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.

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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.

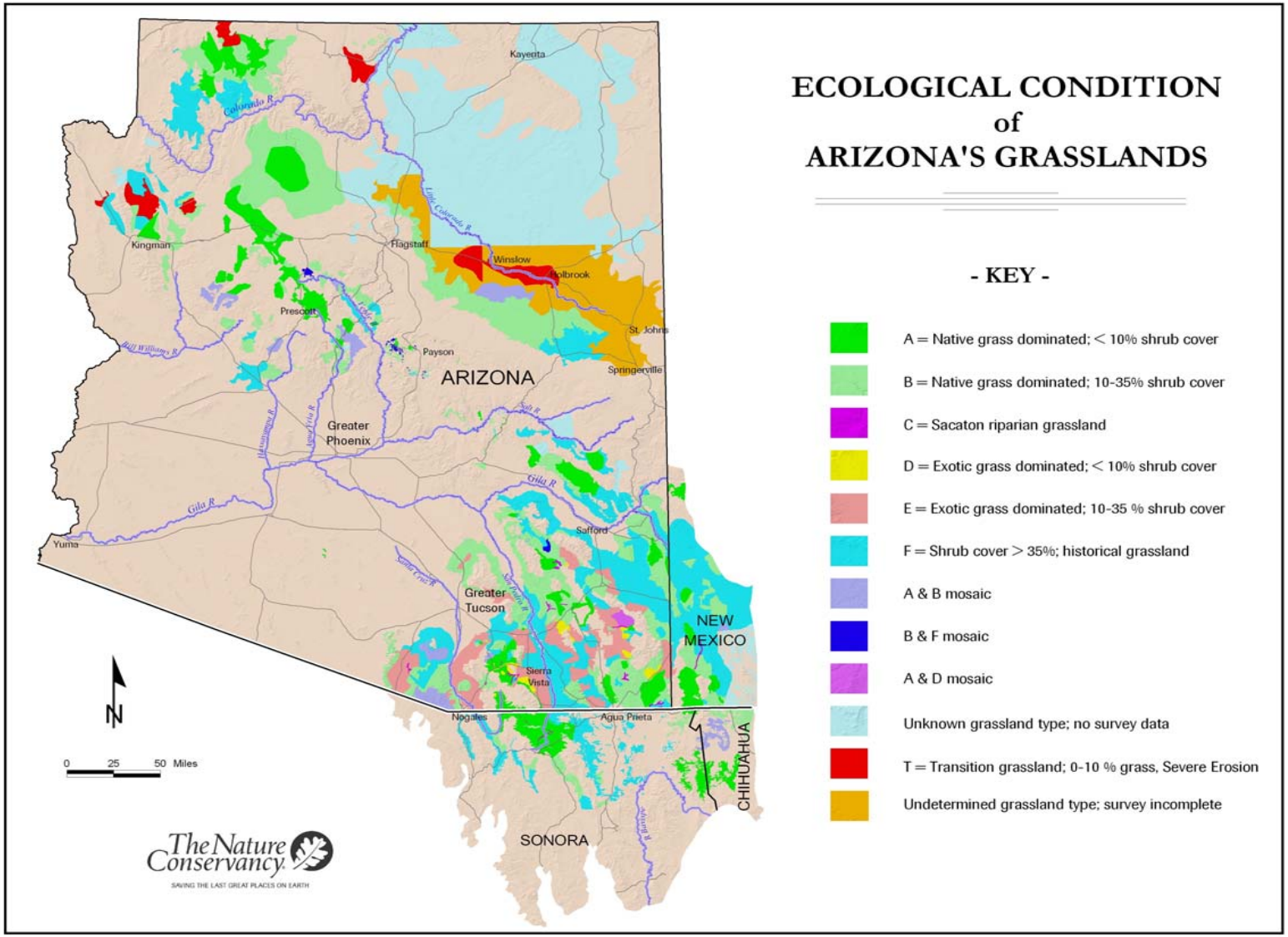

Figure 2-1. The Arizona Statewide Grasslands Assessment (Schussman and Gori 2004, Gori and Enquist 2003) GIS-based layer depicts the condition of grasslands across Arizona, as well as parts of southwest New Mexico and north central Mexico that occur within the Apache Highlands Ecoregion.

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.

The R3 Species Database Fields

- 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).

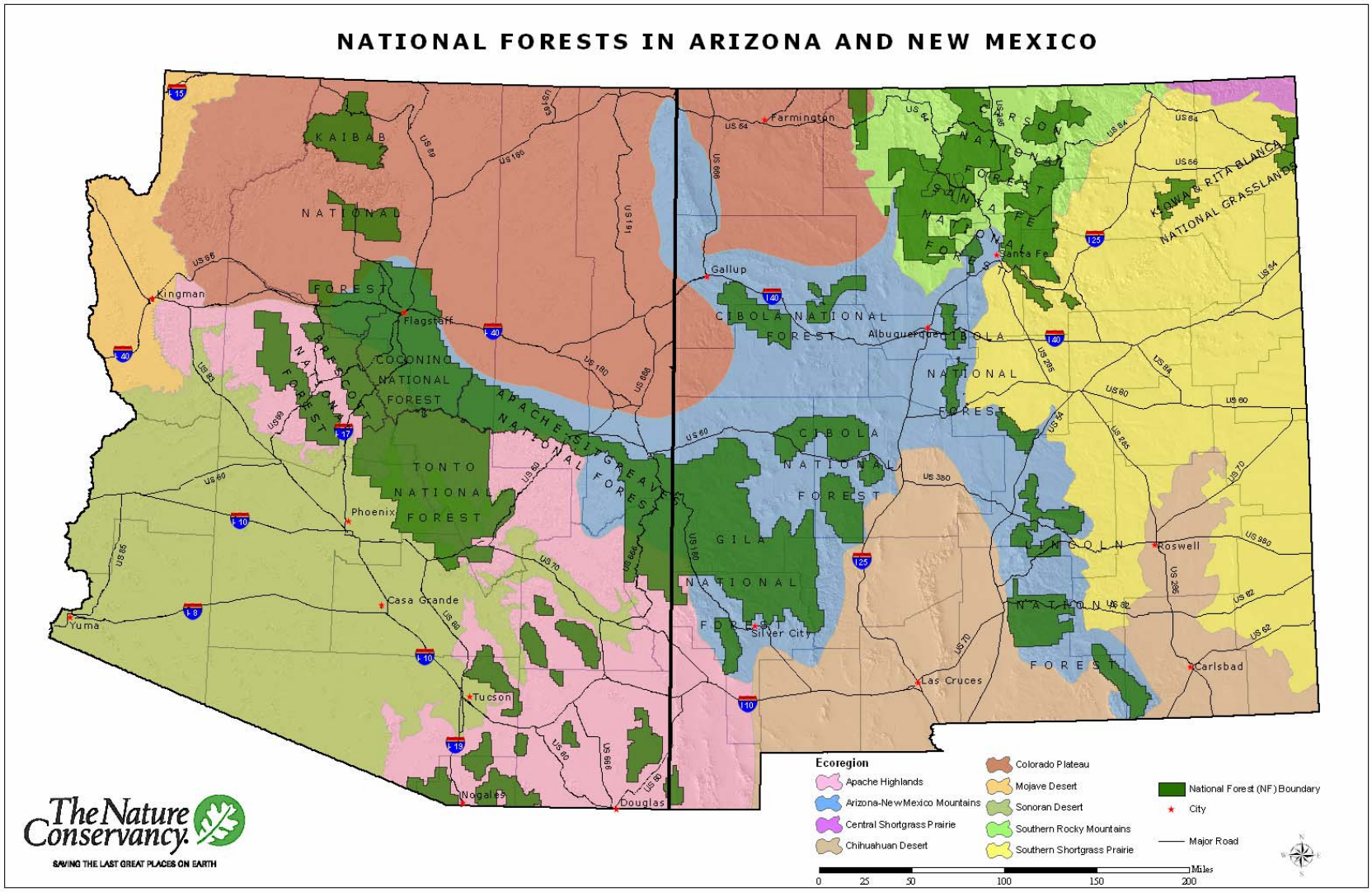

Figure 2-2. Overlap of The Nature Conservancy ecoregions and U.S. Forest Service Region 3 lands in Arizona and New Mexico.

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Appendix 2-A: Potential Natural Vegetation Types (PNVTs) cross-referenced to Southwest Regional GAP

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.

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.

scattered conifers and possibly some quaking aspen (*Populus tremuloides*). Other sites can be dominated by a

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.

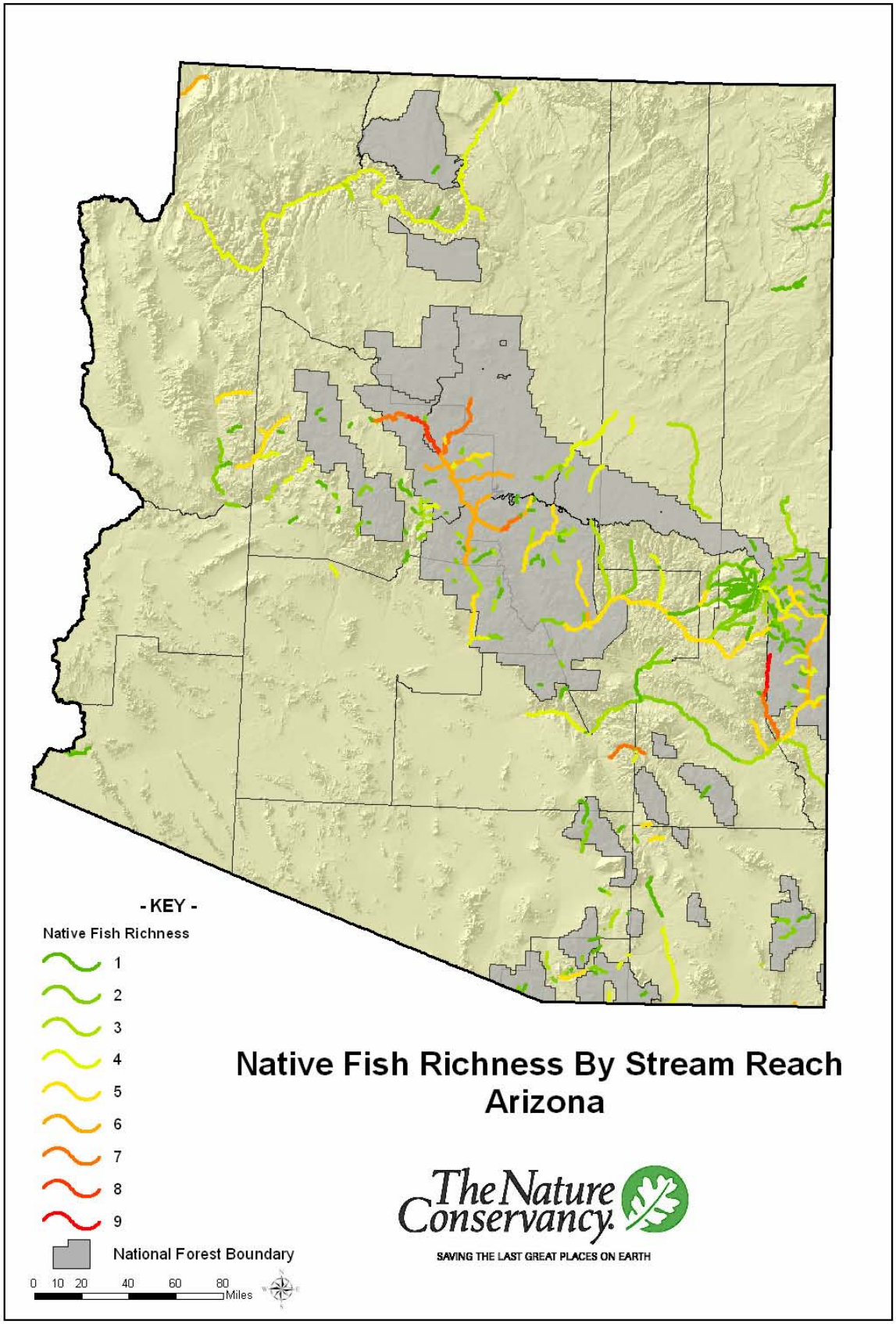

Figure 3-1. Stream reaches with occurrences of a varying number of native fish species (1-9) in Arizona.

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

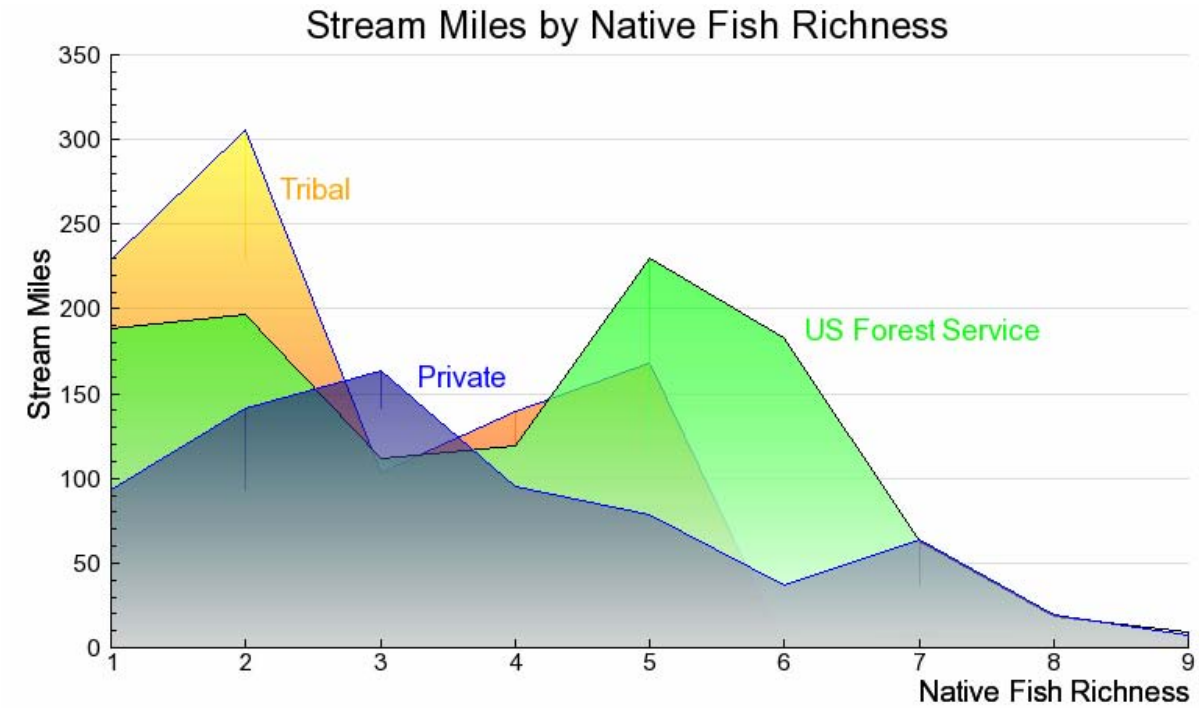

Figure 3-2. Approximate length (miles) of stream reaches with varying numbers of native fish species occurrences (1-9) for the three landowners (Forest Service, tribal, and private) with the most miles of stream with native fish occurrences.

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.

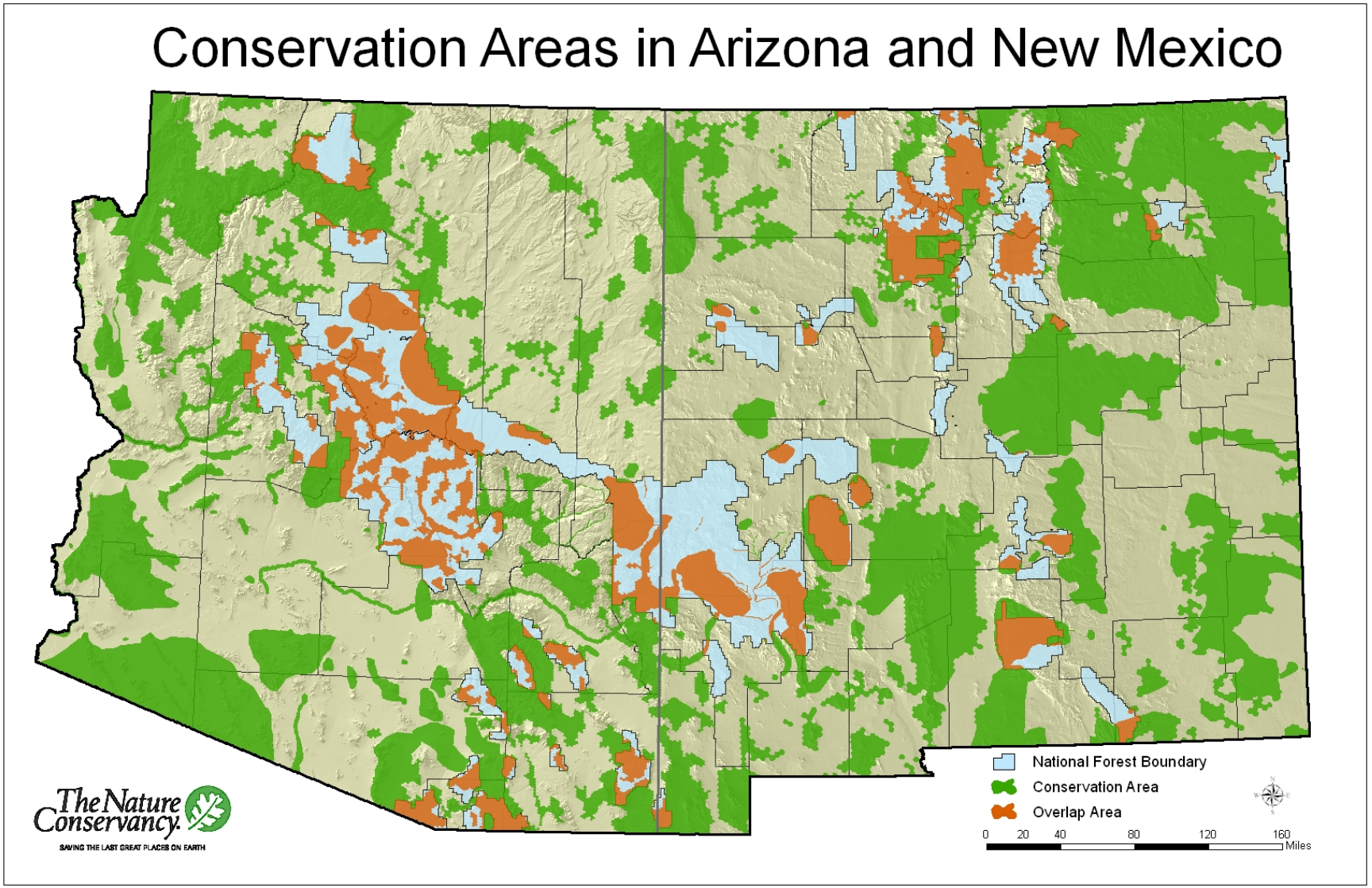

Figure 3-3. Conservation areas from eight ecoregional assessments in Arizona and New Mexico showing overlap with National Forest boundaries.

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 9:

Ecological & Biological Diversity of the Prescott 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 Prescott Forest is one of 11 National Forests of the U.S. Forest Service (USFS) Southwestern Region (Region 3) and comprises approximately 7% of the total area of Region 3 Forests, not including the Cibola National Grasslands. This Forest encompasses approximately 1,255,500 acres (508,083 hectares) in central Arizona and includes a number of mountain ranges as well as the headwaters of the Verde River. Elevation on the Forest ranges from approximately 3,500 ft (1,067 m) to nearly 8,000 ft (2,438 m) on Mount Union.

A large elevation gradient exists on the Prescott National Forest, which leads to a diverse range of vegetation systems and wildlife communities. Vegetation ranges from Sonoran desert communities in the lower elevations of the Forest, up through interior chaparral and pinyon-juniper woodlands to ponderosa pine forests at higher elevations. A relatively small area of mixed conifer is also present at higher elevations in the Bradshaw Mountains. The Forest includes the headwaters and significant portions of the Verde River, one of the most valuable aquatic and riparian systems in the Southwest. This river system, along with others in the area, is of critical conservation concern because of the diverse communities they support, many of which are imperiled in the Southwest.

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

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

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

Results

I. Potential Natural Vegetation Types within the Prescott National Forest

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

Fourteen PNVTs were identified on the Prescott National Forest (Figure 9-1). However, six PNVTs dominate the landscape and comprise 97.5% of the Forest. These six PNVTs include Madrean encinal woodlands (29.5%), interior chaparral (29.3%), semi-desert grasslands (11.7%), pinyon-juniper (11.0%), Madrean pine-oak (8.2%), and ponderosa pine (7.8%). The remaining eight PNVTs cover approximately 2.5% of the Prescott National Forest (Table 9-1).

It is important to note that these results are based on SWReGAP, which may not be appropriate for fine-spatial scale analyses. Thus, small patches of vegetation, such as mixed conifer forest on the Bradshaw Moutains, were not detected (see Chapter 2 for more information regarding the limitations of SWReGAP). In addition, the methodologies used to derive these results involved aggregating SWReGAP cover types and cross-walking these aggregated systems to PNVTs (see Chapter 2). This enabled the variety of vegetation systems within Region 3 lands to be condensed to coarse PNVTs for these analyses. Thus, specific PNVT characteristics may differ from Forest to Forest. Furthermore, the results in these analyses likely differ from that of other vegetation system analyses and maps, such as the General Ecosystem Surveys and Terrestrial Ecosystem Surveys.

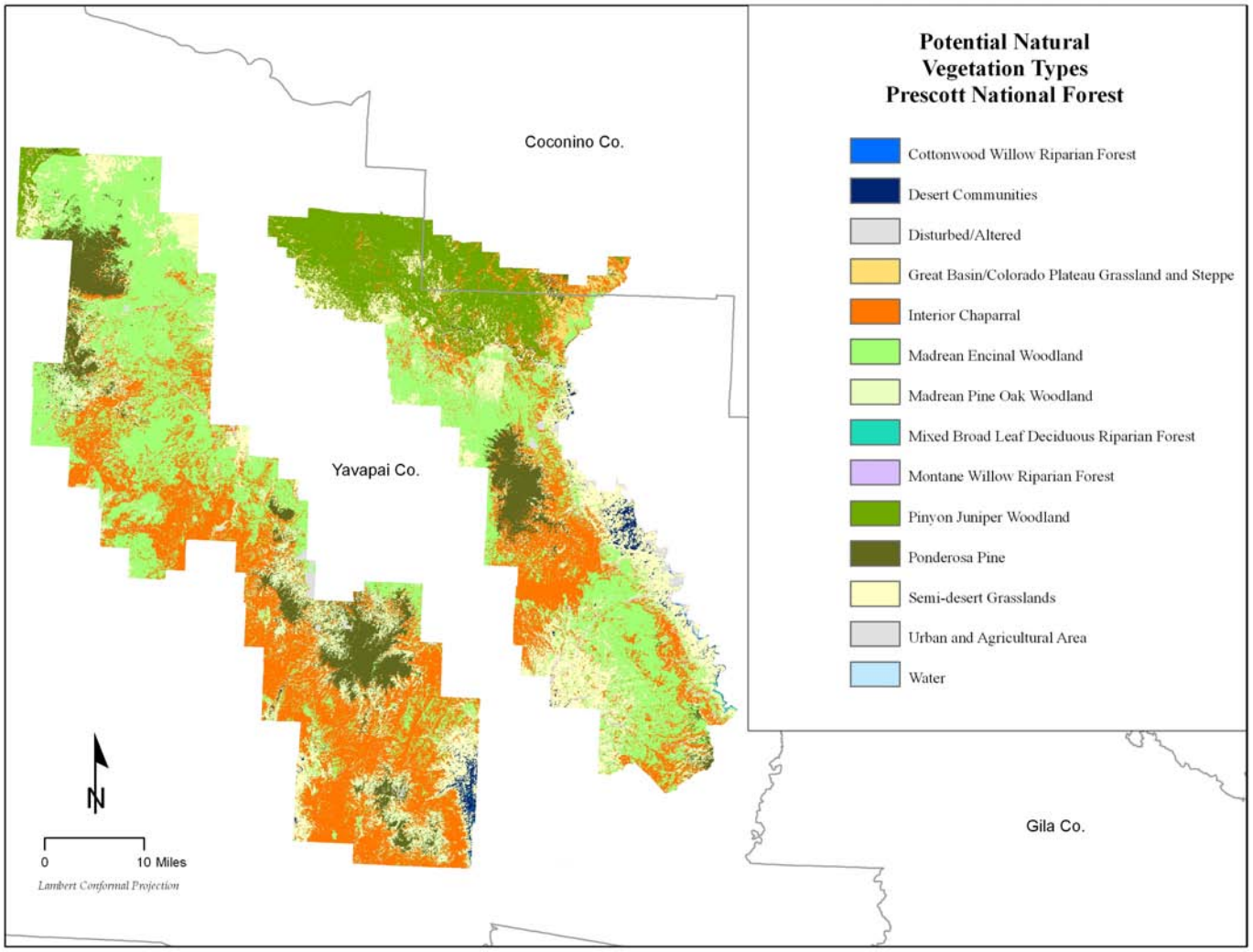

Figure 9-1. Distribution of potential natural vegetation types on the Prescott National Forest. This map was created using data from the Southwest Regional Gap Analysis Project (SWReGAP; U.S. Geological Survey National Gap Analysis Program, 2004). SWReGAP vegetation types were aggregated and cross-walked to potential natural vegetation types. See Chapter 2 for more information regarding methods used. SWReGAP data have not been accuracy tested and are based on satellite imagery. Therefore, SWReGAP may not be appropriate at fine spatial scales.

Table 9-1. Approximate area (in acres) and percent of total area of each potential natural vegetation type on the Prescott National Forest. Areas were calculated using data from the Southwest Regional Gap Analysis Project (SWReGAP). SWReGAP land cover types were aggregated and cross-walked to potential natural vegetation types. See Chapter 2 for more details on methods utilized.

Potential Natural Vegetation Type	Total Area (acres)	Percent of Total Area (%)
Cottonwood Willow Riparian Forest	200	<0.1
Desert Communities	10,100	0.8
Disturbed/Altered (quarries and mines)	500	<0.1
Great Basin/ Colorado Plateau Grassland and Steppe	13,900	1.1
Interior Chaparral	368,400	**29.3**
Madrean Encinal Woodland	370,200	**29.5**
Madrean Pine-Oak Woodland	103,500	8.2
Mixed Broadleaf Deciduous Riparian Forest	400	<0.1
Montane Willow Riparian Forest	3,300	0.3
Pinyon-juniper Woodland	138,400	11.0
Ponderosa Pine	98,400	7.8
Semi-desert Grassland	146,500	11.7
Urban and Agricultural Area	1,600	0.1
Water	100	<0.1
Total	**1,255,500**	

Within Region 3, large proportions of certain PNVTs are found on the Prescott National Forest. For example, approximately 27% of interior chaparral on Region 3 Forest lands can be found on the Prescott National Forest. Furthermore, the Prescott manages 14% of Madrean encinal woodlands and 12% of Madrean pine-oak woodlands on Region 3 National Forests (Figure 9-2; Table 9-2). Additionally, the Prescott National Forest manages approximately 12% of all interior chaparral found in Arizona and New Mexico combined. Chapter 3 provides more information regarding the area of each PNVT on the Prescott National Forest relative to other landowners in the Southwest.

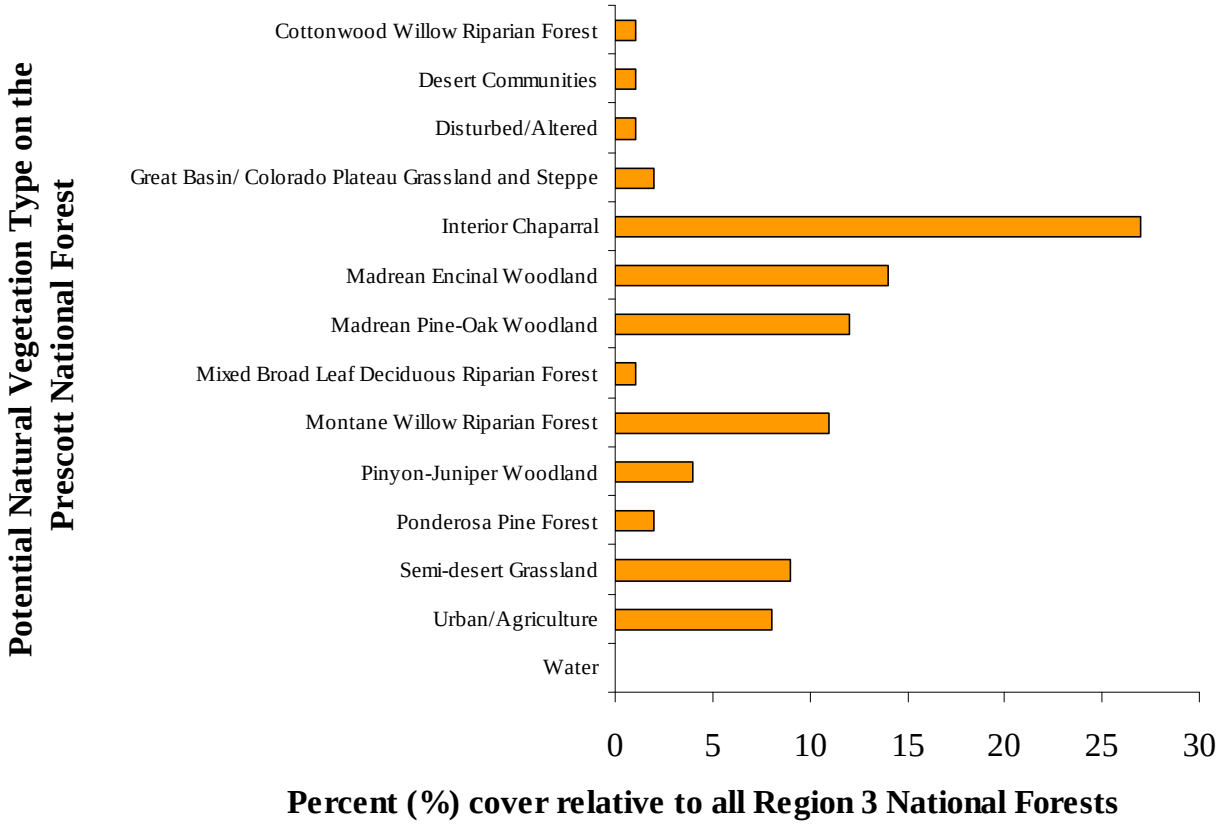

Figure 9-2. Percent area of cover of each potential natural vegetation type that occurs on the Prescott National Forest in relation to all Region 3 National Forests. Analysis was conducted using data from the Southwest Regional Gap Analysis Project (SWReGAP). See Chapter 2 for information regarding the limitations of SWReGAP.

The Prescott National Forest also manages relatively large proportion of certain PNVTs relative to all major landowners in Arizona and New Mexico. For example, 12% of all interior chaparral in the Southwest is found on the Prescott (Table 9-2).

Table 9-2. Proportions of potential natural vegetation types on Prescott National Forest relative to all National Forests in Region 3 and all major landowners in Arizona and New Mexico. Major landowners include: Bureau of Land Management, Department of Defense, National Park Service, private, state trust, tribal, US Fish and Wildlife Service, USDA Region 3 Forest Service, and other (which includes Bureau of Reclamation, non-federal parks, Valles Caldera National Preserve, county lands, Department of Energy, USDA Research, state Game and Fish, and unnamed lands).

Potential Natural Vegetation Type	Prescott relative to all of Region 3 Forests	Prescott relative to all major landowners in Arizona and New Mexico
Cottonwood Willow Riparian Forest	1%	0%
Desert Communities	1%	0%
Disturbed/Altered	1%	0%
Great Basin/ Colorado Plateau Grassland and Steppe	2%	0%
Interior Chaparral	27%	12%
Madrean Encinal Woodland	14%	6%
Madrean Pine-Oak Woodland	12%	7%
Mixed Broad Leaf Deciduous Riparian Forest	1%	0%
Montane Willow Riparian Forest	11%	3%
Pinyon-Juniper Woodland	4%	1%
Ponderosa Pine Forest	2%	1%
Semi-desert Grassland	9%	1%
Urban/Agriculture	8%	0%
Water	0%	0%

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 historic and current low-elevation (<5000 ft) grasslands on the Prescott 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. Here, the term native refers to species composition. 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 Prescott to other major landowners and National Forests within Region 3 is available in Chapter 3.

The Arizona Grassland Assessment identified approximately 330,200 acres of extant and historic grasslands on the Prescott National Forest (Table 9-3), representing 23.4% of the Forest. Overall, the Prescott National Forest manages 17.5% of all grasslands, 38.4% of open native grasslands, 13.1% of restorable grasslands, 13.8% of former grasslands, and 1.5% of non-native grasslands that occur on National Forests in Arizona. The majority of grasslands on the Prescott are in open native (45.6%) and restorable native (43.0%) condition, with the remainder in former grassland condition (10.3%) or non-native condition (0.7%; Table 9-3).

The largest proportions of identified grasslands occur on the Chino Valley (50.0%) and Verde (44.7%) Ranger Districts (Table 9-3). On the Chino Valley District, approximately one-third of grasslands are in open native condition, while two-thirds were identified as being in restorable native condition, meaning that they have been encroached by shrubs and woody species, but have the potential to be restored to open native condition. The Verde District includes a large contiguous block of open native grasslands (61.3%). It also includes grasslands in restorable native condition (14.8%) and a relatively large block of former grasslands which have become shrub invaded, and have likely undergone a type conversion with little potential to be restored to open native grassland condition.

Table 9-3. Acres of low elevation grasslands (<5000 ft) in three condition types occurring on three ranger districts on the Prescott National Forest in Arizona (data from Schussman and Gori 2004, Gori and Enquist 2003)**.**

	Grassland Condition Type									
	Open Native		Restorable Native		Former		Non-Native		Total	
District	Acres	%[A]	Acres	%[A]	Acres	%[A]	Acres	%[A]	Acres	%[B]
Bradshaw	0	0.0	15,200	86.4	0	0.0	2,400	13.6	17,600	5.3
Chino Valley	60,300	36.5	104,800	63.5	0	0.0	0	0.0	165,100	50.0
Verde	90,400	61.3	21,900	14.8	35,200	23.9	0	0.0	147,500	44.7
Total	150,700	45.6	141,900	43.0	35,200	10.7	2,400	0.7	330,200	100.0

[A] Percent of total grasslands on each ranger district in that grassland condition type
[B] Percent of total grasslands on Prescott NF on each ranger district

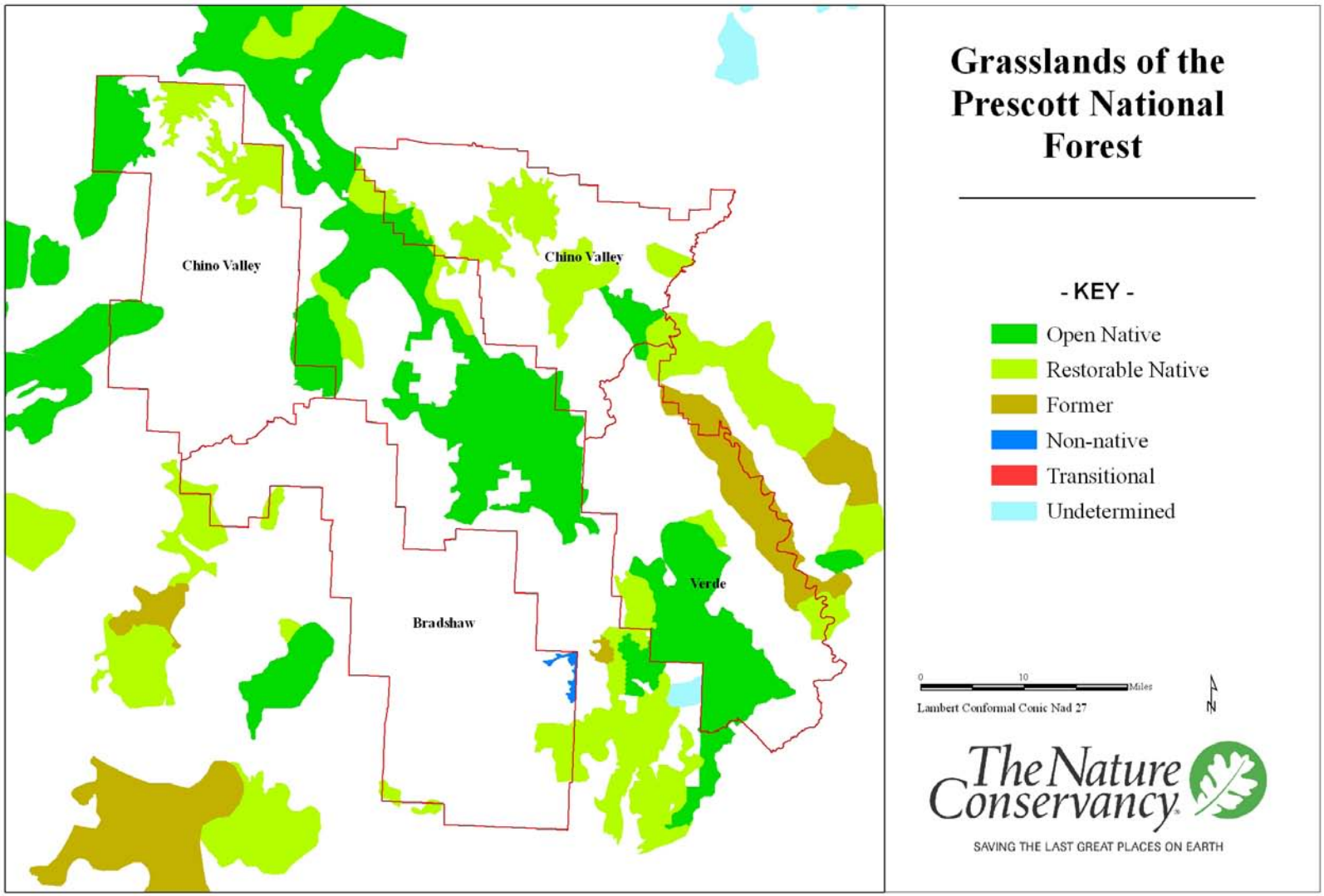

Figure 9-3. Grassland types, based on condition, on three ranger districts on the Prescott National Forest in Arizona (from Schussman and Gori 2004, Gori and Enquist 2003).

III. Riparian and Freshwater Systems and Species

The Arizona Statewide Freshwater Assessment (Turner and List, *In Press;* 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 to present) 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 Prescott 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 Prescott to other landowners in the Southwest and National Forests within Region 3 is available in Chapter 3.

According to the Arizona Freshwater assessment, 10 native fish species have occurrences on one or more stream reaches on the Prescott National Forest (Table 9-4; see Table 2-2 for scientific names). Together, these 10 species have occurrences on approximately 107 miles (82.9%) of the 129 miles of perennial streams that exist on the Prescott (Table 9-4). Overall, the Prescott accounts for 6.9% of the perennial streams and 8.4% of the stream reaches with native fish occurrences that exist on National Forests in Arizona.

The longfin dace and desert sucker have the largest distributions on the Prescott National Forest, while the Gila chub and Gila topminnow have the smallest. Within National Forests in Arizona, a large proportion of the stream reaches with occurrences of spikedace (58.1%), Colorado pikeminnow (34.9%), and razorback sucker (25.3%) occur on the Prescott (Table 9-4). Olden and Poff (2005) characterized the temporal trends in native fish distributions within the Lower Colorado River Basin, including all ten native fish species on the Prescott. Eight of these 10 (80.0%) native fish species have undergone declines in distribution across the basin, with the remaining two showing slight increases (Table 9-4).

According to the Arizona Freshwater Assessment, the Verde and Chino Valley Ranger Districts have the longest lengths of stream reaches with native fish occurrences (Table 9-5). They also have significant reaches with six or more native fish species (Figure 9-4). Fifteen streams on the Prescott National Forest have native fish occurrences (Table 9-6, Figure 9-5). The Verde River is obviously an important aquatic system within the Prescott National Forest and Region 3, with approximately 55 miles of occupied habitat and with occurrences of as many as eight species within a reach. Cherry Creek and Hassayampa River also have significant reaches with native fish occurrences. Within National Forests in Arizona, nearly 20% of stream reaches with occurrences of six or more species occur on the Prescott National Forest.

A review by the Prescott National Forest staff noted differences in current presence and distribution of native fishes on the Forest from that of the Arizona Freshwater Assessment. These differences are primarily due to the dynamic nature of native fish distributions in the Southwest (Olden and Poff 2005), and may be useful in understanding recent changes in native fish distributions on the Prescott National Forest. For example, according to the review, the Gila topminnow does not inhabit the Forest, while spikedace and speckeled dace are rare to non-

existent. Also noted was that the Colorado pikeminnow and razorback sucker are stocked fishes and both currently occupy 15 stream miles on the Verde Ranger District and do not inhabit the Chino Valley Ranger District. Also, longfin dace is presumed rare to non-existent on the Chino Valley and Verde Ranger Districts. Finally, it was noted that the Hassayampa River on the Prescott does not have viable native fish habitat due to water quality problems associated with mining. In addition, the staff provided differing numbers of total stream reach length occupied by native fishes on the Forest, which is provided in Table 9-7. These changes are important from a conservation management perspective. To facilitate analyses of changing fish distributions, additional documentation of fish occurrences will be sought from the USFS to update the Arizona Freshwater Assessment.

Table 9-4. Number of stream miles with occurrences of 10 native fishes on three ranger districts on the Prescott National Forest in Arizona based on the Arizona Freshwater Assessment (Turner and List, *In Press*).

	Ranger District					
Species	Bradshaw	Chino Valley	Verde	Total	% of AZ Forests[A]	% Change in Distribution[B]
Colorado Pikeminnow		15	22	37	34.9	-100.0
Desert Sucker	14	34	43	91	11.3	-13.5
Gila Chub			5	5	2.8	-15.9
Gila Topminnow	2			2	2.1	-36.8
Longfin Dace	14	33	49	96	13.0	11.4
Razorback Sucker		33	34	67	25.3	-49.7
Roundtail Chub		33	34	67	12.2	-6.2
Sonora Sucker		34	34	68	9.3	8.2
Speckled Dace		40	24	64	7.5	-16.5
Spikedace		33	3	36	58.1	-45.9

[A]Percent of all stream reaches with occurrences on National Forests

[B]Based on Olden and Poff (2005) from the Lower Colorado River basin

Table 9-5. Approximate number of perennial stream miles, number of stream miles with occurrences (1975 to present) of one or more native fish species, and number of native fish species with occurrences on three ranger districts on the Prescott National Forest in Arizona based on the Arizona Freshwater Assessment (Turner and List, *In Prep*).

Ranger District	Perennial Flow (Miles)	Occupied Habitat (Miles)	Number of Native Fish Species
Bradshaw	26	16	3
Chino Valley	46	41	8
Verde	57	50	9
Total	129	107	10[A]

[A]Total number of native fish species with occurrences on the Prescott National Forest. Several species occur on multiple ranger districts.

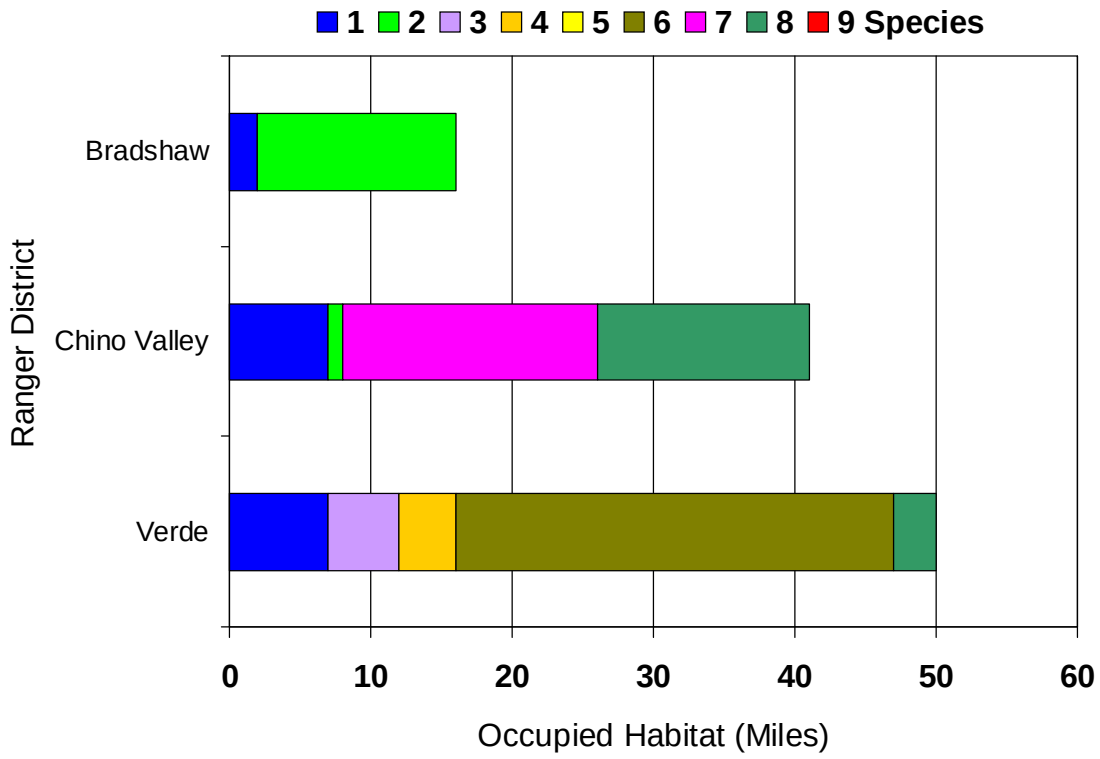

Figure 9-4. Number of stream miles with varying number of native fish species with occurrences from 1975 to present (Turner and List, *In Press*) for three ranger districts on the Prescott National Forest in Arizona.

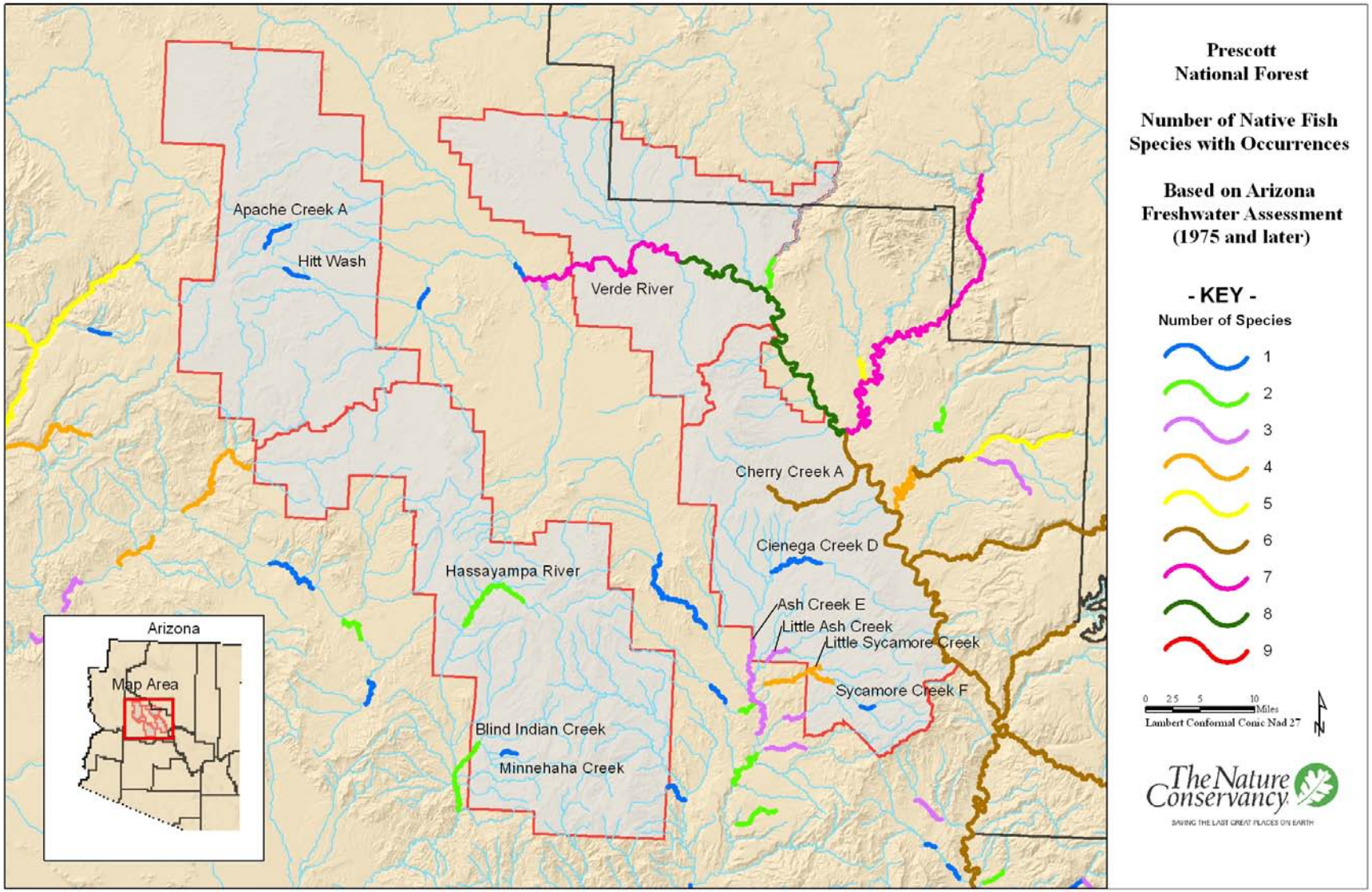

Figure 9-5. Perennial stream reaches with varying numbers of native fish species with occurrences on three ranger districts on the Prescott National Forest in Arizona.

Table 9-6. Stream systems, number of native fish species with occurrences, and the total stream reach length with native fish occurrences for 15 stream systems with native fishes on the Prescott National Forest in Arizona.

Stream Name[A]	Occupied Habitat (miles)	Number of Native Fish Species[B]
Apache Creek A	4	1
Ash Creek E	2	3
Blind Indian Creek	2	2
Castle Creek C	0	1
Cherry Creek A	12	6
Cienega Creek D	6	1
Hassayampa River	12	2
Hitt Wash	3	1
Horner Gulch	0	2
Little Ash Creek	3	3
Little Sycamore Creek	1	4
Minnehaha 1	2	1
Sycamore Creek D	1	2
Sycamore Creek F	4	4
Verde River	55	8

[A]Letters following stream names differentiate multiple streams with identical names within Arizona.
[B]The maximum number of species with occurrences within a reach. Portions of the stream system may have fewer species.

Table 9-7. According to review by Prescott National Forest staff, stream systems and the total stream reach length with native fish occurrences on the Prescott National Forest in Arizona. To facilitate analyses of changing fish distributions, additional documentation of fish occurrences will be sought from the US Forest Service in an effort to update the Arizona Freshwater Assessment.

Stream Name[A]	Occupied Habitat (miles)
Apache Creek A	A few hundred yards
Ash Creek E	Dry
Blind Indian Creek	Perennial interrupted
Castle Creek C	0
Cherry Creek A	0
Cienega Creek D	Perennial interrupted for 1 mile
Hitt Wash	0
Horner Gulch	300 feet
Little Ash Creek	2 – 2.5 miles
Little Sycamore Creek	600 feet
Minnehaha 1	A few yards
Sycamore Creek F	4
Verde River	55
Dry Creek on Verde Road*	0.5 mile

[A]Letters following stream names differentiate multiple streams with identical names within Arizona.
*Dry Creek was not included in the Arizona Freshwater Assessment. According to the review by Prescott National Forest staff, longfin dace is found within this reach

IV. Plant and Animal Species Richness

The R3 Species Database was used to determine plant and animal species richness on the Prescott 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, along with plant and invertebrate species that may be of conservation concern that are known to inhabit the Prescott National Forest. However, for these analyses, non-native aquatic vertebrate species were not included. 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 9-A. For aquatic species, the results in this section of the report differ slightly from those in the Riparian and Freshwater Systems and Species section because of the different datasets utilized.

Species Richness — According to the R3 Species Database, the Prescott National Forest contains at least 364 species of plants and animals (Figure 9-6), which is a conservative estimate. The dataset used for this analysis only includes organisms that are known to inhabit the Forest, including terrestrial vertebrate species, native aquatic vertebrate species, and plant and invertebrate species of management concern. It is also important to note that the number and type of species inhabiting the Prescott National Forest likely changes over time.

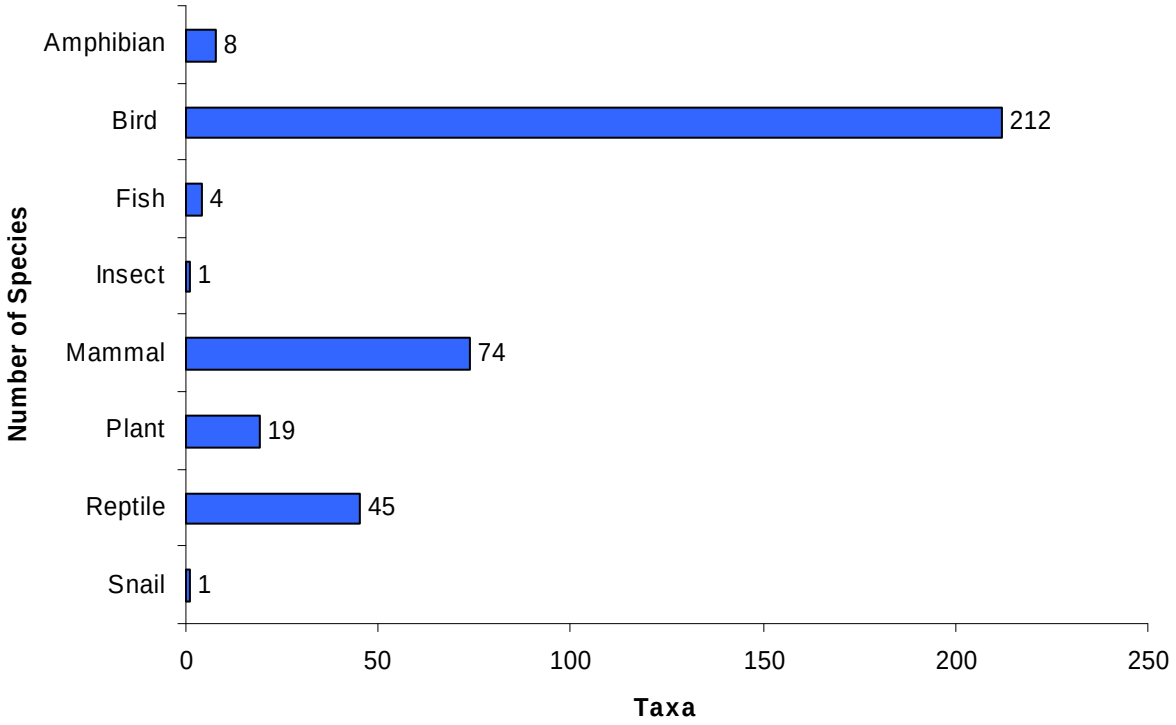

Figure 9-6. Number of species, by taxa, that inhabit the Prescott National Forest based on data from the R3 Species Database. The R3 Species Database includes all known terrestrial and aquatic vertebrates, along with invertebrates and plants of management concern that inhabit Region 3 Forests. For this analysis, non-native aquatic vertebrates were not considered. Due to the limitations of the R3 Species Database (see Chapter 2 for a complete description of the database), the numbers reported in these results are conservative.

Federally listed endangered, threatened, and candidate species — The U.S. Fish and Wildlife Service determines those species that have federal status as endangered or threatened under the Federal Endangered Species Act of 1973. The agency also lists species as candidate species when there is sufficient information to support a proposal for the endangered or threatened status. Currently, the Prescott manages seven species that are federally listed as either endangered or threatened (Table 9-14), and one species that is a candidate species, Western Yellow-Billed Cuckoo (*Coccyzus americanus occidentalis*).

Arizona state conservation status —The Arizona Game and Fish Department designates wildlife species whose occurrence is or may be at risk in the state the status of 'Wildlife of Special Concern' (WSC). The Arizona Department of Agriculture assigns special state status to plants of conservation concern as highly safeguarded (HS), salvage restricted (SR), export restricted (ER), salvage assessed (SA), or harvest restricted (HR). Currently, there are 24 animals and five plant species with special Arizona state conservation status. Table 9-8 provides a breakdown of those species with state conservation status by taxonomic groupings. Appendix 9-A lists all known terrestrial vertebrates, native aquatic vertebrates, and plants and invertebrates of management concern that inhabit the Prescott and identifies those with state conservation status.

Table 9-8. Number of species by taxa on the Prescott that have special state status in Arizona. In the state of Arizona, wildlife of conservation concern is assigned the status of Wildlife of Special Concern (WSC) by the Arizona Game and Fish Department. Plants in Arizona are assigned to conservation status categories (HS = highly safeguarded, SR = salvage restricted) by the Arizona Department of Agriculture

Taxa	HS	SR	WSC	Total
Amphibian	0	0	1	**1**
Bird	0	0	15	**15**
Fish	0	0	2	**2**
Mammal	0	0	3	**3**
Plant	1	4	0	**5**
Reptile	0	0	3	**3**
Total	**1**	**4**	**24**	**29**

NatureServe global conservation status rankings — Seven species (1.9%) of 364 were not included in this analysis because they were not assigned NatureServe global conservation ranks. Results indicate 320 species (87.9%) were ranked as G4/T4 or G5/T5 species (Table 9-9). These are species whose populations are considered 'apparently secure' or 'secure', respectively. Thirty-five species (9.6%) were ranked with a global conservation status of G1, G2, G3, T1, T2 or T3, that warrants conservation concern. The remaining two species were not ranked or unrankable.

Table 9-9. Number of species, by taxon, that inhabit the Prescott National Forest with the various global rankings assigned by NatureServe. Seven species are not included in this table because they were not assigned global ranks. G1 = critically imperiled; G2 = imperiled; G3 = vulnerable; G4 = apparently secure; G5 = secure; TNR = not ranked; TU = unrankable; T = infraspecific taxon (subspecies or varieties).

Global Ranking	Amphibian	Bird	Fish	Insect	Mammal	Plant	Reptile	Snail	**Total**
G1	0	0	0	0	0	1	0	1	**2**
G2	0	0	1	0	0	4	0	0	**5**
G3	1	2	3	0	1	9	2	0	**18**
G4	1	12	0	0	8	0	2	0	**23**
G5	6	188	0	0	54	0	36	0	**284**
T1	0	1	0	0	0	1	0	0	**2**
T2	0	1	0	0	0	2	0	0	**3**
T3	0	2	0	1	0	1	1	0	**5**
T4	0	2	0	0	1	0	3	0	**6**
T5	0	2	0	0	4	0	1	0	**7**
TNR	0	1	0	0	0	0	0	0	**1**
TU	0	1	0	0	0	0	0	0	**1**

National conservation status rankings (N-ranks) — Forty species (11.2%) were ranked with a national conservation status of N1, N2, or N3, indicating conservation concern at the national level (Table 9-10). Three hundred ten species on the Forest (86.8%) were ranked as N4 or N5 species, whose populations are considered 'apparently secure' or 'secure', respectively. Seven species were not considered rankable by Natureserve, and seven species were not assigned a NatureServe national rank.

Table 9-10. Number of species, by taxon, that inhabit the Prescott National Forest with national rankings assigned by NatureServe. Seven species are not included because they do not have an assigned rank. N1 = critically imperiled; N2 = imperiled; N3 = vulnerable; N4 = apparently secure; N5 = secure; NNA = not applicable; NNR = not ranked.

Rank	Amphibian	Bird	Fish	Insect	Mammal	Plant	Reptile	Snail	**Total**
N1	0	1	0	0	0	2	0	1	**4**
N2	0	0	1	0	0	6	1	0	**8**
N3	1	6	3	1	6	9	2	0	**28**
N4	1	22	0	0	7	0	7	0	**37**
N5	6	178	0	0	54	0	35	0	**273**
NNA	0	3	0	0	1	0	0	0	**4**
NNR	0	2	0	0	0	1	0	0	**3**

NatureServe subnational conservation status ranking. — Of the 364 species analyzed for the Prescott National Forest, 347 (96.4%) had assigned subnational conservation status ranks (S-ranks) in the state of Arizona (Table 9-11). Of these, 239 (68.9%) were considered secure or apparently secure (S5 and S4, respectively). Eighty-six species (24.8%) had rankings that merit conservation concern on a state or more local scale (S1, S2, or S3). The remaining 25 species (7.4%) were assigned SNA or SNR rankings. See Appendix 9-A for the complete list of species that are known to inhabit the Prescott and their associated S-ranks.

Table 9-11. Number of species per taxon currently inhabiting the Prescott National Forest that are assigned to the various subnational rankings by the Arizona Natural Heritage. Thirteen of the 364 species were not assigned a subnational conservation rank by Arizona Natural Heritage. S1 = critically imperiled; S2 = imperiled; S3 = vulnerable; S4 = apparently secure; S5 = secure; SNA = not applicable; SNR = not ranked.

Rank	Amphibian	Bird	Insect	Fish	Mammal	Plant	Reptile	Snail	**Total**
S1	0	16	0	0	1	2	0	1	**20**
S2	0	10	0	2	2	6	2	0	**22**
S3	1	18	1	2	12	7	3	0	**44**
S4	1	34	0	0	14	0	7	0	**56**
S5	5	113	0	0	35	0	30	0	**183**
SNA	1	11	0	0	2	0	1	0	**15**
SNR	0	5	0	0	1	3	2	0	**11**

Birds of Conservation Concern — According to the R3 Species Database, the Prescott National Forest is home to at least 212 birds, of which 17 (8.0%) are listed by the U.S. Fish and Wildlife Service as a Bird of Conservation Concern on the National Priority List (Table 9-12). Currently, the U.S. Fish and Wildlife Service lists 131 species of Birds of Conservation Concern, of which 13.0% inhabit the Prescott National Forest. Four of these species also have special conservation status under the state of Arizona (as WSC), while six of the 17 species are also listed on the Partners in Flight Watch List (Table 9-13).

Table 9-12. U.S. Fish and Wildlife Service Birds of Conservation Concern on the National Priority List that inhabit the Prescott National Forest.

Diurnal Raptors
- American peregrine falcon*
- Common black hawk*
- Ferruginous hawk*
- Northern harrier

Cuckoos and Allies
- Western yellow-billed cuckoo*

Owls
- Flammulated owl†

Woodpeckers
- Lewis's woodpecker†

Shrikes and Vireos
- Arizona bell's vireo
- Gray vireo†
- Loggerhead shrike

Mimids – Catbirds, Mockingbirds, Thrashers
- Crissal thrasher

Wood Warblers
- Black-throated gray warbler
- Grace's warbler†
- Red-faced warbler†

Emberizine Sparrows and Allies
- Sage sparrow
- Black-chinned sparrow†
- Lark bunting

* = Arizona Game and Fish Wildlife of Special Concern (WSC)
† = Partners in Flight Watch List

Partners in Flight Watch List — Currently, Partners in Flight lists 100 species on their Watch List, of which 20 (20.0%) can be found on the Prescott National Forest (Table 9-133). This comprises approximately 9.4% of the 212 bird species that inhabit the Prescott. Six of these species overlap with the U.S. Fish and Wildlife Service Birds of Conservation Concern National Priority list and one also has the designation of Wildlife of Special Concern (WSC) in the state of Arizona.

Table 9-13. Bird species on the Partners in Flight Watch list that inhabit the Prescott National Forest.

Diurnal Raptors
Swainson's hawk

Pigeons and Doves
Band-tailed pigeon

Owls
Flammulated owl*
Short-eared owl

Goatsuckers and Swifts
White-throated swift

Hummingbirds
Calliope hummingbird
Rufous hummingbird

Woodpeckers
Lewis's woodpecker*

Tyrant Flycatchers
Olive-sided flycatcher
Willow flycatcher†

Shrikes and Vireos
Gray vireo*

Jays, Crows, and Allies
Pinyon jay

Wood Warblers
Grace's warbler*
Hermit warbler
Red-faced warbler*
Virginia warbler

Emberizine Sparrows and Allies
Abert's towhee
Black-chinned sparrow*
Brewer's sparrow

Finches and Old World Sparrows
Lawrence's goldfinch

* = USFWS Bird of Conservation Concern
† = Arizona Game and Fish Wildlife of Special Concern (WSC)

Potential Species Lists for Forest Planning

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

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

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

3. Species-of-interest were defined as species that fall in one or more of the following categories:
    a. NatureServe N-rank or S-rank of 1 or 2 in Arizona
    b. Listed as wildlife of special concern (WSC) in Arizona
    c. Identified as a priority species in the Arizona Comprehensive Wildlife Conservation Strategy
    d. On the U.S. Fish and Wildlife Service Birds of Conservation Concern National Priority List

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

Extirpated Species — Some species are known to have inhabited the Prescott 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. Rocky Mountain bighorn sheep (*Ovis canadensis canadensis*) are known to have existed historically on the Prescott National Forest, but are now considered extirpated. These species are not considered in the species diversity analysis for the Prescott National Forest.

Threatened and Endangered Species – Six species from three taxa that occur on the Forest are listed by the U.S. Fish and Wildlife Service as endangered or threatened under the Endangered Species Act (Table 9-14).

Table 9-14. Endangered, threatened, and candidate species designated under the Federal Endangered Species Act of 1973 that currently inhabit the Prescott National Forest. The table includes common names that are recognized by NatureServe. For NaturesServe scientific names, see Appendix 9-A.

Taxa	Endangered	Threatened
Bird	Southwest willow flycatcher	Bald Eagle
		Mexican spotted owl
Fish	Gila chub	Sonora chub
Reptile	Desert Tortoise	

Potential species-of-concern — The Prescott National Forest is home to at least 31 potential species-of-concern across seven distinct taxonomic groups (Table 9-15). This number is less than the total number of G1-G3/T1–T3 species noted above, because it does not include species that are listed as endangered or threatened by the US Fish and Wildlife Service, as guided by the directives (FSH 1909.12 Chapter 40). The R3 Species Database, which does not incorporate all species inhabiting the Prescott National Forest, was used to derive these results. Therefore, it is likely that some species may be absent from these results.

Table 9-15. List of potential species-of-concern that inhabit the Prescott National Forest. According to the published Forest Service draft directives (FSH 1909.12 Chapter 40), species are considered potential species-of-concern if they have a NatureServe global conservation rank of G1, G2, G3, T1, T2, or T3 and are not federally listed as endangered or threatened species. Candidate or proposed species for federal listing may be considered for species-of-concern status. Note: Scientific and common names are those recognized by NatureServe unless in bold.

Taxa	Scientific Name	Common Name
Amphibian	*Bufo microscaphus*	Arizona Toad
Bird	*Carduelis lawrencei*	Lawrence's Goldfinch
Bird	*Pipilo aberti*	Abert's Towhee
Bird	*Coccyzus americanus occidentalis*	Western Yellow-Billed Cuckoo
Bird	*Falco peregrinus anatum*	American Peregrine Falcon
Fish	*Catostomus clarki*	Desert Sucker
Fish	*Catostomus insignis*	Sonora Sucker
Insect	*Cicindela oregona maricopa*	Maricopa Tiger Beetle
Mammal	*Myotis occultus*	Occult Little Brn. Myotis Bat
Plant	*Lesquerella kaibabensis*	Kaibab Bladderpod
Plant	*Agave delamateri*	Tonto Basin Agave
Plant	*Eriogonum ripleyi*	Ripley's Wild Buckwheat
Plant	*Penstemon nudiflorus*	Flagstaff Beardtongue
Plant	*Phlox amabilis*	Arizona Phlox
Plant	*Arenaria aberrans*	Mt. Dellenbaugh Sandwort

Plant	*Astragalus rusbyi*	**Rusby's Milkvetch**
Plant	*Desmodium metcalfei*	Metcalfe's Tick-Trefoil
Plant	*Erigeron saxatilis*	**Rock Fleabane**
Plant	*Hedeoma diffusa*	**Flagstaff Pennyroyal**
Plant	*Heuchera eastwoodiae*	Senator Mine Allum-Root
Plant	*Penstemon ophianthus*	Arizona Beardtongue
Plant	*Polygala rusbyi*	Rusby's Milkwort
Plant	*Talinum validulum*	Western Flame Flower
Plant	*Lupinus latifolius ssp. leucanthus*	**Broadleaf Lupine**
Plant	*Asclepias uncialis ssp. uncialis*	**Greene Milkweed**
Plant	*Eriogonum ericifolium var. ericifolium*	Heathleaf Wild Buckwheat
Plant	*Salvia dorrii ssp. mearnsii*	**Mearns Sage**
Reptile	*Thamnophis rufipunctatus*	Narrowhead Garter Snake
Reptile	*Xantusia arizonae*	Arizona Night Lizard
Reptile	*Thamnophis eques megalops*	Mexican Garter Snake
Snail	*Pyrgulopsis glandulosa*	Verde Rim Springsnail

Potential species-of-interest — 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); listed as a priority species in the AZ State Comprehensive Wildlife Conservation Strategies; on the U.S. Fish and Wildlife Service Birds of Conservation Concern National Priority list; and NatureServe national or subnational conservation rank of N1, N2, S1 or S2. These criteria for determining species-of-interest are published in the Forest Service directives (FSH 1909.12 Chapter 40). Species that are federally listed as endangered or threatened, or that were determined to be potential species-of concern were not included as potential species-of-interest.

At least 224 potential species-of-interest representing four taxonomic groups currently inhabit the Prescott National Forest (Figure 9-7). Birds comprise the largest proportion (approximately 76%) of potential species-of-interest. Mammals comprise 18% of the total, reptiles comprise 4%, and amphibians make-up approximately 1%. Appendix 9-A lists all known terrestrial vertebrates, native aquatic vertebrates, and plants and invertebrate species of management concern on the Prescott National Forest and identifies those considered as potential species-of-interest.

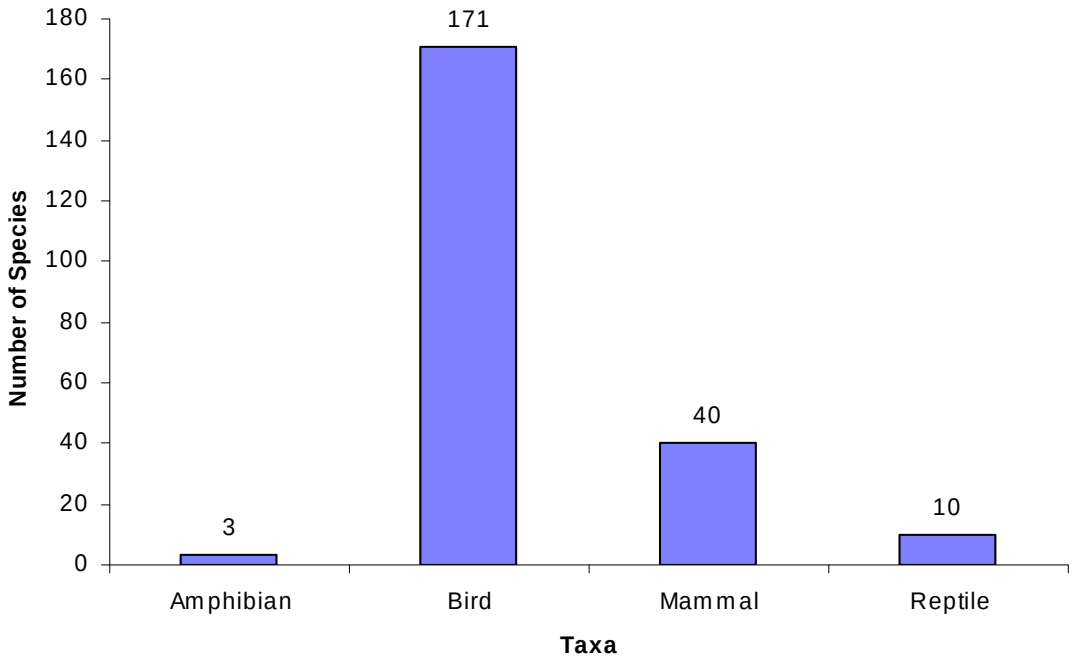

Figure 9-7. The number of potential species-of-interest, by taxon, that inhabit the Prescott National Forest. Species were considered potential species-of-interest if they fell into one or more of the following categories: special state conservation status (WSC, HS, and SR in Arizona); listed as a priority species in the AZ State Comprehensive Wildlife Conservation Strategies; on the U.S. Fish and Wildlife Service Birds of Conservation Concern National Priority list; and NatureServe national or subnational conservation rank of N1, N2, S1 or S2. These are the criteria listed in the published Forest Service directives (FSH 1909.12 Chapter 40) for determining species-of-interest. Species that are federally listed as endangered or threatened, or that were determined to be potential species-of concern were not included as potential species-of-interest.

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, roadless areas, and wilderness areas on the Prescott National Forest. The conservation targets associated with each overlapping conservation area were also identified.

Eight individual conservation areas from ecoregional assessments overlap the Prescott National Forest (Figure 9-8, Table 9-166), totaling 625,800 acres, or 44.4% of the Forest. Conservation area overlap on individual districts ranged from 56.9% on the Verde District to 26.8% on the Bradshaw Ranger District (Table 9-177). Overall, 26.4% of the total area of these eight conservation areas overlaps the Prescott National Forest. Large portions of the Bradshaw Mountains (100.0%) and Hassayampa River/ Blind Indian Creek conservation areas (69.7%) overlap the Prescott National Forest (Table 9-166).

Over three-quarters (77.8%) of the area of the Prescott National Forest overlapped by conservation areas does not have specific land use designations (Table 9-199), while approximately 13.0% of the overlap area is wilderness area and 9.2% is roadless area. A higher percentage of wilderness areas (74.0%) is overlapped by conservation areas than are roadless areas (41.4%) or areas with no designations (41.9%).

Conservation targets were summarized for all eight conservation areas that overlap the Prescott National Forest. A total of 87 conservation targets occur within these conservation areas (Figure 9-9). Of these, 17 (19.5%) are coarse filter targets (ecological systems, communities or features), while 70 (80.5%) are individual species. Forty (46.0%) targets are associated with riparian and aquatic systems, while 47 (54.0%) are associated with terrestrial habitats (Table 9-188). A complete listing of all conservation targets by taxonomic group for the Prescott is provided in Appendix 9-B and conservation targets for each conservation area are provided in Appendix 9-C.

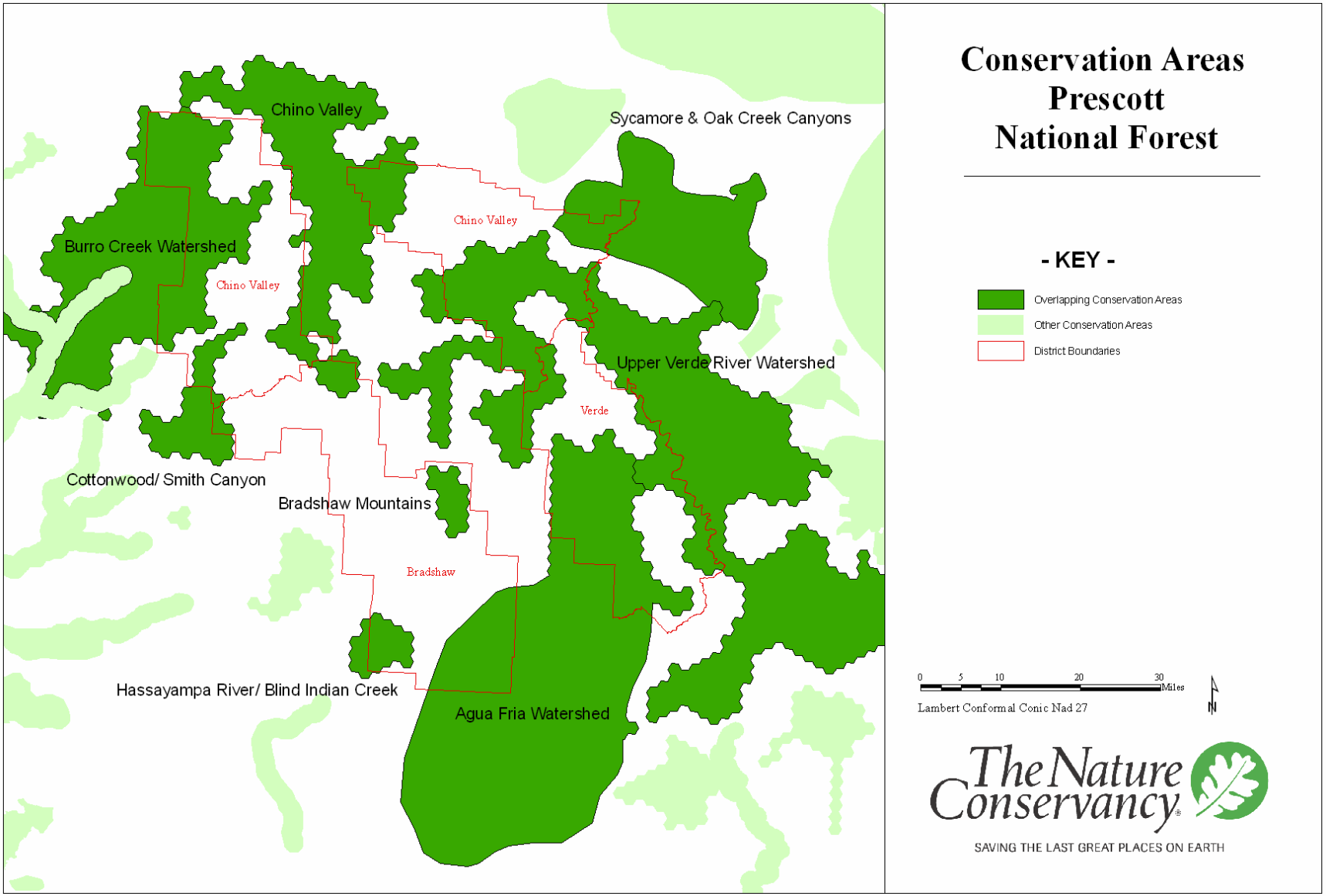

Figure 9-8. Conservation areas (N=8) that overlap the Prescott National Forest in Arizona.

Table 9-16. Conservation areas (N=8) that overlap three ranger districts on the Prescott National Forest in Arizona.

Conservation Area	Ranger Districts[A]	Overlap (Acres)	% of Conservation Area
Agua Fria Watershed	B,V	189,400	28.5
Bradshaw Mountains	B	19,800	100.0
Burro Creek Watershed	CV	131,800	39.2
Chino Valley	B, CV	58,500	21.1
Cottonwood/ Smith Canyon	B, CV	19,600	32.4
Hassayampa River/ Blind Indian Creek	B	19,800	69.7
Sycamore & Oak Creek Canyons	CV	20,700	10.0
Upper Verde River Watershed	CV, V	166,200	21.5

[A]B = Bradshaw, CV= Chino Valley, V= Verde

Table 9-17. Extent of overlap between ecoregional conservation areas and three ranger districts on the Prescott National Forest in Arizona.

District	Number of Conservation Areas	Overlap (Acres)	Percent of District
Bradshaw	5	117,100	26.8%
Chino Valley	5	322,700	50.0%
Verde	2	186,000	56.9%
Prescott N.F Total	8[A]	625,800	44.4%

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

Table 9-18. Number of conservation targets associated with aquatic/riparian and terrestrial habitats for eight conservation areas that overlap the Prescott National Forest in Arizona.

	Habitat		
Conservation Area	Aquatic/ Riparian	Terrestrial	Total
Agua Fria Watershed	20	20	40
Bradshaw Mountains	1	8	9
Burro Creek Watershed	13	14	27
Chino Valley	3	11	14
Cottonwood/ Smith Canyon	7	8	15
Hassayampa River/ Blind Indian Creek	8	3	11
Sycamore & Oak Creek Canyons	7	17	24
Upper Verde River Watershed	35	29	64

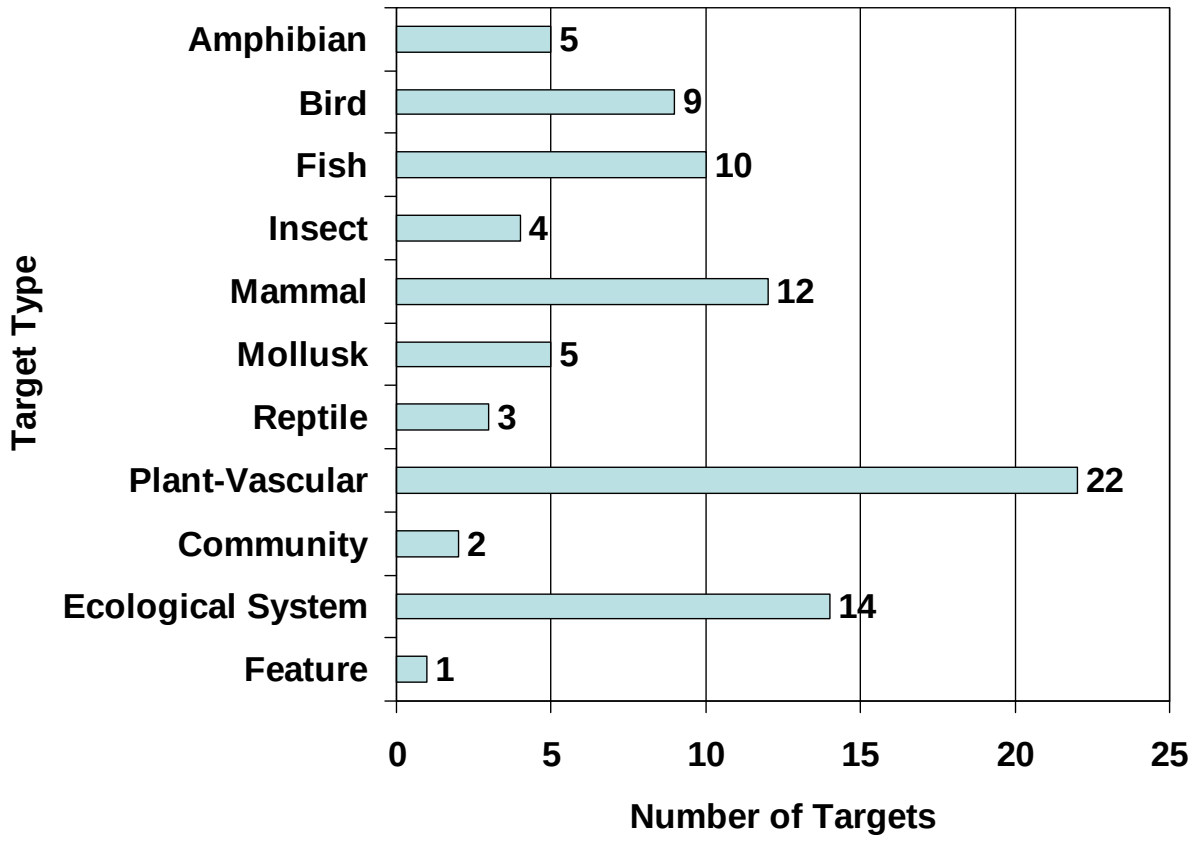

Figure 9-9. Number of conservation targets, by type, that occur on eight conservation areas overlapping the Prescott National Forest in Arizona.

Table 9-19. Overlap between conservation areas and wilderness and roadless areas on the Prescott National Forest in Arizona.

Designation	Acres within Conservation Areas	% of Conservation Areas	% of Designated Areas
Wilderness Areas	81,300	13.0	74.0
Roadless Areas	57,700	9.2	41.4
No Designation	486,100	77.8	41.9

Discussion

Systems Diversity

Six PNVTs dominate the landscape on the Prescott National Forest, including Madrean encinal woodlands (29.5%), interior chaparral (29.3%), semi-desert grasslands (11.7%), pinyon-juniper (11.0%), Madrean pine-oak (8.2%), and ponderosa pine (7.8%). In total, they comprise approximately 1,224,112 acres or 97.5% of the Forest. Most of these systems are unique to the Southwest or western North America, support a host of distinct organisms that depend primarily on these vegetation systems for their survival, and face a variety of conservation threats.

The Madrean encinal woodlands comprise the largest proportion of the Prescott. This system is restricted to the extreme southwestern United States (Arizona, New Mexico and Texas), where it is considered at its northern distributional limit. Unique assemblages of vegetation of both tropical and sub-tropical origins make up this system, which supports unique biota of both northern and southern origins. Maintaining these unique assemblages of plant and animal species is critical for sustaining biodiversity in the Southwest and for Region 3 Forests. Currently, Region 3 Forests manage the largest portion (42%) of Madrean encinal woodlands of all landowners in Arizona and New Mexico, and the Prescott is responsible for approximately 14% of this system within Region 3 National Forest lands.

Interior chaparral covers the second largest area in total on the Prescott. In the Southwest, interior chaparral is an important transition zone between low-elevation desert landscapes and higher elevation wooded evergreens. This PNVT hosts a variety of plant assemblages, mostly dominated by shrubs that are unique to southwestern United States and provide important habitat for a myriad of species. The Prescott is responsible for managing approximately 27% of all interior chaparral found on Region 3 National Forests and approximately 12% of this system throughout Arizona and New Mexico.

Pinyon-juniper woodlands encompass the third largest area on the Forest. These woodlands are unique to southwestern United States (primarily found in Arizona, Colorado, New Mexico, Nevada, and Utah), and also support a host of distinct organisms. For example, pinyon-juniper woodland provides habitat for the pinyon jay (*Gymnorhinus cyanocephalus*), that depends primarily on this vegetation type for its existence. Currently, the health of pinyon-juniper woodlands faces threats across Region 3 Forest Service lands, primarily due to the combined interactions of drought, bark beetle invasions, and altered fire regimes. Such threats to the system also endanger the existence of the species that depend upon the health of the pinyon-juniper woodlands.

Grasslands

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). Notably high diversity of many widespread animal groups, including invertebrates (grasshoppers, termites, and 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, erosion, and habitat fragmentation. The Arizona Statewide Grasslands Assessment documented several of these factors as threats to grasslands on the Prescott National Forest. In particular, over 50% of grasslands on the Prescott are shrub invaded to some degree (restorable native or former grassland conditions). 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 changes are generally associated with increases in habitat generalists and a sharp decline in grassland specialists (Knopf 1992).

According to resource staff on the Prescott, much of the restorable native grassland areas highlighted in the assessment, particularly in the Chino Valley Ranger District area, are the result of extensive type conversion efforts conducted by the National Forest Service throughout the 20th century. Thus, it is thought that some of these grasslands may have a true edaphic potential similar to the neighboring pinyon-juniper woodlands.

A key characteristic of restorable native grasslands is their restoration potential. 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 (Gori and Backer 2005). 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. It is also important to note that burning of grasslands sometimes can result in the introduction of non-native grasses.

According to the Arizona Grasslands Assessment, approximately 11% of grasslands on the Prescott National Forest have exceeded a threshold of 35% shrub cover have likely undergone a type conversion from grassland to shrubland, though some of the grasslands may have a true edaphic potential of the surrounding pinyon-juniper woodlands. This transition can result in a likely permanent loss of grassland systems and the species that depend on them. Even given long periods (50 years) of grazing rest, it is unlikely that these former grasslands can be restored to open native conditions (Hennessey and others 1983). 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 and restore open grassland conditions.

Over 17% of the grasslands that occur on Region 3 National Forests in Arizona are found on the Prescott National Forests. The Verde Ranger District, in particular, has a large contiguous area of open native grasslands. The Verde and Chino Valley Ranger Districts also have significant areas of grasslands that are shrub invaded, but have substantial potential for restoration. As noted by Finch (2004), maintaining grasslands at sufficient scales is vital for supporting grassland-dependent species, as habitat fragmentation has detrimental effects on grassland biodiversity. These grassland areas provide a valuable opportunity to manage grasslands on the Forest, and to partner with adjacent landowners, to restore grassland function and structure at sufficient scales to ensure the sustainability of species that are dependant on this system.

Riparian and Aquatic Species and Systems

Aquatic and Riparian systems are an important component of the diversity that exists on the Prescott National Forest. According to Arizona Freshwater Assessment, the Prescott has over 8% of all occupied stream miles within Region 3 National Forests in Arizona and a high proportion (36%) of stream reaches with 6 or more species. The Verde River system, in particular, is an extremely important component of the aquatic diversity that exists on the Prescott National Forest.

Based on Olden and Poff (2005), 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. According to Olden and Poff (2005), eight of 10 native fish species on the Prescott have declining distributions. The declines in distributions for these species suggest an increased probability of extirpation from the Forest. The Freshwater Assessment clearly identifies areas on the Prescott 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 Prescott National Forest.

The causes of declines in native fish species 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.

Species Richness and Conservation Status

The Prescott National Forest manages numerous species across many taxonomic groups. According to the R3 Species Database, at least 364 species of plants and animals inhabit Prescott. For reasons discussed above, this number is likely conservative. Many of these 364 species are of federal, state or global conservation concern.

For example, the Forest is home to three federally endangered species, three threatened species, and one candidate species; 29 plants and animals with special Arizona state conservation status; 35 species ranked with a global conservation status that warrants conservation concern (G1-G3/T1-T3); 86 species with an S-rank that merits conservation concern on a state or more local scale (S1, S2, or S3); 31 potential species-of-concern; 224 potential species-of-interest; 17 species listed by the U.S. Fish and Wildlife Service as a Bird of Conservation Concern; and 20 species on the Partners in Flight Watch List. All but one species, cactus mouse (*Peromyscus eremicus*), on the Region 3 Sensitive Species list are identified by categories defined in the directives. Many species are on more than one agency or organization conservation list (See Appendix 9-A).

A major threat for many species identified as being of conservation concern is the degradation and loss of habitat. Maintaining healthy vegetation systems that support these species should be an important component in sustaining viable populations of species of conservation concern on the Prescott National Forest. The assessments in this report provide important information on the systems and locations on the Prescott that are important for maintaining system and species diversity. For instance, the analysis of PNVTs highlighted the important vegetation systems that occur on the Prescott, which include Madrean encinal, interior chaparral, semi-desert grasslands, pinyon-juniper, Madrean pine-oak, and ponderosa pine. In addition, conservation areas, identified through ecoregional assessments, identify and delineate areas on the landscape that provide the greatest opportunity for sustaining these systems and species.

Approximately 45% of the Prescott National Forest is overlapped by ecoregional conservation areas and every ranger district is overlapped by at least one conservation area These conservation areas include 87 conservation targets, including 70 individual species. The specific locations where conservation areas overlap the Prescott highlight important places for the conservation of ecosystem and species diversity on the Forest and within the region. These areas of overlap represent the most viable locations on the Prescott for sustaining this suite of species, ecological systems, and biological processes that are represented by the conservation targets associated with each conservation area that overlaps the Prescott National Forest.

Relevance to Forest Planning

This analysis of existing regional assessment information identifies important biological and ecological characteristics of the Prescott National Forest. This information serves as an important baseline for addressing the ecological sustainability component of the forest plan process under the new National Forest Management Act planning regulations, both in terms of ecosystem and species diversity. It may also be useful in understanding the current condition of

ecological resources on the Prescott, 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 Prescott, and identifies systems (and their associated species diversity) for which the Prescott has disproportionate responsibility within the context of Region 3, such as Madrean encinal woodlands and interior chaparral. This analysis also demonstrates the importance of grasslands on the Prescott within a landscape context. The restoration of grasslands on the Prescott to open native grassland condition, including the ecological functions that support them, will help promote the large-scale sustainability of these important grassland areas within the Southwest.

Along with ecosystems, these results demonstrate the diversity of species that occur on the Prescott. The identification of a 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 framework, 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 wilderness and roadless areas on the Prescott demonstrates the wide variety of current management emphases and activities that occur within conservation areas. The largest proportion of conservation area overlap falls on areas with no special designations, although significant areas also overlap wilderness and roadless areas. It is apparent that achieving biodiversity sustainability on the Prescott cannot be accomplished entirely within existing designated special areas, and must be accomplished within the varied uses and activities that occur on the Forest. 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 communities, and ecological systems, and features) that are representative of the biodiversity in that area. Evaluation of the environmental

and ecological needs of these conservation targets, including both the habitats and ecological processes that support them, as well as identifying threats to their sustainability can be used to assess the compatibility of ongoing or planned uses or activities in these areas.

For example, the Hassayampa River/ Blind Indian Creek conservation area encompasses 28,400 acres, of which 19,800 acres (69.7%) fall on the Bradshaw Ranger District of the Prescott National Forest. Eleven conservation targets, including eight individual species, and three ecological systems (see Appendix 9-C), are associated with the Hassayampa River/ Blind Indian Creek conservation area. These targets can be used as a tool to assess the compatibility of current or planned activities within the conservation area with sustainability goals. For example, it may be useful to evaluate current conditions of interior chaparral, montane riparian woodlands, and Sonoran desert scrub conservation targets within this conservation area relative to the 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. Many (72.3%) of the conservation targets within this conservation area are associated with streams and riparian woodlands (e.g. longfin dace, Yavapai leopard frog, western yellow-billed cuckoo). These species are threatened by agricultural, industrial, and recreational development in these areas, stream alteration, and improper range management. It may be useful to evaluate management prescriptions within the conservation area and if necessary, identify changes in allowed activities or uses that may reduce or mitigate these threats.

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Appendix 9-A. Plants and animals of the Prescott National Forest*. Refer to Chapter 2 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	Potential Species List[A]	G-rank	N-rank	AZ S-rank	ESA status[B]	AZ state status[C]	AZ CWCS[D]	Birds of Conserv. Concern	Partners in Flight Watch List
Ambystoma tigrinum	Tiger Salamander		G5	N5	S5					
Bufo cognatus	Great Plains Toad		G5	N5	S5					
Bufo microscaphus	Arizona Toad	SOC	G3	N3N4	S3S4					
Bufo punctatus	Red-Spotted Toad	SOI	G5	N5	S5			X		
Bufo woodhousii	Woodhouse's Toad		G5	N5	S5					
Hyla arenicolor	Canyon Treefrog	SOI	G5	N5	S5			X		
Rana catesbeiana	Bullfrog		G5	N5	SNA					
Rana yavapaiensis	Yavapai Leopard Frog	SOI	G4	N4	S4		WSC	X		
Accipiter cooperii	Cooper's Hawk	SOI	G5	N5B	S4			X		
Accipiter gentilis	Northern Goshawk	SOI	G5	N4B	S3		WSC	X		
Accipiter striatus velox	Sharp-Shinned Hawk	SOI	T5	N5B				X		
Actitis macularia	Spotted Sandpiper	SOI	G5	N5B	S3S4			X		
Aegolius acadicus acadicus	Northern Saw-Whet Owl	SOI	TU	NNR				X		
Aeronautes saxatalis	White-Throated Swift	SOI	G5	N5B	S5			X		X
Agelaius phoeniceus	Red-Winged Blackbird	SOI	G5	N5	S5			X		
Aimophila ruficeps	Rufous-Crowned Sparrow	SOI	G5	N5	S4			X		
Ammodramus savannarum	Grasshopper Sparrow		G5	N5B	S3					
Amphispiza belli	Sage Sparrow	SOI	G5	N5	S4			X	X	
Amphispiza bilineata	Black-Throated Sparrow	SOI	G5	N5	S5			X		
Anas acuta	Northern Pintail	SOI	G5	N5B	S2B S5N			X		
Anas americana	American Wigeon	SOI	G5	N5B	S1B S5N			X		
Anas clypeata	Northern Shoveler	SOI	G5	N5B	S1B S5N					
Anas crecca	Green-Winged Teal	SOI	G5	N5B	S3B S5N			X		
Anas cyanoptera	Cinnamon Teal	SOI	G5	N5B	S5			X		
Anas platyrhynchos	Mallard	SOI	G5	N5B	S5			X		
Anas strepera	Gadwall	SOI	G5	N5B	S5			X		

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

[A] TE = Listed as Threatened of Endangered under the ESA, SOC = potential speices-of-concern, SOI = potential species-of-interest

[B] E = Endangered, T = Threatened, C =Candidate, 90-day = 90-day finding has been made

[C] HS = highly safeguarded, SR = salvage restricted, WSC = wildlife of special concern

[D] Listed as priority species in the Arizona Comprehensive Wildlife Conservation Strategy

NatureServe Scientific Name	NatureServe Common Name	Potential Species List[A]	G-rank	N-rank	AZ S-rank	ESA status[B]	AZ state status[C]	AZ CWCS[D]	Birds of Conserv. Concern	Partners in Flight Watch List
Anthus rubescens	American Pipit	SOI	G5	N5B	S2B S5N			X		
Aphelocoma californica	Western Scrub-Jay		G5	N5	S5					
Aquila chrysaetos	Golden Eagle	SOI	G5	N5B	S4			X		
Archilochus alexandri	Black-Chinned Hummingbird	SOI	G5	N5B	S5			X		
Ardea alba egretta	Great Egret	SOI	TNR	NNR			WSC	X		
Ardea herodias	Great Blue Heron		G5	N5B	S5					
Asio flammeus	Short-Eared Owl	SOI	G5	N5B	SNR			X		X
Asio otus	Long-Eared Owl	SOI	G5	N5B	S2B S3S4N					
Auriparus flaviceps	Verdin		G5	N5	S5					
Baeolophus ridgwayi	Juniper Titmouse		G5	N5	S5					
Baeolophus wollweberi	Bridled Titmouse	SOI	G5	N4	S4			X		
Bombycilla cedrorum	Cedar Waxwing	SOI	G5	N5	S3S4N			X		
Botaurus lentiginosus	American Bittern	SOI	G4	N4B	S1S2		WSC	X		
Bubo virginianus	Great-Horned Owl		G5	N5	S5					
Bucephala albeola	Bufflehead	SOI	G5	N5B	S5N			X		
Bucephala clangula	Common Goldeneye	SOI	G5	N5B	S5N			X		
Buteo albonotatus	Zone-Tailed Hawk	SOI	G4	N4B	S4			X		
Buteo jamaicensis	Red-Tailed Hawk		G5	N5B	S5					
Buteo lagopus	Rough-Legged Hawk	SOI	G5	N5B	SNRN			X		
Buteo regalis	Ferruginous Hawk	SOI	G4	N4B	S2B S4N		WSC	X	X	
Buteo swainsoni	Swainson's Hawk	SOI	G5	N5B	S3			X		X
Buteogallus anthracinus	Common Black-Hawk	SOI	G4	N3B	S3		WSC	X	X	
Butorides virescens	Green Heron	SOI	G5	N5B	S4			X		
Calamospiza melanocorys	Lark Bunting	SOI	G5	N5B	S1B S5N			X	X	
Calidris mauri	Western Sandpiper	SOI	G5	N5B	S1N			X		
Calidris minutilla	Least Sandpiper	SOI	G5	N5B	S5N			X		
Callipepla gambelii	Gambel's Quail		G5	N5	S5					
Calypte anna	Anna's Hummingbird	SOI	G5	N5	S5			X		
Campylorhynchus brunneicapillus	Cactus Wren		G5	N5	S5					
Cardellina rubrifrons	Red-Faced Warbler	SOI	G5	N4B	S4			X	X	X
Cardinalis cardinalis	Northern Cardinal		G5	N5	S5					
Carduelis lawrencei	Lawrence's Goldfinch	SOC	G3	N3N4	SNR			X		X

NatureServe Scientific Name	NatureServe Common Name	Potential Species List[A]	G-rank	N-rank	AZ S-rank	ESA status[B]	AZ state status[C]	AZ CWCS[D]	Birds of Conserv. Concern	Partners in Flight Watch List
Carduelis pinus	Pine Siskin		G5	N5	S5					
Carduelis psaltria	Lesser Goldfinch	SOI	G5	N5	S5			X		
Carduelis tristis	American Goldfinch	SOI	G5	N5	S1B S5N					
Carpodacus cassinii	Cassin's Finch	SOI	G5	N5	S4			X		
Carpodacus mexicanus	House Finch	SOI	G5	N5	S5			X		
Carpodacus purpureus	Purple Finch	SOI	G5	N5B	S1S2N			X		
Cathartes aura	Turkey Vulture	SOI	G5	N5B	S5			X		
Catharus guttatus	Hermit Thrush	SOI	G5	N5	S5			X		
Catharus ustulatus	Swainson's Thrush	SOI	G5	N5B	S1			X		
Catherpes mexicanus	Canyon Wren	SOI	G5	N5	S5			X		
Certhia americana	Brown Creeper	SOI	G5	N5	S5			X		
Ceryle alcyon	Belted Kingfisher	SOI	G5	N5B	S2B S5N		WSC	X		
Charadrius vociferus	Killdeer	SOI	G5	N5B	S5			X		
Chondestes grammacus	Lark Sparrow	SOI	G5	N5B	S5			X		
Chordeiles acutipennis	Lesser Nighthawk	SOI	G5	N5B	S5			X		
Chordeiles minor	Common Nighthawk	SOI	G5	N5B	S5			X		
Cinclus mexicanus	American Dipper	SOI	G5	N5	S3			X		
Circus cyaneus	Northern Harrier	SOI	G5	N5B	S1S2B S5N S2B			X	X	
Cistothorus palustris	Marsh Wren	SOI	G5	N5B	S3S4N			X		
Coccothraustes vespertinus	Evening Grosbeak	SOI	G5	N5	S3			X		
Coccyzus americanus occidentalis	Western Yellow-Billed Cuckoo	SOC	T2	N3B	S3	C	WSC	X	X	
Colaptes auratus	Northern Flicker	SOI	G5	N5B	S5			X		
Columba livia	Rock Dove		G5	NNA	SNA					
Columbina passerina	Common Ground-Dove		G5	N5	S4					
Contopus cooperi	Olive-Sided Flycatcher	SOI	G4	N4B	S4			X		X
Contopus sordidulus	Western Wood-Pewee	SOI	G5	N5B	S5			X		
Corvus brachyrhynchos	American Crow	SOI	G5	N5B	S5			X		
Corvus corax	Common Raven	SOI	G5	N5	S5			X		
Cyanocitta stelleri	Steller's Jay	SOI	G5	N5	S5			X		
Dendroica coronata	Yellow-Rumped Warbler	SOI	G5	N5B	S5			X		
Dendroica graciae	Grace's Warbler	SOI	G5	N5B	S5			X	X	X
Dendroica nigrescens	Black-Throated Gray Warbler	SOI	G5	N5B	S5			X	X	

NatureServe Scientific Name	NatureServe Common Name	Potential Species List[A]	G-rank	N-rank	AZ S-rank	ESA status[B]	AZ state status[C]	AZ CWCS[D]	Birds of Conserv. Concern	Partners in Flight Watch List
Dendroica occidentalis	Hermit Warbler	SOI	G4	N4N5B, NNRN	SNA			X		X
Dendroica petechia	Yellow Warbler	SOI	G5	N5B	S4			X		
Dendroica townsendi	Townsend's Warbler	SOI	G5	N5B	SNA			X		
Egretta thula	Snowy Egret	SOI	G5	N5B	S1B S4N		WSC	X		
Empidonax difficilis	Pacific-Slope Flycatcher	SOI	G5	N5B	SNA			X		
Empidonax traillii	Willow Flycatcher	SOI	G5	N5B	S1		WSC	X		X
Empidonax traillii extimus	Southwest Willow Flycatcher	TE	T1	N1B	S1	E	WSC	X		
Empidonax wrightii	Gray Flycatcher	SOI	G5	N5B	S5			X		
Eremophila alpestris	Horned Lark	SOI	G5	N5B	S5			X		
Euphagus cyanocephalus	Brewer's Blackbird	SOI	G5	N5B	S5			X		
Falco columbarius	Merlin	SOI	G5	N4B	SNRN			X		
Falco mexicanus	Prairie Falcon	SOI	G5	N5B	S4			X		
Falco peregrinus anatum	American Peregrine Falcon	SOC	T3	N3B	S4		WSC	X	X	
Falco sparverius	American Kestrel	SOI	G5	N5B	S5			X		
Fulica americana	American Coot		G5	N5B	S5					
Gallinago delicata	Wilson's Snipe	SOI	G5	N5B	S1B S4N			X		
Geococcyx californianus	Greater Roadrunner		G5	N5	S5					
Geothlypis trichas	Common Yellowthroat	SOI	G5	N5	S4			X		
Glaucidium gnoma californicum	Northern Pygmy Owl		T4	N4N5						
Gymnorhinus cyanocephalus	Pinyon Jay		G5	N5	S5					X
Haliaeetus leucocephalus	Bald Eagle	TE	G4	N5B	S2S3B S4N	T	WSC	X		
Hirundo rustica	Barn Swallow	SOI	G5	N5B	S5			X		
Icteria virens	Yellow-Breasted Chat	SOI	G5	N5B	S4			X		
Icterus bullockii	Bullock's Oriole	SOI	G5	N5B	SNRB			X		
Icterus cucullatus	Hooded Oriole	SOI	G5	N5B	S5			X		
Icterus parisorum	Scott's Oriole	SOI	G5	N5B	S5			X		
Ixobrychus exilis	Least Bittern	SOI	G5	N5B	S3		WSC			
Junco hyemalis	Dark-Eyed Junco	SOI	G5	N5	S5			X		
Junco hyemalis caniceps	Gray-Headed Junco		T5	N5B						
Lanius excubitor	Northern Shrike	SOI	G5	N4B, N5N	S2N			X		
Lanius ludovicianus	Loggerhead Shrike	SOI	G4	N4	S4			X	X	
Loxia curvirostra	Red Crossbill		G5	N5	S4					

NatureServe Scientific Name	NatureServe Common Name	Potential Species List[A]	G-rank	N-rank	AZ S-rank	ESA status[B]	AZ state status[C]	AZ CWCS[D]	Birds of Conserv. Concern	Partners in Flight Watch List
Megascops kennicottii	Western Screech Owl	SOI	G5	N5	S5			X		
Melanerpes formicivorus	Acorn Woodpecker	SOI	G5	N5	S5			X		
Melanerpes lewis	Lewis's Woodpecker	SOI	G4	N4B	S4			X	X	X
Melanerpes uropygialis	Gila Woodpecker		G5	N5	S5					
Meleagris gallopavo	Wild Turkey		G5	N5	S5					
Melospiza lincolnii	Lincoln's Sparrow	SOI	G5	N5B	S3B S5N			X		
Melospiza melodia	Song Sparrow	SOI	G5	N5	S5			X		
Mimus polyglottos	Northern Mockingbird	SOI	G5	N5	S5			X		
Molothrus aeneus	Bronzed Cowbird	SOI	G5	N4N5N, N5B	S5			X		
Molothrus ater	Brown-Headed Cowbird	SOI	G5	N5	S5			X		
Myadestes townsendi	Townsend's Solitaire	SOI	G5	N5	S5			X		
Myiarchus cinerascens	Ash-Throated Flycatcher	SOI	G5	N5B	S5			X		
Myiarchus tyrannulus	Brown-Crested Flycatcher	SOI	G5	N4B	S4			X		
Myioborus pictus	Painted Redstart	SOI	G5	N4B	S4			X		
Nucifraga columbiana	Clark's Nutcracker	SOI	G5	N5	S5			X		
Nycticorax nycticorax	Black-Crowned Night Heron	SOI	G5	N5B	S3			X		
Oporornis tolmiei	Macgillivray's Warbler	SOI	G5	N5B	S4			X		
Oreoscoptes montanus	Sage Thrasher	SOI	G5	N5B	S5			X		
Otus flammeolus	Flammulated Owl	SOI	G4	N4B	S4			X	X	X
Pandion haliaetus	Osprey	SOI	G5	N5B	S2B S4N		WSC			
Parabuteo unicinctus	Harris's Hawk	SOI	G5	N5	S5			X		
Passer domesticus	House Sparrow		G5	NNA	SNA					
Passerella iliaca	Fox Sparrow	SOI	G5	N5B	S2N			X		
Passerina amoena	Lazuli Bunting	SOI	G5	N5B	S4			X		
Passerina caerulea	Blue Grosbeak	SOI	G5	N5B	S5			X		
Passerina cyanea	Indigo Bunting	SOI	G5	N5B	S3			X		
Patagioenas fasciata	Band-Tailed Pigeon	SOI	G4	N4B	S5			X		X
Petrochelidon pyrrhonota	Cliff Swallow	SOI	G5	N5B	S5			X		
Phainopepla nitens	Phainopepla	SOI	G5	N5	S5			X		
Phalacrocorax auritus	Double-Crested Cormorant	SOI	G5	N5B	S5			X		
Phalaenoptilus nuttallii	Common Poorwill	SOI	G5	N5B	S5			X		
Pheucticus melanocephalus	Black-Headed Grosbeak	SOI	G5	N5B	S5			X		
Picoides pubescens	Downy Woodpecker	SOI	G5	N5	S4			X		

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Picoides scalaris	Ladder-Backed Woodpecker		G5	N5	S5					
Picoides villosus	Hairy Woodpecker		G5	N5	S5					
Pipilo aberti	Abert's Towhee	SOC	G3	N3N4	S3			X		X
Pipilo fuscus	Canyon Towhee		G5	N5	S5					
Pipilo maculatus	Spotted Towhee	SOI	G5	N5	S5			X		
Piranga flava	Hepatic Tanager	SOI	G5	N5B	S4			X		
Piranga ludoviciana	Western Tanager	SOI	G5	N5B	S5			X		
Piranga rubra	Summer Tanager	SOI	G5	N5B	S4			X		
Podiceps nigricollis	Eared Grebe	SOI	G5	N5B	S3B S5N			X		
Podilymbus podiceps	Pied-Billed Grebe	SOI	G5	N5B	S5			X		
Poecile gambeli	Mountain Chickadee	SOI	G5	N5	S5			X		
Polioptila caerulea	Blue-Gray Gnatcatcher	SOI	G5	N5B	S5			X		
Porzana carolina	Sora	SOI	G5	N5B	S4			X		
Progne subis	Purple Martin	SOI	G5	N5B	S4			X		
Psaltriparus minimus	Bushtit		G5	N5	S5					
Pyrocephalus rubinus	Vermilion Flycatcher	SOI	G5	N5B	S5			X		
Quiscalus mexicanus	Great-Tailed Grackle	SOI	G5	N5	S5			X		
Rallus limicola	Virginia Rail	SOI	G5	N5B	S4			X		
Regulus calendula	Ruby-Crowned Kinglet	SOI	G5	N5B	S5			X		
Salpinctes obsoletus	Rock Wren	SOI	G5	N5	S5			X		
Sayornis nigricans	Black Phoebe	SOI	G5	N5	S5			X		
Sayornis saya	Say's Phoebe	SOI	G5	N4N	S5			X		
Selasphorus platycercus	Broad-Tailed Hummingbird	SOI	G5	N5B	S5			X		
Selasphorus rufus	Rufous Hummingbird	SOI	G5	N5B	SNA			X		X
Sialia currucoides	Mountain Bluebird	SOI	G5	N5	S5			X		
Sialia mexicana	Western Bluebird	SOI	G5	N5	S5			X		
Sitta canadensis	Red-Breasted Nuthatch		G5	N5	S4					
Sitta carolinensis	White-Breasted Nuthatch		G5	N5	S5					
Sitta pygmaea	Pygmy Nuthatch		G5	N5	S5					
Sphyrapicus nuchalis	Red-Naped Sapsucker	SOI	G5	N5B	S4			X		
Spizella atrogularis	Black-Chinned Sparrow	SOI	G5	N5	S5			X	X	X
Spizella breweri	Brewer's Sparrow	SOI	G5	N5B	S5			X		X
Spizella passerina	Chipping Sparrow	SOI	G5	N5B	S5			X		
Stelgidopteryx serripennis	Northern Rough-Winged	SOI	G5	N5B	S5			X		

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	Swallow									
Stellula calliope	Calliope Hummingbird	SOI	G5	N5B	SNA			X		X
Strix occidentalis lucida	Mexican Spotted Owl	TE	T3	N3	S3S4	T	WSC	X		
Sturnella magna	Eastern Meadowlark	SOI	G5	N5	S5			X		
Sturnella neglecta	Western Meadowlark	SOI	G5	N5	S5			X		
Sturnus vulgaris	European Starling		G5	NNA	SNA					
Tachycineta thalassina	Violet-Green Swallow	SOI	G5	N5B	S5			X		
Thryomanes bewickii	Bewick's Wren		G5	N5B	S5					
Toxostoma crissale	Crissal Thrasher	SOI	G5	N5	S5			X	X	
Toxostoma curvirostre	Curve-Billed Thrasher		G5	N5	S5					
Toxostoma rufum	Brown Thrasher	SOI	G5	N5	S1N					
Tringa solitaria	Solitary Sandpiper	SOI	G5	N4B, N5N	SNA			X		
Troglodytes aedon	House Wren	SOI	G5	N5B	S5			X		
Turdus migratorius	American Robin	SOI	G5	N5	S5			X		
Tyrannus verticalis	Western Kingbird	SOI	G5	N5B	S5			X		
Tyrannus vociferans	Cassin's Kingbird	SOI	G5	N5B	S5			X		
Tyto alba	Barn Owl		G5	N5	S5					
Vermivora celata	Orange-Crowned Warbler	SOI	G5	N5B	S3B S5N			X		
Vermivora luciae	Lucy's Warbler	SOI	G5	N5B	S5			X		
Vermivora ruficapilla	Nashville Warbler	SOI	G5	N5B	SNA			X		
Vermivora virginiae	Virginia's Warbler	SOI	G5	N5B	S5			X		X
Vireo bellii arizonae	Arizona Bell's Vireo	SOI	T4	N4B	S4				X	
Vireo gilvus	Warbling Vireo	SOI	G5	N5B	S5			X		
Vireo huttoni	Hutton's Vireo		G5	N5	S5					
Vireo plumbeus	Plumbeus Vireo	SOI	G5	N5B	S5			X		
Vireo vicinior	Gray Vireo	SOI	G4	N4B	S4			X	X	X
Wilsonia pusilla	Wilson's Warbler	SOI	G5	N5B	SNA			X		
Xanthocephalus xanthocephalus	Yellow-Headed Blackbird	SOI	G5	N5B	S5			X		
Zenaida asiatica	White-Winged Dove	SOI	G5	N5	S5			X		
Zenaida macroura	Mourning Dove	SOI	G5	N5	S5			X		
Zonotrichia atricapilla	Golden-Crowned Sparrow	SOI	G5	N5B	S1S2N			X		
Zonotrichia leucophrys	White-Crowned Sparrow	SOI	G5	N5B	S1B S5N			X		
Catostomus clarki	Desert Sucker	SOC	G3	N3N4	S3S4			X		

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Catostomus insignis	Sonora Sucker	SOC	G3	N3	S3			X		
Gila intermedia	Gila Chub	TE	G2	N2	S2	E	WSC	X		
Gila robusta	Roundtail Chub	TE	G3	N3	S2	T	WSC	X		
Cicindela oregona maricopa	Maricopa Tiger Beetle	SOC	T3	N3	S3					
Ammospermophilus harrisii	Harris' Antelope Squirrel		G5	N5	S5					
Antilocapra americana	Pronghorn	SOI	G5	N5	S5			X		
Antrozous pallidus	Pallid Bat	SOI	G5	N5	S4S5			X		
Bassariscus astutus	Ringtail	SOI	G5	N5	S5			X		
Canis latrans	Coyote	SOI	G5	N5	S5			X		
Castor canadensis	American Beaver	SOI	G5	N5	S4			X		
Cervus canadensis nelsoni	Rocky Mountain Elk		T5	N5	SNA					
Chaetodipus intermedius intermedius	Rock Pocket Mouse	SOI	T5	N5	S5			X		
Chaetodipus penicillatus	Desert Pocket Mouse		G5	N5	S5					
Conepatus leuconotus	White-backed Hog-Nosed Skunk	SOI	G4	N3	S4			X		
Corynorhinus townsendii	Townsend's Big-Eared Bat		G4	N4	S3					
Corynorhinus townsendii pallescens	Pale Lump-nosed Bat		T4	N4	S3S4					
Dipodomys ordii	Ord's Kangaroo Rat	SOI	G5	N5	S5			X		
Eptesicus fuscus	Big Brown Bat		G5	N5	S4S5					
Erethizon dorsatum	North American Porcupine		G5	N5	S4S5			X		
Euderma maculatum	Spotted Bat	SOI	G4	N3N4	S1S2		WSC	X		
Lasionycteris noctivagans	Silver-Haired Bat		G5	N5	S3S4					
Lasiurus blossevillii	Western Red Bat	SOI	G5	N3	S2		WSC	X		
Lasiurus cinereus	Hoary Bat		G5	N5	S4					
Lepus californicus	Black-Tailed Jack Rabbit		G5	N5	S5					
Lynx rufus	Bobcat	SOI	G5	N5	S5			X		
Macrotus californicus	California Leaf-Nosed Bat	SOI	G4	N3N4	S3S4		WSC	X		
Mephitis macroura	Hooded Skunk	SOI	G5	N4	S4			X		
Mephitis mephitis	Striped Skunk	SOI	G5	N5	S5			X		
Microtus mogollonensis	Mogollon Vole	SOI	G4	N5	S5			X		
Mus musculus	House Mouse		G5	NNA	SNA					
Mustela frenata	Long-Tailed Weasel		G5	N5	S3					
Myotis auriculus	Southwestern Myotis		G5	N4	S3					

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Myotis californicus	California Myotis Bat	SOI	G5	N5	S4S5			X		
Myotis ciliolabrum	Western Small-Footed Myotis Bat		G5	N5	S3					
Myotis ciliolabrum melanorhinus	**Western Small Footed Myotis**									
Myotis evotis	Long-Eared Myotis Bat		G5	N5	S3S4					
Myotis evotis evotis	**Long-eared Myotis**									
Myotis occultus	Occult Little Brn. Myotis Bat	SOC	G3	N3N4	S3			X		
Myotis thysanodes	Fringed Myotis Bat		G4	N4N5	S3S4					
Myotis thysanodes thysanodes	**Fringe-tailed Myotis**									
Myotis velifer	Cave Myotis Bat		G5	N4	S4					
Myotis volans interior	**Long-legged Myotis**									
Myotis yumanensis	Yuma Myotis Bat		G5	N5	S3S4					
Myotis yumanensis yumanensis										
Neotoma albigula	Western White-Throated Woodrat	SOI	G5	N5	S5			X		
Neotoma mexicana	Mexican Wood Rat	SOI	G5	N5	S5			X		
Neotoma stephensi	Stephen's Woodrat	SOI	G5	N5	S5			X		
Notiosorex crawfordi	Crawford's Desert Shrew	SOI	G5	N5	S4S5			X		
Nyctinomops femorosaccus	Pocketed Free-Tailed Bat	SOI	G4	N3	S2S3					
Odocoileus hemionus	Mule Deer	SOI	G5	N5	S5			X		
Odocoileus virginianus	White-Tailed Deer	SOI	G5	N5	S5			X		
Ondatra zibethicus	Muskrat	SOI	G5	N5	S4			X		
Onychomys leucogaster	Northern Grasshopper Mouse		G5	N5	S5					
Pecari tajacu	Collared Peccary		G5	N5	S5					
Perognathus amplus	Arizona Pocket Mouse	SOI	G5	N5	S5			X		
Peromyscus boylii	Brush Mouse	SOI	G5	N5	S5			X		
Peromyscus eremicus	Cactus Mouse		G5	N5	S5					
Peromyscus leucopus	White-Footed Mouse		G5	N5	S5					
Peromyscus maniculatus	Deer Mouse	SOI	G5	N5	S5			X		
Peromyscus truei	Pinyon Mouse		G5	N5	S5					
Pipistrellus hesperus	Western Pipistrelle	SOI	G5	N5	S5			X		
Procyon lotor	Northern Raccoon	SOI	G5	N5	S4			X		
Puma concolor	Puma	SOI	G5	N5	S4			X		
Reithrodontomys megalotis	Western Harvest Mouse	SOI	G5	N5	S5			X		

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Sciurus aberti	Abert's Squirrel	SOI	G5	N5	S5			X		
Sciurus arizonensis	Arizona Gray Squirrel	SOI	G4	N4	S4			X		
Sorex merriami leucogenys	Merriam's Shrew	SOI	T5	N5				X		
Spermophilus variegatus	Rock Squirrel		G5	N5	S5					
Spilogale gracilis	Western Spotted Skunk		G5	N5	S5					
Sylvilagus audubonii	Desert Cottontail		G5	N5	S5					
Sylvilagus floridanus	Eastern Cottontail		G5	N5	S5					
Sylvilagus nuttallii pinetis	Nuttall's Cottontail Rabbit	SOI	T5	N5	SNR			X		
Tadarida brasiliensis	Brazilian Free-Tailed Bat	SOI	G5	N5	S3S4			X		
Tadarida brasiliensis mexicana	**Mexican Free-tailed Bat**									
Tamias dorsalis	Cliff Chipmunk		G5	N5	S5					
Taxidea taxus	American Badger	SOI	G5	N5	S5			X		
Urocyon cinereoargenteus	Gray Fox	SOI	G5	N5	S5			X		
Ursus americanus	Black Bear	SOI	G5	N5	S5			X		
Agave delamateri	Tonto Basin Agave	SOC	G2	N2	S2		HS			
Agave phillipsiana										
Arenaria aberrans	Mt. Dellenbaugh Sandwort	SOC	G3	N2N3	SNR					
Asclepias uncialis ssp. uncialis	**Greene Milkweed**	SOC	T2	NNR	SNR					
Astragalus rusbyi	A Milkvetch	SOC	G3	N3	S3					
Desmodium metcalfei	Metcalfe's Tick-Trefoil	SOC	G3	N3	SNR					
Erigeron saxatilis	**Rock Fleabane**	SOC	G3	N3	S3					
Eriogonum ericifolium var. ericifolium	Heathleaf Wild Buckwheat	SOC	T2	N2	S2					
Eriogonum ripleyi	Ripley's Wild Buckwheat	SOC	G2	N2	S2		SR			
Hedeoma diffusa	**Flagstaff Pennyroyal**	SOC	G3	N3	S3		SR			
Heuchera eastwoodiae	Senator Mine Allum-Root	SOC	G3	N3	S3					
Lesquerella kaibabensis	Kaibab Bladderpod	SOC	G1	N1N2	S1S2					
Lupinus latifolius ssp. leucanthus	**Broadleaf Lupine**	SOC	T1	N1N2	S1					
Penstemon nudiflorus	Flagstaff Beardtongue	SOC	G2	N2N3	S2S3					
Penstemon ophianthus	Arizona Beardtongue	SOC	G3	N3N4	S2					
Phlox amabilis	Arizona Phlox	SOC	G2	N2	S2					
Polygala rusbyi	Rusby's Milkwort	SOC	G3	N3	S3					
Salvia dorrii ssp. mearnsii	**Mearns Sage**	SOC	T3	N3	S3		SR			
Talinum validulum	Western Flame Flower	SOC	G3	N3	S3		SR			

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Apalone spinifera	Spiny Softshell		G5	N5	SNA					
Arizona elegans	Glossy Snake	SOI	G5	N5	S5			X		
Aspidoscelis tigris	Western Whiptail		G5	N5	S5					
Aspidoscelis velox	Plateau Striped Whiptail		G5	N5	S5					
Callisaurus draconoides	Zebratail Lizard		G5	N5	S5					
Coleonyx variegatus	Western Banded Gecko		G5	N5	S5					
Crotalus atrox	Western Diamondback Rattlesnake	SOI	G5	N5	S5			X		
Crotalus mitchellii	Speckled Rattlesnake		G5	N5	S5					
Crotalus molossus	Blacktail Rattlesnake	SOI	G5	N5	S5			X		
Crotalus scutulatus	Mojave Rattlesnake	SOI	G5	N5	S5			X		
Crotaphytus collaris	Collared Lizard		G5	N5	S5					
Diadophis punctatus	Ringneck Snake		G5	N5	S4					
Elgaria kingii nobilis	Arizona Alligator Lizard		T4	N4	SNR					
Eumeces gilberti rubricaudatus	Gilbert's Skink	SOI	T4	N4	S3S4			X		
Eumeces multivirgatus epipleurotus	Variable Skink		T5	N4N5	SNR					
Eumeces obsoletus	Great Plains Skink		G5	N5	S5					
Gambelia wislizenii	Longnose Leopard Lizard		G5	N5	S5					
Gopherus agassizii	Desert Tortoise	TE	G4	N4	S4	T	WSC	X		
Heloderma suspectum suspectum	Reticulate Gila Monster		T4	N4	S4					
Holbrookia maculata	Lesser Earless Lizard		G5	N5	S5					
Hypsiglena torquata	Night Snake		G5	N5	S5					
Kinosternon sonoriense	Sonoran Mud Turtle	SOI	G4	N4	S4			X		
Lampropeltis pyromelana	Sonoran Mountain Kingsnake	SOI	G5	N4	S4			X		
Masticophis flagellum	Coachwhip		G5	N5	S5					
Masticophis taeniatus	Striped Whipsnake		G5	N5	S4					
Micruroides euryxanthus	Arizona Coral Snake	SOI	G5	N5	S5			X		
Phrynosoma hernandesi	Short-Horned Lizard	SOI	G5	N5	S2			X		
Phrynosoma platyrhinos	Desert Horned Lizard		G5	N5	S5					
Phrynosoma solare	Regal Horned Lizard		G5	N5	S5					
Pituophis catenifer	Gopher Snake		G5	N5	S5					
Rhinocheilus lecontei	Longnose Snake		G5	N5	S5					
Salvadora hexalepis	Western Patchnose Snake		G5	N5	S5					

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Sauromalus obesus	Chuckwalla		G5	N5	S4					
Sceloporus clarkii	Clark's Spiny Lizard		G5	N5	S5					
Sceloporus magister	Desert Spiny Lizard		G5	N5	S5					
Sceloporus undulatus	Fence/ Prairie/ Plateau Lizard		G5	N5	S5					
Sonora semiannulata	Ground Snake		G5	N5	S5					
Thamnophis cyrtopsis	Western Blackneck Garter Snake	SOI	G5	N5	S5			X		
Thamnophis elegans	Western Terrestrial Garter Snake		G5	N5	S5?					
Thamnophis eques megalops	Mexican Garter Snake	SOC	T3	N2N3	S2S3	90-day	WSC	X		
Thamnophis rufipunctatus	Narrowhead Garter Snake	SOC	G3	N3	S3		WSC	X		
Trimorphodon biscutatus	Western Lyre Snake		G5	N5	S5					
Urosaurus ornatus	Tree Lizard		G5	N5	S5					
Uta stansburiana	Side-Blotched Lizard		G5	N5	S5					
Xantusia arizonae	Arizona Night Lizard	SOC	G3	N3	S3			X		
Pyrgulopsis glandulosa	Verde Rim Springsnail	SOC	G1	N1	S1			X		

Appendix 9-B. Conservation targets (N=87), by target type, that occur on one or more of eight conservation areas that overlap the Prescott National Forest in Arizona.

Target Type / Scientific Name	Common Name	Habitat Type	# of Conservation Areas	Conservation Areas[A]
Amphibian				
Bufo microscaphus microscaphus		Aquatic/Riparian	6	1,3,4,5,6,8
Hyla wrightorum	Mountain Treefrog	Aquatic/Riparian	2	7,8
Rana chiricahuensis	Chiricahua Leopard Frog	Aquatic/Riparian	1	8
Rana pipiens	Northern Leopard Frog	Aquatic/Riparian	1	8
Rana yavapaiensis	Yavapai Leopard Frog	Aquatic/Riparian	5	1,3,6,7,8
Bird				
Accipiter gentilis	Northern Goshawk	Terrestrial	3	3,7,8
Buteo albonotatus	Zone-Tailed Hawk	Aquatic/Riparian	3	1,3,5
Buteogallus anthracinus	Common Black-Hawk	Aquatic/Riparian	4	1,3,6,8
Ceryle alcyon	Belted Kingfisher	Aquatic/Riparian	1	8
Coccyzus americanus occidentalis	Western Yellow-Billed Cuckoo	Aquatic/Riparian	3	1,6,8
Empidonax traillii extimus	Southwest Willow Flycatcher	Aquatic/Riparian	1	8
Falco peregrinus anatum	American Peregrine Falcon	Terrestrial	1	8
Haliaeetus leucocephalus	Bald Eagle	Terrestrial	3	1,3,8
Strix occidentalis lucida	Mexican Spotted Owl	Terrestrial	3	2,7,8
Fish				
Agosia chrysogaster	Longfin Dace	Aquatic/Riparian	5	1,3,5,6,8
Catostomus clarki	Desert Sucker	Aquatic/Riparian	5	1,3,5,6,8
Catostomus insignis	Sonora Sucker	Aquatic/Riparian	3	3,5,8
Cyprinodon macularius	Desert Pupfish	Aquatic/Riparian	1	1
Cyprinodon macularius macularius	Desert Pupfish	Aquatic/Riparian	1	1
Gila intermedia	Gila Chub	Aquatic/Riparian	2	1,8
Gila robusta	Roundtail Chub	Aquatic/Riparian	5	1,3,5,7,8
Meda fulgida	Spikedace	Aquatic/Riparian	1	8
Poeciliopsis occidentalis occidentalis	Gila Topminnow Infraspecific.	Aquatic/Riparian	3	1,6,8
Rhinichthys osculus	Speckled Dace	Aquatic/Riparian	3	1,3,8
Insect				
Abedus herberti	Giant Water Bug	Aquatic/Riparian	1	8
Cicindela oregona maricopa	Maricopa Tiger Beetle	Aquatic/Riparian	3	1,3,8

Target Type / Scientific Name	Common Name	Habitat Type	# of Conservation Areas	Conservation Areas[A]
Cylloepus parkeri	Parker's Cylloepus Riffle Beetle	Aquatic/Riparian	1	8
Metrichia volada		Aquatic/Riparian	2	7,8
Mammal				
Antilocapra americana	Pronghorn	Terrestrial	5	1,3,4,5,8
Cynomys gunnisoni	Gunnison's Prairie Dog	Terrestrial	1	4
Euderma maculatum	Spotted Bat	Terrestrial	1	4
Macrotus californicus	California Leaf-Nosed Bat	Terrestrial	1	1
Mustela frenata arizonensis		Terrestrial	1	7
Myotis lucifugus occultus		Terrestrial	3	1,7,8
Myotis thysanodes	Fringed Myotis Bat	Terrestrial	2	4,8
Myotis velifer	Cave Myotis Bat	Terrestrial	1	1
Nyctinomops femorosaccus	Pocketed Free-Tailed Bat	Terrestrial	1	1
Nyctinomops macrotis	Big Free-Tailed Bat	Terrestrial	1	8
Sciurus arizonensis	Arizona Gray Squirrel	Terrestrial	3	1,2,8
Ursus americanus	Black Bear	Terrestrial	7	1,2,3,4,5,6,8
Mollusk				
Pyrgulopsis glandulosa	Verde Rim Springsnail	Aquatic/Riparian	1	1
Pyrgulopsis montezumensis	Montezuma Well Springsnail	Aquatic/Riparian	1	8
Pyrgulopsis morrisoni	Page Springsnail	Aquatic/Riparian	1	8
Pyrgulopsis simplex	Fossil Springsnail	Aquatic/Riparian	1	8
Pyrgulopsis sola	Brown Springsnail	Aquatic/Riparian	1	8
Reptile				
Lampropeltis pyromelana	Sonoran Mountain Kingsnake	Terrestrial	1	7
Thamnophis eques megalops	Mexican Garter Snake	Aquatic/Riparian	3	1,7,8
Thamnophis rufipunctatus	Narrowhead Garter Snake	Aquatic/Riparian	2	7,8
Plant-Vascular				
Agave arizonica	Arizona Agave	Terrestrial	1	1
Agave delamateri	Tonto Basin Agave	Terrestrial	1	8
Agave murpheyi	Murphy Agave	Terrestrial	1	1
Astragalus troglodytus		Terrestrial	2	3,7
Carex ultra	Cochise Sedge	Aquatic/Riparian	1	8
Cimicifuga arizonica	Arizona Bugbane	Aquatic/Riparian	1	7
Ericameria brachylepis		Terrestrial	1	1

Target Type / Scientific Name	Common Name	Habitat Type	# of Conservation Areas	Conservation Areas[A]
Erigeron anchana		Terrestrial	1	8
Erigeron saxatilis		Terrestrial	1	7
Eriogonum apachense		Terrestrial	1	8
Eriogonum ripleyi	Ripley's Wild Buckwheat	Terrestrial	1	8
Hedeoma diffusum		Terrestrial	1	7
Heuchera eastwoodiae	Senator Mine Allum-Root	Terrestrial	2	1,7
Hymenoxys jamesii		Terrestrial	1	8
Penstemon nudiflorus	Flagstaff Beardtongue	Terrestrial	2	5,8
Phlox amabilis	Arizona Phlox	Terrestrial	2	3,5
Potentilla multifoliolata		Terrestrial	1	7
Purshia subintegra	Arizona Cliff Rose	Terrestrial	1	8
Rumex orthoneurus	Bloomer's Dock	Aquatic/Riparian	1	8
Salvia dorrii ssp mearnsii		Terrestrial	2	7,8
Talinum validulum	Western Flame Flower	Terrestrial	4	3,4,7,8
Washingtonia filifera		Aquatic/Riparian	1	1
Community				
Cienega		Aquatic/Riparian	3	1,8
Ponderosa Pine Forest Community (specific)		Terrestrial	5	7
Ecological System				
Apachean Grassland and Savanna Condition Class A		Terrestrial	4	1,3,4,8
Apachean Grassland and Savanna Condition Class A&B		Terrestrial	3	1,3,8
Apachean Grassland and Savanna Condition Class B		Terrestrial	5	1,3,4,5,8
Apachean Shrubland		Terrestrial	2	1,8
Desert Wash		Aquatic/Riparian	2	3,8
Interior Chaparral		Terrestrial	7	1,2,3,4,5,6,8
Madrean Encinal		Terrestrial	3	2,4,8
Montane Mixed Forest		Terrestrial	2	2,8
Montane Riparian Woodland and Shrubland		Aquatic/Riparian	6	1,2,3,4,6,8
Pinyon-Juniper Woodland		Terrestrial	6	1,2,3,4,5,8
Playa		Aquatic/Riparian	1	8
Ponderosa Pine Forest and Woodland		Terrestrial	3	2,3,8
Riparian Woodland		Aquatic/Riparian	5	1,3,4,5,8
Sonoran Desert Scrub		Terrestrial	5	1,3,5,6,8

Target Type / Scientific Name	Common Name	Habitat Type	# of Conservation Areas	Conservation Areas[A]
Feature				
Ecological gradient		Terrestrial	1	1

[A]1 = Agua Fria Watershed, 2 = Bradshaw Mountains, 3 = Burro Creek Watershed, 4 = Chino Valley, 5 = Cottonwood/ Smith Canyon, 6 = Hassayampa River/ Blind Indian Creek, 7 = Sycamore & Oak Creek Canyons, 8 = Upper Verde River Watershed,

Appendix 9-C. Conservation targets associated with eight conservation areas that overlap the Prescott National Forest in Arizona.

Conservation Area/ Target Type	Scientific Name	Common Name	Habitat Type	Global Rank	ESA Status
Agua Fria Watershed					
Amphibian	*Rana yavapaiensis*	Yavapi Leopard Frog	Aquatic/Riparian	G4	
	Bufo microscaphus microscaphus		Aquatic/Riparian	G3	
Bird	*Buteo albonotatus*	Zone-Tailed Hawk	Aquatic/Riparian	G4	
	Buteogallus anthracinus	Common Black-Hawk	Aquatic/Riparian	G4	
	Coccyzus americanus occidentalis	Western Yellow-Billed Cuckoo	Aquatic/Riparian	G3	C
	Haliaeetus leucocephalus	Bald Eagle	Terrestrial	G4	LT
Fish	*Cyprinodon macularius macularius*	Desert Pupfish	Aquatic/Riparian	G1	LE
	Rhinichthys osculus	Speckled Dace	Aquatic/Riparian	G5	PS
	Gila robusta	Roundtail Chub	Aquatic/Riparian	G3	PS
	Gila intermedia	Gila Chub	Aquatic/Riparian	G2	PE
	Poeciliopsis occidentalis occidentalis	Gila Topminnow Infraspecific.	Aquatic/Riparian	G3	LE
	Cyprinodon macularius	Desert Pupfish	Aquatic/Riparian	G1	LE
	Catostomus clarki	Desert Sucker	Aquatic/Riparian	G3	SC
	Agosia chrysogaster	Longfin Dace	Aquatic/Riparian	G4	SC
Insect	*Cicindela oregona maricopa*	Maricopa Tiger Beetle	Aquatic/Riparian	G3	
Mammal	*Macrotus californicus*	California Leaf-Nosed Bat	Terrestrial	G4	
	Sciurus arizonensis	Arizona Gray Squirrel	Terrestrial	G4	
	Nyctinomops femorosaccus	Pocketed Free-Tailed Bat	Terrestrial	G4	
	Myotis velifer	Cave Myotis Bat	Terrestrial	G5	
	Myotis lucifugus occultus		Terrestrial	G3	
	Antilocapra americana	Pronghorn	Terrestrial	G5	
	Ursus americanus	Black Bear	Terrestrial	G5	
Mollusk	*Pyrgulopsis glandulosa*	Verde Rim Springsnail	Aquatic/Riparian	G1	
Reptile	*Thamnophis eques megalops*	Mexican Garter Snake	Aquatic/Riparian	G3	
Plant-Vascular	*Washingtonia filifera*		Aquatic/Riparian	G2	
	Agave arizonica	Arizona Agave	Terrestrial	G1	LE
	Agave murpheyi	Murphy Agave	Terrestrial	G2	SC
	Ericameria brachylepis		Terrestrial	G4	
	Heuchera eastwoodiae	Senator Mine Allum-Root	Terrestrial	G3	
Community	Cienega		Aquatic/Riparian	GU	
Ecological System	Apachean Grassland and Savanna Condition Class A		Terrestrial	GU	
	Apachean Shrubland		Terrestrial	GU	
	Interior Chaparral		Terrestrial	GU	
	Riparian Woodland		Aquatic/Riparian	GU	

Conservation Area/ Target Type	Scientific Name	Common Name	Habitat Type	Global Rank	ESA Status
	Sonoran Desert Scrub		Terrestrial	GU	
	Apachean Grassland and Savanna Condition Class A&B		Terrestrial	GU	
	Montane Riparian Woodland and Shrubland		Aquatic/Riparian	GU	
	Pinyon-Juniper Woodland		Terrestrial	GU	
	Apachean Grassland and Savanna Condition Class B		Terrestrial	GU	
Feature	Ecological gradient		Terrestrial	GU	
Bradshaw Mountains					
Bird	*Strix occidentalis lucida*	Mexican Spotted Owl	Terrestrial	G3	LT
Mammal	*Ursus americanus*	Black Bear	Terrestrial	G5	
	Sciurus arizonensis	Arizona Gray Squirrel	Terrestrial	G4	
Ecological System	Ponderosa Pine Forest and Woodland		Terrestrial	GU	
	Montane Mixed Forest		Terrestrial	GU	
	Montane Riparian Woodland and Shrubland		Aquatic/Riparian	GU	
	Interior Chaparral		Terrestrial	GU	
	Pinyon-Juniper Woodland		Terrestrial	GU	
	Madrean Encinal		Terrestrial	GU	
Burro Creek Watershed					
Amphibian	*Bufo microscaphus microscaphus*		Aquatic/Riparian	G3	
	Rana yavapaiensis	Yavapi Leopard Frog	Aquatic/Riparian	G4	PS:LT,PDL
Bird	*Haliaeetus leucocephalus*	Bald Eagle	Terrestrial	G4	
	Accipiter gentilis	Northern Goshawk	Terrestrial	G5	
	Buteogallus anthracinus	Common Black-Hawk	Aquatic/Riparian	G4	
	Buteo albonotatus	Zone-Tailed Hawk	Aquatic/Riparian	G4	
Fish	*Agosia chrysogaster*	Longfin Dace	Aquatic/Riparian	G4	SC
	Catostomus clarki	Desert Sucker	Aquatic/Riparian	G3	SC
	Gila robusta	Roundtail Chub	Aquatic/Riparian	G3	PS
	Catostomus insignis	Sonora Sucker	Aquatic/Riparian	G3	SC
	Rhinichthys osculus	Speckled Dace	Aquatic/Riparian	G5	PS
Insect	*Cicindela oregona maricopa*	Maricopa Tiger Beetle	Aquatic/Riparian	G3	
Mammal	*Ursus americanus*	Black Bear	Terrestrial	G5	
	Antilocapra americana	Pronghorn	Terrestrial	G5	
Plant-Vascular	*Talinum validulum*	Western Flame Flower	Terrestrial	G3	
	Astragalus troglodytus		Terrestrial	G2	
	Phlox amabilis	Arizona Phlox	Terrestrial	G2	

Conservation Area/ Target Type	Scientific Name	Common Name	Habitat Type	Global Rank	ESA Status
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	
	Desert Wash		Aquatic/Riparian	GU	
	Montane Riparian Woodland and Shrubland		Aquatic/Riparian	GU	
	Interior Chaparral		Terrestrial	GU	
	Apachean Grassland and Savanna Condition Class A		Terrestrial	GU	
	Ponderosa Pine Forest and Woodland		Terrestrial	GU	
	Riparian Woodland		Aquatic/Riparian	GU	
	Pinyon-Juniper Woodland		Terrestrial	GU	
Chino Valley					
Amphibian	*Bufo microscaphus microscaphus*		Aquatic/Riparian	G3	
Mammal	*Antilocapra americana*	Pronghorn	Terrestrial	G5	
	Euderma maculatum	Spotted Bat	Terrestrial	G4	
	Cynomys gunnisoni	Gunnison's Prairie Dog	Terrestrial	G5	
	Myotis thysanodes	Fringed Myotis Bat	Terrestrial	G4	
	Ursus americanus	Black Bear	Terrestrial	G5	
Plant-Vascular	*Talinum validulum*	Western Flame Flower	Terrestrial	G3	
Ecological System	Pinyon-Juniper Woodland		Terrestrial	GU	
	Interior Chaparral		Terrestrial	GU	
	Apachean Grassland and Savanna Condition Class B		Terrestrial	GU	
	Montane Riparian Woodland and Shrubland		Aquatic/Riparian	GU	
	Riparian Woodland		Aquatic/Riparian	GU	
	Madrean Encinal		Terrestrial	GU	
	Apachean Grassland and Savanna Condition Class A		Terrestrial	GU	
Cottonwood/ Smith Canyon					
Amphibian	*Bufo microscaphus microscaphus*		Aquatic/Riparian	G3	
Bird	*Buteo albonotatus*	Zone-Tailed Hawk	Aquatic/Riparian	G4	
Fish	*Catostomus insignis*	Sonora Sucker	Aquatic/Riparian	G3	SC
	Gila robusta	Roundtail Chub	Aquatic/Riparian	G3	PS
	Catostomus clarki	Desert Sucker	Aquatic/Riparian	G3	SC
	Agosia chrysogaster	Longfin Dace	Aquatic/Riparian	G4	SC
Mammal	*Ursus americanus*	Black Bear	Terrestrial	G5	
	Antilocapra americana	Pronghorn	Terrestrial	G5	
Plant-Vascular	*Penstemon nudiflorus*	Flagstaff Beardtongue	Terrestrial	G2	
	Phlox amabilis	Arizona Phlox	Terrestrial	G2	

Conservation Area/ Target Type	Scientific Name	Common Name	Habitat Type	Global Rank	ESA Status
Ecological System	Sonoran Desert Scrub		Terrestrial	GU	
	Interior Chaparral		Terrestrial	GU	
	Apachean Grassland and Savanna Condition Class B		Terrestrial	GU	
	Riparian Woodland		Aquatic/Riparian	GU	
	Pinyon-Juniper Woodland		Terrestrial	GU	
Hassayampa River/ Blind Indian Creek					
Amphibian	*Bufo microscaphus microscaphus*		Aquatic/Riparian	G3	
	Rana yavapaiensis	Yavapi Leopard Frog	Aquatic/Riparian	G4	
Bird	*Buteogallus anthracinus*	Common Black-Hawk	Aquatic/Riparian	G4	
	Coccyzus americanus occidentalis	Western Yellow-Billed Cuckoo	Aquatic/Riparian	G3	C
Fish	*Agosia chrysogaster*	Longfin Dace	Aquatic/Riparian	G4	SC
	Catostomus clarki	Desert Sucker	Aquatic/Riparian	G3	SC
	Poeciliopsis occidentalis occidentalis	Gila Topminnow Infraspecific.	Aquatic/Riparian	G3	LE
Mammal	*Ursus americanus*	Black Bear	Terrestrial	G5	
Ecological System	Interior Chaparral		Terrestrial	GU	
	Montane Riparian Woodland and Shrubland		Aquatic/Riparian	GU	
	Sonoran Desert Scrub		Terrestrial	GU	
Sycamore & Oak Creek Canyons					
Amphibian	*Rana yavapaiensis*	Yavapi Leopard Frog	Aquatic/Riparian	G4	
	Hyla wrightorum	Mountain Treefrog	Aquatic/Riparian	G4	
Bird	*Accipiter gentilis*	Northern Goshawk	Terrestrial	G5	
	Strix occidentalis lucida	Mexican Spotted Owl	Terrestrial	G3	LT
Fish	*Gila robusta*	Roundtail Chub	Aquatic/Riparian	G3	PS
Insect	*Metrichia volada*		Aquatic/Riparian	GU	
Mammal	*Myotis lucifugus occultus*		Terrestrial	G3	
	Mustela frenata arizonensis		Terrestrial	GU	
Reptile	*Thamnophis eques megalops*	Mexican Garter Snake	Aquatic/Riparian	G3	
	Thamnophis rufipunctatus	Narrowhead Garter Snake	Aquatic/Riparian	G3	
	Lampropeltis pyromelana	Sonoran Mountain Kingsnake	Terrestrial	G5	
Plant-Vascular	*Astragalus troglodytus*		Terrestrial	G2	
	Heuchera eastwoodiae	Senator Mine Allum-Root	Terrestrial	G3	
	Erigeron saxatilis		Terrestrial	G3	
	Potentilla multifoliolata		Terrestrial	G4	
	Cimicifuga arizonica	Arizona Bugbane	Aquatic/Riparian	G2	
	Hedeoma diffusum		Terrestrial	G3	
	Salvia dorrii ssp mearnsii		Terrestrial	G3	

Conservation Area/ Target Type	Scientific Name	Common Name	Habitat Type	Global Rank	ESA Status
	Talinum validulum	Western Flame Flower	Terrestrial	G3	
Community	Ponderosa Pine Forest Community (5 specific occurrences)		Terrestrial	GU	
Upper Verde River Watershed					
Amphibian	*Rana pipiens*	Northern Leopard Frog	Aquatic/Riparian	G5	
	Bufo microscaphus microscaphus		Aquatic/Riparian	G3	
	Rana yavapaiensis	Yavapi Leopard Frog	Aquatic/Riparian	G4	
	Rana chiricahuensis	Chiricahua Leopard Frog	Aquatic/Riparian	G3	LT
	Hyla wrightorum	Mountain Treefrog	Aquatic/Riparian	G4	
Bird	*Falco peregrinus anatum*	American Peregrine Falcon	Terrestrial	G3	PS:LT,PD
	Haliaeetus leucocephalus	Bald Eagle	Terrestrial	G4	L
	Empidonax traillii extimus	Southwest Willow Flycatcher	Aquatic/Riparian	G2	LE
	Buteogallus anthracinus	Common Black-Hawk	Aquatic/Riparian	G4	
	Coccyzus americanus occidentalis	Western Yellow-Billed Cuckoo	Aquatic/Riparian	G3	C
	Ceryle alcyon	Belted Kingfisher	Aquatic/Riparian	G5	
	Strix occidentalis lucida	Mexican Spotted Owl	Terrestrial	G3	LT
	Accipiter gentilis	Northern Goshawk	Terrestrial	G5	
Fish	*Poeciliopsis occidentalis occidentalis*	Gila Topminnow Infraspecific.	Aquatic/Riparian	G3	LE
	Gila robusta	Roundtail Chub	Aquatic/Riparian	G3	PS
	Gila intermedia	Gila Chub	Aquatic/Riparian	G2	PE
	Catostomus insignis	Sonora Sucker	Aquatic/Riparian	G3	SC
	Catostomus clarki	Desert Sucker	Aquatic/Riparian	G3	SC
	Agosia chrysogaster	Longfin Dace	Aquatic/Riparian	G4	SC
	Rhinichthys osculus	Speckled Dace	Aquatic/Riparian	G5	PS
	Meda fulgida	Spikedace	Aquatic/Riparian	G2	LT
Insect	*Metrichia volada*		Aquatic/Riparian	GU	
	Cylloepus parkeri	Parker's Cylloepus Riffle Beetle	Aquatic/Riparian	G1	
	Cicindela oregona maricopa	Maricopa Tiger Beetle	Aquatic/Riparian	G3	
	Abedus herberti	Giant Water Bug	Aquatic/Riparian	GU	
Mammal	*Sciurus arizonensis*	Arizona Gray Squirrel	Terrestrial	G4	
	Myotis lucifugus occultus		Terrestrial	G3	
	Antilocapra americana	Pronghorn	Terrestrial	G5	
	Myotis thysanodes	Fringed Myotis Bat	Terrestrial	G4	
	Nyctinomops macrotis	Big Free-Tailed Bat	Terrestrial	G5	
	Ursus americanus	Black Bear	Terrestrial	G5	
Mollusk	*Pyrgulopsis morrisoni*	Page Springsnail	Aquatic/Riparian	G1	C

Conservation Area/ Target Type	Scientific Name	Common Name	Habitat Type	Global Rank	ESA Status
	Pyrgulopsis montezumensis	Montezuma Well Springsnail	Aquatic/Riparian	G1	
	Pyrgulopsis simplex	Fossil Springsnail	Aquatic/Riparian	G1	
	Pyrgulopsis sola	Brown Springsnail	Aquatic/Riparian	G1	
Reptile	*Thamnophis rufipunctatus*	Narrowhead Garter Snake	Aquatic/Riparian	G3	
	Thamnophis eques megalops	Mexican Garter Snake	Aquatic/Riparian	G3	
Plant-Vascular	*Purshia subintegra*	Arizona Cliff Rose	Terrestrial	G1	LE
	Rumex orthoneurus	Bloomer's Dock	Aquatic/Riparian	G3	
	Salvia dorrii ssp mearnsii		Terrestrial	G3	
	Penstemon nudiflorus	Flagstaff Beardtongue	Terrestrial	G2	
	Talinum validulum	Western Flame Flower	Terrestrial	G3	
	Agave delamateri	Tonto Basin Agave	Terrestrial	G2	
	Erigeron anchana		Terrestrial	G2	
	Eriogonum ripleyi	Ripley's Wild Buckwheat	Terrestrial	G2	
	Eriogonum apachense		Terrestrial	G1	
	Hymenoxys jamesii		Terrestrial	G2	
	Carex ultra	Cochise Sedge	Aquatic/Riparian	G3	
Community	Cienega		Aquatic/Riparian	GU	
	Cienega		Aquatic/Riparian	GU	
Ecological System	Pinyon-Juniper Woodland		Terrestrial	GU	
	Montane Mixed Forest		Terrestrial	GU	
	Sonoran Desert Scrub		Terrestrial	GU	
	Interior Chaparral		Terrestrial	GU	
	Montane Riparian Woodland and Shrubland		Aquatic/Riparian	GU	
	Apachean Shrubland		Terrestrial	GU	
	Madrean Encinal		Terrestrial	GU	
	Apachean Grassland and Savanna Condition Class A		Terrestrial	GU	
	Riparian Woodland		Aquatic/Riparian	GU	
	Desert Wash		Aquatic/Riparian	GU	
	Apachean Grassland and Savanna Condition Class A&B		Terrestrial	GU	
	Playa		Aquatic/Riparian	GU	
	Ponderosa Pine Forest and Woodland		Terrestrial	GU	
	Apachean Grassland and Savanna Condition Class B		Terrestrial	GU	