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AESO/SE
22410-2007-F-0423

September 21, 2017

Ms. Laura Jo West, Forest Supervisor
Coconino National Forest
1824 South Thompson Street
Flagstaff, Arizona 86001

Dear Ms. West:

Thank you for your request for formal consultation and conference with the U.S. Fish and Wildlife Service (FWS) pursuant to section 7 of the Endangered Species Act of 1973 (16 U.S.C. § 1531-1544), as amended (Act). We received your letter and Biological Assessment (BA) dated February 15, 2017, on the same day. This transmits the FWS programmatic biological and conference opinion (PBO/PCO) regarding the effects of the proposed Coconino National Forest (Coconino NF) Revised Land and Resource Management Plan (LRMP) located in Coconino, Gila and Yavapai Counties, Arizona.

In your BA, Coconino NF determined that the proposed action *may affect* and *is likely to adversely affect* the Chiricahua leopard frog (*Lithobates chiricahuensis*) and its critical habitat, the Mexican spotted owl (*Strix occidentalis lucida*) and its critical habitat, the southwestern willow flycatcher (*Empidonax traillii extimus*) and its critical habitat, the yellow-billed cuckoo (*Coccyzus americanus*) and its proposed critical habitat, the Gila chub (*Gila intermedia*) and its critical habitat, the Little Colorado spinedace (*Lepidomeda vittata*) and its critical habitat, loach minnow (*Tiaroga cobitis*) and spikedace (*Meda fulgida*) critical habitat, the Arizona cliffrose (*Purshia subintegra*), the narrow-headed gartersnake (*Thamnophis rufipunctatus*) and its proposed critical habitat, and the northern Mexican gartersnake (*Thamnophis eques megalops*) and its proposed critical habitat.

In your letter, you requested our concurrence that the proposed action *may affect,* and *is not likely to adversely* affect the endangered California condor (*Gymnogyps californianus*), Gila topminnow (*Poeciliopsis occidentalis*), the Gila trout (*Oncorhynchus gilae*), the loach minnow, the spikedace, the razorback sucker (*Xyrauchen texanus*) and its critical habitat, and the San Francisco Peaks ragwort (*Packera franciscana*) and its critical habitat. In addition, the Forest Service determined that the proposed action *will not jeopardize* the 10(j) nonessential experimental populations of the California condor, the Colorado pikeminnow (*Ptychocheilus lucius*), and the Mexican gray wolf (*Canis lupus*). We provide our rationales for our concurrences in Appendix A of the programmatic biological and conference opinion (PBO/PCO).

You also concluded that there would be *no effect* to the Yuma Ridgway's rail (*Rallus obsoletus yumanensis*), or the black-footed ferret (*Mustela nigripes*). Species with "no effect" determinations do not require review from the FWS and are not addressed further.

Certain project activities may also affect species protected under the Migratory Bird Treaty Act (MBTA) of 1918, as amended (16 U.S.C. sec. 703-712) and/or bald and golden eagles protected under the Bald and Golden Eagle Protection Act (Eagle Act). The MBTA prohibits the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests, except when authorized by the FWS. The Eagle Act prohibits anyone, without a FWS permit, from taking (including disturbing) eagles, and including their parts, nests, or eggs. If you think migratory birds and/or eagles will be affected by this project, we recommend seeking our Technical Assistance to identify available conservation measures that you may be able to incorporate into your project.

For more information regarding the MBTA and Eagle Act, please visit the following websites. More information on the MBTA and available permits can be retrieved from http://www.fws.gov/birds and http://www.fws.gov/migratorybirds/mbpermits.html. For information on protections for bald eagles, please refer to the FWS's National Bald Eagle Management Guidelines (72 FR 31156) and regulatory definition of the term "disturb" (72 FR 31132) published in the Federal Register on June 5, 2007 (http://www.fws.gov/southwest/es/arizona/BaldEagle.htm), as well as the Conservation Assessment and Strategy for the Bald Eagle in Arizona (SWBEMC.org).

In keeping with our trust responsibilities to American Indian Tribes, we encourage you to continue to coordinate with the Bureau of Indian Affairs in the implementation of this consultation and, by copy of this biological opinion, are notifying affected Tribes of its completion. We also encourage you to coordinate the review of this project with the Arizona Game and Fish Department.

We appreciate the Forest Service's efforts to identify and minimize effects to listed species from this project. Please refer to the consultation number, 22410-2007-F-0423, in future correspondence concerning this project. Should you require further assistance or if you have any questions please contact Mary Lane (501-321-5201) and Shaula Hedwall (928-556-2118), or Brenda Smith (928-556-2157).

Sincerely,

Brenda H Smith

for Steven L. Spangle
Field Supervisor

cc (electronic):

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BIOLOGICAL OPINION
CONFERENCE OPINION

For the

Coconino National Forest Land and Resource Management Plan

Coconino, Gila, and Yavapai Counties, Arizona

Southwestern Region U.S.D.A. Forest Service

Arizona Ecological Services, Region 2
U.S. Fish and Wildlife Service

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INTRODUCTION

This PBO/PCO is based on information provided in the February 2017 Biological Assessment (BA) (USFS 2017a), the 2013 Draft Environmental Impact Statement (USFS 2013), and the 2017 revised Draft LRMP (USFS 2017b) that you provided, meetings, telephone conversations, field investigations, and other sources of information. Literature cited in this biological and conference opinion is not a complete bibliography of all literature available on the species of concern, forest management, and its effects, or on other subjects considered in this opinion. A complete administrative record of this consultation is on file at this office.

Consultation History

May 2006 – August 2013	The FWS participated in meetings and discussions regarding the Forest Plan Revision.
September 2013-April 2014	Meetings occurred between members of the Coconino NF and FWS Arizona Ecological Services Office (AESO) regarding updates on the Coconino plan revision, concerns, and discussion about lessons learned from other consultations
April 2014	The Forest Service sent us a species list to review prior to initiating consultation/conference.
Various dates 2014 and 2015	The Forest Service and FWS exchanged electronic mails and telephone calls regarding the content of a consultation agreement. In addition, we attended meetings to discuss the consultation process.
April 2016	The Forest Service shared a draft example of analysis for the Chiricahua leopard frog and FWS staff provided comments.
Various dates 2016	Emails and phone calls were exchanged to discuss expected timeframes for submitting draft and final Biological Assessments.
August 16, 2016	The FWS received a draft BA from Forest Service. Due to workload issues we informed the Forest Service it would take the FWS longer than 30 days to provide comments.
November 2016	The FWS provided comments on the draft BA via electronic mail on November 2 and held meeting on November 22 to discuss comments and questions.
February 15, 2017	The FWS received the final BA along with draft Revised Land and Resource Management Plan.

August 8, 2017 The FWS sent a draft PBO/PCO to the Forest Service.

September 1, 2017 The FWS received comments from the Forest Service on the draft PBO/PCO.

DESCRIPTION OF THE PROPOSED ACTION

The proposed action being analyzed in this PBO/PCO is the implementation of the Coconino NF LRMP. The Coconino NF is consulting on the LRMP's program direction and guidance (effects of recreation, roads and facilities, livestock grazing, fire management, etc.), as well as "plan components" (desired conditions, objectives, guidelines, standards, management areas and special designations, and suitability; these are discussed in greater detail below). Most of the actions being consulted on are program management direction and guidance, including standards and guidelines, which tend to minimize effects of the actions and function as conservation measures. Many aspects are similar to those in the previous (1987) LRMP, as amended, although there is a greater emphasis on vegetation and watershed restoration (which may have some short-term effects with long-term benefits).

Once finalized, the revised LRMP will replace the 1987 Coconino NF LRMP and its amendments, and this PBO/PCO will replace the BO/CO issued on March 30, 2012, which addressed effects from continued implementation of the 1987 Coconino NF LRMP. The planning period for the proposed revised LRMP is for 15 years immediately following LRMP approval unless the LRMP is revised within the next 15 years.

The proposed action described below is a "framework programmatic action" as defined in 50 CFR 402.02, where framework programmatic action only establishes a framework for the development of specific future action(s) but does not authorize any future action(s). The effects to listed species and designated critical habitat of future actions that are subsequently authorized, funded, or carried out under this program will be addressed in subsequent section 7 consultation, as appropriate.

The proposed LRMP as identified in the BA (USFS 2017a) includes the following types of direction.

Plan Decisions

- **Desired conditions (or goals)** set forth the desired social, economic, and ecological goals of the Coconino NF. They attempt to paint a picture of what the public and the Forest Service desire the forest to look like or the goods and services we desire it to provide. Desired conditions are generally expressed in broad, general terms; however, more specificity may be added to clarify the intent. Desired conditions are timeless in that there is no specific date by which they are to be completed. They are not commitments or final decisions which approve projects or activities, and they may only be achievable over a long timeframe (e.g., several hundred years).

- **Objectives (O)** are concise, time specific statements of measurable, anticipated results that help achieve or move towards desired conditions over the life of the plan. These are not targets and are not intended to be limitations on management activities. Activities specified in objectives are intended to help make progress toward achieving desired conditions and represent just some of the outcomes or actions expected to accomplish movement toward desired conditions. Objectives are incorporated by reference from the BA. Objectives applicable to this PBO/PCO are listed in Appendix B.
- **Standards (S)** are constraints upon project and activity design. A standard is an absolute requirement to be met in the design of projects and activities. A project or activity is consistent with a standard when its design is in accord with the explicit provisions of the standard; variance from a standard is not allowed except by plan amendment. Standards are incorporated by reference from the BA. Standards applicable to this PBO/PCO are listed in Appendix B.
- **Guidelines (G)** are sideboards that guide management activities and provide specifications that a project or activity would adopt unless there is a compelling or defensible reason to vary from the guideline. Guidelines are incorporated by reference from the BA. Guidelines applicable to this PBO/PCO are listed in Appendix B.
- **Area-Specific Direction** is for spatially delineated areas with a common set of plan components that differ from the general Forest. The LRMP divides area-specific direction into two categories: management areas and special areas. Management areas are defined by the desired settings and types of uses that would occur within them under the Plan.
- **Suitability** describes the appropriateness of applying certain resource management practices to a particular area of land. Suitability is determined based on compatibility with desired conditions and objectives in the plan area. A unit of land may be suitable for a variety of individual or combined management practices. Identification of an area as suitable for a particular use does not mean that the use will occur over the entire area.
- **Special areas** are lands that have management direction that is more specific than forestwide and overlap lands designated as special areas by Congress or another delegated authority. Examples include: wilderness, research natural areas, geological and botanical areas, national trails, and national and state scenic roads.
- **Monitoring** is used to determine the degree to which on-the-ground management is maintaining or making progress toward desired conditions. The monitoring plan includes questions and performance measures designed to inform implementation and effectiveness of plan decisions.

Other Content

Besides the plan decisions mentioned above, the plan also contains other content. Other content includes chapter 1 (i.e., background), certain sections in chapters 3 and 4 (i.e., area-specific direction and suitable uses) and all appendices. These sections are meant to provide information and assist in understanding the larger management context. These sections are not mandatory direction and do not describe or authorize future actions.

The LRMP does not make site-specific decisions about exactly how, when, and where these activities will be carried out. However, all site-specific activities must conform to the programmatic framework set up in the LRMP (they must include the standards and guidelines) and they must meet site-specific National Environmental Policy Act (NEPA) and Act requirements.

Description of the Proposed Action by Plan Section
The following is a summary of the proposed management on the Coconino NF for each forestwide plan section and area-specific direction by program area. Each program area is analyzed for each species to determine if that program will have any effect on the species or its critical habitat. Additional information on each program area can be found in the BA (USFS 2017a) and is incorporated by reference.

Forestwide Direction

All Ecosystems
Guidance in this section of the proposed LRMP applies to all ecosystems on the Forest.

Air Quality
This program area maintains or improves air quality on the Coconino NF to meet State and Federal air quality standards including visibility and public health. Methods used to meet the desired conditions would include advanced notification for smoke sensitive areas; incorporate emission reduction techniques; and coordinate with the Arizona Department of Environmental Quality (ADEQ) to comply with State and Federal regulatory requirements.

Soil
This program area maintains or improves the condition of soils managed by the Coconino NF. Methods used to meet the overall objectives of the program include: assessing and improving soil condition as well as ecological and hydrological functions; coordinating with other Federal, State agencies; improving and maintaining soil conditions through the use of best management practices (BMPs); improving and protecting sensitive ecological areas; and planning and implementing burned area emergency response activities.

Biophysical Features
Biophysical features include geological features such as caves, karst, cliffs, and talus slopes and paleontological resources. Methods used to meet the overall desired conditions of these features include: coordinating with partners, State and Federal agencies; educating the public; monitoring significant features; and fostering collaboration with Arizona Game and Fish Department (AGFD), USFWS, Bat Conservation International and other stakeholders and researchers to address conservation.

Watershed and Water
This program area maintains or improves the condition of watersheds managed by the Coconino NF. Methods used to meet the overall objectives of the program include: assessing watershed condition; prioritizing watersheds for protection or improvement; coordinating with other Federal, and State agencies; securing water rights under State or Federal law to meet National

Forest System (NFS) management; improving and maintaining water quality through the use of BMPs; improving and protecting riparian areas and other groundwater dependent ecosystems; protecting floodplains; and planning and implementing burned area emergency response activities.

Constructed Waters

Constructed waters include reservoirs, earthen stock ponds (tanks), and wildlife drinkers that have been created through human-made structures or activities. They are designed to provide water for people, livestock, and/or wildlife, and some provide recreation opportunities such as fishing, boating, and other water-related sports.

Reservoirs are permanent open water sources that are recharged annually through flooding and precipitation. Earthen stock ponds are small water impoundments that provide water for livestock and wildlife. Wildlife drinkers, also called wildlife guzzlers, are water sources that usually consist of a metal apron to collect water in a storage tank that is connected to a trough.

Riparian Areas

Riparian areas are associated with perennial and intermittent streams, lakes, wetlands, and springs, and their associated riparian vegetation zone. Properly functioning riparian areas depend on water quality and water quantity. Overall desired conditions are met by: assessing water quality and aquatic conditions; coordinating with other Federal and State agencies; securing water rights under State or Federal law to meet NFS management; inventorying all water use annually; improving and maintaining water quality through the use of BMPs; improving and protecting riparian areas and other groundwater dependent ecosystems; and planning and implementing burned area emergency response activities.

Stream Ecosystems

Flowing water, including rivers, creeks, and streams and their associated riparian vegetation zones make up the stream ecosystems. They collect and transport water, sediment, and organic material from upslope, upstream, and moderate flood events. Overall desired conditions are met by: assessing proper functioning condition (PFC); promoting natural water movement; ensuring proper sediment and wood debris levels; improving and maintaining water quality through the use of BMPs; improving and protecting riparian areas and other groundwater dependent ecosystems; and planning and implementing burned area emergency response activities.

Wetlands

Wetland ecosystems encompass discrete bodies of water such as wetlands, cienegas, lakes, and their associated vegetation. Key processes of wetlands include the development and presence of hydric soils, decomposition, and nutrient cycling, as well as the geomorphic setting. Natural disturbances are drought and flooding. Cienegas are linear streams associated with spring recharge that are primarily herbaceous. Methods used to meet the objective of these ecosystems include: assessing proper functioning condition; improving and maintaining water quality through the use of BMPs; improving and protecting riparian areas and other groundwater dependent ecosystems; protecting floodplains; and planning and implementing burned area emergency response activities.

Springs

Springs and wetlands are centers of biological diversity. Springs function as keystone ecosystems that have disproportional impacts on ecology, biodiversity, economics, and culture in relationship to their size. Methods used to meet the overall objective of these ecosystems include: assessing condition; coordinating with partners and stakeholders; classifying and prioritizing springs for restoration; improving and maintaining water quality through the use of BMPs; improving and protecting riparian areas and other groundwater dependent ecosystems; and planning and implementing burned area emergency response activities.

Riparian Forest Types

Cottonwood Willow, Mixed Broadleaf Deciduous, Montane Willow, and Gallery Coniferous Riparian Forests are all riparian communities within the Coconino NF. Methods used to meet the overall objective of the program include: assessing and restoring nonfunctioning and functioning-at-risk riparian areas; assessing PFC; coordinating with other Federal and State agencies; improving and maintaining water quality through the use of BMPs; improving and protecting riparian areas and other groundwater dependent ecosystems; protecting floodplains; and planning and implementing burned area emergency response activities. Future projects would be designed to protect and improve riparian conditions and would employ best management practices, standards and guidelines, and measures to protect watershed resources.

Terrestrial ERUs

Terrestrial ecosystems are grouped by ecological response units (ERUs) and may only be achievable over a long timeframe (e.g., several hundred years). There are 13 terrestrial ERUs on the Forest, which include forests, woodlands, shrublands, and grasslands. Methods used to meet the overall objective of the program include: assessing and improving vegetation and ecosystem function; coordinating with other Federal and State agencies; fostering partnerships with the Rocky Mountain Research Station and other science organizations; and identifying research opportunities related to management activities.

Wildland Urban Interface (WUI)

The wildland urban interface includes residential areas and human developments having special significance at imminent risk from wildfire. Infrastructure that typically is considered part of the wildland urban interface includes residential areas, critical communications sites, water-related facilities, high voltage transmission lines, power lines, dams, observatories, church camps, scout camps, research facilities, and other structures that if destroyed by fire, would result in hardship to communities. Methods used to meet the overall desired conditions of the program include coordinating with residents living within and adjacent to the forest to provide information about wildfire protection of their homes and property, including creating defensible space.

Wildlife, Fish, and Plants

The Wildlife, Fish, and Plants (WFP) program involves activities conducted by the Forest Service and its partners, including inventory and monitoring, habitat assessments, habitat improvements through land treatments and structures, species reintroductions, development of conservation strategies, administrative studies, collaboration with research, and information and education.

Invasive Species
Invasive species pose an increasing threat to the integrity of ecosystems by decreasing native plant and animal diversity, increasing soil erosion and sedimentation, and interfering with natural fires regimes. Reducing the threat of aquatic and terrestrial invasive species will allow for better management of resilient landscapes and species populations that have a greater capacity to survive natural disturbances and uncertain future environmental conditions such as those driven by climate change and increasing human uses. Methods used in this program include: assessing and eradicating priority infestations or populations; monitoring, preventing and controlling infestations; coordinating with other Federal and State agencies; and planning and implementing burned area emergency response activities.

Fire Management
The Fire Management program combines elements of: wildland fire prevention; response and management; post-fire area stabilization and rehabilitation; and hazardous fuels planning, implementation, and monitoring. Wildland fire is defined as any nonstructural fire that occurs in vegetation or natural fuels, and it is further categorized as either wildfire or prescribed fire. Prescribed fire and mechanical treatments are actions that are part of the hazardous fuels program designed to protect communities, watersheds, and species at risk, and to restore and maintain resilient ecosystems. Although wildfires are not covered in this consultation, the Forest Service expects to work closely with the FWS on management responses and emergency consultation procedures.

Livestock Grazing
The Coconino NF authorizes livestock grazing on 41 allotments - of these, 35 are active grazing allotments, 3 are vacant and 3 have been temporality closed. Allotments are managed using an adaptive management strategy whereby results from long and short-term monitoring are used to guide yearly stocking rates, pasture rotations, and other adjustments such as excluding grazing in order to meet desired conditions for rangelands.

Forest Products
Forest products sold on the Coconino NF include timber, special forest products, and forest botanical products. The harvest of timber is a byproduct of thinning forested areas where the primary purpose is to improve forest health and wildlife habitat or to reduce hazardous fuels in the wildland-urban interface, rather than an outcome of regulated forest production. The demand for wood products other than timber has been driven by local and regional needs for firewood. The Coconino NF offers a sustainable mix of special forest products and forest botanical products for sale in response to local and regional needs. Forest products are removed from unsuitable lands solely to benefit forest health, mitigate insect and disease damage, reduce hazardous fuels, improve wildlife habitat, create recreation opportunities, or to perform research or administrative studies.

Mineral Resources
Minerals of economic interest are classified as leasable, salable, or locatable. Mining activity on the Coconino NF falls into three legal and regulatory categories: (1) locatable minerals such as hard rock minerals like manganese (which is subject to claim); (2) salable (permitted) mineral activities such as sand, gravel, and common building stone; and (3) leasable minerals which

includes geothermal resources and oil and gas. Locatable minerals are subject to the General Mining Law of May 10, 1872, as amended, and for the most part are outside the scope of the LRMP. The Forest Service's role in locatable mineral management is limited to overseeing rules and regulations applicable to surface resources. The Bureau of Land Management is the responsible authority for managing locatable minerals on public lands, including the national forests. Several areas across the forest have been withdrawn from mineral entry.

Heritage Resources
Heritage resources are buildings, sites, areas, architecture, memorials, and objects having prehistoric, historic, or social values. The Coconino NF has some of the highest archaeological site densities in the Southwest. The recreational, educational, cultural, and scientific values of the archaeological sites on the forest have been recognized as a recreational and scientific niche that the Coconino NF can provide to the public. Methods used to meet the overall objectives of the program are to maximize opportunities for partnerships and volunteerism, cooperate with local, State, and private agencies, institutions, and local tribes, conduct analysis on sites, provide guidance on evaluating the significance of individual sites, and inventory, study, document, and preserve sites

Tribal Relations and Uses
The Forest Service and federally recognized American Indian tribes have a special and unique government-to-government relationship based on the U.S. Constitution, treaties, and statutes. The Coconino NF regularly consults with 13 tribes. The emphasis for this program is on those relationships.

Roads and Facilities
The transportation system on the Coconino NF consists of roads and trails that provide access to areas on the forest including private land, structures and improvements under special use permit, recreational opportunities, and facilities that support land and resource management activities. The Coconino NF provides management of the transportation system including: conducting inventories, surveys, and analyses; formulating plans; and executing reconstruction, maintenance, and obliteration operations.

The motorized transportation system for the Coconino NF is composed of 773 miles of roads managed and maintained for highway legal vehicles, 4,602 miles of roads open to all motorized vehicles, and 588 miles of roads closed to all motorized vehicles. The miles of road open to motorized use include roads where access may be restricted on a seasonal basis. Any road, regardless of maintenance level, may be closed during extreme weather conditions for public safety or to minimize resource damage. Motor vehicle use off of the designated system of roads, trails and areas is prohibited except as identified on the motor vehicle use map (MVUM) and as authorized by law, permits, and orders in connection with resource management and public safety. Methods used to meet the overall objective of the program include assessing the transportation system to create a more effective road system and to restore natural resources that have been impacted; coordinating with other partners, and Federal and State agencies. Future projects would be designed to restore and improve watershed conditions and would employ best management practices, guidelines, and mitigation measures to protect watershed resources.

The Coconino NF owns and manages 167 administrative facilities and sites. A forest facility master plan guides the acquisition, continued use, maintenance, improvements, and disposal of the facilities. The plan proposes an overall reduction in facilities through consolidation and decommissioning. Methods used to meet the overall desired conditions of the program would include assessing and decommissioning facilities.

Land Adjustments

The Coconino NF lands program is responsible for identification and maintenance of land line locations between Forest Service lands and lands of other ownership and land adjustments. Land ownership adjustments include: sale, purchases, conveyance, land exchanges, and right-of-way. The effects of future development projects such as for utilities and transportation systems would be addressed on a site specific basis and mitigated individually following the Forest Service policy regarding special uses. Mitigations are typically accomplished by consolidation of new developments along existing routes and corridors or by construction techniques that disturb less land and improve reclamation success.

Special Uses

Land Special Uses

The Coconino NF special use program is responsible for activities such as utility lines, road use, communication sites, research, and wind energy development. Utility and energy transmission corridors, along with communication sites, are generally long-term commitments of NFS lands. Increased demand is expected for utility lines; renewable energy sources; community infrastructure; private land access; and local, State, and Federal public transportation systems to serve the growing populations of Arizona and the Southwest. The effects of future development projects would be addressed on a site specific basis and mitigated individually following the Forest Service policy regarding special uses. Mitigations are typically accomplished by consolidation of new developments along existing routes and corridors or by construction techniques that disturb less land and improve reclamation success.

Recreation Special Uses

Recreation special use permits authorize services that support the Forest Service mission and meet the needs of the public. These permits are a partnership between the Forest Service and private businesses and individuals to provide services and facilities such as outfitter-guide services, skiing, and special events.

Recreation

The Recreation program provides a wide range of recreation settings, opportunities, and services. Program components include administration and management of resources and visitors at developed recreation sites, dispersed recreation settings, partnerships and tourism, interpretive services, recreation special use permits, congressionally designated areas, visual quality management, trail management, and scenic byways.

A variety of year-round recreation opportunities exist on the Coconino NF. The forest provides public access to central Arizona settings that accommodate a wide range of opportunities for outdoor, nature-based recreation. Scenic rivers, creeks, and lakes create unique mountain

settings for water-based activities as well as remote back-country areas of the forest that accommodate dispersed recreation activities. Increases in population have led to increased demand for trails and other recreation opportunities. Climate changes include continuing increases in temperatures; it is likely that there will also be increases in recreation visitors to the forest.

Interpretation and Education
The ecological and social diversity associated with the Coconino NF provide opportunities for interpretation of, and education on, a wide array of forest resources. This program strives to improve or expand the experience of forest visitors. These efforts can help build a shared vision of the resources and management of the Coconino NF. This program includes; developing an interpretive strategy, concepts and practices in forest interpretation and visitor education; working with agencies, motorized recreation user groups, and other stakeholders to establish interpretive messages and programs including improved signs, information kiosks, and other interpretive tools; and collaborate with volunteers, other agencies, and stakeholders.

Scenic Resources
The Coconino NF scenic resources program is responsible for activities such as desired landscape character. Scenic integrity objectives (SIOs) are defined by degrees or levels of alteration from the desired landscape character and the intent to achieve the highest possible scenic integrity. Some areas of the forest may require restoration in order to move toward the conditions described in the desired landscape character. Vegetation treatments contribute to the scenic integrity of the desired landscape character. Long-term soil and plant productivity, proper functioning ecosystems, and clean water are considered important components of scenic quality.

Area-Specific Direction

Management Area Direction
The Coconino NF is divided into 18 Management Areas (MA) that are contiguous across the forest. They are managed to protect the special features or character for which they were designated and must be managed in accordance with relevant law, regulation, policy, and any area-specific management plans.

Special Area Direction
Special areas have been statutorily or administratively designed, or are being recommended or proposed in the Coconino NF LRMP. They overlap with management areas, and are managed to protect the special features or character for which they were designated. Direction is provided for seven types of special areas.

Designated Wilderness Areas
There are all or portions of 10 wilderness areas on the Forest. The plan provides direction for the eight that Coconino NF manages: Fossil Springs, Kachina Peaks, Munds Mountain, Red Rock-Secret Mountain, Strawberry, Sycamore, West Clear Creek, and Wet Beaver. Kendrick Mountain is administered by the Kaibab NF, and Mazatzal is managed by the Tonto NF.

Recommended Wilderness
The Coconino NF is recommending three new wilderness areas, which would be additions to existing wildernesses: Abineau (an addition to the Kachina Peaks Wilderness), Strawberry Crater (an addition to Strawberry Crater Wilderness), and Davey's (an addition to Fossil Springs Wilderness). Direction is provided to maintain the characteristics as potential wilderness area additions.

Designated and Eligible Wild and Scenic Rivers
There are only two designated wild and scenic rivers (WSR) on the Coconino NF: Fossil Creek and Verde River. The Verde WSR is managed under a comprehensive river management plan (CRMP) developed jointly by the Coconino, Prescott, and Tonto National Forests. The CRMP for Fossil Creek is currently being developed. Once completed, it will be used to guide management for the Fossil Creek WSR.

There are 11 river segments that are classified as eligible WSRs. Both designated and eligible rivers are managed to protect their free-flowing condition, and to maintain or enhance Outstandingly Remarkable Values identified for those rivers. Wild and scenic rivers are managed to protect free-flowing condition and maintain or enhance values identified for the river.

National Trails
There are three national trails on the Coconino NF: Arizona National Scenic Trail, General George Crook National Recreation Trail, and Wilson Mountain National Recreation Trail.

Scenic Roads
Scenic roads describe several types of federal or state designated roads. There are five roads identified on Coconino NF: Historic Route 66 All American Road, Red Rock All-American Road, Dry Creek Scenic Road, San Francisco Peaks Scenic Road, and Sedona-Oak Creek Scenic Road.

Established and Proposed Research Natural Areas and Designated Botanical and Geological Areas
Special areas, such as research natural areas, botanical areas, and geological areas, are designated to ensure protection of specific biological and geological communities. By definition, they must have unique or special characteristics for which specific management is required. There are four existing botanical areas: Verde Valley, Mogollon Rim, Fossil Springs, and Fern Mountain; one existing geological area, Red Mountain; and one proposed geological area, Cottonwood Basin Fumaroles.

Research Natural Areas (RNAs) have excellent examples of the ecological features for which they were designated. There are four existing RNAs on the Coconino NF: Casner Canyon, G.A. Pearson, Oak Creek Canyon, and San Francisco Peaks. G.A. Pearson is not managed by the forest, Oak Creek Canyon and San Francisco Peaks are within designated wilderness areas. Casner Canyon RNA protects the ecological integrity of a pure stand of Arizona cypress along with Supai sandstone. Three new RNAs are proposed: West Clear Creek, Rocky Gulch, and an expansion of San Francisco Peaks RNA. The West Clear Creek proposed RNA retains the

riparian communities in a steep canyon setting as well as hanging gardens and springs; Rocky Gulch retains the ecological integrity of old-growth ponderosa pine; and San Francisco Peaks expansion retains the characteristics of the transition zone between Mixed Conifer and Alpine Tundra with populations of bristlecone pine.

Inventoried Roadless Areas
There are nine inventoried roadless areas (IRA) on the Forest. There are prohibitions on road construction, road reconstruction, and timber harvesting in IRAs on National Forest System Lands.

Suitable Uses
The proposed LRMP identifies areas that are suitable for timber production, livestock grazing, and recreation and transportation. The identification of an area as suitable for various uses is guidance for project and activity decisionmaking and is not a commitment or a final decision approving or restricting projects and activities. Uses that are not specifically identified as suitable are generally not allowed and would be evaluated at the project level relative to desired conditions and could be reclassified as suitable. Uses that are neutral to or help move the forest toward the desired conditions may be allowed. Uses that are suitable must also be consistent with other plan components and other laws and regulations. All future timber production, livestock grazing, road construction, and timber harvesting would be analyzed on a project level.

Monitoring Strategy
The purpose of monitoring and evaluation is to evaluate, document, and report how the forest plan is applied, how well it works, and if its purpose and direction remain appropriate. Based upon this evaluation, recommendations may be made to the Forest Supervisor to change management direction, or revise, or amend the forest plan. The annual monitoring and evaluation report is intended to inform adaptive management of the plan area especially in light of changing social or environmental conditions.

ACTION AREA

The action area is defined as all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action (50 CFR § 402.02). In delineating the action area, we evaluated the farthest reaching physical, chemical, and biotic effects of the action on the environment.

The action area addressed in this PBO/PCO includes all lands under the jurisdiction of the Coconino NF (Figure 1) and all adjacent lands that could be directly or indirectly affected by decisions or actions implemented under the direction of the revised LRMP. The Coconino NF is divided into three ranger districts: Flagstaff (Flagstaff, AZ), Red Rock (the Village of Oak Creek, AZ), and Mogollon Rim (Blue Ridge, AZ). The Coconino NF ecology, in terms of riparian and terrestrial ecological response units (ERUs or vegetation types), is described in the BA (USFS 2017a), and incorporated by reference.

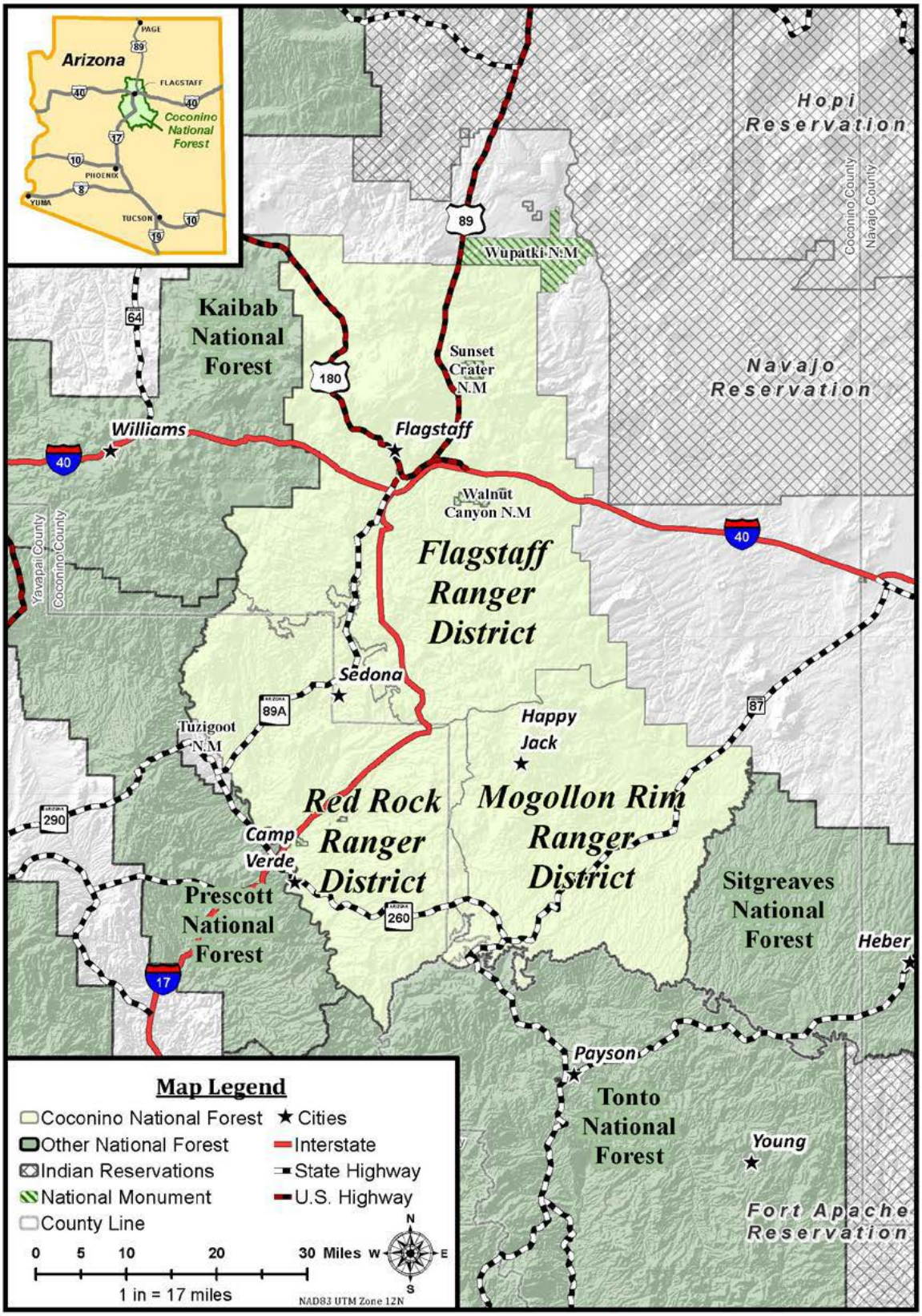

Figure 1. Vicinity map of the Coconino NF.

ANALYTICAL FRAMEWORK FOR THE JEOPARDY AND ADVERSE MODIFICATION DETERMINATIONS

Jeopardy Determination

In accordance with policy and regulation, the jeopardy analysis in this PBO/PCO relies on four components in our evaluation for each species: (1) the *Status of the Species*, which evaluates the species' range-wide condition, the factors responsible for that condition, and its survival and recovery needs; (2) the *Environmental Baseline*, which evaluates the condition of the species in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of the species; (3) the *Effects of the Action*, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on the species; and, (4) *Cumulative Effects*, which evaluates the effects of future, non-Federal activities in the action area on the species.

In accordance with policy and regulation, the jeopardy determination is made by evaluating the effects of the proposed Federal action in the context of the species' current status, taking into account any cumulative effects, to determine if implementation of the proposed action is likely to cause an appreciable reduction in the likelihood of both the survival and recovery of the species in the wild. The jeopardy analysis in this PBO/PCO considers the range-wide survival and recovery needs of the species and the role of the action area in the survival and recovery as the context for evaluating the significance of the effects of the proposed Federal action, taken together with cumulative effects, for purposes of making the jeopardy determination.

Adverse Modification Determination

This Biological Opinion relies on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 CFR 402.02[1]. In accordance with policy and regulation, the adverse modification analysis in this Biological Opinion relies on four components: 1) the *Status of Critical Habitat*, which evaluates the range-wide condition of designated critical habitat for the species in terms of physical and biological features[2], the factors responsible for that condition, and the intended value of the critical habitat for conservation of the species; 2) the *Environmental Baseline*, which evaluates the condition of the critical habitat in the action area, the factors responsible for that condition, and the value of the critical habitat for conservation of the species in the action area; 3) the *Effects of the Action*, which determines the direct and

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[1] See 81 FR 7214

[2] The term "primary constituent elements" was introduced in critical habitat designation regulations (50 CFR 424.12) to describe aspects of "physical or biological features", which are referenced in the statutory definition of critical habitat. The Services have removed the term "primary constituent elements" and returned to using the statutory term "physical or biological features" (81 FR 7414). Existing critical habitat designations will not be republished to reflect this change; however, in future rules we will discontinue using the term "primary constituent elements" and instead will use "physical and biological features".

indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on the physical and biological features and how that will influence the value of affected critical habitat units for conservation of the species; and 4) the *Cumulative Effects*, which evaluates the effects of future, non-Federal activities in the action area on the physical and biological features and how that will influence the value of affected critical habitat units for conservation of the species.

For purposes of the adverse modification determination, the effects of the proposed Federal action on the species' critical habitat are evaluated in the context of the range-wide condition of the critical habitat, taking into account any cumulative effects, to determine if the critical habitat range-wide would remain functional (or would not preclude or significantly delay the current ability for the physical and biological features to be functionally established in areas of currently unsuitable but capable habitat) such that the value of critical habitat for the conservation of the species is not appreciably diminished.

STATUS OF THE SPECIES AND CRITICAL HABITAT

The information in this section summarizes the range-wide status of each species that is considered in this PBO/PCO. Further information on the status of these species can be found in documents on our web page (www.fws.gov/southwest/es/arizona) under Document Library, Document by Species, and in other references cited in each summary below.

Gila Chub and Designated Critical Habitat

Legal Status and Description

Gila chub (*Gila intermedia*) was listed as endangered with critical habitat on November 11, 2005 (USFWS 2005, 67 FR 51948). The final rule cites collection records, historical habitat data, the 1996 AGFD Gila chub status review (Weedman *et al*. 1996), and FWS information documenting currently occupied habitat to conclude that Gila chub has been eliminated from 85 to 90 percent of formerly occupied habitat. It was also estimated that 90 percent of the currently occupied habitat is degraded due to the presence of non-native species and land management actions. Due to fragmented and often small population sizes, extant populations are susceptible to environmental conditions such as drought, flood events, and wildfire. A draft recovery plan has been developed and lists recovery criteria for the Gila chub (USFWS 2015). Primary threats include predation by and competition with non-native organisms; secondary threats are habitat alteration, destruction, and fragmentation. More detailed information can be found in USFWS 2005 and 2015, which are included herein by reference.

Gila chub was formerly considered a separate taxonomic entity, but is now recognized, along with headwater chub and roundtail chub, as a single taxonomic species – the roundtail chub (*Gila robusta*) (82 FR 16981). The FWS intends to reevaluate the status of the Gila chub, which is currently listed as endangered with critical habitat (67 FR 51948). However, until that evaluation is completed and proposed and final rules to delist the Gila chub are published, its legal status remains as an endangered species with designated critical habitat, so our effects analysis in this PBO/PCO reflects this current status. However, because the FWS has not

completed a status assessment of *Gila robusta*, we provide here general life history and habitat information about the entity formerly known as *Gila intermedia*.

Life History and Habitat

The Gila chub is considered a habitat generalist (Schultz and Bonar 2006), and commonly inhabits pools in smaller steams, cienegas, and artificial impoundments throughout its range in the Gila River basin at elevations between 2,000 to 5,500 feet (Miller 1946, Minckley 1973, Rinne 1975, Weedman *et al*. 1996).

Gila chub is a highly secretive species, remaining near cover including undercut banks, terrestrial vegetation, boulders, root wads, fallen logs, and thick overhanging or aquatic vegetation in deeper waters, especially pools (Rinne and Minckley 1991, Nelson 1993, Weedman *et al*. 1996). Recurrent flooding and a natural hydrograph are important in maintaining Gila chub habitats and in helping the species maintain a competitive edge over invading non-native aquatic species (Propst *et al*. 1986, Minckley and Meffe 1987).

Gila chub evolved in a fish community with low species diversity and where few predators existed, and as a result developed few or no mechanisms to deal with predation (Carlson and Muth 1989). It is known to be associated with speckled dace (*Rhinichthys osculus*), longfin dace (*Agosia chrysogaster*), desert sucker (*Pantosteus clarki*), Sonora sucker (*Catostomus insignis*), Gila topminnow (*Poeciliopsis occidentalis*), desert pupfish (*Cyprinodon macularius*), and monkey spring pupfish (*Cyprinodon arcuatus*). Prior to the widespread introduction of non-native fishes, Gila chub was probably the most predatory fish within the habitats it occupied. In the presence of the non-native green sunfish (*Lepomis cyanellus*) in lower Sabino Creek, Arizona, Gila chub failed to recruit young (Dudley and Matter 2000).

While most reproductive activity by Gila chub occurs during late spring and summer, in some habitats it may extend from late winter through early autumn (Minckley 1973). Bestgen (1985) concluded that temperature was the most significant environmental factor triggering spawning. Spawning probably occurs over beds of submerged aquatic vegetation or root wads (Minckley 1973, Nelson 1993).

Distribution, Abundance, Population Trends

Historically, Gila chub were recorded from nearly 50 rivers, streams and spring-fed tributaries throughout the Gila River basin in southwestern New Mexico, central and southeastern Arizona, and northern Sonora, Mexico (Miller and Lowe 1967, Rinne and Minckley 1970, Minckley 1973, Rinne 1976, DeMarais 1986, Sublette *et al*. 1990, Weedman *et al*. 1996); and, occupancy of Gila chub throughout its range was more dense, and likely more expansive in distribution (Hendrickson and Minckley 1984, Minckley 1985, Rinne and Minckley 1991). Gila chub now occupies an estimated 10 to 15 percent of its historical range (Weedman *et al*. 1996, USFWS 2005) and approximately 25 of these current localities are considered occupied, but all are small, isolated and face one or more threats (Weedman *et al*. 1996, USFWS 2005). The biological status of several of these populations is uncertain, and the number of localities currently occupied may overestimate the number of remnant populations in that some might not persist if its core connected population were extirpated.

The Gila chub occurs in the Agua Fria River, the Verde River, Santa Cruz, San Pedro, and Upper Gila subbasins. The Verde River subbasin is within the action area and is discussed further in the environmental baseline. Information regarding the Agua Fria River, the Santa Cruz, San Pedro, and Upper Gila subbasins is included in FWS files.

Threats

Habitat loss

Decline of Gila chub is primarily due to habitat loss from various land-use practices, and predation by and competition with non-native fish species. The highly fragmented and disconnected nature of the remaining Gila chub populations increases their vulnerability to these threats (USFWS 2005). Land uses that have caused past habitat loss and continue to threaten Gila chub habitat include hydrologic modification of rivers, springs, and cienegas for human uses (groundwater pumping, dewatering, diversion of water channels, impoundments, and flow regulation), poorly managed livestock grazing, logging and fuel wood cutting, road construction and use, recreation, mining, and urban and agricultural development (USFWS 2005). All of these activities have promoted erosion and arroyo formation and the introduction of predaceous and competing non-native fish species (Miller 1961, Minckley 1985), and at least one or some combination of these activities is occurring in all of the remaining populations.

Fire

Wildfires and wildfire suppression activities also pose a threat to the remaining populations by causing water quality changes that can kill fish, (Rinne 2004, USFWS 2005, Rhodes 2007), negatively altering food base for fishes (Earl and Blinn 2003), and resulting in stream and riparian vegetation alteration that negatively affects fish habitat (USFWS 2005).

Predation and competition with non-native species

Perhaps the most serious threat to Gila chub is predation by and competition with non-native organisms, including numerous non-native fish species, bullfrogs (*Lithobates catesbeiana*), and virile crayfish (*Orconectes virilis*). The impacts of non-native fish species on native fish including Gila chub have been well documented (Hubbs 1955, Miller 1961, Minckley and Deacon 1968, Minckley 1973, Meffe 1985, Minckley 1985, Williams and Sada 1985, Moyle *et al*. 1986, Minckley and Deacon 1991, Ruppert *et al*. 1993, Clarkson *et al*. 2005). Dudley and Matter (2000) correlated green sunfish presence with Gila chub decline, documented green sunfish predation on Gila chub, and found that even small green sunfish readily consume young-of-year Gila chub. Dudley (1995) found that green sunfish appeared to displace both subadult and adult Gila chub from preferred habitats, found that Gila chub utilized similar habitat types to green sunfish indicating competition for food and space was likely occurring, and concluded that predation by and competition with green sunfish virtually eliminated small chub from where the two species co-occurred, indicating recruitment failure. Unmack *et al*. (2003) similarly found that green sunfish presence was correlated with the absence of young-of-year Gila chub in Silver Creek, Arizona. Non-native fish parasites, such as Asian tapeworm (*Bothriocephalus acheilognathi*) may also be a threat to Gila chub (USFWS 2005).

Overall, the populations of Gila chub rangewide (Arizona and New Mexico) currently appear to be stable. The current distribution Gila chub populations remain extant to the Agua Fria, Blue,

Gila, San Francisco, Santa Cruz and Verde Rivers. These populations are spread across the drainages, and most are isolated from other populations.

Conservation, Consultation and Recovery Planning
Our information indicates that, rangewide, more than 44 consultations have been completed or are underway for actions affecting Gila chub. These opinions primarily include the effects of livestock grazing, water developments, fire, species control efforts, recreation, sportfish stocking, native fish restoration efforts, and mining.

Critical Habitat
Critical habitat for Gila chub is designated for approximately 160.3 miles of stream reaches in Arizona and New Mexico that includes cienegas, headwaters, spring-fed streams, perennial streams, and spring-fed ponds. Critical habitat includes the area of bankfull width plus 300 feet on either side of the banks. The bankfull width is the width of the stream or river at bankfull discharge (i.e., the flow at which water begins to leave the channel and move into the floodplain) (Rosgen 1996, USFWS 2005). Critical habitat is organized into seven areas or river units:

- Upper Gila River, Grant County, New Mexico, and Greenlee County, Arizona, which includes Turkey Creek (New Mexico), Eagle Creek, Harden Cienega Creek, and Dix Creek;
- Middle Gila River, Gila and Pinal Counties Arizona, consists of Mineral Creek;
- Babocomari River, Santa Cruz County, Arizona, includes O'Donnell Canyon and Turkey Creek (Arizona);
- Lower San Pedro River, Cochise and Graham counties, Arizona, includes Bass Canyon, Hot Springs Canyon, and Redfield Canyon;
- Lower Santa Cruz River, Pima County, Arizona, includes Cienega Creek, Mattie Canyon, Empire Gulch, and Sabino Canyon;
- Upper Verde River, Yavapai County, Arizona, includes Walker Creek, Red Tank Draw, Canyon, Hot Springs Canyon, and Redfield Canyon; and
- Agua Fria River, Yavapai County, Arizona, includes Little Sycamore Creek, Sycamore Creek, Indian Creek, Silver Creek, Lousy Canyon, and Larry Creek (USFWS 2005).

Primary Constituent Elements of Critical Habitat
There are seven primary constituent elements (PCEs) of critical habitat, which include those habitat features required for the physiological, behavioral, and ecological needs of the species:

- PCE 1: Perennial pools, areas of higher velocity between pools, and areas of shallow water among plants or eddies all found in headwaters, springs, and cienegas, generally of smaller tributaries;
- PCE 2: Water temperatures for spawning ranging from 63°F to 75 °F, and seasonally appropriate temperatures for all life stages (varying from about 50°F to 86 °F);
- PCE 3: Water quality with reduced levels of contaminants, including excessive levels of sediments adverse to Gila chub health, and adequate levels of pH (e.g. ranging from 6.5 to 9.5), dissolved oxygen (i.e., ranging from 3.0 ppm to 10.0 ppm) and conductivity (i.e., 100 mmhos to 1,000 mmhos);
- PCE 4: Prey base consisting of invertebrates (i.e., aquatic and terrestrial insects) and aquatic plants (i.e., diatoms and filamentous green algae);

- PCE 5: Sufficient cover consisting of downed logs in the water channel, submerged aquatic vegetation, submerged large tree root wads, undercut banks with sufficient overhanging vegetation, large rocks and boulders with overhangs, a high degree of stream bank stability, and a healthy, intact riparian vegetation community;
- PCE 6: Habitat devoid of non-native aquatic species detrimental to Gila chub or habitat in which detrimental non-native species are kept at a level that allows Gila chub to continue to survive and reproduce; and
- PCE 7: Streams that maintain a natural flow pattern including periodic flooding.

Little Colorado Spinedace and Designated Critical Habitat

Legal Status and Description

The Little Colorado spinedace (*Lepidomeda vittata*) was listed as threatened with critical habitat on October 16, 1987 (USFWS 1987). Identified threats were habitat alteration and destruction, predation by and competition with non-native aquatic organisms, and recreational fishery management.

Little Colorado spinedace is a small cyprinid, native to the Little Colorado drainage. The natural history and distribution of the Little Colorado spinedace is covered in detail in the recovery plan (USFWS 1998) and the 5 year Review of Little Colorado Spinedace (USFWS 2008), which also includes a detailed status of the spinedace. This information is incorporated by reference.

Life History and Habitat

The Little Colorado spinedace is found in a variety of habitats (Blinn and Runck 1990, Miller 1963, Nisselson and Blinn 1989). Available information indicates that suitable habitat for the spinedace is characterized by clear, flowing pools with slow to moderate currents, moderate depths, and gravel substrates (Miller 1963, Minckley and Carufel 1967). Cover provided by undercut banks or large rocks is often a feature. Little Colorado spinedace have also been found in pools and flowing water conditions over a variety of substrates, with or without aquatic vegetation, in turbid and clear water (Denova and Abarca 1992, Nisselson and Blinn 1991). Water temperatures in occupied habitats ranged from 58 to 78 ^{o}F (Miller 1963).

Residual pools and spring areas are important refuges during periods of normal low water or drought. From these refuges, Little Colorado spinedace are able to recolonize other stream reaches during wetter periods. This ability to quickly colonize an area has been noted in the literature (Minckley and Carufel 1967) as well as in observations by others familiar with the species. Populations seem to appear and disappear over short time frames and this has made specific determinations on status and exact location of populations difficult. This tendency has been observed by both researchers and land managers (Miller 1963, Minckley 1973) and has led to concerns for the species' survival.

Distribution, Abundance, Population Trends

This fish occurs in disjunct populations throughout much of the Little Colorado River drainage in Apache, Coconino, and Navajo counties. Extensive collections summarized by Miller (1963) indicated that the Little Colorado spinedace had been extirpated from much of the historical range from 1939 to 1960. Although few collections were made of the species prior to 1939, the

species is believed to have inhabited the northward flowing Little Colorado River tributaries of the Mogollon Rim, including the northern slopes of the White Mountains.

Mitochondrial DNA work on the Little Colorado spinedace was initiated in the 1990s and indicated the existence of three sub-groups identifiable by geographic area (Tibbets *et al.* 1994): the East Clear Creek drainage; Chevelon Creek; and the upper Little Colorado River including Nutrioso and Rudd creeks. The study concluded that the genetic patterns seen were likely the result of populations isolated and differentiated by both natural and human-caused events. The East Clear Creek and Chevelon Creek sub-groups are more individually distinctive, likely the result of a higher degree of isolation, and possess unique haplotypes. Individuals from the upper Little Colorado sub- group are more similar to each other. Possibly, until recent time, there was one population with considerable gene flow until various dams and diversions increased local isolation. The cause and exact time of the isolation of the three sub-groups are not known, but Tibbets *et al*. (1994) recommend that all of these populations be maintained to conserve genetic variation in this species.

The Little Colorado spinedace is assumed to still occupy the streams it is known from historically (Chevelon, Silver, Nutrioso, East Clear Creek, and the Little Colorado River). Populations are generally small and the true population size for any occupied stream is unknown due to the yearly fluctuations and difficulty in locating fish. Little Colorado spinedace have a tendency to disappear from sampling sites from one year to the next and may not be found for several years. This ephemeral nature makes management of the species difficult since responses of the population to changes within the watershed cannot be measured with certainty. However, all of the known populations have decreased since 1993 and drought conditions continue to put additional strain on all known populations.

Threats

Threats include habitat alteration and destruction, introduction and spread of exotic predatory and competitive animals (Blinn *et al*. 1993), and chemical manipulation of fish populations in native streams (USFWS 1987, Sweetser *et al*. 2002).

Threats to the Little Colorado spinedace pose a significant challenge to the conservation of the species. Availability of habitats with permanent water in the drainages, particularly East Clear Creek and Chevelon drainages and below Nelson Reservoir is limited due to a variety of factors, including groundwater withdrawals, surface water diversions, dams controlling flows and continuing drought that reduces spring runoff that supports habitat.

The presence of non-native fish species, both coldwater and warmwater species, and crayfish in Little Colorado spinedace habitats have negative effects on spinedace populations. The presence of non-native species was a primary reason for listing the species, and the effects of these species on spinedace through competition and predation varies. Some, such as channel catfish, black bullheads, yellow bullheads, green sunfish, largemouth bass, brown trout, and rainbow trout are likely predators, with fathead minnows, golden shiners, and rainbow trout also competing for food and space. Golden shiners were particularly mentioned as a problem in Chevelon Creek although they have been absent from surveys for the last decade. Crayfish may prey on and compete with spinedace, plus, their activities alter physical habitat conditions through removal of

vegetation and burrowing in the substrate. The recent illegal stockings of largemouth bass, smallmouth bass, green sunfish, yellow bullhead, and yellow perch into headwater lakes in East Clear and Chevelon Creek drainages has added another layer of predators and competitors to the existing degraded condition of the biological environment.

Long-term drought and current and planned water acquisitions are limiting the amount of water available for the fish. Additionally, non-native fishes (rainbow trout, green sunfish) and crayfish compete with spinedace and are predators of them (USFWS, Arizona Ecological Services Field Office).

Habitat loss and fragmentation continue to be serious threats to the fish's existence. Human activities, such as riparian modification and destruction, urban growth, mining, timber harvest, road construction, livestock grazing, and other watershed disturbances (e.g., road construction and maintenance, recreational development and usage, fire management, and inter-basin water diversions) have also had detrimental effects to spinedace habitat. These activities have affected watershed function, runoff patterns, peak flows, seasonal flows, riparian vegetation, wet meadow functions, bank erosion, siltation, and water quality. Introduction of non-native trout, baitfish, and crayfish at recreational lakes and reservoirs have increased competition for available resources and predation on spinedace. In addition, extended drought cycles and increased development of groundwater resources are impacting habitats for spinedace within their historical range. It has become more difficult to find spinedace because drought conditions have reduced available habitat (USFWS 2008).

USFWS (2008) stated that "continued invasion of non-native aquatic species into spinedace habitat and the on-going and future reductions in surface water (due to both drought and surface and groundwater pumping) are threats that are increasing in magnitude, extend to existing spinedace populations, and are contributing factors to the spinedace's continuing decline throughout its range. Within the foreseeable future (50 years) the complete loss of baseflow to the area that supports the largest population of spinedace has been predicted by two different hydrologic models based upon current groundwater pumping; we expect the rate of groundwater pumping to increase in the future as the human population in the area increases. There are very few habitats within the range of the species that are currently able to be occupied due to lack of water or presence of multiple predators, so at this time, recovery options are limited. Areas that are currently able to support spinedace are relatively small, fragmented habitats that frequently have no connection to other habitats due to lack of water."

Conservation, Consultation and Recovery Planning

Our information indicates 42 formal consultations have been completed or are underway for actions affecting Little Colorado spinedace rangewide, but only 4 consultations have been completed for this species on the Coconino NF. All of these biological opinions resulted in non-jeopardy and non-adverse modification determinations, and many resulted in no anticipated incidental take.

Critical Habitat

Forty-four stream miles of critical habitat were designated: 18 miles of East Clear Creek immediately upstream and 13 miles downstream from C.C. Cragin Reservoir (formerly called

Blue Ridge Reservoir) in Coconino County; eight miles of Chevelon Creek in Navajo County; and five miles of Nutrioso Creek in Apache County.

Constituent Elements of Critical Habitat
Constituent elements were identified to include clean, permanent flowing water, with pools and a fine gravel or silt-mud substrate (USFWS 1987).

Loach Minnow Designated Critical Habitat

Critical Habitat
Critical habitat has been designated (March 8, 1994 - 59 FR 10906) and redesignated (April 25, 2000 - 65 FR 24328; March 21, 2007 - 72 FR 13356) in response to legal concerns and policy changes (see summary discussion at 75 FR 66482, p. 66485). The current critical habitat designation was published simultaneously with the reclassification of loach minnow to endangered status on February 23, 2012 (77 FR 10810).

The loach minnow critical habitat designation includes eight units based on river subbasins, including the Verde River, Salt River, San Pedro River, Bonita Creek, Eagle Creek, San Francisco River, Blue River, and Gila River subbasins. Occupancy within these units is described in USFWS (2012). Critical habitat has been designated in each of these subbasins (see USFWS 2012 for additional detail).

Primary Constituent Elements of Critical Habitat
When critical habitat was designated in 2012, FWS determined the PCEs for loach minnow. PCEs include those habitat features required for the physiological, behavioral, and ecological needs of the species. The PCEs describe appropriate flow regimes, velocities, and depths; stream microhabitats; stream gradients; water temperatures; and acceptable pollutant and non-native species levels (see USFWS 2012). PCEs for the loach minnow include:

- PCE 1: Habitat to support all egg, larval, juvenile, and adult loach minnow which includes:
    a. Perennial flows with a stream depth generally less than 3.3 feet, and with slow to swift flow velocities between 0.0 and 31.5 inches per second;
    b. Appropriate stream microhabitat types including pools, runs, riffles, and rapids over sand, gravel, cobble, and rubble substrates with low or moderate amounts of fine sediment and substrate embeddedness;
    c. Appropriate stream habitat with a low gradient of less than approximately 2.5 percent, at elevations below 8,202 feet; and
    d. Water temperatures in the general range of 46.4 to 77 °F;
- PCE 2: An abundant aquatic insect food base consisting of mayflies, true flies, black flies, caddisflies, stoneflies, and dragonflies;
- PCE 3: Streams with no or no more than low levels of pollutants;
- PCE 4: Perennial flows, or interrupted stream courses that are periodically dewatered but that serve as connective corridors between occupied or seasonally occupied habitat and through which the species may move when the habitat is wetted;
- PCE 5: No non-native aquatic species or levels of non-native aquatic species that are sufficiently low as to allow persistence of loach minnow; and

- PCE 6: Streams with a natural, unregulated flow regime that allows for periodic flooding or, if flows are modified or regulated, a flow regime that allows for adequate river functions, such as flows capable of transporting sediments.

Spikedace Designated Critical Habitat

Critical Habitat

Revised critical habitat for spikedace was finalized with the change in its status from threatened to endangered (USFWS 2012). The spikedace critical habitat designation includes eight units based on river subbasins, including the Verde River, Salt River, San Pedro, Bonita Creek, Eagle Creek, San Francisco River, Blue River, and Gila River subbasins (see USFWS 2012 for additional detail on occupancy by subbasin). Critical habitat has been designated in each of these subbasins (see USFWS 2012 for additional detail).

Primary Constituent Elements of Critical Habitat

When critical habitat was designated in 2012, the FWS determined the PCEs for spikedace. PCEs include those habitat features required for the physiological, behavioral, and ecological needs of the species. The PCEs describe appropriate flow regimes, velocities, and depths; stream microhabitats; stream gradients; water temperatures; and acceptable pollutant and non-native species levels (see USFWS 2012). PCEs for the spikedace include:

- PCE 1: Habitat to support all egg, larval, juvenile, and adult spikedace, which includes:
    a. Perennial flows with a stream depth generally less than 3.3 feet, and with slow to swift flow velocities between 1.9 and 31.5 inches per second;
    b. Appropriate stream microhabitat types including glides, runs, riffles, and the margins of pools and eddies, and backwater components over sand, gravel, and cobble substrates with low or moderate amounts of fine sediment and substrate embeddedness;
    c. Appropriate stream habitat with a low gradient of less than approximately 1.0 percent, at elevations below 6,890 feet; and
    d. Water temperatures in the general range of 46.4 to 82.4 °F;
- PCE 2: An abundant aquatic insect food base consisting of mayflies, true flies, black flies, caddisflies, stoneflies, and dragonflies;
- PCE 3: Streams with no or no more than low levels of pollutants;
- PCE 4: Perennial flows, or interrupted stream courses that are periodically dewatered but that serve as connective corridors between occupied or seasonally occupied habitat and through which the species may move when the habitat is wetted;
- PCE 5: No non-native aquatic species or levels of non-native aquatic species that are sufficiently low as to allow persistence of spikedace; and
- PCE 6: Streams with a natural, unregulated flow regime that allows for periodic flooding or, if flows are modified or regulated, a flow regime that allows for adequate river functions, such as flows capable of transporting sediments.

Narrow-Headed Gartersnake and Proposed Critical Habitat

Legal Status and Description
The narrow-headed gartersnake (*Thamnophis rufipunctatus*) was designated a threatened species on July 8, 2014 (USFWS 2014a). Critical habitat was proposed on July 10, 2013 and has not been finalized (USFWS 2013). Please refer to these rules for more in-depth information on the ecology and threats to the species and critical habitat, including references. The final and proposed rules are incorporated herein by reference.

The narrow-headed gartersnake is a small to medium-sized gartersnake with a maximum total length of 44 inches (Painter and Hibbitts 1996). Its eyes are set high on its unusually elongated head that narrows to the snout; and it lacks striping on the dorsum (top) and sides, which distinguish its appearance from other co-occurring gartersnake species (Rosen and Schwalbe 1988). The base color is usually tan or grey-brown (but may darken) with conspicuous brown, black, or reddish spots that become indistinct toward the tail (Rosen and Schwalbe 1988, Boundy 1994). The scales are keeled. Degenhardt *et al*. (1996), Rossman *et al*. (1996), and Ernst and Ernst (2003) further describe the species.

Life History and Habitat
The narrow-headed gartersnake is widely considered to be one of the most aquatic of the gartersnakes (Drummond and Garcia 1983; Rossman *et al*. 1996). This species is strongly associated with clear, rocky streams (Rosen and Schwalbe 1988, Rossman *et al.* 1996). The species has been observed using lake shoreline habitat in New Mexico (Rossman *et al*. 1996).

Narrow-headed gartersnakes have a lower preferred temperature for activity as compared to other species of gartersnakes (Fleharty 1967), which may facilitate their highly aquatic nature in cold streams. Narrow-headed gartersnakes specialize on fish as their primary prey item (Rosen and Schwalbe 1988, Nowak 2006).

Distribution, Abundance, Population Trends
The narrow-headed gartersnake historically ranged across the Mogollon Rim and along its associated perennial drainages from central and eastern Arizona, southeast to southwestern New Mexico (Rosen and Schwalbe 1988; Rossman *et al*. 1996; Holycross *et al*. 2006a and b).

Population densities have noticeably declined in many populations, as compared to previous survey efforts (Holycross *et al*. 2006a and b). Narrow-headed gartersnakes were detected in only 5 of 16 historical localities in Arizona and New Mexico surveyed by Holycross *et al*. (2006a and b) in 2004 and 2005.

Currently, the only remaining narrow-headed gartersnake populations where the species could reliably be found were located at: Whitewater Creek (New Mexico), Tularosa River (New Mexico), Diamond Creek (New Mexico), Middle Fork Gila River (New Mexico), Black River (Arizona) and Oak Creek Canyon (Arizona) (USFWS 2014a). However, the Whitewater-Baldy Complex Fire (June 2012) significantly affected populations found in Whitewater Creek and the Middle Fork Gila River. In 2014, the Slide Fire burned within Oak and West Fork of Oak Creek canyons. Post-fire flooding may impact the native fish and trout populations, which would

affect narrow-headed gartersnakes. If the Whitewater Creek, Middle Fork Gila River, and Oak and West Fork of Oak Creek populations did decline as a result of these fires, only two populations would remain likely viable across their entire distribution. Our most recent review of the population status finds only 6 localities of 46 total rangewide localities known, are considered likely viable; the remaining are considered as likely not viable, or may be extirpated (USFWS 2014a). The status of the narrow-headed gartersnake on tribal land is poorly known, due to limited survey access.

Threats

The occurrence of harmful non-native species, such as the bullfrog (*Lithobates catesbiana*), crayfish (*Orconectes virilis*, *Procambarus clarki*), and numerous species of non-native fish, has contributed to rangewide declines in the narrow-headed gartersnake, and continues to be the most significant threat to this species (USFWS 2014a).

Conservation, Consultation and Recovery Planning

Several Federal actions affect this species every year and require formal section 7 consultation. There have been seven biological opinions that have included the narrow-headed gartersnake. A complete list of all consultations affecting this species can be found here: https://www.fws.gov/southwest/es/arizona/Biological.htm. Survey work and recovery projects also occur periodically, and are summarized in the listing document (USFWS 2014b).

Proposed Critical Habitat

Critical habitat for narrow-headed gartersnake was proposed in six units in Arizona and New Mexico on July 10, 2013 (USFWS 2013). All proposed critical habitat units are considered occupied. Critical habitat units occur in Greenlee, Graham, Apache, Yavapai, Navajo, Gila, and Coconino Counties in Arizona, as well as in Grant, Hidalgo, Sierra, and Catron Counties in New Mexico. Sheep's Crossing is located within the Verde River Subbasin and the Verde River Subunit CHU.

Within these areas, the PCEs of the physical or biological features essential to the conservation of the narrow-headed gartersnake consist of the following four components:

- PCE 1: Stream habitat, which includes:
    a. Perennial or spatially intermittent streams with sand, cobble, and boulder substrate and low or moderate amounts of fine sediment and substrate embeddedness, and that possess appropriate amounts of pool, riffle, and run habitat to sustain native fish populations;
    b. A natural, unregulated flow regime that allows for periodic flooding or, if flows are modified or regulated, a flow regime that allows for adequate river functions, such as flows capable of processing sediment loads;
    c. Shoreline habitat with adequate organic and inorganic structural complexity (e.g., boulders, cobble bars, vegetation, and organic debris such as downed trees or logs, debris jams), with appropriate amounts of shrub-and sapling-sized plants to allow for thermoregulation, gestation, shelter, protection from predators, and foraging opportunities; and

d. Aquatic habitat with no pollutants or, if pollutants are present, levels that do not affect survival of any age class of the narrow-headed gartersnake or the maintenance of prey populations.

- PCE 2: Adequate terrestrial space (600 ft.,182.9 m) lateral extent to either side of bankfull stage) adjacent to designated stream systems with sufficient structural characteristics to support life-history functions such as gestation, immigration, emigration, and brumation;
- PCE 3: A prey base consisting of viable populations of native fish species or soft-rayed non-native fish species; and
- PCE 4: An absence of nonnative fish species of the families Centrarchidae and lctaluridae, bullfrogs (*Lithobates catesbeiamts*), and/or crayfish (*Orconectes virilis*, *Procambarus clarki*, etc.), or occurrence of these nonnative species at low enough levels such that recruitment of narrow-headed gartersnakes and maintenance of viable native fish or softrayed nonnative fish populations (prey) is still occurring.

Critical habitat does not include manmade structures (such as buildings, aqueducts, runways, roads, and other paved areas) and the land on which they are located existing within the legal boundaries on the effective date of this rule.

Northern Mexican Gartersnake and Proposed Critical Habitat

Legal Status and Description

The northern Mexican gartersnake (*Thamnophis eques megalops*) was designated a threatened species under the Act on July 8, 2014 (USFWS 2014a, 79 FR 38678). Please refer to this rule for more in-depth information on the ecology and threats to the species, including references. Critical habitat was proposed on July 10, 2013 (USFWS 2013, 78 FR 41500) and has not yet been designated. Details on proposed critical habitat are provided below. The final listing and proposed critical habitat rules are incorporated herein by reference.

The northern Mexican gartersnake, which reaches up to 44 inches total length, ranges in color from olive to olive-brown or olive-gray with three lighter-colored stripes that run the length of the body, the middle of which darkens towards the tail. It may occur with other native gartersnake species and can be difficult for people without specific expertise to identify because of its similarity of appearance to other native gartersnake species.

Life History and Habitat

The northern Mexican gartersnake is an active predator and is thought to heavily depend upon a native prey base (Rosen and Schwalbe 1988). Northern Mexican gartersnakes forage along vegetated stream banks, searching for prey in water and on land, using different strategies (Alfaro 2002). Primarily, its diet consists of amphibians and fishes, such as adult and larval (tadpoles) native leopard frogs, as well as juvenile and adult native fish (Rosen and Schwalbe 1988). In situations where native prey species are rare or absent, this snake's diet may include non-native species, including larval and juvenile bullfrogs, western mosquitofish (Holycross *et al.* 2006, Emmons and Nowak 2013), or other non-native fishes. In northern Mexican gartersnake populations where the prey base is skewed heavily towards harmful non-native species, recruitment of gartersnakes is often diminished or nearly absent.

Throughout its rangewide distribution, the northern Mexican gartersnake occurs at elevations from 130 to 8,497 feet (Rossman *et al.* 1996) and is considered a "terrestrial-aquatic generalist" by Drummond and Marcías-García (1983). The northern Mexican gartersnake is often found in riparian habitat, but has also been found hiding under cover in grassland habitat up to a mile away from any surface water (Cogan 2015). The subspecies has historically been associated with three general habitat types: 1) source-area wetlands (e.g., Cienegas or stock tanks); 2) large-river riparian woodlands and forests; and 3) streamside gallery forests (Hendrickson and Minckley 1984, Rosen and Schwalbe 1988).

Distribution, Abundance, Population Trends

The northern Mexican gartersnake historically occurred in every county and nearly every subbasin within Arizona, from perennial or intermittent creeks, streams, and rivers as well as lentic wetlands such as cienegas, ponds, or stock tanks (Rosen and Schwalbe 1988, Rosen *et al.* 2001; Holycross *et al.* 2006a and b, Cotton *et al.* 2013). In New Mexico, the gartersnake had a limited distribution that consisted of scattered locations throughout the Upper Gila River watershed in Grant and western Hidalgo Counties (Price 1980, Fitzgerald 1986, Degenhardt *et al.* 1996, Holycross *et al.* 2006a, b). Within Mexico, northern Mexican gartersnakes historically occurred within the Sierra Madre Occidental and the Mexican Plateau, comprising approximately 85 percent of the total rangewide distribution of the subspecies (Rossman *et al.* 1996).

The only viable northern Mexican gartersnake populations in the United States where the subspecies remains reliably detected are all in Arizona: 1) the Page Springs and Bubbling Ponds State Fish Hatcheries along Oak Creek; 2) lower Tonto Creek; 3) the upper Santa Cruz River in the San Rafael Valley; 4) the Bill Williams River; and, 5) the middle/upper Verde River. In New Mexico and elsewhere in Arizona, the northern Mexican gartersnake may occur in extremely low population densities within its historical distribution; limited survey effort is inconclusive to determine extirpation of this highly secretive species. The status of the northern Mexican gartersnake on tribal lands, such as those owned by the White Mountain or San Carlos Apache Tribes, is poorly understood. Less is known about the current distribution of the northern Mexican gartersnake in Mexico due to limited surveys and limited access to information on survey efforts and field data from Mexico.

We have concluded that in as many as 23 of 33 known localities in the United States (70 percent), the northern Mexican gartersnake population is likely not viable and may exist at low population densities that could be threatened with extirpation or may already be extirpated (USFWS files). Only five populations of northern Mexican gartersnakes in the United States are considered likely viable where the species remains reliably detected.

Threats

Natural predators of the northern Mexican gartersnake include birds of prey, other snakes, wading birds, mergansers, belted kingfishers, raccoons, skunks, and coyotes (Rosen and Schwalbe 1988, Brennan *et al.* 2009). Historically, large, highly predatory native fish species such as Colorado pikeminnow may have preyed upon northern Mexican gartersnakes where they co-occurred. Native chubs in their largest size class may also prey on neonatal gartersnakes, but this has not been confirmed in the literature or through field observation.

Harmful non-native species are a significant concern in almost every northern Mexican gartersnake locality in the United States and the most significant reason for their decline. Non-native species can contribute to starvation of gartersnake populations through competitive mechanisms, and may reduce or eliminate recruitment of young gartersnakes through predation. Other threats include alteration of rivers and streams from dams, diversions, flood-control projects, and groundwater pumping that change flow regimes, reduce or eliminate habitat, and favor harmful non-native species; and effects from climate change and drought (USFWS 2014a, 79 FR 38678).

Conservation, Consultation and Recovery Planning

Several Federal actions affect this species every year that require formal section 7 consultation. There have been 15 biological opinions that have included the northern Mexican gartersnake. A complete list of all consultations affecting this species can be found here: https://www.fws.gov/southwest/es/arizona/Biological.htm. Survey work and recovery projects also occur periodically and are summarized in the listing document (USFWS 2014b).

Proposed Critical Habitat

Critical habitat for northern Mexican gartersnake was proposed in 14 subbasin and national wildlife refuge units in Arizona and New Mexico on July 10, 2013 (USFWS 2013) and totals 421,423 acres. In Arizona, proposed critical habitat is located in portions of the Verde, Agua Fria, Bill Williams, Upper Salt, San Pedro, Babocomari, Upper Santa Cruz and Upper Gila rivers, Tonto and Cienega Creeks, Redrock Canyon, and Buenos Aires and San Bernardino National Wildlife Refuges. In New Mexico, proposed critical habitat is located in portions of Mule Creek and the Upper Gila River. Sheep's Crossing is located within the Verde River Subbasin and the Upper Verde River Subunit Critical Habitat Unit (CHU).

Primary Constituent Elements of Critical Habitat

The primary constituent elements of the physical and biological features essential to northern Mexican gartersnake conservation are:

- PCE 1: Aquatic or riparian habitat that includes:
    a. Perennial or spatially intermittent streams of low to moderate gradient that possess appropriate amounts of in-channel pools, off-channel pools, or backwater habitat, and that possess a natural, unregulated flow regime that allows for periodic flooding or, if flows are modified or regulated, a flow regime that allows for adequate river functions, such as flows capable of processing sediment loads; or
    b. Lentic wetlands such as livestock tanks, springs, and cienegas; and
    c. Shoreline habitat with adequate organic and inorganic structural complexity to allow for thermoregulation, gestation, shelter, protection from predators, and foraging opportunities (e.g., boulders, rocks, organic debris such as downed trees or logs, debris jams, small mammal burrows, or leaf litter); and
    d. Aquatic habitat with characteristics that support a native amphibian prey base, such as salinities less than 5 parts per thousand, pH greater than or equal to 5.6, and pollutants absent or minimally present at levels that do not affect survival of

any age class of the northern Mexican gartersnake or the maintenance of prey populations.

- PCE 2: Adequate terrestrial space (600 feet lateral extent to either side of bankfull stage) adjacent to designated stream systems with sufficient structural characteristics to support life-history functions such as gestation, immigration, emigration, and brumation (extended inactivity).
- PCE 3: A prey base consisting of viable populations of native amphibian and native fish species.
- PCE 4: An absence of non-native fish species of the families Centrarchidae and Ictaluridae, bullfrogs, and/or crayfish (*O. virilis, P. clarki*, etc.), or occurrence of these non-native species at low enough levels such that recruitment of northern Mexican gartersnakes and maintenance of viable native fish or soft-rayed, non-native fish populations (prey) is still occurring.

Chiricahua Leopard Frog and Designated Critical Habitat

Legal Status and Description

The Chiricahua leopard frog (*Lithobates [=Rana] chiricahuensis*) was listed as a threatened species without critical habitat in a Federal Register notice dated June 13, 2002 (USFWS 2002, 67 FR 40790). Included was a special rule to exempt operation and maintenance of livestock tanks on non-Federal lands from the section 9 take prohibitions of the Act. Critical habitat was designated in 2012 and includes 44 critical habitat units in Arizona and New Mexico (USFWS 2012, 77 FR 16324). The Chiricahua leopard frog Final Recovery Plan (Recovery Plan) was finalized in April 2007 (USFWS 2007) and is incorporated here by reference.

The frog is distinguished from other members of the *Lithobates pipiens* complex by a combination of characters, including a distinctive pattern on the rear of the thigh consisting of small, raised, cream-colored spots or tubercles on a dark background; dorsolateral folds that are interrupted and deflected medially; stocky body proportions; relatively rough skin on the back and sides; and often green coloration on the head and back (Platz and Mecham 1979). The species also has a distinctive call consisting of a relatively long snore of 1 to 2 seconds in duration (Platz and Mecham 1979, Davidson 1996).

Life History and Habitat

The life history of the Chiricahua leopard frog can be characterized as a complex life cycle, consisting of eggs and larvae that are entirely aquatic and adults that are primarily aquatic, making the species a habitat specialist (USFWS 2007). Eggs are laid from February into October, with most masses found in the warmer months (USFWS 2007). Numbers of eggs in a mass range from 300 to 1,485 (Jennings and Scott 1991) and hatch in 8-14 days, depending on water temperature (USFWS 2007). Tadpoles have a long larval period, from three to nine months, and may overwinter. After metamorphosis, Chiricahua leopard frogs eat an array of invertebrates and small vertebrates and are generally inactive between November and February (USFWS 2007). Males can attain sexual maturity in less than a year (Sredl and Jennings 2005).

Chiricahua leopard frogs can be found active both day and night, but adults tend to be active more at night than juveniles (Sredl and Jennings 2005). Chiricahua leopard frogs presumably

experience very high mortality (greater than 90 percent) in the egg and early tadpole stages, high mortality when the tadpole turns into a juvenile frog, and then relatively low mortality when the frogs are adults (Zug *et al*. 2001, USFWS 2007).

Chiricahua leopard frogs can disperse to avoid competition, predation, or unfavorable conditions (Stebbins and Cohen 1995). Active or passive dispersal (while carried along stream courses) of juveniles or adults to discrete aquatic habitats facilitates the creation and maintenance of metapopulations (USFWS 2007), an important option for a water-dependent frog in an unpredictable environment like the arid Southwest.

For more detailed information on this species, please refer to the Recovery Plan (USFWS 2007), which is the baseline in regard to the current status, biology, and threats to the Chiricahua leopard frog.

Distribution, Abundance, Population Trends

The range of the Chiricahua leopard frog includes central and southeastern Arizona; west-central and southwestern New Mexico; and, in Mexico, northeastern Sonora, the Sierra Madre Occidental of northwestern and west-central Chihuahua, and possibly as far south as northern Durango (Platz and Mecham 1984, Degenhardt *et al*. 1996, Lemos-Espinal and Smith 2007, Rorabaugh 2008). The distribution of the species in Mexico is unclear due to limited survey work and the presence of closely related taxa (especially *Lithobates lemosespinali*) in the southern part of the range of the Chiricahua leopard frog.

Evidence indicates that since the time of listing, the species has probably made at least modest population gains in Arizona, but is apparently declining in New Mexico. Overall in the U.S., the status of the Chiricahua leopard frog is either static or, more likely, improving, with much of the increase attributable to an aggressive recovery program. The effort is showing considerable results on the ground through the reestablishment of populations (mainly in Arizona), captive rearing programs, creation of refugia populations, and enhancement and development of habitat have helped stabilize or improve the status of the species in some areas (USFWS 2011). In Arizona and New Mexico, there are currently two main captive breeding facilities – the Phoenix Zoo and the Ladder Ranch. These programs, in concert with habitat restoration activities occurring across both states, are contributing to range-wide recovery of the frog. Population status and trends in Mexico are unknown. Additional information for the listing and recovery plan are incorporated by reference.

In Arizona, the frog still occurs in seven of eight major drainages of historical occurrence (Salt, Verde, Coronado, San Pedro, Santa Cruz, Yaqui/Bavispe, and Magdalena river drainages), but appears to be extirpated from the Little Colorado River drainage on the northern edge of the species' range.

In New Mexico, the frog historically occurred in west-central and southwestern New Mexico in Catron, Grant, Hidalgo, Luna, Socorro, and Sierra Counties and has been collected or observed at 182 localities over time (Painter 2000). Survey results from the 2004 field season indicate that there are 31 locations where the frog can be considered as likely to occur in New Mexico (R.

Williams, USFWS 2004, unpubl. data; R. Jennings, Western New Mexico University 2005, unpubl. data).

Based on published and unpublished reports and review of Sonora, Mexico collection data from 23 museums, the Chiricahua leopard frog is known from about 26 localities in Chihuahua, Mexico and 19 localities in Sonora (Lemos-Espinal and Smith 2007). *Lithobates [Rana] chiricahuensis* have been reported as far south as the Mexican state of Aguascalientes, but frogs south of central Chihuahua are of questionable identification (USFWS 2007). Based on limited surveys, populations of leopard frogs, gartersnakes, and other native aquatic herpetofauna are generally more intact and non-native predators are much less widely distributed in Sonora and at least parts of Chihuahua (Rosen and Melendez 2010, Lemos-Espinal and Smith 2007, Rorabaugh 2008). However, specifically for the Chiricahua leopard frog, data are insufficient to determine status or trends in Mexico.

The data suggest the status of the Chiricahua leopard frog is at least stable and probably improving in Arizona, declining in New Mexico, and unknown in Mexico. Continued and new aggressive recovery actions are needed to address threats to the species rangewide, to maintain positive trends in Arizona, to stabilize population losses in New Mexico, and to assist partners in Mexico with their conservation efforts. If on-going recovery actions are interrupted, drought worsens, or other threats intensify, the status of the species across its range could easily deteriorate.

Threats

The primary threats to this species are predation by non-native organisms and die-offs caused by a fungal skin disease – chytridiomycosis. The chytridiomycete skin fungus, (*Batrachochytrium dendrobatidis* [*Bd*] is the organism that causes chytridiomycosis) is responsible for global declines of frogs, toads, and salamanders (Berger *et al*. 1998, Longcore *et al*. 1999, Speare and Berger 2000, Hale 2001). Additional threats include: drought, floods, degradation and loss of habitat as a result of water diversions and groundwater pumping; poor livestock management; altered fire regimes; mining, development, and other human activities; disruption of metapopulation dynamics, resulting from an increased chance of extirpation or extinction resulting from small numbers of populations and individuals; and environmental contamination (USFWS 2007). Loss of Chiricahua leopard frog populations is part of a pattern of global amphibian decline, suggesting other regional or global causes of decline may be important as well (Carey *et al*. 2001). Witte *et al*. (2008) analyzed risk factors associated with disappearances of ranid frogs in Arizona and found that population loss was more common at higher elevations and in areas where other ranid population disappearances occurred. Disappearances were also more likely where introduced crayfish occur, but were less likely in areas close to a source population of frogs.

Conservation, Consultation and Recovery Planning

The recovery strategy calls for reducing threats to existing populations; maintaining, restoring, and creating habitat that will be managed in the long-term; translocation of frogs to establish, reestablish, or augment populations; building support for the recovery effort through outreach and education; monitoring; conducting research needed to provide effective conservation and

recovery; and application of research and monitoring through adaptive management (USFWS 2007).

The Recovery Plan identifies eight RUs in Arizona and New Mexico (USFWS 2007). Focus areas, referred to as Management Areas, are identified within each RU. Within Management Areas, sites where metapopulations and robust, isolated populations occur or will be established are referred to as "recovery sites.

Recovery criteria to delist the Chiricahua leopard frog includes: 1) at least two metapopulations located in different drainages, plus at least one isolated and robust population in each RU, 2) protection of these populations and metapopulations, 3) connectivity and dispersal habitat protection, and 4) reduction or elimination of threats and long-term protection. Avoiding loss of populations or other serious adverse effects in a RU will ensure continued contribution of that RU to the recovery of the species.

Existing populations and suitable habitat in Management Areas will be protected by maintaining or improving watershed conditions both upstream and downstream of Chiricahua leopard frog habitats to reduce physical threats to aquatic sites and allow for Chiricahua leopard frog dispersal, reducing or eliminating non-native species, preventing and managing disease, and other actions. Suitable or potentially suitable unoccupied habitat with high potential for supporting Chiricahua leopard frog populations or metapopulations will be protected, and restored or created as needed. These habitats will include aquatic breeding habitats and uplands or ephemeral aquatic sites needed for movement among local populations in a meta-population. Activities to achieve this include habitat management, removal of non-native species, enhancing water quality conditions, reducing sedimentation, and reestablishing populations of Chiricahua leopard frogs.

Critical Habitat

The 2012 final rule for the designation of critical habitat includes 39 critical habitat units across the range of the species in Arizona and New Mexico (USFWS 2012). Through the critical habitat designation process, the FWS determined the PCEs for the Chiricahua leopard frog. We consider the PCEs to be the elements of the physical or biological features that provide for a species' life-history processes and are essential to the conservation of the species.

With the exception of impoundments, livestock tanks, and other constructed waters, critical habitat does not include manmade structures (such as buildings, aqueducts, runways, roads, and other paved areas) and the land on which they are located.

Approximately 31 percent of all critical habitat for the Chiricahua leopard frog is located on five NFs in Region 3 (Coronado, Gila, Tonto, Coconino, and Apache-Sitgreaves NFs). In total, approximately 3,265 acres of critical habitat occurs on these five NFs and the majority of these critical habitat units are represented by populations occupying cattle tanks. The Coconino NF, which is the subject of this BO, includes approximately 1,688 acres of the critical habitat.

Primary Constituent Elements of Critical Habitat

Based on the above needs and our current knowledge of the life history, biology, and ecology of the species, and the habitat requirements for sustaining the essential life-history functions of the species, we have determined that the PCEs essential to the conservation of the Chiricahua leopard frog are:

- PCE 1: Aquatic breeding habitat and immediately adjacent uplands exhibiting the following characteristics:
    a. Standing bodies of fresh water (with salinities less than 5 parts per thousand, pH greater than or equal to 5.6, and pollutants absent or minimally present), including natural and manmade (e.g., stock) ponds, slow-moving streams or pools within streams, off-channel pools, and other ephemeral or permanent water bodies that typically hold water or rarely dry for more than a month. During periods of drought, or less than average rainfall, these breeding sites may not hold water long enough for individuals to complete metamorphosis, but they would still be considered essential breeding habitat in non-drought years.
    b. Emergent and or submerged vegetation, root masses, undercut banks, fractured rock substrates, or some combination thereof, but emergent vegetation does not completely cover the surface of water bodies.
    c. Non-native predators (e.g., crayfish (*Orconectes virilis*), American bullfrogs (*Lithobates catesbeiana*), non-native predatory fishes) absent or occurring at levels that do not preclude presence of the Chiricahua leopard frog.
    d. Absence of chytridiomycosis, or if present, then environmental, physiological, and genetic conditions are such that allow persistence of Chiricahua leopard frogs.
    e. Upland areas that provide opportunities for foraging and basking that are immediately adjacent to or surrounding breeding aquatic and riparian habitat.
- PCE 2: Dispersal and non-breeding habitat, consisting of areas with ephemeral (present for only a short time), intermittent, or perennial water that are generally not suitable for breeding, and associated upland or riparian habitat that provides corridors (overland movement or along wetted drainages) for frogs among breeding sites in a metapopulation with the following characteristics:
    a. Are not more than 1.0 mile overland, 3.0 miles along ephemeral or intermittent drainages, 5.0 miles along perennial drainages, or some combination thereof not to exceed 5.0 miles.
    b. In overland and non-wetted corridors, provides some vegetation cover or structural features (e.g., boulders, rocks, organic debris such as downed trees or logs, small mammal burrows, or leaf litter) for shelter, forage, and protection from predators; in wetted corridors, provides some ephemeral, intermittent, or perennial aquatic habitat.
    c. Are free of barriers that block movement by Chiricahua leopard frogs, including, but not limited to, urban, industrial, or agricultural development; reservoirs that are 50 acres or more in size and contain predatory non-native fishes, bullfrogs, or crayfish; highways that do not include frog fencing and culverts; and walls, major dams, or other structures that physically block movement.

Southwestern Willow Flycatcher and Designated Critical Habitat

Legal Status and Description

The southwestern willow flycatcher (*Empidonax traillii extimus*) (willow flycatcher) was listed as endangered, without critical habitat on February 27, 1995 (USFWS 1995). Critical habitat was designated on January 3, 2013 (USFWS 2013). A final recovery plan for the willow flycatcher was completed in August 2002 (USFWS 2002). The plan describes the reasons for endangerment, current status of the willow flycatcher, addresses important recovery actions, includes detailed issue papers on management issues, and provides recovery goals (USFWS 2002).

The southwestern willow flycatcher is a small grayish-green passerine bird (Family Tyrannidae) measuring approximately 5.75 inches. The song is a sneezy "fitz-bew" or a "fit-a-bew", the call is a repeated "whit." It is one of four currently recognized willow flycatcher subspecies (Phillips 1948, Unitt 1987, Browning 1993). It is a neotropical migrant that breeds in the southwestern U.S. and migrates to Mexico, Central America, and possibly northern South America during the non-breeding season (Phillips 1948, Stiles and Skutch 1989, Peterson 1990, Ridgely and Tudor 1994, Howell and Webb 1995). The historical breeding range of the southwestern willow flycatcher included southern California, Arizona, New Mexico, western Texas, southwestern Colorado, southern Utah, extreme southern Nevada, and extreme northwestern Mexico (Sonora and Baja) (Unitt 1987).

Life History and Habitat

The southwestern willow flycatcher breeding season extends from mid-May to mid-August (Sogge *et al*. 2010). They use dense riparian habitats from sea level in California to approximately 8,500 feet in Arizona and southwestern Colorado. Four basic habitat types can be described for the willow flycatcher: monotypic willow, monotypic exotic, native broadleaf dominated, and mixed native/exotic (Sogge *et al*. 2010).

Tamarisk is an important component of the willow flycatcher's nesting and foraging habitat. In 2002 in Arizona, 80 percent of known willow flycatcher nests were built in a tamarisk (Smith *et al.* 2003). Tamarisk had been believed by some to be a habitat type of lesser quality for the willow flycatcher, however comparisons of reproductive performance (USFWS 2002), prey populations (Durst 2004) and physiological conditions (Owen and Sogge 2002) of willow flycatchers breeding in native and exotic vegetation has revealed no difference (Sogge *et al*. 2010).

The southwestern willow flycatcher's habitat is dynamic and can change rapidly: nesting habitat can grow out of suitability; saltcedar habitat can develop from seeds to suitability in about four to five years; heavy runoff can remove/reduce habitat suitability in a day; or river channels, floodplain width, location, and vegetation density may change over time. The southwestern willow flycatcher's use of habitat in different successional stages may also be dynamic. For example, over-mature or young habitat not suitable for nest placement can be occupied and used for foraging and shelter by migrating, breeding, dispersing, or non-territorial southwestern willow flycatchers (McLeod *et al.* 2005, Cardinal and Paxton 2005).

Distribution, Abundance, Population Trends
Durst *et al.* (2008), the most recent compilation of willow flycatcher breeding sites and territories, reported 288 known breeding sites in California, Nevada, Arizona, Utah, New Mexico, and Colorado (all sites from 1993 to 2007 where a territorial willow flycatcher has been detected) holding an estimated 1,299 territories. It is difficult to arrive at a total of southwestern willow flycatcher territories since not all sites are surveyed annually. Numbers have increased since the bird was listed and some habitat remains unsurveyed; however, after nearly a decade of intense surveys, the existing numbers are just past the upper end of Unitt's (1987) estimate of 20 years ago (500 to 1,000 pairs). About 50 percent of the 1,299 estimated territories throughout its range are located at four general locations: Cliff/Gila Valley; the middle Rio Grande River in New Mexico; Roosevelt Lake and its inflows; and the lower San Pedro River/middle Gila River confluence in Arizona.

Threats
Threats include loss, modification, and fragmentation of riparian breeding habitat, along with a host of other factors including loss of wintering habitat and brood parasitism by the brown-headed cowbird (Sogge *et al.* 1997, McCarthey *et al.* 1998). Habitat loss and degradation are caused by a variety of factors, including urban, recreational, and agricultural development, water diversion and groundwater pumping, channelization, dams, and excessive livestock grazing. Fire is an increasing threat to southwestern willow flycatchers habitat (Paxton *et al.* 1996), especially in monotypic saltcedar vegetation (DeLoach 1991) and where water diversions and/or groundwater pumping desiccates riparian vegetation (Sogge *et al.* 1997). Southwestern willow flycatchers nests can be parasitized by brown-headed cowbirds (*Molothrus ater*), which lay their eggs in the host's nest. Feeding sites for cowbirds are enhanced by the presence of livestock and range improvements such as waters and corrals; agriculture; urban areas; golf courses; bird feeders; and trash areas. When these feeding areas are in close proximity to southwestern willow flycatcher breeding habitat, especially coupled with habitat fragmentation, cowbird parasitism of southwestern willow flycatcher nests may increase (Hanna 1928, Mayfield 1977a, b, Tibbitts *et al.* 1994).

Critical Habitat
When critical habitat was revised in 2013, the FWS determined the PCEs for the southwestern willow flycatcher. PCEs include those habitat features required for the physiological, behavioral, and ecological needs of the species (USFWS 2013).

Primary Constituent Elements of Critical Habitat

- PCE 1: *Riparian vegetation.* Riparian habitat along a dynamic river or lakeside, in a natural or manmade successional environment (for nesting, foraging, migration, dispersal, and shelter) that is comprised of trees and shrubs (that can include Goodding's willow, coyote willow, Geyer's willow, arroyo willow, red willow, yewleaf willow, pacific willow, boxelder, tamarisk, Russian olive, buttonbush, cottonwood, stinging nettle, alder, velvet ash, poison hemlock, blackberry, seep willow, oak, rose, sycamore, false indigo, Pacific poison ivy, grape, Virginia creeper, Siberian elm, and walnut) and some combination of:

a. Dense riparian vegetation with thickets of trees and shrubs that can range in height from about 2 to 30 meters (about 6 to 98 feet.). Lower-stature thickets (2 to 4 meters or 6 to 13 feet. tall) are found at higher elevation riparian forests and tall-stature thickets are found at middle and lower-elevation riparian forests;
b. Areas of dense riparian foliage at least from the ground level up to approximately 4 meters (13 feet.) above ground or dense foliage only at the shrub or tree level as a low, dense canopy;
c. Sites for nesting that contain a dense (about 50 percent to 100 percent) tree or shrub (or both) canopy (the amount of cover provided by tree and shrub branches measured from the ground);
d. Dense patches of riparian forests that are interspersed with small openings of open water or marsh or areas with shorter and sparser vegetation that creates a variety of habitat that is not uniformly dense. Patch size may be as small as 0.1 hectare (0.25 acres) or as large as 70 hectares (175 acres).

- PCE 2: *Insect prey populations.* A variety of insect prey populations found within or adjacent to riparian floodplains or moist environments, which can include: flying ants, wasps, and bees (Hymenoptera); dragonflies (Odonata); flies (Diptera); true bugs (Hemiptera); beetles (Coleoptera); butterflies, moths, and caterpillars (Lepidoptera); and spittlebugs (Homoptera).

Western Yellow-Billed Cuckoo and Proposed Critical Habitat

Additional details on the status of this species and proposed critical habitat are found in the final rule to list the species as threatened (USFWS 2014b, 79 FR 59992) and the proposed rule to designate critical habitat (USFWS 2014a, 79 FR 48548). The discussions of the status of this species in these documents are incorporated herein by reference.

Legal Status and Description

The western DPS of the yellow-billed cuckoo (*Coccyzus americanus)* was listed as a threatened species on October 3, 2014 (USFWS 2014b, 79 FR 59992). Critical habitat was proposed on August 15, 2014 (USFWS 2014a, 79 FR 48548) and has not been finalized. Proposed critical habitat encompasses 546,335 acres across the western United States.

Morphologically, the yellow-billed cuckoos throughout the western continental United States and Mexico are generally larger, with significantly longer wings, longer tails, and longer and deeper bills (Franzreb and Laymon 1993). Birds with these characteristics occupy the Western Distinct Population Segment (DPS) and we refer to them as the "western yellow-billed cuckoo." Only the Western DPS was listed as a threatened species (USFWS 2014b). Yellow-billed cuckoos in the west arrive on the breeding grounds 4 to 8 weeks later than eastern yellow-billed cuckoos at similar latitude (Franzreb and Laymon 1993, Hughes 1999).

Life History and Habitat

Western populations of yellow-billed cuckoos are most commonly found in dense riparian woodlands, consisting primarily of cottonwood (*Populus fremontii*), willow (*Salix* spp.), and mesquite (*Prosopis* spp.), along riparian corridors in otherwise arid areas (Laymon and Halterman 1989, Hughes 1999). Tamarisk may be a component of breeding habitat, but there is

usually a native riparian tree component within the occupied habitat (Gaines and Laymon 1984, Johnson *et al*. 2008, McNeil *et al*. 2013a and b, Carstensen *et al*. 2015). Although cuckoos are most commonly found in gallery riparian forest, in Arizona they may also use narrow bands of riparian woodland (AGFD 2015, Cornell Lab of Ornithology 2016). Adjacent habitat on terraces or in the upland (such as mesquite) can enhance the value of these narrow bands of riparian woodland.

In most of the range, western yellow-billed cuckoos primarily breed in riparian habitat along low-gradient (surface slope less than 3%) rivers and streams, and in open riverine valleys that provide wide floodplain conditions (greater than 325 feet). However, in the Southwest, cuckoos can also breed in higher gradient drainages, and narrower and drier reaches of riparian habitat. Western yellow-billed cuckoos in Arizona will also use areas of mesquite and oak woodlands some distance from riparian gallery forests, including in the mountains of southeastern Arizona. Recent surveys found yellow-billed cuckoos with some regularity in these non-traditional habitats (Corman and Magill 2000; WestLand Resources, Inc. 2011, 2013a, 2013b, 2015a, 2015b, 2015c; Tucson Audubon 2015; MacFarland and Horst 2015, 2016).

Habitat for the western yellow-billed cuckoo in much of its range is largely associated with perennial rivers and streams that support the expanse of vegetation characteristics needed by breeding western yellow-billed cuckoos. Cuckoos may move from one area to another within and between years in response to hydrological conditions. They may also nest at more than one location in a year. Some individuals also roam widely (several hundred miles), apparently assessing food resources before selecting a nest site (Sechrist *et al*. 2012).

In addition to the dense nesting grove, western yellow-billed cuckoos need adequate foraging areas near the nest. Foraging areas can be less dense or patchy with lower levels of canopy cover and may be a mix of shrubs, ground cover, and scattered trees (Carstensen *et al*. 2015, Sechrist *et al*. 2009, USFWS, unpubl. data). Cuckoos often forage in open areas, woodlands, orchards and adjacent streams (Hughes 1999), which include stands of smaller mesquite trees and even tamarisk (Rosenberg *et al*. 1991). In Arizona, adjacent habitat is usually more arid than occupied nesting habitat. This adjacent habitat can be used for foraging where large insects are produced. Habitat types include Sonoran desertscrub, Mojave desertscrub, Chihuahuan desertscrub, chaparral, semidesert grassland, plains grassland, and Great Basin grasslands (Brown and Lowe 1982, Brown 1994, Brown *et al*. 2007).

Distribution, Abundance, Population Trends

Based on historical accounts, the western yellow-billed cuckoo was formerly widespread and locally common in California and Arizona, more narrowly distributed but locally common in New Mexico, Oregon, and Washington and uncommon along the western front of the Rocky Mountains north to British Columbia (AOU 1998, Hughes 1999). The species may be extirpated from British Colombia, Washington, and Oregon (Hughes 1999). The western yellow-billed cuckoo is now very rare in scattered drainages in western Colorado, Idaho, Nevada, and Utah, with single, non-breeding birds most likely to occur (USFWS 2014a, 2014b). The largest remaining breeding areas are in southern and central California, Arizona, along the Rio Grande in New Mexico, and in northwestern Mexico (USFWS 2014b).

In Arizona, the species was a common resident in the (chiefly lower) Sonoran zones of southern, central, and western Arizona (Phillips *et al*. 1964). The yellow-billed cuckoo now nests primarily in the central and southern parts of the state.

Yellow-billed cuckoos spend the winter in South America, east of the Andes, mainly south of the Amazon Basin in southern Brazil, Paraguay, Uruguay, eastern Bolivia, and northern Argentina (Ehrlich *et al*. 1992, AOU 1998). Wintering yellow-billed cuckoos generally use woody lowland vegetation near fresh water. However, wintering habitat of the western yellow-billed cuckoo is poorly known.

Threats

Loss of riparian nesting habitat

The primary threat to the western yellow-billed cuckoo is loss or fragmentation of high-quality riparian habitat suitable for nesting (Corman and Wise-Gervais 2005, USFWS 2014a, 2014b). Habitat loss and degradation results from several interrelated factors, including alteration of flows in rivers and streams, mining, encroachment into suitable habitat from agricultural and other development activities on breeding and wintering grounds, stream channelization and stabilization, diversion of surface and ground water for agricultural and municipal purposes, poorly managed livestock grazing, wildfire, establishment of non-native vegetation, drought, and prey scarcity due to pesticides (Ehrlich *et al*. 1992, USFWS 2014b).

Pesticide impacts

Pesticide use is widespread in agricultural areas in the western yellow-billed cuckoo breeding range in the United States and northern Mexico. Yellow-billed cuckoos have also been exposed to the effects of pesticides on their wintering grounds, as evidenced by DDT found in their eggs and eggshell thinning in the United States (Grocki and Johnston 1974, Laymon and Halterman 1987, Hughes 1999, Cantu-Soto *et al*. 2011). Because much of the species' habitat is in proximity to agriculture, the potential exists for direct and indirect effects to a large portion of the species in these areas through altered physiological functioning, prey availability, and, therefore, reproductive success, which ultimately results in lower population abundance and curtailment of the occupied range (Laymon 1980, Laymon 1998, Hughes 1999, Colyer 2001, Mineau and Whiteside 2013, Hopwood *et al*. 2013, Mineau and Palmer 2013, USFWS 2014b).

Fragmentation

The ongoing threats, including small isolated populations, cause the remaining populations to be increasingly susceptible to further declines and local extirpations through increased predation rates, barriers to dispersal by juvenile and adult yellow-billed cuckoos, chance weather events, fluctuating availability of prey populations, collisions with tall vertical structures during migration, defoliation of tamarisk by the introduced tamarisk leaf beetle (*Diorhabda* spp.), increased fire risk, and climate change events (Thompson 1961, McGill 1975, Wilcove *et al*. 1986).

Climate change

The warmer temperatures already occurring in the southwestern United States may alter the plant species composition of riparian forests over time. An altered climate may also disrupt and change food availability for the western yellow-billed cuckoo if the timing of peak insect

emergence changes in relation to when the cuckoos arrive on their breeding grounds to feed on this critical food source.

Proposed Critical Habitat

The FWS has proposed to designate approximately 546,335 acres of critical habitat in Arizona, California, Colorado, Idaho, Nevada, New Mexico, Texas, Utah, and Wyoming (USFWS 2014a).

Primary Constituent Elements of Proposed Critical Habitat

The PCEs of proposed critical habitat are based on riparian plant species, structure and quality of habitat, and an adequate prey base.

- PCE 1: *Riparian woodlands.* Riparian woodlands with mixed willow-cottonwood vegetation, mesquite-thorn forest vegetation, or a combination of these that contain habitat for nesting and foraging in contiguous or nearly contiguous patches that are generally greater than 325 feet in width and 200 acres or more in extent. These habitat patches contain one or more nesting groves, which are generally willow-dominated, have above average canopy closure (greater than 70 percent), and have a cooler, more humid environment than the surround riparian and upland habitats;
- PCE 2: *Adequate prey base*. Presence of a prey base consisting of large insect fauna (for example, cicadas, caterpillars, katydids, grasshoppers, large beetles, dragonflies) and frogs for adults and young in breeding areas during the nesting season and in post-breeding dispersal areas; and
- PCE 3: *Dynamic riverine processes*. River systems that are dynamic and provide hydrologic processes that encourage sediment movement and deposits that allow seedling germination and promote plant growth, maintenance, health, and vigor (e.g. lower gradient streams and broad floodplains, elevated subsurface groundwater table, and perennial rivers and streams). This allows habitat to regenerate at regular intervals, leading to riparian vegetation with variously aged patches from young to old.

The physical and biological features of yellow-billed cuckoo proposed critical habitat are the principal biological or physical elements essential to yellow-billed cuckoo conservation which may require special management considerations or protection (USFWS 2014b). The proposed critical habitat rule identifies the following physical or biological features of yellow-billed cuckoo habitat to include (USFWS 2014b):

- Rivers and streams of lower gradient and more open valleys with a broad floodplain;
- Presence of abundant, large insect fauna (for example, cicadas, caterpillars, katydids, grasshoppers, large beetles, and dragonflies) and frogs during nesting season;
- Flowing rivers and streams, elevated subsurface groundwater tables, and high humidity;
- Flowing perennial rivers and streams and deposited fine sediments;
- Riparian trees including willow, cottonwood, alder (*Alnus* sp.), walnut (*Juglans* sp.), sycamore (*Platanus* sp.), boxelder (*Acer* sp.), ash (*Fraxinus* sp.), mesquite, and tamarisk that provide cover and shelter for foraging and dispersing yellow-billed cuckoos; and
- Blocks of riparian habitat greater than 200 acres in extent and greater than 325 feet in width, with one or more densely foliaged, willow-dominated nesting sites and cottonwood dominated foraging sites.

Mexican Spotted Owl and Designated Critical Habitat

Legal Status and Description

In 1993, the FWS listed the Mexican spotted owl (*Strix occidentalis lucida*) (hereafter, referred to as Mexican spotted owl, spotted owl, and owl) as threatened under the Act (USFWS 1993, 58 FR 14248). The FWS appointed the Mexican Spotted Owl Recovery Team in 1993, which produced the Recovery Plan for the Mexican spotted owl in 1995 (USFWS 1995). The FWS released the Mexican Spotted Owl Recovery Plan, First Revision (Recovery Plan) in December 2012 (USFWS 2012a, 77 FR 74688). Critical habitat was designated for the spotted owl in 2004 (USFWS 2004, 69 FR 53182).

A detailed account of the taxonomy, biology, and reproductive characteristics of the Mexican spotted owl is found in the Final Rule listing the owl as a threatened species (USFWS 1993), the original Recovery Plan (USFWS 1995), and in the revised Recovery Plan (USFWS 2012a). The information provided in those documents is included herein by reference.

Life History and Habitat

The spotted owl occurs in forested mountains and canyonlands throughout the southwestern United States and Mexico (Gutiérrez *et al*. 1995). It ranges from Utah, Colorado, Arizona, New Mexico, and the western portions of Texas south into several States of Mexico. Although the owl's entire range covers a broad area of the southwestern United States and Mexico, it does not occur uniformly throughout its range. Instead, the Mexican spotted owl occurs in disjunct localities that correspond to isolated forested mountain systems, canyons, and in some cases steep, rocky canyon lands. Known owl locations indicate that the species has an affinity for older, uneven-aged forest, and the species is known to inhabit a physically diverse landscape in the southwestern United States and Mexico.

Distribution, Abundance, Population Trends

Mexican spotted owl surveys since the 1995 Recovery Plan have increased our knowledge of owl distribution, but not necessarily of owl abundance. Population estimates, based upon owl surveys, recorded 758 owl sites from 1990 to 1993, and 1,222 owl sites from 1990 to 2004 in the United States. The Recovery Plan (USFWS 2012a) lists 1,324 known owl sites in the United States. An owl site is an area used by a single or a pair of adult or subadult owls for nesting, roosting, or foraging. The increase in number of known owl sites is mainly a product of new owl surveys being completed within previously unsurveyed areas (e.g., several National Parks within southern Utah, Grand Canyon National Park in Arizona, Guadalupe National Park in West Texas, Guadalupe Mountains in southeastern New Mexico and West Texas, Dinosaur National Monument in Colorado, Cibola National Forest in New Mexico, and Gila National Forest in New Mexico). Thus, an increase in abundance in the species range-wide cannot be inferred from these data (USFWS 2012a). However, we do assume that an increase in the number of areas considered to be occupied is a positive indicator regarding owl abundance.

Threats

Habitat loss – logging, high-severity, stand-replacing fire

Two primary reasons were cited for the original listing of the Mexican spotted owl in 1993: 1) the historical alteration of its habitat as the result of timber-management practices; and, 2) the threat of these practices continuing. The danger of stand-replacing fire was also cited as a looming threat at that time. Since publication of the original Recovery Plan (USFWS 1995), we have acquired new information on the biology, threats, and habitat needs of the Mexican spotted owl. Threats to its population in the U.S. (but likely not in Mexico) have transitioned from commercial-based timber harvest to the risk of stand-replacing wildland fire. Recent forest management has moved away from a commodity focus and now emphasizes sustainable ecological function and a return toward pre-settlement fire regimes, both of which have potential to benefit the spotted owl.

Currently, high-intensity, stand-replacing fires are influencing ponderosa pine and mixed conifer forest types in Arizona and New Mexico. Uncharacteristic, high-severity, stand-replacing wildland fire is probably the greatest threat to the Mexican spotted owl within the action area. As throughout the West, fire severity and size have been increasing within this geographic area. Landscape level wildland fires, such as the Rodeo-Chediski Fire (2002), the Wallow Fire (2011), and the Whitewater-Baldy Complex (2012) have resulted in the loss of tens of thousands of acres of occupied and potential nest/roost habitat across significant portions of the Mexican spotted owl's range.

Livestock grazing, resource extraction, and human recreation

Historical and current anthropogenic uses of Mexican spotted owl habitat include both domestic and wild ungulate grazing, recreation, fuels reduction treatments, resource extraction (e.g., timber, oil, gas), and development. These activities have the potential to reduce the quality of owl nesting, roosting, and foraging habitat, and may cause disturbance during the breeding season. Livestock and wild ungulate grazing is prevalent throughout the range of the owl and is thought to have a negative effect on the availability of grass cover for prey species. Recreation impacts are increasing throughout the Southwest, especially in meadow and riparian areas. There is anecdotal information and research that indicates that owls in heavily used recreation areas are much more erratic in their movement patterns and behavior. Fuels reduction treatments, though critical to reducing the risk of severe wildland fire, can have short-term adverse effects to owls through habitat modification and disturbance. As the human population grows in the southwestern United States, small communities within and adjacent to wildlands are being developed. This trend may have detrimental effects to spotted owls by further fragmenting habitat and increasing disturbance during the breeding season.

Predation and disease

Several fatality factors have been identified as particularly detrimental to the Mexican spotted owl, including predation, starvation, accidents, disease, and parasites. For example, West Nile Virus also has the potential to adversely impact the Mexican spotted owl. The virus has been documented in Arizona, New Mexico, and Colorado, and preliminary information suggests that owls may be highly vulnerable to this disease (Courtney *et al*. 2004). Unfortunately, due to the secretive nature of spotted owls and the lack of intensive monitoring of banded birds, we will

most likely not know when owls contract the disease or the extent of its impact to the owl range-wide.

Climate Change
Global climate variability may also be a threat to the owl. Changing climate conditions may interact with fire, management actions, and other factors discussed above, to increase impacts to owl habitat. Studies have shown that since 1950, the snowmelt season in some watersheds of the western U.S. has advanced by about 10 days (Dettinger and Cayan 1995, Dettinger and Diaz 2000, Stewart et *al*. 2004). Such changes in the timing and amount of snowmelt are thought to be signals of climate-related change in high elevations (Smith *et al*. 2000, Reiners *et al*. 2003). One predicted impact of climate change is the intensification of natural drought cycles and the ensuing stress placed upon high-elevation montane habitats (IPCC 2007, Cook *et al*. 2004, Breshears *et al*. 2005, Mueller *et al*. 2005). The increased stress put on these habitats is likely to result in long-term changes to vegetation, and to invertebrate and vertebrate populations within coniferous forests and canyon habitats that affect ecosystem function and processes.

Critical Habitat
The FWS designated critical habitat for the Mexican spotted owl in 2004 on approximately 8.6 million acres of Federal lands in Arizona, Colorado, New Mexico, and Utah (USFWS 2004). Within the designated boundaries, critical habitat includes only those areas defined as protected habitats (defined as protected activity centers (PACs) and unoccupied slopes >40 percent in the mixed conifer and pine-oak forest types that have not had timber harvest in the last 20 years) and restricted (now called "recovery") habitats (unoccupied owl foraging, dispersal, and future nest/roost habitat) as defined in the 1995 Recovery Plan (USFWS 1995).

Overall, the status of the owl and its designated critical habitat has not changed significantly range-wide in the U.S. (which includes Utah, Colorado, Arizona, New Mexico, and extreme southwestern Texas), based upon the information we have, since issuance of the 2012 LRMP BO for Coconino NF (USFWS 2012b). This indicates that the distribution of owls continues to cover the same area and critical habitat is continuing to provide for the life history needs of the Mexican spotted owl throughout all of the EMUs located in the U.S. We do not have detailed information regarding the status of the Mexican spotted owl in Mexico, so we cannot make inferences regarding its overall status.

Wildland fire has resulted in the greatest loss of PACs and critical habitat relative to other actions (e.g., such as forest management, livestock grazing, recreation, etc.) throughout the U.S. range of the Mexican spotted owl. These wildland fires have mainly impacted Mexican spotted owls within the UGM EMU (e.g., Rodeo-Chediski and Wallow Fires on the Apache- Sitgreaves NF and Whitewater-Baldy Complex on the Gila NF) and BRW EMU (e.g., Horseshoe 2 and Frye Fires on the Coronado NF); but other EMUs have been impacted as well (SRM EMU, the Santa Fe NF by the Las Conchas Fire; CP EMU by the Warm Fire; BRE EMU by the Little Bear Fire). In severely burned areas (e.g. within some areas of the Rodeo-Chediski Fire), owl surveys conducted two or more years following the fire in previously occupied areas, failed to locate Mexican spotted owls (S. Hedwall, pers. comm.). However, we do not know the extent of the effects of these wildland fires on actual owl numbers.

Primary Constituent Elements of Critical Habitat
The primary constituent elements for Mexican spotted owl critical habitat were determined from studies of their habitat requirements and information provided in the Recovery Plan (USFWS 1995). Since owl habitat can include both canyon and forested areas, PCEs were identified in both areas.

The PCEs identified for the owl within mixed-conifer, pine-oak, and riparian forest types that provide for one or more of the owl's habitat needs for nesting, roosting, foraging, and dispersing are:

- PCE 1: Related to forest structure:
    a. A range of tree species, including mixed conifer, pine-oak, and riparian forest types, composed of different tree sizes reflecting different ages of trees, 30 to 45 percent of which are large trees with mean diameter at breast height (4.5 feet above ground) of 12 inches or more;
    b. A shade canopy created by the tree branches covering 40 percent or more of the ground; and
    c. Large, dead trees (snags) with a mean diameter at breast height of at least 12 inches.
- PCE 2: Related to maintenance of adequate prey species:
    a. High volumes of fallen trees and other woody debris;
    b. A wide range of tree and plant species, including hardwoods; and
    c. Adequate levels of residual plant cover to maintain fruits and seeds, and allow plant regeneration.

The PCEs listed above usually are present with increasing forest age, but their occurrence may vary by location, past forest management practices or natural disturbance events, forest-type productivity, and plant succession. These PCEs may also be observed in younger stands, especially when the stands contain remnant large trees or patches of large trees. Certain forest management practices may also enhance tree growth and mature stand characteristics where the older, larger trees are allowed to persist.

Steep-walled rocky canyonlands occur typically within the Colorado Plateau EMU, but also occur in other EMUs. Canyon habitat is used by owls for nesting, roosting, and foraging, and includes landscapes dominated by vertical-walled rocky cliffs within complex watersheds, including many tributary side canyons. These areas typically include parallel-walled canyons up to 1.2 miles in width (from rim to rim), with canyon reaches often 1.2 miles or greater, and with cool north-facing aspects. The PCEs related to canyon habitat include one or more of the following:

- Presence of water (often providing cooler and often higher humidity than the surrounding areas);
- Clumps or stringers of mixed-conifer, pine-oak, pinyon-juniper, and/or riparian vegetation;
- Canyon walls containing crevices, ledges, or caves; and,
- High percent of ground litter and woody debris.

Ms. Laura Jo West, Forest Supervisor

Arizona Cliffrose

Legal Status and Description

Arizona cliffrose (*Purshia subintegra*) was listed as endangered under the Act on May 29, 1984 (USFWS 1984). Critical habitat has not been designated. The Arizona Cliffrose Recovery Plan (Recovery Plan) was completed in 1995 (USFWS 1995) and a 5-year Review was completed in 2013 (USFWS 2013).

Arizona cliffrose is a long-lived, xerophytic, edaphic endemic woody perennial in the family *Rosaceae*. Plants are of low stature and open growth form compared with its congener Stansbury cliffrose (*P. stansburiana*). Flowers are perfect and pollination can occur on any of the first three days of anthesis. Experiments have shown that this species is partially self-compatible, but sets significantly more seeds and produces fruit more often when outcrossed (Fitts *et al.* 1993). Arizona cliffrose generally flowers from late March through early May and is visited by a wide variety of insects, including lepidopterans, dipterans, and bees. Native and introduced honeybees (*Apis mellifera*) are the most important pollinators, the latter becoming the predominant pollinator later in the flowering season (Fitts *et al.* 1993). Fruit dispersal occurs when summer rains dislodge seeds from plants (USFWS 1995). Flower and seed production varies between years based on climatic conditions, plant vigor, browsing, and other factors. Typically hundreds of flowers are produced on each mature plant, which can reproduce for many years (USFWS 1995). Other life history traits, such as age at first reproduction, gross and net reproductive rates, and longevity, are unknown (USFWS 1995).

Habitat

This species has narrow habitat requirements and occurs in four widely separated areas in central Arizona: near Bylas (Graham County), the Horseshoe Lake vicinity (Maricopa County), near Burro Creek (Mohave County), and near Cottonwood in the Verde Valley (Yavapai County) (Rutman 1992). These sites differ slightly in elevation and associated vegetation, but all sites have limestone soils (generally white but also reddish in color) derived from Tertiary lakebed deposits, and at each site Arizona cliffrose is part of a locally unique vegetative community (Anderson 1993).

The geographic and local distribution of Arizona cliffrose appears to be limited by competition from other plant species rather than a requirement for a specific soil type. At all four widely-separated locations, Arizona cliffrose is restricted to limestone-tuff soils derived from Tertiary lacustrine (lakebed) deposits. These soils are relatively infertile and have significantly lower amounts of phosphorus and organic matter compared with surrounding areas where Arizona cliffrose is absent (Anderson 1986, Anderson 1993). These surrounding areas are typically dominated by creosotebush (*Larrea tridentata*), which is thought to have a competitive advantage over Arizona cliffrose due to its aggressive seedling establishment (Anderson 1993). Creosotebush is unable to grow on the relatively infertile lacustrine soils. However, it has been found growing together with Arizona cliffrose in the Verde Valley, in areas with higher amounts or organic matter and phosphorus. This suggests that the distribution of Arizona cliffrose is limited primarily by competition from creosotebush, rather than a requirement for specific soil properties (Anderson 1986, Anderson 1993).

Distribution, Abundance, Population Trends
Arizona cliffrose populations in the state are genetically variable, exhibit phenotypic plasticity in response to environmental conditions, and hybridize with common cliffrose. These factors have complicated taxonomic identification and quantification of population sizes. Phenotypic and genetic variability between populations has been studied using morphometrics and DNA analysis. These studies, which are summarized in the Recovery Plan, indicate that *P. subintegra* is distinct from the more common *P. stansburiana*, despite sometimes overlapping plant characteristics (USFWS 1995). Introgression or hybridization between *P. subintegra* and the more common *P. stansburiana* has resulted in hybrid swarms in the Tonto Basin and Verde Valley of central Arizona (USFWS 1995). Hybrid plants were found in areas supporting Arizona cliffrose along Mingus Avenue south of the project area and appear to grow more readily in disturbed areas (USFWS 2001). The proliferation of hybrids has the potential to negatively affect long-term population dynamics of Arizona cliffrose through loss of genetic integrity (Fitts *et al.* 1993).

The total population size of Arizona cliffrose is not known. Not all areas of potential habitat have been surveyed, and in some areas (e.g., Cottonwood/Verde Valley population) the presence of hybrids or introgressed forms has made quantification of total numbers difficult (USFWS 2001). Total population size for all four sites was estimated to exceed 40,000 plants, although a large percentage may include hybrids (USFWS 1988).

Reproductive output is potentially large, but recruitment rates vary among populations. No demographic studies have been completed in any populations to determine whether recruitment rates are sufficient to maintain or increase population sizes (USFWS 1995). The Cottonwood population appears to have the most recruitment and is likely to be the most stable, while the other populations appear to have poor recruitment (USFWS 1995). When the species was listed, the Burro Creek and Bylas populations were found to lack fertile seeds and have low seedling recruitment, suggesting that reproduction was inadequate to maintain the existing population size (USFWS 1984). Factors potentially affecting reproductive output include browsing by animals; climatic conditions that influence fruit production, seed viability, and seedling recruitment; and ground-disturbance that affect seedling and adult survival.

Threats
Arizona cliffrose is subject to browsing by livestock and wildlife, which may affect its reproductive output. Plants are browsed by livestock, deer, and wild burros, which preferentially select tender seedlings, new growth, and branches with flowers and developing fruit and may therefore reduce plant vigor, reproduction, and seedling establishment (Bingham 1976, Phillips *et al.* 1980, USFWS 1984, Phillips 1986, Denham 1992, Rutman 1992, USFWS 1995). This relatively palatable shrub often receives moderate to heavy grazing pressure when exposed to ungulate herbivores, particularly in the vicinity of water sources and frequently used trails (Bingham 1976, Phillips *et al.* 1980, Reichenbacher 1987). Tender seedlings, new growth, and branches with flowers and developing fruit are preferentially selected (Bingham 1976, Denham 1992). Observations and preliminary data analysis of Bureau of Land Management (BLM) exclosure studies on the Burro Creek population indicate that consistent yearly browsing pressure may have reduced the vigor and/or form-size class of the remaining plants. Reduced vigor may result in less than optimal reproductive success, and the presence of livestock is also

thought to reduce seedling establishment (USFWS 1995). The extent to which browsing has altered successful reproduction in any Arizona cliffrose population has not been quantified (USFWS 2001). However, the studies conducted at Burro Creek showed that exclusion of livestock reduced browsing of Arizona cliffrose from 65% to between 16 and 18%. The relatively low levels of browsing following exclusion of livestock and burros were attributed to mule deer and other wildlife (USFWS 1995).

Primary threats to the species include grazing by wildlife, livestock and feral burros, mining, road and utility development, recreational developments, off-highway vehicle (OHV) use, mining and exploration for bentonite; road maintenance and construction activities, and urban development (USFWS 1991, 2001).

The Kingman Resource Management Plan (BLM 1993) was approved in 1995 and established the 1,119-acre Clay Hills Area of Critical Environmental Concern (ACEC; USFWS 2004). Approximately 98% of the Arizona cliffrose population at Burro Creek occurs within the fenced-off portion of the ACEC. Only a small population of about 100 plants several miles from the main population is located outside the ACEC (John Anderson, BLM, pers. comm., 2005).

U.S. Highway 70, which bisects the Bylas population. No special land management designations or other special protections are afforded this population, although the Arizona Department of Transportation (ADOT) agreed to contact the FWS regarding any activities potentially affecting Arizona cliffrose in this area (USFWS 1984).

The Horseshoe Lake population includes several subpopulations and is found on the Tonto National Forest. This population was the subject of a biological opinion issued on March 10, 1987 for the Central Arizona Water Control Study Plan 6. This biological opinion determined that 250 plants would be affected due to construction and operation of the Cliff Dam (33 percent of the Horseshoe Lake population, USFWS 1987), although the dam was never constructed (USFWS 2001). Increased recreation from the development of a Forest Service recreation area may pose a threat to the Lime Creek subpopulation (AGFD 2001).

The Verde Valley (or Cottonwood) Arizona cliffrose population is the largest and occurs on lands administered by the Coconino NF, Arizona State Parks, Arizona State Land Department, and privately-held lands. Threats to this population include grazing by livestock and wildlife, road development and maintenance, urban development, and recreation (USFWS 2001).

ENVIRONMENTAL BASELINE

The environmental baseline includes past and present impacts of all Federal, State, or private actions in the action area, the anticipated impacts of all proposed Federal actions in the action area that have undergone formal or early section 7 consultation, and the impact of State and private actions that are contemporaneous with the consultation process. The environmental baseline defines the current status of the species and its habitat in the action area to provide a platform to assess the effects of the action now under consultation.

Description of the action area
The action area is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). In delineating the action area, we evaluated the farthest reaching physical, chemical, and biotic effects of the action on the environment. As stated previously, the action area for this PBO/PCO is defined as all Forest Service-administered lands within the Coconino NF's ranger districts: Flagstaff, Red Rock and Mogollon Rim, as well as all adjacent lands that could be directly or indirectly affected by the actions.

Population Growth
The U.S. Census predicts that Arizona will be the second fastest growing state in the country through 2030, adding an additional 5.6 million people (U.S. Census 2005). During the 2010 Census, Arizona maintained its standing as having the second fastest population growth rate by growing more than 20 percent between 2000 and 2010 (Pollard and Mather 2010). If these predictions hold true, listed species and their habitats will be affected, due to habitat fragmentation from continued rural development and infrastructure, and increased human demand for surface and ground water and decreased supply. Use of water for agriculture is Arizona's largest water demand. Surrounding most of Arizona's developed areas groundwater is pumped out faster than the aquifer can recharge, resulting in more dependence on freshwater sources from nearby rivers (U.S. Environmental Protection Agency 2011). Continued groundwater pumping will further stress water supply that support surface water in rivers, creeks, springs, and seeps.

Climate Change
Several climate-related trends have been detected since the 1970s in the southwestern U.S. including increases in surface temperatures, rainfall intensity, drought, heat waves, extreme high temperatures, and average low temperatures (Overpeck 2008). Annual precipitation amounts in the southwestern U.S. may decrease by 10 percent by the year 2100 (Overpeck 2008).

Kundzewicz *et al*. (2007) state that of all ecosystems, freshwater ecosystems will have the highest proportion of species threatened with extinction due to climate change. High temperatures suppress appetite and growth, foster disease, can influence behavioral interactions with other fish (Schrank *et al*. 2003), or be lethal (McCullough 1999). Increased stress from elevated temperatures could lead to greater susceptibility to disease, as well as reduced reproductive success and lower oxygen levels.

Streamflow is predicted to decrease in the Southwest even if precipitation were to increase moderately (Nash and Gleick 1993, State of New Mexico 2005, Hoerling and Eischeid 2007). Winter and spring warming causes an increased fraction of precipitation to fall as rain, resulting in a reduced snow pack, an earlier snowmelt, and decreased summer base flow (Christensen *et al*. 2004, Stewart *et al*. 2005, Regonda *et al*. 2005). The effect of decreased streamflow is that streams become smaller, intermittent or dry, and thereby reduce the amount of habitat available for aquatic species. A smaller stream is affected more by air temperature than a larger one, exacerbating the effects of warm and cold air temperatures (Smith and Lavis 1975). In addition, fish isolated in pools may be subject to increased predation from terrestrial predators.

Another documented effect of climate change is a shift of the timing of spring snowmelt. Stewart *et al.* (2005) show that timing of spring streamflow in the western U.S. during the last five decades has shifted so that the major peak now arrives one to four weeks earlier, resulting in less flow in the spring and summer. Rauscher *et al*. (2008) suggest that with air temperature increases from 37 to 41 °F, snowmelt driven runoff in the western U.S. could occur as much as two months earlier than present. Changes in the hydrograph could potentially alter fish assemblages.

Extreme events such as drought, fires, and floods are predicted to occur more frequently because of climate change (IPCC 2007). It is anticipated that an increase in extreme events will most likely affect populations living at the edge of their physiological tolerances. The predicted increases in extreme temperature and precipitation events may lead to dramatic changes in the distribution of species or to their extirpation or extinction (Parmesan and Matthews 2006).

Current predictions of drought and/or higher winter low temperatures may also stress ponderosa pine forests in which many of the listed species discussed in this consultation occurs. Ganey and Vojta (2010) studied tree mortality in mixed conifer and ponderosa pine forests in Arizona from 1997-2007, a period of extreme drought. They found the mortality of trees to be severe; the number of trees dying over a five-year period increased by over 200 percent in mixed-conifer forest and by 74 percent in ponderosa pine forest during this time frame (Ganey and Vojta 2010). Ganey and Vojta (2010) attributed drought and subsequent insect (bark beetle) infestation for the die-offs in trees.

Drought stress and a subsequent high degree of tree mortality from bark beetles make high elevation forests more susceptible to unnaturally intense wildfires. Warming trends, and fuel load accumulations will support larger, frequent severe wildfires in the southwest. Severity will also be influenced by a predicted reduction in snowpack and an earlier snowmelt (Fulé 2010). Wildfires are expected to reduce vegetative cover, increase soil erosion from increased droplet splash-erosion, and reduced infiltration capacity, subsequently resulting in changes to terrestrial habitat conditions and increased sediment flows in streams (Fulé 2010).

Gila Chub and Designated Critical Habitat

A. Status of the species and critical habitat within the action area

On the Coconino NF in Arizona, there are three known populations of Gila chub. Gila chub populations are known to occur in three tributaries to the Verde River: Walker Creek, Red Tank Draw, and Spring Creek.

Critical habitat

There is only one designated CH area on the Coconino NF. This is Area 6 - Upper Verde River, Yavapai County, Arizona, includes Walker Creek, Red Tank Draw, Spring Creek, and Williamson Valley Wash. Walker Creek, Red Tank Draw, and Spring Creek are within designated CH on the Coconino NF. The Coconino NF contains 10.5 miles of designated CH for Gila chub.

B. Factors affecting the species and critical habitat within the action area

On the Coconino NF, past and present federal, state, private, and other human activities that may affect Gila chub and their habitat include road construction and maintenance, timber harvest, sportfish stocking, livestock grazing, prescribed burning, wildfires, non-native species and any other habitat alterations. We describe activities that have occurred within the Coconino NF to qualify the environmental baseline.

Livestock grazing

Historically improper livestock grazing and logging likely contributed to habitat modifications noted by Miller (1950). Improper livestock grazing has been shown to increase soil compaction, decrease water infiltration rates, increase runoff, change vegetative species composition, decrease riparian vegetation, increase stream sedimentation, increase stream water temperature, decrease fish populations and change channel form (Meehan and Platts 1978, Kauffman and Kruger 1984, Schulz and Leininger 1990, Platts 1991, Fleischner 1994, Ohmart 1996). Upland watershed condition is also important because soil compaction, changes in percent cover, and vegetative type can influence the timing and amount of water delivered to stream channels (Platts 1991, Ohmart 1996, Belsky and Blumenthal 1997). On Coconino NF today, livestock grazing is managed through allotment management plans, annual operating instructions, and in accordance with LRMP standards and guidelines.

Timber harvest

Logging activities in the early to mid-1900s likely also caused major changes in watershed characteristics and stream morphology (Chamberlin *et al*. 1991). Early logging efforts were often concentrated along canyon bottoms with perennial streams. Tree removal along perennial streams within the historical range of Gila chub likely altered water temperature regimes, sediment loading, bank stability, and availability of large woody debris (Chamberlin *et al*. 1991).

Non-native species

Perhaps the most serious threat to Gila chub is predation by and competition with non-native organisms, including numerous non-native fish species, bullfrogs, and crayfish. Non-native fish found in Gila chub habitat include channel catfish (*Ictalurus punctatus*), flathead catfish (*Pylodictis olivaris*), red shiner (*Cyprinella lutrensis*), fathead minnow (*Pimephales promelas*), green sunfish (*Lepomis cyanellus*), western mosquitofish (*Gambusia affinis*), rainbow trout (*Oncorhynchus mykiss*), and common carp (*Cyprinus carpio*) (Marsh *et al.* 1991, Weedman *et al*. 1996).

Post-Fire Flooding

Floods that occur after intense wildfires that have denuded the watershed are a threat. Several streams occupied by Gila trout have had populations extirpated as a result of ash flows from floods after fire (Rinne 1996, Brown *et al*. 2001). Consequently, an increase in rain or snow events, intense precipitation that is unseasonable or heavy precipitation that occurs after fire, could extirpate affected Gila chub. Because Gila chub are now found primarily in isolated, small streams, avoidance of possible post-fire ash flows may be impossible and opportunities for natural recolonization usually do not exist, as documented for Gila trout (Brown *et al*. 2001). Persistence of Gila chub in streams affected by fire and subsequent ash flows depend on management actions.

Severe wildfires capable of extirpating or decimating fish populations are a relatively recent phenomena and result from the cumulative effects of historical or ongoing grazing, which removes the fine fuels needed to carry fire and fire suppression (Madany and West 1983, Savage and Swetnam 1990, Swetnam 1990, Touchan *et al*. 1995, Swetnam and Baisan 1996, Belsky and Blumenthal 1997, Gresswell 1999). Cooper (1960) concluded that prior to the 1950s crown fires were extremely rare or nonexistent in the region.

Little Colorado Spinedace and Designated Critical Habitat

A. Status of the species and critical habitat within the action area
The Little Colorado spinedace occurs in the East Clear Creek Watershed on the Coconino NF. The occupied creeks eventually flow into the Little Colorado River. Critical habitat within the Coconino NF includes East Clear Creek approximately 18 miles from Leonard Canyon upstream to Blue Ridge Reservoir, and approximately 13 miles from the upper end of Blue Ridge Reservoir upstream to Potato Lake.

B. Factors affecting the species and critical habitat within the action area
Recent impacts to the species are due to drought, and non-native species. Livestock and wild ungulate grazing have also been identified as contributing to poor watershed conditions which exacerbate the effects of drought and result in diminished habitat quality.

Loach Minnow Designated Critical Habitat

A. Status of critical habitat within the action area
Critical habitat on the Coconino NF includes portions of the Verde River, and the lower portions of Oak Creek, Beaver/Wet Beaver Creeks, and Fossil Creek. Verde River Subbasin, Yavapai County, Arizona:

- Verde River for approximately 73.6 miles, extending from the confluence with Beaver and Wet Beaver Creek upstream to Sullivan Dam. This mileage does not include the 0.8 miles belonging to the Yavapai-Apache Nation, which is excluded from this designation.
- Granite Creek for approximately 2.0 miles, extending from the confluence with the Verde River upstream to a spring at Township 17 North, Range 2 West, Section 13.
- Oak Creek for approximately 33.7 miles, extending from the confluence with the Verde River upstream to the confluence with an unnamed tributary on the south at Township 17 North, Range 5 East, Section 24.
- Beaver Creek and Wet Beaver Creek for approximately 20.7 miles, extending from the confluence with the Verde River upstream to the confluence with Casner Canyon. This mileage does not include the 0.1 mile belonging to the Yavapai-Apache Nation, which is excluded from this designation.
- Fossil Creek for approximately 13.8 miles from its confluence with the Verde River upstream to the old Fossil Diversion Dam site.

B. Factors affecting critical habitat within the action area
Loach minnow designated critical habitat may be affected on NFs by water use, watershed conditions, stormwater runoff, non-native aquatic species, livestock grazing, timber harvest,

mineral development, wildfire, recreational activities, road development and maintenance, and other habitat alterations.

Spikedace Designated Critical Habitat

A. Status of critical habitat within the action area

All critical habitat on the Coconino NF is in the Verde River subbasin:

- Verde River for approximately 105.9 miles, extending from the confluence with Fossil Creek upstream to Sullivan Dam. This mileage does not include the 0.8 mile belonging to the Yavapai-Apache Nation, which is excluded from this designation.
- Granite Creek for approximately 2.0 miles, extending from the confluence with the Verde River upstream to a spring in Township 17 North, Range 2 West, southwest quarter of the southwest quarter of Section 13.
- Oak Creek for approximately 33.7 miles, extending from the confluence with the Verde River to the confluence with an unnamed tributary from the south in Township 17 North, Range 5 East, southeast quarter of the northeast quarter of Section 24.
- Beaver Creek/Wet Beaver Creek for approximately 20.7 miles, extending from the confluence with the Verde River to the confluence with Casner Canyon. This mileage does not include the 0.1 mile belonging to the Yavapai-Apache Nation and excluded from these designations.
- West Clear Creek for approximately 6.8 miles, extending from the confluence with the Verde River upstream to the confluence with Black Mountain Canyon.
- Fossil Creek for approximately 13.8 miles from its confluence with the Verde River upstream to the old Fossil Diversion Dam site.

B. Factors affecting critical habitat within the action area

Spikedace designated critical habitat may be affected by water use, watershed conditions, stormwater runoff, non-native aquatic species, livestock grazing, timber harvest, mineral development, wildfire, recreational activities, road development and maintenance, and other habitat alterations.

Narrow-headed Gartersnake and Proposed Critical Habitat

A. Status of the species and proposed critical habitat within the action area

Verde River Subbasin Unit

In the Upper Verde River, above Horseshoe Dam, there are several, recent and vouchered records of the narrow-headed gartersnakes (Holycross *et al.* 2006a). In 2010, a neonatal narrow-headed gartersnake was observed near Prospect Point and another (age not specified) was possibly seen (Emmons *et al.* 2011; Emmons and Nowak 2012a; Emmons and Nowak 2012b). Two additional records (neonate and sub-adult) were reported in this same area in 2012 (Emmons 2012, pers. comm.).

The Verde River upstream of Horseshoe Dam supports both native and non-native fish communities, with at least six species of native fish having been reported (Turner and List 2007; Emmons and Nowak 2012b). The upper Verde River appears to generally transition from native to non-native in the downstream direction, to Horseshoe Dam (Voeltz 2002; Holycross *et al.*

2006a). Numerous researchers have documented non-native, spiny-rayed species such as channel catfish, flathead catfish, and smallmouth basin the Verde River (Minckley 1993; Jahrke and Clark 1999; Rinne 2004; Bahm and Robinson 2009; Robinson and Crowder 2009). The Verde River represents a large, complex, and difficult area to survey, but recent records document that at least a low-density, but reproducing, population of narrow-headed gartersnakes occurs within this reach.

Oak Creek supports the most robust and well-studied population of narrow-headed gartersnakes in Arizona, Oak Creek boasts approximately 176 historical and recent records dating back to 1912, and represents the locality where over 80 percent of all Arizona specimens were collected (Holycross *et al.* 2006a). Brennan and Rosen (2009) surveyed Oak Creek in 2009, with a total investment of effort equaling approximately 132 person-search hours, which resulted in the capture of 72 narrow-headed gartersnakes. Survey results, from the lower-most transect near Midgely Bridge, confirmed that the narrow-headed gartersnake continues to exist at very low densities in lower Oak Creek (Brennan and Rosen 2009). Nowak and Santana-Bendix (2002) documented a shift in Oak Creek from a largely native fish community upstream of Midgely Bridge to a community dominated by non-native, spiny-rayed fish species downstream of Midgely Bridge. Bullfrogs and crayfish occur in the lower reach of Oak Creek (Nowak 2006) and crayfish densities grade from low to high in the downstream direction from Slide Rock State Park (Brennan and Rosen 2009). Narrow-headed gartersnake populations reach their highest densities in the upper-most reaches of Oak Creek Canyon, including West Fork Oak Creek and its confluence with Oak Creek. Downstream of that reach, population densities gradually decrease until Midgely Bridge, where the species is very rarely detected (Nowak 2006). From Midgely Bridge downstream to the confluence with the Verde River, narrow-headed gartersnakes likely exist as a low, to very low density population, but is likely supported by occasional emigrants from Oak Creek Canyon or from the Verde River.

In the East Verde River we are aware of a single historical museum record in 1981 (Holycross *et al.* 2006a, Appendix C) of narrow-headed gartersnakes from the East Verde River, but numerous observation records are reported from 1985–1986 (n=12) (Rosen and Schwalbe 1988) and 1992 (n=1) (Sredl *et al.* 1995). These records indicate the species once occurred in the East Verde River, but has apparently declined. Native fish species persist (Voeltz 2002) in the presence of non-native, spiny-rayed fish and abundant crayfish.

B. Factors affecting the species and critical habitat within the action area

The narrow-headed gartersnake and its proposed critical habitat are affected by activities within the Verde River watershed. Non-native aquatic species are the primary factor affecting gartersnakes within the Verde River. Non-native fish species dominate the fish community throughout the Verde River and are a major limiting factor in native aquatic species occurrence because of predation and competition (Hendrickson 1993; Rinne and Stefferud 1998; Bonar *et al*. 2004). Based on data from1987 to 2003, non-native fish species generally comprised 70 to 80 percent of the fish community in the upper Verde River (Rinne 2004).

Other factors include but are not limited to: water diversions or other water-related actions that decrease water quantity and quality that would limit native fish needed in gartersnake diets; improper livestock grazing levels if it reduces habitat quality for native fish or riparian habitat

structure needed by gartersnakes; unauthorized off road vehicle use in riparian corridors, and intentional or unintentional killing of snakes by forest visitors.

Northern Mexican Gartersnake and Proposed Critical Habitat

A. Status of the species and proposed critical habitat within the action area
Verde River Subbasin Unit
Above Horseshoe Dam, several historical and current records exist for northern Mexican gartersnakes (Holycross *et al.* 2006a). Surveys for the northern Mexican gartersnake documented one northern Mexican gartersnake referenced below (Holycross *et al*. 2006a). Recent records include two northern Mexican gartersnake neonates from Tuzigoot National Monument in 2009 and 2010 (Nowak, 2011, pers. comm.; Nowak *et al*. 2011), an adult female and juvenile male from the Verde River just downstream of the Interstate 17 crossing in 2012 (Emmons 2012, pers. comm.), and several records from Dead Horse Ranch State Park in 2004 and 2012 (Holycross *et al*. 2006a; Nowak 2012, pers. comm.). Emmons and Nowak (2012) conducted the most recent sampling effort for northern Mexican gartersnakes in the upper Verde River area; from May – September 2012. The five sites surveyed along the Verde River in this effort were Dead Horse Ranch State Park; Pecks Lake on Freeport McMoRan property; Tavasci Marsh in Tuzigoot National Monument; the Verde River at the Salt River Project property east of the Interstate 17 bridge; the Verde River Greenway adjacent to Deadhorse Ranch State Park; and Tuzigoot National Monument, resulting in the combined capture of 49 individual northern Mexican gartersnakes (Emmons and Nowak 2012). Detailed survey results are provided in Emmons and Nowak (2012).

The uppermost historical record from the Verde River appears to be in the proximity of Sycamore Creek, but less survey effort has been made in the reach upstream of there. The Verde River upstream of Horseshoe Dam supports both native and non-native aquatic communities and the fish community appears to generally transition from native to non-native in the downstream direction in this reach (Voeltz 2002; Holycross *et al*. 2006a). The Verde River represents a large, complex, and difficult area to survey for a secretive species such as the northern Mexican gartersnake, but these records document that at least a low-density, but reproducing and potentially viable, northern Mexican gartersnake population occurs within the upper Verde River.

Historical and recent records from Oak Creek include a 1975 record from near Midgely Bridge, numerous, recent records from the Page Springs and Bubbling Ponds State Fish Hatcheries located adjacent to Oak Creek, and two specimens observed in Oak Creek in 2012 at the Page Spring Cellars and Vineyard; the latter two locations are downstream of Midgely Bridge (Rosen and Schwalbe 1988; Holycross *et al.* 2006a; Boyarski 2011; Nowak, 2012, pers. comm.; Emmons and Nowak 2013). Oak Creek is comprised of two general sections: (1) the upper portion, above Midgely Bridge within Oak Creek Canyon, where Oak Creek is a steep-walled, canyon-bound stream that alternates between riffles, pools, and runs, with occasional side channels and backwaters; and (2) a lower portion, downstream of Midgely Bridge, that is dominated by runs and pools with more sinuosity and a wider floodplain (Nowak and Santana-Bendix 2002). Within Oak Creek Canyon, there are no known records for the northern Mexican

gartersnake above Midgely Bridge, despite considerable survey attention on the narrow-headed gartersnake over the past two decades.

The population of northern Mexican gartersnakes at the Page Springs State Fish Hatchery appears stable despite an abundant bullfrog population there as well as documented predation by largemouth bass (Young and Boyarski 2013), possibly as a result of heavily vegetated habitat that may provide protection from predation and allow recruitment into the population. Undoubtedly, this population acts as a source population for the adjacent reach of Oak Creek below Midgely Bridge. The Verde River, to which Oak Creek is a tributary, is also occupied, may also be a source of individuals occurring in Oak Creek. Nowak and Santana-Bendix (2002) document a shift in Oak Creek from a largely native fish community upstream of Midgely Bridge, to a community dominated by non-native, spiny-rayed fish species downstream of Midgely Bridge to the confluence of the Verde River. Based on recent records, we consider the northern Mexican gartersnake to be extant in Oak Creek, from Midgely Bridge to the confluence with the Verde River, likely as a low-density population, likely supplemented by emigration from the known population core at the Page Springs State Fish Hatchery adjacent to Oak Creek.

A single historical record from 1986 for the northern Mexican gartersnake in Spring Creek is documented by Rosen and Schwalbe (1988). Spring Creek is a tributary to Oak Creek; the confluence is approximately 4.75 river miles downstream of the Bubbling Ponds and Page Springs Fish Hatcheries which act as a source population of northern Mexican gartersnakes to Oak Creek, and may be a source of individuals to Spring Creek. The northern Mexican gartersnake may be extant in Spring Creek, possibly as a low-density population.

Two historical records dated 1954 for the northern Mexican gartersnake from Sycamore Creek, approximately 1.5 river miles upstream from its confluence with the Verde River, are referenced in Holycross *et al.* 2006a. The perennial reach of Sycamore Creek extends from Parsons Spring to the Verde River confluence, a distance of approximately 4.3 river miles. Almost 50 years have passed since the last detection of a northern Mexican gartersnake was made in Sycamore Creek and we do not consider the species extant in Sycamore Creek.

B. Factors affecting the species and critical habitat within the action area

The primary factors affecting the northern Mexican gartersnake on the Coconino NF are the presence and introduction of non-native aquatic species (bullfrogs, crayfish, green sunfish, and other warm water sport fish) that compete with and prey upon both the northern Mexican gartersnake and its native prey species; as well as the loss and/or the decline of the gartersnake's primary prey species. Native prey species for the gartersnake include the lowland leopard frog, (*Lithobates yavapaiensis*), Chiricahua leopard frog, juvenile and adult Gila topminnow, desert pupfish, roundtail chub and Gila chub. Several of its prey species are also endangered or threatened, and have declined in waterways occupied by the gartersnake, contributing to its decline in distribution and density.

Other factors affecting the gartersnake include but are not limited to: heavy recreation such as unauthorized off-road vehicle use in riparian corridors; development of construction activities that trample, remove or degrade suitable stream bank habitat; drought that may exacerbate potential impacts of non-native species on native fish species; water diversions or other water-

related actions that decrease water quantity and quality that would limit native fish needed in gartersnake diets; and improper livestock grazing levels if they reduce habitat quality for native fish or riparian habitat structure needed by gartersnakes.

Factors that may affect proposed critical habitat are competition with harmful non-native species, water diversions, flood-control projects, and development of areas adjacent to and within proposed critical habitat near Coconino NF. In addition, the elimination or reduction of crayfish, bullfrogs, and non-native fish is needed as well as ensuring adequate flow is retained in the rivers and creeks.

Chiricahua Leopard Frog and Designated Critical Habitat

A. Status of the species and critical habitat within the action area

Currently occupied, previously occupied, and suitable habitat for the Chiricahua leopard frog on the Coconino NF is located within Recovery Unit (RU) 5. RU 5 lies along the Mogollon Rim (Rim) in Arizona, including mostly forested lands both above and below the Rim. The Coconino NF occurs within the northwestern portion of RU 5. Historically, Chiricahua leopard frogs were widely-distributed both above and below the Rim in RU 5, including records from the Fossil Creek, West Clear Creek, and East Clear Creek watersheds on the Coconino NF.

Today, Chiricahua leopard frog occupied habitat on the Coconino NF consists almost entirely of cattle (stock) tanks. The area of occupied habitat is referred to as the Buckskin Hills Management Area for Chiricahua leopard frogs (or simply the Buckskin Hills). This area is located east of Camp Verde, Arizona and south of Highway 260 and consists of cattle tanks in the uplands of the Fossil Creek Watershed (but not areas within Fossil Creek itself). Fossil Creek is occupied by lowland leopard frogs (*Lithobates yavapaiensis*) and we have no historical data to indicate that Chiricahua leopard frogs ever occupied Fossil Creek. The Chiricahua leopard frogs likely occupy the cattle tanks because they are the only source of perennial pools of sufficient size for breeding habitat in the area. There are multiple ephemeral drainages in the Buckskin Hills (such as Boulder Canyon, Sycamore Canyon, Mud Tanks Draw), but these drainages either dry during the breeding season (e.g., Boulder and Sycamore Canyons), or contain crayfish (e.g., Mud Tanks Draw) and therefore do not provide breeding habitat for Chiricahua leopard frogs. Up until 2002, the Buckskin Hills appeared to contain a functioning metapopulation of Chiricahua leopard frogs in cattle tanks. Following the 2002 drought, many occupied sites (i.e., cattle tanks) “died out” as the waters dried and frogs became extremely susceptible to other fatality factors (e.g., predation, possibly disease, etc.).

From 2002-2006, the FWS and AGFD monitored the decline of Chiricahua leopard frogs in the Buckskin Hills and in 2005, the FWS removed frogs from the population to start a captive breeding program with The Phoenix Zoo. In October 2005, one female and three male frogs were collected from Sycamore Basin Tank. These were the last remaining frogs that could be located on the Coconino NF. These animals, and Chiricahua leopard frogs collected from Gentry Creek, Tonto NF, produced the frogs that FWS and AGFD released into Middle Tank on April 10, 2008 (26 subadult, pure Buckskin Hills CLF released) and October 15, 2008 (18 subadults and 48 tadpoles of Buckskin Hills/Gentry Creek mixed lineage, 1 adult frog originally from Sycamore Basin Tank released). Since this time, we have conducted additional augmentation of

frogs to Middle Tank and have conducted reintroductions at Walt's Tank, Black Tank, and Buckskin Tank. Since reintroductions began in 2008 (and have continued through the present) we have confirmation of breeding Chiricahua leopard frogs at Middle, Walt's, and Black Tanks. However, since that time we have detected chytrid (*Bd*) die-offs in this area and currently only have frogs at Middle Tank and Sycamore Tank, in the Buckskin Hills.

The FWS and AGFD, in cooperation with the permittee and the Coconino NF, intend to continue stocking frogs into these sites, and possibly others, in order to improve the status of the species within the action area. In addition to reintroducing frogs to historically known locations, the FWS, AGFD, and Forest Service have worked to improve habitat at sites prior to restoring frogs by removing non-native fishes, removing sediment from tanks, fencing portions of the tanks to deny livestock access, and installing erosion socks on hillsides adjacent to tanks to reduce sediment inputs into the tanks.

Critical Habitat
The information provided below describes the status of critical habitat on the Coconino NF within recovery unit and critical habitat unit.

Recovery Unit 5 (Mogollon Rim-Verde River, Arizona)
Buckskin Hills Unit
This unit includes 232 acres within the Coconino NF in Yavapai County, Arizona. Included in this designated critical habitat unit are six tanks occupied at the time of listing (Sycamore Basin, Middle, Walt's, Partnership, Black, and Buckskin) that form a metapopulation. Also included in the critical habitat designation are two tanks occupied in 2001 that probably dried during a drought in 2002: Doren's Defeat and Needed Tanks. The former holds water well in years with average precipitation and is about 0.5 miles from Partnership Tank and 0.67 mile from Walt's Tank. Needed Tank may not hold water long enough for breeding, but it provides a habitat for dispersing frogs (USFWS 2012).

This designated critical habitat also includes drainages and uplands likely used as dispersal corridors among these tanks, including:

- From Middle Tank downstream in Boulder Canyon to its confluence with an unnamed drainage that comes in from the northwest, to include Black Tank, then upstream in that unnamed drainage to a saddle, to include Needed Tank, downstream from the saddle in an unnamed drainage to its confluence with another unnamed drainage, downstream in that drainage to the confluence with an unnamed drainage, to include Walt's Tank, and upstream in that unnamed drainage to Partnership Tank;
- from Doren's Defeat Tank upstream in an unnamed drainage to Partnership Tank;
- from the confluence of an unnamed drainage with Boulder Canyon west to a point where the drainage turns southwest, then directly overland to the top of Sycamore Canyon, and then downstream in Sycamore Canyon to Sycamore Basin Tank; and,
- from Buckskin Tank upstream in an unnamed drainage to the top of that drainage, then directly overland to an unnamed drainage that contains Walt's Tank.

Much recovery work has been accomplished in this unit, including captive rearing, population reestablishments, tank renovations, erosion control, fencing, and elimination of non-native predators such as non-native fish and crayfish.

B. Factors affecting the species and critical habitat within the action area

The greatest threats to Chiricahua leopard frogs on the Coconino NF are non-native species, drought, and disease. Divide Tank, which is adjacent to Highway 260 and up-drainage of occupied stock tanks, currently has crayfish and has supported non-native fishes in the past (it has likely been used by locals to stock non-native bait fishes due to its easy access from the highway). Drought is problematic in the action area because all potentially-occupied stock tanks are currently fed only by rainfall and risk drying during times of extended drought. Much of the action area is very remote so that efforts to decrease drying of tanks, such as installing geotextile liners or drilling wells, are expensive and difficult to implement.

Recently, Chiricahua leopard frogs have tested positive for *Bd* in the action area and have died from infections resulting from the fungus. In addition, Arizona treefrogs (*Hyla wrightorum*) and western chorus frogs (*Pseudacris triseriata*) less than 10 miles to the east have also tested positive for *Bd*.

There has been one formal consultation that has occurred since the 2012 reinitiation consultation of the 1987 LRMP. The BO for the Fossil Creek Range Allotment determined the project would not jeopardize the species or result in adverse modification or destruction of critical habitat.

Southwestern Willow Flycatcher and Designated Critical Habitat

A. Status of the species and critical habitat within the action area

No southwestern willow flycatchers are known to currently nest on the Forest. There are only four surveyed sites on Forest lands that have had flycatcher detections: Dry Beaver Creek at Stagestop (transient male in 1993 and floater male in 2007), Sheepshead (transient male in 1998), Wet Beaver Creek (transient male in 1993), and West Clear Creek Campground (transient male in 1997) (USFS 2017). However, nesting flycatchers occur along the Verde River throughout the Verde Valley on private and Prescott NF lands in and around Coconino NF lands.

The FWS designated stream segments in 24 Management Units found in six Recovery Units as critical habitat for the southwestern willow flycatcher (USFWS 2013). Critical habitat on the Coconino NF occurs along the Verde River, in the Verde Management Unit within the Gila Recovery Unit. The segments are:

- Segment 1 is 26.1 miles long and begins above Tuzigoot National Monument downstream to the north end of Yavapai Apache tribal land;
- Segment 2 is 9.5 miles long and begins at the south end of Yavapai Apache tribal land downstream to the north end of a different parcel of Yavapai Apache tribal land; and
- Segment 3 is 8.7 miles long and begins at the south end of Yavapai Apache tribal land downstream to Beasley Flat.

Land ownership along these segments of the Verde River is mixed, with the majority being non-Coconino NF land. The Verde River forms the Forest's southwestern boundary with the Prescott

NF. Additionally, there is private land, state land, other federal land, and other land ownership designations throughout this critical habitat. There are approximately 474 acres of designated critical habitat on Coconino NF along the Verde River, which represents 0.6 percent of the 79,856 acres of critical habitat in Arizona (USFWS 2013).

B. Factors affecting the species and critical habitat within the action area

There is limited suitable and potential breeding habitat for southwestern willow flycatchers on the Coconino NF. Dispersed recreation occurs along the Verde River, such as kayaking and hiking, but there are no designated trails, access points, or recreation sites within critical habitat on the Coconino NF. Grazing allotments are not currently open to livestock grazing along the riparian corridor. The main factor affecting the flycatcher within critical habitat on the Coconino NF are water management actions (i.e., surface water diversions, groundwater pumping, checkerboard property ownership, and multiple uses of land for recreation, residences, etc.) that impede development and maintenance of dense stands of riparian vegetation. No formal consultations have been conducted for the southwestern willow flycatcher with the Coconino NF since the last reinitiation of the 1987 LRMP was completed in March 30, 2012.

Western Yellow-Billed Cuckoo and Proposed Critical Habitat

A. Status of the species and proposed critical habitat within the action area

Cuckoo surveys and incidental detection data provide evidence of occupancy and likely breeding within the action area. Yellow-billed cuckoo numbers are difficult to determine without intensive surveying and monitoring. The yellow-billed cuckoo survey protocol is designed to document presence/absence during the breeding season, but is not designed to determine the number of breeding cuckoos (Halterman *et al*. 2011, 2016). Additional visits would be needed to determine cuckoo home ranges, occupancy throughout the breeding season, and to observe cuckoo nesting behavior. Because cuckoos have a very short nesting cycle, a pair may not remain in the area for the entire breeding season. However, we can infer breeding from observed behavioral cues. These include vocalizations between individuals, copulation, carrying food repeatedly to the same location, and feeding fledglings. If cuckoos are detected on more than one of the four required surveys, breeding season occupancy is assumed (Halterman *et al*. 2016).

Presence in Coconino National Forest

On the Coconino NF, the Verde River is one of 12 locations in the state that supports populations of greater than 10 pairs (USFWS 2014b). Surveys were conducted in 2004 and 2005, within the Verde watershed. Of the 37 sites surveyed, cuckoos were detected at 22 sites, which included detections at 12 of 16 historic sites, and 10 of 21 random sites (Holmes *et al*. 2008). In addition to the Verde River mainstem, cuckoos have been detected along Oak Creek, West Clear Creek, and Beaver Creek and tributaries (Dry Beaver Creek, Wet Beaver Creek, Red Tank Draw, and Walker Creek) (USFS 2017).

Nesting habitat for the cuckoo consists of low to moderate elevation riparian habitat of 50 acres or more in size (USFWS 2014b). On the Forest, nesting sites are within deciduous riparian habitat at least 325 feet in width (Holmes *et al*. 2008). Cuckoos nesting in the Verde Watershed appear to favor native cottonwood and willow habitat with adjacent stands of mesquite at least

12 ac in size (Holmes *et. al* 2008). ERUs that contain current or potential breeding sites include Cottonwood Willow and Mixed Broadleaf Deciduous Riparian Forests (USFS 2017).

Critical Habitat
Within Coconino and Yavapai Counties, Arizona, on and adjacent to the Coconino NF, critical habitat has been proposed along Upper Verde River, Oak Creek, Beaver Creek, Lower Verde River, and West Clear Creek. There are 9,989 acres of proposed critical habitat for the western yellow-billed cuckoo in the action area (USFWS 2014a). The amount of proposed critical habitat in the action area is 1.8 percent of total proposed cuckoo critical habitat range-wide.

- Proposed critical habitat unit 17 (AZ-9 Upper Verde River) is 4,531 acres in extent and is a 45-mile-long segment of the upper Verde River from the confluence with Granite Creek downstream to Oak Creek below the Town of Cottonwood, in Yavapai County. Nearly 50 percent is in federal ownership and is managed by Coconino and Prescott NFs.
- Proposed critical habitat unit 18 (AZ-10 Oak Creek) is 1,323 acres in extent and a 21-mile-long segment of Oak Creek from the vicinity of the Town of Cornville at Spring Creek upstream to State Highway 179 Bridge within the City of Sedona, in Yavapai and Coconino Counties. Approximately 33 percent is in federal ownership, managed by Coconino NF.
- Proposed critical habitat unit 19 (AZ-11 Beaver Creek and tributaries) is 2,082 acres in extent and is a 23-mile-long segment of Beaver Creek from the confluence with the Verde River near Camp Verde upstream to above the Town of Rimrock in Yavapai County. Approximately 72 percent is in federal ownership, the majority managed by Coconino NF.
- Proposed critical habitat unit 20 (AZ-12 Lower Verde River and West Clear Creek) is 2,053 acres in extent and is a 13-mile-long segment of the lower Verde River, which is joined by a 5-mile-long continuous segment of a tributary called West Clear Creek in Yavapai County. Approximately 22 percent is in federal ownership, the managed by Coconino and Prescott NFs.

B. Factors affecting the species and proposed critical habitat within the action area
Actions on and off the Coconino NF have influenced the condition of cuckoo habitat and the population distribution and abundance of cuckoos within the forest. Actions such as water diversion, groundwater pumping, habitat clearing, flood control, urban/agricultural development, dam building, and dam operations have changed surface and subsurface stream flows, and in combination with historical and current land uses such as livestock grazing, road developments, heavy off-road vehicle use, recreation, and mining have altered the quality distribution, abundance and longevity or riparian and Madrean evergreen woodland vegetation (USFWS 2002).

The primary factors affecting the yellow-billed cuckoo include effects resulting from municipal and rural development, livestock grazing, irrigated agriculture, recreation, and mining.

Mexican Spotted Owl and Designated Critical Habitat

A. Status of the species and critical habitat within the action area

The Coconino NF is located within the Upper Gila Mountains (UGM) Ecological Management Unit (EMU). Approximately 90 percent of suitable Mexican spotted owl habitat has been surveyed on the Coconino NF. On the Coconino NF, ponderosa pine and mixed conifer habitats are the dominant vegetation types within Mexican spotted owl PACs (Table 1). Mexican spotted owls use cliffs and canyons within these habitat types, particularly on the Mogollon Rim Ranger District (USFS 2017). Habitat is characterized by high canopy closure, high stem density, multi-layered canopies within the stand, numerous snags, and downed woody material. As of January 2016, there are 192 Mexican spotted owl PACs that are completely or partially on the Coconino NF, several of which overlap with Walnut Canyon National Monument, Apache-Sitgreaves NF, and Kaibab NF. PACs are established at all Mexican spotted owl known sites, encompassing known nests, roosts, and the best available habitat in the area. Current PAC acreage within Coconino NF is approximately 117,080 acres (Table 1). PAC acreage is a relatively small portion of overall ERU acreages (Table 1).

Table 1. Mexican spotted owl PAC acreage, percent by ERU, and percent of total ERU acreage within PACs.

ERU	ERU Acres	PAC Acres	ERU Percent of Total PAC Acres	Percentage of Total ERU Acreage in PACs
Ponderosa Pine	797,171	85,975	73	11
Pine-oak estimated	*318,868*	*85,975*	*73*	*27*
Mixed Conifer with Infrequent Fire	37,143	13,104	11	35
Mixed Conifer with Frequent Fire	49,595	7,621	7	15
Interior Chaparral	50,471	3,738	3	7
Montane Willow Riparian Forest	3,568	1,615	1	45
Pinyon Juniper Woodland (Persistent)	75,439	1,668	1	2
Gallery Coniferous Riparian Forest	200	138	<1	69
Spruce Fir	13,946	734	<1	5
Montane Subalpine Grassland	23,656	645	<1	3
Water	2,932	81	<1	3
Wetland/Cienega/Lakes	10,121	157	<1	2
Cottonwood Willow Riparian Forest	1,324	17	<1	1
Mixed Broadleaf Deciduous Riparian Forest	5,926	83	<1	1
Great Basin Grassland	92,842	119	<1	<1
Pinyon Juniper with Grass	261,454	558	<1	<1
Pinyon Juniper Evergreen Shrub	263,554	827	<1	<1
Totals:		117,080	100	

Mexican spotted owls are widely distributed on the Coconino NF, and occur on all three ranger districts. Mexican spotted owls are most common in ponderosa pine-Gambel oak and mixed conifer vegetation types.

Since our issuance of the 2012 LRMP BO/CO, 52 Mexican spotted owl PACs within the action area have been impacted by wildfires greater than 100 acres. In addition, there have been 16 wildfires (greater than 100 acres) that have burned through portions of Mexican spotted owl protected, recovery, and critical habitat. Fire has always been a major disturbance agent in southwestern forests (Swetnam 1990), and Mexican spotted owls co-evolved with this disturbance. However, the structure of southwestern forests, the frequency with which they experience fire, and the types of fires experienced have changed greatly following increased human settlement of these lands (Covington and Moore 1994), and high-severity fire can result in the complete loss of habitat, such as in the Schultz Fire.

Critical Habitat

There are six critical habitat units that occur within or partly within the boundaries of the Coconino NF and include the following: UGM-10 (236,768 acres of 576,907 acres in southeast Coconino NF, which includes parts of Fossil Springs and West Clear Creek Wildernesses), UGM-11 (146,042 acres within central Coconino NF), UGM-12 (14,479 acres within central Coconino NF), UGM-13 (112,563 acres of 253,191 acres in west central Coconino NF, which includes parts of Red Rock-Secret Mountain and Sycamore Canyon Wildernesses), UGM-14 (56,820 acres which includes Kachina Peaks Wilderness), and UGM-15 (22,517 acres of northwest Coconino NF, which includes part of the Kendrick Mountain Wilderness). Only areas identified as protected and restricted pursuant to the Recovery Plan (USFWS 2012) within the critical habitat units are considered critical habitat. In the BA provided for the LRMP consultation (USFS 2017), the Forest Service estimates 308,071 acres of recovery habitat (formerly referred to as restricted habitat) are present on the Coconino NF. Surveys in protected and restricted habitat may reveal the presence of additional PACs.

B. Factors affecting the species and critical habitat within the action area

Since the action area consists of NFS lands, there are likely very few, if any, State, tribal, or private actions impacting the Mexican spotted owl or its protected, recovery, and critical habitat in the action area. Key factors that have affected the owl within the action area are vegetation removal activities associated with fire and fuels management and maintenance of vegetation along utility corridors. Three formal consultations have occurred since 2012 (last reinitiation consultation of the 1986 LRMP) (https://www.fws.gov/southwest/es/arizona/). Two of these projects involved harm and/or harassment on the Coconino NF. All BOs for projects conducted on the Coconino NF were determined not to jeopardize the species or result in adverse modification or destruction of critical habitat.

According to the Forest Service's 2015 Annual Report (USFS 2015), the Coconino NF monitors Mexican spotted owl PACs each year as funding allows with priority given to PACs affected by project activities. Though previous actions analyzed did result in adverse effects and incidental take of Mexican spotted owls, stand-replacing fire was likely the most important factor affecting the Mexican spotted owl on this forest.

Arizona Cliffrose

A. Status of the species within the action area

The Coconino NF has management responsibility for much of the Cottonwood population (USFS 2017a). Recruitment rates to maintain viable populations of Arizona cliffrose are not well documented or known; the Cottonwood population supports a relatively large number of established seedlings (USFS 2004). The Cottonwood population has been the subject of one biological opinions since the 2012 LRMP BO. A BO was issued on August 14, 2014, for the Windmill West Range Allotment (USFWS 2014).

B. Factors affecting the species within the action area

Impacts on the Coconino NF near Cottonwood are typical of public lands near an urban fringe. Major threats including roads, utility line construction and livestock grazing have been addressed with forest action or change in management. However, unconstrained recreation continues to be a threat to the Cottonwood population. Expanding human populations and urbanization adjacent to the Coconino NF also are impacting the Arizona cliffrose.

The Cottonwood population is in the North Gyberg, and Duff Flat pastures of the Windmill West Grazing Allotment. The South Gyberg Pasture was removed to grazing in 2014 with the completion of the Environmental Analysis for the Windmill West allotment. Permitted livestock numbers in the term grazing permit authorizes up to 565 head of adult cattle to graze the allotment, with a management guideline for 30-40 percent forage utilization outside of riparian areas.

Long-term drought and climate change also seem to be impacting Arizona cliffrose. Maschinski, *et al*. (2006) determined that Arizona cliffrose has an increased risk of extinction from progressively more arid climates and may eventually go extinct without human intervention. These risks would be even higher if the fragmentation of existing habitat increases from additional roads, trails and other forms of human disturbance.

EFFECTS OF THE ACTION

Effects of the action refer to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated and interdependent with that action that will be added to the environmental baseline. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration. Indirect effects are those that are caused by the proposed action and are later in time, but are still reasonably certain to occur.

Because this is a programmatic consultation and many site-specific actions have not yet been planned, we will only discuss adverse effects in terms of the general effects we anticipate will occur to each species and its critical habitat. We provide a more specific analysis of effects to the PCEs of critical habitat for the Mexican spotted owl because of the known potential effects from vegetation management projects. We provide a table with objectives, standards, and guidelines that are specifically referred to in this consultation in Appendix B of this PBO/PCO.

Detailed effects discussions will occur as each site-specific project is developed, and these projects will be consulted on separately, as required.

In our analysis of the effects of the action on critical habitat, we consider whether or not a proposed action will result in the destruction or adverse modification of critical habitat. In doing so, we must determine if the proposed action will result in effects that appreciably diminish the value of critical habitat for the recovery of a listed species. To determine this, we analyze whether the proposed action will adversely modify any of the PCEs that were the basis for determining the habitat to be critical. To determine if an action results in adverse modification of critical habitat, we must also evaluate the current condition of all designated critical habitat units (CHUs) and the PCEs of those units, to determine the overall ability of all designated critical habitat to support recovery. Further, the functional role of each of the CHUs in recovery must also be considered because, collectively, they represent the best available scientific information as to the recovery needs of the species.

Aquatic Species

Gila Chub, Little Colorado Spinedace, Loach Minnow, Spikedace, Narrow-Headed Gartersnake, Northern Mexican Gartersnake, and their Designated or Proposed Critical Habitats

Forestwide Direction

Specific habitats used by these species may not be identical; however, the effects of implementing projects under the LRMP are similar to all species and their critical habitats. Effects to listed species and their critical habitat could occur due to forestwide activities from soil, biophysical features, watershed and water resources, constructed waters management, riparian resources, terrestrial ecological resource unit program, wildland urban interface, wildlife, fish and plants, invasive species management, fire management, livestock grazing, forest products, minerals resources, roads and facility management, special uses, recreation, and interpretation and education program areas, as well as management area specific and special area direction programs. Projects are expected to occur in all watersheds where these species and their critical habitats occur.

Periodic droughts in the Southwest and climate change are likely to negatively impact many system components within listed species habitats on the Coconino NF through: changes in upland vegetation and fire regime; higher ambient and water temperatures; increased variability in stream hydrographs; and more frequent severe climatic events (such as storms, droughts, wildfires, etc.).

Soil, Biophysical Features, and Watersheds and Water

The Soil program area's objective is to maintain soil conditions and/or improve impaired and unsatisfactory soil conditions (FW-Soil-O-1). There are no objectives for the Biophysical Features program or the Watersheds and Water program. Maintenance and improvement activities for these program areas occur as a result of other resource management actions, such as, road relocation, road decommissioning, vegetation management, fencing areas to protect from human, livestock, or wildlife impacts, vegetation thinning, upland soil and watershed

improvements, restoration of riparian vegetation, prescribed and managed wildfires, channel stabilization, removal of invasive and non-native species, stream habitat improvement, livestock grazing, etc.

Watershed improvement projects would focus on priority watersheds selected through the Watershed Condition Framework process (USFS 2017a). In most cases, projects will be limited in extent and amount of ground disturbance. These activities may have short-term adverse effects by increasing sedimentation during project implementation or prior to vegetation cover reestablishment. Guidelines including BMPs and other project specific design features should minimize the short-term adverse effects of sediment entering water courses during and after project implementation. Long-term benefits of these projects would be reduced chronic sedimentation effects into aquatic habitats, improved water quality, and retained vegetative cover. Biophysical features, such as caves and karst, are often interconnected with surface water, therefore protection of aquatic habitats is important.

Projects and activities in the riparian areas would improve aquatic and riparian conditions and are expected to reduce sediment deposition into aquatic habitats, which would maintain or improve water quality, healthy macroinvertebrate populations, and healthy native fish populations needed by the narrow-headed gartersnake and northern Mexican gartersnake. These projects would also promote recruitment and maintenance of native riparian vegetation, which provide cover for narrow-headed and northern Mexican gartersnakes, and maintain suitable water temperature for listed fish in the streams. Soil improvement projects that involve instream improvement are expected to have short-term adverse effects to the species' habitat components, water quality, and prey base. There may be localized, short-term adverse effects from projects in riparian zones such as localized sediment input into habitat, temporary disruption of prey base, and temporary disturbance of habitat. However, these effects would be minimized by standards and guidelines as previously described. Furthermore, while projects related to instream habitat improvements would likely have short-term adverse effects, we anticipate that long-term benefits to PCEs of critical habitat will occur by maintaining and possibly improving their ability to contribute to the conservation and recovery of the species.

Projects in listed species habitat would have the localized and short-term effects of streambank disturbance, riparian vegetation reduction, sediment deposition into the stream, and disturbance to individual snakes and fish. All activities would implement standards and guidelines and BMPs as described in the BA (USFS 2017a). Projects would have short-term adverse effects to the species and habitat but would have long-term beneficial effects as watersheds, aquatic, and riparian habitats move towards desired conditions.

The BA does not specify the watersheds or riparian or stream areas that would be treated under the LRMP. There are nine relevant guidelines that apply to management and activities in narrow-headed gartersnake, northern Mexican gartersnake and their prey habitats, as well as listed fish habitats:

- FW-Soil-G-1 - Implement and monitor best management practices (BMPs) for all activities with the potential to impair water quality to control and manage nonpoint source pollution;

- FW-Soil-G-2 - Avoid disturbance that would result in long term impacts to soil function and productivity. Where disturbance cannot be avoided, project specific soil and water conservation practices should be developed;
- FW-Soil-G-3 - Project-specific design features should be used when projects occur on slopes with a grade of about 40 percent or greater, on soils with moderate or severe erosion hazard, or on soils that are sensitive to degradation when disturbed, such as calcareous soils to minimize or avoid soil impacts;
- FW-Water-G-1 – Provides for enough vegetative ground cover to recover rapidly from natural and human disturbances and to maintain long term soil productivity;
- FW-Water-G-2 - Ensures that ecosystem processes, resilient vegetation conditions, and natural disturbance regimes are functioning properly within priority 6th code watersheds;
- FW-Water-G-3 – Provides for instream flow water rights to be procured for those streams without instream water rights to ensure sufficient flow is provided for aquatic species, habitat, and recreation;
- FW-Water-G-4 – Provides for best management practices for management activities to be identified, implemented, and monitored to maintain water quality, quantity, and timing of flows, and to prevent or reduce accelerated erosion;
- FW-Water-G-5 - Strives to maintain or improve water quality to meet or exceed Arizona water quality standards and support identified designated beneficial uses for impaired waters or non-attaining waters; and
- FW-Water-G-6 – Provides for excess water to remain in or be allowed to flow freely back into the natural channel, spring, and riparian habitat to maintain and improve ecological function, water quality, quantity, and timing of flows, and to benefit native species and their habitat.

These guidelines are expected to have long-term beneficial impacts, if implemented in streams or watersheds occupied by listed fish or their designated critical habitat, and narrow-headed and northern Mexican gartersnakes, their proposed critical habitat and their prey, through restoration of hydrologic conditions and functions. However, short-term, adverse impacts associated with project implementation could result including increases in sedimentation, soil compaction, alterations in hydrologic conditions and functions, and changes in water quality. Measures are implemented at the project level, and site specific conditions and project activities and timing will determine their efficacy.
These guidelines would reduce sediment or debris flow into listed species habitat, protect riparian and wetland and adjacent resources from soil and vegetation disturbing equipment, vehicles, and activities, retain surface water and protect against the risk of listed species habitat loss, and protect and improve water quality for listed species. BMPs would minimize effects of projects to improve areas impaired for soil conditions such as road relocation (USFS 2017a).

Constructed Waters
Constructed waters projects (i.e., protecting or enhancing water quality, quantity and aquatic habitat; maintaining soil moisture; minimizing sediment) may have localized, short-term adverse effects such as streamflow and streambank alteration, and result in elevated erosion or deposition. Overall, the Constructed Waters program plan components are positive for all of the

listed aquatic species and their habitats in the long-term and would maintain or improve watershed condition indicators relative to water quality, soils, riparian vegetation, and rangeland vegetation. These adverse effects could alter water quality and affect habitat amount; however; we would expect them to be short in duration and intensity.

In most cases, projects would be limited in extent and amount of ground disturbance. Over time, projects in the riparian areas would improve aquatic and riparian conditions and are expected to reduce sediment deposition into aquatic habitats, which would maintain or improve water quality and healthy macroinvertebrate populations. They would also promote recruitment and maintenance of native riparian vegetation, which would maintain suitable water temperature for listed fishes and attenuate floods and sediment in the streams. All activities would implement standards and guidelines and BMPs as described in the BA (USFS 2017a). Projects would have short-term adverse effects to the species and their habitat, but would have long-term beneficial effects as watersheds, aquatic, and riparian habitats become more resilient to natural and other disturbances, including climate change.

The BA does not specify the watersheds, riparian or stream areas that would be treated under the LRMP. Two guidelines ensure stream and water quality protection for listed aquatic species habitat:

- FW-ConstWat-G-1 – Requires a site-specific aquatic management zone identified and maintained around reservoirs to protect water quality and to avoid detrimental changes in water temperature or chemical composition, blockages of streamcourses, or sediment deposits that would seriously and adversely affect water conditions or fish habitat. Soil and vegetation disturbance from management activities should be minimized to meet this intent but is not necessarily excluded in this zone; and
- FW-ConstWat-G-2 – Provides earthen stock ponds determined to be important for threatened, endangered, and Southwestern Region sensitive species, to be managed to maintain water and habitat needed for species survival and reproduction, consistent with existing water rights.

Vegetation treatments implemented under this program that involve ground disturbance and are of sufficient size may cause short-term increases in sediment deposition into listed fish and gartersnake habitats. This is expected to affect listed fish and gartersnakes until adequate ground cover has re-established on the treatment site and any excess sediment moves through the system. The guidelines under this program are intended to reduce this impact on listed fish, gartersnakes, and their habitats. We expect that over the life of the LRMP projects implemented under this program may result in short-term adverse effects to the species and habitat but would have long-term beneficial effects to listed aquatic species and their habitats.

Riparian areas

Riparian areas include the vegetation zone between terrestrial uplands and water. Water dependent plants near the water often transition to a combination of upland and riparian species as distance from water increases. Riparian forests are grouped by riparian forest types. The four riparian forest types on the Coconino NF are: Cottonwood Willow Riparian Forest (Cottonwood Willow), Mixed Broadleaf Deciduous Riparian Forest (Mixed Broadleaf), Montane Willow Riparian Forest (Montane Willow) and Gallery Coniferous Riparian Forest (Gallery Coniferous).

Ms. Laura Jo West, Forest Supervisor

Objectives for this program area include restoring the function of 200 to 500 acres of riparian areas, with emphasis on priority 6th code watersheds, restoring 5 to 10 wetlands not currently in proper functioning condition, and restoring at least 25 springs not currently in proper functioning condition. Management activities include continued work with partners and stakeholders, the relocation or modification of existing developments and infrastructure where appropriate to reduce fragmentation of the unique vegetation communities of Cottonwood Willow Riparian Forest, Mixed Broadleaf Deciduous Riparian Forest, and mesquite bosques.

Guidelines address the needs to manage, maintain, protect, and restore riparian areas needed for listed aquatic species and include:

- FW-Rip-All-G-1 – Requires management and restoration activities to maintain or move toward desired conditions of riparian areas;
- FW-Rip-All-G-2 – Manages to promote the natural movement of water and sediment, maintain ecological functions and maintain habitat and corridors for species;
- FW-Rip-All-G-3 – Requires the maintenance of riparian zones to protect water quality and avoid detrimental changes to the system;
- FW-Rip-Strm-G-1 – Requires project activities to be designed and implemented to retain or restore natural streambank stability, native vegetation, and riparian and soil function;
- FW-Rip-Strm-G-2 - Requires the maintenance of non-riparian zones to reduce sedimentation, maintain channel functionality, and maintain downstream water quality and riparian habitat and function;
- FW-Rip-Spr-G-1 – Requires the maintenance or improvement of spring discharge;
- FW-Rip-Spr-G-2 – Maintains or procures water rights;
- FW-Rip-Spr-G-3 - Requires project activities to be designed and implemented to maintain or improve soil and riparian function, native vegetation, and prevent the introduction or spread of disease, invasive or undesirable species;
- FW-Rip-Spr-G-4 – Protects spring source areas and riparian habitat to safeguard unique ecological and biophysical characteristics, higher biodiversity, endemic species, and cultural values;
- FW-Rip-RipType-G-1 – Protects water table level to prevent loss of or undesired changes to composition, structure, or function to riparian forests or mesquite bosques;
- FW-Rip-RipType-G-2 – Maintains and enhances connectivity within the unique vegetation community created by the combination of Cottonwood Willow Riparian Forest, Mixed Broadleaf Deciduous Riparian Forest, and mesquite bosques;
- FW-Rip-RipType-G-3 - In riparian forests, recreation activities, permitted uses, and management activities should occur at levels that maintain or allow improves soil function, riparian vegetation, and water quality at the stream reach scale in riparian forest where recreation activities, permitted uses and managed activities occur; and
- FW-Rip-RipType-G-4 – Manages fire wood cutting or wood removal in remaining mesquite bosques to avoid impacts to understory species, tree density, tree growth, and to avoid channel downcutting and accelerated erosion.

The above guidelines would maintain or restore riparian and soil functionality, and reduce sedimentation into stream courses. Additionally, they would maintain or protect water rights, spring discharge, and water levels. Although not intended to be applied at the fine scale such as intermittent livestock crossing locations, water gaps, or other infrastructure, guideline FW-Rip-RipType-G-3 would protect riparian function, especially in areas of high recreation use such as Oak Creek, Beaver Creek, and Fossil Creek. This would result in short-term adverse effects, but long-term beneficial impacts for the listed aquatic species.

These guidelines are expected to have long-term beneficial impacts when implemented in riparian areas occupied by narrow-headed and northern Mexican gartersnakes and their prey, adjacent to streams occupied by listed fish, as well as within designated and proposed critical habitats for the listed species, through restoration of hydrologic conditions and functions, and reduction of sediment. Short-term impacts associated with project implementation could result including increases in sedimentation, soil compaction, alterations in hydrologic conditions and functions, and changes in water quality. These adverse effects are expected to be temporary; guidelines implemented under the LRMP would eventually contribute to overall riparian health.

These guidelines would reduce sediment or debris flow into listed species habitat, protect riparian, wetland and adjacent resources from soil and vegetation disturbing equipment, vehicles and activities, retain surface water and protect against the risk of listed species habitat loss, and protect water quality for listed species.

Terrestrial Ecological Response Units

With most terrestrial ERUs being outside of reference condition (USFS 2009), the Coconino NF LRMP focuses on restoration to reduce threats from uncharacteristic fire and flooding, which in turn reduces impacts to aquatic listed species. Tools for restoration include prescribed fire, managed natural wildfires, mechanical treatments, fencing, soil aeration, improved grazing strategies, removal of competing vegetation or disturbances, and relocation of constructed waters and roads. Reducing threats of uncharacteristic fires would reduce the risk of high soil burn severity that could otherwise result in accelerated soil erosion, and loss of protective vegetative ground cover, tree and herbaceous species including riparian areas.

Objectives include restoration of 22,000 – 27,000 acres of grassland (FW-TerrERU-Grass-O-1, 2, and 3), treatment of 8,500 to 17,500 acres within piñon juniper ERUs (FW-TerrERU-PJ-O-1, 2, and 3), 1,000 acres within aspen and maple ERUs acres (FW-TerrERU-AspMpl-O), 200,000 to 595,000 acres within ponderosa pine ERUs (FW-TerrERU-PP-O-1, 2, and 3), and 18,400 to 30,500 acres within mixed conifer ERUs (FW-TerrERU-MC-MCFF-O-1, 2, and 3) every 10 year period.

Guidelines (FW-TerrERU-All-G-1, 4, FW-TerrERU-PJ-G-2) provide for improved watershed condition and maintenance of habitat diversity within transition zones and stringers. Implementation of guidelines would avoid or minimize effects to aquatic and riparian areas. These guidelines would reduce sediment or debris flow into listed species

critical habitat, protect riparian and wetland and adjacent resources from soil and vegetation disturbing equipment, vehicles, and activities, retain surface water and protect against the risk of listed species habitat loss, and protect water quality for listed species.

Wildland-Urban Interface and Fire Management
Desired conditions for the wildland urban interface program are to protect residential areas and other infrastructure from fires, while fire management desired conditions keep wildland fires within the historic fire regime of vegetation communities. Project activities under these programs could include mechanical treatments and low intensity prescribed fires, along with construction of temporary roads and trails to access treatment areas.

Mechanical treatments and prescribed fire may reduce the risk of high-severity wildfire entering riparian habitats and post-fire runoff. Slash piles, commonly generated through mechanical treatments, are an attractive nuisance for gartersnakes and can lead to elevated risk of adverse effects to gartersnakes depending on the size and location of slash piles, how long they are left in place to cure, and when they are burned. When properly applied, prescribed fires should have long-term benefits to narrow-headed gartersnake and northern Mexican gartersnake populations by reducing the likelihood of uncharacteristic wildfire.

Short-term adverse effects from these activities may include increased sedimentation and runoff into adjacent and downstream aquatic communities. Construction of roads through areas occupied by listed species could have adverse effects. There may be adverse effects from implementing this program if there is inadequate ground cover to prevent excessive sediment from being transported into their aquatic habitats, above what is tolerable to listed fish at different life stages. Reducing vegetation within watersheds could increase runoff from floodwaters, deposition of debris and sediment from burned areas.

Treatment of these program areas includes thinning, removal of fuels from the landscape, or altering the fuel profile to reduce the potential for loss of private property. Projects could have short-term adverse effects to the species and the PCEs associated with designated critical habitats, including short-term indirect effects (i.e., increased sedimentation) in habitats downstream, including off the Forest, where these species occur. However, there would also be long-term beneficial effects as watersheds, aquatic, and riparian habitats move towards desired conditions.

Wildlife, Fish, and Plants
This program area includes maintenance of habitat for listed and native species; reintroductions, introductions, or transplants of species; control or eradication of non-native species; and the management of sport and native fishes, including the identification of refugia for native fish and the establishment or removal of fish barriers, along with coordination with federal and state agencies, and partners. Projects could include removal of non-native riparian and aquatic species, installation of fish barriers or opening of aquatic passage, improvement of riparian and instream habitat conditions.

Desired conditions for this program area are to provide properly functioning habitats, survival and recovery of listed species, support self-sustaining populations of native aquatic and riparian

species, and passage barriers to restrict non-native aquatic species. To achieve the desired conditions, there are three objectives which may affect the listed aquatic species:

- FW-WFP-O-1 – Implements activities that contribute to the recovery for federally listed species during each 10 year period over the life of the plan;
- FW-WFP-O-4 - Restores or enhances at least 70 miles of stream habitat during each 10-year period over the life of the plan.; and
- FW- FW-WFP-O-5 – Completes at least 30 products or activities that educate the public about wildlife, fish, and plant resources during each 10-year period over the life of the plan.

These objectives work towards improving listed aquatic species habitats and provide for education to the public. Although there may be short-term negative impacts to the aquatic species due to increased erosion and sedimentation, the long-term effects will result in improved and enhanced habitat, as well as a decrease in erosion and sedimentation.

Standards and guidelines address the needs to manage, maintain, protect, and restore riparian and aquatic areas needed for listed aquatic species and include:

- FW-WFP-S-1 – Precedence will be given to listed species over non-listed species;
- FW-WFP-G-1 – Habitat management objectives and species protection measures from approved recovery plans should be applied to activities occurring within federally listed species habitat to promote recovery of the species;
- FW-WFP-G-3 – Projects and management activities should be designed or managed to maintain or improve habitat for native species and to prevent or reduce the likelihood of introduction or spread of disease;
- FW-WFP-G-4 – Project design should include measures to minimize the negative impact of pesticides, herbicides, or chemicals to species and their habitat. For example, chemical free buffers could be placed around bat roosts, riparian or aquatic habitat; and
- FW-WFP-G-9 – Fire suppression techniques that minimize habitat and disturbance impacts should be used where there are federally listed and Southwestern Region sensitive species, consistent with public and fire fighter safety.
- FW-WFP-G-13 – New road and new trail locations should be designed to maintain species access to adjoining habitat, to maintain habitat for dispersal and migration, and to meet species' life history requirements, including fawning habitat for pronghorn.

Coconino NF's management actions needed to support listed fish restoration could include the management approach of construction of fish barriers (FW-WFP-MgtApp-A) to preclude the movement of non-native species into listed species habitats, as well as other projects that may affect aquatic habitat. Actions resulting in disturbance to individual fish can alter their breeding, sheltering, or feeding behaviors and increase their risk of predation. The standard and guidelines described above, listed in the proposed action, and additional actions the FWS and AGFD typically conduct with restoration projects, will help minimize adverse effects to the species and their habitats. Guidelines would ensure that any forest program activity occurring in listed

aquatic habitats would be consistent with existing recovery plans, maintain or improve habitat, provide for dispersal and migration, meet species needs, and minimizing negative impacts from pesticides by providing riparian and aquatic buffers.

Habitat improvement projects such as riparian fencing to protect habitat could have short-term vegetation and soil impacts in occupied habitat and adjacent uplands (e.g., vehicles delivering/laying out materials, fences being constructed across or alongside occupied habitats). Reintroduction of new populations would increase the number of populations potentially affected by the proposed action. Construction of fish barriers will help preclude the movement upstream of non-native fish species.

Habitat improvements should ultimately result in improved stream conditions, resulting in less sedimentation and erosion downstream. Therefore, these activities could result in long-term beneficial effects where the listed aquatic species occur.

Stream restoration and enhancement projects are expected to benefit the narrow-headed and northern Mexican gartersnakes in the long-term, along with the listed fish species; however, they could also result in short-term adverse effects. These projects could have localized, short-term adverse effects to the species, such as streamflow alteration, sedimentation, and disturbance to individual gartersnakes. Project implementation would follow appropriate standards and guidelines to minimize impacts to the species and aquatic habitat. These restoration and enhancement projects are expected to have long-term benefits by improving existing habitat for the gartersnakes, providing new habitat, and providing increased prey availability and lowered predation risk.

The Coconino NF is proposing to work with FWS and AGFD to restore or enhance at least 70 miles of stream habitat during the 10 years following plan approval. These projects could have localized, short-term adverse effects to the species and their habitat from implementation and maintenance of projects such as streamflow and streambank alteration, sedimentation, and possible disturbance to any individuals that might occur in the area. Streambank alteration and increased sedimentation could alter water quality for Gila chub, Little Colorado spinedace, narrow-headed gartersnake, and northern Mexican gartersnake; however, we would expect the effects of these projects to be very short in duration and intensity. Actions resulting in disturbance to the fish and gartersnakes can alter their breeding or feeding behaviors as well as potentially result in direct fatality. Project activities would be mitigated by implementation of guidelines listed in the proposed action, the BA, and additional actions FWS and AGFD typically conduct with restoration projects, such as salvaging fish prior to the action occurring. Overall, the Wildlife Fish Plants program plan components are positive for all of the listed aquatic species, their prey, and their habitats in the long-term and would maintain or improve watershed condition indicators related to water quality, soils, and riparian vegetation.

Invasive Species

Activities in this program area include assessing and eradicating priority infestations or populations, and monitoring, preventing and controlling infestations. This program area has the potential to benefit listed fish species by removing aquatic non-native invasive species. Pesticide and mechanical treatments would continue under this plan as they have under the previous forest

plan (USFS 2017a). Guidelines directly benefit listed aquatic species by preventing, controlling, containing and eradicating non-native invasive aquatic and terrestrial species to improve watershed condition and maintain ecosystem function.

Guidelines address the needs to protect and restore aquatic areas needed for listed aquatic species and include:

- FW-Invas-G-1 – Measures to prevent, control, contain, and eradicate priority infestations or populations of invasive species to ensure the integrity of native species populations and their habitats is maintained;
- FW-Invas-G-2 – Integrated pest management approaches and other treatments to control invasive species should be used to improve watershed condition and maintain ecosystem function while minimizing project impacts on native species; and
- FW-Invas-G-3 – Weed-free plant material should be selected for all seeding and mulching projects to restore natural species composition and ecosystem function to the disturbed area. Plant or seed materials should be used that are appropriate to the site, capable of becoming established, and are not invasive.

These guidelines are expected to have long-term beneficial impacts, if implemented in streams or watersheds occupied by listed fish or their designated critical habitat, and narrow-headed and northern Mexican gartersnakes, their proposed critical habitat and their prey, through restoration of hydrologic conditions and functions.

A number of generalizations can be made about pesticides and herbicides. First, effective pesticides and herbicides are designed to be selective in their effects: they are extremely toxic to some forms of life and relatively harmless to others. Few are absolutely specific to their target organisms, so other related and unrelated species may be affected. Second, the mode of application of pesticides varies according to the circumstances. Third, in stagnant lentic (i.e., non-flowing) aquatic systems, certain pesticides are more likely to be persistent at low levels (Rand *et al*. 1995).

Runoff that may contain pesticides could cause sublethal toxic effects in a species, affecting hormone regulation, reproduction, and embryonic development. Pesticides may affect not only aquatic species larval development, but also adult immune systems, rendering organisms more susceptible to disease. With fewer healthy adults in the breeding population, fewer young will be produced, and of those produced, more offspring will not develop normally. Constant pesticide applications that affect immune system development can only suppress an already small population as those characterized by an endangered or threatened species (Pattee *et al*. 2003).

Pesticide use can have adverse effects on listed aquatic species. Pesticide uses may impact the forage base for individual aquatic species. Pesticide drift could have direct effects on listed species depending on distance to occupied habitat; however, the indirect effect of a reduced forage base could cause indirect effects to listed species downstream. Use of chemicals in occupied habitat is likely to result in fatality or injury to fish and gartersnakes as well as reduced feeding success and reduced vegetation cover if chemicals are applied on or near water.

Invasive species impact the survival and reestablishment of native gartersnakes. American bullfrogs, northern crayfish, non-native tiger salamanders, along with warm water non-native fishes are increased stressors on these species, as well as the listed fishes. Any potential future projects proposed would be assessed on a case-by-case basis to determine potential effects on individual species and make recommendations on how to minimize the effects on the aquatic listed species using mechanical and/or chemical treatments. These treatments will be used for both aquatic and terrestrial invasive species to reduce competion to listed aquatic species and improve their habitats.

Guideline FW-Invas-G-3 ensures only weed-free plant materials are used for seeding and mulching projects in disturbed areas, thus reducing the chances of invasive species taking hold and adversely effecting species habitat. Most invasive and noxious weed species do not have the dense root characteristics of native wetland plants that are important for streambank stability. The replacement of native riparian/wetland vegetation with non-native vegetation species may cause increased streambank erosion and decreased water and habitat quality for narrow-headed gartersnakes and their prey.

Livestock Grazing

Range management program activities include the production of forage for grazing and browsing livestock and wildlife. Livestock grazing is permitted on the Coconino NF within listed aquatic species watersheds. Grazing use is administered through a grazing permit system on designated livestock grazing allotments. Livestock grazing would continue throughout suitable rangelands on forest lands within the planning area. Most segments of listed aquatic habitat have limited livestock grazing or are protected from grazing by exclosure fences along riparian habitat or have limited accessibility due to steep terrain. Adverse livestock management effects to listed aquatic species and their habitats would primarily be indirect effects associated with habitat disturbance in upland areas and resulting sedimentation. Livestock accessible areas of listed aquatic species habitat and critical habitat may experience adverse effects to streambanks, riparian vegetation, and water quality.

The BA did not provide riparian or aquatic habitat condition information for listed fish occupied streams or their critical habitats. Current range conditions on the Coconino NF are reflective of past and ongoing grazing activities. Condition classes of 6th HUC watersheds on Coconino NF show 62 percent functioning properly (have adequate vegetation, landform, or large woody debris present), 28 percent functioning at risk (watersheds are in functional condition but an existing soil, water, or vegetation attribute makes them susceptible to degradation), 4 percent are non-functional (watersheds clearly are not providing adequate vegetation, landform, or large woody debris to dissipate stream energy associated with high flows and, consequently, are not reducing erosion and improving water quality), and 5 percent with unknown function (USFS 2017a).

There are five relevant guidelines for rangeland management in listed aquatic species habitat:

- FW-Graz-G-2 - Livestock grazing should be managed to meet, or move towards, the desired conditions for forest resources such as soil, water, vegetation, and species;
- FW-Graz – G- 3 - Burned or mechanically treated areas should be given sufficient rest from livestock grazing, especially during the growing season, to ensure plant recovery

and vigor and to ensure that perennial plants would not be permanently damaged by grazing. Grazing should not be authorized in burned or mechanically treated areas until Forest Service specialists determine plant recovery and vigor in the burned or treated area by considering characteristics such as seed heads or flowers, multiple leaves or branches, and/or a root system that does not allow them to be easily pulled from the ground. These characteristics provide evidence of plant recovery, vigor, and reproductive ability;

- FW-Graz – G- 4 - Structural range improvements (e.g., fences, troughs, earthen stock ponds, pipelines) should be located, constructed, reconstructed, maintained, and used in a manner that is consistent with the desired conditions for riparian areas, wet meadows, aspen, formally identified archaeological sites, known locations of Southwestern Region sensitive species, and other sensitive resources. Range improvements should be modified, relocated, or removed when found incompatible;
- FW-Graz – G- 5 - Salt, minerals, and/or other supplements should be located and used so that sensitive resources are protected from excessive trampling, compaction, salinization, and other impacts. For example, these supplements should be located at least a quarter of a mile from riparian areas, formally identified archaeological sites, known locations of Southwestern Region sensitive species and other sensitive resources; and
- FW-Graz – G- 7 - Where permitted livestock have access to riparian areas, the use of riparian species should provide for maintenance of those species, allow for regeneration of new individuals, protect bank and soil stability, and reduce the effects of flooding. Maintenance of woody riparian species should lead to diverse age classes of woody riparian species where potential for native woody vegetation exists. This guideline would not apply to fine scale activities and facilities such as intermittent livestock crossing locations, water gaps, or other infrastructure used to minimize impacts to riparian areas at a larger scale.

Effects from livestock grazing contribute to both direct and indirect effects to listed aquatic species habitat; however these effects are minimized by use of riparian exclosures, limited pasture use, or timing restrictions for livestock use in riparian areas where it occurs. Most riparian habitat on the Coconino NF has been fenced or excluded from permitted livestock grazing. Livestock grazing may still adversely affect important habitats needed by listed aquatic species outside of these protected or specially-managed areas. Adverse effects include disturbance to riparian vegetation, alteration of stream morphology due to trampling and removal of riparian vegetation, and impacts to water quality from sedimentation due to lack of ground cover and bank trampling. The guidelines listed above are expected to minimize these adverse effects by limiting grazing intensity, maintaining riparian vegetation, reducing sedimentation, reducing trampling, and maintaining riparian functions. However, over the life of this consultation, we expect that implementation of the Livestock Grazing Program could result in adverse effects to listed fish and their habitats.

Projects related to improving watershed and soils conditions include direction to implement projects to counter critical threats to riparian functionality during the 10 to 15 years following plan approval. Activities could include, but are not limited to, vegetation reestablishment, non-native invasive plant treatments, erosion control, instream habitat improvement, adjusting the timing and season of grazing, or fencing exclosures. In most cases, projects would be limited in extent and amount of ground disturbance. Projects in the riparian and stream zones would have

localized, short-term effects including streambank disturbance, vegetation reduction, sedimentation into the stream, and disturbance to listed gartersnakes. These projects will occur for the life of the plan; therefore the short-term impacts would continue at numerous locations. All activities would implement the standards, guidelines, and best management practices as described in the BA (USFS 2017a). Additionally, projects would have long-term beneficial effects as watersheds and aquatic and riparian habitats move towards a sustainable landscape that is healthy, diverse, resilient, and functioning, with stable soils, functional hydrology, and biotic integrity, and supporting healthy, diverse populations of native wildlife.

Range projects, such as fencing, within riparian areas could improve aquatic and riparian conditions and are expected to reduce sedimentation to aquatic habitats, which would maintain or improve water quality and healthy macroinvertebrate populations. They would also promote recruitment and maintenance of native riparian vegetation, which would help to maintain suitable water temperature for listed fishes in the streams. However, if the projects include water gaps or cattle crossing lanes, there will be long-term negative effects from the disturbance and increased sedimentation caused by the concentrated cattle.

This program area has the potential through grazing activities to impact the narrow-headed and northern Mexican gartersnakes and/or their habitat, often through livestock trampling of individuals or riparian and floodplain/streambank vegetation removal, or destroying basking features such as logs. Plan components applied to this program area are listed below, followed by discussion of potential effects to the species. The guideline FW-Graz-G-4 recommends that grazing structures within riparian areas be located so as to avoid conflict with riparian functions and processes. Additionally, guidelines FW-Graz-G-3 and 7 provide for plant growth and vigor. These guidelines ensure that cover is available for narrow-headed gartersnake and northern Mexican gartersnake to protect them from potential predators.

Livestock grazing can affect the habitat as a result of movement along the streams, temporarily reducing hiding cover, trampling streambanks, contributing to sedimentation, and adding waste deposits that can impair water quality. Impacts to water quality would be greatest during seasonal low flow periods and during droughts. Additionally, livestock grazing can alter prey availability for the species through reduced cover for prey, reduced water quality for prey, and direct trampling of prey (in particular egg masses). Implementation of rangeland management standards and guidelines, as described above and in the BA, provide guidance to reduce livestock grazing impacts to riparian areas.

Forest Products

Forest products fall into three categories: (1) timber, (2) special forest products, and (3) forest botanical products. Timber products include products such as firewood, wood pellets for home and industrial heating, structural panels, animal bedding, wood molding, pallets, structural lumber, posts and poles, sawtimber, pulpwood, non-sawlog materials removed in log form, cull logs, small roundwood, house logs, and biomass for electricity. Special forest products include products such as bark, berries, boughs, bryophytes (i.e., nonvascular plants such as mosses), bulbs, burls (i.e., deformed tree growths), cactus, Christmas trees, cones, ferns, firewood, forbs, fungi (including mushrooms), grasses, nuts (including piñon nuts), pine straw,

roots, sedges, seeds, transplants, tree sap, wildflowers, fence material, mine props, posts and poles, and rails. Forest botanical products are a subset of special forest products.

Depending upon the size and location of the project, upland project impacts could result in increased runoff and sediment movement from vegetative cover removal during treatments. Projects in the uplands would be limited spatially and temporally to reduce these watershed impacts. However, there may still be short-term adverse effects before adequate vegetation cover has returned.

Vegetation treatments implemented under this program may cause short-term increases in flood runoff, stream channel scouring or sediment deposition into listed aquatic species habitat. The guidelines described above are intended to reduce this impact on listed aquatic species and their habitat.

The sale of forest products are often associated with thinning and fuels reduction projects or silvicultural treatments. Projects such as these can result in impacts to upland and aquatic habitat. The guideline FW-FProd-G-1 would provide for maintaining or moving the site toward the ecological desired conditions, thereby improving water quality, providing habitat with cover, reducing fuel buildup and regulating stream temperatures. These plan components would help to minimize effects of the forest products program to the aquatic listed species.

This program area has the potential to impact the narrow-headed gartersnake and northern Mexican gartersnake and their prey, through disturbance and potential loss/fragmentation of habitat, since they are known to move beyond 600 feet from streams and riparian areas. Short-term impacts would include change in stand structure which may impact foraging areas of the gartersnakes. Additionally, this program could contribute towards sedimentation into the riparian and aquatic systems, adversely affecting the listed fish and gartersnakes, as well as their critical habitat.

Minerals Resources

The Forest Service role in minerals management is to administer mining, oil, gas, and geothermal activities, while providing protection of surface resources (36 CFR 228), such as vegetation and aquatic resources. Authorized activities associated with mineral extraction may impact listed fish and/or their habitats by affecting water quality or impacting stream bodies. Activities associated with mining include removal of trees and surface vegetation, displacement of surface soils, construction of roads, buildings, wells, pumping stations, waste water ponds and transmission lines (USFS 2017a). Effects of these projects could include erosion and sedimentation into riparian areas and streams, as well as loss of habitat from noxious weed infestation and spread. Although unlikely to occur directly within occupied, potential or critical habitat, ground disturbing activities in the uplands of watersheds that contain these habitats could result in indirect effects such as: reduction of water quality from mining effluent, road construction or other ground disturbing actions; groundwater reduction from pumping activities; and changes to riparian vegetation from vegetation removal or establishment of invasive weed species.

The Coconino NF currently has 17 located mining claims across the forest, in addition to another 72 active claims in the Verde Valley area (Haessig 2016). In addition, rock collection is permitted at several locations across the forest, none of which are near perennial water.

There are several guidelines that minimize impacts to the aquatic habitats of the listed species.

- FW-Minerals-G-1 – considers withdrawing for locatable minerals the habitat of species with very limited range, which includes most of the aquatic listed species on the Coconino NF for locatable minerals;
- FW-Minerals-G-3 – considers no surface occupancy, no leasing, or adding leasing stipulations in area with federally listed species;
- FW-Minerals-G-4 - protects listed species habitats through surface occupancy restrictions, mitigation measures, and operating plan requirements imposed on mineral activities; and
- MA-OakCrk-G-12 - manages mineral material operations to protect water quality and recreation settings.

In most cases mineral removal also requires the use of water resources. Mineral extraction activities have been shown to dewater springs and streams that provide habitat for aquatic species, which would have an adverse effect on northern Mexican and narrow-headed gartersnakes, Gila chub, and Little Colorado spinedace, their habitats, and their critical habitats, as well as critical habitats of loach minnow and spikedace. In addition, surface occupancy causes direct habitat loss and the addition of human occupation increases the chances for harassment and mortality. There is a potential for mining operations to be excavated to a depth greater than that of the regional aquifer and water would drain from deep storage in the aquifer into the pit. The need to dewater the pit during mining operations would result in ongoing water removal via pumping of aquifer water storage, having a negative impact on aquatic species. The guidelines above would minimize impacts to aquatic listed species by limiting surface occupancy, withdrawing lands from mineral activity and applying restrictions or requirements in occupied habitats.

Roads and Facilities

The Coconino NF roads and facilities management includes conducting inventories, surveys, and analyses; formulating plans; and executing reconstruction, maintenance, and obliteration operations (USFS 2017a). The motorized transportation system for the Coconino NF is composed of 773 miles of roads managed and maintained for highway legal vehicles, 4,602 miles of roads open to all motorized vehicles, and 588 miles of roads closed to all motorized vehicles. Motor vehicle use off of the designated system of roads, trails and areas is prohibited except as identified on the motor vehicle use map (MVUM) and as authorized by law, permits, and orders in connection with resource management and public safety. Future projects would be designed to restore and improve watershed conditions and would employ BMPs, guidelines, and mitigation measures to protect watershed resources.

The Coconino NF owns and manages 167 administrative facilities and sites. An overall reduction in facilities through consolidation and decommissioning is planned. Methods used to meet the overall desired conditions of the program would include assessing and decommissioning facilities.

Although occurring across the entire forest for the length of the plan, transportation projects could have localized adverse effects to listed aquatic species and their habitat from actions taken near or in-stream. Long-term effects to the species include disturbance, loss/fragmentation of habitat, and erosion from roads that deposit sediment or concentrate runoff into streams. Potential downstream effects of this program area could result in increased sedimentation from forest roads in listed aquatic species habitats and their critical habitats. Roads crossing or adjacent to streams can remove and alter riparian vegetation, impact stream channel function and structure, and alter and degrade aquatic habitat through changes in water quality and increases in erosion and sediment deposition. Improperly designed culverts can create barriers to fish movement and effect habitat by causing downstream erosion and upstream sediment deposition during high flow events from the backwater effects of improperly sized culverts.

Road projects improving soil and vegetation condition in the uplands could improve or minimize this program's impacts to aquatic and riparian conditions along streams where listed fish species and their critical habitats occur. There are several relevant objectives, standards and guidelines that would affect listed aquatic species and their habitats:

- Objective FW-RdsFac-O-1 would decommission 200 to 800 miles of unauthorized and unneeded system roads during the next 10 years. There could be short-term adverse impacts during the restoration period when vegetative cover may be minimal. If these decommissioned and restored roads are within riparian areas or cross stream channels within listed aquatic species habitat, it will have long-term beneficial impacts;
- Standard FW-RdsFac-S-1 would require motorized vehicle use to only occur on designated system roads and trails, and designated areas designated on the MVUM map. This standard minimizes sedimentation from vehicles by restricting cross-country use;
- Guideline FW-RdsFac-G-2 requires roads to be designed, located and maintained to meet desired condition of other resources in the area. Location and design will minimize effects to the resource. This guideline helps minimize sediment into riparian and aquatic areas, thus reducing impacts to the aquatic listed species; and
- Guideline FW-RdsFac-G-3 requires temporary roads to be rehabilitated promptly following project completion. This guideline also helps minimize sediment into riparian and aquatic areas, thus reducing impacts to the aquatic listed species.

Ongoing activities within the transportation program include the operation and maintenance of the transportation system on the Coconino NF, which consists of roads and trails that provide access to areas on the forest including: private land, structures and improvements under special use permit, recreational opportunities, and facilities that support land and resource management activities. We would expect that over the life of the project, there could be additional new and temporary road construction, to help support forest activities and provide access to inholdings, which may result in both short- and long-term adverse effects to listed fish and their habitat. Aquatic listed species occurring on the Coconino NF could be indirectly impacted due to increased sedimentation caused by road maintenance and other transportation activities.

Vehicle traffic on roads may injure or kill northern Mexican and narrow-headed gartersnakes up to 1 mile or more away from aquatic habitat. Disturbance, loss/fragmentation of habitat and erosion from roads that deposit sediment or concentrate runoff into riparian areas may impact the

listed aquatic species. Roads crossing or being adjacent to streams can remove and alter riparian vegetation, impact stream channel function and structure, and alter and degrade aquatic habitat through changes in water quality and increases in sediment deposition which would also have an impact on the prey species.

Impacts from vehicle traffic to the gartersnakes include direct mortality from being run over by vehicles, increased opportunity for collection, and direct habitat loss and/or fragmentation and harassment. The objective, standard and guidelines would help minimize impacts to these species.

Land Adjustments and Special Uses

These program areas are responsible for land adjustments (exchange and purchase) and the issuance of special use permits for lands and recreation. Special use permit issuance may adversely affect narrow-headed and northern Mexican gartersnakes, as well as listed fish, and their habitats and their prey if the authorized activities affect water quality or impact stream bodies.

Five guidelines address potential impacts to listed aquatic species and their habitats.

- FW-LndAdj-G-1 promotes land acquisitions that contain habitat for listed species and/or contain or influence wetlands, riparian areas, or other water-related features. This guideline would be beneficial to the listed aquatic species.
- FW-LndAdj-G-2 restricts lands leaving forest ownership from containing unique ecological resources (i.e.: listed species habitat), thus retaining listed aquatic species habitat.
- FW-SpecUse-G-3 restricts the issuance of permits for activities occurring within 200 feet of streams, springs or water of federally listed species, thus ensuring aquatic species habitat is protected. This will protect riparian resources. Exceptions may be made for hardened or slickrock sites, water-dependent activities, or safety.
- FW-SpecUse-G-5 requires new and reconstructed overhead utility lines, support towers, and other utility infrastructure to be located and designed to minimize adverse ecological, wildlife, and scenic impacts. This would minimize sedimentation and erosion from reaching riparian areas occupied by listed aquatic species.
- FW-SpecUse-G-6 requires vegetation that does not interfere with vegetation clearance requirement within rights-of-ways to be retained to provide habitat and corridors for wildlife species. This would minimize the loss of vegetation needed for cover and prey habitat.

While these guidelines associated with special use permits may limit or prevent short- or long-term impacts to narrow-headed and northern Mexican gartersnake, as well as listed fish species and their critical habitats; adverse effects may still occur to them and their native fish prey. These may include excessive sediment pulses into stream habitats, temporary or permanent reduction or removal in streambank structure and vegetation that provides cover, and human disturbance during fish prey breeding and spawning periods.

Ms. Laura Jo West, Forest Supervisor

Recreation

Reservoirs and streams and adjacent areas receive high levels of recreational activities that can alter vegetation, riparian areas, water quality, and aquatic habitat. Recreation sites and developments and their associated uses and activities can present threats to maintaining, restoring and recovering narrow-headed and northern Mexican gartersnake habitats, as well as listed fish, and their critical habitats. Recreational sites and activities can degrade upland and watershed conditions and function, alter riparian vegetation and function, and reduce water quality and increase sediment into streams which could affect native fish which narrow-headed and northern Mexican gartersnakes feed upon. Recreational activities within and adjacent to riparian areas and streams can also increase the risk of introductions and spread of non-native invasive or undesirable plants and animals.

One standard and several guidelines are included in the LRMP that can address potential impacts of recreation to listed aquatic species, their prey, and their habitats.

- FW-Rec-Disp-S-1 requires motorized vehicle to remain on designated system of roads, trails, and areas (including locations designated for motorized big game retrieval), as defined on motor vehicle use maps, except for those uses authorized by law, permits, and orders in connection with resource management and public safety. This results in reduced impacts to the aquatic and riparian systems;
- FW-Rec-All-G-1 ensures recreational activities, locations, and/or settings are designed and managed to maintain or move toward desired conditions for other uses and resources, which includes aquatic systems;
- FW-Rec-All-G-2 manages recreation activities, locations and/or setting to be in balance with other resources;
- FW-Rec-All-G-4 restricts parking or designates parking so as to prevent resource damage and to promote public safety while ensuring visitor access within the capacity of the site;
- FW-Rec-All-G-5 designs parking to ensure resources are protected;
- FW-Rec-All-G-6 has forest users carry certified weed-free feed for their stock to prevent spread of invasive plants;
- FW-Rec-Dev-G-2 promotes a natural-appearing landscape, emphasizes the use of native plant species during planning activities (such as design of new sites or improvements to existing sites). Invasive species should be removed or treated on existing sites before they become widespread within recreational sites;
- FW-Rec-Dev-G-3 manages developed recreation sites to discourage or prohibit broken or cut tree limbs or the removal of all downed woody debris to maintain a natural-appearing landscape, to maintain the integrity of the site, and to control accelerated erosion;
- FW-Rec-Disp-G-3 restricts visitors from soil and plant restoration sites to promote re-establishment of vegetation and functioning soil;
- FW-Rec-Disp-G-5 manages dispersed camping along riparian areas to maintain or move toward desired conditions for riparian areas and water**;**
- FW-Rec-Trails-G-1 requires trails and trailheads to be designed, built, rerouted, or maintained utilizing current best practices that promote sustainable trail surfaces, prevent conflicts with neighboring lands, address impacts to other resources, and consider user experiences;

- FW-Rec-Trails-G-3 requires rehabilitation of unplanned, user-created trails to prevent future access and to accelerate recovery and to prevent further resource impacts; and
- FW-Rec-Trails-G-5 promotes or expands recreation opportunities on closed roads by considering for conversion to motorized and/or non-motorized trails to promote or expand recreation opportunities when it benefits or does not degrade other resources.

The LRMP includes standards and guidelines to minimize the impacts to listed aquatic species from recreation activities; however, there is also direction in the LRMP to increase and/or improve recreational opportunities. Over the life of the LRMP, this could result in adverse impacts to listed fish and their habitat through multiple mechanisms, through disturbance and potential loss/fragmentation of habitat. Guideline FW-Rec-All-G-4 ensures parking is limited to prevent overland runoff carrying oil products from cars into nearby streams.

Area Specific Direction

Management Areas

Nine of the eighteen proposed management areas (MAs) contain critical habitat for the listed aquatic species (USFS 2017a). Discussions of these MAs are addressed in the BA and are incorporated by reference. There are several guidelines which minimize potential adverse effects to the aquatic habitat within these specific MAs (MA descriptions are discussed in the LRMP (USFS 2017b).

- MA-PineBelt-G-1 manages roads and trails within the Pumphouse Wash to decrease erosion and sedimentation into Oak Creek Canyon to improve watershed conditions;
- MA-OakCrk-G-4 focuses road and trail rehabilitation in steep drainages to reduce sedimentation into Oak Creek Canyon and to mitigate impacts to other forest resources;
- MA-OakCrk-G-5 locates and manages trails and recreation to reduce impacts to woody riparian vegetation and riparian habitat;
- MA-OakCrk-G-6, MA- HouseMtn -G-6, and MA-SedN-G-5 restricts vehicular access to Oak Creek to minimize user conflicts, to maintain the desired conditions of other resources, and to promote public health and safety;
- MA-OakCrk-G-9 manages recreation to maintain water quality standards by placing toilets in strategic locations, providing information about proper sanitation practices, installing shower and hand-washing facilities, and providing gray water disposal sites;
- MA-VerdeV-G-1 maintains and improves watershed and riparian function and/or prevent the introduction or spread of disease, invasive, or undesirable species;
- MA-LongV-G-1 and MA-EastClr-G-1 manages dispersed camping opportunities and motorized recreation to occur outside the vicinity of meadows and riparian areas to maintain soil function, long-term soil productivity, and desired conditions for associated resources;
- MA-CCCrg-G-1 manages the C.C. Cragin Watersheds MA to reduce the threat of uncharacteristic wildfires, flooding, and sedimentation, and to maintain water quality and quantity; and
- MA-CCCrg-G-2 maintains roads and trails within the C.C. CraginWatersheds MA to prevent erosion and sedimentation and to protect existing infrastructure.

These guidelines minimize short-term adverse effects to the aquatic listed species and their habitats by maintaining and improving water quality and quantity, retaining riparian vegetation and habitat, reducing sedimentation and erosion, improving riparian and soil function, and preventing spread of disease and non-native species within these special areas, resulting in beneficial long-term effects.

Special Areas

Special areas include designated wilderness areas, recommended wilderness areas, designated and eligible wild and scenic rivers, national trails, scenic roads, established and proposed research natural areas and botanical and geological areas, and inventoried roadless areas. Several aquatic listed species, occupied habitat, and critical habitats occur within these areas. There is one objective and three guidelines that help minimize any adverse impacts that may occur within listed aquatic species habitats:

- SA-Wild-O-1 rehabilitates one to five wilderness sites or areas annually that have been impacted by recreation in order to restore wilderness character. These sites could include habitat for the listed species, resulting in short-term negative effects from increased sediment from soil disturbance and vegetation removal. However, it would result in beneficial long-term results by reducing sediment and erosion into riparian areas;
- SA-Wild-G-1 implements management activities and permitted uses designed to maintain or move toward the desired conditions for wilderness and other resources. If occurring within occupied habitat, these activities would maintain or improve aquatic and riparian habitat for listed species and their prey;
- SA-Wild-G-8 maintains the travertine formations and water chemistry of Fossil Creek, which in turn will benefit several aquatic listed species and their habitat; and
- SA-WSR-G-1 manages recreation and other activities at designated and eligible rivers and associated corridors to occur at appropriate locations and intensities to protect and enhance the free-flowing condition, and the outstandingly remarkable values, consistent with the classification. Management of the rivers would maintain and protect occupied and critical habitat for the Little Colorado spinedace, loach minnow, and spikedace.

These guidelines minimize short-term adverse effects to the aquatic listed species and their habitats by maintaining and improving water quality and quantity, retaining riparian vegetation and habitat, reducing sedimentation and erosion, improving riparian and soil function, and preventing spread of disease and non-native species within these special areas, resulting in beneficial long-term effects.

Summary of Effects to Gila Chub, Little Colorado Spinedace, Loach Minnow, and Spikedace Designated Critical Habitat

There may be localized, short-term adverse effects to the PCEs of critical habitat from projects in or near riparian zones such as streambank disturbance, vegetation reduction, invasive species control, and sediment input to the streams. Projects related to springs and seeps within critical habitat would have similar effects to the PCEs. These projects may temporarily reduce the function of critical habitat through diminished water quality, breeding habitat, and prey base; however, we anticipate that these PCEs of critical habitat would be maintained or improved in the long-term. We do not anticipate that these activities would diminish the ability of critical habitat to contribute to the conservation and recovery of the species.

Coconino NF management actions needed to support native fish restoration could include construction and maintenance of fish barriers and projects to improve aquatic habitat for the species, including removal of non-native invasive species. These projects could have localized, short-term adverse effects to the PCEs of critical habitat, including streamflow and streambank alteration, decreased water quality from sedimentation, and disruption of prey base from construction and maintenance of structures such as fish barriers. Project activities would be minimized by implementation of guidelines listed above and in the BA.

Overall, the Wildlife, Fish and Plants Program and other program components are positive for critical habitat in the long-term and would maintain or improve watershed condition indicators related to the PCEs of water quality, non-native species, breeding habitat, and prey base. We do not anticipate that these activities will diminish the ability of critical habitat to contribute to the conservation and recovery of Gila chub, Little Colorado spinedace, spikedace, and loach minnow.

Localized short-term adverse effects to critical habitat from roads in and adjacent to critical habitat that affect water quality, food base, and riparian vegetation and streambanks are likely to occur as a result of transportation-related projects. In the long-term, projects are expected to improve soil and vegetation condition in the uplands and will likely improve or at least minimize impacts to aquatic and riparian conditions along streams. Implementation of standards and guidelines previously described are anticipated to reduce the effects of ongoing roads maintenance and future projects in the subwatersheds. Despite the short-term adverse effects that may result from transportation-related projects, we expect that over the long-term, the function of critical habitat for the species will be retained. We do not anticipate that these activities will diminish the ability of critical habitat to contribute to the conservation and recovery of Gila chub, Little Colorado spinedace, spikedace, and loach minnow.

Segments of critical habitat are protected from livestock grazing by exclosure fences, pasture closures, or have limited accessibility due to steep terrain. Areas accessible to livestock within critical habitat could result in short-term adverse effects to streambanks, riparian vegetation and water quality from livestock waste in or near habitat. Impacts to water quality would be greatest during seasonal low flow periods and during droughts. Additionally, recreational activities and special uses can present threats to maintaining and restoring listed aquatic species critical habitats. Recreational activities degrade upland and watershed conditions and function, alter riparian vegetation and function, and reduce water quality and increase sediment into streams. Special use permit issuance may adversely impact water quality or impact stream bodies. These activities can also increase the risk of introductions and spread of non-native invasive or undesirable plants and animals if occurring within and adjacent to critical habitats.

Overall, the livestock grazing, recreation and special use programs could result in short-term adverse effects to water quality in critical habitat, but we anticipate that that these activities will be limited in location, duration, and frequency and would not decrease the functionality or conservation potential of critical habitat over the long-term. We do not anticipate that these activities will diminish the ability of critical habitat to contribute to the conservation and recovery of the species.

Gila Chub Designated Critical Habitat

PCE 1: Perennial pools, areas of higher velocity between pools, and areas of shallow water among plants or eddies all found in headwaters, springs, and cienegas, generally of smaller tributaries.

EFFECT: There may be localized, short-term adverse effects to this PCE from watershed improvement projects, roads and trails, livestock grazing, and minerals projects in aquatic habitats such as streambank disturbance and sediment input which may deposit in important pool habitats. These projects may temporarily reduce the function of critical habitat through diminished pool habitat, which serve as refuges in hot weather; however, we anticipate that this PCE would be maintained or improved in the long-term. In the long-term, projects are expected to improve soil and vegetation condition in the uplands and will likely improve or at least minimize impacts to aquatic and riparian conditions along streams. Implementation of standards and guidelines previously described are anticipated to reduce the effects of forest programs in the sub-watersheds occupied by Gila chub.

PCE 2: Water temperatures for spawning and seasonally appropriate temperatures for all life stages.

EFFECT: The effects described under PCEs 1 and 3 indirectly address water temperature thresholds required to meet Gila chub life cycle needs.

PCE 3: Water quality with reduced levels of contaminants, including excessive levels of sediments adverse to Gila chub health, and adequate levels of pH, dissolved oxygen, and conductivity (100 to 1000 milliohms).

EFFECT: Areas accessible to livestock within critical habitat could result in short-term adverse effects to streambanks, riparian vegetation and water quality from animal waste in or near habitat. Impacts to water quality would be greatest during seasonal low flow periods warm weather and during droughts. The Livestock Grazing Program may cause short-term adverse effects to water quality-related PCEs, but we anticipate that that these activities will be limited in location, duration, and frequency and would not decrease the functionality or conservation potential of critical habitat over the long-term. In addition, there are numerous program desired conditions, objectives, standards, and guidelines that address preventing excessive sediment, fuel, and other contaminants from entering aquatic habitats. We do not anticipate that livestock activities would diminish the ability of critical habitat to contribute to the conservation and recovery of the species.

PCE 4: Food base consisting of invertebrates and aquatic plants.

EFFECT: These effects are discussed under PCEs 2 and 3. The aquatic insect food base relies on adequate water quality (temperature, dissolved oxygen, contaminant-free water) for numerous life cycle stages. Programs that involve mechanized equipment have guidelines that prevent fuels and other contaminants from entering aquatic habitats. Forest program objectives that improve riparian vegetation would increase the availability terrestrial organic matter that many aquatic and terrestrial insects, which are prey for Gila chub, require.

PCE 5: Sufficient cover.

EFFECT: This PCE may be affected by large magnitude floods that scour cover structure from the stream channel. All forest programs have desired conditions, objectives, standards, and guidelines that would minimize effects from authorized activities in the watershed or stream channel. The availability of cover depends upon the presence of woody riparian vegetation growing along the stream channel. The LRMP has numerous plan decisions that protect or promote the growth of riparian vegetation along stream habitats that include Gila chub critical habitat.

PCE 6: Nonnative aquatic species.
EFFECT: While non-natives may already be present in some streams, the Coconino NF is implementing conservation measures to ensure that actions implemented under the LRMP do not result in the incidental movement of non-native species into critical habitat.

PCE 7: Streams that maintain a natural flow pattern including periodic flooding.
EFFECT: Actions implemented under the LRMP are expected to retain and recover this PCE for Gila chub. There are desired conditions, objectives, standards, and guidelines to ensure that areas supporting listed species are not dewatered or impaired to the point that they cannot support Gila chub. These plan decisions also protect instream flow, consistent with existing water rights and laws, that are expected to retain and protect this PCE.

Little Colorado Spinedace Critical Habitat
PCE 1: Clean, permanently flowing water.
EFFECT: Actions implemented under the LRMP have desired conditions, objectives, standards, and guidelines to protect instream flow, consistent with existing water rights and laws, that are expected to retain and protect this PCE. Programs that involved mechanized equipment have guidelines that prevent fuels and other contaminants from entering aquatic habitats. Pesticide use, to control invasive and noxious plant and animals, would be done so as to minimize impacts on non-target species. Actions implemented under the LRMP are expected to retain and recover this PCE for Little Colorado spinedace. There are desired conditions, objectives, standards, and guidelines to ensure that areas supporting listed species are not dewatered or impaired to the point that they cannot support spinedace.

PCE 2: Pools
EFFECT: There may be localized, short-term adverse effects to this PCE from watershed improvement projects, roads and trails, livestock grazing, and minerals projects in aquatic habitats such as streambank disturbance and sediment input. These projects may temporarily reduce the function of critical habitat through diminished pool habitat. However, we anticipate that this PCE would be maintained or improved in the long-term. Projects are expected to improve soil and vegetation condition in the uplands and likely improve or at least minimize impacts to aquatic and riparian conditions along streams. Implementation of standards and guidelines previously described are anticipated to reduce the effects of forest programs in the sub-watersheds occupied by Little Colorado spinedace.

PCE 3: Fine gravel or silt-mud substrates
EFFECT: The LRMP has numerous plan decisions that address desired conditions, objectives, standards and guidelines that require Forest Programs to take into account listed fish habitats.

This would include actions that provide for the appropriate substrate size in Little Colorado spinedace habitat that stable stream channel conditions would support.

Loach Minnow Designated Critical Habitat

PCE 1: Habitat to support all egg, larval, juvenile, and adult loach minnow which includes*:*

PCE 1a. Perennial flows with a stream depth generally less than 3.3 feet, and with slow to swift flow velocities between 0.0 and 31.5 inches per second.
EFFECT: Actions implemented under the LRMP are expected to retain and protect this PCE. Guidelines ensure that within existing water rights, excess water remain in or be allowed to flow freely back into the natural channel, spring, and riparian habitat to maintain and improve ecological function, water quality, quantity, and timing of flows, and to benefit native species and their habitat, and procured instream water rights provide sufficient flow is provided for aquatic species, habitat, and recreation. This helps ensure that areas are not dewatered or impaired to the point that they cannot support listed species, which includes the loach minnow. Actions implemented under the LRMP have required standards and guidelines to protect instream flow, consistent with existing water rights and laws, that are expected to retain and protect this PCE.

PCE 1b. Appropriate microhabitat types including pools, runs, riffles, and rapids over sand, gravel, cobble, and rubble substrates with low or moderate amounts of fine sediment and substrate embeddedness.
EFFECT: There may be localized, short-term adverse effects to this PCE from watershed improvement projects, roads and trails, livestock grazing, and minerals projects in aquatic habitats such as streambank disturbance and sediment input. We anticipate that this PCE would be maintained or improved in the long-term. In the long-term, projects are expected to improve soil and vegetation condition in the uplands and will likely improve or at least minimize impacts to aquatic and riparian conditions along streams. There are standards and guidelines to ensure that areas supporting listed species are not dewatered or impaired to the point that they cannot support fish, which would include the loach minnow. Chronic sedimentation from land management activities such as road maintenance, grazing, and vegetation management could adversely affect natural flood regimes and flood events, which in turn affect the substrate embeddedness of microhabitats.

PCE 1c. Appropriate stream habitats with a low gradient of less than 2.5 percent, at elevations below 8,202 feet.
EFFECT: Activities that may potentially increase stream gradients above the 2.5 percent threshold include those in the watershed that greatly increase flood magnitude so that stream channel downcutting and straightening occurs. In-channel activities, such as sand and gravel extraction, may cause gradient increases if channel incision and straightening occurs as a result of head cut forming and moving upstream. All forest programs have standards and guidelines that would prevent these affects from occurring as a result of authorized activities in the watershed or stream channel.

PCE 1d. Water temperatures in the general range of 46.4 to 77 °F.

EFFECT: The effects described under PCEs *1a*, *1b*, and 6 discuss water quantity and quality which may indirectly address temperature thresholds required to meet loach minnow life cycle needs. Actions implemented under the LRMP are expected to retain or recover this PCE for the loach minnow by implementing LRMP standards and guidelines, along with BMPs.

PCE 2. An abundant aquatic insect food base.
EFFECT: The aquatic insect food base relies on adequate water quality (temperature, dissolved oxygen, contaminant-free water) for numerous life cycle stages. Programs that involve mechanized equipment have guidelines that prevent fuels and other contaminants from entering aquatic habitats. Forest program objectives that improve riparian vegetation would increase the availability of organic matter that many aquatic insects require as a food source. Preventing and/or limiting increased sedimentation will help maintain adequate prey base.

PCE 3. Streams with no or no more than low levels of pollutants.
EFFECT: Programs that involve mechanized equipment have guidelines that prevent fuels and other contaminants from entering aquatic habitats. Pesticide and herbicide use, to control invasive and noxious plants and animals, would be done to minimize impacts on non-target species and their habitat.

PCE 4. Perennial flows, or interrupted stream courses that serve as connective corridors between occupied or seasonally occupied habitat.
EFFECT: Actions implemented under the LRMP are expected to retain and recover this PCE for loach minnow. There are standards and guidelines to ensure that areas supporting listed species are not dewatered or impaired to the point that they cannot support fish, which would include the loach minnow.

PCE 5. No nonnative aquatic species, or low levels of nonnative aquatic species that are sufficiently low to allow persistence of loach minnow.
EFFECT: The Coconino NF is implementing conservation measures to ensure that actions implemented under the LRMP, particularly movement of water under the fire, vegetation and range management programs do not result in the incidental movement of non-native species into critical habitat.

PCE 6. Streams with a natural, unregulated flow regime or, if flows are modified or regulated, a flow regime that allows for flows capable of transporting sediments.
EFFECT: Actions implemented under the LRMP are expected to retain and recover this PCE for loach minnow. There are standards and guidelines to ensure that areas supporting listed species are not dewatered or impaired to the point that they cannot support fish, which would include the loach minnow. Actions implemented under the LRMP have required standards and guidelines to protect instream flow, consistent with existing water rights and laws, that are expected to retain and protect this PCE.

Spikedace Designated Critical Habitat
The PCEs of spikedace critical habitat are very similar to those developed for the loach minnow. We anticipate that the effects of the proposed action to these PCEs would be the same as those described above under loach minnow.

Narrow-Headed Gartersnake Proposed Critical Habitat
Watershed improvement projects that involve instream improvements are expected to have short-term adverse effects to the PCEs of critical habitat related to habitat components, water quality, and prey base. There may be localized, short-term adverse effects from projects in riparian zones such as localized sediment input to the streams, temporary disturbance of habitat, and temporary disruption of prey base; however, these effects would be minimized by standards and guidelines as previously described. Furthermore, while watershed improvement projects related to instream habitat improvements would likely have short-term adverse effects, we anticipate that long-term benefits to PCEs of critical habitat will occur by maintaining and possibly improving their ability to contribute to the conservation and recovery of the species.
Direct effects to the PCEs of narrow-headed gartersnake proposed critical habitat resulting from native fish restoration projects are expected to be similar to the indirect effects to the species through habitat modification as described above. Coconino NF program area management actions needed to support native fish restoration could include construction and maintenance of fish barriers to restrict non-native fish from inhabiting areas currently occupied by only native species, and other projects that would result in improvement of aquatic habitat for the species. These projects would have localized, short-term adverse effects to the PCEs of critical habitat from barrier construction and maintenance such as streamflow alteration, sedimentation, and disturbance to the gartersnakes prey base. Project implementation would follow appropriate standards and guidelines, as described above, to minimize impacts to the PCEs of critical habitat. These native fish restoration projects are expected to have long-term benefits to gartersnake critical habitat by improving existing or increasing available habitat, improving water quality, and potentially providing increased prey availability. We do not anticipate that these activities will diminish the ability of critical habitat to contribute to the conservation and recovery of the species.

Similar to native fish restoration projects, direct effects to the PCEs of proposed critical habitat resulting from livestock grazing are expected to be similar to the indirect effects to narrow-headed gartersnake through habitat modification as described above. Livestock grazing can affect the PCEs of critical habitat as a result of movement along the streams, temporarily reducing shelter cover, trampling streambanks, contributing to sedimentation, and adding nitrogenous waste that can impair water quality. Impacts to water quality would be greatest during warmer months, seasonal low flow periods, and during droughts. Additionally, livestock grazing can alter prey availability for the snakes through reduced cover for prey, reduced water quality for prey, and direct trampling of prey. The implementation of grazing guidelines, as described above and in the BA, would provide guidance to reduce livestock grazing impacts to riparian areas. We do not anticipate that these activities will diminish the ability of critical habitat to contribute to the conservation and recovery of the species.

PCE l. Stream habitat, that includes:

a. Perennial or spatially intermittent streams with sand, cobble, and boulder substrate and low or moderate amounts of fine sediment and substrate embeddedness, and that possess appropriate amounts of pool, riffle, and run habitat to sustain native fish populations;
b. A natural, unregulated flow regime that allows for periodic flooding or, if flows are modified or regulated, a flow regime that allows for adequate river functions, such as flows capable of processing sediment loads;
c. Shoreline habitat with adequate organic and inorganic structural complexity (e.g., boulders, cobble bars, vegetation, and organic debris such as downed trees or logs, debris jams), with appropriate amounts of shrub-and sapling-sized plants to allow for thermoregulation, gestation, shelter, protection from predators, and foraging opportunities; and
d. Aquatic habitat with no pollutants or, if pollutants are present, levels that do not affect survival of any age class of the narrow-headed gartersnake or the maintenance of prey populations.

EFFECT: There may be localized, short-term adverse effects to this PCE from watershed improvement projects, roads and trails, livestock grazing, and minerals projects in aquatic habitats such as streambank disturbance and sediment input which may be deposited in important fish prey habitats. These projects may temporarily reduce the function of critical habitat through diminished prey base; however, we anticipate that this PCE would be maintained or improved in the long-term. In the long-term, projects are expected to improve soil and vegetation condition in the uplands and will likely improve or at least minimize impacts to aquatic and riparian conditions along streams. Implementation of standards and guidelines previously described are anticipated to reduce the effects of forest programs in the sub-watersheds occupied by narrow-headed gartersnakes and their prey.

Maintenance activities conducted within and near proposed narrow-headed gartersnake proposed critical habitat could temporarily increase turbidity of surface water within and downstream of the maintenance area. However, impacts on water quality should be localized and temporary, and BMPs will be implemented to reduce sedimentation and runoff from roads and other infrastructure. With the exception of these potential effects to water quality, activities implemented under the proposed action are expected to retain this PCE for the narrow-headed gartersnake as explained under 1.a. and l.b.

PCE 2. Adequate terrestrial space (600 feet lateral extent to either side of bankfull stage) adjacent to designated stream systems with sufficient structural characteristics to support life-history functions such as gestation, immigration, emigration, and brumation.
EFFECT: The Roads and Facilities Program may have adverse effects if a road is constructed in gartersnake proposed critical habitat. A road constructed in gartersnake habitat would result in the permanent loss of the PCEs of critical habitat associated with terrestrial space adjacent to stream systems. Additionally, if road maintenance activities are required at any time, PCEs related to riparian habitat that have regrown could be diminished.

The Recreation Program authorized activities such as dispersed camping, hiking, and other recreation activities may adversely impact adjacent terrestrial habitat through vegetation manipulation and disturbance. There are numerous plan decisions that address potential impacts

of recreation to riparian and adjacent areas, which would include those proposed as critical habitat. The LRMP includes standards and guidelines to reduce the impacts to riparian habitats, including those inhabited by narrow-headed gartersnake; however, there is also direction in the LRMP to increase and/or improve recreational opportunities. Over the life of the LRMP, this could result in impacts to gartersnake proposed critical habitat.

There are objectives that would enhance or restore stream and riparian habitat which would connect existing habitats and allow movement of riparian obligate species, such as the narrow-headed gartersnake, between them. Roads and motorized trails would be designed and located so as to not impede terrestrial and aquatic species movement and connectivity.

PCE 3. A prey base consisting of viable populations of native fish species or soft-rayed non-native fish species.
EFFECT: Program actions that involve ground disturbing projects in the uplands and within riparian and aquatic habitats are expected to have short-term adverse effects to the PCEs of proposed critical habitat related to prey base. There may be localized, short-term adverse effects from projects in watersheds and riparian zones such as sediment input to the streams, temporary disturbance of habitat, and temporary disruption of prey base. Long-term adverse effects may occur when roads, trails, or other heavy use areas are located within proposed critical habitat. However, these effects would be minimized by standards and guidelines as previously described under the listed aquatic species discussion above.

PCE 4. An absence of non-native fish species of the families Centrarchidae and Ictaluridae, bullfrogs (*Lithobates catesbeianus)*, and/or crayfish *(0. virilis*, *Procambarus clarki*, etc.), or occurrence of these non-native species at low enough levels such that recruitment of narrow-headed gartersnakes and maintenance of viable native fish or soft-rayed, non-native fish populations (prey) is still occurring.
EFFECT: The Coconino NF is implementing measures to ensure that actions implemented under the LRMP, particularly movement of water under the Fire and Livestock Grazing programs, do not result in the incidental movement of non-native species into critical habitat.

Northern Mexican Gartersnake Proposed Critical Habitat
The historical, current, and possible future distribution of the northern Mexican gartersnake on the Coconino NF occurs in the Upper Verde River, lower Oak Creek (below Sedona), and Spring Creek.. The PCEs of critical habitat are very similar for both the northern Mexican and narrow-headed gartersnake species; therefore, the effects to the PCEs of critical habitat for the northern Mexican gartersnake are the same as those described for the narrow-headed gartersnake. We do not anticipate that these activities would diminish the ability of critical habitat to contribute to the conservation and recovery of the species. Please refer to the effects analysis for the narrow-headed gartersnake above for a description of the effects to the northern Mexican gartersnake proposed critical habitat.

Riparian Species

Chiricahua Leopard Frog and Designated Critical Habitat

Forestwide Direction

Soils Management
The primary objectives of this program area are to sustain and stabilize soil productivity, which would improve habitat and prey habitat for this species. The objective, FW-Soil-O-1 would help maintain or improve impaired and unsatisfactory soil conditions on 100,000 to 350,000 acres during each 10-year period. This objective would result in maintenance or improvement of this species habitat.

Soil projects could have short-term adverse effects to leopard frog habitat components, water quality, and prey base. Three guidelines are designed to protect the resources and reduce the potential short-term impacts:

- FW-Soil-G-1 implements and monitors BMPs for projects that may impair water quality;
- FW-Soil-G-2 designs projects to avoid long-term impacts to soil function and productivity; and
- FW-Soil-G-3 designs project-specific features for steep slopes and where there is moderate to severe erosion hazard or soils that are particularly sensitive to disturbance.

There may be localized, short-term adverse effects from projects in and adjacent to riparian zones such as localized sediment input into habitat, temporary disruption of prey base, and temporary disturbance of habitat. However, these effects would be minimized by guidelines as previously described. Furthermore, while projects related to habitat improvements would likely have short-term adverse effects, we anticipate that long-term benefits to PCEs of critical habitat will occur by maintaining and possibly improving their ability to contribute to the conservation and recovery of the species.

Watersheds and Water
Overall, the Water Resources program plan components are positive for the Chiricahua leopard frog and its habitat in the long-term and would maintain or improve watershed condition related to water quality, non-native species, soils, riparian vegetation, and rangeland vegetation. However, these projects (i.e., maintain and improving watershed conditions and water quality) may have localized, short-term adverse effects such as streamflow and streambank alteration, and excess sediment erosion or deposition. These adverse effects could alter water quality and affect habitat quality; however; we would expect them to be short in duration and intensity.

Watershed improvement projects would focus on priority watersheds selected through the Watershed Condition Framework process (USFS 2017a). In most cases, projects will be limited in extent and amount of ground disturbance. These activities may have short-term adverse effects by increasing sedimentation during road relocation or prior to vegetation cover reestablishment. Guidelines including BMPs and other project specific design features should minimize the short-term adverse effects of sediment entering water courses during and after

project implementation. Long-term benefits of these projects would be reduction of chronic sedimentation effects into aquatic habitats, improved water quality, and retained vegetative cover.

Projects and activities in the riparian areas would improve aquatic and riparian conditions and are expected to reduce sediment deposition into riparian habitats, which would maintain or improve water quality. These projects would also promote recruitment and maintenance of native riparian vegetation, which provide cover for Chiricahua leopard frog and its prey. There may be localized, short-term adverse effects from projects in riparian zones such as localized sediment input into habitat, temporary disruption of prey base, and temporary disturbance of habitat. However, these effects would be minimized by standards and guidelines as previously described.

Projects in Chiricahua leopard frog habitat would have the localized and short-term effects of riparian vegetation reduction, sediment deposition, and disturbance to individuals. All activities would implement standards and guidelines and best management practices as described in the BA (USFS 2017a). Projects would have short-term adverse effects to the species and habitat but would have long-term beneficial effects as watersheds, aquatic, and riparian habitats move towards desired conditions.

The BA does not specify the watersheds or riparian or stream areas that would be treated under the LRMP. There are six relevant guidelines that apply to management and activities in Chiricahua leopard frog and their habitats:

- FW-Water-G-1 – Provides for enough vegetative ground cover to recover rapidly from natural and human disturbances and to maintain long term soil productivity;
- FW-Water-G-2 - Ensures that ecosystem processes, resilient vegetation conditions, and natural disturbance regimes are functioning properly within priority 6th code watersheds;
- FW-Water-G-3 – Provides for instream flow water rights to be procured for those streams without instream water rights to ensure sufficient flow is provided for aquatic species, habitat, and recreation;
- FW-Water-G-4 – Provides for best management practices for management activities to be identified, implemented, and monitored to maintain water quality, quantity, and timing of flows, and to prevent or reduce accelerated erosion;
- FW-Water-G-5 - Strives to maintain or improve water quality to meet or exceed Arizona water quality standards and support identified designated beneficial uses for impaired waters or non-attaining waters; and
- FW-Water-G-6 – Provides for excess water to remain in or be allowed to flow freely back into the natural channel, spring, and riparian habitat to maintain and improve ecological function, water quality, quantity, and timing of flows, and to benefit native species and their habitat.

These guidelines are expected to have long-term beneficial impacts, if implemented in watersheds occupied by Chiricahua leopard frog. Short-term impacts associated with project implementation could result including increases in sedimentation, soil compaction, alterations in hydrologic conditions and functions, and changes in water quality. Measures are implemented at

the project level, and site specific conditions and project activities and timing will determine their efficacy.

These guidelines would protect riparian and wetland and adjacent resources from soil and vegetation disturbing equipment, vehicles, and activities, retain surface water and protect against the risk of listed species habitat loss, and protect and improve water quality for listed species. BMPs would minimize effects of projects to improve areas impaired for soil conditions such as road relocation.

Constructed Waters

The Constructed Waters program is both positive and negative for Chiricahua leopard frog and its habitats in the long-term. The program would maintain or improve watershed condition indicators relative to water quality, soils, riparian vegetation, and rangeland vegetation, as well as help with the spread of *Bd* by providing habitat for species that act as reservoirs. These projects (i.e.: protecting or enhancing water quality, quantity and aquatic habitat; maintaining soil moisture; minimizing sediment, etc.) may have localized, short-term adverse effects such as streamflow and streambank alteration, and excess sediment erosion or deposition. These adverse effects could alter water quality and affect habitat amount; however; we would expect them to be short in duration and intensity.

In most cases, projects would be limited in extent and amount of ground disturbance. Overtime, projects in the riparian areas would improve aquatic and riparian conditions and are expected to reduce sediment deposition into aquatic habitats, which would maintain or improve water quality and healthy macroinvertebrate populations. They would also promote recruitment and maintenance of native riparian vegetation. All activities would implement standards and guidelines and BMPs as described in the BA (USFS 2017a). Projects would have short-term adverse effects to the species and its habitat, but would have long-term beneficial effects as watersheds and riparian habitats become more resilient to natural and other disturbances, including climate change.

The BA does not specify the watersheds, riparian or stream areas that would be treated under the LRMP. Guidelines FW-ConstWat-G-2 provides earthen stock ponds determined to be important for threatened, endangered, and Southwestern Region sensitive species, to be managed to maintain water and habitat needed for species survival and reproduction, consistent with existing water rights, which would reduce impacts from recreation, grazing, tank cleaning, and other activities that could affect occupied habitat.

Vegetation treatments implemented under this program that involve ground disturbance and are of sufficient size may cause short-term increases in flood runoff, scouring and sediment deposition into Chiricahua leopard frog habitat. This is expected to negatively effect Chiricahua leopard frogs until adequate ground cover has re-established on the treatment site and any excess sediment moves through the system. The guidelines are intended to reduce this impact on Chiricahua leopard frog and its habitats. We expect that over the life of the LRMP projects implemented under this program may result in short-term adverse effects to the species and habitat but would have long-term beneficial effects to the species and their habitats.

Riparian Areas
Currently all extant Chiricahua leopard frog populations on the Coconino NF are at stock tanks which are not connected to riparian habitat. Objectives for this program area include restoring the function of 200 to 500 acres of riparian areas, with emphasis on priority 6th code watersheds, restoring 5 to 10 wetlands not currently in proper functioning condition, and restoring at least 25 springs not currently in proper functioning condition. Management activities include continued work with partners and stakeholders, the relocation or modification of existing developments and infrastructure where appropriate to reduce fragmentation of the unique riparian vegetation communities.

Guidelines listed above in the aquatic species section for riparian habitat also address the needs to manage, maintain, protect, and restore riparian areas needed for Chiricahua leopard frog. These guidelines would maintain or restore riparian and soil functionality and reduce sedimentation in riparian areas. Although not intended to be applied at the fine scale such as intermittent livestock crossing locations, water gaps, or other infrastructure, guideline FW-Rip-RipType-G-3 would protect riparian function, which would result in beneficial long-term impact for the Chiricahua leopard frog habitat.

These guidelines are expected to have long-term beneficial impacts, when implemented in riparian areas occupied by Chiricahua leopard frog. Short-term impacts associated with project implementation could result in increases in sedimentation, soil compaction, alterations in hydrologic conditions and functions, and changes in water quality. These effects would be temporary and would eventually contribute to overall riparian health.

Wildland Urban Interface and Fire Management
Since there are no known occupied or potential sites of the Chiricahua leopard frog within the WUI, there should be no impact from this program. Project activities under the fire management program could include mechanical treatments and low intensity prescribed fires, along with construction of temporary roads and trails to access treatment areas.

In uplands, juvenile or adult Chiricahua leopard frogs that are dispersing or moving across terrestrial uplands during a prescribed fire may be scorched or burned (Pilliod *et al*. 2003), although the likelihood is low as overland dispersal typically occurs during wet conditions. Eggs, larvae, or adults that are exposed to sudden increases in water temperature or changes in water chemistry from ash and smoke, may be killed or experience some type of sublethal physiological stress (SESAT 2008).

Mechanical thinning and the construction of firebreaks and roads for fire management could also occur in conjunction with these activities. Mechanical removal of fuels, such as thinning of understory vegetation, may also result in ground disturbance. This could potentially influence the quality of the area for dispersing frogs and generate sediments and impact hydrological characteristics of watersheds influencing aquatic sites used by Chiricahua leopard frogs (Madrid *et al*. 2006). Firebreaks may similarly inhibit dispersal (Chan-McLeod 2003). The associated traffic from firebreak construction may also increase the likelihood of contamination of aquatic sites with petroleum products and the adverse effects these chemicals may have on frogs (Mahaney 1994). These firebreaks and roads may also act as a barrier to frog movement and

dispersal. Traffic on roads near occupied frog sites may also result in direct fatality to dispersing frogs, although on lightly used roads this may be uncommon (Forman *et al*. 2003). Unpaved roads and firebreaks can contribute to increased amounts of sedimentation to aquatic sites (Pilliod *et al*. 2003). Roads constructed to waters (perhaps to obtain water for suppression activities) may facilitate the spread of non-native predators/competitors or disease *(Bd, bsal, TSV)*. Roads and firebreaks may create small pools of water that may provide temporary habitat for dispersing frogs (Pilliod *et al*. 2006, USFWS 2007).

Long-term effects from mechanical firebreaks, and other activities to reduce fuels would potentially be positive as these activities reduce the changes wrought by uncharacteristic wildfires.

Wildlife, Fish and Plants

This program area includes maintenance and enhancement of habitat for listed and native species, inventory and monitoring, reintroductions, introductions, or transplants of species, control or eradication of non-native species, management of sport and native fishes, including the identification of refugia for native fish and the establishment or removal of fish barriers, habitat assessments, development of conservation strategies, administrative studies, collaboration with research, and information and education, along with coordination with federal and state agencies, and partners. Projects could include removal of non-native riparian and aquatic species, installation of fish barriers or opening of aquatic passage, improvement of riparian and instream habitat conditions.

Desired conditions for this program area are to provide properly functioning habitats, survival and recovery of listed species, and support self-sustaining populations of native aquatic and riparian species. To achieve the desired conditions, there are three objectives which may adversely effect the Chiricahua leopard frog:

- FW-WFP-O-1 – Implements activities that contribute to the recovery for federally listed species during each 10 year period over the life of the plan;
- FW-WFP-O-4 - Restores or enhances at least 70 miles of stream habitat during each 10-year period over the life of the plan; and,
- FW- FW-WFP-O-5 – Completes at least 30 products or activities that educate the public about wildlife, fish, and plant resources during each 10-year period over the life of the plan.

These objectives work towards improving Chiricahua leopard frog habitats and provide for education to the public. Although there may be short-term impacts to the Chiricahua leopard frog due to increased erosion and sedimentation, the long-term effects will result in improved and enhanced habitat, as well as a decrease in erosion and sedimentation.

Standards and guidelines address the needs to manage, maintain, protect, and restore riparian areas needed for Chiricahua leopard frog and include:

- FW-WFP-S-1 – Precedence will be given to listed species over non-listed species;
- FW-WFP-S-2 – Timing restrictions will be applied to projects that may have the potential to negatively affect listed species, bald eagles, and golden eagles;

- FW-WFP-G-1 – Habitat management objectives and species protection measures from approved recovery plans should be applied to activities occurring within federally listed species habitat to promote recovery of the species;
- FW-WFP-G-3 – Projects and management activities should be designed or managed to maintain or improve habitat for native species and to prevent or reduce the likelihood of introduction or spread of disease;
- FW-WFP-G-4 – Project design should include measures to minimize the negative impact of pesticides, herbicides, or chemicals to species and their habitat. For example, chemical free buffers could be placed around riparian or aquatic habitat;
- FW-WFP-G-9 – Fire suppression techniques that minimize habitat and disturbance impacts should be used where there are federally listed and Southwestern Region sensitive species, consistent with public and fire fighter safety; and,
- FW-WFP-G-13 – New road and new trail locations should be designed to maintain species access to adjoining habitat, to maintain habitat for dispersal and migration, and to meet species' life history requirements.

Project activities would be minimized by the guidelines described above, listed in the proposed action, and additional actions FWS and AGFD typically conduct with restoration projects. Guidelines would ensure that any forest program activity occurring in riparian habitats would be consistent with existing recovery plan, maintain or improve habitat, provide for dispersal and migration, meet species needs, and minimizing negative impacts from pesticides by providing riparian buffers.

Habitat improvement projects such as riparian fencing to protect habitat could have short-term vegetation and soil impacts in occupied habitat and adjacent uplands (e.g., vehicles delivering/laying out materials, fences being constructed across or alongside occupied habitats). Reintroduction of new populations would increase the number of populations potentially affected by the proposed action. Habitat improvements should ultimately result in improved riparian conditions, resulting in less sedimentation and erosion downstream, where the Chiricahua leopard frog occurs. Therefore, these activities may result in long-term beneficial effects. These projects would have localized, short-term adverse effects to the species as increased sedimentation and disturbance to individual Chiricahua leopard frog populations. These restoration and enhancement projects are expected to have long-term benefits by improving existing habitat for the Chiricahua leopard frog, providing new habitat and lowering predation risk.

Overall, the Wildlife, Fish and Plants program plan components are positive for all of the Chiricahua leopard frog and its habitat in the long-term and would maintain or improve watershed condition indicators related to soils, and riparian vegetation.

Invasive Species Management

This program area has the potential to benefit the Chiricahua leopard frog by assisting with removing invasive non-native species. The guideline FW-Invas-G-1 directly benefits this species through removal of non-native invasive animals and plants in or near occupied habitat.

Herbicide and pesticide treatments are expected to continue under this plan as they have under the previous forest plan. The use of herbicide and pesticides can have adverse effects on the Chiricahua leopard frog. Any potential future projects implemented under this plan would be assessed on a case by case basis to determine potential effects on individual species and to minimize them. Amphibians in general and ranid frogs in particular, are quite sensitive to pesticides and other chemicals. These chemicals have a variety of direct and indirect effects on amphibians (Sparling 2003). The use of pesticides may impact forage base for specific individual species. Use of these chemicals in occupied habitat is likely to result in mortality or injury to frogs as well as reduced feeding success and reduced vegetation cover.

Guideline FW-Invas-G-2 integrates pest management approaches and other treatments to control invasive species to improve watershed condition and maintain ecosystem function while minimizing project impacts on native species. Invasive species impact the survival and reestablishment of these native amphibians and reptiles. American bullfrogs, northern crayfish, non-native tiger salamanders, along with warm water non-native fishes are increased stressors on these species.

Guideline FW-Invas-G-3 ensures weed-free plant materials are used for seeding and mulching projects to restore ecosystem function and integrity of native species and their habitats. This in turn would ensure habitat is provided for both the frog, as well as its prey following restoration work.

Livestock Grazing

The livestock grazing program activities include grazing and browsing by cattle, sheep, and horses, and development and maintenance of range improvements such as earthen stock tanks and troughs, fences, cattle guards, and others. This program area has the potential through grazing activities to impact the Chiricahua leopard frog, and/or its habitat, often through livestock trampling of individuals, riparian and floodplain/streambank vegetation removal, lowering water levels through drinking, or destroying basking features such as logs. Adverse livestock management effects to the species and its habitat would primarily be indirect effects associated with habitat disturbance in upland areas and resulting sedimentation, however direct effects from trampling could occur. Livestock accessible areas to Chiricahua leopard frog habitat and critical habitat may experience adverse effects to streambanks, riparian vegetation, and water quality.

There are one standard and five guidelines for the livestock grazing program that could minimize adverse effects to the Chiricahua leopard frog and its habitat:

- FW-Graz-S-1 requires troughs and uncovered storage tanks to incorporate animal escape devices. This will help ensure frogs and other species are not entrapped in tanks which could result in fatality;
- FW-Graz-G-2 - Livestock grazing should be managed to meet, or move towards, the desired conditions for forest resources such as soil, water, vegetation, and species;
- FW-Graz-G-3 - Burned or mechanically treated areas should be given sufficient rest from livestock grazing, especially during the growing season, to ensure plant recovery and vigor and to ensure that perennial plants would not be permanently damaged by grazing. Grazing should not be authorized in burned or mechanically treated areas until Forest

Service specialists determine plant recovery and vigor in the burned or treated area by considering characteristics such as seed heads or flowers, multiple leaves or branches, and/or a root system that does not allow them to be easily pulled from the ground. These characteristics provide evidence of plant recovery, vigor, and reproductive ability;

- FW-Graz-G-4 - Structural range improvements (e.g., fences, troughs, earthen stock ponds, pipelines) should be located, constructed, reconstructed, maintained, and used in a manner that is consistent with the desired conditions for riparian areas, wet meadows, aspen, formally identified archaeological sites, known locations of Southwestern Region sensitive species, and other sensitive resources. Range improvements should be modified, relocated, or removed when found incompatible;
- F FW-Graz-G-5 - Salt, minerals, and/or other supplements should be located and used so that sensitive resources are protected from excessive trampling, compaction, salinization, and other impacts. For example, these supplements should be located at least a quarter of a mile from riparian areas, formally identified archaeological sites, known locations of Southwestern Region sensitive species and other sensitive resources; and
- FW-Graz-G-7 - Where permitted livestock have access to riparian areas, the use of riparian species should provide for maintenance of those species, allow for regeneration of new individuals, protect bank and soil stability, and reduce the effects of flooding. Maintenance of woody riparian species should lead to diverse age classes of woody riparian species where potential for native woody vegetation exists. This guideline would not apply to fine scale activities and facilities such as intermittent livestock crossing locations, water gaps, or other infrastructure used to minimize impacts to riparian areas at a larger scale.

Long-term drought conditions may dry ponds and stock tanks, which could result in lack of breeding by this species and lead to local extirpation. In addition, maintenance of stock tanks could result in short-term adverse effects to the Chiricahua leopard frog by temporarily eliminating habitat and prey for the species. If drought follows the maintenance of stock tanks, the adverse effects are exasperated.

Livestock grazing can affect the habitat of Chiricahua leopard frogs due to livestock movement along the streams, which could temporarily reduce hiding cover, trample streambanks, contribute to sedimentation, and add waste deposits that can impair water quality. Impacts to water quality would be greatest during seasonal low flow periods and during droughts. Implementation of livestock grazing standards and guidelines, as described above and in the BA, provide guidance to reduce livestock grazing impacts to riparian areas. We do not anticipate that these activities will diminish the ability of critical habitat to contribute to the conservation and recovery of the species.

In most cases, projects would be limited in extent and amount of ground disturbance. Projects in the riparian and stream zones would have localized, short-term effects including streambank disturbance, vegetation reduction, sedimentation into the stream, and disturbance to the species. These projects will occur for the life of the plan; therefore the short-term impacts would continue at numerous locations. Additionally, projects would have long-term beneficial effects as watersheds and aquatic and riparian habitats move towards a sustainable landscape that is

healthy, diverse, resilient, and functioning, with stable soils, functional hydrology, and biotic integrity, and supporting healthy, diverse populations of native wildlife.

Effects from livestock grazing contribute to both direct and indirect effects to the species habitat; however these effects are minimized by use of riparian exclosures, limited pasture use, or timing restrictions for livestock use in riparian areas where it occurs. The standard and guidelines listed above are expected to minimize these adverse effects by limiting grazing intensity, maintaining riparian vegetation, reducing sedimentation, reducing trampling, and maintaining riparian functions.

Forest Products
The sale of forest products are often associated with thinning and fuels reduction projects or silvicultural treatments. Projects such as these can result in impacts to upland and riparian habitat. Upland project impacts would include increased runoff and sediment movement from vegetative cover removal during treatments. Projects in the uplands would be limited spatially and temporally to reduce these watershed impacts. However, there may still be short-term adverse effects before adequate vegetation cover has returned.

This program area has the potential to impact Chiricahua leopard frog although minimally, due to possible increased sediment. Vegetation treatments implemented under this program may cause short-term increases in flood runoff, scouring and sediment deposition into potential Chiricahua leopard frog habitats.

Minerals Resources
This program area has the potential through land or facility development or other activities to impact the Chiricahua leopard frog, through disturbance, potential loss/fragmentation of habitat, and dewatering. Minerals activities on the Coconino NF are limited, however if they do occur within frog habitat, access roads and the accompanying vehicle traffic could result in direct mortality to the species from being run over by vehicles. In most cases mineral removal also requires the use of water resources. In addition, surface occupancy causes direct habitat loss and the addition of human occupation increases the chances for harassment and mortality. However, the guidelines listed under the aquatic species section would minimize any impacts to the riparian habitats of the Chiricahua leopard frog.

Roads and Facilities
This program includes construction, maintenance, relocation, and modifications of roads. Transportation projects could have localized and short-term adverse effects, from noise and disturbance, to Chiricahua leopard frog and its habitat from actions taken in or near riparian areas. Infrastructure projects, if done near or within frog habitat, may concentrate visitor use in these areas and cause habitat damage. Vehicle traffic on roads may injure or kill Chiricahua leopard frogs, as they can move up to 1 mile or more away from habitat. Disturbance, loss/fragmentation of habitat and erosion from roads that deposit sediment or concentrate runoff into riparian areas may impact the listed species. Roads crossing or being adjacent to streams can remove and alter riparian vegetation, impact stream channel function and structure, and alter and degrade aquatic habitat through changes in water quality and increases in sediment deposition which would also have an impact on the prey species.

Decommissioning, closing, and restoring existing roads (Objective FW-RdsFac-O-1 and guideline FW-RdsFac-G-6) would have the potential to beneficially affect the Chiricahua leopard frog if the roads are in areas where the species are located. Road closures could benefit the species if roads are near or lead to ponds used by these species, thereby reducing the likelihood of road kills, protecting water quality, and, most importantly, reducing disturbance, potential disease transmission, collection, and introduction of non-native predators associated with recreation or other activities. Impacts from vehicle traffic on roads to these species include direct fatality from being run over by vehicles, increased opportunity for collection, and direct habitat loss and/or fragmentation and harassment.

Land Adjustments and Special Uses

These program areas are responsible for land adjustments (exchange and purchase) and the issuance of special use permits for lands and recreation. Special use permits issuance may adversely affect Chiricahua leopard frogs and their habitats if the authorized activities affect riparian areas.

Five guidelines address potential impacts to the frog and its habitat:

- FW-LndAdj-G-1 promotes land acquisitions that contain habitat for listed species and/or contain or influence wetlands, riparian areas, or other water-related features. This guideline would be beneficial to the Chiricahua leopard frog.
- FW-LndAdj-G-2 restricts lands leaving forest ownership from containing unique ecological resources (i.e.: listed species habitat), thus retaining species habitat.
- FW-SpecUse-G-3 restricts the issuance of permits for activities occurring within 200 feet of streams, springs or water of federally listed species. This will protect riparian resources. Exceptions may be made for hardened or slickrock sites, water-dependent activities, or safety.
- FW-SpecUse-G-5 requires new and reconstructed overhead utility lines, support towers, and other utility infrastructure to be located and designed to minimize adverse ecological, wildlife, and scenic impacts. This would minimize sedimentation and erosion from reaching riparian areas occupied by Chiricahua leopard frog.
- FW-SpecUse-G-6 requires vegetation that does not interfere with vegetation clearance requirement within rights-of-ways to be retained to provide habitat and corridors for wildlife species. This would minimize the loss of vegetation needed for cover habitat.

While these guidelines may limit or prevent short or long-term impacts to Chiricahua leopard frogs; adverse effects may still occur. These may include excessive sediment pulses into stream habitats, temporary or permanent reduction or removal of vegetation that provides cover, and human disturbance during breeding periods.

Recreation

This program area has the potential through recreation activities to impact Chiricahua leopard frog and its habitat, through disturbance and potential loss/fragmentation of habitat. The use of motorized vehicles represents a popular and growing form of recreation on the Coconino NF. Recreational sites and activities can degrade upland and watershed conditions and function, alter riparian vegetation and function, and increase sediment. Recreational activities within and

adjacent to riparian areas and streams can also increase the risk of introductions and spread of non-native invasive or undesirable plants and animals.

The standard and guidelines listed under the listed aquatic species also apply for the Chiricahua leopard frog, and help minimize potential impacts from recreation activities. See the effects aquatic species effects section for an effects discussion that would apply to the leopard frog. Although the habitats used by the species are not the same, the effects of implementing projects under the recreation program are very similar to all species habitats. The LRMP includes standards and guidelines to reduce the impacts to listed aquatic species, as well as the leopard frog from recreation activities; however, there is also direction in the LRMP to increase and/or improve recreational opportunities. Over the life of the LRMP, this could result in adverse impacts to leopard frogs and their habitat through multiple mechanisms, through spread of disease, disturbance and potential loss/fragmentation of habitat. However, the standard and guidelines help minimize adverse effects to riparian or wetland habitats and the uplands that may influence the leopard frog habitat.

Area Specific Direction

Management Areas

Six of the eighteen proposed management areas (MAs) overlap two Chiricahua leopard frog MAs within the Buckskin Hills Recovery Unit (RU) (USFS 2017a). Discussions of these MAs are addressed in the BA and are incorporated by reference. There are several guidelines which minimize adverse effects to the riparian habitat.

- MA-VerdeV-G-1 maintains and improves watershed and riparian function and/or prevent the introduction or spread of disease, invasive, or undesirable species;
- MA-LongV-G-1 and MA-EastClr-G-1 manages dispersed camping opportunities and motorized recreation to occur outside the vicinity of meadows and riparian areas to maintain soil function, long-term soil productivity, and desired conditions for associated resources;
- MA-CCCrg-G-1 manages the C.C. Cragin Watersheds MA to reduce the threat of uncharacteristic wildfires, flooding, and sedimentation, and to maintain water quality and quantity; and
- MA-CCCrg-G-2 maintains roads and trails within the C.C. CraginWatersheds MA to prevent erosion and sedimentation and to protect existing infrastructure.

These guidelines minimize adverse effects to the Chiricahua leopard frog and its habitats by maintaining and improving water quality and quantity, retaining riparian vegetation and habitat, reducing sedimentation and erosion, improving riparian and soil function, and preventing spread of disease and non-native species.

Special Areas

Special areas include designated wilderness areas, recommended wilderness areas, designated and eligible wild and scenic rivers, national trails, scenic roads, established and proposed research natural areas and botanical and geological areas, and inventoried roadless areas. Several designated special areas have potential habitat for the frog. There is one objective and

two guidelines that help minimize any adverse impacts that may occur within Chiricahua leopard frog habitat:

- SA-Wild-O-2 requires developing and implementing management plans for any newly designated wilderness areas within 5 years of designation. If incorporating frog habitat needs into the plan, this would be beneficial for the frog;
- SA-Wild-G-1 implements management activities and permitted uses designed to maintain or move toward the desired conditions for wilderness and other resources. If occurring within occupied or potential habitat, these activities would maintain or improve aquatic and riparian habitat for the species; and
- SA-WSR-G-1 manages recreation and other activities at designated and eligible rivers and associated corridors to occur at appropriate locations and intensities to protect and enhance the free-flowing condition, and the outstandingly remarkable values, consistent with the classification. Management of the rivers would maintain and protect occupied and potential habitat for the species.

These guidelines minimize adverse effects to the Chiricahua leopard frog and its habitat by maintaining and improving water quality and quantity, retaining riparian vegetation and habitat, reducing sedimentation and erosion, improving riparian and soil function, and preventing spread of disease and non-native species within these special areas.

Chiricahua Leopard Frog Designated Critical Habitat
PCE 1: Aquatic Habitats.
EFFECT: WUI and fire management projects that occur in watersheds that contain leopard frog critical habitat could have short-term adverse effects to water quality depending upon watershed conditions. These effects may include increased sediment input into leopard frog-occupied streams, ponds, and stock tanks. These effects may be minimized by standards and guidelines as previously discussed by program in the effects of the action section.

Watershed and soil improvement projects that involve instream improvement and transportation projects that involve roads in or adjacent to streams are expected to have short-term adverse effects to this PCE related to leopard frog habitat and water quality needs of its larval stages. There may be localized, short-term adverse effects from projects in riparian zones such as localized sediment input into habitat, and temporary disturbance of habitat. However, these effects would be minimized by standards and guidelines as previously described. Furthermore, while watershed improvement projects related to instream habitat improvements would likely have short-term adverse effects, we anticipate that long-term benefits to PCEs of critical habitat will occur by maintaining and possibly improving their ability to contribute to the conservation and recovery of the species.

Effects from livestock grazing activities to this PCE are expected to be similar to the indirect effects to narrow-headed gartersnake through habitat modification as described above. Livestock grazing can affect the PCEs of critical habitat as a result of movement along the streams, temporarily reducing cover, trampling streambanks, contributing to sedimentation, and adding nitrogenous waste that can impair water quality which may affect the leopard frog's larval stages. Range program standards and guidelines, as described above and in the BA, provide guidance to reduce livestock grazing impacts to riparian areas. In addition, the standards and

guidelines, discussed above, that prevent the spread of non-native aquatic species and disease during project implementation are expected to benefit the PCEs.

The effects to this PCE from native fish restoration projects, implemented under the Wildlife, Fish and Plants Program, are expected to be through habitat modification and invasive fish species removal. Coconino NF management actions to support native fish restoration could include practices that would improve aquatic habitat and manage for non-native species which would benefit the leopard frog. These projects would have localized, short-term adverse effects of streamflow alteration and sedimentation. Project implementation would follow appropriate standards and guidelines, as described above, to minimize impacts to this PCE.

PCE 2: Dispersal and non-breeding habitat.
EFFECT: Actions implemented under the LRMP should not result in the loss of stock tanks within critical habitat. Therefore, dispersal and non-breeding habitat should remain intact. Actions implemented under the LRMP should not significantly reduce or modify habitats needed for dispersal from one water body to another, nor would they be expected to result in the creation of barriers to movement.

Southwestern Willow Flycatcher and Designated Critical Habitat, and Western Yellow-Billed Cuckoo and Proposed Critical Habitat

Forestwide Direction

Soils Management, Watersheds and Water, and Riparian Areas
The objective, FW-Soil-O-1 would help maintain or improve impaired and unsatisfactory soil conditions on 100,000 to 350,000 acres during each 10-year period. This objective would result in maintenance or improvement of these species habitat. Objectives for the riparian program area include restoring the function of 200 to 500 acres of riparian areas, with emphasis on priority 6th code watersheds, restoring 5 to 10 wetlands not currently in proper functioning condition, and restoring at least 25 springs not currently in proper functioning condition. Activities to maintain or improve soil conditions include road closures, rehabilitation or relocations; road decommissioning; fencing areas to protect from human, livestock, or wildlife impacts; vegetation management; prescribed and managed wildfires; upland soil and watershed improvements; restoration of riparian vegetation; and changes in livestock pasture use and/or rotation.

A challenge for the Coconino NF along the upper Verde River is the small amount of habitat they have compared to non-federal lands. The result of this land ownership pattern is that lands managed by the Coconino NF may be affected by neighboring properties with water diversions, etc. that can affect the entire stream reach.

Short-term adverse effects to flycatcher and cuckoo habitat components and prey base could result from these projects, such as temporary loss of riparian habitat, increased sedimentation, loss of prey, and disturbance. Several guidelines are designed to protect the resources and reduce the potential short-term impacts:

- FW-Soil-G-1 implements and monitors BMPs for projects that may impair water quality;

- FW-Soil-G-2 designs projects to avoid long-term impacts to soil function and productivity;
- FW-Soil-G-3 designs project-specific features for steep slopes and where there is moderate to severe erosion hazard or soils that are particularly sensitive to disturbance;
- FW-Water-G-1 provides for enough vegetative ground cover to recover rapidly from natural and human disturbances and to maintain long term soil productivity;
- FW-Water-G-2 ensures that ecosystem processes, resilient vegetation conditions, and natural disturbance regimes are functioning properly within priority 6th code watersheds;
- FW-Water-G-3 provides for instream flow water rights to be procured for those streams without instream water rights to ensure sufficient flow is provided for aquatic species, habitat, and recreation;
- FW-Water-G-4 provides for best management practices for management activities to be identified, implemented, and monitored to maintain water quality, quantity, and timing of flows, and to prevent or reduce accelerated erosion;
- FW-Water-G-5 strives to maintain or improve water quality to meet or exceed Arizona water quality standards and support identified designated beneficial uses for impaired waters or non-attaining waters;
- FW-Water-G-6 provides for excess water to remain in or be allowed to flow freely back into the natural channel, spring, and riparian habitat to maintain and improve ecological function, water quality, quantity, and timing of flows, and to benefit native species and their habitat;
- FW-Rip-All-G-2 maintains habitat and corridors for species;
- FW-Rip-All-G-3 and FW-Rip-Strm-G-2 identifies aquatic management zones around all riparian habitats to protect water quality and to avoid adverse effects to connected resources;
- FW-Rip-Strm-G-1, FW-Rip-Spr-G-3, and FW-Rip-RipType-G-3 designs and implements projects to retain or restore natural streambank stability, native vegetation, riparian and soil function, water quality, and/or prevent the introduction or spread of disease, invasive, or undesirable species;
- FW-Rip-RipType-G-1 requires water diversions and groundwater pumping to not lower the water table to prevent loss of or undesired changes to composition, structure, or function to riparian forests or mesquite bosques;
- FW-Rip-RipType-G-2 maintains and enhances connectivity within the unique vegetation communities. The intent is to maintain ecological functions, tree density, and growth, native understory, and reduce the risk of predation and nest parasitism and to provide habitat for western yellow-billed cuckoo, Bell's vireo, and other wildlife species; and
- FW-Rip-RipType-G-4 avoids impacts to understory species, tree density, tree growth, and to avoid channel downcutting and accelerated erosion in remaining mesquite bosques when conducting fire wood cutting or wood removal.

There may be localized, short-term adverse effects from projects in and adjacent to riparian zones such as localized sediment input into habitat, soil and vegetation disturbance, and temporary disruption of prey base. However, these effects would be minimized by guidelines as previously described. Furthermore, while projects related to habitat improvements would likely

have short-term adverse effects, we anticipate that long-term benefits to PCEs of critical habitat will occur by maintaining and possibly improving their ability to contribute to the conservation and recovery of the species. Long-term benefits of these projects would reduce sedimentation effects into riparian habitats, improve water quality, and retain vegetative cover.

Wildland Urban Interface, Fire Management, and Forest Products

Since there are no known occupied or potential sites of the southwestern flycatcher and yellow-billed cuckoo within the WUI, there should be no impact from this program. Project activities under the fire management and forest products programs could include mechanical and silvicultural treatments, fuels reduction, and prescribed fires, along with construction of temporary roads, fire lines and trails to access treatment areas, although not commercial timber harvest would occur in riparian habitats. Timber activities in the uplands could result in some amount of increased runoff and sediment movement from vegetative cover removal during treatments. Although, limited spatially and temporally, there may still be short-term adverse effects before adequate vegetation cover has returned. Long-term effects from prescribed fire and forest products activities would potentially be positive for these species and their habitat as these activities reduce the changes wrought by uncharacteristic wildfires, which could impact riparian areas.

There is one standard and one guideline which would help minimize impacts to the southwestern flycatcher and yellow-billed cuckoo. FW-FProd-S-1 restricts timber production on non-suitable lands, which includes riparian areas. FW-Fire-G-2 designs fire management activities consistent with moving toward DCs for other resources. However, indirect effects such as short-term sedimentation and long-term ground vegetation improvement could occur from prescribed fire in adjacent uplands.

There could be adverse effects to the riparian woodland and/or the prey base PCEs through removal of overstory or understory vegetation from woodcutting and firewood collecting. Guidelines within the Riparian Program would minimize the potential for woodcutting within yellow-billed cuckoo habitat within mesquite bosques. Additionally, there are two guidelines, FW-WUI-G-1 and FW-Fire-G-1, which could result in adverse effects to both the flycatcher and cuckoo by reducing tree density, snags, logs and coarse woody debris within WUI areas, and putting priority for fuels reduction within these WUI areas. With much of these species habitats on the Coconino NF being adjacent to and within the urban interface, this reduction is forest structure within WUI areas could result in unsuitable habitat conditions for the species.

Wildlife, Fish and Plants

This program area includes maintenance and enhancement of habitat for listed and native species, inventory and monitoring, reintroductions, introductions, or transplants of species, control or eradication of non-native species, management of sport and native fishes, including the identification of refugia for native fish and the establishment or removal of fish barriers, habitat assessments, development of conservation strategies, administrative studies, collaboration with research, and information and education, along with coordination with federal and state agencies, and partners. Projects could include removal of non-native riparian and aquatic species, installation of fish barriers or opening of aquatic passage, improvement of riparian and instream habitat conditions.

Desired conditions for this program area are to provide properly functioning habitats, survival and recovery of listed species, and support self-sustaining populations of native aquatic and riparian species. To achieve the desired conditions, there are two objectives which may affect the southwestern flycatcher and yellow-billed cuckoo and their habitat:

- FW-WFP-O-1 – Implements at least 20 activities that contribute to the recovery for federally listed species during each 10 year period over the life of the plan;
- FW-WFP-O-4 - Restores or enhances at least 70 miles of stream habitat during each 10-year period over the life of the plan.; and

These objectives work towards improving the southwestern flycatcher and yellow-billed cuckoo habitats. Long-term effects would result in improved and enhanced habitat.

Standards and guidelines address the needs to manage, maintain, protect, and restore riparian areas needed for the southwestern flycatcher and yellow-billed cuckoo and their habitat and include:

- FW-WFP-S-1 – Prioritizes direction for listed species over other species;
- FW-WFP-S-2 – Applies timing restrictions to projects that may have the potential to negatively affect listed species, bald eagles, and golden eagles. If activities should occur within or adjacent to the species habitat, restrictions would be in place so as to not disturb the species;
- FW-WFP-G-1 – Applies habitat management objectives and species protection measures from approved recovery plans to activities occurring within federally listed species habitat to promote recovery of the species;
- FW-WFP-G-3 – Designs or manages projects and management activities to maintain or improve habitat for native species and to prevent or reduce the likelihood of introduction or spread of disease;
- FW-WFP-G-4 – Includes project design measures to minimize the negative impact of pesticides, herbicides, or chemicals to species and their habitat. For example, chemical free buffers could be placed around riparian or aquatic habitat;
- FW-WFP-G-9 – Uses fire suppression techniques that minimize habitat and disturbance impacts where there are federally listed and Southwestern Region sensitive species, consistent with public and fire fighter safety; and
- FW-WFP-G-13 – Designs new road and new trail locations to maintain species access to adjoining habitat, to maintain habitat for dispersal and migration, and to meet species' life history requirements.

Project activities would be minimized by the standards and guidelines described above, listed in the proposed action, and additional actions FWS and AGFD typically conduct with restoration projects. These standards and guidelines would ensure that any forest program activity occurring in riparian habitats would be consistent with existing recovery plan, maintain or improve habitat, provide for dispersal and migration, meet species needs, and minimizing negative impacts from pesticides by providing riparian buffers.

Habitat improvement projects such as riparian fencing to protect habitat could have negative short-term vegetation and soil impacts in occupied habitat and adjacent uplands (e.g., vehicles delivering/laying out materials, fences being constructed across or alongside occupied habitats). Reintroduction of new populations would increase the number of populations potentially affected by the proposed action. These projects would have localized, short-term adverse effects to the species as sedimentation and disturbance to the southwestern flycatcher and yellow-billed cuckoo populations and their habitats.

Overall, the Wildlife, Fish, and Plants program plan components are positive for the southwestern flycatcher and yellow-billed cuckoo and their habitats in the long-term and would maintain or improve watershed condition indicators related to soils, and riparian vegetation.

Invasive Species

The expansion of non-native vegetation or the conversion of native vegetation to non-native vegetation is a threat to the yellow-billed cuckoo, the southwestern willow flycatcher, and their critical habitat. This program area has the potential to benefit these species and their habitats in the long-term by removing invasive non-native vegetation. Activities such as manual treatments and use of herbicides and pesticides will occur under this program area. The guideline FW-Invas-G-1 directly benefits the species through removal of non-native invasive animals and plants in or near occupied habitat. Herbicide and pesticide treatments are expected to continue under this plan as they have under the previous forest plan. The use of herbicide and pesticides can have adverse effects on the southwestern flycatcher and yellow-billed cuckoo. Any potential future projects implemented under this plan would be assessed on a case-by-case basis to determine potential effects on individual species and to minimize them. The use of pesticides could affect the forage base for the cuckoo if chemicals used are detrimental to their prey species. However, use of these chemicals in occupied habitat is intended to target the resprouting of non-native vegetation and promote the persistence of native vegetation and there would likely be beneficial long-term effects to the habitat and species.

Invasive plant species impact these species and their habitat. Guideline FW-Invas-G-3 ensures weed-free plant materials are used for seeding and mulching projects to restore ecosystem function, to help prevent invasive species from taking hold and spreading.

Although considered an undesirable species on the Coconino NF (USFS 2017a), tamarisk is an important species for the southwestern willow flycatcher, and a PCE of its designated critical habitat. The riparian area along the Verde River is predominantly (~80%) native vegetation; therefore, we don’t expect significant impacts from the non-native tamarisk leaf beetle or mechanical removal efforts conducted by the NF along the river. Protection of the natural hydrograph, elevated groundwater, surface flow, and reducing land-based stressors are what will prevent tamarisk from establishing in greater abundance and creating dry habitat conditions.

Livestock Grazing

Livestock grazing program activities include grazing and browsing by cattle, sheep, and horses, and development and maintenance of range improvements such as earthen stock tanks and troughs, fences, cattle guards, and others. This program area has the potential through grazing activities to impact the yellow-billed cuckoo and its habitat, often through riparian vegetation

removal. Livestock grazing is largely excluded from riparian areas on the Coconino NF, so the extent of impacts from grazing and associated activities is expected to be fairly low, but there is potential for site-specific adverse impacts to cuckoo habitat. There is no authorized grazing within southwestern willow flycatcher habitat; therefore, there should be no effect to the species or its habitat from this activity.

There are five guidelines for rangeland management relevant to the yellow-billed cuckoo:

- FW-Graz-G-2 - Livestock grazing should be managed to meet, or move towards, the desired conditions for forest resources such as soil, water, vegetation, and species;
- FW-Graz-G-3 - Burned or mechanically treated areas should be given sufficient rest from livestock grazing, especially during the growing season, to ensure plant recovery and vigor and to ensure that perennial plants would not be permanently damaged by grazing. Grazing should not be authorized in burned or mechanically treated areas until Forest Service specialists determine plant recovery and vigor in the burned or treated area by considering characteristics such as seed heads or flowers, multiple leaves or branches, and/or a root system that does not allow them to be easily pulled from the ground. These characteristics provide evidence of plant recovery, vigor, and reproductive ability;
- FW-Graz-G-4 - Structural range improvements (e.g., fences, troughs, earthen stock ponds, pipelines) should be located, constructed, reconstructed, maintained, and used in a manner that is consistent with the desired conditions for riparian areas, wet meadows, aspen, formally identified archaeological sites, known locations of Southwestern Region sensitive species, and other sensitive resources. Range improvements should be modified, relocated, or removed when found incompatible;
- FW-Graz-G-5 - Salt, minerals, and/or other supplements should be located and used so that sensitive resources are protected from excessive trampling, compaction, salinization, and other impacts. For example, these supplements should be located at least a quarter of a mile from riparian areas, formally identified archaeological sites, known locations of Southwestern Region sensitive species and other sensitive resources; and
- FW-Graz-G-7 - Where permitted livestock have access to riparian areas, the use of riparian species should provide for maintenance of those species, allow for regeneration of new individuals, protect bank and soil stability, and reduce the effects of flooding. Maintenance of woody riparian species should lead to diverse age classes of woody riparian species where potential for native woody vegetation exists. This guideline would not apply to fine scale activities and facilities such as intermittent livestock crossing locations, water gaps, or other infrastructure used to minimize impacts to riparian areas at a larger scale.

Projects related to improving watershed and soils conditions include direction to implement projects to counter critical threats to riparian functionality during the 10 to 15 years following plan approval. Activities could include, but are not limited to, vegetation reestablishment, non-native invasive plant treatments, erosion control, adjusting the timing and season of grazing, or fencing exclosures. In most cases, projects would be limited in extent and amount of disturbance. Projects in the riparian and stream zones would have localized, short-term effects including vegetation reduction and disturbance to the yellow-billed cuckoo. These projects will occur for the life of the plan; therefore the short-term impacts would occur throughout the Coconino NF and not necessarily within cuckoo habitat. All activities would implement the

standards, guidelines, and BMPs as described in the BA (USFS 2017a). Additionally, projects would have long-term beneficial effects as watersheds and riparian habitats move towards a sustainable landscape that is healthy, diverse, resilient, and functioning, with stable soils, functional hydrology, and biotic integrity, and supporting healthy, diverse populations of native wildlife.

Range projects, such as fencing, within riparian areas could improve riparian conditions. They would also promote recruitment and maintenance of native riparian vegetation, which would help to maintain suitable habitat. The guideline FW-Graz-G-4 recommends that grazing structures within riparian areas be located so as to avoid conflict with riparian functions and processes. Additionally, guidelines FW-Graz-G-3 and 7 provide for plant growth and vigor.

Effects from livestock grazing contribute to both direct and indirect effects to the species habitat; however these effects are minimized by use of riparian exclosures, limited pasture use, or timing restrictions for livestock use in riparian areas where it occurs. The guidelines listed above are expected to minimize these adverse effects by limiting grazing intensity, maintaining riparian vegetation, reducing sedimentation, and maintaining riparian functions.

Minerals Resources

This program area has the potential through land or facility development or other activities to impact the southwestern willow flycatcher and yellow-billed cuckoo, through disturbance and potential loss/fragmentation of habitat. Minerals activities on the Coconino NF are limited and unlikely to occur with flycatcher or cuckoo habitat. However if they do occur within their habitats, access roads and the accompanying vehicle traffic could result in indirect adverse effects to the species including noise disturbance and increased sedimentation.

There are several guidelines that minimize impacts to the riparian habitats of the listed species.

- FW-Minerals-G-1 – Considers withdrawing for locatable minerals the habitat of species with very limited range, which includes most of the aquatic listed species on the Coconino NF for locatable minerals;
- FW-Minerals-G-3 – Considers no surface occupancy, no leasing, or adding leasing stipulations in area with federally listed species;
- FW-Minerals-G-4 - Protects listed species habitats through surface occupancy restrictions, mitigation measures, and operating plan requirements imposed on mineral activities; and
- FW-Minerals-G-5 - Calls for reclaiming mining operations to minimize impacts to natural resources.

These guidelines should minimize potential impacts to the southwestern willow flycatcher and yellow-billed cuckoo, their habitat, and their critical habitat, but they don’t remove all potential for adverse effects from habitat destruction, loss of prey, and disturbance, if mineral activities occur within these species habitats.

Roads and Facilities

The Roads program includes construction, maintenance, relocation, and modifications of roads. Transportation projects could have localized and short-term adverse effects, from noise and

disturbance, to southwestern willow flycatcher, yellow-billed cuckoo and their habitats from actions taken in or near riparian areas. Infrastructure projects, such as recreation buildings, if near or within cuckoo and flycatcher habitats, may concentrate visitor use in these areas and cause habitat damage. Designated roads, trails, and motorized recreation areas could impact yellow-billed cuckoo, southwestern willow flycatcher, and their habitat by removing riparian vegetation, the degradation of watershed function and integrity, and by disturbing individuals during maintenance activities. Roads crossing or adjacent to streams and riparian areas can remove and alter riparian vegetation. Transportation projects could have localized and short-term adverse effects to southwestern willow flycatcher, yellow-billed cuckoo, and their habitat from actions within riparian areas. Activities can result in disturbance from loss or alteration of vegetation which may impact the listed species.

Objectives, standards, and guidelines help minimize potential impacts for the roads and facilities program. There is one objective, one standard and five guidelines that help minimize these impacts to the flycatcher and cuckoo:

- FW-RdsFac-O-1 decommissions 200 to 800 miles of a combination of unauthorized roads and system roads not identified on the motor vehicle use map during the 10 years following plan approval.
- FW-RdsFac-S-1 restricts motorized vehicle use to those areas identified on a designated system of roads, trails, and areas (including locations designated for motorized big game retrieval), as defined on motor vehicle use maps, except for those uses authorized by law, permits, and orders in connection with resource management and public safety.
- FW-RdsFac-G-1 locates, designs, and maintains roads so they move toward or maintain desired conditions for other uses and resources.
- FW-RdsFac-G-5 implements soil and water BMPs to protect water quality while designing, constructing, reconstructing, or relocating new and existing roads, parking areas and pullouts. For example, permanent and temporary road construction and relocation should:
    a. Occur outside of streamcourses and aquatic management zones, except where crossing is required.
    b. Avoid wetlands, springs, seasonally wet meadows, and montane meadows.
    c. Avoid soils that are unstable and highly erodible where connected to streamcourses.
- FW-RdsFac-G-6 decommissions unneeded roads to maintain an efficient and sustainable road system that maintains or moves toward other resource desired conditions.
- FW-RdsFac-G-7 uses or realigns existing roads before new roads are constructed to avoid areas where disturbance-sensitive threatened and endangered species are present.
- FW-RdsFac-G-8 temporary roads should be used and naturalized in a timely manner where long-term access is not needed. The intention is to have the road footprint, and potential impacts from road use, such as possible introduction of invasive species, modification of scenic integrity objectives, or increased sedimentation into connected waters, on the landscape for as short a time as possible.

Decommissioning, closing, and restoring existing roads would have the potential to beneficially affect both the flycatcher and cuckoo if the roads are in areas where the species are located. Restricting use minimizes impacts to the species within riparian areas. Although there could be

short-term impacts to the species from realignment, construction and maintenance of roads, implementing BMPs would help reduce the impacts and result in reduced long-term impacts. The standard will help protect southwestern willow flycatcher and yellow-billed cuckoo habitats by ensuring that unauthorized use won't occur in or near flycatcher or cuckoo habitats, reducing the potential for habitat destruction. The guidelines help protect habitat by ensuring BMPs are applied, decommissioning unneeded roads, and naturalize temporary roads soon after use, etc. Direction for roads and facilities, are expected to minimize effects to the southwestern willow flycatcher and yellow-billed cuckoo, their habitat, and their critical habitat. Any potential effects are expected to be of small magnitude, given the limited amount of roads within critical habitat.

Land Adjustments and Special Uses

These program areas are responsible for land adjustments (exchange and purchase) and the issuance of special use permits for lands and recreation, including outfitter guide services. Special use permits issuance may adversely affect southwestern willow flycatcher and yellow-billed cuckoo and their habitats if the authorized activities affect riparian areas.

One standard and six guidelines address potential impacts to the flycatcher, cuckoo and their habitat:

- FW-SpecUse-S-2 requires the rehabilitation by permit holders of unplanned, user-created trails and other impacted areas created by their activities that were not authorized under their special use permit;
- FW-LndAdj-G-1 promotes land acquisitions that contain habitat for listed species and/or contain or influence wetlands, riparian areas, or other water-related features. This guideline would be beneficial to both the flycatcher and cuckoo;
- FW-LndAdj-G-2 restricts lands leaving forest ownership from containing unique ecological resources (i.e.: listed species habitat), thus retaining species habitat;
- FW-SpecUse-G-1 maintains or moves lands and recreation special uses move toward desired conditions for other uses and resources;
- FW-SpecUse-G-3 restricts the issuance of permits for activities occurring within 200 feet of streams, springs or water of federally listed species. This will protect riparian resources. Exceptions may be made for hardened or slickrock sites, water-dependent activities, or safety;
- FW-SpecUse-G-5 requires new and reconstructed overhead utility lines, support towers, and other utility infrastructure to be located and designed to minimize adverse ecological, wildlife, and scenic impacts. This would minimize sedimentation and erosion from reaching riparian areas occupied by the flycatcher and cuckoo; and
- FW-SpecUse-G-6 requires vegetation that does not interfere with vegetation clearance requirement within rights-of-ways to be retained to provide habitat and corridors for wildlife species. This would minimize the loss of vegetation needed for breeding, nesting and cover habitat.

While these standards and guidelines may limit or prevent short or long-term impacts to southwestern willow flycatcher and yellow-billed cuckoo; adverse effects may still occur, including temporary or permanent reduction or removal of vegetation that provides breeding and cover habitat, loss of prey habitat, and human disturbance during breeding periods.

Recreation
This program area has the potential through recreation activities to impact the southwestern willow flycatcher and yellow-billed cuckoo and their habitats through disturbance and potential loss/fragmentation of habitat. Recreational sites and activities can degrade upland and watershed conditions and function, alter riparian vegetation and function, and increase sediment. Recreational activities within and adjacent to riparian areas and streams can also increase the risk of introductions and spread of non-native invasive or undesirable plants and animals. All these potential effects may lead to flycatchers and cuckoos avoiding the area or abandoning nests or fledglings. Streams and adjacent areas on the Coconino NF provide numerous recreational activities. The user demands and concentrated uses in these areas can prevent development of or alter vegetation and habitat needed by the southwestern willow flycatchers and yellow-billed cuckoos by trampling vegetation or compacting soils in riparian areas.

Recreation activities have the potential to attract brood parasites like the brown-headed cowbird, or avian/mammalian predators. Because the Coconino NF is surrounded by private land, their actions can exacerbate existing baseline conditions or can be a victim of surrounding lands. Brood parasitism by can negatively affect southwestern willow flycatchers and populations by reducing reproductive performance (USFWS 2014). For a rare host species, with a short reproductive life-span, such as the southwestern willow flycatcher, brown-headed cowbird parasitism may be a significant impact on production of young at the population level (USFWS 2014).

The standard and guidelines under the listed aquatic species also apply for southwestern willow flycatcher and yellow-billed cuckoo, and help minimize potential impacts from recreation activities. See the aquatic species effects section for an effects discussion that would apply to the flycatcher and cuckoo. Although the habitats used by the species are not the same, the effects of implementing projects under the recreation program are very similar to all species habitats. The LRMP includes standards and guidelines to reduce the impacts to listed aquatic species, as well as the flycatcher and cuckoo from recreation activities; however, there is also direction in the LRMP to increase and/or improve recreational opportunities. Over the life of the LRMP, this could result in adverse impacts to southwestern willow flycatcher and yellow-billed cuckoo and their habitats through multiple mechanisms, including disturbance and potential loss/fragmentation of habitat. However, the standard and guidelines help minimize adverse effects to riparian or wetland habitats and the uplands that may influence the southwestern willow flycatcher and yellow-billed cuckoo.

Area Specific Direction

Management Areas
Four of the eighteen proposed management areas (MAs) overlap southwestern willow flycatcher designated CH and yellow-billed cuckoo proposed CH, which represent a minor portion of CH (USFS 2017a). Discussions of these MAs are addressed in the BA and are incorporated by reference. There are three guidelines which minimize adverse effects to the riparian habitat within critical habitat of the two species:

- MA-SedN-G-5 restricts vehicular access to Oak Creek;

- MA-VerdeV-G-1 maintains and improves watershed and riparian function and/or prevent the introduction or spread of disease, invasive, or undesirable species; and
- MA-VerdeV-G-2 manages recreation reduce user conflicts, to maintain the desired conditions of other resources, and/or to promote public health and safety.

These guidelines minimize adverse effects to the southwestern willow flycatcher and yellow-billed cuckoo and their habitats by maintaining and improving water quality and quantity, retaining riparian vegetation and habitat, reducing sedimentation and erosion, improving riparian and soil function, and preventing spread of disease and non-native species.

Special Areas
Special areas include designated wilderness areas, recommended wilderness areas, designated and eligible wild and scenic rivers, national trails, scenic roads, established and proposed research natural areas and botanical and geological areas, and inventoried roadless areas. Only the Verde Valley Botanical Area has potential habitat for the flycatcher and cuckoo. The Verde Valley Botanical Area preserves a unique, limestone-dependent desert community containing the federally endangered Arizona cliffrose and an assemblage of other endemic plants. Two guidelines that help minimize any adverse impacts that may occur within flycatcher and cuckoo habitat:

- Guideline SA-RNA-BotGeo-G-1 limits human use and access to protect characteristics of the area; and
- Guideline SA-RNA-BotGeo-G-3 manages fire to have minimal impact to protect the resources for which research natural areas, botanical areas, and geological areas were designated, established, or proposed.

These guidelines minimize adverse effects to the flycatcher and cuckoo and their habitat by protecting and maintaining riparian vegetation and habitat.

Southwestern Willow Flycatcher Critical Habitat
PCEs for the Southwestern Willow Flycatcher

PCE 1: Riparian vegetation - Riparian habitat in a dynamic river or lakeside, natural or manmade successional environment (for nesting, foraging, migration, dispersal, and shelter) that is comprised of trees and shrubs (that can include Goodding's willow, coyote willow, Geyer willow, arroyo willow, red willow, yewleaf willow, pacific willow, boxelder, tamarisk, Russian olive, buttonbush, cottonwood, stinging nettle, alder, velvet ash, poison hemlock, blackberry, seep willow, oak, rose, sycamore, false indigo, Pacific poison ivy, grape, Virginia creeper, Siberian elm, and walnut) and some combination of: (a) Dense riparian vegetation with thickets of trees and shrubs that can range in height from about 6 to 98 ft. Lower-stature thickets (6 to 13 ft tall) are found at higher elevation riparian forests and tall-stature thickets are found at middle and lower elevation riparian forests; and/or (b) Areas of dense riparian foliage at least from the ground level up to approximately 13 ft above ground or dense foliage only at the shrub or tree level as a low, dense canopy; and/or (c) Sites for nesting that contain a dense (about 50 percent to 100 percent) tree or shrub (or both) canopy (the amount of cover provided by tree and shrub branches measured from the ground); and/or (d) Dense patches of riparian forests that are interspersed with small openings of open water or marsh or areas with shorter and sparser

vegetation that creates a variety of habitat that is not uniformly dense. Patch size may be as small as 0.25 ac or as large as 175 ac.
EFFECT: Livestock grazing in flycatcher critical habitat could result in indirect adverse effects through habitat manipulation. Livestock consume young age-class riparian woody vegetation that flycatchers could eventually use for breeding. Continued forage use on young riparian vegetation can result in long-term adverse effects if suitable breeding habitat is not permitted to develop.

Watershed and Soil Programs implementation may include instream improvement projects which may have short-term adverse effects to riparian vegetation. There may be localized, short-term adverse effects from projects in riparian zones such as temporary disturbance of habitat through vegetation removal; however, these effects would be minimized by standards and guidelines as previously described. Furthermore, while watershed improvement projects related to instream habitat improvements would likely have short-term adverse effects, we anticipate that long-term benefits to PCEs of critical habitat will occur by maintaining and possibly improving their ability to contribute to the conservation and recovery of the species.

The Roads and Facilities Program may have adverse effects if a road is constructed in flycatcher critical habitat. A road constructed in critical habitat would result in the permanent loss of the PCEs of critical habitat associated with riparian habitat. This loss of riparian habitat-related PCEs would not be considered short-term since the area would remain devoid of vegetation in perpetuity. Additionally, if road maintenance activities are required at any time, PCEs related to riparian habitat that have regrown could be diminished. Because we expect new roads to be limited in critical habitat, we do not anticipate that these activities will diminish the ability of critical habitat to contribute to the conservation and recovery of the species.

The Lands, Special Uses and Minerals Programs may provide access in willow flycatcher critical habitat from land exchanges, rights-of-way authorizations, and mineral production. Adverse effects could occur from increased access or changes in land ownership of critical habitat. Standards and guidelines previously described will be implemented to minimize the effects from these activities. Minerals activities could result in the loss of both the riparian habitat and insect prey base PCEs of critical habitat in those areas. Mining plans of operation will likely require restoration of habitat upon completion of mining activities; however, if mining occurs in willow flycatcher critical habitat, those areas remain devoid of the PCEs of critical habitat, especially the riparian habitat components, throughout the life of the mining activities.

The Recreation Program authorized activities such as dispersed camping, hiking, and other recreation activities could result in diminished riparian habitat through vegetation manipulation and disturbance from activities associated with dispersed camping when recreationists access riparian areas from their campsites. There are numerous plan decisions that address potential impacts of recreation to riparian areas, which would include those designated as critical habitat.

The function of streams under the physical or biological features essential to the conservation of the southwestern willow flycatcher may require special management considerations or protection, which include dynamic stream flows. Actions implemented under the LRMP have

required standards and guidelines to protect instream flow, consistent with existing water rights and laws, that are expected to retain and protect this PCE.

PCE 2: Insect prey populations.
EFFECT: Use of insecticides could kill southwestern willow flycatcher food sources; however, it is unlikely that there would be widespread use of insecticides in southwestern willow flycatcher habitat.

Western Yellow-Billed Cuckoo Proposed Critical Habitat
The FWS has proposed to designate approximately 546,335 acres of critical habitat in Arizona, California, Colorado, Idaho, Nevada, New Mexico, Texas, Utah, and Wyoming (USFWS 2014a).

Proposed PCEs for the Western Yellow-billed Cuckoo
PCE 1 and 2: Riparian vegetation and adequate prey base.
EFFECT: Livestock grazing in yellow-billed cuckoo proposed critical habitat could result in indirect adverse effects through habitat manipulation. Livestock consume young age-class riparian woody vegetation that cuckoos could eventually use for breeding. Continued forage use on young riparian vegetation can result in long-term adverse effects to these PCEs if suitable breeding and prey habitat is not permitted to develop. Insects that the yellow-billed cuckoo feeds upon may also be affected by those actions that affect riparian vegetation.

Watershed and soil projects may include instream improvement projects which may have short-term adverse effects to riparian vegetation. There may be localized, short-term adverse effects from projects in riparian zones such as temporary disturbance of habitat through vegetation removal; however, these effects would be minimized by standards and guidelines as previously described. Furthermore, while watershed improvement projects related to instream habitat improvements would likely have short-term adverse effects, we anticipate that long-term benefits to PCEs of proposed critical habitat will occur by maintaining and possibly improving their ability to contribute to the conservation and recovery of the species.

The roads and facilities program area may have adverse effects if a road is constructed in cuckoo proposed critical habitat. A road constructed in proposed critical habitat would result in the permanent loss of the PCEs of critical habitat associated with riparian areas. This loss of riparian habitat-related PCEs would be considered long-term since the area would remain devoid of vegetation in perpetuity. Additionally, if road maintenance activities are required at any time, PCEs related to riparian habitat that have regrown could be diminished. Because we expect new roads to be limited in critical habitat, we do not anticipate that these activities will diminish the ability of critical habitat to contribute to the conservation and recovery of the species.

Minerals activities could result in the loss of both the riparian habitat and insect prey base PCEs of critical habitat in those areas. Mining plans of operation will likely require restoration of habitat upon completion of mining activities; however, if mining occurs in

proposed cuckoo critical habitat, those areas remain devoid of the PCEs of critical habitat, especially the riparian habitat components, throughout the life of the mining activities.

The recreation program activities such as dispersed camping, hiking, and other recreation activities could result in diminished riparian habitat through vegetation manipulation and disturbance from activities associated with dispersed camping when recreationists access riparian areas from their campsites. There are numerous plan decisions that address potential impacts of recreation to riparian areas, which would include those designated as critical habitat.

PCE 3: Dynamic riverine processes.
EFFECT: Actions implemented under the LRMP are expected to retain and protect this PCE. There are standards and guidelines to ensure that areas supporting listed species are not dewatered or impaired to the point that they cannot support riparian and aquatic species and the habitats they require. There are objectives, standards and guidelines that would enhance or restore stream and riparian habitat. Actions implemented under the LRMP have required standards and guidelines to protect instream flow, consistent with existing water rights and laws, that are expected to retain and protect this PCE.

Erosion resulting from wildland fire, watershed improvements, recreation use, road improvements, mineral activities, and grazing could cause erosion impacts to streams and rivers. In riparian areas, soil erosion may eliminate existing vegetation and limit recovery of vegetation that has been disturbed. In addition to their direct contribution to erosion, these activities may result in additional disturbance from future activities and recreation. A number of standards and guidelines would reduce erosion effects within proposed critical habitat and other occupied territories, thus protect this PCE.

In summary, although there would be long-term effects to the PCEs of proposed critical habitat from vegetation removal, loss of prey base, and possibly increased erosion affecting recovery of riparian habitat, these effects would be small in extent and magnitude and we expect that the function of these critical habitat units for conservation of the cuckoo would not be impeded.

Terrestrial Species

Mexican Spotted Owl and Designated Critical Habitat

Forestwide Direction
The Forest Service's mission, briefly, is to achieve quality land management under the sustainable multiple-use management concept to meet the diverse needs of people. The revised LRMP is the plan the Forest Service will use to guide this mission on the Coconino NF. Although the LMRP is not a project-specific document, it does provide the direction and guidance for designing and planning specific projects. Mexican spotted owls occur on the Flagstaff, Mogollon Rim, and Red Rock Ranger Districts, and Mexican spotted owl habitat and protected, recovery, and critical habitat occur on these districts within mostly ponderosa pine-and mixed conifer forests. We understand that the Coconino NF will integrate habitat management

objectives and species protection measures in the Recovery Plan (USFWS 2012) in order to conserve and manage for the Mexican spotted owl and its protected, recovery, and critical habitat. However, multiple-use management can result in conflicting resource objectives in order to meet the diverse needs of people. In addition, active spotted owl habitat management and forest restoration implemented under the LRMP may result in short-term adverse effects to individuals. Because of this, we expect that there will likely be adverse effects to Mexican spotted owls, their habitat, and/or designated critical habitat over the life of this consultation.

Air Quality

The goals of air quality management are to meet human health standards, to meet visibility goals in areas of high scenic value, and to address and respond to other air quality concerns, such as nuisance smoke. Guideline FW-Air-G-2 directs that decision documents are to identify smoke sensitive areas and include management objectives and courses of action to mitigate impacts to those areas. Mexican spotted owl PACs will be identified as smoke sensitive areas, and this guideline would help avoid but not completely remove, the potential for adverse smoke impacts to owls from prescribed fires during breeding season.

Soils, Biophysical Features, Watershed and Water, and Riparian Areas

These program areas assure that watershed and soil conditions, as well as ledges, cliffs and canyon walls are taken into account during planning for the other Forest Programs. The programs assess and prioritize watersheds and riparian areas for restoration, and maintain or improve soil conditions. Maintenance and improvement activities for these program areas occur as a result of other resource management actions, such as, road relocation, road decommissioning, vegetation management, fencing areas to protect from human, livestock, or wildlife impacts, vegetation thinning, upland soil and watershed improvements, restoration of riparian vegetation, prescribed and managed wildfires, channel stabilization, removal of invasive and non-native species, stream habitat improvement, livestock grazing, etc. These activities have the potential for short-term implementation effects (e.g., disturbance where these restoration efforts occur within Mexican spotted owl habitat), but also have the potential for long-term improvement to overall soil, watershed, and riparian conditions for the Mexican spotted owl.

These program areas have the potential to benefit Mexican spotted owl, their habitats, and their protected, recovery, and critical habitat by improving habitat conditions. Restoration and development of soil and water resources will make surface water more available for Mexican spotted owl and the prey they depend upon. The objectives that apply that would benefit Mexican spotted owl and their habitat in this program area are maintaining soil conditions and/or improve impaired and unsatisfactory soil conditions (FW-Soil-O-1), restoring the function of 200 to 500 acres of riparian areas, with emphasis on priority 6th code watersheds (FW-Rip-RipType-O-1), restoring 5 to 10 wetlands not currently in proper functioning condition (FW-Rip-Wtlnds-O-1), and restoring at least 25 springs not currently in proper functioning condition (FW-Rip-Spr-O-1).

There are several guidelines that guide management and activities in these programs that are relevant to the Mexican spotted owl.

- FW-Soil-G-1 implements and monitors BMPs for all activities with the potential to impair water quality to control and manage nonpoint source pollution;

- FW-Soil-G-2 avoids disturbance that would result in long term impacts to soil function and productivity. Where disturbance cannot be avoided, project specific soil and water conservation practices should be developed;
- FW-Soil-G-3 uses project-specific design features when projects occur on slopes with a grade of about 40 percent or greater, on soils with moderate or severe erosion hazard, or on soils that are sensitive to degradation when disturbed, such as calcareous soils to minimize or avoid soil impacts;
- FW-Bio-Phys-Geo-G-1 calls for designing projects and managing uses to maintain the integrity and function of caves and cliffs;
- FW-Water-G-1 provides for enough vegetative ground cover to recover rapidly from natural and human disturbances and to maintain long term soil productivity;
- FW-Rip-All-G-1 requires management and restoration activities to maintain or move toward desired conditions of riparian areas;
- FW-Rip-All-G-2 manages to promote the natural movement of water and sediment, maintain ecological functions and maintain habitat and corridors for species;
- FW-Rip-All-G-3 requires the maintenance of riparian zones to protect water quality and avoid detrimental changes to the system;
- FW-Rip-Spr-G-1 requires the maintenance or improvement of spring discharge;
- FW-Rip-Spr-G-2 maintains or procures water rights;
- FW-Rip-Spr-G-3 requires project activities to be designed and implemented to maintain or improve soil and riparian function, native vegetation, and prevent the introduction or spread of disease, invasive or undesirable species;
- FW-Rip-Spr-G-4 protects spring source areas and riparian habitat to safeguard unique ecological and biophysical characteristics, higher biodiversity, endemic species, and cultural values;
- FW-Rip-RipType-G-1 protects water table level to prevent loss of or undesired changes to composition, structure, or function to riparian forests or mesquite bosques;
- FW-Rip-RipType-G-2 maintains and enhances connectivity within the unique vegetation community created by the combination of Cottonwood Willow Riparian Forest, Mixed Broadleaf Deciduous Riparian Forest, and mesquite bosques;
- FW-Rip-RipType-G-3 requires that in riparian forests, recreation activities, permitted uses, and management activities should occur at levels that maintain or allow improves soil function, riparian vegetation, and water quality at the stream reach scale in riparian forest where recreation activities, permitted uses and managed activities occur; and
- FW-Rip-RipType-G-4 manages fire wood cutting or wood removal in remaining mesquite bosques to avoid impacts to understory species, tree density, tree growth, and to avoid channel downcutting and accelerated erosion.

The above guidelines would maintain or restore riparian and soil functionality and reduce sedimentation into stream courses. Canyon walls used by the Mexican spotted owl for nesting and roosting are usually fairly inaccessible to humans. However, impacts from rock climbing, hiking, skiing or other recreational uses that go near nesting or roosting owls could cause disturbance as well.

These guidelines are expected to have long-term beneficial impacts for the Mexican spotted owl and their habitat, through restoration of hydrologic conditions and functions, and reduction of sediment. Short-term impacts associated with project implementation could include increases in sedimentation, soil compaction, alterations in hydrologic conditions and functions, and changes in water quality, all of which would be analyzed through project consultations prior to implementation of such projects. These effects would be temporary and would eventually contribute to overall riparian health, resulting in long-term beneficial effects.

Constructed Waters

This program area has the potential to both positively and negatively impact Mexican spotted owl prey species. Prey species would benefit from the improved habitat conditions at constructed water sites (i.e., stock tanks). However, the development of stock tanks would result in increased ungulate grazing, resulting in adverse effects to prey species habitat or the inability of the understory to carry low-intensity fire from reduced vegetative cover. In addition, the construction and maintenance of water sites could result in disturbance to the owl if it is near nest or roost sites; however, this should be short-term disturbance due to timing restrictions.

The two desired conditions of constructed waters (FW-ConstWat-DC-1 and FW-ConstWat-DC-2) provide for accessible water to wildlife, especially during periods of stress such as drought. Guideline FW-ConstWat-G-2 states that stock tanks that are important to listed and sensitive species should be managed to maintain water and habitat for those species. Although stock tanks and wildlife drinkers are not important habitat for the Mexican spotted owls, they do provide for improved conditions for their prey species.

Terrestrial Ecological Response Units

Terrestrial ERUs include forest, woodlands, shrublands, and grasslands. The Coconino NF LRMP focuses on restoration to reduce threats from uncharacteristic fire and flooding, which in turn reduces impacts to Mexican spotted owl and its habitat. Activities for restoration include prescribed fire, mechanical treatments, fencing, soil aeration, improved grazing strategies, removal of competing vegetation or disturbances, and relocation of constructed waters and roads.

Objectives in this program area include restoration of 10,800 to 12,400 acres of grassland (FW-TerrERU-Grass-O-2), treatment of 8,500 to 17,500 acres within piñon juniper ERUs (FW-TerrERU-PJ-O-1, 2, and 3), 1,000 acres within aspen and maple ERUs acres (FW-TerrERU-AspMpl-O), 335,000 to 595,500 acres within ponderosa pine ERUs (FW-TerrERU-PP-O-1, 2, and 3), and 18,400 to 30,500 acres within mixed conifer ERUs (FW-TerrERU-MC-MCFF-O-1, 2, and 3) every 10 year period. Vegetation treatments and other restoration activities can affect Mexican spotted owl habitat components for forest structure and prey species habitat. Potential short-term adverse effects are likely to result from these restoration activities, including prescribed fire, mechanical treatments, and relocation of roads and water sources.

There are several guidelines within the terrestrial ERUs that guide management and activities in these programs that are relevant to the Mexican spotted owl. Guidelines (FW-TerrERU-All-G-1, 4, and FW-TerrERU-PJ-G-2) provide for improved watershed condition and maintenance of habitat diversity. Several guidelines improve habitat for small mammals by retaining slash piles

throughout the treatment area, which improves owl prey habitat. Guidelines encourage development of old growth characteristics as well as retention of old growth components, which provides for habitat components needed by spotted owls, such as snags and down woody logs. In addition, guidelines within the terrestrial ERUs also help reduce bark beetle outbreaks. Short-term adverse impacts from these treatments include noise and disturbance to the owls, as well as temporary loss of habitat. All these guidelines provide for long-term benefits for the Mexican spotted owl, and its protected, recovery, and critical habitat.

Wildland Urban Interface, Fire Management, and Forest Products

This section describes the potential effects to Mexican spotted owls and how implementation of the LRMP may result in short-term adverse effects to the species and its habitat; however, we also expect that implementation of the revised LRMP would reduce the potential for high severity fire effects and provide increased protection to existing and future Mexican spotted owl habitat. These program areas may have localized short-term adverse effects, but would provide long-term benefits through reduced likelihood of habitat loss from large wildland fires. Short-term impacts from implementing certain plan objectives could include the loss of key habitat components, such as snags, downed logs or individual large trees and short-term disturbance to individual birds. Long-term changes could include modifications to stand structure which may impact nesting and foraging habitat. These programs also have the potential to impact PCEs of Mexican spotted owl critical habitat by removing PCEs.

Desired conditions for the wildland urban interface program are to protect residential areas and other infrastructure from fires, while fire management desired conditions keep wildland fires within the historic fire regime of vegetation communities. These program areas include management using mechanical treatment and prescribed fires. Activities include thinning and/or removal of fuels from the landscape to reduce fuels and the potential for loss of private property, as well as, firewood collection, harvest for sawtimber and pulpwood, and other products. These programs would reduce the risk of uncharacteristic fire impacts, including stand-replacing fires, which result in potential impact to Mexican spotted owl through habitat modification and disturbance. The LRMP directs that activities occurring within federally listed species habitat should apply habitat management objectives and species protection measures from recovery plans. In general, the Coconino NF expects that most WUI, prescribed fire, and timber projects implemented under the revised LRMP in PACs and recovery habitat, will follow the Recovery Plan (USFWS 2012). Over the long-term, implementing Recovery Plan guidance should result in positive long-term impacts to the owl and its habitat for most project-specific actions associated with this program.

Burning and thinning treatments are designed to move the vegetation communities toward desired conditions as identified in the Mexican spotted owl recovery plan (USFWS 2012). There are no objectives under these program areas. Thinning and/or prescribed fire treatments in the PAC and nest-roost replacement recovery habitat may indirectly impact Mexican spotted owls by affecting the habitat structure including snags, downed logs, woody debris, multi-storied canopies, and dense canopy cover. Treatment of these habitat types will also have short-term effects to foraging and nest/roost habitat of Mexican spotted owl. Short-term impacts would include: loss or negative effects to key nesting and foraging habitat components; noise from thinning operations which would cause disturbance to any individuals in the area at the time of

operations; and reduced severe wildfire risk. Thinning in foraging/dispersing recovery habitat should aid in fire risk reduction to PACs and nest-roost replacement recovery habitat.

Effects from prescribed fire within PACs and recovery habitats are difficult to quantify due to the uncertainty inherent in prescribed fire. Past experience and research have shown that large logs, snags, large trees, and oaks – all key habitat components for Mexican spotted owl habitat – may be destroyed or damaged during these activities (Horton and Mannan 1988, Randall-Parker and Miller 2000). However, fire also promotes the understory plant diversity needed by owls and their prey.

For most projects, site-specific treatments of Mexican spotted owl habitat will be designed to meet the guideline FW-WFP-G-1, which requires that all activities within federally listed species habitat should apply habitat management objectives and species protection measures from species recovery plans. Guideline FW-WUI-G-1, although designed to protect the WUI from uncharacteristic fires, would result in negative impacts to the Mexican spotted owl and its habitat. This guideline is designed to lower tree density and lower levels of snags, logs, and coarse woody debris. Guideline FW-Fire-G-1 would give priority to WUI areas for fuel reduction and maintenance. With stand-replacing wildfires a key threat to Mexican spotted owls (USFWS 2012), following the guidance in the recovery plan will help minimize impacts from these guidelines and provide long-term protection and recovery for the spotted owl, especially in ponderosa pine and mixed conifer habitats.

When prescribed burning, fuels reduction, or thinning treatments occur within potential Mexican spotted owl habitat there is potential for habitat components to be removed, modified, or re-distributed. There is the potential for loss of snags, logs, and large trees and reduced canopy closure within owl habitat due to conflict with restoration needs and/or habitat enhancement goals. Mechanical treatments adequate to meet fuels and restoration management objectives in recovery habitats may result in the short-term loss of some habitat components (USFWS 2012). There is the potential for mechanical treatments to adversely affect Mexican spotted owls and/or important habitat components. Mechanical treatments in PACs could result in reduced canopy cover, removal of large trees, loss of multi-layered canopy structure, and potentially significant reductions in snags and coarse woody debris.

In summary, WUI, fire management and forest activities implemented under these programs are planned to reduce the risk of severe, stand-replacing wildland fire across the landscape. These activities would be conducted forest-wide and could include PACs and recovery habitat. However, implementation of objectives that move towards desired conditions with projected long-term benefits may reduce habitat quality for Mexican spotted owls in the short-term. In the short-term, adverse effects to the spotted owl may include disturbance (from noise and/or smoke for early entry burns), and effects to habitat may include the loss of key habitat components (e.g., reduced canopy cover, loss of large trees, loss of large snags, etc.), along with the beneficial effect of reduced wildland fire risk. Therefore, over the life of this consultation, we expect that implementation of the Wildland Urban Interface, Fire Management, and Forest Products Programs would result in short-term adverse effects to Mexicans spotted owls and its habitat.

Ms. Laura Jo West, Forest Supervisor

Wildlife, Fish and Plants Program

This program area includes maintenance of habitat for listed and native species; reintroductions, introductions, or transplants of species; control or eradication of non-native species; and the management of sport and native fishes, including the identification of refugia for native fish and the establishment or removal of fish barriers, along with coordination with federal and state agencies, and partners. This program is expected to reduce the effects of other forest programs on the spotted owl. Species surveys and monitoring or habitat assessments could result in short-term disturbance impacts to the Mexican spotted owl.

Desired conditions for this program area are to provide properly functioning habitats, survival and recovery of listed species, support self-sustaining populations of species, and providing multistory forest structures, which would benefit the Mexican spotted owl. To achieve the desired conditions, there are three objectives which may affect the owl:

- FW-WFP-O-1 – Implements activities that contribute to the recovery for federally listed species during each 10 year period over the life of the plan;
- FW-WFP-O-3 - Restores or enhances at least 60,000 acres of terrestrial wildlife habitat during each 10-year period over the life of the plan; and
- FW- FW-WFP-O-5 – Completes at least 30 products or activities that educate the public about wildlife, fish, and plant resources during each 10-year period over the life of the plan.

These objectives work towards improving owl habitat and provide for education to the public. Although there may be short-term impacts to the owl due to noise and disturbance, the long-term effects will result in improved and enhanced habitat.

The standard FW-WFP-S-1 and guideline FW-WFP-G-1 would apply habitat management objective and protection measures from the Mexican spotted owl Recovery Plan, thus improving habitat for the species. These will provide overarching guidance for activities as it directs the forest to apply management objectives in the Mexican spotted owl recovery plan, which describes many standards for management of Mexican spotted owl and its habitat. Additional standards and guidelines address the needs to manage, maintain, protect, and restore owl habitat and include:

- FW-WFP-S-2 – Timing restrictions will be applied to projects that may have the potential to negatively affect listed species, bald eagles, and golden eagles;
- FW-WFP-G-3 – Projects and management activities should be designed or managed to maintain or improve habitat for native species and to prevent or reduce the likelihood of introduction or spread of disease;
- FW-WFP-G-4 – Project design should include measures to minimize the negative impact of pesticides, herbicides, or chemicals to species and their habitat. For example, chemical free buffers could be placed around bat roosts, riparian or aquatic habitat;
- FW-WFP-G-9 – Fire suppression techniques that minimize habitat and disturbance impacts should be used where there are federally listed and Southwestern Region sensitive species, consistent with public and fire fighter safety;
- FW-WFP-G-11 – Project-related activities with the potential to disturb active raptor nests should be restricted within a minimum of 300 yards of these nest sites to promote survival or successful reproduction; and

- FW-WFP-G-13 – New road and new trail locations should be designed to maintain species access to adjoining habitat, to maintain habitat for dispersal and migration, and to meet species' life history requirements, including fawning habitat for pronghorn.

Project activities would be minimized by the standards and guidelines described above, listed in the proposed action, and additional actions FWS and AGFD typically conduct with restoration projects. Guidelines would ensure that any forest program activity occurring in Mexican spotted owl habitat would be consistent with existing recovery plan, maintain or improve habitat, meet species needs, and minimize negative impacts.

Invasive Species

This program area has the potential to benefit the Mexican spotted owl by removing non-native invasive species. Invasive species such as cheatgrass can change and affect food and cover available for spotted owl prey species. Pesticide and mechanical treatments would continue under this plan as they have under the previous forest plan (USFS 2017a).

The guidelines FW-Invas-G-1 and 2 directly benefits the owl by preventing, controlling, containing and eradicating non-native invasive species to improve watershed condition and maintain ecosystem function. Guideline FW-Invas-G-3 ensures only weed-free plant materials are used for seeding and mulching projects in disturbed areas. Treatment of non-native invasive species within Mexican spotted owl habitat could result in short-term impacts from disturbance, however implementing timing restrictions (FW-WFP-S-2) should avoid any adverse impacts to the owl and its habitat.

Livestock Grazing

Grazing allotment plans provide guidance for managing and monitoring public lands range use by livestock on the Coconino NF. Grazing allotment plans will be revised/developed within the framework of the revised LRMP, and the appropriate ESA consultation(s) will be conducted as necessary. Grazing can adversely affect the Mexican spotted owl primarily through four indirect effects: 1) diminished prey availability and abundance; 2) increased susceptibility of habitat to destructive fires; 3) degradation of riparian and meadow plant communities; and, 4) impaired ability of plant communities to recover or develop into more suitable Mexican spotted owl habitat (USFWS 2012). Although the Coconino NF strives to manage livestock allotments to maintain habitat for the owl and its prey, multiple factors (such as yearly precipitation) may determine the specific influences of livestock on Mexican spotted owl habitat. Livestock grazing utilization levels incompatible with sustainable prey habitat has the potential to indirectly affect the Mexican spotted owl. However, the desired conditions for livestock grazing in the revised LRMP should promote understory vegetation production in forested and grassland habitat. The guidelines for livestock grazing would help maintain habitat for prey species.

Livestock grazing may result in minimal effects to PACs on the Coconino NF because of the steep, forested areas where they occur that provide less forage. We also expect that the revised LRMP desired conditions and guidelines would result in insignificant effects to prey availability in recovery habitat in ponderosa pine-Gambel oak.

The following guidelines help minimize adverse impacts to the Mexican spotted owl, its prey and their habitat:

- FW-Graz-G-1 helps minimize impacts to habitat needs for wildlife by balancing the forage production for livestock and wildlife;
- FW-Graz-G -2 calls for managing livestock grazing to meet or move towards desired conditions for other resources, including species, so this would be positive for the MSO and its habitat;
- FW-Graz-G-3 provides for adequate rest during the growing season for treated areas to ensure plant recovery and vigor; and
- FW-Graz -G-5 minimizes impacts to sensitive resources from excessive trampling, compaction, and other impacts by locating supplements away from these areas.

Range program activities provide guidance for managing livestock on the Coconino NF. Livestock grazing may have minimal effects to PACs due to the steep, forested areas where they occur. Livestock grazing may still adversely affect important habitats needed by Mexican spotted owl and their prey species. The standards and guidelines under this program are expected to minimize, but not eliminate these adverse effects. Therefore, over the life of this consultation, we expect that implementation of the livestock grazing program would result in short-term adverse effects to Mexican spotted owls, their prey species and their habitats.

Minerals, Land Adjustments, and Special Uses

The minerals, lands and special uses programs manage the sale and purchase of lands, rights-of-way, utility corridors, mineral extraction, roads to access private property, and other non-recreational uses. Mineral extraction, powerlines, and communication sites may result in the removal of owl habitat and/or disturbance to the Mexican spotted owl during the breeding season. Activities associated with mineral resources include blasting, drilling, vegetation clearing, and other ground disturbing activities which can impact owls and their habitat. Mining activities on the Coconino NF are limited. There are few locatable mineral resources, and only a small amount of common variety mineral materials such as cinders, rock and fill dirt, and landscape rock (Haessig 2016) which occur on the Coconino NF.

Management of utility corridors on the Coconino NF has resulted in the removal of large trees and snags, both of which are key habitat components of owl habitat. The proposed desired conditions and guidelines for these activities would assist in reducing or eliminating these impacts by restricting or prohibiting some surface use in spotted owl habitat. In addition, efforts to concentrate uses to the extent possible would limit the amount of habitat that would be affected by development of these facilities. The desired conditions and guidelines for mineral and mining activities would only apply to new, not existing, leases.

At this time, we cannot predict what might occur in the Minerals Resources, Land Adjustments, and Special Use programs that may impact Mexican spotted owls or their habitat. However, we know from past consultations (e.g., utility line corridor maintenance) that there are likely to be some impacts to owls and/or their habitat from this program on the Coconino NF. These program areas are likely to have short- and long-term adverse effects to the Mexican spotted owl due to habitat fragmentation, noise disturbance, and loss of prey habitat. The standards and guidelines required under these programs are expected to minimize, but may not eliminate all of

these adverse effects. Therefore, over the life of this consultation, we expect that implementation of the Minerals Resources, Land Adjustments, and Special Use programs would result in adverse effects to Mexican spotted owls, their prey species, and their habitats.

Roads and Facilities

The Coconino NF activities under this program include construction, maintenance, relocation, modifications, and obliteration of roads (USFS 2017a). Motor vehicle use off of the designated system of roads, trails and areas is prohibited except as identified on the motor vehicle use map (MVUM) and as authorized by law, permits, and orders in connection with resource management and public safety (USFS 2017a). Future projects would be designed to restore and improve watershed conditions and would employ BMPs, guidelines, and mitigation measures to protect watershed resources.

Roads (including road maintenance) and related recreation activities (often associated with motor vehicles such as all-terrain vehicles) have contributed noise and disturbance to Mexican spotted owl, along with habitat loss and fragmentation. High road densities can increase human presence into areas and increased human presence and/or activities could result in spotted owls flushing or leaving their roost. On a local scale, roads and trails through PACs may fragment habitat continuity, alter natural movement patterns, and increase disturbance to resident owls. Effects are variable depending on time of day/night, intensity, frequency, and distance to Mexican spotted owl. Persistent noises are likely more disruptive than infrequent disturbances, and intensity of disturbance is proportional to noise level. Roads in nest/roost replacement areas and other recovery habitats may also result in a loss of habitat components (e.g., large logs, snags, and hardwoods) as people access these areas for fuelwood cutting.

As of January, 2016 there were 192 Mexican spotted owl PACs within or partially within the Coconino NF (USFS 2017a). Of these PACs, there are approximately 120 PACs that currently have roads within them (USFWS 2011). Most roads are located along the exterior boundaries of the PACs and tend to be more the 0.25 mile from known nesting cores (USFWS 2011). Although occurring across the entire forest for the length of the plan, transportation projects could have localized adverse effects to the Mexican spotted owl and its habitat from these activities. Long-term effects to the species include disturbance, and loss/fragmentation of habitat. The Forest Service typically implements measures to minimize effects to the owl and habitat components from the construction of roads and trails (such as avoiding road maintenance activities near PACs during the breeding season, avoiding construction of new roads in PAC habitat, etc.). Under this program, the Forest Service may also seasonally or permanently close existing roads in certain circumstances. Seasonally or permanently closing roads within areas where spotted owls are known to occur would reduce the amount of disturbance, particularly during the breeding season (March 1 to August 31). The actual effects to the Mexican spotted owl and/or owl protected and recovery habitat would be dependent on methods, location, and timing of such activities.

We would expect that over the life of the project, there could be additional new and temporary road construction to help support forest restoration activities which may result in short and long-term adverse effects to Mexican spotted owls and their habitat.

There are several relevant objectives, standards and guidelines that would affect Mexican spotted owls and their habitats:

- FW-RdsFac-O-1 would decommission 200 to 800 miles of unauthorized and unneeded system roads during the next 10 years. There could be short-term adverse impacts during the restoration period when vegetative cover may be minimal. If these decommissioned and restored roads are within or near PACs, it will have long-term beneficial impacts;
- FW-RdsFac-S-1 would require motorized vehicle use to only occur on designated system roads and trails, and designated areas designated on the MVUM map. This standard minimizes disturbance within PACs;
- FW-RdsFac-G-2 requires roads to be designed, located and maintained to meet desired condition of other resources in the area. Location and design will minimize effects to the resource. This guideline helps minimize transportation activities within owl habitat, thus reducing impacts to PACS and recovery areas;
- FW-RdsFac-G-3 requires temporary roads to be rehabilitated promptly following project completion;
- FW-RdsFac-G-6 requires the decommissioning of unneeded roads; and
- FW-RdsFac-G-7 avoids road construction in threatened and endangered species habitat.

Ongoing activities within the Roads and Facilities program include the operation and maintenance of the transportation system on the Coconino NF, which consists of roads and trails that provide access to areas on the forest including: private land, structures and improvements under special use permit, recreational opportunities, and facilities that support land and resource management activities. We would expect that over the life of the project, there could be additional new and temporary road construction, to help support forest restoration activities and provide access to inholdings, which may result in short-term adverse effects to Mexican spotted owls and their habitats.

Recreation

Recreation activities may affect Mexican spotted owls directly through disturbances caused by human activity (e.g., hiking, shooting, and OHV use at nesting, roosting, or foraging sites) or indirectly through alteration of habitats such as damage to vegetation, soil compaction, illegal trail creation, and increased risk of wildland fire. The nature of the recreation program can come into conflict with Mexican spotted owl management across the forest and may result in disturbance to owls. Typically, this is a result of recreationists wanting to conduct activities (such as OHV group rides) in or adjacent to PACs during the breeding season. Other recreation activities in the region that have resulted in potential adverse effects to the Mexican spotted owl include building trails and developing recreational facilities within PACs.

Effects are variable depending on time of day/night, intensity, frequency, and distance to Mexican spotted owl. Some developed recreation sites are within Mexican spotted owl habitat and some are adjacent to PACs; however, these sites have been in place for decades. Persistent noises are likely more disruptive than infrequent disturbances, and intensity of disturbance is proportional to noise level. The revised LRMP includes measures that would reduce the impacts to Mexican spotted owls from recreation activities; however, there is also direction in the LRMP to increase and/or improve recreational opportunities. Over the life of the LRMP, this could result in impacts to Mexican spotted owls and their habitat.

The LRMP includes standards and guidelines to reduce the impacts to Mexican spotted owls from recreation activities; however, there is also direction in the LRMP to improve recreational opportunities. Over the life of the LRMP, this could result in impacts (i.e., disturbance during nesting/roosting and foraging periods and increased noise from human activities) to Mexican spotted owls and their habitat.

One standard and several guidelines are included in the LRMP that can address potential impacts of recreation to Mexican spotted owls and their habitats.

- FW-Rec-Disp-S-1 requires motorized vehicle to remain on designated system of roads, trails, and areas (including locations designated for motorized big game retrieval), as defined on motor vehicle use maps, except for those uses authorized by law, permits, and orders in connection with resource management and public safety. This results in reduced impacts within spotted owl PACs and CH;
- FW-Rec-All-G-1 ensures recreational activities, locations, and/or settings are designed and managed to maintain or move toward desired conditions for other uses and resources, which includes Threatened and endangered species;
- FW-Rec-All-G-2 manages recreation activities, locations and/or setting to be in balance with other resources;
- FW-Rec-All-G-4 restricts parking or designates parking so as to prevent resource damage to the site;
- FW-Rec-All-G-5 designs parking are to ensure resources are protected;
- FW-Rec-All-G-6 has forest users carry certified weed-free feed for their stock to prevent spread of invasive plants;
- FW-Rec-Dev-G-2 promotes a natural-appearing landscape, emphasizes the use of native plant species during planning activities (such as design of new sites or improvements to existing sites). Invasive species should be removed or treated on existing sites before they become widespread within recreational sites;
- FW-Rec-Dev-G-3 manages developed recreation sites to discourage or prohibit broken or cut tree limbs or the removal of all downed woody debris to maintain a natural-appearing landscape, to maintain the integrity of the site, and to control accelerated erosion;
- FW-Rec-Disp-G-3 restricts visitors from soil and plant restoration sites to promote re-establishment of vegetation and functioning soil;
- FW-Rec-Trails-G-1 requires trails and trailheads to be designed, built, rerouted, or maintained utilizing current best practices that promote sustainable trail surfaces, prevent conflicts with neighboring lands, address impacts to other resources, and consider user experiences;
- FW-Rec-Trails-G-3 requires rehabilitation of unplanned, user-created trails to prevent future access and to accelerate recovery and to prevent further resource impacts; and
- FW-Rec-Trails-G-5 promotes or expands recreation opportunities on closed roads by considering for conversion to motorized and/or non-motorized trails to promote or expand recreation opportunities when it benefits or does not degrade other resources.

The overarching standard FW-WFP-S-1 gives precedence to federally listed species and guideline FW-WFP-G-1 requires that activities are implemented consistent with recovery plans.

Ms. Laura Jo West, Forest Supervisor

The Mexican spotted owl recovery plan guides land management agencies to minimize disturbance from recreational activities in PACs during the breeding season.

Area Specific Direction

Management Areas

Fifteen of the eighteen proposed management areas (MAs) contain Mexican spotted owl PACs and/or protected, recovery, and critical habitat (USFS 2017a). Discussions of these MAs are addressed in the BA and are incorporated by reference.

There are several guidelines and one standard which minimize adverse effects to the spotted owl and its habitat.

- MA-CCCrg-G-1 manages the C.C. Cragin Watersheds MA to reduce the threat of uncharacteristic wildfires, flooding, and sedimentation, and to maintain water quality and quantity;
- MA-CCCrg-G-2 maintains roads and trails within the C.C. CraginWatersheds MA to prevent erosion and sedimentation and to protect existing infrastructure;
- MA-EastClr-G-1 and MA-LongV-G-1 manages dispersed camping and motorized recreation so it occurs outside meadow and riparian area, which helps protect these areas within PACs;
- MA-Peaks-G-1 manages Waterline Road as a non-motorized corridor, which would reduce disturbance to spotted owls;
- MA-VerdeV-G-1 maintains and improves watershed and riparian function and/or prevent the introduction or spread of disease, invasive, or undesirable species, which would improve food and cover for spotted owl prey species;
- MA-VerdeV-G-2 manages recreation to reduce user conflicts, maintain desired conditions of other resources and promote public health and safety, which also reduces disturbance to spotted owl;
- MA-Walnut-S-1 restricts paved roads and utility corridors except on the boundary of Walnut Canyon, which helps protect spotted owl habitat; and
- MA-Walnut-G-1 focuses on preserving habitat for disturbance-sensitive species.

These guidelines minimize adverse effects to the Mexican spotted owl and its habitat by reducing noise and disturbance, retaining vegetation and habitat, and preventing spread of disease and non-native species.

Special Areas

Special areas include designated wilderness areas, recommended wilderness areas, designated and eligible wild and scenic rivers, national trails, scenic roads, established and proposed research natural areas and botanical and geological areas, and inventoried roadless areas. Mexican spotted owls, its habitat, and/or its protected, recovery, and critical habitat are present within these areas.

There is one objective, two standards and one guideline that help minimize any adverse impacts that may occur to spotted owls and their habitat:

- SA-Wild-O-1 rehabilitates one to five wilderness sites or areas annually that have been impacted by recreation in order to restore wilderness character. These sites could include habitat for the spotted owls, resulting in short-term negative effects from noise, disturbance and vegetation removal;
- SA-Wild-S-1 limits groups sizes, which in turn reduces disturbance to habitat as well as the owls;
- SA-Wild-S-5 avoids San Francisco ragwort habitat with constructing new trials, which would reduce disturbance where owl habitat overlaps with ragwort habitat; and
- SA-Wild-G-1 implements management activities and permitted uses designed to maintain or move toward the desired conditions for wilderness and other resources. If occurring within occupied habitat, these activities would maintain or improve habitat for the owl and its prey.

These guidelines minimize adverse effects to the Mexican spotted owl and its habitat by reducing noise and disturbance, and retaining vegetation and habitat.

Summary

In summary, since 2012, we have completed three formal consultations for the Coconino NF, which included a combination of short- and long-term harm and harassment that resulted in the anticipated take of owls. The revised LRMP would strive to implement the Recovery Plan (USFWS 2012) and guidelines that would minimize impacts to the Mexican spotted owl and its habitat. However, due to the Forest Service's multiple use mission, restoration of forested habitats, and active management of spotted owl habitat, we anticipate that over the life of this consultation (15 years) there will be activities implemented under this plan that could result in adverse effects to the owl and its habitat. Project activities associated with forest management (e.g., fuels reduction projects, forest restoration, logging, fire management) would likely be the predominant activities occurring within and adjacent to Mexican spotted owls and their habitat. These activities can result in disturbance during the breeding season (such as mechanized logging, hauling routes, smoke), habitat modification (short-term reductions in large logs, snags, and other key habitat components), and habitat degradation (such as long-term loss of old-growth, pre-settlement trees to create openings for regeneration). Other actions, such as those conducted under the Lands or Special Uses Program (based upon recent site-specific consultations), Recreation, or other programs identified above, could also result in adverse effects to Mexican spotted owls from modification of prey species habitat due to disturbance related to construction of infrastructure near occupied areas.

Mexican Spotted Owl Designated Critical Habitat

PCEs related to forest structure:

PCE 1: A range of tree species, including mixed conifer, pine-oak, and riparian forest types, composed of different tree sizes reflecting different ages of trees, 30 percent to 45 percent of which are large trees with mean diameter at breast height of 12 inches or more.

EFFECT: Actions implemented under the revised LRMP are expected to retain the range of tree species (i.e., conifers and hardwoods associated with Mexican spotted owl habitat) and would not reduce the range of tree sizes needed to create the diverse forest and multi-layered forest canopy preferred by owls. Some loss of trees of all types and mean diameter at breast height

size classes would occur from actions such as hazard tree removal, prescribed fire, and forest thinning (as implemented under WUI, Fire Management and Forest Products Programs). However, actions implemented under the revised LRMP are expected to maintain a range of tree species and sizes needed to maintain this PCE in PACs and recovery habitat across the Coconino NF because the Forest Service is implementing the Recovery Plan guidelines that strive to retain large trees, canopy cover appropriate for owl habitat, and a diverse range of tree species. Removal of trees and various tree species may also occur as part of the Recreation (development of recreation sites) and Roads and Facilities Programs (creation, maintenance of roads); but these effects should be small in extent and intensity. Therefore, the function and conservation role of this PCE would not be compromised by the proposed action.

PCE 2: A shade canopy created by the tree branches covering 40 percent or more of the ground. *EFFECT:* We expect that tree shade canopy would be reduced following thinning and burning treatments implemented under the revised LRMP in WUI, Fire Management and Forest Products Programs. However, we do not expect reduction of canopy cover in Mexican spotted owl forested habitat to be reduced below 40 percent because the Forest Service has adopted the Recovery Plan recommendations that include managing for higher basal area and increased canopy cover in Mexican spotted owl habitat versus pure ponderosa pine or other forest and woodland habitats. Previous treatments under the previous LRMP were not expected to reduce the shaded canopy below 40 percent. We would expect that some small reduction in existing canopy cover (5 to 10 percent) may actually aid in increasing understory herbaceous vegetation and forb production, which could benefit Mexican spotted owl prey species. The function and conservation role of this PCE would not be compromised by the proposed action.

PCE 3: Large, dead trees (snags) with a mean diameter at breast height of at least 12 inches. *EFFECT:* Large snags would most likely be reduced following proposed prescribed burning and hazard tree removal actions conducted under WUI, Fire Management and Forest Products Programs (and possibly other programs as well). Currently, large snags are rare across the action area, and any loss of this habitat component may be significant in terms of maintaining Mexican spotted owl and prey habitat. Some snags would be created through prescribed burning, which could benefit the Mexican spotted owl. However, snags currently used by Mexican spotted owls for nesting are typically very old, large mean diameter at breast height, highly decayed snags with cavities. In individual burning projects, the Forest Service would attempt to minimize loss of these large snags through conservation measures (such as lining or using lighting techniques to avoid snags). Research has indicated that following burning treatments, upwards of 30 percent of these existing snags may be lost within treated (i.e., burned) forests, resulting in short-term adverse effects to this PCE (Randall-Parker and Miller 2000). However, the study design did not include active protective measures for large snags. This is why conservation measures that the Forest Service implements to protect the largest and oldest snags (particularly those with nest cavities) are critically important. Therefore, though we anticipate there would be a measurable loss of snags due to implementation of the revised LRMP, efforts to protect this rare resource would be made as part of any forest or fuels management project. As such, the function and conservation role of this PCE would not be compromised by the proposed action.

Ms. Laura Jo West, Forest Supervisor

PCEs related to maintenance of adequate prey species:

PCE 4: High volumes of fallen trees and other woody debris.
EFFECT: Fallen trees and woody debris would likely be reduced by the proposed burning treatments (broadcast, piling, and maintenance burning) as part of WUI and Fire Management Programs Program, as well as through the Recreation program which would reduce the availability of fallen trees and downed woody debris in the vicinity of picnic areas and campgrounds. Logs are expected to be reduced by approximately 30 percent within protected and recovery Mexican spotted owl habitat (Randall-Parker and Miller 2002). This loss of large logs would result in short-term adverse effects to this PCE and could result in localized impacts to prey species habitat. Furthermore, across the Coconino NF, it is likely that hazard tree removal and prescribed burning would also create fallen trees and woody debris as trees are felled (i.e., cut) and left on the ground or are killed post-burn and fall. However, based upon current data for many of these areas, there is an excess supply of coarse woody debris due to the exclusion of frequent, low-severity fire, which can increase the likelihood of high-severity fire within recovery habitat. Therefore, some removal of woody debris would result in an overall benefit to the function and conservation role of this PCE, though short-term adverse effects would likely occur within some project areas.

PCE 5: A wide range of tree and plant species, including hardwoods.
EFFECT: We expect this PCE would be positively affected by the actions taken under WUI, Fire Management and Forest Products Programs. Plant species richness would increase following thinning and/or burning treatments that result in small, localized canopy gaps. Individual projects conducted under the revised LRMP typically would include conservation measures that focus on retaining oaks and other hardwoods, but some level of short-term loss could occur at the individual project level. However, the function and conservation role of this PCE would not be compromised by the proposed action.

PCE 6: Adequate levels of residual plant cover to maintain fruits and seeds, and allow plant regeneration.
EFFECT: Short-term decreases in plant cover would result from prescribed burning conducted under WUI and Fire Management Programs, and possibly some limited reductions from livestock managed under the Livestock Grazing Program (see discussion in Recovery Plan, pgs. 42-3). We expect long-term increases in residual plant cover because fire treatments would provide conditions suitable for increased herbaceous plant growth by removing a thick layer of dead plant debris within treated areas. The mosaic effect created by burned and unburned areas and by opening up small patches of forest within protected habitat is also expected to increase herbaceous plant species diversity (Jameson 1967, Moore *et al*. 1999, Springer *et al*. 2001) and, in turn, assist in the production and maintenance of the Mexican spotted owl prey base. The combination of low-intensity prescribed burns and thinning during restoration projects would most likely result in only short-term effects to the Mexican spotted owls with regard to modifying prey habitat within treatment areas. In frequent-fire landscapes, herbaceous understory response and plant regeneration tends to be positive following tree removal and prescribed fire (Springer e*t al*. 2001). There is the potential for the Livestock Grazing Program to have adverse effects on the production of plant cover post-burning if livestock were allowed to graze burned areas too soon following fire. However, the revised LRMP includes desired

conditions and guidelines to maintain healthy levels of forage and managing livestock following prescribed fire. Therefore, the function and conservation role of this PCE across the Coconino NF would not be compromised by the proposed action.

Effects of the action on the role of critical habitat in recovery
Adverse effects from the revised LRMP are not expected to negatively affect Mexican spotted owl recovery and/or further diminish the conservation contribution of critical habitat to the recovery of the Mexican spotted owl.

The revised LRMP includes a guideline (FW-WFP-G-1) to integrate habitat management objectives and species protection measures in accordance with the Recovery Plan (USFWS 2012). These actions were identified by the Recovery Team as being necessary to recover the Mexican spotted owl and the Coconino NF is implementing these actions in designated critical habitat. Designated critical habitat includes all protected (PACs) and recovery habitat (unoccupied Mexican spotted owl habitat) within critical habitat units. These actions include the following:

- The Coconino NF has and continues to designate a minimum of 600 acres surrounding known Mexican spotted owl nesting and roosting sites. PACs are established around owl sites and are intended to protect and maintain occupied nest/roost habitat. Nesting and roosting habitat is rare across the range of the Mexican spotted owl, and by identifying these areas for increased protection, the FS is aiding in recovery.
- The Coconino NF has identified and is managing pine-oak, mixed conifer, and riparian forests that have potential for becoming Mexican spotted owl replacement nest-roost habitat, or are currently providing habitat for foraging, dispersal, or wintering habitats. As stated above, nesting and roosting habitat is a limiting factor for the owl throughout its range. By managing protected, recovery, and critical habitat for future replacement nest/roost habitat, the Coconino NF is aiding in recovery.
- The Coconino NF's intent is to integrate the best available recovery habitat management objectives where possible into forest restoration and/or fuels reduction projects with the overall goal to protect owl PACs from high-severity wildland fire, and to conduct actions to improve forest sustainability (e.g., thinning and prescribed burning) to ensure Mexican spotted owl habitat continues to exist on the forest.
- The Coconino NF is implementing on-going projects previously consulted on under site specific BOs. BOs issued for these projects have noted adverse effects to PCEs and spotted owls. However, these projects are designed to result in long-term benefits to spotted owls habitat by reducing fuels and the risk of high severity wildland fire (e.g., Flagstaff Watershed Protection Project). For example, the Arizona Forest Utility Hazard Tree Removal Phase II Project (USFWS 2008), though it is designed to protect infrastructure through the removal of hazard trees near utility lines, will ultimately reduce the risk of fire ignition from a power line into adjacent spotted owl habitat, particularly PACs.

These actions should increase the sustainability and resiliency of Mexican spotted owl habitat (particularly through fuels management and forest restoration actions). Therefore, implementation of the Coconino NF's LRMP is not expected to further diminish the conservation contribution of critical habitat to the recovery of the Mexican spotted owl.

The revised LRMP would strive to implement the Recovery Plan (USFWS 2012) and guidelines that would minimize impacts to the Mexican spotted owl and its habitat. However, due to the Forest Service's multiple use mission, restoration of forested habitats, and active management of spotted owl habitat, we anticipate that over the life of this consultation (15 years) there will be activities implemented within the framework of this plan that could result in adverse effects to the owl and its habitat. Plan implementation activities associated with forest management desired conditions and objectives (e.g., fuels reduction projects, forest restoration, logging, and fire management) would likely be the predominant activities occurring within and adjacent to Mexican spotted owls and their habitat. These activities can result in disturbance during the breeding season (such as mechanical treatments, hauling routes, smoke), habitat modification (short-term reductions in large logs, snags, and other key habitat components), and habitat degradation (such as long-term loss of old-growth, pre-settlement trees to create openings for regeneration). Other actions, such as those conducted under the Minerals, Recreation, or other programs identified above, could also result in adverse effects to Mexican spotted owls from modification of prey species habitat due to disturbance related to construction of infrastructure near occupied areas.

Arizona Cliffrose
We anticipate that the air quality, constructed waters, riparian areas, heritage resources, tribal relations, interpretation and education, and scenic resources programs area will have no effect on Arizona cliffrose or its habitat.

Forestwide Direction

Soils Management
The primary objectives of this program area are to sustain and stabilize soil productivity which would improve habitat for this species. The objective, FW-Soil-O-1 would help maintain or improve impaired and unsatisfactory soil conditions on 100,000 to 350,000 acres during each 10-year period. Activities to maintain or improve soil conditions include grazing, trail construction and maintenance, road closures, rehabilitation or relocations; road decommissioning; fencing areas to protect from human, or wildlife impacts; vegetation management; prescribed and managed wildfires; upland soil and watershed improvements; restoration of riparian vegetation; and changes in livestock pasture use and/or rotation. This objective could result in maintenance or improvement of this species habitat, however, it is unknown if any of the treatment areas will be located in Arizona cliffrose habitat.

Soil projects could have short-term adverse effects to Arizona cliffrose habitat components. Two guidelines are designed to protect the resources and reduce the potential short-term impacts to the species. Guideline FW-Soil-G-2 designs projects to avoid long-term impacts to soil function and productivity, which helps preserve the needed soil substrate for Arizona cliffrose. Additionally, guideline FW-Soil-G-3 designs project-specific features for steep slopes and where there is moderate to severe erosion hazard or soils that are particularly sensitive to disturbance. This helps minimize effects such as trails built through sensitive areas and erodible soils. Mitigations include trail reroutes onto suitable soil types to minimize soil disturbance.

Biophysical Features
Biophysical features include geological features such as caves, karst, cliffs, and talus slopes. FW-BioPhys-Geo-G-2 provides guidance for closing or requiring permits for the casual collection of paleontological resources to protect areas that may be impacted by casual collecting of these resources. Although there is no information that collection of paleontological resources is occurring within cliffrose habitat, this guideline would help to protect the Verde Valley Botanical Area and Verde Formation, and the Arizona cliffrose habitat from the effects of casual collection of paleontological resources. The effects of this guideline on Arizona cliffrose and its habitat are likely minor, but potentially beneficial to the species and its habitat.

Watersheds and Water
Watershed improvement projects focus on priority watersheds selected through the Watershed Condition Framework process (USFS 2017a). These projects will be limited in extent and amount of ground disturbance, and could include road and trail construction and maintenance. Guidelines include providing vegetative cover (FW-Water-G-1) and best management practices to prevent or reduce erosion and soil loss (FW-Water-G-4) should minimize the short-term adverse effects of erosion during and after project implementation. These forest-wide guidelines help projects repair damaged watersheds and maintain healthy ecosystems, thus benefitting cliffrose populations. Long-term benefits of these projects would ensure soil retention in highly erodible areas associated with the Arizona cliffrose.

Terrestrial Ecological Response Units
The Arizona cliffrose range includes portions of the desert communities and semi-desert grassland communities ERUs on the Coconino NF. Activities for restoration include prescribed fire, managed natural wildfires, mechanical treatments, fencing, livestock grazing, recreational activities, removal of competing vegetation or disturbances, and relocation of roads.
There are no desert community objectives, standards or guidelines. There is one grassland objective to restore at least 3,500 acres of semi-desert grassland (FW-TerrERU-Grass-O-1) every 10 year period. In addition, FW-TerrERU-Grass-G-2 requires protecting and enhancing grassland composition, structure, and productivity and soil function using methods such as fencing, aerating soil (decompacting soils), improving grazing strategies, or strategically locating constructed waters or roads. This restoration work could occur within cliffrose habitat.

Wildland Urban Interface, Fire Management, and Forest Products
Arizona cliffrose and its habitat occur within the WUI, and is in close proximity of the City of Cottonwood, Dead Horse Ranch State Park, Tuzigoot National Monument and other areas. Risks in areas containing Arizona cliffrose include destruction of habitat through soil damage and potential loss of plants. Currently wildland fires are rare within Arizona cliffrose habitats (Desert Communities and Semi-desert ERUs), however, if they were to occur in the area of Arizona cliffrose, emergency consultation procedures would occur to address effects of any suppression activities under separate consultation.

Forest products include a variety of items collected for personal use or sale for national forest lands, such as boughs, seeds, and transplants. FW-FProd -G-4 restricts the collection of Arizona cliffrose. However, with proper guidance and permitting from the FWS, research collection could occur.

The LRMP directs that activities occurring within federally listed species habitat should apply habitat management objectives and species protection measures from recovery plans. In general, the Coconino NF expects that for most WUI, fire, and timber projects implemented under the revised LRMP in Arizona cliffrose habitat, they will follow the Recovery Plan (USFS 2017a). This guidance would limit the options for fire suppression in the area but guidance provided by FW-WFP-G-9 would allow for suppression in emergency situations while minimizing habitat and disturbance impacts. Used jointly these plan components would allow for firefighter safety and efficient suppression while protecting plants and habitat.

Wildlife, Fish and Plants Program

This program area includes maintenance of habitat for listed and native species; reintroductions, introductions, or transplants of species; control or eradication of non-native species; and management of sport and native fishes, including the identification of refugia for native fish and the establishment or removal of fish barriers, along with coordination with federal and state agencies, and partners. This program is expected to reduce the effects of other forest programs on the Arizona cliffrose.

Desired conditions for this program area are to provide properly functioning habitats, survival and recovery of listed species, and support self-sustaining populations of species, which would benefit the Arizona cliffrose. To achieve the desired conditions, there are three objectives which may affect the cliffrose:

- FW-WFP-O-1 – Implements activities that contribute to the recovery for federally listed species during each 10 year period over the life of the plan;
- FW-WFP-O-3 - Restores or enhances at least 60,000 acres of terrestrial wildlife habitat during each 10-year period over the life of the plan; and
- FW- FW-WFP-O-5 – Completes at least 30 products or activities that educate the public about wildlife, fish, and plant resources during each 10-year period over the life of the plan.

These objectives work towards improving cliffrose habitat and provide for education to the public. Although there may be short-term impacts to the plant due to disturbance, the long-term effects will result in improved and enhanced habitat.

The standard FW-WFP-S-1 and guideline FW-WFP-G-1 would apply habitat management objective and protection measures from the Arizona Cliffrose Recovery Plan, thus improving habitat for the species. These will provide overarching guidance for activities as it directs the forest to apply management objectives in the recovery plan, which describes recovery objective for the plant and its habitat. Additional guidelines address the needs to manage, maintain, protect, and restore the plant habitat and include:

- FW-WFP-G-3 – Projects and management activities should be designed or managed to maintain or improve habitat for native species and to prevent or reduce the likelihood of introduction or spread of disease;
- FW-WFP-G-4 – Project design should include measures to minimize the negative impact of pesticides, herbicides, or chemicals to species and their habitat. For example, chemical free buffers could be placed around bat roosts, riparian or aquatic habitat;

- FW-WFP-G-9 – Fire suppression techniques that minimize habitat and disturbance impacts should be used where there are federally listed and Southwestern Region sensitive species, consistent with public and fire fighter safety;
- FW-WFP-G-13 – New road and new trail locations should be designed to maintain species access to adjoining habitat, to maintain habitat for dispersal and migration, and to meet species' life history requirements, including fawning habitat for pronghorn; and
- FW-WFP-G-15 - To maintain rare plant populations, seed collection and cuttings (rather than whole plant removal) should be the preferred collection methods when forest product and research collection permits are issued.

Project activities would be minimized by the standards and guidelines described above, listed in the proposed action, and additional actions FWS typically conduct with restoration projects. Guidelines would ensure that any forest program activity occurring in the plant's habitat would be consistent with existing recovery plan, maintain or improve habitat, meet species needs, and minimize negative impacts.

Invasive Species
This program area has the potential to benefit the plant by removing non-native invasive species. Pesticide and mechanical treatments would continue under this plan as they have under the previous forest plan (USFS 2017a).

The guidelines FW-Invas-G-1 and 2 directly benefit the plant by preventing, controlling, containing and eradicating non-native invasive species to improve watershed condition and maintain ecosystem function. Guideline FW-Invas-G-3 ensures only weed-free plant materials are used for seeding and mulching projects in disturbed areas.

Treatments of noxious weeds in Arizona cliffrose habitat is intended to help prevent negative impacts associated with weeds on this plant, especially because of its limited distribution on the Coconino NF. Noxious weeds may be able to encroach into cliffrose habitat, compete with cliffrose and impact their distribution and abundance, and/or help carry wildfire into cliffrose habitat at a higher frequency or intensity.

While we anticipate that these actions will overall have a beneficial impact on cliffrose habitat and populations, it is reasonable to anticipate that not all plants will be detected and that manual treatments or spot applications of herbicides that target invasive species could adversely affect an existing cliffrose plant (also a dicot). We expect that this occurrence will be a rare, and at the most, only affect a few individual plants, and therefore will not result in impacts to the overall populations of cliffrose on the Coconino NF.

Livestock grazing
The FWS identified improperly manage grazing, by both livestock and wildlife, as a threat to Arizona cliffrose (USFWS 1995). Grazing allotment plans, as developed under the revised LRMP, provide guidance for managing livestock on the Coconino NF. Since issuance of the 2012 LRMP BO, the the Forset Service revised the Windmill West Allotment Management Plan to reduce effects to the cliffrose (USFS 2014). However, Arizona cliffrose plants are palatable to

livestock and grazing is authorized in cliffrose habitat, so effects could occur to the plant from authorized grazing.

The following guidelines help minimize adverse impacts to the Arizona cliffrose and its habitat:

- FW-Graz-G -2 calls for managing livestock grazing to meet or move towards desired conditions for other resources, including species;
- FW-Graz-G-3 provides for adequate rest during the growing season for treated areas to ensure plant recovery and vigor; and
- FW-Graz -G-5 minimizes impacts to sensitive resources from excessive trampling, compaction, and other impacts by locating supplements away from these areas;

In order to comply with the Arizona cliffrose recovery plan (FW-WFP-G-1), supplements would need to be placed at least ½ mile for known cliffrose plants. The standards and guidelines under this program are expected to minimize, but not eliminate these adverse effects to the plant as long is livestock grazing is allowed within habitat of the Arizona cliffrose.

Minerals, Land Adjustments, and Special Uses

The Minerals Resources, Land Adjustments, and Special Use programs manage the sale and purchase of lands, rights-of-way, utility corridors, mineral extraction, roads to access private property, and other non-recreational uses. Mining activities on the Forest are limited. There are few locatable mineral resources, and only a small amount of common variety mineral materials such as cinders, rock and fill dirt, and landscape rock (Haessig 2016) which occur on the Coconino NF. BLM has closed mining claims within the Verde Valley Botanical Area, but not in all of the plant's range on the Coconino NF. At this time, we cannot predict what might occur in the Minerals Resources, Land Adjustments, and Special Use programs that may impact the plant or its habitat.

Guidelines FW-Minerals-G-3 and 4 restrict surface occupancy or mineral leasing from areas with federally listed species, along with imposing restrictions and providing mitigation within the plant's habitat. Guideline FW-LndAdj-G-1 promotes land acquisitions that contain threatened or endangered species habitat, while FW-SpecUse-G-3 restricts special use permits within 200 feet of federally listed species, including the cliffrose. FW-SpecUse-G-10 restricts utility corridors within botanical areas, such as Verde Valley. These guidelines are expected to minimize, but may not eliminate all of these adverse effects. Therefore, over the life of this consultation, we expect that implementation of the Minerals Resources, Land Adjustments, and Special Use programs would result in adverse effects to Arizona cliffrose and its habitat.

Roads and Facilities

The Coconino NF activities under this program include construction, maintenance, relocation, modifications, and obliteration of roads (USFS 2017a). Motor vehicle use off of the designated system of roads, trails and areas is prohibited except as identified on the motor vehicle use map (MVUM) and as authorized by law, permits, and orders in connection with resource management and public safety. Currently, there are no open routes in Arizona cliffrose habitat. Future projects would be designed to restore and improve watershed conditions and would employ best management practices, guidelines, and mitigation measures to protect watershed resources.

We would expect that over the life of the LRMP, there could be additional new and temporary road construction to help support forest restoration activities, however recovery plan guidance would help minimize any adverse impacts to the plant and its habitat (FW-WFP-G-1).

There are several relevant objectives, standards and guidelines that would affect Arizona cliffrose and its habitat:

- FW-RdsFac-O-1 would decommission 200 to 800 miles of unauthorized and unneeded system roads during the next 10 years. There could be short-term adverse impacts during the restoration period when vegetative cover may be minimal, however there will be long-term beneficial impacts;
- Standard FW-RdsFac-S-1 would require motorized vehicle use to only occur on designated system roads and trails, and designated areas designated on the MVUM map. This standard minimizes disturbance and soil loss within cliffrose habitat;
- Guideline FW-RdsFac-G-1 requires roads to be designed, located, and maintained to meet desired condition of other resources in the area. Location and design will minimize effects to the resource. This guideline helps minimize sediment into riparian and aquatic areas, thus reducing impacts to the aquatic listed species;
- Guideline FW-RdsFac-G-3 provides for clearly identified roads and boundaries to help facilitate navigation on forest roads while preventing motorized use outside of designated areas and routes. This guideline will help prevent accidental intrusion into areas previously closed to motorized travel and will provide support for enforcement of existing laws and regulations;
- Guideline FW-RdsFac-G-6 requires the decommissioning of unneeded roads; and
- Guideline FW-RdsFac-G-7 avoids road construction in threatened and endangered species habitat.

Ongoing activities within the Roads and Facilities program include the operation and maintenance of the transportation system on the Coconino NF, which consists of roads and trails that provide access to areas on the forest including: private land, structures and improvements under special use permit, recreational opportunities, and facilities that support land and resource management activities. Most of these objectives, standards and guideline provide benefits to Arizona cliffrose because habitat intrusion is minimized or avoided.

Recreation

There is direction in the LRMP to increase and/or improve recreational opportunities. Unconstrained recreation (i.e., the creation of social trails) in the Cottonwood Recovery Unit continues to be problematic for the Arizona cliffrose (USFS 2017a). The Arizona cliffrose recovery plan calls for restricting recreation facilities within 0.5 mile of the plant and is incorporated into the LRMP by FW-WFP-G-1.

The LRMP includes standards and guidelines to reduce the impacts to Arizona cliffrose from recreation activities; however, there is also direction in the LRMP to improve recreational opportunities. Over the life of the LRMP, this could result in impacts (i.e., disturbance) to Arizona cliffrose and its habitat. One standard and several guidelines are included in the LRMP that can address potential impacts of recreation to Arizona cliffrose and its habitat.

- FW-Rec-Disp-S-1 requires motorized vehicle to remain on designated system of roads, trails, and areas (including locations designated for motorized big game retrieval), as defined on motor vehicle use maps, except for those uses authorized by law, permits, and orders in connection with resource management and public safety;
- FW-Rec-All-G-1 ensures recreational activities, locations, and/or settings are designed and managed to maintain or move toward desired conditions for other uses and resources, which includes Arizona cliffrose;
- FW-Rec-All-G-2 manages recreation activities, locations and/or setting to be in balance with other resources, including soil components and Arizona cliffrose plants along trails;
- FW-Rec-Dev-G-2 promotes a natural-appearing landscape, emphasizes the use of native plant species during planning activities (such as design of new sites or improvements to existing sites). Invasive species should be removed or treated on existing sites before they become widespread within recreational sites;
- FW-Rec-Disp-G-3 restricts visitors from soil and plant restoration sites to promote re-establishment of vegetation and functioning soil;
- FW-Rec-Trails-G-1 requires trails and trailheads to be designed, built, rerouted, or maintained utilizing current best practices that promote sustainable trail surfaces, prevent conflicts with neighboring lands, address impacts to other resources, and consider user experiences;
- FW-Rec-Trails-G-3 requires rehabilitation of unplanned, user-created trails to prevent future access and to accelerate recovery and to prevent further resource impacts; and
- FW-Rec-Trails-G-5 promotes or expands recreation opportunities on closed roads by considering for conversion to motorized and/or non-motorized trails to promote or expand recreation opportunities when it benefits or does not degrade other resources.

All the above standards and guidelines will result in beneficial impacts to the plant and its habitat, with the exception of the last guideline. FW-RecTrails-G-5 could result in the creation of social trails, as mentioned above, which could result in trampling of plants, resource damage, and degradation of habitat. However, the overarching standard FW-WFP-S-1 gives precedence to federally listed species and guideline FW-WFP-G-1 requires that activities are implemented consistent with recovery plans, which helps protect the plant and its habitat.

Area Specific Direction

Management Areas

Verde Valley Management Area contains the Cottonwood Recovery Unit. Discussion of this MA is addressed in the BA and is incorporated by reference. There are two guidelines which minimize adverse effects to the plant and its habitat.

- MA-VerdeV-G-1 maintains and improves watershed and riparian function and/or prevent the introduction or spread of disease, invasive, or undesirable species;
- MA-VerdeV-G-2 manages recreation to reduce user conflicts, maintain desired conditions of other resources and promote public health and safety.

These guidelines minimize adverse impacts to the plant and its habitat by retaining vegetation and habitat, and preventing spread of disease and non-native species.

Special Areas
Arizona cliffrose occurs within the Verde Valley Botanical Area and the surrounding areas. This 1,209 acre botanical area preserves a unique, limestone-dependent desert community containing the Arizona cliffrose and an assemblage of other endemic plants. There is no off-road motorized vehicle travel allowed within the area. This botanical area is adjacent to Dead Horse State Park, which gives additional protection from motorized travel.

Guideline SA-RNABotGeo-G 1 gives direction to manage human activities, permitted uses, and types and levels of access to protect the uniqueness and/or ecological condition of these special areas, and the values for which they were designated, established, or proposed. This guideline helps protect the Arizona cliffrose and its habitat.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation under section 7 of the Act.

Many lands within the action area are managed by Federal agencies; thus, many activities that could potentially affect these listed species are Federal activities that are subject to additional section 7 consultation. The effects of these Federal activities are not considered cumulative effects. However, a portion of the action areas for these species also occurs on state and private lands. Residential and commercial development, road construction, farming, livestock grazing, mining, off-highway vehicle use, and other activities occur on these lands and are expected to continue into the foreseeable future.

Gila Chub, Little Colorado Spinedace, Spikedace, Loach Minnow, and Designated Critical Habitats
Residential and commercial development on lands within watersheds containing threatened and endangered native fishes are cumulative effects and can adversely affect the species through a variety of avenues, such as increased sedimentation, alteration of streambanks, and reduced water quality and water quantity.

Additional cumulative effects to the listed fish include ongoing activities in watersheds such as improper livestock grazing and associated activities outside of federal allotments, irrigated agriculture, groundwater pumping, stream diversion, bank stabilization, channelization without a federal nexus, development, road maintenance, and private fuels-reduction treatments. Some of these activities, such as irrigated agriculture, are declining and are not expected to contribute substantially to cumulative long-term adverse effects to native fishes.

Other activities, such as recreation, are increasing. Increasing recreational, residential, or commercial use of the non-federal lands near the riparian areas would likely result in increased cumulative adverse effects to occupied, as well as potentially-occupied native fish habitat through increased water use, increased pollution, and increased alteration of the streambanks

through riparian vegetation suppression, bank trampling, and erosion. Stocking of non-native fish, in or near occupied listed fish habitat, in waters on non-federal lands for recreational sportfishing could result in increased predation and/or competition for space and food with the native listed fish.

Drought and climate change could eventually exacerbate existing threats to streams in the Southwestern U.S. Increased and prolonged drought associated with changing climatic patterns could adversely affect streams by reducing water availability, and altering food availability and predation rates. Drying or warming of streams is of particular concern because listed fish depend on permanent flowing water of appropriate water quality for survival. Long-term climate change could exacerbate the effects of drought.

Narrow-headed Gartersnake, Northern Mexican Gartersnake, and Proposed Critical Habitats

Cumulative effects to the narrow-headed gartersnake, northern Mexican gartersnake and proposed critical habitats would involve impacts to its riparian habitat and native fish upon which they depend on for food. Cumulative effects would include residential home and commercial development on private lands and the resulting impacts to watershed integrity. Off-forest water uses are affecting streamflows on the Forest and are expected to have a greater impact with increasing population and groundwater demands. Continued use of ground and surface water will result in altered hydrologic regimes and increased sedimentation and pollutant to stream systems.

Demand for outdoor recreation is also expected to grow concurrently with increasing population and more visitor use of the Forest. Aquatic and riparian resources are major attractants for recreational activities, and increased recreation in these areas is likely to result in impacts that remove or alter some stream-side habitat. Other land uses such as livestock grazing, mining, and vegetation treatments are occurring on State, private, and tribal lands.

Chiricahua Leopard Frog and Designated Critical Habitat

Unregulated activities on non-Federal lands, such as trespass livestock, inappropriate use of off-highway vehicles, and illegal introduction of non-indigenous aquatic species are cumulative effects and can adversely affect the species through a variety of avenues. Illegal introductions of non-native fishes and other aquatic invasive species are routinely made by the public (e.g., green sunfish, fathead minnows, etc.).

Cumulative effects to native aquatic animals include ongoing activities in the watersheds in which the species occurs such as livestock grazing and associated activities outside of Federal allotments, irrigated agriculture, groundwater pumping, stream diversion, bank stabilization, channelization, and recreation without a Federal nexus. Some of these activities, such as irrigated agriculture, are declining and are not expected to contribute substantially to cumulative long-term adverse effects to native aquatic animals. Other activities, such as recreation, are increasing. Increasing recreational, residential, or commercial use of the non-Federal lands near the riparian area and ciénega would likely result in increased cumulative adverse effects to occupied, as well as potentially occupied native Chiricahua leopard frog habitat through

increased water use, increased pollution, and increased alteration of the stream banks through riparian vegetation suppression, bank trampling, changing flow regimes, and erosion.

Cumulative effects from climate change are expected. That southeastern Arizona and much of the American southwest have experienced serious drought recently is well known. What is known with far less certainty is the frequency and duration of future droughts.

Southwestern Willow Flycatcher and Designated Critical Habitat
Cumulative effects to southwestern willow flycatcher and its critical habitat may include displacement from habitat by actions occurring on private land that result in disturbance to nesting birds or loss of riparian habitat. These activities include livestock grazing outside of federally-managed allotments, irrigated agriculture, groundwater pumping, stream diversions, bank stabilization, channelization, and recreation. Continued and future conversion of floodplains and riparian habitats reduce the habitat available for southwestern willow flycatcher nesting. Livestock feeding stations, corrals, and other associated structures on private lands, which attract cowbirds, may increase cowbird nest parasitism rates and decrease southwestern willow flycatcher productivity. Water developments and diversions on private lands will likely continue to reduce surface water and influence flood regimes necessary to develop and maintain suitable riparian woodland habitat for willow flycatcher nesting.

Western Yellow-billed Cuckoo and Proposed Critical Habitat
Future non-Federal activities contributing cumulative effects to western yellow-billed cuckoo and its proposed critical habitat may include displacement from habitat by actions occurring on state, tribal, or private lands that result in disturbance to nesting birds or loss of riparian and woodland drainage habitats. These activities include livestock grazing (including trespass livestock grazing), irrigated agriculture, groundwater pumping, stream diversions, bank stabilization, channelization, right-of-way vegetation maintenance activities, unleashed and feral dogs and cats, off-road vehicle use, illegal introduction of non-indigenous aquatic species, land development, intentional or accidental wildfire and recreation. Continued and future conversion of floodplains and riparian habitats reduce the habitat available for yellow-billed cuckoo nesting. Water developments and diversions on private lands will likely continue to reduce surface water and influence flood regimes necessary to develop and maintain suitable riparian woodland habitat for yellow-billed cuckoo nesting. The primary cumulative effects to the riparian vegetation and woodland drainages (including within proposed critical habitat) where yellow-billed cuckoos occur are the stresses associated with decreases in water availability due to non-Federal actions.

Some private landowners are also actively working to control non-native vegetation and reestablish native riparian species. These efforts should benefit cuckoos through habitat restoration and protection.

Mexican Spotted Owl and Designated Critical Habitat
Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act. Since Mexican

spotted owl occupied habitat, recovery habitat, and critical habitat within the action area is almost exclusively managed by the Forest Service, most activities that could potentially affect listed species are Federal activities and subject to additional section 7 consultations.

Arizona Cliffrose
As stated in the 2012 BO, Arizona cliffrose populations are not restricted to the Coconino NF, but also occur on adjacent state trust lands and lands managed by a state park. The Cottonwood population has already been affected by urban development, and road maintenance and construction. These activities are likely to continue in the future as the Verde Valley continues to grow.

CONCLUSION

After reviewing the current status of the species and their critical habitat, the environmental baseline for the action area, the effects of the proposed Coconino NF LRMP, and the cumulative effects, it is our biological opinion that implementation of the Coconino NF Revised Land and Resource Management Plan located in Coconino, Gila and Yavapai Counties, Arizona, as proposed, is not likely to jeopardize the continued existence of the Gila chub, Little Colorado spinedace, narrow-headed gartersnake, northern Mexican gartersnake, Chiricahua leopard frog, southwestern willow flycatcher, western yellow billed cuckoo, Mexican spotted owl, and Arizona cliffrose. The proposed action is also not likely to destroy or adversely modify designated critical habitat for Gila chub, Little Colorado spinedace, loach minnow, spikedace, Chiricahua leopard frog, southwestern willow flycatcher, and Mexican spotted owl, and, in conference, proposed critical habitat for the narrow-headed gartersnake, northern Mexican gartersnake, and western yellow billed cuckoo. Our conclusions are based on the rationales provided below. No critical habitat has been designated for the Arizona cliffrose; therefore, none will be affected.

Gila chub and critical habitat
Section 7(a)(2) of the Act directs each Federal agency, in consultation with the Secretary (of the Interior and/or Commerce), to ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat. A biological opinion resulting from formal consultation constitutes the Service's finding whether a proposed agency action is likely to jeopardize a listed species or destroy or adversely modify critical habitat. Although the legal status of Gila chub is as an endangered species, taxonomically it is now part of a single taxonomic species that includes the roundtail chub (*Gila robusta*) and formerly recognized headwater chub (*Gila nigra*). In this PBO, we have not considered the effects of the proposed action on the newly recognized *Gila robusta* that includes, but is not fully comprised of, Gila chub. Therefore, we cannot appropriately conduct a jeopardy analysis of Gila chub since there is no such recognized taxonomic entity (82 FR 16981). We have provided our discussion of effects to the Gila chub above to assist the Forest Service with continued conservation of this entity.

We have included a determination that the proposed action is not likely to destroy or adversely modify designated critical habitat for Gila chub because critical habitat has not been proposed or designated for the taxonomic species, *Gila robusta*, but the legal status of designated critical

habitat still exists for Gila chub. Our "no adverse modification" determination is based on the evaluation of the condition of designated critical habitat for the listed entity.

However, although we are unable to conduct the rangewide analysis needed as described above, after reviewing the current status of the fish formerly recognized as Gila chub and its habitat, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is our biological opinion that implementation of the Coconino NF's LRMP should aid in the persistence of the fish formerly known as the Gila chub. We base our conclusion on the reasoning provided below for the other listed fishes.

Little Colorado spinedace and its critical habitat, and loach minnow and spikedace critical habitat

After reviewing the current status of the Little Colorado spinedace and its critical habitat, loach minnow and spikedace critical habitats, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is our biological opinion that implementation of the Coconino NF's revised LRMP will not jeopardize the continued existence of the Little Colorado spinedace, and will not destroy or adversely modify Little Colorado spinedace, loach minnow, and spikedace designated critical habitats. We base our conclusion on the following:

1. The long-term effect of watershed improvement and forest restoration actions will maintain or improve the ecological condition of the listed fish habitats during the 10- to 15-year life of the plan. These projects will aid in improving hydrologic conditions within the watershed and maintain or improve the PCEs of critical habitats over the long-term.
2. Native fish restoration projects are anticipated to result in the reduction or removal of non-native fish in Little Colorado spinedace, loach minnow, and spikedace habitat, which will improve conditions for these fish on the Coconino NF. Reducing non-native fish will benefit spinedace and will contribute to the conservation and recovery of the species.
3. Actions implemented by the Forest Service for the conservation of Little Colorado spinedace, loach minnow, and spikedace include land management actions designed to improve and/or protect habitat and critical habitat for these species.
4. There are several objectives, standards and guidelines within the Coconino LRMP that support conservation and recovery of Little Colorado spinedace, loach minnow, and spikedace. These objectives, standards and guidelines guide the Forest to implement recovery plans, improve habitat for threatened and endangered species by structural and nonstructural means, and to recover threatened and endangered species.
5. Based on the discussion provided in the effects to Little Colorado spinedace, loach minnow, and spikedace critical habitat sections above, the critical habitat affected by the revised LRMP will continue to serve the function and conservation role of critical habitat for the Little Colorado spinedace, loach minnow, and spikedace.

Narrow-headed gartersnake, northern Mexican gartersnake and proposed critical habitats

After reviewing the current status of the narrow-headed gartersnake, northern Mexican gartersnake and their proposed critical habitats, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is our biological opinion that implementation of the Coconino NF's revised LRMP will not jeopardize the continued existence

of the narrow-headed gartersnake and northern Mexican gartersnake, and will not destroy or adversely modify their proposed critical habitat. We base our conclusion on the following:

1. Watershed improvement and forest restoration actions are anticipated to maintain or improve the ecological condition of narrow-headed gartersnake and northern Mexican gartersnake habitats and the PCEs of proposed critical habitats during the 10- to 15-year life of the plan. These projects are likely to aid in improving hydrologic conditions within the watershed and maintain or improve the PCEs of proposed critical habitat in the long-term.
2. Native fish restoration projects are anticipated to result in the reduction or removal of non-native fish in narrow-headed gartersnake and northern Mexican gartersnake habitats and proposed critical habitats. Reducing non-native fish will improve the ability of proposed critical habitat to contribute to the conservation and recovery of the species. Additionally, increasing the presence of native fish and amphibians will promote prey items for the gartersnakes.
3. Livestock grazing will be managed to maintain or improve aquatic and riparian habitat conditions and manage riparian areas towards properly functioning condition. The Coconino NF has committed to work with us to ensure that effects from grazing to the gartersnakes and their proposed critical habitat are minimized.
4. Based on the discussion provided in the effects to narrow-headed gartersnake and northern Mexican gartersnake proposed critical habitat sections above, the proposed critical habitat affected by the revised LRMP will continue to serve its function and conservation role for the gartersnakes.

Chiricahua leopard frog and critical habitat

After reviewing the current status of the Chiricahua leopard frog and its critical habitat, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is our biological opinion that implementation of the Coconino NF's revised LRMP will not jeopardize the continued existence of the Chiricahua leopard frog, and is not likely to destroy or adversely modify designated critical habitat for the Chiricahua leopard frog. We base our conclusion on the following:

1. Watershed improvement projects are anticipated to maintain or improve the ecological condition of Chiricahua leopard frog habitat and the PCEs during the 10 to 15-year life of the plan. These projects are likely to aid in improving hydrologic conditions within the watershed and maintain or improve the PCEs of critical habitat in the long-term.
2. Projects related to the Roads and Facilities, Minerals Resources, and Forest Products programs are expected to be limited in nature and frequency. Because of this, the likelihood of one of these programs affecting Chiricahua leopard frogs is low. As site-specific projects are developed, the potential for adverse effects associated with those projects to Chiricahua leopard frogs, including incidental take, will be addressed through site-specific consultation, and desired conditions, objectives, standards, and guidelines applied to the activity.
3. Many of the desired conditions, objectives, standards, and guidelines in the LRMP will benefit riparian and aquatic habitats used by the Chiricahua leopard frog.
4. Many standards and guidelines within the LRMP serve as conservation measures that will result in beneficial effects to the Chiricahua leopard frog and its designated critical habitat.

Southwestern willow flycatcher and critical habitat

After reviewing the current status of the southwestern willow flycatcher and its critical habitat, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is our biological opinion that implementation of the Coconino NF's revised LRMP will not jeopardize the continued existence of the southwestern willow flycatcher, and will not destroy or adversely modify its designated critical habitat. We base our conclusion on the following:

1. Southwestern willow flycatchers are not currently known to breed on Coconino NF lands; therefore, projects carried out under this plan will not result in disturbance to breeding flycatchers.
2. Watershed improvement projects are anticipated to maintain or improve the ecological condition of flycatcher habitat and the primary constituent elements of critical habitat during the 10- to 15-year life of the plan. These projects are likely to aid in improving hydrologic conditions within the watershed and maintain or improve the primary constituent elements of critical habitat in the long-term.
3. Projects related to the Watershed and Water, Riparian Areas, Roads and Facilities, Land Adjustments, Special Uses, Mineral Resources, and Forest Products programs are expected to be limited in nature and frequency. Because of this, the amount of habitat expected to be removed, including primary constituent elements of critical habitat, is anticipated to be negligible compared to the amount of both habitat and critical habitat available to the species rangewide. Projects associated with these programs are not anticipated to diminish the ability of critical habitat to contribute to the conservation and recovery of the species.
4. Livestock grazing is not currently authorized along the Verde River on the Coconino NF where the southwestern willow flycatcher and its critical habitat occur, and there are no specific plans identified in the LRMP for grazing in this area in the future. If livestock grazing is authorized during the life of this plan, we will work with the Coconino NF to ensure that effects to southwestern willow flycatcher and its critical habitat are minimized.

Yellow-billed cuckoo and proposed critical habitat

After reviewing the current status of the yellow-billed cuckoo, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is our biological opinion that implementation of the Coconino NF's revised LRMP will not jeopardize the continued existence of the yellow-billed cuckoo, and will not destroy or adversely modify its proposed critical habitat. We base our conclusion on the following:

1. Watershed improvement projects are anticipated to maintain or improve the ecological condition of yellow-billed cuckoo habitat during the 10- to 15-year life of the plan. These projects are likely to aid in improving hydrologic conditions within the watershed and maintain or improve water quality and, therefore, cuckoo habitat and proposed critical habitat in the long-term.
2. Projects related to the Watershed and Water, Riparian Areas, Roads and Facilities, Land Adjustments, Special Uses, Mineral Resources, and Forest Products programs are expected to be limited in nature and frequency. Because of this, the amount of habitat

expected to be affected long-term by these programs is anticipated to be negligible compared to the amount of habitat available to the species on the Coconino NF.

3. Livestock grazing will be managed to maintain or improve aquatic and riparian habitat conditions and manage riparian areas towards properly functioning condition. The Coconino NF has committed to work with us to ensure that effects from grazing to the cuckoo, its habitat, and its proposed critical habitat are minimized.

Mexican spotted owl and critical habitat

After reviewing the current status of the Mexican spotted owl and its critical habitat, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is our biological opinion that implementation of the Coconino NF's revised LRMP will not jeopardize the continued existence of the Mexican spotted owl, and will not destroy or adversely modify its designated critical habitat. We base our conclusion on the following:

1. The revised LRMP will strive to implement the Recovery Plan (USDI FWS 2012) and manage for Mexican spotted owl recovery on the Coconino NF.
2. Desired conditions, objectives, standards and guidelines in the revised LMRP recognize the need to reduce the potential for landscape level, stand-replacing fire in ponderosa pine-Gambel oak and mixed conifer forests that the Mexican spotted owl occupies. These efforts to improve forest condition and sustainability should reduce the risk of high severity fire and subsequently, reduce the loss of owl habitat.
3. While some short-term adverse effects may occur as part of the proposed action or under site specific actions carried out under the LRMP, the desired conditions, standards, guidelines, and objectives will help to minimize those effects and over the long-term, the sustainability and resiliency of owl habitat will be improved.
4. Based on the discussion provided in the Effects to Mexican Spotted Owl Critical Habitat section above, the six CHUs affected by the revised LRMP will continue to serve the function and conservation role of critical habitat for the Mexican spotted owl.

Arizona cliffrose

After reviewing the current status of the Arizona cliffrose, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is our biological opinion that implementation of the Coconino NF's revised LRMP will not jeopardize the continued existence of the Arizona cliffrose. Critical habitat for this species has not been designated; thus none will be affected. We base our conclusion on the following:

1. The Coconino NF revised LRMP will continue to conserve and protect Arizona cliffrose. Actions to be implemented under the revised LRMP include, but are not limited to, surveys, research support, and the creation of a botanical area with designed to protect this species and the fragile habitat on which it occurs.
2. Off-road driving, timber harvest, and fuelwood cutting are prohibited within the Verde Valley Botanical Area, which will result in protection of the plant and its habitat.
3. Standards and guidelines in the revised LRMP contain guidance for maintaining or improving occupied habitat for the Arizona cliffrose.

The conclusions of this PBO/PCO are based on full implementation of the project as summarized in the "Description of the Proposed Action" section of this document, including the standards

and guidelines that apply to the action and serve as conservation measures that were incorporated into the project design.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulations pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harm" is further defined (50 CFR § 17.3) to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. "Harass" is defined (50 CFR § 17.3) as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. "Incidental take" is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

Sections 7(b)(4) and 7(o)(2) of the Act generally do not apply to listed plant species. However, limited protection of listed plants from take is provided to the extent that the Act prohibits the removal and reduction to possession of federally listed endangered plants from areas under Federal jurisdiction, or for any act that would remove, cut, dig up, or damage or destroy any such species on any other area in knowing violation of any regulation of any State or in the course of any violation of a State criminal trespass law.

Programmatic Consultations

The proposed action described above is a "framework programmatic action" as defined in 50 CFR 402.02. In accordance with 50 CFR 402.14(i)(6), an incidental take statement is not required at the programmatic level for a framework that does not authorize future actions; incidental take resulting from any action subsequently authorized, funded, or carried out under the program will be addressed in subsequent section 7 consultation, as appropriate. This biological opinion provides a broad-scale examination of the proposed action's potential impacts on Gila chub, Little Colorado spinedace, narrow-headed gartersnake, northern Mexican gartersnake, Chiricahua leopard frog, southwestern willow flycatcher, western yellow-billed cuckoo, Mexican spotted owl, and Arizona cliffrose, but we lack reasonable certainty of where, when, and how much incidental take may occur. Therefore we have not quantified the amount and extent of incidental take that may result from the proposed action and have not exempted such take in this biological opinion.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

Gila Chub, Little Colorado Spinedace, Loach Minnow, and Spikedace

1. We recommend the Forest Service continue to assist in implementing recovery actions identified in the recovery plans for individual species.
2. We recommend that the Forest Service acquire instream flow water rights to ensure perennial flow in streams with listed fish.
3. We recommend the Forest Service continue to work with the FWS and AGFD to remove non-native species and reestablish native fish on the Coconino NF.
4. We recommend the Forest Service continue to identify factors that limit the recovery of these and other listed species on NFS lands and work to correct them.

Narrow-Headed Gartersnake and Northern Mexican Gartersnake

1. Many Standards and Guidelines call for watershed, range, and/or habitat improvements. These improvements are not given a timeframe, thus populations may be impacted and individuals may be taken over time. We recommend the Forest Service work with FWS to prioritize the projects that will allow for the greatest benefit to these species.
2. We recommend the Forest Service work with FWS to implement recovery actions as described within the narrow-headed gartersnake and northern Mexican gartersnake recovery plans when they are completed.
3. We recommend the Forest Service work with FWS and AGFD to prevent the introduction or movement of non-native aquatic species, as well as implement a removal program for non-native aquatic species on NFS lands.
4. We recommend the Forest Service work with FWS and AGFD to conduct surveys to better determine the distribution, abundance, and trends of species populations on the Coconino NF.
5. We recommend the Forest Service maintain active participation in the Gartersnake Conservation Working Group, by ensuring forest biologists and other appropriate staff attend meetings and coordinate in monitoring and recovery planning.
6. We recommend the Forest Service work with the FWS, AGFD, and the Arizona Department of Environmental Quality, or other appropriate partners to improve water quality across the forest.

Chiricahua Leopard Frog

1. We recommend the Forest Service work with FWS and AGFD to participate in, implement, and/or help fund research that will improve our understanding of the conservation and recovery needs of the Chiricahua leopard frog.
2. We recommend the Forest Service work with FWS and AGFD to identify area or route closures needed to reduce impacts on breeding success and dispersal.

3. We recommend the Forest Service maintain active participation in the Chiricahua leopard frog Steering Committee and Local Recovery Groups, by ensuring forest biologists and other appropriate staff attend meetings and coordinate in monitoring and recovery planning.

Southwestern Willow Flycatcher

1. We recommend the Forest Service conduct surveys to better determine the distribution, abundance, and trends of willow flycatcher populations on the Coconino NF.
2. We recommend the Forest Service work with FWS, AGFD, and other partners to develop and improve habitat for the southwestern willow flycatcher.

Western Yellow-Billed Cuckoo

1. We recommend the Forest Service work with FWS and AGFD to implement specific actions to assist in recovery of the yellow-billed cuckoo throughout the Coconino NF.
2. We recommend the Forest Service conduct or continue to fund yellow-billed cuckoo surveys (per Halterman *et al.* 2016 or subsequent protocols) to assess and better determine cuckoo distribution on the Coconino NF.
3. We recommend the Forest Service avoid grazing activities in the action area that reduce the suitability or regeneration of woody riparian or upland species (especially in woodland drainages) necessary to maintain yellow-billed cuckoo breeding and foraging habitat.
4. We recommend the Forest Service avoid grazing activities that do not comply with the descriptions provided in Table 2, Appendix G of the 2002 U.S. Fish and Wildlife Service Southwestern Willow Flycatcher Final Recovery Plan (Appendix A). The guidelines for the Southwestern Willow Flycatcher are used as a surrogate for the Yellow-billed Cuckoo until such guidelines are developed for this species.

Mexican Spotted Owl

1. We recommend the Forest Service continue to work with FWS to implement actions to protect PACs from high-severity fire and improve the resiliency of fire-adapted forested habitats.
2. We recommend the Forest Service continue to work with the FWS to conduct spotted owl surveys over the next several years to attempt to determine how owls modify their territories in response to fuels treatments, forest restoration, and wildland fire. This information will aid us in understanding the short- and long-term impacts of these actions on the owl, and their subsequent effect on the status of the species.
3. We recommend the Forest Service continue to work with the FWS to design forest restoration treatments across the forest that protect existing nest/roost replacement habitat from high severity, stand-replacing fire and enhance existing or potential habitat to aid in sustaining spotted owl habitat across the landscape. PACs can be afforded substantial protection from wildland fire by emphasizing fuels reduction and forest restoration in surrounding areas outside of PACs and nest/roost replacement recovery habitat.

Arizona Cliffrose

1. We recommend the Forest Service work with FWS and other partners to monitor for populations of Arizona cliffrose on the Coconino NF.
2. We recommend the Forest Service implement the recommendations that will aid in the recovery of Arizona Cliffrose.

In order that we are kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, we request notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

This concludes the conference for Revised Coconino NF Land and Resource Management Plan. You may ask us to confirm the conference opinion as a biological opinion issued through formal consultation if the proposed species is listed or critical habitat is designated. The request must be in writing. If we review the proposed action and find there have been no significant changes in the action as planned or in the information used during the conference, we will confirm the conference opinion as the biological opinion for the project and no further section 7 consultation will be necessary.

After listing as threatened or endangered and any subsequent adoption of this conference opinion, the Forest Service shall request reinitiation of consultation if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action.

This concludes formal consultation on the action(s) outlined in the request. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

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APPENDIX A

CONCURRENCE and CONFERENCE REPORTS

In your correspondence requesting consultation on the effects of the programmatic LRMP you concluded that the proposed action *may affect*, and *is not likely to adversely affect* the endangered California condor (*Gymnogyps californianus*), the endangered Gila topminnow (*Poeciliopsis occidentalis*), the threatened Gila trout (*Oncorhynchus gilae*), the endangered loach minnow (*Tiaroga cobitis*), the endangered spikedace (*Meda fulgida*), the endangered razorback sucker (*Xyrauchen texanus*) and its critical habitat, and the threatened San Francisco Peaks ragwort (*Packera franciscana*) and its critical habitat.

You also concluded that the proposed action *will not jeopardize* the continued existence of the 10(j) nonessential experimental, populations of the California condor, the endangered Colorado pikeminnow (*Ptychocheilus lucius*), and the endangered Mexican gray wolf (*Canis lupus baileyi*). For the purposes of section 7(a)(2) of the Act, we treat a non-essential experimental population as a species proposed to be listed, except when it occurs in an area within the National Wildlife Refuge System or National Park System. We agree with your determinations and provide our rationales below.

Gila Topminnow

The Gila topminnow (*Poeciliopsis occidentalis*) was listed as endangered in 1967, with no critical habitat designated (USFWS 1967). Within the analysis area, Gila topminnow has been stocked into Fossil Creek (2007 to 2011), Spring Creek (2015), and Sheepshead Creek (2014), all within Yavapai County. The Fossil Creek stocking appears to be successful, while the Spring Creek and Sheepshead Creek stockings are too recent to determine success.

The FWS concurs with your determination that the proposed action *may affect, but is not likely to adversely affect* the Gila topminnow. Our concurrence is based on the following reasons:

- The implementation of the revised LRMP is expected to maintain or improve conditions for Gila topminnow in Fossil Creek, Spring Creek, and Sheepshead Canyon. Desired conditions for watershed and riparian areas to improve water quality and floodplain connectivity, as well as spring and wetland restoration projects would improve potential habitat for Gila topminnow.
- Vegetation treatments in ponderosa and piñon ERUs in the Upper and Lower Verde watersheds may cause short-term moderate increases in the amount of sediment that enters these drainages. Gila topminnow can tolerate a range of water quality conditions and are not especially sensitive to moderate sedimentation. Standards and guidelines would minimize sedimentation from entering Gila topminnow drainages, rendering any effects of sedimentation insignificant.
- There are long-term benefits expected for the species related to the desired conditions in Watersheds and Water, Riparian, Soils, and Wildlife/Fish/ Plants programs, especially projects that may secure water rights or remove non-native species within its habitat.
- Implementation of standards and guidelines within the Livestock Grazing, Roads and Facilities, and Forest Products programs would provide for a trend towards maintaining or improving Gila topminnow habitat.

Gila Trout
Gila trout (*Oncorhynchus gilae*), was listed as endangered in 1967 (USFWS 1967), and downlisted to threatened in 2006 (USFWS 2006). Surveys on most of the 18 existing populations indicate that the recovery efforts to remove non-native fish and prevent their return to the renovated areas have mostly been successful (USFWS 2003; USFWS 2012). Historically, a native trout occurred in Oak Creek and West Clear Creek on the Coconino NF. By the time the species was first scientifically described in 1950, it had long been extirpated from Arizona and only occurred in a few remote streams in New Mexico. Gila trout were stocked into West Fork Oak Creek for recreational purposes in the fall of 2015 under the provisions of the 4(d) rule. Additional supplemental stockings by USFWS and AGFD are likely to occur in the future.

The FWS concurs with your determination that the proposed action *may affect, but is not likely to adversely affect* the Gila trout. Our concurrence is based on the following reasons:

- Most of the West Fork Oak Creek watershed is located within wilderness and natural area designations; therefore, it is unlikely that large scale vegetation management projects or other actions would occur in that watershed. Therefore, potential effects from vegetation management projects would have insignificant and discountable effects to Gila trout.
- There are long-term benefits expected for the species related to the desired conditions in Watersheds and Water, Riparian, Soils, and Wildlife/Fish/ Plants programs, especially projects that may secure water rights or remove nonnative species within Gila trout habitat.

Razorback Sucker and Designated Critical Habitat
Razorback sucker (*Xyrauchen texanus*), was listed as endangered in 1991 (USFWS 1991), with critical habitat designated in 1994 (USFWS 1994). The razorback sucker once ranged in the Verde River mainstem up to Perkinsville, Arizona, with the sucker still persisting near Peck's Lake in the Verde River until 1954 (Minckley 1973). Razorback suckers have been stocked at numerous locations on the Coconino NF since 1981, including the Verde River below Camp Verde, Fossil Creek, Oak Creek, and West Clear Creek, as well as Cherry Creek, and Grindstone Wash areas. Recruitment has not been documented at any of these locations.

The FWS concurs with your determination that the proposed action *may affect, but is not likely to adversely affect* the razorback sucker or its critical habitat. Our concurrences are based on the following reasons:

- Conservation measures and best management practices will be implemented to minimize potential sedimentation from project activities to aquatic habitats. Therefore, any increase in sedimentation as a result of implementing the LRMP to potential razorback habitats is likely to be minor, and therefore, insignificant.
- Effects to PCEs as defined in the 1994 critical habitat rule for the razorback sucker (59 FR 13374) would be insignificant because effects to the water (such as temperature, dissolved oxygen, turbidity, etc.), physical habitat, and biological environment (such as food supply, predation, and competition) would not be measurable.

Loach Minnow
The loach minnow (*Tiaroga cobitis*) was listed as threatened on October 28, 1986 (USFWS 1986a) and reclassified as endangered on February 23, 2012 (USFWS 2012). Within the proposed action area, historical records for loach minnow are restricted to the Verde River and potentially its tributaries. Currently, we consider it to be extirpated from the Verde River. Loach minnow were recently reintroduced into Fossil Creek, however they have failed to establish. Surveys in 2016 did not detect loach minnow, which were last detected in 2014 (T. Robinson, AGFD, pers. comm. 2016).

The FWS concurs with your determination that the proposed action *may affect, but is not likely to adversely affect* the loach minnow. Our concurrence is based on the following reasons:

- There are no current populations of loach minnow on the Coconino NF; therefore, at this time there would be no effects to the species from implementation of the LRMP.
- Should loach minnow reestablish on the Coconino NF, there would be long-term benefits expected for the species related to the desired conditions in Watersheds and Water, Riparian, Soils, and Wildlife/Fish/Plants programs, especially through projects that secure water rights or remove non-native species within its habitat.
- Management under the LRMP is directed towards achieving desired conditions, which include sustaining flows and natural flow regimes in streams; maintaining water quality suitable for supporting growth, reproduction, and migration of native aquatic species, which includes loach minnow; and maintaining a diversity of instream habitats and organic materials that support fish and aquatic invertebrates.
- Watershed improvement and transportation projects, associated with the Watershed and Water, Soil, and Roads and Facilities programs, are anticipated to maintain or improve the ecological condition of potential loach minnow habitat during the 10- to 15-year life of the plan. These projects are likely to aid in improving hydrologic conditions within the watershed.

Spikedace
The spikedace (*Meda fulgida*) was originally listed as a threatened species on July 1, 1986 (USFWS 1986b) and reclassified as endangered on February 23, 2012 (USFWS 2012). In Arizona, the species is now only common in Aravaipa Creek. The Verde River is presumed occupied; however, the last captured fish from this river was from a 1999 survey (Brouder 2002). Spikedace from the Eagle Creek population have not been seen for over a decade, although they are still thought to exist in numbers too low for the sampling efforts to detect. Translocated populations are present in Hot Springs Canyon, Fossil Creek, Spring Creek and Bonita Creeks. There are two recently reintroduced populations on the Coconino NF in Spring Creek and Fossil Creek. Spikedace are considered established (T. Robinson, AGFD, pers. comm. 2016) in Fossil Creek. Livestock are currently excluded from Spring Creek and Fossil Creek except for a water gap in Fossil Creek near the bridge.

The FWS concurs with your determination that the proposed action *may affect, but is not likely to adversely affect* the spikedace. Our concurrence is based on the following reasons:

- The implementation of plan components within the Recreation, Minerals, Roads and Facilities, Forest Products, and Fire programs are expected to have insignificant effects to spikedace in Fossil Creek and Spring Creek, because projects and activities will be

designed and implemented to maintain or improve watershed and riparian function and/or prevent the introduction or spread of disease, invasive, or undesirable species within Verde Valley Management Area.

- There are long-term benefits expected for the spikedace related to the desired conditions in the Watersheds and Water, Riparian, Soils, and Wildlife/Fish/ Plants programs, especially projects that may secure water rights or remove non-native species within its habitat.
- Management under the LRMP is directed towards achieving desired conditions, including sustaining flows and natural flow regimes in streams; maintaining water quality suitable for supporting growth, reproduction, and migration of native aquatic species, which includes spikedace; and maintaining a diversity of instream habitats and organic materials that support fish and aquatic invertebrates.
- Watershed improvement and transportation projects, associated with the Watershed and Soil Management, and Roads and Facilities programs, are anticipated to maintain or improve the ecological condition of spikedace habitat during the 10 to 15-year life of the plan. These projects are likely to aid in improving hydrologic conditions within the watershed.

California Condor

California condor (*Gymnogyps californianus*) was listed as endangered in 1967 (USFWS 1967), with the nonessential experimental §10(j) population designated in 1996 (USFWS 1996).

To date, there have only been two reports of condors on the Coconino NF. One was reported north of Flagstaff, and another condor roosted one night near Sedona, Arizona as it made a large loop back north (C. Parish, pers. comm. to C. Overby 2008). They only rarely travel outside of the primary range within the 10(j) population area, but when outside of the nonessential experimental population area, they are fully protected as endangered. There have been no reports of breeding or over-wintering of condors on the Coconino NF. The main threat to the Arizona population of California condors is lead poisoning from ingestion of lead ammunition.

The FWS concurs with your determination that the proposed action may *affect, but is not likely to adversely affect* the endangered California condor, and is *not likely to jeopardize* the nonessential experimental population of California condors. No critical habitat will be affected because none has been designated in Arizona. Our concurrence is based on the following reasons:

- Plan guidance has protections for potential nest and roost habitat, should condors ever establish on the Forest. Therefore any effects to nesting or roosting would be insignificant.
- Environmental education programs presentations could include information on the effects of ingestion of lead on condors and other wildlife. Guidance in the plan is supportive of re-introduction and management of listed species, which would apply to the condor if it establishes in the future within or outside of the nonessential experimental population area.
- Many of the resource activities undertaken by the Coconino NF in conformance to LRMP guidance are beneficial to the condor (specifically, those standards and guidelines related to Livestock Grazing; Wildlife, Fish, and Plants; and Forest Products).

- The Coconino NF LRMP includes guideline FW-SpecUse-G-5 that requires utility lines, towers, and support structures to be built (construction or reconstruction) to specifications that minimize impacts to wildlife, including raptors. Implementation of this guideline would also avoid adverse impacts to condors from new power lines.
- By definition, a nonessential experimental population is not essential to the continued existence of the species. Thus, no proposed action impacting a population so designated under the Act §10(j) could lead to a jeopardy determination for the entire species.

San Francisco Peaks Ragwort and Designated Critical Habitat

San Francisco Peaks ragwort (*Packera franciscana*) was listed as threatened, with designated critical habitat in 1983 (USFWS 1983). The San Francisco Groundsel Recovery Plan was approved in 1987 (USFWS 1987). Areas designated as critical habitat are the summits of Agassiz and Humphries Peaks and the surrounding slopes and alpine areas, San Francisco Peaks, Coconino NF, Coconino County, Arizona, and covers approximately 720 acres. San Francisco Peaks ragwort is an endemic, perennial species, with its range limited to the San Francisco Peaks. The population of San Francisco Peaks ragwort appeared stable and was estimated to exceed 100,000 plants (USFWS 1984). Fowler and Sieg (2010) estimated the total population to be as high as 180,000 clones, while USFS (2012) estimated the population to be between 90,000-135,000 plants.

The FWS concurs with your determination that the proposed action *may affect, but is not likely to adversely affect* the San Francisco Peaks ragwort and its designated critical habitat. Our concurrences are based on the following reasons:

- The Coconino NF LRMP will protect the San Francisco Peaks ragwort and its habitat through the avoidance of new trail route construction in areas of occupied habitat, high density of plants and designated critical habitat, as well as placement of trails and signs to discourage and reduce off-trail travel to protect alpine tundra vegetation. The implementation of the revised Coconino NF LRMP would have beneficial effects for the San Francisco Peaks ragwort and any potential effects would be insignificant and/or discountable.
- The proposed action will not result in negative effects to alpine tundra habitat, a PCE of designated critical habitat for the ragwort. Sensitive alpine tundra habitat, within and adjacent to designated critical habitat, is protected from recreational impacts through closure of the alpine tundra to off-trail hiking except when covered by snow, and is closed to grazing and camping.

Colorado Pikeminnow

Colorado pikeminnow (*Ptychocheilus lucius*) was listed as an endangered species in 1967 (USFWS 1967). In 1985, portions of the Salt River and the Verde River were designated as nonessential experimental populations (USFWS 1985).

The FWS concurs with your determination that the proposed action is *not likely to jeopardize* the Colorado pikeminnow nonessential experimental population. No critical habitat will be affected because none has been designated in Arizona. Our concurrence is based on the following:

- The implementation of actions under the Coconino NF LRMP will have limited effects to the lower Verde River, where stocking of pikeminnow has occurred. Management is directed towards achieving desired conditions, which include sustaining flows and natural flow regimes in streams; maintaining water quality suitable for supporting growth,

reproduction, and migration of native aquatic species; and maintaining a diversity of instream habitats and organic materials that support fish and aquatic invertebrates.

- The Forest Service has made efforts to acquire water rights to improve the flow regime on the Verde River as well as monitor non-native fish populations (in partnership with University of Arizona, ADGF and Rocky Mountain Research Station) in relation to the Colorado pikeminnow. These monitoring activities are being used to further guide management in the future to improve habitat conditions that will benefit Colorado pikeminnow.

Mexican Gray Wolf

The Mexican gray wolf (*Canis lupus baileyi*) was listed as an endangered species in April, 1976 (41 FR 24062, USFWS 1976). A detailed account of the taxonomy, biology, and reproductive characteristics of the Mexican gray wolf is found in the Mexican Wolf Conservation Assessment (USFWS 2010), as well as the Mexican Wolf Recovery Plan (USFWS 1982). This information is incorporated herein via reference. There are no known wolves occurring within the action area.

The FWS concurs with your determination that the proposed action is *not likely to jeopardize* the nonessential experimental population of Mexican gray wolves. No critical habitat will be affected because none has been designated. Our concurrence is based on the following:

- Because of the Mexican wolf's status as a nonessential experimental population, wolves found in Arizona are treated as though they are proposed for listing for section 7 consultation purposes. By definition, a nonessential experimental population is not essential to the continued existence of the species. Thus, no proposed action impacting a population so designated under the Act §10(j) could lead to a jeopardy determination for the entire species.

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APPENDIX B

Forest Land Management Plan Decisions specifically-referred to in this Biological Opinion (Objective = O; Standard = S; and Guideline = G) [1].

Component code	Plan component
FW-Soil-O-1	Maintain satisfactory soil conditions and/or improve impaired and unsatisfactory soil conditions on 100,000 to 350,000 acres during each 10 year period over the life of the plan. Maintenance and improvement would occur as a result of some management actions in other resources. For example, re-locating a road in a grassland could improve impaired soil conditions.
FW-Rip-RipType-O-1	Restore the function of 200 to 500 acres of nonfunctioning and functioning-at-risk riparian areas during each 10 year period over the life of the plan, with emphasis on priority 6th code watersheds, so that they are in or moving toward proper functioning condition.
FW-Rip-Wtlnds-O-1	Restore 5 to 10 wetlands currently not in proper functioning condition (PFC) so that they are in, or are trending toward, proper functioning condition during each 10 year period over the life of the plan.
FW-Rip-Spr-O-1	Restore riparian function to at least 25 springs identified as not in proper functioning condition to provide water quantity and aquatic habitat for the recovery of plant and animal species during each 10 year period during the life of the plan.
FW-TerrERU-Grass-O-1	Restore, or improve at least 3,500 acres of Semi-desert Grasslands during each 10 year period over the life of the plan.
FW-TerrERU-Grass-O-2	Restore or improve 10,800 to 12,400 acres of Great Basin Grasslands during each 10 year period over the life of the plan.
FW-TerrERU-Grass-O-3	Restore or improve 7,600 to 11,400 acres of Montane/Subalpine Grasslands during each 10 year period over the life of the plan.
FW-TerrERU-PJ-O-1	Mechanically treat between 1,000 and 10,000 acres of Pinyon Juniper with Grass during each 10 year period over the life of the plan.
FW-TerrERU-PJ-O-2	Use naturally ignited wildfires (i.e., lightning-caused fires that are managed for resource objectives) to treat at least 3,750 acres of Pinyon Juniper with Grass within the natural fire regime during each 10 year period over the life of the plan.
FW-TerrERU-PJ-O-3	Use naturally ignited wildfires (i.e., lightning-caused fires that are managed for resource objectives) to treat at least 3,750 acres in Pinyon Juniper Evergreen Shrub within the natural fire regime during each 10 year period over the life of the plan.

Component code	Plan component
FW-TerrERU-AspMpl-O-1	Restore at least 1,000 acres of aspen and maple during each 10 year period over the life of the plan. Restoration could include, but is not limited to, activities that promote regeneration, remove competing vegetation, or remove disturbances that could negatively impact aspen or maple.
FW-TerrERU-PP-O-1	Use prescribed cutting to treat 50,000 to 260,500 acres of Ponderosa Pine during each 10 year period over the life of the plan.
FW-TerrERU-PP-O-2	Use prescribed fire to underburn 150,000 to 200,000 acres of Ponderosa Pine within the natural fire regime during each 10 year period over the life of the plan.
FW-TerrERU-PP-O-3	Use naturally ignited wildfires (i.e., lightning-caused fires that are managed for resource objectives) to treat at least 135,000 acres of Ponderosa Pine within the natural fire regime during each 10 year period over the life of the plan.
FW-TerrERU-MC-MCFF-O-1	Use prescribed cutting to treat 2,900 to 15,000 acres of Mixed Conifer with Frequent Fire during each 10 year period over the life of the plan.
FW-TerrERU-MC-MCFF-O-2	Use prescribed fire on at least 8,000 acres of Mixed Conifer with Frequent Fire within the natural fire regime during each 10 year period over the life of the plan.
FW-TerrERU-MC-MCFF-O-3	Use naturally ignited wildfires (i.e., lightning-caused fires managed for resource objectives) to treat at least 7,500 acres of Mixed Conifer with Frequent Fire within the natural fire regime, during each 10 year period over the life of the plan.
FW-WFP-O-1	Implement at least 20 activities that contribute to the recovery for federally listed species during each 10 year period over the life of the plan. An example of an activity could be thinning a Mexican spotted owl protected activity center to reduce the risk of uncharacteristic fire and to improve habitat conditions for prey species.
FW-WFP-O-3	Restore or enhance at least 60,000 acres of terrestrial wildlife habitat during each 10-year period over the life of the plan.
FW-WFP-O-4	Restore or enhance at least 70 miles of stream habitat during each 10-year period over the life of the plan.
FW-WFP-O-5	Complete at least 30 products or activities that educate the public about wildlife, fish, and plant resources during each 10-year period over the life of the plan. Examples of products include: educational signs and brochures, Web site pages, species checklists, presentations, and field trips.
FW-RdsFac-O-1	Decommission 200 to 800 miles of a combination of unauthorized roads and system roads not identified on the Motor Vehicle Use Map during the 10 years following plan approval. The Motor Vehicle Use Map is developed through a separate process established under the Travel Management Rule. Road decommissioning may be done in coordination with other management activities, such as the Four Forest Restoration Initiative.
SA-Wild-O-1	Annually, rehabilitate one to five wilderness sites or areas that have been impacted by recreation in order to restore wilderness character.

Component code	Plan component
SA-Wild-O-2	Develop and implement management plans for any newly designated wilderness areas within 5 years after designation occurs if required by the designating legislation.
FW-WFP-S-1	Direction for species listed as threatened, endangered, proposed, or candidate takes precedence over direction for species not listed by the U.S. Fish and Wildlife Service.
FW-WFP-S-2	Timing restrictions will be applied to projects and activities that have the potential to negatively affect federally listed species, bald eagles, and golden eagles to minimize or avoid impacts to survival or successful reproduction.
FW-Graz-S-1	Troughs and uncovered storage tanks shall incorporate animal escape devices.
FW-FProd-S-1	No harvest for purposes of timber production shall occur on lands not suited for timber production.
FW-RdsFac-S-1	Motorized vehicle use shall occur as identified on a designated system of roads, trails, and areas (including locations designated for motorized big game retrieval), as defined on motor vehicle use maps (MVUM), except for those uses authorized by law, permits, and orders in connection with resource management and public safety.
FW-SpecUse-S-2	Require permit holders to rehabilitate unplanned, user-created trails and other impacted areas created by their activities that were not authorized under their special use permit.
FW-Rec-Disp-S-1	Motorized vehicle use shall occur as identified on a designated system of roads, trails, and areas (including locations designated for motorized big game retrieval), as defined on motor vehicle use maps, except for those uses authorized by law, permits, and orders in connection with resource management and public safety.
MA-Walnut-S-1	No new paved roads or utility corridors occur except on the boundaries of the Walnut Canyon MA.
SA-Wild-S-1	In wilderness, group size limit is 12 persons and stock animals (combined).
SA-Wild-S-3	In the Kachina Peaks Wilderness in the Alpine Tundra ERU recreational activities shall only occur on designated trails during snow-free periods. Off-trail travel may occur when there is enough snowpack to protect underlying vegetation.
SA-Wild-S-4	In the Kachina Peaks Wilderness above treeline in the Alpine Tundra ERU, overnight camping, and recreational livestock use such as horses, pack stock, mules, or llamas shall be prohibited.
SA-Wild-S-5	In the Kachina Peaks Wilderness, new route construction shall avoid important habitat for the San Francisco Peaks ragwort, such as designated critical habitat, occupied habitat, and high density of plants.

Component code	Plan component
FW-Air-G-2	Decision documents for wildfires and prescribed burns should identify smoke sensitive areas and include management objectives and courses of action to mitigate impacts to those areas.
FW-Soil-G-1	The forest should implement and monitor best management practices (BMPs) for all activities with the potential to impair water quality in accordance with the intergovernmental agreement between ADEQ and the Forest Service Southwestern Regional Office to control and manage nonpoint source pollution.
FW-Soil-G-2	Projects should be designed to avoid disturbance that would result in long term impacts to soil function and productivity. Where disturbance cannot be avoided, project specific soil and water conservation practices should be developed.
FW-Soil-G-3	Project-specific design features should be used when projects occur on slopes with a grade of about 40 percent or greater, on soils with moderate or severe erosion hazard, or on soils that are sensitive to degradation when disturbed, such as calcareous soils to minimize or avoid soil impacts.
FW-BioPhys-Geo-G-1	Projects should be designed and uses should be managed to maintain the integrity and function of caves, karst, cliffs, and talus slopes. Where alteration of these resources cannot be avoided, they should be mitigated to mimic pre-disturbance conditions and function.
FW-BioPhys-Geo-G-2	Projects and activities should be designed to prevent siltation into sinkholes and cave entrances, collapse of cave passageways, and alteration of the chemical, physical, and biological conditions of the cave resource. A radius of 300 feet should be used for restrictions on activities that can alter the cave's resources, functions and associated features unless site-specific adjustments are made based on topography, drainage, soil type, and the expected impact of the proposed activity.
FW-Water-G-1	Watersheds should have enough vegetative ground cover to recover rapidly from natural and human disturbances and to maintain long term soil productivity.
FW-Water-G-2	Watershed restoration and maintenance, and vegetation treatments should focus on priority 6th code watersheds to ensure that ecosystem processes, resilient vegetation conditions, and natural disturbance regimes are functioning properly.
FW-Water-G-3	Instream flow water rights should be procured for those streams without instream water rights to ensure that sufficient flow is provided for aquatic species, habitat, and recreation.
FW-Water-G-4	Best management practices for management activities should be identified, implemented, and monitored to maintain water quality, quantity, and timing of flows, and to prevent or reduce accelerated erosion.
FW-Water-G-5	For impaired waters or non-attaining waters, approved total maximum daily load (TMDL) recommendations or implementation plans should be implemented to maintain or improve water quality to meet or exceed Arizona water quality standards and support identified designated beneficial uses.

Component code	Plan component
FW-Water-G-6	Within existing water rights, excess water should remain in or be allowed to flow freely back into the natural channel, spring, and riparian habitat to maintain and improve ecological function, water quality, quantity, and timing of flows, and to benefit native species and their habitat.
FW-ConstWat-G-1	For new projects and management activities, a site-specific aquatic management zone should be identified and maintained around reservoirs to protect water quality and to avoid detrimental changes in water temperature or chemical composition, blockages of streamcourses, or sediment deposits that would seriously and adversely affect water conditions or aquatic habitat. Soil and vegetation disturbance from management activities should be minimized to meet this intent but is not necessarily excluded in this zone.
FW-ConstWat-G-2	Earthen stock ponds determined to be important for threatened, endangered, and Southwestern Region sensitive species, should be managed to maintain water and habitat needed for species survival and reproduction, consistent with existing water rights.
FW-Rip-All-G-1	Management activities such as vegetation treatments or other restoration actions should be designed to maintain or move towards desired conditions for other uses and resources.
FW-Rip-All-G-2	Riparian areas should be managed to promote natural movement of water and sediment, to maintain ecological functions, and to maintain habitat and corridors for species.
FW-Rip-All-G-3	An aquatic management zone should be identified and maintained in riparian areas to protect water quality and to avoid detrimental changes in water temperature or chemical composition, blockages of streamcourses, or sediment deposits that would seriously and adversely affect water conditions, fish habitat, or connected downstream cave, karst, and lava tube resources. Soil and vegetation disturbance from management activities should be managed to meet these intents but is not necessarily excluded in this zone. The general starting points for widths of aquatic management zones are: Severe 150 feet each side of streamcourse or riparian area Moderate 125 feet each side of streamcourse or riparian area Slight 100 feet each side of streamcourse or riparian area
FW-Rip-Strm-G-1	In perennial and intermittent riparian streamcourses, projects and management activities should be designed and implemented to retain or restore natural streambank stability, native vegetation, and riparian and soil function.

Component code	Plan component
FW-Rip-Strm-G-2	An aquatic management zone for non-riparian, intermittent streamcourses should be identified and maintained to reduce sedimentation, maintain functioning of the channel within its floodplain, and maintain downstream water quality and riparian habitat and function. This management zone would also avoid detrimental changes in water temperature or chemical composition, blockages of streamcourses, or sediment deposits that would seriously and adversely affect water conditions, fish habitat, or connected downstream cave, karst, and lava tube resources. Soil and vegetation disturbance from management activities should be managed to meet these intents but is not necessarily excluded in this zone. The general starting points for widths of aquatic management zones are: Severe 100 feet each side of streamcourse Moderate 70 feet each side of streamcourse Slight 35 feet each side of streamcourse
FW-Rip-Spr-G-1	Spring recharge areas, where known, should be managed to maintain or improve spring discharge.
FW-Rip-Spr-G-2	Water rights should be maintained or procured to protect in situ (onsite) water quantity where no water rights exist.
FW-Rip-Spr-G-3	Projects and activities should be designed and implemented to maintain or improve soil and riparian function; maintain or improve native vegetation; and/or prevent the introduction or spread of disease, invasive, or undesirable species. Design features could include road, recreation, and/or livestock management.
FW-Rip-Spr-G-4	Where there is a structure in place to utilize water from a spring as a water source or when designing restoration projects, priority should be given to the protection of spring source areas and riparian habitat to safeguard the unique ecological and biophysical characteristics, higher biodiversity, endemic species, and cultural values associated with spring sources. For example, water could be piped out of the riparian area to avoid negative impacts to soil, water, and vegetation or if water is to be diverted, a flow-splitter could be installed to maintain some flow at the source.
FW-Rip-RipType-G-1	Water diversions and ground water pumping should not lower the water table to prevent loss of or undesired changes to composition, structure, or function to riparian forests or mesquite bosques.
FW-Rip-RipType-G-2	Connectivity within the unique vegetation community created by the combination of Cottonwood Willow Riparian Forest, Mixed Broadleaf Deciduous Riparian Forest, and mesquite bosques should be maintained and enhanced. The intent is to maintain ecological functions, tree density, and growth, native understory, and reduce the risk of predation and nest parasitism and to provide habitat for western yellow-billed cuckoo, Bell's vireo, and other wildlife species.
FW-Rip-RipType-G-3	In riparian forests, recreation activities, permitted uses, and management activities should occur at levels that maintain or allow improvement of soil function, riparian vegetation, and water quality at the stream reach scale. This guideline would not apply to fine scale activities and facilities such as intermittent livestock crossing locations, water gaps, or other infrastructure used to manage impacts to riparian areas at a larger scale.

Component code	Plan component
FW-Rip-RipType-G-4	Fire wood cutting or wood removal should be managed in remaining mesquite bosques to avoid impacts to understory species, tree density, tree growth, and to avoid channel downcutting and accelerated erosion.
FW-TerrERU-All-G-1	Management activities such as vegetation treatments or other restoration actions should be designed to maintain or move towards desired conditions, to minimize impacts to other uses and resources, and to maintain biodiversity created by inclusions, landscape variability, and transition zones.
FW-TerrERU-All-G-3	If needed to support restoration activities, seeding with native species appropriate for the ecological unit (or similar in elevation, soil type, and ecosystem) should be used to restore the desired native species composition of the area. Use of desirable, non-native plant materials may be allowed where native plant materials are unavailable, cost-prohibitive, insufficient to address site specific problems, and the non-native plant materials do not impede re-establishment of native species.
FW-TerrERU-All-G-4	Stringers should be protected from uncharacteristic disturbances to prevent stand replacement and to protect their unique contribution to habitat diversity.
FW-TerrERU-Grass-G-2	Grassland composition, structure, and productivity and soil function should be protected and enhanced using methods such as fencing, aerating soil (decompacting soils), improved grazing strategies, or strategic location of constructed waters or of roads.
FW-TerrERU-PJ-G-2	In areas where there is little understory and treatments are proposed, slash treatments (e.g., lop and scatter and mastication) should be used that improve herbaceous vegetation growth, watershed condition, and soil productivity. The intent is to encourage response in herbaceous vegetation and allow smaller debris to decompose in place on the ground.
FW-TerrERU-PJ-G-3	Large accumulations of green material (such as slash, wind thrown trees) should be managed to reduce the risk of uncharacteristic bark beetle outbreaks.
FW-TerrERU-PJ-G-4	To increase small mammal occupancy in areas where coarse woody debris is deficient and to provide nesting habitat and cover for turkeys, birds, small mammals, reptiles, and invertebrates, slash piles should be retained across the landscape for several years, rather than immediately being burned. The number and distribution of retained slash piles should be consistent with scenic integrity objectives (SIO) and balanced with potential threats from bark beetles and fire/fuels concerns. If slash is scattered, it should be at a height that still allows big game movement.
FW-TerrERU-PJ-G-5	In Pinyon Juniper with Grass and Pinyon Juniper Evergreen Shrub, the development of old growth conditions should be encouraged in areas where old growth is lacking to perpetuate old growth forest components, uneven-aged vegetation treatments should be designed such that replacement structural stages and age classes are proportionally present to assure continuous representation of old growth characteristics across the landscape over time.

Component code	Plan component
FW-TerrERU-PP-G-1	To protect old growth forest components, existing old growth forest attributes should be protected from uncharacteristic natural disturbances. Methods of protecting existing old growth forest components on the landscape may include prescribed cutting, prescribed fire, and wildfires managed for resource objectives.
FW-TerrERU-PP-G-2	To perpetuate old growth forest components, the development of old growth conditions should be encouraged in areas where old growth is lacking. Uneven-aged vegetation treatments should be designed such that replacement structural stages and age classes are proportionally present to assure continuous representation of old growth characteristics across the landscape over time.
FW-TerrERU-PP-G-3	In promoting an uneven-aged forest condition that maintains or contributes to the restoration of old growth conditions characteristic of the forest type, preference for retention should be given to presettlement trees, often the largest, oldest, and tallest trees onsite. For Ponderosa Pine, presettlement trees may be determined by the following characteristics described by Thomson (1940) as age class 3 (intermediate to mature) and age class 4 (mature to over-mature) and vigor class A (full), B (medium), C (light), and D (weak): **Age** – approximately 150 years and older. **Bark** – ranging from reddish brown, shading to black in the top with moderately large plates between the fissures, to reddish brown to yellow, with very wide, long and smooth plates. **Branching** – ranging from upturned in upper third of the crown, horizontal in the middle third and drooping in the lower third of the crown to mostly large, drooping, gnarled or crooked. Branch whorls range from incomplete and indistinct except at the top to completely indistinct and incomplete.
FW-TerrERU-PP-G-4	To promote old growth attributes consistent with desired conditions, manage for large Gambel oak trees and snags to be sustained over time.
FW-TerrERU-PP-G-5	To provide necessary habitat components, the largest and tallest snags representative of the stand and downed logs should be emphasized along edges of openings and within groups/clumps of trees to provide habitat and roost sites for wildlife species such as small mammals, cavity-nesting birds, and tree-dwelling bats.
FW-TerrERU-PP-G-6	Large accumulations of green material (such as slash, wind throw trees) should be managed to reduce the risk of uncharacteristic bark beetle outbreaks.
FW-TerrERU-PP-G-7	To increase small mammal occupancy in areas where logs are deficient and to provide nesting habitat and cover for turkeys, birds, small mammals, reptiles, and invertebrates, slash piles should be retained across the landscape for several years, rather than immediately being burned. This should be consistent with scenic integrity objectives (SIO) and balanced with potential threats from bark beetles and fire/fuels concerns.

Component code	Plan component
FW-TerrERU-MC-All-G-1	To increase small mammal occupancy in areas where coarse woody debris is deficient and to provide nesting habitat and cover for turkeys, birds, small mammals, reptiles, and invertebrates, slash piles should be retained across the landscape for several years, rather than immediately being burned. The number and distribution of retained slash piles should be consistent with scenic integrity objectives (SIO) and balanced with potential threats from bark beetles and fire/fuels concerns. If slash is scattered, it should be at a height that still allows big game movement.
FW-TerrERU-MC-All-G-2	To retain structural diversity, existing and developing old growth forest structures should be protected from uncharacteristic disturbances. Methods of protecting existing old growth may include thinning, prescribed fire, and the use of wildfires managed for resource objectives in adjacent areas, especially those areas that are situated upwind or are topographically lower.
FW-TerrERU-MC-All-G-3	To promote structural diversity, the development of old growth structural components should be encouraged in areas where lacking. Vegetation treatments should be designed such that replacement structural stages and age classes are proportionally present to assure continuous representation of old growth characteristics across the landscape over time.
FW-TerrERU-AT-G-1	Recreational activities should be managed to maintain or improve ecological attributes, ecological processes, and habitat for native biota.
FW-WUI-G-1	While still remaining within the range of desired conditions, forest structure in the WUI should have lower tree density and lower levels of snags, logs, and coarse woody debris than non-WUI areas and be arranged spatially in order to reduce fire hazard and to increase suppression success.
FW-WFP-G-1	Habitat management objectives and species protection measures from approved recovery plans should be applied to activities occurring within federally listed species habitat to promote recovery of the species.
FW-WFP-G-3	Projects and management activities should be designed or managed to maintain or improve habitat for native species and to prevent or reduce the likelihood of introduction or spread of disease.
FW-WFP-G-4	Project design should include measures to minimize the negative impact of pesticides, herbicides, or chemicals to species and their habitat. For example, chemical free buffers could be placed around bat roosts, riparian or aquatic habitat.
FW-WFP-G-9	Fire suppression techniques that minimize habitat and disturbance impacts should be used where there are federally listed and Southwestern Region sensitive species, consistent with public and fire fighter safety.
FW-WFP-G-11	Project-related activities with the potential to disturb active raptor nests should be restricted within a minimum of 300 yards of these nest sites to promote survival or successful reproduction.
FW-WFP-G-12	Established protocols should be followed to prevent the introduction and spread of disease, such as chytrid fungus (Batrachochytrium dendrobatidis) that kills amphibians.

Component code	Plan component
FW-WFP-G-13	New road and new trail locations should be designed to maintain species access to adjoining habitat, to maintain habitat for dispersal and migration, and to meet species' life history requirements, including fawning habitat for pronghorn.
FW-WFP-G-15	To maintain rare plant populations, seed collection and cuttings (rather than whole plant removal) should be the preferred collection methods when forest product and research collection permits are issued. An exception would be when whole plant removal is required to meet the needs of the permittee and removal would not have the potential to negatively impact rare plant populations. This guideline does not apply to pre-cleared areas for wilding permits of specific species.
FW-Invas-G-1	Measures should be incorporated into authorized activities, project planning, and implementation to prevent, control, contain, and eradicate priority infestations or populations of invasive species to ensure the integrity of native species populations and their habitats is maintained.
FW-Invas-G-2	Integrated pest management approaches and other treatments to control invasive species should be used to improve watershed condition and maintain ecosystem function while minimizing project impacts on native species.
FW-Invas-G-3	Weed-free plant material should be selected for all seeding and mulching projects to restore natural species composition and ecosystem function to the disturbed area. Plant or seed materials should be used that are appropriate to the site, capable of becoming established, and are not invasive.
FW-Fire-G-1	WUI areas should be a high priority for fuels reduction and maintenance to reduce the fire hazard.
FW-Fire-G-2	Fire management activities should be designed to be consistent with maintaining or moving toward desired conditions for other resources.
FW-Graz-G-1	Grazing and browsing use by authorized livestock and wildlife should be in balance with available forage production.
FW-Graz-G-2	Livestock grazing should be managed to meet, or move towards, the desired conditions for forest resources such as soil, water, vegetation, and species.
FW-Graz-G-3	Burned or mechanically treated areas should be given sufficient rest from livestock grazing, especially during the growing season, to ensure plant recovery and vigor and to ensure that perennial plants would not be permanently damaged by grazing. Grazing should not be authorized in burned or mechanically treated areas until Forest Service specialists determine plant recovery and vigor in the burned or treated area by considering characteristics such as seed heads or flowers, multiple leaves or branches, and/or a root system that does not allow them to be easily pulled from the ground. These characteristics provide evidence of plant recovery, vigor, and reproductive ability.

Component code	Plan component
FW-Graz-G-4	Structural range improvements (e.g., fences, troughs, earthen stock ponds, pipelines) should be located, constructed, reconstructed, maintained, and used in a manner that is consistent with the desired conditions for riparian areas, wet meadows, aspen, formally identified archaeological sites, known locations of Southwestern Region sensitive species, and other sensitive resources. Range improvements should be modified, relocated, or removed when found incompatible.
FW-Graz-G-5	Salt, minerals, and/or other supplements should be located and used so that sensitive resources are protected from excessive trampling, compaction, salinization, and other impacts. For example, these supplements should be located at least a quarter of a mile from riparian areas, formally identified archaeological sites, known locations of Southwestern Region sensitive species and other sensitive resources.
FW-Graz-G-6	Gates in waterlot fencing should be left open to wildlife except when controlling livestock distribution.
FW-Graz-G-7	Where permitted livestock have access to riparian areas, the use of riparian species should provide for maintenance of those species, allow for regeneration of new individuals, protect bank and soil stability, and reduce the effects of flooding. Maintenance of woody riparian species should lead to diverse age classes of woody riparian species where potential for native woody vegetation exists. This guideline would not apply to fine scale activities and facilities such as intermittent livestock crossing locations, water gaps, or other infrastructure used to minimize impacts to riparian areas at a larger scale.
FW-FProd-G-1	Timber harvest activities should be designed to be consistent with maintaining or moving toward ecological/social desired conditions.
FW-FProd-G-4	Plant species recognized as rare, limited in distribution, or on the Southwestern Region's sensitive species list should not be collected unless the forest has information that the species can withstand collection and will persist on the forest. Research collection requests should be considered when the results of the research will aid management of the collected species.
FW-Minerals-G-1	To protect social, cultural, and ecological values and where management direction is not compatible with mineral development, the following areas should be considered for withdrawal for locatable minerals: · Properties with a substantial Forest Service investment in facilities such as administrative sites and campgrounds. · Traditional cultural properties where historic preservation laws alone do not adequately protect the cultural resource. · Established research natural areas not located in wilderness. · Geological areas and botanical areas not located in wilderness. · Habitat of species having a very limited range and specific habitat requirements not found elsewhere where law and regulation alone do not adequately protect the resource.

Component code	Plan component
FW-Minerals-G-3	To protect social, cultural, and ecological values, the following areas should be considered for no surface occupancy, no leasing, or other leasing stipulations for leasable minerals in: · Designated and eligible wild and scenic rivers. · Research natural areas not located in wilderness. · Geological areas and botanical areas not located in wilderness. · The foreground of State scenic roads, national All-American roads, and national trails. · Areas of very high scenic integrity not located in wilderness, designated and eligible wild and scenic rivers, or other withdrawals. · San Francisco Peaks/Mount Elden Recreation Area withdrawal. · Areas of very high archaeological site density (greater than 60 sites per square mile) and potentially eligible for the National Register of Historic Places. · Areas with Federally threatened or endangered, or Forest Service sensitive species. · Traditional cultural properties where historic preservation laws alone do not adequately protect the cultural resource.
FW-Minerals-G-4	Important wildlife and plant habitats, visually sensitive areas, archaeological sites, places of cultural importance to American Indians, and areas with large capital investments should be protected through surface occupancy restrictions, mitigation measures, and operating plan requirements imposed on mineral activities.
FW-Minerals-G-5	Past and present mining operations should be reclaimed to provide for public safety and to minimize impacts to cultural and natural resources.
FW-RdsFac-G-2	Roads should have adequate drainage to avoid accelerated soil erosion, loss of vegetation, and long term impacts to soil productivity.
FW-RdsFac-G-3	Roads should be signed to facilitate navigation of designated motorized routes and to prevent motorized use outside of designated areas and routes. Boundaries and routes should be clearly and uniformly identified through appropriate tools and management techniques.
FW-RdsFac-G-5	Soil and water BMPs should be implemented to protect water quality while designing, constructing, reconstructing, or relocating new and existing roads, parking areas and pullouts. For example, permanent and temporary road construction and relocation should: · Occur outside of streamcourses and aquatic management zones, except where crossing is required. · Avoid wetlands, springs, seasonally wet meadows, and montane meadows. · Avoid soils that are unstable and highly erodible where connected to streamcourses.

Component code	Plan component
FW-RdsFac-G-6	Unneeded roads should be decommissioned to maintain an efficient and sustainable road system that maintains or move toward other resource desired conditions.
FW-RdsFac-G-7	Existing roads should be used or realigned before new roads are constructed to avoid areas where disturbance sensitive threatened and endangered species are present.
FW-RdsFac-G-8	For projects where long term access is not needed, temporary roads should be used and naturalized in a timely manner. The intention is to have the road footprint, and potential impacts from road use, such as possible introduction of invasive species, modification of scenic integrity objectives, or increased sedimentation into connected waters, on the landscape for as short a time as possible.
FW-RdsFac-G-9	Bridges, culverts, stream crossings on permanent roads, and diversion structures should be designed to allow safe passage for aquatic organisms. Passage barriers are acceptable when needed to physically separate native and non-native species.
FW-LndAdj-G-1	To better promote the mission of the Agency, lands that the forest considers for acquisition should have one or more of the following qualities: · Contains habitat for threatened or endangered species and sensitive species. · Contributes to the continuity of wildlife and plant habitat. · Contains or influences wetlands, riparian areas, or other water-related features · Provides needed access, protects public lands from fire or encroachment, or prevents damage to resources. · Contributes to areas of high or very high scenic integrity. · Improves the ability to manage a designated special area. · Contains significant sites with cultural, scientific, or recreational values.

Component code	Plan component
FW-LndAdj-G-2	To retain the forest's setting and contribution, lands that leave forest ownership as part of a land adjustment should have one or more of the following qualities: · Isolated from other NFS lands. · Does not contain unique cultural, scientific, or ecological resources. · Managed for a single commercial or other special use, for which it is being exchanged or sold. · Has lost its wildland characteristics. · Meets the needs for communities and the public such as for a water treatment plant. · Resolve innocent encroachments as opportunities arise. · Improve National Forest system management such as administrative sites, recreation residence tracts, and organizational camps. · Adjacent to existing lands of other ownership.
FW-SpecUse-G-1	Lands and recreation special uses should be designed to maintain or move toward desired conditions for other uses and resources.
FW-SpecUse-G-3	Lands and recreation special use permits should not be issued for activities proposed to occur within 200 feet of perennial streams, springs, or waters that contribute to or support sensitive resources such as Federally listed or Southwestern Region sensitive species. The intent is to protect riparian resources. Exceptions may be made for hardened or slickrock sites, water dependent activities, or safety.
FW-SpecUse-G-5	New and reconstructed overhead utility lines, support towers, and other utility infrastructure should be located and designed to minimize adverse ecological, wildlife, and scenic impacts.
FW-SpecUse-G-6	Vegetation that does not interfere with meeting vegetation clearance requirements in rights-of-ways should be retained to allow screening for scenery, habitat for species, and corridors for wildlife movement.
FW-SpecUse-G-10	To support the purposes of research natural areas, geological areas, botanical areas, and environmental study areas, new utility corridors should avoid these areas.
FW-Rec-All-G-1	Recreational activities, locations, and/or settings should be designed and managed to maintain or move towards desired conditions for other uses and resources.
FW-Rec-All-G-2	Recreational activities, locations, and/or settings should be managed to have minimal user conflicts, to be in balance with the capacity of other resources to support them, to promote public health and safety, and/or to prevent wildlife access to food, trash, and human waste.

Component code	Plan component
FW-Rec-All-G-3	To accommodate varying visitor access needs, programs, infrastructure, and services should incorporate principles of universal design and reflect current accessibility guidelines.
FW-Rec-All-G-4	Parking should be restricted or designated parking spots should be provided to prevent resource damage and to promote public safety while ensuring visitor access within the capacity of the site.
FW-Rec-All-G-5	To improve access and safety for forest visitors while protecting other resources, parking areas should be designed, based on the recreational opportunities provided at the site, for a variety of vehicles, including larger vehicles and trailers.
FW-Rec-All-G-6	Forest visitors with recreational stock should carry hay, cubed, pelleted, or rolled feed that is certified weed free to prevent the spread of invasive plants.
FW-Rec-Dev-G-2	To promote a natural appearing landscape, use of native plant species should be emphasized during planning activities (e.g., design of new sites or improvements to existing sites). Invasive species should be removed or treated on existing sites before they become widespread within recreational sites.
FW-Rec-Dev-G-3	Developed recreation sites should be managed to discourage or prohibit broken or cut tree limbs or the removal of all downed woody debris to maintain a natural appearing landscape, to maintain the integrity of the site, and to control accelerated erosion.
FW-Rec-Disp-G-3	Visitors should be restricted from soil and plant restoration sites to promote re-establishment of vegetation and functioning soil.
FW-Rec-Disp-G-5	Dispersed camping along riparian areas should be managed to maintain or move towards desired conditions for riparian areas and water.
FW-Rec-Trails-G-1	Trails and trailheads should be designed, built, rerouted, or maintained utilizing current best practices that promote sustainable trail surfaces, prevent conflicts with neighboring lands, address impacts to other resources, and consider user experiences.
FW-Rec-Trails-G-3	Unplanned, user-created trails should be managed to prevent future access. Resources damaged by unplanned, user-created trails should be rehabilitated to accelerate recovery and to prevent further resource impacts.
FW-Rec-Trails-G-5	Closed roads should be considered for conversion to motorized and/or nonmotorized trails to promote or expand recreation opportunities when it benefits or does not degrade other resources.
MA-PineBelt-G-1	In Pumphouse Wash, roads and trails should be managed to decrease erosion and reduce sedimentation that could flow down canyon and into Oak Creek Canyon. This is intended to improve and maintain watershed conditions and rare plant communities.
MA-Peaks-G-1	The Waterline Road should be managed as a nonmotorized recreation corridor to limit motorized intrusion into wilderness.
MA-Walnut-G-1	Activities and uses on the forest should be managed to protect cultural sites and to preserve habitat for disturbance-sensitive species both on the forest and within Walnut Canyon National Monument.
MA-OakCrk-G-4	Road and trail rehabilitation should be focused in steep drainages to reduce sedimentation into Oak Creek Canyon and to mitigate impacts to other forest resources.

Component code	Plan component
MA-OakCrk-G-5	Trails and recreation should be located and managed to reduce impacts to woody riparian vegetation and riparian habitat.
MA-OakCrk-G-6	Vehicular access to Oak Creek should be restricted by measures, such as vehicle barriers, to minimize user conflicts, to maintain the desired conditions of other resources, and to promote public health and safety.
MA-OakCrk-G-9	Recreation should be managed to maintain water quality standards by placing toilets in strategic locations, providing information about proper sanitation practices, installing shower and hand-washing facilities, and providing gray water disposal sites.
MA-OakCrk-G-12	Mineral material operations should be managed to protect water quality and recreation settings.
MA-HouseMtn-G-6	Vehicular access to Oak Creek should be restricted by measures, such as vehicle barriers, to minimize user conflicts, to maintain the desired conditions of other resources, and to promote public health and safety.
MA-SedN-G-5	Vehicular access to Oak Creek should be restricted by measures, such as vehicle barriers, to minimize user conflicts, to maintain the desired conditions of other resources, and to promote public health and safety.
MA-VerdeV-G-1	Projects and activities should be designed and implemented to maintain or improve watershed and riparian function and/or prevent the introduction or spread of disease, invasive, or undesirable species.
MA-VerdeV-G-2	Recreation should be managed to reduce user conflicts, to maintain the desired conditions of other resources, and/or to promote public health and safety.
MA-LongV-G-1	Dispersed camping opportunities and motorized recreation should be managed to occur outside the vicinity of meadows and riparian areas to maintain soil function, long-term soil productivity, and desired conditions for associated resources.
MA-EastClr-G-1	Dispersed camping opportunities and motorized recreation should be managed to occur outside the vicinity of meadows and riparian areas to prevent negative resource impacts.
MA-CCCrg-G-1	The C. C. Cragin Watersheds MA should be managed to reduce the threat of uncharacteristic wildfires, flooding, and sedimentation, and to maintain water quality and quantity.
MA-CCCrg-G-2	Roads and trails within the C.C. Cragin Watersheds MA should be maintained to prevent erosion and sedimentation and to protect existing infrastructure.
SA-Wild-G-1	Management activities and permitted uses should be designed to maintain or move towards the desired conditions for wilderness and other resources.
SA-Wild-G-2	Use levels should be managed through permit systems or other methods to prevent wilderness values and opportunities from being compromised.
SA-Wild-G-8	In the Fossil Creek Wilderness, projects and activities should be designed to maintain the travertine formations and water chemistry of Fossil Creek.

Component code	Plan component
SA-Wild-G-9	In the Kachina Peaks Wilderness, trails and signs should be managed to discourage and reduce off trail travel to protect alpine tundra vegetation.
SA-RNABotGeo-G-1	To support the area's purpose, human activities, permitted uses, and types and levels of access should be managed to protect the uniqueness and/or ecological condition of these special areas, and the values for which they were designated, established, or proposed.
SA-RNABotGeo-G-3	Fire should be managed using minimal impact suppression tactics or other appropriate suppression tactics to protect the resources for which research natural areas, botanical areas, and geological areas were designated, established, or proposed.

[1] Not all plan decisions in the LRMP are relevant to this biological opinion.