applicable; SNR = not ranked.

Global Ranking	Amphibian	Bird	Clam	Crustacean	Fish	Insect	Mammal	Plant	Reptile	Snail	**Total**
S1	0	9	1	0	1	0	3	4	1	3	**22**
S2	0	14	0	0	2	0	9	19	2	4	**50**
S3	3	17	0	0	1	0	9	14	4	1	**49**
S4	2	108	0	0	0	0	24	3	10	4	**151**
S5	7	100	0	0	0	0	34	0	33	8	**182**
SNA	0	3	0	0	1	0	1	0	0	0	**5**
SNR	0	0	1	0	0	7	1	14	0	24	**46**

Other Conservation Rankings

Birds of Conservation Concern — According to the R3 Species Database, the Lincoln National Forest, is home to at least 257 birds, of which 18 (7.0%) are listed on the U.S. Fish and Wildlife Service Birds of Conservation Concern National Priority list (Table 15-5). In all, the U.S. Fish and Wildlife Service lists 131 species of Birds of Conservation Concern, and 13.7% of these inhabit the Lincoln National Forest. Three of these species also are listed as threatened under the state of New Mexico: American peregrine falcon, baird's sparrow, and gray vireo.

Partners in Flight Watch List — Of the 100 birds species currently on the Partners in Flight Watch List, 21 (21%) can be found on the Lincoln National Forest (Table 15-5). This comprises 8.2% of the known 257 bird species that inhabit the Forest. Three species, the Baird's Sparrow, Gray Vireo, and the Varied Bunting, are also listed as threatened under the state of New Mexico. Eight species on the Forest occur on both the Partners in Flight Watch List and the U.S. Fish and Wildlife Service Birds of Conservation Concern list, and are highlighted in bold in Table 15-6.

Table 15-5. Bird species on the Partners in Flight Watch list or the U.S. Fish and Wildlife Service Birds of Conservation Concern list that inhabit the Lincoln National Forest. P = Species on the Partners in Flight Watch list; CC = USFWS Bird of Conservation Concern; * = New Mexico Department of Game and Fish Threatened Species; species on both lists are in bold.

Diurnal Raptors
- American peregrine falcon* (CC)
- Ferruginous hawk* (CC)
- Northern harrier (CC)
- Swainson's hawk (P)

Cuckoos and Allies
- Western yellow-billed cuckoo (CC)

Upland Game Birds
- Montezuma Quail (P)
- Scaled Quail (P)

Pigeons and Doves
- Band-tailed pigeon (P)

Owls
- **Elf owl**
- **Flammulated owl**
- Short-Eared Owl (P)

Goatsuckers and Swifts
- White-throated swift (P)

Hummingbirds
- Calliope hummingbird (P)
- Rufous hummingbird (P)

Tyrant Flycatchers
- Olive-sided flycatcher (P)

Shrikes and Vireos
- Arizona Bell's Vireo (CC)
- **Gray vireo**
- Loggerhead Shrike (CC)

Jays, Crows, and Allies
- Pinyon jay (P)

Mimids – Catbirds, Mockingbirds and Thrashers
- Crissal thrasher (CC)

Wagtails and Pipits
- **Sprague's Pipit**

Wood Warblers
- Black-throated gray warbler (CC)
- **Grace's warbler**
- **Red-faced warbler**
- Virginia's warbler (P)

Emberizine Sparrows and Allies
- **Baird's sparrow***
- **Black-chinned sparrow**
- Cassin's sparrow (CC)
- Lark bunting (CC)
- McCown's longspur (P)
- Varied bunting (P)

Potential Species Lists for Forest Planning

The R3 Species Database was used to identify species that are potential 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 or S-rank of 1 or 2 in New Mexico
   b. Listed as threatened or endangered species in New Mexico
   c. Identified a priority species in the New Mexico Comprehensive Wildlife Conservation Strategy
   d. 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-of-interest, 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.

Extirpated Species — Some species are known to have inhabited the Lincoln National Forest, but have since been extirpated. While the cause of extirpation for each species may not be fully understood, it is well accepted that major threats to species' existence can include loss or alteration of habitat, competition and/or predation by non-native species and poaching. Mexican wolf (*Canis lupus baileyi*) and Rocky Mountain bighorn sheep (*Ovis canadensis canadensis*) are known to have existed historically on the Lincoln National Forest, but are now considered extirpated. These species are not considered in the species diversity analysis for the Lincoln National Forest.

Threatened and Endangered Species – Six species from two taxa that occur on the Forest are listed by the U.S. Fish and Wildlife Service as endangered or threatened under the Endangered Species Act (Table 15-6).

Table 15-6. Species listed as endangered or threatened under the Federal Endangered Species Act of 1973 that inhabit the Lincoln National Forest. The table includes common names recognized by NatureServe.

Taxa	Endangered	Threatened
Bird		Bald Eagle Mexican Spotted Owl
Plant	Kuenzler's Hedgehog Cactus Sacramento Prickly Poppy Todsen's Pennyroyal	Sacramento Mountain Thistle

Potential species-of-concern — The Lincoln National Forest is home to at least 74 potential species-of-concern across nine distinct taxonomic groups (Table 15-7). Plants comprise over one-half of all potential species-of-concern on the Forest, 52.7%; snails comprise the next largest proportion (18.9%); mammals represent 9.4%; insects, 6.8%; fish, 5.4%; birds, 2.7%; and amphibians, clams, and reptiles, 1.4% each (Figure 15-5). Two candidate species for federal listing inhabit the Lincoln National Forest, the Western Yellow-Billed Cuckoo (*Coccyzus americanus occidentalis*) and Texas Hornshell (*Popenaias popeii*), and are included in the list of potential species-of-concern. The R3 Species Database, which may not be comprehensive for the Lincoln National Forest, was used to derive these results. Therefore, it is feasible that some species may be absent from these results.

Among both potential species-of-concern and ESA listed threatened and endangered species, plants continue to comprise over half of all listed species on the Forest (approximately 53.8%); snails (17.5%) and mammals (8.8%) make up the next largest proportionsFigure 15-4).

Table 15-7. Potential species-of-concern on the Lincoln National Forest. Potential species-of-concern include species with NatureServe global ranks (G/T-ranks) of three or less, species that are listed as candidate or proposed under the Federal Endangered Species Act (ESA), have been recently de-listed under ESA, or species which have been petitioned for listing under ESA and for which a positive '90 day finding' has been made.

Taxa Scientific Name	Common Name	G/T rank	ESA Status	Recently Delisted
Amphibians				
Aneides hardii	Sacramento Mtn. Salamander	G3		
Birds				
Coccyzus americanus occidentalis	Western Yellow-Billed Cuckoo	T2	Candidate	
Falco peregrinus anatum	American Peregrine Falcon	T3		Yes
Clams				
Popenaias popeii	Texas Hornshell	G1	Candidate	
Fish				
Etheostoma lepidum	Greenthroat Darter	G3		
Gila pandora	Rio Grande Chub	G3		
Ictalurus lupus	Headwater Catfish	G3		
Oncorhynchus clarkii virginalis	Rio Grande Cutthroat Trout	T3		
Insects				
Amblycheila picolominii	Plateau Giant Tiger Beetle	G3		
Cicindela politula petrophila	Guadalupe Mountains Tiger Beetle	T3		
Euphydryas chalcedona cloudcrofti	Chalcedon Checkerspot	T1		
Megathymus ursus violae	Viola Yucca Borer	T3		
Satyrium polingi	Poling's Hairstreak	G2		
Mammals				
Cynomys ludovicianus	Black-Tailed Prairie Dog	G3		
Myotis occultus	Occult Little Brn. Myotis Bat	G3		
Spermophilus tridecemlineatus monticola	White-Mountain Ground Squirrel	T3		
Tamias minimus atristriatus	Penasco Chipmunk	T1		
Thomomys bottae guadalupensis	Guadalupe Pocket Gopher	T2		
Vulpes velox	Swift Fox	G3		
Zapus hudsonius luteus	New Mexican Jumping Mouse	T2		
Plants				
Agastache pringlei var. verticillata		T2		
Anulocaulis leiosolenus var. howardii	Howard's Gyp Ringstem	T2		
Aquilegia chrysantha var. chaplinei	Chapline's Columbine	T2		
Astragalus altus	Winged Milkvetch	G2		
Astragalus kerrii	Kerr's Milkvetch	G2		
Astragalus neomexicanus	New Mexico Milkvetch	G3		
Besseya oblongifolia	Egg-Leaf Coral-Drops	G2		
Brickellia floribunda	Chihuahuan Desert Brickell-Bush	G3		
Brickellia rusbyi	Stinking Brickell-Bush	G3		
Brickellia simplex	Sonoran Brickell Brush	G3		
Chaetopappa hersheyi	Guadalupe Cliff Daisy	G3		
Cirsium wrightii	Wright's Marsh Thistle	G2		

Taxa Scientific Name	Common Name	G/T rank	ESA Status	Recently Delisted
Crataegus wootoniana	Wooton's Hawthorn	G2		
Ericameria nauseosa var. texensis	Guadalupe Rabbitbrush	T2		
Erigeron rybius	Sacramento Mountain fleabane	G3		
Eriogonum jamesii var. wootonii		T2		
Escobaria guadalupensis	Guadalupe Mountain Pincushion Cactus	G1		
Escobaria villardii	Villard's Pincushion Cactus	G2		
Hedeoma apiculata	Mckittrick Pennyroyal	G3		
Hedeoma pulcherrima	White Mountain false pennyroyal	G2		
Heuchera wootonii	White Mountain allumroot	G3		
Hexalectris nitida	Glass Mountain Coralroot	G3		
Hymenopappus biennis	Biennial Woolly-white	G3		
Hymenopappus mexicanus	Mexican Woolly-white	G3		
Hymenoxys rusbyi	Ruby's Bitterweed	G3		
Ionactis elegans	Sierra Blanca Cliff Daisy	G2		
Lesquerella aurea	Golden Bladderpod	G3		
Ligusticum porteri	Porter's Lovage	G3		
Mentzelia humilis var. guadalupensis	Gypsum Blazing-Star	T2		
Penstemon alamosensis	Alamo Beardtongue	G3		
Penstemon cardinalis ssp. regalis	Royal Red Penstemon	T2		
Perityle staurophylla var. staurophylla	New Mexico Rock Daisy	T3		
Rumex orthoneurus	Bloomer's Dock	G3		
Salvia summa	Great Sage	G3		
Senecio sacramentanus	Sacramento groundsel	G3		
Sibara grisea	Marble Canyon Rockcress	G3		
Sophora gypsophila var. guadalupensis	Guadalupe Mescal Bean	T1		
Streptanthus sparsiflorus	Sparsely Flowered Jewelflower	G2		
Valeriana texana	Guadalupe Valerian	G3		
Reptiles				
Sistrurus catenatus edwardsii	Desert Massasauga	T3		
Snails				
Ashmunella carlsbadensis	Guadalupe Woodlandsnail	G1		
Ashmunella pseudodonta	Capitan Woodlandsnail	G1		
Ashmunella rhyssa altissima		T1		
Columella columella alticola		T1		
Gastrocopta armifera ruidosensis		T3		
Gastrocopta ashmuni	Sluice Snaggletooth	G3		
Gastrocopta quadridens	Cross Snaggletooth	G2		
Holospira montivaga	Vagabond Holospira	G2		
Humboldtiana ultima	Northern Threeband	G2		
Oreohelix neomexicana		G2		
Rabdotus dealbatus neomexicanus		T2		
Radiodiscus millecostatus	Ribbed Pinwheel	G3		
Thysanophora hornii	Southwestern Fringed Snail	G3		
Vertigo modesta ingersolli		T2		

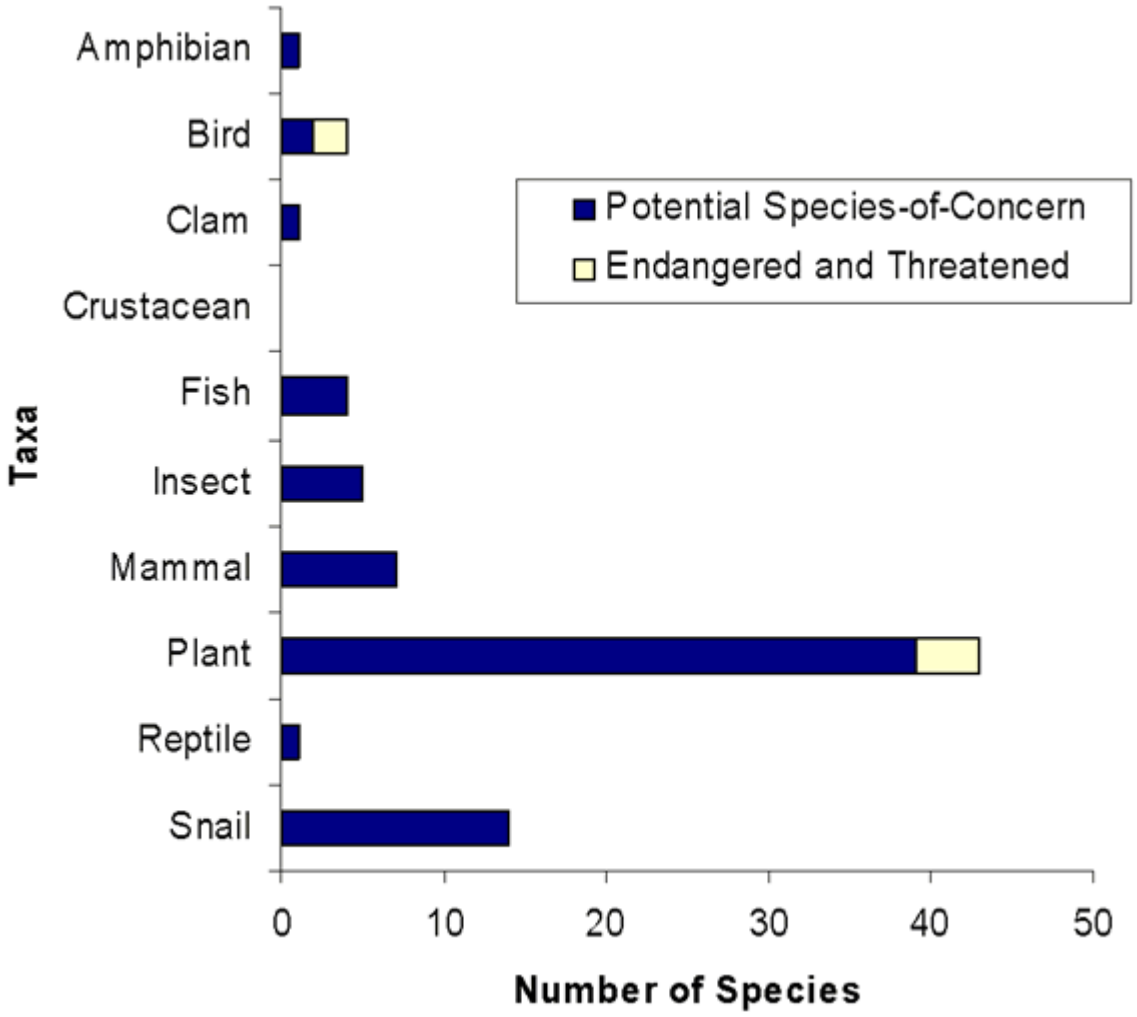

Figure 15-4. Number of potential species-of-concern (in blue) and federally listed endangered and threatened species (yellow) by taxon that currently inhabit the Lincoln National Forest. Potential species-of-concern include species with NatureServe global ranks (G/T-ranks) of three or less, species that are listed as candidate or proposed under the Federal Endangered Species Act (ESA), have been recently de-listed under ESA, or species which have been petitioned for listing under ESA and for which a positive '90 day finding' has been made.

Potential species-of-interest —At least 86 potential species-of-interest representing six taxonomic groups occur on the Lincoln National Forest (Figure 15-5). Birds make up the largest proportion (59.3%) of potential species-of-interest. Mammals comprise 14.0% of the total, while reptiles comprise 10.5%, and snails make up approximately 9.3%. Amphibians comprise 3.5%, while crustaceans, insects, and plants comprise 1.2% each of all potential species-of-interest on the Lincoln National Forest. The species used in this analysis for Lincoln National Forest are listed in Appendix 15-A, and those determined as potential species-of-interest are identified.

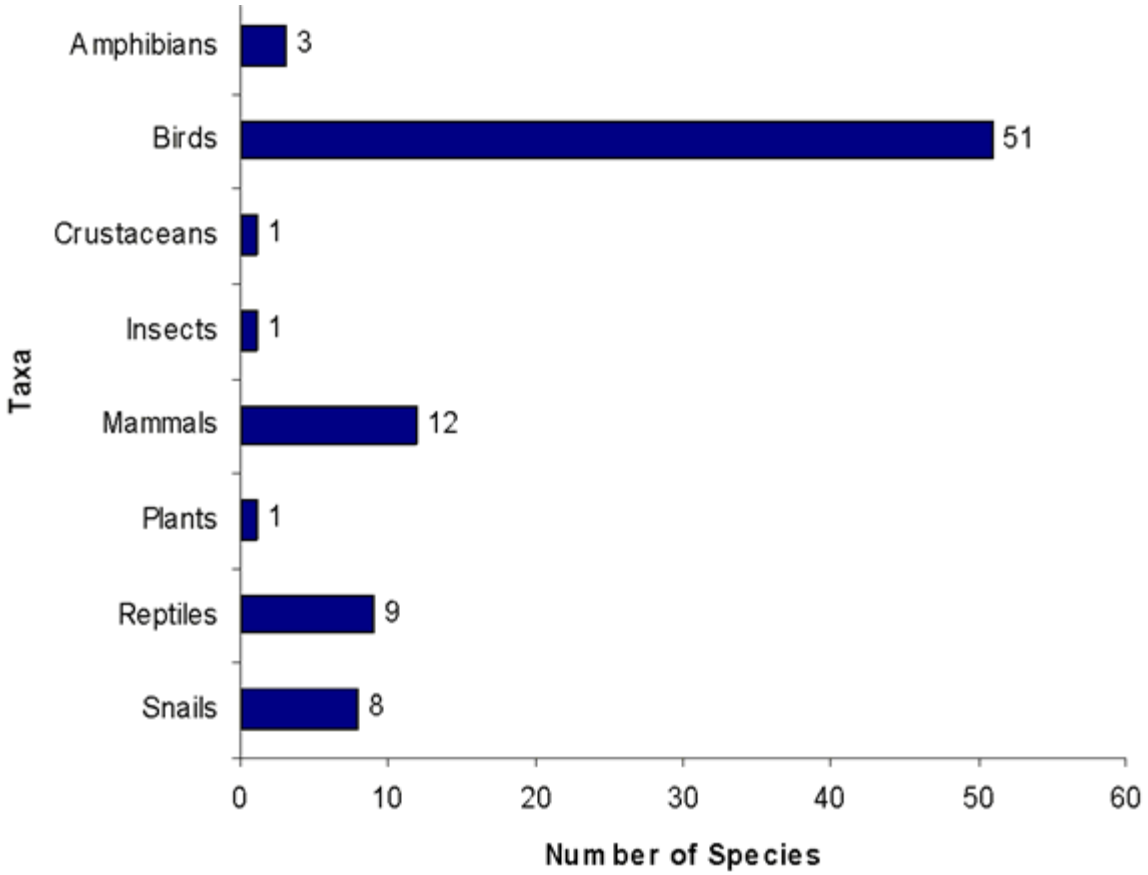

Figure 15-5. Number of potential species-of-interest, by taxa, that currently inhabit the Lincoln National Forest. Species were considered potential species-of-interest if they fell into one or more of the following categories: state listed threatened or endangered species (NM); listed as a species of concern or priority species in the NM State Comprehensive Wildlife Conservation Strategy; 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 – Almost one-third (31.3%) of all species on the Lincoln National Forest were identified as falling within categories defined by the USFS planning directives (Table 15-8). While 13.9% were identified as potential species-of-concern, approximately 16.3% were identified as potential species-of-interest. Notably, 79.6% of all plants that occur on the Lincoln are either federally listed as threatened or endangered or are identified as potential species-ofconcern. Also, a majority of the insects (71.4%) and fish (80.0%) that occur on the Lincoln 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. Only two species (Cactus mouse (*Peromyscus eremicus*) and Orange giant skipper (*Agathymus neumoegeni*)) on the current Region 3 Sensitive Species List that inhabit the Lincoln National Forest were not captured within the categories defined by the directives.

Table 15-8. Number of species identified as endangered or threatened, species-of-concern, species-of-interest, or no category for the Lincoln 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	1	8.3	3	25.0	8	66.7	**12**
Bird	2	0.8	2	0.8	51	19.8	202	78.6	**257**
Clam	0	0.0	1	100.0	0	0.0	0	0.0	**1**
Crustacean	0	0.0	0	0.0	1	100.0	0	0.0	**1**
Fish	0	0.0	4	80.0	0	0.0	1	20.0	**5**
Insect	0	0.0	5	71.4	1	14.3	1	14.3	**7**
Mammal	0	0.0	7	7.4	12	12.8	75	79.8	**94**
Plant	4	7.4	39	72.2	1	1.9	10	18.5	**54**
Reptile	0	0.0	1	1.9	9	17.0	43	81.1	**53**
Snail	0	0.0	14	29.8	8	17.0	25	53.2	**47**
Total	6	1.1	74	13.9	86	16.3	365	68.7	**531**

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 Lincoln National Forest. The conservation targets associated with each overlapping conservation area were also identified.

Seven individual conservation areas from ecoregional assessments overlap the Lincoln National Forest (Figure 15-6, Table 15-9), totaling 609,600 acres, or 48.4% of the Forest. Conservation area overlap on individual districts ranged from 24.5% on the Guadalupe District to 73.1% on the Sacramento Ranger District (Table 15-10). Overall, 59.8% of the total area of these ten conservation areas overlaps the Lincoln National Forest. For several conservation areas, a large proportion of the conservation area overlaps the Lincoln National Forest (Table 15-1), demonstrating the Forest has the primary responsibility for managing these areas to sustain the biodiversity within them.

Approximately 25% of the area of the Lincoln National Forest overlapped by conservation areas is designated wilderness area (9.8%) or inventoried roadless area (14.1%), while approximately 75% overlap areas without these designations (Table 15-12). Nearly three-quarters (72.2%) of all wilderness areas and just under one-half of inventoried roadless areas (47.3%) and undesignated areas (46.5%) on the forest are overlapped by conservation areas.

Conservation targets were summarized for all seven conservation areas that overlap the Lincoln National Forest. A total of 69 conservation targets occur within these conservation areas. Of these, nine (13.0%) are coarse filter targets (ecological systems, communities or features), while 60 (87.0%) are individual species. Ten (14.5%) targets are associated with riparian and aquatic systems, while 59 (85.5%) are associated with terrestrial habitats (Table 15-11). A complete listing of all conservation targets by taxonomic group for the Lincoln is provided in Appendix 15-B and conservation targets for each conservation area are provided in Appendix 15-C.

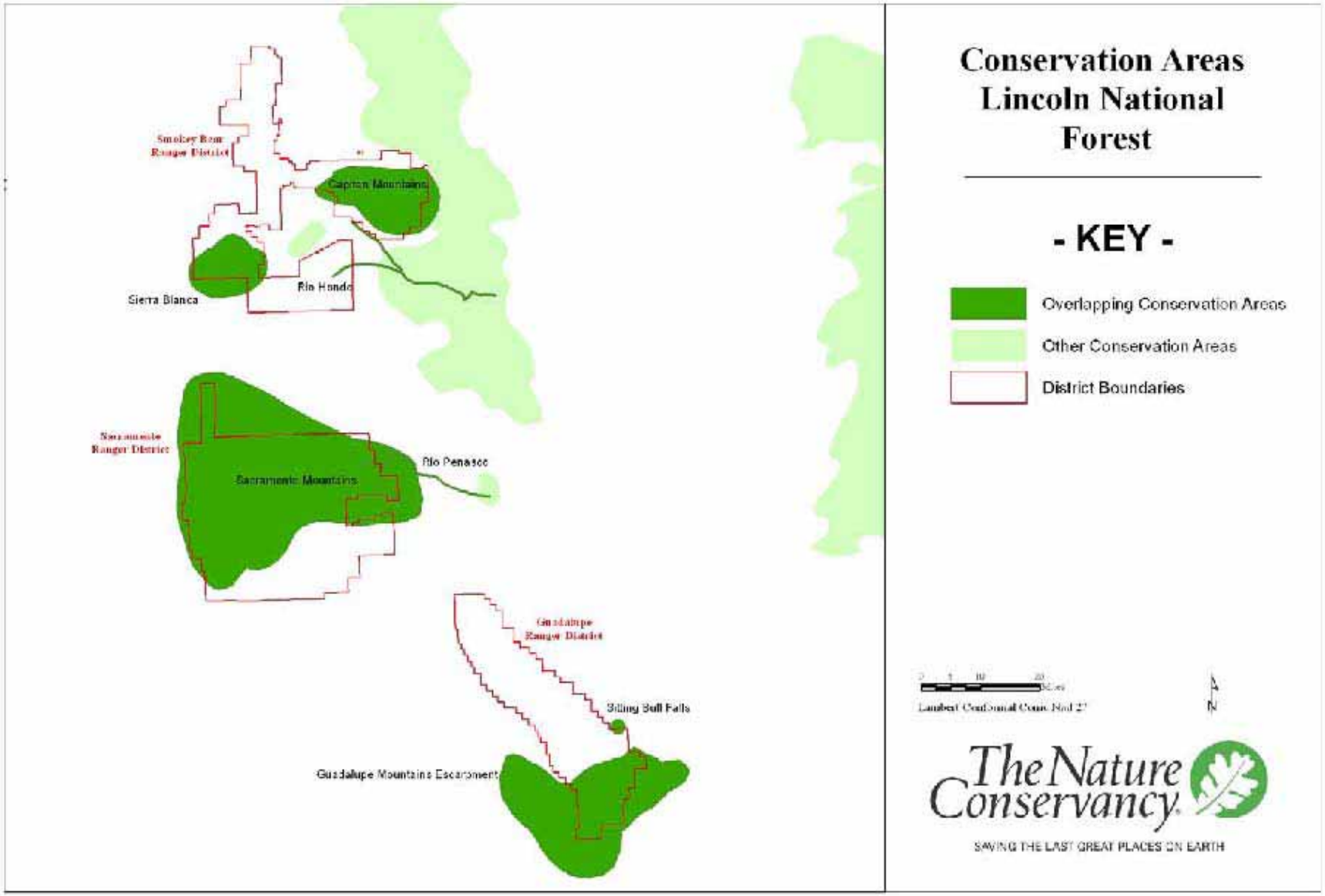

Figure 15-6. Conservation areas (N=7) that overlap three ranger districts on the Lincoln National Forest in New Mexico.

Table 15-9. Conservation areas (N=7) that overlap three ranger districts on the Lincoln National Forest in New Mexico.

Conservation Area	Ranger Districts[A]	Overlap (Acres)	% of Conservation Area
Capitan Mountains	SB	91,500	85.4
Guadalupe Mountains Escarpment	G	69,500	28.1
Rio Hondo	SB	1,200	11.0
Rio Penasco	S	800	11.9
Sacramento Mountains	S	400,400	69.2
Sierra Blanca	SB	45,000	68.4
Sitting Bull Falls	G	1,200	38.7

[A] G = Guadalupe, S = Sacramento, SB = Smokey Bear

Table 15-10. Extent of overlap between ecoregional conservation areas and three ranger districts on the Lincoln National Forest in New Mexico.

District	Number of Conservation Areas	Overlap (Acres)	Percent of District
Guadalupe	2	70,700	24.5%
Sacramento	2	401,200	73.1%
Smokey Bear	3	137,700	32.5%
Lincoln N.F Total	7	609,600	48.4%

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

Conservation Area	Habitat		Total
	Aquatic/ Riparian	Terrestrial	
Capitan Mountains	1	8	9
Guadalupe Mountains Escarpment	0	21	21
Rio Hondo	1	0	1
Rio Penasco	1	3	4
Sacramento Mountains	5	37	42
Sierra Blanca	3	18	21
Sitting Bull Falls	1	0	1

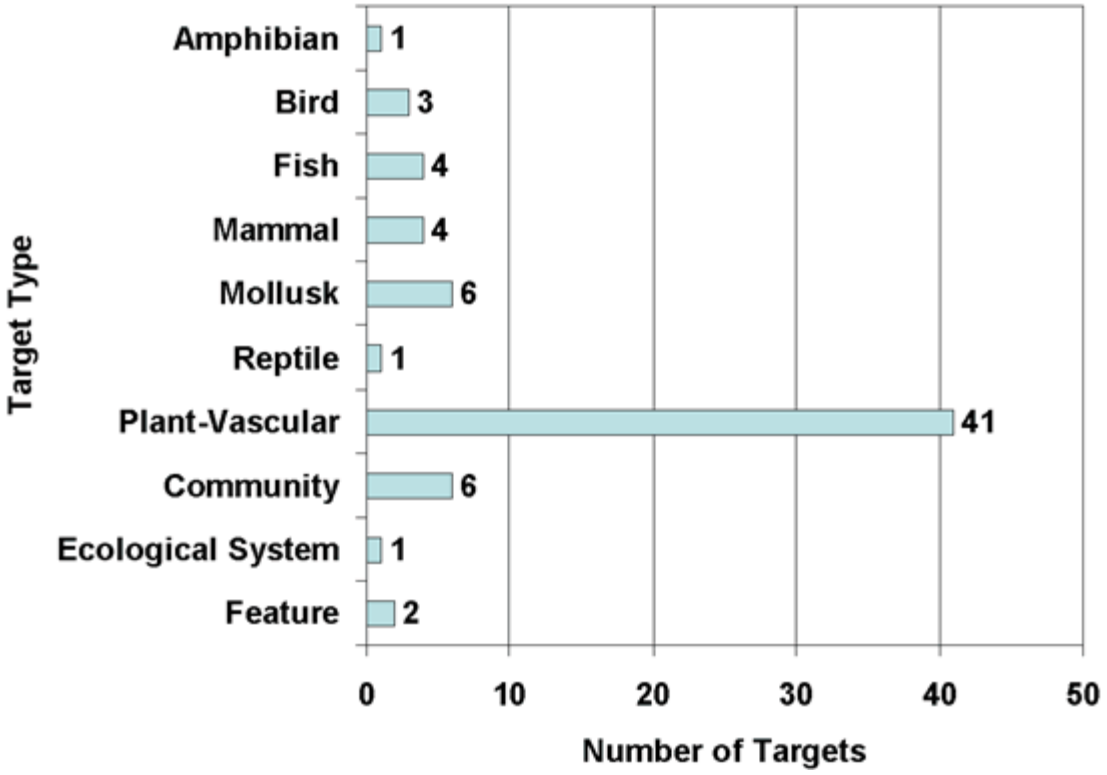

Figure 15-7. Number of conservation targets, by type, that occur on 7 conservation areas that overlap the Lincoln National Forest in New Mexico.

Table 15-12. Overlap between conservation areas wilderness areas, and non-wilderness inventoried roadless areas on the Lincoln National Forest in New Mexico.

Designation	Acres within Conservation Areas	% of Conservation Areas	% of Designated Areas
Wilderness Areas	59,800	9.8	72.2
Roadless Areas	85,900	14.1	47.3
No Designation	463,500	76.1	46.5

Discussion

Systems Diversity

According to Southwest Regional Gap Analysis Project (USGS National Gap Analysis Program 2004), four PNVTs cover three-quarters of the Lincoln National Forest, including Madrean encinal woodland, semi-desert grassland, Madrean pine-oak woodland, and mixed conifer forest. All of these systems are restricted to the Southwest in the United States, and consequently support a host of plant and animal species that are also restricted in their distribution and range. The health and ecological integrity of these systems and the species that inhabit them are currently being threatened, primarily by altered fire regimes. Madrean encinal woodland, semidesert grassland, and Madrean pine-oak woodland depend upon the maintenance of low intensity, frequent fires. Over the past century, common management practices have excluded fire, which can result in catastrophic crown fires and changes in species composition of the system. Other threats, especially those to semi-desert grasslands, include drought and inappropriate grazing techniques.

The Lincoln National Forest manages a fairly large proportion of Madrean pine-oak woodland relative to other Region 3 Forests (19.5%) and other landowners throughout the Southwest (11.4%). Recently, the Madrean pine-oak woodland system was added to a list of global conservation "hotspots" by Conservation International (Conservation International 2005). These hotspots represent vegetation systems that are rich in biodiversity (at least 1,500 plant species) and have experienced at least a 70% loss in total area. The Madrean pine-oak woodland system spans 178,095 square miles and harbors approximately 3,975 flowering plant species throughout its range. This system remains intact within less than 20% of the area of its historical range (Conservation International 2005). It is not clear if the historical range of Madrean pine-oak woodland on the Lincoln National Forest is currently diminishing; however, fire has largely been excluded for some time on the Forest and is an important natural disturbance that maintains essential ecological processes. Implementing appropriate disturbance regimes may allow the Lincoln an opportunity to preserve a large portion of this system throughout the Southwest, while preserving its ecological integrity.

Species Richness and Conservation Status

The R3 Species Database includes conservation status information for 531 species that inhabit the Lincoln 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 Lincoln manages 8 federally endangered, threatened, candidate or proposed species. Furthermore, the Lincoln manages 23 species listed by the state of New Mexico as threatened or endangered; 79 species with NatureServe global rankings that warrant conservation concern; 80 species with NatureServe national rankings that warrant conservation concern; and 121 species with NatureServe state rankings that warrant conservation concern.

Seventy-four potential species-of-concern were identified. Species-of-concern are those for which 'management actions may be necessary to prevent listing under the Endangered Species Act' according to forest planning directives. An additional 86 species were identified as potential species-of-interest, which, according to the directives, are species for which 'management actions may be necessary or desirable to achieve ecological or other multiple-use objectives.' Overall, almost one-third (31.3%) of all species that are known to inhabit Lincoln National Forest were identified as species that might need to be considered within Forest planning.

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 Lincoln National Forest. The assessments in this report provide important information on the systems and locations on the Lincoln that are important for maintaining system and species diversity. For instance, the analysis of PNVTs highlighted the important vegetation systems that occur on the Lincoln, which include Madrean encinal woodlands, semi-desert grasslands, Madrean pine-oak, and mixed conifer forest. 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 Lincoln National Forest has significant areas of overlap with ecoregional conservation areas. All of the ranger districts on the Lincoln are overlapped by one or more conservation areas. These conservation areas include 69 conservation targets, including 60 individual species. The specific locations where conservation areas overlap the Lincoln 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 Lincoln for sustaining the suite of species, ecological systems, and biological processes that are represented by the conservation targets associated with each conservation area that overlaps the Lincoln National Forest.

Relevance to Forest Planning

This analysis of existing regional assessment information identifies important biological and ecological characteristics of the Lincoln 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 Lincoln, 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 Lincoln, and identifies systems (and their associated species diversity) for which the Lincoln has disproportionate responsibility within the context of Region 3, such as mixed broadleaf deciduous riparian forest, Madrean pine-oak woodland, montane willow riparian forest, semi-desert grassland and Madrean encinal woodland.

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 Lincoln demonstrates the variety of current management emphases and activities that occur within conservation areas. The largest proportion (76.1%) of conservation areas that overlap the Lincoln 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 Lincoln 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 ecological 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 restrictions 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 Capitan Mountains conservation area encompasses 107,100 acres, of which 91,500 (85.4%) acres overlap the Smokey Bear Ranger District of the Lincoln National Forest. Nine conservation targets, including 7 individual species and 2 vegetation communities (see Appendix 15-C), are associated with the Capitan Mountains conservation area. These targets 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.

References

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