Chapter 1:

Introduction

In

Ecological and Biological Diversity of National Forests in Region 3

Bruce Vander Lee, Ruth Smith, and Joanna Bate
The Nature Conservancy

EXECUTIVE SUMMARY

We summarized existing regional-scale biological and ecological assessment information from Arizona and New Mexico for use in the development of Forest Plans for the eleven National Forests in USDA Forest Service Region 3 (Region 3). Under the current Planning Rule, Forest Plans are to be strategic documents focusing on ecological, economic, and social sustainability. In addition, Region 3 has identified restoration of the functionality of fire-adapted systems as a central priority to address forest health issues. Assessments were selected for inclusion in this report based on (1) relevance to Forest Planning needs with emphasis on the need to address ecosystem diversity and ecological sustainability, (2) suitability to address restoration of Region 3's major vegetation systems, and (3) suitability to address ecological conditions at regional scales.

We identified five assessments that addressed the distribution and current condition of ecological and biological diversity within Region 3. We summarized each of these assessments to highlight important ecological resources that exist on National Forests in Arizona and New Mexico:

- Extent and distribution of potential natural vegetation types in Arizona and New Mexico
- Distribution and condition of low-elevation grasslands in Arizona
- Distribution of stream reaches with native fish occurrences in Arizona
- Species richness and conservation status attributes for all species on National Forests in Arizona and New Mexico
- Identification of priority areas for biodiversity conservation from Ecoregional Assessments from Arizona and New Mexico

Analyses of available assessments were completed across all management jurisdictions for Arizona and New Mexico, providing a regional context to illustrate the biological and ecological importance of National Forests in Region 3. For example, we identified several ecologically important potential natural vegetation types that occur predominately on Region 3 National Forests – ponderosa pine forest, Madrean encinal woodland, interior chaparral, and mixed conifer forest (Chapter 3). Understanding the regional context of the biological and ecological resources managed by Region 3 – both the distribution and condition of those resources – is a necessary pre-requisite to the identification of management strategies that would enable Region 3 to attain ecosystem diversity and ecological sustainability goals. Moreover, multiple land managers share management responsibility for some of the same resources across Arizona and New Mexico; regional data and syntheses provide a starting point for identifying areas where collaborative restoration would be feasible and an effective means of addressing land health issues that span jurisdictional boundaries.

Syntheses of several other assessments illustrate the importance of National Forests within Arizona. For example, based on an assessment of native fish habitat, headwater streams in Region 3 National Forests contain more native fish habitat with higher levels of species richness than streams managed by any other landowner. Our analysis also identified stream reaches on each National Forest that might appropriately be managed to

maintain native fishes based on contemporary occurrences. Based on the Arizona Grasslands Assessment, we summarized the distribution and condition of low-elevation grasslands (5,000 ft. and below) on National Forests in Arizona. As a statewide assessment, it provides valuable context for identifying appropriate grassland management strategies, as some of the best native-dominated grasslands remaining in Arizona overlap National Forests. The assessment also identifies areas where grassland restoration is most feasible. The Forest Plan revision process provides an important opportunity to develop strategies that will maintain grasslands in good condition or enhance those in need of restoration to maximize Region 3's ability to meet sustainability goals for this important regional ecosystem type.

As with vegetation systems, it is important to address species sustainability at appropriate scales. We aggregated existing information on species occurrences on each Region 3 National Forest to develop a regional database with consistent attributes that are useful in addressing species diversity and conservation needs within Forest Plans. The database can be used to quickly identify potential species of management concern for each Forest. Importantly, the database can also be used to distinguish species that might appropriately be considered at multi-forest scales for planning, management, and monitoring activities.

Ecoregional conservation assessments provide an important starting point for evaluating overall ecosystem diversity and ecological sustainability. These large-landscape assessments synthesize numerous datasets and identify a network of areas that are vital to the sustainability of biodiversity in the region. Our analysis of ecoregional assessment information demonstrated significant overlap between the network and National Forest lands in Arizona and New Mexico, demonstrating the important role Region 3 Forests play in maintaining the region's biological diversity. The assessments also point to priority geographies on National Forest lands where the role of natural disturbance processes in maintaining ecosystem diversity, and the compatibility of land management activities and land-use allocations, should be evaluated to maximize options for attaining ecological sustainability goals.

The assessments analyzed in this report provide basic information on the status and distribution of ecosystems and species that occur throughout Region 3 Forests. The data provide a starting point for understanding the range of biological and ecological elements that would need to be addressed during the Forest Plan revision process. Regional-scale assessment information provides a context for understanding the role USFS plays in managing regional-scale resources and how proposed management strategies will affect the balance of those resources both on USFS lands and the region as a whole.

Acknowledgments

We would like to thank the following people for their assistance in reviewing and/or developing the Ecological and Biological Diversity Reports:

- Wayne Robbie, Bryce Rickell, Amy Unthank, Ron Maes, Charlie McDonald, Rueban Weisz, Ernie Taylor, and several anonymous reviewers from the U.S. Forest Service Region 3 Office

- Jennifer Ruyle, Tom Skinner, Larry Jones, Gary Helbing, Glenn Frederick, Anne Casey from the Coronado National Forest

- Susan Bruin, Beverly DeGruyter, Dan Garcia de la Cadena, Bryan Hajny, Chuck Milner, David Heft, Alan Warren, Rick Newmon, and Hart Schwartz from the Cibola National Forest and Grasslands

- Bruce Higgins and Bill Noble from the Kaibab National Forest

- Jerry Ward, Mitchel R. White, and Cathy Taylor From the Apache-Sitgreaves National Forests

- Katherine Farr, Mike Manthei, Carol Boyd, Rory Steinke, Russ Copp, Cecelia Overby, Barbara Phillips, and Heather Green from the Coconino National Forest

- Maximillian Wahlberg, Maximillian Wahlberg, and Noel Fletcher from the Prescott National Forest

- Art Telles from the Gila National Forest

- Bill Britton and Esther Nelson from the Santa Fe National Forest

- Chirre Keckler from the Carson National Forest

- Danney Salas, Larry Paul, and Larry Cordova from the Lincoln National Forest

- Richard Holthausen from the U.S. Forest Service Washington Office

- Marilyn Myers from U.S. Fish and Wildlife Service

- Rob Marshall, Patrick McCarthy, Bill Ulfelder, Gary Bell, Dave Gori, Heather Schussman, Ed Smith, Bob Dale, Mike List, Dale Turner, Reese Lolley, and Carrie Enquist of The Nature Conservancy

Introduction

The 11 National Forests of the U.S. Forest Service (USFS) Southwestern Region (Region 3) will begin revising their Forest Management Plans (forest plans) in the near future. The new National Forest Management Act (NFMA) planning regulations [published in the *Federal Register* on 5 January 2005 (70 Fed. Reg. 1023)] that will be used in the revision of forest plans within Region 3 emphasize the importance of ecological, social, and economic sustainability as the overall goal in forest planning. Forest plans will be strategic in nature and will describe desired future conditions for ecological, social, and economic components. A central focus of the ecological sustainability component is restoring and maintaining ecosystem health (structure and function) as a means to maintain the plant and animal communities that depend on them. Additionally, the planning regulations provide a framework for maintaining species diversity by identifying and developing provisions for species whose continued existence may be of concern. In addition to the planning regulations, Region 3 has identified strategic priorities for forest plans. A central priority is the restoration of the ecological functionality of southwestern forests and rangelands, with a primary focus on the functionality of fire-adapted systems.

A key need within the plan revision process is the availability of timely and relevant scientific information on the ecosystems, biological processes, and species that occur on Region 3 Forests. In preparation for this, Region 3 developed a *Strategic Approach to Meet Regional Priorities and Prepare for Forest Plan Revisions* that identified tools, techniques and information "to conduct analyses needed to support the regional and national central priority of restoring the functionality of fire-adapted systems," and to revise forest plans. In 2004, The Nature Conservancy entered into a cost-share agreement with Region 3 to conduct ecological analyses and gather pertinent scientific information relating to the needs identified by Region 3. This collaborative project aims to prepare relevant scientific background information relating to three primary objectives:

1. **Assessment of Assessments**, a review of information developed since creation of the previous Land and Resource Management Plans that will enable the Forest Service to satisfy information standards established under new planning regulations and to ensure that the best available scientific information is integrated into the development of forest plans.

2. **Determining the Historical/Natural Range of Variation** for major vegetation types and the biological diversity they harbor. HRV characterizations provide a baseline for evaluating the short- and long-term effects of natural and anthropogenic disturbances on forest resources. The historical range of variation in disturbance regimes, and climatic effects on those regimes, is the foundation for developing models of vegetative change.

3. **Developing Models of Vegetation Change** for major southwestern vegetation types. Development of ecological models for vegetation types will enable the Forest Service to evaluate management activities and better incorporate the role of ecological processes in forest management.

This report provides a summary and analysis of existing, relevant ecological assessments (Objective 1) pertinent to forest plans in Region 3. In order to provide consistent information

across Region 3, a priority has been placed on identifying and analyzing assessments conducted at large spatial scales, such as state or regional levels. Also, the assessments included in this report are directly related to the ecosystem health, functionality, and species diversity objectives in the planning regulations and Region 3's strategic priorities. Assessments relating to the following types of information relevant to forest planning needs are included:

- 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 on Region 3 Forests
- Conservation areas and targets associated with Ecoregional Assessments

Details about the specific assessments used for analyses are provided in Chapter 2 (Methods).

A primary focus of this report is to identify the important biological values that occur on National Forests in Region 3. This information may be useful as part of 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 due to continuing threats to their existence.

Because understanding ecosystem structure and functions, as well as species diversity, requires information at several scales, this report provides analysis of assessment information at two scales. Chapter 3 provides a detailed analysis of the assessments across major landowners within Region 3, as well as comparisons amongst individual National Forests. Chapters 4 -15 provide a detailed analysis of the assessment information for each National Forest in Region 3 (National Grasslands on the Cibola National Forest are considered in a separate chapter).

Chapter 2:

Methods

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Introduction

This report utilizes existing ecological assessment information to identify and summarize important biological values that exist on the 11 U.S. Forest Service (USFS) Southwestern Region (Region 3) National Forests. The individual assessments analyzed in this report were included based on their geographic scale and relevance to the development of forest plans. Assessments conducted at broad geographic scales (regional or state level) and across multiple or all National Forests were included to provide as consistent information as possible for each National Forest. Additionally, we included assessments that were closely associated with the ecological sustainability (ecosystem and species diversity) focus of the National Forest Management Act (NFMA) planning regulation, and Region 3's central priority of restoring the functionality of fire-adapted systems. Descriptions of each assessment analyzed in this report, including a summary of its content, the methods used to create it, its geographic scale, and specific details regarding its analysis are provided below.

In general, the ecological information within each assessment was characterized by major landowners across Region 3 (see Chapter 3; including all of New Mexico and Arizona), as well as for each National Forest within Region 3 (see Chapters 4-15; Grasslands of the Cibola National Forest are considered in a separate chapter). For these analyses, the following two geographic information systems (GIS) data layers were utilized in addition to the assessment data:

1. A land ownership layer developed using data from the Arizona Land Resource Information Service (ALRIS; http://www.land.state.az.us/alris/index.html) and the New Mexico Resource Geographic Information System Program (RGIS; http://rgis.unm.edu/). ALRIS and RGIS data layers were edge-matched using topological editing procedures and management attributes were cross-walked. Land ownership categories included: US Forest Service, Bureau of Land Management, Department of Defense, National Park Service, Private, State Trust, Tribal, US Fish and Wildlife Service and Other. The 'Other' category included non-federal parks, Valle Calderas National Preserve, county lands, Department of Energy, USDA Research, State Game and Fish, and unnamed areas.

2. National Forest administrative boundaries, including ranger districts.

Due to the occurrence of non-USFS owned lands within the administrative boundaries, the calculation of area or stream lengths relating to National Forest lands may differ between these two scales of analysis. All geo-spatial analyses were conducted using ArcGIS 9.0/9.1 (ESRI; Redlands, CA).

I. Potential Natural Vegetation Types

The distribution of potential natural vegetation types (PNVTs) on Region 3 National Forest lands and across land owners throughout Arizona and New Mexico was analyzed. Potential natural vegetation types are coarse-scale groupings of ecosystem types that share similar geography, vegetation, and historic ecosystem disturbances such as fire, drought, and native herbivory. 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 the forest planning process.

To determine PNVTs for Region 3 Forests and throughout Arizona and New Mexico, geo-spatial vegetation data were obtained from The Southwest Regional Gap Analysis Project (SWReGAP). SWReGAP is a collaborative project covering five states (Arizona, Colorado, Nevada, New Mexico and Utah) coordinated by the U.S. Geological Survey's Gap Analysis Program (GAP; USGS National Gap Analysis Program 2004). Parts of the Oklahoma Gap Analysis Program (OK-GAP; USGS National Gap Analysis Program) and the Texas Gap Analysis Program (TX-GAP; USGS National Gap Analysis Program) data were used to analyze PNVTs on Region 3 National Grasslands in Oklahoma and Texas, respectively.

The geo-referenced spatial dataset of SWReGAP is based on multi-season data acquired from Landsat 7 Enhanced Thematic Mapper 30m satellite imagery, coincident digital elevation models, and extensive field observations. The OK-GAP data are based on Thematic Mapper I imagery from 1991- 1993 and field reconnaissance. For more information regarding OK-GAP refer to the following website: http://www.biosurvey.ou.edu/gap-ok.html. The TX-GAP data is generated from Multi-Resolution Land Characteristics Consortium's hyper-clustered Landsat Thematic Mapper satellite imagery. For more information regarding TX-GAP see the final report at ftp://ftp.gap.uidaho.edu/products/Texas/report/TX_GAPReport.pdf.

Land cover (vegetation) types from SWReGAP, OK-GAP, and TX-GAP data were modeled and/or interpreted by each state team and described as ecological systems or map classes as developed by NatureServe. (For information on NatureServe and ecological systems see http://www.natureserve.org. For information on the SWReGAP map classes see http://earth.gis.usu.edu/swgap/legend_desc.html.) Ecological systems are based on ecological and geographical groupings of vegetation associations as defined by the National Vegetation Classification System (http://biology.usgs.gov/npsveg/nvcs.html).

A total of 135 ecological system types were identified from the SWReGAP, OK-GAP, and TX-GAP for all of Arizona, New Mexico, and the Region 3 National Grasslands in Oklahoma and Texas. These ecosystem types were then aggregated and cross-walked to 30 PNVTs identified by The Nature Conservancy (TNC) ecologists. A cross-walk between these ecosystem types and TNC-designated PNVTs can be found in Appendix 2-A. In addition, descriptions of each PNVT can be found in Appendix 2-B.

It should be noted that SWReGAP data have not been accuracy tested, and some errors with this dataset are known. Therefore, these inaccuracies may be compounded by our ecosystem type grouping and cross-walk process. However, this cross-walk allows for a comprehensive look at

PNVTs across the southwest region and hence, is a valuable tool for comparing PNVTs of Region 3 Forests and other landowners within Arizona and New Mexico. Also, it should be noted that SWReGAP, OK-GAP, and TX-GAP data may not be appropriate for use at fine spatial scales.

Other data sources considered for these analyses but not utilized include: Brown, Lowe, and Pase (1980); USFS General Ecosystem Survey; USFS Terrestrial Ecosystem Survey; and the USFS Region 3 mid-scale vegetation maps currently being developed. Data from Brown, Lowe, and Pase (1980) and the General Ecosystem Survey were deemed too coarse in scale for these analyses. The USFS Terrestrial Ecosystem Survey data and USFS Region 3 mid-scale vegetation maps were not completed at the time of this project for all Region 3 National Forests, and were therefore not utilized. Furthermore, data from the General Ecosystem Survey, Terrestrial Ecosystem Survey, and mid-scale vegetation maps do not extend beyond Forest Service boundaries and were therefore not available for comparisons between PNVTs of Region 3 Forests and other landowners in Arizona and New Mexico.

Total area and distribution of PNVTs were calculated for each Region 3 National Forest and compared amongst other Region 3 Forest and to other landowners in Arizona and New Mexico using the land ownership layer for Region 3 described above.

II. Distribution and Condition of Grasslands

The Arizona Statewide Grassland Assessment (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 that exist across land ownerships and on each National Forest within Arizona. This statewide assessment (which also includes the portions of southwest New Mexico and Mexico that are within the Apache-Highlands Ecoregion; Figure 2-1) 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).

The Arizona Grasslands Assessment was limited to low-elevation grasslands (< 5000 ft.), and so does not address all grasslands (particularly montane grasslands) that exist within Arizona. Also, approximately 32% of grasslands within the state, predominately on Native American Trust Lands, were not assigned to a condition type. Therefore, these areas were excluded from all percentage calculations associated with relative abundance of grassland classes. In addition, this analysis only includes portions of the grassland assessment in Arizona and New Mexico and does not include the Mexican portion of the assessment. Due to differences in the approach and scale used to classify vegetation, the distribution and extent of grasslands identified by the grassland assessment likely vary from other vegetation assessment and mapping projects, such as the SWReGAP. Comparable data were not available for most of New Mexico.

Detailed descriptions of the grassland categories that exist in Arizona and New Mexico (i.e. desert, Great Basin, Colorado Plateau, Plains, and Montane grasslands), their ecology, and general changes from historic conditions were provided by Finch (2004). This resource provides valuable information for understanding the changes in grassland structure and function documented in the Arizona Grassland Assessment.

In Chapter 3, the Arizona Grasslands GIS-based layer (available at http://www.azconservation.org) was used, along with the land ownership layer (described above), to identify the distribution and condition of grasslands amongst major landowners and each National Forest in Arizona. In Chapters 4-15, the grasslands layer was overlaid on the administrative boundaries for each National Forest to identify the location and extent of grasslands of varying condition types amongst ranger districts.

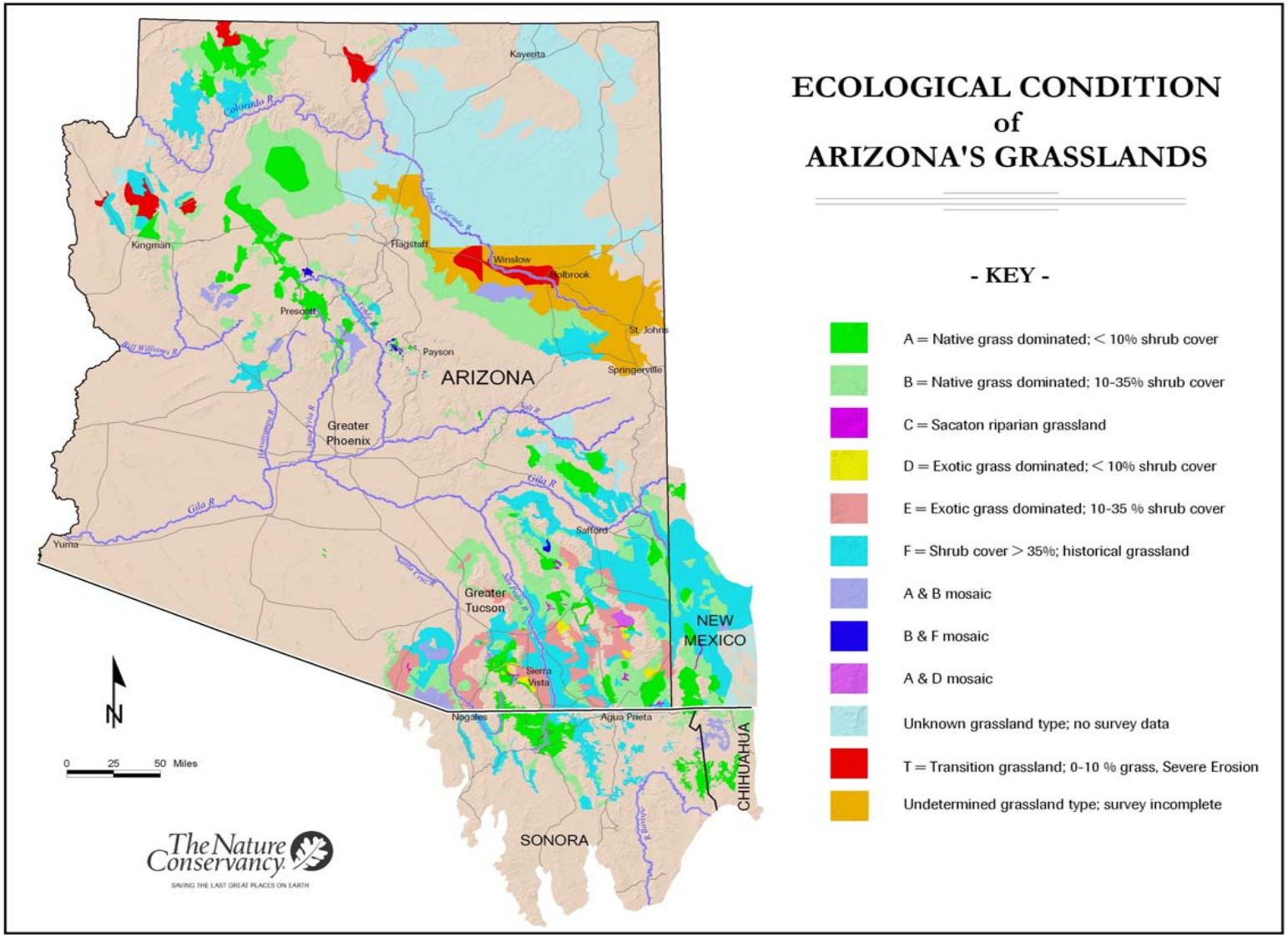

Figure 2-1. The Arizona Statewide Grasslands Assessment (Schussman and Gori 2004, Gori and Enquist 2003) GIS-based layer depicts the condition of grasslands across Arizona, as well as parts of southwest New Mexico and north central Mexico that occur within the Apache Highlands Ecoregion.

Table 2-1. Grassland types identified in the Arizona Grasslands Assessment (Schussman and Gori 2004, Gori and Enquist 2003) based on native/non-native perennial grass dominance and cover, shrub cover, and soil erosion severity.

Grassland Type	Description
Open Native Grassland	A grassland with <10% shrub cover and herbaceous component is predominantly native perennial grasses and herbs.
Restorable (Shrub Invaded) Native Grassland	A grassland with 10-35% total shrub cover and mesquite or juniper cover < 15% whose herbaceous component is predominantly native perennial grasses and herbs.
Non-native Grassland	A grassland with herbaceous component dominated by non-native perennial grasses. Includes both open (<10% shrub cover) and shrub invaded (10-35% total shrub cover of mesquite and juniper cover > 15%) grassland types.
Former Grasslands	A grassland that has been converted to shrub land, with > 15% canopy cover of mesquite and juniper and/or > 35% total shrub cover, and little or no perennial grass cover.
Transition Grasslands	A grassland with <5% canopy cover of perennial grasses and/or severe soil erosion problems.

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 fish occurrences across major landowners and National Forests in Arizona. This assessment was developed for use in regional planning and includes occurrence information for 33 native fish species (Table 2-2) in streams across all of Arizona. Point localities for each species from 1975 and later were obtained from a variety of sources, including the Arizona Game and Fish Department's (AGFD) Heritage Data Management System, the SONFISHES database (Fagan and others 2002), US Fish and Wildlife Service (Sponholtz and others 2003), U.S. Forest Service, and the AGFD native fish program. For each species, these point localities were mapped to perennial stream reaches on a 1:100,000 scale linear hydrography layer for Arizona to approximate the extent of occupied habitat. This process accounted for biologically significant breaks in stream continuity, including dams and ephemeral reaches. Additionally, the assessment integrated the distributions for all 33 native fishes into a single geo-spatial data layer that represents the number of native fish with occurrences on stream reaches across Arizona. While this analysis currently includes only Arizona (including the Kaibab, Coconino, Prescott, Tonta, Apache-Sitegreaves National Forests, and the Coronado National Forest in Arizona), a similar data set for New Mexico is currently being developed and results from that analysis may be incorporated into this document .

In Chapter 3, this geo-spatial data was overlaid on landownership information from the Arizona Land Resource Information Service and the New Mexico Resource Geographic Information system (see description above) to determine the distribution (number of stream miles) of stream reaches with varying numbers of native fish species occurrences for nine major landowners and six individual National Forests in Arizona. In areas where streams serve as the boundary between landowners for a distance greater than five miles, one-half of the length of that stream reach was attributed to each landowner.

The Freshwater Assessment data was also used, along with a data layer representing the administrative boundaries of each National Forest, to identify and summarize the distribution of each species on stream reaches within each National Forest (Chapters 4-15). It is recognized that at these relatively fine scales, reaches with identified occurrences of various native fish species in the Freshwater Assessment may differ from current native fish distributions. Thus, each National Forest was given the opportunity to review the information in the Freshwater Assessment to identify stream reaches that differed from known current conditions. These differences are addressed and the information is used to demonstrate the types and magnitude of changes in native fish distributions that have occurred on National Forests within the last 30 years. In addition, information from Olden and Poff (2005) was used, where applicable, to characterize the long-term changes in distributions for native fish that occur on National Forest lands. It is important to note that the stream mile lengths for these analyses, based on Forest boundaries, differ from those presented in Chapter 3, which are based on land ownership information.

Table 2-2. Common names, scientific names, and status under the Endangered Species Act (ESA) for 33 native fishes included in the Arizona State-wide Freshwater Assessment (Turner and List, *In Prep).*

Common Name	Scientific Name	ESA Status[A]
Longfin Dace	*Agosia chrysogaster*	SC
Mexican Stoneroller	*Campostoma ornatum*	SC
Desert Sucker	*Catostomus clarki*	SC
Bluehead Sucker	*Catostomus discobolus*	
Sonora Sucker	*Catostomus insignis*	SC
Flannelmouth Sucker	*Catostomus latipinnis*	SC
Little Colorado Sucker	*Catostomus sp.*	
Zuni Mountain Sucker	*Catostomus yarrowi*	
Beautiful Shiner	*Cyprinella formosa*	LT
Desert Pupfish	*Cyprinodon macularius*	LE
Machete (Pacific Tenpounder)	*Elops Affinis*	
Humpback Chub	*Gila cypha*	LE
Sonora Chub	*Gila ditaenia*	LT
Bonytail Chub	*Gila elegans*	LE
Gila Chub	*Gila intermedia*	PE
Headwater Chub	*Gila nigra*	
Yaqui Chub	*Gila purpurea*	LE
Roundtail Chub	*Gila robusta*	PS
Virgin River Chub	*Gila seminuda*	LE
Yaqui Catfish	*Ictalurus pricei*	LT
Virgin Spinedace	*Lepidomeda mollispinis mollispinis*	PS
Little Colorado Spinedace	*Lepidomeda vittata*	LT
Spikedace	*Meda fulgida*	LT
Striped Mullet	*Mugil Cephalus*	
Apache (Arizona) Trout	*Oncorhynchus apache*	LT
Gila Trout	*Oncorhynchus gilae*	LE
Woundfin	*Plagopterus argentissimus*	LE
Gila Topminnow	*Poeciliopsis occidentalis occidentalis*	LE
Yaqui Topminnow	*Poeciliopsis occidentalis sonoriensis*	LE
Colorado Pikeminnow	*Ptychocheilus lucius*	LE
Speckled Dace	*Rhinichthys osculus*	PS
Loach Minnow	*Tiaroga cobitis*	LT
Razorback Sucker	*Xyrauchen texanus*	LE

[A]C = Candidate, LE = Listed Endangered, LT = Listed Threatened, SC= Species of Concern, PS = Partial Status

IV. Plant and Animal Species Richness

The R3 Species Database was used to examine the plant and animal species richness on each Region 3 Forest and the conservation status of these species. The R3 Species Database was developed collaboratively by Region 3 staff, species experts, and The Nature Conservancy to address information needs associated with forest plan revisions. It was compiled from several Regional and Forest level datasets into one database that consists of updated and consistent information across taxa regarding state, federal, non-government, and USFS conservation statuses, and identifies the National Forest(s) a species inhabits. The R3 Species Database incorporates information on all terrestrial and aquatic vertebrates that are known to inhabit Region 3 National Forests. It also includes known crustacean, clam, insect, plant and snail species that are of conservation concern. Table 2-3 lists the taxonomic groups and species' attributes included in the R3 Species Database. More information regarding the R3 Species Database can be found at http://www.azconservation.org.

Table 2-3. List of taxa and species' attributes included in the R3 Species Database. The R3 Species Database includes all amphibian, bird, fish, mammal, and reptile species that are known to occur on Region 3 National Forest Service lands, and species of conservation concern for crustaceans, clams, insects, plants and snails.

Taxa Included in R3 Species Database	**The R3 Species Database Fields**
• Amphibian • Bird • Crustacean • Clam • Fish • Insect • Mammal • Plant • Reptile • Snail	• General Taxonomic Group • NatureServe Unique Identifier Number • NatureServe Scientific Name • Synonyms • NatureServe Common Name • Other Common Names • NatureServe Global Conservation Status (G-rank) • NatureServe Subnational Conservation Status (S-rank) for Arizona • NatureServe Subnational Conservation Status (S-rank) for New Mexico • NatureServe Subnational Conservation Status (S-rank) for Oklahoma • NatureServe Subnational Conservation Status (S-rank) for Texas • Federal Listing Status under Endangered Species Act • Arizona State Status (Arizona Native Plant Law 1983, Wildlife of Special Concern in Arizona 1996) • New Mexico State Status under Wildlife Conservation Act (1978) and Endangered Plant Species Act (1985) • Oklahoma State Status of Threatened, Endangered and Species of Special Concern • Texas State Status of threatened fish and wildlife • U.S. Forest Service Region 3 Sensitive Species (Updated 2000) • U.S. Forest Service Region 3 Proposed Sensitive Species (2005) • U.S. Fish and Wildlife Service Birds of Conservation Concern • Partners in Flight Watch List • Species Occurrence on each National Forest in Region 3

Conservation status information for the R3 Species Database was gathered from USFS data as well as from NatureServe, U.S. Fish and Wildlife Service, Arizona Game and Fish Department, New Mexico Department of Game and Fish, Oklahoma Department of Wildlife and Conservation, Texas Parks and Wildlife Department, and Partners in Flight. It is important to note that nomenclature (NatureServe is the standard used in the database) and conservation statuses can change over time. Data regarding species presence by National Forest were based on datasets maintained by USFS personnel and were reviewed by biologists and other resource staff on each Region 3 Forest. Because the accuracy of these data is dependent upon the quality of the source datasets and the review by a limited number of personnel in each Forest, data gaps may exist in the R3 Species Database.

Because the R3 Species Database was developed specifically for Region 3 National Forests, it was not possible to summarize species information across landowners for Chapter 3. However, information in the R3 Species Database was used to summarize plant and animal information for each Region 3 Forest and National Grasslands in Chapters 4-15. Additionally, the species that occur on each forest, along with the associated conservation status attributes, were included as an appendix within each individual Forest chapter.

Species Richness — Occurrence information from the R3 Species Database was used to identify the numbers of species, by taxon, that occur on each National Forest.

Federally listed threatened, endangered, and candidate species — Under the Endangered Species Act (1973) the U.S. Fish and Wildlife Service designates a suite of species as federally threatened or endangered. Also of importance are those species that are currently being considered for the status of threatened or endangered (including candidate or proposed species). The R3 Species Database was used to determine the federally listed endangered, threatened, candidate or proposed species (status determined as of 1 May 2005) that inhabit each Region 3 National Forest.

Arizona, New Mexico, Oklahoma, and Texas state conservation status — Included in the R3 Species Database are the Arizona, New Mexico, Oklahoma, and Texas state conservation statuses for plant and animal species. The designations for each state are:

- In Arizona, Wildlife of Special Concern (WSC) status may be assigned to species whose occurrence is or may be at risk in the state, as described by the Arizona Game and Fish Department (1996). WSC status does not include plant species. The Arizona Department of Agriculture assigns special state status for plant species under the Arizona Native Plant Law (1993) which includes: highly safeguarded (HS), salvage restricted (SR), export restricted (ER), salvage assessed (SA), and harvest restricted (HR).
- The New Mexico Game and Fish Department designates special state status to both wildlife and plant species as threatened or endangered.
- The Oklahoma Department of Wildlife and Conservation assigns species with the rank of endangered, threatened, or of special concern.
- Texas Parks and Wildlife Department considers fish or wildlife indigenous to Texas endangered if listed on: (1) the United States List of Endangered Native Fish and Wildlife; or (2) the list of fish or wildlife threatened with statewide extinction as filed by the director of the department.

The R3 Species Database was used to identify, by taxon, the numbers of species that have special state conservation status as of 1 May 2005, that occur on each National Forest.

NatureServe global conservation status ranking — The R3 Species Database includes NatureServe global rankings that reflect the conservation status of species from a global perspective. These ranks are primarily based on three biological attributes: the number of species occurrences; the total overall abundance of the species; and the overall size of the geographic range of the species (Natural Heritage New Mexico 2005). Global conservation status rankings are determined by NatureServe based on data provided by Natural Heritage Programs and Conservation Data Centers. The global conservation status rankings are: GX = presumed extinct; GH = possibly extinct; G1 = critically imperiled; G2 = imperiled; G3 = vulnerable; G4 = apparently secure; G5 = secure; GNR = not ranked; GU = unrankable; T = infraspecific taxon (subspecies, race, variety). The numbers of species by taxon occurring on each National Forest and assigned to each global conservation status ranking as of 1 May 2005 were identified.

NatureServe subnational conservation status ranking — The R3 Species Database incorporates NatureServe subnational rankings for Arizona, New Mexico, Oklahoma, and Texas for species that have rankings assigned to them. The NatureServe subnational conservation status ranking reflects the conservation status of a species from a local perspective, characterizing the relative rarity or risk of a species' population within each state. Rankings are based on the estimated or actual number of extant occurrences of the species within a state and other aspects such as threats, trends and abundance (Natural Heritage New Mexico 2005). The subnational conservation status rankings are: SX = presumed extirpated; SH = possibly extirpated; S1 = critically imperiled; S2 = imperiled; S3 = vulnerable; S4 = apparently secure; S5 = secure; SNA = not applicable; SNR = not ranked; SU = unrankable. Some species in the R3 Species Database have a subnational conservation status ranking from one or more states (Arizona, New Mexico, Oklahoma, and Texas), while some species do not have a subnational conservation status ranking from any state. The numbers of species, by taxon, assigned to each subnational conservation status as of 1 May 2005 were identified.

Potential Species-of-Concern — According to the interim directives published in the Federal Register on March 23, 2005 (70 Fed. Reg. 14637), which supplement the NFMA planning regulations (70 Fed. Reg. 1023), each National Forest may consider a category of species called "species-of-concern" as part of the new forest plans. The interim directives suggest determining species-of-concern by their NatureServe Global conservation rank. Any species with a NatureServe global conservation rank of G1, G2, G3, T1, T2, or T3 and not listed as federally endangered or threatened, may be considered a species-of-concern. Federally designated candidate or proposed species may also be considered species-of-concern. The R3 Species Database was used to identify potential species-of-concern for each Region 3 National Forest using the criteria listed above.

Potential Species-of-Interest — Another category of species addressed in the interim directives is species-of-interest. According to the sustainability directive in the Forest Service Handbook (FSH 1909.12 chapter 40) that supplements the new NFMA planning regulations, this category may include state-listed threatened and endangered species; birds on the U.S. Fish and Wildlife

Service's "Birds of Conservation Concern National Priority" list; S1 and S2 ranked species in the NatureServe ranking system; and other species of regional or local concern due to significant threats, declining populations, or rarity (FSH 43.22b). For this analysis, if a National Forest occurs in one state, the state conservation status from that state was considered. If a National Forest occurs in more than one state, species that have special state conservation status in any of those states were included as a potential species-of-interest. Based on these criteria, a suite of potential species-of-interest were identified for each Region 3 National Forest, using information from the R3 Species Database. We did not include 'other species of regional or local concern due to significant threats, declining populations, or rarity' as suggested in the interim directives, due to the subjective nature of this determination. Species listed as federally threatened or endangered, or included in species-of-concern were not included as potential species-of-interest.

Birds of conservation concern — In 2002, the U.S. Fish and Wildlife Service Division of Migratory Bird Management identified 131 bird species and subspecies as Birds of Conservation Concern for those species that were likely to become federally threatened or endangered under the Endangered Species Act if conservation measures were not taken. The R3 Species Database was used to identify the bird species with this designation for each National Forest.

Partners in Flight Watch List — Partners in Flight (PIF), a cooperative effort involving governmental agencies and non-governmental organizations dedicated to the conservation of birds that inhabit terrestrial habitats, developed a Watch List that contains bird species whose populations are thought to be of management concern and are believed to be in need of monitoring. The PIF Watch List consists of three categories of conservation status for bird species, including: species with multiple causes for concern across their entire range; species that are moderately abundant or widespread with declines or high threats; and species with restricted distribution or low population size. For more information about PIF and their Watch List refer to the website at http://www.partnersinflight.org/. The R3 Species Database was used to identify the bird species on the PIF Watch List as of 1 May 2005 for each National Forest.

Accidental species in the R3 Species Database — The R3 Species Database includes several species of birds that are designated as occurring on one or more Region 3 National Forest, but are considered 'accidental' according to The Sibley Guide to Birds (2001) and NatureServe Explorer (http://www.natureserve.org/explorer/). Accidental species are those thought to be out of their normal distributional range for the species' known over-wintering or breeding grounds, or migratory path. Because it is unlikely that more than a few individuals of these species occur on a National Forest at any given time, analyses in this report did not include accidental species.

Extirpated Species – Species that are known to be extirpated on individual Forests are not included in the R3 Species Database, but are identified in the individual Forest chapters. This information is based on species experts, forest biologists, scientific literature and wildlife databases that include NatureServe Explorer (http://www.natureserve.org/explorer/) and Biota Information System of New Mexico (http://fwie.fw.vt.edu/states/nm.htm).

V. Ecoregional Assessment Conservation Areas and Conservation Targets

The results of eight ecoregional assessments (Bell and others 1999, 2004 Marshall and others 2000, 2004, Neely and others 2001, The Nature Conservancy 2001, 2005, Tuhy 2002) were used to identify the extent and distribution of conservation areas across land ownerships in Arizona and New Mexico. 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.

Ecoregions are large, contiguous units of land or water defined by ecological and environmental elements, rather than geo-political boundaries, and typically contains geographically distinct assemblages of species, natural communities, and environmental conditions. Because ecoregions typically include large proportions of ecosystem, community, and species distributions, they are useful for conservation planning. Ecoregional assessments rely on a comprehensive scientific analysis to identify conservation areas sufficient in size and distribution to maintain the biological diversity of the entire ecoregion. As an initial step, assessments identify conservation targets, a subset of organisms and ecological systems that comprehensively represent the ecoregion's biological diversity. Targets include ecological systems, typically represented by plant communities and supporting ecological processes, and a broad range of species representing major taxonomic groups, which often serve as surrogates for other species. For each conservation target, a conservation goal is determined that defines the number, spatial distribution, and spatial extent of viable occurrences of the target necessary to maintain its existence. An iterative process relying on computer software and expert review was used to identify a suite of areas that most efficiently meet the conservation goals for all conservation targets within the ecoregion. These conservation areas, collectively called a conservation portfolio, represent the most current and scientifically robust hypotheses on the magnitude and distribution of areas on the landscape necessary to protect the biodiversity of the region.

In general, ecoregional assessments serve several conservation, management and scientific purposes, including:

1. A spatial hypothesis on how to maximize the viability of a region's native species and ecological systems.
2. A spatial delineation of the areas where land-uses and land management activities should be evaluated to identify and minimize potential adverse effects to the viability of species and ecological systems.
3. A spatial delineation of priority areas that land managers and others interested in promoting conservation should evaluate first to ensure that disturbance processes that perpetuate native ecological systems (e.g., fire, flooding) are maintained at a scale, frequency, and intensity that falls within the historical range of variation.
4. A network of cross-jurisdictional priorities that could serve as a basis for collaboration and the use of limited resources to maximize conservation values.

While nine ecoregional assessments overlap Arizona and New Mexico (Figure 2-2), information from eight ecoregions was synthesized as part of this analysis. The Central Shortgrass Prairie Ecoregional Assessment (The Nature Conservancy 1998), which overlaps a small portion of

northeast New Mexico (not including any National Forest lands), was not included in this analysis. As part of a regional data rollup effort, The Nature Conservancy merged conservation area information from six individual assessments (Apache Highlands, Arizona-New Mexico Mountains, Colorado Plateau, Mojave Desert, Sonoran Desert, and the Southern Rocky Mountains) into a single regional geo-spatial data layer (http://www.azconservation.org). This dataset includes conservation area boundaries and attributes for the conservation targets that occur within each conservation area in those ecoregions. The assessments for Chihuahuan Desert Ecoregion, which overlaps a small part of the Lincoln National Forest, the Southern Shortgrass Prairie Ecoregion, which includes portions of the Santa Fe National Forest and Cibola National Grasslands, were included individually.

Date from the ecoregional assessments were used, along with the land ownership GIS-based layer and National Forest boundary layer (see descriptions above), to identify the extent and distribution of overlap of conservation areas and major landowners (Chapter 3) and each Forest in Region 3 (Chapters 4 - 15). Additionally, the individual targets associated with each conservation area were identified for each Forest. To determine how conservation areas overlap with current land-use designations on each National Forest, conservation areas were overlaid with designated wilderness areas, inventoried roadless areas, and other areas with special designations (e.g. research natural areas, zoological-botanical areas).

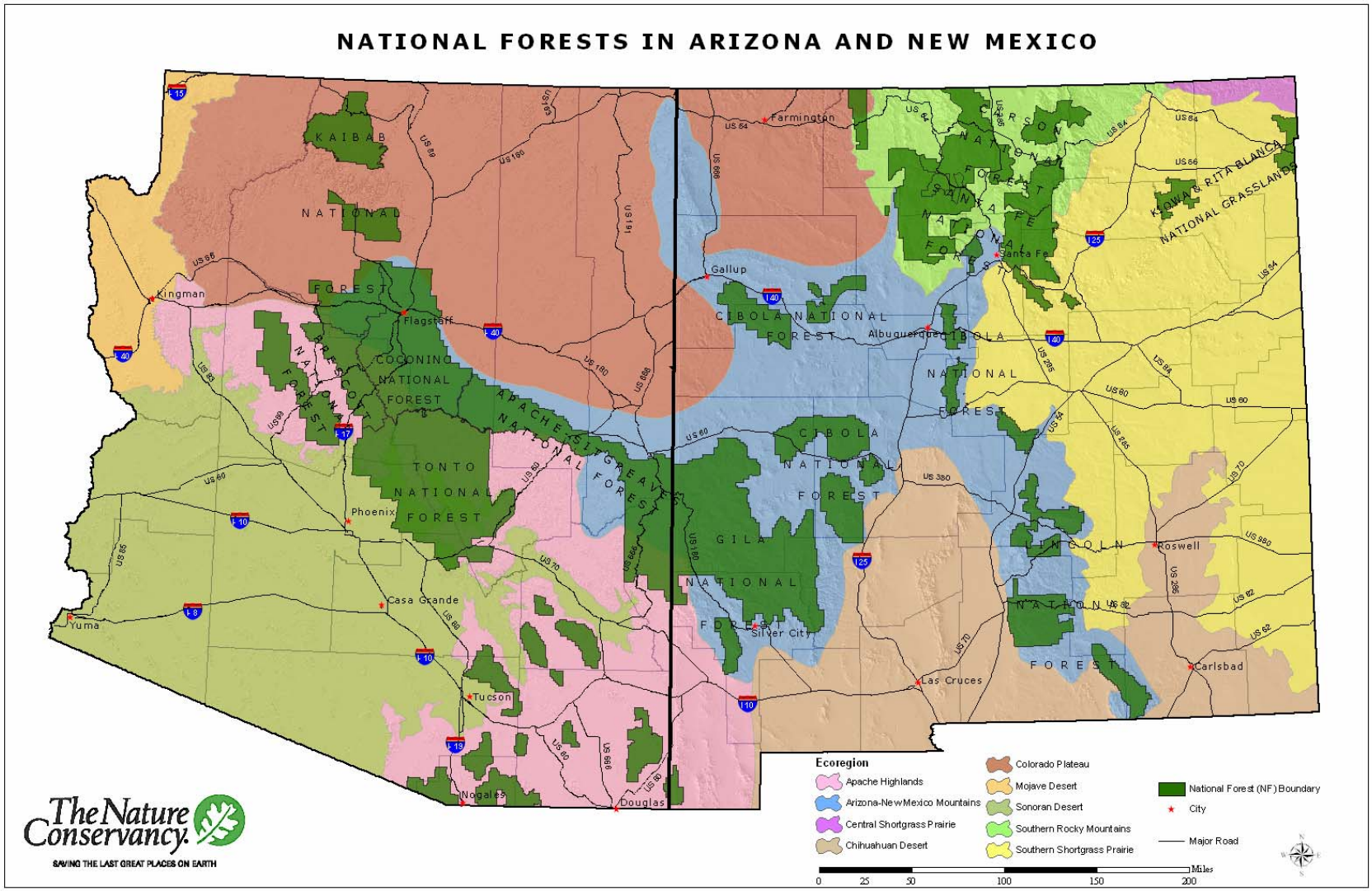

Figure 2-2. Overlap of The Nature Conservancy ecoregions and U.S. Forest Service Region 3 lands in Arizona and New Mexico.

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Appendix 2-A: Potential Natural Vegetation Types (PNVTs) cross-referenced to Southwest Regional GAP Analysis Project (SWReGAP), Oklahoma GAP Analysis Project (OK-GAP), and Texas GAP Analysis Project (TX-GAP) ecosystem types.

PNVT (Number of Land Cover Types)	SWReGAP, OK-GAP, and TX-GAP Land Cover Types
Alpine and tundra (3)	Rocky Mountain Alpine Bedrock and Scree Rocky Mountain Alpine Fell-Field Rocky Mountain Dry Tundra
Aspen forest and woodland (2)	Inter-Mountain West Aspen-Mixed Conifer Forest and Woodland Rocky Mountain Aspen Forest and Woodland
Barren (2)	Bare Soil Barren Lands, Non-specific
Cottonwood willow riparian forest (7)	Western Bottomland Forests Western Great Plains Riparian Woodland and Shrubland Invasive Southwest Riparian Woodland and Shrubland North American Warm Desert Riparian Mesquite Bosque Temporary Flooded Cold-Deciduous Woodland Temporary Flooded Microphyllous Shrublands Temporary Flooded Temperate Grasslands with Sparse Cold-Deciduous Woodlands
Desert communities (15)	Chihuahuan Mixed Salt Desert Scrub Chihuahuan Stabilized Coppice Dune and Sand Flat Scrub Chihuahuan Succulent Desert Scrub Mojave Mid-Elevation Mixed Desert Scrub North American Warm Desert Active and Stabilized Dune North American Warm Desert Badland North American Warm Desert Bedrock Cliff and Outcrop North American Warm Desert Pavement North American Warm Desert Playa North American Warm Desert Volcanic Rockland North American Warm Desert Wash Sonora-Mojave Creosotebush-White Bursage Desert Scrub Sonora-Mojave Mixed Salt Desert Scrub Sonoran Mid-Elevation Desert Scrub Sonoran Paloverde-Mixed Cacti Desert Scrub
Disturbed/altered (2)	Recently Burned Recently Mined or Quarried
Gallery coniferous riparian forest (1)	Rocky Mountain Sub-alpine-Montane Riparian Woodland
Great Basin / Colorado Plateau grassland and steppe (16)	Colorado Plateau Blackbrush-Mormon-tea Shrubland Colorado Plateau Mixed Bedrock Canyon and Tableland (not with Mixed Conifer) Inter-Mountain Basins Greasewood Flat Inter-Mountain Basins Juniper Savanna Inter-Mountain Basins Mat Saltbush Shrubland Inter-Mountain Basins Mixed Salt Desert Scrub

PNVT (Number of Land Cover Types)	SWReGAP, OK-GAP, and TX-GAP Land Cover Types
	Inter-Mountain Basins Montane Sagebrush Steppe Inter-Mountain Basins Playa Inter-Mountain Basins Semi-Desert Grassland Inter-Mountain Basins Semi-Desert Shrub Steppe Inter-Mountain Basins Shale Badland Inter-Mountain Basins Volcanic Rock and Cinder Land Inter-Mountain Basins Wash Invasive Annual and Biennial Forbland Invasive Annual Grassland Southern Colorado Plateau Sand Shrubland
Great Plains grassland (24)	Annual Graminoid or Forb Vegetation Extremely Xeromorphic Deciduous Shrubland Grama – Buffalograss Prairie Gypsum Grasslands Intermittently Flooded Temperate or Subpolar Grassland Lowland Mixed Evergreen – Drought Deciduous Shrubland Medium – Tall Bunch Temperate or Subpolar Grassland Microphyllous Evergreen Shrubland Midgrass Prairie Midgrass Sand Prairie Midgrass Sandsage Prairie Sandsage Prairie Sandsage Savanna Semi-permanently Flooded Temperate or Subpolar Grassland Shinnery Oak Shrubland Short Sod Temperate or Subpolar Grassland Southern Rocky Mountain Juniper Woodland and Savanna Tall Sod Temperate Grasslands Temperate or Subpolar Grassland with a Sparse Shrub Layer Western Great Plains Cliff and Outcrop Western Great Plains Foothill and Piedmont Grassland Western Great Plains Mesquite Woodland and Shrubland Western Great Plains Sandhill Shrubland Western Great Plains Shortgrass Prairie
Interior chaparral (4)	Coahuilan Chaparral Great Basin Semi-Desert Chaparral Mogollon Chaparral Rocky Mountain Gambel Oak-Mixed Montane Shrubland (Not with Mixed Conifer)
Madrean encinal woodland (2)	Madrean Encinal Madrean Pinyon-Juniper Woodland
Madrean pine-oak woodland (1)	Madrean Pine-Oak Forest and Woodland
Mixed broad leaf deciduous riparian forest (3)	North American Warm Desert Riparian Woodland and Shrubland Rocky Mountain Bigtooth Maple Ravine Woodland Rocky Mountain Lower Montane Riparian Woodland and Shrubland
Mixed conifer forest (5)	Madrean Upper Montane Conifer-Oak Forest and Woodland

PNVT (Number of Land Cover Types)	SWReGAP, OK-GAP, and TX-GAP Land Cover Types
	Recently Logged Areas Rocky Mountain Cliff and Canyon Rocky Mountain Montane Dry-Mesic Mixed Conifer Forest Rocky Mountain Montane Mesic Mixed Conifer Forest and Woodland
Montane grassland (1)	Rocky Mountain Sub-alpine Mesic Meadow
Montane Willow Riparian Forests (2)	North American Warm Desert Lower Montane Riparian Woodland Rocky Mountain Sub-alpine-Montane Riparian Shrubland
No Value (1)	No Value
Oklahoma Oak Woodland (1)	Eastern Red Cedar – Oak Woodland
Pinyon-juniper woodland (6)	Colorado Plateau Pinyon-Juniper Shrubland Colorado Plateau Pinyon-Juniper Woodland Great Basin Pinyon-Juniper Woodland Recently Chained Pinyon-Juniper Areas Rocky Mountain Lower Montane-Foothill Shrubland (Not with Montane Conifer) Southern Rocky Mountain Pinyon-Juniper Woodland
Ponderosa pine (1)	Southern Rocky Mountain Ponderosa Pine Woodland
Sagebrush shrubland (3)	Colorado Plateau Mixed Low Sagebrush Shrubland Inter-Mountain Basins Active and Stabilized Dune Inter-Mountain Basins Big Sagebrush Shrubland
Semi-desert grasslands (8)	Apacherian-Chihuahuan Mesquite Upland Scrub Apacherian-Chihuahuan Piedmont Semi-Desert Grassland Chihuahuan Creosotebush, Mixed Desert and Thorn Scrub Chihuahuan Gypsophilous Grassland and Steppe Chihuahuan Sandy Plains Semi-Desert Grassland Chihuahuan-Sonoran Desert Bottomland and Swale Grass Invasive Perennial Grassland Madrean Juniper Savanna
Shinnery Oak Shrubland (1)	Shinnery Oak Shrubland
Spruce-fir forest (4)	Rocky Mountain Lodgepole Pine Forest Rocky Mountain Sub-alpine Dry-Mesic Spruce-Fir Forest Rocky Mountain Sub-alpine Mesic Spruce-Fir Forest and Rocky Mountain Sub-alpine-Montane Limber-Bristlecone
Sub-alpine grassland (1)	Southern Rocky Mountain Montane-Sub-alpine Grassland
Texas Oak Woodland (2)	Cold Deciduous Woodland Temperate Broad-leafed Evergreen Shrubland
Texas Pinyon-Juniper (1)	Round Crowned Temperate or Subpolar Needle-leaved Evergreen Woodland

PNVT (Number of Land Cover Types)	SWReGAP, OK-GAP, and TX-GAP Land Cover Types
Urban and agricultural area (7)	Agriculture Crop – Warm Season Cropland (irrigated, row, herbaceous, etc.) Developed, Medium - High Intensity Developed, Open Space - Low Intensity Improved/Introduced Pasture – Warm Season Residential/ Industrial
Water (5)	Lake/Reservoir Open Water Pond Riverine Water
Wetland/cienega (4)	North American Arid West Emergent Marsh Rocky Mountain Alpine Wet Meadow Western Great Plains Saline Depression Wetland Wetland

Appendix 2-B: Descriptions of potential natural vegetation types (PNVTs).

Alpine and Tundra – Alpine conditions begin around 10,600 ft. Alpine areas are typically barren with sparse vegetation including grasses, forbs, lichens and low shrubs. Unstable substrates, exposure to high winds, and short growing season make it difficult for plants to establish and grow in these areas. Barren areas include rocky outcroppings, scree slopes, and open fell-fields. Open fell-fields may include the following species: mountain sandwort (*Arenaria capillaries*), black and white sedge (*Carex albonigra*), Payson's sedge (*Carex paysonis*), Ross's avens (*Geum rossii*), Bellardi bog sedge (*Kobresia myosuroides*), twinflower sandwort (*Minuartia obtusiloba*), Asian forget-me-not (*Myosotis asiatica*), nailwort (*Paronychia pulvinata*), wherry (*Phlox pulvinata*), creeping sibbaldia (*Sibbaldia procumbens*), and moss campion (*Silene acaulis*). Within the alpine region, tundra can be found on gradual to moderate slopes, flat ridges, valleys, and basins, where there is fairly stable soil. The tundra system is typically characterized by low-growing, perennial graminoids and forbs. Rhizomatous, sod-forming sedges are the dominant graminoids, and prostrate and mat-forming plants with thick rootstocks or taproots characterize the forbs. Dominant species include sagebrush (*Artemisia arctica*), sedges (*Carex* spp.), tufted hairgrass (*Deschampsia caespitosa*), fescue grasses (*Festuca* spp.), Ross's avens (*Geum rossii*), Bellardi bog sedge (*Kobresia myosuroides*), wherry (*Phlox pulvinata*), and alpine clover (*Trifolium dasyphyllum*).

Aspen Forest and Woodland – Aspen forest and woodlands are found in montane and sub-alpine zones at elevations ranging from approximately 5,000 to10,000 ft., but occasionally at lower elevations in some areas. These upland forests and woodlands are dominated by quaking aspen (*Populus tremuloides*) and may or may not have a significant conifer component, depending upon successional status. The understory structure may have shrubs and an herbaceous layer, or just an herbaceous layer. The herbaceous layer may be dense or sparse, dominated by graminoids or forbs. Some of the species typically found associated with aspen include Arizona peavine (*Lathyrus arizonica*), meadow rue (*Thalictrum fendleri*), deer's ears (*Swertia radiata*), yarrow (*Achillea lanulosa*), violet (*Viola canadensis*), paintbrush (*Castilleja* spp.), arnica (*Arnica montanum*), and several grasses and sedges (*Poa spp.* and *Carex* spp.). Distribution of this PNVT is limited by several factors including soil type, adequate soil moisture required to meet its high evapotranspiration demand, the length of the growing season or low temperatures, and major disturbances that clear areas of vegetation and stimulate root sprouting and colonization.

Barren – Areas where there is less than approximately 15% vegetation cover and accumulation of earthen materials.

Cottonwood Willow Riparian Forest – This system is typically found at lower elevations along rivers and streams in unconstrained valley bottoms. Dominant woody species include cottonwood spp. (*Populus* spp.), willow species (*Salix* spp.), and mesquite spp. (*Prosopis* spp.). Various grasses and forbs are also present. These areas are often subjected to heavy grazing and/or agriculture and can be heavily degraded and the water table can be severely depleted. In addition, many of the areas with this PNVT have experienced an increase in invasive species such as salt cedars (*Tamarix* spp.), and Russian olive (*Elaeagnus angustifolius*). The vegetation is dependent upon on seasonal flooding and high water tables for germination, growth and survivorship of the woody dominants.

Desert Communities – This PNVT spans several types of desert communities, and desert provinces including the Sonoran, Chihuahuan, Great Basin and Mojave. Vegetation types and density will vary with geographic location, precipitation, and topography. Some areas within this PNVT may be barren with an abundance of sand, rock, gravel, scree or tallus. Other areas may have sparse to dense vegetation cover that includes succulent species, desert grasses, desert scrub, and some herbaceous cover. Some species occurring in desert communities include: catclaw acacia (*Acacia greggii*), triangleleaf bursage (*Ambrosia deltoidea*), white bursage (*Ambrosia dumosa*), mesquite (*Prosopis* spp.), desert ironwood (*Olneya tesota*), saltbush (*Atriplex* spp.), cresosote (*Larrea tridentate*), iodine bush (*Allenrolfea occidentalis*), splitleaf brickellia (*Brickellia laciniata*), desert broom (*Baccharis sarothroides*), desert willow (*Chilopsis linearis*), Apache plume (*Fallugia paradoxa*), cheesebush (*Hymenoclea salsola*), barrel cactus (*Ferocactus* spp.), hedgehog cacti (*Echinocereus spp.*), cholla and prickly pear (*Opuntia* spp.) saguaro (*Carnegia gigantean)*, salt grass (*Distichlis spicata*), rice grasses (*Oryzopsis* spp.), and dropseed grasses (*Sporobolus* spp.).

Disturbed/Altered – Areas that are barren or have relatively low vegetation cover due to some form of human alteration or management regime.

Gallery Coniferous Riparian Forest – Found at montane to sub-alpine elevations (5,000 to 11,000 ft) in the Rocky Mountains and Sierra Madre Occidental, this "canyon bottom forest" system contains many of the woody species that occur in the conifer and aspen woodlands adjacent to montane streams. This PNVT experiences periodic flooding and high water tables. Dominant tree species typically include sub-alpine fir (*Abies lasiocarpa*), Engelmann spruce (*Picea engelmannii*), Douglas-fir (*Pseudotsuga menziesii*), blue spruce (*Picea pungens*), quaking aspen (*Populus tremuloides*), narrowleaf cottonwood (*Populus angustifolia*), bigtooth maple (*Acer gradidentatum*); box elder (*Acer negundo*), alder (*Alnus oblongifolia*), willows (*Salix* spp.), Gambel oak (*Quercus gambel*ii), Ponderosa pine (*Pinus ponderosa*), and Rocky Mountain juniper (*Juniperus scopulorum*).

Great Basin / Colorado Plateau Grassland and Steppe – In general, this PNVT is found at lower elevations with vegetation coverage consisting of mostly grasses and interspersed shrubs. Grass species may include but are not limited to: Indian ricegrass (*Achnatherum hymenoides*), threeawn spp. (*Aristida* spp.), blue grama (*Bouteloua gracilis*), fescue spp. (*Festuca* spp.), needle and thread grass (*Hesperostipa comata*), spike fescue (*Leucopoa kingii*), *Muhlenbergia* spp., James' galleta (*Pleuraphis jamesii*), and Sandberg bluegrass (*Poa secunda*). Shrub species may include but are not limited to: sagebrush (*Artemesia tridentate* spp.), saltbush (*Atriplex* spp.), *Ephedra*, snakeweed (*Gutierrezia)*, winterfat (*Krascheninnikovia lanata*), one-seeded juniper (*Juniperus monosperma*), and wax currant (*Ribes cereum*).

Great Plains Grassland -- This PNVT is characterized by mixed grass to tall grass prairie found on moderate to gentle slopes. Rain, temperature and soils limit this PNVT to lower elevations. This PNVT is mostly dominated by one or some of the following species: big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), mountain muhly (*Muhlenbergia montana*), green needlegrass (*Nassella viridula*), western wheatgrass (*Pascopyrum smithii*), sand dropseed (*Sporobolus cryptandrus*), blue grama (*Bouteloua gracilis*), needle and thread grass (*Hesperostipa comata*), or New Mexico feathergrass (*Hesperostipa neomexicana*). This PNVT may also include areas that are dominated by low cover grasses and forbs.

Interior Chaparral – This PNVT is typically found on mountain foothills and lower slopes where low-elevation desert landscapes transition into wooded evergreens. Interior chaparral consists of mixed shrub associations including but not limited to the following species: Manzanita spp. (*Arctostaphylos* spp.), crucifixion thorn (*Canotia holacantha*), desert ceanothus (*Ceanothus greggii*), mountain mahogany (*Cercocarpus montanus*), little-leaved mountain mahogany (*Cercocarpus intricatus*), Antelope bushes (*Purshia* spp.), silktassles (*Garrya spp.*), Stansbury cliffrose (*Purshia stansburiana*), shrub live oak (*Quercus turbinella*), and sumacs (*Rhus* spp.)

Madrean Encinal Woodland – Found in the Madrean Province, this PNVT occurs on foothills, canyons, bajadas and plateaus between the semi-desert grasslands and Madrean pine-oak woodlands. This PNVT is dominated by Madrean evergreen oaks such as Arizona white oak (*Quercus arizonica*), Emory oak (*Quercus emoryi*), gray oak (*Quercus grisea*), Mexican blue oak (*Quercus oblongifolia*), and Toumey oak (*Quercus toumeyi*). Madrean pine, Arizona cypress, pinyon and juniper trees and interior chaparral species may be present, but do not co-dominate. The ground cover is dominated by warm-season grasses such as threeawns (*Aristida* spp.), blue grama (*Bouteloua gracilis*), sideoats grama (*Bouteloua curtipendula*), Rothrock grama (*Bouteloua rothrockii*), Arizona cottontop (*Digitaria californica*), plains lovegrass (*Eragrostis intermedia*), curly-mesquite (*Hilaria belangeri*), green sprangletop (*Leptochloa dubia*), muhly grasses (*Muhlenbergia* spp.), or Texas bluestem (*Schizachyrium cirratum*).

Madrean Pine-Oak Woodland – Found in the Madrean province, this PNVT is dominated by open to closed canopy of evergreen oaks such as Arizona white oak (*Quercus arizonica*), alligator juniper (*Juniperus deppeana*), Chihuahua pine (*Pinus leiophylla*) and other various pines with a grassy understory. Madrean pine-oak woodlands usually occupy foothills and mountains ranging from approximately 4000 to 7000 ft. in elevation. Climate generally consists of mild winters and wet summers with mean annual precipitation ranging from about 10 to 25 inches; half of the precipitation typically occurs in summer, with the remainder occurring during the winter and spring.

Mixed Broad Leaf Deciduous Riparian Forest – Located in the Madrean and Chihuahuan provinces, mixed broadleaf deciduous riparian forests are found along rivers and streams starting at low elevations (approximately 4,000 ft.) and climbing up to montane elevations of approximately 9,000 ft. The vegetation is a mix of riparian woodlands and shrublands with a variety of vegetation associations. The dominant vegetation is likely to depend upon a suite of site-specific characteristics including elevation, substrate, stream gradient, and depth to groundwater. For example, one vegetation association is dominated by bigtooth maple with mixed stands of Gambel oak, some

scattered conifers and possibly some quaking aspen (*Populus tremuloides*). Other sites can be dominated by a mixture of the following woody species: boxelder, narrowleaf cottonwood, Fremont cottonwood (*Populus fremontii*), Arizona sycamore (*Platanus wrightii*), velvet ash (*Fraxinus velutina*), Arizona walnut (*Juglans major*), Arizona cypress (*Cupressus arizonica*) and willows (*Salix exigua* and others). The forest often contains oaks (*Quercus gambelii, Q. emoryi, Q. arizonica*) and conifers (*P. ponderosa, Juniperus deppeana*) from upstream and adjacent uplands. Exotic species such as Russian olive (*Elaeagnus angustifolia*) and salt cedar (*Tamarix* spp.) are common in some stands, especially at lower elevations. Vegetation can be dependent upon annual or periodic flooding for growth and reproduction, especially at lower elevations.

Mixed Conifer Forest – This PNVT spans a variety of dominant and co-dominant species in both dry and mesic environments in the Rocky Mountain and Madrean Provinces. In the Rocky Mountains, montane conifer forests may be found at elevations between 5,000 and 10,000 ft., situated between ponderosa pine, pine-oak, or pinyon-juniper woodlands and spruce-fir or sub-alpine conifer forests. Dominant and co-dominant vegetation varies in elevation and moisture availability. In the lower and drier elevation portions within this PNVT, Gambel oak (*Quercus gambelii*) and ponderosa pine (*Pinus ponderosa*) may co-dominate. In higher and more mesic areas ponderosa pine may co-dominate with Douglas fir (*Pseudotsuga menziesii*) and white fir (*Abies concolor*). Other vegetation that may be present but does not co-dominate in these higher and mesic areas include Englemann spruce (*Picea engelmannii*) and Colorado blue spruce (*Picea pungens*). In the Madrean Province, this PNVT can be characterized by large and small-patch forests and woodlands dominated by Douglas fir or white fir with Madrean oaks such as silverleaf oak (*Quercus hypoleucoides*) and netleaf oak (*Quercus rugosa*). The understory vegetation is comprised of a wide variety of shrubs, grasses, graminoids (sedges, etc.), and forbs; the compositions depends on soil type, aspect, elevation, disturbance history and other factors.

Montane Grassland – This PNVT is typically found at sub-alpine elevations (9,000 ft. and higher) on gentle to moderate gradient slopes. Soils are usually moist throughout the year. Dominant vegetation cover includes forbs with some graminoids. Common species found in this PNVT include but are not limited to: fleabane spp. (*Erigeron* spp.), asters (*Asteraceae* spp.), bluebells (*Mertensia* spp.), *Penstimon* spp., lupine spp. (*Lupinus* spp.) and goldenrods (*Solidago* spp.).

Montane Willow Riparian Forest – This PNVT stretches along various elevational gradients from lower elevations (3,500 ft.) in mountain canyons and valleys to higher mountainous elevations (10,000ft.). At lower elevations this PNVT can be found along perennial and seasonally intermittent streams. Here, the dominant woody vegetation includes cottonwood spp. (*Populus* spp.), Arizona sycamore (*Platanus wrightii*), Arizona Walnut, (*Juglans major*), velvet ash (*Fraxinus velutina*), and soapberry (*Sapindus saponaria*). Shrubs include willow spp. (*Salix* spp.), cherry (*Prunus* spp.) and Arizona alder (*Alnus oblongifolia*). At higher elevations, this PNVT is found along streambanks, seeps, fens, and isolated springs. At higher elevations, this PNVT are shrub and herb dominated. Dominant shrubs include alder spp. (*Alnus* spp.), birch spp. (*Betula* spp.), redosier dogwood (*Cornus sericea*), and a variety of willow spp. (*Salix* spp.).

Oklahoma Oak woodland – This PNVT can be found on portions of Region 3 National Grasslands. It is dominated by blackjack oak (*Q. marilandica*) and post oak (*Q. stellata*) with a savanna-like structure at the boundaries with the tall grass prairie and denser canopies occurring away from the forest grassland transition. This woodland type occurs throughout the Great Plains region on xeric sites with sandy soils.

Pinyon-juniper Woodland – Mostly found on lower slopes of mountains and in upland rolling hills at approximately 4,500 to 7,500 ft. in elevation. Most common pinyon pine is the Colorado pinyon (*Pinus edulis*), with singleleaf pinyon (*Pinus monophylla*) occurring in limited areas. One-seed juniper (*Juniperus monosperma*) is most common in Arizona and New Mexico; however, there are areas with Utah juniper (*Juniperus osteosperma*) and Rocky Mountain juniper (*Juniperus scopulorum*). In addition, annual and perennial grasses and graminoids, forbs, half-shrubs and shrubs can be found beneath the woodland overstory.

Ponderosa Pine – The ponderosa pine forest is widespread in the Southwest occurring at elevations ranging from 6,000-9,000 ft on igneous, metamorphic, and sedimentary parent soils with good aeration and drainage, and across elevational and moisture gradients. The dominant species in this system is Ponderosa pine (*Pinus ponderosa*). Other trees, such as Gambel oak (*Quercus gambelii*), Douglas-fir (*Pseudotsuga menziesii*), pinyon pine (*Pinus edulis*), and juniper spp. (*Juniperus* spp.) may be present. There is typically a shrubby understory mixed with

grasses and forbs, although this type sometimes occurs as savannah with extensive grasslands interspersed between widely spaced clumps or individual trees. This system is adapted to drought during the growing season, and has evolved several mechanisms to tolerate frequent, low intensity surface fires.

Sagebrush Shrubland -- This PNVT is dominated by big sagebrush (*Artemisia tridentata*) and ranges from the state of Washington east to the Dakotas, and south as far as Arizona and New Mexico. Within the southwest sagebrush shrubland primarily occurs in northern Arizona and northwestern New Mexico adjacent to Great Basin grassland and pinyon juniper woodland PNVTs. While big sagebrush is the dominant species other shrubs such as broom snakeweed and shadscale (*Atriplex confertifolia*) are common, as are grassland species such as blue grama (*Bouteloua gracilis*). Shrubland sites in the southwest are usually found on deep well-drained valley bottom soils between 4,800 and 5,800 ft. with precipitation ranging between 10 to 18 inches per year.

Semi-desert Grassland – Semi-desert grassland occurs throughout southeastern Arizona and southern New Mexico at elevations ranging from 3,000 to 4,500 ft. These grasslands are bounded by Sonoran or Chihuahuan desert at the lowest elevations and woodlands or chaparral at the higher elevations. Species composition and dominance varies across the broad range of soils and topography that occur within the two states. Dominant grassland associations/types are black grama (*Bouteloua eriopoda*) grassland, blue grama (*Bouteloua gracilis*) grassland, tobossa (*Hilaria mutica*) grassland, giant sacaton (*Sporobolus wrightii*) grassland, mixed native perennial grassland, and non-native perennial grassland. Shrubs also occupy these grasslands and their abundance and species composition also varies.

Shinnery Oak Woodland – This PNVT is can be found on portions of Region 3 National Grasslands. This PNVT is found in the western regions of the Great Plains on primarily sandy soils. The dominant vegetation type is shinnery oak also known as Harvard oak (*Quercus harvardii*). Other vegetation that may be present includes a variety of grasses such as bluestems (*Andropogon gerardi*), grama species (*Bouteloua* spp.), and sand dropseed (*Sporobolus cryptandrus*). Also may be present may be present are yucca spp. (*Yucca* spp.); mesquite species (*Prosopis* spp.); catclaw acacia (*Acacia greggii*), and sand sage (*Artemesia filifolia*) and other vegetation.

Spruce-fir Forest – Also known as sub-alpine conifer forests, spruce-fir forests range in elevation from 9,000 to 11,500 ft. along a variety of gradients including gentle to very steep mountain slopes. Englemann spruce (*Picea engelmannii*) and sub-alpine fir (*Abies lasiocarpa*) or corkbark fir (*Abies lasiocarpa* var. *lasiocarpa*) dominate this PNVT either mixed or alone. Douglas-fir (*Pseudotsuga menziesii*) along with mixed conifer and quaking aspen (*Populus tremuloides*) stands may also be present in this system for long periods without regeneration. Herbaceous species may include but are not limited to red baneberry (*Actaea rubra*), starry false Solomon's seal (*Maianthemum stellatum*), fleabane (*Erigeron eximius*), blackberry (*Rubus pedatus*), and sub-alpine lupine (*Lupinus arcticus* spp. *Subalpinus*). Natural disturbances in this PNVT are blow-downs, insect outbreaks and stand replacing fires.

Sub-alpine Grassland - Also referred to as montane grasslands, this system occurs at elevations ranging from 8,000-11,000 ft., and often harbors several plant associations with varying dominant grasses and herbaceous species. Such dominant species may include Parry's oatgrass (*Danthonia parryi*), Arizona fescue (*Festuca arizonica*), Thurber's fescue (*Festuca thurberi*), pine dropseed (*Blepharoneuron tricholepis*), Kentucky bluegrass (*Poa pratensis*), small camas (*Camassia quamash*), various sedges (*Carex* spp.), shooting star (*Dodecatheon jeffreyi*), fowl manna grass (*Glyceria striata*), Sierra rush *(Juncus nevadensis*), Rocky Mountain iris (*Iris missouriensis*), Parry's bellflower (*Campanula parryi*), California false hellebore (*Veratrum californicum*), and bulrush spp. (*Scirpus* and/or *Schoenoplectus* spp). Trees may occur along the periphery of the meadows, which may include southwestern white pine (*Pinus strobiformis*), Engelmann spruce (*Picea engelmannii*), and sub-alpine fir (*Abies lasiocarpa*). Some shrubs may also be present. These meadows are seasonally wet, which is closely tied to snowmelt. They typically do not experience flooding events.

Texas Oak Woodland – This PNVT can be found on small portions of Region 3 National Grasslands. This PNVT includes the Harvard oak or shinnery oak (*Quercus harvardii*) shrubland alliance, honey mesquite (*Prosopis glandulosa*) woodland alliance, and post oak-black jack oak (*Quercus stellata – Quercus merilandica*) woodland alliances.

Texas Pinyon-juniper Woodland – This can be found on small portions of Region 3 National Grasslands. This PNVT includes the following species: ashe juniper (*Juniperus ashei*), alligator juniper (*Juniperus deppeana*), one-

seed juniper (*Juniperus monosperma*), red berry juniper (*Juniperus erythrocarpa*), pinyon pine (*Pinus edulis*), and a few oak spp. (Quercus spp.)

Urban and Agricultural Area – Dominated by urban development and land used for agricultural purposes.

Water – Areas with water including reservoirs, rivers, and streams.

Wetland/Cienega – This PNVT is associated with perennial springs or headwater streams where groundwater intersects the surface and creates pools of standing water, sometime with channels flowing between pools. Often soils in the area are highly saline. Distribution and types of vegetation vary due to a gradient in saturated soils and salinity. Some vegetation types found in wetland/cienegas include salt grass (*Distichlis spicata*), yerba mansa (*Anemopsis californica*), and sacaton in more saline areas; in saturated soils are rushes, sedges, flat sedges and spike rushes and deep pools support a variety of aquatic vegetation. This PNVT also includes high elevation (3,500 – 11,000 ft.) meadows with subsurface flows dominated by herbaceous cover.

Chapter 3:

Ecological and Biological Assessments Across Major Landowners in Arizona and New Mexico

In

Ecological and Biological Diversity of National Forests in Region 3

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Introduction

Within Arizona and New Mexico, the US Forest Service (USFS) Region 3 National Forests include a broad range of ecological components, including a large diversity of vegetation systems, ranging along elevational gradients from deserts to alpine/tundra, and the species that depend on these systems. In addition, many important aquatic and riparian systems, some of the most threatened in the nation, occur on Region 3 National Forests. While these important ecological systems and species are distributed across many landowners in the Southwest, Region 3 National Forests contain relatively large proportions of certain systems and species. Identifying these systems and species may be useful in planning efforts that focus on ensuring ecological sustainability across the region.

In this chapter, existing regional (Arizona and New Mexico) scale assessment information was used to highlight the ecological importance of Region 3 National Forests within the context of major landowners in Arizona and New Mexico. Additionally, important ecological components of individual National Forests were identified. Four existing regional-scale assessments were used to examine the ecological diversity and conservation opportunities on Region 3 National Forests relative to other landowners. These include assessments relating to the distribution of potential natural vegetation types (PNVTs), distribution and condition of grasslands, distribution of native fish occurrences, and the distribution of conservation areas identified through ecoregional assessments. A fifth data source, the R3 Species Database, contains species diversity information specific to Region 3 National Forests and was used to compare and highlight animal and plant diversity amongst Region 3 National Forests.

I. Potential Natural Vegetation Types

The relative distribution of potential natural vegetation types in Arizona and New Mexico across the various major landowners was assessed. (Refer to Chapter 2, Appendix 2-A and 2-B for a listing and descriptions of PNVTs). Total acreage of each PNVT was also compared amongst the 11 Region 3 National Forests lands in Arizona and New Mexico. Region 3 National Grasslands in New Mexico, Oklahoma and Texas were not included in either of these analyses.

To conduct these analyses two geo-spatial datasets (described in detail in Chapter 2) were utilized:

1) The Southwest Regional Gap Analysis Project (SWReGAP; USGS National Gap Analysis Program 2004). The SWReGAP data are a geo-spatial vegetation dataset based on multi-season data from satellite imagery (Landsat ETM+) and digital elevation models (DEM) from 1999-2001. Ecosystem cover types from SWReGAP were aggregated and cross-walked to PNVTs (see Chapter 2, Appendix 2-A for cross-walk details). Although the accuracy of SWReGAP data have not been assessed, the dataset serves as the most recent and complete data source for all of Arizona and New Mexico at the time of this analysis.

Furthermore, because SWReGAP is built upon remote sensing data, inaccuracies are likely to be found when used at finer spatial scales. Therefore, SWReGAP data may be best suited for regional assessments rather than for project planning or district level analyses.

2) The second dataset used was the landownership GIS-based layer. This data layer was generated from information from the Arizona Land Resource Information Service (http://www.land.state.az.us/alris/index.html) and the New Mexico Resource Geographic Information System Program (http://rgis.unm.edu/). Major landowner categories included in this data layer were: Bureau of Land Management, Department of Defense, National Park Service, private, State Trust, tribal, US Fish and Wildlife Service, USDA Forest Service, and other (which included Bureau of Reclamation, non-federal Parks, Valle Calderas National Preserve, County Lands, Department of Energy, USDA Research, State Game and Fish, and unnamed lands).

Results indicate that Region 3 manages the highest relative proportions of nine of the 25 PNVTs analyzed (36%) across all major landowners in Arizona and New Mexico. These nine PNVTs and the proportions that Region 3 Forests collectively manage for include: aspen forest and woodland (64%), interior chaparral (43%), Madrean encinal woodland (42%), Madrean pine-oak woodland (59%), mixed conifer forest (68%), montane grasslands (47%), ponderosa pine forest (63%), spruce-fir forest (58%) and sub-alpine grasslands (52%; Table 3-1).

Results also demonstrate the diversity and distribution of PNVTs across Region 3 National Forests, and identify which Forests manage large proportions of certain PNVTs within Region 3 (Table 3-2). For example, the Carson National Forest manages the largest proportion of aspen forest and woodlands (35%), gallery coniferous riparian forests (100%), montane grasslands (97%), spruce-fir conifer forests (49%), sub-alpine grasslands (37%), and wetland/cienegas (84%) across all Region 3 Forests. The Cibola National Forest (not including the National Grasslands in New Mexico, Oklahoma or Texas) has the largest proportion of Great Plains grasslands (61%), mixed-broadleaf deciduous riparian forests (34%), and pinyon-juniper woodland (21%). The Coconino National Forest contains the largest proportion of alpine/tundra (80%) and Great Basin/Colorado Plateau grassland and steppe (23%). The Coronado manages 26% of the Madrean encinal found on Region 3 National Forests. The Gila manages the largest proportion (30%) of ponderosa pine forests. The Kaibab National Forest manages 50% of the sagebrush shrubland on Region 3 lands. The Santa Fe National Forest contains the largest proportion of mixed conifer forests (32%) across Region 3. The Tonto National Forest manages the largest proportion of cottonwood willow riparian forests (41%), desert communities (76%), interior chaparral (40%), Madrean pine-oak (41%), montane willow riparian forests (20%), and semi-desert grasslands (37%) on Region 3 Forests. As discussed earlier, these results are based on SWReGAP data that may not be inaccurate at Forest level spatial analyses.

Table 3-1. Approximate area (in acres) of potential natural vegetation types (PNVTs) in Arizona and New Mexico across major landowners. The Other landowner category in this table includes: Bureau of Reclamation, non-federal parks, Valle Calderas National Preserve, county lands, Department of Energy, USDA Research, State Game and Fish, and unnamed lands. USFS Region 3 National Grasslands in New Mexico, Oklahoma and Texas were not included in this analysis. Data used to generate this table came from The Southwest Regional Gap Analysis Program (SWReGAP) and the landownership GIS-based layer. Note that accuracy testing has not been conducted for SWReGAP data. See Chapter 2 for further information regarding these datasets.

Potential Natural Vegetation Type	US Forest Service	Bureau of Land Management	Department of Defense	National Park Service	Private	State Trust	Tribal	US Fish and Wildlife Service	Other
Alpine/Tundra	1,600	0	0	0	**6,100**	0	0	0	0
Aspen Forest and Woodland	**335,900**	500	0	3,400	93,200	2,200	75,900	0	11,600
Barren	0	26,900	13,000	100	35,900	14,900	**196,400**	2,100	300
Cottonwood Willow Riparian Forest	19,500	74,800	14,900	7,100	219,500	55,600	**389,000**	28,500	11,000
Desert Communities	1,018,300	**8,593,300**	3,537,800	1,321,000	3,418,000	3,340,700	3,429,500	1,583,200	252,800
Disturbed/Altered	83,300	9,200	600	6,000	**218,200**	37,200	47,800	5,600	400
Gallery Coniferous Riparian Forest	100	0	0	0	**1,100**	0	100	0	0
Great Basin/ Colorado Plateau Grassland and Steppe	684,400	2,853,400	23,000	572,300	5,695,500	2,599,300	**12,175,500**	43,200	18,500
Great Plains Grassland	316,800	1,270,300	29,000	10,000	**16,055,000**	3,158,400	181,000	14,100	11,400
Interior Chaparral	**1,345,900**	414,600	33,800	31,300	590,500	350,800	333,100	6,400	11,000
Madrean Encinal Woodland	**2,736,200**	518,800	151,400	34,400	1,259,800	609,300	1,165,200	14,800	2,200
Madrean Pine-Oak Woodland	**831,900**	20,200	1,700	5,000	89,200	30,100	438,400	100	200
Mixed Broad Leaf Deciduous Riparian Forest	42,600	36,200	5,000	4,200	**115,800**	17,300	65,500	7,900	4,300
Mixed Conifer Forest	**1,216,300**	33,900	2,700	43,500	225,900	13,800	191,000	1,000	52,000
Montane Grassland	**17,200**	0	0	0	16,900	0	2,300	0	0
Montane Willow Riparian Forest	17,300	14,400	800	600	**42,800**	11,500	12,100	100	4,100
Pinyon-Juniper Woodland	3,375,200	2,872,700	22,300	556,700	4,442,500	1,505,300	**5,647,800**	19,000	51,600
Ponderosa Pine Forest	**5,835,300**	112,500	16,400	94,200	1,408,400	147,000	1,588,900	900	44,100
Sagebrush Shrubland	134,500	685,200	1,600	66,300	642,100	184,700	**977,200**	21,200	11,700
Semi-desert Grassland	1,642,300	8,013,000	1,463,300	99,000	**7,996,600**	5,914,600	951,900	321,000	185,000
Spruce-fir Forest	**355,200**	35,000	1,000	7,000	128,200	2,300	72,000	300	10,000
Sub-alpine Grasslands	**311,700**	13,900	200	2,500	183,400	10,700	55,700	0	27,000
Urban/Agriculture	20,800	35,100	49,200	2,300	**4,119,500**	219,000	334,900	5,600	23,900
Water	25,300	25,000	2,300	79,100	**122,000**	900	38,100	15,600	55,500
Wetland/Cienega	8,900	9,500	200	400	**35,000**	7,100	6,800	2,900	1,100

Table 3-2. Approximate area (in acres) of potential natural vegetation types (PNVTs) across 11 Region 3 National Forests in Arizona and New Mexico. Region 3 National Grasslands in New Mexico, Oklahoma and Texas were not included in this analysis. Data used to generate this table included The Southwest Regional Gap Analysis Program (SWReGAP) and the landownership GIS-based layer. Note that SWReGAP data have not been tested for accuracy and is derived from remote sensing; therefore, analyses at the individual National Forest scale may be inaccurate. See Chapter 2 for further information regarding these datasets.

Potential Natural Vegetation Type	Apache-Sitgreaves	Carson	Cibola (Mt. Districts)	Coconino	Coronado	Gila	Kaibab	Lincoln	Prescott	Santa Fe	Tonto
Alpine/Tundra	0	300	0	**1,200**	0	0	0	0	0	0	0
Aspen Forest and Woodland	29,000	**118,400**	13,500	18,300	6,600	90,300	7,700	6,100	0	46,000	100
Barren	0	0	0	0	0	0	0	0	0	0	0
Cottonwood Willow Riparian Forest	0	300	1,000	200	5,300	0	0	1,000	200	3,600	**7,900**
Desert Communities	800	0	19,900	23,000	173,800	4,700	11,000	3,200	10,100	0	**771,900**
Disturbed/Altered	3,000	3,800	100	10,400	200	9,200	10,300	3,200	500	**36,600**	5,900
Gallery Coniferous Riparian Forest	0	**100**	0	0	0	0	0	0	0	0	0
Great Basin/ Colorado Plateau Grassland and Steppe	62,500	51,200	113,400	**159,400**	13,900	115,900	100,600	1,200	13,900	43,000	9,400
Great Plains Grassland	0	25,000	**191,900**	0	0	0	0	19,800	0	80,200	0
Interior Chaparral	18,000	32,800	9,500	76,800	151,400	48,800	19,500	53,200	368,400	23,400	**543,900**
Madrean Encinal Woodland	275,300	0	18,900	219,600	**723,900**	396,500	500	331,600	370,200	100	399,700
Madrean Pine-Oak Woodland	16,600	0	600	29,700	139,200	32,100	2,900	162,200	103,500	300	**344,800**
Mixed Broad Leaf Deciduous Riparian Forest	100	2,300	**14,300**	300	800	200	0	8,900	400	5,400	9,800
Mixed Conifer Forest	146,300	189,500	74,100	31,000	26,800	157,200	70,600	123,100	0	**392,700**	5,100
Montane Grassland	0	**16,600**	0	0	0	0	0	100	0	500	0
Montane Willow Riparian Forest	2,500	2,000	2,700	3,100	3,600	1,500	0	5,700	3,300	600	**6,200**
Pinyon-Juniper Woodland	381,700	278,200	**724,800**	290,000	100	578,300	640,100	70,800	138,400	269,600	3,300
Ponderosa Pine Forest	926,400	408,000	508,900	814,600	65,400	**1,754,600**	555,100	68,500	98,400	505,400	130,100
Sagebrush Shrubland	700	58,000	700	100	0	200	**67,200**	0	0	7,800	0
Semi-desert Grassland	74,100	200	41,000	106,800	406,300	47,900	6,800	204,000	146,500	100	**608,600**
Spruce-fir Forest	18,500	**174,900**	10,700	7,200	0	17,900	20,800	17,600	0	87,400	0
Sub-alpine Grasslands	56,800	**113,900**	1,600	31,900	0	10,200	26,800	14,600	0	55,800	0
Urban/Agriculture	1,200	2,900	1,200	**6,700**	300	200	1,700	100	1,600	500	4,400
Water	2,000	200	300	2,700	200	300	300	0	100	1,500	**17,700**
Wetland/Cienega	0	**7,400**	1,100	0	0	0	0	0	0	300	0

II. Distribution and Condition of Grasslands

The Arizona Statewide Grasslands Assessment (Schussman and Gori 2004, Gori and Enquist 2003) was used to summarize the extent of low elevation historic grasslands and their current condition by major landowners within Arizona and the portion of the Apache Highlands ecoregion that falls within New Mexico (See Chapter 2, Figure 2-1). The Mexico portion of the Grassland Assessment was not included in this analysis. In addition, grasslands on National Forests within the assessment area were summarized for each Forest. This included all of the Kaibab, Coconino, Prescott, Tonto, Apache-Sitgreaves, and Coronado National Forests in Arizona, and a small portion of the Gila National Forest in New Mexico.

The Grassland Assessment used a combination of expert mapping and intensive field verification and vegetation sampling to identify low elevation (< 5000 feet) historic grasslands in Arizona and determine their current condition. Montane grasslands were not included in the assessment. Current grassland condition was assessed based on relative dominance of native/non-native species, degree of encroachment by woody species, and erosion severity. Based on these factors, grasslands were assigned to five condition types: open native, restorable native, former, non-native, and transitional (see Chapter 2, Table 2-1, for detailed descriptions of these condition types). The current condition of grasslands in parts of the assessment area was not determined.

The extent and current condition of grasslands were determined for major landowners within the analysis area using landownership information from the Arizona Land Resource Information Service and the New Mexico Resource Geographic Information system. Detailed information about this data layer is provided in Chapter 2. For this analysis, areas were calculated for each major landowner as well as for each National Forest. It is important to note that the acreages calculated for National Forests in this section of the report which are based strictly on landownership, differ from acreages presented within the individual Forest chapters (Chapters 4-15), which are based on administrative boundaries and include lands owned by other landowners. Areas where current grassland conditions are undetermined are not included in percentages of grassland conditions by landowner.

The Grasslands Assessment identified over 26.6 millions acres of low elevation grasslands (< 5000 feet) within the analysis area (Table 3-3). Tribal lands, privately owned lands, and state trust lands contain the largest acreages of these grasslands. Nearly 2 million acres (7.5%) fall on National Forest lands. Within the National Forests, the Coronado, Coconino, and Apache-Sitgreaves National Forests have the largest acreages of low elevation grassland.

Overall, over 2.9 million acres (18.4%) of grasslands in the analysis area remain in open native condition (Table 3-4). Substantial portions of historic grasslands have experienced some shrub encroachment (restorable native, 37.6%), but can be restored to open native condition, while other portions (30.6%) have experienced significant shrub encroachment and probable conversion to shrubland (former grasslands). Compared to overall

conditions in the analysis area, grasslands on National Forests have higher proportions in open native (20.0%) and restorable native condition (58.5%), and lower proportions that have converted to shrublands (12.4%). The proportion of grasslands on National Forests dominated by non-native grasses is similar to the overall assessment area. However, nearly all non-native grasslands on National Forest occur on the Coronado National Forest, primarily due to the presence of Lehman (*Eragrostis lehmanniana*) and Boer (*Eragrostis chloromelas*) lovegrasses.

Table 3-3. Area (acres) identified as low elevation (<5000 feet) historic grasslands (Schussman and Gori 2004, Gori and Enquist 2003) for nine major landowners and seven National Forests in Arizona and parts of New Mexico that fall within the Apache Highlands Ecoregion. Grassland areas are based on all identified historic grasslands areas, even if the current condition was not determined.

Landowner	Total Acres	% of Assessment Area	Grassland Acres	% of Total Grassland Area
Bureau of Land Management	13,103,000	17.3	3,627,900	13.6
Department of Defense	2,848,700	3.8	59,500	0.2
US Fish and Wildlife Service	1,710,800	2.3	115,500	0.4
National Park Service	2,567,300	3.4	334,400	1.3
Other	304,300	0.4	21,500	0.1
Private	13,836,000	18.3	6,872,300	25.8
State Trust	9,789,400	12.9	5,460,800	20.5
Tribal	20,109,400	26.6	8,186,600	30.7
US Forest Service				
Apache-Sitgreaves N.F	2,013,200	2.7	347,000	1.3
Coconino N.F	1,831,300	2.4	365,100	1.4
Coronado N.F.	1,717,900	2.3	726,400	2.7
Gila N.F.	117,400	0.2	10,000	<0.1
Kaibab N.F	1,541,900	2.0	153,300	0.6
Prescott N.F	1,254,100	1.7	271,600	1.0
Tonto N.F	2,865,400	3.8	119,100	0.4
US Forest Service Total	11,341,200	15.0	1,992,400	7.5
Total	75,610,100	100.0	26,670,900	100.0

Table 3-4. Current condition of low elevation (< 5000 feet) grasslands for nine landowner categories and seven National Forests in Arizona and parts of New Mexico that fall within the Apache Highlands Ecoregion (from Schussman and Gori 2004, Gori and Enquist 2003). Areas with undetermined current condition are not listed or included in percentage calculations.

	Grassland Condition									
	Open Native		Restorable Native		Former		Non-native		Transitional	
Landowner	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%
Bureau of Land Management	404,500	12.2	1,101,300	33.1	1,569,800	47.2	18,800	0.6	234,800	7.1
Department of Defense	8,900	14.9	600	1.0	1,200	2.0	48,900	82.0	0	0.0
US Fish and Wildlife Service	3,100	2.7	13,000	11.3	3,800	3.3	95,600	82.8	0	0.0
National Park Service	1,400	1.0	6,400	4.5	131,000	91.9	2,500	1.8	1,200	0.8
Other	500	5.7	4,400	50.0	2,000	22.7	600	6.8	1,300	14.8
Private	1,230,700	23.4	1,862,100	35.4	1,210,700	23.0	646,000	12.3	313,100	5.9
State Trust	747,100	16.5	1,722,100	38.0	1,453,300	32.0	497,500	11.0	117,400	2.6
Tribal	220,100	25.3	317,000	36.4	324,000	37.2	0	0.0	10,500	1.2
US Forest Service										
Apache-Sitgreaves N.F	0	0.0	236,400	72.6	89,100	27.4	0	0.0	0	0.0
Coconino N.F	3,800	1.4	244,100	90.5	21,800	8.1	0	0.0	0	0.0
Coronado N.F.	180,200	24.8	317,500	43.7	75,700	10.4	153,000	21.1	0	0.0
Gila N.F.	9,000	90.0	0	0.0	1,000	10.0	0	0.0	0	0.0
Kaibab N.F	0	0.0	23,100	83.1	0	0.0	0	0.0	4,700	16.9
Prescott N.F	129,400	47.6	116,900	43.0	23,100	8.5	2,100	0.8	0	0.0
Tonto N.F	27,000	22.7	85,700	72.0	6,300	5.3	0	0.0	0	0.0
US Forest Service Total	349,400	20.0	1,023,800	58.5	217,100	12.4	155,100	8.9	4,700	0.3
Total	2,965,700	18.4	6,050,700	37.6	4,912,900	30.6	1,465,000	9.1	683,000	4.2

III. Distribution of Stream Reaches with Native Fish Occurrences

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 for 33 native fish species. Point localities for each species from 1975 and later, obtained from a variety of sources (see Chapter 2 for more details), were mapped to perennial stream reaches on a 1:100,000 scale linear hydrography layer for Arizona. Native fish occurrences were mapped to stream reaches which approximate the bounds of currently occupied habitat. However, it is recognized that at finer scales these reaches may differ somewhat from current native fish distributions. These differences are addressed on a forest by forest basis in the individual Forest chapters (Chapters 4-15). At the large statewide scale of this analysis, this data set provides the most current and useful information available for understanding the distribution of important stream reaches for native fishes. This analysis includes only Arizona. However, a similar data set for New Mexico is currently being developed, and results from that analysis may be incorporated into this document when available.

The Freshwater Assessment includes a database that integrates the distribution of all 33 native fishes into a single data layer that represents number of native fish species with occurrences on stream reaches across Arizona. This information was used along with landownership information from the Arizona Land Resource Information Service and the New Mexico Resource Geographic Information system (detailed information about this geo-spatial data layer is provided in Chapter 2) to determine the distribution (number of stream miles) of stream reaches with varying levels of native fish richness by major landowners and for individual National Forests in Arizona. In areas where streams serve as the boundary between landowners for a distance greater than five miles, one-half of the length of that stream reach was attributed to each landowner. More detailed information on the species and stream reaches with occurrences are provided in individual Forest chapters (Chapters 4-15).

Approximately 3,650 miles of stream reaches within Arizona have had occurrences of native fish species in the last 30 years, with the number of species with occurrences on stream reaches ranging from one to nine (Figure 3-1). Of major landowners in the state, the largest number of stream miles with native fish occurrences occurs on USFS lands, followed by Tribal and privately owned lands (Table 3-5). Together, these three landowner categories account for more than 75% of the stream miles with native fish occurrence in Arizona. While tribal lands tend to have more stream miles at low native species richness, National Forest lands tend to have the largest number of stream miles with high native fish richness (Figure 3-2). Overall, 50% of the stream miles with occurrences of five or more native fish species occur on Forest lands. Within National Forests, the Apache-Sitgreaves and Tonto National Forests have the majority of stream miles with native fish occurrences, including a large portion of the stream miles with occurrences of a large number of native fish species. However, the Coconino and Prescott National Forests also have noteworthy areas with occurrences of a high number of native fish species.

Of all native species in Arizona, fish may have suffered the largest losses (Minckley & Deacon, 1968; Williams and others 1985; Minckley & Rinne 1991; Olden & Poff 2005). Arizona has been ranked first among states in the proportion of native freshwater species at risk of extinction (Stein 2002). Olden and Poff (2005) documented substantial changes in the abundances of lower

Colorado River Basin species that occur on USFS lands in Region 3. For example, the following species have shown population declines: the Gila topminnow (36.8% decline), Apache trout (26.9% decline), speckled dace (16.5% decline), Gila chub (15.9% decline), and desert sucker (13.5% decline). However, some species have shown population increases, such as the longfin dace and Sonora (11.4% and 8.2%, respectively).

The causes of decline are many and have varied over time and space. Demands placed upon the region's limited water supplies are increasing as Arizona's population continues to grow, suggesting that activities occurring outside Forest boundaries could play an increasing role in the status of resources USFS is responsible for managing in a sustainable manner. Regional assessment data summarized here demonstrate the important role USFS plays in managing native fish habitat. Changes documented in native fish distribution combined with increasing pressure on limited water supplies indicate that native fish, watershed, and ground-water management may be an important focal area for comprehensive evaluation in forest plan revisions.

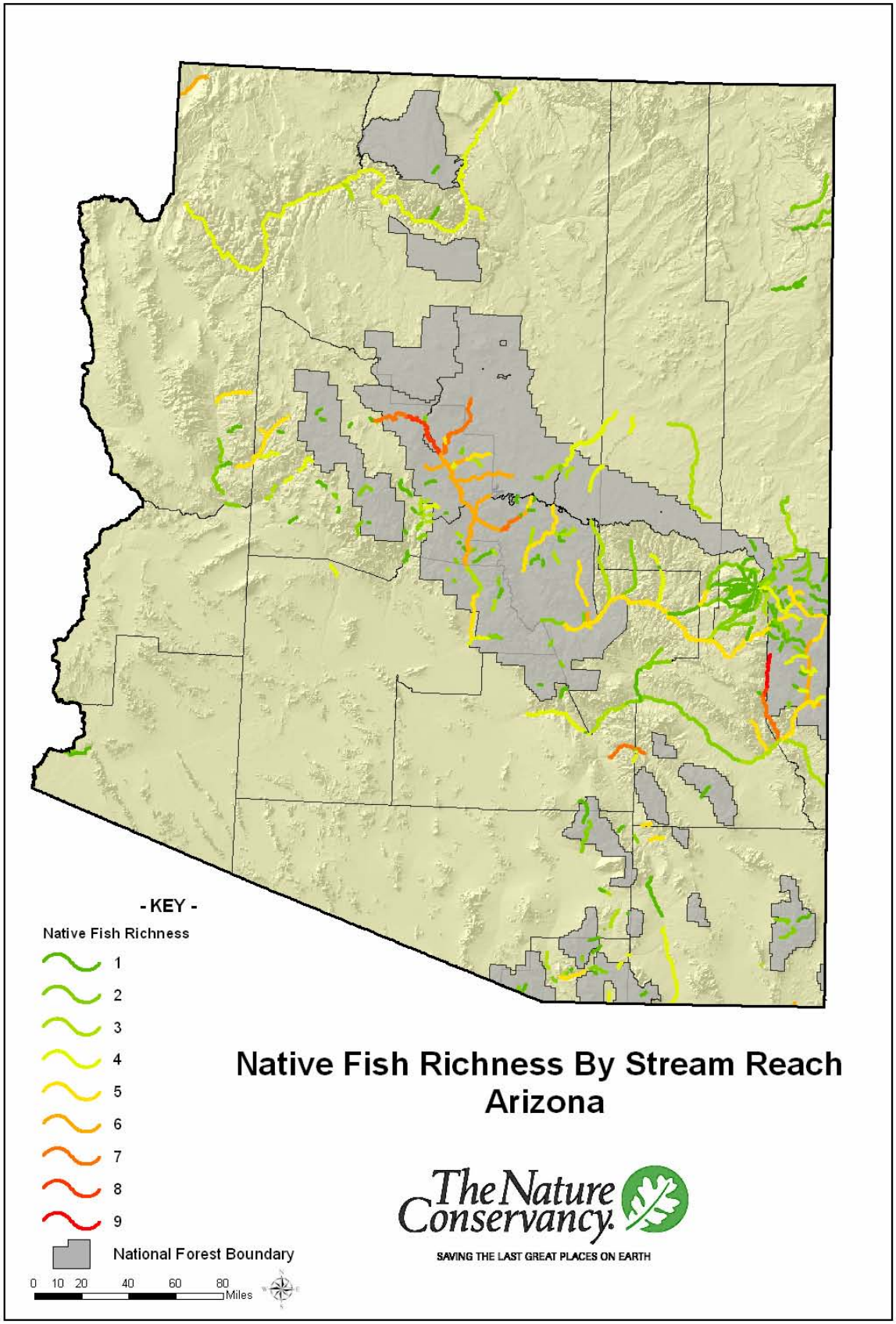

Figure 3-1. Stream reaches with occurrences of a varying number of native fish species (1-9) in Arizona.

Table 3-5. Approximate length (miles) of stream reaches with varying numbers of native fish species occurrences (1-9) for nine major landowner categories and six National Forests in Arizona. Native fish occurrences in stream reaches were determined based on occurrence information from 1975 and later.

	Native Fish Richness									
Landowner	1	2	3	4	5	6	7	8	9	Total
Bureau of Land Management	29	63	88	51	52	13	11	0	0	307
Department of Defense	0	4	0	0	0	0	0	0	0	4
US Fish and Wildlife Service	0	36	25	0	0	2	0	0	0	63
National Park Service	27	71	5	207	0	1	0	0	0	311
Other	1	5	9	19	2	0	5	0	0	41
Private	93	141	163	95	78	37	63	19	7	696
State Trust	25	20	24	44	27	1	2	0	0	143
Tribal	229	305	103	140	168	2	9	6	2	964
US. Forest Service										
Apache-Sitgreaves N.F	95	87	21	97	87	34	4	0	10	435
Coconino N.F	0	13	18	7	12	53	21	7	0	131
Coronado N.F.	34	41	0	0	0	0	0	0	0	75
Kaibab N.F	4	0	0	0	0	0	0	0	0	4
Prescott N.F	13	13	3	2	0	13	17	12	0	73
Tonto N.F	43	43	69	13	130	84	21	0	0	403
US. Forest Service Total	189	197	111	119	230	183	63	19	10	1121
Total	593	842	528	675	557	239	153	44	19	3650

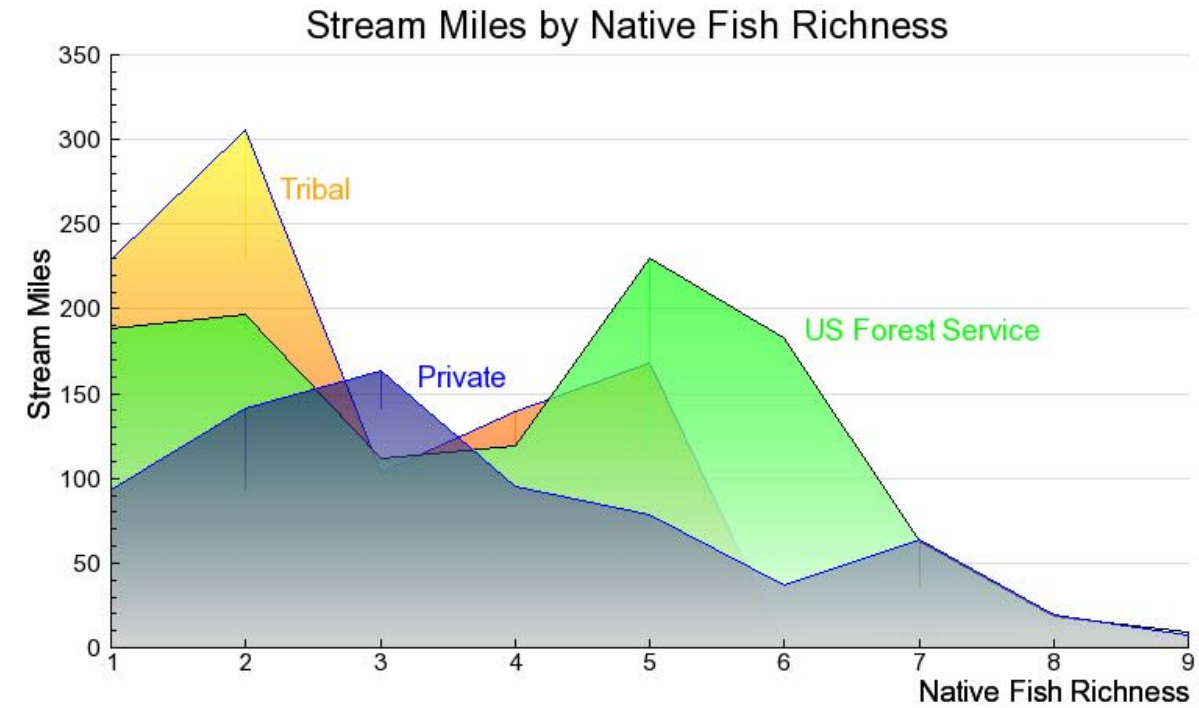

Figure 3-2. Approximate length (miles) of stream reaches with varying numbers of native fish species occurrences (1-9) for the three landowners (Forest Service, tribal, and private) with the most miles of stream with native fish occurrences.

IV. Ecoregional Assessments and Conservation Areas

The results of eight ecoregional assessments (Bell and others 1999, 2004 Marshall and others 2000, 2004, Neely and others 2001, The Nature Conservancy 2001, 2005, Tuhy 2002) were used to identify a network of areas important for sustaining the viability of the region's species and ecological systems across landownerships in Arizona and New Mexico. The individual areas that make up the network are referred to as conservation areas. Ecoregional assessments are comprehensive and systematic efforts to identify the minimum network of conservation areas on the landscape that are necessary to maintain the biological diversity of the ecoregion.

Ecoregions are large, contiguous units of land or water defined by ecological and environmental elements, rather than geo-political boundaries, and typically contain geographically distinct assemblages of species, natural communities, and environmental conditions. Because ecoregions typically include large proportions of ecosystem, community, and species distributions, they are useful for conservation planning. 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 network of conservation areas that most efficiently meets the conservation goals for all conservation targets within the ecoregion. These conservation areas, collectively called a conservation portfolio, represent the most current and scientifically robust hypotheses on the magnitude and distribution of areas on the landscape necessary to protect the biodiversity of the region. A more detailed description of the ecoregional assessment process can be found in Chapter 2, and the specific methods used for each ecoregion can be found within the ecoregional assessments. Many of the assessments are available for download at http://www.azconservation.org.

In general, ecoregional assessments serve several conservation, management and scientific purposes, including:

1. A spatial hypothesis on how to maximize the viability of a region's native species and ecological systems.
2. A spatial delineation of areas where land-uses and land management activities should be evaluated to identify and minimize potential adverse effects to the viability of species and ecological systems.
3. A spatial delineation of priority areas that land managers and others interested in promoting conservation should evaluate first to ensure that disturbance processes that perpetuate native ecological systems (e.g., fire, flooding) are maintained at a scale, frequency, and intensity that falls within the historical range of variation.
4. A network of cross-jurisdictional priorities that could serve as a basis for collaboration and the efficient use of limited resources to maximize conservation values.

While nine ecoregional assessments overlap Arizona and New Mexico (See Chapter 2, Figure 2-2), information from eight ecoregions was synthesized as part of this analysis. The Central Shortgrass Prairie Ecoregional Assessment (The Nature Conservancy 1998), which overlaps a small portion of northeast New Mexico (not including any National Forest lands), was not

included in this analysis. As part of a regional data rollup effort, The Nature Conservancy merged conservation area information from six individual assessments (Apache Highlands, Arizona-New Mexico Mountains, Colorado Plateau, Mojave Desert, Sonoran Desert, and the Southern Rocky Mountains) into a single regional data layer (http://www.azconservation.org). This dataset includes conservation area boundaries and attributes for the conservation targets that occur within each conservation area in those ecoregions. The assessments for Chihuahuan Desert Ecoregion, which overlaps a small part of the Lincoln National Forest, the Southern Shortgrass Prairie Ecoregion, which includes portions of the Santa Fe National Forest and Cibola Grasslands, were included individually.

The amount of overlap between conservation areas from the eight ecoregional assessments and major landowners within Arizona and New Mexico was calculated using landownership information from the Arizona Land Resource Information Service and the New Mexico Resource Geographic Information system. Detailed information about this geo-spatial data layer is provided in Chapter 2. It is important to note that the acreages calculated for National Forests here, based strictly on landownership, differ from those presented within the individual Forest chapters (Chapters 4-15), which are based on administrative boundaries and include lands owned by other landowners.

Nearly 57 million acres (37.6%) of land within Arizona and New Mexico have been identified as part of the network of conservation areas (Figure 3-3). The majority of these acres occur on private (29.7%), Region 3 US Forest Service (17.1%), and Bureau of Land Management (15.8%) lands (Table 3-6). However, the highest percentage overlap with conservation areas occurs on US Fish and Wildlife Service (93.1%), National Park Service (83%), and the Department of Defense (72.4%) lands, followed by US Forest Service (47.1%). Within National Forests, the Tonto (1,349,500 acres), Coconino (1,294,700 acres), Coronado (1,067,200 acres), and Gila (1,016,200 acres) National Forests have the largest acreages within conservation areas, while the Coconino (70.7%), Coronado (62.1%), and Santa Fe (58.8%) National Forests have the highest proportion of their lands overlapping with conservation areas.

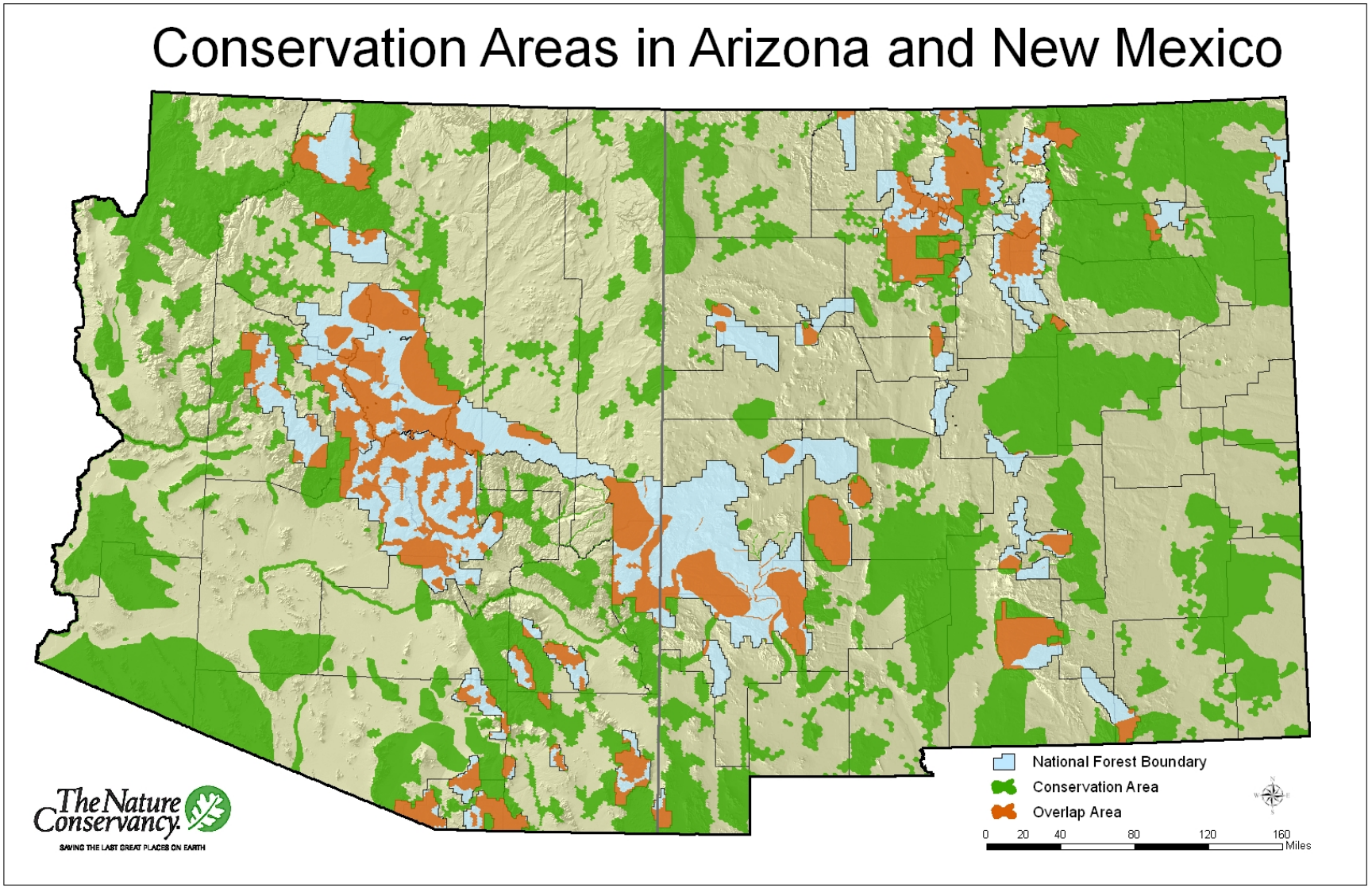

Figure 3-3. Conservation areas from eight ecoregional assessments in Arizona and New Mexico showing overlap with National Forest boundaries.

Table 3-6. Overlap between conservation areas from eight ecoregional assessments with major landowners and 11 National Forests in Arizona and New Mexico.

Landowner	Total Acres Overlapped by Conservation Areas	% in Conservation Areas	% of All Conservation Areas
Bureau of Land Management	8,940,200	34.9	15.8
Department of Defense	3,876,500	72.4	6.8
US Fish and Wildlife Service	1,950,300	93.1	3.4
National Park Service	2,448,100	83.0	4.3
Other	366,200	46.3	0.6
Private	16,834,500	35.7	29.7
State Trust	6,372,300	35.0	11.2
Tribal	6,244,700	22.2	11.0
US Forest Service			
Apache-Sitgreaves N.F	943,500	46.9	1.7
Carson N.F.	769,000	51.7	1.4
Cibola N.F.	683,300	39.1	1.2
Coconino N.F	1,294,700	70.7	2.3
Coronado N.F.	1,067,200	62.1	1.9
Gila N.F.	1,016,200	31.1	1.8
Kaibab N.F	547,200	35.5	1.0
Lincoln N.F.	539,600	49.3	1.0
Prescott N.F	560,500	44.7	1.0
Santa Fe N.F.	918,100	58.8	1.6
Tonto N.F	1,349,500	47.1	2.4
US Forest Service Total	9,688,800	47.5	17.1
Total	56,721,700	37.6	100.0

Discussion

This synthesis of existing regional assessment information highlights the ecological components that exist on National Forests and places them in context of other major landowners in Arizona and New Mexico. This information may be useful in identifying the opportunities and challenges that National Forests across the region face in developing forest plans that meet the ecological sustainability standard of the new forest planning rule [36 CFR sec. 219.10(b)]. In addition, the synthesis also provides a comparison of the ecological components across individual Forests. Each Forest contains ecological components that are either unique or occur disproportionately on their lands.

Potential Natural Vegetation Types

Within Arizona and New Mexico, Region 3 National Forests contain large proportions of several PNVTs that support unique plant and animal species. For example, according to SWReGAP data (note limitations of these data discussed earlier in this Chapter), Region 3 (led by the Carson, Gila, and Tonto National Forests) manages more high elevation PNVTs (aspen forest and woodlands, Madrean pine-oak, mixed conifer forests, montane grasslands, ponderosa pine forests, spruce-fir forests, and sub-alpine grasslands) than other major landowners in the Southwest. Also, Region 3 manages more interior chaparral (led by the Tonto National Forest) and Madrean encinal (led by the Coronado National Forest) than other landowners. It is obvious that Region 3 National Forests have an important role to play in maintaining the sustainability of these systems and the species that depend on them. Within the forest planning process, it may be important to consider the range of ecological processes that shaped historic conditions within these PNVTs, and evaluate the ability of current management actions to support ecosystem and species diversity. By understanding the context in which these PNVTs exist on National Forests, this information can be used to identify processes and conditions that support sustainability, formulate strategic goals, and evaluate the need to change management to meet the goal of ecological sustainability across the region.

According to the Arizona Grasslands Assessment (Schussman and Gori 2004) National Forests within the Southwest contain a relatively small proportion of low elevation (< 5000 feet) grasslands compared to other landowners. While a similar proportion of grasslands on National Forests remain in open native condition compared to other landowners, the proportions of other grassland conditions differ from other landowners in notable ways. For example, it is apparent that grasslands for all landowners, including National Forests face significant threats from encroachment by woody species as noted by the high proportion of grasslands in restorable native and former grassland conditions. However, on National Forests, a smaller proportion of these encroached grasslands have undergone a type conversion to shrublands while a larger proportion retains the potential for restoration to open native condition. Amongst National Forests, the Apache-Sitgreaves has seen a larger proportion of its grasslands converted to shrublands. The Coronado National Forest, due to the threats from non-native lovegrasses, has the largest proportion of non-native grasslands.

Based on the documented loss of grasslands region-wide, the need for appropriate maintenance and restoration goals and management to arrest declines is paramount. Based on this analysis, the Coronado, Prescott, Apache-Sitgreaves, Coconino, and Tonto National Forests, with their large acreages of open native and restorable grasslands, can make a significant contribution to regional sustainability of grasslands by identifying and evaluating the drivers of grassland change and developing strategic goals that would provide for the restoration and maintenance of this important ecological system.

Protecting and restoring grasslands in the Southwest from encroaching shrubs and non-native grasses are some of the major challenges landowners, including USFS, face in maintaining the ecological and biological integrity of grassland systems. Brunson and others (2001) suggest that prescribed burns can be utilized to reduce shrub cover when sufficient fuel loads are present, which may require rest from grazing. According to Schussman and Gori (2004), some

grasslands in Arizona could be burned with only three growing seasons or less of rest, while other sites would require longer periods of rest to build adequate fuel loads. In contrast, fire may not be a useful approach when attempting to control the spread of non-native grasses. Because some non-native grasses may spread further when burned and the general lack of information of how many non-native grasses respond to fire, Schussman and Gori (2004) suggest using caution when burning areas dominated by non-native grass species such as Lehmann lovegrass (*Eragrostis lehmanniana*), Boer lovegrass (*Eragrostis chloromelas*) and especially cheatgrass (*Bromus tectorum*).

Freshwater Species and Systems

It is widely recognized that native freshwater fishes in the United States are highly imperiled, and Arizona and New Mexico have some of the highest percentages of threatened fish species (85% and 30%, respectively; Warran and Burr 1994). It is thought that the first and most dramatic decline in native fishes in the Southwest occurred between 1890 and 1935 as a result of intensive water management, introduction of non-native species, and the construction of dams (Mueller and Marsh 2002, Olden and Poff 2005). Today, many native fish species in the Southwest have limited distributions, making their continued viability particularly vulnerable to local and regional threats. Within Arizona, National Forests have a vital role in assuring the sustainability of these species. Amongst major landowners, National Forests have the largest proportion of stream miles with occurrences of one or more of 33 native fish species. The Apache-Sitgreaves and Tonto National Forests, in particular, have substantial stream miles with native fishes. Compared to other landowners, National Forests have a greater proportion (as much as one-half) of the stream miles with high native fish species richness. From a planning perspective, these areas, which are identified in individual Forest chapters (Chapters 4-15) may serve as important areas in considering the sustainability of aquatic vertebrate species. Given the magnitude and rate of loss of native fishes in the Southwest, and the potential role Region 3 can play in maintaining biodiversity of freshwater systems, it is vital that these systems and the species that depend upon them are an integral component of the ecological sustainability of forest plans.

Ecoregional Assessments

The ecoregional assessments that address Arizona and New Mexico provide a useful regional perspective on areas important for sustaining biodiversity. They also point to the role that National Forest lands play in maintaining biodiversity in the region. The degree of overlap between ecoregional conservation areas and National Forests in Arizona and New Mexico underscores the important ecological values that exist on National Forests lands. Nearly one-half of National Forest lands overlap conservation areas, representing over 17% of all conservation areas in the two-state region, which is the second highest percentage of any landowner overlap. Nearly all Region 3 National Forests have significant areas of overlap, led by the Tonto, which has the largest acreage (1,349,500 acres) and proportion (2.4%) of overlap.

The suite of conservation areas, when considered as a whole, represents not only priority locations in these two states for maintaining biodiversity, but also the minimum area on the landscape needed to maintain the region's biodiversity. As such, the suite of areas is intended to be highly strategic and can provide important leverage for maintaining biodiversity at large, ecoregional scales. Furthermore, none of the identified conservation areas should be considered inconsequential for maintaining biodiversity at an ecoregional scale. Each conservation area is important and should be evaluated in terms of currently allowable uses and activities and their associated impacts to biodiversity. In some cases, analyses of this type may indicate the need for management change.

It is important to note that these conservation areas do not necessarily imply the need for special protections; nor does it necessitate blanket restriction of activities within these areas. Rather, conservation areas can be viewed as priority areas for assessment of impacts associated with ongoing uses and activities and determination of their compatibility with sustaining biodiversity at ecoregional scales. From the perspective of forest planning for the maintenance of ecosystem and species diversity, conservation areas can serve several important functions. First, they can be used as an analysis tool for assessing land use suitability. Second, they can be used to help determine appropriate objectives for individual management areas; for example, managing ecosystem characteristics and processes within the historic range of variability. Third, they can aid in identifying specific plan components, including management objectives and guidelines, for species whose sustainability is threatened.

To further aid in planning efforts, each conservation area has associated with it a number of conservation targets (species, vegetation systems, and ecological features), which are representative of the biodiversity in the area. An analysis and breakdown of these conservation targets is provided for each National Forest in the individual Forest chapters (Chapters 4-15). These conservation targets and the threats they face can be used to analyze and address the likely impacts of current management on ecological sustainability in terms of both ecosystem and species diversity. These targets can also aid in identifying and characterizing the need for management change and evaluating new management strategies for addressing sustainability, i.e., maintaining both ecosystem and species diversity.

Given the regional perspective of the ecoregional assessments and the strategic nature of the conservation areas, use of conservation areas and conservation targets as analysis tools for addressing the threats facing biodiversity can provide a key step, within the context of forest planning, in sustaining the ecosystems and species that exist in the region.

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Chapter 4:

Ecological & Biological Diversity of the Coronado National Forest

In

Ecological and Biological Diversity of National Forests in Region 3

Bruce Vander Lee, Ruth Smith, and Joanna Bate
The Nature Conservancy

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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.

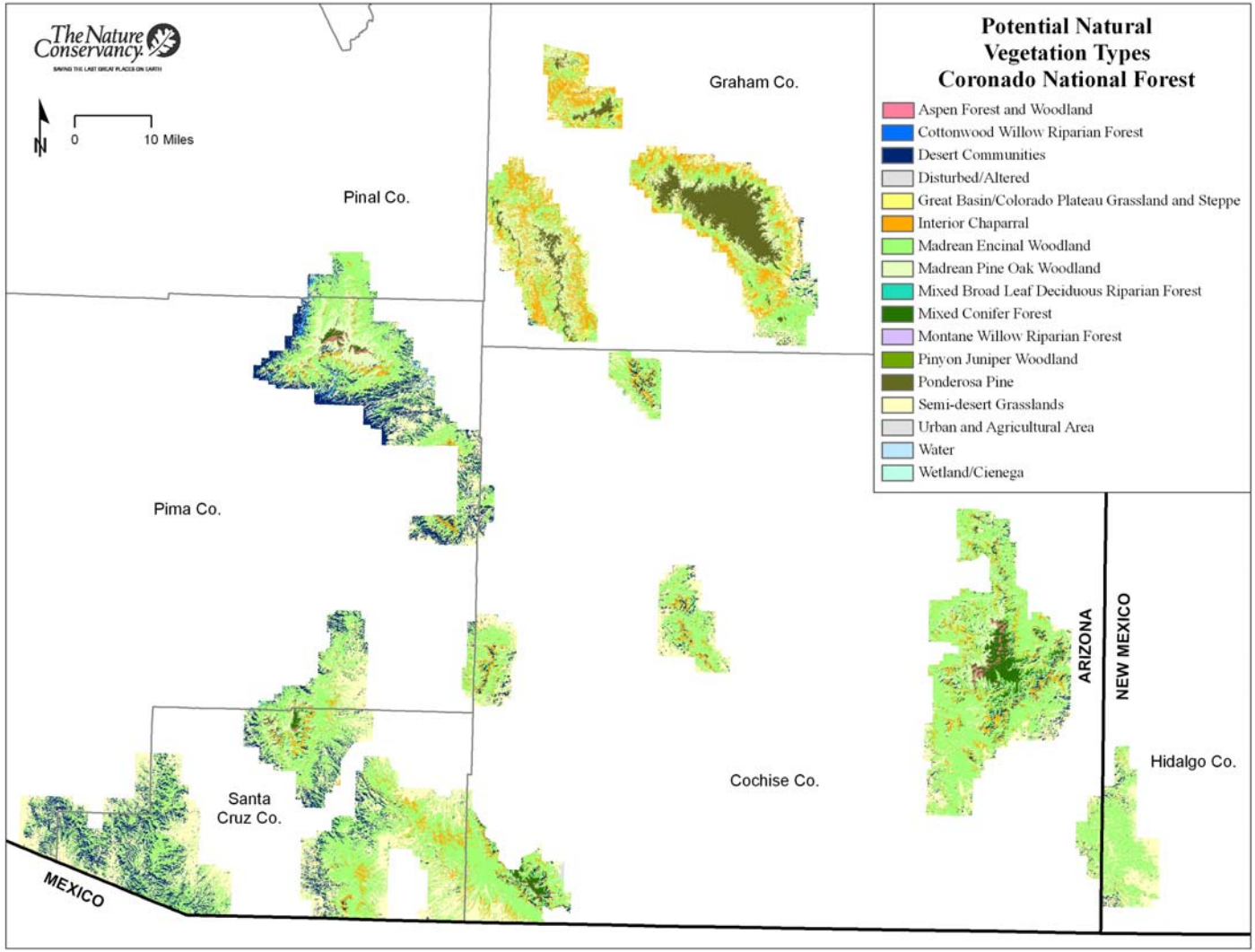

Figure 4-1. Distribution of potential natural vegetation types on the Coronado National Forest. This map was created using data from the Southwest Regional Gap Analysis Project (SWReGAP; U.S. Geological Survey National Gap Analysis Program. 2004). SWReGAP vegetation types were aggregated and converted 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
Semi-desert Grassland	406,300	23.7
Urban and Agricultural Area	300	<0.1
Water (open water)	200	<0.1
Total	1,717,800	

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.

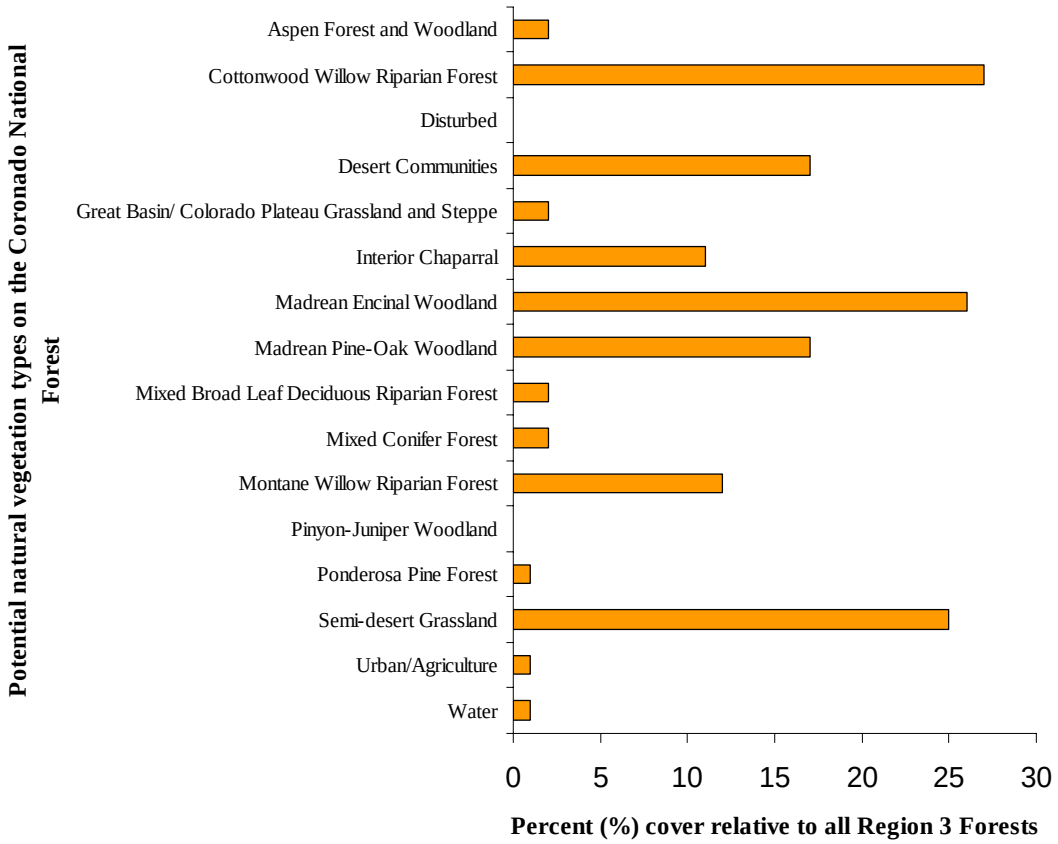

Figure 4-2. Percentage of cover area of each potential natural vegetation type that occurs on the Coronado National Forest in relation to all other Region 3 National Forests combined. Analysis was conducted using data from the Southwest Regional Gap Analysis Project (SWReGAP). For information about the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

	Grassland Type									
	Open Native		Restorable Native		Non-native		Former		Total	
District	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	154600	20.4
Nogales	127,800	48.4	93,300	35.3	39,000	14.8	4,000	1.5	264100	34.9
Safford	9,500	8.0	47,800	40.2	3,900	3.3	57,600	48.5	118800	15.7
Santa Catalina	0	0.0	69,000	62.6	33,100	30.0	8,200	7.4	110300	14.6
Sierra Vista	43,100	39.4	17,100	15.6	46,300	42.4	2,800	2.6	109300	14.4
Total	200,900	26.5	321,300	42.4	157,300	20.8	77,600	10.2	757100	100.0

[a] Percent of grasslands on ranger district in grassland condition type
[b] Percent of grasslands on Coronado NF on each ranger district

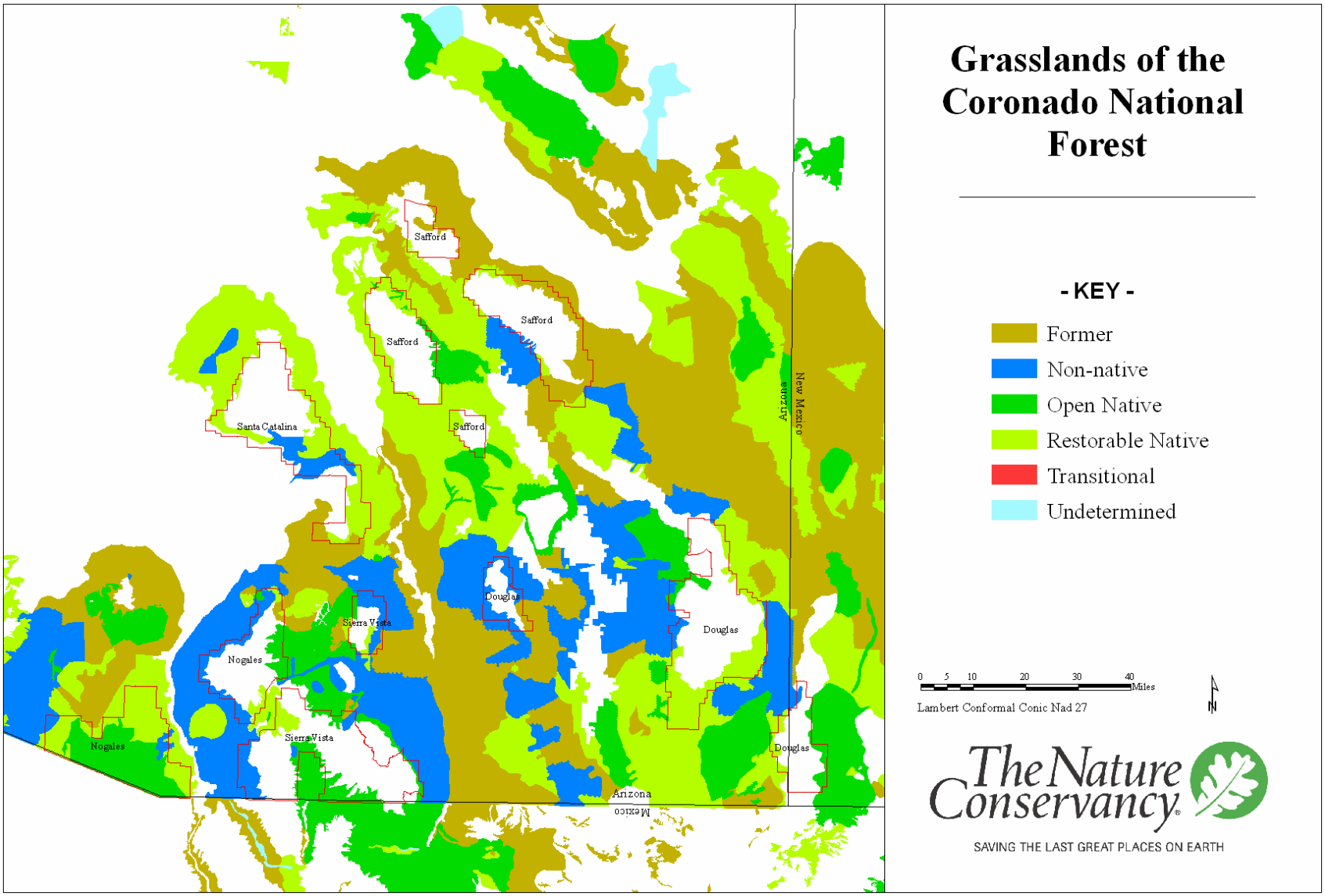

Figure 4-3. Grassland types, based on condition, on five ranger districts on the Coronado National Forest in Arizona and New Mexico (from Schussman and Gori 2004, Gori and Enquist 2003).

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 Gila topminnow 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 Gila topminnow (36.8% decline), Apache trout (26.9% decline), speckled dace (16.5% decline), Gila chub (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, Gila topminnow, and Gila chub have the 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 bee 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.

	Ranger District					
Species	Douglas	Nogales	Safford	Santa Catalina	Sierra Vista	Total
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.

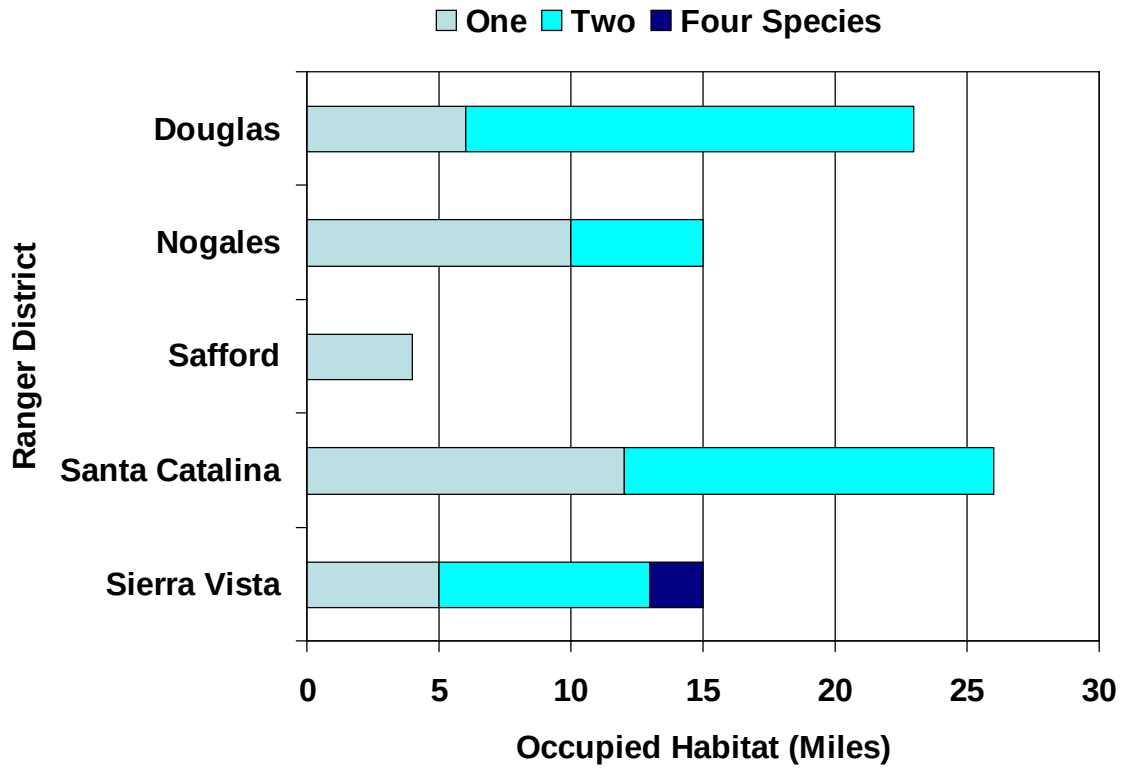

Figure 4-4. Number of stream miles with varying native fish species richness based on occurrences from 1975 and later for five districts on the Coronado National Forest, Arizona.

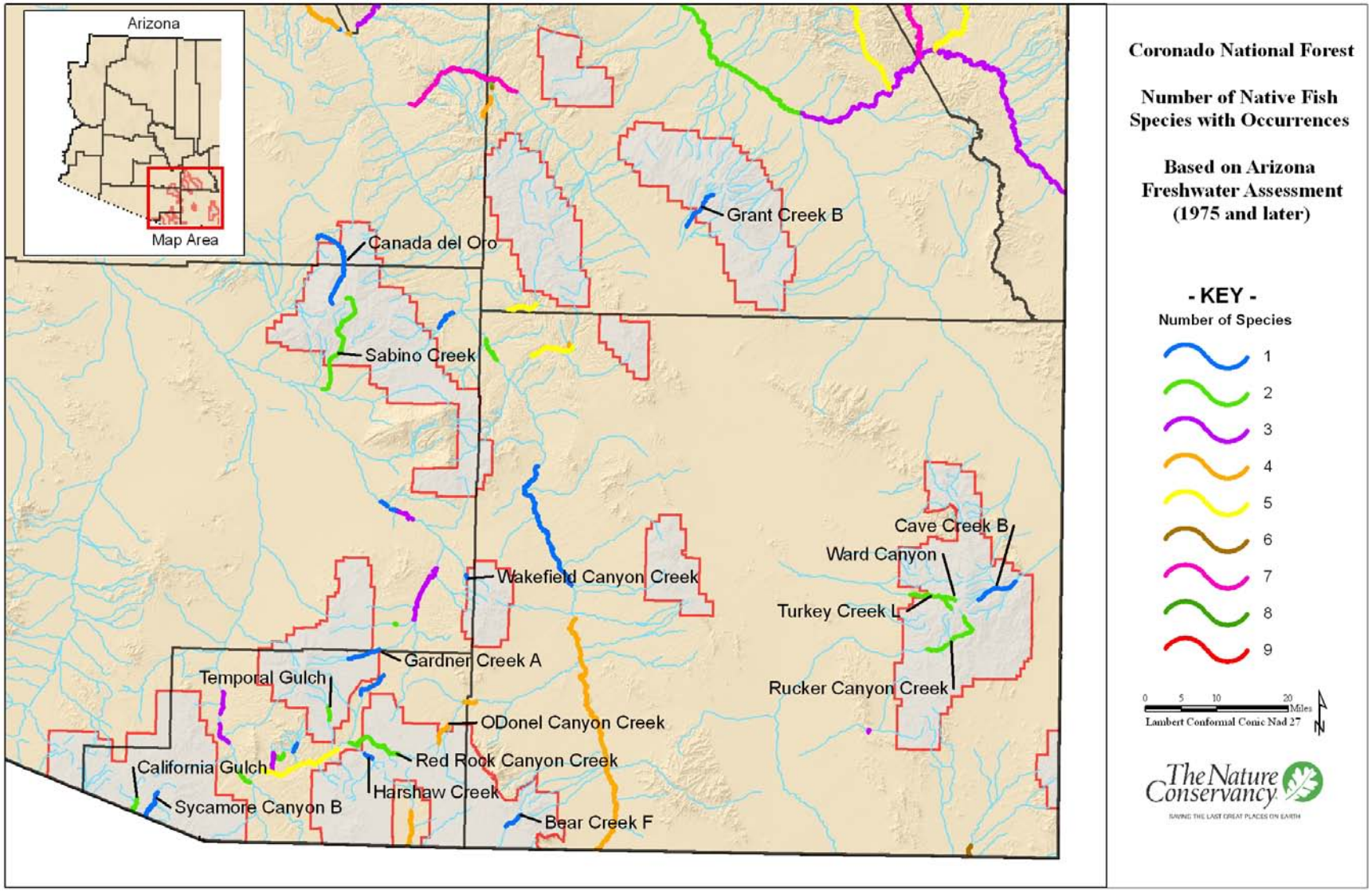

Figure 4-5. Perennial stream reaches with varying numbers of native fish species with occurrences on five ranger districts on the Coronado National Forest in Arizona.

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.

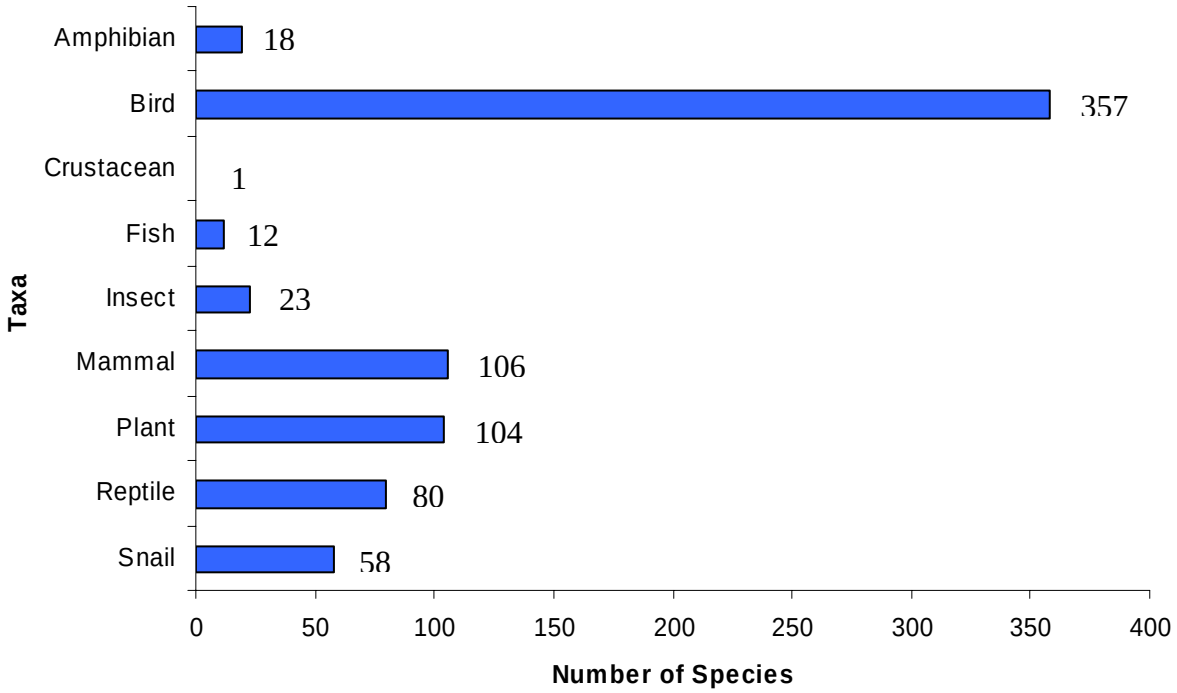

Figure 4-6. Number of species, by taxa, that inhabit the Coronado National Forest based on data from the R3 Species Database. This database includes all known terrestrial and aquatic vertebrates, but only known plants, crustaceans, insects and snails of management concern. Because of the limitations 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 Gila topminnow Gila trout Yaqui chub	Apache trout Sonora chub		Gila chub
INSECT			Stephan's heterelmis riffle beetle	
MAMMAL	Jaguar Lesser long-nosed bat Mexican long-nosed bat Mount Graham red squirrel			
PLANT	Canelo Hills ladies' tresses orchid Pima pineapple cactus			
REPTILE		Deset tortoise New Mexican ridgenose rattlesnake		
SNAIL			Huachuca springsnail	

Table 4-8. Number of species by taxon that inhabit the Coronado National Forest that are assigned the various global rankings by NatureServe. Eleven species are not included in this table as they do not have an assigned global rank. G1 = critically imperiled; G2 = imperiled; G3 = vulnerable; G4 = apparently secure; G5 = secure; GNR = not ranked; GU = unrankable; T = infraspecific taxon (subspecies or varieties).

Global Ranking	Amphibian	Bird	Crustacean	Fish	Insect	Mammal	Plant	Reptile	Snail	Total
G1	1	0	0	2	3	0	15	1	27	49
G2	0	2	1	2	5	0	24	0	21	55
G3	2	4	0	4	6	5	28	0	8	57
G4	2	26	0	1	4	11	11	9	0	64
G5	11	303	0	1	0	73	5	56	0	449
GNR	0	0	0	0	1	0	2	0	0	3
GU	0	0	0	0	0	0	1	0	0	1
T1	1	0	0	0	0	1	2	1	2	7
T2	0	2	0	0	1	0	8	0	0	11
T3	1	6	0	2	2	3	6	3	0	23
T4	0	3	0	0	0	3	0	4	0	10
T5	1	2	0	0	0	2	1	6	0	12
TNR	0	2	0	0	0	1	0	0	0	3
TU	0	4	0	0	0	0	0	0	0	4

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	5	4
S2	0	1	29	28	0	0	2	2	6	0	10	14	27	8	8	2	3	1
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.

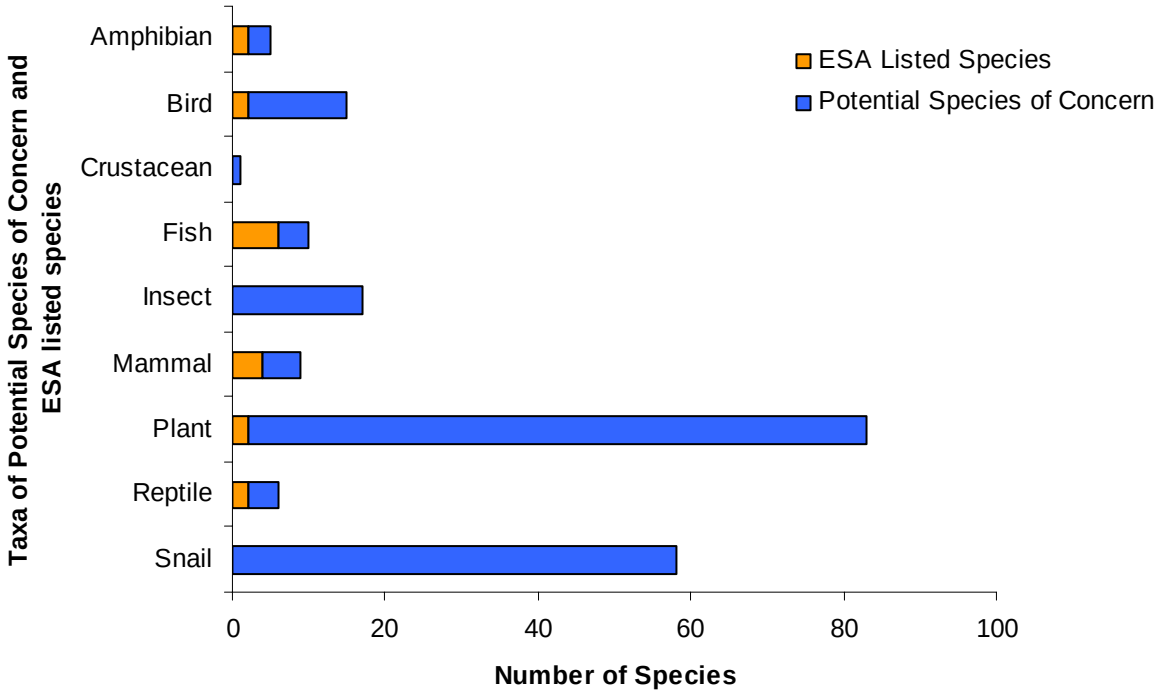

Figure 4-7. The number of federally listed endangered and threatened species by taxa (in orange) and potential species-of-concern (in blue) that currently inhabit the Coronado National Forest. Endangered and threatened conservation status is designated by the US Fish and Wildlife Service. Species that 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.

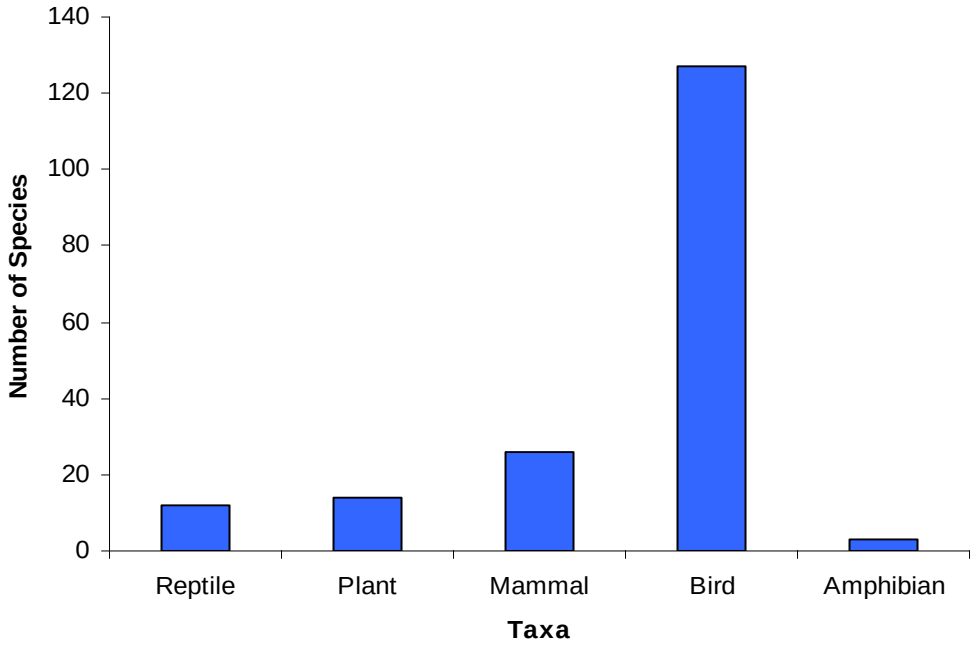

Figure 4-8. The number of potential species-of-interest by taxa that currently inhabit the Coronado National Forest. Species were considered potential species-of-interest if they fell into one or more of the following categories: special state conservation status (WSC, HS, and SR in Arizona or threatened 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
American peregrine falcon
Common black-hawk
Ferruginous hawk
Northern harrier

Gruiformes – Coots, Cranes, Limpkin, Moorhens, and Rails
Yellow rail

Shorebirds
Long-billed curlew
Mountain plover
Stilt sandpiper

Owls
Burrowing owl
Elf owl
Flammulated owl
Whiskered screech owl

Hummingbirds
Lucifer hummingbird
Broad-billed hummingbird

Trogons
Elegant trogon

Woodpeckers
Arizona woodpecker
Lewis's woodpecker

Tyrrant Flycatchers
Buff-breasted flycatcher
Greater peewee
Northern beardless tyrannulet
Rose-throated becard

Shrikes and Vireos
Arizona Bell's Vireo
Gray vireo
Loggerhead shrike

Mimids – Catbirds, Mockingbirds and Thrashers
Bendire's thrasher
Crissal thrasher

Pipits
Sprague's pipit

Wood Warblers
Black-throated gray warbler
Grace's warbler
Kentucky warbler
Louisiana waterthrush
Olive warbler
Prothonotary warbler
Red-faced warbler
Worm-eating warbler

Emberizine Sparrows and Allies
Baird's sparrow
Black-chinned sparrow
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

Upland Game Birds
Montezuma quail
Scaled quail

Pigeons and Doves
Band-tailed pigeon

Owls
Elf owl
Flammulated owl
Short-eared owl

Goatsuckers and Swifts
Black swift
White-throated swift

Hummingbirds
Allen's hummingbird
Calliope hummingbird
Costa'a hummingbird
Rufous hummingbird

Trogons
Elegant trogon

Woodpeckers
Arizona woodpecker
Lewis's woodpecker

Tyrrant Flycatchers
Olive-sided flycatcher
Thick-billed kingbird
Willow flycatcher

Shrikes and Vireos
Gray vireo

Jays, Crows, and Allies
Pinyon jay

Mimids – Mockingbirds and Thrashers
Bendire's thrasher

Pipits
Sprague's pipit

Wood Warblers
Grace's warbler
Hermit warbler
Kentucky warbler
Prothonotary warbler
Red-faced warbler
Virginia's warbler
Worm-eating warbler

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

Finches and Old World Sparrows
Lawrence's goldfinch

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.

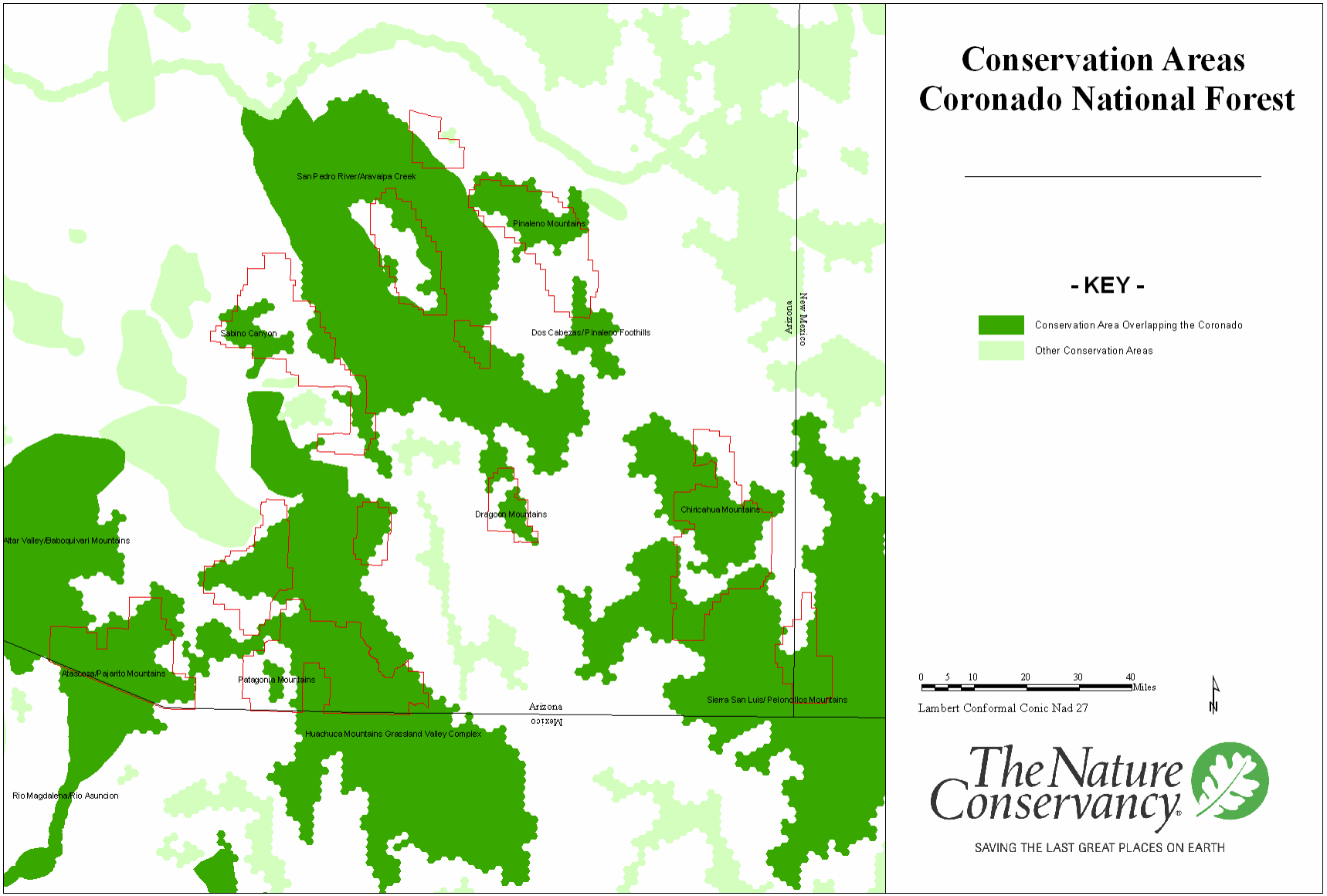

Figure 4-9. Conservation areas (N=14) that overlap the Coronado National Forest in Arizona and New Mexico.

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.

	Habitat		
Conservation Area	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

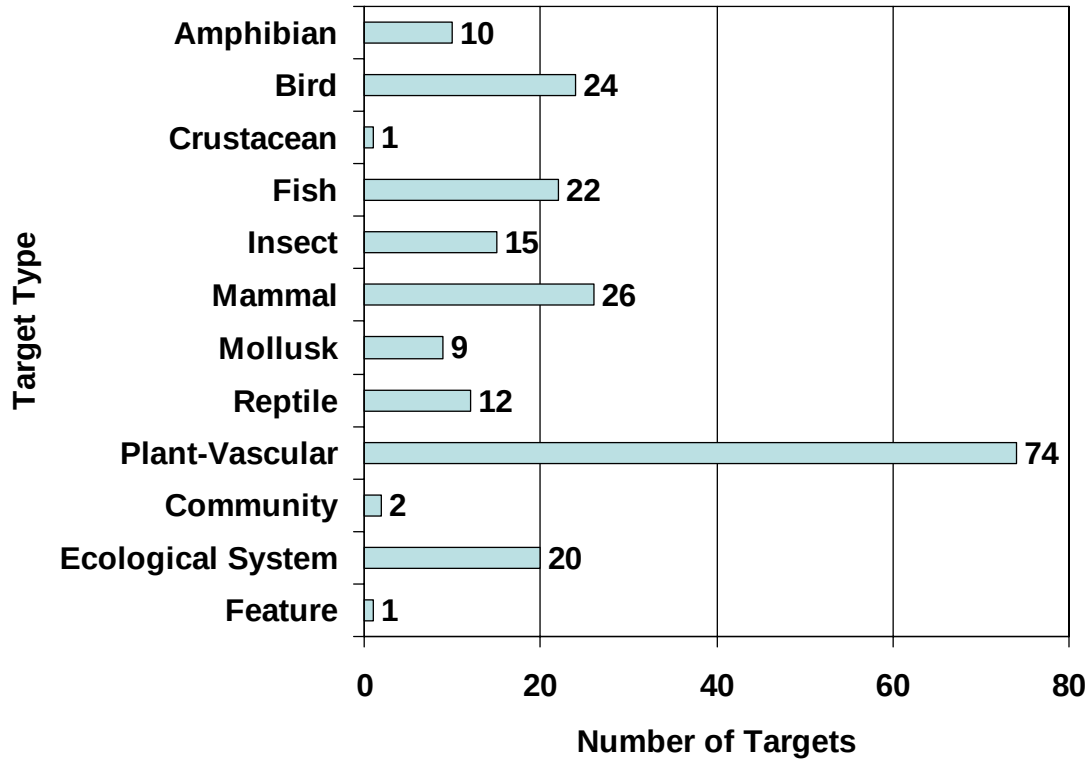

Figure 4-10. Number of conservation targets, by type, that occur on 13 conservation areas overlapping the Coronado National Forest in Arizona and New Mexico.

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 glandulsoa 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				
	Rana chiricahuensis	Chiricahua leopard frog	G3	LT
Bird				
	Callipepla squamata	Scaled quail	G5	
	Falco peregrinus anatum	American peregrine falcon	G3	
	Leptonycteris curasoae	Lesser long-nosed bat	G3	LE
Mammal				
	Myotis thysanodes	Fringed myotis	G4	
	Plecotus townsendii pallescens	Pale Townsend's big eared bat	G4	
	Ursus americanus	Black bear	G5	
Vascular plant				
	Carex ultra	Arizona giant sedge	G3	
	Graptopetalum bartramii	Batram stonecrop	G3	
	Hedeoma dentatum	Mock pennyroyal	G3	
	Lupinus Lemmonii	Lemmon's lupine	G1	
	Penstemon discolor	Catalina beardtongue	G2	

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Appendix 4-A: Plants and animals of the Coronado National Forest*. Refer to Chapter 2, section IV, for more information on how the data was generated for this table. Also, see information regarding the R3 Species data base at www.azconservation.org.

NatureServe Scientific Name	NatureServe Common Name	G-rank	AZ S-rank	NM S-rank	ESA status	AZ state status	NM state status	Birds of Conserv. Concern	Partners in Flight Watch List
Ambystoma tigrinum	Tiger Salamander	G5	S5	S5					
Ambystoma tigrinum stebbinsi	Sonoran Tiger Salamander	T1	S1S2		E	WSC			
Bufo alvarius	Colorado River Toad	G5	S5	S2			T		
Bufo cognatus	Great Plains Toad	G5	S5	S5					
Bufo debilis insidior	Western Green Toad	T5	S3	S4					
Bufo punctatus	Red-Spotted Toad	G5	S5	S5					
Bufo woodhousii	Woodhouse's Toad	G5	S5	S5					
Eleutherodactylus augusti cactorum	Western Barking Frog	T3	S1			WSC			
Gastrophryne olivacea	Great Plains Narrowmouth Toad	G5	S3	S1		WSC	E		
Hyla arenicolor	Canyon Treefrog	G5	S5	S4					
Hyla wrightorum	Mountain Treefrog	G4	S4	S3					
Rana catesbeiana	Bullfrog	G5	SNA	SNA					
Rana chiricahuensis	Chiricahua Leopard Frog	G3	S3	S1	T	WSC			
Rana subaquavocalis	Ramsey Canyon Leopard Frog	G1	S1						
Rana yavapaiensis	Yavapi Leopard Frog	G4	S4	S1		WSC	E		
Scaphiopus couchii	Couch's Spadefoot	G5	S5	S5					
Spea bombifrons	Plains Spadefoot	G5	S3	S5					
Spea multiplicata	New Mexico Spadefoot	G5	S5	S5					
Accipiter cooperii	Cooper's Hawk	G5	S4	S4B S4N					
Accipiter gentilis	Northern Goshawk	G5	S3	S2B S2N		WSC			
Accipiter gentilis apache	Apache Northern Goshawk	T3	S1S2			WSC			
Accipiter striatus velox	Sharp-Shinned Hawk	T5							
Aechmophorus clarkii	Clark's Grebe	G5	S3	S4B S5N		WSC			

* Note: Scientific and common names recognized by NatureServe are used, unless highlighted in bold.

NatureServe Scientific Name	NatureServe Common Name	G-rank	AZ S-rank	NM S-rank	ESA status	AZ state status	NM state status	Birds of Conserv. Concern	Partners in Flight Watch List
Aechmophorus occidentalis	Western Grebe	G5	S3	S4B S5N					
Aegolius acadicus acadicus	Northern Saw-Whet Owl	TU							
Aeronautes saxatalis	White-Throated Swift	G5	S5	S4B S4N					x
Agelaius phoeniceus	Red-Winged Blackbird	G5	S5	S5B S5N					
Aimophila botterii arizonae	Botteri's Sparrow	T4						x	
Aimophila carpalis	Rufous-Winged Sparrow	G4	S3					x	x
Aimophila cassinii	Cassin's Sparrow	G5	S4	S5B S5N				x	
Aimophila ruficeps	Rufous-Crowned Sparrow	G5	S4	S5B S5N					
Amazilia violiceps	Violet-Crowned Hummingbird	G5	S3	S1B S1N		WSC	T		
Ammodramus bairdii	Baird's Sparrow	G4	S2N	S2N		WSC	T	x	x
Ammodramus savannarum	Grasshopper Sparrow	G5	S3	S3B S4N					
Ammodramus savannarum ammolegus	Arizona Grasshopper Sparrow	TU	S2	S1B S1N					
Amphispiza belli	Sage Sparrow	G5	S4	S4B S4N				x	
Amphispiza bilineata	Black-Throated Sparrow	G5	S5	S5B S5N					
Anas acuta	Northern Pintail	G5	S2B S5N	S4B S5N					
Anas crecca	Green-Winged Teal	G5	S3B S5N	S4B S5N					
Anas cyanoptera	Cinnamon Teal	G5	S5	S4B S5N					
Anas platyrhynchos	Mallard	G5	S5	S5B S5N					
Anas strepera	Gadwall	G5	S5	S4B S5N					
Anthus rubescens	American Pipit	G5	S2B S5N	S4B S5N					
Anthus spragueii	Sprague's Pipit	G4	S2N	S2N		WSC		x	x

NatureServe Scientific Name	NatureServe Common Name	G-rank	AZ S-rank	NM S-rank	ESA status	AZ state status	NM state status	Birds of Conserv. Concern	Partners in Flight Watch List
Aphelocoma californica	Western Scrub-Jay	G5	S5	S5B S5N					
Aphelocoma ultramarina	Mexican Jay	G5	S5	S4B S4N					
Aquila chrysaetos	Golden Eagle	G5	S4	S4B S4N					
Archilochus alexandri	Black-Chinned Hummingbird	G5	S5	S5B S5N					
Ardea alba egretta	Great Egret	TNR				WSC			
Ardea herodias	Great Blue Heron	G5	S5	S4B S5N					
Asio flammeus	Short-Eared Owl	G5	SNR	S2N					x
Asio otus	Long-Eared Owl	G5	S2B S3S4N	S4B S4N					
Athene cunicularia hypugaea	Burrowing Owl	T4	S3	S4B S4N				x	
Auriparus flaviceps	Verdin	G5	S5	S4B S4N					
Aythya affinis	Lesser Scaup Duck	G5	S5N	S4B S5N					
Aythya americana	Redhead	G5	S4	S4B S5N					
Aythya valisineria	Canvasback Duck	G5	S1B S4N	S4B S4N					
Baeolophus ridgwayi	Juniper Titmouse	G5	S5	S5B					
Baeolophus wollweberi	Bridled Titmouse	G5	S4	S4B S4N					
Bombycilla cedrorum	Cedar Waxwing	G5	S3S4N	S5N					
Botaurus lentiginosus	American Bittern	G4	S1S2	S3B S4N		WSC			
Branta canadensis	Canada Goose	G5	S4N	S4B S5N					
Bubo virginianus	Great-Horned Owl	G5	S5	S5B S5N					
Bubulcus ibis	Cattle Egret	G5	S1B S4N	S3B S4N					
Bucephala albeola	Bufflehead	G5	S5N	S5N					

NatureServe Scientific Name	NatureServe Common Name	G-rank	AZ S-rank	NM S-rank	ESA status	AZ state status	NM state status	Birds of Conserv. Concern	Partners in Flight Watch List
Bucephala clangula	Common Goldeneye	G5	S5N	S5N					
Buteo albonotatus	Zone-Tailed Hawk	G4	S4	S3B S3N					
Buteo jamaicensis	Red-Tailed Hawk	G5	S5	S5B S5N					
Buteo lagopus	Rough-Legged Hawk	G5	SNRN	S4N					
Buteo nitidus maxima	Northern Gray Hawk	T3	S3	S1N		WSC			
Buteo regalis	Ferruginous Hawk	G4	S2B S4N	S2B S4N		WSC		x	
Buteo swainsoni	Swainson's Hawk	G5	S3	S4B S4N					x
Buteogallus anthracinus	Common Black-Hawk	G4	S3	S2B S3N		WSC	T	x	
Butorides virescens	Green Heron	G5	S4	S4B S4N					
Calamospiza melanocorys	Lark Bunting	G5	S1B S5N	S4B S5N				x	
Calcarius mccownii	Mccown's Longspur	G4	S2N	S4N					x
Calcarius ornatus	Chestnut-Collared Longspur	G5	S3N	S5N					
Calidris alba	Sanderling	G5	SNA	S4N					
Calidris alpina	Dunlin	G5	S2N	S4N					
Calidris bairdii	Baird's Sandpiper	G5	SNA	S4N					
Calidris himantopus	Stilt Sandpiper	G5		S4N				x	
Calidris melanotos	Pectoral Sandpiper	G5	SNA	S4N					
Calidris minutilla	Least Sandpiper	G5	S5N	S4N					
Calidris pusilla	Semipalmated Sandpiper	G5		S3N					
Callipepla gambelii	Gambel's Quail	G5	S5	S5B S5N					
Callipepla squamata	Scaled Quail	G5	S5	S5B S5N					x
Calothorax lucifer	Lucifer Hummingbird	G4	S2	S1B S1N			T	x	
Calypte anna	Anna's Hummingbird	G5	S5	S3N					

NatureServe Scientific Name	NatureServe Common Name	G-rank	AZ S-rank	NM S-rank	ESA status	AZ state status	NM state status	Birds of Conserv. Concern	Partners in Flight Watch List
Calypte costae	Costa's Hummingbird	G5	S5	S1B S1N			T		x
Camptostoma imberbe	Northern Beardless Tyrannulet	G5	S4	S1B S1N			E	x	
Campylorhynchus brunneicapillus	Cactus Wren	G5	S5	S5B S5N					
Caprimulgus ridgwayi	Buff Colored Nightjar	G5	S2S3	S1B S1N			E		
Caprimulgus vociferus	Whip-Poor-Will	G5	S4	S4B S4N					
Caracara cheriway	Crested Caracara	G5	S1S2	SXB SNAN		WSC			
Cardellina rubrifrons	Red-Faced Warbler	G5	S4	S4B S4N				x	x
Cardinalis cardinalis	Northern Cardinal	G5	S5	S5B S5N					
Cardinalis sinuatus	Pyrrhuloxia	G5	S5	S5B S5N					
Carduelis lawrencei	Lawrence's Goldfinch	G3	SNR	S3N					x
Carduelis pinus	Pine Siskin	G5	S5	S5B S5N					
Carduelis psaltria	Lesser Goldfinch	G5	S5	S5B S5N					
Carduelis tristis	American Goldfinch	G5	S1B S5N	S4B S5N					
Carpodacus cassinii	Cassin's Finch	G5	S4	S4B S5N					
Carpodacus mexicanus	House Finch	G5	S5	S5B S5N					
Carpodacus purpureus	Purple Finch	G5	S1S2N	S2N					
Cathartes aura	Turkey Vulture	G5	S5	S5B S5N					
Catharus fuscescens	Veery	G5	S1	S1B S1N		WSC			
Catharus guttatus	Hermit Thrush	G5	S5	S5B S5N					
Catharus ustulatus	Swainson's Thrush	G5	S1	S3B S4N					

NatureServe Scientific Name	NatureServe Common Name	G-rank	AZ S-rank	NM S-rank	ESA status	AZ state status	NM state status	Birds of Conserv. Concern	Partners in Flight Watch List
Catherpes mexicanus	Canyon Wren	G5	S5	S5B S5N					
Catoptrophorus semipalmatus	Willet	G5	SNA	S4N					
Certhia americana	Brown Creeper	G5	S5	S5B S5N					
Ceryle alcyon	Belted Kingfisher	G5	S2B S5N	S4B S4N		WSC			
Chaetura pelagica	Chimney Swift	G5		S1B S4N					
Chaetura vauxi	Vaux's Swift	G5	SNA						
Charadrius alexandrinus nivosus	Western Snowy Plover	T3	S1	S3B S3N		WSC			
Charadrius montanus	Mountain Plover	G2	S1B S2N	S2B S4N				x	
Charadrius semipalmatus	Semipalmated Plover	G5	SNA	S4N					
Chen caerulescens	Snow Goose	G5	S3N	S5N					
Chen rossii	Ross's Goose	G4	S2N	S4N					
Chlidonias niger	Black Tern	G4	SNA	S4N					
Chloroceryle americana	Green Kingfisher	G5	S2						
Chondestes grammacus	Lark Sparrow	G5	S5	S5B S4N					
Chordeiles acutipennis	Lesser Nighthawk	G5	S5	S5B S5N					
Chordeiles minor	Common Nighthawk	G5	S5	S5B S5N					
Cinclus mexicanus	American Dipper	G5	S3	S4B S4N					
Circus cyaneus	Northern Harrier	G5	S1S2B S5N	S2B S5N				x	
Cistothorus palustris	Marsh Wren	G5	S2B S3S4N	S1B S5N					
Coccothraustes vespertinus	Evening Grosbeak	G5	S3	S4B S4N					
Colaptes auratus	Northern Flicker	G5	S5	S5B S5N					
Columba livia	Rock Dove	G5	SNA	SNA					

NatureServe Scientific Name	NatureServe Common Name	G-rank	AZ S-rank	NM S-rank	ESA status	AZ state status	NM state status	Birds of Conserv. Concern	Partners in Flight Watch List
Columbina inca	Inca Dove	G5	S5	S4B S4N					
Columbina passerina	Common Ground-Dove	G5	S4	S1B S1N			E		
Contopus cooperi	Olive-Sided Flycatcher	G4	S4	S4B S4N					x
Contopus pertinax	Greater Pewee	G5	S4	S3B S3N				x	
Contopus sordidulus	Western Wood-Pewee	G5	S5	S5B S5N					
Coragyps atratus	Black Vulture	G5	S1S2						
Corvus corax	Common Raven	G5	S5	S5B S5N					
Corvus cryptoleucus	Chihuahuan Raven	G5	S4	S5B S5N					
Cyanocitta cristata	Blue Jay	G5		S4B S4N					
Cyanocitta stelleri	Steller's Jay	G5	S5	S5B S5N					
Cygnus columbianus	Tundra Swan	G5	S1N	S4N					
Cynanthus latirostris magicus	Broad-Billed Hummingbird	TU					T	x	
Cypseloides niger	Black Swift	G4		S1B S2N					x
Cyrtonyx montezumae	Montezuma Quail	G4	S4	S3B S3N					x
Dendrocygna autumnalis	Black-Bellied Whistling Duck	G5	S3	S3		WSC			
Dendroica caerulescens	Black-Throated Blue Warbler	G5		S3N					
Dendroica coronata	Yellow-Rumped Warbler	G5	S5	S5B S5N					
Dendroica graciae	Grace's Warbler	G5	S5	S5B S5N				x	x
Dendroica magnolia	Magnolia Warbler	G5		S2N					
Dendroica nigrescens	Black-Throated Gray Warbler	G5	S5	S4B S4N				x	
Dendroica occidentalis	Hermit Warbler	G4	SNA	S3N					x
Dendroica palmarum	Palm Warbler	G5		S3N					

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Dendroica pensylvanica	Chestnut-Sided Warbler	G5	S1N	S3N					
Dendroica petechia	Yellow Warbler	G5	S4	S4B S5N					
Dendroica pinus	Pine Warbler	G5		S1N					
Dendroica townsendi	Townsend's Warbler	G5	SNA	S4N					
Dendroica virens	Black-Throated Green Warbler	G5		S3N					
Dumetella carolinensis	Gray Catbird	G5	S1	S4B S4N		WSC			
Egretta caerulea	Little Blue Heron	G5		S2B S4N					
Egretta thula	Snowy Egret	G5	S1B S4N	S4B S4N		WSC			
Elanus leucurus	White-Tailed Kite	G5	S2B S2S3N	S2N					
Empidonax difficilis	Pacific-Slope Flycatcher	G5	SNA						
Empidonax fulvifrons	Buff-Breasted Flycatcher	G5	S1	SHB		WSC		x	
Empidonax fulvifrons pygmaeus	Northern Buff-breasted Flycatcher	T5	S1						
Empidonax hammondii	Hammond's Flycatcher	G5	S1B S2S3N	S4B S4N					
Empidonax minimus	Least Flycatcher	G5		S2N					
Empidonax oberholseri	Dusky Flycatcher	G5	S4	S4B S4N					
Empidonax occidentalis	Cordilleran Flycatcher	G5		S5B S5N					
Empidonax traillii	Willow Flycatcher	G5	S1	S4N		WSC			x
Empidonax wrightii	Gray Flycatcher	G5	S5	S4B S4N					
Eremophila alpestris	Horned Lark	G5	S5	S5B S5N					
Eugenes fulgens	Magnificent Hummingbird	G5	S4	S4B S4N					
Euphagus cyanocephalus	Brewer's Blackbird	G5	S5	S5B S5N					
Euptilotis neoxenus	Eared Quetzal	G3	SNR						
Falco columbarius	Merlin	G5	SNRN	S4N					

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Falco femoralis septentrionalis	Aplomado Falcon	T2	SH	SHB S1N		WSC	E		
Falco mexicanus	Prairie Falcon	G5	S4	S4B S4N					
Falco peregrinus anatum	American Peregrine Falcon	T3	S4	S2B S3N		WSC	T	x	
Falco sparverius	American Kestrel	G5	S5	S5B S5N					
Gavia immer	Common Loon	G5	S2N	S4N					
Geococcyx californianus	Greater Roadrunner	G5	S5	S5B S5N					
Geothlypis trichas	Common Yellowthroat	G5	S4	S4B S4N					
Grus canadensis	Sandhill Crane	G5	S3N	S4N					
Gymnorhinus cyanocephalus	Pinyon Jay	G5	S5	S5B S5N					x
Haliaeetus leucocephalus	Bald Eagle	G4	S2S3B S4N	S1B S3N	T	WSC	T		
Heliomaster constantii									
Helmitheros vermivorus	Worm-Eating Warbler	G5		S2N				x	x
Himantopus mexicanus	Black-Necked Stilt	G5	S2	S4B S4N					
Hirundo rustica	Barn Swallow	G5	S5	S5B S5N					
Hylocharis leucotis borealis	White-Eared Hummingbird	TNR					T		
Icteria virens	Yellow-Breasted Chat	G5	S4	S4B S4N					
Icterus bullockii	Bullock's Oriole	G5	SNRB	S5B					
Icterus cucullatus	Hooded Oriole	G5	S5	S4B S4N					
Icterus galbula	Baltmore Oriole	G5		S1N					
Icterus parisorum	Scott's Oriole	G5	S5	S5B S5N					
Icterus spurius	Orchard Oriole	G5		S3B S3N					
Ixobrychus exilis	Least Bittern	G5	S3	S3B		WSC			

NatureServe Scientific Name	NatureServe Common Name	G-rank	AZ S-rank	NM S-rank	ESA status	AZ state status	NM state status	Birds of Conserv. Concern	Partners in Flight Watch List
				S3N					
Ixobrychus exilis hesperis	Western Least Bittern	T3	S3						
Ixoreus naevius	Varied Thrush	G5	S1N	S2N					
Junco hyemalis	Dark-Eyed Junco	G5	S5	S5B S5N					
Junco phaeonotus	Yellow-Eyed Junco	G5	S3	S2B S2N			T		
Lampornis clemenciae	Blue-Throated Hummingbird	G5	S4	S2B S2N					
Lanius ludovicianus	Loggerhead Shrike	G4	S4	S4B S4N				x	
Larus californicus	California Gull	G5	S3N	S2B S4N					
Larus delawarensis	Ring-Billed Gull	G5	S5N	S5N					
Larus philadelphia	Bonaparte's Gull	G5	SNA	S4N					
Larus pipixcan	Franklin's Gull	G4	SNA	S4N					
Limnodromus griseus	Short-Billed Dowitcher	G5	SNA	S3N					
Limosa fedoa	Marbled Godwit	G5	SNA	S4N					
Lophodytes cucullatus	Hooded Merganser	G5	S2N	S1B S4N					
Loxia curvirostra	Red Crossbill	G5	S4	S4B S4N					
Megascops kennicottii	Western Screech Owl	G5	S5	S4B S4N					
Megascops trichopsis	Whiskered Screech Owl	G5	S5	S1B S1N			T	x	
Melanerpes lewis	Lewis's Woodpecker	G4	S4	S5B S5N				x	x
Melanerpes uropygialis	Gila Woodpecker	G5	S5	S2B S2N			T		
Meleagris gallopavo	Wild Turkey	G5	S5	S5B S5N			T		
Meleagris gallopavo merriami	Merriam's Turkey	TU	S5						
Melospiza georgiana	Swamp Sparrow	G5	S2S3N	S4N					
Melospiza lincolnii	Lincoln's Sparrow	G5	S3B	S4B					

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			S5N	S5N					
Melospiza melodia	Song Sparrow	G5	S5	S4B S5N					
Mergus merganser	Common Merganser Duck	G5	S3S4	S3B S5N					
Micrathene whitneyi	Elf Owl	G5	S5	S4B S4N				x	x
Mimus polyglottos	Northern Mockingbird	G5	S5	S5B S5N					
Mniotilta varia	Black-And-White Warbler	G5	S1B S1N	S4N					
Molothrus aeneus	Bronzed Cowbird	G5	S5	S4B S4N					
Molothrus ater	Brown-Headed Cowbird	G5	S5	S5B S5N					
Myadestes townsendi	Townsend's Solitaire	G5	S5	S5B S5N					
Myiarchus cinerascens	Ash-Throated Flycatcher	G5	S5	S5B S5N					
Myiarchus tuberculifer	Dusky-Capped Flycatcher	G5	S4	S3B S4N					
Myiarchus tyrannulus	Brown-Crested Flycatcher	G5	S4	S4B S4N					
Myioborus miniatus									
Myioborus pictus	Painted Redstart	G5	S4	S4B S4N					
Myiodynastes luteiventris	Sulphur-Bellied Flycatcher	G5	S3	S1N					
Nucifraga columbiana	Clark's Nutcracker	G5	S5	S4B S4N					
Numenius americanus	Long-Billed Curlew	G5	S1B S3S4N	S4B				x	
Nycticorax nycticorax	Black-Crowned Night Heron	G5	S3	S4B S4N					
Oporornis tolmiei	Macgillivray's Warbler	G5	S4	S5B S5N					
Oreoscoptes montanus	Sage Thrasher	G5	S5	S4B S5N					
Otus flammeolus	Flammulated Owl	G4	S4	S4B				x	x

NatureServe Scientific Name	NatureServe Common Name	G-rank	AZ S-rank	NM S-rank	ESA status	AZ state status	NM state status	Birds of Conserv. Concern	Partners in Flight Watch List
				S4N					
Pachyramphus aglaiae	Rose-Throated Becard	G4	S1			WSC		x	
Pandion haliaetus	Osprey	G5	S2B S4N	S1B S4N		WSC			
Parabuteo unicinctus	Harris's Hawk	G5	S5	S3B S3N					
Parula americana	Northern Parula	G5		S3N					
Passer domesticus	House Sparrow	G5	SNA	SNA					
Passerculus sandwichensis	Savannah Sparrow	G5	S5	S3B S5N					
Passerella iliaca	Fox Sparrow	G5	S2N	S4N					
Passerina amoena	Lazuli Bunting	G5	S4	S5B S5N					
Passerina caerulea	Blue Grosbeak	G5	S5	S5B S5N					
Passerina ciris	Painted Bunting	G5		S4B					x
Passerina cyanea	Indigo Bunting	G5	S3	S5B S5N					
Passerina versicolor	Varied Bunting	G5	S3	S1B S1N			T		x
Patagioenas fasciata	Band-Tailed Pigeon	G4	S5	S4B S4N					x
Pelecanus erythrorhynchos	American White Pelican	G3	S3N	S3N					
Perisoreus canadensis	Gray Jay	G5	S2	S4B S4N					
Petrochelidon fulva	Cave Swallow	G5		S3B S3N					
Petrochelidon pyrrhonota	Cliff Swallow	G5	S5	S5B S5N					
Peucedramus taeniatus	Olive Warbler	G5	S4	S4B S4N				x	
Phainopepla nitens	Phainopepla	G5	S5	S4B S4N					
Phalacrocorax brasilianus	Neotropic Cormorant	G5	S1N	S3B S4N			T		
Phalaenoptilus nuttallii	Common Poorwill	G5	S5	S5B					

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				S5N					
Phalaropus lobatus	Red-Necked Phalarope	G4	SNA	S4N					
Phalaropus tricolor	Wilson's Phalarope	G5	S1B S5N	S1B S5N					
Phasianus colchicus	Ring-Necked Pheasant	G5	SNA	SNA					
Pheucticus ludovicianus	Rose-Breasted Grosbeak	G5		S4N					
Pheucticus melanocephalus	Black-Headed Grosbeak	G5	S5	S5B S5N					
Picoides arizonae	Arizona Woodpecker	G5	S3	S2B S2N				x	x
Picoides pubescens	Downy Woodpecker	G5	S4	S5B S5N					
Picoides scalaris	Ladder-Backed Woodpecker	G5	S5	S5B S5N					
Pipilo aberti	Abert's Towhee	G3	S3	S1B S1N			T		x
Pipilo chlorurus	Green-Tailed Towhee	G5	S3B S4N	S4B S4N					
Pipilo erythrophthalmus	Eastern Towhee	G5							
Pipilo fuscus	Canyon Towhee	G5	S5	S5B S5N					
Pipilo maculatus	Spotted Towhee	G5	S5	S5B S5N					
Piranga flava	Hepatic Tanager	G5	S4	S5B S5N					
Piranga ludoviciana	Western Tanager	G5	S5	S5B S5N					
Piranga rubra	Summer Tanager	G5	S4	S5B S5N					
Plegadis chihi	White-Faced Ibis	G5	SNRB S2S3N	S1B S4N					
Pluvialis squatarola	Black-Bellied Plover	G5	SNA	S4N					
Podiceps nigricollis	Eared Grebe	G5	S3B S5N	S4B S5N					
Podilymbus podiceps	Pied-Billed Grebe	G5	S5	S5B S5N					

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Poecile gambeli	Mountain Chickadee	G5	S5	S5B S5N					
Poecile sclateri	Mexican Chickadee	G5	S3	S1B S1N					
Polioptila caerulea	Blue-Gray Gnatcatcher	G5	S5	S4B S4N					
Polioptila melanura	Black-Tailed Gnatcatcher	G5	S5	S3B S3N					
Pooecetes gramineus	Vesper Sparrow	G5	S5	S5B S4N					
Porzana carolina	Sora	G5	S4	S4B S4N					
Progne subis	Purple Martin	G5	S4	S4B S4N					
Protonotaria citrea	Prothonotary Warbler	G5		S2N				x	x
Psaltriparus minimus	Bushtit	G5	S5	S5B S5N					
Pyrocephalus rubinus	Vermilion Flycatcher	G5	S5	S4B S4N					
Quiscalus mexicanus	Great-Tailed Grackle	G5	S5	S5B S5N					
Recurvirostra americana	American Avocet	G5	S2	S4B S4N					
Regulus calendula	Ruby-Crowned Kinglet	G5	S5	S5B S5N					
Regulus satrapa	Golden-Crowned Kinglet	G5	S3	S4B S4N					
Rhynchopsitta pachyrhyncha	Thicked-Billed Parrot	G2				WSC			
Ridgwayia pinicola									
Riparia riparia	Bank Swallow	G5	SNR	S4B S5N					
Salpinctes obsoletus	Rock Wren	G5	S5	S5B S5N					
Sayornis nigricans	Black Phoebe	G5	S5	S5B S5N					
Sayornis phoebe	Eastern Phoebe	G5	S1N	S3B S4N					
Sayornis saya	Say's Phoebe	G5	S5	S5B					

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				S4N					
Seiurus aurocapilla	Ovenbird	G5		S3N					
Seiurus noveboracensis	Northern Waterthrush	G5	SNA	S4N					
Selasphorus platycercus	Broad-Tailed Hummingbird	G5	S5	S4B S4N					
Selasphorus rufus	Rufous Hummingbird	G5	SNA	S5N					x
Selasphorus sasin	Allen's Hummingbird	G5	SNA						x
Setophaga ruticilla	American Redstart	G5	S1	S4N		WSC			
Sialia currucoides	Mountain Bluebird	G5	S5	S5B S5N					
Sialia mexicana	Western Bluebird	G5	S5	S5B S5N					
Sialia sialis	Eastern Bluebird	G5	S4	S1B S5N					
Sitta canadensis	Red-Breasted Nuthatch	G5	S4	S4B S4N					
Sitta carolinensis	White-Breasted Nuthatch	G5	S5	S5B S5N					
Sitta pygmaea	Pygmy Nuthatch	G5	S5	S5B S5N					
Sphyrapicus nuchalis	Red-Naped Sapsucker	G5	S4	S5B S5N					
Sphyrapicus varius	Yellow-Bellied Sapsucker	G5	S1N	S4N					
Spiza americana	Dickcissel	G5		S1B S4N					x
Spizella atrogularis	Black-Chinned Sparrow	G5	S5	S4B S4N				x	x
Spizella breweri	Brewer's Sparrow	G5	S5	S3B S4N					x
Spizella pallida	Clay-Colored Sparrow	G5	S1N	S4N					
Spizella passerina	Chipping Sparrow	G5	S5	S5B S5N					
Stelgidopteryx serripennis	Northern Rough-Winged Swallow	G5	S5	S4B S5N					
Stellula calliope	Calliope Hummingbird	G5	SNA	S4N					x

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Sterna antillarum athalassos	Interior Least Tern	T2		S1B S2N					
Sterna forsteri	Forster's Tern	G5	S2N	S1B S5N					
Strix occidentalis lucida	Mexican Spotted Owl	T3	S3S4	S2B S2N	T	WSC			
Sturnella magna	Eastern Meadowlark	G5	S5	S5B S5N					
Sturnella neglecta	Western Meadowlark	G5	S5	S5B S5N					
Sturnus vulgaris	European Starling	G5	SNA	SNA					
Tachycineta bicolor	Tree Swallow	G5	S3	S4B S4N					
Tachycineta thalassina	Violet-Green Swallow	G5	S5	S5B S5N					
Thryomanes bewickii	Bewick's Wren	G5	S5	S5B S5N					
Toxostoma bendirei	Bendire's Thrasher	G4	S4	S4B S4N				x	x
Toxostoma crissale	Crissal Thrasher	G5	S5	S5B S5N				x	
Toxostoma curvirostre	Curve-Billed Thrasher	G5	S5	S5B S5N					
Toxostoma rufum	Brown Thrasher	G5	S1N	S4N					
Tringa flavipes	Lesser Yellowlegs	G5	SNA	S5N					
Troglodytes aedon	House Wren	G5	S5	S5B S5N					
Troglodytes troglodytes	Winter Wren	G5	S2S3N	S3N					
Trogon elegans	Elegant Trogon	G5	S3	S1B S1N		WSC	E	x	x
Turdus migratorius	American Robin	G5	S5	S5B S5N					
Turdus rufopalliatus	Rufous-Backed Robin	G5		S1N					
Tyrannus crassirostris	Thick-Billed Kingbird	G5	S2	S1B S1N		WSC	E		x
Tyrannus melancholicus	Tropical Kingbird	G5	S3			WSC			

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Tyrannus tyrannus	Eastern Kingbird	G5		S4B S4N					
Tyrannus verticalis	Western Kingbird	G5	S5	S5B S5N					
Tyrannus vociferans	Cassin's Kingbird	G5	S5	S5B S5N					
Tyto alba	Barn Owl	G5	S5	S4B S4N					
Vermivora celata	Orange-Crowned Warbler	G5	S3B S5N	S4B S5N					
Vermivora luciae	Lucy's Warbler	G5	S5	S4B S4N					
Vermivora ruficapilla	Nashville Warbler	G5	SNA	S4N					
Vermivora virginiae	Virginia's Warbler	G5	S5	S4B S4N					x
Vireo bellii arizonae	Arizona Bell's Vireo	T4	S4	S2B S2N				x	
Vireo flavifrons	Yellow-Throated Vireo	G5		S2N					
Vireo flavoviridis	Yellow-Green Vireo	G5							
Vireo gilvus	Warbling Vireo	G5	S5	S5B S5N					
Vireo huttoni	Hutton's Vireo	G5	S5	S4B S4N					
Vireo olivaceus	Red-Eyed Vireo	G5		S3N					
Vireo philadelphicus	Philadelphia Vireo	G5		S2N					
Vireo plumbeus	Plumbeus Vireo	G5	S5	S5B S5N					
Vireo vicinior	Gray Vireo	G4	S4	S4B S3N			T	x	x
Wilsonia citrina	Hooded Warbler	G5		S2N					
Wilsonia pusilla	Wilson's Warbler	G5	SNA	S4B S5N					
Xanthocephalus xanthocephalus	Yellow-Headed Blackbird	G5	S5	S4B S5N					
Zenaida asiatica	White-Winged Dove	G5	S5	S4B S4N					

NatureServe Scientific Name	NatureServe Common Name	G-rank	AZ S-rank	NM S-rank	ESA status	AZ state status	NM state status	Birds of Conserv. Concern	Partners in Flight Watch List
Zenaida macroura	Mourning Dove	G5	S5	S5B S5N					
Zonotrichia albicollis	White-Throated Sparrow	G5	S2S3N	S4N					
Zonotrichia atricapilla	Golden-Crowned Sparrow	G5	S1S2N	S3N					
Zonotrichia leucophrys	White-Crowned Sparrow	G5	S1B S5N	S5B S5N					
Zonotrichia querula	Harris's Sparrow	G5	S1N	S3N					x
Stygobromus arizonensis	Arizona Cave Amphipod	G2	S1?						
Campostoma ornatum	Mexican Stoneroller	G3	S1			WSC			
Catostomus clarki	Desert Sucker	G3	S3S4	S2					
Catostomus insignis	Sonora Sucker	G3	S3	S2					
Cyprinodon macularius	Desert Pupfish	G1	S1		E	WSC			
Gila ditaenia	Sonora Chub	G2	S1		T	WSC			
Gila intermedia	Gila Chub	G2	S2	S1	PE	WSC	E		
Gila purpurea	Yaqui Chub	G1	S1		E	WSC			
Oncorhynchus gilae	Gila Trout	G3	SH	S1	E	WSC	T		
Oncorhynchus gilae apache	Apache Trout Infraspecific.	T3	S3		T	WSC			
Poeciliopsis occidentalis occidentalis	Gila Topminnow Infraspecific.	T3	S2		E	WSC	T		
Rhinichthys chrysogaster	Longfin Dace	G4	S3S4	SNA					
Rhinichthys osculus	Speckled Dace	G5	S3S4	S3					
Agathon arizonicus		G1	SNR						
Agathymus aryxna	Arizona Giant Skipper	G4	SNR	SNR					
Agathymus evansi	Huachuca Giant Skipper	G2	SNR						
Agathymus polingi	Poling's Giant Skipper	G4	SNR	SNR					
Amblycheila baroni	Montane Giant Tiger Beetle	G3	S3						
Anthocharis pima									
Argia sabino	Sabino Dancer	G1	SNR						
Atrytonopsis cestus	Cestus Skipper	G3	SNR						

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Calephelis arizonensis	Arizona Metalmark	G3	S2	SNR					
Chlorochroa rita	Santa Rita Mtns Chlorochroan Bug	GNR	SNR						
Cicindela hornii	Horn's Tiger Beetle	G3	S3	SNR					
Cymbiodyta arizonica	Arizona Cymbiodytan Water Scavenger Beetle	G2	S2?						
Erynnis scudderi	Scudder's Duskywing Butterfly	G4	SNR						
Eumorsea pinaleno	Pinaleno Monkey Grasshopper	G2	S1S3						
Heterelmis stephani	Stephan's Heterelmis Riffle Beetle	G1	S2?		C				
Limenitis archippus obsoleta	Arizona Viceroy	T3	SNR	SNR					
Megathymus ursus	Ursine Giant Skipper	G4	SNR	SNR					
Megathymus ursus ursus	Ursine Giant Skipper	T3	SNR	SNR					
Neophasia terlooii	Chiricahua White	G3	S2?	SNR					
Piruna polingii	Four-Spotted Skipperling	G3	SNR	SNR					
Psephenus arizonensis	Arizona Water Penny Beetle	G2	S2?						
Psephenus montanus	White Mountains Water Penny Beetle	G2	S2?						
Speyeria nokomis coerulescens	Bluish Fritillary	T2	SH						
Ammospermophilus harrisii	Harris' Antelope Squirrel	G5	S5	S2					
Antilocapra americana mexicana	Chihuahuan Pronghorn	T4	SNR			WSC			
Antrozous pallidus	Pallid Bat	G5	S4S5	S5					
Baiomys taylori	Northern Pygmy Mouse	G4	S2S3	S2					
Bassariscus astutus	Ringtail	G5	S5	S4					
Canis latrans	Coyote	G5	S5	S5					
Chaetodipus baileyi	Bailey's Pocket Mouse	G5	S5	S2					
Chaetodipus formosus	Long-Tailed Pocket Mouse	G5	S5						
Chaetodipus hispidus	Hispid Pocket Mouse	G5	S5	S5					
Chaetodipus intermedius intermedius	Rock Pocket Mouse	T5	S5						
Chaetodipus nelsoni	Nelson's Pocket Mouse	G5							

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Chaetodipus penicillatus	Desert Pocket Mouse	G5	S5	S4					
Choeronycteris mexicana	Mexican Long-Tongued Bat	G4	S2	S1		WSC			
Conepatus leuconotus	White-backed Hog-Nosed Skunk	G4	S4	S2S3					
Corynorhinus townsendii	Townsend's Big-Eared Bat	G4	S3	S3					
Corynorhinus townsendii pallescens	Pale Lump-nosed Bat	T4	S3S4	S3					
Dipodomys merriami	Merriam's Kangaroo Rat	G5	S5	S5					
Dipodomys ordii	Ord's Kangaroo Rat	G5	S5	S5					
Eptesicus fuscus	Big Brown Bat	G5	S4S5	S5					
Erethizon dorsatum	North American Porcupine	G5	S4S5	S5					
Eumops perotis californicus	Greater Western Mastiff Bat	T4	S1S2						
Idionycteris phyllotis	Allen's Big-Eared Bat	G3	S2S3	S2					
Lasionycteris noctivagans	Silver-Haired Bat	G5	S3S4	S5					
Lasiurus blossevillii	Western Red Bat	G5	S2	S2		WSC			
Lasiurus borealis	Eastern Red Bat	G5							
Lasiurus cinereus	Hoary Bat	G5	S4	S3N					
Lasiurus xanthinus	Western Yellow Bat	G5	S1	S1		WSC	T		
Leptonycteris curasoae yerbabuenae	Lesser Long-Nosed Bat	T3	S2	S1	E	WSC	T		
Leptonycteris nivalis	Mexican Long-Nosed Bat	G3		S1	E		E		
Lepus alleni	Antelope Jackrabbit	G5	S4						
Lepus californicus	Black-Tailed Jack Rabbit	G5	S5	S5					
Lynx rufus	Bobcat	G5	S5	S4					
Macrotus californicus	California Leaf-Nosed Bat	G4	S3S4			WSC			
Mephitis macroura	Hooded Skunk	G5	S4	S2					
Mephitis mephitis	Striped Skunk	G5	S5	S5					
Microtus longicaudus	Long-Tailed Vole	G5	S4	S4					
Microtus longicaudus leucophaeus	White-Bellied Long-Tailed Vole	T3	S3						
Mormoops megalophylla	Ghost-Faced Bat	G4							

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Mus musculus	House Mouse	G5	SNA	SNA					
Mustela frenata	Long-Tailed Weasel	G5	S3	S4					
Myotis auriculus	Southwestern Myotis	G5	S3	S4					
Myotis californicus	California Myotis Bat	G5	S4S5	S5					
Myotis ciliolabrum	Western Small-Footed Myotis Bat	G5	S3	S5					
Myotis ciliolabrum melanorhinus									
Myotis occultus	Occult Little Brn. Myotis Bat	G3	S3	S3					
Myotis thysanodes	Fringed Myotis Bat	G4	S3S4	S5					
Myotis thysanodes thysanodes									
Myotis velifer	Cave Myotis Bat	G5	S4	S4					
Myotis volans interior									
Myotis yumanensis	Yuma Myotis Bat	G5	S3S4	S5					
Myotis yumanensis yumanensis									
Nasua narica	White-Nosed Coati	G5	S4	S2					
Neotoma albigula	Western White-Throated Woodrat	G5	S5	S5					
Neotoma mexicana	Mexican Wood Rat	G5	S5	S5					
Notiosorex crawfordi	Crawford's Desert Shrew	G5	S4S5	S4					
Nyctinomops femorosaccus	Pocketed Free-Tailed Bat	G4	S2S3	S1					
Nyctinomops macrotis	Big Free-Tailed Bat	G5	S2S3	S2					
Odocoileus hemionus	Mule Deer	G5	S5	S5					
Odocoileus virginianus	White-Tailed Deer	G5	S5	S4					
Onychomys leucogaster	Northern Grasshopper Mouse	G5	S5	S5					
Onychomys torridus	Southern Grasshopper Mouse	G5	S5	S4					
Ovis canadensis	Desert Bighorn Sheep	G4	S4	S1			E		
Panthera onca	Jaguar	G3	S1	S1	E	WSC			
Pecari tajacu	Collared Peccary	G5	S5	S2					
Perognathus flavus	Silky Pocket Mouse	G5	S5	S5					

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Peromyscus boylii	Brush Mouse	G5	S5	S5					
Peromyscus eremicus	Cactus Mouse	G5	S5	S5					
Peromyscus leucopus	White-Footed Mouse	G5	S5	S5					
Peromyscus maniculatus	Deer Mouse	G5	S5	S5					
Peromyscus merriami	Mesquite Mouse	G5	S2						
Peromyscus nasutus	Northern Rock Mouse	G5	S3	S4					
Peromyscus pectoralis	White-Ankled Mouse	G5		S1					
Peromyscus truei	Pinyon Mouse	G5	S5	S5					
Pipistrellus hesperus	Western Pipistrelle	G5	S5	S5					
Procyon lotor	Northern Raccoon	G5	S4	S4					
Puma concolor	Puma	G5	S4	S3?					
Rattus rattus	Black Rat	G5	SNA	SNA					
Reithrodontomys fulvescens	Fulvous Harvest Mouse	G5	S4	S1					
Reithrodontomys megalotis	Western Harvest Mouse	G5	S5	S5					
Reithrodontomys montanus	Plains Harvest Mouse	G5	S2	S4					
Sciurus aberti	Abert's Squirrel	G5	S5	S4					
Sciurus arizonensis	Arizona Gray Squirrel	G4	S4	S2					
Sciurus arizonensis catalinae									
Sigmodon arizonae	Arizona Cotton Rat	G5	S4	S1					
Sigmodon hispidus	Hispid Cotton Rat	G5	S5	S5					
Sigmodon ochrognathus	Yellow-Nosed Cotton Rat	G4	S3S4	S2					
Sorex arizonae	Arizona Shrew	G3	S2S3	S1		WSC	E		
Sorex monticolus	Montane Shrew	G5	S4	S4					
Spermophilus spilosoma	Spotted Ground Squirrel	G5	S4	S5					
Spermophilus tereticaudus	Round-Tailed Ground Squirrel	G5	S5						
Spermophilus variegatus	Rock Squirrel	G5	S5	S5					
Spilogale gracilis	Western Spotted Skunk	G5	S5	S4					

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Sylvilagus audubonii	Desert Cottontail	G5	S5	S5					
Sylvilagus floridanus	Eastern Cottontail	G5	S5	S4					
Tadarida brasiliensis	Brazilian Free-Tailed Bat	G5	S3S4	S2					
Tadarida brasiliensis mexicana									
Tamias dorsalis	Cliff Chipmunk	G5	S5	S4					
Tamiasciurus hudsonicus	Red Squirrel	G5	S5	S5					
Tamiasciurus hudsonicus grahamensis	Mount Graham Red Squirrel	T1	S1		E	WSC			
Taxidea taxus	American Badger	G5	S5	S4					
Thomomys bottae grahamensis									
Thomomys bottae mearnsi	Graham Mountain Pocket Gopher	T5	S5	S2					
Thomomys umbrinus emotus	Southern Pocket Gopher	TNR		S1					
Thomomys umbrinus intermedius	Southern Pocket Gopher	T3	S3				T		
Urocyon cinereoargenteus	Gray Fox	G5	S5	S5					
Ursus americanus	Black Bear	G5	S5	S4					
Abutilon parishii	Parish's Abutilon	G2	S2			SR			
Acacia farnesiana	Sweet Acacia	G5	S1						
Aconitum infectum	Arizona Monkshod	G1	SNR						
Agave parviflora ssp. parviflora		T3	S3			HS			
Agave schottii var. treleasei	Schott Agave	T1	S1			HS			
Allium glandulosum	Gland Onion	G4	SNR	SNR		SR			
Allium gooddingii	Goodding's Onion	G4	S3S4	S1		HS	E		
Amoreuxia gonzalezii	Santa Rita Yellowshow	G1	S1			HS			
Amsonia grandiflora	Arizona Slimpod	G2	S2						
Arabis tricornuta	Rincon Mountain Rockcress	G1	S1?						
Asclepias lemmonii	Lemmon's Milkweed	G4	S2						
Asclepias uncialis ssp. uncialis		T2	SNR	S2					
Astragalus cobrensis var. maguirei	A Milkvetch	T2	S1	S2		SR			

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Astragalus hypoxylus	Huachuca Milkvetch	G1	S1			SR			
Ayenia truncata		GNR	S1						
Browallia eludens	Elusive New Browallia Species	G2	S1						
Capsicum annuum var. glabriusculum		T5	S2						
Carex chihuahuensis	A Sedge	G3	S2S3						
Carex ultra	Cochise Sedge	G3	S2	S3?					
Castilleja nervata		G3	S1						
Chamaesyce gracillima	Mexican broomspurge	G4	S3						
Choisya dumosa var. mollis	Soft Mexican Orange	T2	S2						
Cirsium rusbyi	Rusby's Thistle	G1	SNR						
Conioselinum mexicanum	Mexican Hemlock Parsley	G2	S1						
Coryphantha recurvata	Recurved Corycactus	G3	S3			HS			
Coryphantha scheeri var. robustispina	Pima Pineapple Cactus	T2	S2		E	HS			
Coursetia glabella		G3	S1						
Cynanchum arizonicum	Arizona swallow-wort	G3	SNR	S2?					
Cynanchum wigginsii	Norrowleaf Or Wiggin's Swallow Wort	G3	S1S2						
Dalea tentaculoides	Gentry's Indigo Bush	G1	S1			HS			
Desmodium metcalfei	Metcalfe's Tick-Trefoil	G3	SNR	S3?					
Draba standleyi	Standley's Whitlowgrass	G2	S2S3	S2					
Erigeron arisolius		G2	S2	SNR					
Erigeron heliographis		G1	S1						
Erigeron kuschei	A Fleabane	G1	S1			SR			
Erigeron scopulinus	Winn Falls Fleabane	G3	S1	S3?					
Eryngium phyteumae	Huachuca Mountain Coyote Thistle	G2	SNR						
Escobaria orcuttii		G3	SNR	S3					
Eupatorium bigelovii	Bigelow Thoroughwort	G2	S1						
Gentianella wislizeni	Chiricahua Gentian	G2	S1			SR			

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Graptopetalum bartramii	Patagonia Mountain Leather-Petal	G3	S3			SR			
Hackelia ursina	Chihuahuam Stickseed	G3	S2	SNR					
Hedeoma costata		G5	S1	SNR					
Hedeoma dentata	Arizona False Pennyroyal	G3	S3	SNR					
Hermannia pauciflora	Santa Catalina Burstwort	G2	S1						
Heterotheca rutteri	Rutter's Golden-Aster	G2	S2						
Heuchera glomerulata	Chiricahua Mountain Allum-Root	G3	S3	S1					
Hexalectris revoluta	Chisos Coral-Root	G1	S1						
Hexalectris spicata var. arizonica		T3	SNR	SNR					
Hexalectris warnockii	Purple-Spike Coralroot	G2	S1			HS			
Hieracium pringlei	Pringle's Hawkweed	G2	S1	S2					
Hieracium rusbyi	Rusby's Hawkweed	G2	S1	SNR					
Hymenoxys ambigens var. neomexicana		T2		S2?					
Ipomoea plummerae var. cuneifolia		T3	S3	SNR					
Ipomoea tenuiloba var. lemmonii	Lemmon's Morning Glory	T3	SNR						
Ipomoea thurberi	Thurber's Morning Glory	G3	S1						
Laennecia eriophylla		G3	S2						
Lilium parryi	Lemon Lily	G3	S2			SR			
Limosella pubiflora	Chiricahua Mudwort	GU	SX	SH					
Lotus alamosanus	Sonoran Trefoil	G3	S1						
Lupinus huachucanus	Huachuca Mountain Lupine	G2	S2						
Lupinus lemmonii	Lemmon's Lupine	G1	SU						
Malaxis porphyrea	Cochise Adder's-Mouth Orchid	G4	S2	SNR					
Mammillaria mainiae	Main's Nipple Cactus	G3	S1			SR			
Manihot davisiae	Arizona Manihot	G4	S2						
Margaranthus lemmonii									
Marina diffusa	Spreading Marina	G5	S1						

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Matelea balbisii	Balbis' Milkvine	G2	SH						
Matelea cordifolia	Sonora Milkvine	G4	S1						
Muhlenbergia elongata		G4	SNR						
Muhlenbergia palmeri		GNR	SNR						
Packera neomexicana var. toumeyi	Toumey Groundsel	T2	S2						
Paspalum virletii	Virlet Paspalum	G3	S1						
Passiflora foetida	Scarlett Fruit Passionflower	G5	S2						
Pectis imberbis	Beardless Chinch Weed	G3	S1						
Pediomelum pentaphyllum	Chihuahua Scurf-Pea	G1	SH	S1					
Penstemon discolor	A Beardtongue	G2	S2			HS			
Penstemon ramosus	Branching Penstemon	G3	S1	S3?					
Penstemon superbus	Superb Beardtongue	G3	S2?	S2					
Perityle cochisensis	Cochise Rockdaisy	G1	S1S2			SR			
Phaseolus supinus	Supine Bean	G2	S1			SR			
Physalis latiphysa	Broadleaf Ground Cherry	G1	S1						
Polemonium foliosissimum var. flavum	Anway	T3	S2	SNR					
Polemonium pauciflorum ssp. hinckleyi	Hinckley Jacob's Ladder	T2	S1						
Potentilla albiflora	White-Flowered Cinquefoil	G2	SNR						
Psilactis gentryi	Gentry's Bare Ray Aster	G3	S1						
Roldana hartwegii	Hartweg's Groundsel	G4	SNR						
Salvia amissa	Catalina Mountain Sage	G2	S2						
Samolus vagans	Chiricahua Mountain Brookweed	G2	SNR						
Sclerocactus erectocentrus var. 1		T1	S1						
Senecio multidentatus var. huachucanus	Huachuca Groundsel	T2	S2			HS			
Sisyrinchium cernuum	Nodding Blue-Eyed Grass	G5	S2						
Solanum lumholtzianum	Sonoran Nightshade	G3	S3						
Spiranthes delitescens	Canelo Hills Ladies' Tresses Orchid	G1	S1		E	HS			

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Stellaria porsildii	Porsild's Starwort	G1	S1	S1					
Stevia lemmonii	Lemmon's Stevia	G3	SNR						
Symphyotrichum potosinum		G2	S1						
Talinum humile	Pinos Altos Mountains Flame Flower	G2	S1	S2		SR			
Talinum marginatum	Tepic Flame Flower	G2	S1			SR			
Tephrosia thurberi	Thurber's Hoary Pea	G4	S3						
Thelypteris puberula var. sonorensis	Aravaipa Woodfern	T3	S2						
Tragia laciniata	Sonoita Noseburn	G3	S3?						
Tumamoca macdougalii	Tumamoc Globeberry	G4	S3			SR			
Viola umbraticola	Ponderosa Violet	G3	S2?						
Arizona elegans	Glossy Snake	G5	S5	S5					
Aspidoscelis arizonae	Arizona Striped Whiptail	G1	S1S2						
Aspidoscelis burti stictogrammus	Giant Spotted Whiptail	T3	S3						
Aspidoscelis exsanguis	Chihuahuan Spotted Whiptail	G5	S3	S5					
Aspidoscelis flagellicauda	Gila Spotted Whiptail	G4	S4	S3					
Aspidoscelis inornata	Little Striped Whiptail	G5		S5					
Aspidoscelis sonorae	Sonoran Spotted Whiptail	G5	S5	S3					
Aspidoscelis tigris	Western Whiptail	G5	S5	S3					
Aspidoscelis uniparens	Desert Grassland Whiptail	G5	S5	S5					
Callisaurus draconoides	Zebratail Lizard	G5	S5	S3					
Coleonyx variegatus	Western Banded Gecko	G5	S5	S3					
Cophosaurus texanus	Greater Earless Lizard	G5	S5	S5					
Crotalus atrox	Western Diamondback Rattlesnake	G5	S5	S5					
Crotalus lepidus klauberi	Banded Rock Rattlesnake	T5	S3S4	S2					
Crotalus molossus	Blacktail Rattlesnake	G5	S5	S5					
Crotalus pricei	Twin-Spotted Rattlesnake	G5	S3						
Crotalus scutulatus	Mojave Rattlesnake	G5	S5	S3					

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Crotalus tigris	Tiger Rattlesnake	G5	S5						
Crotalus viridis	Western Rattlesnake	G5	S5	S5					
Crotalus viridis cerberus	Arizona Black Rattlesnake	T5	S5						
Crotalus willardi obscurus	New Mexican Ridgenose Rattlesnake	T1	S1	S1	T		E		
Crotalus willardi willardi	Arizona Ridge-Nosed Rattlesnake	T3	S3			WSC			
Crotaphytus collaris	Collared Lizard	G5	S5	S5					
Diadophis punctatus	Ringneck Snake	G5	S4	S4					
Elgaria kingii nobilis	Arizona Alligator Lizard	T4	SNR						
Eumeces callicephalus	Mountain Skink	G5	S2	S1			T		
Eumeces obsoletus	Great Plains Skink	G5	S5	S5					
Gambelia wislizenii	Longnose Leopard Lizard	G5	S5	S5					
Gopherus agassizii	Desert Tortoise	G4	S4		T	WSC			
Gyalopion canum	Western Hooknose Snake	G5	S3	S4					
Gyalopion quadrangulare	Desert Hooknose Snake	G4	S1S2			WSC			
Heloderma suspectum	Gila Monster	G4	S4	S3					
Heloderma suspectum suspectum	Reticulate Gila Monster	T4	S4						
Heterodon nasicus	Western Hognose Snake	G5	S3	S5					
Holbrookia elegans thermophila	Sonoran Earless Lizard	T4	SNR			WSC			
Holbrookia maculata	Lesser Earless Lizard	G5	S5	S5					
Hypsiglena torquata	Night Snake	G5	S5	S5					
Kinosternon sonoriense	Sonoran Mud Turtle	G4	S4	S3					
Lampropeltis getula	Common Kingsnake	G5	S5	S5					
Lampropeltis pyromelana	Sonoran Mountain Kingsnake	G5	S4	S3					
Lampropeltis triangulum	Milk Snake	G5	S2	S4					
Leptotyphlops dulcis	Texas Threadsnake	G5	S2	S4					
Leptotyphlops humilis segregus	Trans-Pecos Blind Snake	T5	SNR						
Masticophis bilineatus	Sonoran Whipsnake	G5	S5	S3					

NatureServe Scientific Name	NatureServe Common Name	G-rank	AZ S-rank	NM S-rank	ESA status	AZ state status	NM state status	Birds of Conserv. Concern	Partners in Flight Watch List
Masticophis flagellum	Coachwhip	G5	S5	S5					
Masticophis taeniatus	Striped Whipsnake	G5	S4	S5					
Micruroides euryxanthus	Arizona Coral Snake	G5	S5	S3					
Oxybelis aeneus	Mexican Vine Snake	G5	S2			WSC			
Phrynosoma cornutum	Texas Horned Lizard	G4	S3S4	S5					
Phrynosoma hernandesi	Short-Horned Lizard	G5	S2	S5					
Phrynosoma modestum	Roundtail Horned Lizard	G5	S3	S5					
Phrynosoma solare	Regal Horned Lizard	G5	S5	SNR					
Phyllorhynchus browni browni	Pima Leafnose Snake	T5	S5						
Phyllorhynchus decurtatus	Spotted Leaf-Nose Snake	G5	S5						
Pituophis catenifer	Gopher Snake	G5	S5	S5					
Rhinocheilus lecontei	Longnose Snake	G5	S5	S5					
Salvadora grahamiae	Mountain Patchnose Snake	G5	S4	S5					
Salvadora hexalepis	Western Patchnose Snake	G5	S5						
Sceloporus clarkii	Clark's Spiny Lizard	G5	S5	S4					
Sceloporus consobrinus	Southern Prairie Lizard	T5							
Sceloporus jarrovii	Yarrow's Spiny Lizard	G5	S5	S4					
Sceloporus magister	Desert Spiny Lizard	G5	S5	S5					
Sceloporus poinsettii	Crevice Spiny Lizard	G5		S5					
Sceloporus slevini	Slevin's Bunchgrass Lizard	G4	S2S3	S1			T		
Sceloporus tristichus	Southern Plateau Lizard	T5							
Sceloporus virgatus	Striped Plateau Lizard	G4	S3	S3					
Senticolis triaspis intermedia	Green Rat Snake	T4	S3				T		
Sonora semiannulata	Ground Snake	G5	S5	S5					
Tantilla hobartsmithi	Southwestern Black-Headed Snake	G5	S5	S4					
Tantilla nigriceps	Plains Black-Headed Snake	G5	S3	S5					
Tantilla wilcoxi	Chihuahuan Black-headed Snake	G5	S1	S2					

NatureServe Scientific Name	NatureServe Common Name	G-rank	AZ S-rank	NM S-rank	ESA status	AZ state status	NM state status	Birds of Conserv. Concern	Partners in Flight Watch List
Tantilla yaquia	Yaqui Black-headed Snake	G4	S2	S1					
Terrapene ornata	Western Box Turtle	G5	S3S4	S4					
Thamnophis cyrtopsis	Western Blackneck Garter Snake	G5	S5	S5					
Thamnophis elegans	Western Terrestrial Garter Snake	G5	S5?	S5					
Thamnophis eques megalops	Mexican Garter Snake	T3	S2S3			WSC	E		
Thamnophis marcianus	Checkered Garter Snake	G5	S5?	S4					
Trimorphodon biscutatus	Western Lyre Snake	G5	S5	S4					
Urosaurus ornatus	Tree Lizard	G5	S5	S5					
Uta stansburiana	Side-Blotched Lizard	G5	S5	S5					
Ashmunella angulata	Angulate Woodlandsnail	G2	SNR						
Ashmunella chiricahuana	Cave Creek Woodlandsnail	G1	SNR						
Ashmunella esuritor	Barfoot Woodlandsnail	G1	SNR						
Ashmunella ferrissi	Reed's Mountain Woodlandsnail	G1	SNR						
Ashmunella lenticula	Horseshoe Canyon Woodlandsnail	G1	S1						
Ashmunella lepiderma	Whitetail Woodlandsnail	G1	SNR						
Ashmunella levettei	Huachuca Woodlandsnail	G1	SNR	SNR					
Ashmunella proxima	Chiricahua Woodlandsnail	G2	SNR						
Ashmunella varicifera	Miller Canyon Woodlandsnail	G2	SNR						
Gastrocopta dalliana dalliana	Shortneck Snaggletooth	T1		S1?			E		
Gastrocopta prototypus	Sonoran Snaggletooth	G1	SNR	SNR					
Holospira arizonensis	Arizona Holospira	G2	SNR						
Holospira campestris	A Holospira	G3Q	SNR						
Holospira chiricahuana	Cave Creek Holospira	G2	SNR						
Holospira cionella	A Holospira	G3Q	SNR						
Holospira danielsi	Strongrib Holospira	G3	SNR						
Holospira ferrissi	Stocky Holospira	G2	SNR						
Holospira millestriata	A Holospira	G1Q	SNR						

NatureServe Scientific Name	NatureServe Common Name	G-rank	AZ S-rank	NM S-rank	ESA status	AZ state status	NM state status	Birds of Conserv. Concern	Partners in Flight Watch List
Holospira montivaga	Vagabond Holospira	G2	SNR	S2					
Holospira sherbrookei	Silver Creek Holospira	G1	SNR						
Holospira whetstonensis	Whetstone Holospira	G1	SNR	SNR					
Oreohelix barbata	Bearded Mountainsnail	G1	SNR	S1					
Oreohelix concentrata	Huachuca Mountainsnail	G2	SNR						
Oreohelix grahamensis	Pinaleno Mountainsnail	G2	S2						
Pallifera pilsbryi	Arizona Mantleslug	G2	SNR						
Pyrgulopsis thompsoni	Huachuca Springsnail	G2	S2		C				
Radiocentrum chiricahuana	Chiricahua Mountainsnail	G2	SNR						
Radiocentrum clappi	Cave Creek Mountainsnail	G2	SNR						
Radiodiscus millecostatus	Ribbed Pinwheel	G3	SNR	SNR					
Sonorella apache	Apache Talussnail	G1	SNR						
Sonorella bagnarai	Rincon Talussnail	G1	SNR						
Sonorella bequaerti	Happy Valley Talussnail	G2	SNR						
Sonorella binneyi	Horseshoe Canyon	G1	SNR						
Sonorella bowiensis	Quartzite Hill Talussnail	G1	SNR						
Sonorella christenseni	Clark Peak Talussnail	G1	S1S2						
Sonorella clappi	Madrea Tallusnail	G1	SNR						
Sonorella dalli	Garden Canyon Talussnail	G1	SNR						
Sonorella danielsi	Bear Canyon Talussnail	G3	SNR						
Sonorella dragoonensis	Stronghold Canyon Talussnail	G1	SNR						
Sonorella ferrissi	Dragoon Talussnail	G1	SNR						
Sonorella galiurensis	Galiuro Talussnail	G2	SNR						
Sonorella grahamensis	Pinaleno Talussnail	G1	S1						
Sonorella granulatissima	Ramsey Canyon Talussnail	G3	SNR						
Sonorella hachitana peloncillensis		T1		S1					
Sonorella imitator	Mimic Talussnail	G2	S2						

NatureServe Scientific Name	NatureServe Common Name	G-rank	AZ S-rank	NM S-rank	ESA status	AZ state status	NM state status	Birds of Conserv. Concern	Partners in Flight Watch List
Sonorella insignis	Whetstone Talussnail	G1	SNR						
Sonorella macrophallus	Wet Canyon Talussnail	G1	S1						
Sonorella macrophallus	Wet Canyon Talussnail	G1	S1						
Sonorella magdalenensis	Sonoran Talussnail	G2	SNR						
Sonorella micra	Pygmy Sonorella	G1	SNR						
Sonorella neglecta	Portal Talussnail	G1	SNR						
Sonorella odorata	Pungent Talussnail	G2	SNR						
Sonorella optata	Big Emigrant Talussnail	G2	SNR						
Sonorella rinconensis	Posta Quemada Talussnail	G2	SNR						
Sonorella santaritana	Agua Caliente Talussnail	G3	SNR						
Sonorella tryoniana	Sanford Talussnail	G1	SNR						
Sonorella virilis	Chiricahua Talussnail	G2	SNR						
Vertigo hinkleyi	Heart Vertigo	G3	SNR	S1					

Appendix 4-B. Conservation targets (n=216), by target type, that occur on one or more of 13 conservation areas that overlap the Coronado National Forest in Arizona and New Mexico.

Target Type / Scientific Name	Common Name	Habitat Type	# of Conservation Areas	Conservation Areas[A]
Amphibians				
Ambystoma tigrinum stebbinsi	Sonoran Tiger Salamander	Aquatic/Riparian	1	6
Eleutherodactylus augusti cactorum	Western Barking Frog	Aquatic/Riparian	2	2, 6
Gastrophryne olivacea	Great Plains Narrowmouth Toad	Aquatic/Riparian	1	2
Hyla eximia	Mountain Treefrog	Aquatic/Riparian	1	6
Rana blairi	Plains Leopard Frog	Aquatic/Riparian	3	3, 11, 12
Rana chiricahuensis	Chiricahua Leopard Frog	Aquatic/Riparian	7	1, 2, 3, 5, 6, 11, 12
Rana pipiens	Northern Leopard Frog	Aquatic/Riparian	1	6
Rana subaquavocalis	Ramsey Canyon Leopard Frog	Aquatic/Riparian	1	6
Rana tarahumarae	Tarahumara Frog	Aquatic/Riparian	1	2
Rana yavapaiensis	Yavapi Leopard Frog	Aquatic/Riparian	6	2, 6, 8, 10, 11, 12
Birds				
Accipiter gentilis	Northern Goshawk	Terrestrial	6	3, 6, 7, 8, 11, 12
Aimophila botterii	Botteri's Sparrow	Terrestrial	3	2, 6, 12
Aimophila carpalis	Rufous-Winged Sparrow	Terrestrial	3	2, 6, 11
Ammodramus bairdii	Baird's Sparrow	Terrestrial	2	6, 12
Asturina nitida maxima	Northern Gray Hawk	Aquatic/Riparian	5	2, 6, 9, 11, 12
Athene cunicularia hypugaea	Burrowing Owl	Terrestrial	2	6, 11
Buteo albonotatus	Zone-Tailed Hawk	Aquatic/Riparian	6	2, 3, 6, 7, 11, 12
Buteogallus anthracinus	Common Black-Hawk	Aquatic/Riparian	3	6, 11, 12
Callipepla squamata	Scaled Quail	Terrestrial	8	1, 3, 4, 5, 6, 8, 11, 12
Ceryle alcyon	Belted Kingfisher	Aquatic/Riparian	2	6, 12
Chloroceryle americana	Green Kingfisher	Aquatic/Riparian	2	6, 12
Coccyzus americanus occidentalis	Western Yellow-Billed Cuckoo	Aquatic/Riparian	6	2, 3, 6, 9, 11, 12
Colaptes chrysoides	Gilded Flicker	Terrestrial	2	6, 11
Cyrtonyx montezumae	Montezuma Quail	Terrestrial	1	6

Target Type / Scientific Name	Common Name	Habitat Type	# of Conservation Areas	Conservation Areas[A]
Dendroica petechia	Yellow Warbler	Aquatic/Riparian	2	9, 11
Empidonax traillii extimus	Southwest Willow Flycatcher	Aquatic/Riparian	4	2, 6, 9, 11
Falco femoralis septentrionalis	Aplomado Falcon	Terrestrial	2	6, 12
Falco peregrinus anatum	American Peregrine Falcon	Terrestrial	8	2, 3, 5, 6, 7, 8, 11,13
Glaucidium brasilianum cactorum	Cactus Ferruginous Pygmy Owl	Terrestrial	5	1, 2, 6, 10, 11
Grus canadensis	Sandhill Crane	Aquatic/Riparian	1	11
Haliaeetus leucocephalus	Bald Eagle	Terrestrial	2	6, 12
Pipilo aberti	Abert's Towhee	Aquatic/Riparian	4	1, 6, 11, 12
Strix occidentalis lucida	Mexican Spotted Owl	Terrestrial	7	2, 3, 6, 7, 8, 11, 12
Trogon elegans	Elegant Trogon	Aquatic/Riparian	4	2, 3, 6, 12
Crustaceans				
Stygobromus arizonensis	Arizona Cave Amphipod	Subterranean	1	6
Fish				
Agosia chrysogaster	Longfin Dace	Aquatic/Riparian	5	2, 3, 6, 11, 12
Agosia sp.	Agosia sp.	Aquatic/Riparian	1	9
Campostoma ornatum	Mexican Stoneroller	Aquatic/Riparian	2	3, 12
Catostomus bernardini	Yaqui Sucker	Aquatic/Riparian	1	12
Catostomus clarki	Desert Sucker	Aquatic/Riparian	2	6, 11
Catostomus insignis	Sonora Sucker	Aquatic/Riparian	3	2, 6, 11
Catostomus wigginsii	Matalote Opata	Aquatic/Riparian	1	6
Cyprinella formosa	Beautiful Shiner	Aquatic/Riparian	1	12
Cyprinodon macularius	Desert Pupfish	Aquatic/Riparian	1	6
Cyprinodon macularius macularius	Desert Pupfish	Aquatic/Riparian	2	6, 11
Gila ditaenia	Sonora Chub	Aquatic/Riparian	2	2, 9
Gila intermedia	Gila Chub	Aquatic/Riparian	4	6, 10, 11, 12
Gila purpurea	Yaqui Chub	Aquatic/Riparian	2	3, 12
Gila robusta	Roundtail Chub	Aquatic/Riparian	2	11, 12
Gila sp.	Gila sp.	Aquatic/Riparian	1	9

Target Type / Scientific Name	Common Name	Habitat Type	# of Conservation Areas	Conservation Areas[A]
Ictalurus pricei	Yaqui Catfish	Aquatic/Riparian	1	12
Meda fulgida	Spikedace	Aquatic/Riparian	1	11
Oncorhynchus apache	Apache Trout Infraspecific.	Aquatic/Riparian	1	8
Poeciliopsis occidentalis occidentalis	Gila Topminnow Infraspecific.	Aquatic/Riparian	3	2, 6, 9
Poeciliopsis occidentalis sonoriensis	Yaqui Topminnow Infraspecific.	Aquatic/Riparian	1	12
Rhinichthys cobitis	Loach Minnow	Aquatic/Riparian	1	11
Rhinichthys osculus	Speckled Dace	Aquatic/Riparian	2	6, 11
Insects				
Abedus herberti	Giant Water Bug	Aquatic/Riparian	5	2, 3, 6, 8, 11
Adopaeoides prittwitzi	Sunrise Skipper	Aquatic/Riparian	1	6
Agathymus evansi	Huachuca Giant Skipper	Terrestrial	1	6
Amblyscirtes elissa	Elissa Roadside-skipper	Terrestrial	1	2
Amblyscirtes texanae	Texas Roadside-skipper	Terrestrial	1	11
Ancyloxypha arene	Tropical Least Skipper	Aquatic/Riparian	1	6
Ascia howarthi	Howard's White	Terrestrial	1	9
Atrytonopsis cestus	Cestus Skipper	Aquatic/Riparian	2	2, 11
Calephelis arizonensis	Arizona Metalmark	Aquatic/Riparian	2	2, 6
Chioides catillus albofasciatus	White-striped Longtail	Terrestrial	1	11
Cicindela oregona maricopa	Maricopa Tiger Beetle	Aquatic/Riparian	1	11
Eumorsea pinaleno	Pinaleno Monkey Grasshopper	Terrestrial	1	8
Heliopetes lavianus	Laviana Skipper	Terrestrial	1	2
Heterelmis stephani	Stephan's Heterelmis Riffle Beetle	Aquatic/Riparian	1	6
Psephenus arizonensis	Arizona Water Penny Beetle	Aquatic/Riparian	1	3
Mammals				
Antilocapra americana	Pronghorn	Terrestrial	4	2, 6, 11, 12
Antilocapra americana sonoriensis	Sonoran Pronghorn	Terrestrial	1	2
Choeronycteris mexicana	Mexican Long-Tongued Bat	Terrestrial	3	2, 6, 11
Corynorhinus townsendii pallescens	Pale Lump-nosed Bat	Terrestrial	4	2, 3, 5, 6

Target Type / Scientific Name	Common Name	Habitat Type	# of Conservation Areas	Conservation Areas[A]
Cynomys ludovicianus	Black-Tailed Prairie Dog	Terrestrial	2	6, 12
Eumops perotis californicus	Greater Western Mastiff Bat	Terrestrial	1	11
Idionycteris phyllotis	Allen's Big-Eared Bat	Terrestrial	2	3, 11
Leptonycteris curasoae yerbabuenae	Lesser Long-Nosed Bat	Terrestrial	5	3, 5, 6, 11, 12
Lepus callotis	White-sided Jackrabbit	Terrestrial	1	12
Macrotus californicus	California Leaf-Nosed Bat	Terrestrial	2	6, 11
Myotis ciliolabrum	Western Small-Footed Myotis Bat	Terrestrial	2	3, 6
Myotis thysanodes	Fringed Myotis Bat	Terrestrial	3	3, 5, 6
Myotis velifer	Cave Myotis Bat	Terrestrial	5	2, 3, 6, 11, 12
Myotis volans	Long-legged Myotis	Terrestrial	1	3
Nyctinomops macrotis	Big Free-Tailed Bat	Terrestrial	1	3
Panthera onca	Jaguar	Terrestrial	4	1, 2, 6, 12
Perognathus intermedius pinacate	Rock Pocket Mouse	Terrestrial	1	1
Peromyscus eremicus papagensis	Pinacate Cactus Mouse	Terrestrial	1	1
Peromyscus merriami	Mesquite Mouse	Terrestrial	1	6
Sciurus arizonensis	Arizona Gray Squirrel	Terrestrial	3	6, 7, 11
Sciurus nayaritensis chiricahuae	Chiricahua Fox Squirrel	Terrestrial	1	3
Sigmodon ochrognathus	Yellow-Nosed Cotton Rat	Terrestrial	6	2, 4, 6, 7, 11, 12
Sorex arizonae	Arizona Shrew	Terrestrial	3	3, 6, 12
Tamiasciurus hudsonicus grahamensis	Mount Graham Red Squirrel	Terrestrial	1	8
Thomomys umbrinus	Southern Pocket Gopher	Terrestrial	1	12
Ursus americanus	Black Bear	Terrestrial	10	2, 3, 4, 5, 6, 7, 8, 11, 12,13
Mollusks				
Ashmunella animasensis	Animas Peak Woodlandsnail	Terrestrial	1	12
Oreohelix grahamensis	Pinaleno Mountainsnail	Terrestrial	1	8
Pyrgulopsis bernardina	San Bernardino Springsnail	Aquatic/Riparian	1	12
Pyrgulopsis thompsoni	Huachuca Springsnail	Aquatic/Riparian	1	6
Sonorella animasensis	Animas Talussnail	Terrestrial	1	12
Sonorella christenseni	Clark Peak Talussnail	Terrestrial	1	8

Target Type / Scientific Name	Common Name	Habitat Type	# of Conservation Areas	Conservation Areas[A]
Sonorella grahamensis	Pinaleno Talussnail	Terrestrial	1	8
Sonorella imitator	Mimic Talussnail	Terrestrial	1	8
Sonorella macrophallus	Wet Canyon Talussnail	Terrestrial	1	8
Plants-Vascular				
Abutilon parishii	Parish's Abutilon	Terrestrial	2	10, 11
Abutilon thurberi	Thurber Indian Mallow/Thurber Abutilon	Terrestrial	1	9
Agave parviflora ssp flexiflora	Maguey	Terrestrial	1	2
Agave parviflora ssp parviflora	Small-Flowered Agave/Santa Cruz striped agave	Terrestrial	2	2, 6
Amoreuxia gonzalezii	Santa Rita Yellowshow	Terrestrial	1	6
Amsonia grandiflora	Arizona Slimpod	Terrestrial	2	2, 6
Amsonia kearneyana	Kearney's Slimpod	Terrestrial	1	1
Apacheria chiricahuensis	Cliff Brittlebush/Chiricahua Rock Flower	Terrestrial	1	3
Arabis tricornuta	Rincon Mountain Rockcress	Terrestrial	2	3, 6
Asclepias uncialis	Greene Milkweed	Terrestrial	1	6
Aster potosinus	Lemmon's Aster	Aquatic/Riparian	1	6
Astragalus cobrensis var. maguirei	A Milkvetch	Terrestrial	2	3, 12
Astragalus hypoxylus	Huachuca Milkvetch	Terrestrial	2	6, 7
Atriplex griffithsii	Griffith's Saltbush	Terrestrial	1	11
Browallia eludens	Elusive New Browallia Species	Aquatic/Riparian	1	6
Carex ultra	Cochise Sedge	Aquatic/Riparian	6	2, 3, 5, 6, 11, 12
Choisya mollis	Soft Mexican Orange	Terrestrial	1	2
Cleome multicaulis	Many-stemmed Spider-flower/Playa Spider Plant	Terrestrial	1	12
Coryphantha robbinsorum	Cochise Pincushion Cactus	Terrestrial	1	12
Coryphantha scheeri var. robustispina	Pima Pineapple Cactus	Terrestrial	3	1, 2, 6
Dalea tentaculoides	Gentry's Indigo Bush	Terrestrial	2	1, 2
Draba standleyi	Standley's Whitlowgrass	Terrestrial	1	3
Dryopteris patula var. rossii	Mexican Shield Fern	Terrestrial	1	6
Echinomastus erectocentrus var. erectocentrus	Needle-spined Pineapple Cactus	Terrestrial	2	6, 11

Target Type / Scientific Name	Common Name	Habitat Type	# of Conservation Areas	Conservation Areas[A]
Erigeron arisolius	Erigeron arisolius	Terrestrial	3	2, 3, 6
Erigeron heliographis	Pinalenos Fleabane	Terrestrial	1	8
Erigeron kuschei	A Fleabane	Terrestrial	1	3
Erigeron lemmonii	Lemmon's Fleabane	Terrestrial	1	6
Erigeron piscaticus	Fish Creek Fleabane	Aquatic/Riparian	1	11
Erigeron pringlei	Pringle's Fleabane	Terrestrial	1	6
Eupatorium bigelovii	Bigelow Thoroughwort	Terrestrial	1	8
Euphorbia macropus	Woodland Spurge	Terrestrial	2	6, 7
Fraxinus gooddingii	Goodding's Ash	Terrestrial	1	2
Gentianella wislizeni	Chiricahua Gentian	Terrestrial	1	3
Graptopetalum bartramii	Patagonia Mountain Leather-Petal	Terrestrial	3	2, 5, 6
Hedeoma dentatum	Arizona False Pennyroyal	Aquatic/Riparian	5	2, 3, 5, 6, 11
Heterotheca rutteri	Rutter's Golden-Aster	Terrestrial	1	6
Hexalectris revoluta	Chisos Coral-Root	Terrestrial	1	6
Hexalectris warnockii	Purple-Spike Coralroot	Terrestrial	2	3, 6
Hieracium pringlei	Pringle's Hawkweed	Terrestrial	1	6
Hieracium rusbyi	Rusby's Hawkweed	Terrestrial	1	6
Hymenoxys ambigens var. ambigens	Pinaleno Mountains Rubberweed/Pinaleno Mountain Plummera	Terrestrial	3	8, 12,13
Laennecia eriophylla	Cochise Marshtail	Terrestrial	1	2
Lilaeopsis schaffneriana var. recurva	Affolter	Aquatic/Riparian	4	6, 9, 11, 12
Lilium parryi	Lemon Lily	Aquatic/Riparian	2	3, 6
Lotus alamosanus	Sonoran Trefoil	Terrestrial	1	2
Lupinus huachucanus	Huachuca Mountain Lupine	Terrestrial	1	6
Lupinus lemmonii	Lemmon's Lupine	Terrestrial	3	3, 5, 11
Macroptilium supinum	Supine Bean	Terrestrial	2	2, 6
Metastelma mexicanum	Norrowleaf Or Wiggin's Swallow Wort	Terrestrial	2	2, 6
Muhlenbergia dubioides	Box Canyon Muhly	Terrestrial	2	6, 10
Notholaena lemmonii	Lemmon's Cloak-fern	Terrestrial	1	2
Paspalum virletii	Virlet Paspalum	Terrestrial	1	2

Target Type / Scientific Name	Common Name	Habitat Type	# of Conservation Areas	Conservation Areas[A]
Pectis imberbis	Beardless Chinch Weed	Terrestrial	3	2, 6, 7
Penstemon discolor	A Beardtongue	Terrestrial	3	2, 5, 11
Penstemon superbus	Superb Beardtongue	Terrestrial	4	2, 6, 11, 12
Perityle cochisensis	Cochise Rockdaisy	Terrestrial	1	3
Physalis latiphysa	Broadleaf Ground Cherry	Terrestrial	3	2, 4, 12
Polemonium pauciflorum ssp hinckleyi	Hinckley Jacob's Ladder	Terrestrial	1	3
Potentilla albiflora	White-Flowered Cinquefoil	Terrestrial	1	8
Psilactis gentryi	Gentry's Bare Ray Aster	Aquatic/Riparian	1	6
Puccinellia parishii	Parish's Alkali Grass	Aquatic/Riparian	1	11
Rumex orthoneurus	Bloomer's Dock	Aquatic/Riparian	3	3, 6, 8
Salvia amissa	Catalina Mountain Sage	Aquatic/Riparian	1	11
Samolus vagans	Chiricahua Mountain Brookweed	Aquatic/Riparian	3	3, 6, 11
Senecio hartwegii	Hartweg's Groundsel/Huachuca groundsel	Terrestrial	1	2
Senecio huachucanus	Huachuca Groundsel	Terrestrial	2	3, 6
Senecio neomexicanus var. toumeyi	Toumey Groundsel	Terrestrial	1	3
Spiranthes delitescens	Canelo Hills Ladies' Tresses Orchid	Aquatic/Riparian	1	6
Stellaria porsildii	Porsild's Starwort	Terrestrial	1	3
Talinum humile	Pinos Altos Mountains Flame Flower	Terrestrial	1	6
Talinum marginatum	Tepic Flame Flower	Terrestrial	1	6
Thelypteris puberula var. sonorensis	Aravaipa Woodfern	Aquatic/Riparian	1	11
Vauquelinia californica ssp pauciflora	Arizona Limestone Rosewood	Terrestrial	1	12
Reptiles				
Cnemidophorus burti stictogrammus	Giant Spotted Whiptail	Terrestrial	3	2, 6, 11
Cnemidophorus opatae	Huico de Oputo	Terrestrial	1	6
Crotalus pricei	Twin-Spotted Rattlesnake	Terrestrial	3	3, 6, 8
Crotalus willardi obscurus	New Mexican Ridgenose Rattlesnak	Terrestrial	1	12
Crotalus willardi willardi	Arizona Ridge-Nosed Rattlesnake	Terrestrial	2	6, 7
Eumeces callicephalus	Mountain Skink	Terrestrial	2	2, 6
Phrynosoma cornutum	Texas Horned Lizard	Terrestrial	4	3, 6, 11, 12

Target Type / Scientific Name	Common Name	Habitat Type	# of Conservation Areas	Conservation Areas[A]
Sceloporus slevini	Slevin's Bunchgrass Lizard	Terrestrial	3	3, 6, 12
Sceloporus virgatus	Striped Plateau Lizard	Terrestrial	2	3, 12
Sistrurus catenatus edwardsii	Desert Massasauga	Terrestrial	1	12
Terrapene ornata luteola	Desert Box Turtle	Terrestrial	3	6, 9, 12
Thamnophis eques megalops	Mexican Garter Snake	Aquatic/Riparian	4	6, 9, 10, 12
Communities				
Cienega		Aquatic/Riparian	7	2, 3, 6, 6, 8, 11, 12
Sacaton riparian grassland		Aquatic/Riparian	4	3, 6, 11, 12
Ecological Systems				
Apachean Grassland and Savanna Condition Class A		Terrestrial	4	3, 6, 11, 12
Apachean Grassland and Savanna Condition Class A&B		Terrestrial	5	1, 2, 6, 11, 12
Apachean Grassland and Savanna Condition Class A&D		Terrestrial	1	3
Apachean Grassland and Savanna Condition Class B		Terrestrial	8	1, 2, 3, 4, 6, 8, 11, 12
Apachean Grassland and Savanna Condition Class D		Terrestrial	5	3, 5, 6, 11, 12
Apachean Shrubland		Terrestrial	10	1, 2, 3, 4, 6, 8, 9, 11, 12,13
Chihuahuan Desert Scrub		Terrestrial	7	3, 4, 5, 6, 8, 11, 12
Desert Wash		Aquatic/Riparian	2	6, 11
Interior Chaparral		Terrestrial	7	3, 4, 6, 8, 11, 12,13
Madrean Encinal		Terrestrial	12	1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 12,13
Madrean Oak-Pine Woodland		Terrestrial	8	3, 4, 5, 6, 8, 11, 12,13
Mesquite Bosque		Aquatic/Riparian	1	11
Montane Mixed Forest		Terrestrial	4	3, 6, 8, 11
Montane Riparian Woodland and Shrubland		Aquatic/Riparian	6	2, 3, 6, 8, 11, 12
Pinyon-Juniper Woodland		Terrestrial	4	3, 6, 8, 11
Playa		Aquatic/Riparian	3	8, 11, 12
Ponderosa Pine Forest and Woodland		Terrestrial	1	12
Riparian Woodland		Aquatic/Riparian	8	1, 2, 6, 8, 9, 11, 11, 12

Target Type / Scientific Name	Common Name	Habitat Type	# of Conservation Areas	Conservation Areas[A]
Sonoran Desert Scrub		Terrestrial	5	2, 6, 8, 9, 11
Subalpine Spruce-Fir Forest and Woodland		Terrestrial	1	8
Features				
Ecological gradient		Terrestrial	2	1, 11

[A]1=Altar Valley/Baboquivari Mountains, 2=Atascosa/Pajarito Mountains, 3=Chiricahua Mountains, 4=Dos Cabezas/ Pinaleno Foothills, 5=Dragoon Mountains, 6=Huachuca Mountains Grassland Valley Complex, 7=Patagonia Mountains, 8=Pinaleno Mountains, 9=Rio Magdalena/Rio Asuncion, 10=Sabino Canyon, 11=San Pedro River/Aravaipa Creek, 12=Sierra San Luis/ Peloncillos Mountains, 13 =Santa Teresa Mountians

Appendix 4-C. Conservation targets associated with conservation areas that overlap the Coronado National Forest in Arizona and New Mexico.

Conservation Area/ Target Type	Scientific Name	Common Name	Habitat Type	Global Rank	ESA Status
Altar Valley/Baboquivari Mountains					
Amphibian	*Rana chiricahuensis*	Chiricahua Leopard Frog	Aquatic/Riparian	G3	LT
Bird	*Glaucidium brasilianum cactorum*	Cactus Ferruginous Pygmy Owl	Terrestrial	G3	LE
	Callipepla squamata	Scaled Quail	Terrestrial	G5	
	Pipilo aberti	Abert's Towhee	Aquatic/Riparian	G3	
Mammal	*Perognathus intermedius pinacate*	Rock Pocket Mouse	Terrestrial	GU	
	Peromyscus eremicus papagensis	Pinacate Cactus Mouse	Terrestrial	G2	C
	Panthera onca	Jaguar	Terrestrial	G3	LE
Plant-Vascular	*Coryphantha scheeri var. robustispina*	Pima Pineapple Cactus	Terrestrial	G2	LE
	Dalea tentaculoides	Gentry's Indigo Bush	Terrestrial	G1	
	Amsonia kearneyana	Kearney's Slimpod	Terrestrial	G1	LE
Ecological System		Apachean Shrubland	Terrestrial	GU	
		Riparian Woodland	Aquatic/Riparian	GU	
		Apachean Grassland and Savanna Condition Class B	Terrestrial	GU	
		Apachean Grassland and Savanna Condition Class A&B	Terrestrial	GU	
		Madrean Encinal	Terrestrial	GU	
Feature		Ecological gradient	Terrestrial	GU	
Atascosa/Pajarito Mountains					
Amphibian	*Eleutherodactylus augusti cactorum*	Western Barking Frog	Aquatic/Riparian	G3	
	Gastrophryne olivacea	Great Plains Narrowmouth Toad	Aquatic/Riparian	G5	
	Rana chiricahuensis	Chiricahua Leopard Frog	Aquatic/Riparian	G3	LT
	Rana yavapaiensis	Yavapi Leopard Frog	Aquatic/Riparian	G4	
	Rana tarahumarae	Tarahumara Frog	Aquatic/Riparian	G3	
Bird	*Strix occidentalis lucida*	Mexican Spotted Owl	Terrestrial	G3	LT
	Buteo albonotatus	Zone-Tailed Hawk	Aquatic/Riparian	G4	
	Asturina nitida maxima	Northern Gray Hawk	Aquatic/Riparian	G3	
	Glaucidium brasilianum cactorum	Cactus Ferruginous Pygmy Owl	Terrestrial	G3	LE

Conservation Area/ Target Type	Scientific Name	Common Name	Habitat Type	Global Rank	ESA Status
	Empidonax traillii extimus	Southwest Willow Flycatcher	Aquatic/Riparian	G2	LE
	Coccyzus americanus occidentalis	Western Yellow-Billed Cuckoo	Aquatic/Riparian	G3	C
	Falco peregrinus anatum	American Peregrine Falcon	Terrestrial	G3	
	Aimophila botterii	Botteri's Sparrow	Terrestrial	G4	
	Aimophila carpalis	Rufous-Winged Sparrow	Terrestrial	G4	
	Trogon elegans	Elegant Trogon	Aquatic/Riparian	G5	
Fish	*Catostomus insignis*	Sonora Sucker	Aquatic/Riparian	G3	SC
	Agosia chrysogaster	Longfin Dace	Aquatic/Riparian	G4	SC
	Gila ditaenia	Sonora Chub	Aquatic/Riparian	G2	LT
	Poeciliopsis occidentalis occidentalis	Gila Topminnow Infraspecific.	Aquatic/Riparian	G3	LE
Insect	*Heliopetes lavianus*	Laviana Skipper	Terrestrial	G5	
	Amblyscirtes elissa	Elissa Roadside-skipper	Terrestrial	GU	
	Abedus herberti	Giant Water Bug	Aquatic/Riparian	GU	
	Atrytonopsis cestus	Cestus Skipper	Aquatic/Riparian	G1	
	Calephelis arizonensis	Arizona Metalmark	Aquatic/Riparian	G3	
Mammal	*Ursus americanus*	Black Bear	Terrestrial	G5	
	Panthera onca	Jaguar	Terrestrial	G3	LE
	Myotis velifer	Cave Myotis Bat	Terrestrial	G5	
	Sigmodon ochrognathus	Yellow-Nosed Cotton Rat	Terrestrial	G4	
	Corynorhinus townsendii pallescens	Pale Lump-nosed Bat	Terrestrial	G4	
	Choeronycteris mexicana	Mexican Long-Tongued Bat	Terrestrial	G4	
	Antilocapra americana sonoriensis	Sonoran Pronghorn	Terrestrial	G1	LE
	Antilocapra americana	Pronghorn	Terrestrial	G5	
Reptile	*Eumeces callicephalus*	Mountain Skink	Terrestrial	G5	
	Cnemidophorus burti stictogrammus	Giant Spotted Whiptail	Terrestrial	G3	
Plant-Vascular	*Carex ultra*	Cochise Sedge	Aquatic/Riparian	G3	
	Notholaena lemmonii	Lemmon's Cloak-fern	Terrestrial	G3	
	Metastelma mexicanum	Norrowleaf Or Wiggin's Swallow Wort	Terrestrial	G3	
	Dalea tentaculoides	Gentry's Indigo Bush	Terrestrial	G1	
	Fraxinus gooddingii	Goodding's Ash	Terrestrial	G3	

Conservation Area/ Target Type	Scientific Name	Common Name	Habitat Type	Global Rank	ESA Status
	Macroptilium supinum	Supine Bean	Terrestrial	G2	
	Laennecia eriophylla	Cochise Marshtail	Terrestrial	G2	
	Lotus alamosanus	Sonoran Trefoil	Terrestrial	G3	
	Amsonia grandiflora	Arizona Slimpod	Terrestrial	G2	
	Agave parviflora ssp parviflora	Small-Flowered Agave/Santa Cruz striped agave	Terrestrial	G3	
	Agave parviflora ssp flexiflora	Maguey	Terrestrial	G3	
	Coryphantha scheeri var. robustispina	Pima Pineapple Cactus	Terrestrial	G2	LE
	Paspalum virletii	Virlet Paspalum	Terrestrial	G3	
	Erigeron arisolius	Erigeron arisolius	Terrestrial	G2	
	Choisya mollis	Soft Mexican Orange	Terrestrial	G2	
	Pectis imberbis	Beardless Chinch Weed	Terrestrial	G3	
	Graptopetalum bartramii	Patagonia Mountain Leather-Petal	Terrestrial	G3	
	Penstemon discolor	A Beardtongue	Terrestrial	G2	
	Penstemon superbus	Superb Beardtongue	Terrestrial	G2	
	Senecio hartwegii	Hartweg's Groundsel/Huachuca groundsel	Terrestrial	G3	
	Hedeoma dentatum	Arizona False Pennyroyal	Aquatic/Riparian	G3	
	Physalis latiphysa	Broadleaf Ground Cherry	Terrestrial	G1	
Community		Cienega	Aquatic/Riparian	GU	
Ecological System		Sonoran Desert Scrub	Terrestrial	GU	
		Apachean Grassland and Savanna Condition Class A&B	Terrestrial	GU	
		Apachean Grassland and Savanna Condition Class B	Terrestrial	GU	
		Apachean Shrubland	Terrestrial	GU	
		Madrean Encinal	Terrestrial	GU	
		Riparian Woodland	Aquatic/Riparian	GU	
		Montane Riparian Woodland and Shrubland	Aquatic/Riparian	GU	
Chiricahua Mountains					
Amphibian	*Rana chiricahuensis*	Chiricahua Leopard Frog	Aquatic/Riparian	G3	LT
	Rana blairi	Plains Leopard Frog	Aquatic/Riparian	G5	

Conservation Area/ Target Type	Scientific Name	Common Name	Habitat Type	Global Rank	ESA Status
Bird	*Strix occidentalis lucida*	Mexican Spotted Owl	Terrestrial	G3	LT
	Trogon elegans	Elegant Trogon	Aquatic/Riparian	G5	
	Coccyzus americanus occidentalis	Western Yellow-Billed Cuckoo	Aquatic/Riparian	G3	C
	Callipepla squamata	Scaled Quail	Terrestrial	G5	
	Buteo albonotatus	Zone-Tailed Hawk	Aquatic/Riparian	G4	
	Falco peregrinus anatum	American Peregrine Falcon	Terrestrial	G3	
	Accipiter gentilis	Northern Goshawk	Terrestrial	G5	
Fish	*Gila purpurea*	Yaqui Chub	Aquatic/Riparian	G1	LE
	Agosia chrysogaster	Longfin Dace	Aquatic/Riparian	G4	SC
	Campostoma ornatum	Mexican Stoneroller	Aquatic/Riparian	G3	SC
Insect	*Psephenus arizonensis*	Arizona Water Penny Beetle	Aquatic/Riparian	G2	
	Abedus herberti	Giant Water Bug	Aquatic/Riparian	GU	
Mammal	*Corynorhinus townsendii pallescens*	Pale Lump-nosed Bat	Terrestrial	G4	
	Myotis volans	Long-legged Myotis	Terrestrial	G5	
	Leptonycteris curasoae yerbabuenae	Lesser Long-Nosed Bat	Terrestrial	G3	LE
	Myotis velifer	Cave Myotis Bat	Terrestrial	G5	
	Nyctinomops macrotis	Big Free-Tailed Bat	Terrestrial	G5	
	Myotis thysanodes	Fringed Myotis Bat	Terrestrial	G4	
	Sciurus nayaritensis chiricahuae	Chiricahua Fox Squirrel	Terrestrial	G2	
	Myotis ciliolabrum	Western Small-Footed Myotis Bat	Terrestrial	G5	
	Idionycteris phyllotis	Allen's Big-Eared Bat	Terrestrial	G3	
	Ursus americanus	Black Bear	Terrestrial	G5	
	Sorex arizonae	Arizona Shrew	Terrestrial	G3	
Reptile	*Sceloporus virgatus*	Striped Plateau Lizard	Terrestrial	G4	
	Sceloporus slevini	Slevin's Bunchgrass Lizard	Terrestrial	G4	
	Crotalus pricei	Twin-Spotted Rattlesnake	Terrestrial	G5	
	Phrynosoma cornutum	Texas Horned Lizard	Terrestrial	G4	
Plant-Vascular	*Carex ultra*	Cochise Sedge	Aquatic/Riparian	G3	
	Senecio huachucanus	Huachuca Groundsel	Terrestrial	G2	
	Hedeoma dentatum	Arizona False Pennyroyal	Aquatic/Riparian	G3	

Conservation Area/ Target Type	Scientific Name	Common Name	Habitat Type	Global Rank	ESA Status
	Arabis tricornuta	Rincon Mountain Rockcress	Terrestrial	G1	
	Lupinus lemmonii	Lemmon's Lupine	Terrestrial	G1	
	Perityle cochisensis	Cochise Rockdaisy	Terrestrial	G1	
	Lilium parryi	Lemon Lily	Aquatic/Riparian	G3	
	Polemonium pauciflorum ssp hinckleyi	Hinckley Jacob's Ladder	Terrestrial	G2	
	Rumex orthoneurus	Bloomer's Dock	Aquatic/Riparian	G3	
	Samolus vagans	Chiricahua Mountain Brookweed	Aquatic/Riparian	G2	
	Stellaria porsildii	Porsild's Starwort	Terrestrial	G1	
	APACHERIA CHIRICAHUENSIS	Cliff Brittlebush/Chiricahua Rock Flower	Terrestrial	G2	
	Gentianella wislizeni	Chiricahua Gentian	Terrestrial	G2	
	Astragalus cobrensis var. maguirei	A Milkvetch	Terrestrial	G2	
	Senecio neomexicanus var. toumeyi	Toumey Groundsel	Terrestrial	G2	
	Erigeron kuschei	A Fleabane	Terrestrial	G1	
	Erigeron arisolius	Erigeron arisolius	Terrestrial	G2	
	Draba standleyi	Standley's Whitlowgrass	Terrestrial	G2	
	Hexalectris warnockii	Purple-Spike Coralroot	Terrestrial	G2	
Community		Cienega	Aquatic/Riparian	GU	
		Sacaton riparian grassland	Aquatic/Riparian	GU	
Ecological System		Apachean Grassland and Savanna Condition Class A&D	Terrestrial	GU	
		Madrean Encinal	Terrestrial	GU	
		Madrean Oak-Pine Woodland	Terrestrial	GU	
		Apachean Grassland and Savanna Condition Class D	Terrestrial	GU	
		Montane Mixed Forest	Terrestrial	GU	
		Pinyon-Juniper Woodland	Terrestrial	GU	
		Apachean Grassland and Savanna Condition Class B	Terrestrial	GU	
		Montane Riparian Woodland and Shrubland	Aquatic/Riparian	GU	
		Apachean Shrubland	Terrestrial	GU	
		Apachean Grassland and Savanna Condition Class A	Terrestrial	GU	
		Chihuahuan Desert Scrub	Terrestrial	GU	

Conservation Area/ Target Type	Scientific Name	Common Name	Habitat Type	Global Rank	ESA Status
		Interior Chaparral	Terrestrial	GU	
Dos Cabezas/ Pinaleno Foothills					
Bird	*Callipepla squamata*	Scaled Quail	Terrestrial	G5	
Mammal	*Sigmodon ochrognathus*	Yellow-Nosed Cotton Rat	Terrestrial	G4	
	Ursus americanus	Black Bear	Terrestrial	G5	
Plant-Vascular	*Physalis latiphysa*	Broadleaf Ground Cherry	Terrestrial	G1	
Ecological System		Chihuahuan Desert Scrub	Terrestrial	GU	
		Madrean Oak-Pine Woodland	Terrestrial	GU	
		Interior Chaparral	Terrestrial	GU	
		Apachean Grassland and Savanna Condition Class B	Terrestrial	GU	
		Madrean Encinal	Terrestrial	GU	
		Apachean Shrubland	Terrestrial	GU	
Dragoon Mountains					
Amphibian	*Rana chiricahuensis*	Chiricahua Leopard Frog	Aquatic/Riparian	G3	LT
Bird	*Falco peregrinus anatum*	American Peregrine Falcon	Terrestrial	G3	
	Callipepla squamata	Scaled Quail	Terrestrial	G5	
Mammal	*Leptonycteris curasoae yerbabuenae*	Lesser Long-Nosed Bat	Terrestrial	G3	LE
	Corynorhinus townsendii pallescens	Pale Lump-nosed Bat	Terrestrial	G4	
	Ursus americanus	Black Bear	Terrestrial	G5	
	Myotis thysanodes	Fringed Myotis Bat	Terrestrial	G4	
Plant-Vascular	*Carex ultra*	Cochise Sedge	Aquatic/Riparian	G3	
	Penstemon discolor	A Beardtongue	Terrestrial	G2	
	Lupinus lemmonii	Lemmon's Lupine	Terrestrial	G1	
	Hedeoma dentatum	Arizona False Pennyroyal	Aquatic/Riparian	G3	
	Graptopetalum bartramii	Patagonia Mountain Leather-Petal	Terrestrial	G3	
Ecological System		Madrean Oak-Pine Woodland	Terrestrial	GU	
		Chihuahuan Desert Scrub	Terrestrial	GU	
		Madrean Encinal	Terrestrial	GU	

Conservation Area/ Target Type	Scientific Name	Common Name	Habitat Type	Global Rank	ESA Status
		Apachean Grassland and Savanna Condition Class D	Terrestrial	GU	
Huachuca Mountains Grassland Valley Complex					
Amphibian	*Rana subaquavocalis*	Ramsey Canyon Leopard Frog	Aquatic/Riparian	G1	
	Rana pipiens	Northern Leopard Frog	Aquatic/Riparian	G5	
	Rana chiricahuensis	Chiricahua Leopard Frog	Aquatic/Riparian	G3	LT
	Hyla eximia	Mountain Treefrog	Aquatic/Riparian	G4	
	Ambystoma tigrinum stebbinsi	Sonoran Tiger Salamander	Aquatic/Riparian	G1	LE
	Rana yavapaiensis	Yavapi Leopard Frog	Aquatic/Riparian	G4	
	Eleutherodactylus augusti cactorum	Western Barking Frog	Aquatic/Riparian	G3	
Bird	*Pipilo aberti*	Abert's Towhee	Aquatic/Riparian	G3	
	Glaucidium brasilianum cactorum	Cactus Ferruginous Pygmy Owl	Terrestrial	G3	LE
	Trogon elegans	Elegant Trogon	Aquatic/Riparian	G5	
	Strix occidentalis lucida	Mexican Spotted Owl	Terrestrial	G3	LT
	Haliaeetus leucocephalus	Bald Eagle	Terrestrial	G4	PS:LT,PDL
	Callipepla squamata	Scaled Quail	Terrestrial	G5	
	Accipiter gentilis	Northern Goshawk	Terrestrial	G5	
	Aimophila botterii	Botteri's Sparrow	Terrestrial	G4	
	Aimophila carpalis	Rufous-Winged Sparrow	Terrestrial	G4	
	Ammodramus bairdii	Baird's Sparrow	Terrestrial	G4	
	Asturina nitida maxima	Northern Gray Hawk	Aquatic/Riparian	G3	
	Athene cunicularia hypugaea	Burrowing Owl	Terrestrial	G4	
	Chloroceryle americana	Green Kingfisher	Aquatic/Riparian	G5	
	Buteogallus anthracinus	Common Black-Hawk	Aquatic/Riparian	G4	
	Falco peregrinus anatum	American Peregrine Falcon	Terrestrial	G3	
	Ceryle alcyon	Belted Kingfisher	Aquatic/Riparian	G5	
	Coccyzus americanus occidentalis	Western Yellow-Billed Cuckoo	Aquatic/Riparian	G3	C
	Colaptes chrysoides	Gilded Flicker	Terrestrial	G5	
	Cyrtonyx montezumae	Montezuma Quail	Terrestrial	G4	
	Empidonax traillii extimus	Southwest Willow Flycatcher	Aquatic/Riparian	G2	LE

Conservation Area/ Target Type	Scientific Name	Common Name	Habitat Type	Global Rank	ESA Status
	Falco femoralis septentrionalis	Aplomado Falcon	Terrestrial	G2	LE
	Buteo albonotatus	Zone-Tailed Hawk	Aquatic/Riparian	G4	
Crustacean	*Stygobromus arizonensis*	Arizona Cave Amphipod	Subterranean	G2	
Fish	*Catostomus wigginsii*	Matalote Opata	Aquatic/Riparian	G3	
	Rhinichthys osculus	Speckled Dace	Aquatic/Riparian	G5	PS
	Gila intermedia	Gila Chub	Aquatic/Riparian	G2	PE
	Cyprinodon macularius macularius	Desert Pupfish	Aquatic/Riparian	G1	LE
	Cyprinodon macularius	Desert Pupfish	Aquatic/Riparian	G1	LE
	Poeciliopsis occidentalis occidentalis	Gila Topminnow Infraspecific.	Aquatic/Riparian	G3	LE
	Catostomus insignis	Sonora Sucker	Aquatic/Riparian	G3	SC
	Catostomus clarki	Desert Sucker	Aquatic/Riparian	G3	SC
	Agosia chrysogaster	Longfin Dace	Aquatic/Riparian	G4	SC
Insect	*Agathymus evansi*	Huachuca Giant Skipper	Terrestrial	G2	
	Abedus herberti	Giant Water Bug	Aquatic/Riparian	GU	
	Ancyloxypha arene	Tropical Least Skipper	Aquatic/Riparian	G4	
	Adopaeoides prittwitzi	Sunrise Skipper	Aquatic/Riparian	G3	
	Heterelmis stephani	Stephan's Heterelmis Riffle Beetle	Aquatic/Riparian	G2	C
	Calephelis arizonensis	Arizona Metalmark	Aquatic/Riparian	G3	
Mammal	*Sorex arizonae*	Arizona Shrew	Terrestrial	G3	
	Sigmodon ochrognathus	Yellow-Nosed Cotton Rat	Terrestrial	G4	
	Myotis ciliolabrum	Western Small-Footed Myotis Bat	Terrestrial	G5	
	Panthera onca	Jaguar	Terrestrial	G3	LE
	Myotis velifer	Cave Myotis Bat	Terrestrial	G5	
	Peromyscus merriami	Mesquite Mouse	Terrestrial	G5	
	Sciurus arizonensis	Arizona Gray Squirrel	Terrestrial	G4	
	Myotis thysanodes	Fringed Myotis Bat	Terrestrial	G4	
	Antilocapra americana	Pronghorn	Terrestrial	G5	
	Ursus americanus	Black Bear	Terrestrial	G5	
	Cynomys ludovicianus	Black-Tailed Prairie Dog	Terrestrial	G4	C
	Choeronycteris mexicana	Mexican Long-Tongued Bat	Terrestrial	G4	

Conservation Area/ Target Type	Scientific Name	Common Name	Habitat Type	Global Rank	ESA Status
	Corynorhinus townsendii pallescens	Pale Lump-nosed Bat	Terrestrial	G4	
	Macrotus californicus	California Leaf-Nosed Bat	Terrestrial	G4	
	Leptonycteris curasoae yerbabuenae	Lesser Long-Nosed Bat	Terrestrial	G3	LE
Mollusk	*Pyrgulopsis thompsoni*	Huachuca Springsnail	Aquatic/Riparian	G2	C
Reptile	*Thamnophis eques megalops*	Mexican Garter Snake	Aquatic/Riparian	G3	
	Terrapene ornata luteola	Desert Box Turtle	Terrestrial	G4	
	Sceloporus slevini	Slevin's Bunchgrass Lizard	Terrestrial	G4	
	Phrynosoma cornutum	Texas Horned Lizard	Terrestrial	G4	
	Eumeces callicephalus	Mountain Skink	Terrestrial	G5	
	Crotalus willardi willardi	Arizona Ridge-Nosed Rattlesnake	Terrestrial	G3	
	Crotalus pricei	Twin-Spotted Rattlesnake	Terrestrial	G5	
	Cnemidophorus opatae	Huico de Oputo	Terrestrial	G1	
	Cnemidophorus burti stictogrammus	Giant Spotted Whiptail	Terrestrial	G3	
Plant-Vascular	*Euphorbia macropus*	Woodland Spurge	Terrestrial	G4	
	Aster potosinus	Lemmon's Aster	Aquatic/Riparian	G2	
	Astragalus hypoxylus	Huachuca Milkvetch	Terrestrial	G1	
	Erigeron pringlei	Pringle's Fleabane	Terrestrial	G2	
	Erigeron lemmonii	Lemmon's Fleabane	Terrestrial	G1	C
	Erigeron arisolius	Erigeron arisolius	Terrestrial	G2	
	Echinomastus erectocentrus var. erectocentrus	Needle-spined Pineapple Cactus	Terrestrial	G3	SC
	Dryopteris patula var. rossii	Mexican Shield Fern	Terrestrial	G1	
	Coryphantha scheeri var. robustispina	Pima Pineapple Cactus	Terrestrial	G2	LE
	Asclepias uncialis	Greene Milkweed	Terrestrial	G3	
	Browallia eludens	Elusive New Browallia Species	Aquatic/Riparian	G2	
	Carex ultra	Cochise Sedge	Aquatic/Riparian	G3	
	Metastelma mexicanum	Norrowleaf Or Wiggin's Swallow Wort	Terrestrial	G3	
	Hedeoma dentatum	Arizona False Pennyroyal	Aquatic/Riparian	G3	
	Graptopetalum bartramii	Patagonia Mountain Leather-Petal	Terrestrial	G3	
	Talinum marginatum	Tepic Flame Flower	Terrestrial	G2	

Conservation Area/ Target Type	Scientific Name	Common Name	Habitat Type	Global Rank	ESA Status
	Talinum humile	Pinos Altos Mountains Flame Flower	Terrestrial	G2	
	Spiranthes delitescens	Canelo Hills Ladies' Tresses Orchid	Aquatic/Riparian	G1	LE
	Senecio huachucanus	Huachuca Groundsel	Terrestrial	G2	
	Samolus vagans	Chiricahua Mountain Brookweed	Aquatic/Riparian	G2	
	Rumex orthoneurus	Bloomer's Dock	Aquatic/Riparian	G3	
	Psilactis gentryi	Gentry's Bare Ray Aster	Aquatic/Riparian	G2	
	Penstemon superbus	Superb Beardtongue	Terrestrial	G2	
	Lilium parryi	Lemon Lily	Aquatic/Riparian	G3	
	Muhlenbergia dubioides	Box Canyon Muhly	Terrestrial	G1	
	Arabis tricornuta	Rincon Mountain Rockcress	Terrestrial	G1	
	Macroptilium supinum	Supine Bean	Terrestrial	G2	
	Hexalectris revoluta	Chisos Coral-Root	Terrestrial	G1	
	Lupinus huachucanus	Huachuca Mountain Lupine	Terrestrial	G2	
	Lilaeopsis schaffneriana var. recurva	Affolter	Aquatic/Riparian	G2	LE
	Hieracium rusbyi	Rusby's Hawkweed	Terrestrial	G2	
	Agave parviflora ssp parviflora	Small-Flowered Agave/Santa Cruz striped agave	Terrestrial	G3	
	Amoreuxia gonzalezii	Santa Rita Yellowshow	Terrestrial	G1	
	Hieracium pringlei	Pringle's Hawkweed	Terrestrial	G2	
	Hexalectris warnockii	Purple-Spike Coralroot	Terrestrial	G2	
	Heterotheca rutteri	Rutter's Golden-Aster	Terrestrial	G2	
	Pectis imberbis	Beardless Chinch Weed	Terrestrial	G3	
	Amsonia grandiflora	Arizona Slimpod	Terrestrial	G2	
Community		Cienega	Aquatic/Riparian	GU	
		Cienega	Aquatic/Riparian	GU	
		Sacaton riparian grassland	Aquatic/Riparian	GU	
Ecological System		Madrean Oak-Pine Woodland	Terrestrial	GU	
		Montane Mixed Forest	Terrestrial	GU	
		Apachean Grassland and Savanna Condition Class B	Terrestrial	GU	
		Pinyon-Juniper Woodland	Terrestrial	GU	
		Apachean Grassland and Savanna Condition Class A	Terrestrial	GU	

Conservation Area/ Target Type	Scientific Name	Common Name	Habitat Type	Global Rank	ESA Status
		Apachean Grassland and Savanna Condition Class A&B	Terrestrial	GU	
		Riparian Woodland	Aquatic/Riparian	GU	
		Sonoran Desert Scrub	Terrestrial	GU	
		Montane Riparian Woodland and Shrubland	Aquatic/Riparian	GU	
		Desert Wash	Aquatic/Riparian	GU	
		Interior Chaparral	Terrestrial	GU	
		Chihuahuan Desert Scrub	Terrestrial	GU	
		Apachean Grassland and Savanna Condition Class D	Terrestrial	GU	
		Madrean Encinal	Terrestrial	GU	
		Apachean Shrubland	Terrestrial	GU	
Patagonia Mountains					
Bird	*Strix occidentalis lucida*	Mexican Spotted Owl	Terrestrial	G3	LT
	Falco peregrinus anatum	American Peregrine Falcon	Terrestrial	G3	
	Accipiter gentilis	Northern Goshawk	Terrestrial	G5	
	Buteo albonotatus	Zone-Tailed Hawk	Aquatic/Riparian	G4	
Mammal	*Sciurus arizonensis*	Arizona Gray Squirrel	Terrestrial	G4	
	Ursus americanus	Black Bear	Terrestrial	G5	
	Sigmodon ochrognathus	Yellow-Nosed Cotton Rat	Terrestrial	G4	
Reptile	*Crotalus willardi willardi*	Arizona Ridge-Nosed Rattlesnake	Terrestrial	G3	
Plant-Vascular	*Euphorbia macropus*	Woodland Spurge	Terrestrial	G4	
	Astragalus hypoxylus	Huachuca Milkvetch	Terrestrial	G1	
	Pectis imberbis	Beardless Chinch Weed	Terrestrial	G3	
Ecological System		Madrean Encinal	Terrestrial	GU	
Pinaleno Mountains					
Amphibian	*Rana yavapaiensis*	Yavapi Leopard Frog	Aquatic/Riparian	G4	
Bird	*Callipepla squamata*	Scaled Quail	Terrestrial	G5	
	Accipiter gentilis	Northern Goshawk	Terrestrial	G5	

Conservation Area/ Target Type	Scientific Name	Common Name	Habitat Type	Global Rank	ESA Status
	Strix occidentalis lucida	Mexican Spotted Owl	Terrestrial	G3	LT
	Falco peregrinus anatum	American Peregrine Falcon	Terrestrial	G3	
Fish	*Oncorhynchus apache*	Apache Trout Infraspecific.	Aquatic/Riparian	G3	LT
Insect	*Abedus herberti*	Giant Water Bug	Aquatic/Riparian	GU	
	Eumorsea pinaleno	Pinaleno Monkey Grasshopper	Terrestrial	G2	
Mammal	*Ursus americanus*	Black Bear	Terrestrial	G5	
	Tamiasciurus hudsonicus grahamensis	Mount Graham Red Squirrel	Terrestrial	G1	LE
Mollusk	*Oreohelix grahamensis*	Pinaleno Mountainsnail	Terrestrial	G2	
	Sonorella christenseni	Clark Peak Talussnail	Terrestrial	G1	
	Sonorella grahamensis	Pinaleno Talussnail	Terrestrial	G1	
	Sonorella macrophallus	Wet Canyon Talussnail	Terrestrial	G1	C
	Sonorella imitator	Mimic Talussnail	Terrestrial	G2	
Reptile	*Crotalus pricei*	Twin-Spotted Rattlesnake	Terrestrial	G5	
Plant-Vascular	*Potentilla albiflora*	White-Flowered Cinquefoil	Terrestrial	G2	
	Eupatorium bigelovii	Bigelow Thoroughwort	Terrestrial	G2	
	Rumex orthoneurus	Bloomer's Dock	Aquatic/Riparian	G3	
	Erigeron heliographis	Pinalenos Fleabane	Terrestrial	G1	
	Hymenoxys ambigens var. ambigens	Pinaleno Mountains Rubberweed/Pinaleno Mountain Plummera	Terrestrial	G1	
Community		Cienega	Aquatic/Riparian	GU	
Ecological System		Chihuahuan Desert Scrub	Terrestrial	GU	
		Apachean Shrubland	Terrestrial	GU	
		Riparian Woodland	Aquatic/Riparian	GU	
		Montane Mixed Forest	Terrestrial	GU	
		Subalpine Spruce-Fir Forest and Woodland	Terrestrial	GU	
		Sonoran Desert Scrub	Terrestrial	GU	
		Madrean Oak-Pine Woodland	Terrestrial	GU	
		Apachean Grassland and Savanna Condition Class B	Terrestrial	GU	
		Madrean Encinal	Terrestrial	GU	
		Montane Riparian Woodland and Shrubland	Aquatic/Riparian	GU	

Conservation Area/ Target Type	Scientific Name	Common Name	Habitat Type	Global Rank	ESA Status
		Interior Chaparral	Terrestrial	GU	
		Playa	Aquatic/Riparian	GU	
		Pinyon-Juniper Woodland	Terrestrial	GU	
Rio Magdalena/Rio Asuncion					
Bird	*Dendroica petechia*	Yellow Warbler	Aquatic/Riparian	G3	
	Empidonax traillii extimus	Southwest Willow Flycatcher	Aquatic/Riparian	G2	LE
	Asturina nitida maxima	Northern Gray Hawk	Aquatic/Riparian	G3	
	Coccyzus americanus occidentalis	Western Yellow-Billed Cuckoo	Aquatic/Riparian	G3	C
Fish	*Gila ditaenia*	Sonora Chub	Aquatic/Riparian	G2	LT
	Poeciliopsis occidentalis occidentalis	Gila Topminnow Infraspecific.	Aquatic/Riparian	G3	LE
	Gila sp.	Gila sp.	Aquatic/Riparian	GU	
	Agosia sp.	Agosia sp.	Aquatic/Riparian	GU	
Insect	*Ascia howarthi*	Howard's White	Terrestrial	GU	
Reptile	*Thamnophis eques megalops*	Mexican Garter Snake	Aquatic/Riparian	G3	
	Terrapene ornata luteola	Desert Box Turtle	Terrestrial	G4	
Plant-Vascular	*Lilaeopsis schaffneriana var. recurva*	Affolter	Aquatic/Riparian	G2	LE
	Abutilon thurberi	Thurber Indian Mallow/Thurber Abutilon	Terrestrial	G2	
Ecological System		Riparian Woodland	Aquatic/Riparian	GU	
		Madrean Encinal	Terrestrial	GU	
		Apachean Shrubland	Terrestrial	GU	
		Sonoran Desert Scrub	Terrestrial	GU	
Sabino Canyon					
Amphibian	*Rana yavapaiensis*	Yavapi Leopard Frog	Aquatic/Riparian	G4	
Bird	*Glaucidium brasilianum cactorum*	Cactus Ferruginous Pygmy Owl	Terrestrial	G3	LE
Fish	*Gila intermedia*	Gila Chub	Aquatic/Riparian	G2	PE
Reptile	*Thamnophis eques megalops*	Mexican Garter Snake	Aquatic/Riparian	G3	
Plant-Vascular	*Muhlenbergia dubioides*	Box Canyon Muhly	Terrestrial	G1	
	Abutilon parishii	Parish's Abutilon	Terrestrial	G2	

Conservation Area/ Target Type	Scientific Name	Common Name	Habitat Type	Global Rank	ESA Status
San Pedro River/Aravaipa Creek					
Amphibian	*Rana yavapaiensis*	Yavapi Leopard Frog	Aquatic/Riparian	G4	
	Rana chiricahuensis	Chiricahua Leopard Frog	Aquatic/Riparian	G3	LT
	Rana blairi	Plains Leopard Frog	Aquatic/Riparian	G5	
Bird	*Grus canadensis*	Sandhill Crane	Aquatic/Riparian	G5	
	Glaucidium brasilianum cactorum	Cactus Ferruginous Pygmy Owl	Terrestrial	G3	LE
	Aimophila carpalis	Rufous-Winged Sparrow	Terrestrial	G4	
	Buteo albonotatus	Zone-Tailed Hawk	Aquatic/Riparian	G4	
	Empidonax traillii extimus	Southwest Willow Flycatcher	Aquatic/Riparian	G2	LE
	Athene cunicularia hypugaea	Burrowing Owl	Terrestrial	G4	
	Accipiter gentilis	Northern Goshawk	Terrestrial	G5	
	Buteogallus anthracinus	Common Black-Hawk	Aquatic/Riparian	G4	
	Strix occidentalis lucida	Mexican Spotted Owl	Terrestrial	G3	LT
	Callipepla squamata	Scaled Quail	Terrestrial	G5	
	Dendroica petechia	Yellow Warbler	Aquatic/Riparian	G3	
	Pipilo aberti	Abert's Towhee	Aquatic/Riparian	G3	
	Colaptes chrysoides	Gilded Flicker	Terrestrial	G5	
	Coccyzus americanus occidentalis	Western Yellow-Billed Cuckoo	Aquatic/Riparian	G3	C
	Falco peregrinus anatum	American Peregrine Falcon	Terrestrial	G3	
	Asturina nitida maxima	Northern Gray Hawk	Aquatic/Riparian	G3	
Fish	*Gila robusta*	Roundtail Chub	Aquatic/Riparian	G3	PS
	Rhinichthys osculus	Speckled Dace	Aquatic/Riparian	G5	PS
	Gila intermedia	Gila Chub	Aquatic/Riparian	G2	PE
	Catostomus clarki	Desert Sucker	Aquatic/Riparian	G3	SC
	Meda fulgida	Spikedace	Aquatic/Riparian	G2	LT
	Cyprinodon macularius macularius	Desert Pupfish	Aquatic/Riparian	G1	LE
	Rhinichthys cobitis	Loach Minnow	Aquatic/Riparian	G2	LT
	Catostomus insignis	Sonora Sucker	Aquatic/Riparian	G3	SC
	Agosia chrysogaster	Longfin Dace	Aquatic/Riparian	G4	SC

Conservation Area/ Target Type	Scientific Name	Common Name	Habitat Type	Global Rank	ESA Status
Insect	*Amblyscirtes texanae*	Texas Roadside-skipper	Terrestrial	G4	
	Abedus herberti	Giant Water Bug	Aquatic/Riparian	GU	
	Atrytonopsis cestus	Cestus Skipper	Aquatic/Riparian	G1	
	Cicindela oregona maricopa	Maricopa Tiger Beetle	Aquatic/Riparian	G3	
	Chioides catillus albofasciatus	White-striped Longtail	Terrestrial	GU	
Mammal	*Myotis velifer*	Cave Myotis Bat	Terrestrial	G5	
	Idionycteris phyllotis	Allen's Big-Eared Bat	Terrestrial	G3	
	Leptonycteris curasoae yerbabuenae	Lesser Long-Nosed Bat	Terrestrial	G3	LE
	Antilocapra americana	Pronghorn	Terrestrial	G5	
	Macrotus californicus	California Leaf-Nosed Bat	Terrestrial	G4	
	Eumops perotis californicus	Greater Western Mastiff Bat	Terrestrial	G4	
	Sigmodon ochrognathus	Yellow-Nosed Cotton Rat	Terrestrial	G4	
	Ursus americanus	Black Bear	Terrestrial	G5	
	Choeronycteris mexicana	Mexican Long-Tongued Bat	Terrestrial	G4	
	Sciurus arizonensis	Arizona Gray Squirrel	Terrestrial	G4	
Reptile	*Phrynosoma cornutum*	Texas Horned Lizard	Terrestrial	G4	
	Cnemidophorus burti stictogrammus	Giant Spotted Whiptail	Terrestrial	G3	
Plant-Vascular	*Salvia amissa*	Catalina Mountain Sage	Aquatic/Riparian	G2	
	Samolus vagans	Chiricahua Mountain Brookweed	Aquatic/Riparian	G2	
	Penstemon superbus	Superb Beardtongue	Terrestrial	G2	
	Thelypteris puberula var. sonorensis	Aravaipa Woodfern	Aquatic/Riparian	G3	
	Puccinellia parishii	Parish's Alkali Grass	Aquatic/Riparian	G2	
	Penstemon discolor	A Beardtongue	Terrestrial	G2	
	Erigeron piscaticus	Fish Creek Fleabane	Aquatic/Riparian	G1	
	Echinomastus erectocentrus var. erectocentrus	Needle-spined Pineapple Cactus	Terrestrial	G3	SC
	Lilaeopsis schaffneriana var. recurva	Affolter	Aquatic/Riparian	G2	LE
	Abutilon parishii	Parish's Abutilon	Terrestrial	G2	
	Lupinus lemmonii	Lemmon's Lupine	Terrestrial	G1	
	Carex ultra	Cochise Sedge	Aquatic/Riparian	G3	

Conservation Area/ Target Type	Scientific Name	Common Name	Habitat Type	Global Rank	ESA Status
	Atriplex griffithsii	Griffith's Saltbush	Terrestrial	G2	
	Hedeoma dentatum	Arizona False Pennyroyal	Aquatic/Riparian	G3	
Community		Sacaton riparian grassland	Aquatic/Riparian	GU	
		Cienega	Aquatic/Riparian	GU	
Ecological System		Apachean Shrubland	Terrestrial	GU	
		Apachean Grassland and Savanna Condition Class B	Terrestrial	GU	
		Sonoran Desert Scrub	Terrestrial	GU	
		Madrean Encinal	Terrestrial	GU	
		Chihuahuan Desert Scrub	Terrestrial	GU	
		Apachean Grassland and Savanna Condition Class A&B	Terrestrial	GU	
		Montane Riparian Woodland and Shrubland	Aquatic/Riparian	GU	
		Desert Wash	Aquatic/Riparian	GU	
		Mesquite Bosque	Aquatic/Riparian	GU	
		Interior Chaparral	Terrestrial	GU	
		Montane Mixed Forest	Terrestrial	GU	
		Madrean Oak-Pine Woodland	Terrestrial	GU	
		Riparian Woodland	Aquatic/Riparian	GU	
		Pinyon-Juniper Woodland	Terrestrial	GU	
		Playa	Aquatic/Riparian	GU	
		Apachean Grassland and Savanna Condition Class D	Terrestrial	GU	
		Apachean Grassland and Savanna Condition Class A	Terrestrial	GU	
		Riparian Woodland	Aquatic/Riparian	GU	
Feature		Ecological gradient	Terrestrial	GU	
Santa Teresa Mountians					
Bird	*Falco peregrinus anatum*	American Peregrine Falcon	Terrestrial	G3	
Mammal	*Ursus americanus*	Black Bear	Terrestrial	G5	
Plant-Vascular	*Hymenoxys ambigens var. ambigens*	Pinaleno Mountains Rubberweed/Pinaleno Mountain Plummera	Terrestrial	G1	
Ecological System		Interior Chaparral	Terrestrial	GU	

Conservation Area/ Target Type	Scientific Name	Common Name	Habitat Type	Global Rank	ESA Status
		Madrean Encinal	Terrestrial	GU	
		Apachean Shrubland	Terrestrial	GU	
		Madrean Oak-Pine Woodland	Terrestrial	GU	
Sierra San Luis/ Peloncillos Mountains					
Amphibian	*Rana chiricahuensis*	Chiricahua Leopard Frog	Aquatic/Riparian	G3	LT
	Rana yavapaiensis	Yavapi Leopard Frog	Aquatic/Riparian	G4	
	Rana blairi	Plains Leopard Frog	Aquatic/Riparian	G5	
Bird	*Trogon elegans*	Elegant Trogon	Aquatic/Riparian	G5	
	Pipilo aberti	Abert's Towhee	Aquatic/Riparian	G3	
	Strix occidentalis lucida	Mexican Spotted Owl	Terrestrial	G3	LT
	Buteogallus anthracinus	Common Black-Hawk	Aquatic/Riparian	G4	
	Haliaeetus leucocephalus	Bald Eagle	Terrestrial	G4	PS:LT,PDL
	Asturina nitida maxima	Northern Gray Hawk	Aquatic/Riparian	G3	
	Ammodramus bairdii	Baird's Sparrow	Terrestrial	G4	
	Aimophila botterii	Botteri's Sparrow	Terrestrial	G4	
	Accipiter gentilis	Northern Goshawk	Terrestrial	G5	
	Buteo albonotatus	Zone-Tailed Hawk	Aquatic/Riparian	G4	
	Coccyzus americanus occidentalis	Western Yellow-Billed Cuckoo	Aquatic/Riparian	G3	C
	Falco femoralis septentrionalis	Aplomado Falcon	Terrestrial	G2	LE
	Callipepla squamata	Scaled Quail	Terrestrial	G5	
	Ceryle alcyon	Belted Kingfisher	Aquatic/Riparian	G5	
	Chloroceryle americana	Green Kingfisher	Aquatic/Riparian	G5	
Fish	*Ictalurus pricei*	Yaqui Catfish	Aquatic/Riparian	G2	LT
	Campostoma ornatum	Mexican Stoneroller	Aquatic/Riparian	G3	SC
	Gila robusta	Roundtail Chub	Aquatic/Riparian	G3	PS
	Catostomus bernardini	Yaqui Sucker	Aquatic/Riparian	G4	
	Agosia chrysogaster	Longfin Dace	Aquatic/Riparian	G4	SC
	Gila purpurea	Yaqui Chub	Aquatic/Riparian	G1	LE
	Poeciliopsis occidentalis sonoriensis	Yaqui Topminnow Infraspecific.	Aquatic/Riparian	G3	LE

Conservation Area/ Target Type	Scientific Name	Common Name	Habitat Type	Global Rank	ESA Status
	Cyprinella formosa	Beautiful Shiner	Aquatic/Riparian	G2	LT
	Gila intermedia	Gila Chub	Aquatic/Riparian	G2	PE
Mammal	*Leptonycteris curasoae yerbabuenae*	Lesser Long-Nosed Bat	Terrestrial	G3	LE
	Panthera onca	Jaguar	Terrestrial	G3	LE
	Antilocapra americana	Pronghorn	Terrestrial	G5	
	Sigmodon ochrognathus	Yellow-Nosed Cotton Rat	Terrestrial	G4	
	Sorex arizonae	Arizona Shrew	Terrestrial	G3	
	Cynomys ludovicianus	Black-Tailed Prairie Dog	Terrestrial	G4	C
	Thomomys umbrinus	Southern Pocket Gopher	Terrestrial	G5	
	Ursus americanus	Black Bear	Terrestrial	G5	
	Myotis velifer	Cave Myotis Bat	Terrestrial	G5	
	Lepus callotis	White-sided Jackrabbit	Terrestrial	G3	
Mollusk	*Sonorella animasensis*	Animas Talussnail	Terrestrial	G1	
	Ashmunella animasensis	Animas Peak Woodlandsnail	Terrestrial	G1	
	Pyrgulopsis bernardina	San Bernardino Springsnail	Aquatic/Riparian	G1	
Reptile	*Thamnophis eques megalops*	Mexican Garter Snake	Aquatic/Riparian	G3	
	Sistrurus catenatus edwardsii	Desert Massasauga	Terrestrial	G3	
	Sceloporus virgatus	Striped Plateau Lizard	Terrestrial	G4	
	Phrynosoma cornutum	Texas Horned Lizard	Terrestrial	G4	
	Sceloporus slevini	Slevin's Bunchgrass Lizard	Terrestrial	G4	
	Terrapene ornata luteola	Desert Box Turtle	Terrestrial	G4	
	Crotalus willardi obscurus	New Mexican Ridgenose Rattlesnak	Terrestrial	G2	LT
Plant-Vascular	*Vauquelinia californica ssp pauciflora*	Arizona Limestone Rosewood	Terrestrial	G3	
	Penstemon superbus	Superb Beardtongue	Terrestrial	G2	
	Physalis latiphysa	Broadleaf Ground Cherry	Terrestrial	G1	
	Cleome multicaulis	Many-stemmed Spider-flower/Playa Spider Plant	Terrestrial	G2	
	Astragalus cobrensis var. maguirei	A Milkvetch	Terrestrial	G2	
	Lilaeopsis schaffneriana var. recurva	Affolter	Aquatic/Riparian	G2	LE
	Coryphantha robbinsorum	Cochise Pincushion Cactus	Terrestrial	G1	LT
	Carex ultra	Cochise Sedge	Aquatic/Riparian	G3	

Conservation Area/ Target Type	Scientific Name	Common Name	Habitat Type	Global Rank	ESA Status
	Hymenoxys ambigens var. ambigens	Pinaleno Mountains Rubberweed/Pinaleno Mountain Plummera	Terrestrial	G1	
Community		Sacaton riparian grassland	Aquatic/Riparian	GU	
		Cienega	Aquatic/Riparian	GU	
Ecological System		Apachean Grassland and Savanna Condition Class A	Terrestrial	GU	
		Chihuahuan Desert Scrub	Terrestrial	GU	
		Riparian Woodland	Aquatic/Riparian	GU	
		Ponderosa Pine Forest and Woodland	Terrestrial	GU	
		Playa	Aquatic/Riparian	GU	
		Interior Chaparral	Terrestrial	GU	
		Montane Riparian Woodland and Shrubland	Aquatic/Riparian	GU	
		Apachean Grassland and Savanna Condition Class A&B	Terrestrial	GU	
		Apachean Shrubland	Terrestrial	GU	
		Madrean Oak-Pine Woodland	Terrestrial	GU	
		Madrean Encinal	Terrestrial	GU	
		Apachean Grassland and Savanna Condition Class B	Terrestrial	GU	
		Apachean Grassland and Savanna Condition Class D	Terrestrial	GU	