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Fish and Wildlife Service
Arizona Ecological Services Office
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In reply refer to:
AESO/SE
02EAAZ00-2018-F-1160
2022-0013274-S7-001

March 4, 2022

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Coconino National Forest
1824 South Thompson Street
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Tonto National Forest
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Phoenix, Arizona 85006

Judy Palmer, Forest Supervisor
Apache-Sitgreaves National Forests
Post Office Box 640
Springerville, Arizona 85938

RE: Four Forest Restoration Initiative (4FRI) Rim Country Project Biological Opinion

Dear Forest Supervisors West, Bosworth, and Palmer:

Thank you for your request for formal consultation with the U.S. Fish and Wildlife Service (FWS) pursuant to section 7 of the Endangered Species Act of 1973 (16 U.S.C. *et seq.*), as amended (Act). We received your original April 23, 2021, request for consultation via electronic mail on April 26, 2021. At issue are effects to listed species and critical habitat from implementing the Four Forest Restoration Initiative (4FRI) Rim Country Project (Rim Country Project or project) within the Coconino, Tonto, and Apache-Sitgreaves National Forests (NFs) in Apache, Coconino, Yavapai, Gila, and Navajo counties, Arizona. You determined that the proposed action "may affect, and is likely to adversely affect" the threatened Mexican spotted owl (*Strix occidentalis lucida*; Mexican spotted owl, spotted owl or owl) and its designated critical habitat, Little Colorado spinedace (*Lepidomeda vittata*; spinedace) and its designated critical habitat, the Chiricahua leopard frog (*Lithobates* [=*Rana*] *chiricahuensis*; Chiricahua leopard frog or frog) and its designated critical habitat, the narrow-headed gartersnake (*Thamnophis rufipunctatus*; gartersnake) and its designated critical habitat, the Gila trout

(*Oncorhynchus gilae*; Gila trout or trout), and the Western distinct population segment (DPS) of the yellow-billed cuckoo (*Coccyzus americanus*; cuckoo).

In your letter, you also requested our concurrence that the proposed action "may affect, but is not likely to adversely affect" the endangered Gila topminnow (*Poeciliopsis occidentalis*) and spikedace (*Meda fulgida*), or spikedace and loach minnow (*Tiaroga cobitis*) designated critical habitat. Additionally, you asked us to concur with your determination that the proposed action is not likely to jeopardize the nonessential experimental population of the Mexican wolf (*Canis lupus baileyi*; wolf). We concur with your determinations and include our rationales in Appendix A.

You also determined that the proposed action would not affect the endangered loach minnow, the Gila chub (*Gila intermedia*; chub) and its designated critical habitat, and cuckoo critical habitat. Species with "no effect" determinations do not require our review; therefore, we do not address these species further in this document.

The BA also requested that we provide our technical assistance with respect to compliance with the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d) for bald eagles (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*). Our documentation of the Forest Service's implementation of minimization measures to reduce the likelihood of take is included in Appendix B.

We based this biological opinion on information provided in the April 2021, biological assessment (BA), additional amendments to the BA (see consultation history below), updates to the BA provided by District Biologists, telephone conversations, meetings, and other sources of information. The action under consultation includes all of the amendments listed below, not all of which are authorized under the Rim Country Project EIS. Some of these amendments have their own National Environmental Policy Act (NEPA) documents, but they are included in this consultation because of minor changes to the proposed action that affect the Mexican spotted owl and thus warrant section 7 consultation. In addition, the Forest Service included within the BA, both the original BA (April 2021) and in amendments (see below), portions of existing forest thinning and/or restoration projects in order to update these projects to follow the Mexican spotted owl Recovery Plan, First Revision (USFWS 2012; Recovery Plan). We detail this information and why the project is included in this consultation below. These changes may need additional NEPA, but they will not need additional section 7 consultation for the actions included below. Literature cited in this biological opinion is not a complete bibliography of all literature available on the species of concern or on other subjects considered in this opinion. A complete record of this consultation is on file at this office.

Consultation History

- **November 2015 – March 2021**: The BA lists most of the specific consultation events that occurred between this time, and we incorporate this list by reference. We worked collaboratively with the Forest Service to provide comments and feedback on several versions of the BA. Additionally, as a member of the 4FRI Stakeholder Group, we provided feedback and suggestions to clarify and substantiate the Rim Country Project description.

- **April 26, 2021**: The Forest Service submitted the Final BA for initiation of formal consultation.
- **June 11, 2021**: We issued a letter initiating formal consultation.
- **July 8, 2021**: We received an email from the Forest Service with an Erratum for the Terrestrial Species BA. The Erratum included corrections or changes to the BA, including edits to design features and updated acreages for the Mexican spotted owl analysis.
- **July 26, 2021**: We received an email from the Tonto NF with the Poco Pino BA Supplement/Amendment that identified approximately 2.2 miles of temporary roads inside Aquatic Management Zones (AMZs) within Pine Canyon on which the Tonto NF needs to complete several thinning projects within the Rim Country Project area. These roads do not cross any streams occupied by listed species, but are within Mexican spotted owl critical habitat. This biological opinion includes this change as the Forest Service needs it to facilitate thinning treatments included in the Rim Country Project.
- **August 17, 2021**: We received an email from the Tonto NF that corrected information within the BA amendment for the Poco Pino area within the Rim Country Project area.
- **August 20, 2021**: Following extensive discussion with the District Biologist on the Black Mesa Ranger District, Apache-Sitgreaves NFs, we received a request to include the Rancho PAC within the Rim Lakes Forest Restoration Project. The Forest Service proposes to treat 457 acres within the Rancho PAC by modifying treatments to follow guidelines in the Recovery Plan (USFWS 2012). This PAC is within the Rim Country Project area; however, there are no adverse effects identified in the documentation.
- **August 20, 2021**: We sent a letter to the Forest Service requesting an extension for delivery of the biological opinion.
- **September 3, 2021**: We received the request from the Apache-Sitgreaves NFs to include a newly designated Mexican spotted owl Protected Activity Center (PAC) located within the Alder Task Order (TO) of the Nagel Forest Health Project into this consultation because the new PAC is within the 4FRI Rim Country Project area. Originally, the Forest Service used the March 2004 Joint Counterpart Regulations Alternative Consultation Agreement (ACA) to conduct Section 7 analysis, so the project was not consulted on with the FWS. Much of the project is complete, but the thinning units within the Alder Task Order, within the new PAC, are the last contracted units for mechanical treatment that the operator needs to complete the Alder TO and Nagel Forest Health Project. There is no recovery habitat in this TO. Therefore, the Forest Service proposes to modify treatments within the new PAC to follow the Recovery Plan. This PAC is within the Rim Country Project area; however, there are no adverse effects identified in the documentation.
- **September 24, 2021**: We received an email from the Forest Service containing updated information regarding the Mexican spotted environmental baseline (new PACs added to the Rim Country Project area) and a summary analysis of proposed cable yarding operations in Mexican spotted owl recovery habitat.
- **October 4, 2021**: We received Appendices C (Design Features), D (Implementation Plan), E (Monitoring Plan), and K (Mexican spotted owl Recovery Plan Framework) to the Final Environmental Impact Statement (FEIS), via email.
- **October 15, 2021**: We received the GIS files and a PowerPoint presentation for the proposed cable yarding.

- **October 7, 2021**: We received portions of 4FRI Rim Country Project FEIS, Volume 1, via email.
- **November 9, 2021**: The Forest Service released the (4FRI) Restoration Strategy (Strategy). This document identified Pine Canyon, Tonto NF, as an extremely high priority project for 2022 (consistent with the BA Addendum for Poco Pino) and indicated that the Forest Service may want to use helicopters to conduct this work, which is not currently part of the Rim Country proposed action and is not included in the EIS.
- **November 23, 2021**: Based upon the urgency of conducting this thinning treatment to protect the City of Pine, the Tonto NF and FWS agreed that the biological opinion should analyze the effects of helicopter logging in Pine Canyon (Tonto NF). The Strategy also contained additional items that are not included in the proposed action for this consultation (*e.g.*, 73 bridges).
- **December 3, 2021**: We provided feedback to the Forest Service on the Draft BA Addendum for Cable Logging Operations. You accepted our modifications to the bald and golden eagle design features.
- **December 9, 2021**: We received the final edits to the bald and golden eagle design features from the Forest Service.
- **December 10, 2021**: We received the Final BA Addendum for Cable Logging Operations as well as the Draft Soils Specialist Report.
- **January 10, 2022**: We sent the Forest Service the draft biological opinion.
- **January 28, 2022**: We received your comments into the draft biological opinion.

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BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

Regulations implementing the Act (50 CFR 402.02) define "action" as all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by federal agencies of the United States or upon the high seas.

A complete description of the proposed action is in your April 23, 2021, BA, the revisions and amendments to the proposed action as submitted by the Forest Service (see Consultation History), and other supporting information in the administrative record. We include these documents herein by reference, but provide a summary of the proposed action below.

The Rim Country Project is located on portions of Coconino, Apache-Sitgreaves, and Tonto NFs (Figure 1). The main purpose of the Rim Country Project is to modify the structure, pattern, health, function, and vegetation composition and diversity in ponderosa pine and mixed-conifer forests within the project area using, primarily, mechanical tree thinning and prescribed burning (fire). The purpose of this proposed action is to increase the resilience of these forested areas and improve watershed condition (Figure 2). Resilience is the ability of an ecosystem to survive natural disturbances such as fire, insects and disease, and climate change without changing its inherent function. The Rim Country Project would use condition-based management as an approach (described further below) to determine where and what treatments (*e.g.*, thinning, burning) occur across this landscape. This approach does not assign specific treatments to specific acres or areas at the outset, but rather assigns treatments to a set of existing landscape conditions using an interdisciplinary approach.

The proposed action for the Rim Country Project would mechanically thin trees and/or implement prescribed burning on up to 991,060 acres of predominately ponderosa pine and mixed-conifer forest. There is overlap in treatment acres, so acres may receive multiple treatments (*e.g.*, mechanical thinning, burning, etc.).

- The action includes implementing mechanical and/or hand thinning and prescribed burning on approximately 562,470 acres and prescribed burning only on approximately 103,740 acres in ponderosa pine and mixed-conifer frequent fire forest types.
- The project would improve aspen stands on approximately 1,410 acres including the use of mechanical and prescribed fire on approximately 1,200 acres and prescribed fire only on approximately 210 acres.
- The project would conduct management actions on approximately 135,490 acres that have experienced severe disturbance, such as high-intensity wildfire (*e.g.*, Rodeo-Chediski Fire area).
- The project would conduct management actions on approximately 133,450 acres in non-target cover types in order to facilitate operations on target vegetation cover types.
- The action would treat vegetation using mechanical and/or prescribed fire on approximately 14,570 acres of riparian habitat; 36,330 acres of grasslands and meadows; and 6,720 acres of wet meadows.

The proposed action for the Rim Country Project includes associated actions that the Forest Service may implement to support the upland vegetation treatments. These include In-woods Processing Sites (processing sites), use and/or expansion of existing rock pits, construction of temporary roads, as well as use and maintenance of maintenance level 1(ML-1) roads (Table 1). The proposed action also includes comprehensive aquatic restoration activities to improve form and function to riparian, wetland, grassland, spring, and stream systems such as decommissioning, relocation of, and removal of some road crossings. We describe the upland vegetation and aquatic management action categories below.

In addition to the mechanical and prescribed fire activities proposed for the Rim Country Project, the Forest Service proposes to modify treatments originally proposed under the Rim Lakes and Nagel projects. The Forest Service would modify prescriptions to meet the Recovery Plan for the Mexican spotted owl, First Revision (USFWS 2012; hereafter Recovery Plan). Specifically, the Forest Service proposes to modify prescriptions on 457 acres within the proposed Rancho spotted owl Protected Activity Center (PAC) as part of the Rim Lakes Forest Restoration Project and 266 acres within the Cliff Springs PAC as part of the Nagel Forest Health Project.

The proposed action also includes helicopter logging and development of temporary roads. Separately from the Rim Country NEPA, but analyzed in this biological opinion, the Tonto National Forest would conduct helicopter logging within Pine Canyon. Pine Canyon is within the Rim Country Project area and the Forest Service identified helicopter logging as potential tool in the 4FRI Restoration Strategy (USFS 2021). Additionally, the Tonto NF identified project areas within the Rim Country Project area that need to utilize approximately 2.2 miles of temporary roads in Aquatic Management Zones (AMZs) to implement forest thinning. They would decommission all temporary roads when treatments are completed. We included the 2.2 miles of temporary road within AMZs on the Tonto within this biological opinion. These temporary roads are not included within the Rim Country EIS even though the thinning actions that require the temporary roads are included within the Rim Country Project EIS.

Upland Vegetation Management Actions

Mechanical Vegetation Treatments

These are silvicultural treatments the Forest Service would implement to reduce tree density, modify forest structure, and change tree species composition. For the Rim Country Project, on approximately 857,060 acres, 562,470 in ponderosa pine and mixed-conifer frequent fire forest types. Mechanical vegetation treatments would include associated actions such as machine or hand piling as well as lop and scatter of slash material with traditional ground-based logging methods and hand thinning. Ground-based operations (*e.g.*, whole-tree, cut-to-length systems) occur on slopes that are less than 35%. To allow for harvesting trees where ground-based logging systems would not work, the Forest Service also proposes to use cable yarding operations on steep slopes (30 to >40%) on approximately 54,609 acres that were originally proposed for mechanical treatment (Figure 3). These acres include ponderosa pine, ponderosa pine-evergreen oak, and dry mixed-conifer vegetation cover types.

Separately from the Rim Country Project NEPA, in the 4FRI Restoration Strategy (USFS 2021) the Forest Service proposed using helicopters to remove materials (*i.e.*, trees and slash) in Pine Canyon on the Tonto NF. This specific use of helicopter logging is included in the proposed

action for this biological opinion, but the Forest Service did not include it in the Rim Country EIS.

Prescribed Fire Treatments

As part of every mechanical vegetation treatment, the project includes prescribed burning, or the application of fire to the land to return nutrients to the soil and remove excess fuels to reduce wildfire risk (*i.e.*, intensity and severity) and to manage watersheds and habitat. Implementation could occur using both hand (drip torch) and aerial ignition (helicopters) as well as associated fire line needed to contain burn units. This treatment includes broadcast burning as well as pile burning on approximately 991,060 acres across the project area including some areas within the Upper Beaver Creek, Clint's Well, Rim Lakes, and Nagel projects because existing PAC boundaries have changed or we have designated new PACs, and the use of prescribed fire within the PAC nest core areas was not previously analyzed in those project section 7 consultations.

Facilitative Operations

Facilitative operations include mechanical or prescribed fire treatments in non-target cover types (*e.g.*, piñon-juniper, mixed-conifer with aspen, Madrean piñon-oak and Madrean encinal woodland) to support the use of prescribed fire in vegetation cover types targeted for restoration (*e.g.*, ponderosa pine) when those non-target cover types lie between target cover types and natural or human-made features appropriate to use as prescribed fire unit boundaries. Facilitative operations would improve fire staff safety and treatment effectiveness, protect WUI-related infrastructure, expand burn windows, decrease undesirable fire behavior and effects, and minimize disturbance from fireline construction. Mechanical facilitative operations may include mastication/chipping; lop and scatter; thinning/limbing; and moving, rearranging, or removal of jackpots or excessive surface fuels. Prescribed fire facilitative operations may include broadcast burning, jackpotting, pile burning, or blacklining and could occur on up to 121,610 acres.

Aspen Restoration

To do this, the Forest Service would mechanically remove non-aspen species using ground-based logging systems within 66 feet (one chain) of an aspen clone to promote growth on approximately 1,200 acres. This treatment also includes associated actions such as machine or hand piling as well as lop and scatter of slash material. Installation of fencing at aspen restoration sites may also be necessary to protect aspen from ungulate herbivory.

Severe Disturbance Area Treatments

These areas (approximately 135,490 acres) represent a variety of post high-intensity fire conditions (*i.e.*, Rodeo-Chediski Fire area). Treatments would include mechanical thinning and mastication of undesirable species such as juniper, thinning of ponderosa pine in areas with an abundance of regeneration (ground-based logging systems), and reforestation (planting with site preparation) where inadequate regeneration occurs. Site preparation can range from reforestation completed by hand or using machinery such as a gas-powered auger or skid steer with an auger attachment. Site preparation can include mechanical, prescribed burning, or mulching. This treatment also includes associated actions such as machine or hand piling as well as lop and scatter of slash material. Broadcast and pile burning are also included.

Savanna Restoration
The Forest Service would conduct these mechanical treatments on approximately 18,570 acres to reduce ponderosa pine encroachment to pre-settlement tree densities using ground-based logging systems, hand thinning, and prescribed fire to restore and sustain these habitat types.

Grassland and Meadow Restoration
The Forest Service would use mechanical vegetation treatments to remove conifer encroachment in grassland and meadows (36,330 acres). Methods would include ground-based logging systems and hand thinning.

Barrier (Fence) Construction
The Forest Service would construct up to 200 miles of protective barriers around springs, aspen, native willows, and big-tooth maples as needed to protect these areas.

Road Use
The Forest Service would utilize and maintain approximately 5,127 miles of system roads for implementation of all treatments. This includes opening 1,683 miles of existing closed roads (Maintenance Level-1 [ML-1]) to provide access for project work. Upon completion of work, the Forest Service would close these roads in areas they access and return them to a closed status (ML-1). The Forest Service would also construct approximately 330 miles of new temporary roads or improve non-system roads to facilitate mechanical treatments. The Forest Service would not construct temporary roads within Aquatic Management Zones (AMZs), except for the approximately 2.2 miles of temporary roads that the Tonto NF identified as necessary to implement the proposed action. They would decommission all temporary roads when treatments are completed. As described in the consultation history, the Tonto NF added these temporary roads to the action under analysis for this biological opinion in order to conduct the forest thinning treatments analyzed under the Rim Country EIS.

Rock Pits
The project would include the use, including potential expansion, of 11 individual rock pits totaling approximately 113 acres on the Apache-Sitgreaves NFs. The removal and transportation of the rock pit materials would be used for improvement and maintenance of roads for specific projects that utilize ML-1 (closed roads used for administrative purposes only) or ML-2 roads (maintained roads used by high-clearance vehicles). In addition, the Forest Service may use rock material from these pits for construction and maintenance of temporary roads.

On the Coconino NF, the Forest Service previously analyzed and consulted on rock pit expansion and new pit creation for eight pits within the Rim Country Project area (USFWS Consultation #22410-2011-F-0210); therefore, these rock pits may be used as part of the proposed Rim Country Project but are not analyzed as part of this proposed action.

The Tonto NF plans to meet all road surface material needs from local commercial sources and the Rim Country Project does not include any pit operations or expansion on NFS lands within the Tonto NF.

In-woods Processing Sites

Due to the distance of portions of the proposed action from facilities that can process wood products, the project includes the construction of 12 in-woods processing sites, or processing sites, located within projects areas on NFS lands. These 12 sites will total approximately 128 acres. Tasks carried out at processing sites include drying, debarking, chipping stems and bark, cutting logs, manufacturing, and sorting logs to size, scaling, and weighing logs and creating poles from suitable sized logs. Equipment types commonly used at processing sites include circular or band saws, various sizes and types of front-end loaders, and log loaders and chippers of several types, and may include timber processors, planers and mechanized cut-to-length systems, associated conveyers and log sorting bunks for accumulation and storage of logs. Operators may use electric motors, and/or gas or diesel generators to provide power at the processing sites.

Proposed processing site locations are all on flat uplands of less than 5% slope; more than 200 feet from perennial, intermittent, and ephemeral stream channels; more than 300 feet from meadows, springs, and karst features; more than 0.25 mile from PACs, system hiking trails, campgrounds, group event recreation sites, private lands, residences, or offices; and adjacent to roads that are open year-round for product removal. The 12 sites range in size from 4 to 21 acres. The processing sites occur 100 to 300 feet from forest roads and state highways to provide for visual screening. Site boundaries are approximate and the Forest Service may modify processing site location boundaries further during implementation and layout.

Aquatic Management Actions

Riparian and Wet Meadow Restoration

The project would conduct treatments in riparian vegetation to improve watershed conditions throughout the entire area and especially in headwater meadow areas. The Forest Service would use mechanical vegetation methods (*i.e.*, ground-based logging systems, hand thinning) and prescribed fire treatments to remove trees encroaching into riparian (14,570 acres) and wet meadows (6,720 acres). The Forest Service may also plant desirable riparian tree species using methods ranging from planting by hand (*e.g.*, with a planting hoe such as a dibbler or hoedad) to a skid-steer with an auger.

Spring Restoration

The project would implement treatments to improve spring function and condition at 184 springs in the project area. The Forest Service would identify specific treatments using the Condition-Based Management Approach for Aquatic and Watershed Activities (Appendix D). Treatments may include tree removal, prescribed fire, re-pluming the spring infrastructure to conserve water, fencing the spring, and/or removing or relocating nearby roads or trails.

Stream Restoration

The project would strive to improve function and aquatic habitat in up to 647 miles of streams within the project area. Heavy mechanical stream restoration activities (*i.e.*, re-stablishing drainage patterns, stabilizing slopes) could occur on 402 of the 647 stream miles (Figure 2). Existing species recovery plans, Forest Land and Resource Management Plans (LRMPs), and Watershed Restoration Action Plans (WRAPs) would guide the need for these actions. The Forest Service would identify specific treatments using the Condition-Based Management

Approach for Aquatic and Watershed Activities (Appendix D). The objectives of these treatments would be to increase habitat complexity, reduce downcutting and sedimentation, improve riparian areas, and enhance stream shading. The Forest Service, cooperating agencies, and partners would develop project proposals for riparian restoration.

Road Decommissioning and Relocation

The proposed action would conduct treatments to stabilize and restore up to 1,290 miles of existing system roads and unauthorized roads to a more natural state. Treatment methods include blocking the entrance, revegetation, and water barring, removing fills and culverts, establishing drainage ways, removing unstable road shoulders, and full obliteration (recontouring and restoring natural slopes). Additionally, the proposed action includes actions to relocate and reconstruct existing open roads that are adversely affecting water quality and natural resources or are of concern to human safety. As part of this project, the Forest Service could decommission up to 490 miles of existing system roads and up to 800 miles of unauthorized roads on the Coconino, Apache-Sitgreaves, and Tonto NFs.

Comprehensive Restoration Actions

Collectively, we will refer to the aspen restoration; severe disturbance area treatments; savanna, grassland and meadow restoration; barrier (fence) construction; riparian, wet meadow, spring, and stream restoration; and road decommissioning as "Comprehensive Restoration Actions" or by the individual action as needed to disclose effects as clearly as possible, but not repeat information.

Condition-Based Management

Vegetation treatments would use the Condition-Based Management Approach for Mechanical Treatments and the Condition-Based Management Approach for Aquatic and Watershed Restoration Activities for meadows, springs, streams, and riparian habitat (Appendix D).

Condition-Based Management Approach - Mechanical Treatments

The Rim Country Project would use condition-based management as an approach (Appendix D) to allocate upland vegetation treatments. This approach does not assign specific treatments to specific acres, but rather assigns treatments to a set of existing landscape conditions. An interdisciplinary team (IDT) would review proposed treatments and existing conditions for a site-specific activity and then apply the appropriate treatment to that piece of ground. The Forest Service and partners (including the FWS) identified the need for this approach based upon adaptive management considerations and lessons learned from past projects.

Condition-based management begins with an initial project resource review of forest conditions and site-specific considerations that inform the condition-based management process. This process would include the consideration of the integration of upland and aquatic restoration treatments. An IDT would identify the need for special management considerations that would result in a specific treatment assignment (*i.e.*, listed species habitat, wildland urban interface, and severe disturbance areas). Areas that do not fall within the special management considerations are limited to the ponderosa pine, ponderosa pine/evergreen oak cover type as well as Mexican spotted owl foraging/dispersal recovery habitat. The IDT would assign these areas a treatment

using a decision tree. Finally, the Forest Service would use a set of decision tree modifiers to identify an appropriate treatment intensity within the ranges describe by the decision tree. The result would be a treatment that should best meet the desired condition for that site.

Condition-based management is a strategy that allows the Forest Service, prior to implementation, to align proposed treatments with actual conditions on the ground. The process uses a combination of selection criteria and vegetation conditions to determine habitat and forest cover filters and modifiers, as well as the appropriate treatments for each. The Forest Service would conduct site-specific field reviews prior to implementation to verify that ground conditions match the predicted conditions. If they do not, then staff would apply the correct selection criteria on the actual ground conditions to ensure that the right treatment occurs on the right acre.

Condition-Based Management Approach - Aquatic and Watershed Restoration

Due to the size and complexity of the Rim Country Project area, the Forest Service was unable to identify specific sites and projects to analyze all areas of need and the possible combinations of restoration activities. Therefore, as part of the proposed action, prior to proposing aquatics and watershed restoration treatments and identifying the methods needed to improve aquatic conditions (Table 2), an Aquatic Restoration Review Team (ARRT) would be developed and would be comprised of multiple agencies and partners, including FWS. In designing site-specific projects (Appendix E), the ARRT would guide aquatic restoration priorities and review restoration proposals to consider the restoration needs and goals for the specific area, the extent and cause of degraded resources, water quality issues, threatened and endangered species habitat, scenic sensitivity levels, and effects on non-forest lands. The ARRT would meet annually to review project-specific proposals that improve hydrologic function of the streams and aid species recovery. Additionally, the ARRT would review past project implementation to provide guidance and feedback regarding successful implementation methods. Yochum (2018) provides information needed to develop and design projects as well as guidelines for aquatic restoration projects.

As projects are developed and brought into design phase, the ARRT (Appendix E) may determine that it is appropriate to have additional technical review for projects that are complex or have the potential to have greater effects, such as large aquatic passage or channel realignment projects. The Forest Service would ensure that there is a standing panel composed of experienced individuals including engineers, hydrologists, and others to provide project review. The team should be no larger than required to review the technical soundness of designs (Yochum 2018). In Oregon and Washington, the interagency group that works with salmon habitat restoration developed a matrix of review based on the anticipated effects and stream response (Skidmore *et al*. 2011) and the Forest Service anticipates developing a similar review process with their partners (including FWS) for the Rim Country Project.

The Forest Service developed WRAPs for priority watersheds within the Rim Country Project. These include East Verde River Headwaters (Tonto NF), Long Tom Canyon-Chevelon Canyon and Upper Wildcat Canyon (Apache-Sitgreaves NFs), and East Clear Creek-C.C. Cragin Reservoir (Coconino NF). These WRAPs outline priority projects the Forest Service identified to improve watershed conditions and would provide initial guidance planning projects.

Whenever possible, restoration treatments would be coordinated with other activities in the same area to create efficiencies and minimize both ground and noise disturbance.

Best Management Practices/Conservation Measures

The Forest Service uses multiple policy and regulatory documents in the planning and implementation of management activities to reduce or prevent negative effects. Land Management Plan standards and guidelines for the Coconino, Tonto, and Apache-Sitgreaves NFs, as well as the direction contained in the Watershed Conservation Practices Handbook (FSH 2509.25) include protection measures the Forest Service would apply to projects they implement under this proposed action. We incorporate these sources by reference into the proposed action. In addition, the Forest Service included specific project design features (DFs), best management practices (BMPs), and conservation measures (CMs) to minimize or avoid effects to listed species and their habitats from the proposed action (Appendix F). We listed these measures in an appendix because there are too many to list here. We specifically note BMPs and CMs that minimize effects to listed species and/or critical habitat in the effects section for particular species.

Additional Actions

In areas already covered by National Environmental Policy Act (NEPA) decisions, the Forest Service is also consulting on the addition of comprehensive restoration activities such as road decommissioning, spring and stream channel restoration, and wildlife habitat restoration to compliment the activities already analyzed in those project areas that fall within the Rim Country Project area. The following actions are included in this consultation because they are within the Rim Country Project area, but were not included in previous section 7 consultations:

- The Forest Service proposes to include prescribed (maintenance) burning within the Rim Lakes project area, including within PAC core areas (USFWS Consultation #22410-2010-I-0415 and #22410-2010-I-R001).
- The Forest Service proposes to conduct prescribed fire treatments within owl core areas within the Clint's Well project area (USFWS Consultation #02EAAZ00-2012-I-0390) and within identified owl PACs in the Upper Beaver Creek project area (USFWS Consultation #22410-2005-F-0569).
- The Forest Service proposes to conduct thinning and burning activities with a newly identified and designated PAC within the Nagel Forest Health Project (see Consultation History).

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 project area is approximately 991,060 acres and encompasses 398,880 acres on the Mogollon Rim and Red Rock Ranger Districts of the Coconino NF, 299,710 acres on the Payson and Pleasant Valley Ranger Districts of the Tonto NF, and 540,020 acres on the Black Mesa and

Lakeside Ranger Districts of the Apache-Sitgreaves NFs (Figure 1). The action area for this biological opinion is defined as the areas proposed for mechanical thinning, prescribed burning, and other restoration treatments (collectively the "treatment area", Figure 1) and anywhere outside of this treatment footprint that other project-related effects could spread (such as smoke or sedimentation effects). The two major drainage systems encompassed in the action area are the Little Colorado River and the Salt River. We defined the action area as the project area and the 6th Level Hydrologic Unit Code (HUC) sub-watersheds that intersect with the project area. The 6th Level HUC sub-watersheds range in size from 15 to 62 square miles. This accounts for any downstream effects that may occur from project activities and includes approximately 142 sub-watersheds. We discuss the specific sub-watersheds of interest for each species in the Environmental Baseline.

This consultation covers a period of 20 years.

STATUS OF THE SPECIES AND CRITICAL HABITAT

Mexican Spotted Owl

Legal Status

In 1993, we listed the Mexican spotted owl (hereafter, referred to as Mexican spotted owl, spotted owl, and owl) as threatened under the Act (USFWS 1993) and designated critical habitat in 2004 (USFWS 2004). The FWS appointed the Mexican Spotted Owl Recovery Team in 1993 (USFWS 1993), which produced the Recovery Plan for the Mexican spotted owl in 1995 (USFWS 1995). The FWS released the final Mexican Spotted Owl Recovery Plan, First Revision (Recovery Plan) in December 2012 (USFWS 2012).

Description and Life History

The Mexican spotted owl is a medium-sized owl without ear tufts. Spotted owls have mottled feathers with irregular white spots on a brown abdomen, back, and head. Mexican spotted owls nest in caves, in stick nests built by other birds, on debris platforms in trees, and in tree cavities. Mexican spotted owls have distinct annual breeding periods, with courtship beginning in March. Owls typically lay eggs in late March or early April, with eggs hatching approximately 30 days later. Nestling owls generally fledge in early to mid-June. 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 the revised Recovery Plan (USFWS 2012). We include the information provided in those documents by reference.

Habitat Requirements and Distribution

The spotted owl occurs in forested mountains and canyonlands throughout the southwestern United States (U.S.) and Mexico (Figure B.1 *in* USFWS 2012). The owl ranges from Utah, Colorado, Arizona, New Mexico, and the western portions of Texas south into several states in Mexico. Although the owl's entire range covers a broad area of the southwestern U.S. and Mexico, it does not occur uniformly throughout its range. Instead, the owl occurs in disjunct localities that correspond to isolated forested mountain systems, canyons, and in some cases steep, rocky canyon lands. Known owl locations in forested habitats indicate that the species has an affinity for older, uneven-aged forests, and the species inhabits a physically diverse landscape

in the southwestern U.S. and Mexico.

In the Recovery Plan (USFWS 2012), the Recovery Team defined specific forest cover types (mixed-conifer and pine-oak) and rocky-canyon habitats that provide nesting, roosting, and foraging habitat for Mexican spotted owls (USFWS 2012). The availability of habitat used for nesting/roosting of Mexican spotted owls in forested and rocky-canyon environments limits owl distribution (meaning the nesting and roosting habitat is a limiting factor for spotted owls). Habitat used for nesting/roosting also provides adequate conditions for foraging and dispersal activities. Thus, sustaining nesting/roosting habitat meets other survival and recovery requirements. Based on the specific forest cover type and rocky-canyon definitions, the Recovery Plan (USFWS 2012) focuses management recommendations on two categories of owl habitat: PACs and "recovery habitat" (the Recovery Team previously called recovery habitat "restricted habitat" in the 1995 Recovery Plan; the terms are synonymous).

PACs are intended to sustain and enhance areas that are presently, recently, or historically occupied by breeding Mexican spotted owls (USFWS 2012). Minimum PAC area is 600 acres and is based on the median size of the adaptive kernel contour enclosing 75% of the foraging locations for 14 pairs of radio-marked owls (595 acres) (Ganey and Dick 1995). Thus, PACs protect activity centers used by owls rather than entire home ranges. Consequently, there is no upper limit for PAC sizes; managers may create larger PACs if appropriate. The Service and land managers establish PACs around owl sites (as defined in the Recovery Plan). All PACs should contain a designated 100-acre nest/roost core area, designed to offer additional protection to the nest or primary roost areas. The Recovery Plan (USFWS 2012) emphasizes protection of habitat used for nesting and roosting within PACs because the owls are most selective for such habitat (Ganey and Dick 1995, USFWS 2012 [Appendix B]) and these forest conditions are most limited across the landscape. These areas also provide resources to meet other life-history needs of the owl. Therefore, designating PACs protects and maintains occupied owl habitat.

Recovery habitat occurs in forest types and rocky canyons used by owls for roosting, foraging, dispersal and other life history needs; however, recovery habitat occurs outside of PACs. Recovery habitat is intended to: (1) provide protection for areas that may be used by owls; (2) foster creation of nest/roost habitat; (3) simultaneously provide managers with greater management flexibility than is allowed in PACs; and, (4) facilitate development and testing of management strategies that could be applied in PACs (USFWS 2012). Areas not classified as either PACs or recovery habitats, are classified as "Other Forest and Woodland Types" and "Other Riparian Forest Types" (USFWS 2012). These areas, which nesting owls rarely use, but owls may use for foraging and dispersal, generally include pure ponderosa pine forest, piñon-juniper woodland, or other habitat types. Given their relatively limited importance to nesting owls, the Recovery Plan (USFWS 2012) contains no owl-specific recommendations in "Other Forest and Woodland Types" and "Other Riparian Forest Types".

In addition to this natural variability in habitat influencing owl distribution, human activities also vary across the owl's range. The combination of natural habitat variability, human influences on owls, international boundaries, and logistics of implementation of the Recovery Plan necessitates subdivision of the owl's range into smaller management areas. The 1995 Recovery Plan subdivided the owl's range into 11 "Recovery Units" (RUs): six in the U.S. and five in Mexico.

In the revision of the Recovery Plan (Service 2012), we renamed RUs as "Ecological Management Units" (EMUs) to be in accord with current Service guidelines. The Recovery Team divided the owl's range within the U.S. into five EMUs: Colorado Plateau (CP), Southern Rocky Mountains (SRM), Upper Gila Mountains (UGM), Basin and Range-West (BRW), and Basin and Range-East (BRE) (USFWS 2012). Within Mexico, the revised Recovery Plan delineated five EMUs: Sierra Madre Occidental Norte, Sierra Madre Occidental Sur, Sierra Madre Oriental Norte, Sierra Madre Oriental Sur, and Eje Neovolcanico.

Threats

The FWS cited two primary reasons 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. We also identified the danger of stand-replacing fire as a looming threat at that time. Since publication of the original Recovery Plan (USFWS 1995), the FWS and Recovery Team acquired new information on the biology, threats, and habitat needs of the 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 (USFWS 2012). Recent forest management has moved away from a commodity focus, such as commercial-based timber harvest, and now emphasizes sustainable ecological function and a return toward pre-settlement fire regimes, both of which have potential to benefit the spotted owl. However, as stated in the revised Recovery Plan (USFWS 2012), there is much uncertainty regarding thinning and burning treatment effects and the risks to owl habitat with or without forest treatment as well.

Southwestern forests have experienced larger and more severe wildland fires from 1995 to the present than prior to 1995 (Westerling 2016). Climate variability combined with unhealthy forest conditions (*i.e.*, too many trees; high levels of insects and disease; excessive fuel loads; etc.) also synergistically result in increased negative effects to habitat from fire (Fulé *et al.* 2004, Littell *et al.* 2009). The intensification of natural drought cycles and the ensuing stress placed upon overstocked forested habitats could result in even larger and more severe fires in owl habitat (Jones *et al.* 2016, Ganey *et al.* 2017). Currently, high-severity, stand-replacing fires are influencing the persistence of ponderosa pine and mixed-conifer forest types in Arizona and New Mexico. High-intensity wildfire is likely the greatest threat to the Mexican spotted owl within the action area. As long-term drought persists, fires are increasing in intensity and patch sizes of high-intensity fire within fire perimeters is increasing (USFWS 2012). 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 owl's range. Although owls will forage in severely burned areas, habitat is often lacking for nesting and roosting in these areas, particularly when high-severity fire affects large patches of habitat (Jones *et al.* 2016).

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 U.S., 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.

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 affects 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). Researchers think such changes in the timing and amount of snowmelt are signals of climate-related change in high elevations (Smith *et al.* 2000, Reiners *et al.* 2003). The effect 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, and 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.

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 are prevalent throughout the range of the owl and can have an adverse effect on the availability of grass cover for prey species. Recreation effects 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.

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 affect the owl. We have not documented the virus in spotted owls in Arizona, New Mexico, and Colorado, but 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 birds that we have banded, we would most likely not know when owls contract the disease or the extent of its effect to the owl range-wide.

Population Status and Process of Delisting

The recovery objective stated in the Recovery Plan (USFWS 2012) is "to support the Mexican spotted owl throughout its range into the foreseeable future, and to maintain the habitat conditions necessary to provide roosting and nesting habitat for the Mexican spotted owl." In addition, the FWS and Recovery Team developed two recovery (or delisting) criteria (addressing listing factors A, C, and E; 58 FR 14248) that we must meet before the owl can be delisted. These criteria are:

1. Owl occupancy rates must show a stable or increasing trend after 10 years of monitoring.

2. Indicators of habitat conditions (key habitat variables) are stable or improving for 10 years in roosting and nesting habitat.

Once we can show that we have met these two criteria across the range of the owl, we would then review the regulations and known distribution (the spatial arrangement across its range) of Mexican spotted owls to determine if the delisting process should proceed. At this time, we cannot describe the future desired distribution of owls across their range because changes in the

species' range may occur due to factors such as climate change, which could result in shifts in the owl population to the northern portion of its range. In addition to meeting the delisting criteria, to delist the Mexican spotted owl, we must be able to demonstrate, using the best scientific information, that Federal, state, and tribal land managers have moderated and/or regulated anthropogenic and non-anthropogenic threats to the Mexican spotted owl (USFWS 2012). We derive the best scientific information from research, management experiments, and monitoring conducted at the appropriate scales and intensity. The FWS must also conduct an analysis of the five listing factors to verify that threat levels are acceptable for likely persistence of owl populations into the future.

In the Recovery Plan (USFWS 2012), the Recovery Team identified two types of monitoring recommended for the Mexican spotted owl. The first is surveying for individual owls by using the FWS Mexican spotted owl survey protocol (USFWS 2012 [Appendix D]). These are surveys conducted to locate individual owls (which allow the FWS and land managers to designate PACs) and to monitor the status of owls associated with known PACs (to locate nests and roosts, and determine their reproductive status). Mexican spotted owl surveys conducted 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 U.S. The Recovery Plan (USFWS 2012) lists 1,324 known owl sites in the U.S. An owl site is an area used by a single owl or a pair of adults or subadult owls for nesting, roosting, or foraging. The increase in number of known owl sites is mainly a product of agencies completing new owl surveys within previously unsurveyed areas (*e.g.*, several National Parks within southern Utah, Guadalupe National Park in West Texas; Guadalupe Mountains in southeastern New Mexico and West Texas; Dinosaur National Monument in Colorado; and the Cibola and Gila NFs in New Mexico). Thus, we cannot infer an increase in abundance in the species range-wide from these data (Service 2012). However, the FWS and the Recovery Team assume that an increase in the number of occupied sites is a positive indicator regarding owl abundance.

In addition to this survey protocol for individual owls, the Recovery Team also developed and recommended a methodology for conducting Mexican spotted owl population monitoring, using an occupancy (presence/absence) model to determine the population trend (stable, increasing, decreasing) of owls range-wide (USFWS 2012 [Appendix E]). The FWS is currently working with the Southwestern Region of the Forest Service to conduct the population monitoring recommended in the Recovery Plan (USFWS 2012 [Appendix E]) on National Forest System (NFS) lands in Arizona and New Mexico. The effort to conduct this work has occurred during the 2014-2019 and 2021 breeding seasons (seven years). The Recovery Team, Forest Service, FWS, and the Bird Conservancy of the Rockies (BCR, contractor) are continuing to collect data on NFS lands. Of the 200 quadrats sampled on NFS lands in Arizona and New Mexico, 60 are located within the Coconino, Tonto, and Apache-Sitgreaves NFs. The FWS is developing a strategy for incorporating additional lands (*e.g.*, National Park Service, Bureau of Land Management, and Department of Defense) into the monitoring. It is important to state that delisting criteria in the Recovery Plan (USFWS 2012) require that monitoring occur across the range of the owl, not just across an individual land management entity (*e.g.*, must include lands managed by all entities, *i.e.*, not just NFS lands). Currently, based on the work conducted by the

Forest Service and BCR, we have further developed the process for conducting rangewide population monitoring as described in Appendix E of the Recovery Plan (USFWS 2012).

It is important to note that the entire range of Mexican spotted owls covers area in five U.S. states (Arizona, Colorado, New Mexico, Texas, and Utah) and a large area of Mexico. Within the U.S., Region 3 (Southwestern) NFS lands are in Arizona and New Mexico, which is only a portion of the range of the Mexican spotted owl. Occupancy monitoring conducted on NFs in Region 3 alone may not allow the FWS to meet rangewide-delisting criteria, but it would allow the FWS and Forest Service to assess population trends on Region 3 NFS lands in Arizona and New Mexico. The spatial scale at which this monitoring is occurring allows for interpretation of owl population trends for all Region 3 NFS lands. However, we (BCR, the Forest Service and the FWS) did not design the current NFS occupancy sampling scheme to scale down to monitor owl occupancy trends on any individual NF within the Southwestern Region. We did not design it to meet this smaller scale objective because the objective is to develop a trend for all NFS lands in Region 3, not for each individual forest.

Mexican Spotted Owl 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 (69 FR 53182). Critical habitat includes only those areas in designated critical habitat units (CHUs) that meet the definition of protected (PAC and steep slopes, as defined) and restricted (now called "recovery") habitat (unoccupied owl foraging, dispersal, and future nest/roost habitat) as defined in the 1995 Recovery Plan (USFWS 1995). We determined the primary constituent elements (PCEs) for owl critical habitat 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, we identified PCEs for both habitat types.

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:

- 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% of which are large trees with diameter at breast height (dbh) (4.5 feet above ground) of 12 inches or more;
- A shade canopy created by the tree branches covering 40% or more of the ground;
- Large, dead trees (snags) with a dbh of at least 12 inches;
- High volumes of fallen trees and other woody debris;
- A wide range of tree and plant species, including hardwoods; and,
- 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 occur 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 older, larger trees

persist.

Steep-walled rocky canyonlands occur typically within the Colorado Plateau EMU, but also occur in other EMUs. Owls use canyon habitat for nesting, roosting, and foraging, and this 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, piñon-juniper, and/or riparian vegetation;
- Canyon walls containing crevices, ledges, or caves; and,
- High amounts of ground litter and woody debris.

Overall, the status of the Mexican spotted owl and its designated critical habitat has not changed significantly since listing range-wide in the U.S. (which includes Utah, Colorado, Arizona, New Mexico, and extreme southwestern Texas). This means 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 the EMUs located in the U.S. We know this because project-level surveys continue to find Mexican spotted owls in the same locations across the range of the owl, and we continue to conduct section 7 consultations on federal agency actions and receive section 10(a)(1)(b) recovery reports that provide rangewide updates regarding owl and habitat status. We do not have detailed information regarding the status of the owl in Mexico, so we cannot make inferences regarding its overall status.

However, this is not to say that changes have not occurred within the owl's U.S. range. Wildland fire has resulted in the greatest loss of PACs and critical habitat relative to other actions (*e.g.*, forest management, livestock grazing, recreation, etc.) throughout the U.S. range of the Mexican spotted owl. These wildland fire effects have mainly affected Mexican spotted owls within the UGM EMU (*e.g.*, Slide and Schultz Fires on the Coconino NF, Rodeo-Chediski and Wallow Fires on the Apache-Sitgreaves NFs, and Whitewater-Baldy Complex on the Gila NF) and BRW EMU (*e.g.*, Bighorn Fire Frye Fire, Nuttall-Gibson Complex, and Horseshoe 2 Fire on the Coronado NF). However, high-severity wildfire effects have caused significant effects to owl habitat within other EMUs as well (*e.g.*, SRM EMU by the Las Conchas Fire, CP EMU by the Warm Fire).

Previous Consultations

Given the wide-range of this species, several Federal actions affect this species every year. A complete list of all formal consultations affecting this species in Arizona is on our Arizona Ecological Services website.

Little Colorado Spinedace

Legal Status

The FWS listed the spinedace as threatened with critical habitat on October 16, 1987 (52 FR 35034). We completed a recovery plan for the species in 1998 (USFWS 1998). We completed 5-

year status reviews in 2008 (USFWS 2008) and 2018 (USFWS 2018). In the 2008 review, we recommended that we change the spinedace's listing status to endangered; however, no listing change occurred and the more recent status review (USFWS 2018) concluded that classification as threatened remains an appropriate designation for the species.

We based the 2008 recommendation to list the spinedace as endangered on projections of water losses, non-native sportfish movements, and persistent drought conditions affecting the spinedace into the future. However, the 2018 review found that spinedace habitats are persisting and some areas support robust numbers and age classes of spinedace despite fluctuating water levels and extreme drought. In addition, some non-native sportfish invasions that in 2008 seemed imminent were not as severe as predicted, and since 2008, the FWS and Arizona Game and Fish Department (AGFD) established three new spinedace populations within the species' historic range (USFWS 2018).

Description and Life History

The spinedace is a small (about 4-inch) minnow native to the Little Colorado River drainage. This fish occurs in disjunct populations throughout much of the drainage in Apache, Coconino, and Navajo counties, Arizona. Extensive collections summarized by Miller (1963) indicated that the spinedace no longer occurred within much of its historical range from 1939 to 1960. Although few collections were made of the spinedace prior to 1939, we think the species inhabited the northward flowing Little Colorado River tributaries of the Mogollon Rim, including the northern slopes of the White Mountains.

Researchers conducted mitochondrial DNA work on the spinedace in the 1990s and indicated the existence of three sub-groups identifiable by geographic area (Tibbets *et al.* 2001): 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 and possess unique haplotypes, likely the result of a higher degree of isolation. Individuals from the upper Little Colorado sub-group are more like each other. Possibly, at least until recent times, there was one population with considerable gene flow. Later, dams and water diversions contributed to the current distribution of disjunct populations. The cause and exact timing of the isolation of the three sub-groups is unknown, but Tibbets *et al*. (2001) recommended that managers maintain all these populations to conserve genetic variation in the species.

Habitat Requirements and Distribution

The spinedace occurs in a variety of stream habitats (Blinn and Runck 1990, Miller 1963, Nisselson and Blinn 1989). It is unclear whether occupancy of these habitats reflects the local preferences of the species or its ability to tolerate less-than-optimal conditions. Suitable stream habitat for the spinedace includes 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. Surveys have located spinedace 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 14.4 to 25.5 degrees Celsius (58 to 78 degrees Fahrenheit) (Miller 1963).

As with most aquatic habitats in the southwest, the Little Colorado River Basin contains a variety of aquatic habitat types and is prone to severe seasonal and yearly fluctuations in water quality and quantity. Both mountain streams and lower-gradient streams and rivers have provided habitat for the spinedace. Residual pools and spring areas are important refuges during periods of normal low water or drought.

The spinedace likely still occupies the streams it is known from historically (Chevelon, Nutrioso, East Clear Creek, and the Little Colorado River), except for Silver Creek where surveys have not located spinedace in over 20 years. Populations are generally small and the true population size for any occupied stream is unknown due to yearly fluctuations in their numbers and the difficulty in locating fish. Spinedace have disappeared from sampling sites for several years, but have reappeared later. The ephemeral nature of their occurrences makes management of the species difficult because we cannot measure population responses to changes within the watershed with certainty.

Threats

The spinedace is a fish with a limited, highly fragmented distribution and relatively low numbers, making it highly vulnerable to stressors, particularly drought, ground-water and surface water withdrawals, high-intensity landscape scale wildfires, and predation and competition with non-native warm water fishes. Uncertainties and data gaps that may impede recovery progress include climate change and the effects of extended drought and increased human water consumption to the persistence of spinedace habitat; the lack of knowledge regarding genetic diversity; and, our ability to develop techniques to assist with the control of invasive non-native fishes and other aquatic organisms.

Population Status

The number of areas within the East Clear Creek watershed where spinedace are persisting has increased over the last several years (USFWS 2018). In addition, occupied sites in the Little Colorado River, West Chevelon Creek, Nutrioso Creek, and Rudd Creeks continue to support spinedace. Efforts by AGFD, FWS, and the Forest Service have resulted in an increased number of habitats, albeit relatively small areas, which spinedace occupy.

Critical Habitat

We designated forty-four stream miles of critical habitat for spinedace in 1987 (USFWS 1987): 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. Primary biological factors of critical habitat consist of clean, permanent flowing water with pools and a fine gravel or silt-mud substrate.

Previous Consultations

Given the wide-range of this species, several Federal actions affect this species every year. A complete list of all formal consultations affecting this species in Arizona is on our Arizona Ecological Services website.

Chiricahua Leopard Frog

Legal Status

The FWS listed the frog as a threatened species without critical habitat in 2002 (USFWS 2002). Included was a special rule under Section 4(d) of the Act to exempt operation and maintenance of livestock tanks on non-Federal lands from the section 9 take prohibitions of the Act. Since that time, the taxonomists' subsumed the Ramsey Canyon leopard frog (*Lithobates subaquavocalis*) into *Lithobates chiricahuensis* (Crother 2008) and the FWS recognizes it as part of the listed entity (USFWS 2012). As a result, the FWS reassessed the status of and threats to the currently described species *Lithobates chiricahuensis*, including the population previously described as the Ramsey Canyon leopard frog. We published a revised final rule on March 20, 2012 (USFWS 2012) that listed the species as threatened rangewide with designated critical habitat and included the special rule from the original listing. Final designation of critical habitat includes 39 areas in Arizona and New Mexico. The FWS finalized the Chiricahua Leopard Frog Final Recovery Plan (Recovery Plan) in 2007 (USFWS 2007).

Description and Life History

We distinguish the Chiricahua leopard frog from other members of the *Lithobates pipiens* complex using a combination of physical characteristics. These characteristics include 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). Snout-vent lengths of adults range from approximately 2.1 to 5.4 inches (Platz and Mecham 1979, Stebbins 2003).

Habitat Requirements and Distribution

The frog's range extends through the southeastern sections of Arizona and adjacent Sonora, Mexico, at elevations ranging from 1,219 to 4,023 feet, and from montane central Arizona east and south along the Mogollon Rim to montane parts of west-southwestern New Mexico, at elevations ranging from 3,500 to 8,040 feet. This species inhabits federal, tribal, and privately owned land.

The frog no longer occurs in about 80% of its historical localities in Arizona and New Mexico. The species is still extant in the major drainage basins in Arizona and New Mexico where it occurred historically except for the Little Colorado River drainage in Arizona and possibly the Yaqui drainage in New Mexico. However, we do not have recent detections from many rivers within those major drainage basins, valleys, and mountains ranges, including the following in Arizona: White River, West Clear Creek, Tonto Creek, Verde River mainstem, San Francisco River, San Carlos River, upper San Pedro River mainstem, Santa Cruz River mainstem, Aravaipa Creek, Babocomari River mainstem, and Sonoita Creek mainstem. In southeastern Arizona, no records from 1995 to the present exist for the Pinaleño Mountains or Sulphur Springs Valley. The total number of known sites occupied by frogs in Arizona increased to 155 in 2018 (Mosley *et al.* 2019). The species' status in Mexico is unclear; however, in recent years, observers have detected the frog in western Chihuahua.

The primary habitat type for the frog includes oak, mixed oak, and pine woodlands, although its habitat ranges into areas of chaparral, grassland, and desert, particularly for the southern populations. This species requires permanent water sources, including streams, rivers, backwaters, ponds, and stock tanks that are mostly free from introduced fish, crayfish (*Orconectes virilis)*, and American bullfrogs (*Lithobates catesbeianus*). Natural aquatic systems include rocky streams with deep rock-bound pools, river overflow pools, oxbows, permanent springs, permanent pools in intermittent streams, and beaver dams. Human-influenced aquatic systems include earthen stock tanks, livestock drinkers, irrigation sloughs, mine entrances, abandoned swimming pools, and ornamental backyard pools (USFWS 2007).

Although restoring movement corridors is a conservation strategy for Chiricahua leopard frogs, we know little about their movement habits and abilities (USFWS 2007). Recent research found that rain triggers Chiricahua leopard frog movements from aquatic to terrestrial habitats, the distance frogs can move is highly variable among individuals (1 mile in one day up to 6 miles over 36 days), and smaller frogs tend to move farther (Hinderer *et al*. 2017). Additionally, frogs tend to move during intermediate (versus heavy) rainfall events (Hinderer *et al.* 2017).

Threats

The primary threats to this species are predation by nonnative organisms and die-offs caused by a fungal skin disease – Chytridiomycosis. The Chytridiomycete skin fungus (*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, Hale 2001). Additional threats include: drought, floods, degradation and loss of habitat because 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.

Chytridiomycosis and nonnative organisms, coupled with habitat fragmentation and loss resulting from water diversion, groundwater pumping, and pollution, have meant that recovery criteria outlined in the recovery plan have not been met for this species. Climate change and increases in ultraviolet radiation will likely affect this species in the future. Other threats include drought, floods, wildfires, degradation and destruction of habitat, water diversions and groundwater pumping, disruption of metapopulation dynamics (relationships among populations of frogs), increased chance of extirpation or extinction resulting from small numbers of populations and individuals, and environmental contamination.

Population Status

The Recovery Plan identifies eight RUs in portions of Arizona, New Mexico, and Mexico. The Rim Country Project occurs with RUs 5 and 6, and includes four Management Areas (MAs)

(USFWS 2007). The Recovery Team and stakeholders identified MAs in each RU where we think the potential for successful recovery actions is greatest.

The recovery criteria to delist the frog include:

- At least two metapopulations located in different drainages, plus at least one isolated and robust population in each RU;
- Protection of these populations and metapopulations;
- Connectivity and dispersal habitat protection; and,
- Reduce or eliminate threats and causes of decline, and commitments of long-term management are in place in each Recovery Unit such that the frog is unlikely to need protection under the Act in the foreseeable future.

The total number of known sites occupied by frogs in Arizona increased from 49 in 2002 to 84 in 2009 (USFWS 2012) and 155 in 2018 (Mosley *et al.* 2019). The number of occupied sites in Arizona has increased markedly since implementation of the recovery actions outlined in the Recovery Plan (USFWS 2007).

Critical Habitat

The 2012 critical habitat rule for the frog designated 39 CHUs (approximately 10,346 acres) in the eight RUs within the range of the species in Arizona and New Mexico (USFWS 2012). The purpose of the designation of critical habitat is to conserve the physical or biological features essential to the conservation of the species, which may require special management consideration or protection. Based on our current knowledge of the physical or biological features and habitat characteristics required to sustain the species' life-history processes, we determined that the PCEs specific to the frog are:

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 we still consider these sites 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. Nonnative predators (*e.g.*, crayfish, American bullfrogs, nonnative predatory fishes) absent or occurring at levels that do not preclude presence of the frog.
    d. Absence of chytridiomycosis, or if present, then environmental, physiological, and genetic conditions are such that allow persistence of frogs.
    e. Upland areas that provide opportunities for foraging and basking that are immediately adjacent to or surrounding breeding aquatic and riparian habitat.

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 frogs, including, but not limited to, urban, industrial, or agricultural development; reservoirs that are 50 acres or more in size and contain predatory nonnative fishes, American bullfrogs, or crayfish; highways that do not include frog fencing and culverts; and walls, major dams, or other structures that physically block movement.

Except for 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 existing within the legal boundaries.

All areas designated as critical habitat will require some level of management to address the current and future threats to the frog and to maintain or restore the PCEs. Special management in aquatic breeding sites should occur to ensure that these sites provide water quantity, quality, and permanence or near permanence; cover; and absence of extraordinary predation and disease that can affect population persistence. In dispersal habitat, special management should occur to ensure frogs could move through those sites with reasonable success.

Critical habitat occurs within the Rim Country Project, and includes approximately 334 acres in the Crouch, Gentry, and Cherry creeks and Parallel Canyon Unit and 83 acres in the Ellison and Lewis creeks Unit within RU 5 (Mogollon Rim-Verde River, Arizona). This is approximately 57% (417 acres) of the critical habitat in this RU.

Previous Consultations
Given the wide-range of this species, several Federal actions affect this species every year. A complete list of all formal consultations affecting this species in Arizona is on our Arizona Ecological Services website.

Gila Trout

Legal Status
On March 11, 1967, we listed the Gila trout as endangered under the Federal Endangered Species Preservation Act of 1966 (32 FR 4001). Reasons for listing included hybridization, competition and predation by nonnative trout, and habitat degradation. The trout's endangered status was continued under the Endangered Species Act of 1973 (USFWS 1967), and we

reclassified it as a threatened species on July 18, 2006, with a special rule under section 4(d) of the Act (USFWS 2006). The 4(d) rule enables AGFD and the New Mexico Department of Fish and Game (NMDFG) to promulgate special regulations, in collaboration with FWS, allowing recreational fishing for trout (USFWS 2006).

Description and Life History

Gila trout have iridescent gold sides that blend to a darker shade of copper on the opercles (bony plates surrounding the gills). Spots on the body of this trout are small and profuse, generally occurring above the lateral line and extending onto the head, dorsal fin, and caudal fin. A faint, salmon-pink band is present on adults, particularly during spawning season when the normally white belly may have yellow or reddish orange streaks. A yellow cutthroat mark is present on most mature fish. Adult Gila trout commonly retain their parr marks (markings present when trout are less than a year old), although they may be faint or absent (Miller 1950, David, 1976).

There are five known remnant genetic lineages: Main Diamond Creek, South Diamond Creek, Whiskey Creek, Spruce Creek (USFWS 2006), and Iron Creek (Turner and Camack 2017). Analysis has found that the Iron Creek population is at least as "pure," genetically, as any of the other remnant populations (Turner and Camack 2017). None of the remnant lineages have indication of rainbow trout introgression (Iron Creek: Turner and Camack 2017, remaining 4 lineages: Wares *et al.* 2004).

Spawning of Gila trout occurs mainly in April and begins when water temperatures reach about 46 degrees Fahrenheit, but day length may also be an important cue. Gila trout fry emerge in 56 to 70 days. Females reach maturity between two to four years after hatching, and males typically reach maturity at two or three years. Most individuals are mature at a length of 6 inches or greater and live five years. Thus, most adult female Gila trout spawn only twice before dying, and most adult males only spawn three or four times before dying.

Habitat Requirements and Distribution

Gila trout require perennial streamflow and cold water aquatic habitats with unimpaired water quality to maintain persistent, viable populations. Flow regimes vary depending on the site-specific characteristics of stream reaches (*e.g.*, stream gradient, seepage, substrate composition, channel dimensions, and watershed hydrology) (Propst and Stefferud 1997). Streams with suitable habitat for Gila trout occur in coniferous and mixed woodland, montane coniferous forest, and subalpine coniferous forest (Dick-Peddie 1993).

Water quality in Gila trout habitat is generally characterized by high dissolved oxygen concentration, low turbidity and conductivity, low levels of total dissolved solids, and near-neutral pH (Hanson 1971). However, localized and radical changes in water quality may occur with removal of canopy shading and introduction of ash and sediment following forest fires (*e.g.*, Baker 1988, Novak 1988, Amaranthus *et al.* 1989, Rinne 1996, Gresswell 1999). Maximum water temperatures typically do not exceed 25 degrees Celsius (77 degrees Fahrenheit) (USFWS 2003).

Gila trout require a diversity of habitats sufficient to sustain all life stages of the species (*i.e.*, eggs, fry, juveniles, and adults). This includes suitable spawning habitat, habitat where fry can find shelter and food, and areas suitable for occupancy by juvenile and adult Gila trout.

Sufficient pool habitat and spawning habitat are likely the two most important habitat features with respect to Gila trout population persistence (USFWS 2021a).

Cover and large woody debris are important components of pool habitat, in terms of both pool formation and providing cover (Rinne 1980, Stefferud 1994). Gila trout size is positively correlated with maximum pool depth and individuals larger than 8 inches total length are typically found in pools 1.6 feet deep or deeper (Rinne 1978, 1981). Deep pools with low current velocity are also important for overwinter survival of Gila trout (Behnke 1992).

Gila trout are primarily insectivorous with adult dipterans, aquatic insect larvae or nymphs, and aquatic beetles commonly taken. Gila trout may also be somewhat piscivorous. In streams, they establish a feeding hierarchy in the pools and larger fish would chase away smaller fish.

Gila trout are endemic to mountain streams within the Gila, San Francisco, Agua Fria and Verde River drainages in New Mexico and Arizona (Miller 1950, Minckley 1973, Behnke 1992). The Miller (1950) described Gila trout as a species and they are native to the upper Gila and Verde watersheds of Arizona and New Mexico, but have declined significantly since the 1800s.

Threats

For Gila trout to be able to sustain populations in the wild over time, the species requires combinations of sufficiently large, healthy populations that, where possible, have connectivity to dendritic stream networks to maintain adequate population sizes and genetic variation (USFWS 2021a). Dendritic stream networks provide Gila trout with access to suitable habitat enabling the species to respond to changes in their biological and physical environment, environmental stochasticity, and catastrophic events. Few, if any, extant populations of Gila trout are large enough to survive extremes in environmental conditions, and the existing genetic diversity of the species is limited to five remnant lineages (USFWS 2021a). The spatial distribution of populations is constrained by the patchy distribution and geographic isolation of cold-water streams, many of which are single stream systems that are relatively small. Significant factors affecting the viability of Gila trout include habitat loss and fragmentation that result from large-scale, high-intensity wildfire and the effects of climate change; unregulated angling; predation and competition from nonnative fish that are naturalized throughout the Gila trout's historical range; hybridization with rainbow trout (*Oncorhynchus mykiss*); and small, isolated population sizes (USFWS 2021a).

Population Status

Since the 1990s and through 2020, there have been several Gila trout translocation efforts with varying success in Arizona and New Mexico. Stockings have occurred on the Prescott, Apache-Sitgreaves, Tonto, and Coconino NFs in Arizona, and the Gila NF in New Mexico. All Gila trout in New Mexico are in the Gila NF.

As of January 2020, 22 recovery populations of Gila trout occur in approximately 93.1 miles of stream (Gila trout Recovery Team 2020). AGFD stocked Coleman Creek with Spruce Creek lineage fish in August 2020, Marijilda Creek with a mix of lineages in October 2020, and in October 2021 they stocked KP Creek with Iron Creek lineage trout. These stockings increased the number of Gila trout recovery streams in Arizona to eight. The current recovery streams in Arizona are Grapevine Creek, Prescott NF; Dude and Chase creeks, Tonto NF; Frye and

Marijilda creeks, Coronado NF; and, Raspberry, Coleman, and KP creeks, Apache-Sitgreaves NFs (AGFD 2020; Zachary Beard, UFWS, pers. comm., 2020, 2021b).

Previous Consultations
Given the wide-range of this species, several Federal actions affect this species every year. A complete list of all formal consultations affecting this species in Arizona is on our Arizona Ecological Services website.

Narrow-headed Gartersnake

Legal Status
The FWS published the notice listing the gartersnake as threatened under the Act on July 8, 2014 (USFWS 2014). We re-proposed critical habitat on April 28, 2020 (USFWS 2020) and issued our final rule on October 21, 2021 (USFWS 2021a). Please refer to these rules for more in-depth information on the ecology and threats to the species and critical habitat, including references.

Description and Life History
The 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 distinguishes its appearance from other gartersnakes with which it could co-occur (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 towards the tail (Rosen and Schwalbe 1988, Boundy 1994). The scales are keeled.

Sexual maturity in gartersnakes occurs at 2.5 years of age in males and at 2 years of age in females (Degenhardt *et al.* 1996). Gartersnakes are viviparous (live bearing) and breed annually. Females give birth from late July into early August, perhaps earlier at lower elevations (Rosen and Schwalbe 1988). Longevity in this species may be as much as 10 years in the wild (Rosen and Schwalbe 1988).

Gartersnakes eat fish (Rosen and Schwalbe 1988, Degenhardt *et al.* 1996, Rossman *et al.* 1996, Nowak and Santana-Bendix 2002, Nowak 2006). The species is an underwater ambush hunter that is heavily dependent on visual cues when foraging (de Queiroz 2003, Hibbitts and Fitzgerald 2005); thus, sediment and turbidity levels may affect foraging success.

Habitat Requirements and Distribution
The gartersnake is widely considered aquatic in nature (Drummond and Marcías-García 1983, Rossman *et al.* 1996). It is strongly associated with clear, rocky streams, using predominantly pool and riffle habitat that includes cobbles and boulders (Rosen and Schwalbe 1988, Degenhardt *et al.* 1996, Rossman *et al.* 1996, Nowak and Santana-Bendix 2002, Ernst and Ernst 2003). The gartersnake is strongly associated with clear, rocky, perennial streams, using predominantly pool and riffle habitat that includes cobbles and boulders (Rosen and Schwalbe 1988, Degenhardt *et al.* 1996, Rossman et al. 1996, Nowak and Santana-Bendix 2002, Ernst and Ernst 2003). Observers have also documented the gartersnake using isolated pools within intermittent streams as foraging habitat; in some cases over a half-mile away from the nearest reach with above-ground flow (Cotton *et al.* 2017). Gartersnakes found in water represented less

than 10% of total observations according to a multi-year telemetry study in New Mexico (Jennings and Christman 2012). These data suggest that this species may spend a relatively small percentage of its time in the water, but compared to other native gartersnakes, it is still the most aquatic.

Terrestrial habitat is also important to gartersnake survival and includes the presence of cobbles, boulders, and bankside shrub vegetation for basking and foraging. The species will use rocks, logs or stumps, and debris jams as cover, while bankside vegetation composed of shrub- and sapling-sized plants such as Arizona alder (*Alnus oblongifolia*), velvet ash (*Fraxinus velutina*), and willows (*Salix spp.*) is used for thermoregulation at the water's edge. Gartersnakes also use terrestrial, upland habitat when hibernating, gestating, to escape floods, and during dispersal. Nowak (2006) found gartersnakes used upland habitat that was 328 feet from the nearest stream during early fall and spring months, and the species may strongly associate with boulders in the floodplain during summer months. Gartersnakes, when hibernating, may use upland habitat up to 656 feet from the floodplain (Nowak 2006).

The gartersnake occurs across the Mogollon Rim of Arizona and New Mexico, at elevations from approximately 2,300 to 8,000 feet. The species inhabits Petran Montane Conifer Forest, Great Basin Conifer Woodland, Interior Chaparral, and Arizona Upland Sonoran Desertscrub communities (Rosen and Schwalbe 1988, Brennan and Holycross 2006). The species occurred historically in headwater streams of the Gila River subbasin that drain the Mogollon Rim and White Mountains in Arizona, and the Gila Wilderness in New Mexico. Major subbasins in its historical distribution included the Salt and Verde River subbasins in Arizona, and the San Francisco and Gila River subbasins in New Mexico (Holycross *et al.* 2006). Despite the 2,300 foot low elevation record for gartersnakes at Horseshoe Bend along the Salt River (Rosen and Schwalbe 1988), Holycross *et al.* (2006) suspect the species was likely not historically present in the lowest reaches of the Salt, Verde, and Gila Rivers, even where perennial flow persisted. AGFD maintains numerous records for the gartersnake (through 1996) in their Heritage Database.

Threats

The occurrence of harmful (predatory) nonnative aquatic species such as crayfish (*O. virilis, Procambarus clarki*), numerous species of non-native fish (*i.e.*, bass [*Micropterus* spp.], flathead catfish [*Pylodictis olivaris*], channel catfish [*Ictalurus punctatus*], bullheads [*Ameiurus* spp.], and to a lesser extent, American bullfrogs, are the primary cause of gartersnake population declines rangewide, and continues to be the most significant threat to the species (*e.g.*, Rosen and Schwalbe 1988, Rinne 2004, Minckley and Marsh 2009). These nonnative species prey on gartersnakes and compete with snakes for a prey base of native fish, ultimately leading to reduced recruitment within gartersnake populations. Additional threats to the species and its habitat include water management actions that reduce stream flows or de-water gartersnake habitat (*e.g.*, dam construction, water diversions, flood-control projects, and groundwater pumping) threaten gartersnake habitat persistence and quality (Ligon *et al.* 1995; Turner and List 2007, USGS 2013). We also consider post-fire effects following high-severity, large-scale wildfires that remove habitat and prey species (sedimentation, ash flows, fish kills) a significant threat to the species (Rinne and Neary 1996, Gresswell 1999, Rinne 2004).

Other threats include development and recreation within riparian corridors, environmental contaminants, mortality from entanglement hazards such as erosion control products, intentional or unintentional killing of snakes by humans, drought, and climate change (USFWS 2014).

Population Status

Population densities have noticeably declined at many sites across the species' range (Holycross *et al*. 2006). In 2011, the only remaining gartersnake populations where surveys reliably found gartersnakes include: (1) Whitewater Creek (New Mexico), (2) Tularosa River (New Mexico), (3) Diamond Creek (New Mexico), (4) Middle Fork Gila River (New Mexico), and (5) Oak Creek Canyon (Arizona). However, in 2012, New Mexico's largest wildfire in state history occurred, the Whitewater-Baldy Complex Fire and post-fire ash and sediment flows negatively affected gartersnake populations in Whitewater Creek and the Middle Fork Gila River by killing fish. The gartersnake population in the Middle Fork Gila River appears to be stabilizing with the return of native fish (Christman 2016), but we consider gartersnakes in Whitewater Creek extirpated. Existing sampling data suggest that there are only three populations of gartersnakes where surveyors can somewhat reliably detect gartersnakes: (1) Tularosa River (New Mexico); (2) Middle Fork Gila River (New Mexico); and (3) Oak Creek/West Fork Oak Creek (Arizona).

Critical Habitat

We designated critical habitat for the gartersnake in eight CHUs in portions of Arizona and New Mexico comprising approximately 447 stream miles with a maximum 326-foot lateral extent of the stream channel in an area of 23,784 acres. Within the Rim Country Project area, there are portions of two CHUs, the Canyon Creek Unit 6 (Unit 6) and the Tonto Creek Subbasin Unit 7 (Unit 7). Unit 6 includes 204 acres along 5 stream miles of Canyon Creek, generally located along the Mogollon Rim in east central Arizona, Gila County. The Tonto NF manages all lands within this unit. Unit 7 consists of 2,293 acres in three subunits: Tonto Creek (28 stream miles), Houston Creek (0.7 stream mile), and Haigler Creek (12 stream miles). This unit is located southeast of Payson and northeast of the Phoenix metropolitan area, in Gila County, Arizona. Lands within this unit include NFS lands that the Tonto NF manages in the Hellsgate Wilderness and privately owned land.

We determined that the following physical or biological features (PBFs) are essential to the conservation of the gartersnake:

1. Perennial streams or spatially intermittent streams that provide both aquatic and terrestrial habitat that allows for immigration, emigration, and maintenance of population connectivity of gartersnakes and contain:
    (A) Pools, riffles, and cobble and boulder substrate, with low amount of fine sediment and substrate embeddedness;
    (B) Organic and natural inorganic structural features (*e.g*., cobble bars, rock piles, large boulders, logs or stumps, aquatic and wetland vegetation, logs, and debris jams) in the stream channel for basking, thermoregulation, shelter, prey base maintenance, and protection from predators;
    (C) Water quality that meets or exceeds applicable State surface water quality standards; and
    (D) Terrestrial habitat within 328 feet of the active stream channel (water's edge) that includes flood debris, rock piles, and rock walls containing cracks and crevices,

small mammal burrows, downed woody debris, and streamside vegetation (*e.g.*, alder, willow, sedges, and shrubs) for thermoregulation, shelter, brumation, and protection from predators throughout the year.

2. Hydrologic processes that maintain aquatic and riparian habitat through:
   (A) A natural flow regime that allows for periodic flooding, or if flows are modified or regulated, a flow regime that allows for the movement of water, sediment, nutrients, and debris through the stream network, as well as maintenance of native fish populations; and,
   (B) Physical hydrologic and geomorphic connection between the active stream channel and its adjacent terrestrial areas.
3. A combination of native fishes, and soft-rayed, nonnative fish species such that prey availability occurs across seasons and years.
4. An absence of nonnative aquatic predators, such as fish species of the families Centrarchidae and Ictaluridae, American bullfrogs, and crayfish, or occurrence of these nonnative predators at low enough levels such that recruitment of gartersnakes is not inhibited and maintenance of viable prey populations is still occurring.
5. Elevations of 2,300 to 8,200 feet.

Unit 6 contains all PBFs and fish community is primarily native and includes speckled dace (*Rhinichthys osculus*), desert sucker (*Catostomus clarkii*), and brown trout (*Salmo trutta*) (Burger 2015). The PBFs in this unit may require special management due to potential invasion by nonnative aquatic predatory species as well as the potential for high-intensity wildfires. Unit 7 contains PBFs 1, 2, 3, and 5, but PBF 4 is in degraded condition. The PBFs in this unit may require special management due to competition with, and predation by, nonnative aquatic species that are present in this unit; water diversions; flood-control projects; potential for high-intensity wildfires; and development of areas adjacent to or within critical habitat.

Previous Consultations
Given the wide-range of this species, several Federal actions affect this species every year. A complete list of all formal consultations affecting this species in Arizona is on our Arizona Ecological Services website.

Western Yellow-billed Cuckoo

Legal Status
The FWS listed the cuckoo as threatened on October 3, 2014 (USFWS 2014); we listed only the Western DPS. The FWS finalized critical habitat for the cuckoo on April 21, 2021 (USFWS 2021).

The cuckoo is a member of the avian family Cuculidae and the American Ornithologists' Union (AOU) recognizes it as a species (Chesser *et al*. 2019). The AOU does not currently recognize the western yellow-billed cuckoo as a subspecies; however, we accept this classification. The FWS's Genetics Community of Practice concluded that the cuckoo genetics studies (Fleischer 2001; Pruett *et al*. 2001; Farrell 2006, 2013; McNeil 2015) are inconclusive as to whether the eastern and western yellow-billed cuckoo populations are genetically different, primarily due to small sample size and lack of geographic representation in genetics samples (USFWS 2021).

Description and Life History

Adult cuckoos have a stout and slightly down-curved bill, a slender, elongated body with a long tail, and a narrow yellow ring of colored, bare skin around the eye (USFWS 2014). The plumage is grayish-brown above and white below, with reddish primary flight feathers. The tail feathers have large white spots on a black tail. They are a medium-sized bird about 12 inches in length, and about 2 ounces in weight. The bill is blue-black with yellow on the basal half of the lower mandible. The legs are short and bluish-gray. Males and females differ slightly and are indistinguishable in the field (Hughes 1999). The cuckoo breeding season is from May 15 through September 30, with most nesting occurring later in the season (July 1 through September 30).

Habitat Requirements and Distribution

Western populations of the cuckoo occur most commonly in large tracts of dense, multi-layered gallery forests consisting primarily of cottonwood (*Populus* spp.), willow (*Salix* spp.), and mesquite (*Prosopis* spp.), including mesquite bosque, along riparian corridors in otherwise arid areas (Laymon and Halterman 1989, Hughes 1999). Home ranges are flexible and territories may overlap in this weakly territorial species (Hughes 1999, Halterman 2009, Sechrist *et al.* 2013). Rangewide, individual home ranges during the breeding season average over 100 acres (Dillon and Moore 2020, Laymon and Halterman 1987; Laymon *et al.* 1997; Laymon and Williams 2002; Halterman 2009; Sechrist *et al.* 2009; McNeil *et al.* 2011, 2012, 2013; Sechrist *et al.* 2013). However, Laymon and Halterman (1985) found that cuckoo territory sizes ranged from 20 to 100 acres, and home range estimates for radio-telemetered cuckoos in New Mexico varied from 12 to 697 acres (Sechrist *et al.* 2009). In New Mexico, the average maximum daily distance traveled was 2,795 feet and the average maximum seasonal distance traveled was 4,790 feet.

Extensive riparian forests may support the greatest density of breeding cuckoos, but other habitats are also important for recovery (USFWS 2015). In Arizona, cuckoos use narrow bands of riparian woodland for nesting (AGFD 2015, Cornell Lab of Ornithology 2015) and even non-riparian habitats (*e.g.*, Madrean evergreen woodlands in the mountain drainages of southeastern Arizona) (Brown 1994, Corman and Magill 2000, Sferra *et al.* 2019). Tamarisk (*Tamarix* spp.) may be a component of breeding habitat, but there is usually a native riparian tree component present (Gaines and Laymon 1984, Johnson *et al.* 2008, McNeil *et al.* 2013, Carstensen *et al.* 2015). Site-specific variation is likely a result of characteristics unique to each location (*e.g.*, type and quality of habitat, patch configuration) (Hughes 1999, Halterman 2009, Sechrist *et al.* 2013). Habitat occurs in relatively contiguous stands of dense vegetation, in irregularly shaped mosaics of dense and open vegetation, and in patches that are narrow and linear or savannah-like.

Humid conditions created by surface and subsurface moisture and a multi-layered canopy appear to be important for successful hatching and rearing of young (Hamilton and Hamilton 1965, Gaines and Laymon 1984). Within the boundaries of the DPS, cuckoos occur from sea level to elevations up to 7,000 feet or more; however, the moist conditions that support riparian plant communities typically occur at lower elevations.

Cuckoo breeding habitat in much of the species' range is associated with perennial rivers and streams with regulated and unregulated flows (Poff *et al.* 1997). In southeastern Arizona, cuckoo's nest along more arid ephemeral and intermittent drainages (Corman and Magill 2000,

Corman and Wise-Gervais 2005, AGFD 2015, Cornell Lab of Ornithology 2015, Sferra *et al.* 2019). Hydrologic conditions at cuckoo breeding sites can vary widely in a single year and among years, and due to these changes, cuckoos may move from one area to another in the same season and from year to year.

Recent guidance on cuckoo habitat use (USFWS 2015) indicates that cuckoos are more flexible in their choice of foraging and migration stopover habitat than they are in selecting nesting habitat. Foraging areas can be less dense or patchier than nesting areas, with lower levels of canopy cover (Carstensen *et al.* 2015; Sechrist *et al.* 2009; USFWS, unpublished data). In Arizona, adjacent foraging habitat is usually more arid than nesting habitat. Habitat flexibility during migration may extend to monotypic tamarisk and shrubby habitats, hedgerows, coastal scrub, orchards, and semi-desert grasslands.

Cuckoos in the DPS were formerly widespread and locally common in much of the western U.S., Canada, and Mexico (AOU 1998, Hughes 1999). The largest remaining breeding areas are in southern and central California, Arizona, New Mexico, and northwestern Mexico (USFWS 2014). In Arizona, the species was a common resident chiefly in the lower Sonoran zones of southern, central, and western Arizona (Phillips *et al.* 1964). The cuckoo now nests primarily in the central and southern parts of the state.

Threats

The primary threat to the cuckoo is loss or fragmentation of high-quality riparian nesting habitat. Many factors have altered and eliminated cuckoo habitats, including damming, water diversions, ground water pumping, stream channelization and stabilization, agricultural development, mining, livestock grazing, high-severity wildfires, establishment of nonnative vegetation, drought, defoliation of tamarisk by the introduced tamarisk leaf beetle, and prey scarcity due to pesticides (Ehrlich *et al*. 1992, Corman and Wise-Gervais 2005, USFWS 2014). Habitat fragmentation has led to the isolation of small populations and has increased their susceptibility to further declines and local extirpations due to all the factors discussed above and to stochastic factors such as weather, fluctuating prey populations, and climate change (Thompson 1961, McGill 1975, Wilcove *et al.* 1986).

Population Status

In Arizona, cuckoos were a common resident in the lower Sonoran zones of southern, central, and western Arizona (Phillips *et al.* 1964, Groschupf 1987). Today, we know of cuckoo nests primarily in the central and southern parts of the state, in the Bill Williams, Verde, Gila, Santa Cruz, and San Pedro river basins, and at revegetation sites along the Lower Colorado River (McNeil *et al.* 2013, Halterman *et al.* 2016, USFWS 2020). Breeding cuckoos have declined recently in some of Arizona's largest populations (*e.g*., on the Bill Williams River) (USFWS 2020).

The San Pedro River in southeastern Arizona supports the state's largest cuckoo population and one of the largest populations in the DPS (USFWS 2020). Much of that population occurs in the San Pedro River National Conservation Area (SPRNCA) in the river's upper basin. Halterman (2002) reported >150 cuckoos in the SPRNCA in 2001, including up to 50 territorial pairs, though more recently detections of individual birds have been in the 25 to 80 range (EEC 2006, Vernadero Group 2009).

In 2019, the FWS estimated the cuckoo population in Arizona in 2019 at 450 breeding pairs; of these, approximately 100 were along the lower Colorado River (USFWS 2019). Despite cuckoo declines in perennial riparian habitat, the population in Arizona is the largest in the U.S. (USFWS 2019).

Previous Consultations
Given the wide range of this species, several Federal actions affect this species every year. A complete list of all formal consultations affecting this species in Arizona is on our Arizona Ecological Services website.

ENVIRONMENTAL BASELINE

Regulations implementing the Act (50 CFR 402.02) define the environmental baseline as the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. The environmental baseline includes the past and present effects of all Federal, State, or private actions and other human activities in the action area, the anticipated effects of all proposed Federal projects in the action that have already undergone formal or early section 7 consultation, and the effect of State or private actions which are contemporaneous with the consultation in process. The consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline.

The action area consists primarily of NFS lands so the majority of actions occurring within the Rim Country Project area are federal actions, and there are few State, tribal, or private actions affecting listed species and critical habitat. Key factors that have affected terrestrial and aquatic listed species and their critical habitat within the action area are past and ongoing vegetation removal activities associated with fuels reduction and forest restoration projects, fire and fuels management (particularly in the Wildland Urban Interface [WUI]), maintenance of vegetation along utility corridors, lands projects involving infrastructure repair/maintenance, recreation, and wildfire. The ongoing projects occurring within the Rim Country Project area have all included conservation measures to minimize effects to these species and their habitat.

Terrestrial Environmental Baseline

The Rim Country terrestrial landscape is a mosaic of forested canyons that include areas burnt by wildfires over the past 30 years as well as a legacy of land management actions that includes logging, livestock grazing, and road development. The focal forested vegetation for the project is ponderosa pine and mixed-conifer forest types, but the project area includes juniper forest types as well. The forested landscapes in the Rim Country Project area are highly departed from Forest Service desired conditions because the forests lack the preferred species composition, spatial arrangement, and structure. Forest stands across much of the project area exhibit extremely high tree densities as measured by basal area (BA; the total cross-sectional area of all tree stems in a stand measured at breast height, and expressed in square feet per acre) and the number of trees

per acre (TPA). Some of these areas are likely at high risk for high-intensity, stand-replacing fire; insects and disease; density-related mortality, and decreased resiliency to climate change.

Over the past 36 years, wildfire has burned an average of over 5.5 million acres of wildlands in the U.S. annually, with over 10 million acres burned in 2020 (Hoover and Hanson 2021, NIFC 2021). Although the number of fires burning did not change significantly over this time, the size and intensity of the fires have increased due to multiple factors, including higher ambient temperatures, drought, earlier snowmelt due to climate change, the spread of invasive species which increases fuel continuity, and historically high fuel loading from increased tree density and thick undergrowth (Landis *et al.* 2018). Across much of the project area, fuel loading within and adjacent to stands containing ecologically valuable large and/or old trees is such that tree mortality would be high in the event of a wildfire burning under high temperature and wind (unfavorable) conditions. There are approximately 133,000 acres where high-severity effects from past wildfires, such as the Dude and Rodeo-Chediski fires, insect and disease outbreaks, or harvesting operations have resulted in the loss of forest habitat. Warming temperatures and long-term drought have increased the potential for conditions across the project area that make the entire project area susceptible to landscape level, high-severity wildfire. This is a substantial threat to the landscape and to the listed species and critical habitat within the Rim Country Project area.

In the meadows and grasslands of the Rim Country Project area, junipers and other conifers have encroached into these once open grassland habitats, decreasing the size and function of vast areas that were historically much more open (*i.e.*, fewer conifers, more grassy expanses). As tree canopy increases, understory productivity decreases (Laughlin *et al.* 2011). The existing grasslands have impaired soil conditions due to inadequate protective ground cover, compacted soil surfaces, and encroaching pines and junipers. In many meadows, vegetative ground cover is low, hydrologic soil function is reduced from compaction, groundwater levels have dropped below root zones due to gully formation, and encroaching upland tree species are competing with desired understory plant species.

The Forest Service has implemented or is in the process of implementing multiple forest fuels reduction projects including the C.C. Cragin Watershed Protection, East Clear Creek Watershed Protection, Upper Beaver Creek Watershed Fuels Reduction, Clint's Well Forest Restoration, Spring Prescribed Burn, Rim Lakes Forest Restoration, and Nagel Forest Restoration projects. These projects are occurring within and/or adjacent to the Rim Country Project area, but have similar goals and objectives regarding reducing fuels, improving watershed condition, and decreasing high-intensity wildfire risk.

Aquatic Environmental Baseline

The Rim Country Project area encompasses the headwaters for the Little Colorado, Salt, and Verde rivers. There are approximately 4,055 miles of ephemeral, intermittent, and perennial stream channels within the project area (Table 3). Within the action area, both intermittent and perennial streams support riparian vegetation and provide aquatic habitat. Of these streams, approximately 360 miles are occupied or suitable habitat for listed aquatic species. Many riparian streams in the Rim Country Project area, particularly within the Rodeo-Chediski Fire area, are currently non-functioning or functioning-at-risk, with accelerated erosion and increased peak flows because of fire effects during and following the Rodeo-Chediski Fire. Most watersheds

within the Rim Country Project area rank as "fair" or "poor" for road and trail density, location, distribution, and maintenance. Roads near streams have the greatest effects on water quality and high road density increases effective drainage density, which can increase the size of damaging peak flows.

Watershed condition is the state of the physical and biological characteristics and processes within a watershed that affect the soil and hydrologic functions supporting aquatic ecosystems. The Forest Service used Watershed Condition Framework (WCF) rankings (USFS 2011) to describe the existing conditions for the 27 sub-watersheds that include habitat for spinedace, frog, gartersnake, and trout (Table 4). The WCF provides a consistent means to evaluate watershed condition by describing watershed condition in terms of discrete categories (or classes) that reflect the level of watershed health or integrity (USFS 2011). There are 12 watershed condition indicators, and the BA provided information regarding five of the indicators for each sub-watershed: *aquatic habitat* (habitat fragmentation, large woody debris, channel shape and function), *aquatic biota* (life form presence, native species, exotic/invasive species), *riparian/wetland vegetation* (vegetation condition), *water quality* (percent miles of impaired waters/303d listed or with water quality problems/not listed), and *roads and trails* (open road density, road maintenance, proximity to water, mass wasting) (Table 4).

The Rim Country Project occurs within portions of 142 different 6th Level HUC sub-watersheds. Of these sub-watersheds, thirty-eight have less than 5% of their total area within the project boundary. There are 27 sub-watersheds completely or mostly within the Rim Country Project area that include listed species habitat, as stated above. Overall, the project area is dominated by functional-at-risk sub-watersheds (about 451,500 acres or 46% of the analysis area); with several impaired sub-watersheds (about 316,800 acres or 32% the analysis area) and a few properly functioning sub-watersheds (about 220,400 acres or 22% of the analysis area). Twenty-nine sub-watersheds include federally listed species and/or habitat (Table 4).

The Forest Service rated aquatic habitat in 4 sub-watersheds in good condition, 16 in fair condition, and 7 in poor condition based on habitat quality, fragmentation, and stream channel condition (Table 4). Watersheds in 'poor condition' for aquatic habitat largely reflect past land uses (*i.e.*, livestock and wild ungulate grazing, logging), including fragmentation by roads, lack of large wood in channels, and altered channel morphology. For aquatic biota rankings, the Forest Service ranked 3 sub-watersheds in good condition, 12 in fair condition, and 12 watersheds in poor condition based on community structure (native vs. nonnative/invasive species) and continuity of populations. For the riparian vegetation indicator, they rated 2 sub-watersheds in good condition, 13 in fair condition, and 12 in poor condition based on relative condition and departure from potential vegetation. As with aquatic habitat, riparian conditions also reflect past land uses that are no longer active or allowed as well as ongoing effects from recreation (*e.g.*, OHV use). For water quality, they rated 14 sub-watersheds in good condition, 7 in fair condition, and 6 in poor condition.

The Forest Service determined riparian condition for listed aquatic species by averaging the WCF scores for the riparian vegetation indicator for all sub-watersheds within a species habitat. This provides an overview of riparian condition as it relates to each species and their associated habitat. Averages from 1-1.4 they considered 'Good,' 1.5-2.4 is 'Fair', and 2.5-3.0 is 'Poor.'

Sub-watersheds with listed species and critical habitat rated 'Fair' for trout and gartersnake, and 'Poor' for spinedace and frog.

Ecological Response Units (ERUs) are map unit constructs, or technical groupings, from the National Vegetation Classification (Cleland *et al.* 1997). The Rim Country Project area contains six ERU types: riparian, human/other (water), grassland, shrubland, woodland, and forest. Riparian ERUs occur on approximately 21,326 acres (<2% of project area) and represent vegetation types most closely associated with aquatic species and habitats. However, many high elevation streams are within Forested ERUs where ponderosa pine or mixed-conifer forests provide riparian functions such as stream shading and bank stabilization.

High concentrations of springs are present in the headwaters of Upper Clear Creek, West Clear Creek and East Verde River watersheds. Of the approximate 360 springs that the Spring Stewardship Institute inventoried within the Rim Country Project area, 214 have survey information. Information regarding historical flow or water quality from these springs is minimal. Most springs within the project area are either *rheocrene* (meaning they flow directly from the ground resulting in a small stream), *helocrene* (meaning they emerge from low gradient wetlands) or *hillslope* (meaning they emerge from confined or unconfined aquifers on a hillslope, often with indistinct or multiple sources).

Eighty springs, all of them on the Coconino NF, have Spring Ecosystem Assessment Protocol surveys (Stevens *et al.* 2016). The Spring Ecosystem Assessment Protocol (SEAP) is a process of evaluating the inventory data as well as other external information to generate a condition and risk score in each of the six predefined categories of variables. The potential threat or the "condition inertia" of that variable remaining unchanged is the risk to the spring. The six variable categories are: aquifer and water quality, site geomorphology, habitat and microhabitat array, site biota, human uses and influences, and administrative context or management. Of these eighty springs, surveys rated 82% to be at low to no risk with the remaining 18% at moderate or greater risk.

Current predictions of drought and/or higher winter low temperatures may also stress forest vegetation in the headwaters of the watersheds in which the spotted owl, spinedace, frog, trout and gartersnake occur. Drought and drier climates in conjunction with increased fuel loading could result in larger, more frequent, and more severe wildfires in the southwestern U.S. (Flannigan *et al.* 2009, Jolly *et al.* 2015). The effects of high-intensity wildfire include reduced vegetative cover and can result in greater soil erosion from increased droplet splash-erosion and reduced infiltration capacity, subsequently resulting in increased sediment flows in streams (Robinne *et al*. 2020). Increases in the number and severity of wildland fires on the landscape are likely to translate into more suppression activities and therefore more use of retardants, which could potentially affect aquatic and riparian habitats in the project area (USFWS 2011).

Climate Change

Warming of the earth's climate is unequivocal, as is now evident from observations of increases in average global air and ocean temperatures, widespread melting of glaciers and the polar ice cap, and rising sea level (Intergovernmental Panel on Climate Change [IPCC] 2007, 2014). The IPCC (2007) describes changes in natural ecosystems with potential widespread effects on many

organisms. The potential for rapid climate change poses a significant challenge for fish and wildlife conservation. Species abundance and distribution is dynamic, and dependent on a variety of factors, including climate (Parmesan and Galbraith 2004). Typically, as climate changes, the abundance and distribution of fish and wildlife will also change. Highly specialized or endemic species are likely to be most susceptible to the stresses of changing climate. Based on these findings and other similar studies, the Department of the Interior requires agencies under its direction to consider potential climate change effects as part of their long-range planning activities.

The Southwest is the hottest and driest region in the U.S. (Garfin *et al.* 2014). The IPCC (2007) stated that there would be an increase in the frequency of hot extremes, heat waves, and heavy precipitation events. Climate forecasts predict a northward shift in the jet stream and winter-spring storm tracks, which are consistent with observed trends over recent decades (Trenberth 2007). This would likely result in future drier conditions for the Southwest and an increasing probability of drought for the region (Trenberth 2007). Seager *et al.* (2007) show that there is a broad consensus among climate models that the Southwest will get drier in the 21st century and that the transition to a more arid climate is already under way. Only one of 19 models showed a trend toward a wetter climate in the Southwest (Seager *et al.* 2007).

The following are the likely future effects of climate change in Arizona and the Southwest (Frankson *et al.* 2017):

1. Average annual temperature has increased by almost 2 degrees Fahrenheit since the 1970s, and the number of hot days and warm nights has increased. Historically unprecedented future warming is likely.

2. The summer monsoon rainfall, which provides much needed water for agricultural and ecological systems, varies greatly from year to year and future trends in such precipitation are highly uncertain.

3. Droughts are a serious threat in this water-scarce state. Experts predict that drought intensity will increase and snowpack accumulation will decrease, which will pose a major challenge to environmental, agricultural, and human systems. Models project that wildfire frequency and severity will increase in Arizona.

Changes associated with climate change to riparian areas and aquatic habitats present some of the most important challenges for federally listed aquatic species within the Rim Country Project area. Predicted climate change effects include reduced precipitation and increased water losses from elevated evapotranspiration rates (Cayan *et al*. 2010, Easterling *et al.* 2017); altered flow regimes and increases in drought severity during summer low flows (Jaeger *et al.* 2014); and, increasing water temperatures in small streams that further limit habitat during seasonal low flows (Jaeger *et al.* 2014).

Key climate change factors affecting the entire Rim Country Project include increases in the frequency of extreme weather events and landscape level, high-intensity wildfire. The proposed action intends to indirectly address these climate change factors by increasing resiliency of

forests by reducing their vulnerability to high-intensity wildfire and by maintaining and/or enhancing native vegetation. Climate-induced changes to forest, riparian, and aquatic systems will continue to threaten listed species within the project area (Hagman *et al.* 2021); however, by reducing wildfire risk and improving watershed function, the proposed action may reduce, delay, and/or minimize anticipated climate change effects (Stephens *et al.* 2020).

Climate change has and will continue to affect the Rim Country Project area, particularly as high-intensity wildfire frequency and size increase. In addition, prolonged drought is reducing water availability throughout Arizona (EPA 2016). Currently, the best adaptation strategy we have for addressing the effects of climate change in areas like Rim Country is to implement projects that provide management direction, monitoring, and adaptive management that would improve the resiliency of the action area by reducing the effects of recreation and providing refugia for sensitive fish and wildlife species. We expect that the effects of climate change to fish, wildlife, and their habitat, as measured by key indicators in the monitoring plan, would inform Forest Service decisions regarding implementation of the Rim Country Project.

Mexican Spotted Owl

Status of the Species and Critical Habitat within the Action Area

The action area contains both PAC and recovery habitats as defined in the Recovery Plan (USFWS 2012). PACs are occupied activity centers that meet the definition of an owl site (USFWS 2012). Recovery habitat is defined as suitable, currently unoccupied habitat (outside of PACs) and is divided into two types: those areas that are identified as future nesting and roosting habitats, referred to as nest/roost replacement recovery habitat, and those habitats that are identified for all other uses, referred to as foraging/non-breeding recovery habitat. Management recommendations in the Recovery Plan are most conservative within nest cores of PACs and in nest/roost replacement habitat because spotted owl distribution in forested and rocky-canyon environments is limited primarily by the availability of habitat used for nesting and/or roosting (USFWS 2012).

Protected Activity Centers (PACs)

In the Rim Country Project area on the Coconino and Apache-Sitgreaves NFs, the Mexican spotted owl occupies mixed-conifer and ponderosa pine (*Pinus ponderosa*)-Gambel oak (*Quercus gambelii*) (hereafter pine-oak) vegetation types, usually characterized by high canopy closure, high stem density, multi-layered canopies within the stand, numerous snags, and downed woody material. On the Tonto NF within the project area, owls tend to use areas with pine and mixed-conifer “stringers” or areas in steep canyons often with large trees.

There are 214 designated Mexican spotted owl PACs on 120,522 acres in the Rim Country Project area (Table 5). We consider all PACs occupied for the life of the Recovery Plan (USFWS 2012). There are 98 PACs on the Coconino NF, 63 on the Apache-Sitgreaves NFs and 53 PACs on the Tonto NF. An additional 39,748 PAC acres are adjacent (outside) to the Rim Country Project boundary. Those PAC acres are part of separate NEPA analyses and section 7 consultation, except for the PACs that are in the Clint’s Well, Upper Beaver Creek, Rim Lakes, and Nagel project areas. These PACs are included in this project analysis to accommodate for recent PAC boundary changes and to analyze the effects of prescribed fire within nest cores.

Recovery Habitat
There are approximately 219,657 acres of recovery (suitable, but currently unoccupied) habitat within the Rim Country Project area. There are approximately 47,322 acres of mixed-conifer and approximately 138,324 acres of pine-oak habitat, based upon three different modeling techniques (Table 5). The Forest Service also modeled 34,011 acres of additional recovery habitat on the Tonto NF using two models the FWS recommended (Johnson 2003, Prather *et al.* 2005). The Recovery Plan (USFWS 2012, Table C.3) calls for managing 25% of mixed-conifer recovery habitat and 10% of pine-oak recovery habitat as nest/roost replacement habitat across the landscape. The Forest Service identified 13,664 acres of mixed-conifer, 19,639 acres of pine-oak, and 3,389 acres of modeled recovery habitat that they intend to manage as potential nest/roost replacement habitat within the Rim Country Project area (Table 5), which exceeds recovery plan recommendations. The Forest Service has not ground-truthed the recovery habitat; therefore, there will need to be corrections made during implementation either as areas that they modeled as habitat turn out not to be or areas the model did not identify are identified to be recovery habitat. This process of ground-truthing the modeled nest/roost replacement habitat is important for ensuring that the Forest Service is managing the most suitable areas for owl recovery.

Critical Habitat
Four CHUs overlap the Rim Country Project area (UGM-7, UGM-10, UGM-11, and BRW-5). Within these four CHUs, the Forest Service states that there are 266,275 acres of Mexican spotted owl habitat (111,599 PAC acres and 154,676 recovery/restricted acres) within the CHUs that meet the definition of critical habitat (Table 6). All of CHUs UGM-10 and BRW-5, and portions of UGM-7 and UGM-11, cover the project area.

Factors Affecting the Species and Critical Habitat within the Action Area
The interrelated effects from high-intensity, large wildland fires, historical and current fire management practices, historical silvicultural practices, grazing practices, recreational activities, and a changing climate have affected the Mexican spotted owl and its critical habitat through direct habitat loss and alteration or elimination of vegetation that may develop into roosting or nesting habitat. The potential for more large and intense wildland fire exists within the action area and has already resulted in the loss of extensive patches of owl habitat associated with fires such as the Rodeo-Chediski and Dude fires.

There is currently a high risk of crown fire in approximately 40% of PAC acres, in approximately 50% of nest/roost replacement recovery habitat acres, and in approximately 35% of foraging/dispersal recovery habitat acres. The Forest Service estimates that surface fuel loading in PACs is approximately 26 tons per acre in mixed-conifer and 19 tons per acre in pine-oak forest types. The reality is that surface fuel loading varies across the project area, but the desired condition is 5 to 15 tons per acre in mixed-conifer and 3 to 10 tons per acre in pine-oak forest types.

The Rim Country Project area has high scenic, cultural, wildlife, and recreational value. Public use of the project area is very heavy, with many heavily-used roads and trails (for both motorized and non-motorized use) and extensive camping, particularly in the late spring through late fall. The heavy use by people in these areas effects both owls, through disturbance (particularly

during the owl-breeding season [March 1-August 31]) and their habitat through cutting of oaks for firewood, user-created roads in sensitive habitats, etc.).

Little Colorado Spinedace

Status of the Species and Critical Habitat within the Action Area
Spinedace occur or have suitable habitat in approximately 132 miles of streams within the project area on the Coconino and Apache-Sitgreaves NFs (Table 7). There are seven streams that are either currently occupied by the spinedace or provide suitable habitat for recovery. Critical habitat occurs within two sections of East Clear Creek: 13 miles of stream above C.C. Cragin Reservoir and 18 miles of stream from the confluence of Leonard Canyon upstream to C.C. Cragin Reservoir.

Eleven sub-watersheds contain spinedace or suitable habitat within the project area. Riparian condition within these watersheds ranges from Properly Functioning (n=1) to Impaired (n=7) (Table 7). The average riparian condition for spinedace watersheds is 2.5 or 'Poor', which equates to Impaired.

Factors Affecting the Species and Critical Habitat within the Action Area
Dam construction (*i.e.*, C.C. Cragin Reservoir, Knoll Lake, and Bear Lake) on East Clear Creek, Leonard Canyon, and upper Chevelon Creek watershed altered spinedace habitats within the project area, prior to its listing as a threatened species. Other land management activities that have altered the habitat include historical timber harvest, livestock grazing, road construction and maintenance (or lack of road maintenance in many cases), recreational development and usage, fire management, and inter-basin water diversions. These activities have affected watershed function, runoff patterns, peak flows, seasonal flows, riparian vegetation, wet meadow functions, bank erosion, siltation, and water quality. Wildlife and fisheries management largely associated with providing hunting or fishing opportunities have altered the faunal component of the habitat. Introduction of non-native trout, baitfish, and crayfish at reservoirs within the project area increased competition for available resources and possibly predation on spinedace (USFWS 2021). In addition, there is concern that elk (*Cervus elaphus*) are much more abundant and consistently present in spinedace drainages than they were historically, and that they may have a significant effect on the existing riparian and aquatic habitats (USFS 1999). Elk are likely more abundant due to the creation of stock tanks across the area, which allows for more permanent water, which was likely a limiting factor historically. Elk likely spend more time in the project area due to warmer, drier winters with less snow to move them to lower elevations in the winter.

Soil compaction, particularly in headwater meadows, from roads, timber harvest operations, recreational development, and dispersed recreation cause these meadow areas to be less effective at storing water, which effects downstream flow into spinedace habitat.

Past fire management likely effected the hydrology of the watershed. Historically, fires burned through the pine and mixed-conifer forests within the East Clear and Chevelon watersheds and created a mosaic of stand sizes, ages, and densities. The success of suppression efforts over the past 100 years has resulted in densely stocked forests with high canopy closure. Although Forest Service fire staff has made significant efforts to conduct both prescribed fires and manage for

natural ignitions within the East Clear Creek watershed (Coconino NF), the increase in the number of trees within the watershed imposes a negative effect on the hydrologic cycle.

Permanent flowing water is a primary constituent element of critical habitat for the spinedace. Therefore, water currently being withdrawn from the area, and potentially lost to the watershed, affects habitat for the species. Livestock tanks, reservoirs, and water rights all have the potential to reduce the amount of water available for the spinedace. In addition, the C.C. Cragin Reservoir, Knoll Lake Reservoir, and ongoing water rights adjudication procedures all have the potential to affect the amount of water available to spinedace and critical habitat within the project area.

Chiricahua Leopard Frog

Status of the Species and Critical Habitat within the Action Area
The Rim Country Project Area occurs in RUs 5-Mogollon Rim (Coconino and Tonto NFs) and 6-Gila-White Mountain (Apache-Sitgreaves NFs). The RU 5 MAs that overlap the project area include Gentry Creek, Upper Verde River, West Mogollon, Alder Creek/West Chevelon Canyon, and East Clear Creek. All occupied sites and critical habitat areas are in the south flowing drainages on the Tonto NF (Figure 2). Critical habitat (approximately 417 total acres) occurs within the project area within the Gentry Creek MA (approximately 334 acres) including Cherry Creek and the West Fork of Gentry Creek and within the East Verde MA (approximately 83 acres) within the headwaters of Ellison Creek. The Chiricahua leopard frog currently does not occupy areas nor is there designated critical habitat within the north flowing Little Colorado River drainages on the Coconino and Apache-Sitgreaves NFs.

The AGFD, FWS, Forest Service, and Phoenix Zoo (collectively referred to as the Partners) have implemented captive rearing/head-starting recovery actions throughout the species range, including sites within the Rim Country Project area. It is due to our collective efforts that this species is persisting in the wild. This partnership is critical to keeping frogs on the landscape. Recovery actions include: (1) releasing captive bred and/or head-started frogs to unoccupied sites; (2) augmenting existing occupied sites to increase genetic variability; and (3) translocating wild egg masses to new or existing sites. Since 2009, the partners have released frogs to multiple sites on the Tonto NF, with a focus on releases to the Gentry and Upper Verde MAs in the last six years. There are at least six future release sites within the project area or within dispersal distance of it. Gruwell Spring occurs within the project area, while Rim, Grasshopper, Martin, and Lost tanks, and Pine Spring are within dispersal distance. We do not consider these populations robust (per the Recovery Plan definition) due to the small size of breeding habitats.

The Tonto NF defined potential frog habitat as areas where surveys have detected the frog or Partners have released frogs since 1998, plus a one-mile buffer to account for overland dispersal. This equates to approximately 42,274 acres of potential Chiricahua leopard frog habitat on the Tonto NF.

Calculating dispersal distance for frogs from currently occupied sites and proposed stocking locations encompasses an area across portions of fourteen sub-watersheds where the species could occur during the life of the project (Table 8). Riparian condition for these watersheds averages a rating of 2.5 or ‘Impaired.’

Factors Affecting the Species and Critical Habitat within the Action Area
The greatest threats to frogs in the Rim Country Project area are disease (*i.e.*, Chytridiomycosis, ranavirus), high-intensity fire effects to habitat, drought, and invasive species.

Surveys have detected Chytridiomycosis (Bd) in RU 5 and it appears to be an impediment to local recovery. Effective anti-fungal treatments or increased genetic diversity may allow for more persistence in the presence of disease. In 2018, the Partners detected it at Trail Tank and Carroll Spring in Gentry Creek MA. AGFD is working with a disease researcher to investigate the abundance of ranavirus on the landscape and its potential effects to frogs.

Large scale, high-intensity wildfire is a threat to frog habitats within the Rim Country Project area. Post-fire effects from high-flow events on hydrophobic soils could result in sedimentation of pools and tanks, thus reducing frog habitat quality and limit breeding activity. These effects occurred following the Highline Fire, which resulted in scouring of tributaries to Ellison Creek as well as other areas.

Lentic (standing water) and lotic (running water) sites in RU 5 tend to fluctuate heavily based on rainfall and snowpack, and many stable frog sites are dependent on precipitation to refill stock tanks or maintain flow in streams.

American bullfrogs are currently not a substantial threat in RU 5, although individuals continue to show up within the RU, on the Tonto NF, and require Partners to remove them quickly so they do not establish.

Gila Trout

Status of the Species within the Action Area
Gila trout occur in approximately 32.1 miles of streams within the project area (Table 9). There are six streams that are either currently occupied by the trout or provide suitable habitat for recovery efforts. Occupied streams are Chase and Dude creeks within the East Verde River sub-watershed; Christopher Creek within the Bull Tank Canyon-Tonto and Christopher creeks sub-watersheds; Ellison Creek within the Ellison Creek-East Verde River sub-watershed; Haigler Creek within the Haigler Creek sub-watershed; and Workman Creek in the Workman Creek sub-watershed. Riparian condition within the sub-watersheds ranges from Properly Functioning (Workman Creek) to Impaired (Chase, Christopher, and Dude creeks). The average riparian condition for Gila trout watersheds is 2.3, which equates to Functioning at Risk (Table 9).

Recovery populations exist in Dude Creek and Chase Creek. Dude Creek consists of mixed lineage fish (Main Diamond, South Diamond, Whiskey, and Spruce x Whiskey) stocked from 2015 to 2017 with evidence of reproduction in 2018 and 2019. AGFD conducted visual surveys in Dude Creek in 2019 and 2021 (Zachary Beard, UFWS, pers. comm., 2021a). In 2020, they observed 8 adults, 21 subadults, and 11 young-of-year which, compared with the last visual survey in 2019, found fewer adult fish but a substantial increase in young-of-year fish (42 adults, 19 subadults, and 183 young-of-year). Gila trout in Chase Creek came from the Iron Creek lineage which AGFD stocked in 2017 and 2018. AGFD conducted visual surveys in Chase Creek in 2020 and 2021 (Zachary Beard, UFWS, pers. comm., 2021a). In 2021, they observed 5 adults, 3 subadults and no young-of-year. These numbers are lower than the 2020 observations (23

adults, 12 subadults and 18 young-of-year). AGFD plans to complete a population estimate for Chase Creek in 2022.

As noted in the status of the species, the FWS did not designate critical habitat for Gila trout; therefore, none occurs within the Rim Country Project area.

Factors Affecting the Species within the Action Area

Within the Rim Country Project area Gila trout populations have decreased mainly due to wildfires and habitat loss, but former pressures like overfishing, competition with non-natives, and hybridization have also played a role in their decline (USFWS 2021b). Within the Rim Country Project area, high-intensity wildfire and climate change are the greatest factors affecting Gila trout.

High-intensity wildfires can adversely affect Gila trout through indirect effects to habitat quality. The 2012 Whitewater-Baldy Complex Fire in the Gila NF resulted in the loss of half of the existing Gila trout populations. High-severity fire effects degrade trout habitat quality by removing vegetation and depositing sediment and ash into streams, which alters flows and decreases stream oxygen such that trout cannot survive. Ellison Creek, on the Tonto NF and within the Rim Country Project area, burned in the 1990 Dude Fire, which resulted in the loss of almost all macroinvertebrates and trout in the affected streams (Rinne 1996). Ellison Creek, along with other affected headwater streams in the Dude Fire perimeter was still recovering from those fire effects (Leonard *et al.* 2017) when the 2017 Highline Fire re-burned the headwater area previously affected by the Dude Fire (Bogart 2020). Results show that repeated post-fire flooding disturbances on Ellison Creek had substantial changes to stream geomorphology and macroinvertebrate communities, both of which negatively affect trout habitat (Bogart 2020).

Climate change will result in a loss of suitable habitat (due to increased water temperature, reduced flow, and increased sediment input). Regional climate model predictions predict a 20% decrease in summer precipitation, a nearly 35.6 degrees Fahrenheit (2 degrees Celsius) increase in summertime average air temperature, and a pronounced increase in the number of days above 89.6 degree Fahrenheit (32 degrees Celsius) and 98.6 degree Fahrenheit (37 degrees Celsius), by mid-century (years 2040 to 2059) (Kennedy *et al.* 2008). These calculations indicate an elevation range shift of approximately 0.17 to 0.18 mile for Gila trout, and could represent a 70% loss in suitable habitat for existing trout streams during summer months based on changes in elevation (Kennedy *et al.* 2008). The increased temperatures and potential for decreased summer precipitation will also increase the risk of high-intensity wildfires, which are also a major threat to trout survival.

Within the Rim Country Project area, sport fishing for Gila trout occurs on the Tonto NF. Locations that overlap with recovery populations are catch and release, while non-recovery locations are put-and-take. In the fall of 2019, AGFD began stocking the East Verde River with Gila trout for recreation put-and-take fishing in lieu of the rainbow trout AGFD stocked historically. Beginning in 2021, AGFD approved a rule to open Dude Creek to catch-and-release angling between May 1 and December 31. AGFD stocked Gila trout into Christopher Creek in 2021, and AGFD completed section 7 consultation on plans to stock Haigler, Workman, Bonita, and Ellison Creeks and the lower Verde River (USFWS 2021b).

Narrow-headed Gartersnake

Status of the Species and Critical Habitat within the Action Area

Within the Rim Country Project area, two sub-watersheds, Canyon Creek headwaters and Haigler Creek, contain gartersnakes and critical habitat. Haigler Creek consists of alternating riffle, pool and waterfall habitats and has thick streamside vegetation, consisting of dense shrub thickets, overhanging tree canopies, tall grasses, and flood-associated debris (Goode and Parker 2015). These conditions are all indicative of high-quality gartersnake habitat. Non-native fish species present are brown trout in the upper reaches of the creek, and green sunfish at the confluence of Haigler and Gordon Creeks (Goode and Parker 2015). Haigler Creek also contains crayfish. Records documenting gartersnake occupancy of Haigler Creek go back to the 1990s. Surveys in Haigler Creek in 2014 found three juvenile gartersnakes in the project area (Goode and Parker 2015), but the habitat is complex and difficult to survey and the species is difficult to detect. The Tonto NF contracted AGFD biologists to survey Haigler Creek (O'Donnell *et al.* 2018). AGFD accumulated 28,800 trap-hours and did not detect any narrow-headed gartersnakes in Haigler Creek.

Canyon Creek contains a stable gartersnake population (Ryan *et al.* 2019). Canyon Creek, is one of the few streams draining the Mogollon Rim that does not have crayfish; it supports a fish community composed of native and nonnative species. The first approximately 5.6 miles of Canyon Creek, including its spring-fed headwaters, is on NFS lands and then if flows onto and through the Fort Apache Indian Reservation. The Rodeo-Chediski fire burned through the headwaters of Canyon Creek in 2002, but today there is a fish community consisting of brown trout, desert sucker, and speckled dace. Multiple gartersnake surveys in Canyon Creek from 2015 to 2018 found a relatively stable population with multiple size classes within the project area (Ryan *et al.* 2019).

Designated critical habitat includes all 5 miles of Unit 6 (Canyon Creek), and approximately 3.3 miles of the 12 miles within Unit 7 (Haigler Creek subunit) within the Rim Country Project area.

The riparian condition for both gartersnake watersheds, Canyon Creek headwaters and Haigler Creek, is 2.0, or 'Fair,' which equates to Functioning at Risk.

Factors Affecting the Species and Critical Habitat within the Action Area

The primary factors affecting the gartersnake and its critical habitat on the Tonto NF are the presence and introduction of predatory non-native aquatic species (bullfrogs, brown trout, crayfish, and predatory warm water fish) that compete with and prey upon both the gartersnake and its native prey species. Other factors include, but are not limited to, water diversions or other water-related actions that decrease water quantity and quality and limit native fish needed for the gartersnakes prey base; development or construction activities that trample, remove or degrade suitable stream bank habitat; drought; and, livestock grazing levels that reduce habitat quality for native fish or riparian habitat structure needed by gartersnakes.

Sport fishing and sport fish stocking occur on the Tonto NF overlaps narrow-headed gartersnake locations and critical habitat. Within Canyon Creek, the fish community is primarily native; however, there is the potential for nonnative aquatic predatory species to invade the creek. Additionally, the AGFD will stock brown trout two times over the next 10 years in Canyon

Creek (USFWS 2021b). There are nonnative fishes within Haigler Creek (Unit 7) that may affect gartersnake persistence.

In addition to nonnative sport fish, there is the potential for high-intensity wildfire, which could remove or substantially degrade habitat for the gartersnake. In Haigler Creek (Unit 7), there are also water diversions and flood control projects in areas adjacent to or within critical habitat.

Western Yellow-billed Cuckoo

Status of the Species within the Action Area

There are no known cuckoo locations within the Rim Country Project area. The nearest known possibly breeding cuckoos to the project area occur in the East Verde River near Doll Baby Ranch (approximately 8 miles straight line distance from the project boundary, Tonto NF). Other known cuckoo locations include the Verde River, Fossil Creek, Tonto Creek, and Rye Creek, none of which are within or adjacent to the project area, but are 8 or more miles away from the project boundary.

Due to a lack of cuckoo surveys within the project area, the Forest Service modeled potential cuckoo habitat. Using the Southwestern Region Forest Service riparian potential vegetation layer, the Forest Service estimated that there are approximately 14,500 acres of potential riparian habitat within the project area. Wildlife biologists have yet to ground-truth these areas to determine their suitability for migrating and/or nesting cuckoos. The habitat with the most potential to support migrating and/or nesting cuckoos is on the Tonto NF as there is very little cottonwood-willow riparian forest on the north-flowing drainages on the Coconino and Apache-Sitgreaves NFs within the project area. Regardless, the Forest Service took a very conservative approach and included areas of riparian vegetation in the Little Colorado River drainage in the pool of potential habitat.

We anticipate that foraging cuckoos use habitat in some of the drainages in the Rim Country Project area. The Rim Country Project area consists of steep, high-elevation drainages ranging from 4,300 to 8,850 feet elevation. The majority of cuckoo nest locations and detections are below 6,500 feet elevation in Arizona (AGFD 2015, Beauregard 2021), so we expect there may be some areas within the 1.2 million-acre project area that include potential cuckoo nesting habitat. While many of these riparian reaches are narrow, it is possible that cuckoos are using these areas. Narrow drainages with linear or scattered reaches of riparian trees can be cuckoo habitat. Intermittent and ephemeral reaches with water for at least part of the summer may also be cuckoo habitat (Susan Sferra USFWS, pers. comm., 2018). Higher elevation areas that spotted owls occupy are unlikely to provide cuckoo nesting habitat, but information is lacking in these areas and in the potential area of overlap (Beauregard 2021). Beauregard (2021) observed cuckoos in canyons containing pine and fir (*Abies* spp.) intermixed with riparian species in southeastern Arizona, but they have not yet documented nesting in such habitats and presume most of the higher-elevation cuckoo detections are migratory/transient. Higher-elevation canyons may be too cold to support the insects that cuckoos depend on, particularly in late-summer when cuckoos are attempting to breed.

There is no designated critical habitat within the Rim Country Project area. The nearest CHU, Beaver Creek (CHU-19) is approximately 7 miles east of the project area and Tonto Creek (CHU-22) is approximately 7 miles southeast of the project area.

Factors Affecting the Species within the Action Area
Tonto NF land use and management actions, such as livestock grazing and recreation, may have broad watershed and site-specific influences that may affect riparian habitat quality within and surrounding the action area. Factors affecting the potential 14,500 acres of cuckoo habitat include the risk of high-intensity wildfire to these areas as well as the effects of roads on riparian drainages within these acres.

EFFECTS OF THE ACTION

In accordance with 50 CFR 402.02, effects of the action are all consequences to listed species or critical habitat that the proposed action causes, including the consequences of all other activities that are caused by the proposed action. The proposed action causes a consequence if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (see §402.17).

For the proposed action, there are different treatments that combine mechanical vegetation treatment and prescribed fire, as well as restoration actions. The long-term goal of treatments is for improvement of overall watershed and riparian condition and function, including reduction of large-scale, high-intensity wildfire risk in watersheds. The proposed action would result in both long-term benefits as well as short-term adverse effects to spotted owls, spinedace, frogs, Gila trout, gartersnakes, and cuckoos, their habitat and critical habitat. These effects would occur from upland vegetation management actions that include mechanical vegetation removal, prescribed fire, facilitative operations, aspen management, severe disturbance area treatments, savanna restoration, grassland and meadow restoration, barrier (fence) construction, roads, rock pit use, and in-woods processing sites. Aquatic management actions may affect species and their habitats through riparian and wet meadow management, spring improvements, stream restoration action, and road decommissioning and relocation activities. Not all of these actions may result in adverse effects to listed species and/or critical habitat. We summarize the effects of these actions below and provide specific effects discussions for the owl, spinedace, frog, trout, gartersnake, and cuckoo following the general discussion.

GENERAL EFFECTS DISCUSSION

Due to the very large project area (approximately 1.2 million acres) it is unlikely that proposed actions would occur on all the acres and stream miles that the Forest Service has proposed for upland vegetation management (mechanical thinning, prescribed burning) and aquatic (riparian, spring and stream) restoration. We anticipate that the pace and scale of the proposed actions may be increased from previous years following completion of NEPA and ESA compliance, but other factors would also affect the pace of project implementation (*e.g.*, operator availability, focus on WUI acres, etc.). Additionally, the Forest Service, in cooperation with the FWS and other partners, would still need to determine feasibility of the actions proposed as well as ground-truth areas. This is where Condition-Based Management (Appendix D) and the ARRT (Appendix E)

would be used to ensure that the appropriate treatment (be it terrestrial or aquatic) is applied in the correct location utilizing the most appropriate design features to ensure that short-term adverse effects result in long-term benefits, as desired with implementation of the Rim Country Project. Therefore, the effects analyzed include the maximum effect anticipated to listed species and their habitats and are likely an overestimation of effects. Our experience with landscape level analyses is that implementation occurs at a slower rate than expected (*i.e.*, 4FRI Phase 1) and/or on-the ground conditions warrant less mechanical thinning than anticipated in areas as thinning, prescribed burning, and/or wildfires occur, or other factors change (*i.e.,* Flagstaff Watershed Protection Project).

Upland Vegetation Management Effects

Mechanical Vegetation Treatments

Thinning activities in target forest types (ponderosa pine and mixed-conifer) would modify forest structure by selectively removing mostly live trees to improve forest structure and function, and to reduce the risk of high-intensity wildfire. However, mechanical thinning can affect all forest structure and habitat components, including snags, downed logs, coarse woody debris, multi-storied canopies, canopy cover, and understory vegetation. The Forest Service may remove trees through many different mechanical methods. These methods may include using ground-based logging, cable logging, helicopter logging (only proposed as method in Pine Canyon for this consultation), and hand-thinning. The purpose in removing the trees is to reduce fuels in order to reduce fire risk as well as modify forest structure and tree density to align with the Forest Service's desired conditions for the project area. Besides affecting the TPA and tree BA, harvest methods may also result in increased or decreased effects to forest components such as snags (dead trees), an increase in weeds, and/or effects to soil, which can result in increased sedimentation and/or runoff if substantial soil compaction and rutting occurs.

The proposed action includes ground-based logging systems, cable yarding operations, hand thinning, and helicopter logging in Pine Canyon (Tonto NF).

- Ground-based systems drag or carry logs from the stump to the landing by driving over the harvest unit on or off skid trails. If slopes are less than 30-35%, ground-based operations, not cable or helicopter, are typically the methods of choice. Ground-based harvesting most commonly causes soil disturbance through compaction and the effect of this on site productivity or hydrologic function depends upon the degree, extent, distribution, and duration of the activity (Crawford *et al.* 2021). Depending upon the degrees of soil compaction, the duration of effects to soils may range from short- to long-term (Crawford e*t al.* 2021). The majority of mechanical vegetation treatments would occur outside of AMZs and the Forest Service would spread mechanical vegetation treatments out temporally and spatially within sub-watersheds to maintain soil condition and water quality. In addition, the Forest Service would implement design features to reduce potential erosion, sedimentation, and loss of streamside vegetation within the Rim Country Project area (Appendix F, see AQ008-013, AQ018, AQ032, AQ034, AQ040; FE011; RM004; RS010; SI014, SI019; SW001-013, SW022, SW027, SW045; WL002). For these reasons, we anticipate no meaningfully measurable effects from upland treatments to aquatic habitats.
- The Rim Country Project proposes to use cable yarding operations on approximately 54,609 acres of steep (≥35%) slopes within owl recovery and critical habitat, Gila trout

and Chiricahua leopard frog habitat, and gartersnake critical habitat. There would be no cable yarding in spinedace occupied or suitable habitat. Cable yarding operations conducted on steep slopes involve felling trees with a chainsaw, attaching them to a cable, and then pulling them up or down the slope by partially or completely suspending the tree above the soil (Garren *et al.* 2019). Cable yarding operations use a system of cables to drag whole logs from the cutting unit to a roadside landing on sites too steep for ground-based operations. Operators place roughly parallel "corridors" for the cable or skyline every 100 to 140 feet. These corridors are approximately 12 feet wide and operators must remove all trees from the corridor to facilitate worker safety. The areas proposed for cable yarding operations include steep slopes in drainages that likely contain larger trees and snags if they are on north to northeasterly facing slopes because of the wetter microclimate and historically decreased access to log these areas in the past. In the Flagstaff Watershed Protection Project, the Forest Service estimated the proposed cable/skyline logging would denude (strip) approximately 3% of the project area. Using the 3% as an estimate for this project as well means that cable logging may denude approximately 1,753 acres of steep slope forested areas. Cable operations generally reduce the need for the construction of temporary roads, which is a positive effect. Cable operations within AMZs could have short- and long-term negative effects to aquatic species and habitats over time resulting in erosion and sedimentation, streambank damage, and reduced riparian vegetation cover and structure from selective removal or crushing by people or logs. We expect increased sediment delivery to streams and reduced riparian vegetation to occur in the short-term until ground cover reestablishes within AMZs. In order to minimize negative effects to soil and watershed condition, the Forest Service would implement design features (Appendix F, see SW033-044). Project design criteria for erosion control structures and measures (SW022), cross ditches (SW036), and slash on cable corridors (SW033) would reduce the potential for sedimentation to reach streams and aquatic habitats from upland treatments. In addition, the Forest Service would utilize uphill cable yarding whenever practical (SW034) and would design any downhill cable yarding layout to minimize soil displacement. The same criteria also identify the need to minimize the number and widths of cable yarding corridors (RS010), if practicable.

- Hand thinning typically consists of mechanical thinning performed with the use of hand tools, such as, but not limited to, chainsaws, trimmers and loppers. Hand thinning involves the use of roads to access areas and crews typically cut and pile smaller diameter trees (usually ≤11 inches dbh). Because hand thinning removes small trees in the understory and involves minimal equipment, there may be disturbance effects to owls, but habitat effects are mostly positive from the removal of ladder fuels.
- Operations in Pine Canyon on the Tonto NF may include the use of helicopters to conduct tree thinning and woody material removal. Helicopter logging reduces the level of infrastructure (*i.e.*, roads, machinery) required to remove trees. This method also substantially reduces ground and soil effects and spread of invasive and/or noxious weeds because the ground is not being compacted by heavy machinery nor is that machinery present to spread weeds or bring in new invasive vegetation. There is the potential for increased noise disturbance from the helicopter to Mexican spotted owls in Pine Canyon.

Unless sediment is routed via a drainage, sediment delivery from logging >33 feet from streams is unlikely, particularly when the thinning uses design features to minimize adverse effects (Rashin *et al.* 2006). For the Rim Country Project, AMZ widths for listed aquatic species are a minimum of 150 feet. Additionally, Forest Service specialists may widen AMZs site-specifically, as needed, to protect resources. We expect that when thinning operations occur outside of AMZs, project design criteria for mechanized harvest and those specific to cable operations would maintain soil productivity and reduce erosion. Project design criteria should also minimize the potential for concentrated drainages and sediment delivery to streams and aquatic or riparian habitat from cable operations in the uplands. Design criteria include that no landings, decking areas or temporary roads would occur in AMZs (SW013), so these activities should not contribute sediment to aquatic habitats under the Rim Country Project. To implement thinning treatments in three areas on the Tonto NF, there is a need to build approximately 2.2 miles of temporary roads in AMZs; however, the temporary roads would be decommissioned when treatments are completed.

The Forest Service would utilize mechanical vegetation treatments within AMZs to reduce conifer density, reduce fire hazard, improve riparian forest health, and accelerate large woody debris recruitment. Treatments would focus on riparian desired condition. Short-term adverse effects could occur to AMZ vegetation from cable logging or skidding that removes or degrades canopy cover.

Cable operations within AMZs could have short- and long-term negative effects to aquatic species and habitats over time. Effects include exposed soils resulting in erosion and sedimentation, streambank damage, and reduced riparian vegetation cover and structure from selective removal or crushing by people or logs. Increased sedimentation can negatively alter habitat conditions by increasing fines and embeddedness to spawning substrates, decrease pool depths, and reduce the macroinvertebrate prey base by decreasing water quality. The Forest Service anticipates that increased sediment delivery to streams and reduced riparian vegetation would be short-term until ground cover reestablishes within AMZs. We anticipate that implementation of design criteria and best management practices (Appendix F) would minimize sedimentation delivery to streams, and that these effects would be short-term because as herbaceous ground cover reestablishes, soil impairment and loss would decrease.

Cable operations may damage stream banks causing bank instability and increased erosion and sedimentation. Design feature SW035 states that the Forest Service would use full suspension cable yarding across intermittent streams, perennial streams, and wetlands to the fullest extent possible to minimize dragging and creation of erosion features to soils and would minimize streambank damage, thereby reducing sedimentation to streams. No landings, decking areas, piling of any kind or temporary roads would occur in AMZs (SW013), except for the exception area identified on the Tonto NF, so these activities should not contribute sediment to aquatic habitats.

The current riparian condition of streams is another factor that would affect sediment delivery to streams. We expect negative sedimentation effects in drainages with poor riparian condition because the vegetation is not adequate to capture sediment. Additionally, areas in poor riparian condition tend lack connection to the water table and typically contain plant species more

reflective of upland areas due to the drier conditions. Fair riparian condition has riparian vegetation present and functioning at some level; therefore, we expect potential sedimentation delivery to streams to be less in these areas.

In the short-term (<5 years), treatments that use heavy machinery to conduct thinning activities may result in soil effects, such as compaction. Additionally, surface disturbance and decreased vegetation cover may temporarily result in higher levels of sediment entering waterways. Elevated sedimentation above current levels could negatively affect aquatic habitat, aquatic species, and water quality; particularly fish eggs and early life history stages that occur on or within substrate as well as the aquatic macroinvertebrate community structure. In the longer term (>5 years), herbaceous ground cover would reestablish and should increase given reduced conifer canopy cover and increased sunlight reaching the ground. Therefore, we anticipate that forest thinning activities over the next two decades may result in short-term adverse effects, but would ultimately decrease soil loss and watershed impairment, thereby benefiting watershed habitat conditions for listed species.

Prescribed Fire Treatments

Prescribed fire, the deliberate application of fire to reduce forest fuels and reestablish fire as a process as stated above, is part of the proposed action. Fire may affect wildlife either directly through heat and flames, or indirectly through modification of habitat (Knapp *et al*. 2009, Block *et al*. 2016). Effects from prescribed burning in forested wildlife habitats are difficult to quantify due to the uncertainty inherent in the application of prescribed fire, the variability in existing condition prior to burning (*i.e*., TPA, BA, etc.), and the time since the area last burned. The Rim Country Project includes design features to minimize the loss or modification of large trees, snags, and logs during all prescribed burning treatments (Appendix F) and the use of prescribed fire would aid in reducing the risk of high-severity crown fire effects (Fernandes and Botelho 2003, Schwilk *et al.* 2009). The benefits to all listed species and critical habitats analyzed in this biological opinion far outweigh the negative effects of prescribed fire because of the long-term benefits to the landscape in reduced high-intensity fire risk and size of high-severity burn patches (Block *et al.* 2016, Jones *et al.* 2020). Therefore, although there would be short-term adverse effects to large logs, snags, large trees, and Gambel oaks from these activities (Horton and Mannan 1988); prescribed fire would also maintain and enhance wildlife habitat and aid in reducing the risk of high-severity wildfires that can generate toxic smoke, contaminate waters, and disrupt hydrologic processes (Ebel and Moody 2017, Sil *et al.* 2019.).

Randall-Parker and Miller (2002) monitored the effects of prescribed fire in ponderosa pine forest on snags, downed logs, Gambel oaks, and old ponderosa pine trees at five sites on two national forests (Coconino and Kaibab) and a national monument (Walnut Canyon). Crews conducted all burns in the fall. At all sites except one, some snags were lined (*i.e*., duff and debris raked away from the base of the dead tree). Results included the following:

- Fire consumed or converted to logs 21% of all snags monitored and the range of loss across sites was 12 to 38%. Fire also created 9 snags: 6 of these were old-growth trees that the fire converted from live to dead trees and two were Gambel oaks.
- Fire consumed 53% of all logs monitored. Log loss did not differ by tree species.
- Six percent of the 282 Gambel oaks greater than ten inches dbh were lost, and loss ranged from 0 to 9% across the five sites.

- Old growth tree loss across the sites ranged from 0 to 6%.

Another study conducted as part of the Birds and Burns Network (Saab *et al*. 2006), also evaluated the magnitude of change in the quantities of downed wood, snags, and trees within one year after prescribed burn treatments in the Southwest. Study areas were located in ponderosa pine forests in six treatment units located on the Apache-Sitgreaves, Coconino, Kaibab, and Gila NFs. Although few of the results were statistically significant at $p \leq 0.05$, results included the following:

- Prescribed fire consumed nearly half of large downed wood (≥9 inch large end diameter). The authors surmised that drought conditions, followed by low wood moistures prior to fire treatments, may have contributed to the large loss of downed wood.
- Fire treatments significantly reduced overall tree densities. However, the greatest reduction in tree densities was in the smallest size classes (< 3 inches dbh and ≥3 to <9 inches dbh), with little change in larger (≥9 inches dbh) tree densities. Small diameter trees tend to function as ladder fuels in dense stands and can carry flames into the crowns of mature trees; therefore, the removal of these smaller trees would reduce the likelihood of stand-replacing fire, which is one goal of the proposed action. Large tree (≥9 inches dbh) densities changed relatively little following prescribed fire.
- Smaller snag (<9 inches dbh) densities increased 30 to 60%. With time, these dead trees could contribute to increased risk of spot fires.

The Coconino NF's monitoring data from previously implemented projects in ponderosa pine forest also has shown losses of key habitat components following prescribed burns. Microhabitat monitoring from burns implemented on the Happy Jack Urban Interface Project on the Mogollon Rim Ranger District through late 2004 showed an 8% loss of trees greater than 18 inches dbh, a 21% loss of snags (based on a pre-treatment count), a 71% loss of logs, and a 47% loss of Gambel oak trees greater than five inches dbh. In addition, prescribed burns conducted along Highway 87 and Forest Highway 3 (2005 to 2006) appear to have had loss of canopy cover and basal area. We think that implementation of design features to protect key forested habitat components (*i.e*., large trees, snags) and the reduced risk of landscape level, high-intensity wildfire, will aid in reducing short-term adverse effects and ensuring long-term beneficial effects.

Burning slash piles can result in soil disturbance and large piles can have long-lasting effects on the soil with burn scars lasting up to 50 years (Korb *et al.* 2004, Seymour and Tecle 2004, Rhoades and Fornwalt 2015). Slash pile burning may cause soil sterilization, increased erosion risk and an increased risk of invasive and noxious weeds that displace native vegetation. Employing piling techniques that minimize soil burn severity (*e.g*., rack-and-pile technique) can reduce the amount of detrimental soil disturbance (Gier *et al*. 2018). Further, smaller piles (<16.5 feet in diameter) can be rehabilitated with mulches (Fornwalt and Rhoades 2011). The Forest Service would implement design features to reduce negative soil effects from burning slash piles. Design features the Forest Service would implement to minimize effects to upland habitat from prescribed fire include BT003, FE002, FE003, FE004, FE005, FE006, FE007, FE008, FE010, and RS004 (Appendix F).

The amount of smoke produced by a prescribed burn will vary depending upon fuel characteristics (*e.g.*, type, loading, continuity, combustion) and total area burned (NWCG 2020). Smoke can negatively affect human health, particularly when the duration of exposure is prolonged and concentrations are high (Fowler 2003, EPA 2021). Few studies have investigated the effects of smoke on wildlife; however, Sanderfoot *et al.* (2021, *In Press*) determined that wildfires, particularly large, high-intensity wildfires, can generate smoke that is adverse to the health and behavior of wildlife. Because of social issues around smoke, fire managers typically plan prescribed burns to minimize effects to human communities (*i.e.*, burn unit size/location, season of burn, air movement); some of these considerations likely reduce adverse effect to wildlife as well. This does not mean there are no adverse smoke effects to wildlife from prescribed burns; however, we think that adverse effects to wildlife from smoke generated during a prescribed burn would be of shorter duration and less intense than the smoke a large, high-intensity wildlife may generate. The Rim Country Project also includes design features to minimize the effects of prescribed fire smoke to listed species (See WL015 and WL024, Appendix F).

Prescribed burning has the potential for negative short-term effects to riparian condition and harm to individual gartersnakes or frogs. If the Forest Service constructs fire lines in aquatic species habitat or fire removes or reduces vegetation, this may result in increased sedimentation from the disturbed soils in the fire line and decreased canopy cover from fire-killed vegetation. However, the Rim Country Project includes a design feature (SW008) that stated that fire managers would construct fire lines in AMZs only with District Biologist approval and they must use non-ground disturbing techniques. Implementation of this design feature will minimize the effects of fire line to spinedace, frogs, trout and/or gartersnakes riparian habitat.

Flames from prescribed fire are unlikely to affect aquatic habitats; however, wind and water can transport ash from the burn into stream courses and may temporarily and in small areas alter the water chemistry (Stephens *et al.* 2004). The potential for these effects depends upon the size of the burn units, proximity to aquatic habitats, the intensity of the fire, subsequent precipitation, and prior conditions of the watershed and riparian conditions (Rieman *et al.* 2003). Fire managers would spread prescribed burns out in time and space within watersheds, with no more than 50% of a sub-watershed treated in a given year and no more than 80% treated over 5 years. Spatial and temporal distribution of burns should also reduce potential effects (no greater than 5% areal extent of uplands or within an AMZ in each burn unit). In areas where riparian condition is currently impaired, we anticipate that short-term adverse effects may be increased and last longer because vegetation in these systems is not adequate to capture sediment.

We anticipate that the long-term effects of prescribed burning would be positive for riparian condition. Reduced fuel loading would protect these areas from high-intensity wildfire in the future. Large woody debris recruitment and streamside cover or structure can also improve with prescribed fire. Fire plays an important role in maintaining heterogeneity in riparian and aquatic systems (Gresswell 1999); therefore, restoring the fire regime would benefit long-term riparian condition.

Design features the Forest Service would implement to minimize effects to aquatic habitat from prescribed fire include FE003, FE007, FE008, FE011, RM004, SW012, SW054, SW050, SW051, TR002 (Appendix F).

Facilitative Operations

Facilitative operations includes the use of mechanical treatment methods and would use ground-based logging systems or hand thinning as well as prescribed burning on non-target cover types to support treatments in target cover types. The effects from facilitative operations are as described under Mechanical Vegetation Treatments and Prescribed Fire treatments, above.

Aspen Restoration

The Forest Service would use the tools described above under Mechanical Vegetation Treatments to remove conifers within 66 feet (one chain) of identified aspen clones to promote growth. The removal of conifers would create openings to allow for early seral species, such as aspen, to regenerate and increase vegetative diversity within forested areas.

Severe Disturbance Area Treatments

The Forest Service would conduct mechanical thinning, mastication, prescribed burns (broadcast and pile burns), machine or hand piling, as well as lop and scatter of slash material within areas affected by past disturbances (*e.g.*, Rodeo-Chediski Fire area). We describe the effects of these actions on habitat (vegetation cutting and burning) under Mechanical Vegetation Treatments, above.

Savanna Restoration

The Forest Service would use ground-based logging systems, hand thinning, and prescribed fire to restore and sustain open-savanna habitat types. There is no listed species habitat within savanna restoration sites; therefore, there would be no effects to listed species from this activity.

Grassland and Meadow Restoration

The Forest Service would use ground-based logging systems and hand thinning to remove conifers from grassland and meadows. We described the effects of ground-based logging and thinning systems under Mechanical Vegetation treatments, above.

Barrier Fence Construction

The Forest Service would construct fences to protect aspen restoration, sensitive plant areas, springs, and ephemeral channel restoration exclosures from domestic and wild ungulate browsing. They may remove vegetation (*i.e.*, trees) and use mechanical or hand tools to construct fences, but they would implement design feature (AQ010) to minimize the removal of vegetation during fence construction. Installation of fencing generally occurs outside of wetted areas and is unlikely to have adverse effects to aquatic species. All fencing will include bird diverters to protect birds.

Road Use

The proposed action assumes that the Forest Service may use nearly all the existing roads in the Rim Country Project area to provide access for a variety of restoration activities, including hauling of forest products resulting from mechanical treatments. The Forest Service would open ML-1 roads (currently closed roads used for administrative purposes only) to facilitate

mechanical vegetation treatments and close these roads once treatment units are completed. Project use of ML-1 roads adds to the open road density when combined with ML 2 through ML-5 roads. Approximately 2,184 miles of ML-1 roads occur in the project area with 1,683 miles identified for maintenance, and the proposed action would allow for the construction of temporary roads. The Forest Service would not open all of the ML-1 roads or construct temporary roads at the same time across the project area, so effects from road opening, maintenance, and closing would shift through space and time. The Forest Service would only open and/or construct those ML-1 and temporary roads required for implementation of the proposed action and they would properly maintain roads during implementation. Road maintenance, closure, and decommissioning would follow Forest Service policy and design features (Appendix F).

The proposed action may use approximately 333 miles of temporary roads to facilitate mechanical vegetation activities. These may be new locations and/or utilizing non-system roads and the Forest Service would decommission the roads following their use. Temporary roads can cause negative effects to riparian condition, and habitat connectivity, as well as potentially introduce pollutants and or invasive species. Effects to riparian condition include reduced riparian vegetation cover or structure removal of vegetation, both of which are components of gartersnake critical habitat as well as some aquatic macroinvertebrates that are part of the prey base for fish.

Low water road crossings can cause negative short-term effects to riparian condition, habitat connectivity, individual fish, frogs, and/or gartersnakes, and introduction of pollutants or aquatic invasive species that are similar to the discussion above on ML-1 roads. Low water road crossings can alter riparian condition by reducing riparian vegetation cover or structure, impacting stream channel function and structure; alter and degrade aquatic habitat by compacting substrates; and alter and degrade aquatic habitat through changes in water quality from increased sedimentation. Increased use low water stream crossings can also cause harm to individual fish, frogs, and/or gartersnakes when they occur within species habitats or AMZs. The number of stream crossings could also increase, which can fragment habitat unless crossings allow for fish passage. Additionally, stream crossings may increase sedimentation from streambank damage. Harm could potentially occur to listed aquatic species from vehicles utilizing stream crossings or driving within riparian areas. Associated ground disturbance and increased sedimentation delivery to riparian areas and streams is expected to occur in the short term until the Forest Service decommissions the temporary roads.

In general, roads compact soils and reduce infiltration of water leading to increased erosion and runoff. They increase the drainage network to riparian areas and streams and connect these areas to the uplands by altering surface water pathways. This converts dispersed surface runoff and sediment filtering through a riparian area to direct deliveries of accumulated runoff and sediment. Subsequent decreases in riparian condition from increases in peak flows and sedimentation could occur, but would vary based on their current condition.

Design features for limiting stream crossings, not creating new temporary roads in AMZs (except for 2.2 miles on the Tonto NF that is not in listed species aquatic habitat), and limiting crossings to ephemeral channels should minimize the effects described. Design features the Forest Service

would implement to minimize effects from road use include SW013, as well as others (Appendix F).

Pollutants (contaminants) in the form of fuels and lubricants would be present at equipment staging areas and near operating equipment, but the Forest Service included design features to mitigate potential effects from spills and leaks. These measures range from checking for leaks daily to ensuring that refueling and staging areas are outside AMZs. Similarly, machinery or vehicles using temporary roads can introduce aquatic invasive species or diseases. There are design features included in the proposed action of cleaning and decontamination of equipment to minimize or eliminate this effect. Design features the Forest Service would implement to prevent contaminants, disease, or aquatic invasive species from entering riparian areas, waterbodies and aquatic habitats include AQ001, AQ003, AQ023, AQ026, AQ028, AQ038, SW015, SW016, and SW074 (Appendix F).

Rock Pits

In order to provide adequate sources of road surfacing material for the proposed action, the Forest Service would utilize and expand 11 existing rock pits within the project area. In order to allow for potential future material needs, the Forest Service may expand all pits by 30%. We do not anticipate any effects to any aquatic species or habitats from rock pit use or expansion because none of the proposed rock pits occur within 0.5 mile of occupied or suitable spinedace, Chiricahua leopard frog, Gila trout, or gartersnake aquatic habitat.

In-Woods Processing Sites

In order to facilitate the types of tasks and equipment that may use these sites, the Forest Service would clear all vegetative cover at processing sites resulting in displacement of topsoil and exposure of subsoil. The operation of equipment on these sites would result in compaction of the soil, reducing the ability of soils to infiltrate water. To minimize erosion and facilitate use of the site, the Forest Service (or operator) would cover exposed soil with aggregate. The aggregate surfacing would cover the surface soil where it is not graded and protect the soil productivity.

Following completion of use of processing sites and removal of all equipment and materials, the operator would conduct site rehabilitation, including removal of aggregate, restoration of pre-disturbance site grades, de-compaction of soil for seedbed preparation, and seeding and mulching of the site with native grasses and forbs. As described in the proposed action, the Forest Service selected these sites to avoid listed species and critical habitat. The Forest Service would implement design features to minimize ground disturbance, erosion, and effects to sensitive habitats (Appendix F, see SU011, SU012, SW065, WL046, and WL050).

Aquatic Management Effects

Riparian and Wet Meadow Restoration

The intent of restoring riparian vegetation is to benefit aquatic species by storing more water in riparian floodplains, which should result in cooler and increased water availability during dry periods. Improving riparian vegetation composition and distribution in headwater meadows can improve the riparian function, water flows and timing of water flows. Vegetative density should be such that high flows push down plants so they cover any bare ground, which would decrease eroding streambanks and help trap sediments, thus aggrading the site.

The Forest Service would use hand thinning, mechanical thinning, prescribed fire, hand planting, mechanical planting/seeding, fence installation, seasonal restrictions, trail or road removal/relocation, and trail creation to improve riparian and wet meadow function.

- Thinning riparian areas by hand thinning would have insignificant effects to aquatic species within the stream systems. There is potential for disturbance to frogs and gartersnakes that may be onshore or in the AMZ.
- Mechanical riparian thinning would result in insignificant effects to aquatic species within the stream systems unless there is ground disturbance. There may be some change in conifer shade cover, but it should not result in effects that increase stream temperature or change invertebrate abundance. The Forest Service would implement design features to maintain stream shade (Appendix F, see AQ032, AQ033-34, BT001). The Forest Service would also implement design features to minimize sedimentation inputs from equipment or tree skidding (Appendix F).
- We anticipate that prescribed fire in riparian and wet meadows would have short-term effects to riparian vegetation because it generally recovers quickly in response to low intensity fire. There is the potential for disturbance effects to gartersnakes and frogs when managers conduct prescribed fires within riparian areas or dispersal areas but the Forest Service would implement design features exist to reduce effects.
- We anticipate insignificant and discountable effects from hand planting vegetation. Riparian planting increases bank stability, shade, and organic matter inputs to streams improving stream habitat.
- The installation of fencing should not affect aquatic species in stream systems. There is potential for disturbance or trampling of frogs or gartersnakes onshore if the Forest Service uses mechanized equipment.
- Implementation of seasonal restrictions is an administrative action that should have long-term positive effects to habitats for aquatic species by removing human disturbance. The Forest Service may use timing restrictions to reduce effects to listed species or soil conditions.
- Trail or road removal/relocation could result in disturbance to frogs or gartersnakes in occupied or dispersal habitat.
- The Forest Service may create trails in areas to minimize further resource damage. Trail construction may result in negative effects during construction, but design features should minimize short-term adverse effects (Appendix F).

Spring Restoration

Spring projects are varied but are concentrated on improving the flow and vegetation around springs. Some of this work may occur within wetted areas and could potentially have short-term negative effect to species that inhabit the springs. Ultimately the action should be beneficial for aquatic species, particularly Chiricahua leopard frogs. The Forest Service would implement design features to minimize ground disturbance and effects to these sensitive areas (Appendix F, see SW014, SW018-19, SW045, and SW070).

The Forest Service may improve or remove boxes or other infrastructure using hand methods for excavation such as shovels, or mechanical methods such as trackhoes, jackhammers, or concrete

saws to restore natural spring function. If listed species occupy spring habitats there is the potential for direct effects to Chiricahua leopard frogs and tadpoles and short-term effects from sedimentation from digging within wetted areas. Design features such as timing restrictions or salvage should minimize these potential effects.

The Forest Service may install fencing to protect the spring emergence zone and/or springbrook from ungulate disturbance and to benefit aquatic species habitats. Fencing installation generally occurs outside of wetted areas and is unlikely to have direct negative effects to aquatic species.

Stream Restoration

Due to the large area, it is unlikely that restoration actions would occur in all the acres and stream miles that the Forest Service is proposing for riparian, spring and stream restoration. In the past, the Forest Service has only been able to implement a few projects per year. The pace and scale of restoration may be increased from previous years since much of the compliance paperwork will be accomplished with this project. The Rim Country Project proposes to conduct stream restoration treatments in watersheds occupied by the spinedace, Chiricahua leopard frog, Gila trout, and gartersnake. The intent is that these projects would result in long-term benefits, but there would be short-term adverse effects, including harm and harassment to these aquatic species.

The Forest Service may conduct general stream treatments by hand or using machinery such as driving a vehicle to a site, pneumatic post pounder, or gas-powered auger. Heavy mechanical treatments are those that require machinery such as a trackhoe or front-end loader. Both implementation types could have effects to aquatic species. These methods generally occur within the stream channel and floodplains. Projects utilizing heavy machinery are likely to be larger in scope than those utilizing only hand methods. Although disturbance may be initially higher with heavy machinery, project effects are often less noticeable soon after the project is completed. Projects that utilize hand methods often take a more natural approach and require several seasons of flow events or vegetation growth to produce measurable improvements to habitats.

We expect that the long-term effects of stream restoration projects would be positive for aquatic species, although some actions may result in a degree of short-term negative effects to aquatic species and their habitats, including displacement within project areas or even death from dewatering. Short-term effects include disturbance within the streams and nearby floodplains, which may result in sediment plumes while work is occurring or during storm events. Additionally, temporary disturbance of occupied habitats and displacement of individuals, temporary reduction of riparian vegetation cover in the project area, and change of channel structure could occur. These effects are considered short-term and sediment should be moved downstream during the first high stream flow. Beneficial effects of general stream treatments can be immediate and long-term. The response to projects such as headcut stabilization may have an immediate effect of improving stream function and restoring fish passage upstream.

Multiple project design features are included in the project to minimize adverse effects where feasible given the nature of these methods (Appendix F). The Forest Service would implement design features AQ008, AQ011, AQ030, SW063, SW065-68, SW070 to reduce the effects of heavy equipment and the effects of sedimentation. They would reduce effects to riparian

vegetation by implementing AQ014, AQ032-34, AQ035, AQ037, SI001, SI003, SI023, and SW008-9. There are also design features for site rehabilitation (SW059-63) and stockpiling materials from uplands for use in streams (SI007).

Road Decommissioning and Relocation

Proposed road projects include road relocation and decommissioning, which includes restoring a road surface to a more natural state, as well as projects that improve the interaction of roads with stream channels. The Forest Service would design these projects to improve stream function and morphology. Short-term negative effects to individual aquatic species and riparian condition would be similar to those discussed above for aquatic restoration. Direct effects to individuals could occur for species in riparian or in stream habitats that interact with these roads.

There are long-term benefits from reducing road density, including: improved riparian condition from reduction in runoff and sedimentation; fewer road crossings; and, decreased fatality or disturbance of frogs or gartersnakes along roads. Road density is a major factor in the current condition of most sub-watersheds with listed aquatic species in the project area. Reducing road density by decommissioning roads could help improve watershed condition. Relocating and improving roads and stream crossings does not reduce overall road density, but can help alleviate effects to streams, particularly if the action moves roads further from a stream or riparian area.

The Forest Service would implement design features to reduce affects from road decommissioning (SW045, SW062-64, TR008-9, and TR011) and relocation (SW058, TR010, and TR011) (Appendix F).

Mexican Spotted Owl and Critical Habitat

Effects of the Action on the Mexican Spotted Owl

If the proposed action is able to reduce the risk of large, high-intensity fire to PACs and nest/roost replacement habitat, the most substantial effect to owls, in the long term, would be beneficial. In order to accomplish this task, there would be short-term adverse effects to owls and their habitat following mechanical vegetation and prescribed burn treatments in PACs and nest-roost replacement habitat (including effects from comprehensive restoration activities); and, road use (maintenance, hauling, creation of skid trails, and temporary road construction). There would also be smoke effects and potential for noise disturbance, but we anticipate these effects to be less severe and occur less often, particularly since most activities would occur outside the owl breeding season (March 1 – August 31). Below we summarize the effects of these activities, as well as other components of the proposed action, on owls and their habitat.

Mechanical Vegetation and Prescribed Burn Treatments

- There are approximately 120,522 acres within PAC boundaries (214 PACs), 219,657 acres of recovery habitat, and 266,275 acres of critical habitat in the Rim Country Project area (Tables 5 and 6). The proposed action is to mechanically thin and burn approximately 14,641 PAC acres (this includes 1,190 acres of hand thinning and 2,192 acres of grassland, riparian, and wet meadow restoration) and conduct prescribed burn only treatments on approximately 82,254 PAC acres (this includes 1,356 PAC acres of grassland, riparian and wet meadow restoration). The Forest Service included approximately 169,435 acres of recovery habitat for mechanical thinning, prescribed

burning and comprehensive restoration treatments. No cable operations would occur in PACs (WL016, Appendix F), but cable operations could occur in recovery habitat (30,985 acres [5,045 acres in nest/roost recovery habitat, and 25,941 acres in foraging/non-breeding recovery habitat]). AS noted above, there is the potential for increased noise disturbance from the helicopter to Mexican spotted owls in Pine Canyon.

The Forest Service would also use mechanical thinning as part of grassland, wet meadow, and riparian restoration (comprehensive restoration actions) to remove conifer encroachment and meet desired conditions in these areas. In addition, they may utilize mechanical equipment for stream and spring restoration actions. There are up to 2,192 PAC acres of mechanical thinning and 4,990 acres of recovery habitat (1,636 acres nest/roost replacement recovery habitat and 3,355 in foraging/dispersal recovery habitat) proposed for comprehensive restoration. The Forest Service proposes up to 148.2 miles of general stream restoration and 23.3 miles of heavy mechanical stream restoration habitat in PACs, with potentially 23.3 miles of general and 4.9 miles of heavy mechanical stream restoration in nest cores. General stream treatments include hand methods as well as pneumatic post pounders, gas-powered augers, or similar equipment. Heavy mechanical treatments are those that require machinery such as a trackhoe or front-end loader. Both of these activities could result in noise disturbance and/or habitat alteration. Design features (Appendix F) and conservation measures would remove the potential to disturb breeding owls as comprehensive restoration actions would occur outside the owl-breeding season. The Forest Service would implement design features AQ008, AQ014, AQ024, AQ032-035, AQ037-038, SI001, SI003, SI023, SW008-009, SW060-061, SW073-074, SW076, and SW079 (Appendix F) to minimize effects to owls and their habitat from these activities.

The Forest Service would implement the following conservation measures, as well as other design features (Appendix F), to minimize adverse effects to owls.

- Treatment in PACs and nest/roost recovery habitat would be consistent with recovery plan management recommendations and desired conditions (USFWS 2012).
- The Forest Service would hand-mark trees for thinning within PAC stands. Forest Service silvicultural and timber staff would coordinate PAC prescriptions and tree marking with the FWS.
- Fire managers would protect owl nest trees in the design and during implementation of prescribed fires.
- All potential Mexican spotted owl habitat would be surveyed to FWS survey protocol.
- Coordinate burning spatially and temporally to limit adverse smoke effects, particularly in low-lying areas where smoke may settle, to breeding Mexican spotted owls (March 1 – August 31).
- The Forest Service would not conduct any cable operations or temporary road construction in PACs.
- If the Forest Service and FWS establish new PACs within the Rim Country Project area, all existing design features and conservation measures to minimize effects to owls would apply to management activities. This would include modifying prescriptions and activities, as appropriate.
- The Forest Service would ensure that all personnel involved in thinning and burning activities, transportation of equipment and forest products, research, or restoration activities are briefed on Mexican spotted owl biology; would be provided guidance on

how to avoid disturbance to owls and other pertinent conservation measures; and, would be are informed as to whom to contact and what to do if an owl is seen, incidentally injured, killed, or found injured or dead. The Forest Service would develop these materials in coordination with the FWS.

To minimize disturbance to owls during the breeding season (March 1 – August 31), the Forest Service included the following measures:

- The Forest Service, contractors, or partners would not conduct mechanical (including the potential use of helicopters in Pine Canyon, Tonto NF) or prescribed fire treatments, road or trail maintenance, or comprehensive restoration operations during the breeding season in PACs.
- Fire managers would not construct fireline for prescribed burning operations during the breeding season in PACs.
- The Forest Service, contractors, and/or partners would not conduct spring, riparian and stream restoration, and road obliteration, relocation, and maintenance in PACs during the breeding season.
- For all breeding season restrictions, the Forest Service proposes to waive timing restrictions on a case-by-case basis if protocol surveys confirm non-nesting or if the District Biologist, in coordination with FWS, determines actions within 0.25 mile would not disturb breeding birds. Thinning equipment would remain ≥0.25 mile from PAC boundaries during the breeding season unless the District Biologist, in coordination with FWS, determines topographic features would reduce noise such that noise effects would be discountable.

Thinning and/or prescribed burning activities in PAC and recovery habitat may indirectly affect Mexican spotted owls by affecting the habitat structure including snags, downed logs, woody debris, multi-storied canopies, and dense canopy cover. Under the proposed action, the Forest Service would work with the FWS to design all treatments in PAC and recovery habitats to move toward the desired conditions as identified in the Recovery Plan (USFWS 2012). The Forest Service conducted models that show that the treatments would mostly move toward development of desired conditions both immediately after treatment and continuing over the next 10 to 20 years. There are modeled reductions of 12 to 18 inch dbh trees in mixed-conifer areas post-treatment, and we expect there would be other reductions in key habitat components across the project area. Resource managers are still learning how to conduct mechanical thinning treatment in owl habitat and as such, there is little data to show that mechanical thinning is able to create the modeled conditions when the intent is to remove trees and fuels. It is also unclear how over the next 20 years climate change within the project area would exacerbate long-term drought; wildfire size and intensity; and, what compounding effects these things would have on owl habitat.

Treatments would maintain large snags and large logs and develop trees into the larger size classes. Operators would not target snags for removal except where necessary for cable corridor locations and safety requirements. Trees greater than 18 inches dbh would not be cut in PAC or recovery nest/roost habitat, and trees greater than 24 inches dbh would not be cut in recovery habitat (including nest/roost replacement habitat), except where necessary for cable corridor locations. Cable and helicopter logging (helicopter logging only analyzed for Pine Canyon,

Tonto NF) also may require that operators remove hazard trees to provide for safety of personnel on the ground outside of protected (closed cab) machinery. Therefore, although the proposed action is to maintain snags and large and old trees, we anticipate cable operations would result in the loss of these two habitat components across approximately 3% of the nest/roost replacement habitat (approximately 211 acres) and foraging/dispersal recovery habitat (approximately 811 acres). The potential adverse effects to nest/roost replacement habitat increase because the Rim Country Project proposes to mechanically treat a substantial number of acres of nest/roost replacement habitat. Although the Forest Service intends to protect large and old trees as part of the proposed action, the removal of snags and trees greater than 24 inches dbh would occur in nest/roost replacement recovery habitat. Forest Service modeling indicates that following treatment there would still be enough large trees to meet the LRMP desired conditions, but the location and distribution of these trees may or may not be conducive to development of future nest/roost habitat.

If the Forest Service uses helicopter logging in Pine Canyon (Tonto NF), it would occur outside the owl-breeding season to minimize breeding season disturbance to owls. Helicopter logging tends to need large and more landings for the woody biomass material and for the helicopter and the operations that support it. We anticipate that these larger landings could result in either increasing the size of existing openings and/or the creation of larger openings within owl PAC and/or recovery habitat. The Forest Service would work with the FWS to place these landings as far from nest core areas as practicable and reduce the effects to key habitat components; however, there would be some adverse effects because of the helicopter logging in Pine Canyon.

A benefit of cable and helicopter logging would be the reduction in ground disturbance from heavy machinery on steep slopes, which would minimize soil compaction, rutting, and/or exposure of bare mineral soil. The protection of soil on these steep slopes should allow for quicker herbaceous recovery post-logging.

Effects from prescribed burning in PAC and recovery habitats are difficult to quantify due to the uncertainty inherent in using fire as a treatment. Design features are in place to minimize the loss or modification of large trees, snags, and logs during prescribed burning treatments. In the process of applying fire deliberately to this landscape, experience and research have shown that large logs, snags, large trees, and Gambel oaks – all key habitat components of Mexican spotted owl habitat – may be lost or damaged during these activities (Horton and Mannan 1988, Randall-Parker and Miller 2002, Saab *et al.* 2006).

The Forest Service may conduct prescribed burning (broadcast and pile burns) in 214 PACs. Smoke from broadcast and pile-burning could temporarily disturb owls. To minimize the potential for smoke to affect breeding owls, the Forest Service plans to conduct prescribed burns outside the owl-breeding season (March 1 – August 31) (Appendix F). Fire managers may reduce short-term adverse smoke effects through coordination and timing and type of burning with wind direction, topography, time of year, and distance to PACs. Prevailing southwest winds and the topography of the area typically act to lift smoke, carrying it away from ignitions sites. We do not expect smoke to settle in PACs on raised topographic features (higher elevation sites, headwaters, along the Mogollon Rim) long enough to cause discernable effects to owls because of air movement in these landscape-scaled features; however, owl in drainages off the Mogollon

Rim may have smoke settle in them. First-entry burns are likely to result in greater amounts of smoke due to existing fuel loads that are above pre-settlement levels. Because of these fuel loads, uncharacteristically dense smoke could settle into PACs during initial burn operations or if weather conditions change during a prescribed burn, causing owls to breathe heavy smoke and/or causing behavioral changes that result in energy expenditures or increased risk of predation.

We expect that prescribed burning would reduce the risk of wildfire by reducing accumulations of fuels, but it would also modify and/or result in the loss of the key habitat components that comprise Mexican spotted owl habitat, both in recovery habitat and within PACs. The Forest Service would implement design features/conservation measures in an attempt to minimize these losses, but it is difficult to reduce and protect fuels on the same piece of ground. We think that fire staff involved in implementing the project have gained experience over the years and would use design features (Appendix F) to ensure that they enhance or maintain most key habitat components (*i.e.*, large trees, large snags, etc.) post-fire. However, based upon the sheer number of acres proposed for burning each year, and because the intention is to apply prescribed fire to most PACs and nest-roost replacement habitat, we think that there is a likelihood that key habitat components would be unintentionally lost to fire and that this could result in short-term adverse effects to Mexican spotted owls, particularly within nest cores and nest/roost recovery habitat.

Facilitative Operations

The Forest Service would use mechanical and fire treatments in the piñon-juniper vegetation cover type to support the use of prescribed fire in mixed-conifer and pine-oak habitat on 140 PAC acres. This could include mastication/chipping; lop and scatter; thinning and/or limbing trees; and moving, rearranging, or removing excessive surface fuels. The Forest Service identified facilitative operation areas to improve safety, improve treatment effectiveness, expand burn windows, decrease undesirable fire behavior and effects, and minimize disturbance from fireline construction. The Forest Service would implement design features (Appendix F) to reduce adverse effects to the owl and its habitat on these acres. The acres are included in the mechanical thinning and prescribed burning treatment acres identified above.

Severe Disturbance Area Treatments

Severe disturbance areas would use a combination of reforestation, prescribed fire, lopping/scattering, mastication, and other mechanical methods to encourage low to low-moderate intensity fire within target vegetation types. The Forest Service identified approximately 130 PAC acres within Severe Disturbance Area treatment areas. The Forest Service would implement design features (Appendix F) to reduce adverse effects to the owl and its habitat on these acres. The acres are included in the mechanical thinning and prescribed burning treatment acres identified above.

Barrier Fence Construction

In PACs, the Forest Service would not construct any new wire fencing and all added fencing will include bird diverters to minimize the risk of owls colliding with new fences. Staff would identify other fencing alternatives for aspen, sensitive plants, springs, and ephemeral channel restoration exclosures within PACs. Although new fences can adversely affect owls, the use of non-wire fencing alternatives and efforts to minimize vegetation removal during fence construction (AQ010) would result in insignificant effects to owls. Additionally, design features include PAC breeding season restrictions. Implementation will occur outside of the owl-breeding

season unless protocol surveys do not locate owls during the breeding season of activity (with concurrence from FWS).

Road Use

Maintaining, using, and constructing a transportation system to move people, equipment, and forest products on and off the Rim Country Project area would result in effects to owls. Effects from road maintenance and construction, high volumes of traffic, and decommissioning can result in minor effects to habitat (widening, tree removal, fill and grading), noise disturbance to owls in the presence of large amounts of traffic, and possible death from collisions of owls and vehicles. The Forest Service would not build any roads, including temporary roads in PACs or nest cores, but would build roads, including temporary roads, in recovery habitat.

Hauling would generally avoid Mexican spotted owl PACs during the breeding season (March 1 to August 31) unless the District Biologist, in coordination with the FWS, conducts a site-specific analysis indicating the hauling would not lead to additional adverse effects or FWS protocol surveys indicate non-breeding or infer absence. The Forest Service proposes to waive timing restrictions on a case-by-case basis if protocol surveys confirm non-nesting or if the District Biologist, in coordination with FWS, determines hauling within 0.25 mile of the PAC would not disturb breeding birds. The Forest Service included a design feature indicating that logging trucks would drive less than or equal to 25 miles per hour (mph) in PACs during the breeding season (March 1 – August 31). However, owls are present in the project area year round and hauling would occur during sunrise and sunset hours when owls are most active.

Road maintenance and construction would have short-term negative effects to habitat from up to 330 miles of new temporary or existing non-system roads project wide. The Forest Service would decommission these roads following completion of restoration activities. We expect long-term beneficial effects from the decommissioning of 490 miles of existing roads and up to 800 miles of unauthorized roads in the project area. Neither road maintenance nor road decommissioning activities would occur during the breeding season in PACs. The Forest Service may waive this breeding season restriction on a case-by-case basis, using the process described above. We do not anticipate that road maintenance and construction may result in owl collisions because these actions tend to occur during the day, when owls are less active and they have less exposure to collisions.

Rock Pits

There are no rock pits within PACs in the project area. The Rim Country Project incorporates design features to reduce potential adverse effects from rock pit development, operation, and hauling to owls and other wildlife (Appendix F). Specifically for the Mexican spotted owl:

- The Forest Service would conduct protocol surveys at rock pits within 0.5 mile of PACs and recovery habitat before operations begin, unless the District Biologist, in coordination with FWS, determines this restriction is unnecessary.
- No ground disturbance from rock pit development or operation would occur in known PACs, or within 0.25 mile of nests and roosts during the breeding season, unless a District Biologist, in coordination with FWS, determines this restriction is unnecessary.
- Material hauling from rock pits 0.25 mile or less from PACs would occur outside of the owl breeding season unless the District Biologist, in coordination with FWS, determines this restriction is unnecessary.

In-Woods Processing Sites
The proposed action includes 12 processing sites ranging in size from 2 to 21 acres on the Coconino and Tonto NFs. All proposed processing sites occur >0.25 mile from PACs and are not located in recovery habitat; therefore there should be reduced noise and disturbance effects from these sites to owls.

The Recovery Plan (USFWS 2012) recommends that when a land management agency proposes mechanical thinning treatments in PACs, the following should occur:

- Strategic Placement of Treatments: The Rim Country Project did conduct a landscape-level risk assessment to prioritize mechanical treatments. The 4FRI Restoration Strategy (USFS 2021) emphasizes the need to prioritize and strategically place treatments.
- Area Limitations: The Rim Country Project proposes to mechanically thin approximately 15.1% of the non-core PAC area within the project area that are within the UGM EMU and approximately 5.9% of the non-core PAC area within the project area that are within the BRW EMU. Although this is a substantial amount of PAC area to treat, we expect these treatments to aid in improving forest structure, function and resiliency as long-term drought and climate change continue to be significant factors affecting the project area.
- Designate Nest/Roost Core Areas: All PACs would have designated nest/roost cores prior to mechanical treatment occurring in the PAC.
- Types of Treatments: The proposed action includes the Forest Service working with the FWS to produce and implement prescriptions for both mechanical and prescribed burn treatments that would reduce fire hazard while we strive to maintain or improve habitat conditions for the owl and its prey. The Forest Service would strive to implement actions that meet the FWS's desired conditions for PACs (Table C.2, USFWS 2012).
- Seasonal Restrictions: The Forest Service would conduct mechanical treatments from September 1 through February 28, which is during the non-breeding season, to minimize disturbance to resident owls during the breeding season, unless non-breeding is inferred or confirmed that year, per the FWS survey protocol (Appendix D, USFWS 2012).
- Monitoring Treatment Effects on Owls: Per the Recovery Plan (USFWS 2012), monitoring must be designed and implemented to evaluate the effects of treatments on owls and retention of or movement towards desired conditions. The Recovery Team knew that not all projects would lend themselves to monitoring, but recommended specifically that the 4FRI include monitoring. The Forest Service and FWS emphasized in their October 26, 2020, letter to WildEarth Guardians that we would work collaboratively to develop and implement rigorous and quality controlled management experiments to determine the effects of management treatments on owls and owl habitat, per the Recovery Plan (USFWS 2012). The BA did not include a monitoring plan, but as noted in the Forest Service/FWS letter, the biological opinion for this project would provide the final monitoring plan for landscape level project. We worked with the Southwestern Region Forest Service Staff and Rocky Mountain Research Station to develop the management experiment/monitoring plan in this document (Appendix C) to increase not only our knowledge of the owl and its habitat use, but to also address the increased speed with which we need to learn so that we can implement mechanical and prescribed fire treatments more efficiently and effectively, thus improving our ability to reduce the risk of high-severity fire effects to existing and potential nest/roost habitat within the project area.

Summary
In summary, we expect that the proposed mechanical thinning and prescribed burning would reduce the risk of large, high-intensity wildfires by reducing accumulations of fuels and increasing vegetative diversity, and in the long term is our best plan for maintaining and creating owl nest/roost habitat. The proposed action would also have short-term adverse effects over the lifespan of the project due to the modification and/or loss of the key habitat components, both in PACs and nest/roost replacement recovery habitat. The Forest Service would implement design features (Appendix F) and conservation measures to minimize adverse habitat effects, but these measures would not remove all short-term adverse effects. Based upon the number of acres proposed for treatments, we think the proposed action would cause the loss of key habitat components, particularly within nest cores because of prescribed fire and within nest/roost replacement habitat because of mechanical treatments, particularly cable operations. These effects would result in loss of potential nest/roost habitat, albeit at a relatively small scale as implementation of the Recovery Plan (USFWS 2012) recommendations would aid in minimizing the removal/loss of key habitat components. The breeding season restrictions and efforts to minimize noise disturbance to owls would substantially reduce potential adverse effects to owls during the breeding season.

Road use and hauling may also result in harm to owls, if traffic, especially of log trucks, increases substantially throughout the project area. Log trucks tend to drive into the forest in the very early morning (pre-sunrise) and leave late at the end of the day, which would mean that there is an increased chance of a vehicle-owl collision. The 25 mph speed limit in PACs during the breeding season is unlikely to reduce the potential of this occurring. We do think that the effort to spatially and temporally spread mechanical treatments across the project area would aid in reducing this potentially adverse effect as it would reduce owl-log hauling exposure potential in any given watershed or sub-watershed over the life of the project.

The large size of this project is also a potential concern. Although the Forest Service used the best available information to model potential nest/roost replacement recovery habitat within the Rim Country Project area, based on our experience, the process may not have identified habitat locations that owls are or would use for nesting and/or roosting (most limited habitat). We think that the Conditions-based Management Approach would minimize this to some extent, but we think the monitoring plan (Appendix C) would improve our collective ability to identify the highest quality owl habitat and treat it accordingly while freeing up other acres for more intensive treatment.

Based upon the above information, we have determined that the proposed action “may affect, and is likely to adversely affect” the Mexican spotted owl.

<u>Effects of the Action on Mexican Spotted Owl Critical Habitat</u>
Below, we describe the PCEs related to forest structure and maintenance of adequate prey species and the effects from implementation of the Rim Country Project. We did not analyze the PCEs for steep-walled rocky canyonlands in this biological opinion because this habitat does not occur within the action area.

The Forest Service proposes to mechanically thin and/or prescribe burn 210,304 acres of critical habitat (PAC and recovery habitat within the CHUs) within the Rim Country Project area.

Primary Constituent Elements Related to Forest Structure:

PCE: 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% of which are large trees with dbh of 12 inches or more.

Effect: We expect that actions implemented under the proposed project would 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. In addition, the Forest Service intends to improve remaining tree growth by reducing competition among trees for nutrients, sunlight, and moisture. Some loss of trees of all types and dbh size classes would occur during mechanical thinning and prescribed fire activities. However, actions implemented under the project are expected to maintain a range of tree species and sizes needed to maintain this PCE in PACs and recovery habitat across the treatment area because the Forest Service is implementing the Recovery Plan (USFWS 2012) guidelines that strive to retain large trees, canopy cover appropriate for owl habitat, and a diverse range of tree species (such as Gambel oak in pine-oak forests). Treatments that would reduce key habitat components in the short term are also designed to develop an uneven-aged structure and to increase the number of large trees in critical habitat over time, resulting in long-term benefits to this PCE and owl habitat.

PCE: A shade canopy created by the tree branches covering 40% or more of the ground.

Effect: We expect that thinning and burning treatments would reduce the tree shade canopy and Forest Service vegetation modeling supports this conclusion, finding that treatments would reduce the average percent canopy cover from approximately 70% to 56%. Therefore, we do not expect these treatments to reduce canopy cover in Mexican spotted owl forested habitat below 40% because the Forest Service would retain multi-layered canopies where they occur in protected and recovery habitat and patches of regeneration would be interspersed throughout the thinning treatment areas. Over time, these would contribute to development of multi-layered canopy structure. We expect that some reduction in existing canopy cover (5 to 10%) may aid in increasing understory herbaceous vegetation and forb production, which could benefit Mexican spotted owl prey species. Because recovery habitat would retain canopy closure of 40% or more with a goal of developing larger trees, the proposed action would not compromise the function and conservation role of this PCE.

PCE: Large, dead trees (snags) with a dbh of at least 12 inches.

Effect: Following prescribed burning, the action may create and destroy large snags (Horton and Mannan 1988, Randall-Parker and Miller 2002). When fire kills trees, it creates snags. This may benefit Mexican spotted owls, particularly their prey species, as most snags created through the prescribed fire are likely to be ≤9 inches dbh (Saab *et al.* 2006). Snags used by Mexican spotted owls for nesting are typically very old, large diameter, highly decayed snags with cavities. Snags with these characteristics tend to be limited in ponderosa pine and mixed-conifer forests in northern Arizona (Ganey and Vojta 2004). In individual burning projects, the Forest Service would attempt to minimize loss of these large snags through conservation measures (such as

using lighting techniques to avoid snags). The Forest Service would implement conservation measures/design features to protect the largest and oldest snags. Therefore, although we anticipate there would be a measurable loss of snags due to implementation of the proposed action, the Forest Service would make an effort to protect this rare resource and minimize the loss, and the proposed action would not compromise the function and conservation role of this PCE.

Primary Constituent Elements Related to Maintenance of Adequate Prey Species:

PCE: High volumes of fallen trees and other woody debris.

Effect: The Forest Service intends to reduce the amount of coarse woody debris as part of the action; therefore, there would be a reduction in the number of downed trees and woody debris. Research and monitoring indicate that prescribed burning could reduce logs by as much as 30 to 50% (Randall-Parker and Miller 2002, Saab *et al.* 2006). The loss of larger logs could result in short-term adverse effects to this PCE and could result in localized adverse effects to prey species habitat. The Forest Service would use site preparation, implementation planning, and ignition techniques to minimize the loss of large logs. However, across the treatment area, it is likely that prescribed burning would also create fallen trees and woody debris as trees are killed post-burn and fall, and in areas where large snags are cut for safety purposes. In addition, current data for many of these areas indicates that 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 areas.

PCE: A wide range of tree and plant species, including hardwoods.

Effect: The proposed action would result in both positive and negative consequences to this PCE. Plant species richness would likely increase following thinning and/or burning treatments that result in small, localized canopy gaps. The project includes conservation measures that focus on retaining Gambel oaks and other hardwood and coniferous species, but some level of short-term loss could occur during logging operations, prescribed fires, or road construction/maintenance. Based upon review of recently thinned areas though, we also anticipate that there would be adverse effects to native herbaceous and woody vegetation as nonnative vegetative species tend to increase following the use of heavy equipment in relatively undisturbed areas. The proposed action includes design features that should promote native plant communities, reduce the risk of noxious or invasive weed invasions, and prevent the establishment and spread of invasive weeds because of mechanical thinning and prescribed fire treatments (BT003, FE005, NW001-002, NW004, NW006-008, and SW026; Appendix F). Unfortunately, we continue to see weeds spread, particularly post-mechanical thinning. Therefore, we anticipate adverse effects to this PCE as the action, in discrete areas, may increase weeds in critical habitat, at least for the short term until actions to treat weed infestations occur, as described in the proposed action. Therefore, although there may be some adverse effects to this PCE, the proposed action would not compromise the function and conservation role of this PCE.

PCE: 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. 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. We expect that the mosaic effect created by burned and unburned areas and by opening small patches of forest within protected habitat would 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 would most likely result in only short-term effects to Mexican spotted owls by 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 *et al.* 2001). There is the potential for wild and domestic ungulates to have adverse effects on the production of plant cover post-burning if ungulates graze burned areas too soon following fire. However, the Forest Service includes desired conditions and guidelines to maintain appropriate levels of forage and for managing livestock following prescribed fire. Therefore, the proposed action would not compromise the function and conservation role of this PCE across the Rim Country Project area.

Effects of the Action on the Role of Critical Habitat in Recovery
We do not expect adverse effects and associated incidental take from the Rim Country Project to negatively affect Mexican spotted owl recovery or further diminish the conservation contribution of critical habitat to the recovery of the Mexican spotted owl. The Rim Country Project includes objectives and protection measures in accordance with the Recovery Plan (USFWS 2012). The Recovery Team identified these actions as necessary to conserve and recover the Mexican spotted owl, and the proposed action would implement these actions in designated critical habitat. Designated critical habitat includes all PACs and recovery habitat (unoccupied suitable spotted owl habitat) within the project area. These actions include the following:

- The Forest Service within the project area has and continues to designate 600 acres surrounding known Mexican spotted owl nesting and roosting sites. Managers, in coordination with the FWS, establish PACs around owl sites 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, which are also critical habitat, for increased protection, the Forest Service is aiding in recovery.
- The Rim Country Project identified and would manage mixed-conifer and ponderosa pine-oak forests that have potential for becoming Mexican spotted owl recovery nest/roost replacement habitat, or are currently providing habitat for foraging, dispersal, or wintering habitats. Nesting and roosting habitat is a limiting factor for the owl throughout its range. By managing critical habitat for future nest/roost replacement habitat, the Forest Service is aiding in recovery.
- The Project's intent is to integrate the best available recovery habitat management objectives where possible into the proposed fuels reduction treatments with the overall goal to protect owl PACs from high-severity fire effects and to conduct actions to improve forest sustainability (*e.g.*, thinning and prescribed burning). This management would ensure that Mexican spotted owl habitat continues to exist on the forest and that

critical habitat would continue to retain its function for conservation and recovery of the owl.

Over the long term, these actions should increase the sustainability and resiliency of Mexican spotted owl habitat (particularly through fuels management and forest restoration actions). Therefore, we do not expect that implementation of the Rim Country Project would further diminish the conservation contribution of critical habitat to the recovery of the Mexican spotted owl.

Effects to Recovery (Tipping Point)

In *Wild Fish Conservancy v. Salazar*, 628 F.3d 513 (9th Cir.2010), the Ninth Circuit held that the Service must identify when a species would likely pass the tipping point for recovery and determine whether the proposed action would cause the species to reach that tipping point. We have determined that the proposed action may affect, and is likely to adversely affect the owl and its designated critical habitat within the action area. Adverse effects to the owl and critical habitat from the project would be short-term. The Rim Country Project, to the extent practicable, would implement the Recovery Plan (USFWS 2012). We expect the Rim Country Project would not cause Mexican spotted owls to reach the tipping point for recovery because the proposed action would spatially and temporally distribute project activities such that habitat and disturbance effects to individual owls are short-term. A substantial project objective is to reduce the potential for high-intensity, landscape-level fires to remove existing nest/roost habitat within PACs and future nest/roost recovery habitat by implementing treatments to reduce the risk of large, high-intensity wildfire to owls and their habitat. Numerous conservation measures have been included in the proposed action and will reduce overall effects to the owl and its critical habitat. In addition, the Rim Country Project would implement monitoring to increase our understanding of owl habitat use, thereby increasing our ability to minimize project effects through time.

Little Colorado Spinedace and Critical Habitat

Effects of the Action on the Little Colorado Spinedace

Upland Vegetation Treatments

Within spinedace sub-watersheds, the Forest Service proposes to conduct 2,198 acres of mechanical thinning and 3,880 acres of prescribed burns within AMZs, and 118,974 acres of mechanical thinning and 144,124 acres of prescribed burning outside of AMZs. Mechanical riparian thinning is not likely to have measurable negative effects within spinedace sub-watersheds, particularly since there would be no cable operations in occupied spinedace habitat and critical habitat. Within AMZs, there may be some change in conifer shade cover, which could increase stream temperature or change invertebrate abundance; however, the Forest Service incorporated design features to maintain stream shade to avoid or minimize those effects (AQ032, AQ033-34, and BT001; Appendix F). Prescribed burning should also have minor effects to riparian vegetation and water quality as the proposed action is to have low to low-moderate burn severity in spinedace sub-watersheds.

There are currently three miles of open forest roads within spinedace AMZs, and the Forest Service proposes to open one additional mile of road. Additionally, within spinedace sub-

watersheds, there are currently 789 miles of open forest roads and the Forest Service proposes use 1,303 miles of road to support project activities (514 mile increase). The Forest Service would implement multiple design features (Appendix F) to reduce the effects of increased roads and would close or decommission roads if they are not part of the NF's open road system.

The Forest Service proposes to open approximately one mile of ML-1 road with an associated low water crossing across an intermittent tributary to Leonard Canyon to support proposed mechanical thinning projects. This road crosses Leonard Canyon at Dines Tank, an occupied site that is extremely important to spinedace as it is a large, (usually) perennial pool. Use of the road and crossing would cause channel widening and increased sedimentation, but more importantly driving across the road would kill spinedace. The Coconino NF closed this low-water crossing at Dines Tank as part of the East Clear Creek Watershed Health Strategy to protect spinedace and their habitat. The road remains an existing system road on the Apache-Sitgreaves NFs.

Aquatic Restoration (Riparian, Wet Meadow, Spring, and Stream Restoration; and, Road Decommissioning and Relocation)
The Forest Service would establish an ARRT (Appendix E) to guide aquatic restoration priorities and review submitted watershed restoration proposals. The ARRT would consist of a core group of fish biologists, species leads, geographic leads, and a hydrologist, from the Forest Service, FWS, and AGFD. This step in the aquatic restoration process would increase collaboration between the agencies and reduce effects to spinedace as the species experts from FWS and AGFD are involved in the ARRT.

There are 113 miles of spinedace habitat within the project area that the Forest Service identified for stream restoration. Of those stream miles, they proposed eleven miles for heavy mechanical stream restoration treatments within spinedace sub-watersheds. The Forest Service would minimize the potential to harm or harass individual spinedace during instream restoration work through pre-project design coordination and collaboration with FWS and AGFD, and isolating instream work areas. Within spinedace sub-watersheds 118,974 acres of mechanical thinning and 144,124 acres of prescribed burning could occur. The Forest Service proposes to use up to 514 miles of ML-1 roads with an associated 191 low water crossings during the life of the project. Spreading treatments out in time and space within a watershed and establishing limits on percent of a watershed treated would decrease potential effects to soil condition and promote herbaceous recovery, but the potential for increased sediment during any given activity exists, particularly given the existing poor riparian condition.

The priority goal for aquatic restoration in the Little Colorado River drainages would be to enhance and protect surface water flow and increase habitat for spinedace. Projects that help restore hydrologic function to the upland wet meadows and floodplains along these streams are crucial to maintaining and improving flow in downstream areas. Other high priorities would include projects to decommission or relocate poorly located roads that have caused adverse effects to channel morphology or have altered water movement through meadow systems.

Summary
Ground disturbing activities associated with opening of currently closed (ML-1) roads within the watershed and stream restoration may adversely affect spinedace and their habitat by decreasing water quality and increasing sedimentation into streams, resulting in altered habitat conditions

and reduced food resources. Design features associated with the project should minimize potential negative effects, particularly spreading out treatments spatially and temporally to reduce potential watershed effects and allow for ground cover reestablishment (Appendix F). In the long term, implementation of the proposed action would benefit habitat for spinedace by improving stream and riparian conditions, especially conditions in wet meadows. This would improve water retention in the upland meadows and may help maintain water in downstream areas in dry times. Long term, improved watershed function and riparian and stream habitat would contribute to spinedace recovery and substantially reduce the potential for large, high-intensity wildfire.

We have determined that the proposed action "may affect, and is likely to adversely affect" the spinedace.

Effects of the Action on Little Colorado Spinedace Critical Habitat

There would be short-term adverse and long-term beneficial effects to spinedace designated critical habitat. Proposed activities within critical habitat include 102 acres of mechanical thinning and 114 acres of prescribed burning, and 31 miles of stream restoration with 2 miles of potential heavy mechanical stream work. Within sub-watersheds where the FWS designated critical habitat, an additional 33,275 acres of mechanical thinning and 39,410 acres of prescribed burning may occur. In addition, the Forest Service proposes to use up to 82 miles of ML-1 roads and an associated 87 low water crossings within critical habitat throughout the life of the project. Short-term adverse effects could occur to spinedace critical habitat PCEs from increased sedimentation and decreased vegetative cover. Potential long-term benefits of improved watershed and stream function should improve habitat quality and contribute to spinedace recovery.

PCE 1: Clean, permanent flowing water

Effects: There is the potential for short-term adverse effects from increased sediment delivery or drifting ash from ground disturbing vegetation management activities, roads, and prescribed fires. Additionally, short-term adverse effects from sediment plumes or water diversion during stream restoration activities could occur. Because the Rim Country Project would promote properly functioning watersheds and decrease high-intensity wildfire risk, which would have beneficial effects to flow and water quality, the proposed action would not compromise the function and conservation role of this PCE. Other projects such as road decommissioning, wet meadow restoration, and stream restoration would have long-term beneficial effects for clean flowing water as well.

PCE 2: Presence of pools

Effects: Pools may experience increased sediment delivery due to ground disturbing vegetation management activities, roads, and prescribed fires, resulting in reduced pool size. The Forest Service would implement design features (Appendix F) to minimize sedimentation as well as implement projects to increase instream habitat diversity and pools. Because the Rim Country Project would reduce the risk of high-intensity wildfire that could fill in pools and the Forest Service would temporally and spatially distribute treatments within sub-watersheds to minimize

sedimentation effects, the proposed action would not compromise the function and conservation role of this PCE.

PCE 3: Presence of fine gravel or silt-mud substrate

Effects: The proposed action may have short-term adverse effects to substrate because of increased sediment delivery from vegetation management activities, roads, and prescribed fires that could increase gravel embeddedness. We anticipate this effect would be relatively short-term and would occur in discrete areas through time, not throughout an entire sub-watershed. As upland treatment areas heal and herbaceous vegetation responds to increased sunlight from opening the forest canopy, sedimentation would decrease. Additionally, road decommissioning and relocation would reduce sedimentation effects. Therefore, the proposed action would not compromise the function and conservation role of this PCE.

Effects to Recovery (Tipping Point)

In *Wild Fish Conservancy v. Salazar*, 628 F.3d 513 (9th Cir.2010), the Ninth Circuit held that the Service must identify when a species would likely pass the tipping point for recovery and determine whether the proposed action would cause the species to reach that tipping point. We have determined that the proposed action may affect, and is likely to adversely affect the spinedace and its designated critical habitat within the action area. The FWS completed the spinedace recovery plan in 1998 (USFWS 1998). In the existing recovery plan enhancing or restoring habitat and reintroducing spinedace to historically occupied habitat are important recovery steps. The Rim Country Project area includes a substantial portion of spinedace's range and although there are likely to be short-term adverse effects from increased sedimentation from this project, the long-term benefits of improving wet meadow function and increasing water storage; improving watershed function; and, reducing the potential for high-intensity wildfire are imperative to our maintaining existing occupied spinedace habitat and restoring habitat for potential future introductions. The proposed action would aid in the recovery of spinedace on NFS lands. Therefore, we conclude that the proposed action would not cause spinedace to reach the tipping point for recovery.

Chiricahua Leopard Frog and Critical Habitat

Effects of the Action on the Chiricahua Leopard Frog

Upland Vegetation Treatments

While implementation of upland vegetation treatments has the potential for long-term beneficial effects by reducing the risk for large, high-intensity wildfire, short-term adverse effects could result to Chiricahua leopard frog dispersal habitat. The Forest Service proposed up to 12,616 acres of mechanical thinning and 13,974 acres of prescribed burning within frog dispersal habitat, which is 83% and 91% of the mapped dispersal habitat in the project area, respectively. There are an additional 93,722 acres of mechanical thinning and 104,643 acres of prescribed burning that could occur outside of potential dispersal habitat, but within the sub-watersheds. As part of the mechanical thinning operations, the Forest Service proposes to use cable operations to on 1,375 acres within AMZs and 9,557 acres outside AMZs.

Cable operations within AMZs could have short and long-term negative effects to aquatic

species and habitats over time. Effects include exposed soils resulting in erosion and sedimentation, streambank damage, and reduced riparian vegetation cover and structure from selective removal or crushing. Increased sediment delivery to streams would occur until ground cover reestablishes within AMZs. The implementation of design criteria (SW003 and SW035) and BMPs would minimize these effects (Appendix F). We expect sedimentation to streams and aquatic habitat to be higher in AMZs where riparian condition is currently impaired or poor. Average riparian condition for Chiricahua leopard frog is poor, thus vegetation in these systems is not generally adequate to capture sediment now, so adverse effects could occur until riparian vegetation grows back. We expect that project design features would minimize potential adverse effects of vegetation management from increased sedimentation, by spreading out treatments spatially and temporally to reduce overall effects and allow reestablishment of ground cover. Additional design features for thinning and burning in AMZs further reduce potential decreases in ground cover in AMZs (Appendix F).

For all mechanical operations in frog habitat, there is the potential of harming individual frogs if they are present in the work area during mechanical operations. Frogs may avoid or move out of these areas while work is occurring causing displacement or disruption of social and feeding behavior. These effects have the potential to reduce the health or reproductive capability of individuals and may be lethal. Additional design criteria specific to frogs also reduce the potential for harm or harassment in the form of displacement, injury, or death from vegetation management activities. The150-foot AMZ for frogs does not allow for skid trails without District Biologist approval. The use of heavy mechanical equipment will temporarily cease in leopard frog dispersal or occupied habitat for the length of an isolated monsoon rain event if >0.10 inch of rain occurs over a 24-hour period (based on the nearest rain gauge/station) in an active treatment area unless continuation of work is supported by the District Biologist and approved by a sale administrator or contracting officer's representative. These mitigations reduce the potential for harm to individual frogs within dispersal habitat.

The Forest Service would use up to 26 miles of ML-1 roads and an associated 186 low water crossings within frog habitat throughout the life of the project. Opening more than one mile of ML-1 roads and stream crossings could occur in following sub-watersheds: Canyon Creek Headwaters (6 miles, 35 crossings), East Verde River Headwaters (2.8 miles, 28 crossings), Ellison Creek-East Verde River (10.8 miles, 82 crossings), Gruwell Canyon-Cherry Creek (0.9 mile, 3 crossings), Haigler Creek (1.1 mile, 8 crossings), Horton Creek-Tonto Creek (2.6 miles, 12 crossings), and Parallel Canyon-Cherry Creek (1.5 miles, 17 crossings). Road crossings actively produce sedimentation through vehicular disturbance or road maintenance activities and passively through erosion of the disturbed banks forming the sides of crossings. Ellison Creek, Gruwell Canyon, Haigler, Horton Creek and Parallel Canyon sub-watersheds have riparian conditions that are currently functioning at risk (fair) or impaired (poor) and all of these sub-watersheds are impaired for the roads and trails indicator. Design features and BMPs (Appendix F) would reduce sedimentation, but some of the ML-1 roads are along perennial or intermittent drainage bottoms in multiple areas that have a higher potential for increased sedimentation and reduced cover. Similarly, multiple low water crossings could occur on the same stream creating additive effects. Use of ML-1 roads and crossings can affect frogs in the short term by altering water quality, increasing sedimentation into streams, and reducing herbaceous or woody cover. These lead to altered riparian and terrestrial habitat conditions, reduced algal and

macroinvertebrate food resources for tadpoles, reduced foraging and basking habitat, and reduced survival. Design features for low water crossings would mitigate potential sedimentation during the time they were in use but could lead to behavioral changes (avoidance) or possible harm or harassment to dispersing frogs in the form of displacement, injury, or death. The Rim Country Project would not use all ML-1 roads or crossings at the same time, but we expect there would be measurable increased sedimentation during use of these ML-1 roads and crossings, resulting in short-term negative effects to frogs.

Aquatic Restoration (Riparian, Wet Meadow, Spring, and Stream Restoration; and, Road Decommissioning and Relocation)
The Forest Service would establish an ARRT (Appendix E) to guide aquatic restoration priorities and review submitted watershed restoration proposals. The ARRT would consist of a core group of fish biologists, species leads, geographic leads, and a hydrologist, from the Forest Service, FWS, and AGFD. This step in the aquatic restoration process would increase collaboration between the agencies and reduce effects to frogs as the species experts from FWS and AGFD are involved in the ARRT.

We anticipate that there would be short-term adverse effects and long-term beneficial effects to frogs from stream restoration activities. The Forest Service proposes to conduct stream restoration activities (Table 2) in 19 miles of frog dispersal habitat with the potential for 14 miles of heavy mechanical treatments. Stream restoration may occur in streams within the following sub-watersheds: Canyon Creek Headwaters (8.7 miles), Crouch Creek (0.4 mile), East Verde River Headwaters (4.5 miles), Gruwell Canyon-Cherry Creek (0.9 mile), Haigler Creek (3.4 miles), and Horton Creek-Tonto Creek (1.5 miles). Because heavy stream restoration would use machinery in the stream, these actions have the potential to displace or harm individual frogs or egg masses. Heavy mechanical stream restoration can also cause plumes of sediment, which can result in increased turbidity and embeddedness during implementation; however, those effects usually dissipate after the first high flow event. The Forest Service would implement design features to minimize effects from stream restoration actions. To minimize effects to frogs during project implementation, during pre-project planning for all treatments in springs, streams, and riparian areas, the District Biologist would review the project to determine the status of and identify necessary measures to protect Chiricahua leopard frogs (AQ018). Additionally, the project proponents would coordinate with the Forest Service District Biologist, FWS, and AGFD at least 6 months prior to implementation within Chiricahua leopard frog occupied habitat to determine if surveys or temporary holding facilities are needed prior to or during project implementation (AQ020).

General stream restoration techniques focus more on riparian restoration (planting, fencing, etc.), which has the potential to disturb individual frogs, but would have minimal ground-disturbance and would not remove vegetation frogs use for hiding cover or thermoregulation.

Summary
There is the potential for harm to occur to dispersing frogs from heavy machinery associated with mechanical thinning and stream restoration actions. Additionally, there may be substantial, short-term sedimentation effects to habitat from the use of cable operations, ML-1 roads, and associated low water crossings. Design features and BMPs that include early planning and coordination between the Forest Service, FWS, and AGFD would minimize these effects. In the

long term, we expect that improved watershed function and riparian and stream habitat could contribute to species recovery while also reducing the potential for adverse effects from large, high-intensity wildfire.

Based upon the potential for adverse effects, we have determined that the proposed action "may affect, and is likely to adversely affect" the frog.

Effects of the Action on Chiricahua Leopard Frog Critical Habitat

Proposed activities within critical habitat include 1.6 acres of mechanical thinning and prescribed burning in the Crouch, Gentry, Cherry creeks, and Parallel Canyon CHUs and 0.4 acre of mechanical thinning and prescribed burning in the Ellison and Lewis Creeks CHU. The project does not include any other activities within Chiricahua leopard frog critical habitat. Within sub-watersheds that include critical habitat, the Forest Service proposed 8,652 acres of mechanical thinning and 8,666 acres of prescribed burning.

PCE 1a: 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.

Effects: The proposed action may affect critical habitat by increasing sedimentation and embeddedness due to the use over the life of the Rim Country Project of up to 13 miles of ML-1 roads and an associated 17 low water crossings. Road crossings actively produce sedimentation and may adversely affect water quality as well as pool size and depth. There is also the potential for short-term adverse effects to stream habitat from heavy equipment during implementation of stream restoration actions (Table 2) in the headwaters of Canyon Creek. These effects would be short-term; however, long-term effects would result from stream restoration actions to improve habitat and hydrology in the Canyon Creek headwaters. The Rim Country Project would include appropriate design criteria and measures to minimize effects, promote properly functioning watersheds, and decrease high-intensity wildfire risk, which would have beneficial effects to flow and water quality. Therefore, the proposed action would not compromise the function and conservation role of this PCE.

PCE 1b: 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.

Effects: The Forest Service proposed no stream restoration treatments in critical habitat; therefore, the proposed action would not effect this PCE.

PCE 1c: Nonnative predators (*e.g*., crayfish, American bullfrogs, nonnative predatory fishes) absent or occurring at levels that do not preclude presence of the frog.

Effects: The proposed action would not affect the presence of nonnative predators; therefore, the proposed action would not affect this PCE.

PCE 1d: Absence of chytridiomycosis, or if present, then environmental, physiological, and genetic conditions are such that allow persistence of frogs.

Effects: The project includes a design feature to minimize the potential for spreading aquatic diseases or invasive species (AQ001). Any equipment or personnel for activities in and around streams, natural or constructed waters, springs, or wetlands of any kind would use decontamination procedures to prevent the spread of disease (Chytrid fungus) and aquatic invasive species. Personnel entering the water would follow Appendix G in the Chiricahua Leopard frog Recovery Plan (USFWS 2007) and the Stop Aquatic Hitchhikers Clean, Drain, Dry procedures. Therefore, the proposed action would not compromise the function and conservation role of this PCE.

PCE 1d: Upland areas that provide opportunities for foraging and basking that are immediately adjacent to or surrounding breeding aquatic and riparian habitat.

Effects: The proposed action would mechanically thin and prescribe burn two acres of upland foraging/basking critical habitat. Therefore, there may be short-term adverse effects from temporary loss of vegetation, but the actions may also create more basking and foraging sites by opening up the forested canopy and increasing herbaceous vegetation. Therefore, the proposed action would not compromise the function and conservation role of this PCE.

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 frogs, including, but not limited to, urban, industrial, or agricultural development; reservoirs that are 50 acres or more in size and contain predatory nonnative fishes, American bullfrogs, or crayfish; highways that do not include frog fencing and culverts; and walls, major dams, or other structures that physically block movement.

Effect: The proposed action would not decrease the amount of water within dispersal drainages (2a), but in the long term may actually improve hydrologic function by removing vegetation, potentially resulting in a small increase in water within these areas. Within overland and non-wetted corridors (2b) there may be short-term adverse effects to upland foraging/basking habitat from mechanical thinning and burning until vegetation recovers; but as we stated above, these treatments may also in the short and long term improve basking habitat by opening up the forest canopy and provide for more herbaceous vegetation that may provide shelter and/or protection

from predators. The proposed action would not affect 2c. Because effects to this PCE would be short-term and occur across relatively small area of critical habitat, the proposed action would not compromise the function and conservation role of this PCE.

Effects to Recovery (Tipping Point)
In *Wild Fish Conservancy v. Salazar*, 628 F.3d 513 (9th Cir.2010), the Ninth Circuit held that the Service must identify when a species would likely pass the tipping point for recovery and determine whether the proposed action would cause the species to reach that tipping point. We have determined that the proposed action may affect, and is likely to adversely affect the frog, and its designated critical habitat within the action area. The FWS completed the Chiricahua Leopard Frog Recovery Plan in 2007 (USFWS 2007). The recovery strategy includes efforts to reduce threats to existing populations; and to maintain, restore, and create habitat; translocate frogs to establish, reestablish, or augment populations. We expect the Rim Country Project would not cause Chiricahua leopard frogs to reach the tipping point for recovery because a project goal is to provide for long-term benefits to frog habitat from improved watershed, riparian and stream habitat conditions. Proposed actions to improve watershed and stream function would contribute to Chiricahua leopard frog recovery while reducing potential adverse effects from large, high-intensity wildfire.

Gila Trout

Effects of the Action on Gila Trout

Upland Vegetation Management Treatments
The proposed action would result in short-term adverse effects to recovery and recreational populations of Gila trout within the project area. Up to 839 acres of thinning and 926 acres of burning could occur adjacent to Gila trout habitat within AMZs. In addition, mechanical thinning (up to 90,268 acres) and prescribed burning (up to 101,559 acres) within Gila trout watersheds (outside of AMZs) could occur. The Forest Service is proposing to use cable operations in 158 acres within AMZs and 15,373 acres within Gila trout watersheds. Most of the proposed cable operations within AMZs are within the Haigler Creek sub-watershed (approximately 104 acres) followed by Workman Creek (30 acres). We expect that these areas may have increased fine sediment inputs to habitat. Design features (Appendix F) would minimize potential adverse effects of mechanical thinning and burning, particularly since the Forest Service would spatially and temporally spread out treatments to reduce potentially negative watershed effects and allow re-establishment of ground cover in thinned and burned areas. Additional design features for thinning and burning in AMZs further reduce potential ground disturbance (*e.g.*, only allowing raking, brushing, or other techniques that limit disturbance to soils in AMZs). Because of implementation of project design criteria, we anticipate that effects from thinning and burning in Gila trout habitat may have short-term adverse effects from slight increases in sedimentation and spatially small, but negative effects to AMZs through reduced canopy cover. Average riparian condition for Gila trout is fair (functioning at risk); therefore, effects should be less because vegetation is present and capturing sediment. The long-term benefits of thinning and burning include the reduced risk of high-intensity wildfire and improved watershed condition.

Opening two miles of ML-1 roads and an associated seven low water crossings in Gila trout habitat would have short-term adverse effects. These increases occur in Ellison (six crossings)

and Workman creeks (one crossing). Additionally, the Forest Service may use 161 miles of ML-1 roads and 213 low water crossings within occupied or suitable trout habitat. Sub-watersheds that contain Ellison and Workman Creeks have riparian condition that is currently functioning at risk (fair) and show as impaired for the roads and trails indicator. Road crossings actively produce sedimentation through vehicular disturbance or road maintenance activities and passively through erosion of the disturbed banks forming the sides of crossings. Increased sedimentation to trout streams can reduce water and spawning gravel quality, fill in pools, and reduce food resources. This can result in decreased reproductive success or survival of particularly younger age classes. Roads and crossings within occupied trout habitat would have increased effects, but the incremental increases of sediment from roads and crossings would be additive. While operators would not utilize all ML-1 roads or crossings at the same time, use of any of these ML-1 roads or crossing have the potential for short-term adverse effects to Gila trout from increased sedimentation.

Aquatic Restoration (Riparian, Wet Meadow, Spring, and Stream Restoration; and, Road Decommissioning and Relocation)

The Forest Service would establish an ARRT (Appendix E) to guide aquatic restoration priorities and review submitted watershed restoration proposals. The ARRT would consist of a core group of fish biologists, species leads, geographic leads, and a hydrologist from the Forest Service, FWS, and AGFD. This step in the aquatic restoration process would increase collaboration between the agencies and reduce effects to Gila trout as the species experts from FWS and AGFD are involved in the ARRT.

Stream restoration activities are likely to have both adverse and beneficial effects to Gila trout. These activities may occur in 8 of 32 miles of Gila trout streams. Of those, only four miles may utilize heavy mechanical stream restoration methods, the Forest Service would spread these actions temporally and spatially to minimize overall effects. General stream restoration methods, design features for block netting instream work areas, removal and relocation of trout (fish salvage) and timing restrictions determined by listed species present (during spawning seasons) reduce the potential for harm to individuals or redds. Short-term inputs of sediment could result from mechanical stream restoration that occurs inside or near the bankfull channel. The sediment plume from activities would be most concentrated in the immediate project area and should dissipate within a few hours, because the area of disturbance would be relatively small. The increased stream turbidity may deposit fine sediment on substrate a short distance downstream, encourage fish to move downstream, and alter behavior patterns for a short time. We anticipate that the high flows following project completion would flush all project related sediment out of the system, but the increase in sediment would persist until flushing flows occur. Additionally, project design features should prevent sediment inputs from persisting into the future, therefore, long-term negative effects from sedimentation are not expected. Stream restoration activities would provide immediate and long-term benefits to Gila trout habitat such as decreased direct sediment inputs from unstable banks or headcuts, increased habitat complexity and thermal refugia, and improved riparian areas and stream shading.

Summary

The Rim Country Project would have long-term benefits to Gila trout habitat from improved watershed, riparian and stream function that would contribute to species recovery while reducing potential effects from large, high-intensity wildfire. Design features would minimize negative

effects for most activities (Appendix F); however, short-term effects from ML-1 roads, low water crossings and stream restoration to Gila trout would not be insignificant or discountable and we anticipate adverse effects from these actions.

Therefore, we have determined that the proposed action "may affect, and is likely to adversely affect" the Gila trout.

Effects to Recovery (Tipping Point)

In *Wild Fish Conservancy v. Salazar*, 628 F.3d 513 (9th Cir.2010), the Ninth Circuit held that the Service must identify when a species would likely pass the tipping point for recovery and determine whether the proposed action would cause the species to reach that tipping point. We have determined that the proposed action may affect, and is likely to adversely affect the Gila trout within the action area. The FWS is currently in the process of finalizing the draft Gila Trout Recovery Plan (USFWS 2021a). The trout recovery program goal is to maintain existing and establish new resilient populations in suitable habitats distributed throughout the species historical range and to abate significant threats, particularly large, high-intensity wildfire. Additionally, there are only two recovery populations in Dude Creek and Chase Creek within the action area. Implementation of the Rim Country Project, which would decrease the potential for high-severity fire effects and improve watershed function, support the Gila trout recovery strategy. Although there may be short-term adverse effects to individual trout during implementation of these actions, the long-term effects of the project would contribute to recovery goals. Additionally, the project design features would minimize effects to existing trout populations while stream restoration actions would improve stream habitat and increase opportunities to establish new populations. Therefore, we conclude that the proposed action would not cause Gila trout to reach the tipping point for recovery.

Narrow-headed Gartersnake

Effects of the Action on the Narrow-headed Gartersnake

Upland Vegetation Management Treatments

The long-term effect of reducing the risk of large, high-intensity wildfires would improve the resiliency of watersheds and aid in maintaining water quality, pool habitat, and fish (prey) that gartersnakes need to survive. However, there are likely to be short-term adverse effects to gartersnakes and their habitat from implementation of both upland and watershed improvement actions.

There are approximately 552 acres of proposed mechanical thinning and prescribed burning within gartersnake habitat (288 acres in Canyon Creek and 262 acres in Haigler Creek). In addition, 31,602 acres of mechanical thinning and 43,825 acres of prescribed burning may occur in the uplands of these two sub-watersheds. Of these mechanical treatment acres, cable operations could occur within AMZs (37 acres) and within gartersnake sub-watersheds (7,435 acres). Average riparian condition for gartersnake sub-watersheds is fair (functioning at risk); therefore, we anticipate that there would be lessened sedimentation effects to gartersnake habitat from cable operations. Vegetation management may reduce herbaceous cover in the short-term, but design features associated with the project would reduce and minimize any potential negative effects, particularly by spreading out treatments spatially and temporally to reduce overall effects

and allow vegetation to re-establish. Design features for thinning and burning in AMZs (FE006) further minimize reductions in ground cover such as equipment driving in and backing out and limitation on fire line in AMZs. The Forest Service would construct fire lines in AMZs only with District Biologist approval and fire managers must use non-ground disturbing techniques (SW008). These techniques include brushing (cutting woody shrubs), which would minimize overall effects from fire lines, but would also reduce hiding cover for gartersnakes. Additional design criteria specific to gartersnakes reduce potential harm from vegetation management. Design feature AQ019 outlines a 150 feet AMZ for gartersnakes and does not allow for piling of any kind to occur within in them, as gartersnakes could utilize piles as hiding cover, which could lead to harm during prescribed burns. The design feature further reduces potential harm during the gartersnake brumation/inactive period by minimizing disturbance of rock/boulder piles and woody debris within the AMZ. Long-term effects of mechanical thinning and prescribed burning include a reduced risk of widespread high-intensity fire and improved watershed condition.

The Forest Service may utilize up to one mile of ML-1 roads and an associated five low water crossings in gartersnake habitat within Canyon Creek throughout the life of the project. Less than 0.03 mile of ML-1 road and no low water crossings would occur in Haigler Creek. Localized effects of channel widening and sedimentation may occur while the roads are open but when managers close the roads, these effects would stop. Road crossings actively produce sedimentation through vehicular disturbance or road maintenance activities and passively through erosion of the disturbed banks. Design features for low water crossings would reduce potential sedimentation during that time but not eliminate it.

To facilitate mechanical thinning treatments, the Forest Service may open an additional 114 miles of ML-1 roads in the Canyon Creek sub-watershed and 30 miles in the Haigler Creek sub-watershed with 30 and 39 low water crossings, respectively. These roads are in the sub-watershed (uplands), but not in gartersnake habitat. While riparian condition in gartersnake sub-watersheds is functioning at risk (fair), the specific roads and trails indicator is functioning at risk for the Canyon Creek sub-watershed and impaired for Haigler Creek. Design features and roads BMPs would reduce sedimentation, but some of the ML-1 roads are along intermittent drainage bottoms such as Lost Salt Canyon which have a higher potential for increased sedimentation to Haigler Creek. Similarly, multiple low water crossings occur on perennial tributaries to Canyon Creek. The incremental increases to the baseline for roads and crossings would indicate the potential for measurable increased sedimentation during use and short-term negative effects. Increased sedimentation leads to turbidity and embeddedness, which could negatively affect fish (gartersnake prey base) and decrease visibility for hunting gartersnakes. These sedimentation effects would be short-term and would not persist over multiple years.

Aquatic Restoration (Riparian, Wet Meadow, Spring, and Stream Restoration; and, Road Decommissioning and Relocation)

The Forest Service would establish an ARRT (Appendix E) to guide aquatic restoration priorities and review submitted watershed restoration proposals. The ARRT would consist of a core group of fish biologists, species leads, geographic leads, and a hydrologist, from the Forest Service, FWS, and AGFD. This step in the aquatic restoration process would increase collaboration between the agencies and reduce effects to gartersnakes as the species experts from FWS and AGFD are involved in the ARRT.

Stream restoration activities would result in short-term adverse effects and long-term benefits to gartersnakes. General stream restoration could occur in up to seven miles of gartersnake habitat within Canyon and Haigler Creeks. General stream restoration techniques focus on riparian restoration (planting, fencing, *etc*.) and have the potential to disturb individual gartersnakes, but these activities would have minimal ground disturbance and would not remove vegetation gartersnakes may use for hiding cover, brumation, or thermoregulation.

Up to three miles of heavy mechanical restoration could occur in Canyon Creek, which would have the potential to displace or harm individuals during implementation. Construction activities associated with heavy mechanical methods could also disturb individual gartersnakes and could result in a flight response, possibly resulting in harassment, injury, or death. Similar effects could also occur from heavy machinery working next to the stream bank, working in the stream, or during excavation activities. Design features AQ020 and AQ023 (Appendix F), would minimize potential harm. Heavy mechanical stream restoration has adverse effects from sedimentation during implementation, those effects dissipate after the first high flow event and benefits are almost immediate. In the long term, the project would improve watershed conditions and the ability of streams to maintain water during drought conditions, which would contribute to gartersnake recovery.

Summary
The Rim Country Project would have long-term benefits to the gartersnake and its habitat from improved watershed, riparian and stream function that would contribute to species recovery while reducing potential effects from large, high-intensity wildfire. Design features would minimize negative effects for most activities (Appendix F); however, short-term effects from ML-1 roads, low water crossings and stream restoration to gartersnakes would not be insignificant or discountable and we anticipate adverse effects from these actions.

Therefore, we have determined that the proposed action "may affect, and is likely to adversely affect" the gartersnake.

Effects of the Action on Narrow-headed Gartersnake Critical Habitat
Proposed activities within CHUs include 227 acres of mechanical thinning (148 acres in Canyon Creek and 78 acres in Haigler Creek). The Forest Service proposes to conduct prescribed burning on up to 233 acres in critical habitat (155 acres in Canyon Creek and 78 acres in Haigler Creek). Up to 7 miles (total) of general stream restoration could occur within critical habitat in Canyon and Haigler creeks and up to 3 miles of potential heavy mechanical stream work may occur in Canyon Creek. Sub-watershed areas upstream and/or in the uplands of critical habitat may have an additional 31,602 acres of mechanical thinning and 43,825 acres of prescribed burning. The Forest Service may use up to 56 miles of ML-1 roads and an associated 74 low water crossings within critical habitat watersheds throughout the life of the project.

PBF 1: Perennial streams or spatially intermittent streams that provide both aquatic and terrestrial habitat that allows for immigration, emigration, and maintenance of population connectivity of gartersnakes and contains:

(A) Pools, riffles, and cobble and boulder substrate, with low amount of fine sediment and substrate embeddedness;

(B) Organic and natural inorganic structural features (*e.g.*, cobble bars, rock piles, large boulders, logs or stumps, aquatic and wetland vegetation, logs, and debris jams) in the stream channel for basking, thermoregulation, shelter, prey base maintenance, and protection from predators;
(C) Water quality that meets or exceeds applicable State surface water quality standards; and
(D) Terrestrial habitat within 328 feet of the active stream channel (water's edge) that includes flood debris, rock piles, and rock walls containing cracks and crevices, small mammal burrows, downed woody debris, and streamside vegetation (*e.g.*, alder, willow, sedges, and shrubs) for thermoregulation, shelter, brumation, and protection from predators throughout the year.

Effects: There is the potential for increases in fine sediment and embeddedness (PBF 1A) in Canyon and Haigler Creeks from use of ML-1 roads and low water crossings while roads are open, and from heavy equipment during implementation of stream restoration in Canyon Creek. In the long term, the restoration activities completed to promote watershed condition and function should decrease chronic sedimentation and substrate embeddedness issues in critical habitat, as well as increase instream habitat diversity.

Heavy stream restoration activities in Haigler and Canyon creeks may also have short-term adverse effects to instream habitat structure (PBF 1B) if actions remove or modify these habitats (*e.g.*, logs). These effects would be small in scale and the restoration would result in immediate improvements to in-stream structural features and increase habitat diversity.

Water quality in critical habitat would continue to meet applicable State surface water quality standards during and post-restoration; therefore there would be insignificant effects to PBF 1C. The Forest Service would implement design features (Appendix F) to maintain water quality and reduce sedimentation during all proposed activities.

Mechanical thinning and prescribed burning may have short-term affects to riparian vegetation cover (PBF 1D) immediately following treatments in Haigler and Canyon creeks. Riparian vegetation would recover/reestablish quickly and there would be an immediate increase in downed wood following treatment, which would be beneficial and increase habitat complexity. We anticipate that changes to this PBF in critical habitat would be insignificant as design features (Appendix F) would minimize the size of the effect spatially and temporally. Riparian thinning and burning treatments would ultimately improve watershed condition and the terrestrial vegetation's ability to hold and process sediment.

In summary, although there may be some short-term adverse effects because of increased sedimentation form roads, most effects to this PBF would be very small and would ensure that Canyon and Haigler creeks continue to provide aquatic and terrestrial habitat to support gartersnakes. Therefore, the proposed action would not affect the function and conservation role of this PBF.

PBF 2: Hydrologic processes that maintain aquatic and riparian habitat through:

(A) A natural flow regime that allows for periodic flooding, or if flows are modified or regulated, a flow regime that allows for the movement of water, sediment, nutrients, and debris through the stream network, as well as maintenance of native fish populations; and,

(B) Physical hydrologic and geomorphic connection between the active stream channel and its adjacent terrestrial areas.

Effects: The proposed action would not result in any adverse effects to the natural flow regime (PBF 2A) and would increase the physical and geomorphic connection between the active stream channel and terrestrial habitat (PBF 2B) through riparian and stream restoration actions. Therefore, the proposed action would not affect the function and conservation role of this PBF.

PBF 3: A combination of native fishes, and soft-rayed, nonnative fish species such that prey availability occurs across seasons and years.

Effects: The proposed action would not change the fish species community, but may temporarily displace fish (prey) during instream restoration activities. The proposed action would ultimately improve water retention and habitat for fish in Canyon and Haigler creeks, as well as in other streams throughout the project area, which may benefit the gartersnake if this work allows for expansion of the gartersnake into new areas because of habitat improvements. Therefore, the proposed action would not affect the function and conservation role of this PBF.

PBF 4: An absence of nonnative aquatic predators, such as fish species of the families Centrarchidae and Ictaluridae, American bullfrogs, and crayfish, or occurrence of these nonnative predators at low enough levels such that recruitment of gartersnakes is not inhibited and maintenance of viable prey populations is still occurring.

Effects: The Rim Country Project would not affect this PBF.

PBF 5: Elevations of 2,300 to 8,200 feet.

Effects: The Rim Country Project would not affect this PBF.

Effects to Recovery (Tipping Point)

The FWS has not yet developed a recovery plan for the gartersnake. We anticipate primary recovery objectives to focus on the primary threats affecting the species such as effects from predatory nonnative species, as well as drought and human-caused dewatering of streams. We have determined that the proposed action may affect, and is likely to adversely affect the gartersnake, and its designated critical habitat within the action area. Adverse effects to the gartersnake and adjacent critical habitat from the project would be short-term. Because this proposed action would ultimately benefit the gartersnake by reducing the risk of large, high-intensity wildfire to its habitat, and improving watershed condition and function within the Rim Country Project area, we do not anticipate the proposed action would adversely affect implementation success of likely recovery objectives. Therefore, we conclude that the proposed action is not likely to cause the gartersnake to reach the tipping point for recovery.

Western Yellow-billed Cuckoo

Effects of the Action on the Yellow-billed Cuckoo

Mechanical Vegetation Treatments
As described in the Environmental Baseline above, the Forest Service used their regional potential vegetation layer to estimate that there is a candidate pool of 14,500 acres of potential riparian habitat that cuckoos may use, most likely for foraging based upon what we know of cuckoo habitat use in Arizona. If cuckoos use these areas, they are likely rare and present for a limited time because the areas identified occur at higher elevations (approximately 4,000 to 9,000 feet elevation) than known cuckoo breeding areas (up to approximately 6,500 feet elevation) in Arizona; are located 7 to 8 miles from known cuckoo use areas; and are unlikely to support food resources until very late in the cuckoo breeding season due to cooler ambient air temperatures. In addition, many of the habitat polygons are small, spatially isolated pockets of riparian vegetation. Biologists have yet to visit these areas to determine their habitat suitability and it is likely that the regional potential vegetation layer provides an overestimation of potential habitat.

Because this project covers a spatially large and complex area and all of the potential habitat is modeled (and not ground-truthed), we assume that cuckoos may use some of these identified riparian areas where mechanical thinning may occur within riparian habitat or in adjacent woodland vegetation. Mechanical removal of vegetation (including hand thinning) could result in noise disturbance to foraging cuckoos, and alteration of foraging/breeding habitat through thinning, temporary road construction and tree removal. To reduce these effects, the Forest Service would implement the following conservation measures and design features (Appendix F).

- The Forest Service would not conduct mechanical thinning in potential cuckoo habitat during the height of the breeding season (July 1 through September 30), but thinning could occur from May 15 through July 1, when cuckoos may be present. The Forest Service will coordinate with AGFD and FWS cuckoo species leads to determine when potential habitat polygons require timing restrictions prior to project implementation. Field visits, in coordination with FWS, to assess habitat, stream gradient, vegetation, and floodplain width will determine if and where timing restrictions should occur.
- Mechanical thinning activities would spread across the landscape spatially and temporally to minimize effects in an individual watershed (SW054). Additional design features that would minimize effects to riparian habitat from mechanical thinning include AQ008, BT001, FE004, SW003, SW004, SW006, SW029, SW032, SW039-042, and TR003, as well as others (Appendix F).

There would be no effects to potential cuckoo habitat from cable thinning operations because the Forest Service is not proposing to use this tool in any of the potential cuckoo habitat polygons.

Prescribed Burning Treatments
Prescribed burning of vegetation across the 14,500 acres could disturb foraging cuckoos through noise disturbance, short-term alteration of habitat and increased smoke. To reduce potential effects, the Forest Service would implement the following two conservation measures in potential cuckoo habitat:

- The Forest Service would not conduct any prescribed burns in potential cuckoo habitat during the height of the breeding season (July 1 through September 30), but burning activities could occur from May 15 through July 1, when cuckoos may be present. The Forest Service will coordinate with AGFD and FWS cuckoo species leads to determine when potential habitat polygons require timing restrictions. Field visits in coordination with FWS will assess habitat, stream gradient, vegetation, and floodplain width to determine if and where timing restrictions should occur.
- The Forest Service would use low to low-moderate burn intensity in potential cuckoo habitat to avoid affecting riparian over story (to protect potential breeding habitat), but to target thinning of ground cover and dense shrubs. This may have short-term adverse effects to cuckoo prey, but would likely improve invertebrate (prey) habitat in the long term because of the increased nutrient cycling.
- Prescribed burning activities would spread across the landscape spatially and temporally to minimize effects in an individual watershed (SW054). Additional design features that would minimize effects to riparian habitat from prescribed burns include FE002, FE003, FE004, FE005, FE007, FE008, SW001-009, and SW050 (Appendix F).

Prescribed burning treatments could have short-term adverse effects on cuckoo habitat by reducing cover and temporarily reducing prey abundance. The prescribed burn treatments prior to the breeding season may promote tree re-sprouting, herbaceous growth, and insect production during the monsoon season. Although design features are included in this alternative to minimize effects from treatments, adverse effects to cuckoos could still occur during migration and the early or late parts of the breeding season. Prescribed burning just prior to cuckoo arrival would reduce the available foraging habitat and prey species to cuckoos. Fire and smoke may alter cuckoo behavior through visual and aural disturbance, which may result in avoidance, ranging from less than a day where visual and noise disturbance is temporary to one or more foraging/breeding seasons if there are more substantial habitat effects.

While prescribed fire may disturb cuckoos occurring in riparian and adjacent habitat while they are present (May 15 through September 30), conservation measures and design features (Appendix F) would avoid or minimize the adverse effects to potential cuckoo habitat. Although suitable habitat occurs in the project area, the habitat is at the species outer limits (higher elevation with smaller reaches of riparian habitat) and may not support a breeding population of cuckoos.

Facilitative Operations
The effects of any mechanical thinning or prescribed burning in non-target vegetation cover types (*e.g.*, juniper) would be as described above in the mechanical thinning and prescribed burning treatment sections. There would be no additional effects to cuckoos or potential cuckoo habitat from facilitative operations other than what we discussed above.

Aspen Restoration
Based upon the information provided by the Forest Service, we do not anticipate that aspen restoration would affect cuckoos. The aspen areas are not within the identified riparian habitat and aspen is not a known forest type used by the cuckoo. Therefore, there would be no effects to cuckoos or potential habitat from aspen restoration.

Severe Disturbance Area Treatments
Severe disturbance area treatments would not occur within potential cuckoo habitat; therefore, there would be no effects to cuckoos or potential cuckoo habitat from this action. If a Forest Service biologist determines a particular potential habitat polygon would not support breeding cuckoo, mastication could occur up to the appropriate AMZ.

Savanna Restoration
Savanna restoration actions would not occur in or adjacent to potential cuckoo habitat; therefore, there would be no effects to cuckoos or potential cuckoo habitat from this action.

Grassland and Meadow Restoration
Grassland and meadow restoration actions would not occur in or adjacent to potential cuckoo habitat; therefore, there would be no effects to cuckoos or potential cuckoo habitat from this action.

Barrier Fence Construction
Barrier (fence) construction would not occur in or adjacent to potential cuckoo habitat; therefore, there would be no effects to cuckoos or potential cuckoo habitat from this action.

Road Use
Within potential cuckoo habitat there may be existing closed roads (ML-1) that the Forest Service opens to provide access for mechanical thinning and prescribed burning treatments to facilitate the work. The Forest Service would return these roads to a closed status (ML-1) upon completion of work in the immediate area. There may also be a need for temporary roads in some of the potential habitat to access areas. The Forest Service would decommission any temporary roads or existing non-system roads when treatments are completed. We anticipate there may be short-term adverse effects to potential cuckoo habitat because of vegetation removal from the opening of closed roads and/or the creation of temporary roads.

Rock Pits
The Forest Service is not constructing or expanding any rock pits in or adjacent to potential cuckoo habitat; therefore, there would be no effects to cuckoos or potential cuckoo habitat from this action.

In-Woods Processing Sites
The Forest Service is not proposing to permit/construct in-woods processing sites within or adjacent to potential cuckoo habitat; therefore, there would be no effects to cuckoos or potential cuckoo habitat from the creation and operation of these processing sites.

Aquatic Restoration (Riparian, Wet Meadow, Spring, and Stream Restoration; and, Road Decommissioning and Relocation)
The Forest Service proposes to conduct mechanical thinning and prescribed burning in 14,571 acres of riparian habitat, which includes potential cuckoo habitat, as described above. The effects of any mechanical thinning or prescribed burning in riparian vegetation cover types would be as described above in the mechanical thinning and prescribed burning treatment sections. There would be no additional effects to cuckoos or potential cuckoo habitat from riparian restoration other than what we discussed above.

Wet meadow restoration could occur on approximately 6,721 acres, but these meadows are at the top of the headwater drainages and likely include very little, if any, of the identified potential cuckoo habitat. Therefore, there would be discountable effects to potential cuckoo habitat from the wet meadow restoration. There may be some beneficial effects to potential cuckoo habitat downstream of these areas if the actions are able to improve wet meadow function and increase (or at least aid in maintaining) water flow in these drainages.

Summary
Using the Southwestern Region's riparian potential vegetation layer, the Forest Service estimated that there are approximately 14,500 acres of potentially suitable cuckoo foraging habitat in the Rim Country Project area. This project proposes mechanical thinning and prescribed burn treatments in this potential cuckoo habitat and in adjacent woodlands. We anticipate that the effects of the proposed thinning is unlikely to result in substantial disturbance effects to breeding cuckoos, as we are not reasonably certain that cuckoos use these areas within the higher elevations, for breeding. Although the Forest Service identified potential habitat in the project area, these areas are located at the outer limits of what we understand cuckoos to use for breeding (higher elevation with small reaches of riparian habitat) and is, therefore, unlikely to support breeding cuckoos. Therefore, although there may be short-term adverse effects to foraging cuckoos due to short-term habitat alteration and increased smoke, the proposed actions would benefit foraging cuckoos and potential habitat in the long term by reducing the risk of a high-intensity wildfire, increasing vegetative diversity that may improve prey habitat, and improving watershed function within and adjacent to the Rim Country Project area.

We have determined that the proposed action "may affect, and is likely to adversely affect" the cuckoo. There is no cuckoo critical habitat in the project area; therefore, there would be no effects to critical habitat.

Effects to Recovery (Tipping Point)
In *Wild Fish Conservancy v. Salazar*, 628 F.3d 513 (9th Cir.2010), the Ninth Circuit held that the Service must identify when a species would likely pass the tipping point for recovery and determine whether the proposed action would cause the species to reach that tipping point. We determined that the proposed action may affect, and is likely to adversely affect the cuckoo, particularly through short-term adverse effects to potential habitat. The FWS has not yet developed a recovery plan for the cuckoo. We anticipate primary recovery objectives to focus on the threats affecting cuckoo habitat, such as drought and human-caused dewatering of streams that degrade riparian nesting and foraging habitat. Because this proposed action would ultimately benefit the cuckoo and its habitat by reducing the potential for high-intensity wildfire and improving overall watershed condition, we do not anticipate the proposed action would adversely affect implementation or success of likely recovery objectives and we conclude that the proposed action is not likely to cause cuckoos to reach the tipping point for recovery.

CUMULATIVE EFFECTS

Cumulative effects are those effects of future State or private activities, not involving federal activities, that are reasonably certain to occur within the action area considered in this biological opinion (50 CFR 402.02).

The following includes future State, tribal or private activities that may affect species or their critical habitat within the Rim Country Project area.

- Specific activities associated with private lands within and/or adjacent to the project area include livestock and agricultural uses, water developments and diversions, and road and infrastructure developments.
- State lands within the project area provide recreational opportunities such as hunting and watchable wildlife. These lands include multiple wildlife areas and fish hatcheries. Specific activities associated with state lands include existing water developments and diversions, road and infrastructure developments, and recreation. Future management actions by AGFD and FWS within the watersheds, especially relative to the stocking of nonnative aquatic species, continue to affect watersheds within the project area.

State and private lands comprise a small portion of species' action areas ranging from 0-4% Spinedace and Gila trout have the highest acreage of non-federal lands within the area under analysis.

Future actions within the project area that may affect listed species and/or their habitats include road and trail use and maintenance, recreational activities (hunting and wildlife viewing), water developments and diversions, infrastructure developments, and non-native species. These actions may affect the owl, spinedace, frog, trout, gartersnake and cuckoo through decreased vegetation, increased sedimentation or through overall deterioration of soil stability, which can contribute to a loss of site integrity and habitat.

JEOPARDY AND ADVERSE MODIFICATION ANALYSIS

Section 7(a)(2) of the ESA requires that federal agencies ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of designated critical habitat.

Jeopardy Analysis Framework

Our jeopardy analysis relies on the following:

"Jeopardize the continued existence of" means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR 402.02). The following analysis relies on four components:

(1) Status of the Species, which evaluates the range-wide condition of the listed species addressed, the factors responsible for that condition, and the species' survival and recovery needs;

(2) 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) Effects of the Action (including those from conservation measures), which determines the direct and indirect effects 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.

The jeopardy analysis in this biological opinion emphasizes the range-wide survival and recovery needs of the listed species and the role of the action area in providing for those needs. We evaluate the significance of the proposed Federal action within this context, taken together with cumulative effects, for making the jeopardy determination.

Destruction/Adverse Modification Analysis Framework

The final rule revising the regulatory definition of "destruction or adverse modification of critical habitat" became effective on March 14, 2016 (81 FR 7214). The revised definition states: "Destruction or adverse modification means a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of a listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features."

Like our jeopardy analysis, our adverse modification analysis of critical habitat relies on the following four components:

(1) the Status of Critical Habitat, which evaluates the range-wide condition of designated critical habitat in terms of PCEs, the factors responsible for that condition, and the intended recovery function of the critical habitat overall;

(2) the Environmental Baseline, which evaluates the condition of the critical habitat in the action area, the factors responsible for that condition, and the recovery role of the critical habitat in the action area;

(3) the Effects of the Action, which determine the direct and indirect effects of the proposed federal action and the effects of any interrelated or interdependent activities on the PCEs and how they would influence the recovery role of affected critical habitat units; and,

(4) Cumulative Effects, which evaluate the effects of future, non-federal activities in the action area on the PCEs and how they would influence the recovery role of affected critical habitat units.

Conclusion

After reviewing the status of the species, the environmental baseline for the action area, the effects of the action, as proposed, and the cumulative effects, it is our biological opinion that Rim Country Project, as proposed, is not likely to jeopardize the continued existence of the

Mexican spotted owl, Little Colorado spinedace, Chiricahua leopard frog, narrow-headed gartersnake, Gila trout and western DPS of yellow-billed cuckoo, and is not likely to destroy or adversely modify designated critical habitat for the owl, spinedace, frog, and gartersnake. We base these conclusions on the following:

Mexican Spotted Owl and Critical Habitat

- The Rim Country Project would strive to implement the Recovery Plan (USFWS 2012) and manage for Mexican spotted owl recovery within the 1.2 million acre project area.

- Desired conditions and design features in the Rim Country Project would reduce the potential for landscape level, stand-replacing fire in pine-oak and mixed-conifer forests that the Mexican spotted owl occupies. These efforts to improve forest condition and sustainability would also provide for future nest/roost replacement recovery habitat on the landscape, which is an extremely important recovery action. These actions would contribute to owl recovery in the UGM and BRW EMUs.

- Based on the discussion provided in the Effects to Mexican Spotted Owl Critical Habitat section above, the CHUs (UGM-7, 10, and 11 and BRW-5) that the Rim Country Project would affect, would continue to serve the function and conservation role of critical habitat for the Mexican spotted owl.

Little Colorado Spinedace and Critical Habitat

- Although the project may result in short-term increases in sediment inputs to spinedace habitat within the project area, these actions would improve spinedace habitat over the long term and would protect currently occupied habitats from further degradation due to existing poor watershed condition.

- Conducting thinning and prescribed burning will improve water infiltration and increase base flows to occupied, potential, and critical habitat within the project area. Improving water retention in these drainages is vital to maintaining spinedace habitat in a warming and drying climate.

- Implementing the proposed upland vegetation and aquatic restoration actions, including the design features, conservation measures, and establishing the ARRT, would improve spinedace recovery potential in the project area.

- Critical habitat within the Rim Country Project area would continue to serve the function and conservation role of critical habitat for the spinedace.

Chiricahua Leopard Frog and Critical Habitat

- Although the project may result in short-term adverse effects to frog habitat, especially dispersal habitat, over the long term the proposed action would improve frog habitat and watershed condition.

- Implementing the proposed upland vegetation and aquatic restoration actions, including the design features, conservation measures, and establishing the ARRT, would improve

leopard frog recovery potential in the project area.

- Critical habitat within the Rim Country Project area would continue to serve the function and conservation role of critical habitat for the frog.

Gila Trout

- Although the project may result in short-term increases in sediment inputs to trout habitat within the project area, over the long term the proposed action would improve trout habitat and watershed condition by completing restoration activities and by reducing the potential for high-intensity, stand-replacing wildfire.

- Conducting thinning and prescribed burning would improve water infiltration and increase base flows to occupied and potential habitat within the project area. Improving water retention in these drainages is vital to maintaining Gila trout habitat in a warming and drying climate.

- Implementing the proposed upland vegetation and aquatic restoration actions, including the design features, conservation measures, and establishing the ARRT, would improve Gila trout recovery potential in the project area.

- The FWS did not designate critical habitat for the Gila trout; therefore, there would be no effect to PBFs from the proposed action.

Narrow-headed Gartersnake and Critical Habitat

- Although the project may result in short-term increases in sediment inputs to aquatic gartersnake habitat within the project area and there is the potential for disturbance and/or harm to gartersnakes from stream restoration activities, over the long term the proposed action would improve gartersnake habitat and watershed condition by completing restoration activities and by reducing the potential for high-intensity, stand-replacing wildfire.

- The Rim Country Project would maintain and enhance perennial streams or spatially intermittent streams that provide both aquatic and terrestrial habitat for gartersnakes.

- The Rim Country Project would improve gartersnake habitat, including watershed function and condition, through implementation of treatments to reduce large, high-intensity wildfire effects and riparian and stream restoration activities.

- Implementing the proposed upland vegetation and aquatic restoration actions, including the design features, conservation measures, and establishing the AART, would improve gartersnake recovery potential in the project area.

- Critical habitat in Canyon and Haigler creeks would continue to serve the function and conservation role of critical habitat for the gartersnake.

Western Yellow-billed Cuckoo

- We do not think that breeding cuckoos occur within the Rim Country Project area. However, the Forest Service identified potential habitat that could serve as foraging habitat and intends to manage it to promote riparian habitat and vegetation diversity. Therefore, regardless of cuckoo presence, the proposed action would improve riparian vegetation and reduce wildfire risk to riparian areas, which would benefit foraging habitat for the cuckoo.

- There is no cuckoo critical habitat the Rim Country Project area; therefore, there will be no effect to PBFs from the proposed action.

We based the conclusions of this biological opinion on full implementation of the project as presented in the **Description of the Proposed Action** section of this document.

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. We define "incidental take" 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 if such taking is in compliance with the terms and conditions of this Incidental Take Statement.

MEXICAN SPOTTED OWL

AMOUNT OR EXTENT OF TAKE

For the purpose of evaluating incidental take of Mexican spotted owls from the action under consultation, incidental take can be anticipated as either the direct fatality of individual owls or the alteration of habitat that affects owl behavior (*e.g.*, breeding or foraging) only temporarily, or to such a degree that the owls are considered lost as viable members of the population and thus "taken." Owls experiencing only temporary or short-term effects may fail to breed, fail to successfully rear young, or raise less fit young; longer-term disturbance may result in owls deserting the area because of chronic disturbance or because habitat no longer meets the owl's needs.

We anticipate that the proposed action is reasonably certain to result in incidental take of Mexican spotted owls. However, it is difficult to quantify the number of individual owls potentially taken because: (1) dead or impaired individuals are difficult to find and losses may be masked by seasonal fluctuations in environmental conditions; (2) the status of the species could

change over time through immigration, emigration, and loss or creation of habitat; and (3) the species is secretive and we rarely have information regarding the number of owls occupying a PAC and/or their reproductive status. For these reasons, we will attribute incidental take at the PAC level. This fits well with our current section 7 consultation policy which provides for incidental take if an activity compromises the integrity of an occupied PAC to an extent that we are reasonably certain that incidental take occurred (USFWS 1996). Actions outside PACs will generally not result in incidental take because we are not reasonably certain that Mexican spotted owls are nesting and roosting in areas outside of PACs. We may modify this determination in cases when there is suitable habitat where there is inadequate survey data and we are reasonably certain spotted owls are present.

Based upon analyses of the effects of Forest Service projects within previous forest restoration biological opinions, we anticipate the majority of incidental take for actions implemented under the Rim Country Project will be in the form of short-term harassment. Owls experiencing short-term harassment may fail to successfully rear young in one or more breeding seasons, but will not likely desert the area because of a short-term disturbance (Delaney *et al.* 1999). We measure harassment as owls taken associated with a specific number of PACs. We also anticipate incidental take in the form of harm, albeit at a lesser amount than take from harassment and we measure it as the number of owls taken. For this project, harm would be the direct fatality of individual birds.

The Rim Country Project may affect more than 214 PACs. The Forest Service is not proposing treatment within 11 PACs that occur within the project area. Besides mechanical thinning and prescribed burning, many PACs may have comprehensive and/or aquatic restoration activities within them, but this work will occur outside the breeding season (unless protocol surveys indicate non-breeding, which may allow for waiving the timing restriction) and the actions would not modify habitat such that we think there would be incidental take because of these actions.

Using available information as summarized within this document, we have identified conditions of incidental take for the Mexican spotted owl associated with implementation of the Rim Country Project. Based upon the potential for incidental take to occur as part of implementation of the project, we anticipate the following incidental take for the proposed action, which is in addition to previously authorized incidental take resulting from ongoing projects or projects that have yet to be implemented:

- We anticipate the take of one pair of Mexican spotted owls and/or associated eggs/juveniles in the form of harassment in up to five PACs per year due to a single (one breeding season) or short-term (one to three consecutive breeding seasons) disturbance (non-habitat altering action that disrupts or is likely to disrupt owl behavior within the PACs) or habitat alteration (*e.g.*, short-term loss of key habitat components) associated with implementation of the proposed action. We do not expect that owls associated with five PACs may be taken each year because of short-term disturbance and/or habitat alteration; however, we think the potential is there in any given year. The disturbance and short-term habitat modification generated by activities associated with the Rim Country Project is likely to interrupt, impede, or disrupt normal behavior patterns to the point that breeding and feeding activities are adversely affected over the course of one to three

consecutive breeding seasons. We will consider incidental take to be exceeded if owls associated within an individual PAC are harassed over the course of more than three consecutive breeding seasons or if owls associated with more than five PACs are harassed in one year because of actions authorized under the Rim Country Project. We expect this incidental take to occur on the Coconino, Tonto, and Apache-Sitgreaves NFs within the project area.

- The Clint's Well, Nagel, Rim Lakes, and Upper Beaver projects may affect, but are not likely to adversely affect Mexican spotted owls as mechanical thinning is almost complete, and remaining work includes initial and maintenance prescribed fire that would follow Recovery Plan guidelines (USFWS 2012); therefore, and no additional incidental take coverage is necessary for these projects.
- In addition, we anticipate the incidental take of four Mexican spotted owls in the form of harm and/or direct fatality due to vehicular collision over the 20-year life of this consultation. Previous project analysis has indicated that we have not exceeded incidental take of one owl every five years from increased vehicular activity associated with restoration projects. Annual reporting will document how, when, and where such fatalities occur. Following the discovery of three fatalities within the Rim Country Project area, we will re-assess the project with the Forest Service and determine how to reduce fatalities.

EFFECT OF THE TAKE

In the accompanying biological opinion, we have determined that the level of anticipated take is not likely to result in jeopardy to the Mexican spotted owl. Although we anticipate incidental take to occur, the implementation of conservation measures, design features, and BMPs should ultimately result in avoidance and minimization of adverse effects. We describe these measures in the Description of the Proposed Action, the Effects Section, and Appendix F.

REASONABLE AND PRUDENT MEASURES AND TERMS AND CONDITIONS

In addition to conservation measures, design features, and BMPs included in the proposed, action, the FWS thinks the following reasonable and prudent measure(s) are necessary and appropriate to minimize take of Mexican spotted owls:

1. Minimize adverse effects to owls affected by the Rim Country Project.
2. Minimize adverse effects to owl habitat affected by the Rim Country Project.
3. Monitor the effects of mechanical thinning, prescribed burning, and comprehensive restoration actions to the Mexican spotted owl from the Rim Country Project.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the Forest Service must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

1. The following terms and conditions will implement reasonable and prudent measure 1:
    1.1 Forest Service management activities within PACs and nest/roost replacement recovery habitat shall be coordinated with FWS staff through an IDT and implemented to reduce potential disturbance to Mexican spotted owls. For example, where possible, prescribed burning associated with aquatic restoration

actions would be coordinated with overall PAC burning activities in order to minimize the frequency and duration of operations within and immediately adjacent to these areas.

1.2 The Forest Service, in coordination with the FWS, shall develop contingency plans when new owl sites are detected (as defined in the Recovery Plan) or PAC boundary modifications occur due to owl movement or habitat changes. The Forest Service shall build flexibility into project implementation and contracts (including task orders) so that as owls move or new sites are located, the Forest Service can modify actions appropriately to accommodate these situations.

2 The following terms and conditions will implement reasonable and prudent measure 2:

2.1 The Forest Service shall coordinate timing of management activities (*e.g.*, thinning, burning, comprehensive restoration, etc.) within PACs and nest/roost replacement recovery habitat in order to reduce effects to habitat from multiple entries that result in adverse effects to habitat.

2.2 The Forest Service shall meet annually with the FWS to discuss the upcoming year's upland vegetation management (*e.g.*, mechanical thinning and prescribed burning) and aquatic restoration schedule in Mexican spotted owl habitat and review the past year's thinning and burning activities in owl habitats. This meeting should occur in January or February of each calendar year.

2.3 The Forest Service shall develop a process for the review/ground-truthing and tracking of stands identified as nest/roost replacement habitat by December 31, 2022. This will allow for early identification of the acres with the most potential to support nesting/roosting owls so that the Forest Service can identify the least impactful mechanical treatment methods to key habitat components within these acres (*e.g.*, if a candidate nest/roost stand contains many trees >24 inches dbh, perhaps we do not use cable operations on this site). The Forest Service will share these processes and the GIS data with the FWS.

3 The following terms and conditions will implement reasonable and prudent measure 3:

3.1 The Forest Service shall work with the FWS and RMRS to implement a study examining the influence of upland vegetation management treatments on Mexican spotted owl habitat selection and resource use (Appendix C). This information would inform adaptive management of mechanical thinning and prescribed burning treatments in owl habitat and increase our knowledge regarding the effects of these treatments to owls. This would minimize effects to owls by using data to inform treatments and satisfy the commitment our agencies made to monitor the effects of Rim Country Project mechanical thinning and burning treatments to the owl and its habitat.

3.2 The Forest Service shall monitor the effects of incidental take resulting from implementation of the proposed action and report these findings to the FWS in the annual report. Design features include reporting of any owl fatality within 48 hours. Incidental take monitoring shall include information such as when the activities occurred in PACs, whether the activity was implemented as proposed and analyzed in this biological opinion (including conservation measures,

design features, and BMPs), relevant owl survey information, and any other pertinent information about the projects effects to the owl and its habitat.

3.3 Annual reports will describe actions taken under this proposed action and effects to the owl and its critical habitat. The annual report shall be sent to the Flagstaff FWS Ecological Services field office by March 1st of each year.

LITTLE COLORADO SPINEDACE

AMOUNT OR EXTENT OF TAKE

We anticipate that the proposed action is reasonably certain to result in incidental take of spinedace. We expect this incidental take to be in the form of harm (direct fatality or injury) and harassment resulting from the effects of aquatic restoration actions and road use (specifically the ML-1 road and associated low water crossing on Leonard Canyon) on the spinedace. The Forest Service has proposed eleven miles for heavy mechanical stream restoration treatments within spinedace sub-watersheds. The FWS anticipates incidental take of spinedace will be difficult to detect because: (1) dead or impaired individuals are almost impossible to find (and are readily consumed by predators) and losses may be masked by seasonal fluctuations in environmental conditions; (2) the status of the species is changing over time through immigration, emigration, and natural loss or active creation of habitat through management; and, 3) the species is small-bodied, well-camouflaged, and occurs under water of varying clarity, and thus individuals are difficult to detect. Since we cannot estimate the number of individual spinedace that will be incidentally taken for the reasons listed above, we are providing a mechanism to quantify when take would be considered to be exceeded as a result of the implementing the Rim Country Project. If the Forest Service affects more than 11 miles of spinedace occupied or suitable habitat through heavy mechanical stream restoration, incidental take would be exceeded.

EFFECT OF THE TAKE

In the accompanying biological opinion, we have determined that the level of anticipated take is not likely to result in jeopardy to the spinedace. Although we anticipate incidental take to occur, the implementation of conservation measures, design features, and BMPs should ultimately result in avoidance and minimization of adverse effects. We describe these measures in the Description of the Proposed Action, the Effects Section, and Appendix F.

REASONABLE AND PRUDENT MEASURES AND TERMS AND CONDITIONS

In addition to conservation measures, design features, and BMPs included in the proposed, action, the FWS thinks the following reasonable and prudent measure(s) are necessary and appropriate to minimize take of spinedace:

1. Minimize adverse effects to spinedace and habitat affected by the Rim Country Project.
2. Monitor incidental take resulting from the proposed action and report this information to the FWS.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the Forest Service must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

1. The following terms and conditions will implement reasonable and prudent measure 1:
    1.1 The Forest Service shall not use the low water crossing at Dines Tank that crosses Leonard Canyon. The Coconino NF closed the road as part of a previous watershed protection project to protect spinedace and it should remain closed.
    1.2 Forest Service management activities within occupied spinedace habitat shall be coordinated and implemented to reduce adverse effects to spinedace. For example, where possible, prescribed burning associated with riparian restoration or earth moving associated with channel restoration will be coordinated with other Forest Service activities to minimize the frequency and duration of operations within and immediately adjacent to occupied habitat.

2 The following terms and conditions will implement reasonable and prudent measure 2:
    2.1 Annual reports will describe actions taken under this proposed action and effects to the spinedace and its critical habitat. The annual report shall be sent to the Flagstaff FWS Ecological Services field office by March 1st of each year.

CHIRICAHUA LEOPARD FROG

AMOUNT OR EXTENT OF TAKE

We anticipate that the proposed action is reasonably certain to result in incidental take of frogs, specifically juvenile dispersing frogs. We expect this incidental take to be in the form of harm (direct fatality or injury) and harassment to dispersing juvenile frogs resulting from the increased presence of low water stream crossings (up to more than 186 more low water crossings than are currently open) as well as other project activities that dispersing frogs may encounter. Implementation of design features (especially AQ035 and AQ037) will reduce the likelihood of incidental take. The FWS anticipates that incidental take of dispersing frogs will be difficult to detect for the following reasons: (1) dead or impaired individuals are almost impossible to find (and are readily consumed by predators) and losses may be masked by seasonal fluctuations in environmental conditions; (2) the status of the species is changing over time through immigration, emigration, and natural loss or active creation of habitat through management; and, (3) the species is small-bodied, well camouflaged, and occurs under water of varying clarity, and thus individuals are difficult to detect. Due to the difficulty in quantifying the number of frogs that will be taken because of the proposed action, we are quantifying take incidental to the project as the harm, harassment, and injury of all dispersing juvenile frogs that attempt to cross at low water crossings opened as part of the proposed action and that are struck by vehicles. Because we anticipate take of all dispersing frogs in this manner, and “all” cannot be exceeded, there is no exceedance criterion.

EFFECT OF THE TAKE

In the accompanying biological opinion, we have determined that the level of anticipated take is not likely to result in jeopardy to the Chiricahua leopard frog. Although we anticipate incidental take to occur, the implementation of conservation measures, design features, and BMPs should ultimately result in avoidance and minimization of adverse effects. We describe these measures in the Description of the Proposed Action, the Effects Section, and Appendix F.

REASONABLE AND PRUDENT MEASURES AND TERMS AND CONDITIONS

In addition to conservation measures, design features, and BMPs included in the proposed, action, the FWS thinks the following reasonable and prudent measure(s) are necessary and appropriate to minimize take of Chiricahua leopard frogs:

1. Monitor the effects to frogs from comprehensive and aquatic restoration actions implemented by the Rim Country Project.

Terms and Conditions
In order to be exempt from the prohibitions of section 9 of the Act, the Forest Service must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

1 The following terms and conditions will implement reasonable and prudent measure 1:
- 1.1 The Forest Service shall monitor the effects of incidental take resulting from implementation of the proposed action and report these findings to the FWS in the annual report. Incidental take monitoring shall include information such as when upland and aquatic restoration actions occurred within potential frog habitat, whether the project was implemented as proposed and analyzed in this biological opinion (including conservation measures, design features, and BMPs), if actions occurred during monsoon season(s) when frogs are most likely to disperse, and any other pertinent information about the project's effects on the species. The annual report should document where and when implementation of the proposed action has likely resulted in minimization, reduction, or elimination of adverse effects, as well as when project implementation has likely resulted in incidental take to this species or significant adverse effects to occupied or periodically occupied habitat. This will assist us in interpreting long-term frog population trend and their relation to project implementation.
- 1.2 Annual reports will describe actions taken under this proposed action and effects to the Chiricahua leopard frog. The annual report shall be sent to the Flagstaff FWS Ecological Services field office and the Chiricahua leopard frog species lead by March 1st of each year.

GILA TROUT

AMOUNT OR EXTENT OF TAKE
Because of implementation of project design criteria, we anticipate that thinning and burning in Gila trout habitat may have short-term adverse effects from slight increases in sedimentation and spatially small, but negative effects to AMZs through reduced canopy cover. While operators would not utilize all ML-1 roads or crossings at the same time, use of any of these ML-1 roads or crossing have the potential for short-term adverse effects to Gila trout from increased sedimentation that would result in short-term harassment of all Gila trout stocked in Christopher, Ellison, Haigler, and Workman creeks not removed through angling and that are still present during project implementation.

Gila trout would not be in Christopher, Ellison, Haigler, and Workman creeks except for

stocking under the statewide sport fish stocking action (USFWS 2021a). In the statewide sport fish stocking consultation we provided an incidental take statement for 50% of Gila trout stocked due to angling, and 50% due to predation or through other causes for Ellison Creek, and 70% of Gila trout stocked due to angling and 30% due to other causes for Christopher, Haigler, and Workman creeks. While we anticipate incidental take of Gila trout from this proposed action, we have already assessed take in the sport fish stocking consultation (USFWS 2021a) under "other causes" for Gila trout in Ellison, Christopher, Haigler, and Workman creeks. We are therefore not providing additional coverage for incidental take here. However, we quantify take here to ensure that take from this action will not result in jeopardy to Gila trout. Additionally, we are assessing incidental take of Gila trout recovery populations in Dude and Chase creek for this action.

We anticipate the number of Gila trout present and affected will be small due to low numbers of stocking in Christopher (n = 8,000), Ellison (n = 1,000), Haigler (n = 12,000), and Workman (n = 1,500) creeks. Of the fish stocked, we anticipate that 50% to 70% would be removed via angling (USFWS 2021a). We anticipate incidental take of all Gila trout remaining in the proposed action area through short-term harassment due to thinning, burning, or restoration activities. Because we anticipate take of all Gila trout in this manner, and "all" cannot be exceeded, there is no exceedance criterion.

For Chase and Dude Creek, which are both Gila trout recovery streams, we anticipate that the heavy mechanical restoration actions are reasonably certain to result in incidental take of Gila trout within the footprint of the action area (between block nets). We anticipate most Gila trout that occur within stream restoration areas will be salvaged prior to heavy mechanical stream or comprehensive restoration activities, and any remaining fish incidentally taken will be difficult to detect or quantify. However, because fish removal and/or isolation activities prior to aquatic stream restoration implementation are not likely to capture all fish and the fish they collect would be harassed and may be harmed, we therefore expect limited direct and indirect incidental take of Gila trout occurring within the stream in the form of injury or death from heavy mechanical stream restoration activities. We anticipate take of all Gila trout in the form of harm and/or harassment due to handling during capture and removal efforts, or due to harm of limited numbers of unsalvaged fish during stream restoration activities in Chase and Dude creeks. Because we anticipate take of all Gila trout in this manner, and "all" cannot be exceeded, there is no exceedance criterion.

EFFECT OF THE TAKE

In the accompanying biological opinion, we have determined that the level of anticipated take is not likely to result in jeopardy to the Gila trout. Although we anticipate incidental take to occur, the implementation of conservation measures, design features, and BMPs should ultimately result in avoidance and minimization of adverse effects. We describe these measures in the Description of the Proposed Action, the Effects Section, and Appendix F.

REASONABLE AND PRUDENT MEASURES AND TERMS AND CONDITIONS

In addition to conservation measures, design features, and BMPs included in the proposed, action, the FWS thinks the following reasonable and prudent measure(s) are necessary and appropriate to minimize take of Gila trout:

1. Monitor the effects of comprehensive and aquatic restoration actions to the trout from the Rim Country Project.

Terms and Conditions
In order to be exempt from the prohibitions of section 9 of the Act, the Forest Service must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

1. The following terms and conditions will implement reasonable and prudent measure 1:
    1.1 The Forest Service shall monitor the effects of incidental take resulting from implementation of the proposed action and report these findings to the FWS in the annual report. Incidental take monitoring shall include information such as when the aquatic restoration action was implemented, whether the project was implemented as proposed and analyzed in this biological opinion (including conservation measures, design features, and BMPs) and any other pertinent information about the project's effects on the trout (including the number of low-water crossings used for project activities that cross occupied Gila trout streams and length (miles) and area (acres) AMZs thinned and burned in occupied Gila trout streams).
    1.2 Annual reports will describe actions taken under this proposed action and effects to the Gila trout. The annual report shall be sent to the Flagstaff FWS Ecological Services field office and the Gila trout species lead by March 1st of each year.

NARROW-HEADED GARTERSNAKE

AMOUNT OR EXTENT OF TAKE
We anticipate that the proposed action is reasonably certain to result in incidental take of gartersnakes. We expect incidental take to be in the form of harm (direct injury or fatality, *i.e.*, crushing) and harassment resulting from heavy equipment during stream restoration actions, increase in road use (including low water crossings on perennial tributaries to Canyon Creek), and vegetation treatments in occupied habitat. Incidental take of gartersnakes will occur if the action crushes them in their brumation sites or if heavy equipment kills the gartersnakes while they on the surface or in the water (*e.g.*, placing logs for stream restoration actions, use of low-water crossings, etc.). Design features will reduce the potential for harm and death, but observers are unlikely to see gartersnakes that are hiding or brumating under logs or vegetation or are underground or in the water.

While the entire proposed action may be implemented over 20 years, activities along Haigler and Canyon creeks would not occur for the entire 20-year period, but over smaller, discrete timeframes. We anticipate additional gartersnakes are likely present outside of known detection areas; however, additional survey is needed to determine the complete distribution of gartersnakes. In addition, it is not certain that the entire occupied area would be treated over the life of the proposed action.

The FWS anticipates that incidental take of gartersnakes will be difficult to detect because they

are cryptically colored, secretive, and use subsurface retreats and protective cover. Due to the difficulty in quantifying the number of gartersnakes that will be taken because of the proposed action, we are quantifying incidental take based on the average number of gartersnakes detected at Haigler and Canyon creeks over the last several survey years. For Haigler Creek, gartersnakes have been detected in 4 separate years, with the number of detections ranging from 1 to 3 individual snakes (Holycross et al. 2006, Kern and Burger 2008, Good 2014a, 2014b, Jones 2014, Timmons et al. 2015). Overall, gartersnake detections at Haigler Creek are low. Based on existing survey information, we anticipate incidental take at 2 individual gartersnakes over the life of the action in the form of harm and harassment as described above. Because they are difficult to detect, more gartersnakes may be incidentally taken by the project than would be observed. For this reason, we will use detection of gartersnakes as a surrogate measure for incidental take. Therefore, if one gartersnake is observed or killed during heavy equipment operation during aquatic restoration activities, it is likely gartersnakes are being incidentally taken and the action in Haigler Creek has exceeded incidental take.

For Canyon Creek, gartersnakes detected in the most recent four surveys ranged from two to eight individual snakes. Multiple gartersnake surveys in Canyon Creek from 2015 to 2018 found a relatively stable population with multiple size classes within the project area (Burger 2015, Cotton 2016, 2017, Lashway 2017a, 2017b, Ryan *et al.* 2019, Lashway 2020). Because our information indicates there are more gartersnakes in Canyon Creek, there is the potential for higher exposure between the project and gartersnakes than for Haigler Creek. Based on this information, we anticipate incidental take of gartersnakes at four individuals over the life of the action. Therefore, if three gartersnakes are observed or killed during heavy equipment operation during aquatic restoration activities, it is likely gartersnakes are being incidentally taken and the action in Canyon Creek has exceeded incidental take.

As the design features identify, the Forest Service will contact the FWS gartersnake species lead within 48 hours if they observe gartersnakes to discuss project activities and whether consultation reinitiation or additional protective measures are necessary.

EFFECT OF THE TAKE

In the accompanying biological opinion, we have determined that the level of anticipated take is not likely to result in jeopardy to the gartersnake. Although we anticipate incidental take to occur, the implementation of conservation measures, design features, and BMPs should ultimately result in avoidance and minimization of adverse effects. We describe these measures in the Description of the Proposed Action, the Effects Section, and Appendix F.

REASONABLE AND PRUDENT MEASURES AND TERMS AND CONDITIONS

In addition to conservation measures, design features, and BMPs included in the proposed, action, the FWS thinks the following reasonable and prudent measure(s) are necessary and appropriate to minimize take of gartersnakes:

1. Monitor the effects of comprehensive and aquatic restoration actions to the gartersnake from the Rim Country Project.

Terms and Conditions
In order to be exempt from the prohibitions of section 9 of the Act, the Forest Service must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

1 The following terms and conditions will implement reasonable and prudent measure 1:
  1.1 The Forest Service shall monitor the effects of incidental take resulting from implementation of the proposed action and report these findings to the FWS in the annual report. Incidental take monitoring shall include information such as when actions were implemented, whether the project was implemented as proposed and analyzed in this biological opinion (including conservation measures, design features, and BMPs), season(s) over which the project occurred (active or inactive season for the gartersnake), relevant survey information, and any other pertinent information about the project's effects on the gartersnake.
  1.2 Annual reports will describe actions taken under this proposed action and effects to the gartersnake and its critical habitat. The annual report shall be sent to the Flagstaff FWS Ecological Services field office and the gartersnake species lead by March 1st of each year.

WESTERN YELLOW-BILLED CUCKOO

AMOUNT OR EXTENT OF TAKE
We do not anticipate the proposed action will incidentally take cuckoos. Current information indicates that although there may be potential habitat, we have no information upon which to base incidental take (*e.g*., breeding status of cuckoos, number of cuckoos, potential nesting locations, etc.). If formal cuckoo surveys indicate cuckoos are breeding within the action area, the Forest Service should consider the cuckoo's location, the proposed action, and confer with us to determine whether consultation reinitiation is appropriate. At this time, it is likely that the long-term beneficial effects of decreased high-intensity fire risk and improved watershed function as well as the conservation measures and design features associated with the proposed action will minimize the potential for take within the action area.

Through modeling described above, the Forest Service has estimated that there are approximately 14,500 acres of potentially suitable cuckoo foraging habitat in the Rim Country Project area, and mechanical thinning and prescribed burn treatments would occur in these areas. We anticipate that the effects of the proposed thinning is unlikely to result in substantial disturbance effects to breeding cuckoos, as we are not reasonably certain that cuckoos use these areas within the higher elevations. Suitable habitat identified by the Forest Service within the project area is located at the outer limits of what we understand cuckoos to use for breeding (higher elevation with small reaches of riparian habitat). It is possible foraging cuckoos maybe present. Therefore, although there may be short-term adverse effects to foraging cuckoos due to habitat alteration and increased smoke, we do not anticipate adverse effects to breeding cuckoos. The proposed action may benefit foraging cuckoos and potential habitat in the long term by reducing the risk of a high-intensity wildfire, increasing vegetative diversity that may improve prey habitat, and improving watershed function within and adjacent to the Rim Country Project

area. While disturbance to foraging cuckoos may occur, we do not anticipate that this disturbance will rise to the level of incidental take.

EFFECT OF THE TAKE

We do not anticipate the proposed action will incidentally take any cuckoos. No breeding cuckoos are known to occur in the project area. If foraging cuckoos are present, the implementation of conservation measures, design features, and BMPs should ultimately result in avoidance and minimization of adverse effects, and may provide beneficial effects in the long term. We describe these measures in the Description of the Proposed Action, the Effects Section, and Appendix F.

Review requirement: We designed the reasonable and prudent measures, with their implementing terms and conditions, to minimize the effect of incidental take that might otherwise result from the proposed action. If, during the course of the action, the action exceeds the level of incidental take, such incidental take would represent new information requiring review of the reasonable and prudent measures provided. The Forest Service must immediately provide an explanation of the causes of the taking and review with the FWS the need for possible modification of the reasonable and prudent measures.

Disposition of Dead or Injured Listed Species

Upon locating a dead, injured, or sick listed species initial notification must be made to the FWS's Law Enforcement Office: Efren Chavez, Special Agent; Chandler, Arizona Investigations Office; Post Office Box 6342; Chandler, Arizona 85246; Office: (480) 967-7900 within three working days of its finding. Provide written notification within five calendar days and include the date, time, and location of the animal, a photograph if possible, and any other pertinent information. Send the notification to the Law Enforcement Office with a copy to this office. Care must be taken in handling sick or injured animals to ensure effective treatment and care, and in handling dead specimens to preserve the biological material in the best possible state.

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.

1. We recommend that the Forest Service work with FWS and AGFD to reduce and/or remove nonnative aquatic species within the Rim Country Project area. This action would increase the effectiveness this habitat restoration project, by also addressing an important threat to spinedace, Gila trout, Chiricahua leopard frogs, and gartersnakes.

2. We recommend that the Forest Service work with FWS and AGFD to improve our ability to detect narrow-headed gartersnakes so that we can better understand their distribution within the Rim Country Project area.

3. We recommend the Forest Service work with FWS and AGFD to improve our knowledge of cuckoo use (foraging and breeding) within the Rim Country Project area.

REINITIATION NOTICE

This concludes formal consultation for the Rim Country Project. 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 project exceeds the amount or extent of incidental take, any operations causing such take must cease pending reinitiation.

In keeping with our trust responsibilities to American Indian Tribes, we encourage you to coordinate with the Bureau of Indian Affairs in the implementation of this consultation. By copy of this biological opinion, are notifying the Hopi Tribe, Navajo Nation, San Carolos Apache Tribe, Tonto Apache Tribe, White Mountain Apache Tribe, Yavapai-Apache Nation, Yavapai Prescott Indian Tribe, and Zuni Tribe of its completion. We also encourage you to coordinate the review of this project with the AGFD.

We appreciate the Forest Service's efforts to identify and minimize effects to listed species from this project. We also appreciate your efforts to include us in the development, and implementation of this project.

Please refer to the consultation number, 2022-0013274-S7-001, in future correspondence concerning this project. Should you require further assistance or if you have any questions, please contact Shaula Hedwall (Shaula_Hedwall@fws.gov) or Mary Richardson (Mary_Richardson@fws.gov).

Sincerely,

MARY RICHARDSON

Digitally signed by MARY RICHARDSON
Date: 2022.03.04 16:18:53 -07'00'

for Mark A. Lamb
Acting Field Supervisor

cc (electronic):
Chief, Habitat Branch, Arizona Game and Fish Department, Phoenix, AZ
Regional Supervisor, Arizona Game and Fish Department, Flagstaff, AZ
Regional Supervisor, Arizona Game and Fish Department, Pinetop, AZ
Assistant Field Supervisor, Fish and Wildlife Service, Tucson, AZ (Attn: M. Conway C. Crawford, D. Duncan, and J. Servoss)

Assistant Field Supervisor, Fish and Wildlife Biologist, Phoenix, AZ (Attn: R. Gonzalez, R. Gordon)
Director, Hopi Cultural Preservation Office, Kykotsmovi, AZ
Director, Zuni Heritage and Historic Preservation Office, Zuni, NM
Director, Historic Preservation Department, Navajo Nation, Window Rock, AZ
Director, Tribal Historic Preservation Office, San Carlos Apache Tribe, San Carlos, AZ
Director, Recreation and Wildlife, San Carlos Apache Tribe, San Carlos, AZ
Director, Cultural Resources Department, Tonto Apache Tribe, Payson, AZ
Director, Cultural Resources Department, White Mountain Apache Tribe, Whiteriver, AZ
Director, Game and Fish Department, White Mountain Apache Tribe, Whiteriver, AZ
Director, Apache Cultural Program, Yavapai-Apache Nation, Camp Verde, AZ
Director, Yavapai Cultural Program, Yavapai-Apache Nation, Camp Verde, AZ
Director, Cultural Research Program, Yavapai-Prescott Indian Tribe, Prescott, AZ
Environmental Protection Officer, Environmental Quality Services, Western Regional Office, Bureau of Indian Affairs, Phoenix, AZ

TABLES AND FIGURES

Table 1. Associated actions the Forest Service may implement to support the vegetation (thinning and burning) treatments.

Action	Action Components
Mechanical Thinning/Logging	Mechanical equipment could be used for mastication/chipping, lop and scatter, thinning, limbing, moving, rearranging, or removal of jackpots or excessive surface fuels, or any combination of the above.
Prescribed Fire	Broadcast burning, jackpotting, pile burning, blacklining.
Fireline Construction	Mechanical or hand construction, vegetation removal.
Vegetation Planting/Reforestation	Site preparation and planting using either hand or mechanical means such as augers or skid steer.
Facilitative Operations Mechanical	Mastication, chipping, lop and scatter.
Rock Pits	Use and potential expansion of pits for source rock for roads and stream restoration projects; may include mechanical surface disturbance.
Road Construction	Mechanical surface disturbance, including digging, filling, rock placement, relocation, etc.
Road Decommissioning	Closing roads, road surface rehabilitation, and cutting trees.
In-woods Processing Sites	Mechanical surface disturbance; includes potential presence of fuel and other petroleum-based chemicals in the log processing area.

Table 2. Methods for restoration of riparian, spring, road/trail, and stream areas.

Project Type	Actions to address issues	Methods
Riparian restoration	Remove upland tree(s) or shrub encroachment.	Use of hand tools, mechanical thinning, and/or prescribed fire to remove undesired vegetation.
	Address loss or decline of native and/or rare wetland, riparian, and aquatic plant species, bank stability and leaf litter.	Plant native aquatic or riparian plants or seeds by hand or mechanically.
	Promote plant growth and vigor, reduce erosion and sediment inputs to aquatic systems, removal of riparian or aquatic stressors. Reduce ungulate grazing, excessive soil disturbance, OHV effects, user-created trails, and dispersed camping causing resource damage. Reduce erosion, bank instability.	Implement seasonal, temporary, or year-round access restrictions. Install fencing, remove or relocate roads or trails, create defined trails for recreation management using manual or mechanical tools.
Spring restoration	Improve or remove spring boxes or other infrastructure, to restore natural spring function. Remove unneeded channels to consolidate spring outflow and increase habitat.	Surface disturbance, including digging, filling, rock placement, etc. Use heavy machinery or hand tools.
	Split flow in developed springs to allow for water in excess of water right to go to spring run. Hand methods for fixing spring boxes, piping, or diversions to split spring flow.	Surface disturbance, including digging, filling, rock placement, etc. Use heavy machinery or hand tools.
	Protect spring emergence zone and/or spring brook from ungulates.	Install fencing.
Road/trail restoration to benefit springs, streams, wetlands	Existing roads causing resource damage such as confining a stream, draining wetlands, loss or degradation of riparian or aquatic vegetation and habitat, and loss or degradation to proper soil function.	Obliterate roads restoring natural contours and vegetation using mechanical roads treatments.
	Unauthorized roads, trails or other recreational activities causing resource damage such as confining a stream, draining wetlands, degrading riparian or aquatic vegetation, and/or degrading proper soil function.	Close and restore unauthorized roads, trails, and dispersed camping areas using mechanical treatments.
	Erosion, sedimentation, degradation or loss of vegetation from ML-1 roads.	Close ML-1 roads after project use for by removing drainage infrastructure (e.g., culverts); reestablishing road drainage by constructing

Project Type	Actions to address issues	Methods
		lead-out ditches, water bars, rolling dips; removal of unstable fill; and/or placement of slash using mechanical roads treatments.
	Increased erosion and scouring downstream of culverts that causes bank instability, and channel downcutting.	Use mechanical roads treatments to armor banks downstream of culvert outlets.
	Streams scouring around culverts and over roads, increased erosion to streams or wetlands, reduced aquatic organism passage from road culverts.	Use mechanical roads treatments to upsize culverts.
	Roads causing loss of stream connectivity, channel widening, erosion and sedimentation, channelization, and increased channel width.	Use mechanical road treatments to install or add culverts or culvert arrays.
	Culverts causing decreased fish passage or habitat access; blocking high flows and bedload; and reduced channel complexity.	Use mechanical road treatments to install bridge, replace culvert, or remove crossing.
	Road crossings causing loss or degradation of riparian vegetation or soil function, channel widening, increased erosion, sedimentation to aquatic habitats, and/or increased bank instability to streams or wetlands.	Use mechanical road treatments to install hardened low water crossings or fords (e.g., rock, concrete slab, concrete planks, concrete blocks, geocell fords, and vented fords on existing ML-1 and ML-2 roads needed for mechanical thinning operations.
	Decreased aquatic and wildlife passage through culverts or under existing bridges; deposition of stream bedload upstream of culverts; scouring of channel and floodplain or log jams forming upstream of culverts or bridges.	Use mechanical road treatments to install and replace bridges on ML-1 and ML-2 roads needed for mechanical thinning operations.
	Reduced natural flow paths and connection of flow to floodplain areas.	Raise culverts where invert elevations have resulted in stream incision.
	Reduced natural flow paths.	Install raised permeable roadbeds with or without culverts where roads cross areas of seasonal or perennial water inundation.

Project Type	Actions to address issues	Methods
	Channel widening, erosion and sedimentation upstream or downstream of a road crossing causing loss or degradation of riparian vegetation and soil function.	Use mechanical road treatments to restore channels affected by road crossings.
	ML-1 and ML-2 roads causing resource damage to springs, wetlands, or streams from sedimentation and erosion, impaired vegetation and soil condition, and degrading stream banks.	Use mechanical road treatments to decommission or relocate ML-1 and ML-2 roads following mechanical thinning operations.
	User created trails causing increased sedimentation, erosion, and loss or degrading of vegetation and soil condition.	Use hand or mechanical treatments to remove user created trails or improve footpath(s) on designated trails.
Stream channel and floodplain restoration	Channels and floodplains not functioning.	Use mechanical equipment to install boulders and/or log deflectors.
		Use mechanical treatments to restore meanders, induce meanders, recontour channel, plug and pond, or other similar methods.
		Use mechanical treatments to reconstruct channel and/or realign floodplain.
		Use mechanical treatments to create or widen floodplain, and/or lay back incised stream banks.
		Use mechanical treatments to removing instream stock tanks and replace them with guzzlers or drinkers in the uplands.
		Use mechanical treatments to reconnect historical side channels.
	Channels and floodplains not functioning.	Use hand or mechanical methods to install weirs and/or beaver dam analogs.
		Use hand or mechanical methods to install wicker, log and rock weirs, vanes or baffles; brush bundles; and/or

Project Type	Actions to address issues	Methods
		root wads.
		Use mechanical methods (including helicopters) to install large woody debris and/or log structures, within channel. Trees/root wads may be from site or brought in from elsewhere.
		Use hand or mechanical treatments to install Zuni bowls, rock dams, or similar features.
		Use of hand or mechanical methods to maintain existing in-channel structures.
		Use hand or mechanical methods to remove existing erosion control structures.
		Hand girdle trees near channel to provide for future large woody debris stream inputs.

Table 3. Miles of ephemeral, intermittent, and perennial streams within the Rim Country Project area by National Forest.

National Forest	Ephemeral stream miles	Intermittent stream miles	Perennial stream miles	Total stream miles
Apache-Sitgreaves NFs	719.6	876.3	51.6	1,647.5
Coconino NF	23.9	1,077	118.9	1,219.8
Tonto NF	1.3	969.5	217.3	1,188.1
Total miles	**744.8**	**2,922.8**	**387.8**	**4,055.4**

Table 4. Twenty-seven sub-watersheds associated with spinedace, frog, gartersnake, and trout by condition class for selected Watershed Condition Framework indicators. These ratings are as stated in the BA and in all cases do not match the ratings in the Watershed Condition Framework interactive map viewer.

Sub-Watershed Name	Watershed	Aquatic Habitat	Aquatic Biota	Riparian/Wetland Vegetation	Water Quality	Roads/Trails
Barbershop Canyon	Little Colorado	Fair	Poor	Poor	Good	Good
Bear Canyon	Little Colorado	Fair	Poor	Poor	Good	Fair
Bull Tank Canyon-Tonto Creek	Salt	Poor	Fair	Poor	Poor	Fair
Canyon Creek Headwaters	Salt	Fair	Poor	Fair	Good	Fair
Christopher Creek	Salt	Poor	Poor	Poor	Poor	Poor
Crouch Creek	Salt	Fair	Fair	Fair	Good	Fair
Durfee Draw-Chevelon Canyon	Little Colorado	Good	Poor	Good	Good	Fair
East Clear Creek-C.C. Cragin Reservoir	Little Colorado	Fair	Poor	Poor	Good	Fair
East Clear Creek-Clear Creek	Little Colorado	Fair	Poor	Fair	Good	Poor
East Verde	Salt	Poor	Poor	Good	Good	Good

Sub-Watershed Name	Watershed	Aquatic Habitat	Aquatic Biota	Riparian/Wetland Vegetation	Water Quality	Roads/Trails
River Headwaters						
Ellison Creek-East Verde River	Salt	Good	Fair	Fair	Good	Poor
Gentry Canyon-Upper Clear Creek	Little Colorado	Fair	Good	Poor	Fair	Poor
Green Valley Creek	Salt	Poor	Good	Poor	Good	Poor
Gruwell Canyon-Cherry Creek	Salt	Fair	Good	Poor	Fair	Poor
Haigler Creek	Salt	Poor	Fair	Poor	Good	Poor
Horton Creek-Tonto Creek	Salt	Fair	Fair	Fair	Good	Poor
Houston Creek	Salt	Fair	Poor	Fair	Fair	Poor
Leonard Canyon	Little Colorado	Fair	Fair	Poor	Poor	Poor
Lower Willow Creek	Little Colorado	Good	Fair	Fair	Fair	Fair
Miller Canyon	Little Colorado	Fair	Poor	Fair	Good	Fair
Parallel Canyon-Cherry Creek	Salt	Good	Fair	Poor	Fair	Fair
Rock Creek-Spring Creek	Salt	Poor	Poor	Fair	Poor	Fair
Upper East Verde River	Salt	Fair	Fair	Fair	Fair	Poor
Upper Spring Creek	Salt	Fair	Fair	Fair	Poor	Fair
Upper West	Little	Fair	Fair	Fair	Good	Poor

Sub-Watershed Name	Watershed	Aquatic Habitat	Aquatic Biota	Riparian/Wetland Vegetation	Water Quality	Roads/Trails
Chevelon Canyon	Colorado					
Upper Willow Creek	Little Colorado	Fair	Fair	Poor	Fair	Fair
Webber Creek	Salt	Poor	Poor	Fair	Poor	Poor

Table 5. Acres of Mexican spotted owl protected activity centers (PACs) and recovery habitat within the project area, by National Forests (NFs).

Habitat Designation (acres[1])	Coconino NF	Apache-Sitgreaves NFs	Tonto NF	Total
Number of PACs	98	63	53	214
PAC	**49,991**	**39,716**	**30,816**	**120,522**
Mixed-conifer (MC) Recovery Habitat	**24,632**	**18,622**	**4,069**	**47,322**
MC Nest/Roost Replacement Recovery Habitat	6,142	6,393	1,129	13,664
MC Foraging/Dispersal Recovery Habitat	18,490	12,229	2,940	33,658
Pine-Oak (PO) Recovery Habitat	**71,661**	**32,255**	**34,408**	**138,324**
PO Nest/Roost Replacement Recovery Habitat	10,644	4,005	4,989	19,639
PO Foraging/Dispersal Recovery Habitat	61,016	28,250	29,419	118,685
Modeled Recovery Habitat	0	0	**34,011**	**34,011**
Modeled Nest/Roost Replacement Recovery Habitat	0	0	3,389	3,389
Modeled Foraging/Dispersal Recovery Habitat	0	0	30,622	30,622
Total Habitat[2]	**146,284**	**90,592**	**103,303**	**340,179**

[1]All numbers, except numbers of PACs, are the number of acres within each category.
[2]We calculated the Total Habitat by adding the PAC acres + Total Mixed-conifer Recovery + Total Pine-Oak acres + Total Modeled acres. Nest/Roost Replacement and Foraging/Dispersal Recovery habitats are subsets of the total acres of recovery habitat. Due to rounding, the total acres may not match the category totals.

Table 6. Acres of Mexican spotted owl critical habitat within the Rim Country Project area by Critical Habitat Unit (CHU).

Habitat Category (acres)	CHU BRW-5 (acres)	CHU UGM-10 (acres)	CHU UGM-11 (acres)	CHU UGM-7 (acres)	Total (acres)
PAC	**4,853**	**96,160**	**9,007**	**1,578**	**111,599**
Recovery Habitat	**20,340**	**109,381**	**14,711**	**10,243**	**154,676**
Recovery Nest/Roost Replacement (Subset of Recovery Habitat)	2,150	20,640	2,464	951	26,205
Recovery Foraging/Dispersal (Subset of Recovery Habitat)	18,191	88,741	12,247	9,293	128,470
Total CH Acres (PAC + Recovery Habitat)	**25,194**	**203,901**	**23,718**	**11,822**	**266,275**

Table 7. Condition of spinedace 6th Level HUC sub-watersheds within the Rim Country Project area.

Stream Name	6th Level HUC sub-watershed	Stream miles in Project Area	Sub-watershed Rating
Barbershop Canyon	Barbershop Canyon	2.7	Poor
Bear Canyon	Bear Canyon	7.3	Poor
Chevelon Creek	Durfee-Draw-Chevelon Canyon	7.7	Good
Dane Canyon	Barbershop Canyon	4.8	Poor
East Clear Creek	East Clear Creek-C.C. Cragin Reservoir	16.1	Poor
	East Clear Creek – Clear Creek	20	Fair
East Leonard Canyon	Leonard Canyon	2.5	Poor
Gentry Canyon	Gentry Canyon – Upper Clear Creek	1.0	Poor
Kehl Canyon	East Clear Creek-C.C. Cragin Reservoir	1.5	Poor
Leonard Canyon	Leonard Canyon	23.7	Poor
Middle Leonard Canyon	Leonard Canyon	1.5	Poor
Miller Canyon	Miller Canyon	7.0	Poor
Potato Lake Draw	East Clear Creek-C.C. Cragin Reservoir	0.6	Poor
Turkey Creek	Gentry Canyon – Upper Clear Creek	3.1	Poor
West Chevelon Creek	Upper West Chevelon Canyon	4.2	Fair
West Leonard Canyon	Leonard Canyon	4.9	Poor
Willow Creek	Lower Willow Creek	13.3	Fair
	Upper Willow Creek	9.2	Poor
Yeager Canyon	East Clear Creek – Clear Creek	0.8	Fair
Total		**131.8**	**Poor**

Table 8. Condition of Chiricahua frog 6th Level HUC sub-watersheds within the Rim Country Project area.

6th Level HUC Sub-watershed	Riparian Condition Score	Sub-Watershed Rating
Bull Tank Canyon-Tonto Creek	3	Poor
Canyon Creek Headwaters	2	Fair
Crouch Creek	2	Fair
East Verde River Headwaters	3	Poor
Ellison Creek-East Verde River	2	Fair
Gentry Canyon-Canyon Creek	3	Poor
Green Valley Creek	3	Poor
Gruwell Canyon-Cherry Creek	3	Poor
Haigler Creek	2	Fair
Horton Creek-Tonto Creek	2	Fair
Houston Creek	3	Poor
Parallel Canyon-Cherry Creek	3	Poor
Upper East Verde River	2	Fair
Webber Creek3	2	Fair
Average Score	**2.5**	**Poor**

Table 9. Condition of Gila trout 6th Level HUC sub-watersheds within the Rim Country Project area.

Stream Name	6th Level HUC sub-watershed	Recovery or Recreational Stream	Stream miles in Project Area	Sub-watershed Rating
Chase Creek	East Verde River Headwaters	Recovery	4.4	Poor
Christopher Creek	Christopher Creek	Recreational	8.1	Poor
	Bull Tank Canyon – Tonto Creek		0.1	Poor
Dude Creek	East Verde River Headwaters	Recovery	2.2	Poor
Ellison Creek	Ellison Creek – East Verde River	Recreational	4.4	Fair
Haigler Creek	Haigler Creek	Recovery & Recreational	8.9	Fair
Workman Creek	Workman Creek	Recreational	4.0	Good
Total			**32.1**	**Fair**

Table 10. Acres of Mexican spotted owl PAC, recovery, and critical habitat in which the Forest Service proposes to conduct mechanical thinning, including the acres they proposed for cable operations.

Habitat Categories	Mechanical Thinning* (acres)	Percentage of Total Habitat Category Acres	Cable Operations (acres)	Percentage of Total Habitat Category Acres
PACs (total)	14,641	12.1%	0	0%
Recovery Mixed-conifer (total)	29,269	62%	4,121	8.7%
Replacement Nest/Roost	9,770	72%	1,282	9.4%
Foraging/Dispersal	19,499	58%	2,839	8.4%
Recovery Pine-Oak (total)	96,381	70%	13,774	10%
Replacement Nest/Roost	12,561	64%	2,482	12.6%
Foraging/Dispersal	83,820	71%	11,291	9.5%
Recovery Geophysical Model (total)	33,425	98%	13,091	38.5%
Replacement	3,118	92%	1,281	38%

Habitat Categories	Mechanical Thinning* (acres)	Percentage of Total Habitat Category Acres	Cable Operations (acres)	Percentage of Total Habitat Category Acres
Nest/Roost				
Foraging/Dispersal	30,307	99%	11,810	39%
Critical Habitat	128,403	48%	22,484	8.4%
Protected Habitat	13,470	12%	0	0%
Recovery Habitat	114,932	74%	22,484	14.5%

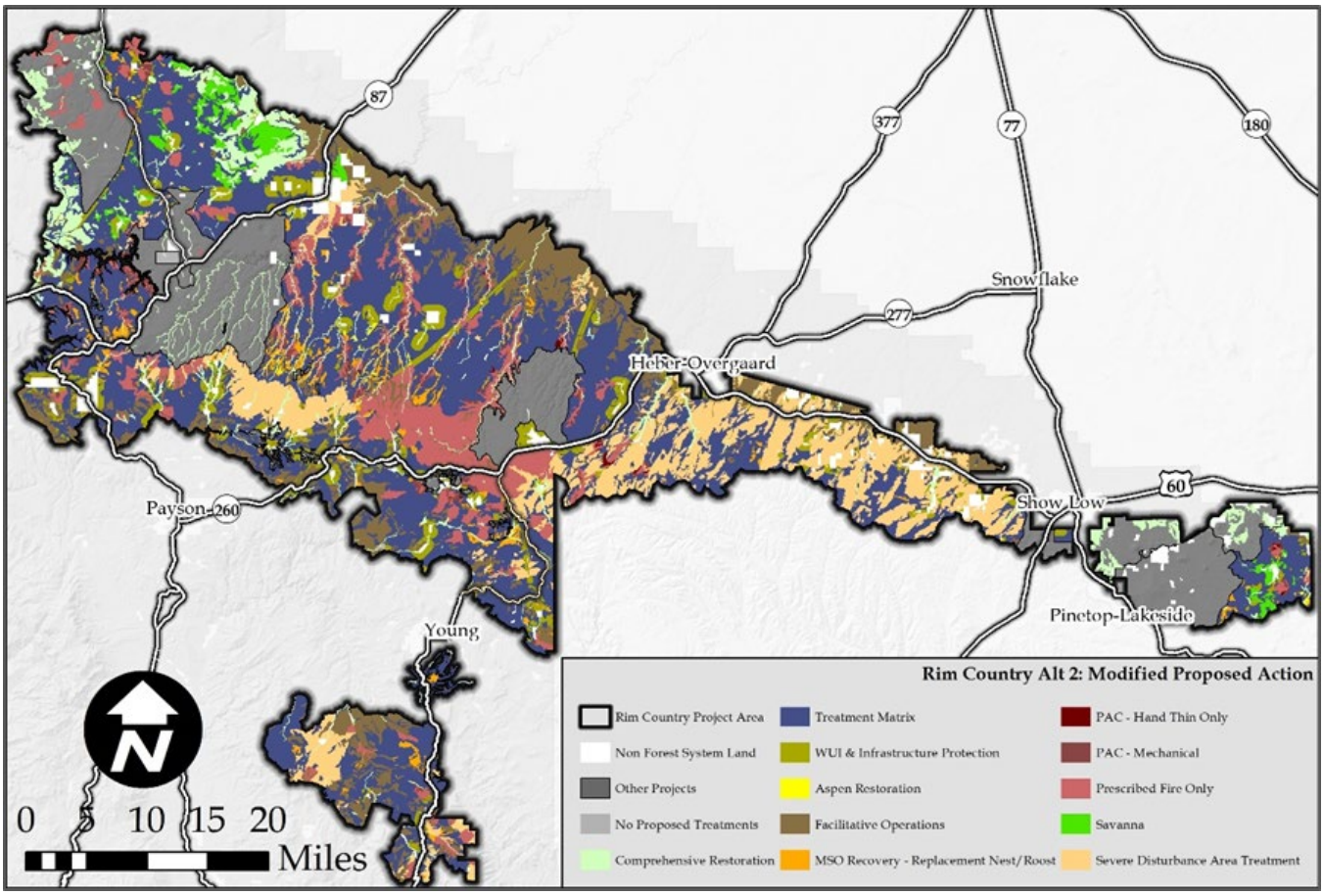

Figure 1. Map of the 4FRI Rim Country Project area.

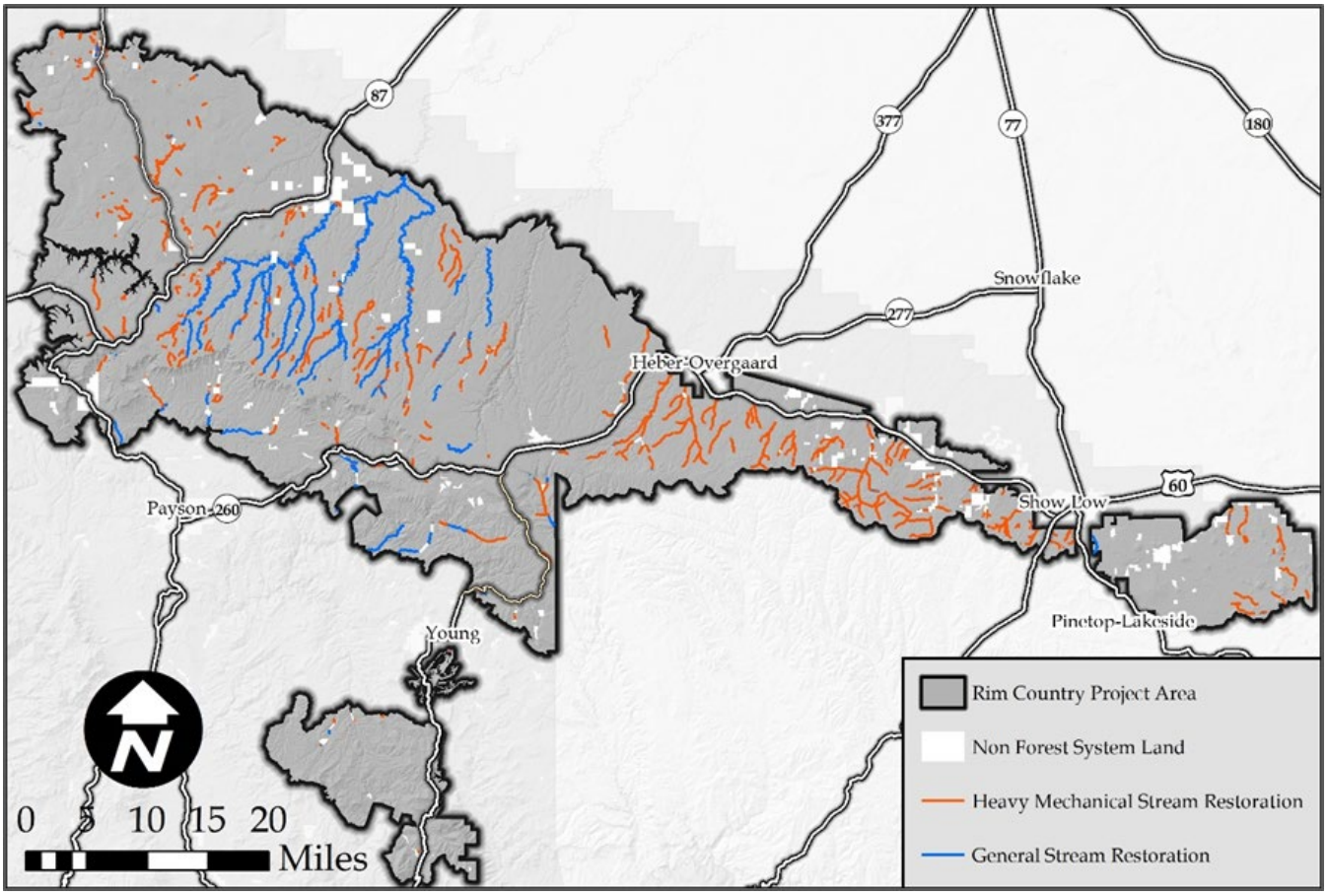

Figure 2. Map of areas analyzed for stream restoration (general and heavy mechanical) under the 4FRI Rim Country Project.

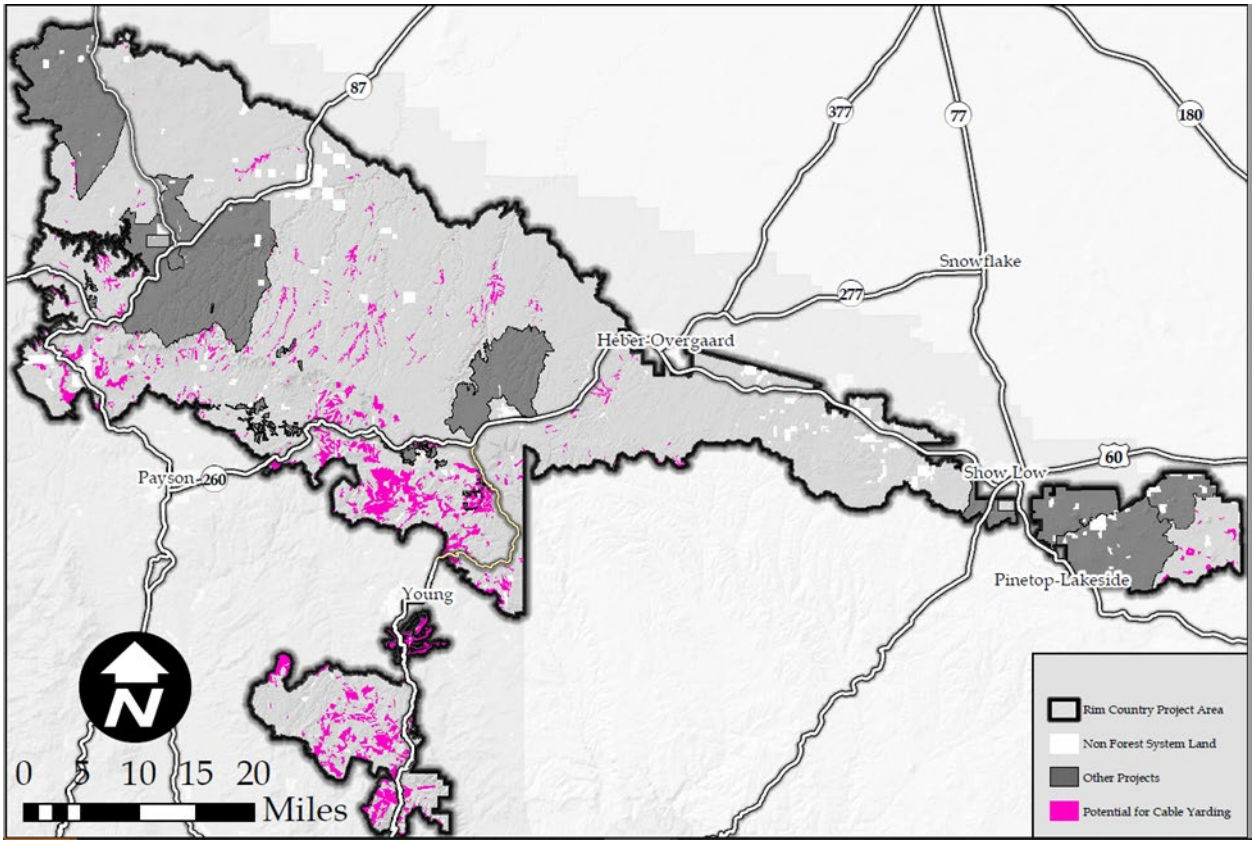

Figure 3. Estimated extent and distribution of proposed cable operations in the Rim Country Project.

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APPENDIX A: CONCURRENCE AND CONFERENCE REPORT FOR NONESSENTIAL EXPERIMENTAL 10(J) POPULATION AND PROPOSED CRITICAL HABITAT

This appendix contains our concurrences with your "may affect, not likely to adversely affect" determinations for the endangered Gila topminnow (*Poeciliopsis occidentalis*; topminnow), spikedace (*Meda fulgida*) and its critical habitat, and loach minnow (*Tiaroga cobitis*).

This appendix also contains our concurrence with your determinations that the proposed action is not likely to jeopardize the nonessential experimental population of the Mexican wolf (*Canis lupus baileyi;* wolf).

Concurrences

Gila Topminnow and Spikedace

Gila topminnow and spikedace do not occur within the project footprint, but do occur within Fossil Creek, which is in the action area, several miles downstream of proposed treatments. Mechanical thinning and prescribed burning could occur in the ponderosa pine forest within the upper Fossil Creek watershed, between Highways 260 and 87 and the canyon rim of the upper Fossil Creek watershed. Within this area, the Forest Service may conduct mechanical thinning and prescribed fire on 11,628 acres, and an additional 272 acres of prescribed fire only (this is approximately 22% of the entire Fossil Creek watershed including both upper and lower watersheds). Fish habitat in Fossil Creek is over seven miles downstream of the project footprint.

We concur with your determination that the proposed action "may affect, but is not likely to adversely affect" the Gila topminnow and the spikedace, for the following reasons:

- The proposed action would spread out mechanical thinning and burning projects, both temporally and spatially, within the upper Fossil Creek watershed to minimize effects. Spreading treatments out this way would minimize effects by decreasing the amount of disturbed ground in the upper watershed at any one time, which would reduce the potential for sedimentation by allowing vegetative ground cover to reestablish before additional areas are treated. In addition, the distance of the proposed treatment areas from occupied fish habitat would also ameliorate the potential for any measurable sedimentation effects to Fossil Creek or the fish. Therefore, we expect insignificant effects from these actions to Gila topminnow, spikedace, and their habitat within Fossil Creek

- The proposed action would reduce the risk of large scale, high-intensity wildfire in the upper Fossil Creek watershed. Therefore, there would be long-term beneficial effects to the watershed from the proposed action from substantially decreased potential for increased ash and sediment flow to occur in Fossil Creek following a high-intensity wildfire.

- There would be no effect to Gila topminnow, spikedace, and their habitat from stream restoration activities because the project would not implement these actions within Fossil Creek.

Loach Minnow and Spikedace Critical Habitat

Loach minnow and spikedace critical habitat do not occur within the project area, but do occur within the action area, in Fossil Creek. The upstream end of critical habitat in Fossil Creek is several miles from the closest mechanical thinning and/or prescribed burn treatment areas that occur adjacent to the town of Strawberry, Arizona.

We concur with your determination that the proposed action "may affect, but is not likely to adversely affect" critical habitat for loach minnow and spikedace, for the following reasons:

- The proposed action would not affect primary constituent elements (PCEs) #1 (habitat for all life stages), #2 (aquatic food base), #3 (pollutants), #4 (perennial flows), #5 (nonnative species), and #6 (flow regime) because no project actions (thinning, burning, stream restoration) would occur within or adjacent to critical habitat, but would be several miles upstream.

- The design features included in the proposed action, including practices that minimize the temporal and spatial spread of treatments, reduce vegetation and soil compaction, and limit the ground disturbance that would minimize the potential for sediment to affect microhabitat associated with PCE #1 (microhabitat) and PCE #3 (pollutants). In addition, the distance from the closest mechanical thinning and burning treatment area to critical habitat substantially reduces the potential for sediment to affect microhabitats associated with PCE #1 or pollutants (PCE #3) to enter Fossil Creek. Therefore, there would be insignificant and discountable effects to PCEs related to substrate embeddedness and pollution because of this project.

- The proposed action would reduce the risk of large scale, high-intensity wildfire in the upper Fossil Creek watershed. Therefore, there would be long-term beneficial effects to spikedace and loach minnow critical habitat within Fossil Creek from the proposed action, which will substantially decrease the potential for increased ash and sediment flow to occur in Fossil Creek following a wildfire.

Conference Report for Nonessential Experimental 10(j) Population

Mexican Wolf (inside non-essential experimental boundary)

- The Forest Service determined that the proposed action, within its nonessential experimental boundary, would not jeopardize the Mexican wolf. Because of the Mexican wolf's status as an experimental, non-essential population, the FWS treats wolves found in Arizona as though they are proposed for listing for section 7 consultation purposes. By definition, an experimental non-essential population is not essential to the continued existence of the species. Thus, no proposed action effecting a designated population could lead to a jeopardy determination for the entire species.

APPENDIX B: TECHNICAL ASSISTANCE FOR BALD AND GOLDEN EAGLES

This appendix contains recommendations to the Forest Service to reduce the likelihood of take of bald eagles (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*) from implementation of the Rim Country Project.

The FWS published the final rule to remove the bald eagle from the Federal List of Threatened and Endangered Species in the Federal Register on July 9, 2007, and it took effect on August 8, 2007. However, the Bald and Golden Eagle Protection Act (Eagle Act) protects eagles from actions that may take or disturb them. The Eagle Act prohibits anyone, without a permit issued by the Secretary of the Interior, from taking eagles, including their parts, nests, or eggs. "Take" is defined under the Eagle Act as "to pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb" eagles. Disturb means to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based upon the best scientific information available: (1) injury to an eagle; (2) a decrease in an eagle's productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior; or, (3) nest abandonment by substantially interfering with normal breeding, feeding, or sheltering behavior (USDI 2007).

Currently, there are seven known nesting pairs of bald eagles within the project boundary as well as wintering bald eagle habitat. Communal bald eagle winter roost areas occur across and adjacent to the Rim Country Project area. The AGFD also provided important wintering bald eagle habitat areas to consider for the Rim Country analysis. These areas occur at the Apache-Sitgreaves NF's lakes; Lake Mary Road; Rattlesnake Canyon; Lake Mountain; Verde River Valley; Wingfield Mesa, Jack's Canyon; Slim Jim Ridge; Mogollon Rim; West Chevelon Canyon; Chevelon Canyon Lake; Willow Springs Lake; Cottonwood Wash; Sierra Ancha Mountains (Dupont Canyon); and, the Buckhead Mesa Landfill.

There are no known golden eagle nests within the Rim Country Project area. On the Tonto NF, there are three golden eagle breeding areas outside the project area on the Pleasant Valley Ranger District, Tonto NF and several historic and active nest sites within 1-3 miles of the project area in the Sierra Ancha Mountains. On the Apache-Sitgreaves NFs, there are active breeding areas in Black Canyon and northeast of Chevelon Crossing, a few miles north of the project boundary, as well as a historical nest site from the late 1990s on the Lakeside Ranger District.

The FWS and Forest Service used the Conservation Assessment and Strategy for Bald eagles in Arizona (Driscoll *et. al.* 2006), the Bald Eagle National Guidelines (USDI 2007), and the "Interim Golden Eagle Technical Guidance: Inventory and Monitoring Protocols; and Other Recommendations in Support of Golden Eagle Management and Permit Issuance" (Pagel *et al.* 2010) to identify the following conservation measures to minimize effects to bald and golden eagles in the project area. We agree that implementation of the following measures would reduce the likelihood of take.

Bald and Golden Eagle Nests

- During project implementation, the Forest Service will not remove or degrade bald and golden eagle nest trees and treatments will reduce the risk of high-intensity fire affecting nest sites.

- The Forest Service will coordinate with AGFD and FWS prior to planning treatments within bald or golden eagle breeding areas.
- In bald and golden eagle breeding areas, mechanical treatments within 900 feet of bald or golden eagle nest trees or nest sites would only occur outside the breeding season (January 1st to August 31st), unless the nest is determined to be inactive by the District Biologist in coordination with AGFD and FWS.
- In bald and golden eagle breeding areas, fire staff will coordinate burn plans with the District Biologist to ensure smoke will not adversely affect nesting eagles.

Bald Eagle Winter Roosts

- Continue to identify winter roost locations and record those locations.
- Protect existing, newly discovered, and potential winter roost sites by doing the following:
    - Restrict project activities within 500 feet of known bald eagle winter roost sites from October 15th to April 15th, unless, in coordination with AGFD and FWS, it is determined eagles are not using the winter roost at that time.
    - If the Forest Service determines that thinning or temporary road construction must occur within 300 feet of a known bald eagle winter roost, the Forest Service will coordinate with AGFD and FWS during project layout to ensure roost habitat is maintained.

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APPENDIX C: MEXICAN SPOTTED OWL MONITORING PLAN

Introduction

As part of the Rim Country Project, mechanical thinning and prescribed burning activities would occur within Mexican spotted owl (*Strix occidentalis lucida*) protected activity centers (PACs; occupied owl sites). We do not fully understand the effects of these treatments to owls and their nesting/roosting habitat. The Mexican spotted owl Recovery Team thinks that PACs can be afforded substantial protection by emphasizing fuels reduction and forest restoration in surrounding areas outside of PACs and nest/roost habitat; however it is recognized that to reduce the risk of large, high-intensity wildfire where there are high-densities of owl sites, requires these actions to occur within PACs. The Mexican spotted owl Recovery Plan, First Revision (USFWS 2012) provides guidance for these treatments and emphasizes the need for monitoring and feedback loops to allow management to be adaptive. Well-designed monitoring will provide valuable information on the effects of these activities on the owls and their habitat. Therefore, the Forest Service has been working with the U.S. Fish and Wildlife Service (FWS) to implement monitoring plans as part of the Flagstaff Watershed Protection Project (FWPP) and the 4FRI Phase 1 Forest Restoration Project. For these projects we collaboratively developed management experiments to inform how mechanical thinning and prescribed burning treatments affect Mexican spotted owl occupancy, reproduction, and habitat. We initiated these management experiments in 2015 for both projects. Although we are making progress on owl monitoring, prescribed burning, and mechanical treatments, almost seven years has elapsed and we have not substantially increased our knowledge of treatment effects to owls and owl habitat. We anticipated implementing a similar management experiment for the Rim Country Project; however, progress is slow and very expensive when a study is reliant on implementing mechanical thinning treatments to assess their effects to owls and habitat. Therefore, to more effectively reduce the risk of high-intensity fire, accomplish forest restoration objectives, and manage for Mexican spotted owls, we propose a different study design for the Rim Country Project to meet our objective.

The Rocky Mountain Research Station (RMRS), the FWS, and the Forest Service (hereafter "we") propose to incorporate methods using GPS technology to track owls across the landscape as the 4FRI Forests conduct mechanical and prescribed burn treatments. This method will allow us to capture fine-scale data on owl movements and habitat use more efficiently, and therefore help us refine and adapt our treatment prescriptions to be more compatible with Mexican spotted owl conservation efforts.

The results of this study would improve our adaptive management capabilities by giving us more fine-scale data, faster, which would allow us to more effectively meet the conservation goals established in the Recovery Plan (USFWS 2012), which the Region 3 Mexican spotted owl Management Strategy supports, as well as the Forest's Land and Resource Management Plans (LRMP). We would conduct this study through a partnership involving the RMRS, FWS, and Forest Service, as well as potentially other partners. This collaborative effort would support multiple federal agency missions by reducing the risk of large scale, high-intensity wildfire, conserving and enhancing habitat for a listed species, and contributing new applied knowledge to an important field of study.

Project Description and Methods

This study will examine how GPS-tagged Mexican spotted owls (1) use different vegetation features (*e.g.*, canopy cover, tree size, landscape configuration) across the landscape, and (2) change their space use in response to vegetation treatments. Results from this study will help us refine vegetation treatments to be more compatible with Mexican spotted owl conservation efforts and inform mapping of suitable habitat in PACs to guide optimal spatial location of treatments (Figure 1).

With proper state and federal permits, we propose capturing 20 Mexican spotted owls (10 in 2023, 10 in 2024, and 10 in 2025) across a gradient of forest conditions and vegetation treatments on the Apache-Sitgreaves, Coconino, and Tonto NFs within the Rim Country Project area. We will capture spotted owls near or adjacent to recent and planned vegetation treatments and work closely with District Biologists to identify candidate sites to capture and tag Mexican spotted owls.

Each male owl will be fitted with a mini backpack- or tail-mounted GPS unit that collects up to 250 locations within the breeding season. We would link the GPS location data to vegetation conditions to derive fine-scale habitat relationships; for example, whether Mexican spotted owls 'select' or 'avoid' different structural features related to vegetation treatments (*e.g.*, forests with different canopy cover or tree densities). We can also use these relationships to produce 'heat maps' showing the distribution of fine-scale habitat across the landscape which can then be used to inform treatment planning in PACs (Figure 1).

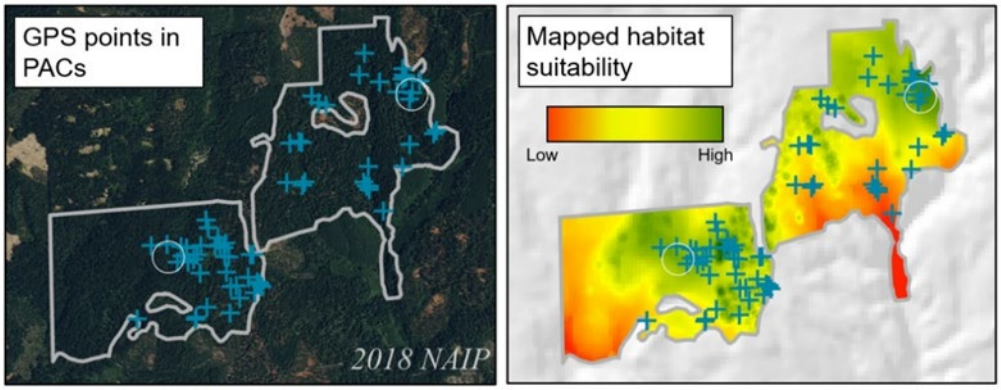
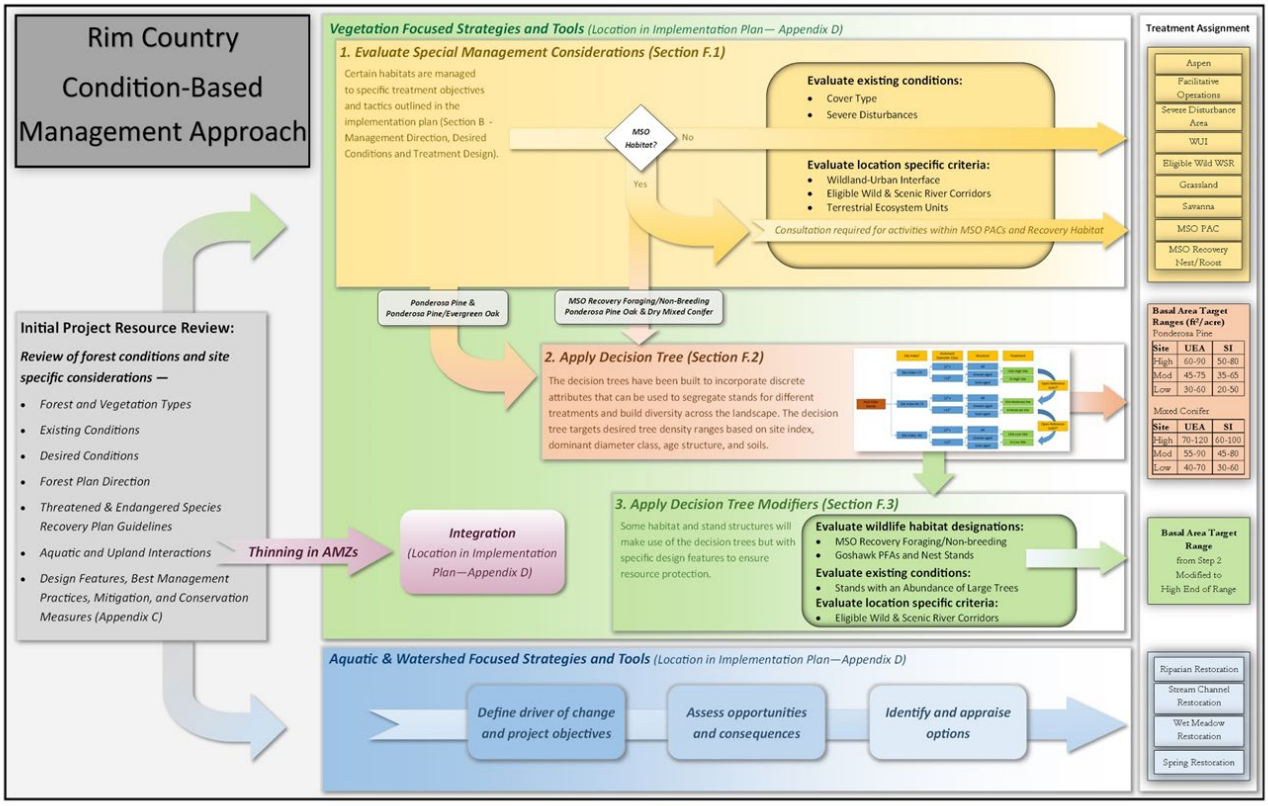


Figure 1. Left: Spotted owl GPS locations (+) within two adjacent PACs.
Right: Example Map product that overlays owl locations on mapped habitat suitability that would inform stand-level vegetation treatments within PACs using owl location data.

APPENDIX D: CONDITION-BASED MANAGEMENT APPROACH



The 4FRI Stakeholders and Forest Service, develop the schematic above to demonstrate how the condition-based management approach would work.

APPENDIX E: AQUATIC RESTORATION REVIEW TEAM

The Forest Service would establish an Aquatic Restoration Review Team (ARRT) to guide aquatic restoration priorities and review submitted restoration proposals. The ARRT would consist of a core group of fish biologists, species leads, geographic leads, and a hydrologist, from the Forest Service, FWS, and AGFD (three to five people). Core team members may change based upon the geographic area and species involved. The core team should have on-the-ground knowledge of aquatic systems in the Rim Country Project area and possess expertise and experience in their field. There may be opportunities to consider additional core team members from the Bureau of Reclamation and/or Army Corps of Engineers. The core team may recruit additional technical experts (fluvial geomorphologist, engineer, riparian ecologist, and soil scientist) from these or other agencies depending upon projects under review.

A request for proposals would occur biannually, after which the ARRT would hold meetings, facilitated by a 4FRI stakeholder or Forest Service personnel, to review project proposals. We anticipate that the ARRT would review both heavy mechanical and general project proposals initially, but would later focus on only heavy mechanical project proposals once processes are refined and implementer expertise is further developed. Additionally, as local personnel gain experience with project implementation and understanding, the ARRT may decrease the review needs for projects that are similar to projects 4FRI and/or stakeholders have already successfully implemented.

After proposal submittal and prior to the ARRT meeting, site visits of all proposal projects would occur including the project proponent and at least one member of the ARRT core group. During the review meeting, team members would review proposals focusing on their strengths, challenges, and other relevant information. The ARRT would choose to "Support," Support with Conditions," or "Not Support," the projects and rank all projects by priority. The ARRT would provide their recommendations to the 4FRI Board of Directors, and present them to the 4FRI Stakeholder Group[1].

The ARRT would guide focus areas for projects and preferred projects would focus on hydrological function of the project streams and species recovery. The Forest Service has developed Watershed Restoration Action Plans (WRAPs) for priority watersheds within the Rim Country Project. These include East Verde River Headwaters (Tonto NF), Long Tom Canyon-Chevelon Canyon and Upper Wildcat Canyon (Apache-Sitgreaves NFs), and East Clear Creek-C.C. Cragin Reservoir (Coconino NF). These plans outline priority projects to improve watershed conditions and could provide initial guidance for needed restoration. In addition, projects already implemented over the past decade could help provide guidance for methods that have proven effective. Yochum (2018) provides guidelines for Forest Service stream restoration projects and the information needed to development and design. In addition, Yochum (2018) presents a variety of case studies of various methods.

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1 The 4FRI Board of Directors consists of the four Forest Supervisors of the four NFs that make up 4FRI and is the decision-making entity for 4FRI. The 4FRI Stakeholder Group consists of many individuals and groups, including members of local, county, and state governments, environmental groups, organizations, institutions, and industry representatives, that are committed to working with the Forest Service to implement forest and watershed restoration to reduce the risk of high intensity wildfire and restore ecological processes.

The Forest Service and 4FRI Stakeholders developed a decision matrix to guide implementation of aquatics and watershed restoration treatments and assist with their prioritization. The matrix gives guidance on the types of information to collect to identify the need for restoration treatments, identify potential restoration options and constraints, and prioritize projects for implementation.

1. **Define project objectives and driver of change:** The first step is identifying the primary goals for watershed management within a given area and issues to address. An example for the Little Colorado River drainage might be the goal to increase habitat for spinedace with the objective to protect and enhance surface flow within drainages. Evaluation of the watershed conditions would allow managers to identify the main drivers that influence surface flow and subsequently identify potential sites to conduct restoration activities.

   Information such as management history, hydrology, and geology should inform the existing baseline conditions and help to determine underlying causes of degradation. Understanding the drivers of change or causes of degradation is necessary to help design the best approach and reach the most appropriate solution. Many times, projects are also driven by opportunities, driven either by funding or adjacent projects, however all projects should contribute to the goals for the given watershed.

   Key information managers and project designers would use to understand issues and restoration needs include:

   - Site reconnaissance: IDT, partners, stakeholders walk the potential project area to identify areas of concern and potential causes of degradation. Things that the group would take note of include:
     - Landforms (valley type (transport vs. depositional reaches), relic channels, floodplains, and distinct reach breaks.
     - Occurrence of excess erosion or deposition, loss or change in species composition or density (plant or animal), loss of floodplain and in-channel roughness elements (large and coarse wood, vegetation, etc.).
     - Signs of manipulation (berms, ditches, skid roads, landings, unusually flat surfaces, hummocks, old or unauthorized roads, infrastructure, etc.)
   - Research the history of an area.
     - Historic aerial photos, Forest Service photo archives, local historical societies, universities
     - Prior reports and local knowledge
     - Use information to piece together what happened to cause the degradation.
   - Characterize the past, current, and likely future trajectory of the area (*e.g.*, SEM or Rosgen stream type, spring type, riparian successional stage, or Proper Functioning Condition.
   - Assessment and inventory:
     - Valley and channel types (valley and channel gradients, entrenchment ratio, width to depth ration, sinuosity)
     - Hydrology (flood, low flow, bankfull, regional curves, channel bed material,

roughness).
    - Sediment inputs (roads, fires, other land ownership, banks)
    - Riparian habitat and condition (existing, potential, and function)
    - Habitat connectivity (aquatic, terrestrial)
    - Forest resources (terrestrial and aquatic species, rare plants, weeds, etc.)
    - Springs Ecosystem Assessment Protocol (SEAP) evaluation (Springs Stewardship Institute).
- Determine potential cause(s) of the problem (human activity, animals, past management, or natural processes). Whenever feasible, manage the cause of the problem rather than its symptoms.
- Determine the baseline of the system to adequately assess all restoration treatments.
- Identify other drivers likely to affect the system over its lifetime (*e.g.*, growth, climate change).

2. **Assess opportunities, consequences, and constraints:** The second step is to identify potential consequences of current condition (*e.g.*, bank or bed erosion) and assess the opportunities to improve site conditions to inform the identification of restoration measures and their prioritization. Identifying the possible constraints of a project such as accessibility, land ownership, and permanent roads are beneficial to determining restoration opportunities, prioritization, and potential treatments. Identify potential short- and long-term consequences of treatments. Finally, evaluate the scope of the potential activity to determine if the fit within the constraints of the NEPA analysis and section 7 consultation.
    - Promote resilient ecological functions of the system.
    - Integrate approaches to seek solutions that deliver multiple benefits whilst increasing resilience.
    - All feasible options should be clearly set out and described in relation to the baseline.
        - Describe and assess key effects to all stakeholders, both positive and negative for each restoration treatment.
        - Determine scope of restoration projects.
        - Start big and whittle down based on process drivers.
        - Find a downstream vertical grade control (start of a canyon reach, natural nick point, etc.).
    - For springs (Springs Stewardship Institute): Evaluate condition and need for spring function and species use.
    - Develop specific goals for restoration:
        - Restore the site to as nearly natural and ecologically functioning a condition as possible,
        - OR restore specific resources, characteristics or populations as desired by the manager,
        - OR restore other desired future condition of the site.
    - Consider: Minimizing maintenance costs and activities
    - For developed springs:
        - Evaluate the water use needs and costs, irrigation schedule, and maintenance;
        - Identify features to preserve in situ; and.
        - Identify features to remove – old pipes, concrete, fencing, roads/trails, etc.

Consider the following questions (Beechie *et al.* 2008):

- Question 1: What restoration actions are necessary to restore habitat availability, quality, and diversity?
- Question 2: Which restored habitats would most improve biological populations, communities, or ecosystems?
- Question 3: How might land-use constraints limit restoration opportunities?

3. **Identify and appraise options**: Consider and appraise potential options to provide a robust basis upon which to make a decision on how to move forward. Assess and describe all feasible options and methods in relation to the baseline (no action) to provide decision makers and partners all the necessary information to base their decisions.

   In addition, describe and assess the effects of all options. This includes effects to all stakeholders, both positive and negative. Screen effects for relevance and significance. Assess the effects either qualitatively, or quantitatively where enough information is available to support the assessment.

   In summarizing the results of the options, aggregate costs and benefits across relevant categories to provide a consistence basis for assessment. Comparisons should be consistent and describe and address any uncertainties. Consider:

   - Can the restoration treatment meet and fulfill the objectives for the project?
   - What are the chances of success?
   - Does it address the causes rather than the symptoms?
   - Consider the consequences of taking no action, assess the risks, costs, and benefits of implementing each option.

   No Treatment: Allows for the natural adjustment of a system and therefore is the most sustainable. Apply this determination when natural processes are likely to constitute a solution to the problem and the system can adjust (all processes functioning and no anthropogenic constraints).

   Management Option(s)/Restoration Activities: Prescribed activities should address the cause(s) of the problem. This option involves restoration treatments to improve existing conditions.

4. **Prioritization - Restoration activities:** Discuss within the RRT and prioritize projects at the forest and district level in collaboration with partners.

   There are many considerations to consider when prioritizing proposed locations and timing of aquatic and watershed restoration activities, including: immediate conservation needs, watershed condition framework planning, corresponding vegetation restoration activities, partner interest, and benefits or potential effects to federally-listed or candidate species. In addition, opportunities may arise during proposed vegetation treatments in an area to efficiently accomplish beneficial aquatic restoration include, but are not limited to: thinning conifers along and within riparian areas, restoring incised channels, riparian

planting, removing/obliterating unauthorized routes, and/or putting in drainage and closing ML-1 system roads after completing all treatments.

Prioritization of aquatic and watershed restoration projects would depend upon multiple site-specific factors. Therefore, we list considerations when prioritizing activities rather than requirements.

5. **Implementation of restoration projects**

   Consultation and Implementation: Conduct pre-implementation surveys for federally-listed and sensitive species, rare plants, invasive species, and cultural resources. If surveys or observers locate federally-listed, rare, or sensitive species, or cultural sites during pre-implementation surveys or during activity implementation, the project would incorporate the appropriate mitigation/conservation measures into activity design and Forest Service would coordinate with FWS and SHPO. Any cultural resource findings would be coordinated with SHPO.

   Validation and Collaboration Period: Activities would include written, specific activity descriptions and associated design criteria. Use the Implementation Checklist (Appendix D of the FEIS, and stand-alone Implementation Plan) to ensure each activity is consistent with the Rim Country NEPA analysis, within the scope of the decision and accompanying section 7 consultation.

   Pre-project notification to all required regulatory agencies should occur at least 60 days prior to implementation of the activity.

6. **Monitor and evaluate:** Monitor the effects of the project to appraise them against initial objectives of the project. Use the information to ensure the project is consistent with the assumptions, analysis and section 7 consultation for the project and to inform future restoration treatment decisions.

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APPENDIX F: DESIGN FEATURES (DF)/BEST MANAGEMENT PRACTICES (BMP)/CONSERVATION MEASURES

The following table lists the relevant Design Features (DFs), Best Management Practices (BMPs) and/or Conservation Measures to our biological opinion that the Forest Service would implement as part of the Rim Country Project. There are additional measures the Forests Service would include in the Final Environmental Impact Statement, but the measures below are the aquatic (AQ), botany (BT), fire ecology (FE), noxious weeds (NW), range management (RM), recreation and scenery (RS), silviculture (SI), special uses (SU) soils and watershed (SW), transportation (TR), and wildlife (WL) measures most relevant to listed species.

DF/BMP/CM Identifier	Description	Primary Purpose	Basis
AQ001	Any equipment or personnel for activities in and around streams, natural or constructed waters, springs, or wetlands of any kind will use decontamination procedures to prevent the spread of disease (Chytrid fungus) and aquatic invasive species. Personnel entering the water will follow Appendix G in the Chiricahua Leopard frog Recovery Plan (USFWS 2007) and the Stop Aquatic Hitchhikers Clean, Drain, Dry procedures.	To minimize potential for spreading aquatic diseases or invasive species.	Land Management Plan (LMP) compliance
AQ006	All aquatic bearing stream crossings must be approved by the Sale Administrator or Contracting Officer's Representative after coordination with the resource specialist and authorized Forest Service officer in advance of use to minimize the number and length of stream crossings. Such crossings will be at right angles and avoid potential spawning or breeding areas to the greatest extent possible. Stream crossings shall not increase the risk of channel re-routing at low and high-water conditions. After project completion, temporary stream crossings will be restored. Timing of crossings is addressed in AQ017.	To minimize ground disturbance in aquatic and associated habitats during site preparation and sedimentation to aquatic habitats.	LMP compliance and specialist recommendation
AQ007	For recreation relocation projects—such as trails—move out of the riparian area or as far away from the stream as possible.	To reduce recreation effects on aquatic habitats.	LMP compliance

DF/BMP/CM Identifier	Description	Primary Purpose	Basis
AQ008	To the extent feasible, heavy equipment will work from the top of the bank, unless working from within the stream bed would result in less damage to the aquatic ecosystem, as determined by a biologist.	To minimize ground disturbance in aquatic and associated habitats during site preparation and sedimentation to aquatic habitats.	LMP compliance and specialist recommendation
AQ010	When building riparian enclosure fences, minimize vegetation removal, especially potential large wood recruitment sources, when constructing fence lines (see RM006 and SI003).	To reduce detrimental effects to riparian species (flora and fauna) and floodplains.	Specialist recommendation
AQ013	Minimize removal of desirable vegetation around springs, streams and wetlands.	To reduce detrimental effects to sensitive habitats.	LMP compliance and specialist recommendation
AQ016	Structural erosion control measures will not include materials (such as straw waddles) that can trap reptiles or amphibians in their habitat. Structural erosion control measures not made of biodegradable material (for example, silt fences) will be removed and material contoured in or removed once the site is stabilized to prevent them from causing resource issues and decomposing on site.	To minimize detrimental effects to federally listed, sensitive, or other reptiles and amphibians	LMP an compliance and specialist recommendation
AQ017	Given the potential for multiple aquatic species to occur at a location, Forest Service, FWS, and AGFD biologists will cooperatively prioritize aquatic species of concern on a site-specific basis regarding timing restrictions for instream and riparian restoration activities. Work will occur during base-flow conditions, and on dry or frozen riparian soil conditions where possible.	To minimize direct effects to critical habitat (for example, spawning and breeding) for federally listed and forest sensitive species.	LMP compliance and specialist recommendation
AQ018	Biologists will be consulted during pre-planning for all treatments that will occur in springs, streams, and riparian areas, as well as fens or bogs where histic soils are present, to determine presence of federally listed or sensitives species	To minimize effects to rare/sensitive aquatic species during project implementation	LMP compliance and specialist recommendation

DF/BMP/CM Identifier	Description	Primary Purpose	Basis
	(plants or animals), as well as mitigations needed for rare or sensitive species in/near the work areas. See SI019.		
AQ019	**Narrow-headed gartersnakes**: • AMZs in narrow-headed gartersnake proposed critical habitat will be 150 ft. on either side of the stream. • No mechanical or hand piling will occur within the gartersnake AMZ to minimize harm during controlled burns or pile burning since gartersnakes utilize piles for cover (see also FE006). • Disturbance of rock/boulder piles and large woody debris in narrow-headed gartersnake habitat or proposed critical habitat will be avoided to the greatest extent practical during gartersnake brumation/inactive period (November/December-February, depending on elevation). • Do not build temporary roads in narrow-headed gartersnake AMZs.	To minimize detrimental effects to federally listed gartersnakes.	LMP compliance and specialist recommendation
AQ020	Coordinate with Forest Service District Biologist, FWS, and AGFD early (at least 6 months prior to implementation within narrow-headed gartersnake and Chiricahua leopard frog occupied habitat) to determine if surveys are required and to determine agreed upon, short-term care facilities for any Chiricahua leopard frog or narrow-headed gartersnakes found prior to or during implementation.	To minimize direct effects to federally listed amphibians and reptiles.	Specialist recommendation
AQ021	Take precautions to ensure fish are isolated from instream work areas during heavy mechanical stream restoration or any road/crossing work where equipment is in the stream or water may be diverted. If dewatering is necessary, ensure diversion passes flows and aquatic species to minimize detrimental effects. If surface water needs to be diverted to meet construction needs and aquatic species are or may be present,	To minimize sedimentation and detrimental effects to aquatic species and habitat during aquatic and watershed restoration projects.	Specialist recommendation

DF/BMP/CM Identifier	Description	Primary Purpose	Basis
	fish screen(s) will be installed, operated, monitored, and maintained.		
AQ022	Avoid water withdrawals from streams bearing aquatic species whenever possible. Water drafting must take no more than 10% of the stream flow and must not dewater the channel to the point of isolating species. Pump intakes shall have fish screens of 3/32 inch mesh or less and will have an intake flow of less than 1 foot/second to prevent entraining fish. Implement decontamination procedures as outlined in AQ001 when drafting from waterbodies and streams. Biologists must be consulted in all situations when pumping water from streams or other natural waterbodies	To avoid or minimize detrimental effects to native or desirable aquatic species and habitats.	LMP compliance
AQ023	Avoid discharging water from one source into a different body of water, such as dumping unused water from a water tender in or near a water body other than the water body from which it was acquired.	To avoid spread of invasive species, disease, and contaminants.	LMP compliance
AQ028	Imported gravel for use in or around aquatic systems must be free of invasive species, non-native seeds, and aquatic diseases. If necessary, wash gravel prior to placement and allow it to completely dry for a minimum of 2 days to prevent spread of Chytrid fungus. More time for drying may be needed depending on the amount of gravel.	To prevent spread or introduction of invasive species and aquatic diseases in stream habitat.	LMP compliance and specialist recommendation
AQ030	Ensure that an experienced engineer, fisheries biologist, hydrologist and/or geomorphologist are involved in the design of all aquatic restoration projects as needed. Their experience should be commensurate with the technical requirements of the project being undertaken.	To ensure technical skills and planning requirements for all aquatic and watershed restoration treatments.	Specialist recommendation
AQ035	In Chiricahua leopard frog occupied and dispersal habitat, a 150 feet Aquatic Management Zone (AMZ) would be established around designated stream courses, stock tanks, or other water bodies. Designated skid trail crossings through the	To minimize direct effects to federally listed and sensitive amphibians.	Specialist recommendation

DF/BMP/CM Identifier	Description	Primary Purpose	Basis
	AMZ are only allowed with biologist recommendation.		
AQ036	Utilize prescribed firing techniques that ensure low severity in native leopard frog AMZs and Arizona toad habitats within dispersal distance from occupied sites. No direct ignition will occur in occupied habitat (unless to ensure low severity fire) or in riparian areas (FE006 and FE007). If fuel conditions result in significant ash and sediment flow into an occupied site that cannot be mitigated through erosion control measures following guidelines in AQ016, the resource advisor or biologist will contact AGFD and FWS.	Minimize disturbance while restoring forest conditions	Specialist recommendation
AQ037	Use of heavy mechanical equipment will temporarily cease in leopard frog dispersal or occupied habitat if a monsoon rain event greater than one tenth of an inch occurs over a 24 hour period (based on the nearest rain gauge/station) unless supported by a biologist and approved by a sale administrator or COR.	To minimize direct effects to federally listed and sensitive amphibians	Specialist recommendation
AQ038	Do not use tanks for water sources known to have populations of leopard frogs as water sources for prescribed fire activities. Activities in and around natural or constructed waters would use decontamination procedures to prevent the spread of Chytrid fungus and invasive aquatic species unless an evaluation by a forest biologist determines it unnecessary.	To minimize direct effects to federally listed and sensitive amphibians and introduction of disease	Specialist recommendation
AQ039	Prior to reinitiating operations in rock pits where standing water is pooled, a biologist will determine if aquatic surveys for federally listed or sensitive species should occur.	To avoid or minimize potential effects to federally listed or sensitive aquatic species.	LMP compliance and specialist recommendation
AQ040	No cable operations would occur within spinedace occupied or critical habitat or slopes above said habitat.	To avoid or minimize potential effects to federally listed or sensitive aquatic	Specialist recommendation

DF/BMP/CM Identifier	Description	Primary Purpose	Basis
		species.	
BT001	During layout and marking, protect Southwestern Region sensitive plants and Species of Conservation Concern (identified in LMPs) where practical by including the plants within tree groups and using areas not occupied by the plants as interspaces. If Species of Conservation Concern could benefit from thinning operations, work with local specialist to develop marking guidelines.	Provide protection and shade needed by the sensitive plants while allowing for the least effect on clump/group/interspace design and layout during implementation and help mitigate effects on Southwestern Region sensitive plants and LMP analysis species.	Specialist recommendation
BT002	Survey springs and channels for Bebb's willow (Salix bebbiana) before implementation and identify locations. If plants are found, operational modifications will include avoiding plants, altering designs, or including plants in enclosures in coordination with the forest botanist or district wildlife biologist. Identify opportunities to enhance Bebb's willow where plants are decadent or dying. Manual grubbing of grasses may be used to increase the likelihood of planting success.	Protects populations and habitat of Bebb's willow. Bebb's willow stands would be enhanced by using cuttings, planting locally cultivated plants, and fencing existing or newly planted willows.	LMP compliance
BT003	Prescribed fires will be conducted under conditions that promote native plant communities, hinder weed species germination, aid with controlling existing weed infestations, and prevent the spread of existing weeds to the extent possible.	Promote native plant communities and reduces the risk of noxious or invasive weed invasions.	LMP compliance
FE002	Burn unit size, as well as strategic placement, would be a consideration in designing units and implementation prioritization.	Fire effects and behavior: large treatment areas arranged across a landscape are	Specialist recommendation

DF/BMP/CM Identifier	Description	Primary Purpose	Basis
		generally more effective at reducing fire behavior than arrangements of small treatment areas are. The arrangement of treatment units, regardless of size, can also make a significant difference in the effectiveness of treatments.	
FE003	As burn plans and burn units are developed, ensure consideration is given to the spatial and temporal effects of broadcast burning in the upper levels of a watershed.	To mitigate sedimentation and ash delivery effects to aquatic habitats and riparian areas from broadcast burning multiple areas within a watershed.	LMP compliance and specialist recommendation
FE004	When necessary and practicable, damage or mortality to old trees and large trees would be mitigated by implementing prescription parameters, ignition techniques, raking, wetting, thinning, compressing slash, or otherwise mitigating fire effects to the degree necessary to meet burn objectives and minimize fire effects and behavior that could threaten old trees. Trees identified as being of particular concern (for example, trees with known nests or roosts for herons, eagles, osprey, or other raptors, occupied nest cores, or in Mexican spotted owl PACs would be managed in accordance with wildlife design features. Thin or rake from around old trees before a burn, if possible.	Old trees are rare components and are under-represented across much of the project area. Implementing mitigation measures when possible is a critical component of restoration on a landscape scale. Large trees that are not old are	Specialist recommendation

DF/BMP/CM Identifier	Description	Primary Purpose	Basis
		not as susceptible to damage from fire as old trees.	
FE005	Fire personnel should confer with the appropriate district or forest personnel to identify noxious or invasive weeds within the perimeter of the prescribed burn unit, and areas that will be utilized as part of the implementation (such as staging areas), before burning is implemented. Jointly they shall identify the necessary mitigations as identified in the applicable forest weed management document. Mitigations may include, but are not limited to, avoiding noxious weeds while implementing and/or pretreatment of weeds before implementation. Follow-up monitoring should be conducted, especially in areas of severe disturbance. Large slash pile sites should be monitored after burning, and noxious or invasive weeds should be controlled according to the applicable forest weed management document.	Detect new weed infestations before they spread. Controls weeds, reduces risk of invasion and reduces risk to native species by reducing weed competition.	Specialist recommendation
FE006	Prescribed fire within narrow-headed gartersnake AMZs will not occur during the inactive period (November/December-February, depending on elevation) when gartersnakes are more likely to be brumating in wood piles, debris jams, etc., unless cleared by a biologist (see AQ019).	To avoid or minimize effects to the narrow-headed gartersnake.	LMP compliance and specialist recommendation
FE007	Prescribed fire ignitions will not occur within any AMZ, unless approved by a watershed specialist and/or a biologist.	To prevent the introduction of chemicals, such as drip torch fuel, into soils and water.	LMP compliance and specialist recommendation
FE008	Fire lines would be used to facilitate prescribed fire operations as needed to balance fire management and other resource protection objectives: 1) Fire lines may consist of natural barriers, roads and	To provide for activities needed to implement prescribed fire while minimizing disturbance	Specialist recommendation

DF/BMP/CM Identifier	Description	Primary Purpose	Basis
	trails, or may be constructed, if necessary, in coordination with other resource specialists (See RS004). 2) Fireline width would be determined as adjacent fuels and expected fire behavior dictate, assuming compliance with the requirements of cultural, wildlife, and other resource areas. 3) Rehabilitate constructed fire lines when they are no longer needed, using methods appropriate to the site.	to all resources.	
FE011	Mechanical treatments following broadcast burns would occur after surface vegetation has recovered sufficiently to minimize soil disturbance from the mechanical treatments. Prescribed fire treatments following mechanical treatments would occur after there has been adequate surface vegetation recovery that fuel loads are sufficient to meet the objectives of a prescribed burn.	Minimize effects from the combined effects from mechanical treatments and prescribed fire on vegetation and soil. To maintain soil condition and productivity, and to meet prescribed fire objectives.	Specialist recommendation
NW001	Survey for noxious or invasive weeds in treatment areas prior to treatment and follow appropriate guidance based on location: • Apache-Sitgreaves NFs: Follow the guidance in Appendix A of the Environmental Assessment for the ASNFs Integrated Forest-Wide Noxious Or Invasive Weed Management Program • Coconino NF: Follow the guidance in appendix B of the "Final Environmental Impact Statement for Integrated Treatment of Noxious or Invasive Weeds, Coconino, Kaibab, and Prescott NFs within Coconino, Gila, Mojave, and Yavapai Counties, Arizona"	Provides guidance and mitigation for noxious or invasive weeds.	LMP compliance

DF/BMP/CM Identifier	Description	Primary Purpose	Basis
	• Tonto NF: Follow the guidance in Appendix C of the Tonto NF Weed Treatment EA when operating on the Tonto NF.		
NW002	Prevent spread of potential and existing noxious or invasive weeds by vehicles and equipment used in management activities by washing vehicles and equipment to remove seeds, soil, vegetative matter, and other debris that could contain or hold seeds prior to entering the project area and when moving from one treatment unit to another.	Reduces the potential for introduction of noxious weeds onto NFS lands and mitigates effects of management actions on existing and potential noxious or invasive weed infestations.	LMP compliance and specialist recommendation
NW004	If forest priority noxious or invasive weeds are identified during or post-implementation, treat the weeds and monitor for a minimum of three to five growing seasons. Consider seeding treated areas with the appropriate native plant materials to restore native plant communities and suppress invasive species.	This measure would eliminate noxious or invasive weeds identified within a treatment area and provide assurance that the treatments were successful.	LMP compliance and specialist recommendation
NW006	Before ground disturbing activities begin, inspect material sources on site annually (or before disturbance for new sites) to ensure they are weed- free before use and transport. Treat weed-infested sources for eradication, and strip, stockpile, and treat contaminated materials before using pit materials.	Prevent establishment and spread of invasive weed populations	LMP compliance and specialist recommendation
NW007	If weed treatments are not successful or not possible, inform operators of locations of noxious or invasive weed populations and ground disturbance associated with rock pit sites would be located away from noxious or invasive weed populations.	Prevent establishment and spread of invasive weed populations	Specialist recommendation
NW008	Maintain stockpiled, un-infested material in a weed-free condition.	Prevent establishment and spread of invasive	LMP compliance

DF/BMP/CM Identifier	Description	Primary Purpose	Basis
		weed populations	
RM004	Rest or deferment of a pasture by livestock may occur after the completion of ground disturbing activities, such as prescribed burning and mechanical thinning. Range management personnel will evaluate conditions to determine when adjustment to livestock management, such as rest or deferment of a pasture is needed. Several factors may be used to assist in these determinations, such as plant recovery, plant vigor, and size of the disturbed area in relation to the pasture size. Plants that are well rooted, have multiple leaves or branches, and/or are producing seed head or flowers provide evidence of plant recovery, vigor, and reproductive ability.	Post ground-disturbing treatment assessment.	Specialist recommendation
RM007	Range and fire managers will coordinate prescribed burning and grazing schedules to minimize disruption of grazing while maximizing the implementation of prescribed fires. Each allotment will have specific management needs to be considered as management actions are planned and implemented. Past and future burns and projected rest/deferment are examples of conditions that should be considered when burn plans are being written and prior to implementation of prescribed fire. Use grazing options, such as swing pastures, to increase flexibility for range and fire managers. Long-term and annual prescribed fire plans should be developed and adjusted to minimize burning in multiple pastures of an allotment.	Coordination will help maintain good working relationships and will minimize hardships to the permittees, while managing for ecosystem health. Coordinating the management of these programs for minimal disruption to both is desirable.	Specialist recommendation
RS010	Minimize the impact of cable logging corridors in visually sensitive areas. When possible, select skyline systems with lateral yarding capabilities. Design skyline corridors for cable yarding without linear edges by utilizing existing openings and clearing the vegetation to promote meandering edges. Strive to make corridor widths 14 ft. to reduce scenic impacts with 20 ft.		Specialist recommendation

DF/BMP/CM Identifier	Description	Primary Purpose	Basis
	as the maximum exception and rarely occurring.		
RS020	Material extraction activities should not be permitted in designated or recommended special areas or Chevelon Canyon.	To protect the unique character of these areas.	LMP compliance
RS021	All restoration activities within eligible or suitable wild and scenic river corridors will be designed to protect or enhance the free-flowing character and outstandingly remarkable values (ORVs) of rivers, and to maintain the rivers' current inventoried classifications (wild, scenic, or recreational), unless a suitability study is completed that recommends management for a less restrictive classification (See RS022).	To protect eligible and suitable wild and scenic rivers.	LMP compliance
RS022	Restoration activities within the corridors of eligible or suitable wild river segments on the Apache-Sitgreaves NFs will not include any tree cutting.	To protect the primitive character of eligible or suitable rivers classified as wild.	LMP compliance
SI002	Where livestock or wildlife grazing could be a threat to restoration of riparian deciduous vegetation and an immediate moderate-severity burn would consume large amounts of felled trees, consider delaying the burn and leaving felled trees in place to create grazing barriers to help assure plant growth. Felled trees may be left in place, lower limbs may be cut and scattered, or all or part of trees may be used for streambank or wetland restoration to provide surface roughness and bank stabilization or as necessary to protect riparian or wetland shrubs from grazing by livestock or wildlife (for example, jackstraw barriers).	To create grazing barriers and assure desirable vegetation response.	Specialist recommendation
SI003	Exclosure fencing to prevent utilization of plantings by deer, elk, and livestock is permitted (See RM006).	To provide desired vegetation composition in riparian areas.	Specialist recommendation
SI006	Identified wildlife trees shall not be felled.	To maintain nest/roost habitat.	Specialist recommendation
SI008	Remove juniper to natural stocking levels where the Forest	To maintain desired	Specialist

DF/BMP/CM Identifier	Description	Primary Purpose	Basis
	Service determines that juniper trees are expanding into neighboring plant communities to the detriment of other native riparian vegetation, soil, or streamflow.	vegetation composition in riparian areas and wetlands.	recommendation
SI009	For each area evaluated for juniper treatments, interdisciplinary teams would discuss the following questions to identify the attributed of an area and select the appropriate treatments: • What kind of site (potential natural vegetation, soils)? • Successional state of site? • Components to restore? • How units may fit into the overall landscape mosaic? • Long-term goals and objectives?	To maintain desired vegetation composition in riparian areas and wetlands.	LMP Compliance
SI010	Do not cut old-growth juniper, which typically has several of the following features: sparse limbs, dead limbed or spiked-tops, deeply furrowed and fibrous bark, branches covered with bright-green arboreal lichens, noticeable decay of cambium layer at base of tree, and limited terminal leader growth in upper branches.	To provide future snag and coarse woody debris habitat.	LMP Compliance
SI012	On steep or south-facing slopes, where ground vegetation is sparse, leave enough course woody debris in sufficient quantities to promote reestablishment of vegetation and prevent erosion.	To provide soil resource protection in wetlands and riparian areas.	Specialist recommendation
SI019	Coordinate with FWS during planning and implementation of cable operations that occur in critical habitat and/or occupied habitat for federally listed species.	To avoid or minimize potential effects to federally listed species.	Specialist recommendation
SU005	Place project-generated slash outside of permitted utility line and pipeline rights-of-way; do not interfere with utility corridor management.	Ensure that activities do not interfere with the operation of utility corridors.	Specialist recommendation
SU011	In-woods processing sites would be authorized under the terms of the timber contract or through a special use authorization	Ensure proper authorization and	LMP compliance

DF/BMP/CM Identifier	Description	Primary Purpose	Basis
	depending on who would be the operator. Fees may be associated with special use authorizations. Before implementation, all sites would require interdisciplinary surveys and/or involvement.	permitting of in-woods processing sites.	
SU012	Through the Arizona Department of Environmental Quality (ADEQ), the operator of an in-woods processing site would obtain coverage under a Multi-Sector General Permit (MSGP) for storm water discharges associated with non-mining industrial facilities such as timber products. Coverage under this permit would entail preparation and implementation of a storm water pollution prevention plan (SWPPP) as well as periodic inspections of the facility consistent with requirements of the permit.	Ensure proper authorization and permitting of in-woods processing sites.	LMP compliance
SW001	All waterbodies, including reservoirs, lakes, streams, and water dependent features including groundwater dependent ecosystems (GDEs) such as springs, seeps, fens, and other wetland features such as wet meadows will be protected with AMZs (referred to as Riparian Management Zones on the Tonto NF), measured as the slope distance from the edge of each side the stream and or riparian areas (wet meadows, springs, wetlands, etc.). Base AMZ widths on LMP direction or other guidance documents. Where AMZ widths are not customized to site conditions or species (see AQ021, AQ0040), the default minimum width for ground-based mechanical and prescribed burning treatments for perennial, intermittent, and ephemeral streams are 150, 75, and 50 feet, respectively. AMZ widths for all other features are 150 feet. Features to be protected with an AMZ will be shown on the project task order, contract or agreement maps, or burn plan maps. Clearly label and describe AMZ widths. Project specific design features such as BMPs for water quality protection	To ensure adequate protection of surface water quality during ground-based mechanical vegetation treatments and to provide consistency in how AMZ widths are measured and identified on the ground.	Specialist recommendation

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	within AMZs will be implemented prior to construction when specified. See SW003 for acceptable activities within AMZs.		
SW002	Unless prescribed by LMP direction, AMZs can be increased by an interdisciplinary team (IDT) of qualified specialists prior to project implementation based on desired conditions along the stream reach and the nature of resource values at risk (such as the presence of aquatic federally listed species or their potential introduction), special concerns for water quality degradation, erosion hazard, existing vegetative ground cover conditions, stream bank and riparian conditions, natural geologic features, and flow regime. The IDT will determine appropriate AMZ widths and treatment limitations within these zones. These changes should be reflected in the implementation documents and included in the task order or contract maps.	To allow the greatest flexibility in designing AMZ prescription to meet resource benefits while protecting the values at risk.	Specialist recommendation
SW003	Accepted activities within AMZs include mechanical and hand tree felling, yarding, limited skidding, backing fire, and stream and springs restoration projects. When completing mechanical vegetation treatments within an AMZ, minimize the area of equipment usage in the AMZ. Vehicular operations including skidding should not occur longitudinally through AMZ. Turning machines and skidding within an AMZ should be minimized to the greatest extent possible. Landings, decking areas, machine or hand piles will occur outside of AMZs unless otherwise specified. Skidding across stream channels is covered in SW029 and SW031. Minimize disturbance and removal of riparian vegetation within AMZ's.	To avoid, improve, or minimize effects to soils, water quality, and aquatic species and habitat.	LMP compliance and specialist recommendation
SW004	Mechanical vegetation treatments within AMZs will minimize the amount of thinning debris deposited in stream channels and remove excess debris by hand or end-lining with one end suspension except where coarse woody debris is needed for	To minimize the potential for stream or culvert blockage.	Specialist recommendation

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	stream health as identified by fisheries or watershed specialist (a specialist responsible for hydrologist or soil scientist duties). Remove thinning debris less than six inches in diameter and less than six feet long and place it above the ordinary high-water mark.		
SW005	Mechanical vegetation treatments within AMZs will fell trees outside the stream channel unless otherwise specified as a stream treatment.	To minimize disturbance to stream morphology as much as possible and reduce the amount of fine woody debris entering the stream system.	Specialist recommendation
SW006	If completing mechanical vegetation treatments within an AMZ, do not designate trees for removal where the root system is important in maintaining channel morphology without first consulting with a watershed specialist (a specialist responsible for hydrologist or soil scientist duties).	To provide for bank stability and minimize erosion and bank instability to streams or other aquatic habitats.	LMP compliance and specialist recommendation
SW007	Burn plans that allow fire to enter AMZs will be driven by the need to maintain or improve riparian and stream habitat (except for WUI areas, see SW010). Consult with a watershed specialist (specialist responsible for hydrologist or soil scientist duties) and biologist if within listed species habitat where treatment in the AMZ is proposed.	Proper maintenance of prescribed burning activities adjacent to and/or within AMZs should help maintain the sediment filtering capacity of drainage way and reduce potential erosion in these locations.	Specialist recommendation
SW008	Fire control lines shall only be constructed within AMZs if mutually agreed upon by the authorized Forest Service officer, fuels specialist, watershed specialist (specialist responsible for hydrologist or soil scientist duties), and biologist. When	To minimize the disturbance of riparian vegetation and minimize sediment.	Specialist recommendation

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	constructing fire lines, only the following are allowed in AMZs: Raking, brushing (< 3 feet wide), leaf-blower, or other techniques that limit disturbance to soils. Any fire line in AMZ's need to be rehabilitated by removing any berms and raking removed material back across the fire line as soon as possible to prevent sediment movement.		
SW009	The following direction should be incorporated in developing the burn plan and project implementation: High soil burn severity should not occur on greater than 5% areal extent of the uplands or an AMZ in each burn unit unless to meet specific IDT treatment objectives. High severity should be patchy rather than concentrated. No more than 5% mortality should occur in the mature desired riparian canopy along a streamside in each burn unit, with this mortality occurring as discontinuous patches. Variance in these parameters would need to be approved by appropriate specialist(s).	Maintaining low / moderate burn intensities and limiting the areal extent of high intensity burning will reduce the potential for severe soil burning which ultimately helps retain long-term soil stability/productivity and minimizes detrimental effects to soil, aquatic species, aquatic habitat, and desirable riparian species (flora and fauna) in AMZs.	LMP compliance and specialist recommendation
SW011	As part of seeding or other revegetation activities, do not apply surface fertilizer within an AMZ.	To protect water quality.	LMP compliance and specialist recommendation
SW012	Domestic livestock grazing within an AMZ affected by prescribed fire may be deferred until ground cover is adequately re-established as per guidance outlined in RM004.	Promote recovery and establishment of riparian species, protect floodplain function, and provide for resilient	Specialist recommendation

DF/BMP/CM Identifier	Description	Primary Purpose	Basis
		stream systems.	
SW013	During project implementation use existing system travel courses and stream crossings whenever possible unless new construction would result in less resource disturbance. Minimize the number of temporary access roads and operational travel courses to lessen soil disturbance, compaction, and effects to vegetation. Temporary roads will not be constructed on slopes where grade, soil, or other features suggest a likelihood of excessive erosion or failure. Temporary road construction is not allowed within AMZs (except for the approximately 2.2 miles of temporary roads identified by the Tonto NF that is not authorized under the Rim Country NEPA, but is analyzed under this biological opinion). Temporary roads areas will be restored to natural, preconstruction conditions as much as possible.	To minimize soil disturbance and reduce sedimentation and erosion in aquatic habitats.	LMP compliance and specialist recommendation
SW014	When altering spring developments or splitting flow, place troughs far enough away from groundwater-dependent ecosystems (GDEs), wetlands, and other sensitive or unique habitats to prevent erosion, compaction, or degradation to sensitive soils and vegetation due to livestock or wildlife congregations.	To maintain or improve the integrity of springs and other GDE and minimize effects on these sensitive systems.	Specialist recommendation
SW015	During implementation, vehicle staging, fueling of vehicles, and storage of petroleum products would be done on a designated protected upland outside of AMZs. Equipment operators shall maximize the recovery and proper disposal of all fuels, fluids, lubricants, empty containers, and replacement parts. If more than 1,320 of gallons of petroleum products are to be stored onsite above ground or if a single container exceeds 660 gallons, then a Spill Prevention Control and Countermeasure (SPCC) Plan would be prepared as per 40 CFR 112. All herbicide and pesticide servicing and storage	To protect soil/water resources and aquatic species from petroleum, herbicide and pesticide contamination.	LMP compliance and specialist recommendation

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	will be on designated, approved, upland sites.		
SW016	Contractor shall take all reasonable precautions to prevent pollution of air, soil, and water by Contractor's Operations. If facilities for employees are established on a Project Area, they shall be operated in a sanitary manner. If Contractor's Operations or servicing of equipment result in pollution to soil or water, Contractor shall conduct cleanup and restoration of the polluted site to the satisfaction of Forest Service and state regulations. Contractor shall maintain all equipment operating within the project area in good repair and free of abnormal leakage of lubricants, fuel, coolants, and hydraulic fluid. Contractor shall not service tractors, trucks, or other equipment on National Forest lands where servicing is likely to result in pollution to soil or water. Contractor shall furnish oil-absorbing mats for use under all stationary equipment or equipment being serviced to prevent leaking or spilled petroleum-based products from contaminating soil and water resources. Contractor shall remove from NFS lands all contaminated soil, vegetation, debris, vehicle oil filters (drained of free-flowing oil), batteries, oily rags, and waste oil resulting from use, servicing, repair, or abandonment of equipment.	To protect soil/water resources and aquatic species from petroleum contamination.	LMP compliance
SW017	Dry meadow and grassland locations will be identified during the layout phase of a project sale and will be clearly labeled on contract maps for protection. In meadow and grassland restoration sites where, encroaching trees are being removed, designate skid trails to limit disturbance. Where material is not being removed, lop and scatter or manually remove slash from meadow are the preferred methods of treating slash. Do not machine pile within meadows or grasslands. Temporary roads, storage areas, camp sites, landings, machine piles and/or	To minimize effects to meadow systems and improve implementation.	Specialist recommendation

DF/BMP/CM Identifier	Description	Primary Purpose	Basis
	skidding should not occur on dry meadows in a project area.		
SW018	At spring development restoration sites, place watering troughs far enough from a steam or surround with a protective surface to prevent sediment delivery to the stream. Avoid steep slopes and areas where compaction or damage could occur to sensitive soils, slopes or vegetation due to congregating livestock or wildlife.	To reduce sediment delivery to aquatic habitats.	Specialist recommendation
SW019	Spring developments should not disturb the spring orifice (point where water emerges). Spring head boxes should be placed in a location that will cause the least amount of disturbance to the soils and vegetation of the Groundwater Dependent Ecosystem (GDE). Preferable locations for spring head boxes should be in an established channel downstream from the orifice or a locations where flowing water becomes subsurface.	To maintain or improve the integrity of springs and other GDE's and minimize effects on these sensitive systems.	Specialist recommendation
SW020	Formerly used skid trails should be utilized where they do not impair soil or other watershed resource conditions. The designation of new skid trails should be oriented to the contour of the slope as much as operationally feasible. Skid trail design should minimize concentrated runoff and sediment delivery by avoiding long, straight skid trails and providing breaks in grade. Designated skid trails and log landings would be required within the tree removal contracts (BMP 24.18 in FSH 2509.22) on all cutting units. Location of new skid trails and overall skid trail placement should be designed to minimize the overall disturbance footprint across the treatment unit while still meeting the objectives of the stand treatment.	Utilization of existing skid trails, designation of new skid trails, and proper skidding design should reduce the overall heavy disturbance footprint across the treatment unit. Skid trail placement that follows the contour of the slope as much as operationally feasible will help lessen the potential for accelerated erosion downslope.	Specialist recommendation

DF/BMP/CM Identifier	Description	Primary Purpose	Basis
SW021	Closed skid trails and roads must have adequate runoff and erosion control features to minimize excess erosion and sedimentation. Slash is the preferred method for diverting water if of sufficient quantity and size is available to maintain complete contact with the ground. Otherwise, construct water bars and lead out ditches. Waterbars should not be constructed more than 2 feet high. Lead-out ditches or water bars shall be constructed to hydrologically disconnect travel route surface runoff from stream channels. All berms and depressions (such as ruts) created along the skid trail or road will be filled in to restore the natural grade of the slope as much as possible.	Minimize the concentration of run-off and sediment delivery into stream channels.	LMP compliance and specialist recommendation
SW022	Erosion control structures and measures must be in place prior to the first erosive event. Contracts and agreements should outline the timing and application of erosion control methods to minimize soil loss and sedimentation of stream courses.	Minimize the concentration of run-off and sediment delivery into stream channels.	LMP compliance and specialist recommendation
SW023	Scarification or shallow ripping of landings should be conducted in a manner as not to mix the surface soil and subsoils to the point where subsoil becomes inverted and exposed at the surface.	Mixing of surface soil and subsoil is generally not conducive to obtaining desirable herbaceous revegetation.	Specialist recommendation
SW024	During machine piling of slash, rough piling is encouraged. This involves piling only large concentrations of slash, leaving areas of low concentration undisturbed. Also, where feasible, use a brush rake to minimize disturbance to the soil surface.	Rough piling minimizes disturbance to existing ground cover and the surface soil.	Specialist recommendation
SW025	Slash can be placed on skid trail and travel corridors to a maximum depth of 18 inches to drive on to reduce rutting and soil disturbance from mechanized equipment.	To reduce potential for rutting and compaction along mechanical equipment travel courses.	LMP compliance and specialist recommendation
SW026	Seed mixes for erosion control on disturbed locations should	Minimize soil loss and	LMP compliance

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	be certified weed-free native species at a minimum of 5 pounds per acre pure live seed. Potential vegetation for individual sites should utilize the Apache-Sitgreaves, Coconino, and Tonto NFs' Terrestrial Ecosystem Surveys (TES) to identify species to be utilized. Where appropriate and feasible, protect site with a variety of methods (for example, ungulate proof fencing, spreading slash etc.).	sedimentation of stream courses from skidding operations. Minimize noxious weed spread and reestablish native vegetation. Minimize effects on severe erosion soils.	
SW027	. Mechanical crushing or placement of lopped slash for the purposes of promoting long-term soil productivity or maintaining soil stability is appropriate in accordance with SW025.	Incorporate slash into the soil to promote long-term soil productivity.	LMP compliance
SW028	Slash and/or chips can be scattered on landings to help minimize the formation of rills and gullies.	Minimize the concentration of run-off and sediment delivery into stream channels.	Specialist recommendation
SW029	Skid trail stream crossings on intermittent and perennial streams must be pre-approved by the authorized Forest Service officer in consultation with a watershed specialist (a specialist responsible for hydrologist or soil scientist duties) or another qualified specialist. Ephemeral stream skid trail crossings will be authorized in locations to minimize soil and channel disturbance by the authorized Forest Service officer. The number of designated crossings should be minimized.	A qualified person should designate stream crossings to protect stream banks and stream morphology.	Specialist recommendation
SW030	Felling to the lead would be required within the timber sale and/or stewardship contract, and or agreement to minimize ground disturbance from skidding operations.	Felling of timber should be done to minimize ground disturbance from skidding operations and to minimize effects on severe erosion soils.	LMP compliance
SW031	Culverts, temporary bridges, low-water crossings, log-fords, or	Protect stream	LMP compliance

DF/BMP/CM Identifier	Description	Primary Purpose	Basis
	other types of acceptable features will be required on all reopened and utilized ML-1 systems roads, and skid crossings on all streams that will have flowing water during the life of the temporary crossing. All constructed features and fill material will be removed from these stream crossings and the channel and stream banks restored to a pre-project condition, unless otherwise approved by the Sale Administrator or Contracting Officer's Representative (COR) after coordination with a hydrologist, soils specialist, and biologist, and the authorized Forest Service officer.	morphology from damage from crossings while avoid damming or impounding free-flowing waters to provide streamflows needed for aquatic and riparian-dependent species.	and specialist recommendation
SW032	During thinning, operators shall avoid excavating skid trails whenever practical, locate skid trails where the need for sidecasting is minimized, and avoid adverse skidding to the greatest extent possible. If specialized equipment is available, utilize equipment designed to minimize ground disturbance when operating on sensitive soils and adverse slopes.	To prevent soil displacement.	Specialist recommendation
SW033	Slash should be distributed throughout skid trails, forwarder trails and cable corridors wherever mineral soils are exposed.	To provide surface roughness and prevent concentrated runoff that could cause accelerated erosion.	Specialist recommendation
SW034	During cable thinning operation, operators shall limit cable thinning to uphill yarding whenever practical. When downhill cable yarding is necessary, operators shall layout the cutting system in a manner which minimizes soil displacement. The numbers and widths of yarding corridors shall be minimized.	To prevent soil displacement from cable yarding operations.	Specialist recommendation
SW035	Operators shall minimize the yarding of logs across streams or wetlands. Yarding across ephemeral streams shall be performed in ways that minimize soil and bank disturbances. Where it is necessary to yard across intermittent or perennial streams or wetlands, it shall be done by swinging the yarded	To prevent adverse effects to water quality.	Specialist recommendation

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	material free from the ground to the greatest extent practicable (i.e., full suspension).		
SW036	During cable thinning, operators shall install effective cross ditches that drain onto undisturbed forest floor or spread slash on all skid trails and cable corridors located on steep or erosion-prone slopes	To prevent erosion and sediment delivery to stream courses and other waterbodies.	Specialist recommendation
SW037	Landings and decks should be clearly designated on the timber sale project plan.	To aid in implementation of project.	Specialist recommendation
SW038	Sizing, spacing, and placement of landings should be designed to minimize the overall ground disturbance footprint across the treatment unit while still meeting the objectives of the stand treatment.	Limit the overall amount and extent of heavy ground disturbance that implicates soil stability/ productivity as well as the filtering capacity of upland areas.	LMP compliance and specialist recommendation
SW039	Heavy ground disturbance activity areas (landings, major skid trails, unsurfaced haul roads, etc.) and excessive ground disturbance in any location (such as exceeding the rutting guidelines) should aim to not exceed 15 percent -areal extent of a treatment unit within a timber sale area.	To meet soil condition thresholds for management concern and to reduce the overall heavy ground disturbance footprint across a treatment unit.	LMP compliance and specialist recommendation
SW040	Skid trails, landings, and temporary roads are to be closed and have erosion control measures implemented as outlined in SW021 post-treatment and landings are to be scarified and seeded with a certified weed-free mix of primarily native, perennial grasses. The Coconino NF does not require scarification unless compaction is present.	Scarification and seeding of heavily disturbed areas will help break up soil compaction and reintroduction of native, perennial grass species	LMP compliance and specialist recommendation

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		will aid in mitigating the over-establishment of exotic or noxious weeds. Water-barring, restoring the natural grade or the slope, and utilizing slash for additional erosion control mitigation will dissipate the run-off energy, reduce sediment delivery, as well as aiding in long-term site stability/productivity.	
SW041	When thinning trees, no skidding is allowed across wetlands or springs and their outflows. This restriction needs to be displayed on contract or agreement area maps.	To minimize effects to streams and soils in meadows from tree thinning operations.	LMP compliance
SW042	Prior to the closure of the project contract, the authorized Sale Administrator or COR, in consultation with a watershed specialist (a specialist responsible for hydrologist or soil scientist duties) or other applicable specialist, will verify that the contractor has properly implemented the project watershed BMPs and erosion control measures. In evaluating acceptance, the following definition will be used by the Forest Service: "Acceptable" erosion control means only minor deviation from the established standards and guidelines, providing no major or lasting effect is caused to soil and water resources. Include biology staff where units are adjacent to federally listed and sensitive aquatic species habitat. Certified Timber Sales Administrators or CORs will not accept erosion control	It is necessary to have a watershed specialist present during closeout to ensure that project watershed BMPs were implemented correctly as they were the original designer of the conservation practice. To minimize sediment delivery to listed and sensitive species aquatic habitat	Specialist recommendation

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	measures that fail to meet these criteria.		
SW043	Meadow vegetation treatments will be conducted in a site-specific manner to be determined by a watershed specialist (specialist responsible for hydrologist or soil scientist duties) and a silviculturist.	Dry meadow soil types have low soil weight-bearing strength due to seasonally high moisture contents and inherent soil characteristics which make them highly prone to detrimental soil compaction and topsoil displacement.	Specialist recommendation
SW044	Whether identified pre-implementation and on a task order/contract area map OR during the implementation phase, locations above 25 percent slope gradient on sensitive soil types (for example, cinder cones) will include a "protected area" designation that is clearly marked to exclude the use of mechanized thinning equipment. Hand-felling methods only will be permitted in these locations, unless use of specialized equipment may allow operations on steeper slopes. Viability and authorization of specialized equipment use above these slope gradients will be determined during the layout phase of a sale by the pre-sale forester AND a watershed specialist (specialist responsible for hydrologist or soil scientist duties). This specification of desired equipment must be specified in the contract.	To protect highly erodible/sensitive soils on steep slopes by preventing traffic by heavy machinery on soils that are susceptible to destabilization and erosion.	Specialist recommendation
SW045	All ground disturbing activities using heavy equipment must be done under conditions which maintain soil condition (i.e., avoiding excess rutting, compaction, and displacement).	Ensure that mechanical operations do not take place when ground conditions are such that detrimental soil	Specialist recommendation

DF/BMP/CM Identifier	Description	Primary Purpose	Basis
		compaction and topsoil displacement can occur.	
SW046	Skid Trails: Allow up 6 inches of rutting over no more than 15% areal extent along a skid trail (two or more drags being considered a skid trail). Depth of rut is a measurement from the bottom to the top of a berm.	Excessive ground disturbance and rutting causes detrimental soil compaction and topsoil displacement. Compaction effects to the surface soil and inverted, exposed subsoil is not conducive to obtaining desirable long-term herbaceous revegetation. Excessive ground disturbance hinders long-term soil stability and productivity through increased erosion and establishment of exotic or invasive species that out-compete native, perennial grasses and forbs.	LMP compliance and specialist recommendation
SW047	At landings and within 75 feet of landings, rutting depths greater than 10 inches will not be allowed. Landings on slopes greater than 20 percent will be minimized to the greatest extent practicable and soil and watershed mitigation measures will be applied on a case-by-case basis to ensure that unacceptable soil loss does not occur.	Prevents detrimental soil disturbance to depths that are difficult to adequately ameliorate and that could lead to broken tree roots resulting in drought	LMP compliance and specialist recommendation

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		stress of remaining trees.	
SW048	Rutting on an unsurfaced road (generally maintenance Level 1, 2 and temporary roads) will not exceed 8 inches depth for more than 75 linear feet or 10% of road length, whichever is shorter. Rutting more than 3 inches depth will not be permitted on surfaced collector or arterial roads (generally some maintenance level 2 and all maintenance level 3 and 4 roads).	Prevents rutting of the road traveled way that could lead to concentrated runoff, erosion and adverse effects to surface water quality.	LMP compliance and specialist recommendation
SW049	For any other locations (for example, interior locations other than skid trails) within a sale area, if wheel tracks or depressions consistently exceed 2 inches then conditions are too wet to operate in these areas.	To prevent detrimental soil disturbance and compaction that would make it difficult for vegetation to become reestablished.	LMP compliance and specialist recommendation
SW050	No prescribed fire control lines should be constructed using mechanized equipment on slopes greater than 40 percent or greater than 25 percent on identified fragile or sensitive soil types.	Restriction of fire control line construction and burning activities to these slope breaks will help mitigate accelerated overland flow and erosion typically associated with these settings.	Specialist recommendation
SW051	If fire control lines are constructed, rehabilitate lines after use by either rolling berm back over the entire fire line, spreading slash across the fire line, or water barring the fire line. If water barring only, vary spacing dependent on slope and disguise the first 300 feet of line to discourage use as a trail.	To prevent erosion and sediment delivery from fire lines to stream courses. Also, prevent fire lines from being used as trails, thereby hastening recovery.	Specialist recommendation

DF/BMP/CM Identifier	Description	Primary Purpose	Basis
SW052	Coarse woody debris will be managed to achieve LMP direction and specialist recommendations. These recommended levels may be lower in WUI areas. • Ponderosa Pine Forest: 3 to 10 tons/acre (For Tonto NF: Refer to LMP). • Dry Mixed-conifer: 5 to 15 tons/acre (For Tonto NF: Refer to LMP). For facilitative operations or other activities that may occur in non-target vegetation types (for example, Piñon-Juniper, Wet Mixed-conifer), refer to the applicable LMP to find appropriate fuel loading levels.	Maintain long-term soil productivity. To provide levels of surface fuels (fine and coarse woody debris) to address the need for habitat (cover), soils (organic material and limited areas of high burn severity), and fire (to limit areas of high burn severity and a high resistance to control).	LMP compliance and specialist recommendation
SW053	Burn plans will be designed to promote resource benefits to riparian and wetland areas. Minimize fire severity in areas where degradation to riparian or wetland existing condition is a concern.	These systems may lack the vegetation to adequately dissipate energy and protect stream banks, therefore retaining the vegetative cover is necessary.	Specialist recommendation
SW054	At some stage prior to mechanical treatment and prescribed burning, implementation include a watershed specialist (specialist responsible for hydrologist or soil scientist duties) or other relevant specialist to determine whether treatment extent or severity is appropriate for a sub-watershed (HUC12). As a default, limit the areal extent of mechanical treatment which may occur in a sub-watershed to 25% each year and 40% over 5 years of that sub-watershed. For prescribed burning the percentages can be doubled. This is for sub-watersheds that have not experienced a relatively recent largescale disturbance such as a fire and/or in a nonfunctioning	Reduce potential cumulative effects which may adversely affect sub-watershed scale (HUC12) condition or function.	Specialist recommendation

DF/BMP/CM Identifier	Description	Primary Purpose	Basis
	condition. If exceeding these percentages by either treatment type or in combination, perform a more detailed watershed evaluation/analysis using a procedure such as the Equivalent Disturbed Area Analysis or other appropriate methodology. If it is determined that potential cumulative effects may be adverse to watershed function and condition, treatments should be spread out spatially and temporally.		
SW056	Open system road and temporary road erosion control features, such as lead-out ditches or cross drains, shall be constructed and maintained as needed to hydrologically disconnect road surface runoff from stream channels.	Minimize the concentration of run-off and sediment delivery into stream channels.	Specialist recommendation
SW057	Road drainage is controlled by a variety of methods including rolling the grade, insloping, outsloping, crowning, water spreading ditches, and contour trenching. Sediment loads at drainage structures can be reduced by installing sediment filters, rock and vegetative energy dissipaters, and settling ponds. Design of roads is included in the transportation plan of the forest product removal contract or agreement and T- specs. Road maintenance through the integrated resource service contract forest product removal contracts/agreements should require pre-haul and post-haul maintenance on all roads to be used for hauling.	Minimize soil movement, maintain water quality, and minimize effects on severe erosion soils.	LMP compliance and specialist recommendation
SW058	Prioritize relocation of trails or roads in locations that benefit multiple resource areas. Relocated trails or roads will be constructed in a manner that does not hydrologically connect them to stream courses to the extent practical. Relocated roads and trails will have sufficient drainage features to maintain the integrity of the traveled way. New cross drains or lead-out ditches shall discharge to stable areas where the outflow will quickly infiltrate the soil and not develop an erosional feature such as a gully.	To provide for stable and serviceable roads and trails that do not adversely affect soils, surface water quality or aquatic habitats.	Specialist recommendation

DF/BMP/CM Identifier	Description	Primary Purpose	Basis
SW059	Site rehabilitation on riparian sites for stream channel and road reconstruction projects where ground disturbance occurs: seed at 5 pounds per acre or other appropriate rate with certified weed-free native seed mix to rehabilitate the site and minimize effects of noxious weeds.	To comply with State and Federal water quality standards by minimizing soil erosion through the stabilizing influence of vegetation ground cover.	LMP compliance and specialist recommendation
SW060	Site rehabilitation on disturbed sites and stream channel shaping on decommissioned roads consists of several revegetation methods, such as, but not limited to: (1) Storing sod removed from the initial ground disturbance and replace the sod from the top of the bank on the disturbed site; (2) Use appropriate mix of species that will achieve vegetation establishment and erosion control objectives at the site. (3) Protect site with slash spread across the disturbed area to create microclimates and protect from grazing ungulates. Slash placement should be limited to the upper two-thirds of the bank to limit transport downstream of woody material;(4) Consider the use of mycorrhizal inoculum on severely disturbed sites where no topsoil is left; and (5) install erosion mat; and, (6) Protect site with herptile-friendly barriers until the site has reestablished (see AQ016). Temporary erosion control should be installed before land or channel disturbing activities commence and will be inspected for adequacy/effectiveness at sufficient intervals to minimize adverse effects to soils or surface water quality.	Comply with State and Federal water quality standards by minimizing soil erosion through the stabilizing influence of vegetation ground cover. To rehabilitate all disturbed areas from aquatic and watershed restoration treatments, minimize erosion and sedimentation to aquatic habitats and potential effects to federally listed and sensitive species.	Specialist recommendation
SW061	All potential seeding areas as part of restoration treatment to re-establish native, perennial grass abundance and vigor will be evaluated on a site-specific, case-by-case basis by the project IDT. Seeding product for potential treatment areas will contain a mixture of certified weed-free native grasses, which	For locations that do not have a viable enough seed bank to be propagated by prescribed fire activities	Specialist recommendation

DF/BMP/CM Identifier	Description	Primary Purpose	Basis
	will contain a composition and ratio to be determined by the IDT.	alone, seeding may be necessary to help sites rejuvenate a more abundant and diverse herbaceous cover component that is aligned with the natural vegetative potential of the site.	
SW062	De-compact soil by scarifying the soil surface of roads and paths, stream crossings, staging, and stockpile areas so that seeds and plantings can take root (see SW040).	To rehabilitate all disturbed areas from aquatic and watershed restoration treatments, minimize erosion and sedimentation to aquatic habitats and potential effects on species.	LMP compliance
SW063	For road, trail, aquatic, and watershed treatments: dispose of slide and waste material in stable sites out of the flood-prone area. Use native materials to restore natural or near-natural contours.	To protect water quality and aquatic habitat.	Specialist recommendation
SW064	If soil compaction occurs during implementation, mitigate through ripping, seeding with native weed-free seed, and covering compacted areas with slash or other certified weed free mulch material.	Minimize soil compaction, soil detachment, and sediment transport. To maintain long-term soil productivity.	Specialist recommendation
SW065	Erosion control measures for roads, skid trails, landings, fire control lines, in-woods processing sites, rock pits, and restoration and construction activities will be implemented in a timely manner to prevent excessive erosion and sedimentation	To minimize ground disturbance in aquatic and associated habitats during site preparation	Specialist recommendation

DF/BMP/CM Identifier	Description	Primary Purpose	Basis
	from precipitation events or other disturbances. If implementation timing is not specified in a contract consult with a watershed specialist (specialist responsible for hydrologist or soil scientist duties) for clarification if needed.	and sedimentation to aquatic habitats.	
SW066	Minimize clearing and grubbing activities when preparing staging, project, and or stockpile areas. Any large wood, topsoil, and native channel material displaced by construction will be stockpiled for use during restoration if applicable. Materials used for implementation of aquatic and watershed restoration categories (for example, large wood, boulders, fencing material) should be staged out of the 100-year floodplain.	To minimize ground disturbance in aquatic and associated habitats during site preparation and sedimentation to aquatic habitats.	Specialist recommendation
SW067	Minimize time that heavy equipment is in stream channels, riparian areas, and wetlands. Complete earthwork as quickly as possible when ground conditions are driest. During excavation, stockpile native streambed materials above the bankfull elevation, where it cannot reenter the stream, for later use.	To minimize ground disturbance in aquatic and associated habitats during site preparation and sedimentation to aquatic habitats.	LMP compliance and specialist recommendation
SW068	Disturbance to streambank vegetation should be minimized in all project activities.	To protect riparian vegetation and stream channel stability.	Specialist recommendation
SW069	Do not borrow road fill or embankment materials from the stream channel or meadow surface for road maintenance projects. End-load all material hauled onsite and compact fill.	Minimize disturbance in drainage systems and minimize sediment production within channel.	Specialist recommendation
SW070	Heavy equipment will be commensurate with the project and operated in a manner that minimizes adverse effects to the environment (for example, minimally sized, low-pressure tires, minimal hard turn paths for tracked vehicle, temporary mats or plates within wet areas or sensitive soils).	To minimize effects to streams and wetlands as well as aquatic habitats from heavy equipment use to implement	LMP compliance and specialist recommendation

DF/BMP/CM Identifier	Description	Primary Purpose	Basis
		restoration treatments.	
SW071	Placement piles for burning will occur outside of fragile or sensitive soil types.	Minimize disturbance of sensitive soil.	Specialist recommendation
SW072	Project implementation activities will be completed as to not negatively affect existing water rights as recognized and being consistent with Arizona Department of Water Resources and applicable regulations.	To protect existing water rights.	LMP compliance
SW073	All erosion control work to be constructed related to ground disturbing activities would be in place or maintained prior to potential damaging runoff events	To avoid and minimize effects to water quality and watershed integrity.	LMP compliance and specialist recommendation
SW074	One 50-gallon spill kit (or two 30-gallon spill kits) must be located on-site during use of all heavy equipment.	To avoid effects to water quality and wildlife.	Specialist recommendation
SW075	No permanent structures would be constructed as part of any rock pit; although at least one self-contained portable toilet is required to be on-site during all operations.	To protect water quality and prevent unnecessary effects to vegetation and wildlife.	Specialist recommendation
SW076	In rock pit areas, minimize soil and vegetation disturbance to the extent practical outside of the area needed for extraction of material from the pit.	Prevents effects to soil, vegetation, and wildlife.	Specialist recommendation
SW077	If possible, stockpile rock pit soil for reclamation that is first removed to access the aggregate material source. Soil would be stockpiled in-stratum and replaced so that the “A” horizon is back on the surface. Replace soil, revegetate, and reclaim mined areas pit as soon as possible once pit use is discontinued.	To facilitate reclamation efforts.	Specialist recommendation
SW078	In rock pits, stockpiled material should be placed and shaped to prevent water from ponding and to direct water to a drainage system. Mine pit areas would be designed to be internally draining, keeping sediment on-site of rock pits using settling ponds, check dams, or sediment barriers; and monitor and	To protect water quality.	Specialist recommendation

DF/BMP/CM Identifier	Description	Primary Purpose	Basis
	inspect the site frequently and correct problems promptly. Ponds should be cleaned out before they are more than one third full of sediment.		
SW079	Slash piles should not be placed within 300 feet of perennial or intermittent streams or within 100 feet of ephemeral streams unless local conditions suggest otherwise	To minimize effects to streams and wetlands as well as aquatic habitats.	LMP Conformance
SW080	Surveys will be conducted prior to implementation for biological soil crusts using "A Field Guide to Biological Soil Crusts of Western US Drylands: Common lichens and bryophytes" (Rosentreter et al. 2007) documentation within the modeled habitat. Flag and avoid areas to the extent possible with confirmed biological soil crusts for mechanical treatments and temporary road building.	To minimize effects to biological soil crusts.	Specialist recommendation
TR001	Avoid locating temporary roads on soils with severe erosion hazard.	The completion of a total maximum daily load assessment may result in developing additional water quality improvement strategies and mitigation of effects within associated watersheds.	Specialist recommendation
TR002	On areas to be prescribe burned, if decommissioned roads are used as fire lines, return decommissioned roads to their pre-burn condition. Rehabilitation of the surface should refer to the soil and water BMPs for rehabilitation of fire lines and disturbed areas.	Discourage use on previously decommissioned roads and maintain a safe and economic road system.	Specialist recommendation
TR003	Where temporary road construction is unavoidable, provide soil protection through implementation of any of the following methods to control sediment and protect water quality. Methods may include but are not limited to: properly locating	To protect long-term soil productivity.	Specialist recommendation

DF/BMP/CM Identifier	Description	Primary Purpose	Basis
	the temporary road in an upland position, road drainage (waterbars/rolling dips), and outsloped roads. For activities adjacent to the road to control runoff, include tactics such as wattling, hydro-mulching, straw or wood-shred mulching, spread slash, erosion mats, terraces, blankets, mats, silt fences, riprapping, tackifiers, soil seals, seeding and side drains.		
TR007	Decommissioned roads should have the roadbed removed and natural contours and gradients restored as much as possible. Slash or other suitable erosion material (mats, wattles, jute, silt fence, etc.) should be used where necessary and disturbed areas should be seeded with a suitable erosion control see mix consisting primarily of native grass species. Roads that are in closed status should be either lightly scarified and seeded or stabilized with erosion control features (for example, rolling the grade, waterbars, etc.). Road entrances should be blocked to prevent access and signed as closed. Camouflaging of road entrances with large rocks and woody debris may prevent unauthorized access and improve stability. Road drainage features such as lead-out ditches or waterbars should not be hydrologically connected to stream channels on active or closed roads.	To protect long-term soil stability/productivity and water quality by reducing overland flow and sediment delivery originating from these locations.	Specialist recommendation
TR008	As a condition of approval for use of a temporary road under any contract involving mechanical thinning, temporary roads will be decommissioned, using any one or combination of appropriate methods, by the purchaser/contractor when mechanical treatments are finished.	To protect long-term soil productivity and water quality and ensure that temporary roads do not become de facto new roads.	Specialist recommendation
TR009	Roads causing damage to hydrological resources, cultural resources or federally listed and sensitive species habitat are a priority for decommissioning.	To reduce effects to aquatic habitats from roads.	Specialist recommendation
TR010	Where feasible, relocate roads out of drainage bottoms to an	To minimize sediment	Specialist

DF/BMP/CM Identifier	Description	Primary Purpose	Basis
	upland location. If this is not feasible, rock armor outfall of drainage features as an energy dissipater.	delivery into and disturbance to drainage systems and minimize sediment production within channels.	recommendation
TR011	Avoid road rehabilitation and maintenance during periods of sustained or heavy rainfall.	To minimize erosion and negative effects from sediment and other contaminants on water bodies and aquatic and associated habitats and cave/karst systems.	Specialist recommendation
WL001	In Mexican spotted owl recovery foraging/non-breeding habitat strive to maintain all trees more than 24 inches dbh except in overriding management situations such as for human safety. Consult Appendix F – Mexican Spotted Owl Recovery Plan (USFWS 2012) framework for further guidance.	To minimize adverse effects on Mexican spotted owls while restoring Mexican spotted owl habitat, contribute towards the recovery of the owl, and to comply with direction in the Recovery Plan.	LMP compliance and specialist recommendation
WL002	Mexican spotted owl PACs and Recovery Nest/Roost habitat will be managed to meet basal area, trees per acre, and canopy cover requirements as specified in the most current Mexican Spotted Owl Recovery Plan. In PACs and Recovery Nest/Roost habitat strive to maintain all trees ≥18 inches dbh except in overriding management situations such as for human safety. Consult Appendix F - Mexican Spotted Owl Recovery Plan (USFWS 2012) framework for further guidance. See SI019.	To minimize adverse effects on Mexican spotted owls while restoring Mexican spotted owl habitat, contribute towards the recovery of the owl, and to comply with direction in the Recovery Plan.	LMP compliance and specialist recommendation
WL003	Coordinate and implement management activities within	To minimize adverse	LMP compliance

DF/BMP/CM Identifier	Description	Primary Purpose	Basis
	Mexican spotted owl PACs to reduce potential disturbance and minimize the frequency and duration of operations within and immediately adjacent to these areas.	effects on Mexican spotted owls while restoring Mexican spotted owl habitat, contribute towards the recovery of the owl, and to comply with ESA.	and specialist recommendation
WL004	In Mexican spotted owl Recovery Foraging/Non-breeding habitat, follow the most current Mexican Spotted Owl Recovery Plan and incorporate the following guidelines: • Crown spacing between tree groups (interspace) would average 25 to 60 feet distance, providing for forest health, prey habitat development, and to move toward or facilitate stand conditions more conducive to low severity fire. • Tree thinning in pine-oak would target 40 to 110 BA; thinning in mixed-conifer would target 40 to 135 BA. The goal is to manage for a sustainable range of density and structural characteristics. • No trees greater than 24 inches dbh would be cut and trees greater than 18 inches dbh would be retained, unless overriding management situations require their removal.	To minimize adverse effects to Mexican spotted owls and contribute towards the recovery of the owl while restoring Mexican spotted owl habitat.	LMP compliance and specialist recommendation
WL005	In Mexican spotted owl PACs, springs, riparian and stream restoration, obliteration, relocation, and maintenance, would not occur during the breeding season (March 1 to August 31). Timing restrictions may be waived on a case-by-case basis if protocol level surveys confirm non-nesting or an active nest is more than 0.25 mile from project work. Timing restrictions may also be waived if the District Biologist, in coordination with FWS determines actions within 0.25 mile will not disturb	To minimize adverse effects on Mexican spotted owls while restoring Mexican spotted owl habitat, contribute towards the recovery of the owl, and to comply with ESA.	LMP compliance and specialist recommendation

DF/BMP/CM Identifier	Description	Primary Purpose	Basis
	nesting birds.		
WL006	In Mexican spotted owl PACs, no mechanical or prescribed fire treatments or road or trail maintenance would occur during the breeding season (March 1 to August 31). Timing restrictions may be waived if protocol surveys indicate non-breeding or infer absence. Timing restrictions may also be waived if the District Biologist, in coordination with FWS determines actions within 0.25 mile will not disturb breeding owls.	To minimize adverse effects to Mexican spotted owls and comply with ESA and the 2012 MSO Recovery Plan, table C.1 while restoring Mexican spotted owl.	LMP compliance and specialist recommendation
WL007	Thinning equipment would remain greater than or equal to 0.25 mile from Mexican spotted owl PAC boundaries during breeding season unless topographic features would minimize noise such that breeding owls would not be disturbed.	To minimize disturbance effects to breeding Mexican spotted owls while restoring Mexican spotted owl habitat, contribute towards the recovery of the owl, and to comply with ESA	LMP compliance and specialist recommendation
WL008	• Hauling would generally avoid Mexican spotted owl PACs during the breeding season (March 1 to August 31) unless specific analysis has documented that this would not lead to adverse effects or protocol surveys indicate non-breeding or infer absence. Timing restrictions may also be waived if the District Biologist, in coordination with FWS determines actions within 0.25 mile will not disturb breeding owls. Trucks would drive less than or equal to 25 miles per hour in PACs during breeding season.	To minimize disturbance effects on Mexican spotted owls while restoring Mexican spotted owl habitat, contribute towards the recovery of the owl, and to comply with ESA.	LMP compliance and specialist recommendation
WL009	In Mexican spotted owl PACs, no new wire fencing would be constructed in PACs to minimize the risk of owls colliding with new fences. Other alternatives would be used for aspen,	To minimize adverse effects to Mexican spotted owls and	Specialist recommendation

DF/BMP/CM Identifier	Description	Primary Purpose	Basis
	sensitive plants, springs, and ephemeral channel restoration exclosures.	contribute towards the recovery of the owl while restoring Mexican spotted owl habitat.	
WL010	In Mexican spotted owl PACs, road maintenance would not occur during the breeding season (Effective March 1 to August 31). Timing restrictions may be waived if protocol surveys indicate non-breeding or infer absence. Timing restrictions may also be waived if the District Biologist, in coordination with FWS determines actions within 0.25 mile will not disturb nesting birds.	To minimize disturbance effects on Mexican spotted owls while restoring Mexican spotted owl habitat, contribute towards the recovery of the owl, and comply with ESA.	LMP compliance and specialist recommendation
WL011	All stands included in the proposed mechanical treatments for Mexican spotted owl PACs would be hand-marked for thinning, and prescriptions and marking would be coordinated with the FWS.	To improve site specificity of treatments to retain trees with the greatest habitat value and continue coordination with the FWS during implementation.	Specialist recommendation
WL012	Fireline associated with prescribed burning would not be constructed during the breeding season in Mexican spotted owl PACs and/or core areas. Timing restrictions may be waived if protocol surveys indicate non-breeding or infer absence. Timing restrictions may also be waived if the District Biologist, in coordination with FWS determines actions within 0.25 mile will not disturb breeding owls.	To minimize adverse effects to Mexican spotted owls while restoring Mexican spotted owl habitat, contribute towards the recovery of the owl, and comply with ESA.	LMP compliance and specialist recommendation
WL013	In Mexican spotted owl PACs, nest trees would be protected in the design and implementation of prescribed fires.	To minimize adverse effects to Mexican spotted owls while	LMP compliance and specialist recommendation

DF/BMP/CM Identifier	Description	Primary Purpose	Basis
		restoring Mexican spotted owl habitat, contribute towards the recovery of the owl, and comply with ESA.	
WL014	Survey all potential Mexican spotted owl areas including protected and recovery nest/roost, within the implementation area plus all habitat up to 0.5-mile beyond the perimeter of the proposed treatment area. Surveys should be conducted for two years, with the second-year survey either the year before or the year of (but prior to) project implementation. If more than five years have elapsed between the last survey year and the initiation of the proposed action, then one additional year of survey will be conducted prior to project implementation.	To minimize adverse effects to Mexican spotted owls while restoring Mexican spotted owl habitat, contribute towards the recovery of the owl, and comply with ESA.	LMP compliance and specialist recommendation
WL015	Coordinate burning spatially and temporally to limit smoke effects on nesting Mexican spotted owls, particularly for PACs in low-lying areas (March 1 to August 31).	To minimize adverse effects to Mexican spotted owls and comply with ESA.	LMP compliance and specialist recommendation
WL016	No cable yarding or temporary road construction will be conducted in Mexican spotted owl PACs.	To minimize adverse effects to Mexican spotted owls and comply with ESA.	Specialist recommendation
WL023	• During project implementation, the Forest Service will not remove or degrade bald and golden eagle nest trees and treatments will reduce the risk of high intensity fire affecting nest sites. • The Forest Service will coordinate with AGFD and FWS prior to planning treatments within bald or golden eagle breeding areas. • In bald and golden eagle breeding areas, mechanical treatments within 900 feet of bald or golden eagle nest	To minimize disturbance to eagles while restoring forest habitat.	Specialist recommendation

DF/BMP/CM Identifier	Description	Primary Purpose	Basis
	trees or nest sites would only occur outside the breeding season (January 1st to August 31st), unless the nest is determined to be inactive by the District Biologist in coordination with AGFD and FWS.		
WL024	In bald and golden eagle breeding areas, fire staff will coordinate burn plans with the District Biologist to ensure smoke will not adversely affect nesting eagles.	To minimize disturbance to eagles while restoring forest habitat.	Specialist recommendation
WL025	• Restrict project activities within 500 feet of known bald eagle winter roost sites from October 15th to April 15th, unless, in coordination with AGFD and FWS, it is determined eagles are not using the winter roost at that time. • If the Forest Service determines that thinning or temporary road construction must occur within 300 feet of a known bald eagle winter roost, the Forest Service will coordinate with AGFD and FWS during project layout to ensure roost habitat is maintained.	To minimize disturbance to bald eagles while restoring forest habitat.	Specialist recommendation
WL026	If new Mexican spotted owl PACs are established in areas with planned or ongoing 4FRI activities, then existing design features related to Mexican spotted owl protection would apply to management activities. New PACs would be drawn in coordination with FWS.	To minimize adverse effects to Mexican spotted owls while restoring Mexican spotted owl habitat.	LMP compliance and specialist recommendation
WL032	All personnel involved in thinning and prescribed burning activities, transportation of equipment and forest products, research, or restoration activities would be briefed on the Mexican spotted owl, know to report sightings and to whom, avoid harassment of the owl, and are informed as to whom to contact (FWS) and what to do if an owl is incidentally injured, killed, or found injured or dead.	To minimize adverse effects to Mexican spotted owls while restoring Mexican spotted owl habitat, contribute towards the recovery of the owl, and comply with ESA.	Specialist recommendation

DF/BMP/CM Identifier	Description	Primary Purpose	Basis
WL034	Where cover exists near dependable waters, consult with a wildlife biologist to determine where and if hiding areas, openings, and interspaces should be created.	Maintain hiding cover where wildlife congregates while restoring forest structure.	Specialist recommendation
WL035	Snags and Logs: Protect snags and logs wherever possible by placing landings in existing openings or in areas where snags and/or logs, and old trees would be minimally affected in accordance with OTIP and LTIP (Old Tree and Large Tree Implementation plans).	Maintain key but limited wildlife habitat components while restoring forest structure.	LMP compliance
WL036	Snags and Logs: • In ponderosa pine, protect/provide snags and logs wherever possible through site prep, implementation planning, green tree selection, and ignition techniques to retain 1-2 snags per acre greater than or equal to 18 inches dbh, and greater than or equal to 3 logs greater than or equal to 8 feet long and greater than or equal to 12 inches mid-point diameter, and 3-10 tons of coarse woody debris (greater than 3 inches in diameter) per acre in pine and pine-oak habitat. • In dry mixed-conifer, protect/provide snags and logs wherever possible through site prep, implementation planning, green tree selection, and ignition techniques to retain 3 snags per acre greater than or equal to 18 inches dbh, and greater than or equal to 3 logs greater than or equal to 8 feet long and greater than or equal to 12 inches mid-point diameter, and 5-15 tons of coarse woody debris (greater than 3 inches in diameter) per acre.	Maintain key but limited wildlife habitat components while restoring forest structure.	LMP compliance
WL037	Snags: Retain trees greater than or equal to 18 inches dbh with dead tops, cavities, and lightning strikes wherever possible to	Maintain key but limited wildlife habitat	Specialist recommendation

DF/BMP/CM Identifier	Description	Primary Purpose	Basis
	provide cavity nesting/foraging habitat (such as the living dead) in ponderosa pine habitat.	components while restoring forest structure.	
WL040	Gambel oak, juniper and piñon species greater than 5-inch diameter at the root collar (drc) may be considered as residual trees in the target group spacing and stocking. Manage for large Gambel oaks (≥10-inch drc) by removing ponderosa pine up to 18 inches dbh that do not meet the "old tree" definition and do not have interlocking crown with oaks and occur within 30 feet of base of oak ≥10-inch drc. In areas of savanna restoration and wildland-urban interface piñon-juniper mechanical treatment, seedling/sapling, young and mid-aged piñon and juniper may be cut.	Maintain a range of structure conditions (such as wildlife habitat heterogeneity) while restoring forest conditions.	Specialist recommendation
WL041	Burn plans will develop prescriptions that will maintain coarse woody debris levels that align with LMP direction.	Maintain a range of structure conditions (such as wildlife habitat heterogeneity) while restoring forest conditions.	Specialist recommendation
WL042	Burn Plans: Ensure that the potential cumulative effects of multiple fires burning in an area do not produce negative effects to local wildlife; coordinate burning between administrative units and between wildlife and fire management to minimize potential disturbance.	Minimize disturbance to wildlife while conducting restoration activities.	Specialist recommendation
WL044	Temporarily restrict human access and disturbance-causing land-use activities within a 1-mile radius around active Mexican wolf dens between April 1 and July 31, and around active rendezvous sites between June 1 and September 30. Exceptions include any authorized specific land use that was active and ongoing at the time Mexican wolves chose to locate a den or rendezvous site nearby. Coordinate with the	To avoid adverse effects to reproductive success, natural behavior, or persistence of Mexican wolves. To prevent loss of IFT equipment (cameras, etc.) on	Specialist recommendation

DF/BMP/CM Identifier	Description	Primary Purpose	Basis
	Interagency Field Team (IFT) to determine current denning/rendezvous site locations.	Forest.	
WL045	Rock pits within 0.5 mile of Mexican spotted owl recovery and protected habitat would be surveyed to protocol to determine occupancy status of recovery habitat or breeding status of owls in PACs before operations are initiated, unless a wildlife biologist determines this restriction is unnecessary	To avoid or minimize potential effects to Mexican spotted owls.	LMP compliance and specialist recommendation
WL046	No ground disturbance from rock pit development or operation and in-woods processing sites would occur in known Mexican spotted owl PACs, or within 0.25 mile of nests and roosts during the breeding season, unless a wildlife biologist determines this restriction is unnecessary.	To avoid or minimize potential effects to Mexican spotted owls.	LMP compliance and specialist recommendation
WL047	Material hauling from rock pits in or within 0.25 mile of occupied Mexican spotted owl PACs would occur outside of the Mexican spotted owl breeding season unless a wildlife biologist determines this restriction is unnecessary.	To avoid or minimize potential effects to Mexican spotted owls.	LMP compliance and specialist recommendation
WL050	No ground disturbance from in-woods processing site development or operation would occur within 0.25 mile of Mexican spotted owl PAC or northern goshawk PFAs, unless a wildlife biologist determines this restriction is unnecessary, and in coordination with FWS for the Mexican spotted owl (unless subsequent finalized revised LMP Species of Conservation Concern determinations do not include northern goshawk).	To avoid or minimize potential effects to Mexican spotted owls.	Specialist Recommendation

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