

Chapter 4:
Ecological & Biological Diversity of the Coronado National Forest
In
Ecological and Biological Diversity of National Forests in Region 3

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Introduction

The Coronado National Forest is one of 11 National Forests within U.S. Forest Service (USFS) Southwestern Region (Region 3). This Forest is located in southeastern Arizona and extreme southwestern New Mexico. The Coronado National Forest encompasses approximately 1,717,800 acres (695,169 hectares) which comprises approximately eight percent of the total area of Region 3 Forests.

The extreme southeastern portions of Arizona and southwestern New Mexico are home to mountain ranges where the Sierra Madre Occidental of Mexico and the Rocky Mountains converge. These mountains, where sub-tropical and tropical origins intersect, are also known as part of the Sky Island archipelago. Here, the desert floor rises approximately 7,720 ft. (2,353 m) to forested mountains where five “life-zones” (environments that are characterized by particular groupings of plants and animals) occur: the Lower Sonoran, Upper Sonoran, Transition, Canadian, and Hudsonian. As a result, the Coronado National Forest exhibits an impressive diversity of ecosystems that provide habitat for myriad plant and animal species. Plant and animal diversity is relatively high in this area due to the geographic mixing of species of northern and southern origins. Furthermore, distinct species have evolved in the Sky Islands due to the isolation of the forested mountainous regions where the ‘desert sea’ acts as a barrier for movement and gene flow. Consequently, many of Coronado’s mountain ranges harbor numerous endemic and rare species.

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

- Distribution and extent of potential natural vegetation types (PNVTs)
- Distribution and condition of grassland systems
- Distribution of native fish species
- Conservation status of plant and animal species
- 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 across major landowners and National Forests in Region 3 is provided in Chapter 3.

Results

I. Potential Natural Vegetation Types within the Coronado National Forest

Information from the Southwest Regional Gap Analysis Project (SWReGAP; USGS National Gap Analysis Program 2004) was used to characterize the extent of potential natural vegetation types (PNVTs) on the Coronado 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 for PNVTs in preparation for forest planning. For this analysis, the extent and proportion of each PNVT on the Coronado was summarized, as well as the proportion of each PNVT within Region 3 that occurs on the Coronado. More detailed information on the data and methods used in this analysis can be found in Chapter 2, and information comparing PNVTs on the Coronado to other Forests and landowners within Region 3 is available in Chapter 3.

Sixteen PNVTs were identified on the Coronado National Forest (Table 4-1, Figure 4-1). (For a detailed description of each PNVT see Appendix 2-B in Chapter 2). Desert communities, interior chaparral, Madrean encinal woodlands, Madrean pine-oak woodlands, and semi-desert grasslands make up approximately 93% of the total area of the Coronado National Forest (Table 4-1). Of this 93%, madrean encinal woodlands accounts for approximately 42%. In contrast, the combined area of aspen forest and woodland, cottonwood willow riparian forests, Great Basin/Colorado Plateau grassland and steppe, mixed broadleaf deciduous riparian forest, mixed conifer forest, montane willow riparian forest, pinyon-juniper woodland, and water comprises less than four percent of the total area of the Coronado National Forest. These results are based on data from the Southwest Regional GAP Analysis Program (SWReGAP), which has not been accuracy tested. Furthermore, SWReGAP data is based on satellite imagery that may not be appropriate at small spatial scales. For example, it is well known that spruce-fir forest exists on the Coronado National Forest; however, this PNVT was not detected in the SWReGAP data and thus is not listed in Table 4-1. This is likely due to the small area that spruce-fir forest occupies on the Forest. Furthermore, it is likely that the small portion (0.8%) of Great Basin/Colorado Plateau grassland and steppe identified in this analysis is an artifact of inaccuracies in the SWReGAP data.

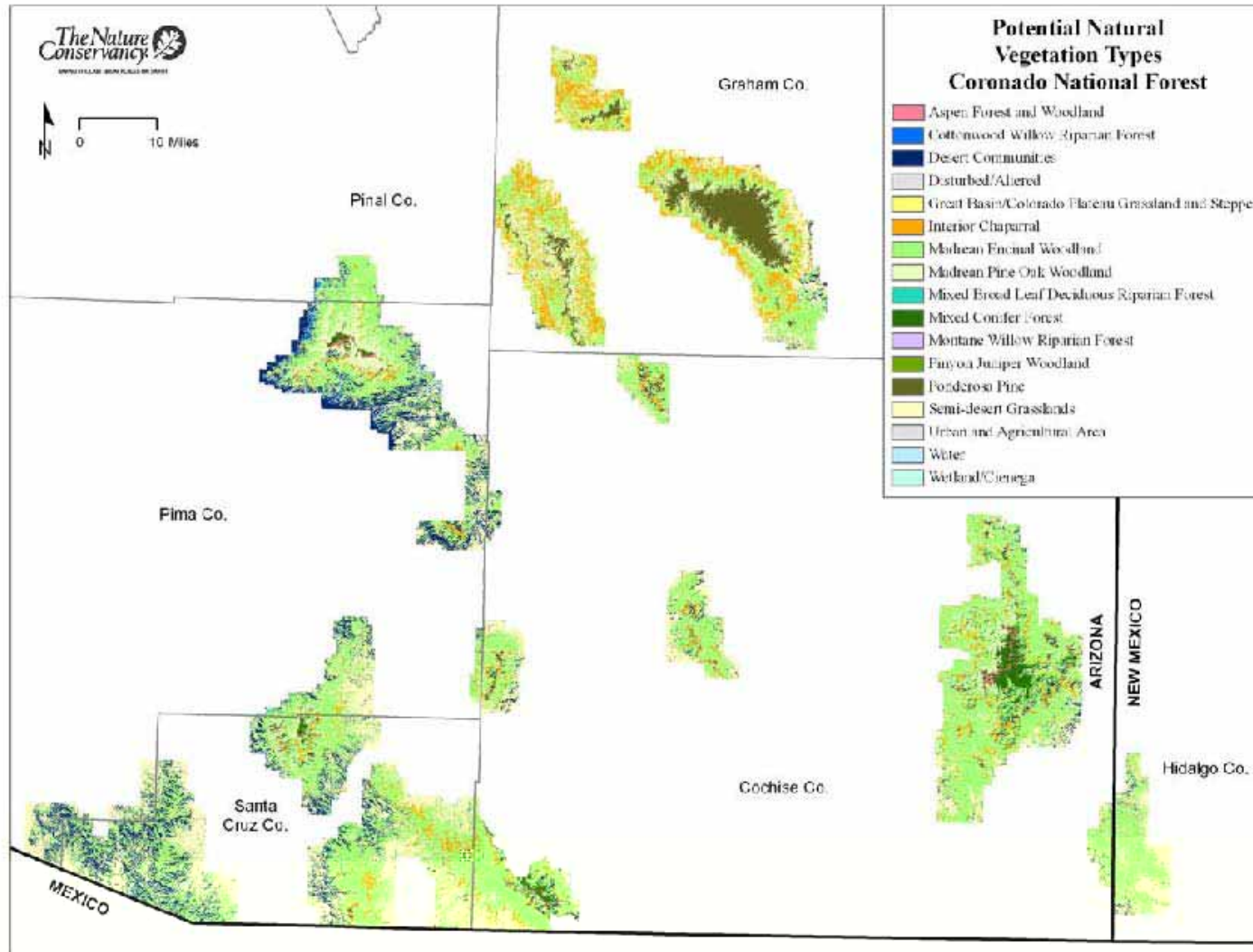


Figure 4-1. Distribution of potential natural vegetation types on the Coronado National Forest. This map was created using data from the Southwest Regional Gap Analysis Project (SWReGAP; U.S. Geological Survey National Gap Analysis Program, 2004). SWReGAP vegetation types were aggregated and converted to potential natural vegetation types. See Chapter 2 for more information regarding methods used. SWReGAP data have not been accuracy tested and is based on satellite imagery. Therefore, SWReGAP may not be appropriate at fine spatial scales.

Table 4-1. Approximate area (acres) and percent of total area of potential natural vegetation types on the Coronado 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.

Potential Natural Vegetation Type	Total Area (acres)	Percent of Total Area (%)	
Aspen Forest and Woodland	6,600	0.4	
Cottonwood Willow Riparian Forests	5,300	0.3	
Desert Communities	173,800	10.1	
Disturbed/Altered (quarries and mines)	200	<0.1	
Great Basin/ Colorado Plateau Grassland and Steppe	13,900	0.8	
Interior Chaparral	151,400	8.8	
Madrean Encinal Woodland	723,900	42.1	
Madrean Pine-Oak Woodland	139,200	8.1	
Mixed Broadleaf Deciduous Riparian Forest	800	<0.1	
Mixed Conifer Forest	26,800	1.6	
Montane Willow Riparian Forest	3,600	0.2	
Pinyon-juniper Woodland	100	<0.1	
Ponderosa Pine Forest	65,400	3.8	
6,300	23.7	Semi-desert Grassland	40
0	<0.1	Urban and Agricultural Area	30
0	<0.1	Water (open water)	20
17,800		Total	1,7

The Coronado National Forest comprises approximately eight percent of the total area of Region 3 National Forests, but manages for large percentages of certain PNVTs across the Region. For example, the largest proportion of all Madrean encinal woodlands (approximately 26%) on Region 3 National Forests is found on the Coronado National Forest (Figure 4-2). In addition, the Coronado manages 27% of the cottonwood willow riparian forests, 25% of semi-desert grasslands, approximately 17% of desert communities and Madrean pine-oak, 12% of montane willow riparian forests, and 11% of interior chaparral found over all Region 3 Forest lands.

Furthermore, the Coronado National Forest manages large percentages of certain PNVTs across the many landownership entities throughout Arizona and New Mexico. For example, the Coronado manages the second largest portion (11%) of Madrean encinal woodlands relative to other major land managers throughout Arizona and New Mexico. The largest proportion of Madrean encinal woodlands (19%) in Arizona and New Mexico is managed by private landowners, while state lands (9%) manage the third largest proportion of this PNVT. Refer to Chapter 3 (Tables 3-1 and 3-2) for more information regarding the proportion of each PNVT found on the Coronado National Forest that is managed by other landowners in Arizona and New Mexico.

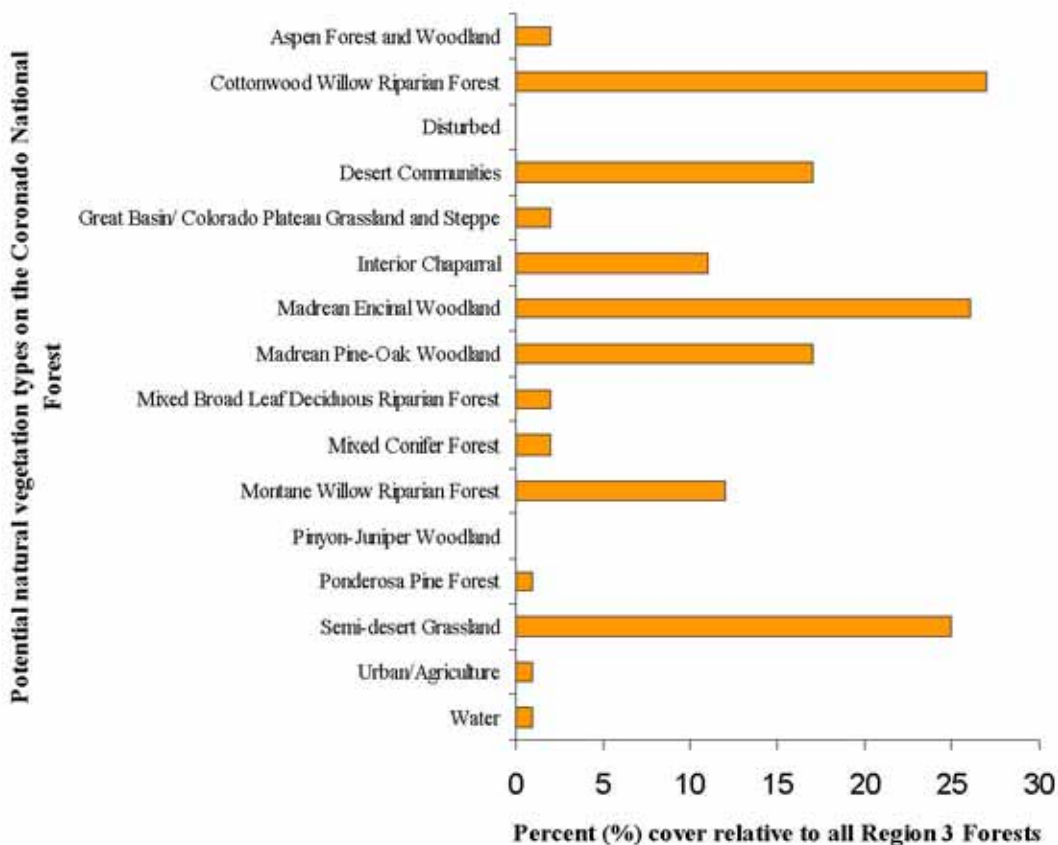


Figure 4-2. Percentage of cover area of each potential natural vegetation type that occurs on the Coronado National Forest in relation to all other Region 3 National Forests combined. Analysis was conducted using data from the Southwest Regional Gap Analysis Project (SWReGAP). For information about the limitations of SWReGAP data see Chapter 2.

II. Distribution and Condition of Grasslands

The Arizona Statewide Grassland Assessment (Schussman and Gori 2004, Gori and Enquist 2003; available at <http://www.azconservation.org>) was used to identify the extent, distribution, and condition of former and current grasslands on the Coronado National Forest. This statewide assessment (which also includes the portions of southwest New Mexico and Mexico that are within the Apache-Highlands Ecoregion; Figure 2-1 in Chapter 2) was developed through a combination of expert-based mapping and intensive, quantitative field sampling to verify and improve accuracy. Grassland condition was assessed and assigned to condition classes based on native/non-native grass dominance and cover, shrub cover, and erosion severity. For the purposes of this analysis, condition classes were aggregated into five grassland condition types (Table 2-1 in Chapter 2): open native, restorable native, non-native, former, and transitional grasslands. More detailed information on the data and methods used in this analysis can be found in Chapter 2, and information comparing the extent and distribution of grasslands on the Coronado to other forests and landowners within Region 3 is available in Chapter 3.

The Arizona Grassland Assessment identified approximately 757,100 acres of extant and former grassland lands on the Coronado (Table 4-2), representing 42.6% of the Forest. This is the largest extent and proportion of land in grasslands for any National Forest in Arizona. Overall, the Coronado manages 35.5% of all grasslands, 52.4% of open native grasslands, and 29.8% of restorable grasslands that occur on National Forests in Arizona. The majority (68.9%) of grasslands on the Coronado are either in the open native or restorable native types, with the remainder in non-native or former grassland types (Table 4-2).

Grasslands on the Coronado are distributed relatively evenly across ranger districts (Figure 4-3), ranging from just under 15% of grasslands occurring on the Santa Catalina and Sierra Vista Districts to nearly 35% of grasslands occurring on the Nogales District (Table 4-2). A significant portion (75.0%) of the Nogales District was identified as extant or former grasslands, while approximately one-quarter to one-half (Douglas – 35.6%, Safford – 28.9%, Santa Catalina – 42.5%, Sierra Vista – 33.9%) of the remaining districts were identified as grasslands.

Table 4-2. Acres of grasslands in four condition types occurring on five ranger districts on the Coronado National Forest in Arizona and New Mexico (from Schussman and Gori 2004).

District	Grassland Type									
	Open Native		Restorable Native		Non-native		Former		Total	
	Acres	% ^a	Acres	% ^a	Acres	% ^a	Acres	% ^a	Acres	% ^b
Douglas	20,500	13.3	94,100	60.9	35,000	22.6	5,000	3.2	154,600	20.4
Nogales	127,800	48.4	93,300	35.3	39,000	14.8	4,000	1.5	264,100	34.9
Safford	9,500	8.0	47,800	40.2	3,900	3.3	57,600	48.5	118,800	15.7
Santa Catalina	0	0.0	69,000	62.6	33,100	30.0	8,200	7.4	110,300	14.6
Sierra Vista	43,100	39.4	17,100	15.6	46,300	42.4	2,800	2.6	109,300	14.4
Total	200,900	26.5	321,300	42.4	157,300	20.8	77,600	10.2	757,100	100.0

^a Percent of grasslands on ranger district in grassland condition type

^b Percent of grasslands on Coronado NF on each ranger district

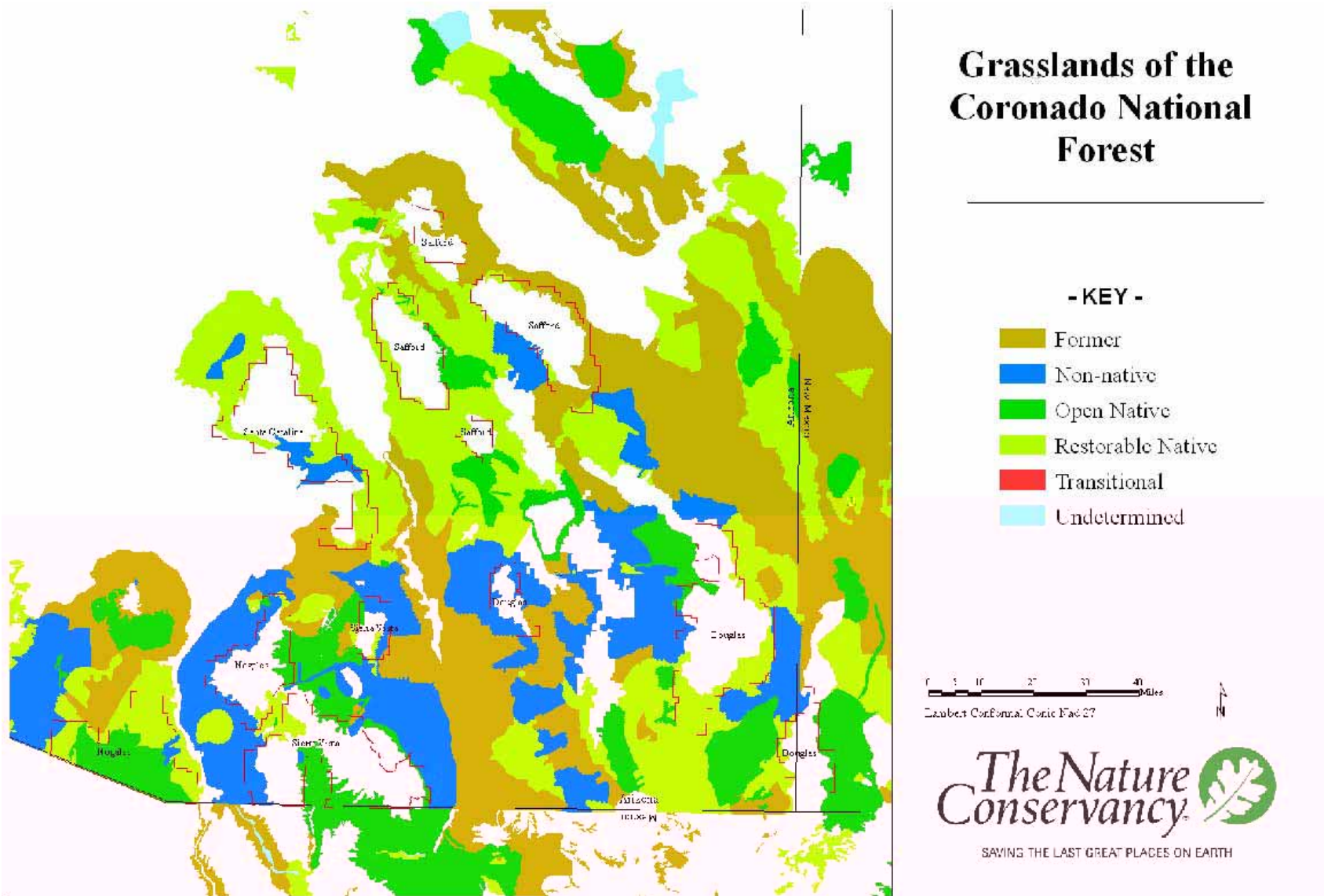


Figure 4-3. Grassland types, based on condition, on five ranger districts on the Coronado National Forest in Arizona and New Mexico (from Schussman and Gori 2004, Gori and Enquist 2003).

III. Riparian and Freshwater Systems and Species

The Arizona Statewide Freshwater Assessment (Turner and List, *In Prep*; available at www.azconservation.org) was used to summarize the occurrence and distribution of stream reaches with native fishes across major landowners and National Forests in Arizona. This assessment was developed for use in regional planning and includes occurrence information (1975 and later) for 33 native fish species (Table 2-2 in Chapter 2) in streams across all of Arizona. This information was used to identify and summarize the occurrences of each native fish species on stream reaches within the Coronado National Forest and to summarize the number of native fish species with occurrences on stream reaches on the Forest. More detailed information on the data and methods used in this analysis can be found in Chapter 2, and information comparing the extent of native fish occurrences on the Coronado to other forests and landowners within Region 3 is available in Chapter 3.

According to the Arizona Freshwater assessment, ten native fish species have occurrences on one or more stream reaches on the Coronado (Table 4-3; see Table 2-2 for scientific names). Together, these ten species have occurrences on approximately 83 miles (55.0%) of the 151 miles of perennial streams that exist on the Coronado (Table 4-3). Overall, the Coronado accounts for 8.1% of the perennial streams and 6.5% of the stream reaches with native fish occurrences that exist on National Forests in Arizona. However, 100% of stream miles with occurrence for the Mexican stoneroller, Sonora chub, and Yaqui chub, and nearly 30% of stream reaches with occurrences of the Gilastreainnow that occur on National Forest lands in Arizona are found on the Coronado.

Olden and Poff (2005) characterized the temporal trends in native fish distributions within the Lower Colorado River Basin, including seven of the 10 native fish species on the Coronado (not including the Mexican stoneroller, Sonora chub, and Yaqui chub). Five of the seven native fish species on the Coronado have undergone declines in distribution across the basin, including the Gilastreainnow (36.8% decline), Apache trout (26.9% decline), speckled dace (16.5% decline), 15.9% decline), and desert sucker (13.5% decline). Longfin dace and Sonora sucker have shown increases in distribution of 11.4% and 8.2%, respectively.

Seven species (70%) have occurrences on only one ranger district, including the three species that do not occur on any other National Forest lands in Arizona. The number of species with occurrences on each ranger district ranges from 1 to 4, while the length of stream reaches with occurrences of one or more species ranges from 4 miles on the Safford District to 26 miles on the Santa Catalina District (Table 4-4). Longfin dace, Gilaopminnow, and Gila largest lengths of stream reaches with occurrences on the Coronado. Longfin dace is also the most widely distributed species, having occurrences on 4 of 5 districts.

Overall, 37 miles (44.6%) of stream reaches on the Coronado have occurrences of one native fish species, 44 miles (53.0%) have occurrences of two species, and 2 miles (2.4%) have occurrences of four species. Douglas, Santa Catalina, and Sierra Vista Districts, in particular, have significant stream length with occurrence of two or more native fish species (Figure 4-4).

According to the Freshwater Assessment, 16 stream systems on the Coronado (Table 4-5 and Figure 4-5) have occurrences of native fish species. O'Donnell Canyon Creek includes approximately two miles of stream with occurrences of four species. Other important streams, including Red Rock Canyon Creek, Rucker Canyon Creek, and Sabino Canyon contain relatively large lengths with occurrences of two species.

According to review by Coronado National Forest Resource staff, current fish distribution differs somewhat from the contemporary occurrence information in the Freshwater Assessment, demonstrating the ongoing changes and dynamic nature of native fish distributions across the landscape. These changes are listed in parentheses in the accompanying tables. The results of the review indicate that the Sonora sucker does not currently occur on the Coronado, and that the number of stream miles occupied by the longfin dace and Gila topminnow have been reduced by 24.0% and 63.0% respectively. Additionally, several reaches with native fish occurrences in the Freshwater Assessment (Canada del Oro and Wakefield Canyon Creek) no longer have occupied habitat (Table 4-5), and the number of native fish species with occurring on the Nogales, Santa Catalina, and Sierra Vista Ranger Districts has decreased (Table 4-4).

Table 4-3. Number of stream miles with occurrences of ten native fishes on five ranger districts on the Coronado National Forest in Arizona based on the Arizona Freshwater Assessment (Turner and List, *In Prep*). Numbers in parentheses represent the current extent of each species based on review of current fish distributions by Coronado National Forest Resource Staff.

Species	Ranger District					Total
	Douglas	Nogales	Safford	Santa Catalina	Sierra Vista	
Longfin dace	17	6	0	12 (0)	15	50 (38)
Mexican stoneroller*	10	0	0	0	0	10
Desert sucker	0	2	0	0	0	2
Sonora sucker	0	0	0	0	2 (0)	2 (0)
Sonora chub*	0	9	0	0	0	9
Gila chub	0	0	0	14	2	16
Yaqui chub*	7	0	0	0	0	7
Apache trout	0	0	4	0	0	4
Gila topminnow	0	3 (0)	0	14 (0)	10	27 (10)
Speckled dace	6	0	0	0	0	6

*Within National Forests in Arizona, this species occurs only on the Coronado.

Table 4-4. Number of perennial stream miles, number of stream miles with occurrences (1975 and later) of one or more native fish species, and number of native fish species with occurrences on five ranger districts on the Coronado National Forest in Arizona based on the Arizona Freshwater Assessment (Turner and List, In Prep). Values in parentheses represent the current number of fish species on each ranger district according to Coronado National Forest Resource Staff.

Ranger District	Perennial Flow (Miles)	Occupied Habitat (Miles)	Number of Native Fish Species
Douglas ^a	42	23	4
Nogales	15	15	4 (3)
Safford	43	4	1
Santa Catalina	27	26	3 (1)
Sierra Vista	24	15	4 (3)
Total	151	83	10 ^b

^a Data do not exist for the portion of the Douglas Ranger District that lies in New Mexico.

^b Total number of native fish species occupying habitat on the Coronado. Several species occur on multiple ranger districts.

Figure 4-4. Number of stream miles with varying native fish species richness based on occurrences from 1975 and later for five districts on the Coronado National Forest, Arizona.

Figure 4-5. Perennial stream reaches with varying numbers of native fish species with occurrences on five ranger districts on the Coronado National Forest in Arizona.

Table 4-5. Stream systems, number of native fish species with occurrences, and the total stream reach length with native fish occurrences for 16 stream systems with native fishes on the Coronado National Forest in Arizona. Values in parentheses represent the current number of native fish species and the miles of occupied habitat for each stream according to Coronado National Forest Resource Staff.

Stream Name	Number of Native Fish Species	Occupied Habitat (miles)
Bear Creek F ^A	1	3
California Gulch	2 (1)	3
Canada del Oro	1 (0)	12 (0)
Cave Creek B	1	6
Gardner Creek A	1	4
Grant Creek B	1	4
Harshaw Creek	1	2
O'Donnell Canyon Creek	4 (3)	2
Red Rock Canyon Creek	2	8
Rucker Canyon Creek	2	10
Sabino Creek	2 (1)	14
Sycamore Canyon B	1	6
Temporal Gulch	2	2
Turkey Creek L	2	5
Wakefield Canyon Creek	1 (0)	< 1 (0)
Ward Canyon	2	2

^A Letters following stream names differentiate multiple streams with identical names within Arizona.

IV. Plant and Animal Species Richness

The R3 Species Database was used to determine plant and animal species richness on the Coronado National Forest and to characterize the conservation status of these species. The R3 Species Database was created by combining several existing datasets into a single database that 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 terrestrial and aquatic vertebrate species, and plant and invertebrate species that may be of conservation concern. More detailed information on the data and methods used for analysis in this section of the report can be found in Chapter 2. The complete list of species used in this analysis and their conservation status attributes is provided in Appendix 4-A.

Species Richness — According to the R3 Species Database, the Coronado National Forest is home to at least 759 species of plants and animals (Figure 4-6). This number is conservative, as the dataset used for this analysis only includes known plant and invertebrate species of management concern. Therefore, many plant and invertebrate species that inhabit the Coronado may be absent from these results. It is also important to note that the number and type of species inhabiting the Coronado National Forest likely changes over time.

Figure 4-6. Number of species, by taxa, that inhabit the Coronado National Forest based on data from the R3 Species Database. This database includes all known terrestrial and aquatic vertebrates, but only known plants, crustaceans, insects and snails of management concern. Because of the limitations of the R3 Species Database, the numbers reported in these results are likely conservative.

Federally listed threatened, endangered, candidate and proposed species — Twenty-one endangered, threatened, candidate or proposed species across eight taxa currently occur on the Coronado National Forest (Table 4-7). Of these, 11 are federally listed endangered species of four distinct taxonomic groups, seven are threatened species representing four unique taxa, two are candidate species of two distinct taxa, and one is a proposed endangered species.

Arizona and New Mexico state conservation status — A total of 110 species of special state conservation status in Arizona and/or New Mexico are found on the Coronado National Forest. Refer to Appendix A for a complete list of those species. Table 4-6 provides a breakdown of those species with state conservation status by taxonomic groupings.

Table 4-6. Number of species by taxon on the Coronado that have special state status in Arizona and New Mexico. In Arizona, wildlife of conservation concern is assigned the status of Wildlife of Special Concern (WSC). Plants in Arizona are in different conservation status categories that include salvage restricted (SR) and highly safeguarded (HS). New Mexico plants and wildlife of conservation concern is designated as threatened or endangered.

Taxa	HS	SR	WSC	Endangered	Threatened	HS and Endangered	WSC and Endangered	WSC and Threatened
Amphibian	0	0	6	2	1	0	2	0
Bird	0	0	32	6	17	0	3	5
Fish	0	0	8	2	1	0	2	1
Mammal	0	0	9	3	3	0	1	2
Plant	11	14	0	1	0	1	0	0
Reptile	0	0	6	3	3	0	1	0
Snail	0	0	0	1	0	0	0	0

NatureServe global conservation status rankings — Eleven species of 759 (approximately 2%) were not included in the analysis because they were not assigned a NatureServe global conservation rank. Results show that approximately 70% of these species were ranked as G4, G5, T4 or T5 species (Table 4-8). These are species whose populations are considered ‘apparently secure’ or ‘secure’, respectively. Twenty-seven percent of the species were ranked with a global conservation status of G1, G2, G3, T1, T2 or T3, which warrants conservation concern. The remaining 3% were GNR, GU, TNR, or TU ranked species. Global conservation status ranking for all 748 species identified as inhabiting the Coronado National Forest are provided in Appendix 4-A.

NatureServe subnational conservation status ranking. — Of the 759 species that were analyzed for the Coronado National Forest, 692 had assigned subnational conservation status ranks (S-ranks) by Arizona and 542 species had S-ranks from New Mexico. Of the Arizona state-ranked species, 41% of the species were considered secure or apparently secure. Similarly, 41% of the species had rankings that merit conservation concern on a state or more local scale (S1, S2, S3, SH). The remaining 16% were ranked SNA or SNR. Of the 542 species with an S-rank from New Mexico, 60% of the species are considered secure or apparently secure, while 34% are of local or state level conservation concern (S1, S2, S3, SH). Table 4-9 shows the number of species assigned the various S-ranks in Arizona and New Mexico. See Appendix 4-A for the complete list of species with their associated S-ranks.

Table 4-7. Threatened, endangered, candidate and proposed species, designated under the Federal Endangered Species Act of 1973, that currently inhabit the Coronado National Forest. The table includes common names that are recognized by NatureServe.

	Endangered	Threatened	Candidate	Proposed
AMPHIBIAN	Sonoran tiger salamander	Chiricahua leopard frog		
BIRD		Bald eagle Mexican spotted owl		
FISH	Desert pupfish	Apache trout		Gila chub

Table 4-9. Number of species per taxon currently inhabiting the Coronado National Forest that are assigned to various subnational rankings in Arizona and New Mexico by their respective State Heritage Programs. Sixty-seven and 217 of the 759 species were not assigned a subnational conservation rank by the Arizona and New Mexico Heritage Programs, respectively. S1 = critically imperiled; S2 = imperiled; S3 = vulnerable; S4 = apparently secure; S5 = secure; SH = possible extirpated; SX = presumed extirpated; SNA = not applicable; SNR = not ranked.

	Amphibian		Bird		Crustacean		Fish		Insect		Mammal		Plant		Reptile		Snail		
	AZ	NM	AZ	NM	AZ	NM	AZ	NM	AZ	NM	AZ	NM	AZ	NM	AZ	NM	AZ	NM	
S1	3	3	38	34	1	0	4	2	1	0	4	12	43	4	4	4	4	5	4
S2	0	1	29	28		0	2	2	6	0	10	14	27	8	8	2	31		
S3	4	1	40	36	0	0	5	1	2	0	15	5	12	5	13	12	0	0	
S4	2	2	48	126	0	0	0	0	0	0	20	20	0	0	9	10	0	0	
S5	8	7	120	99	0	0	0	0	0	0	41	32	0	0	39	31	0	0	
SH	0	0	1	2	0	0	1	0	1	0	0	0	2	1	0	0	0	0	
SX	1	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	
SNA	1	1	27	4	0	0	0	1	0	0	2	2	0	0	0	0	0	0	
SNR	0	0	8	0	0	0	0	0	12	9	1	0	17	10	3	1	13	4	

Potential species-of-concern — Results indicate 186 potential species-of-concern representing nine distinct taxonomic groups inhabit the Coronado National Forest. Plants comprise the largest number of species of potential species-of-concern, approximately 44%. Snails (31%) and insects (9%) are the second and third largest taxonomic group, respectively. Birds constitute 7% of the potential species-of-concern, mammals 3%, reptiles, amphibians and fish 2%, and crustaceans less than 1% (Figure 4-7). Appendix 4-A lists the species that inhabit the Coronado and highlights those that were determined potential species-of-concern.

Figure 4-7. The number of federally listed endangered and threatened species by taxa (in orange) and potential species-of-concern (in blue) that currently inhabit the Coronado National Forest. Endangered and threatened conservation status is designated by the US Fish and Wildlife Service. Species that have a NatureServe global conservation rank of G1, G2, G3, T1, T2, or T3 and are not listed as federally endangered or threatened are considered potential species-of-concern according to the published Forest Service draft directives (70 Fed. Reg. 14637). Species that are a candidate or proposed for federal listing may also be considered for species-of-concern status.

Potential species-of-interest — A total of 182 potential species-of-interest (See Chapter 2 for discussion of criteria used) occur on the Coronado National Forest. Birds make up the largest proportion (70%) of potential species-of-interest. Mammals comprise 14% of the total, plants 8%, reptiles 7%, and amphibians approximately 2%. Figure 4-8 illustrates the number of species in each taxonomic group that are potential species-of-interest for the Coronado National Forest. Appendix 4-A lists species that were identified as potential species-of-interest on the Coronado National Forest.

Figure 4-8. The number of potential species-of-interest by taxa that currently inhabit the Coronado National Forest. Species were considered potential species-of-interest if they fell into one or more of the following categories: special state conservation status (WSC, HS, and SR in Arizona or threatened or endangered in New Mexico); on the U.S. Fish and Wildlife Service Birds of Conservation Concern National Priority list; and NatureServe subnational conservation rank of 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.

Birds of Conservation Concern — Of the 361 bird species on the Coronado National Forest, 42 (approximately 12%) are listed by the U.S. Fish and Wildlife Service as a Bird of Conservation Concern. In all, the U.S. Fish and Wildlife Service lists 131 species of Birds of Conservation Concern, and 32% of these inhabit the Coronado. This includes all bird species listed in Table 4-10. Thirteen of these species (31%) have special conservation status under the state of Arizona (WSC) or New Mexico (threatened or endangered).

Table 4-10. Birds of Conservation Concern that occur on the Coronado National Forest.

Diurnal Raptors	Tyrant Flycatchers	
American peregrine falcon	Buff-breasted flycatcher	
Common black-hawk	Greater pewee	
Ferruginous hawk	Northern beardless tyrannulet	
Northern harrier	Rose-throated becard	
Gruiformes – Coots, Cranes, Limpkin, Moorhens, and Rails	Shrikes and Vireos	
Yellow rail	Arizona Bell's Vireo	
	Gray vireo	
	Loggerhead shrike	
Shorebirds	Mimids – Catbirds, Mockingbirds and Thrashers	
Long-billed curlew	Bendire's thrasher	
Mountain plover	Crissal thrasher	
Stilt sandpiper		
Owls	Pipits	
Burrowing owl	Sprague's pipit	
Elf owl		
Flammulated owl	Wood Warblers	
Whiskered screech owl	Black-throated gray warbler	
	Grace's warbler	
	Kentucky warbler	
Hummingbirds	Louisiana waterthrush	
Lucifer hummingbird	Olive warbler	
Broad-billed hummingbird	Prothonotary warbler	
	Red-faced warbler	
Trogon	Worm-eating warbler	Elegant trogon
Woodpeckers	Emberizine Sparrows and Allies	Woodpeckers
Arizona woodpecker	Baird's sparrow	Arizona woodpecker
Black-chinned woodpecker	Black-chinned sparrow	Lewis's woodpecker
	Botteri's sparrow	
	Cassin's sparrow	
	Lark bunting	
	Rufous-winged sparrow	

Partners in Flight Watch List — Currently 100 species are on the Partners in Flight Watch List, of which 41 (41%) can be found on the Coronado National Forest. This comprises 11% of the 361 bird species that inhabit the Coronado. Sixteen of these are also on the U.S. Fish and Wildlife Service Birds of Conservation Concern list.

Table 4-11. Bird species on the Partners in Flight Watch List that inhabit the Coronado National Forest.

Diurnal Raptors Swainson's hawk	Shrikes and Vireos Gray vireo
Upland Game Birds Montezuma quail Scaled quail	Jays, Crows, and Allies Pinyon jay
Pigeons and Doves Band-tailed pigeon	Mimids – Mockingbirds and Thrashers Bendire's thrasher
Owls Elf owl Flammulated owl Short-eared owl	Pipits Sprague's pipit
Goatsuckers and Swifts Black swift White-throated swift	Wood Warblers Grace's warbler Hermit warbler Kentucky warbler Prothonotary warbler Red-faced warbler Virginia's warbler Worm-eating warbler
Hummingbirds Allen's hummingbird Calliope hummingbird Costa's hummingbird Rufous hummingbird	Emberizine Sparrows and Allies Abert's towhee Baird's sparrow Black-chinned sparrow Brewer's sparrow Harris's sparrow McCown's longspur Painted bunting Rufous-winged sparrow Varied bunting Dicksissel
Trogon Elegant trogon	Finches and Old World Sparrows Lawrence's goldfinch
Woodpeckers Arizona woodpecker Lewis's woodpecker	
Tyrant Flycatchers Olive-sided flycatcher Thick-billed kingbird Willow flycatcher	

Extirpated Species – Some species are known to have inhabited the Coronado 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. Extirpated species of the Coronado National Forest include but are not limited to: Mexican wolf (*Canis lupus*), black-tailed prairie dog (*Cynomys ludovicianus*), grizzly bear (*Ursus arctos*), Gould's wild turkey (*Meleagris gallopovo mexicana*), Sonora sucker (*Castostomus insignis*), and the Tarahumara frog (*Rana tarahumarae*).

V. *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 that are 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, management areas, roadless areas, and wilderness areas on the Coronado National Forest. The conservation targets associated with each overlapping conservation areas were also identified.

Fourteen individual conservation areas from ecoregional assessments overlap the Coronado (Figure 4-9, Table 4-12), totaling 1,115,500 acres, or 62.7% of the Forest. Of other Forests in Region 3, only the Coconino National Forest has a higher degree (69.1%) of overlap. Conservation area overlap on individual districts ranged from 35.9% on the Santa Catalina to 77.4% on the Sierra Vista (Table 4-1). Overall, 17.0% of the total area of these 14 conservation areas overlaps the Coronado. For six of the 14 overlapping conservation areas, more than half of the conservation area overlaps the Coronado (Table 4-12).

Over one-half (57.1%) of the area of the Coronado National Forest overlapped by conservation areas does not have specific land use designations (Table 4-15), while approximately 20% is roadless area and 17.5% is wilderness area. While approximately 62.7% of the Coronado is overlapped by conservation areas, a higher percentage of special areas (99.4), areas with no designation (66.9%), and roadless/special areas are overlapped. A smaller percentage of wilderness areas (57.8%) and roadless areas (55.9%) on the Coronado are overlapped by conservation areas. Nearly two-thirds (63.6%) of the area overlapped by conservation areas on the Coronado National Forest are in Management Area 4 (Table 4-16), while approximately 20% is in Management Area 9.

Conservation targets were summarized only for 13 conservation areas that overlap with the Coronado National Forest. The East Tucson Riparian Conservation Area was not included

because only a very small area and proportion of the conservation overlapped the Forest. A total of 216 conservation targets occur within these conservation areas (Table 4-14, Figure 4-10). Twenty-three of these targets (10.6%) are ecological systems, communities or features, while 193 (89.4%) are individual species. Seventy-five (34.7%) targets are associated with riparian and aquatic systems. A complete listing of all conservation targets by taxonomic group for the Coronado is provided in Appendix 4-B and conservation targets for each conservation area are provided in Appendix 4-C.

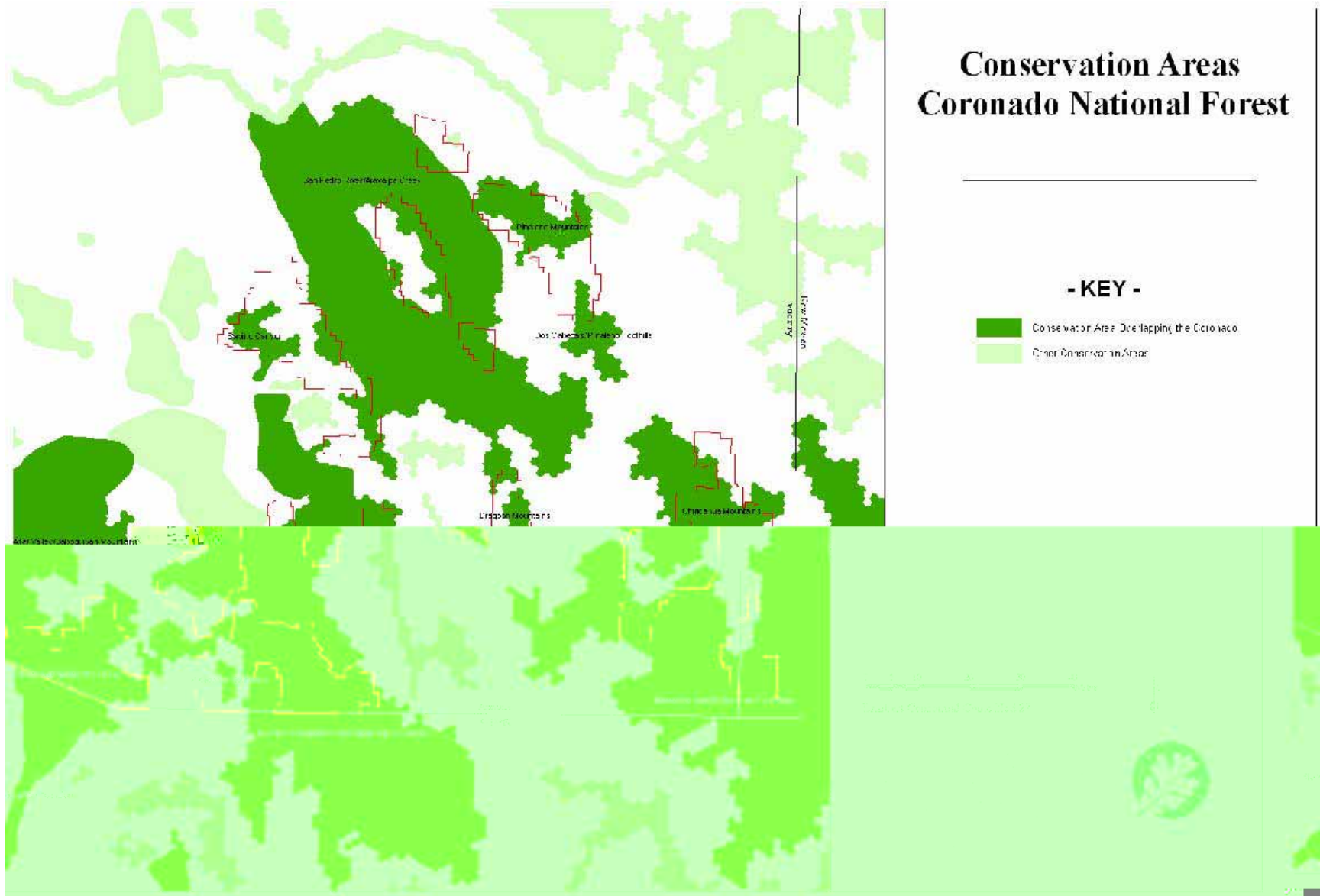


Figure 4-9. Conservation areas (N=14) that overlap the Coronado National Forest in Arizona and New Mexico.

Table 4-12. Conservation areas (n=14) that overlap five ranger districts on the Coronado National Forest, acres of overlap, and the percentage of each conservation area overlapping the Coronado National Forest in Arizona and New Mexico.

Conservation Area	Districts ^a	Overlap (Acres)	% of Conservation Area
Altar Valley/Baboquivari Mountains	N	13,600	2.5
Atascosa/Pajarito Mountains	N	166,100	51.3
Chiricahua Mountains	D	136,000	51.2
Dos Cabezas/ Pinaleno Foothills	S	13,200	19.4
Dragoon Mountains	D	24,200	93.3
East Tucson Riparian	SC	100	1.3
Huachuca Mountains Grassland Valley Complex	N,SC,SV	325,800	21.7
Patagonia Mountains	SV	13,600	100.0
Pinaleno Mountains	S	93,800	78.0
Rio Magdalena/Rio Asuncion	N	2,400	0.7
Sabino Canyon	SC	49,300	85.2
San Pedro River/Aravaipa Creek	D,S,SC	153,400	10.8
Santa Teresa Mountains	S	700	20.1
Sierra San Luis/ Peloncillo Mountains	D	123,200	6.6

^a D= Douglas, N = Nogales, S = Safford, SC = Santa Catalina, SV = Sierra Vista

Table 4-13. Extent of overlap between ecoregional conservation areas and five ranger districts on the Coronado National Forest in Arizona and New Mexico.

District	Number of Conservation Areas	Overlap (Acres)	Percent of District
Douglas	4	290,400	66.9
Nogales	5	271,100	77.0
Safford	4	211,800	51.5
Santa Catalina	4	93,200	35.9
Sierra Vista	2	249,000	77.4
Coronado N.F Total	14 ^a	1,115,500	62.7

^a Several conservation areas overlap more than one district on the Coronado.

Table 4-14. Number of conservation targets associated with aquatic/riparian and terrestrial habitats for 13 conservation areas that overlap the Coronado National Forest in Arizona and New Mexico.

Conservation Area	Habitat		
	Aquatic/ Riparian	Terrestrial	Total
Altar Valley/Baboquivari Mountains	3	13	16
Atascosa/Pajarito Mountains	22	42	64
Chiricahua Mountains	18	44	62
Dos Cabezas/ Pinaleno Foothills	0	10	10
Dragoon Mountains	3	13	16
Huachuca Mountains Grassland Valley Complex	48	78	126
Patagonia Mountains	1	11	12
Pinaleno Mountains	8	27	35
Rio Magdalena/Rio Asuncion	11	6	17
Sabino Canyon	3	3	6
San Pedro River/Aravaipa Creek	39	41	80
Santa Teresa Mountains	0	7	7
Sierra San Luis/ Peloncillos Mountains	29	42	71

Figure 4-10. Number of conservation targets, by type, that occur on 13 conservation areas overlapping the Coronado National Forest in Arizona and New Mexico.

Table 4-15. Overlap between conservation areas and areas with special designations on the Coronado National Forest in Arizona and New Mexico.

Designation	Acres within Conservation Areas	% of Conservation Areas	% of Designated Areas
Wilderness Areas	195,100	17.5	57.8
Roadless Areas	231,800	20.8	55.9
Roadless/Special Area	46,000	4.1	66.4
Special Area	6,200	0.6	99.4
No Designation	637,200	57.1	66.9

Table 4-16. Overlap between conservation areas and Management Areas on the Coronado National Forest in Arizona and New Mexico.

Management Area	Acres within Conservation Areas	% of Conservation Areas	% of Management Areas
Visual Resources and Semi-Primitive Dispersed Recreation (1)	68,000	6.1	61.0
Dispersed Recreation and Timber Harvest (2)	25,900	2.3	70.9
Dispersed Recreation (3)	19,700	1.8	94.4
Livestock Grazing (Level D), Game Habitat and Fuel Wood Harvest (4)	711,200	63.6	62.3
Unique Resources (Including Riparian Areas) (7)	51,300	4.6	63.6
Research Natural Area / Wilderness (8)	5,200	0.5	75.3
Wilderness (9)	230,900	20.6	58.8
Zoological-Botanical Areas (14)	4,000	0.4	100.0
Wild Chili Botanical Area (15)	2,800	0.3	100.0

Discussion

Systems Diversity

The Coronado National Forest harbors 16 PNVTs, many of which are of significant biodiversity importance. For example, the Madrean pine-oak system on the Coronado National Forest supports several species that are unique to this Forest, and have limited distribution in the Southwest, such as: the whiskered screech owl (*Megascops trichopsis*), white-eared hummingbird (*Hylocharis leucotis borealis*), elegant trogon (*Trogon elegans*), and the Huachuca giant skipper (*Agathymus evansi*). 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). Although it is not clear if the historical range of Madrean pine-oak woodland is currently diminishing on the Coronado, fire is an important natural disturbance that has been excluded on the Forest for some time. In order to maintain important biological processes, Madrean pine-oak woodlands depend upon low-intensity frequent fires. Madrean pine-oak woodlands comprise approximately 8% of the total area on the Coronado National Forest.

Madrean encinal woodlands span approximately 42% of the Coronado National Forest. The 723,900 acres on the Coronado represents 26% of all Madrean encinal woodlands on all Region 3 National Forests and 19% throughout Arizona and New Mexico. Refer to Chapter 3 for more information regarding how the PNVTs found on the Coronado relate to other R3 Forests and landowners in Arizona and New Mexico. Like Madrean pine-oak woodlands, Madrean encinal woodlands depend upon low intensity frequent fires that ensure healthy biological processes. Several unique and limited species of the Coronado inhabit Madrean encinal woodlands including: violet-crowned hummingbird (*Amazilia violiceps*), Scudder's duskywing butterfly (*Erynnis scudderi*), ursine giant skipper (*Megathymus ursus ursus*) and the Arizona water penny beetle (*Psephenus arizonensis*).

Grasslands

Grasslands are an important ecosystem on the Coronado, both in terms of the overall area they encompass as well as the diversity they support. Nearly 24% of the Coronado National Forest is semi-desert grasslands, of which the Nogales, Sierra Vista, and Douglas Ranger Districts manage almost three quarters. In addition, the Coronado National Forest is responsible for one-quarter of all semi-desert grasslands in all of Region 3 Forests. Finch (2004) described the grasslands on the Coronado as Desert and Great Basin Grasslands. Desert grasslands (also referred to as semi-desert grasslands) occur at low elevations adjacent to the Sonoran Desert. Typical grass species include black grama (*Bouteloua eripoda*), tobasa (*Pleuraphis mutica*), creosote bush (*Larrea tridentate*) and velvet mesquite (*Prosopis glandulosa var. torreyana*). Great Basin grasslands occur at higher elevations and often mix with juniper and savanna systems. Typical grass

species include blue grama (*Bouteloua gracilis*), Indian ricegrass (*Achnatherum humenoides*), and sideoats grama (*Bouteloua curtipendula*).

Grasslands in the Southwest typically maintain high levels of diversity for both plants and animals. In part, this is a result of the blending of several biogeographical regions (Parmenter and others 1995) and the resultant mixing of species from northern and southern regions. Also, southwestern grasslands tend to lie adjacent to other habitat types and along with grassland-specialist species, are used by generalist species from adjacent habitats (Parmenter and Van Devender 1995). This is particularly true on the Coronado, where altitudinal gradients lead to a blending of low and mid-elevation communities. Notably high diversity of many widespread animal groups, including invertebrates (grasshoppers, termites, ants) and vertebrates (rodents) are associated with southwestern grasslands. The richness of these species found on southwestern grasslands is tied to the species composition, habitat structure, and productivity of the plant community (Arenz and Joern 1996, Lawton 1983). Changes in the structure and function of grassland systems have been noted as the primary cause of the loss of native diversity within grasslands (Stacy 1995). Finch (2004) identified and summarized the major threats to grassland biodiversity as the loss of natural fire cycles, overgrazing by livestock, prairie dog eradication, exotic grasses, shrub encroachment, and habitat fragmentation.

The Arizona Statewide Grasslands Assessment documented many of these factors as threats to grasslands on the Coronado National Forest. However, significant areas (26.5%) of open native grasslands continue to exist on the Coronado. The Nogales District, in particular, has a large (110,300 acres) contiguous area of open native grassland, which is the largest of any on National Forest lands in Arizona. Additionally, a substantial area (84,500 acres) of restorable grassland lies adjacent, allowing a unique opportunity to restore and maintain a significant area of grassland. Maintaining grasslands at sufficient scales is vital for supporting grassland-dependent species, as habitat fragmentation may have detrimental effects on grassland biodiversity (Finch 2004).

Overall, over 321,000 acres (42.4%) of grasslands on the Coronado are shrub invaded. A key characteristic of shrub invaded grasslands is its restoration potential, and significant restoration potential exists on all ranger districts on the Coronado. The Douglas, Nogales, and Santa Catalina Districts, in particular, have significant acres of restorable grasslands. If all restorable grasslands on the Coronado were restored to open native condition, nearly 70% of grasslands on the Coronado could be maintained in this condition. Increases in shrub cover within grasslands can significantly affect species richness. While the diversity of some groups, such as birds, may actually increase due to increased vertical structure associated with shrubs or trees (Knopf and Scott 1990) these change are generally associated with increases in habitat generalists and a sharp decline in grassland specialists (Knopf 1992).

The potential to restore shrub-invaded grasslands is affected by a complex web of interacting physical and biological factors that include climate, topography, grazing, introduced/invasive species, and fire. Shrub cover can be reduced with prescribed burns when sufficient fuels are present to carry a fire of adequate intensity (Brunson and others 2001). Often, the fuels required to allow fires of adequate intensity to achieve this goal are lacking, and areas must be rested from grazing to allow fuels to accumulate. The number of growing seasons of rest needed to

accumulate these fuels varies from site to site. Schussman and Gori (2004) estimated that 44% of sites in Arizona could be burned with three growing seasons or less of rest, while the remainder of grasslands would need longer periods of rest.

According to the Arizona Grasslands Assessment, grasslands that have exceeded a threshold of 35% shrub cover have undergone a type conversion from grassland to shrubland. Statewide, nearly 22% of historic grasslands have been lost while on the Coronado, just over 10% of historic grasslands have been converted to shrublands. A predominance of this former grassland area occurs on the Safford District. Even given long periods (50 years) of grazing rest (Hennessey and others 1983), it is unlikely that these former grasslands can be restored to open native conditions. While increases in perennial grass cover may occur (Valone and others. 2002) at certain sites based upon soil type, erosion and shrub species composition, it is unlikely that these sites will accumulate sufficient fine fuels to carry a fire intense enough to reduce shrub cover.

The spread of non-native perennial grasses has substantially reduced the occurrence of native grasslands in Arizona. Statewide, non-native grasslands comprise 9% of current grasslands, primarily due to the spread of Boer lovegrass (*Eragrostis chlorodelas*) and Lehmann lovegrass (*Eragrostis lehmanniana*) in southeastern Arizona. Over 157,000 acres (20.8% of all Coronado grasslands) of non-native grasslands occur on the Coronado. This conversion to dominance by non-native species can result in significant negative impacts to grassland-dependent organisms. Bock and others (1986), for example, documented that 26 species including plants, birds, rodents, and grasshoppers, were less abundant in grasslands dominated by lovegrasses compared to native grasslands.

Riparian and Aquatic Species and Systems

Riparian forests and woodlands along with other freshwater systems are also an integral part of the biodiversity on the Coronado and throughout Arizona and New Mexico. Although the area represented by riparian forests and woodlands on the Coronado National Forest appears small (0.5% of the Forest) it represents 16% of riparian forests and woodlands on Region 3 lands. Like other systems on the Coronado, riparian and freshwater systems in the Southwest have experienced significant losses and degradation (Arizona State Parks 1988). Much of this has been attributed to human practices such as livestock grazing, logging, road construction, and diversions of water channels. These activities have resulted in stream bank erosion, loss of native species, proliferations of non-native species and loss of organisms that depend upon riparian habitats (Brookshire and others 1996).

Analysis of the Arizona Freshwater Assessment showed that ten species of native fishes currently occupy 54.9% of the available perennial stream habitat on the Coronado. Three of these species are unique to the Coronado within Region 3. Overall the number of native fish species with occurrences on stream reaches on the Coronado ranges from one to four species, with over half of these reaches having occurrences of two or more species. Based on Olden and Poff (2005) and the comparison of current native fish distributions to contemporary occurrence information in the Freshwater Assessment, it is evident that native fish distributions within the Lower Colorado watershed and throughout the Southwest are dynamic, with the distribution of

most native fishes declining. Interestingly, Olden and Poff (2005) found a significant relationship between distributional declines and probability of local extirpation for native fish species. Five (Gila topminnow, Apache trout, speckled dace, gila chub, and desert sucker) of seven native fish species on the Coronado addressed by Olden and Poff (2005) were determined to have declining distributions. The decline in populations throughout the lower Colorado watershed for these five species suggest an increased probability of expiration from the Forest. The Freshwater Assessment clearly identifies areas on the Coronado with occurrences of these native fish. Within a forest planning context, it may be important to consider the uses and activities that occur within these areas to assess their compatibility with maintaining the distribution and populations of native fish on the Coronado.

Many aquatic and riparian conservation targets were also identified on the Coronado by the ecoregional assessments conducted in Region 3, representing over one-third of all targets on the Coronado. As is the case generally with conservation targets on the Coronado, this suite of aquatic and riparian targets is relatively distinct from those found on other National Forests. A major goal of ecoregional assessments is to determine the magnitude and distribution of areas on the landscape necessary to maintain the biodiversity of the region. These areas are generated independent of geo-political boundaries and provide a perspective on biodiversity conservation at a large scale. From this perspective, these results indicate the Coronado includes an important and distinct component of the aquatic and riparian diversity that exists within Region 3.

Species Richness and Conservation Status

In addition to the native fishes that occur on the Forest, the Coronado is unique among Southwestern Region National Forests due to the rich diversity of plant and terrestrial animal species of sub-tropical or temperate origins. According to the R3 species database, at least 759 terrestrial and aquatic vertebrate species, and plants and invertebrates of conservation concern occur on the Coronado National Forest.

The Coronado is also responsible for managing many of the species of conservation concern on Region 3 Forests. For example, the Coronado manages for 21 federally endangered, threatened, candidate or proposed species. Furthermore, the Coronado manages 110 species with special state conservation status; 202 species with NatureServe global rankings that warrant conservation concern; 186 potential species-of-concern; 182 potential species-of-interest; 41 bird species on the Partners in Flight Watch List; and 42 Birds of Conservation Concern.

A large proportion of the Coronado overlaps with conservation areas identified within ecoregional assessments, including significant portions of all five ranger districts. Just as importantly, a majority of many of the conservation areas falls within the Coronado. For its size, the Coronado has the opportunity to affect a disproportionate number of conservation targets within the Southwest. Over 35% of targets that occur on Region 3 lands occur on the Coronado. More importantly, the suite of conservation targets that occur on the Coronado is distinct from that of other National Forests. For instance, over 65% of these targets on the Coronado do not occur anywhere else in Region 3 and nearly a quarter of conservation targets on Forest lands in Region 3 occur only on the Coronado. From the large-scale perspective provided by the ecoregional assessments, this distinct suite of targets demonstrates the unique combinations of

species, systems, and ecological functions that exist on the Coronado. The specific locations where conservation areas overlap the Coronado describe 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 Coronado for sustaining this distinct suite of species, ecological systems, and biological process that exist on the Coronado National Forest.

Relevance to Forest Planning

This analysis of existing regional assessment information identifies important biological and ecological characteristics of the Coronado 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 regulation, both in terms of ecosystem and species diversity. It may be also be useful in understanding the current condition of ecological resources on the Coronado, identifying ecological characteristics that may be useful in defining desired future conditions, and identifying changes in management necessary to sustain biodiversity. For example, the analysis of ecosystem data demonstrates the variety of systems that occur on the Coronado, and identifies several systems (and their associated species diversity) for which the Coronado has disproportionate responsibility within the context of Region 3, such as the Madrean encinal woodlands. This analysis also demonstrates the importance of grasslands as a system that supports substantial diversity on the Coronado. According to the Arizona Grasslands Assessment, the Coronado has over one-third of the grasslands on National Forests in Arizona, including the largest contiguous stand of open native grasslands within Arizona National Forests. The maintenance of these open native grassland areas, including the ecological functions that support them, may serve as a starting point for developing desired conditions that incorporate the ecosystem and species diversity components of sustainability.

Along with ecosystems, these results demonstrate the diversity of species that occur on the Coronado. The identification of a large suite of potential species-of-concern and species-of-interest suggests that there are many species whose viability may need to be addressed beyond just providing for healthy ecosystems. The specific needs of these species, as well as their distribution at National Forest and regional scales, may need to be considered to sustain them.

Ecoregional assessments provide a strategic, regional perspective on maintaining biodiversity at large, ecoregional 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 its boundaries.

Within the forest planning context, it may be useful to evaluate currently allowable land uses and activities within conservation areas and determine associated impacts to biodiversity. A synthesis of conservation area overlap with current Management Areas and areas with special designations (e.g. wilderness areas, research natural areas) on the Coronado demonstrates the

wide variety of current management emphases and activities that occur within conservation areas. While the largest proportion of conservation area overlap falls on areas with no special designations, significant areas of wilderness and roadless areas also occur. Interestingly, nearly two-thirds of conservation area overlap occurs within Management Area 4, a multiple use management area that emphasizes sustained harvest of forage and fuel wood, along with consideration for game and non-game wildlife habitats, visual quality, and cultural resources. It is apparent that achieving biodiversity sustainability on the Coronado cannot be accomplished entirely within existing designated special areas, and must be accomplished within the varied uses and activities that occur on the Forest. In addition, for forest planning purposes, it may be useful to determine the compatibility of forest management and uses within conservation areas with desired biodiversity goals, and identify changes that may be needed to achieve sustainability within these 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 systems, and ecological 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 uses or activities in these areas.

For example, the Dragoon Mountains conservation area encompasses 25,900 acres, of which approximately 24,200 acres overlap the Douglas district of the Coronado National Forest. Approximately one-third of this conservation area is roadless area, while the rest has no special designations. Approximately 20,700 acres (85.6%) of the conservation area is within Management Area 4 (Livestock Grazing (Level D), Game Habitat and Fuel wood Harvest), 3000 acres (12.4%) are in Management Area 1 (Visual Resources and Semi-Primitive Dispersed Recreation), with the remainder in Management Areas 3 (Dispersed Recreation) and 7 (Unique Resources, including Riparian Areas).

Sixteen conservation targets, including four ecological systems and 12 species (Table 4-17), are associated with the Dragoon 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 condition of the ecological system targets within the conservation area relative to historic range of variability and, if necessary, 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 activities can be assessed. For example, several common threats facing targets within the Dragoon Mountains conservation area include human disturbance (e.g. bat roosting areas, peregrine falcon nest sites), livestock grazing (e.g. overgrazing of scaled quail habitat, trampling of riparian/aquatic areas), and invasive species (e.g. lovegrasses). It may be useful to evaluate current designations and management prescriptions within the conservation area and if necessary, identify changes in allowed activities

or uses that may reduce or mitigate these threats.

Table 4-17. Conservation targets (n=16) associated with the Dragoon Mountains conservation area in Arizona.

Taxonomic Group	Scientific Name	Common Name	Global Rank	ESA Status
Ecological system		Apachean Grassland and Savanna Condition Class D Chihuahuan Desert Scrub Madrean Encinal Madrean Oak-Pine Woodland		
Amphibian	<i>Rana chiricahuensis</i>	Chiricahua leopard frog	G3	LT
Bird	<i>Callipepla squamata</i>	Scaled quail	G5	
	<i>Falco peregrinus anatum</i>	American peregrine falcon	G3	
	<i>Leptonycteris curasoae</i>	Lesser long-nosed bat	G3	LE
Mammal	<i>Myotis thysanodes</i>	Fringed myotis	G4	
	<i>Plecotus townsendii pallescens</i>	Pale Townsend's big eared bat	G4	
	<i>Ursus americanus</i>	Black bear	G5	
Vascular plant	<i>Carex ultra</i>	Arizona giant sedge	G3	
	<i>Graptopetalum bartramii</i>	Batram stonecrop	G3	
	<i>Hedeoma dentatum</i>	Mock pennyroyal	G3	
	<i>Lupinus Lemmonii</i>	Lemmon's lupine	G1	
	<i>Penstemon discolor</i>	Catalina beardtongue	G2	

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