Final

Biological Assessment

for the

Apache-Sitgreaves National Forests

USDA Forest Service, Southwestern Region (R3)

Apache, Coconino, Greenlee, and Navajo Counties, Arizona

Land Management Plan

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References. References cited in this BA are found in a separate document titled "References for the Biological Assessment for the Apache-Sitgreaves National Forests, Arizona, Land Management Plan".

INTRODUCTION

This biological assessment (BA) has been prepared to initiate ESA consultation on a Land Management Plan for the Apache-Sitgreaves National Forests (ASNFs) in compliance with requirements of Section 7(a)(2) of the Endangered Species Act (ESA). This is alternative B in the Final Environmental Impact Statement (FEIS) for the ASNFs Land Management Plan. Therefore, the ASNFs' Land Management Plan in its entirety, (hereafter referred to as the LMP) is the proposed action under consultation.

The LMP has been prepared as required by the National Forest Management Act of 1976 under the provisions of the 1982 Planning Rule. LMPs must comply with the National Environmental Policy Act (NEPA) and the ESA as well as other laws and regulations; they can be amended over time. The LMP herein under consultation replaces the 1987 ASNFs LMP; however, new LMP direction does not require a reevaluation or change in decisions that have been made under the 1987 ASNFs LMP.

The LMP provides programmatic, forest-level direction for management of the ASNFs. Site specific management (projects or activities) must be in compliance with the LMP. Future site specific projects and activities implementing the LMP are also subject to individual NEPA and ESA requirements, as necessary. Any project or activity not in compliance with the LMP would require a plan amendment with associated NEPA and ESA analyses. The LMP period is 15 years which is the analysis period for this BA.

This BA determines the potential effects of implementing the LMP programmatic direction to all federally listed and proposed species, proposed and designated critical habitats, and candidate species (collectively, "ESA species"). Because LMPs are programmatic and do not prescribe the specific timing or exact location of land management activities, there is some uncertainty about the potential environmental consequences of implementing LMP direction which is addressed in this BA.

The FEIS and LMP contain a glossary of terms not otherwise defined in this document. Sources cited in this BA are found in a separate document titled "References for the Biological Assessment for the Apache-Sitgreaves National Forests, Arizona, Land Management Plan".

Species List

ESA consultation on the ASNFs LMP addresses all ESA species as agreed to between the United States Forest Service (Forest Service) and United States Fish and Wildlife Service (USFWS) by letter of concurrence dated September 20, 2013. Table 1 identifies the 18 listed or proposed species and 12 designated or proposed critical habitats that are addressed in this biological assessment.

Table 1. Federally listed, proposed, and candidate species; and designated or proposed critical habitats with determinations in this biological assessment

Common Name	Scientific Name	Federal Status	Species determination [a/]	Critical Habitat	Critical habitat determination [a/]
Mammals					
New Mexico meadow jumping mouse	*Zapus hudsonius luteus*	Proposed endangered	NLJ MALAA, if listed	Proposed	NLAM MALAA, if designated
Mexican gray wolf	*Canis lupus baileyi*	Experimental non-essential	NLJ	--	--
Lesser long-nosed bat	*Leptonycteris curasoae yerbabuenae*	Endangered	NE [b/]	--	--
Birds					
Mexican spotted owl	*Strix occidentalis lucida*	Threatened	MALAA	Designated	MALAA
Southwestern willow flycatcher	*Empidonas traillii extimus*	Endangered	MALAA	Designated	MALAA
Western yellow-billed cuckoo	*Coccyzus americanus occidentalis*	Proposed threatened	NLJ MALAA, if listed	Under consideration	--
Amphibians/Reptiles					
Chiricahua leopard frog	*Lithobates (Rana) chiricahuensis*	Threatened	MALAA	Designated	MALAA
Narrow-headed gartersnake	*Thamnophis rufipunctatus*	Proposed threatened	NLJ MALAA, if listed	Proposed	NLAM MALAA, if designated
Northern Mexican gartersnake	*Thamnophis eques megalops*	Proposed threatened	NLJ MALAA, if listed	Proposed	NLAM MALAA, if designated
Invertebrates					
Three forks springsnail	*Pyrgulopsis trivialis*	Endangered	MALAA	Designated	MALAA

Common Name	Scientific Name	Federal Status	Species determination [a/]	Critical Habitat	Critical habitat determination [a/]
Fish					
Apache trout	*Oncorhynchus apache*	Threatened	MALAA	--	--
Gila chub	*Gila intermedia*	Endangered	MALAA	Designated	MALAA
Gila trout	*Oncorhynchus gilae*	Threatened	MALAA	--	--
Little Colorado spinedace	*Lepidomeda vittata*	Threatened	MALAA	Designated	MALAA
Loach minnow	*Tiaroga cobitis*	Endangered	MALAA	Designated	MALAA
Razorback sucker	*Xyrauchen texanus*	Endangered	NE [b/]	Designated	NE [b/]
Roundtail chub	*Gila robusta*	Candidate	NLJ, if proposed	--	NLAM, if proposed
Spikedace	*Meda fulgida*	Endangered	MALAA	Designated	MALAA

[a/] Determinations based on current status unless otherwise noted; NLJ = not likely to jeopardize; NLAM = not likely to adversely modify; MANLAA = may affect, not likely to adversely affect; MALAA = may affect, likely to adversely affect; NE = no effect

[b/] No effect determinations are found in appendix B

DESCRIPTION OF THE PROPOSED ACTION

As noted above, the LMP in its entirety is the proposed action. However, key elements of the plan are further described below, including a discussion about fire terminology. Note that all items below, except potential natural vegetation types and fire terminology, are "plan decisions" required under NFMA. Information about how the LMP and BA are organized is also provided.

KEY PLAN ELEMENTS

Plan Decisions

Desired conditions

Desired conditions (goals) set forth desired ecological, social, and economic attributes of the ASNFs. They provide for sustainability and resiliency. Ecologically, this would be the capacity of a system to absorb disturbance and reorganize while undergoing change so as to retain essentially the same function, structure (over time), and identity. Desired conditions are expressed in broad terms and there is no specific date by which they are to be reached. Projects or activities must be consistent with applicable desired conditions (i.e., maintain them or move current conditions toward them). Desired conditions, while not actions themselves, guide how and where LMP actions (see objectives section below) occur.

Objectives

Objectives are concise statements of measurable, planned results (actions) and they may be stated as a range such as treatment of 5,000 to 35,000 acres. As such, they most often represent a project or a management activity to be taken with potential attendant impacts to ESA species and their habitat. Objectives are time specific (e.g., a certain number of miles treated annually or a certain number of acres treated over the 15-year life of the plan), but are not specific to within-year timing (although this may be incorporated at the site specific project or activity level). The location where most LMP objectives would be implemented is also not specifically identified in the LMP. The primary purpose of implementing objectives is to maintain or move toward desired conditions.

Not all objectives within the LMP may be implemented due to changes in environmental conditions, available budgets, etc. On the other hand, some annual or periodic objectives may be exceeded in any one year or period and not met in another, but objectives are not exceeded as an average annual amount over the life of the plan. In addition, not every action the ASNFs may initiate is identified in the plan; just the primary ones identified to address attainment of desired conditions. However, all actions would be subject to individual NEPA and ESA requirements, as necessary.

Standards

Standards are constraints upon project and activity decisions meaning they often limit or mitigate impacts from the actions associated with implementing the project or activity. A project or activity must be consistent with all applicable standards. Standards must be followed or the plan amended. A project or activity is consistent with a standard in only one way:

- The project or activity is designed in exact accord with the standard. Variance from a standard is not allowed except by plan amendment. The project documentation should confirm that the project is consistent with applicable standards.

Guidelines

Guidelines are also constraints upon project and activity decisions, also often limiting or mitigating impacts from the actions associated with implementing a project or activity. A project or activity must be consistent with all applicable guidelines. Guidelines must be followed, but they may be modified for a specific project if the intent of the guideline is followed and the deviation is addressed with supporting rationale in the project record. However, when deviation from a guideline does not meet the original intent, a plan amendment is required. A project or activity is consistent with a guideline in either of two ways:

- The project or activity is designed exactly in accord with the guideline; or
- A project or activity design varies from the exact words of the guideline, but it is as effective in meeting the purpose of the guideline to contribute to the maintenance of or movement toward the relevant desired conditions and objectives.

Suitability

Suitability determinations identify areas of land as suitable or unsuitable at the forestwide level. Specifically this is done for livestock grazing, special uses, timber, motorized uses, and recreation. Chapter 4 of the LMP contains more detail about the determinations of suitability for these uses at the forestwide level. Except for a project with the purpose of timber production, the project documentation should describe that a project or activity is either: (1) a use for which the area is specifically identified in the LMP as suitable or (2) not a use for which the area is specifically identified in the LMP as suitable for that location (LMP pg. 8). While some areas are not currently grazed by livestock, almost all of ASNFs acreage is suitable for livestock grazing (LMP chapter 4). For more information about livestock grazing suitability, see the FEIS Range Specialist Report (2014). Where suitability has relevance for ESA species, it is discussed in this BA.

Management areas including special areas

Management areas which include special areas (i.e., lands that have designations by Congressional or other delegated authority) are areas that have similar management intent and common management strategy. Direction for management areas focuses less on actions to be taken than what they allow (level of management intensity as in prescribed burning only) or disallow (motorized vehicle use). Chapter 3 of the LMP contains the descriptions of management areas and LMP appendix F contains maps of the management areas. Where a management area has relevance for ESA species, it is discussed in this BA. Maps of all management areas are found in appendix F of the LMP.

Monitoring

LMP monitoring determines how the LMP is being applied, how well it works, and if its purpose and direction remain appropriate. Chapter 5 contains the monitoring strategy for the LMP. ASNFs LMP monitoring helps inform adaptive management over time and contains monitoring questions for ESA and Regional Forester sensitive species. This includes reviewing implementation of biological opinion terms and conditions and mitigation measures.

Not Plan Decisions

Potential Natural Vegetation Types

Management of potential natural vegetation types or PNVTs are the focus of management or actions to either maintain or restore these vegetation types to desired conditions, assumed to be healthy and resilient to

disturbance, and which reflect reference conditions[1]. PNVTs are coarse-scale groupings of ecosystem types that share similar geography, vegetation, and historic ecosystem disturbances, such as fire and drought. The PNVTs represent the vegetation type and characteristics that would occur when natural disturbance regimes and biological processes prevail. PNVTs have various states or seral stages depending on disturbances and time.

All 14 PNVTs help sustain terrestrial and aquatic ecosystems and provide goods and services for people. PNVTs are delineated at the 1:24,000 scale but are ground-truthed during planning and analysis of site specific projects or activities. Currently, all PNVTs (except chaparral PNVT) vary, sometimes substantially, in structure, composition, function, and natural disturbance processes from desired conditions. Changes within PNVTs with implementation of the LMP form the basis for analysis of many effects to ESA species' habitat.

For the LMP analysis, changes in the structure and subsequent function of PNVTs with LMP implementation were modeled using the Vegetation Dynamics Development Tool or VDDT. This is a non-spatial model that allows the user to model vegetation as a series of vegetation states over time based on varying types and rates of disturbances and management. Input data used in modeling for the ASNFs came directly from management activities and fire data over the last 25 years. For more information about the VDDT model, see the FEIS Vegetation Specialist Report (2014).

Fire terminology

All fire terminology is per the Guidance for the Implementation of Federal Wildland Fire Management Policy (NWCG 2009). The ASNFs LMP addresses only "wildland fire" because this distinguishes it from fire in urban or other non-wildland settings. Unplanned wildland fires are suppressed depending on weather and fuels conditions (they must be if human caused) and these have accompanying emergency consultation, where necessary. On the other hand, an unplanned wildland fire may be managed where it can accomplish resource objectives and where weather and fuels conditions are appropriate. Managed unplanned wildland fire, or "wildfire", is one LMP treatment option to accomplish desired conditions, and the VDDT modeling incorporated managed wildfire in the LMP outcomes for PNVTs. However, given that use of managed wildfire cannot be predicted and would have its own emergency consultation, it is not included in this BA. Hence, this BA addresses *only* planned wildland fires, i.e., "prescribed fire", sometimes referred to as just "burning." Any reference to unplanned wildland fire in this BA is always termed "wildfire", regardless whether it is managed for resource benefit or not.

For the LMP analysis, changes in the vegetation fire regime were analyzed using the Forest Vegetation Simulator-Fire and Fuels Extension (FVS-FFE) in conjunction with VDDT. Fire regimes are the patterns, frequency, and severity of fire that occur over a long period of time across a landscape and its effect on the ecosystem in which it occurs Historic fire regimes in most Southwestern ecosystems was a more frequent, less severe fire regime and restoration toward more historic fire regimes is desirable. There are five fire regime condition classes (FRCC) ranging from high fire frequency with generally low fire severity, to low fire frequency with generally high fire severity (see the LMP glossary). Each PNVT has its own characteristic fire regime condition class(es). For more information about FRCC, see the FEIS Fire Specialist Report (2014).

Summary of LMP actions for consultation

[1] Reference conditions are environmental conditions that infer ecological sustainability and are represented by the historic range of variation (i.e., the characteristic range of variation, not the total range of variation) for a particular attribute, prior to European settlement and under the current climatic period (see LMP glossary).

While the entire LMP is under consultation, some plan decisions (key plan elements) are more relevant to impacts on ESA species and their habitats. For example, implementation of objectives includes project activities and management actions that will likely affect species as through disturbance and their habitat as through sedimentation or removal for vegetation structure. In addition, standards and guidelines may require actions that help mitigate these impacts. However, suitability and management areas may or may not influence the type or amount of management or actions that can occur which might reduce species disturbance and impacts to habitat components such as herbaceous plant height.

Therefore, objectives, standards, guidelines, and (where applicable) suitability and management areas, are the focus for determining potential effects for ESA species in this BA. Desired conditions (also discussed because they shape the application of objectives) along with objectives, standards, and guidelines are often collectively referred to as "plan components" in this BA. Appendix A of this BA contains a complete list of these four LMP plan components for reference.

LMP AND BA ORGANIZATION

In addition to designating management areas, suitability, and monitoring as noted above, the LMP provides forestwide direction for the broad management of the ASNFs. That direction falls under three primary areas, or revision topics, identified during forest planning as areas where there is a need for change (for more detail, see LMP pgs. 2-5). These are 1) maintenance and improvement of ecosystem health, 2) managed recreation, and 3) community-forest interaction. The LMP provides direction under about 40 sections: 22 separate resource sect ons addressing ecosystem health, 9 separate use sections addressing managed recreation, and another 9 separate sections addressing community-forest interaction. Given the integrated nature of the LMP, plan direction can and most often does apply across Forest Service program areas (e.g., across timber, range, recreation, etc.).

However, for organizational consistency with other prior plan consultations, BA species effects are grouped by program area. Although all possible program area details are not prescribed by the ASNFs programmatic LMP, a general determination of the potential effects is provided for each program area for each species and critical habitat when possible to do so. In addition, a single determination of effect for each species and each critical habitat are provided based on implementation of all LMP direction. The following section provides a brief summary of the ASNFs' program areas.

ASNFs PROGRAM AREAS

Descriptions of the general program areas are shown in bold and the LMP sections grouped and addressed under each program area are shown in parentheses. However, not all aspects of every program can be detailed or specifically addressed in a programmatic LMP, nor are all aspects of, or activities within, a program area over the 15 year of the life of the LMP known. The following descriptions are brief but more information can be found in the FEIS.

Wildland Fire Management

This program area handles various aspects of wildland fire. This includes wildfire suppression, wildfire prevention, and aviation (water or slurry drops with consideration of aerial fire retardant avoidance areas) with the purpose of protecting communities, watersheds, and species at risk. It also includes use of wildland fire, both planned and unplanned, applied for 1) resource benefits (see Key Plan Elements section above), or 2) hazardous fuels reduction, or 3) ecosystem restoration. The program area also manages residual fuels generated as a result of forest restoration thinning work.

The purpose of applying or using wildland fire is to maintain or restore resilient fire-adapted ecosystems. This includes maintaining or moving toward desired conditions relative to reference or historic fire regimes. Activities to attain or moved toward desired fire regime condition classes over time are expected to reduce the incidence (extent and frequency) of large scale uncharacteristic wildfires that have the potential associated risk for substantial or complete loss of habitat.

Ecosystem/Vegetation Health

(Overall Ecosystem Health, Landscape Scale Disturbance, All PNVTs, Forest and Woodland PNVTs, Grasslands and Chaparral PNVTs, and Forest Products)

Traditionally this program area was the "timber program" focused on outputs of forest products such as volume of merchantable timber. Today the focus is on the overall ecosystem health of both forested and non-forested vegetation. While functioning physical features (see Soils and Watershed program area below) and biotic features such as wildlife (see Wildlife and Rare Plants program area section below) are part of a healthy ecosystem, the focus here is on vegetation (structure and function). While ecosystem health is not a separate program area per se, it spans many program areas and all vegetation types. Its purpose is to maintain current vegetation condition at or move them toward desired conditions through management or activities in forests, woodlands, riparian areas and associated floodplains, and in other PNVTs such as grassland and chaparral types. Considerations are also given to landscape scale disturbances that occur within and are often vital to ecosystems.

This program area also includes the provision of forest materials or products, often as the by-product of ecosystem restoration activities. Forest wood products include timber, biomass, and fuel wood. These are provided commercially, noncommercially, or in partial exchange for services (e.g., thinning). Small forest products are available by permit. These include Christmas trees, cones, decorative and specialty wood, mushrooms and other plants, berries or nuts, and wildings (i.e., transplants of trees, shrubs, or herbaceous plants).

Rangeland Management

(Livestock Grazing and Invasive Species)

This program area provides for grazing of domestic livestock on the ASNFs. As of 2014, there are 92 active grazing allotments, including two sheep driveways. There are approximately 80 livestock grazing permittees, both local and non-local. Information in this BA regarding livestock grazing (numbers, season of use, level of use, etc.) or removal of livestock grazing from an area or stream are based on the current situation or analyses, although all are subject to change which would result in project level specific ESA Section 7 consultation.

Almost all of the acreage on the ASNFs (94%) is considered suitable for livestock grazing (see LMP chapter 4) even though some areas are not now grazed based on livestock grazing decisions or for other reasons (as previously noted, suitability is validated at the site specific project or activity level). A large majority of allotments are grazing by cow/calf pairs, some by yearling cattle, and a few by horses. Given the generally higher elevations on the ASNFs, two-thirds of the allotments are grazed primarily during the summer and fall seasons. Just over one-fifth of allotments are grazed yearlong (most of these are located below the Mogollon Rim on the Clifton Ranger District). The remaining allotments are grazed during the winter and spring periods. The majority of allotments are grazed under a deferred- (i.e., pasture-) rotation system. Many of the allotments on the ASNFs have NEPA analyses and attendant ESA consultation per the Forest Service Chief's schedule.

The rangeland management program area develops annual operation instructions for each allotment and monitors livestock presence and grazing levels in accordance with NEPA analyses while addressing the needs of permittees. Program activities include oversight of the construction, implementation, and maintenance of range developments for improved livestock management and control of invasive or noxious weeds. This program area also has responsibility to address livestock grazing adjustments needed as a consequence of drought (Forest Service Handbook 2209.13, Ch. 10-19.1).

The management of invasive species portion of this program area includes prevention and treatment of invasive or noxious plants (treatment of invasive animals is under the Wildlife, Fish, and Rare Plant program). Treatment takes place under the 2008 ASNFs Noxious or Invasive Weed Management Program Decision and the 2008 draft ASNFs Integrated Forest-wide Noxious Weed or Invasive Plant Management Plan. However, all program areas are responsible to prevent the establishment of these species and not all invasive plants are terrestrial (e.g., Eurasian watermilfoil grows in reservoirs on the ASNFs). There are other species besides plants such as green sunfish, mountain pine beetle, and crayfish which are treated under other program areas. However, for organizational simplicity in this BA, all plan direction regarding invasive species is covered under the rangeland management program area.

Watershed and Soil Management
(Water Resources, Water Uses, Riparian Areas, and Air)

This program area provides specialist input to management and activities in all other program areas. It has responsibility to see that the condition of watersheds and soils are maintained or improved to provide favorable flows, water quality, and productive soils, all of which support healthy plant and animal populations and human needs. The program areas assesses watershed condition; prioritizes watersheds for protection or improvement (i.e., restoration); coordinates with other federal, State, and Tribal agencies; makes water right applications under State or Federal law to meet National Forest System (NFS) mandates; and addresses sediment and water quality.

The watershed and soil management program area also addresses the functionality and protection of riparian areas, floodplains, and other groundwater-dependent ecosystems. It is responsible to conduct burned area emergency response (BAER) assessments and implement actions to protect property and resources as needed after large wildfires (conducted under emergency consultation). This program area is additionally responsible for protecting State air quality values and works with the wildland fire program area and the State on air quality matters related to burning and human health.

This program area (like wildlife) is a cross-program in that it evaluates impacts to watershed, soils, riparian areas, and water and air quality from management and activities associated with other program areas. It provides migitations, e.g., application of site specific best management practices (BMPs), and assists in developing or shaping resource management actions that will maintain or move toward applicable desired conditions.

Engineering Program
(Infrastructure, Roads, and Developed Recreation)

This program area is responsible for the management and maintenance of infrastructure necessary for use and management of the ASNFs. Infrastructure consists of buildings, parking areas, visitor centers, pavilions, restrooms, towers, and water and waste water systems. A facility master plan was completed in 1994 that guides acquisition, maintenance, and disposal of facilities. It identifies facility needs and guides decisions regarding proposed and existing facilities. The engineering program area is also responsible for implementing

the Forest Service Southwestern Region's environmental management system and the environmental compliance and protection program (e.g., handling and disposal of regulated materials).

The Engineering program area is also responsible for the forest transportation system to meet public and administrative needs. This includes design, construction, and maintenance of roads, bridges, and drainage structures, as well as road closures, relocations, and decommissionings. The motorized transportation system is currently comprised of 765 miles of roads open only to highway legal vehicles (maintenance level 3 through 5); 2,067 miles of roads open to all motorized vehicles (maintenance level 2); 3,372 miles of roads closed to all motorized vehicles (maintenance level 1); and 156 miles of trails open to motorized vehicles less than 50 inches wide. The miles of open motorized transportation system includes roads with access restricted on a seasonal basis for public safety and to minimize resource damage. Over the last few decades, funding has been insufficient to maintain all NFS roads and NFS motorized trails to appropriate standards to meet the road and trail management requirements.

Additional travel ways exist that are not part of the NFS road network and are considered unauthorized routes. The use of motorized vehicles for recreation activities has increased dramatically in recent years. Advances in the performance and the technology of off-highway vehicles (OHVs), all-terrain vehicles (ATVs), and utility-terrain vehicles (UTVs) have increased the demand for additional motorized recreation trails (i.e., motorized routes less than 50 inches wide), specifically connectors between routes to create loops. Some adjustments to the road network have been made during project level analyses and decisions, most related to poorly located roadbeds in riparian areas or wet meadows, etc. Temporary roads have been used for forest products extraction where a permanent road is not needed for future access.

Travel management planning has been initiated but not completed on the ASNFs. Potential changes to the ASNFs transportation system will be evaluated by the framework provided by the LMP (LMP pg. 80). Once completed, the system will be delineated and published on the motor vehicle use map (MVUM) and motorized travel would be limited to a designated system or roads, trails, and areas. Uses inconsistent with those designations, and inconsistent with the LMP, would be prohibited.

Lands and Minerals Program
(Energy, Lands, Minerals and Geology, and Special Uses)

This program area is responsible for land ownership adjustments including purchases, withdrawals, and land exchanges and it identifies and addresses property boundaries and encroachments onto the ASNFs. It also issues non-recreational special use authorizations for occupancy of water lines, utility and transportation rights-of-way and easements, and common minerals pits on NFS lands. Increasing development on adjacent private land has increased the demand for all these occupancies. Special use authorizations are also issued for communication locations of which there are currently 34 sites. Currently there are three high voltage energy corridors traversing a total of about 40 miles of the ASNFs. Proponents (e.g., state and local agencies, private industry and individuals) are asked to exhaust opportunities to use other lands before occupancy of ASNFs lands is considered which sometimes can encumber public land.

A number of special use authorizations are also issued under other program areas (e.g., recreation activities like outfitter/ guides or special events). However, for organizational simplicity in this BA, all special uses are addressed under the lands and minerals program area. As of 2011, there were 454 existing rights-of-way and special use permits for a variety of uses on the ASNFs. A majority of these are categorized as lands permits (381) versus recreation permits (73).

This program area also handles mining (locatable, leasable, and salable mineral materials), oil, gas, and geothermal activities. There are a number of locatable mineral claims for which an operating plan or notice of

intent must be filed; however, potential for these claims on the ASNFs is low because of geology. There are minimal extractable (leasable) resources available and there are no known leases for oil, gas, geothermal or coal on the ASNFs. The demand for salable or common variety mineral material such as rock, gravel, clay, or sand (typically extracted in pits which require annual operating plans) is currently low but growing.

Recreation and Wilderness Program

(Developed Managed Recreation, Dispersed Managed Recreation, Scenic Byways, Motorized Opportunities, Nonmotorized Opportunities, National Recreation Trails, Scenic Resources, Wild and Scenic Rivers, Wilderness and Recommended Wilderness, Conservation Education, Community-Forest Interaction, Special Uses, Cultural Resources, and American Indian Rights and Interests)

This varied program area provides a wide range of recreation settings, opportunities, and services. Program area components include administration and management of resources and visitors at developed recreation sites, dispersed recreation settings, partnerships and tourism, interpretive services, recreation special use permits, congressionally designated wilderness areas, the Nation's only remaining primitive area, visual quality management, trail management, and scenic byways. As noted above, development of facilities and trails is covered under the engineering program area and recreation special uses are covered under the lands and minerals program area.

The heritage program area manages cultural resources through identification and protection of cultural resources or historic properties by providing opportunities for public education and cultural resource stewardship. The Tribal Government Relations Program (American Indian Rights and Interests) involves the development and maintenance of government to government relationships, cultural interests, sovereignty, treaty rights, self-determination, consultation, religious freedom, and other areas of tribal concern. This includes the use of ASNFs lands and resources for a variety of traditional cultural and religious activities (e.g., plant material collection or ceremonies).

Wildlife, Fish, and Rare Plant Program

(Wildlife and Rare Plants, Aquatic Habitat and Species, Research Natural Areas, and Recommended RNAs)

This program area provides specialist input to management and activities in all other program areas. The responsibility for this program area is to see that habitat is managed for all existing native and desired non-native wildlife, fish, and plant species in order to maintain viable populations throughout their geographic range with a focus on ecological integrity. Habitat enhancement projects or activities, inventory or monitoring, and habitat assessments are conducted. While treatment of invasive plants falls under the Rangeland Management program area, treatment of invasive animal species, e.g., nonnative fish, falls under this program area and is most often undertaken in partnership with Arizona Game and Fish Department (AZGFD). Conservation strategies, research or studies, and public education are additional important components of this program that are often conducted in collaboration with other resource areas and agencies.

The wildlife, fish, and rare plan program area (like the watershed and soils program area) is a cross-program in that it evaluates impacts to species, habitat, and plants from management and activities associated with other program areas. It often suggests project or activity migitations to reduce impacts and assists in developing or shaping resource management actions that will maintain or move toward applicable desired conditions for plants, species, and their habitats. It conducts ESA Section 7 consultations on forest project and management activities.

Research natural areas (RNAs) are a national network of areas utilized for research and education, and/or to maintain biological diversity on NFS lands. Here natural physical and biological processes generally prevail

without human intervention except that deliberate manipulation may occur as when research is conducted. The RNA program currently falls under the Wildlife, Fish, and Rare Plant Program at the Forest Service Southwestern Regional office level. However, because they are LMP management areas, the implications of RNAs and recommended RNAs that are relevant to an individual non-fish ESA species are not discussed in the wildlife, fish, and rare plant program area but separately (note that fish species analyses do not address RNAs or other specific management areas but rather address suitability on a broader, across action area, basis).

RNAs and recommended RNAs are not suitable for new motorized routes, tree cutting, energy corridors, special use communication sites, or livestock grazing. The process for approving a recommended RNA to become a designated RNA is described in the LMP (p. 118). LMP management direction for recommended RNAs is that if an individual recommended RNA is not designated within 5 years of LMP approval, an analysis with associated ESA consultation, as necessary, may be completed to return the land area to another management area with its associated plan direction. Hence, preclusion of the above noted uses that are relevant for some ESA species may not be long term.

BA ANALYSIS APPROACH AND ASSUMPTIONS

Besides the social and economic features of the LMP, the purpose of plan direction for forest management and activities is, over time, to achieve overall ecosystem health and provide for species diversity and viability as required by NFMA. Restoring ecological structure, e.g., balancing age and size classes of forests, restoring ecological function, e.g., fire regimes, and restoring satisfactory watershed conditions are of key importance. A variety of methods for implementing ecosystem restoration are available such as mechanical thinning, prescribed burning, or even no use.

The overall assumptions and analysis approach for this biological assessment include the following; some of these may be reiterated elsewhere, as necessary, for emphasis:

- The LMP timeframe is 15 years which is the analysis period for the BA.
- The LMP characterizes ecosystem vegetation as potential natural vegetation types or PNVTs, each composed of various seral or successional stages called "states"; most, but not all, ESA species' habitat is characterized by PNVTs in this BA analysis. PNVTs are mapped across the ASNFs at 1:24,000 scale.
- For the most part, the LMP does not direct *where* objective treatments will be located on the landscape, nor what amount of each objective will be implemented within each PNVT providing habitat; hence it cannot be predicted how much of an individual species' habitat may be treated annually, periodically, or over the timeframe of the plan.
- The LMP does not generally direct *when* specifically within the plan timeframe, a treatment objective will be implemented; hence, the impacts to a species based on timing of implementation cannot be specifically determined.
- Objective treatments are generally expressed in terms of miles or acres of land to treat and, while there are various treatment methods (e.g., thin, burn), the LMP does not prescribe methods to use; hence, potential effects associated specifically with a type of method cannot be addressed in the BA analysis (but are rather analyzed at the site specific project or activity level).
- Where LMP direction is for a range of treatment amounts (e.g., 200-500 acres or 5-15 miles), potential effects to species in this BA are based, in part, on VDDT modeling of the high treatment amount in the respective PNVT, where applicable. Hence, species and habitat (which includes critical habitat) analyses and determinations of effect are based on the high treatment level to account for all possible impacts and changes even though the low amounts or no treatments may occur.

- Analyses of potential effects to individual species are generally organized by program area (see above LMP and BA organization section above).
- Analyses of potential effects to individual species include effects to their habitat which applies to proposed or designated critical habitat. Potential habitat effects relative to primary constituent elements of critical habitat are included in a separate section.
- Miles and/or acreages for a species' habitat or designated/proposed critical habitat on the ASNFs is determined using the ASNFs' geographic information system (GIS) based on USFWS shapefiles.

SPECIES EVALUATIONS

In the following sections, ESA species are grouped as mammals, birds, amphibians/reptiles/invertebrates, and fish. For each species, their natural history, distribution, and status are provided, followed by threats and status in the action area, i.e., threats and status (including relevant existing conditions for the species) within the ASNFs. Primary constituent elements (PCEs) of designated or proposed critical habitat are described, where applicable.

Discussion of the potential impacts to each species and its habitat follows, organized by program area. Plan components that may contribute to, or mitigate, impacts to species and their habitats are listed (bulleted) under each program area. Many of these plan components apply to more than one program area and they are reiterated, as applicable, under each program area. This is because any one plan component can have differing aspects influencing a species, depending on type of action or program area. Potential impacts to critical habitat, where proposed or designated, follow. Cumulative effects and climate change are also addressed.

Lastly for each species, potential impacts previously discussed for each program area are summarized and a determination of effect for the programmatic action, i.e., LMP implementation, is made for the species and its critical habitat. For proposed species and proposed critical habitat, the determination of effect for the programmatic LMP action is based on their proposed status; in addition, determinations of effect are also provided should the species be listed or critical habitat be designated. Note that, given the programmatic nature of the proposed action, impacts described are often general and not detailed. In addition, determinations reflect a number of uncertainties such as when and where, specifically, a project or action might occur and the fact that all aspects of, or activities within, a program area over the 15 year life of the LMP are not known.

While the relationship of desired conditions to each species and its habitat under each program areas is briefly addressed, desired conditions are not listed (not bulleted) for each program area. All desired conditions and all of the other three plan components (objectives, standards, and guidelines) are shown in appendix A of this BA. Where other LMP key elements, e.g., management areas and/or suitability, are relevant to the species, they are also discussed. "No effect" determinations for two species are found in appendix B.

MAMMALS

New Mexico meadow jumping mouse *Zapus hudsonius luteus*

Endangered Species Act status:	Proposed endangered, June 20, 2013
District Occurrence:	Alpine
Recovery plan:	No
Critical habitat:	Proposed, June 20, 2013

Determination of Effects (Species-Proposed):	Not Likely to Jeopardize
Determination Critical Habitat (Proposed):	Not Likely to Adversely Modify
Determination of Effects (Species-Listed):	May Affect, Likely to Adversely Affect
Determination Critical Habitat (Designated):	May Affect, Likely to Adversely Affect

For brevity, the New Mexico meadow jumping mouse is referred to as NMMJM throughout the document.

NMMJM Specific Assumptions

- All twelve of the known occupied NMMJM sites are assumed to be occupied for this BA analysis. AZGFD surveys of all known 2008-2009 NMMJM sites the year after the 2011 Wallow Fire found NMMJM in seven of the 12 locations; however, one year of survey is not enough to conclusively determine the species' long term persistence at these locations.
- Much of the NMMJM proposed critical habitat is planned for survey in 2014 and, depending on funding, there are out-year plans to survey other high elevation streams and wet sites on the ASNFs.

Natural History, Distribution, and Status of the Species Range-wide

Life history, distribution, status of the species range-wide and listing factors are found in documents located on the USFWS website http://www.fws.gov/southwest/es/arizona/NMjmouse.htm (accessed 2014). An account of the taxonomy, biology, and reproductive characteristics of this species is found in the 2013 Federal Register proposing endangered species status and the 2013 Federal Register proposing critical habitat for the NMMJM and in the NMMJM draft species assessment report (USFWS 2013). Vaughn (2014) also compiled information on the species from various sources. All these documents are incorporated by reference into this document.

Status and Threats within the Action Area

Between 2007 and 2011, NMMJM were known from twelve isolated sites on the ASNFs (6 historic sites and 6 newly surveyed sites) as indicated in the site list below based on Frey (2011). The main drainages are listed with the dates of Frey's survey, then local ASNFs site names follow (italicized). All of these sites are within proposed critical habitat (see the following section).

The site list contains a general description of the 2011 Wallow Fire impacts, based on fire severity in the vicinity and upstream of the NMMJM sites, determined from the 6/23/11 Wallow Fire soil burn severity or SBS map (sometimes called the BARC map) and from personal observations (on the ground and by helicopter). It also notes post fire observations of flooding from 2011 through 2013. Riparian cross-section and photo-point monitoring sites were established in 2011 by David Smith (USFWS) at all locations except for sites (g) and (h). Notations of flooding are relative to flooding post fire *in excess of* normal annual or biannual flooding levels.

(a) East Fork Little Colorado River, 2008, *Montlure*:
>moderate to mostly high severity fire in adjacent uplands and moderate to heavy flooding

(b) Nutrioso Creek, 2008, *Nutrioso*:
>mixed severity in adjacent uplands and heavy flooding

(c) San Francisco River, 2008, *Noble*:
>mostly moderate to high severity fire in adjacent uplands and moderate flooding

(d) San Francisco River, 2008, *Tal-wi-wi*:

>moderate to high severity fire in adjacent uplands and moderate flooding

(e) East Fork Black River, 2008, *Three Forks*:
>moderate severity fire in adjacent uplands and no flooding

(f) West Fork Black River, 2009, *Thompson Ranch*:
>low severity fire in adjacent uplands and low flooding

(g) West Fork Black River, *Forest Road 68* (2007):
>low to moderate severity fire in adjacent uplands and low flooding

(h) West Fork Black River, 2008, *PS Ranch*:
>low to moderate severity fire in adjacent uplands and low flooding

(i) Boggy Creek, 2008, *Boggy*:
>low severity fire in adjacent uplands and low flooding

(j) Centerfire Creek, 2008, *Centerfire*:
>low to moderate severity fire in adjacent uplands and low flooding

(k) Corduroy Creek, 2009, *Corduroy*:
>moderate to mostly high severity fire in adjacent uplands and moderate flooding

(l) Campbell Blue Creek, 2008, *Campbell Blue*:
>low to moderate fire in adjacent uplands but high severity at headwaters and high severity flooding

Site (f) is currently on private land but may be exchanged into NFS land ownership and site (h) is on AZGFD property. Site (l) experienced especially heavy summer rains in 2013 with extensive outwash of rock and gravel. This is the only site that is known to have had significant additional flooding in 2013.

All of the above twelve sites, except site (l), fall within the montane-willow riparian forest PNVT (mapped at the 1:24,000 scale). Campbell Blue Creek is within cottonwood-willow riparian forest PNVT. However, all sites have elements of the wetland-cienega PNVT wet vegetation. In addition, Frey (2009) has noted that alders are often in the vicinity of where NMMJM are captured, although they are not typically captured under alders. While the current trend in most ASNFs riparian areas is away from desired riparian conditions, all of the above sites were likely at or near desired conditions, primarily due to exclusion of livestock grazing over the last several years or more. Surrounding upland vegetation is primarily montane/subalpine grassland and ponderosa pine forest PNVTs at the PS Ranch; primarily ponderosa pine PNVT at the Centerfire and Campbell Blue sites; and montane/subalpine grassland PNVT at the Thompson site. Otherwise, surrounding vegetation is a mixture of spruce-fir, wet mixed conifer, dry mixed conifer, and/or ponderosa pine forest PNVTs.

Threats on the ASNFs and information about them include the following.

Uncharacteristic wildfire and new or ongoing scouring floods within watersheds where NMMJM are found are possible until watersheds stabilize after high severity fires. Even after travel management planning is complete, roads will continue to be located in riparian areas and water developments and recreational use in riparian areas are likely to increase, see below.

In total there are 16.6 miles of open roads within NMMJM proposed critical habitat, most of which are next to or within ¼ mile of streams in proposed critical habitat. Roads crossing potential NMMJM riparian corridors could be inhibiting movement but it is not known if this is occurring on the ASNFs. The Campbell Blue, Montlure, Three Forks, Boggy, Centerfire, Forest Road 68, and Corduroy sites are along or near forest arterial level 4 roads (level 4 is the highest level of maintenance for unpaved roads).

Road use and maintenance on these roads also likely contributes runoff and sediment into some occupied or potential habitat, although at what level this becomes a detriment to habitat and the NMMJM is not known. The Noble and PS Ranch sites are near level 2 roads (level 2 is the lowest level of maintenance for unpaved roads). Forest road 249 adjacent to the Three Forks site is scheduled to be paved by the Federal Highway Administration over the next few years. The Thompson Ranch site has a two-track road, the status of which would be determined should the property become NFS lands.

Water development and removal or diversion can pose a threat to NMMJM habitat by impacting riparian water flows. There are numerous spring developments in the Greer area under special use permit on NFS lands to provide domestic water that could impact downstream flows that could support movement or dispersal habitat. The Alpine Water Company has four wells on NFS lands under special use permit as well and there are about ten springs around Alpine under special use permit that were developed for water on private land many years ago. However, while most of these water withdrawals are below known NMMJM sites they could potentially affect development of suitable habitat downstream.

Recreation such as camping, fishing, and off-road vehicle use can pose a threat to NMMJM and their habitat. The Three Forks site is excluded from public entry by ASNFs special closure order. The Montlure site has been authorized by special use permit as a youth church camp since the 1930s. Outdoor recreation is not a focus of camp activities and heavy recreation use or streamside tramping has not been observed here, according to Barbara Romero, Springerville Ranger District recreation staff since 1998. The sections of the East Fork and West Fork of the Little Colorado River upstream from the community of Greer and all of the East Fork Black River within that recreation and camping area receive heavy summer recreational activities. Impacts primarily include multi-user-made trails for hiking and fishing that wind through the tall grassy floodplains; however, floodplain vegetation has not been observed to be entirely trampled (personal observation) by recreationists.

Livestock grazing once heavily impacted NMMJM habitat which is considered suitable for livestock grazing under the LMP. Although subject to change, most NMMJM occupied sites are currently excluded from livestock grazing (see the following critical habitat section). The exception is about 2.7 miles of the West Fork Black River between Buffalo Crossing Campground and Horse Springs Campground (in PCH unit 5D). This is in the River Pasture of the PS Allotment grazed by livestock two weeks every other year before Memorial Day or after Labor Day per a 1999 livestock grazing decision with accompanying ESA informal batch consultation. At some sites, there have been occasional unauthorized (e.g., permittee) or trespass (e.g., non permittee) livestock use, especially post Wallow Fire. Elk continue to have access to occupied NMMJM sites and to suitable or restorable habitat.

Drought and climate change have also been identified as threats to this species. Since 2000, persistent drought on the ASNFs has at times reduced the extent of effective (wetted, tall vegetation) habitat. What has also occurred are limited, interspersed periods of higher than normal precipitation and flooding well above bankfull could have the potential to impacted NMMJM nests, but this is not known. Loss of beaver and subsequent loss of wetted areas has also been identified as a threat to the species. While beaver are present along the San Francisco River and Campbell Blue Creek, none are in the vicinity of known NMMJM sites but they are contributing to potentially occupiable habitat.

Potentially positive actions for the species undertaken by the ASNFs include the following. The ASNFs has undertaken some measure over the years to protect riparian areas now known to be occupied by NMMJM which has helped improve or protect riparian conditions. This has included construction of riparian exclosure fences and staging resource advisors on site during fires. Public entry into the Three Fork area (NMMJM site e) has been prohibited by ASNFs Special Closure Order since 2001 except for research purposes with required mitigations.

In addition, substantial annual reductions in numbers and time in pasture to livestock grazing on the Alpine Ranger District were made from 2000 through 2003 in response to drought; this has helped reduce livestock impacts especially to riparian areas that often stay green, thereby helping to retain vegetation vigor (height and density) and help protect streambanks. Although subject to change, the Nutrioso, Noble, Three Forks, Forest Road 68, Boggy, Centerfire, Corduroy, and Campbell Blue NMMJM sites are currently not authorized for livestock grazing via livestock grazing decisions on the Alpine Ranger District with accompanying ESA informal consultations. The Montlure site is within the South Fork Conservation Area which is not authorized for livestock grazing based on a Springerville Ranger District grazing decision and which is determined unsuitable for grazing under the LMP. The Thompson Ranch site is currently on private land and the PS Ranch site is on AZGFD property, neither of which has been used for livestock grazing in a number of years, other than incidental unauthorized use.

Critical Habitat and Primary Constituent Elements

Critical habitat primary constituent elements are the physical or biological features essential to the conservation of the species that may require special management considerations or protection. In proposing critical habitat, the USFWS considered verified collections of NMMJM between 2005 and 2012 even though there is now some uncertainty of population persistence after wildfire and flooding from the 2011 Wallow Fire. Proposed critical habitat extends laterally outward from either side of the stream, starting at bankfull, for 100 m or 330 ft.

The twelve known ASNFs sites for NMMJM noted above (a-l) occur within proposed critical habitat unit 5 (White Mountains) which lies along 72.4 miles of stream and encompasses a total of 6,047 acres. Table 4 shows the NMMJM sites noted above, along with which subunit of proposed critical habitat each occurs within.

Table 4. NMMJM sites and proposed critical habitat (CH)

2013 ASNFs site notation	ASNFs Site Name	Proposed CH Unit Name	Proposed CH Subunit	Stream Miles Proposed CH [1/]	Acres of Proposed CH [2/]
(a)	*Montlure*	Little Colorado	5A	14.0	1,181
(b)	*Nutrioso*	Nutrioso	5B	12.7	1,021
(c) (d)	*Noble* *Tal-wi-wi*	San Francisco	5C	7.3	622
(e)	*Three Forks*	East Fork Black River	5D	12.6	1,040
(f) (g) (h)	*Thompson Ranch* [3/] *Forest Road 68* *PS Ranch*	West Fork Black River	5E	14.3	1,188
(i) (j)	*Boggy* *Centerfire*	Boggy and Centerfire	5F	5.5	485
(k)	*Corduroy*	Corduroy	5G	3.0	256
(l)	*Campbell Blue*	Campbell Blue	5H	3.0	253

[1/] Stream miles include mileage through private land per 2013 the Federal Register proposing critical habitat.
[2/] Acreage is only NFS land and does not include private land acreage per the 2013 Federal Register proposing critical habitat.
[3/] Thompson Ranch acreage was included as private land in the 2013 Federal Register; it may become NFS land based on an upcoming land exchange.

There are four primary constituent elements of proposed critical habitat for the NMMJM as follows.

1) Riparian Communities
   a. Riparian communities along rivers and streams, springs and wetlands, or canals and ditches characterized by one of two wetland types:
      i. Persistent emergent herbaceous wetlands dominated by beaked sedge (*Carex rostrata*) or reed canarygrass (*Phalaris arundinacea*) alliances; or
      ii. Scrub-shrub riparian areas that are dominated by willows (*Salix* spp.) or alders (*Alnus* spp.);

2) Flowing Water
   a. Flowing water that provides saturate soils throughout the mouse's active season that supports tall (average stubble height of herbaceous vegetation of at least 69 cm (27 inches) and dense herbaceous riparian vegetation (cover averaging at least 61 vertical cm (24 inches) composed primarily of sedges (*Carex* spp. or *Schoenoplectus pungens*) and forbs, including, but not limited to one or more of the following associated species: Spikerush (*Eleocharis macrostachya*), beaked sedge (*Carex rostrata*), reed canarygrass (*Phalaris arundinacea*), rushes (*Juncus* spp. and *Scirpus* spp.), and numerous species of grasses such as bluegrass (*Poa* spp.), slender wheatgrass (*Elymus trachycaulus*), brome (*Bromus* spp.), foxtail barley (*Hordeum jubatum*), or Japanese brome (*Bromus japonicas*), and forbs such as water hemlock (*Circuta douglasii*), field mint (*Mentha arvense*), asters (*Aster* spp.), or cutleaf coneflower (*Rudbeckia laciniata*);

3) Sufficient Space
   a. Sufficient areas of 9 to 24 km (5.6 to 15 mi) along stream, ditch, or canal that contain suitable or restorable habitat to support movements of individual NMMJM; and

4) Floodplain and Upland Areas
   a. Include adjacent floodplain and upland areas extending approximately 100 m (330 ft) outward from the water's edge (as defined by the bankfull stage of streams).

Species and Habitat Effects

In the individual program area discussions below, the implication of relevant desired conditions to NMMJM are noted. Potential impacts of each objective, standard, and guideline to the species and habitat are described. Where applicable, management areas are addressed. A determination of effects is then made for that program area. Subsequent to all program areas, an overall determination of effects for this species and its proposed critical habitat from LMP implementation is provided in the Summary of Effects and Determinations section for NMMJM.

Wildland Fire Management

There are two relevant desired conditions that guide management and activities here (see appendix A). Desired conditions 42 and 296 would direct management activities to help restore fire to its historic role where large scale high severity fires were rare.

Based on FVS-FFE modeling, the risk of uncharacteristic wildfire would be reduced by one fire regime condition class after 15 years of treatment in the dry mixed conifer PNVT. Although the fire regime condition class does not change for the ponderosa pine, wet mixed conifer, and spruce-fir PNVTs, each has a trend toward improvement. These upland PNVT improvements have the potential to reduce the likelihood of wildfire entering riparian habitat and could result in reduced runoff from fires that do occur, provided treatments encompass NMMJM habitat. Prescribed fire has the potential to result in short term

impacts to NMMJM habitat (e.g., loss of floodplain or immediate upland area vegetation), especially if followed by an unpredicted heavy rainfall event.

- GL 174 Firelines, helispots, and fire camps should be located to avoid disturbance to critical species and impacts to cultural resources.
- GL 175 Aerial retardant drops should avoid threatened, endangered, proposed, or candidate, or identified sensitive species and waterways.

Guidelines 174 and 175 requirements would reduce the risk of fire suppression impacts to NMMJM and its habitat.

Prescribed fire could, over the long term, help reduce uncharacteristic wildfire and the associated risk of substantial or complete loss of riparian and floodplain habitat although activities associated with it and suppression of wildfires could also result in short term impacts to suitable or restorable riparian habitat. While guidelines could limit impacts, not all negative impacts are reduced or eliminated. As such, this program area may affect and is likely to adversely affect NMMJM and its habitat.

Ecosystem/Vegetation Health

There are seven relevant desired conditions that guide management and activities here (see appendix A). Desired condition 1 directs management toward development of habitat conditions that sustain animal populations which would include NMMJM. Desired conditions 4 and 44 would help contribute to genetic diversity and habitat/population connectivity so that species such as NMMJM may be able to adjust to climate change. Desired condition 46 directs management actions to provide upland soil cover conditions such that water flow and quality would be appropriate for NMMJM, where present. Desired conditions 43 and 75 direct management to retain or restore native vegetation which would include willows and alders found in NMMJM habitat. Desired condition 45 would help provide vegetation connectivity which could facilitate dispersal of NMMJM along riparian areas.

- OBJ 11 Annually, treat 5,000 to 35,000 acres to reduce [forest PNVTs] tree densities, restore natural fire regimes, promote species habitat and ecosystem health, reduce fire hazard, maintain desired conditions, initiate recovery from uncharacteristic disturbance, and provide forest products, leaving a desired mix of species with the range of desired densities that are resilient to changing climatic conditions.

Based on VDDT modeling of this objective, changes in conditions for forested PNVTs that surround NMMJM habitat are shown in table 5. Modeling indicates that three of the four PNVTs move toward desired conditions, i.e., become less departed from desired conditions, after 15 years of management under the LMP (although only slightly so for the wet mixed conifer PNVT). Modeling the spruce-fir PNVT indicates it becomes more departed from desired conditions at 15 years; however, spruce-fir only occurs in small scattered clusters along streams in some NMMJM locations (these scenarios are indicative of particularly cold air pockets along drainages) and these small pockets are not likely to be actively managed.

Table 5. Movement toward DC after 15 and 50 years within PNVTs surrounding NMMJM habitat (based on VDDT modeling [a/])

PNVT	Current (%) departure from DC	Departure (%) at 15 years	Departure (%) at 50 years [b/]
Ponderosa pine forest	77	63	46
Dry mixed conifer	67	53	43

forest			
Wet mixed conifer forest	54	52	51
Spruce-fir forest	59	64	61

[a/] Based on VDDT modeling of the high treatment acres for alternative B, the proposed LMP.

[b/] Assuming LMP direction would continue to be implemented to year 50; however, a new forest plan would be required before then which would be based on current conditions at that time.

Reduced departures after 15 years indicate that conditions (e.g., stand openness, herbaceous vegetation ground cover, density, and vigor) and disturbances (e.g., wildland fire) are closer to desired and reference or historic conditions (the context of reference and historic conditions is explained in a previous footnote). Where thinning and burning activities occur upslope and upstream of NMMJM habitat, objective 11 has the potential to increase ground cover to carry periodic cool ground fires and, with decreased crown densities, to reduce the risk of severe wildfires that can burn intensely into riparian habitat. However, these activities have the potential to also result in short term increased runoff and deposition of debris on top of tall herbaceous plants needed by NMMJM.

- ST 4 Vegetation treatments shall include measures to reduce the potential for introduction of invasive plants and animals and damage from nonnative insects and diseases.

Standard 4 has the potential to limit introduction of invasive plants, including bull thistle (a fairly common invasive plant in some riparian areas), being carried into NMMJM riparian or adjacent habitat by equipment or activities during restoration treatments.

- GL 23 Landscape scale restoration projects should be designed to spread treatments out spatially and/or temporally within the project area to reduce implementation impacts and allow reestablishment of vegetation and soil cover.
- GL 30 Ground-disturbing projects (including prescribed fire) which may degrade long term riparian conditions should be avoided.

Guideline 23 has the potential to maintain or reestablish vegetation and soil cover, thereby limiting possible higher flows with debris and sediment into adjoining riparian areas that may be used by NMMJM. By avoiding projects that could degrade riparian areas over the long term, guideline 30 has the potential to protect down slope and downstream NMMJM habitat.

This program area could help improve upland conditions that contribute to more stabilized riparian areas and adjacent upland habitat needed by NMMJM. While standards and guidelines could limit short term impacts from restoration thinning (equipment, soil disturbance, and sediment), not all negative effects would be reduced or eliminated. As such, this program area may affect and is likely to adversely affect NMMJM and its habitat.

Rangeland Management

There are four relevant desired conditions that guide management and activities here (see appendix A). Desired conditions 60, 64, and 82 address NMMJM's need for tall, vigorous herbaceous riparian vegetation (cool and warm season growing species), including the need for seedheads. Where annual fluctuations and seasonality of forage production are considered, desired 278 would help retain sufficient ground cover to help reduce the ability of overland flow to carry sediment and organic matter into suitable or restorable riparian habitat for the NMMJM.

- OBJ 17 Annually, control or eradicate invasive species (e.g., tamarisk, bullfrogs) on at least 2 stream miles.

Objective 17 has the potential to help limit the spread of noxious weeds in riparian areas such as bull thistle where this objective is implemented in NMMJM habitat, although short term trampling of tall, dense herbaceous riparian vegetation need by NMMJM may occur during treatments.

- ST 3 Within each PNVT, vegetation management activities shall be designed to maintain or move plant composition towards a moderate to high plant community similarity as compared to site potential.
- ST 11 Projects and authorized activities shall be designed to reduce the potential for introduction of new species or spread of existing invasive or undesirable aquatic or terrestrial nonnative populations.

Standard 3 has the potential to help limit impacts from activities like control of invasive species within NMMJM habitat. Standard 11 has the potential to reduce the risk of new or the spread of existing invasive or undesirable species within NMMJM habitat. This could include introduction of plants such as cheatgrass into riparian areas which could possibly displace native vegetation and which increases the risk of fire when it proliferates.

- GL 4 Locally collected seed should be used where available and cost effective. Seeds should be tested to ensure they are free from noxious weeds and invasive nonnative plants at a State certified seed testing laboratory before acceptance and mixing.
- GL 81 Pesticide use should minimize impacts on nontarget plants and animals.
- GL 32 Active grazing allotments should be managed to maintain or improve to desired riparian conditions.
- GL 132 Critical areas [e.g., riparian areas] should be managed to address the inherent or unique site factors, condition, values, or potential conflicts.
- GL 133 Grazing use on seasonal allotments should be timed to the appropriate plant growth stage and soil moisture.
- GL 134 New livestock troughs, tanks, and holding facilities should be located out of riparian areas to reduce concentration of livestock in these areas. Existing facilities in riparian areas should be modified, relocated, or removed where their presence is determined to inhibit movement toward desired riparian or aquatic conditions.
- GL 136 Forage, browse, and cover needs of wildlife, authorized livestock, and wild horses should be managed in balance with available forage.
- GL 138 To minimize potential resource impacts from livestock, salt or nutritional supplements should not be placed within a quarter of a mile of any riparian area or water source. Salt or nutritional supplements should also be located to minimize herbivory impacts to aspen clones.
- GL 139 To prevent resource damage (e.g., streambanks) and disturbance to federally listed and sensitive wildlife species, trailing of livestock should not occur along riparian areas. Where no alternative route is available, approval may be granted where effective mitigation measures are implemented (e.g., timing of trailing, number of livestock trailed at one time).

Four guidelines have the potential to help protect or restore riparian or wetland habitat and the uplands that contribute to riparian conditions that may support NMMJM. This would be addressed by stocking in balance with available forage (GL 136), by proper timing of grazing relative to plant growth (GL 133), by requirements to improve habitat (GL 32) and by managing for the special concerns within riparian areas (GL 132) which are critical areas for livestock grazing management. Critical areas for grazing management are areas which should be treated with special consideration because of inherent site factors, size, location, condition, values, or significant potential conflicts. These areas are evaluated separately

from the remainder of a management unit because they contain special or unique values; critical areas include riparian areas.

Guidelines 134, 138, and 139 have the potential to reduce livestock impacts within NMMJM habitat which may facilitate movement of NMMJM along riparian areas. Guideline 4 would potentially protect NMMJM habitat from establishment of nonnative plant species that might compete with or preclude the native, tall-growing riparian herbaceous plants the NMMJM needs. Where treatments occur within or near NMMJM habitat, guideline 81 has the potential to help limit impacts to nontarget vegetation.

Following is a synopsis of where, within a NMMJM proposed critical habitat unit (pCHU), livestock grazing is currently authorized, although subject to change. Included are the main pastures and areas authorized for grazing; smaller portions of pastures or other areas within a pCHU are not shown. Note that the following does not include other suitable or restorable riparian areas that NMMJM might use or travel through.

- West Fork Little Colorado River pCHU – no livestock grazing.
- East Fork Little Colorado River pCHU – livestock grazing on the Voigt allotment in the Home, New, and Phoebes pastures (297 acres); and livestock grazing on the 26 Bar allotment in the Pool Knoll pasture.
- West Fork Black River pCHU – livestock grazing on the Reservation allotment in the Burro Creek Riparian pasture; livestock grazing on the PS allotment in the Double Bar K and 2 segments in PS North pastures (107 acres); livestock grazing on the Grandfather allotment in the Holding1 pasture.
- East Fork Black River pCHU – livestock grazing on the PS allotment in the River and PS North pastures.

This program area could move vegetation toward needed native plant composition similarity in riparian areas. However, regardless of plant composition, livestock grazing could still impact plant vigor, height, and density of the tall, emergent vegetation needed by the NMMJM, as well as impact associated wet, saturated soils through trampling. While standards and guidelines could limit grazing and livestock management impacts, not all negative impacts would be reduced or eliminated. Hence there may be competition or conflict (FEIS pg. 462), but the specific impacts of livestock grazing would be analyzed in site specific NEPA analyses (FEIS pg. 470). As such, this program area may affect and is likely to adversely affect NMMJM and its habitat.

Watershed and Soil Management

There are eight relevant desired conditions that guide management and activities here (see appendix A). Desired condition 299 directs management to move toward or maintain satisfactory watershed conditions including soil conditions (DC 77) which could contribute to improved riparian habitat. Desired condition 34 would help provide habitat that is capable of providing for self-sustaining riparian species populations like NMMJM. This would include floodplains and adjacent upland areas used by nesting or hibernating NMMJM. Desired conditions 292 and 293 would help ensure that water is available and not diminished for the needs of riparian species such as NMMJM. Streambanks, floodplains, and adjacent upland areas would have diverse habitat components needed by NMMJM for hibernation (DCs 81 and 83). Desired condition 78 would provide vegetation supporting NMMJM consists mostly of natives and which is free from invasive plants.

- OBJ 4 Annually, enhance or restore 5 to 15 miles of stream and riparian habitat to restore structure, composition, and function of physical habitat for native fisheries and riparian-dependent species.

- OBJ 5 During the planning period, complete at least five projects (e.g., remove barriers, restore dewatered stream segments, or connect fragmented habitat) to provide for aquatic and riparian associated species and migratory species.
- OBJ 6 Annually, move 200 to 500 acres toward desired composition, structure, and function of streams, floodplains, and riparian vegetation.
- OBJ 38 Annually, prepare at least one instream flow water rights application until water acquisition needs are complete to sustain riparian areas, fish, wildlife, and water-based recreation.

Where restoration projects or activities are undertaken within NMMJM habitat, objectives 4 and 6 could potentially improve riparian vegetation composition (native grasses and sedges) and structure (vigorous, tall plant heights) needed by NMMJM habitat. There would likely be short term implementation impacts (e.g., use of equipment to remove invasive conifers from riparian areas). Objective 5 has the potential to help retain and possibly expand potential riparian corridors for NMMJM movements. Objective 38 has the potential to help protect water and sustain riparian vegetation where instream flow applications are filed for within watersheds providing or potentially providing NMMJM habitat.

No regional riparian VDDT models were developed to assess movement toward desired conditions with implementation of the first three objectives where they may be implemented within NMMJM habitat or watersheds. However, the Riparian Specialist Report (2014) estimates that improvement of 2 - 6% in overstory conditions may occur in riparian PNVTs across the ASNFs including the montane willow riparian forest PNVT; otherwise, some overall movement toward desired conditions is expected, but this is not quantified.

- ST 32 Streams on NFS lands with high aquatic values and at risk from new water diversions shall be preserved and protected with instream flow water rights.
- ST 33 Groundwater withdrawals shall not measurably diminish surface water flows on NFS lands without an appropriate surface water right.

Standards 32 and 33 have the potential to protect water flows necessary to maintain and support riparian areas that might provide NMMJM habitat.

- GL 2 Projects with ground-disturbing activities should be designed to minimize long and short term impacts to soil resources. Where disturbance cannot be avoided, project specific soil and water conservation practices should be developed.
- GL 8 Streamside management zones should be in place between streams and disturbed areas and/or road locations to maintain water quality and suitable stream temperatures for aquatic species.
- GL 9 As State of Arizona water rights permits (e.g., water impoundments, diversions) are issued, the base level of instream flow should be retained by the Apache-Sitgreaves NFs.
- GL 10 Constraints (e.g., maximum limit to which water level can be drawn down or minimum distance from a connected river, stream, wetland, or groundwater-dependent ecosystem) should be established for new groundwater pumping sites permitted on NFS lands in order to protect the character and function of water resources.
- GL 18 Sufficient water should be left in streams to provide for aquatic species and riparian vegetation.
- GL 19 Projects and activities should avoid damming or impounding free-flowing waters to provide streamflows needed for aquatic and riparian-dependent species.
- GL 82 Erosion control mitigation features should be implemented to protect significant resource values and infrastructure such as stream channels, roads, structures, threatened and endangered species, and cultural resources.

Guideline 2 could potentially minimize impacts to soils resources which would potentially reduce impacts like sediment or debris flow into NMMJM habitat. Guideline 8 has the potential to help protect riparian/wetland and adjacent resources from soil and vegetation disturbing equipment, vehicles, and activities. Guidelines 9, 10, 18, and 19 would require that projects, activities, and permits retain sufficient water flows to support riparian vegetation and species which would help retain surface water and protect against the risk of NMMJM habitat loss. Erosion control measures (e.g., straw waddles) for landscape scale disturbances (GL 82) have the potential to protect NMMJM habitat after large scale disturbance events such as severe wildfire and flooding.

This program area could improve overall watershed and riparian conditions and could help limit impacts to riparian/wetland areas providing suitable or restorable NMMJM habitat. While standards and guidelines could help limit impacts from restoration and other activities (e.g., planting vegetation), not all short term negative impacts would be reduced or eliminated. As such, this program area may affect and is likely to adversely affect NMMJM and its habitat.

Engineering Program

There is one relevant desired condition that guides management and activities here (see appendix A). Desired condition 235 directs that the location and design of roads not impede wildlife and fish movement which would help address habitat connectivity and NMMJM movement and population expansion through riparian corridors.

- OBJ 7 Within the planning period, relocate, repair, improve, or decommission a minimum of 4 miles of National Forest System roads or trails that add sediment to streams, damage riparian vegetation, erode streambanks, cause gullies, and/or compact floodplain soils.
- OBJ 8 Annually, remove an average of 2 miles of unauthorized roads or trails that add sediment to streams, damage riparian vegetation, erode streambanks, cause gullies, and/or compact floodplain soils.

Through road removal within NMMJM habitat, objectives 7 and 8 have the potential to restore or improve connectivity of riparian areas which the NMMJM might occupy or use as corridors for expansion and dispersal. In addition, restoration of streambanks and riparian vegetation could also potentially provide more stable habitat for NMMJM.

- ST 15 Motorized vehicle travel shall be managed to occur only on the designated system of NFS roads and motorized trails and designated motorized areas.
- ST 18 Road maintenance and construction activities shall be designed to reduce sediment (e.g., water bars, sediment traps, grade dips) while first providing for user safety.

Standard 15 has the potential to limit impacts from motorized vehicle use in riparian, floodplain, and adjacent upland areas where NMMJM might be present. Standard 18 has the potential to help limit sediment-carrying flows from entering riparian areas that might provide suitable or restorable NMMJM habitat.

- GL 31 Wet meadows and cienegas should not be used for concentrated activities (e.g., equipment storage, forest product or mineral stockpiling, livestock handling facilities, special uses) that cause damage to soil and vegetation.
- GL 33 Storage of fuels and other toxicants should be located outside of riparian areas to prevent spills that could impair water quality or harm aquatic species.
- GL 34 Equipment should be fueled or serviced outside of riparian areas to prevent spills that could impair water quality or harm aquatic species.

- GL 99 New roads, motorized trails, or designated motorized areas should be located to avoid meadows, wetlands, riparian areas, stream bottoms, sacred sites, and areas with high concentrations of significant archaeological sites. The number of stream crossings should be minimized or mitigated to reduce impacts to aquatic species.
- GL 100 As projects occur in riparian or wet meadow areas, unneeded roads or motorized trails should be closed or relocated, drainage restored, and native vegetation reestablished to move these areas toward their desired condition.
- GL 105 Roads and motorized trails should be designed and located so as to not impede terrestrial and aquatic species movement and connectivity.

While it is unlikely that equipment would be kept or operated within NMMJM habitat or upstream of it, guidelines 31, 33, and 34 have the potential to help prevent contaminations such as oil, gas, or salt entering riparian habitat. Guidelines 99 and 100 could potentially help prevent or reduce road impacts to sensitive (critical) riparian areas. These two guidelines, along with guideline 105, have the potential limit barriers to NMMJM movement along riparian areas.

This program area, primarily through the presence and maintenance of roads and motorized trails, can damage soil and vegetation within riparian, floodplain, and adjacent areas that could serve as suitable or restorable NMMJM habitat. It could also improve some riparian areas where NMMJM may be present by removing degrading factors like roads, although there would be short term impacts from restoration activities. While standards and guidelines could limit road related impacts, not all negative impacts would be reduced or eliminated. As such, this program area may affect and is likely to adversely affect NMMJM and its habitat.

Lands and Minerals Program

There are no desired conditions that guide management and activities in this program area relevant for the NMMJM.

- ST 31 Special uses for water diversions shall maintain fish, wildlife, and aesthetic values and otherwise protect the environment.

Standard 31 has the potential to help retain water in riparian areas that provide suitable or restorable NMMJM habitat.

- GL 146 Streambed and floodplain alteration or removal of material should not occur if it prevents attainment of riparian, channel morphology, or streambank desired conditions.
- GL 166 As applicable, issuance of special use authorizations should incorporate measures to reduce potential impacts to wildlife and avoid rare and unique habitats (e.g., bogs, fens).
- GL 206 Research special use authorizations should limit impacts to sensitive resources, unique features, and species within recommended RNAs [see management areas below].

Guideline 146 could potentially limit material removal from riparian and floodplain areas within and upstream of NMMJM habitat, thereby reducing the likelihood of heavier flows and sediment downstream. Where special uses or other authorizations (e.g., collection of decorative rock) are issued, guideline 166 has the potential to limit impacts to riparian/wetland habitat where the NMMJM might occur. In addition, special use permits issued within the Three Forks or Corduroy recommended research natural areas (both are occupied and contain NMMJM proposed critical habitat) could potentially contain measures to limit impacts to NMMJM and habitat, as necessary.

The minerals portion of this program area could impact riparian areas where removal of materials like gravel might occur within the watershed upstream of NMMJM and special use activities could impact the NMMJM in a variety of ways (e.g., trampling, disturbance). While standards and guidelines could help limit impacts, not all negative impacts would be reduced or eliminated. As such, this program area may affect and is likely to adversely affect NMMJM and its habitat.

Recreation and Wilderness Program

There is one relevant desired condition that guides management and activities here (see appendix A). Desired condition 211 would provide for recreation that does not negatively impact wildlife habitat and populations. If the need develops, it would support future forest closure orders or developments (e.g., fence construction, trail reroutes) determined necessary for NMMJM sites.

- OBJ 18 Annually, rehabilitate, stabilize, revegetate, or relocate an average of five dispersed campsites to improve recreation opportunities and/or protect the environment.

Objective 18 has the potential to improve degraded dispersed campsites and associated riparian areas within or upslope or upstream of NMMJM habitat. It also has the potential to result in short term implementation impacts until sites revegetate and stabilize.

- ST 13 Dispersed campsites shall not be designated in areas with sensitive soils or within 50 feet of streams, wetlands, or riparian areas to prevent vegetation and bank damage, soil compaction, additional sediment, or soil and water contamination.

Standard 13 has the potential to help preclude recreation impacts to soils, streambanks, floodplains, and riparian vegetation within NMMJM suitable or restorable habitat.

- GL 94 Timing restrictions on recreation uses should be considered to reduce conflicts with wildlife needs or soil moisture conditions.
- GL 95 Dispersed campsites should not be located on or adjacent to archaeological sites or sensitive wildlife areas.

Timing restrictions under guideline 94 could potentially limit recreation related impacts during the NMMJM active summer period. Guideline 95 has the potential to preclude dispersed campsites within its habitat, thereby helping to prevent trampling of vegetation and damage to burrows.

This program area could impact NMMJM habitat primarily during the summer months when the species is active, especially because of concentrated recreation (e.g., camping, fishing, hiking) within the East Fork Black River developed recreation area. There could be some habitat improvement where campsites are rehabilitated but recreation at these sites could still impact NMMJM habitat. While standards and guidelines could help limit impacts, not all negative impacts would be reduced or eliminated. As such, this program area may affect and is likely to adversely affect NMMJM and its habitat.

Wildlife, Fish, and Rare Plant Program

There are five relevant desired conditions that guide management and activities here (see appendix A). Desired condition 6 directs that management and activities provide for habitat configuration and availability to allow for adjustments in movements in response to climate and to provide for genetic diversity, especially important for this disjunct species. Desired conditions 7, 197 and 200 direct management and activities to maintain and support recovery of the NMMJM, if listed, including providing for habitat connectivity. Desired condition 72 supports the presence of beavers and the

wetland habitat they created which can provide habitat for NMMJM. A sixth desired condition (DC 7) would support recovery of NMMJM, if listed under the ESA.

- OBJ 10 Annually, work with partners to reduce animal damage to native willows and other riparian species on an average of 5 miles of riparian habitat.

Objective 10 could help maintain and protect willows and alders by potentially limiting ungulate browsing in NMMJM suitable or recoverable habitat.

- GL 19 Projects and activities should avoid damming or impounding free-flowing waters to provide streamflows needed for aquatic and riparian-dependent species.
- GL 29 Project plans should include quantitative and/or qualitative objectives for implementation monitoring and effectiveness monitoring to assist in moving toward or maintaining desired conditions.
- GL 65 Activities occurring within federally listed species habitat should apply habitat management objectives and species protection measures from recovery plans.
- GL 67 Modifications, mitigations, or other measures should be incorporated to reduce negative impacts to plants, animals, and their habitats and to help provide for species needs, consistent with project or activity objectives.
- GL 71 Cool and/or dense vegetation cover should be provided for species needing these habitat components (e.g., Goodding's onion, black bear, White Mountains chipmunk, western yellow-billed cuckoo).
- GL 76 The needs of localized species (e.g., New Mexico meadow jumping mouse, Bebb willow, White Mountains paintbrush) should be considered and provided for during project activities to ensure their limited or specialized habitats are not lost or degraded.

Guideline 19 would require that streamflows not be impeded such that riparian-dependent species like NMMJM or its habitat be impacted. Guideline 29 would require monitoring to provide feedback about project implementation effects or effectiveness of mitigation measures for this species, and would guide future management toward desired conditions. Guideline 71 has the potential to help provide the dense, herbaceous vegetation needed by NMMJM. Guidelines 67 and 76 would require project and activity mitigation to help provide for and reduce negative impacts to flowing water and saturated soils. Guideline 65, by requiring activities comply with listed species recovery plans, would contribute to the recovery of the NMMJM, if listed, and once a recovery plan is developed.

This program area could reduce impacts to NMMJM, although survey for NMMJM and habitat assessments could result in short term impacts from vegetation trampling. Habitat enhancement projects such as riparian fencing to protect habitat could also have short term vegetation and soil impacts in adjacent uplands (e.g., vehicles delivering/laying out materials). While guidelines could limit restoration and other activity impacts and require project or activity mitigations or modifications, not all negative impacts would be reduced or eliminated. As such, this program area may affect and is likely to adversely affect NMMJM and its habitat.

Community-Forest Intermix Management Area

This management area would receive more intensive treatments relative to reducing the risk of uncharacteristic wildfire. Two community-forest intermix areas (Greer and Alpine) contain riparian habitat with NMMJM occupied sites. However, DC 314 directs that the integrity of riparian areas be maintained within treatments in this management area which could help retain habitat supporting NMMJM.

Research Natural Area and Recommended Research Natural Area Management Areas

Both designated research natural areas and recommended research natural areas not suitable for livestock grazing, energy development, communication sites, or timber (LMP chapter 4). The existing Phelps Cabin research natural area encompasses about 0.4 mile of the East Fork Little Colorado River section of proposed critical habitat for NMMJM. Desired condition 362 would help protect natural conditions within this area and provide opportunity for education and research that may be of benefit to NMMJM.

The Three Forks Closure Area (30 acres) which contains a NMMJM site is within the recommended Three Forks research natural area which would be free from human trampling and other disturbances (DC 358). Guidelines 204, 205, and 207 would require protection of this recommended management area resources including fencing from livestock or other impacting uses. However, actions associated with fencing or other protection measures may have short term impacts to NMMJM and its habitat.

Critical Habitat and Primary Constituent Elements

Effects to occupied, suitable, recoverable or dispersal habitat discussed above would apply to proposed critical habitat for this species. Table 6 shows which program areas may impact specific proposed critical habitat PCEs in either a positive or negative manner.

Table 6. NMMJM proposed critical habitat PCEs potentially impacted by program area

Program Area	Affected PCEs (by number) and Principle Mechanism
Wildland Fire Management	1. Prescribed burning of tall, dense riparian vegetation.
Ecosystem/Vegetation Health (Forest Products)	1. Equipment or activity impacts to upland soils with sediment into riparian areas; there is also the potential to reduce risk of severe wildland fire and associated scouring floods.
Rangeland Management	1, 2, 3 and 4. Vegetation trampling and grazing, inhibit recovery to vegetation potential (composition, density, height) in riparian and adjacent upland areas; sufficient space (length of riparian area for travel corridor).
Watershed and Soil Management (Riparian Areas)	1 and 3. As above; water quality and quantity plus potential restoration of riparian structure and function.
Engineering	1 and 4. Road within floodplains and riparian areas that limit or influence wetted areas.
Lands and Minerals (Special Uses)	2. Special uses impacting water quantity or quality.
Recreation and Wilderness	1 and 4. Vegetation trampling in riparian/wetland and adjacent areas.
Wildlife, Fish, and Rare Plants	1, 2, and 4. Potential for short term trampling impacts from survey and habitat assessments and from habitat enhancement projects.

PCE 1 Riparian communities characterized by emergent herbaceous wetland [vegetation]
All program areas are likely to have some impact on riparian/wetland vegetation within proposed critical habitat given that riparian areas are where most types of forest activities occur. Developed recreation use

is especially heavy within the West Fork Black River recreation area within the proposed critical habitat unit of this name. Dispersed recreation is also heavy along the West and East Forks of the Little Colorado River.

PCE 2 Flowing water, saturated soils, dense vegetation
While special uses for water diversion or groundwater pumping are not known to be impacting flow in proposed critical habitat, there is potential that increased development of private land may create more demand for special uses for water conveyances (e.g., spring developments, pipelines) from NFS to private land. Livestock grazing is likely impacting some areas that may be suitable or restorable NMMJM habitat.

PCE 3 Sufficient space
Not all segments of proposed critical habitat provide a minimum of 5.6 miles in length of suitable habitat but may contain restorable habitat. Objectives to enhance or restore riparian areas may or may not occur within proposed critical habitat. Where they do, there would be short term negative impacts from equipment or people such as vegetation trampling and streambank disturbance.

PCE 4 Floodplain and upland areas
While standards and guidelines limit impacts in floodplains and upland areas, not all acreage within approximately 100 m (330 ft. outward of the water's bankfull edge) within proposed critical habitat and not all impacting activities (e.g., grazing, roads, developed campsites) are precluded here.

Overall, essentially all program areas are likely to have some negatively impacts to NMMJM primary constituent elements of proposed critical habitat. However, it is important to note that LMP implementation would not necessarily have these impacts across all proposed critical habitat for the NMMJM on the ASNFs.

Cumulative Effects and Climate Change

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur within the action area of impacts for a listed species. State activities to date have included survey for presence or absence of NMMJM. ADOT use of de-icing agents in the winter occurs next to the Tal-wi-wi site. ADOT will also be paving sections of forest road 249 that would likely increase recreation use on the Alpine Ranger District and, in particular, in the East Fork Black River recreation area. AZGFD's fish stocking program draws people to some NMMJM sites and proposed critical habitat, e.g., West Fork Black River and West and East Forks Little Colorado River. Private land activities include some business and homesites with associated structures as well livestock grazing with facilities. Private land grazing is typically heavy and some is year round. Just beginning in 2013, summer long heavy grazing by horses has occurred on private land pastures just above the Tal-wi-wi NMMJM site. This use is likely to increase with the future paving of forest road 249 from Big Lake to Alpine.

The implications of climate change and variability for NMMJM with greater extremes of temperature and moisture could reduce water quantity and habitat quantity over time. With potential for higher intensity of storms, there could also be the possibility that flood impacts along streams may occur at more frequent intervals and at greater intensities resulting in continued threats to NMMJM and habitat.

NMMJM and Critical Habitat
Summary of Effects and Determinations

Overall LMP direction is to maintain or restore desired conditions for PNVTs, watersheds, and riparian areas. Objectives 4, 5, 6, 7, 8, 10, 18, and 38 have the potential to maintain or improve riparian habitat conditions. Objective 11 has the potential to reduce uncharacteristic wildfire and possible loss of NMMJM habitat from wildfire or subsequent heavy. Objective 17 could help reduce the proliferation of noxious weeds in riparian areas that can eventually impact native species.

All objectives except 38 are likely to have short term detrimental effects. Standards and guidelines would require measures to limit the extent, level, and duration of potential short term effects (e.g., GL 23) and preclude negative long term effects in the case where long term riparian degradation cannot be avoided (e.g., GL 30). However, LMP implementation does not provide for mitigation of all potential effects to a level that can be equated to or considered insignificant and/or discountable. Therefore, LMP implementation is **not likely to jeopardize the continued existence** of the proposed NMMJM, and it is **not likely to adversely modify** proposed critical habitat for the species.

However, LMP implementation does not provide for mitigation of all potential effects to a level that can be equated to or considered insignificant and/or discountable. Therefore, if listed, it is determined that LMP implementation **may affect and is likely to adversely affect** the NMMJM and, if designated, it **may affect and is likely to adversely affect** critical habitat for this species.

Mexican gray wolf *Canis lupis baileyi*

Endangered Species Act Status:	Endangered, 1976 Non-essential, Experimental Population, 1998
Recovery Plan:	1982, update pending
Critical Habitat:	None
Determination of Effects:	Not Likely to Jeopardize

The Mexican gray wolf is a subspecies of gray wolf. All pertinent documents refer to this wolf as the Mexican wolf and it is herein referred to as such.

Natural History, Distribution, and Status of the Species Range-wide

Life history, distribution, status of the species range-wide and listing factors are found in documents located on the USFWS Mexican wolf website http://www.fws.gov/southwest/es/ mexicanwolf/ (accessed 2014). A detailed account of the taxonomy, biology, and reproductive characteristics of the Mexican wolf is found in the Mexican Wolf Conservation Assessment (USFWS 2010). Current proposals regarding the Mexican wolf and its management are available at the above cited webpage.

The 2012 Biological and Conference Opinion for the Continued Implementation of the Land and Resource Management Plan for the ASNFs (US FWS 2012) provide information about the Mexican wolf in Forest Service Southwestern Region 3. Vaughn (2014) also compiled information on the species from various sources. All these documents are incorporated by reference into this document.

Status and Threats within the Action Area

The most recent count of Mexican wolves in the Blue Range Wolf Recovery Area (BRWRA) estimated that there was a minimum of 83 wolves as of December 31, 2013. Young of the year made up 20% of the known population and 100% of the population was wild born. There were 46 collared wolves, made up of 21 adults, 18 subadults, and 7 pups. There were also 37 uncollared wolves in the population. These

animals occurred among 14 packs and five single wolves and represent an estimated 10% increase in population from December 31, 2012 when the count resulted in an estimate of a minimum of 75 wolves, with young of the year representing 27% of the population.

Of the 83 known wolves in the BRWRA at the end of 2013, twenty-six were located on the ASNFs. Of the 17 collared wolves, 5 were adults, 7 were sub-adults, and 5 were pups of the year associated with two packs. Seven of the nine uncollared wolves were associated with two of the four packs on the ASNFs, while two were single animals. In comparison, twenty-four of the 75 known wolves in the BRWRA at the end of 2012 were located on the ASNFs. Out of 14 collared wolves, 6 were adults, 2 were sub-adults, and 6 were pups of the year associated with 2 packs. Three uncollared wolves in two packs were also located on the ASNFs. Two pairs of wolves were released in on the ASNFs in early 2014; both contain wild-born males and naïve females with important genetics.

Threats to Mexican wolves on the ASNFs and information about them include the following (figures cited include both Arizona and New Mexico).

- Illegal shooting of Mexican wolves is the single greatest source of wolf mortality in the reintroduced population. Between 1998 and Dec, 31, 2013, there have been fifty-two known deaths due to illegal shooting of wild wolves which represents over fifty percent of total documented mortalities during this period. Almost half of that number has occurred in the last several years signaling an increased trend in this threat.

- Vehicle-related deaths of wolves occur each year with a total of fourteen deaths from 1998 through 2013. The greater the miles of roads and the more vehicle use within their habitat, the greater the likelihood of vehicle-caused mortality, and disturbance to denning wolves, which readily move den locations when disturbed. Such relocation can lead to loss of pups or decreased survival of pups.

- Wildfires can modify habitats of the Mexican wolf and its prey; however, the recent 2011 Wallow Fire did not have a major impact. While the den areas of three packs were burned over, no adult wolves were lost in the fire. Prior to the fire, two of the packs with dens were verified to have pups, and both were observed to have the same number of pups after the fire. Wolf prey typically readily flee from wildfire and wolf prey habitat can improve through increased post-fire vegetation response.

- Concerns regarding regulations or management procedures for livestock management continue even on the ASNFs where most wolf packs are found on seasonal (summer/fall) allotments. This includes animal husbandry practices, season and timing of livestock grazing, carcass removal, etc.

- There are still concerns about the inadequacy of the size of the BRWRA with the primary recovery zone that encompasses just the Apache side of the ASNFs (exclusive of the area south of the San Francisco River below the Mogollon Rim on the Clifton Ranger District).

Other threats to Mexican wolves outside of ASNFs management include susceptibility to disease, parasites, and inbreeding. Lack of an updated recovery plan has resulted in inadequate guidance for recovery. Threats to the BRWRA population are not so severe as to put the population at immediate risk of extinction. However, forest management and activities, illegal shooting, and inbreeding together have hindered the growth and fitness of the population. Current mortality rates and removals are substantially above the 34% that has been identified as the inflection point for wolf populations resulting in failure rates too high for unassisted population growth.

Potentially positive actions for the species undertaken by the ASNFs include the following. The Forest Service Region 3 employs a full time Mexican wolf liaison who is stationed on the Apache-Sitgreaves NFs working with both the ASNFs and the Gila National Forest. Where wolf/livestock conflicts occur, forest actions include temporary restrictions around wolf den sites and adjusting livestock pasture use where there is management flexibility. Other forest activities such as prescribed burning and firefighting are coordinated among all of these parties to avoid impacts to breeding wolves.

In addition, the ASNFs have conducted the site specific NEPA necessary for release of wolves at locations across the forests. Substantial reductions in in numbers and time in pasture have been made during livestock grazing analyses and decisions, including removing some sensitive areas from grazing (primarily riparian areas for fish concerns). These changes were based on grazing decisions primarily on the Alpine Ranger District between 1995 and 2004 with accompanying ESA informal batch consultations. In addition, further adjustments were made in annual livestock grazing from 2001 through 2003 in response to drought; this has helped retain plant vigor in forage plants. These decisions and actions likely helped reduce livestock-wolf encounters (Oakleaf 2004).

Species and Habitat Effects

A discussion of general program effects and the potential effects of applicable plan components to the Mexican wolf and its prey follows. Habitat effects are most often relative to prey species. Because there are numerous plan components that address the needs of the wolf's broad range of prey, just some key plan components for prey are included. Disturbance is most often the effect of project activities and forest management upon wolves themselves. As defined in the ESA Section 10(j) rule for the Mexican Gray Wolf, "disturbance causing land use activity" means any land use activity that the USFWS determines could adversely affect reproductive success, natural behavior, or survival of Mexican wolves (USFWS 1998). However, certain activities are specifically excluded from this definition as noted below.

In the individual program area discussions below, the implication of relevant desired conditions to the Mexican wolf are noted. Potential impacts of each objective, standard, and guideline to the species and habitat are described. Where applicable, management areas are addressed. Because potential impacts for the wolf are much the same across program areas, program area determinations are grouped under the Summary of Effects and Determinations section where an overall determination of effects for the Mexican wolf from LMP implementation is provided.

Wildland Fire Management

There are two relevant desired conditions that would guide management and activities here (see Appendix A). Desired condition 2 would provide restored ecosystems within their natural disturbance regimes, including fire as an ecological function. Desired condition 61 would direct management actions to provide for abundant grasses, forbs, shrubs, and litter to support a natural fire regime. These and similar desired conditions would help contribute to healthy, vigorous forage by reducing tree density and potentially providing greater amounts of herbaceous and shrubby forage plants for Mexican wolf prey such as elk, deer, and other smaller mammals.

Based on FVS-FFE modeling, the risk of uncharacteristic wildfire would be either reduced or be trending toward a fire regime condition class with less severity of burn in almost all of the PNVTs after 15 years. This could help reduce the risk of large scale loss of habitat through uncharacteristic wildfire.

- GL 174 Firelines, helispots, and fire camps should be located to avoid disturbance to critical species and impacts to cultural resources.

This guideline has the potential to reduce potential impacts from fire suppression and fire support activities in areas where wolves may be denning. Here and elsewhere in this biological assessment, guideline 174 would be applied to any species as determined necessary by the resource advisor through the Wildland Fire Decision Support System (WFDSS) assessment for the particular wildfire scenario, but always within the context of human and firefighter safety first.

Ecosystem/Vegetation Health

There are three relevant desired conditions that guide management and activities here (see appendix A). Desired conditions 48 and 157 address the wide range of vegetation conditions needed by wolf prey. Desired condition 4 would provide the conditions within habitat (distribution, connectivity) that supports the life functions and genetic diversity of both predator and prey. Based on VDDT modeling, movement toward desired conditions (i.e., decreased departure from desired condition) after 15 years of LMP implementation occurs in almost all PNVTs. Specifically, this would include decreased tree densities in the forest and woodland PNVTs, and removal of trees in grassland PNVTs. This would help improve habitat for wild ungulates that make up the majority of wolf prey.

- OBJ 11 Annually, treat 5,000 to 35,000 acres to reduce [forest PNVTs] tree densities, restore natural fire regimes, promote species habitat and ecosystem health, reduce fire hazard, maintain desired conditions, initiate recovery from uncharacteristic disturbance, and provide forest products, leaving a desired mix of species with the range of desired densities that are resilient to changing climatic conditions.
- OBJ 13 Annually, treat or maintain 5,000 to 15,000 [woodland PNVTs] acres to promote a highly diverse structure.

Objectives 11 and 13 have the potential to help maintain or move habitat toward desired conditions (e.g., improve understory herbaceous forage), thereby improving wolf prey habitat. It could potentially help make habitat more resilient to climate change and uncharacteristic wildfire. Implementation of these objectives also has the potential for short term disturbance impacts to both Mexican wolves and their prey from restoration activities caused by thinning and burning and by associated equipment and personnel activity.

- GL 23 Landscape scale restoration projects should be designed to spread treatments out spatially and/or temporally within the project area to reduce implementation impacts and allow reestablishment of vegetation and soil cover.
- GL 24 Restoration methods, such as thinning or prescribed fire, should leave a mosaic of untreated areas within the larger treated project area to retain or allow recolonization of treated areas by plants, small mammals, and insects (e.g., long-tailed voles, fritillary butterflies).

Guideline 23 has the potential to help reduce disturbance to Mexican wolves and their prey by providing for spatial and temporal movement and habitat use of yet untreated areas. Guideline 24 could potentially result in a variety of seral stages or vegetation states that provide for various life cycle needs of prey species.

Rangeland Management

There are seven relevant desired conditions that guide management and activities here (see appendix A). Where annual fluctuations and seasonality of forage production are considered, desired conditions 276 and 278 would maintain or move conditions on the ASNFs toward healthier rangelands, soils, and wildlife habitat by authorizing livestock grazing within available forage at appropriate forage use levels. Desired condition 64 would provide the vegetation (plant density, height, etc.) needed by wildlife and

prey which is further detailed in desired conditions 185 and 190. Desired conditions 55 and 60 would help provide for specific Mexican wolf prey forage needs, e.g., shrubs for browse during winter and spring, and cool season forage (grasses and forbs) in the spring and early summer. These desired conditions would help support large, healthy ungulate populations which would reduce the potential for wolf depredations on livestock and help support recovery of the species (Bangs et al. 2005).

- OBJ 15 Annually, improve wildlife connectivity by removing at least five unneeded structures (e.g., fence).

Objective 15 could potentially contribute to safe wolf prey movements and help provide for prey viability.

- GL 32 Active grazing allotments should be managed to maintain or improve to desired riparian conditions.
- GL 132 Critical areas [e.g., typically riparian areas] should be managed to address the inherent or unique site factors, conditions, values, or potential conflicts associated with them.
- GL 133 Grazing use on seasonal allotments should be timed to the appropriate plant growth stage and soil moisture.
- GL 135 As areas are mechanically treated or burned, or after large disturbances, timing of livestock grazing should be modified as needed, in order to move toward desired conditions and to accomplish the objectives for the treatment.
- GL 136 Forage, browse, and cover needs of wildlife, authorized livestock, and wild horses should be managed in balance with available forage so that plants providing these needs remain at or move toward a healthy, persistent condition.
- GL 139 To prevent resource damage (e.g., streambanks) and disturbance to federally listed and sensitive wildlife species, trailing of livestock should not occur along riparian areas. Where no alternative route is available, approval may be granted where effective mitigation measures are implemented (e.g., timing of trailing, number of livestock trailed at one time).
- GL 216 Only nonmotorized travel may occur in recommended wilderness [as is the case in designated wildernesses and the primitive area]. However, motorized use associated with grazing allotments may occur and should be limited to that needed to carry out required management practices as authorized.

Guidelines 32, 132, and 139 have the potential to improve prey habitat and potentially limit wolf-livestock interaction where prey are attracted to the forage and water found especially in riparian areas. Guideline 136 could potentially maintain or improve vegetation production for wolf prey species. This would include considerations of livestock grazing during appropriate growth and soil moisture periods on seasonal allotments (GL 133). Guideline 135, by requiring that adjustments in livestock locations be made to reduce combined (grazing and project) impacts, has the potential to maintain prey habitat conditions (e.g., recovery of prey herbaceous forage after thinning or burning treatments).

Guideline 216 has the potential to contribute disturbance to Mexican wolves that may be using recommended wilderness areas for denning or for wolf pup rendezvous sites (motorized vehicle use in existing wilderness areas or the primitive area may also be allowed with Regional Forester approval per Forest Service Manual 2326.04b).

Watershed and Soil Management

There are five relevant desired conditions that guide management and activities here (see appendix A). Desired conditions 15, 17, 19, 77, and 82 would help provide for the health of soils to support vegetation used by Mexican wolf prey species for forage and cover, especially in riparian areas.

- GL 3 Severely disturbed sites should be revegetated with native plant species when loss of long term soil productivity is predicted.

Guideline 3 has the potential to contribute to forage needs of prey species by restoring vegetative productivity to severely disturbed areas.

Engineering Program

There is one relevant desired condition that guides management and activities here (see appendix A). Desired condition 235 directs consideration of road locations and their impact to wildlife, including Mexican wolves and their prey.

- OBJ 7 Within the planning period, relocate, repair, improve, or decommission a minimum of 4 miles of National Forest System roads or trails that add sediment to streams, damage riparian vegetation, erode streambanks, cause gullies, and/or compact floodplain soils.
- OBJ 8 Annually, remove an average of 2 miles of unauthorized roads or trails that add sediment to streams, damage riparian vegetation, erode streambanks, cause gullies, and/or compact floodplain soils.

Removal or decommissioning of roads under objectives 7 and 8 has the potential to reduce the road exposure hazard for wolves (vehicle and illegal mortality).

- ST 15 Motorized vehicle travel shall be managed to occur only on the designated system of NFS roads and motorized trails and designated motorized areas.

Standard 15 could potentially limit the hazard of wolf-vehicle encounters which would help reduce the number of wolves lost to vehicle collisions and wolves illegally shot from roads. It also has the potential to substantially reduce vehicle damage to prey habitat (e.g., rutting, soil compaction, and ripped out vegetation). This standard would apply to the current and any future designated system of motorized roads, trails, and areas.

- GL 97 New motorized trails or additions to existing trails should include destinations and loops to provide for a variety of opportunities.
- GL 98 New roads or motorized trails should be located to avoid Mexican spotted owl protected activity centers, northern goshawk post-fledging family areas, and other wildlife areas as identified; seasonal restrictions may be an option.
- GL 102 As projects occur, redundant roads or motorized trails should be removed to reduce degradation of natural resources.
- GL 105 Roads and motorized trails should be designed and located so as to not impede terrestrial and aquatic species movement and connectivity.
- GL 107 After management activities occur in areas with high potential for cross-country motorized vehicle use, methods (e.g., barriers, signing) should be used to control unauthorized motorized use.

Motorized routes with loops (GL 97) have the potential to increase exposure and disturbance to wildlife and possibly harm to Mexican wolves (injury or fatality from motorized vehicles or illegal shooting). On the other hand, guideline 98 could potentially support temporary road closures around wolf denning sites. Guidelines 102 and 107 would help reduce encounters between vehicles or people and wildlife, while guideline 105 would require that new motorized routes consider wildlife movement across the landscape. All but guideline 97 have the potential to reduce disturbance impacts to wolves and their prey.

Lands and Minerals Program

There is one relevant desired condition that guides management and activities here (see appendix A). Desired condition 263 would provide for connected, generally well distributed habitat for almost all wildlife including the Mexican wolf and its prey.

- GL 121 Access points to NFS land from adjacent non-NFS developments and subdivisions should be limited and provide all residents (not just edge lot owners) common entry points. Individual access points should be discouraged to minimize the development of unauthorized roads or trails.
- GL 150 Oil and geothermal leases should contain the "no surface occupancy" restriction in designated or recommended special areas (e.g., recommended wilderness, primitive area, eligible or suitable wild and scenic rivers corridors, research natural areas, botanical area, and wild horse territory), sacred sites, American Indian TCPs, and properties on the National Register of Historic Places to protect the unique character of these areas.
- GL 166 As applicable, issuance of special use authorizations should incorporate measures to reduce potential impacts to wildlife and avoid rare and unique habitats (e.g., bogs, fens).
- GL 169 Large group and recreation event special uses should not be authorized within wilderness, recommended wilderness, primitive area, wildlife quiet areas, eligible "wild" river corridors, riparian and wetland areas, cultural resource sites, Phelps Cabin Botanical Area, Phelps Cabin Research Natural Area, or recommended research natural areas to protect the unique character of these areas.
- GL 203 Research special use authorizations should limit impacts to sensitive resources, unique features, and species within the RNA.

Guideline 121 has the potential to reduce the proliferation of user made roads from private land and thereby the potential to reduce harm to wolves from exposure and disturbance to their prey. Guideline 150 could potentially limit disturbance and harm to wolves from oil and geothermal activities, should these take place in certain recommended or designated special areas (e.g., recommended wilderness, primitive areas, research natural area) should these occur. Guidelines 166, 169, and 203 also have the potential to limit disturbance to wolves and their prey by inclusion of clauses addressing this within special use permits and other authorizations.

Recreation and Wilderness Program

There are five relevant desired conditions that guide management and activities here (see appendix A). Desired conditions 206 and 373 would provide roadless areas that help preserve natural wildlife (e.g., predator and prey) behaviors and limit human encounters. Desired condition 211 would provide for recreation that does not negatively impact wildlife habitat and populations. Desired condition 231 would limit the exposure of wolves to vehicle motorized use and associated risks from unintentional cross motorized country travel.

- ST 16 Unless specifically authorized, motorized cross-country travel shall be managed to occur only in designated motorized areas.
- ST 38 Party size of 12 persons and/or 12 head of stock for hiking and riding groups in Mount Baldy Wilderness shall not be exceeded. A party size of 6 persons for overnight camping shall not be exceeded.
- ST 39 Party size of 12 persons and/or 15 head of stock for hiking and riding groups in Escudilla and Bear Wallow Wilderness and the Blue Range Primitive Area shall not be exceeded.

Standard 16 has the potential to limit the exposure of wolves to vehicles travelling off-road across the ASNFs which could substantially reduce harm to wolves. By limiting party and stock size, standards 38

and 39 could reduce the potential for human and stock encounters with wolves in these wildernesses which are or have been part of various wolf pack territories over the years.

- GL 94 Timing restrictions on recreation uses should be considered to reduce conflicts with wildlife needs or soil moisture conditions.
- GL 214 Grazing of pack stock should not occur except as authorized by the district ranger when adequate forage is available.

Timing restrictions under guideline 94 have the potential to reduce disturbance to wolves especially when recreation activities might occur in the vicinity of wolf dens causing them to relocate the den with the potential for pup loss or decreased survival. It could support the continued use of temporary area closures around wolf dens and, if needed, pup rendezvous sites. Guideline 214 could have the potential to reduce encounters between wolves and pack stock.

Wildlife, Fish, and Rare Plant Program

There are seven relevant desired conditions that guide management and activities here (see appendix A). Desired conditions 5, 45, and 197 would provide necessary and connected habitat for both wolves and their prey across the landscape. In addition, desired conditions 7 and 196 direct that habitat needs, specifically for federally listed species such as the Mexican wolf, be provided. Desired condition 198 directs that wildlife is free from harassment and disturbance at a scale which would impact vital functions (especially young rearing at the den site) and which would harm species' persistence. This would help strengthen both wolf and prey populations. Desired condition 220 would provide for more secure, less disturbed habitat conditions during the critical winter period for both wolves and their prey.

- GL 29 Project plans should include quantitative and/or qualitative objectives for implementation monitoring and effectiveness monitoring to assist in moving toward or maintaining desired conditions.
- GL 46 Hiding cover, approach cover (by waters), and travel corridor cover should be provided where needed by wildlife [forest PNVTs].
- GL 58 Hiding cover, approach cover (by waters), and travel corridor cover should be provided where needed by wildlife [woodland PNVTs].
- GL 65 Activities occurring within federally listed species habitat should apply habitat management objectives and species protection measures from recovery plans.
- GL 67 Modifications, mitigations, or other measures should be incorporated to reduce negative impacts to plants, animals, and their habitats and to help provide for species needs, consistent with project or activity objectives.
- GL 91 Food and other items that attract wildlife should be managed to prevent reliance on humans and to reduce human-wildlife conflicts.

Guideline 29 would require monitoring to provide feedback about project implementation effects or effectiveness of mitigation measures for the Mexican wolf, and would guide future management toward desired conditions. Guidelines 46 and 58 would require cover needs of wolf prey be provided, while guideline 67 would require that mitigations for both wolves and their prey be incorporated into projects or activities where consistent. Recovery plan direction would be required for federally listed species under guideline 65 which would help improve survivorship of Mexican wolves. While there have been no instances where wolves and prey have been drawn into areas used by humans, guideline 91 would require actions that could potentially prevent these conflicts.

Wildlife Quiet Area Management Area

Desired condition 331 and guideline 192 for this management area provide for blocks of habitat in the form of wildlife quiet areas (WQAs) to help meet wildlife life stage requirements during breeding, and rearing, including the critical winter period. While WQAs would be considered suitable for livestock grazing, they would not be suitable for motorized vehicle use (except when otherwise authorized, e.g., for restoration thinning or burning). Desired conditions 333 and 334 would provide for no motorized use in WQAs. This would therefore result in less stress for these wide ranging predators and their big game prey species from fewer people and no motorized vehicle use.

Recommended Wilderness and Recommended Research Natural Area Management Areas

Both of these management areas are unsuitable for motorized use. Desired condition 376 would direct recommended wildernesses contribute to preserving natural behaviors and processes that sustain wildlife populations. Guideline 207 would require recommended research natural areas be managed for nonmotorized use. Both of these management areas would therefore have fewer disturbances (motorized and total number of people) to Mexican wolves and their prey, as compared to most other areas (except wildernesses and the Blue Range Primitive Area). While recommended wilderness areas are suitable for livestock grazing, recommended research natural areas are not. Guideline 205 would require that recommended research natural areas be fenced from livestock where necessary to protect their resources. Unlike recommended wilderness areas, recreational activities within recommended research natural areas are not encouraged (but not prohibited) in order to minimize impacts within them (GL 204).

Cumulative Effects and Climate Change

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur within the action area of impacts for a listed species. On private land within and adjacent to the ASNFs, activities with relevance for Mexican wolves include the presence of homes, some businesses, people, vehicles, pets, and livestock. Increasing population growth with associated activity is likely on private land. Trees are harvested and cattle are grazed on the adjacent White Mountain and San Carlos Reservations which are well roaded, although no information is available about the level of these and other activities on tribal lands.

There are several AZGFD properties occurring within the boundaries of the ASNFs. The Chevelon Ranches comprise five separate inholdings managed for wildlife habitat and one (Vincent parcel) managed as an administrative site. The Bear Springs Ranch is a 25 acre inholding managed for big game habitat with one building for administrative use (e.g., staging wildlife surveys from). The Sipe Wildlife Area was purchased for management of Little Colorado spinedace and other species. It is sometimes hayed and there are working horses present; a wildlife property manager with pets lives onsite. The P.S. Ranch property totals two parcels for a total of 250 acres managed for big game and other wildlife; it also has an administrative buildings and corrals.

The implications of climate change and variability for plants and animals are that their populations would shift even in the absence of human influence. For the Mexican wolf any changes would relate to shifts in habitat for and resulting impacts to prey species populations.

Mexican Wolf
Summary of Effects and Determinations

The program areas of wildland fire, ecosystem/vegetation health, and watershed and soil could potentially improve wolf prey habitat conditions related to forage and cover although could be associated short term disturbance impacts. While guidelines could limit impacts, not all negative impacts would be reduced or eliminated within these program areas.

The program areas of rangeland management and engineering could disturb Mexican wolves through such activities as motor vehicle use and herding of livestock, *although* authorized livestock grazing and trailing, and legally allowed vehicle use on established roads are specifically exempted from the definition of disturbance under the ESA Section 10(j) rule for the Mexican wolf. However, these program areas and some associated activities could also expose Mexican wolves to harm through the presence of roads and vulnerable livestock.

The program areas for lands and minerals, recreation and wilderness, and wildlife, fish, and rare plants could disturb wolves and their prey, primarily through short term activities such as mineral exploration, special use facility maintenance, group recreational events, or wildlife survey or monitoring. While standards and guidelines could limit disturbance impacts (e.g., reduce the need to relocate dens), not all negative impacts would be reduced or eliminated within these program areas.

While limited, infrequent activities within wildlife quiet areas and recommended and designated research areas can occur, motorized vehicle use is otherwise prohibited which removes this type of disturbance to wolves and their prey in these two management areas. These management areas could help protect wolves from disturbance and harm and may help with pup survival if denning occurs within them.

The reintroduced population of Mexican wolves in the BRWRA has been designated an experimental, nonessential population under the ESA Section 10(j). This means that any loss of wolves would not be likely to appreciably reduce the likelihood of survival of the species in the wild. Also, by definition, a nonessential experimental population is not essential to the continued existence of the species and implementation of the LMP cannot lead to a jeopardy determination for the entire species. Therefore, the implementation of the ASNFs LMP is **not likely to jeopardize** the continued existence of the Mexican wolf.

Mexican spotted owl *Strix occidentalis lucida*

Endangered Species Act Status:	Threatened, March 16, 1993
Recovery Plan, First Revision:	September 5, 2012
Critical Habitat:	August 31, 2004
Determination of Effects (species):	May Affect, Likely to Adversely Affect
Determination Effects (critical habitat):	May Affect, Likely to Adversely Affect

For brevity, the Mexican spotted owl is referred to as MSO throughout the document. MSO protected activity centers are referred to as PACs. The first revised MSO Recovery Plan (USFWS 2012) is referred to as simply the MSO Plan.

MSO Specific Assumptions

- Not all successional stages or states within a PNVT that can provide suitable MSO habitat are themselves suitable, e.g., the seed/sapling state of wet mixed conifer is not yet suitable for nesting owls.
- While small or large acreages of a PNVT may be substantially burned, those acres remain the same PNVT but in various earlier successional states after the fire. However, within appropriate PNVTS, those burned acres are expected to develop into suitable MSO habitat over time. Depending on fire severity, timeframes may be very long (100 years or more).
- Until comprehensive post-fire surveys are conducted, all MSO PACs within the Wallow Fire boundary are assumed to be occupied for this analysis even though several were entirely or

almost entirely burned (no remaining trees). This is because, at this time, it is not known if those owls are lost or have moved to adjacent areas that were burned less severely.
- All other MSO PACs across the ASNFs are also assumed to be occupied for this analysis although most have not been consistently surveyed over the years.
- All information about seral stages (states) for PNVTs that can provide MSO habitat is based on conditions post-2011 Wallow Fire.
- MSO critical habitat is considered a subset of overall MSO habitat so that statements regarding MSO habitat apply to critical habitat, where designated.
- Forest conditions for MSO will be consistent with the habitat requirements specified in the MSO Plan per the Final Regional Products of the Vegetation Desired Conditions Working Group (see http://fsweb.r3.fs.fed.us/eap/nfma/working-group/products/ desired-conditions/index.shtml, last accessed 2014)).

Natural History, Distribution, and Status of the Species Range-wide

Life history, distribution, status of this species range-wide along with listing factors are found in documents located on the USFWS website http://www.fws.gov/southwest/es/arizona/MSO.htm (accessed 2014). An account of the taxonomy, biology, and reproductive characteristics of the MSO is found in the Final Rule listing the MSO as a threatened species (USFWS 1993) and the MSO Plan, first revision (USFWS 2012). The 2012 Biological and Conference opinion for the Continued Implementation of the Land and Resource Management Plan for the ASNFs (USFWS 2012) also provides information. Vaughn (2014) also compiled information on this species from various sources. All these documents are incorporated by reference into this document.

Status within the Action Area

Most of the ASNFs fall within the Upper Gila Mountains ecological management unit (EMU) for MSO. Roughly the southern half of the Clifton Ranger District, all of which is below the Mogollon Rim, falls within the Basin and Range-West EMU. Total acreage of PNVTs that can provide MSO habitat is found in each of the recovery, protected, and critical habitat sections below.

Vegetation types in the MSO Plan and those in the ASNFs LMP cannot be directly equated. There are 6 vegetation types defined in the MSO Plan that include both existing and potential vegetation and which are defined in terms of "pure," "majority," and "plurality" (FWS 2012). Three of these recovery vegetation types are found on the ASNFs: 1) pine-oak forest, 2) mixed-conifer forest, and 3) riparian forest. The following paragraph contains descriptions and comparisons of both.

On the ASNFs, there are two PNVTs that encompass pine-oak. Within these, pine is most often ponderosa pine above the Mogollon Rim, but below the rim it can include Apache pine, Chiricahuan pine, and/or Arizona pine. In the portion of the ponderosa PNVT that is pine-oak, the species of oak is "Gambel oak" with diameter at root crown (drc) of >5 inches. In the portion of the Madrean pine-oak woodland PNVT that is pine-oak (within the Basin and Range-West EMU which includes part of the Clifton Ranger District), oak includes "any oak" species with drc at >5 inches. The mixed-conifer vegetation type described by the MSO Plan is not separated into dry and wet mixed conifer as it is per Forest Service Region 3 PNVT desired conditions and by forest plan vegetation (VDDT) modeling. In addition, the spruce-fir PNVT for the ASNFs meets the MSO Plan definition of the mixed-conifer forest type.

Recovery Habitat

Recovery habitat includes pine-oak, mixed-conifer, and riparian forests, as well as rocky canyons areas outside MSO protected activity centers (PACs) that are managed as nest/roost, foraging, dispersal, and

wintering habitat. The intent of management within recovery habitat is to maintain and create nest/roost habitat where appropriate, while providing for both diversity in ecological conditions across the landscape and flexibility for managers (USFWS 2012). In addition, recovery habitat, well distributed across the landscape, is also necessary to help offset unpredictable changes in owl habitat from large scale landscape disturbance events and long term climate change.

The MSO Plan contains direction for management under its *forested recovery habitat* and *riparian recovery habitat* sections. There is also direction for foraging/non-breeding forested recovery habitat. PNVTs that can provide recovery habitat at the programmatic level of forest plan revision are listed in table 7 showing the corresponding MSO Plan-defined forest types.

Table 7. PNVT composition of recovery habitat on the ASNFs showing equivalent MSO Plan forest types

PNVTs that can provide MSO recovery habitat and acreage	PNVT recovery habitat (excludes protected habitat)	*Corresponding MSO Plan forest type (italicized)* Notation or explanation
Ponderosa pine forest with Gambel oak * 180,662	157,556	*Pine-oak forest type* *On the ASNFs, this is not a separate PNVT; the pine-oak portion of this PNVT is determined based on Forest Inventory and Analysis (FIA) plot and comprises about 30% of the 602,206 acres of ponderosa pine PNVT.
Dry mixed conifer forest 147,885	119,330	*Mixed-conifer forest type* Mixed conifer with history of frequent fires; often with some (not majority or plurality) ponderosa pine and often with some (not majority or plurality) aspen.
Wet mixed conifer forest 177,995	150,758	*Mixed-conifer forest type* Infrequent fire regime; often with some (not majority or plurality) Englemann/blue spruce or corkbark fir; and/or often with some (not majority or plurality) aspen.
Spruce-fir forest ** 17,667	15,186	*Mixed-conifer forest type* ** None of this PNVT on the ASNFs meets MSO definition of high-elevation forest type (pure spruce-fir) because no one species provides all or a majority of the basal area; it does, however, meet the MSO Plan definition of the mixed-conifer forest type.
Madrean pine-oak woodland *** 42,903	33,536	*Pine-oak forest type* *** On the ASNFs, that portion on north and northeast aspects where slopes are ≥40% slope within the 394,927 acres of Madrean pine-oak PNVT.
Mixed broadleaf deciduous riparian forest 9,657	9,550	*Riparian forest type* Primarily along larger riverine systems and all below the Mogollon Rim.
Cottonwood-willow riparian forest 15,876	14,366	*Riparian forest type* Primarily, but not entirely, on Sitgreaves side of ASNFs.
Montane willow riparian forest 4,808	4,309	*Riparian forest type* Primarily occurs on Apache side of ASNFs above the Mogollon Rim.
Total acres within recovery habitat:	504,591	

Protected Habitat

PACs encompass the best nesting and roosting habitat based owl occurrence, and often includes steep slopes and sometimes canyon habitat that is often in association with riparian forest types. Management of these areas is largely restricted to forest health actions in order to protect and enhance occupied owl habitat (USFWS 2012). Currently there are 150 PACs on the ASNFs totaling 96,957 acres. Three of the 150 PACs (Knoll Lake, Ohaco Lookout, and Leon Limestone) are partially on the Coconino NF (381 total acres on that forest) and one PAC (Lower Stone Creek) is partially on the Gila NF (123 total acres on that forest); however, these four are numbered as ASNFs PACs so are included in the ASNFs count of PACs.

There are an additional five PACs partially on the ASNFs that are numbered as Coconino NF PACs (Leon Limestone, Weimer, Victorine, Lower Leonard, and Leonard Point), totaling 1,303 acres on that forest, and one PAC partially on the Gila NF (Cap Mamie) for a total of 607 acres on that forest. These six PACs are not included in the ASNFs count. However, acreage in these six PACs that falls within the ASNFs is included as protected habitat within this analysis.

As previously noted, most PACs fall within the Upper Gila Mountains EMU. Four PACs occur within the Basin and Range-West EMU below the Mogollon Rim. PNVT composition within existing PACs is shown in table 8.

Table 8. PNVT composition within 150 MSO PACs on the ASNFs

PNVT	Acreage	PNVT	Acreage
Ponderosa pine forest with Gambel oak [a/]	23,427 [b/]	Madrean pine-oak woodland [a/]	9,367 [c/]
Dry mixed conifer forest	28,555	Mixed broadleaf deciduous riparian forest	107
Wet mixed conifer forest	27,766	Cottonwood-willow riparian forest	1,510
Spruce-fir forest [a/]	2,481	Montane willow riparian forest	499
Other non-suitable PNVT acres	3,245	TOTAL acres within protected habitat (PACs)	96,957

[a/] See notations of explanation (*) in table 7 for these PNVTs.
[b/] This includes some ponderosa pine PNVT acreage without Gambel oak within PAC boundaries.
[c/] This includes some acreage that is not on >40% slopes and not on north and northeast aspects within PAC boundaries.

The 2011 Wallow Fire affected habitat in 74 PACs. The biological assessment for subsequent burned area emergency response actions (#22410-2011-IE-0276) evaluated fire impacts to just nesting and roosting habitat acreage within PACs. This evaluation was made using a remote sensing technology called the Rapid Assessment of Vegetation Condition after Fire or RVAG which determines basal area loss through canopy cover loss. The 7/8/11 RVAG map version was utilized. Half or more of the acreage within 48 of these PACs experienced basal area/canopy loss of 50% or more. Prior to the Wallow Fire, other large fires since 2002 have impacted MSO including the Blue River Complex/KP/Three Forks fires (22410-2011-IE-0276). There have been about 62 PACs with 100 acres or more burned at various levels. Eleven of these were again burned in the Wallow Fire (although only 6 of the 11 had 100 acres or more burned prior to 2011).

Since the 2011 Wallow Fire, a breeding pair of MSO was discovered in 2012 in an area not previously surveyed; these owls could or could not be from nearby PACs that burned heavily. Because there is no way of knowing at this time, their breeding area is delineated and treated as an additional PAC. In 2013, two additional MSO pairs were discovered on the Black Mesa Ranger District with new PACs delineated (West Chevelon and Bear Willow). These are located at about 14 or more miles away from the 2002 Rodeo-Chediski Fire area so unlikely represent owls shifting from burned areas.

Monitoring of some MSO PACs within the Wallow Fire boundary occurred in 2012 and 2013, and is again underway in 2014. The following general observations are from Deb Brewster, wildlife lead for MSO survey within the Wallow Fire boundary (Alpine and Springerville RDs). Where owls have been detected, they are using the least burned areas within PACS (≤50% loss of basal area/canopy). For PACs that had substantial loss of basal area/canopy (>75% loss), they are generally using non-PAC adjacent areas with ≤50% loss of basal area/canopy.

Threats within the Action Area

Threats on the ASNFs and information about them include the following (status within the action area is found in the next section).

The MSO Plan describes a number of threats to MSO and habitat. Stand-replacing fires can be and have been a threat to MSO and their habitat on the ASNFs. From 2000-2012, a total of roughly 771,000 acres has burned on the ASNFs in fires of 5,000 acres or larger, although not all have been within MSO habitat. Another identified threat to MSO has been silviculture treatments. The 1987 ASNFs plan initially emphasized even-aged cutting methods but was later amended to include more uneven-aged management. From 1987 to 2003, annual harvest volumes ranged from 5,000 to 100,000 thousand board feet on the ASNFs. Under the White Mountain Stewardship (WMS) program beginning in 2004, treatments have occurred on an average of about 12,200 acres each year. The WMS program has primarily treated wildland-urban interface (WUI) areas with the objective to reduce the risk of uncharacteristic wildfire. Although not all have fallen within WUI projects to date, there are 30 PACs within ½ mile of private land within the boundary of the ASNFs. Biological assessments for three WUI projects (Alpine, Nutrioso, and Greer) determined that treatments may affect and were likely to adversely affect the MSO within these WUI treatments.

Improper livestock grazing is another identified threat to MSO and habitat; important considerations include livestock use levels (grazing, browsing, and trampling) and season of use relative to plant physiological need for recovery. Since 1995, the ASNFs have been analyzing livestock grazing through the NEPA process and conducting ESA consultation. Although not all allotments have been completed, some important adjustments have been made such as number or kind of livestock, pasture, season of use, and level of forage use. These analyses have focused in part on the needs of riparian (i.e., critical) areas and associated species. While the return of livestock for grazing after the 2002 Rodeo-Chediski Fire was delayed for four years to allow for vegetation and soils recovery, there was an emphasis to return livestock grazing to allotments in 2012 after the 2011 Wallow fire.

Land development in terms of facilities or structures can pose a threat to MSO. On the ASNFs, since the 1987 Forest Plan came into effect, there have not been extensive developments and most have little to no impact to MSO habitat (e.g., recovery, protected, and critical habitat here and elsewhere). There have been additions to existing sites like the Big Lake Recreation area, extensions of power lines to private properties, and limited expansion of communication sites for additional users. While there are mineral pits, there are no energy developments on the ASNFs at this time.

Water developments have been identified as a possible threat to MSO. New water developments such as stock tanks have been very limited due to Arizona Department of Water Resources' moratorium on processing water applications. Spring development and piping of water to private land is common and many of these are within MSO habitat around the communities of Alpine, Nutrioso, and Greer. There are a number of water diversions on larger ASNFs rivers. Some diversions and associated ditches are located in the mixed broadleaf deciduous riparian forest PNVT (e.g., along the Blue River).

Roads are extensive on the ASNFs and there are currently 84.7 miles of open roads within PACs. Some large developed recreation sites are within MSO habitat and some are adjacent to PACs; however, these PACs have been in place for decades (e.g., East Fork Black River PAC and Rim Lakes PAC both partially encompass developed recreation sites). On the ASNFs there is concentrated recreation use along many streams including those that provide MSO recovery habitat. User made roads and trails are often created from private land onto NFS lands; there are 15 MSO PACs adjacent to or within about 300 feet of private land on the ASNFs.

Special use permits issued for commercial recreation events (e.g., dog trials, outfitting/guiding) and non-commercial recreation events (e.g., scout campouts, weddings) mean concentrations of people, animals, and vehicles and these are common on the ASNFs. These sometimes occur within MSO habitat.

Roads (including road maintenance) and recreation activities (often associated with motor vehicles such as ATVs) have contributed noise and disturbance to MSO. Effects are variable depending on time of day/night, intensity, frequency, and distance to MSO. Persistent noises are likely more disruptive than infrequent disturbances, and intensity of disturbance is proportional to noise level.
Other threats to MSO like West Nile virus, predation, or potential for Barred owls are outside of the scope of forest management.

Potentially positive actions for the species undertaken by the ASNFs include the following. Douglas-fir trees damaged by fire is highly susceptible to attack by Douglas-fir beetle (*Dendroctonus pseudotsugae*) and suffer subsequent death. The ASNFs has taken actions to help limit beetle damage within some MSO PACs (and recreation sites) within large fire perimeters. This has included placement of MCH (3-methylcyclohex-2-en-1-one) capsules on large, old Douglas-fir (also on some large Southwestern pine and spruce trees). The capsules emit anti-aggregrate pheromones that help repel attacking beetles that sense the tree is already under attack by other beetles. These capsules were placed in 2011 under emergency consultation (22410-2011-IE-0276) and are continuing to be placed in 2014 (02EAAZ00-2014-I-0165). In addition to annual MSO monitoring, the ASNFs has conducted post-Wallow Fire monitoring of MSO PACs within the fire consisting of formal protocol surveys of 44 PACs in 2012 and 55 PACs in 2013, with plans for survey of about 30 PACs in 2014 (these represent repeated years of monitoring in some PACs of up to three years).

Critical Habitat and Primary Constituent Elements

Critical habitat primary constituent elements are the physical or biological features essential to the conservation of the species that may require special management considerations or protection. Primary constituent elements for MSO occur within dry mixed conifer, wet mixed conifer, spruce-fir, the pine-oak portion of ponderosa pine forest PNVTs, and within a portion of the Madrean pine-oak woodland PNVT (as described above).

Critical habitat for MSO was designated in 2004 with critical habitat unit UGM-7 encompassing just over one million acres on the ASNFs. Within UGM-7 on the ASNFs, there is just less than 601,000 acres of critical habitat. This is based on protected habitat and PNVTs that can provide recovery habitat which include ponderosa pine where Gambel oak occurs, dry mixed conifer, wet mixed conifer, spruce-fir, and a portion of the Madrean pine-oak woodland PNVTs. On the ASNFs, some protected habitat is outside of critical habitat UGM-7 on the ASNFs; specifically, six PACs are entirely outside of critical habitat units and 15 others are partially outside (total of 5,348 acres). However, to facilitate analysis in this biological assessment, all protected and recovery habitat is handled as critical habitat (i.e., no distinction regarding UGM-7).

Primary constituent elements for MSO nesting, roosting, foraging, and dispersal follow (vegetation descriptions are per the 2012 MSO Plan).

1. Primary constituent elements related to forest structure:
   a. A range of tree species, including mixed conifer, pine-oak, and riparian forest types, composed of different tree sizes reflecting different ages of trees, 30% to 45% of which are large trees with a trunk diameter of 12" or more when measured at 4.5' from the ground;
   b. A shade canopy created by the tree branches covering 40% or more of the ground; and
   c. Large dead trees (snags) with a trunk diameter of at least 12" when measured 4.5' from the ground.

2. Primary constituent elements related to maintenance of adequate prey species:
   a. High volumes of fallen trees and other woody debris;
   b. A wide range of tree and plant species, including hardwoods; and
   c. Adequate levels of residual plant cover to maintain fruits, seeds, and allow plant regeneration.

3. Primary constituent elements related to canyon habitat include one or more of the following:
   a. Presence of water (often providing cooler and often higher humidity than the surrounding areas);
   b. Clumps or stringers of mixed-conifer, pine-oak, piñon-juniper, and/or riparian vegetation;
   c. Canyon wall containing crevices, ledges, or caves; and
   d. High percent of ground litter and woody debris.

Species and Habitat Effects

In the individual program area discussions below, the implication of relevant desired conditions to MSO are noted. Potential impacts of each objective, standard, and guideline to the species and habitat are described. Where applicable, management areas are addressed. A determination of effects is then made for that program area. Subsequent to all program areas, an overall determination of effects for this species and its critical habitat from LMP implementation is provided in the Summary of Effects and Determinations section for MSO.

Wildland Fire Management

There are eight relevant desired conditions that guide management and activities here (see appendix A). Desired conditions 41, 42, and 296 directs management toward activities and conditions where fire is again able to play its historic role in maintaining fire adapted ecosystems; this would reduce the threat of stand-replacing or uncharacteristic wildfire to MSO and habitat. Desired conditions 93, 112, 128, 145, and 166 represent a restored the fire frequency interval in five specific PNVTs which can provide MSO and its habitat.

Based on FVS-FFE modeling, the risk of uncharacteristic wildfire would be reduced by one fire regime condition class in the dry mixed conifer and Madrean pine-oak woodland PNVTs after 15 years. There would be an improvement in FRCC trend for the remaining PNVTs. This could help reduce the risk of high severity, landscape scale fires. The fire regime condition class for the riparian forest PNVTs, which can also provide MSO habitat, is not considered because flooding rather than fire is the primary disturbance force in riparian forests.

- GL 171 Wildland fire may be used to meet PNVT desired conditions and enable natural fire regimes.
- GL 174 Firelines, helispots, and fire camps should be located to avoid disturbance to critical species and impacts to cultural resources.

Guideline 171 has the potential to help maintain or restore the vegetation structural conditions needed by MSO and their prey. Guideline 174 could potentially mitigate noise and disturbance during fire suppression activities where MSO may be present.

Prescribed fire could, over the long term, reduce uncharacteristic wildfire and the associated risk of substantial or complete loss of areas providing MSO protected and recovery habitat. However, activities associated with burning (equipment, personnel) could also result in short term impacts such as disturbance to nesting MSO and temporary loss of herbaceous vegetation needed by their prey. While guidelines could help limit these impacts, not all negative impacts would be reduced or eliminated. As such, this program area may affect and is likely to adversely affect MSO and its habitat.

Ecosystem/Vegetation Health

There are sixteen relevant desired conditions that guide management and activities here (see appendix A). Desired conditions 1, 40, 52, and 58 direct management actions toward forest conditions better able to withstand disturbances, including the threat of insects/disease and climate change. Desired conditions 48, 111, 127, and 144 provides for the characteristics of old growth needed by MSO and their prey (e.g., old trees, snags, coarse woody debris, multi-stories) in various PNVTs. While desired conditions for dry mixed conifer forest PNVT are similar to ponderosa pine, desired conditions 100 and 105 provides conditions within the ponderosa pine and dry mixed conifer PVNTs provide the structural complexity of habitat needed by MSO or its prey.

Desired conditions 90 and 103 provide for the Gambel oak component of MSO habitat within ponderosa pine while desired condition 167 provides various habitat components needed by MSO where they may occur in the Madrean pine-oak woodland PNVT. Desired conditions 18, 100, 119, and 138 provide for MSO small prey needs such as down logs and interlocking crowns (e.g., voles, squirrels).

- OBJ 11 Annually, treat 5,000 to 35,000 acres to reduce [forest PNVTs] tree densities, restore natural fire regimes, promote species habitat and ecosystem health, reduce fire hazard, maintain desired conditions, initiate recovery from uncharacteristic disturbance, and provide forest products, leaving a desired mix of species with the range of desired densities that are resilient to changing climatic conditions.
- OBJ 13 Annually, treat or maintain 5,000 to 15,000 acres to promote a highly diverse structure [woodland PNVTs].
- OBJ 36 Annually, provide up to 94,000 CCF (73,400 cords) of firewood for personal and commercial use [forest products regardless of PNVT].

Based on VDDT modeling of these three objectives, changes in conditions for PNVTs providing MSO habitat are shown in table 9. Modeling indicates that four of the five PNVTs move toward desired conditions, i.e., become less departed from desired conditions, after 15 years of management under the LMP (although only slightly so for the wet mixed conifer PNVT). Based on modeling parameters, the spruce-fir PNVT indicates it becomes more departed from desired conditions at 15 years but then starts moving toward desired conditions in the long term (as noted earlier, the spruce-fir PNVT on the ASNFs meets the MSO Plan definition of mixed conifer needed by MSO).

Table 9. Movement toward DC after 15 and 50 years within PNVTs that can provide MSO habitat (based on VDDT modeling [a/])

PNVT	Current (%) departure from DC	Departure (%) at 15 years	Departure (%) at 50 years [b/]
Ponderosa pine	77	63	46

forest			
Dry mixed conifer forest	67	53	43
Wet mixed conifer forest	54	52	51
Spruce-fir forest	59	64	61
Madrean pine-oak forest	61	41	30

[a/] Based on VDDT modeling of the high treatment acres for alternative B, the proposed LMP.

[b/] Assuming LMP direction would continue to be implemented to year 50; however, a new forest plan would be required before then which would be based on current conditions at that time.

Reduced departures after 15 years indicate that conditions (e.g., stand openness, herbaceous vegetation density and vigor) and disturbances (e.g., wildland fire) are closer to desired and reference or historic conditions. Where restoration activities occur in the vicinity of MSO recovery riparian habitat, these objectives have the potential to increase ground cover to carry periodic cool ground fires in the uplands and, with decreased crown densities, to reduce the risk of severe wildfires that can burn intensely enough to consume riparian forests used by MSO and their prey. However, these activities also have the potential for short term impacts including disturbance to MSO and loss of disturbance of prey habitat (vegetation and logs). Most, but not all, firewood cutting occurs in the fall after the MSO breeding season; however, in general, desirable firewood/fuelwood or firewood species utilized by MSO are Douglas fir and Gambel oak-which could potentially impact MSO habitat to some extent. Fuelwood permits contain special condition clauses that limit the size of trees that can be cut (typically 12 or 16 inches diameter at breast height).

- ST 3 Within each PNVT, vegetation management activities shall be designed to maintain or move plant composition towards a moderate to high plant community similarity as compared to site potential.
- ST 9 Harvesting systems shall be selected based on their ability to meet desired conditions and not strictly on their ability to provide the greatest dollar return.
- ST 24 Permits which authorize the collection of forest products shall include permit provisions to ensure the needs of wildlife, which depend upon those forest products, will continue to be met (e.g., cone and mushroom collection and the overwinter forage needs of squirrels).

Standard 3 has the potential to help ensure that plant composition (overstory, understory) needed by MSO is extended period of time to reestablish forest structure. Standard 9 could potentially limit damage to remaining large trees during tree removal operations. Standard 24 has the potential to limit impacts to MSO prey (e.g., fungi, cones used by squirrels) by including provisions for this in forest product permits.

- GL 23 Landscape scale restoration projects should be designed to spread treatments out spatially and/or temporally within the project area to reduce implementation impacts and allow reestablishment of vegetation and soil cover.
- GL 24 Restoration methods, such as thinning or prescribed fire, should leave a mosaic of untreated areas within the larger treated project area to retain or allow recolonization of treated areas by plants, small mammals and insects (e.g., long-tailed voles, fritillary butterflies).
- GL 30 Ground-disturbing projects (including prescribed fire) which may degrade long term riparian conditions should be avoided.
- GL 47 Where Gambel oak or other native hardwood trees and shrubs are desirable to retain for diversity, treatments should improve vigor and growth of these species.
- GL 50 Where consistent with project or activity objectives, canopy cover should be retained on the south and southwest sides of small, existing forest openings that are naturally cooler and moister.

These small (generally one-tenth to one-quarter acre) shaded openings provide habitat conditions needed by small mammals, plants, and insects (e.g., Merriam's shrew, Mogollon clover, four-spotted skipperling butterfly). Where these openings naturally occur across a project area, these conditions should be maintained on an average of 2 or more such openings per 100 acres.

- GL 59 Where Mexican spotted owls are found nesting in canyons or on north slopes within the Madrean pine-oak woodland, adjacent treatments should be modified to meet the needs of foraging owls.
- GL 86 Management should emphasize long term reestablishment of native deciduous trees, shrubs, and herbaceous vegetation to maintain ecosystem diversity.

Guidelines 23, 24, and 50 have the potential to help ensure persistence of MSO prey and their habitat. Additionally, guideline 23 could potentially reduce noise and disturbance to MSO within a project area. Guideline 30 would require that MSO riparian habitat be protected from other than short term impacts as a result of activities such as thinning or burning. Guideline 47 has the potential to retain and improve Gambel oak, an important habitat component for MSO within the ponderosa pine PNVT. Guideline 59 could potentially provide for the needs of foraging MSO within the Madrean pine-oak woodland by modifying treatments in adjacent area where MSO might forage. Guideline 86 has the potential to help ensure the long term reestablishment of native deciduous trees after landscape scale disturbance events within MSO habitat, although it may take an extended period of time to reestablish nesting structure.

This program area could improve overall ecosystem health, including helping to maintain or improve habitat conditions needed by MSO. Restoration activities could also result in short term impacts to MSO through disturbance and loss or reduction of herbaceous plants and down woody material providing for MSO prey. While standards and guidelines could limit impacts, not all negative impacts would be reduced or eliminated. As such, this program area may affect and is likely to adversely affect MSO and its habitat.

Rangeland Management

There are four relevant desired conditions that guide management and activities here (see appendix A). Desired conditions 54 and 64 provide for MSO prey species and their habitat by retaining needed amounts and structure of herbaceous vegetation. These desired conditions along with desired condition 61 (adequate vegetation residual and density of vegetation remains with grazing) support the return of fire to its historic role (i.e., supports cool ground burns), helping reduce the threat of stand-replacing or uncharacteristic wildfire to MSO and habitat. Where annual fluctuations and seasonality of forage production are considered, desired condition 278 helps retain sufficient ground cover to sustain MSO prey.

- ST 3 Within each PNVT, vegetation management activities shall be designed to maintain or move plant composition towards a moderate to high plant community similarity as compared to site potential.

Standard 3 has the potential to help ensure that plant composition (overstory, understory) needed by MSO and its prey are retained or restored with thinning and burning treatments. Relative to overstory vegetation, this may take an extended period of time to achieve in some areas.

- GL 32 Active grazing allotments should be managed to maintain or improve to desired riparian conditions.
- GL 132 Critical areas should be managed to address the inherent or unique site factors, conditions, values, or potential conflicts associated with them.

- GL 133 Grazing use on seasonal allotments should be timed to the appropriate plant growth stage and soil moisture.
- GL 134 New livestock troughs, tanks, and holding facilities should be located out of riparian areas to prevent concentration of livestock in these areas. Existing facilities in riparian areas should be modified, relocated, or removed where their presence is determined to inhibit movement toward desired riparian or aquatic conditions.
- GL 135 As areas are mechanically treated or burned, or after large disturbances, timing of livestock grazing should be modified as needed, in order to move toward desired conditions and to accomplish the objectives for the treatment.
- GL 136 Forage, browse, and cover needs of wildlife, authorized livestock, and wild horses should be managed in balance with available forage so that plants providing these needs remain at or move toward a healthy, persistent condition.
- GL 138 To minimize potential resource impacts from livestock, salt or nutritional supplements should not be placed within a quarter of a mile of any riparian area or water source. Salt or nutritional supplements should also be located to minimize herbivory impacts to aspen clones.
- GL 139 To prevent resource damage (e.g., streambanks) and disturbance to federally listed and sensitive wildlife species, trailing of livestock should not occur along riparian areas. Where no alternative route is available, approval may be granted where effective mitigation measures are implemented (e.g., timing of trailing, number of livestock trailed at one time).

Four guidelines have the potential to help protect or restore riparian habitat and the adjacent uplands that contribute to riparian conditions that support MSO and its prey. This would be addressed by stocking in balance with available forage (GL 136), by proper timing of grazing relative to plant growth (GL 133), by requirements to improve habitat (GL 32), and by managing for the special concerns within riparian areas (GL 132) which are critical areas for livestock grazing management.

Guidelines 134, 138, and 139 have the potential to help limit impacts from livestock grazing and trampling within MSO and prey habitat through judicious placement of water and salt, and limits to livestock trailing. Livestock impacts include concentrated grazing, browsing, and trampling of riparian vegetation. Guideline 135 has the potential, by requiring adjustments in timing of livestock grazing as needed, to help reduce cumulative site and disturbance impacts to MSO and habitat where livestock grazing and projects such as thinning or burning might concurrently take place.

This program area could impact MSO through disturbance (livestock presence or herding activities around nesting owls) and through impacts to prey species habitat and development of riparian forest structure and function (tramping of vegetation, prevention of seed head development, trampling or removal of forest or riparian woody species regeneration). Although standards and guidelines could limit livestock grazing and management impacts, not all negative impacts would be reduced or eliminated. Hence there may be competition or conflict (FEIS pg. 462), but the specific impacts of livestock grazing would be analyzed in site specific NEPA analyses (FEIS pg. 470). As such, this program area may affect and is likely to adversely affect MSO and its habitat.

Watershed and Soil Management

There are five relevant desired conditions that guide management and activities here (see appendix A). Desired conditions 34 and 85 would provide for structurally diverse, dense, and large tree conditions to support riparian dependent species. Desired conditions 292 and 293 would protect against the risk of diminished water that supports riparian MSO recovery habitat. Desired condition 77 would help protect soil, and hence vegetation density, cover, and height (seedheads) conditions in riparian recovery habitat needed by MSO prey.

- OBJ 1 During the planning period, improve the condition class on at least 10 priority 6th level HUC watersheds by removing or mitigating degrading factors.
- OBJ 6 Annually, move 200 to 500 acres toward desired composition, structure, and function of streams, floodplains, and riparian vegetation.

Objective 1 has the potential to improve overall soil and vegetation conditions within selected watersheds through restoration projects (e.g., increase herbaceous ground cover with thinning, recontour incised channels, plantings of willows and grasses). However, there would also be the potential for short term implementation impacts (e.g., disturbance where these restoration efforts occur within MSO habitat). Where it occurs within MSO recovery habitat, objective 6 has the potential to improve MSO habitat in riparian areas but it would also potentially have short term implementation impacts to MSO (e.g., disturbance to MSO and soil or vegetation compaction to prey habitat).

No regional riparian VDDT models were developed to assess movement toward desired conditions with implementation of these two objectives where they may be implemented within MSO habitat. However, the Riparian Specialist Report (2014) estimates that improvement of 2 - 6% in overstory conditions may occur in riparian PNVTs across the ASNFs including the three riparian forest PNVTs; otherwise, some overall movement toward desired conditions is expected, but this is not quantified.

- GL 10 Constraints (e.g., maximum limit to which water level can be drawn down or minimum distance from a connected river, stream, wetland, or groundwater-dependent ecosystem) should be established for new groundwater pumping sites permitted on NFS lands in order to protect the character and function of water resources.
- GL 19 Projects and activities should avoid damming or impounding free-flowing waters to provide streamflows needed for aquatic and riparian-dependent species.

Guidelines 10 and 19 have the potential to help protect water resources that support riparian recovery habitat for MSO and their prey.

This program area could improve overall watershed and riparian conditions, including soil and vegetation conditions that provide MSO prey habitat. While guidelines could limit impacts from restoration and other activities, not all short term negative impacts would be reduced or eliminated. As such, this program area may affect and is likely to adversely affect MSO and its habitat.

Engineering Program

There are no desired conditions that guide management and activities in this program area relevant for the MSO.

- OBJ 8 Annually, remove an average of 2 miles of unauthorized roads or trails that add sediment to streams, damage riparian vegetation, erode streambanks, cause gullies, and/or compact floodplain soils.

Objective 8 has the potential to help reduce noise and disturbance from unauthorized roads or trails where these restoration actions occur within MSO habitat, although the road removal activity itself has the potential to disturb MSO, if present.

- ST 15 Motorized vehicle travel shall be managed to occur only on the designated system of NFS roads and motorized trails and designated motorized areas.

Standard 15 could also potentially reduce noise and disturbance to MSO and reduce vehicle soil and vegetation impacts across MSO habitat.

- GL 98 New roads or motorized trails should be located to avoid Mexican spotted owl protected activity centers, northern goshawk post-fledging family areas, and other wildlife areas as identified; seasonal restrictions may be an option.
- GL 107 After management activities occur in areas with high potential for cross-country motorized vehicle use, methods (e.g., barriers, signing) should be used to control unauthorized motorized use.

Guideline 98 has the potential to prevent further habitat impacts and disturbance to MSO within protected habitat. Guideline 107 has the potential to reduce noise and disturbance within MSO habitat as well.

This program area could damage needed soil and vegetation and disturb MSO, primarily related to the presence and maintenance of motorized roads and trails. It could also improve some areas where MSO may be present, although there could also be short term impacts with removal of unauthorized roads or trails. While standards and guidelines could limit impacts, not all negative impacts would be reduced or eliminated. As such, this program area may affect and is likely to adversely affect MSO and its habitat.

Lands and Minerals Program

There are two relevant desired conditions that guide management and activities here (see appendix A). Desired condition 263 would protect MSO from potential land exchanges where protected habitat is next to or near private land (15 MSO PACs occur adjacent to or near private land on the ASNFs). Desired condition 274 would limit impacts from special use forest product (e.g., commercial cone collection) permits to MSO prey species food needs (e.g., squirrels).

- OBJ 27 Annually, survey and post on average 2 to 5 miles of unposted NFS boundary.

Objective 27 has the potential, during breeding season, to result in limited short term disturbance to MSO during survey and posting of forest/private land boundaries where there are adjacent or nearby PACs.

- ST 31 Special uses for water diversions shall maintain fish, wildlife, and aesthetic values and otherwise protect the environment.

Standard 31 has the potential to help protect MSO riparian and prey habitat by retaining water flows that sustain riparian recovery habitat vegetation.

- GL 121 Access points to NFS land from adjacent non-NFS developments and subdivisions should be limited and provide all residents (not just edge lot owners) common entry points. Individual access points should be discouraged to minimize the development of unauthorized roads or trails.
- GL 146 Streambed and floodplain alteration or removal of material should not occur if it prevents attainment of riparian, channel morphology, or streambank desired conditions.
- GL 155 New communications sites, energy developments, and energy corridors should be located to minimize impacts to scenery, special areas, and species.
- GL 166 As applicable, issuance of special use authorizations should incorporate measures to reduce potential impacts to wildlife and avoid rare and unique habitats (e.g., bogs, fens).

The guideline 121 has the potential to help limit the threat of noise and disturbance within MSO PACs adjacent to or near private land. Guideline 146 could potentially protect MSO riparian habitat by precluding certain activities. Guideline 155 has the potential to reduce the impacts of land development

and associated activities (e.g., snotels, stream gauging stations, or other data collection facilities) on MSO and its habitat. Guideline 166 could potentially protect MSO from disturbance and habitat impacts, where needed.

This program area could impact MSO habitat with mineral extraction, special use facilities (e.g., powerlines), or energy exploration and associated activities, although impacts are generally more localized and limited. While standards and guidelines could limit impacts, not all negative impacts would be reduced or eliminated. As such, this program area may affect and is likely to adversely affect MSO and its habitat.

Recreation and Wilderness Program

There is one relevant desired condition that guides management and activities here (see appendix A). Desired condition 211 would provide for recreation in a manner that does not negatively impact wildlife habitat and populations.

- OBJ 18 Annually, rehabilitate, stabilize, revegetate, or relocate an average of five dispersed campsites to improve recreation opportunities and/or protect the environment.

Objective 18 could potentially reduce impacts to MSO where dispersed campsites occur within MSO protected habitat.

- ST 16 Unless specifically authorized, motorized cross-country travel shall be managed to occur only in designated motorized areas.

Standard 16 has the potential to reduce the threat of noise and disturbance to MSO from cross-country motorized travel across the ASNFs.

- GL 94 Timing restrictions on recreation uses should be considered to reduce conflicts with wildlife needs or soil moisture conditions.
- GL 95 Dispersed campsites should not be located on or adjacent to archaeological sites or sensitive wildlife areas.

Guidelines 94 and 95, by restricting where and when recreation might occur, could potentially reduce disturbance to MSO and/or impacts to habitat (e.g., trampling of prey habitat), where needed.

This program area could impact MSO through disturbance and impacts to habitat, especially where there may be concentrated gatherings of people and their animals. There could be some habitat improvement where campsites are rehabilitated but recreation at these sites could still impact MSO. While standards and guidelines could help limit impacts, not all negative impacts would be reduced or eliminated. As such, this program area may affect and is likely to adversely affect MSO and its habitat.

Wildlife, Fish, and Rare Plant Program

There are ten relevant desired conditions that guide management and activities here (see appendix A). Desired conditions 196 and 198 direct management toward the recovery of MSO and its habitat and address the threat to MSO from noise and disturbance. Desired conditions 65, 133, and 150 provide habitat components for MSO and their prey (e.g., mistletoe and logs).

- OBJ 10 Annually, work with partners to reduce animal damage to native willows and other riparian species on an average of 5 miles of riparian habitat.

Objective 10 has the potential to protect woody riparian species needed by MSO and prey where this occurs within MSO riparian recovery habitat.

- GL 29 Project plans should include quantitative and/or qualitative objectives for implementation monitoring and effectiveness monitoring to assist in moving toward or maintaining desired conditions.
- GL 65 Activities occurring within federally listed species habitat should apply habitat management objectives and species protection measures from recovery plans.
- GL 67 Modifications, mitigations, or other measures should be incorporated to reduce negative impacts to plants, animals, and their habitats and to help provide for species needs, consistent with project or activity objectives.
- GL 71 Cool and/or dense vegetation cover should be provided for species needing these habitat components (e.g., Goodding's onion, black bear, White Mountains chipmunk, western yellow-billed cuckoo).

Guideline 29 would require monitoring to provide feedback about project implementation effects or effectiveness of mitigation measures for MSO, and would guide future management toward desired conditions. Guideline 65 has the potential to contribute to recovery of MSO while guideline 67 has the potential to protect MSO and its habitat. Guideline 71 could potentially help provide the dense, cool microhabitat needed by MSO.

This program area could reduce impacts to MSO and its habitat, although monitoring or habitat assessments could result in short term disturbance impacts to MSO and possibly some limited trampling of prey habitat. While guidelines could limit project or activity impacts, not all negative impacts would be reduced or eliminated. As such, this program area may affect and is likely to adversely affect MSO and its habitat.

Community-Forest Intermix Management Area

This management area, where there are 22 PACs with one-quarter mile of private land, would receive more intensive treatments relative to reducing the risk of uncharacteristic wildfire. Desired condition 310 directs management for more open forest conditions than elsewhere within wet mixed conifer and spruce-fir PNVTs where they occur within these areas. While this can and has resulted in adverse impacts to MSO in previous and ongoing WUI treatment areas (Alpine, Greer, and Nutrioso WUIs[2]), desired condition 304 has the potential to help reduce intensity of stand-replacing wildfires in these adjacent and nearby PACs.

Natural Landscape Management Area

Desired condition 353 directs that acreage within this management area contribute to preserving natural behaviors and processes that sustain wildlife. There are 41 PACs within or partially within natural landscape of which 33 have one-third or more of their acreage within this management area. While this management reflects primarily natural processes, management for ecosystem restoration and motorized vehicle use would be allowed on existing roads. Guideline 197 would also allow limited cross-country

[2] To date, wildland-urban interface (WUI) project areas on the ASNFs have encompassed some of the LMP community-forest intermix (CFI) management area; however, these WUIs are typically much larger, treating at distances, up to 3miles or more away from private land, as compared to the CFI management area of one-half mile around private land.

motorized travel which could disturb MSO, if present. However, overall this management area has the potential for fewer disturbances to MSO and habitat.

Wilderness, Recommended Wilderness, and Blue Range Primitive Area Management Areas

Desired conditions 373 and 376 direct that these three management areas contribute to preserving natural wildlife (including MSO) behaviors and processes that sustain wildlife populations. There are 25 PACs with at least some acreage in these management areas. While mechanized treatments are precluded in these management areas, prescribed fires (and appropriate natural ignition wildfires) can help maintain or facilitate movement toward desired conditions in these management areas.

Critical Habitat and Primary Constituent Elements

Effects to MSO recovery and protected habitat discussed above would apply to critical habitat for this species. Table 10 shows which program areas may impact specific critical habitat PCEs in either a positive or negative manner. It is important to note that LMP implementation would not necessarily have these impacts across all critical habitat for the MSO on the ASNFs.

Table 10. MSO critical habitat PCEs potentially impacted by program area

Program Area	Affected PCEs (by number) and Principle Mechanism
Wildland Fire Management	1, 2, and 3. Potential to reduce uncharacteristic wildfire; also prescribed burning potential to reduce snags, woody species regeneration, canopy cover, and herbaceous prey habitat.
Ecosystem/Vegetation Health (Forest Products)	
Rangeland Management	1 and 2. Livestock grazing or trampling impacts to woody species regeneration or herbaceous prey species habitat.
Watershed and Soil Management (Riparian Areas)	1 and 2. Impacts to soil and vegetation during treatments.
Engineering	1, 2, and 3. Road building or maintenance impacts to habitat (woody and herbaceous vegetation).
Lands and Minerals (Special Uses)	1 and 2. Some site specific impacts to forest structure.
Recreation and Wilderness	1, 2 and 3. Recreation vehicle and foot impacts to riparian vegetation and disturbance of ground litter and woody debris.
Wildlife, Fish, and Rare Plants	2. Potential for limited short term impacts from trampling of prey habitat during monitoring or habitat assessments.

PCE 1 Forest structure

All program areas are likely to impact regeneration of woody species and herbaceous plant prey habitat. Most are likely to impact forest canopy cover and snag persistence through burning or thinning to some level.

PCE 2 Adequate prey species

Some program areas are likely to impact the amount of down woody material while others are likely to influence the density and vigor of herbaceous vegetation through foot, hoof, or equipment action.

PCE 3 Canyon habitat components

Some program areas are likely to impact the tree density that supports the cool microclimate needed to sustain MSO in canyon habitat; these are also likely to impact ground litter and woody debris.

Overall, essentially all program areas are likely to have some negative impacts to MSO primary constituent elements of critical habitat. However, it is important to note that LMP implementation would not necessarily have these impacts across all critical habitat for the MSO on the ASNFs.

Cumulative Effects and Climate Change

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur within the action area of impacts for a listed species. Timber harvest, prescribed burning activities, and livestock grazing occur on the adjacent White Mountain Apache and San Carlos Apache Reservations. The 15 PACs adjacent to or within about 300 feet of adjacent to private land may be subject to disturbance associated with residential, business, livestock grazing, and other activities.

The implications for MSO of climate change and variability with greater extremes of temperature and moisture could include declining acreage of forested habitat, greater risk of insect and disease impacts to habitat, and greater risk of stand-replacing wildfire.

MSO and Critical Habitat
Summary of Effects and Determinations

Overall LMP direction is to maintain or restore desired conditions for forest, woodland, and riparian forest PNVTs needed to support MSO. Objectives 1, 6, and 8 have the potential to help stabilize riparian areas and improve riparian composition, structure, and function where road removal and restoration projects occur within MSO recovery habitat. Objective 10 could potentially help improve riparian structure and the development of large trees. Objectives 11 and 13 have the potential to restore the composition and structure of forest and woodland PNVTs and reduce the potential for uncharacteristic wildfire.

All objectives except objective 27 (posting private land boundaries) are likely to have short term implementation impacts to MSO and prey habitat, although replacement of old, large trees and snags would be over the long term. All objectives, including objective 36 (personal and commercial fuelwood use), have the potential to disturb breeding MSO.

Standards and guidelines are designed to limit the extent, level, and duration of potential short term effects; however, LMP implementation does not provide for mitigation of all potential effects to a level that can be equated to or considered insignificant and/or discountable. Therefore, LMP implementation **may affect and is likely to adversely affect** the Mexican spotted owl and it **may affect and is likely to adversely affect** critical habitat for the species.

Southwestern willow flycatcher *Empidonax traillii extimus*

Endangered Species Act Status:	Endangered, February 27, 1995
Recovery Plan:	August 30, 2002
Critical Habitat:	January 3, 2013, revised
Determination of Effects (species):	May Affect, Likely to Adversely Affect
Determination Effects (critical habitat):	May Affect, Likely to Adversely Affect

For brevity, the Southwestern willow flycatcher is referred to as SWWF throughout the document.

Natural History, Distribution, and Status of the Species Range-wide

Life history, distribution, status of this species range-wide along with listing factors are found in documents located on the USFWS website http://www.fws.gov/southwest/es/arizona/Southwes.htm (accessed 2014). An account of the taxonomy, biology, and reproductive characteristics of the SWWF is found in the Final Recovery Plan (USFWS 2002). Vaughn (2014) also compiled information on this species from various sources. All these documents are incorporated by reference into this document.

Status and Threats within the Action Area

The ASNFs fall within two SWWF Recovery Units: the Lower Colorado Recovery Unit and the Gila Recovery Unit. There are three SWWF nesting sites on the ASNFs that are mostly or entirely surrounded by private land. The Little Colorado-Greer Townsite (hereafter Greer Townsite) and Little Colorado-Greer River Reservoir (hereafter Greer Reservoir) are located on the Springerville Ranger District. The San Francisco Creek [River]-Alpine Horse Pasture (hereafter Alpine HP) is located on the Alpine Ranger District. All three nesting sites occur within the montane willow riparian forest PNVT and the dominant willow at all sites is Geyer willow. Adjacent upland PNVTs on NFS lands include the ponderosa pine and wet mixed conifer forest PNVTs.

Together the two breeding sites in the vicinity of Greer make up about 46 acres of breeding habitat for the SWWF within the 4th code Little Colorado River Headwaters sub-basin. The dense willow patches here are very extensive across the broad floodplain and up to 20 feet tall with some younger trees present. These sites did not burn during the 2011 Wallow Fire; however, much of the uplands of the watershed draining into the two Greer sites burned severely. The public is not excluded from within these two SWWF breeding sites and they receive some fishing use throughout the summer. These two sites are adjacent to the Greer administrative horse pasture (HP) used for Springerville Ranger District riding stock (horses) but only grazed outside of the SWWF breeding season. State Highway 373 runs adjacent to these two Greer breeding sites; homes, businesses, and other structures and associated activities occur on adjacent private land.

The Alpine HP site contains about 55 acres of breeding habitat located within the 4th code San Francisco River sub-basin. Before 2000, heavy elk use (browsing and breakage) was impacting the density of the willows. In 2001, this site was fenced and willows are now 16-18 feet tall with various stages of younger willows present and all have increased their extent within the exclosure. Alpine Ranger District riding stock (horses and mules) do not graze within the elk exclosure and only graze in the remainder of the horse pasture outside of the breeding season. The public is excluded from entry into the Alpine HP breeding site by forest special order from May through July (in one year, when there was SWWF renesting due to a nest failure, the closure was extended through August 15th). US Highway 180 runs adjacent to the Alpine HP site; one county road on the east and one forest road on the west bound the Alpine HP breeding site.

Beavers became established at the Alpine HP site within the 7-foot high elk exclosure about 2007 and have created a series of dams that have backed up a substantial amount of water. While the beaver have impacted some willows, the ponding associated with their dams has helped to further the extent of willows in the exclosure. This nesting site did not burn during the 2011 Wallow Fire; however, much of the uplands of the watershed draining into the horse pasture burned severely. In 2013, due to heavy summer rainfalls on steep, burned slopes around the community of Alpine, the Alpine HP site experienced flooding much of the summer with some heavy pulses of flows; the beaver dams all held.

Another site, consisting of potential SWWF breeding habitat with primarily Geyer willow, is located just south of Nelson Reservoir on the Alpine RD. This site, along a broad floodplain on Nutrioso Creek, is referred to as the Nutrioso Wetland which encompasses approximately 104 acres. Nutrioso Wetland is located in the 4th code Little Colorado River Headwaters sub-basin. In 1994, a single SWWF male was detected in willows here. Because he did not remain, it was assumed this bird was migrating and this area provided a suitable stopover; however, there have been no other known surveys since. Because this site was also being heavily impacted by elk in the early 2000s, a 7-foot fencing was installed in 2003, comprised of one smaller (approximately 25 acres) and one larger (approximately 50 acres) exclosure. Since that time, many of the willows have increased to approximately 12-14 feet tall with smaller patches of willows expanding in size. This site did not burn during the 2011 Wallow Fire; however, much of the headwaters of Nutrioso Creek that drains into Nelson Reservoir below the willows burned severely.

AZGFD (1998) evaluated some other riparian areas for SWWF nesting potential on the Apache side of the ASNFs in both montane willow and mixed broadleaf deciduous riparian forest PNVTs. This included larger rivers, smaller streams, and other areas like wetlands with at least the potential for extensive willow stands. AZGFD determined that some sites have the long term potential (more than 10 years) to develop large stands provided that [typically] elk browsing be removed. These were PS Ranch, Wonderland Trap, Phelps Cabin, Spence Cabin, and Thompson Ranch. AZGFD also concluded that large riverine systems like the Blue, Black, and San Francisco are generally not suitable nesting sites over the long term because, while they can develop broad willow and cottonwood floodplains with slow or back water areas, they are subject to periodic high intensity flooding. As such, AZGFD has conducted no further habitat assessments for SWWF. However, both the further development of willow areas for nesting and/or the loss of backwater willow areas has likely occurred since 1998.

Between 1993 and 2004, AZGFD surveyed for nesting SWWF in the White Mountains including these three breeding sites. Greer Townsite was occupied consistently between 1996 and 2002 and again in 2006 with the number of territories ranging from 0 to 4 and a maximum of 8 adult birds. Greer Reservoir site was consistently occupied in all years surveyed, with 1 to 7 territories and a range of 1 to 16 adult birds. Alpine HP site was consistently occupied in all years surveyed, with 1 to 5 territories and a range of 1 to 10 adult birds. Formal monitoring of these sites ceased after 2006. Informal monitoring by the ASNFs has continued. No SWWF were located between 2007 and 2009 at the Alpine site; however, in 2010 six adults were observed during one survey attempt. No surveys were conducted in 2011 due to the Wallow Fire; surveys in 2012 and 2013 detected no SWWF.

Threats on the ASNFs and information about them include the following.

Loss or reduction of SWWF riparian habitat is an identified threat to SWWF, attributed in part to livestock grazing which can degrade and modify hydrology and vegetation structure of riparian habitats. Before about 2000, livestock grazing and browsing (use levels and seasons) on the ASNFs had reduced habitat conditions necessary for nesting (dense, multi-layered, extensive woody species with backwater or slow moving water for insect prey habitat). While livestock grazing is currently excluded from the three SWWF nesting sites, livestock use may be continuing to limit the development of potential nesting, foraging, and riparian migration corridor habitat elsewhere. Willows and willow-cottonwood habitats are yet typically fragmented across river and stream systems on the ASNFs. Grazing or browsing impacts are compounded by wild ungulate impacts to riparian habitat on the ASNFs, even where livestock have been removed. However, no recent, post-Wallow fire assessments of wild ungulate use on woody riparian species have been conducted.

Water developments and land development are also identified SWWF threats. Located on the ASNFs, spring developments that pipe water to private land are common in Greer (11 special use permits) and in Alpine (7 special use permits and one easement for a total of 10 spring developments and 4 wells), with

further development and demand for water likely. These are located both and above and below nesting sites and, while there is no way to assess, these water withdrawals could be impacting total water available to support riparian vegetation.

Large scale logging may result in damaging floods that could harm nesting habitat but his has not been observed on the ASNFs where large scale treatments have been implemented in the Alpine and Nutrioso wildland urban interface areas. Heavy flooding post 2011 Wallow Fire resulted in high flows but damaging debris flows did not reach the three SWWF nesting sites or the Nutrioso Wetland area. Recreation activities, if heavy enough, can damage and reduce the extent of willow nesting habitat but this has not occurred on the ASNFs. Disturbance to nesting SWWF from recreation activities at the two Greer sites (fishing, hiking) is possible but not likely due to limited use per Vicente Ordonez, staff wildlife biologist on the Springerville Ranger District. There is a special closure order prohibiting public entry during the nesting season at the Alpine HP SWWF site. The Nutrioso Wetland site receives essentially no recreational use.

The nonnative tamarisk has shown up on the ASNFs for at least the last decade, being found along streams or even roadsides from 6,000 to 9,000 feet in elevation. Although tamarisk is not known at the three nesting sites, the length of SWWF designated critical habitat or other possible migration riparian habitat outside of these sites has not been surveyed for tamarisk. Tamarisk can proliferate into, but on the ASNFs has not yet resulted in, monotonous layered stands with shifts in diversity of riparian vegetation and insect prey with the greater potential for fire, flooding, and erosion.

Drought and climate change may be threatening this species. Since 2000, persistent drought occurred frequently across the ASNFs with reduced stream flows and lowered levels in water bodies such as reservoirs, beaver dams, or cienegas. What has also occurred are limited, interspersed periods of higher than normal precipitation.

Cowbird nest parasitism can also threaten SWWF. Nest monitoring by AZGFD between 1993 and 2006 did not detect any cowbird nest parasitism at ASNFs nesting sites. Cattle, horses, donkeys, and llamas graze on private land throughout the summer in both the Greer and Alpine valleys. Based on current livestock grazing decisions and associated informal consultations, all pastures or portions of them within 2 miles of the Alpine SWWF nesting site are not grazed until August 1st or thereafter each year.

Potentially positive actions for the species undertaken by the ASNFs include the following. As noted above, there is a special closure order at the Alpine HP nesting site. Tamarisk control has taken place on along various streams. To date, these have primarily been along the Blue River (along about 25 stream miles in 2012 and 2013) with plans for continuing control provided funding is available. Substantial annual reductions in numbers and time in pasture to livestock grazing on the Alpine Ranger District were made from 2001 through 2003 in response to drought; this has helped retain plant vigor especially in riparian areas.

Beginning in 1998, the ASNFs conducted cowbird trapping at all three SWWF nesting sites in accordance with the Southwestern Regional Forester's 1997 direction (USFS 1997) based on reinitiation of consultation on the 1987 forest plan (i.e., SWWF was one of seven "species of concern"). Cowbird trapping was used for livestock grazing consultations under various versions of the evaluation criteria or framework for streamlining consultation for livestock grazing. In conjunction, the threat of cowbird nest parasitism is addressed by current livestock grazing decisions on the Alpine Ranger District whereby livestock do not graze within 2 miles of the Alpine nest site during the SWWF breeding and young rearing period (May through July). From 2003 to 2007, traps were only monitored for cowbirds with a total of three cowbird detections; trapping was thereafter discontinued. In 2013, after discussions with

USFWS it was determined there was no longer a need for cowbird trapping (Beth Humphrey, ASNFs Forest Biologist).

For a number of reasons, (grazing decisions, vacant allotments or pastures, etc. but all subject to change) several streams that may provide riparian migration corridor habitat for SWWF (e.g., Hannagan Creek, Fish Creek, Bear Wallow, Reservation Creek, Corduroy Creek, Double Cienega Creek, Conklin Creek, Black River, Blue River, Lower Campbell Blue Creek, Nutrioso Creek, and portions of Rudd Creek) are not grazed by livestock (originally, for the most part, related to listed fish species concerns within livestock grazing decisions).

Critical Habitat and Primary Constituent Elements

Critical habitat primary constituent elements are the physical or biological features essential to the conservation of the species that may require special management considerations or protection. The USFWS designated critical habitat for the SWWF in Arizona, California, and New Mexico in 1997 and in 2005 designated revised critical habitat to include Nevada and Utah. In 2013, the USFWS again revised the critical habitat designation to include 1,227 miles of streams and 208,973 acres. On the ASNFs, there is a total of approximately 1,711 acres of designated SWWF critical habitat (with an additional 388 acres of private land within the ASNFs boundary). SWWF critical habitat includes 39.4 stream miles on the ASNFs (with an additional 6.6 miles of stream on private land within the ASNFs boundary). The width of SWWF critical habitat coincides with the 100-year floodplain as detailed by the critical habitat listing (USFWS 2013).

Details of this critical habitat (CH), which encompasses one river segment with a tributary and two different segments on another river, follow.

1. Along the West Fork Little Colorado River and along the main stem Little Colorado River within the Springerville Ranger District (some of which goes through the community of Greer): In length about 13.9 miles, encompassing a total of 368 acres. Of this acreage, 94% or about 344 acres are NFS lands. Livestock grazing occurs as follows:
   a) Private lands have both seasonal and yearlong grazing by primarily horses and cattle (cumulative effect).
   b) The Springerville Greer administrative HP, situated next to private land sections along the river, is grazed outside of the SWWF breeding season (as noted above), and
   c) Allotment pastures on other NFS lands that contain some CH are grazed by authorized livestock, some as early as May.
2. Along the (north segment of) San Francisco River through the Alpine valley within the Alpine Ranger District (some of which goes through the community of Alpine): In length about 9.4 miles, encompassing a total of 452 acres. Of this acreage, 18% or about 81 acres are on private land. Livestock grazing occurs as follows:
   a) Private lands have both seasonal and yearlong grazing by primarily horses and cattle (cumulative effect).
   b) The NFS lands occur along three sections of the San Francisco River:
      b1) No livestock grazing is currently authorized on CH upstream of the community of Alpine on NFS lands [per the Williams Valley allotment decision, 2001, a drift fence keeps cattle off the San Francisco River roughly in what became SWWF CH in 2013],
      b2) CH within the Alpine Horse Pasture situated between private land segments along the river is grazed by Forest Service stock outside of the SWWF breeding season (as noted above), and

b3) CH from where Little Creek enters the river below the Luna Lake dam to the New Mexico state line can be grazed after July 15th each year.

3. Along the (south segment of) San Francisco from the New Mexico state line downstream within the Clifton Ranger District (a small segment of which goes through private land along the river): In length about 22.8 miles encompassing a total of 1,278 acres. Of this acreage, 1.6% or about 20 acres are on private land. Livestock grazing occurs as follows:
   a) Private lands have both seasonal and yearlong grazing by primarily horses and cattle (cumulative effect).
   b) The NFS lands that occur along the San Francisco River within CH are not currently authorized for livestock grazing.

There are two primary constituent elements of critical habitat for the SWWF as follows.

1) Riparian Vegetation
   a. Riparian habitat along a dynamic river or lakeside, in a natural or manmade successional environment (for nesting, foraging, migration, dispersal, and shelter) that is comprised of trees and shrubs and some combination of:
      i. Dense riparian vegetation with thickets of trees and shrubs ranging in height from 6 to 98 feet,
      ii. Areas of dense riparian foliage at least from the ground level up to 13 feet above the ground, or dense foliage only at the shrub or tree level as a low, dense canopy,
      iii. Sites for nesting that contain a dense (about 50 to 100% tree and/or shrub canopy,
      iv. Dense patches of riparian forests that are interspersed with small openings of open water or marsh or areas with shorter, sparser vegetation that creates a variety of habitat that is not uniformly dense. Patch size may be as small as 0.25 acres or as large as 175 acres.
2) Insect Prey Populations
   a. A variety of insect prey populations found within or adjacent to riparian floodplains or moist environments, which can include:
      i. flying ants, wasps, and bees (*Hymenoptera*); dragonflies (*Odonata*); flies (*Diptera*); true bugs (*Hemiptera*); beetles (*Coleoptera*); butterflies, moths, and caterpillars (*Lepidoptera*); and spittlebugs (*Homoptera*).

Species and Habitat Effects

In the individual program area discussions below, the implication of relevant desired conditions to SWWF are noted. Potential impacts of each objective, standard, and guideline to the species and habitat are described. Where applicable, management areas are addressed. A determination of effects is then made for that program area. Subsequent to all program areas, an overall determination of effects for this species and its critical habitat from LMP implementation is provided in the Summary of Effects and Determinations section for SWWF.

Wildland Fire Management

There are two relevant desired conditions that guide management and activities here (see appendix A). Desired conditions 42 and 296 would direct management actions to restore fire to its historic role where large scale high severity fires were rare.

Based on FVS-FFE modeling, the risk of uncharacteristic wildfire would be reduced by one fire regime condition class in the dry mixed conifer PNVT and it would improve trend in in the other surrounding forested PNVTs after 15 years. These upland improvements could reduce the likelihood of wildfire entering riparian habitat. Prescribed fire and wildfire suppression could also result in short term impacts (e.g., heavy flows with ash or sediment) to SWWF nesting, potential nesting, foraging, and riparian migration corridor habitat.

- GL 174 Firelines, helispots, and fire camps should be located to avoid disturbance to critical species and impacts to cultural resources.
- GL 175 Aerial retardant drops should avoid threatened, endangered, proposed, or candidate, or identified sensitive species and waterways.

Guidelines 174 and 175 have the potential to reduce the likelihood of fire suppression impacts to the SWWF and its habitat.

Prescribed fire could, over the long term, to reduce uncharacteristic wildfire and the associated risk of substantial or complete loss of riparian areas providing SWWF nesting or migratory habitat. While guidelines could help limit potential disturbance and habitat impacts from wildfire, not all impacts associated with prescribed burning and other program activities may be reduced or eliminated. As such, this program area may affect and is likely to adversely affect SWWF and its habitat.

Ecosystem/Vegetation Health

There are four relevant desired conditions that guide management and activities here (see appendix A). Desired conditions 1 and 4 would help ensure resilient, connected habitat conditions that could support SWWF nesting and migration. Desired condition 43 would help provide for the willows that comprise nesting structure and foraging and riparian migration corridor habitat. Desired condition 45 would provide for the habitat necessary to support the SWWF breeding population in the White Mountains as well as migratory habitat used by SWWF.

- OBJ 11 Annually, treat 5,000 to 35,000 acres to reduce [forest PNVTs] tree densities, restore natural fire regimes, promote species habitat and ecosystem health, reduce fire hazard, maintain desired conditions, initiate recovery from uncharacteristic disturbance, and provide forest products, leaving a desired mix of species with the range of desired densities that are resilient to changing climatic conditions.

Based on VDDT modeling of this objective, changes in conditions for PNVTs surrounding SWWF habitat are shown in table 11. Modeling indicates that both PNVTs move toward desired conditions, i.e., become less departed from desired conditions, after 15 years of management under the LMP (although only slightly so for the wet mixed conifer PNVT).

Table 11. Movement toward DC after 15 and 50 years within PNVTs associated with SWWF (based on VDDT modeling [a/])

PNVT	Current (%) departure from DC	Departure (%) at 15 years	Departure (%) at 50 years [b/]
Ponderosa pine forest	77	63	54
Wet mixed conifer forest	54	52	51

[a/] Percentage is based on VDDT modeling of the *high* treatment acres for alternative B, the proposed LMP.

[b/] Assuming LMP direction would continue to be implemented to year 50; however, a new forest plan would be required

before then which would be based on current conditions at that time.

Reduced departures after 15 years indicate that conditions (e.g., stand openness, herbaceous vegetation density and vigor) and disturbances (e.g., wildland fire) are closer to desired and reference or historic conditions. Where thinning and burning activities occur upslope and upstream of SWWF habitat, objective 11 has the potential to increase ground cover to carry periodic cool ground fires and, with decreased crown densities, to reduce the risk of severe wildfires that can burn intensely enough to consume riparian forests used by SWWF. However, these activities also have the potential to result in short term ash and sediment impacts that could possibly impact insect prey, as well as possibly disturb nesting or migrating SWWF, depending on proximity of activities.

- GL 23 Landscape scale restoration projects should be designed to spread treatments out spatially and/or temporally within the project area to reduce implementation impacts and allow reestablishment of vegetation and soil cover.
- GL 30 Ground-disturbing projects (including prescribed fire) which may degrade long term riparian conditions should be avoided.
- GL 86 Management should emphasize long term reestablishment of native deciduous trees, shrubs, and herbaceous vegetation to maintain ecosystem diversity.

Guideline 23 has the potential to help maintain or reestablish vegetation and soil cover, thereby limiting possible higher flows with debris and sediment into adjoining riparian areas. Guideline 30 could potentially protect SWWF habitat from other than short term impacts caused by activities such as thinning or burning. After a landscape scale disturbance event, guideline 86 has the potential to contribute to the reestablishment of dense canopies in riparian areas that might provide SWWF habitat, although it may take an extended period of time to reestablish nesting structure.

This program area could help improve upland conditions that contribute to a more stabilized riparian areas that characterizes SWWF habitat (extensive, well developed willow stands). While guidelines could limit short term impacts from restoration thinning (equipment, soil disturbance, and sediment), not all negative effects would be reduced or eliminated. As such, this program area may affect and is likely to adversely affect SWWFC and its habitat.

Rangeland Management

There are three desired conditions relevant here. Desired condition 78 would provide for riparian areas free of invasive plants like tamarisk and desired condition 202 would provide, as necessary, areas free of cowbirds parasitism where SWWF might nest. Considerations of importance to rangeland management are the timing and amount of vegetation removed by livestock through foraging and trampling. Where annual fluctuations and seasonality of forage production are considered, desired condition 278 would help provide sufficient ground cover to reduce the ability of overland flow to carry sediment and organic matter into riparian areas that may be used by SWWF for nesting, forging, or as riparian migration corridors.

- OBJ 17 Annually, contain, control, or eradicate invasive species (e.g., tamarisk, bullfrogs) on at least 2 stream miles.

Objective 17 has the potential to help limit invasives plants like tamarisk from proliferating in SWWF habitat where this objective is implemented in SWWF habitat.

- ST 3 Within each PNVT, vegetation management activities shall be designed to maintain or move plant composition towards a moderate to high plant community similarity as compared to site potential.
- ST 11 Projects and authorized activities shall be designed to reduce the potential for introduction of new species or spread of existing invasive or undesirable aquatic or terrestrial nonnative populations.

Standard 3 has the potential to help ensure that vegetation management activities help provide for appropriate plant composition in riparian areas that provide or may potentially provide habitat for SWWF; in some areas this may take an extended period of time to achieve. Standard 11 has the potential to help preclude impacts from nonnative species within SWWF habitat (e.g., Canada thistle).

- GL 81 Pesticide use should minimize impacts on nontarget plants and animals.
- GL 32 Active grazing allotments should be managed to maintain or improve to desired riparian conditions.
- GL 132 Critical areas should be managed to address the inherent or unique site factors, conditions, values, or potential conflicts associated with them.
- GL 134 New livestock troughs, tanks, and holding facilities should be located out of riparian areas to reduce concentration of livestock in these areas. Existing facilities in riparian areas should be modified, relocated, or removed where their presence is determined to inhibit movement toward desired riparian or aquatic conditions.
- GL 136 Forage, browse, and cover needs of wildlife, authorized livestock, and wild horses should be managed in balance with available forage so that plants providing these needs remain at or move toward a healthy, persistent condition.
- GL 138 To minimize potential resource impacts from livestock, salt or nutritional supplements should not be placed within a quarter of a mile of any riparian area or water source. Salt or nutritional supplements should also be located to minimize herbivory impacts to aspen clones.
- GL 139 To prevent resource damage (e.g., streambanks) and disturbance to federally listed and sensitive wildlife species, trailing of livestock should not occur along riparian areas. Where no alternative route is available, approval may be granted where effective mitigation measures are implemented (e.g., timing of trailing, number of livestock trailed at one time).

Three guidelines have the potential to help protect or restore riparian habitat and the uplands that contribute to riparian conditions that support or may support SWWF nesting, foraging, and riparian corridor migration habitat. This would be addressed by stocking in balance with available forage (GL 136), by requirements to improve habitat (GL 32), and by managing for the special concerns within riparian areas (GL 132) which are critical areas for livestock grazing management.

Guidelines 134, 138, and 139 have the potential to help limit impacts from livestock grazing and trampling within potential SWWF nesting, foraging, and riparian corridor migration habitat through proper placement of water and salt and limits to livestock trailing. Should pesticides be needed in riparian areas (e.g., tamarisk control), guideline 81 has the potential to help limit impact to nontarget vegetation.

Following is a synopsis of where, within critical habitat for SWWF livestock grazing is currently authorized, although subject to change. Included are the main pastures and areas authorized for grazing; smaller portions of pastures or other areas within critical habitat are not shown. Note that the following does not include other potentially suitable nesting, foraging, or riparian migration corridor habitat for SWWF.

- Main stem Little Colorado River – livestock grazing on the Greer Allotment in the Fish Creeks and, Bigelow pastures; riding stock grazing on the Springerville Ranger District administrative horse pasture, only post SWWF breeding season.
- West Fork Little Colorado River – no livestock grazing on South Fork Conservation Area and Mount Baldy Wilderness.
- San Francisco River (north) – livestock grazing on the Williams Valley allotment in the Williams Valley pasture with a short segment adjacent to private land excluded; riding stock grazing on the Alpine administrative HP, only post SWWF breeding season; livestock grazing on the Whitmer portion of the Coyote-Whitmer/Turkey Creek allotment in the Luna Lake Campground and Little Creek pastures.
- San Francisco (south) – no livestock grazing (numerous grazing allotments).

This program area could, where livestock are not excluded, impact SWWF through trampling or browsing of riparian woody vegetation in potential nesting and riparian corridor migration habitat. In addition, cowbird parasitism is always a possibility even though it has not been known to previously occur. Even where excluded, adjacent livestock use could degrade stream hydrology or impact the aquatic habitat of SWWF insect prey. While standards and guidelines could limit livestock grazing and management impacts, not all negative impacts would be reduced or eliminated. Hence there may be competition or conflict (FEIS pg. 462), but the specific impacts of livestock grazing would be analyzed in site specific NEPA analyses (FEIS pg. 470). As such, this program area may affect and is likely to adversely affect SWWF and its habitat.

Watershed and Soil Management

There are ten relevant desired conditions that guide management and activities here (see appendix A). Desired conditions 9, 22, 33, and 77 would provide for functioning watersheds, soils, and vegetation that maintain or improve riparian conditions. These would help support habitat and self-sustaining riparian plant and animal populations (DC 34) including the SWWF. Diverse, multi-age, large, and dense riparian structure which is used for nesting, foraging, and migrating SWWF is provided for by desired conditions 66 and 85. Desired conditions 292 and 293 would help secure surface flows necessary to sustain riparian vegetation while desired condition 71 would provide, in part, the ponding or back water areas needed by SWWF insect prey.

- OBJ 4 Annually, enhance or restore 5 to 15 miles of stream and riparian habitat to restore structure, composition, and function of physical habitat for native fisheries and riparian-dependent species.
- OBJ 6 Annually, move 200 to 500 acres toward desired composition, structure, and function of streams, floodplains, and riparian vegetation.
- OBJ 38 Annually, prepare at least one instream flow water rights application until water acquisition needs are complete to sustain riparian areas, fish, wildlife, and water-based recreation.

Objectives 4 and 6 have the potential to improve riparian areas (e.g., by removing invasive conifers) that could be potential nesting or riparian migration corridor habitat for SWWF. Objective 38 has the potential to help protect water and sustain riparian vegetation where instream flow applications are filed for within watersheds providing or potentially providing SWWF habitat.

No regional riparian VDDT models were developed to assess movement toward desired conditions with implementation of the first two objectives where they may be implemented within SWWF habitat. However, the Riparian Specialist Report (2014) estimates that improvement of 2 - 6% in overstory conditions may occur in riparian PNVTs across the ASNFs including the montane willow riparian forest PNVT; otherwise, some overall movement toward desired conditions is expected, but this is not quantified.

- ST 1 Consistent with existing water rights, water diversions or obstructions shall at all times allow sufficient water to pass downstream to preserve minimum levels of waterflow that maintain aquatic life and other purposes of national forest establishment.
- ST 32 Streams on NFS lands with high aquatic values and at risk from new water diversions shall be preserved and protected with instream flow water rights.
- ST 33 Groundwater withdrawals shall not measurably diminish surface water flows on NFS lands without an appropriate surface water right.

Standards 1, 32, and 33 have the potential to help preserve water flows and associated riparian vegetation that supports or could potentially support SWWF habitat.

- GL 2 Projects with ground-disturbing activities should be designed to minimize long and short term impacts to soil resources. Where disturbance cannot be avoided, project specific soil and water conservation practices should be developed.
- GL 8 Streamside management zones should be in place between streams and disturbed areas and/or road locations to maintain water quality and suitable stream temperatures for aquatic species.
- GL 10 Constraints (e.g., maximum limit to which water level can be drawn down or minimum distance from a connected river, stream, wetland, or groundwater-dependent ecosystem) should be established for new groundwater pumping sites permitted on NFS lands in order to protect the character and function of water resources.
- GL 18 Sufficient water should be left in streams to provide for aquatic species and riparian vegetation.

Guidelines 2 and 8 have the potential to limit impacts to soils and help protect steam and water qualities from impacts caused by riparian enhancement or restoration projects. Guidelines 10 and 18 could also potentially help preserve water flows and associated riparian vegetation that supports or could potentially support nesting, foraging, or riparian migration corridor habitat for SWWF.

This program area could help to improve overall watershed conditions, including soil and vegetation conditions in PNVTs surrounding SWWF habitat. It also could improve riparian conditions by supporting actions that could maintain or expand riparian habitat. However, there could be short term impacts from equipment, plantings, or other restoration activities. While standards and guidelines could limit impacts, not all negative impacts would be reduced or eliminated. As such, this program area may affect and is likely to adversely affect SWWF and its habitat.

Engineering Program

There are no desired conditions that guide management and activities in this program area relevant for the SWWF.

- OBJ 8 Annually, remove an average of 2 miles of unauthorized roads or trails that add sediment to streams, damage riparian vegetation, erode streambanks, cause gullies, and/or compact floodplain soils.

Objective 8 has the potential to improve SWWF habitat or potential habitat by removing some road impacts (e.g., gullying and sediment deposition) within riparian and floodplain areas, although restoration activities could disturb SWWF, if present.

- ST 15 Motorized vehicle travel shall be managed to occur only on the designated system of NFS roads and motorized trails and designated motorized areas.

Standard 15 has the potential to limit impacts from motorized vehicle use within riparian areas and could potentially improve or facilitate the development of woody species structure needed within riparian migration corridor habitat.

- GL 99 New roads, motorized trails, or designated motorized areas should be located to avoid meadows, wetlands, riparian areas, stream bottoms, sacred sites, and areas with high concentrations of significant archaeological sites. The number of stream crossings should be minimized or mitigated to reduce impacts to aquatic species.
- GL 100 As projects occur in riparian or wet meadow areas, unneeded roads or motorized trails should be closed or relocated, drainage restored, and native vegetation reestablished to move these areas toward their desired condition.

Guidelines 99 and 100 have the potential to reduce road impacts within riparian areas that could provide potential nesting, foraging, or migration habitat for SWWF, although motorized road or trail removal activities have the potential to result in sediment flows and disturbance of vegetation.

This program area, primarily through the presence and maintenance of roads and motorized trails, could damage soil and vegetation within riparian areas developing as SWWF nesting and foraging or riparian migration corridor habitat. It could also restore some riparian areas where SWWF may be present by road removal, although there would be short term impacts from restoration activities. While there are standards and guidelines that support this improvement, not all short term negative impacts would be reduced or eliminated. As such, this program area may affect and is likely to adversely affect SWWF and its habitat.

Lands and Minerals Program

There are no desired conditions that guide management and activities in this program area relevant for the SWWF.

- ST 31 Special uses for water diversions shall maintain fish, wildlife, and aesthetic values and otherwise protect the environment.

Standard 31 has the potential to help sustain water and vegetation within existing and potential nesting, foraging, and riparian migration corridor habitat for SWWF.

- GL 146 Streambed and floodplain alteration or removal of material should not occur if it prevents attainment of riparian, channel morphology, or streambank desired conditions.
- GL 166 As applicable, issuance of special use authorizations should incorporate measures to reduce potential impacts to wildlife and avoid rare and unique habitats (e.g., bogs, fens).

Guideline 146, by prohibiting some riparian area alterations (e.g., mineral pits) that could impact river hydrology, has the potential to help limit impacts to SWWF habitat. Guideline 166 could potentially reduce impacts to developing nesting or foraging and riparian migration corridor habitat for the SWWF from special uses (e.g., large group gatherings).

The minerals portion of this program area could impact riparian function and special uses could damage riparian vegetation and disturb SWWF, if present. While guidelines could limit impacts, not all negative

impacts would be reduced or eliminated. As such, this program area may affect and is likely to adversely affect SWWF and its habitat.

Recreation and Wilderness Program

There is one relevant desired condition that guides management and activities here (see appendix A). Desired condition 211 would provide for recreation that does not negatively impact wildlife habitat and populations. It would also support future forest closure orders or developments (e.g., willow protection fencing), as needed.

- OBJ 18 Annually, rehabilitate, stabilize, revegetate, or relocate an average of five dispersed campsites to improve recreation opportunities and/or protect the environment.

Objective 18 has the potential to improve degraded dispersed campsites and associated riparian areas within or upslope or upstream of SWWF habitat. It also has the potential to result in short term implementation impacts until sites revegetate and stabilize.

- ST 13 Dispersed campsites shall not be designated in areas with sensitive soils or within 50 feet of streams, wetlands, or riparian areas to prevent vegetation and bank damage, soil compaction, additional sediment, or soil and water contamination.

Standard 13 has the potential to help preclude recreation impacts to soils, streambanks, floodplains, and riparian vegetation within developing SWWF habitat.

- GL 7 Streams, streambanks, shorelines, lakes, wetlands, and other bodies of water should be protected from detrimental changes in water temperature and sediment to protect aquatic species and riparian habitat.
- GL 94 Timing restrictions on recreation uses should be considered to reduce conflicts with wildlife needs or soil moisture conditions.
- GL 95 Dispersed campsites should not be located on or adjacent to archaeological sites or sensitive wildlife areas.

Guideline 7 has the potential to limit impacts from recreational activities. Timing restrictions under guideline 94 could potentially limit recreation related impacts where recreation is found to be impacting nesting SWWF. Guideline 95 has the potential to preclude dispersed campsites within sensitive wildlife areas which could include potential nesting, foraging, or riparian migration corridor habitat for SWWF.

This program area could impact SWWF and habitat where hiking, fishing, or camping occurs within potential nesting, foraging, and riparian migratory corridor habitat. There could be some habitat improvement where campsites are rehabilitated but recreation at these sites could still impact SWWF. While standards and guidelines could limit impacts, not all negative impacts would be reduced or eliminated. As such, this program area may affect and is likely to adversely affect SWWF and its habitat.

Wildlife, Fish, and Rare Plant Program

There are four relevant desired conditions that guide management and activities here (see appendix A). Desired conditions 196 and 198 would direct management to contribute to the recovery of SWWF and would address the threat to nesting SWWF from noise and disturbance. Desired condition 203 would address invasive species like tamarisk at an early stage. The presence of beavers would contribute to development of extensive woody species regeneration and backwater areas that can provide for SWWF needs (DC 72).

- OBJ 5 During the planning period, complete at least five projects (e.g., remove barriers, restore dewatered stream segments, or connect fragmented habitat) to provide for aquatic and riparian associated species and migratory species.
- OBJ 10 Annually, work with partners to reduce animal damage to native willows and other riparian species on an average of 5 miles of riparian habitat.

Objective 5 has the potential to help retain and possibly expand desirable woody species to provide additional SWWF nesting, foraging, and riparian corridor migration habitat. Objective 10 could potentially help protect willows from ungulate damage, thereby allowing them to proliferate and provide more robust and expanded SWWF habitat.

- GL 19 Projects and activities should avoid damming or impounding free-flowing waters to provide streamflows needed for aquatic and riparian-dependent species.
- GL 29 Project plans should include quantitative and/or qualitative objectives for implementation monitoring and effectiveness monitoring to assist in moving toward or maintaining desired conditions.
- GL 65 Activities occurring within federally listed species habitat should apply habitat management objectives and species protection measures from recovery plans.
- GL 67 Modifications, mitigations, or other measures should be incorporated to reduce negative impacts to plants, animals, and their habitats and to help provide for species needs, consistent with project or activity objectives.
- GL 71 Cool and/or dense vegetation cover should be provided for species needing these habitat components (e.g., Goodding's onion, black bear, White Mountains chipmunk, western yellow-billed cuckoo).

Guideline 19 has the potential to retain or expand habitat for SWWF and their insect prey by ensuring free-flowing water. Guideline 29 would require monitoring to provide feedback about project implementation effects or effectiveness of mitigation measures for SWWF and would guide future management toward desired conditions. Guideline 65 has the potential to contribute to recovery of SWWF while guideline 67 has the potential to help protect SWWF and habitat. Guideline 71 could potentially help provide the dense, extensive willow habitat used by SWWF for nesting.

This program area could reduce impacts to riparian habitat, although surveys for SWWF and habitat assessment could disturb nesting SWWF, if present, and possibly impact some aquatic insect prey habitat. While guidelines could limit restoration and other activity impacts and require project or activity mitigations or modifications, not all negative impacts would be reduced or eliminated. As such, this program area may affect and is likely to adversely affect SWWF and its habitat.

Community-Forest Intermix Management Area

This management area would receive more intensive treatments relative to reducing the risk of uncharacteristic wildfire and two community-forest intermix management areas (Greer and Alpine) contain riparian habitat with nesting SWWF. However, desired condition 314 would help provide for the integrity of riparian areas within community-forest intermix treatments.

Critical Habitat and Primary Constituent Elements

Effects to suitable and potential nesting, foraging, and riparian corridor migration habitat for SWWF discussed above would apply to critical habitat for this species. Table 12 shows which program areas may impact specific critical habitat PCEs in either a positive or negative manner.

Table 12. SWWF critical habitat PCEs potentially impacted by program area

Program Area	Affected PCEs (by number) and Principle Mechanism
Wildland Fire Management	1 and 2. Equipment or burning impacts such as ash and sediment deposition from equipment or burning; there is also the potential to reduce risk of severe wildland fire and associated scouring floods.
Ecosystem/Vegetation Health (Forest Products)	
Rangeland Management	1 and 2. Where livestock are not excluded, grazing and trampling impacts to vegetation, possible hydrologic changes; and water quality impacts that may affect insect prey.
Watershed and Soil Management (Riparian Areas)	1 and 2. Short term impacts from implementation of riparian restoration objectives and other watershed restoration work plus potential restoration of riparian structure and function.
Engineering	1 and 2. Sediment deposition channeled by roads; short term impacts to vegetation and water with removal or relocation of unneeded roads.
Lands and Minerals (Special Uses)	1. Potential impacts to vegetation from mineral pits or special use activities in potential nesting or riparian migration corridor habitat.
Recreation and Wilderness	1 and 2. Trampling streambank and riparian herbaceous vegetation; possible crushing/breaking woody vegetation; and sediment impacts to insect backwater or moist floodplain vegetation prey habitat.
Wildlife, Fish, and Rare Plants	2. Potential for short term impact from trampling of insect prey aquatic habitat with monitoring or habitat assessments.

PCE 1 Riparian vegetation
All program areas are likely to influence runoff, sediment deposition, and possibly stream hydrology to some extent which can impact vegetation that supports or could support nesting, foraging, and migrating SWWF.

PCE 2 Insect prey populations
Most all program areas that influence water and vegetation are likely to impact production, and possibly timing, of insect prey.

Overall, essentially all program areas are likely to have some negative impacts to SWWF primary constituent elements of critical habitat. However, it is important to note that LMP implementation would not necessarily have these impacts across all critical habitat for the SWWF on the ASNFs.

Cumulative Effects and Climate Change

Private land around the Alpine and Greer SWWF nesting sites include homes, livestock facilities, and businesses such as restaurants, markets, and gas stations. Uses like wells, water diversions, and septic systems are common. These same private land features or uses also occur along the Blue River and elsewhere with the potential for developing SWWF habitat. ADOT uses de-icing agents on US Highway 180 in Alpine and on State Highway 373 in Greer which could damage nearby willows. Although

damage here is not currently evident in these locations, it is evident elsewhere on the ASNFs along US Highway 260 where this practice has occurred for a longer period of time and tree damage there has been determined to have been caused by road salts (USFS 2008).

The implications of climate change and variability for SWWF with greater extremes of temperature and moisture could include reduced water quantity or result in inconsistent stream flows and loss of riparian habitat. Cycles of insect prey may also be modified or disrupted.

SWWF and Critical Habitat
Summary of Effects and Determinations

Overall LMP direction is to maintain or restore desired conditions for watersheds and riparian areas. Objectives 4, 5, 6, 8, 10, 17, and 38 have the potential to maintain or improve riparian conditions, including within potential SWWF nesting, foraging, and migration corridor habitat. Objective 11 has the potential to reduce uncharacteristic wildfire from entering riparian areas and subsequent damage to SWWF habitat from potentially heavy flooding.

All objectives except 38 are likely to have short term detrimental effects. Standards and guidelines would require measures to limit the extent, level, and duration of potential short term effects and even preclude negative long term effects in the case where long term riparian degradation cannot be avoided. However, not all restoration or other activity implementation effects would be mitigated to a level that can be equated to or considered insignificant and/or discountable. Therefore, LMP implementation **may affect and is likely to adversely affect** the Southwestern willow flycatcher, and it **may affect and is likely to adversely affect** critical habitat for the species.

Western yellow-billed cuckoo *Coccyzus americanus occidentalis*

Endangered Species Act Status:	Proposed threatened, October 3, 2013
Recovery Plan:	None
Critical Habitat:	Under consideration
Determination of Effects (Species-Proposed):	Not Likely to Jeopardize
Determination Effects (Species-Listed):	May Affect, Likely to Adversely Affect

The 2013 proposal is regarding the western distinct population segment of the yellow-billed cuckoo; hence, for brevity, the western yellow-billed cuckoo is referred to as WYBCU throughout the document.

Natural History, Distribution, and Status of the Species Range-wide

Life history, distribution, status of this species range-wide are found in documents located on the USFWS website http://www.fws.gov/southwest/es/arizona/Yellow.htm (accessed 2014). An account of the taxonomy, natural history, and status is found in the 12-month finding for a petition to list the WYBCU. (USFWS 2001). Vaughn (2014) also compiled information on this species from various sources. All these documents are incorporated by reference into this document.

Status and Threats within the Action Area

There have been no systematic surveys for the WYBCU on the ASNFs; however, there are some incidental known occurrences. In 1985, at the confluence of the Blue and San Francisco Rivers on the Clifton Ranger District, eight WYBCU pairs were detected. This area was again surveyed in 1998 and two pairs and a single male were detected. Also in 1998, at the confluence of Horse Canyon and the Blue

River just south of the Blue Range Primitive Area boundary also on the Clifton Ranger District, one pair and one single male were detected. In July 2008, then Alpine District staff wildlife biologist Jim Copeland, who had previously worked in occupied YBCU habitat in Texas, detected cuckoo calls in the upper Blue River by Bobcat Flat (T4N R32E sec. 5 SE¼SE¼) on the Alpine Ranger District. Incidental observations of WYBCU along Eagle Creek on the Clifton Ranger District have been made over the years according to Lance Brown, Clifton Ranger District biologist from 2007 to 2013.

The Clifton Ranger District WYBCU locations on the Blue and San Francisco Rivers and along Eagle Creek occur within the mixed broadleaf deciduous riparian forest PNVT. These sites also include sycamore and mesquite. Adjacent uplands include the Madrean pine-oak and semi-desert grassland PNVTs. The Alpine Ranger District location is within the cottonwood-willow riparian forest PNVT and includes box elder. Adjacent uplands include the ponderosa pine PNVT.

Lower segments of tributaries on the Blue and San Francisco Rivers contain larger areas with mixed broadleaf deciduous and cottonwood-willow riparian forest PNVTs in places that could potentially provide WYBCU nesting habitat. However, no surveys are known to have been conducted in locations other than those cited above. The cottonwood-willow riparian forest PNVT occurrence on the Sitgreaves side of the ASNFs is not likely to provide habitat extensive enough for nesting.

Threats on the ASNFs and information about them include the following.

High severity wildfire and subsequent flooding can put WYBCU at risk. A number of large scale wildfires have occurred within the Blue River (2003 and 2004) and Eagle Creek (2007 and 2008) watersheds. While only a limited amount of riparian forest was burned, subsequent heavy flooding has removed some riparian forest structure along the Blue River and upper Eagle Creek but the extent of impacts has not been assessed. Heavy rainfall in 2013 continued to impact some riparian forest structure in these drainages but again this has not been assessed. Prescribed fire has been commonly utilized on the Clifton Ranger District and some burning has occurred near but not within tributaries of the San Francisco River.

Roads can remove or degrade riparian vegetation or alter stream or fluvial dynamics that could support nesting WYBCU habitat. Forest road 271 (maintenance level 3) crosses a mix of NFS and private land. It occurs within the floodplain and crosses the length of Eagle Creek numerous times. Forest road 281 (level 3) occurs within the floodplain and crosses the Blue River several times. Forest Road 30 (level 2) occurs with the floodplain of Campbell Blue Creek. This road ends at private land.

Historically, livestock grazing has also been a major contributor to degradation and modification of riparian habitats on the Blue River (Leopold 1946) and likely elsewhere. Current ASNFs decisions to remove livestock grazing on NFS lands along the Blue and San Francisco Rivers and Eagle Creek has removed grazing impacts and may be helping the development of possible WYBCU nesting habitat over time (although livestock trailing is still authorized on Eagle Creek (2/26/02 biological opinion)). Livestock grazing is also not currently authorized on lower Campbell Blue Creek on the Turkey Creek allotment based on 1995 grazing decision with accompanying ESA informal batch consultation.

Groundwater pumping and stream water diversions can contribute to the loss of riparian habitat for WYBCU. There are three stream diversions on the Blue River located on NFS lands, one on lower Campbell Blue Creek, one on the San Francisco River, and two on Eagle Creek (others on private land). The nonnative tamarisk has shown up on the ASNFs for at least the last decade being found along streams, including along the Blue River. It can proliferate into (but on the ASNFs has not yet resulted in) monotonous layered stands with shifts in diversity of riparian vegetation and insect prey with the greater potential for fire, flooding, and erosion.

Cowbird nest parasitism, predation by snakes and other mammals, and potential for West Nile virus could occur but are not currently considered threats to the WYBCU but it is not known if these might be occurring on the ASNFs. Drought and climate change may be threatening this species. Since 2000, persistent drought occurred frequently across the ASNFs with reduced stream flows and lowered levels in side channels and backwater areas but the long term impact to riparian forest structure is not known.

Potentially positive actions for the species undertaken by the ASNFs include the following. In 2004, the Alpine Ranger District fisheries biologist worked with private land owners on the Blue River to limit the amount of and impacts from their legal water withdrawals for irrigation ditches (these diversions on NFS lands). Tamarisk control has taken place on the ASNFs consisting of individual plant removal along major streams. To date, these have been along the Blue River (in 2012 and 2013, along a total of about 25 stream miles) with plans for continuing control provided funding is available. Substantial annual reductions in numbers and time in pasture to livestock grazing on the Alpine Ranger District were made from 2001 through 2003 in response to drought; this has helped retain plant vigor especially in riparian areas.

Species and Habitat Effects

In the individual program area discussions below, the implication of relevant desired conditions to WYBCU are noted. Potential impacts of each objective, standard, and guideline to the species and habitat are described. Where applicable, management areas are addressed. A determination of effects is then made for that program area. Subsequent to all program areas, an overall determination of effects for this species and its proposed critical habitat from LMP implementation is provided in the Summary of Effects and Determinations section for WYBCU.

Wildland Fire Management

There are two relevant desired conditions that guide management and activities here (see appendix A). Desired conditions 42 and 296 would direct management actions to restore fire to its historic role where large scale high severity fires were rare.

Based on FVS-FFE modeling, the risk of uncharacteristic wildfire would be reduced by one fire regime condition class in the Madrean pine-oak PNVT and trend would be improved in the semi-desert grassland PNVT after 15 years. These upland improvements could reduce the likelihood of wildfire entering riparian areas that may provide WYBCU habitat.

- GL 175 Aerial retardant drops should avoid threatened, endangered, proposed, or candidate, or identified sensitive species and waterways.

This guideline has the potential to reduce the risk of fire suppression impacts to WYBCU (e.g., disturbance) and potential impacts to vegetation and possibly insect and other aquatic prey.

Prescribed fire could, over the long term, reduce uncharacteristic wildfire and the associated risk of substantial or complete loss of riparian and floodplain habitat. However, activities associated with burning (fireline preparation) could also result in short term impacts such as disturbance to nesting and young rearing WYBCU. Although unknown, the effect of smoke on nesting WYBCU and sediment or ash bearing flows on prey could be factors. As such, this program area may affect and is likely to adversely affect WYBCU and its habitat.

Ecosystem/Vegetation Health

There are three relevant desired conditions that guide management and activities here (see appendix A). Desired conditions 4 and 6 would provide for the habitat (abundance, configuration, etc.) needed to sustain native species such as WYBCU, including under changing climate conditions. These desired conditions along with desired condition 43 would help provide large blocks of densely wooded riparian habitat composed of native cottonwoods, willows, box elders, and sycamores to help support nesting WYBCUs.

- OBJ 11 Annually, treat 5,000 to 35,000 acres to reduce [forest PNVTs] tree densities, restore natural fire regimes, promote species habitat and ecosystem health, reduce fire hazard, maintain desired conditions, initiate recovery from uncharacteristic disturbance, and provide forest products, leaving a desired mix of species with the range of desired densities that are resilient to changing climatic conditions.
- OBJ 13 Annually, treat or maintain 5,000 to 15,000 acres [woodland PNVTs] to promote a highly diverse structure.
- OBJ 14 Decrease or maintain the woody canopy cover [grassland PNVTs] at less than 10 percent by treating up to 25,000 acres annually.

Based on VDDT modeling of these three objectives, changes in conditions for PNVTs adjacent to WYBCU habitat are shown in table 13. Modeling indicates that all PNVTs move toward desired conditions, i.e., become less departed from desired conditions, after 15 years of management under the LMP.

Table 13. Movement toward DC after 15 and 50 years within PNVTs surrounding WYBCU habitat (based on VDDT modeling [a/])

PNVT	Current (%) departure from DC	Departure (%) at 15 years	Departure (%) at 50 years [b/]
Ponderosa pine forest	77	63	54
Madrean pine-oak woodland	61	47	38
Semi-desert grassland	79	68	58

[a/] Percentages are based on VDDT modeling of the *high* treatment acres for alternative B, the proposed LMP.

[b/] Assuming LMP direction would continue to be implemented to year 50; however, a new forest plan would be required before then which would be based on current conditions at that time.

Reduced departures in the uplands after 15 years indicate that conditions (e.g., stand openness, herbaceous vegetation density and vigor, reduced encroachment in grasslands) and disturbances (e.g., wildland fire) are closer to desired and reference or historic conditions. Where restoration occurs upslope and upstream of WYBCU habitat, these objectives have the potential to increase ground cover to carry periodic cool ground fires and, with decreased crown densities, to reduce the risk of severe wildfires that can burn intensely enough to consume riparian forests used by WYBCU. However, these activities also have the potential to result in short term impacts such as pulses of sediment not consistent with cottonwood seedling establishment and the introduction of sediment or ash that may impact the aquatic conditions needed by WYBCU prey such as tree frogs or dragonflies

- ST 3 Within each PNVT, vegetation management activities shall be designed to maintain or move plant composition towards a moderate to high plant community similarity as compared to site potential.

Standard 3 has the potential to ensure that vegetation management activities (e.g., removal of invasive conifers from riparian areas) provide for appropriate plant composition in riparian areas that may provide habitat for WYBCU; in some areas this may take an extended period of time to achieve.

- GL 23 Landscape scale restoration projects should be designed to spread treatments out spatially and/or temporally within the project area to reduce implementation impacts and allow reestablishment of vegetation and soil cover
- GL 30 Ground-disturbing projects (including prescribed fire) which may degrade long term riparian conditions should be avoided.
- GL 86 Management should emphasize long term reestablishment of native deciduous trees, shrubs, and herbaceous vegetation to maintain ecosystem diversity.

Guideline 23 has the potential to maintain or reestablish vegetation and soil cover, thereby limiting possible higher flows with debris and sediment into adjoining riparian areas. Guideline 30 could help protect WYBCU riparian habitat from long term degrading impacts caused by activities in the uplands such as thinning or burning. After a landscape scale disturbance event, guideline 86 could potentially contribute to the reestablishment large trees with dense canopies in riparian areas that might be used by WYBCU, although it may take an extended period of time to reestablish nesting structure.

This program area could improve overall ecosystem health by contributing to healthy, stable riparian conditions and habitat for WYBCU (e.g., streambanks, woody species regeneration). While standards and guidelines could limit impacts from restoration projects and other activities, not all negative impacts are likely to be reduced or eliminated. As such, this program area may affect and is likely to adversely affect WYBCU and its habitat.

Rangeland Management

There are four relevant desired conditions that guide management and activities here (see appendix A). Desired conditions 12 and16 would help limit soil impacts by livestock in order to help stabilize and ensure high quality riparian habitat downslope or downstream. Desired condition 202 would help limit undesirable nonnative species that might impact plant composition or affect the fire regime. Where annual fluctuations and seasonality of forage production are considered, desired condition 278 would help limit livestock browsing on establishing cottonwoods or willows.

- OBJ 17 Annually, control or eradicate invasive species (e.g., tamarisk, bullfrogs) on at least 2 stream miles.

Objective 17 has the potential to help limit invasives plants like tamarisk from proliferating in WYBCU habitat where this objective is implemented in WYBCU habitat, although there may be potential for disturbance to nesting WYBCU during treatment, if present.

- ST 11 Projects and authorized activities shall be designed to reduce the potential for introduction of new species or spread of existing invasive or undesirable aquatic or terrestrial nonnative populations.

Standard 11 has the potential to help protect WYBCU habitat from the introduction of invasives such as cheatgrass that can bring wildfire more readily into riparian areas.

- GL 32 Active grazing allotments should be managed to maintain or improve to desired riparian conditions.
- GL 81 Pesticide use should minimize impacts on nontarget plants and animals.

- GL 132 Critical areas should be managed to address the inherent or unique site factors, conditions, values, or potential conflicts associated with them.
- GL 134 New livestock troughs, tanks, and holding facilities should be located out of riparian areas to reduce limit concentration of livestock in these areas. Existing facilities in riparian areas should be modified, relocated, or removed where their presence is determined to inhibit movement toward desired riparian or aquatic conditions.
- GL 136 Forage, browse, and cover needs of wildlife, authorized livestock, and wild horses should be managed in balance with available forage so that plants providing these needs remain at or move toward a healthy, persistent condition.
- GL 138 To minimize potential resource impacts from livestock, salt or nutritional supplements should not be placed within a quarter of a mile of any riparian area or water source. Salt or nutritional supplements should also be located to minimize herbivory impacts to aspen clones.
- GL 139 To prevent resource damage (e.g., streambanks) and disturbance to federally listed and sensitive wildlife species, trailing of livestock should not occur along riparian areas. Where no alternative route is available, approval may be granted where effective mitigation measures are implemented (e.g., timing of trailing, number of livestock trailed at one time).

Three guidelines have the potential to help protect or restore riparian areas that support or may support WYBCU. This would be addressed by stocking in balance with available forage (GL 136), by requirements to improve habitat (GL 32), and by management focused on the special concerns within riparian areas (GL 132) which are critical areas for livestock grazing management.

Guidelines 134and 138 have the potential to help limit livestock impacts from livestock grazing and trampling thereby allowing vegetation to develop into the cooler, denser, and higher canopy conditions needed by WYBCU (guideline 139 has the same potential outside of Eagle Creek where livestock are currently trailed). Should pesticides be used to treat tamarisk in riparian areas, guideline 81 has the potential to help limit impacts to nontarget vegetation.

This program area could impact WYBCU habitat through livestock trampling impacts to understory vegetation and woody species regeneration in Eagle Creek during trailing. Riverine hydrologic function could also be impacted. Livestock grazing upslope could also impact water quality and quantity that supports native riparian vegetation and associated WYBCU prey habitat. While standards and guidelines could limit impacts associated with livestock grazing and management, not all negative impacts would be reduced or eliminated. Hence there may be competition or conflict (FEIS pg. 462), but the specific impacts of livestock grazing would be analyzed in site specific NEPA analyses (FEIS p. 470). As such, this program area may affect and is likely to adversely affect WYBCU and its habitat.

Watershed and Soil Management

There are ten relevant desired conditions that guide management and activities here (see appendix A). Desired condition 34 directs that management and activities result in conditions that support riparian dependent plants like cottonwoods and animals like WYBCU. Desired conditions 292 and 293 would help ensure that water is available and not diminished for the needs of riparian species such as WYBCU. Instream flows and stream channel and floodplain resiliency would be provided by desired conditions 23 and 26. Diversity, density, and ages of native species that can be used by WYBCU for nesting (e.g., Goodding's willow) are provided by desired conditions 66, 75, and 85 while herbaceous vegetation provides WYBCU insect prey habitat (DC 71). Desired condition 82 provide for ponding that contributes to the cool, humid conditions necessary for WYBCU young rearing.

- OBJ 6 Annually, move 200 to 500 acres toward desired composition, structure, and function of streams, floodplains, and riparian vegetation.

- OBJ 7 Within the planning period, relocate, repair, improve, or decommission a minimum of 4 miles of National Forest System roads or trails that add sediment to streams, damage riparian vegetation, erode streambanks, cause gullies, and/or compact floodplain soils.
- OBJ 38 Annually, prepare at least one instream flow water rights application until water acquisition needs are complete to sustain riparian areas, fish, wildlife, and water-based recreation.

Where they occur within riparian areas that provide or could develop into WYBCU habitat, objectives 6 and 7 have the potential to improve riparian forest structure and help recover damaged vegetation. Where riparian restoration projects occur, there is the potential for short term implementation effects such as soil disturbance and vegetation damage from equipment and disturbance to nesting WYBCU, if present. Objective 38 has the potential to help protect water and sustain riparian vegetation where instream flow applications are filed for within watersheds providing or potentially providing WYBCU habitat.

No regional riparian VDDT models were developed for the first two objectives to assess movement toward desired conditions with implementation of the first two objectives where they may be implemented within WYBCU habitat. However, the Riparian Specialist Report (2014) estimates that improvement of 2 - 6% in overstory conditions may occur in the riparian PNVTs across the ASNFs including the mixed broadleaf deciduous and cottonwood-willow riparian forest PNVTs; otherwise, some overall movement toward desired conditions is expected, but this is not quantified.

- ST 1 Consistent with existing water rights, water diversions or obstructions shall at all times allow sufficient water to pass downstream to preserve minimum levels of waterflow that maintain aquatic life and other purposes of national forest establishment.
- ST 32 Streams on NFS lands with high aquatic values and at risk from new water diversions shall be preserved and protected with instream flow water rights.

Standards 1 and 32 have the potential to retain sufficient water flows to sustain riparian areas and protect which would include the WYBCU.

- GL 9 As State of Arizona water rights permits (e.g., water impoundments, diversions) are issued, the base level of instream flow should be retained by the Apache-Sitgreaves NFs.
- GL 10 Constraints (e.g., maximum limit to which water level can be drawn down or minimum distance from a connected river, stream, wetland, or groundwater-dependent ecosystem) should be established for new groundwater pumping sites permitted on NFS lands in order to protect the character and function of water resources.
- GL 18 Sufficient water should be left in streams to provide for aquatic species and riparian vegetation.

Guidelines 9, 10 and 18 have the potential limit groundwater pumping and surface water diversion which would help retain flows in the Blue and San Francisco Rivers and in Eagle Creek, thereby helping to sustain hydrologic functions that support riparian vegetation needed by WYBCU.

This program area could improve overall watershed condition, including soil and vegetation conditions in PNVTs surrounding WYBCU habitat which could improve associated riparian hydrologic and vegetation conditions. While standards and guidelines could help support this improvement, not all short term negative impacts from riparian restoration activities would be reduced or eliminated. As such, this program area may affect and is likely to adversely affect WYBCU and its habitat.

Engineering Program

There are no desired conditions that guide management and activities in this program area relevant for the WYBCU.

- OBJ 8 Annually, remove an average of 2 miles of unauthorized roads or trails that add sediment to streams, damage riparian vegetation, erode streambanks, cause gullies, and/or compact floodplain soils.

Objective 8 has the potential to reduce road impacts within riparian areas (e.g., damage to vegetation, changes to hydrologic function) where removal occurs within riparian areas that might provide WYBCU habitat. Activities associated with road removal have the potential to result in short term impacts to soil and vegetation, and disturbance to nesting WYBCU, if present.

- ST 15 Motorized vehicle travel shall be managed to occur only on the designated system of NFS roads and motorized trails and designated motorized areas.

Standard 15 has the potential to limit vehicle impacts to riparian vegetation and limit disturbance to nesting WYBCU, if present.

- GL 99 New roads, motorized trails, or designated motorized areas should be located to avoid meadows, wetlands, riparian areas, stream bottoms, sacred sites, and areas with high concentrations of significant archaeological sites. The number of stream crossings should be minimized or mitigated to reduce impacts to aquatic species.

Guideline 99 has the potential to reduce road and trail impacts to riparian areas where WYBCU may be present.

This program area, primarily through the presence and maintenance of roads and motorized trails, could damage soil and vegetation within riparian areas that provides WYBCU habitat. It could also improve some riparian areas where WYBCU may be present by removing degrading factors like roads, although there could be short term impacts from restoration activities. While there are standards and guidelines that support this improvement, not all short term negative impacts would be reduced or eliminated. As such, this program area may affect and is likely to adversely affect WYBCU and its habitat.

Lands and Minerals Program

There are no desired conditions that guide management and activities in this program area relevant for the WYBCU.

- ST 31 Special uses for water diversions shall maintain fish, wildlife, and aesthetic values and otherwise protect the environment.

Standard 31 has the potential to help retain adequate water thereby sustaining dependent riparian vegetation needed by nesting and foraging WYBCU.

- GL 146 Streambed and floodplain alteration or removal of material should not occur if it prevents attainment of riparian, channel morphology, or streambank desired conditions.
- GL 166 As applicable, issuance of special use authorizations should incorporate measures to reduce potential impacts to wildlife and avoid rare and unique habitats (e.g., bogs, fens).

Guideline 146 has the potential to help limit impacts to WYBCU habitat by prohibiting some riparian area alterations (e.g., mineral pits) that could impact river hydrologic functions. Guideline 166 could

potentially reduce vegetation impacts (e.g., outfitter/guide stock) in riparian areas that could provide WYBCU habitat.

The minerals portion of this program area could impact the hydrologic function of riparian areas and special uses could damage riparian vegetation and disturb WYBCU, if present. While standards and guidelines could help limit impacts, not all negative impacts would be reduced or eliminated. As such, this program area may affect and is likely to adversely affect WYBCU and its habitat

Recreation and Wilderness Program

There is one relevant desired condition that guides management and activities here (see appendix A). Desired condition 211 would provide for recreation that does not negatively impact wildlife habitat and populations.

- OBJ 18 Annually, rehabilitate, stabilize, revegetate, or relocate an average of five dispersed campsites to improve recreation opportunities and/or protect the environment.

Objective 18 has the potential to improve degraded dispersed campsites and associated riparian areas within WYBCU habitat. It also has the potential to result in short term disturbance to WYBCU, if present.

- ST 13 Dispersed campsites shall not be designated in areas with sensitive soils or within 50 feet of streams, wetlands, or riparian areas to prevent vegetation and bank damage, soil compaction, additional sediment, or soil and water contamination.

Standard 13 has the potential to help preclude recreation impacts to soils, streambanks, floodplains, and riparian vegetation within WYBCU habitat.

- GL 94 Timing restrictions on recreation uses should be considered to reduce conflicts with wildlife needs or soil moisture conditions.

Guideline 94 has the potential to restrict recreation activities where they may be impacting nesting WYBCU.

This program area could impact WYBCU and habitat where hiking, fishing, or camping occurs with nesting and foraging habitat. There could be some habitat improvement where campsites are rehabilitated but recreation at these sites could still disturb WYBCU, if present. While standards and guidelines could limit impacts, not all negative impacts would be reduced or eliminated. As such, this program area may affect and is likely to adversely affect WYBCU and its habitat.

Wildlife, Fish, and Rare Plant Program

There is three relevant desired conditions that guides management and activities here (see appendix A). Desired conditions 7 and 198 could help provide habitat quality, distribution, and abundance to support WYBCU and conditions free from disturbance. Desired condition 203 directs action to deal with detrimental invasive species like tamarisk at an early stage. A fourth desired conditions (DC 7) would support recovery of WYBCU, once listed as threatened under the ESA.

- OBJ 5 During the planning period, complete at least five projects (e.g., remove barriers, restore dewatered stream segments, or connect fragmented habitat) to provide for aquatic and riparian associated species and migratory species.

- OBJ 10 Annually, work with partners to reduce animal damage to native willows and other riparian species on an average of 5 miles of riparian habitat.

Objective 5 has the potential to help retain and possibly expand riparian components such as developing canopy conditions or watered riparian segments that may be used by WYBCU, although there could be short term impacts from project implementation (e.g., use of equipment). Objective 10 could potentially lead to partnerships to help protect riparian habitat, especially along adjacent private land (e.g., Eagle Creek).

- GL 19 Projects and activities should avoid damming or impounding free-flowing waters to provide streamflows needed for aquatic and riparian-dependent species.
- GL 29 Project plans should include quantitative and/or qualitative objectives for implementation monitoring and effectiveness monitoring to assist in moving toward or maintaining desired conditions.
- GL 67 Modifications, mitigations, or other measures should be incorporated to reduce negative impacts to plants, animals, and their habitats and to help provide for species needs, consistent with project or activity objectives.
- GL 71 Cool and/or dense vegetation cover should be provided for species needing these habitat components (e.g., Goodding's onion, black bear, White Mountains chipmunk, western yellow-billed cuckoo).

Guideline 19 has the potential to help protect river hydrologic processes necessary to support WYBCU habitat. Guideline 29 would require monitoring to provide feedback about project implementation effects or effectiveness of mitigation measures for this species, and would guide future management toward desired conditions. Guidelines 67 has the potential to reduce disturbance impacts to breeding WYBCU, while guideline 71 has the potential to help provide the cool/dense vegetation needed by WYBCU for young rearing.

This program area could reduce impacts to riparian habitat, although survey for WYBCU and habitat assessments could disturb nesting or young rearing WYBCU. While guidelines could limit restoration and other activity impacts and require project or activity mitigations or modifications, not all negative impacts would be reduced or eliminated. As such, this program area may affect and is likely to adversely affect WYBCU and its habitat.

Management Areas

There are no LMP management areas with plan components of relevance for WYBCU and its habitat.

Cumulative Effects and Climate Change

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur within the action area of impacts for a listed species. Activities on private land along the Blue and San Francisco Rivers, and Eagle and Campbell Blue Creeks, include homes and ranches, livestock holding facilities, septic systems, wells, and water diversions. There is extensive ground water pumping on private land along Eagle Creek whereby private land owners are providing water for Freeport McMoRan's Morenci mine operations. The headwaters for Eagle Creek and many segments of it occur on the San Carlos Apache Reservation where livestock grazing and timber production with associated roads occur. The San Francisco River traverses many miles of private land upstream in New Mexico where livestock grazing, farming, river channelization, and other activities associated with home and ranch sites occurs. State, tribal and private land activities and management are likely impacting water

quality and quantity, hydrologic function, and subsequently riparian vegetation that could or may historically have supported WYBCU.

Implications for WYBCU from climate variability with greater extremes of temperature and moisture could include reduced water quantity or result in inconsistent stream flows and loss or further fragmentation of riparian habitat. Cycles of insect prey may also be modified or disrupted.

WYBCU
Summary of Effects and Determinations

Overall LMP direction is to maintain or restore desired conditions for PNVTs, watersheds, and riparian areas. Objectives 6, 5, 7, 8, 10, and 38 have the potential to help maintain or improve riparian conditions, although such actions could have short term impacts to WYBCU habitat and disturb the species, if present. Objectives 11 and 13 have the potential to reduce uncharacteristic wildfire from entering riparian areas and subsequent heavy flooding and debris flows that could damage WYBCU or prey habitat. Objective 17 could help address cowbird parasitism, if necessary. All objectives except 38 are likely to have short term detrimental effects but standards and guidelines would require measures to limit help site specific impacts (e.g., vehicle or recreation impacts to vegetation) within riparian areas. Therefore, LMP implementation is **not likely to jeopardize the continued existence** of the proposed threatened western yellow-billed cuckoo.

Should the species become listed under the Endangered Species Act, LMP implementation does not provide for mitigation of all potential effects to a level that can be equated to or considered insignificant and/or discountable. Therefore, if listed, it is determined that LMP implementation **may affect and is likely to adversely affect** the western yellow-billed cuckoo.

AMPHIBIANS, REPTILES, and INVERTEBRATES

Chiricahua Leopard Frog *Lithobates chiricahuensis*

Endangered Species Act Status:	Threatened, June 13, 2002
District Occurrence:	Alpine, Clifton, Springerville
Recovery plan:	April, 2007
Critical habitat:	March 20, 2012
Determination (Species-Listed):	May Affect, Likely to Adversely Affect
Determination Critical Habitat (Designated):	May Affect, Likely to Adversely Affect

For brevity, the Chiricahua leopard frog is referred to as CLF throughout the document. The original listing cited the species as *Rana chiricahuensis*.

CLF Specific Assumptions

- All designated critical habitat is assumed to be occupied although this may not be the case.

Natural History, Distribution, and Status of the Species Range-wide

Life history, distribution, status of the species range-wide along with listing factors are found in documents located on the USFWS website http://www.fws.gov/southwest/es/arizona/CLF.htm (accessed 2014). An account of the taxonomy, biology, and reproductive characteristics of this species is found in

the Final Rule listing the CLF as a threatened species (USFWS 2002) with designation of critical habitat (FWS 2012).

The 2012 Biological and Conference Opinion for the Continued Implementation of the Land and Resource Management Plan for the ASNFs (USFWS 2012) provide information about the CLF in Forest Service Southwestern Region 3. Vaughn (2014) also compiled information on the species from various sources. All these documents are incorporated by reference into this document.

Status and Threats within the Action Area

The CLF historically occurred on the ASNFs in the Little Colorado River watershed on what is today the Black Mesa, Lakeside, and Springerville Ranger Districts in the 1970s but is no longer present at historic sites. It also historically occurred on the Alpine and Clifton Ranger Districts in the San Francisco River, Blue River, Black River, and Eagle Creek watersheds primarily in the 1970s and 1980s but is also no longer known from these locations. CLF were present in the Three Forks area (East Fork Black River watershed) within what is referred to as the Three Forks tributary into the 1990s. Egg masses collected by AZGFD between about 1997 and 1998 from this area provided the initial and the ongoing source of CLF stocking through 2013.

As part of CLF recovery efforts, AZGFD has stocked CLF into 5 sites on the ASNFs from 2000 through 2013. These sites were stocked from two to six different times. In addition, CLF were also stocked into two sites in 1996 and into one site 2001 on AZGFD's Sipe White Mountain Wildlife Area property which is within the boundaries of the Springerville RD. A total of 458 larvae and 1,271 juvenile CLF have been placed into Concho Bill Spring and adjacent stock tank, Sierra Blanca Lake, Dry Lake Tank, Head Tank, and Prescribed Tank. Most were raised at AZGFD's Pinetop breeding facility but some were raised at Grand Canyon University's facility.

Vegetation surrounding Sierra Blanca Lake is montane/subalpine grassland PNVT and ponderosa pine forest PNVT with just ponderosa pine forest PNVT at Prescribed Tank. Dry mixed conifer and wet mixed conifer forest PNVTs surround Dry Lake and Head Tanks. The historic CLF location at the Three Forks area is wetland-cienega riparian area surrounded by ponderosa pine and dry mixed conifer forest PNVTs. The Concho Bill site is montane willow riparian forest PNVT surrounded by the dry mixed conifer, wet mixed conifer, and some ponderosa pine forest PNVTs.

Threats on the ASNFs and information about them include the following.

Water quality is the main habitat factor that can threaten CLF. Livestock feces and chemicals from smoke or ash can impact water quality. Even where livestock are excluded, livestock grazing occurs upstream and upslope of occupied CLF habitat on the ASNFs (e.g., Concho Bill Spring and Tank site). Smoke and ash produce a variety of chemicals that may enter aquatic systems, the effect of which can be more potent when other environmental stressors are present such as variations in pH and temperatures. Chemicals from road treatment and possibly fire retardant micro-drift from the 2011 Wallow Fire may have affected CLF. Up until several years ago, magnesium-chloride was used as dust abatement on the heavily traveled forest road 249; in the past few years, lignin, a wood product has since been used for this purpose (D. MacIvor, Forest Engineer). Heavy impacts from these activities can alter hydrologic and biologic features of riparian habitat needed by CLF. Movement of people, equipment, plant materials, and water has the potential to spread chytridiomycosis disease and nonnative predators like crayfish.

Loud noises associated with forest activities (e.g., road construction, thinning) may interrupt the advertisement calling of CLF during breeding season and periodic use of heavy equipment for road maintenance along the Three Forks CLF site occurs periodically during summer months in some years.

Drought and climate change may be threatening this species. Since 2000, persistent drought occurred frequently across the ASNFs with reduced stream flows and lowered levels in water bodies such as reservoirs, tanks, or cienegas. What has also occurred are limited, interspersed periods of higher than normal precipitation.

Potentially positive actions for the species undertaken by the ASNFs include the following. The ASNFs has taken several measures over the years to protect CLF and its habitat. This has included removing livestock from the Three Forks area and he Boneyard Bog, staging resource advisors on site during fires, and placement of straw wattles post fire to protect spring sites from ash flows. Public entry into the Three Fork area has been prohibited by ASNFs Special Closure Order since 2001 except for research purposes with required mitigations. Substantial annual reductions in numbers and time in pasture to livestock grazing on the Alpine Ranger District were made from 2001 through 2003 in response to drought; this has helped retain plant vigor especially in riparian areas. The ASNFs have representatives to AZGFD's CLF steering committee and each of the local recovery groups for recovery units 6 and 7. These entities annually plan and implement recovery actions for CLF, including on the ASNFs. The ASNFs also coordinate with the Gila NF in these two recovery units that extend into New Mexico.

Critical Habitat and Primary Constituent Elements

Critical habitat primary constituent elements are the physical or biological features essential to the conservation of the species that may require special management considerations or protection. In 2012, the FWS designated 10,348 acres in Arizona, New Mexico, and Mexico as CLF critical habitat. This critical habitat falls within eight recovery units (RUs) and is made of 39 units of critical habitat. There are portions of three CLF RUs on the ASNFs. One, the Mogollon Rim-Verde Valley RU 5 encompasses a small portion of the westernmost portion of the ASNFs and is not currently actively managed for CLF releases, i.e., there are no critical habitat units for management on the ASNFs. The other two RUs on the ASNFs contain about 270 acres of critical habitat and are detailed below.

1) Recovery Unit 6 – White Mountains-Upper Gila
    a. Concho Bill and Deer Creek Unit
        i. 17 acres on the ASNFs, Apache County, AZ.
        ii. Contains important breeding habitat necessary for recovery.
        iii. This is an isolated population that was established through captive breeding and translocation of stock from Three Forks.
            - Frogs were first released at the spring pool in 2000; subsequent releases have augmented the population.
            - Persistence of frogs after initial release unknown.
        iv. A spring and a meadow ephemeral stream reach extending for 2,667 ft and PCE 1 present in unit.
        v. Primary threat is limited pool habitat for breeding and overwintering.
            - Has so far limited the population.
            - Crayfish present nearby in the Black River and could invade site.
    b. Campbell Blue and Coleman Creek Unit
        i. 174 acres on the ASNFs, Greenlee County, AZ.
        ii. Contains PCE 1 to support life-history.
        iii. Approximately 2.04 miles of Campbell Blue Creek and approximately 1.04 miles of Coleman Creek available as habitat.
        iv. Crayfish and rainbow trout present throughout stream system.
2) Recovery Unit 7 – Upper Gila-Blue River
    a. Left Prong of Dix Creek Unit
        i. 13 acres on the ASNFs, Greenlee County, AZ.

ii. Contains breeding habitat necessary for recovery and PCE 1.
iii. Approximately 4,248 ft of stream habitat available.
iv. Population discovered in 2003 and observed again in 2005.

b. Rattlesnake Pasture Tank and Associated Tanks Unit
   i. 59 acres on the ASNFs, Greenlee County, AZ.
   ii. Contains three tanks, along with dispersal corridors that could help support a metapopulation.
      - Rattlesnake Pasture Tank
      - Rattlesnake Gap Tank
      - Buckhorn Tank
   iii. Both PCEs 1 and 2 are present.
   iv. Population discovered in 2003 in Rattlesnake Pasture Tank and is currently extant. None found at other two tanks.
   v. Threats include nonnative predators and risk of drying during drought periods.

c. Coal Creek Unit
   i. 7 acres on the ASNFs, Greenlee County, AZ.
   ii. 3,447 ft. reach of Coal Creek.
   iii. Contains important breeding habitat necessary for recovery and PCE 1.
   iv. Population discovered in 2001 and is currently extant.
   v. Threats include the potential for wildfires that result in ash flow, sedimentation, and erosion in Coal Creek and extended drought resulting in severely limited or eliminated habitat.

There are two primary constituent elements with subsets for the CLF as follows.

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).
      i. 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.
   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, bullfrogs, nonnative fish) absent or occurring at levels that do not preclude presence of the Chiricahua leopard frog.
   d. Absence of chytridiomycosis, or if present, then environmental, physiological, and genetic conditions are such that allow persistence of Chiricahua leopard frogs.
   e. Upland habitats that provide opportunities for foraging and basking that are immediately adjacent to or surrounding breeding aquatic and riparian habitat.
2) Dispersal and nonbreeding 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 (1.6 kilometers) overland, 3.0 miles (4.8 kilometers) along ephemeral or intermittent drainages, 5.0 miles (8.0 kilometers) along perennial drainages, or some combination thereof not to exceed 5.0 miles (8.0 kilometers).
   b. In overland and non-wetted corridors, provide 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, provide some ephemeral, intermittent, or perennial aquatic habitat.

c. Are free of barriers that block movement by Chiricahua leopard frogs,
   i. Including, but not limited to, urban, industrial, or agricultural development; reservoirs that are 50 acres (20 hectares) or more in size and contain nonnative predatory fish, bullfrogs, or crayfish; highways that do not include frog fencing and culverts; and walls, major dams, or other structures that physically block movement.
   ii. With the exception of impoundments, livestock tanks, and other constructed waters, critical habitat does not include manmade structures (such as buildings, aqueducts, runways, roads, and other paved areas) and the land on which they are located existing within the legal boundaries.

Species and Habitat Effects

In the individual program area discussions below, the implication of relevant desired conditions to CLF are noted. Potential impacts of each objective, standard, and guideline to the species and habitat are described. Where applicable, management areas are addressed. A determination of effects is then made for that program area. Subsequent to all program areas, an overall determination of effects for this species and its critical habitat from LMP implementation is provided in the Summary of Effects and Determinations section for CLF.

Wildland Fire Management

There are two relevant desired conditions that guide management and activities here (see appendix A). Desired conditions 42 and 296 would direct management actions to restore fire to its historic role where large scale high severity fires were rare.

Based on FVS-FFE modeling, the risk of uncharacteristic wildfire would be reduced by one fire regime condition class in the Madrean pine-oak woodland PNVT after 15 years. Trend would be improved in the semi-desert grassland, ponderosa pine, dry mixed conifer, and wet mixed conifer PNVTs. These upland improvements could reduce the likelihood of wildfire entering riparian areas that may provide habitat for CLF. Prescribed fire and wildfire suppression has the potential to also result in short term impacts to CLF habitat (e.g., introduction of ash bearing flows), especially if burning is followed by an unexpected heavy rainfall event.

- GL 174 Firelines, helispots, and fire camps should be located to avoid disturbance to critical species and impacts to cultural resources.
- GL 175 Aerial retardant drops should avoid threatened, endangered, proposed, or candidate, or identified sensitive species and waterways.

Guidelines 174 and 175 have the potential to reduce the risk of fire suppression impacts to CLF and its habitat.

Prescribed fire could, over the long term, reduce uncharacteristic wildfire and the associated risk of complete loss of riparian and floodplain habitat. While guidelines could limit short term impacts from burning, not all negative effects would be reduced or eliminated. As such, this program area may affect and is likely to adversely affect CLF and its habitat.

Ecosystem/Vegetation Health

There are five relevant desired conditions that guide management and activities here (see appendix A). Desired conditions 4 and 44 would help provide conditions to support genetic diversity so that species, especially aquatic ones, can adjust to changing climate and other conditions. Desired condition 46 directs management actions to provide upland soil cover conditions such that water flow and quality would be appropriate for CLF, where present. Desired conditions 43 and 75 would help ensure native vegetation composition dominates within the riparian habitat of CLF.

- OBJ 11 Annually, treat 5,000 to 35,000 acres to reduce [forest PNVTs] tree densities, restore natural fire regimes, promote species habitat and ecosystem health, reduce fire hazard, maintain desired conditions, initiate recovery from uncharacteristic disturbance, and provide forest products, leaving a desired mix of species with the range of desired densities that are resilient to changing climatic conditions.
- OBJ 13 Annually, treat or maintain 5,000 to 15,000 acres [woodland PNVTs] to promote a highly diverse structure.
- OBJ 14 Decrease or maintain the woody canopy cover [grassland PNVTs] at less than 10 percent by treating up to 25,000 acres annually.

Based on VDDT modeling of these three objectives, changes in conditions for PNVTs surrounding CLF habitat are shown in table 14. Modeling indicates that all PNVTs move toward desired conditions, i.e., become less departed from desired conditions, after 15 years of management under the LMP (although only slightly so for the wet mixed conifer PNVT).

Table 14. Movement toward DC after 15 and 50 years within PNVTs surrounding CLF habitat (based on VDDT modeling [a/])

PNVT	Current (%) departure from DC	Departure (%) at 15 years	Departure (%) at 50 years [b/]
Ponderosa pine forest	77	63	54
Dry mixed conifer	67	56	48
Wet mixed conifer	54	52	51
Madrean pine-oak woodland	61	47	38
Semi-desert grassland	79	68	58

[a/] Percentages are based on VDDT modeling of the *high* treatment acres for alternative B, the proposed LMP.

[b/] Assuming LMP direction would continue to be implemented to year 50; however, a new forest plan would be required before then which would be based on current conditions at that time.

Reduced departures after 15 years indicate that conditions (e.g., stand openness, herbaceous vegetation density and vigor, reduced encroachment in grasslands) and disturbances (e.g., wildfire) are closer to desired and reference or historic conditions. Where restoration occurs upslope and upstream of CLF habitat, these objectives have the potential to increase ground cover to carry periodic cool ground fires and, with decreased crown densities, to reduce the risk of severe wildfires that can burn intensely enough to consume riparian areas used by CLF. However, these activities also have the potential to result in short term impacts such as increased flows carrying ash or sediment.

- ST 4 Vegetation treatments shall include measures to reduce the potential for introduction of invasive plants and animals and damage from nonnative insects and diseases.

Standard 4 has the potential to reduce the risk of introduction of chytrid fungus or nonnative predators like crayfish associated with vegetation treatments.

- GL 23 Landscape scale restoration projects should be designed to spread treatments out spatially and/or temporally within the project area to reduce implementation impacts and allow reestablishment of vegetation and soil cover.
- GL 30 Ground-disturbing projects (including prescribed fire) which may degrade long term riparian conditions should be avoided.

Guideline 23 could potentially help retain vegetation cover in some areas within landscape scale projects while allowing reestablishment of vegetation and soil cover in treated areas and helping to limit short term water flow alterations across the landscape under treatment. By avoiding projects that could degrade riparian areas over the long term, guideline 30 has the potential to protect down slope and downstream CLF habitat.

This program area could help improve upland conditions that contribute to a more stabilized riparian habitat needed by CLF. While standards and guidelines could limit short term impacts (e.g., heavy equipment, soil, and vegetation disturbances) caused by restoration thinning and other projects and activities, not all negative impacts would be reduced or eliminated. As such, this program area may affect and is likely to adversely affect CLF and its habitat.

Rangeland Management

There are two relevant desired conditions that guide management and activities here (see appendix A). With greater cover in grasses and forbs, desired condition 170 would help contribute to lower intensity wildfires that allow vegetation ground cover to readily resprout, thereby limiting sediment flow into riparian areas. Desired condition 202 would help limit the presence of undesirable nonnative species such as bullfrogs that predate on CLF. Where annual fluctuations and seasonality of forage production are considered, desired condition 278 has the potential to retain sufficient ground cover to reduce the ability of overland flow to carry sediment and organic matter into riparian areas that may be used by CLF for breeding or dispersal habitat.

- ST 2 When drafting (withdrawing) water from streams or other water bodies, measures will be taken to prevent entrapment of fish and aquatic organisms and the spread of parasites or disease (e.g., Asian tapeworm, chytrid fungus, whirling disease).
- ST 3 Within each PNVT, vegetation management activities shall be designed to maintain or move plant composition towards a moderate to high plant community similarity as compared to site potential.
- ST 11 Projects and authorized activities shall be designed to reduce the potential for introduction of new species or spread of existing invasive or undesirable aquatic or terrestrial nonnative populations.

Standard 2 has the potential to reduce the risk of entrapping fish and aquatic organisms and spreading CLF predators (nonnative fish, crayfish, bull frogs), as well as reduce the potential to spread chytrid fungus. Standard 3 could potentially help ensure that healthy, native, emergent plant composition is present to support CLF basking, foraging, and dispersal habitat is provided where livestock grazing is not otherwise excluded. Standard 11 has the potential to help protect CLF from invasive predators like crayfish.

- GL 32 Active grazing allotments should be managed to maintain or improve to desired riparian conditions.
- GL 78 Projects and activities should not transfer water between drainages or between unconnected water bodies within the same drainage to avoid spreading disease and aquatic invasive species.

- GL 132 Critical areas should be managed to address the inherent or unique site factors, condition, values, or potential conflicts.
- GL 133 Grazing use on seasonal allotments should be timed to the appropriate plant growth stage and soil moisture.
- GL 134 New livestock troughs, tanks, and holding facilities should be located out of riparian areas to reduce concentration of livestock in these areas. Existing facilities in riparian areas should be modified, relocated, or removed where their presence is determined to inhibit movement toward desired riparian or aquatic conditions.
- GL 136 Forage, browse, and cover needs of wildlife, authorized livestock, and wild horses should be managed in balance with available forage so that plants providing these needs remain at or move toward a healthy, persistent condition.
- GL 138 To minimize potential resource impacts from livestock, salt or nutritional supplements should not be placed within a quarter of a mile of any riparian area or water source. Salt or nutritional supplements should also be located to minimize herbivory impacts to aspen clones.
- GL 139 To prevent resource damage (e.g., streambanks) and disturbance to federally listed and sensitive wildlife species, trailing of livestock should not occur along riparian areas. Where no alternative route is available, approval may be granted where effective mitigation measures are implemented (e.g., timing of trailing, number of livestock trailed at one time).

Four guidelines have the potential to help protect or restore riparian or wetland habitat and the uplands that contribute to riparian conditions that support CLF. This would be addressed by stocking in balance with available forage (GL 136), by proper timing of grazing relative to plant growth (GL 133), and by requirements to improve habitat (GL 32), and by managing for the special concerns within riparian areas (GL 132) which are critical areas for livestock grazing management.

Guidelines 134, 138, and 139 have the potential to reduce livestock impacts (e.g., water quality, flow alteration) within riparian areas where CLF or their habitat may be present through proper placement of water and salt and limits to livestock trailing. Guideline 78 could potentially prohibit water transfers (e.g., water hauling from steams to tanks for livestock) to prevent spread of disease such as chytrid fungus.

Following is a synopsis of where, within a CLF critical habitat unit (CHU), livestock grazing is currently authorized, although subject to change. Included are the main pastures and areas authorized for grazing; smaller portions of pastures or other areas within a CHU are not shown. Note that the following does not include potentially occupiable or dispersal or nonbreeding habitat that might be used by CLF.

- Concho Bill and Deer Creek CHU – no livestock grazing
- Campbell Blue and Coleman Creek CHU – no livestock grazing
- Left Prong of Dix Creek CHU – livestock grazing on the Pleasant Valley allotment in the Mesquite Flat and Left Prong pastures.
- Rattlesnake Pasture Tank and Associated Tanks CHU – livestock grazing on the Hickey allotment in the Hamilton pasture.
- Coal Creek CHU – livestock grazing on the Blackjack allotment in the Coal Creek pasture.

This program area could move vegetation toward needed native plant composition similarity in riparian areas that supports CLF. However, regardless of plant composition, livestock grazing could impact emergent plant vegetation and streambanks needed by CLF and impact associated wet saturated soils through trampling. While standards and guidelines could limit impacts associated with livestock grazing and management (e.g., trailing and salt), not all negative would be reduced or eliminated. Hence there may be competition or conflict (FEIS pg. 462), but the specific impacts of livestock grazing would be

analyzed in site specific NEPA analyses (FEIS pg. 470). As such, this program area may affect and is likely to adversely affect CLF and its habitat.

Watershed and Soil Management

There are eleven relevant desired conditions here). Desired condition 22 would provide vegetation and soil conditions above the floodplain that protect water quality and aquatic habitat. Desired conditions 30, 31, and 71 would provide the pools and back habitat quality needed by CLF, including within breeding and dispersal habitat. Desired condition 78 would provide mostly native vegetation free from invasive plants like bull thistle and animals like bullfrogs in CLF habitat. Streambanks, floodplains, and adjacent upland areas would have the logs and plant litter for CLF loafing and foraging (DCs 81 and 83). Desired conditions 292 and 293 would ensure that water is available and not diminished for the needs of CLF. Satisfactory watersheds and soil conditions would contribute to healthy riparian conditions (DCs 77 and 299).

- OBJ 2 Annually, enhance or restore an average of 350 acres within priority 6th level HUC watersheds, including treating the causes of State and federally designated impaired or threatened water to improve watershed condition and water quality.
- OBJ 4 Annually, enhance or restore 5 to 15 miles of stream and riparian habitat to restore structure, composition, and function of physical habitat for native fisheries and riparian-dependent species.
- OBJ 5 During the planning period, complete at least five projects (e.g., remove barriers, restore dewatered stream segments, or connect fragmented habitat) to provide for aquatic and riparian associated species and migratory species.
- OBJ 6 Annually, move 200 to 500 acres toward desired composition, structure, and function of streams, floodplains, and riparian vegetation.
- Annually, move 200 to 500 acres toward desired composition, structure, and function of streams, floodplains, and riparian vegetation.
- OBJ 38 Annually, prepare at least one instream flow water rights application until water acquisition needs are complete to sustain riparian areas, fish, wildlife, and water-based recreation.

Objective 2 has the potential to help improve water quality should this objective take place in two impaired stream stretches (lower Blue River and lower San Francisco River (its confluence with the Blue River) where CLF may be stocked (S. Coleman, ASNFs fisheries biologist). Where restoration projects or activities occur within CLF habitat, objectives 4, and 6 could potentially improve habitat (e.g., improve water quality and temperatures), although there would be short term implementation impacts (e.g., trampling or loss of streamside vegetation). Objective 5 could have the potential to help provide for CLF passage within dispersal habitat by removing barriers to movements (e.g., raised culverts). Where instream water flow applications are filed within CLF habitat or where CLF may be stocked, objective 38 has the potential to retain needed water within riparian areas.

No regional riparian VDDT models were developed to assess movement toward desired conditions with implementation of the first five objectives where these may be implemented within CLF habitat or watersheds. However, the Riparian Specialist Report (2014) estimates that improvement of 2 - 6% in overstory conditions may occur in riparian PNVTs across the ASNFs; otherwise, some overall movement toward desired conditions is expected, but this is not quantified.

- ST 32 Streams on NFS lands with high aquatic values and at risk from new water diversions shall be preserved and protected with instream flow water rights.
- ST 33 Groundwater withdrawals shall not measurably diminish surface water flows on NFS lands without an appropriate surface water right.

Standards 32 and 33 have the potential to help protect water flows necessary to sustain CLF within watersheds containing CLF habitat.

- GL 5 Coarse woody debris retention and/or creation should be used as needed to help retain long term soil productivity.
- GL 8 Streamside management zones should be in place between streams and disturbed areas and/or road locations to maintain water quality and suitable stream temperatures for aquatic species.
- GL 9 As State of Arizona water rights permits (e.g., water impoundments, diversions) are issued, the base level of instream flow should be retained by the Apache-Sitgreaves NFs.
- GL 10 Constraints (e.g., maximum limit to which water level can be drawn down or minimum distance from a connected river, stream, wetland, or groundwater-dependent ecosystem) should be established for new groundwater pumping sites permitted on NFS lands in order to protect the character and function of water resources.
- GL 17 To prevent degradation of native species habitat and the incidental or accidental introduction of diseases or nonnative species, aquatic species should not be transferred through management activities from one 6th level HUC watershed to another.
- GL 18 Sufficient water should be left in streams to provide for aquatic species and riparian vegetation.
- GL 19 Projects and activities should avoid damming or impounding free-flowing waters to provide streamflows needed for aquatic and riparian-dependent species.
- GL 82 Erosion control mitigation features should be implemented to protect significant resource values and infrastructure such as stream channels, roads, structures, threatened and endangered species, and cultural resources.

Guideline 8 has the potential to protect aquatic breeding habitat and adjacent areas with emergent vegetation and root masses or logs from upland project or activity impacts (e.g., ash from burning, sediment from heavy equipment soil disturbance). Guidelines 9, 10, 18, and 19 have the potential to retain needed water flows in CLF habitat. Guideline 5 has the potential to provide down logs and debris used by CLF for loafing and during dispersal. Guideline 17 could potentially reduce the risk of chytrid fungus into CLF habitat. Erosion control measures such seeding (GL 82) have the potential to limit erosion and sediment from entering CLF habitat after large scale disturbance events such as severe wildfire and flooding.

This program area could improve overall watershed and riparian conditions, including soil and vegetation conditions (e.g., more upland and streamside vegetative ground cover to filter sediment and ash). It could potentially help retain water quantity and quality needed to sustain CLF. While standards and guidelines could limit impacts from thinning, burning or other activities, not all short term impacts are likely to be reduced or eliminated. As such, this program area may affect and is likely to adversely affect CLF and its habitat.

Engineering Program

There is one relevant desired condition that guides management and activities here (see appendix A). By addressing the location and design of roads within CLF recovery units, desired condition 235 would aid dispersal of this species.

- OBJ 7 Within the planning period, relocate, repair, improve, or decommission a minimum of 4 miles of National Forest System roads or trails that add sediment to streams, damage riparian vegetation, erode streambanks, cause gullies, and/or compact floodplain soils.

- OBJ 8 Annually, remove an average of 2 miles of unauthorized roads or trails that add sediment to streams, damage riparian vegetation, erode streambanks, cause gullies, and/or compact floodplain soils.

Through road removal adjacent to or within riparian habitat within CLF recovery units, objectives 7 and 8 have the potential to restore or improve connectivity of riparian areas which could facilitate expansion and dispersal of CLF. In addition, restoration of streambanks and riparian vegetation could also potentially improve riparian areas that might provide habitat for CLF by reducing chemical-bearing (e.g., oil and lubricants) sediment input from roads and restoring riparian hydrologic function.

- ST 15 Motorized vehicle travel shall be managed to occur only on the designated system of NFS roads and motorized trails and designated motorized areas.
- ST 18 Road maintenance and construction activities shall be designed to reduce sediment (e.g., water bars, sediment traps, grade dips) while first providing for user safety.

Standard 15 has the potential to limit impacts from motorized use in riparian and floodplain areas where CLF may be present (e.g., migratory corridors). Standard 18 has the potential to reduce contaminants from roads from entering CLF habitat.

- GL 13 To protect water quality and aquatic species, heavy equipment and vehicles driven into a water body to accomplish work should be completely clean of petroleum residue. Water levels should be below the gear boxes of the equipment in use. Lubricants and fuels should be sealed such that inundation by water should not result in leaks.
- GL 33 Storage of fuels and other toxicants should be located outside of riparian areas to prevent spills that could impair water quality or harm aquatic species.
- GL 34 Equipment should be fueled or serviced outside of riparian areas to prevent spills that could impair water quality or harm aquatic species.
- GL 99 New roads, motorized trails, or designated motorized areas should be located to avoid meadows, wetlands, riparian areas, stream bottoms, sacred sites, and areas with high concentrations of significant archaeological sites. The number of stream crossings should be minimized or mitigated to reduce impacts to aquatic species.
- GL 100 As projects occur in riparian or wet meadow areas, unneeded roads or motorized trails should be closed or relocated, drainage restored, and native vegetation reestablished to move these areas toward their desired condition.
- GL 105 Roads and motorized trails should be designed and located so as to not impede terrestrial and aquatic species movement and connectivity.

While it is unlikely that equipment would be kept or operated within CLF habitat or upstream of it, guidelines 13, 33, and 34 have the potential to keep contaminants like gas or salt out of CLF habitat. Guidelines 99 and 100 have the potential to help prevent or reduce road impacts to sensitive riparian plant and other resources. These two guidelines, along with GL 105, could potentially limit barriers movement of gartersnakes along riparian areas.

This program area, primarily through the development, maintenance, and use of roads, can damage vegetation and soils, change water flow patterns, and degrade water quality. While guidelines limit road and road associated impacts, not all are likely to be reduced or eliminated. As such, this program area may affect and is likely to adversely affect CLF and its habitat.

Lands and Minerals Program

There are no desired conditions that guide management and activities in this program area relevant for the CLF.

- ST 28 Special use authorizations for the collection of live species with limited distribution (e.g., some invertebrates, plants) shall include permit provisions to ensure the species persist onsite.
- ST 31 Special uses for water diversions shall maintain fish, wildlife, and aesthetic values and otherwise protect the environment.

Standard 28 has the potential to prevent overcollection of CLF, including egg masses which might be authorized by special use permit. Standard 31 could potentially limit impacts from water diversions (e.g., reduced flows) that that might be authorized by special use permit upstream of CLF habitat.

- GL 146 Streambed and floodplain alteration or removal of material should not occur if it prevents attainment of riparian, channel morphology, or streambank desired conditions.
- GL 166 As applicable, issuance of special use authorizations should incorporate measures to reduce potential impacts to wildlife and avoid rare and unique habitats (e.g., bogs, fens).
- GL 206 Research special use authorizations should limit impacts to sensitive resources, unique features, and species within recommended RNAs [see management areas section below].

Guideline 146 could potentially limit material removal from riparian areas within and upstream of CLF habitat, thereby reducing the likelihood of heavier sediment flows and reduced water quality downstream. Where special uses or other authorizations are issued, guideline 166 has the potential to limit trampling of emergent vegetation (e.g., large group gathering near riparian areas like family reunions). In addition, special use permits issued within the Three Forks or Lower Campbell Blue recommended research natural areas (both contain CLF habitat) have the potential to limit impacts to CLF.

The minerals portion of this program area could impact the hydrologic function of riparian areas that might be used by CLF and special uses could damage riparian vegetation or streambanks. While standards and guidelines could limit impacts, not all negative impacts would be reduced or eliminated. As such, this program area may affect and is likely to adversely affect CLF and its habitat.

Recreation and Wilderness Program

There is one relevant desired condition here. Desired condition 211 would provide for recreation that does not negatively impact wildlife habitat and populations. If the need develops, it would support future forest closure orders determined necessary for important gartersnake sites.

- OBJ 18 Annually, rehabilitate, stabilize, revegetate, or relocate an average of five dispersed campsites to improve recreation opportunities and/or protect the environment.

Objective 18 has the potential to improve dispersed campsites that are degrading associated riparian areas within or upslope or upstream of CLF habitat. It may also result in short term implementation impacts until sites revegetate and stabilize.

- ST 13 Dispersed campsites shall not be designated in areas with sensitive soils or within 50 feet of streams, wetlands, or riparian areas to prevent vegetation and bank damage, soil compaction, additional sediment, or soil and water contamination.

Standard 13 has the potential to help preclude recreation impacts to streambanks, floodplains, and emergent vegetation in CLF habitat, including within dispersal or nonbreeding habitat.

- GL 95 Dispersed campsites should not be located on or adjacent to archaeological sites or sensitive wildlife areas.

Guideline 95 has the potential to preclude dispersed campsites within CLF habitat, thereby limiting impacts to water or emergent vegetation.

This program area could impact CLF and its habitat with concentrations of people and their animals (e.g., stock or pets) within riparian areas. There could be some habitat improvement where campsites are rehabilitated but recreation at these sites could still impact CLF habitat. While standards and guidelines could limit impacts to stream, pond, or shoreline areas, not all negative impacts would be reduced or eliminated. As such, this program area may affect and is likely to adversely affect the CLF and its habitat.

Wildlife, Fish, and Rare Plant Program

There are seven relevant desired conditions that guide management and activities here (see appendix A). Desired condition 6 would direct management and activities to provide for habitat configuration and availability to allow for adjustments in movements in response to climate and to provide for genetic diversity, especially important for this widely dispersed species with limited occurrences. Desired conditions 32 and 197 would help provide well distributed habitat that contributes to the recovery of CLF. DC 35 would help protect CLF from nonnatives such as crayfish, and DC 199 would protect CLF from over collection. Desired condition 35 would help keep CLF free from or minimally impacted by nonnatives while desired condition 199 would assure that collection does not negatively impact CLF abundance.

- OBJ 17 Annually, control or eradicate invasive species (e.g., tamarisk, bullfrogs) on at least 2 stream miles.

Objective 17 has the potential to help protect CLF from invasive species (e.g., bullfrog predation on tadpoles and juvenile frogs) where this objective is implemented within CLF habitat.

- GL 15 Activities occurring within federally listed species habitat should apply habitat management direction and species protection measures from recovery plans.
- GL 29 Project plans should include quantitative and/or qualitative objectives for implementation monitoring and effectiveness monitoring to assist in moving toward or maintaining desired conditions.
- GL 65 Activities occurring within federally listed species habitat should apply habitat management objectives and species protection measures from recovery plans.
- GL 67 Modifications, mitigations, or other measures should be incorporated to reduce negative impacts to plants, animals, and their habitats and to help provide for species needs, consistent with project or activity objectives.

Guideline 15 would help contribute to the recovery of CLF. Guideline 29 would require monitoring to provide feedback about project implementation effects or effectiveness of mitigation measures for CLF, and would guide future management toward desired conditions. Guideline 65, by requiring activities comply with listed species recovery plans, would contribute to the recovery of the CLF. Guideline 67 would require projects or activities mitigations or modification to reduce negative impacts to banks and emergent vegetation in CLF habitat.

This program area could reduce impacts to CLF through control of invasive species. However, habitat enhancement projects like fencing to protect habitat could also have short term vegetation and soil

impacts to adjacent uplands that might be used for basking (e.g., digging fence post holes). In addition, survey for CLF and habitat assessments could also result in short term impacts from vegetation trampling. While guidelines could limit impacts, not all negative impacts would be reduced or eliminated. As such, this program area may affect and is likely to adversely affect CLF and its habitat.

Recommended Research Natural Area Management Area

CLF habitat, including some critical habitat for the CLF, falls within the Three Forks and Lower Campbell Blue recommended research natural areas which are not suitable for livestock grazing, energy development, communication sites, or timber (LMP chapter 4). Guidelines 204, 205, and 207 would require protection of this recommended management area resources including livestock fencing if necessary, although implementing such actions may have short term impacts to CLF and its habitat.

Critical Habitat and Primary Constituent Elements

Effects to CLF aquatic breeding, dispersal, and nonbreeding habitat discussed above would apply to critical habitat for this species. Table 15 shows which program areas may impact specific critical habitat PCEs in either a positive or negative manner.

Table 15. CLF critical habitat PCEs potentially impacted by program area

Program Area	Affected PCEs (by number) and Principle Mechanism
Wildland Fire Management	1a, 1b, 1d, 1e, and 2b. Burning, thinning or grazing/ trampling impacts to water quality, streambank and adjacent upland features (logs, vegetation); potential to spread chytrid fungus; trampling of aquatic features in movement corridor features such as vegetation or organic debris.
Ecosystem/Vegetation Health (Forest Products)	
Rangeland Management	
Watershed and Soil Management (Riparian Areas)	
Engineering	1a, 1d, and 2c. Roads sediment, affecting hydrology; roads commonly immediately adjacent to riparian habitat; rare potential for spread of disease or predators; road features such as culverts potential to hinder movement.
Lands and Minerals (Special Uses)	1a-e, 2b, and 2c . Minerals removal, and recreation, or special use activities can impact water quality, needed vegetation; introduce disease and predators; distrubance of movement corridor features such as rocks, organic debris, vegetation.
Recreation and Wilderness	
Wildlife, Fish, and Rare Plants	1b and 1d. Possible short term impacts from survey and habitat assessmentsand from habitat enhancement projects.

PCE 1 Aquatic breeding habitat and immediately adjacent uplands

All programs have the potential to impact the water and vegetation component of CLF aquatic and adjacent upland habitat and even possibly the potential for spread of chytrid (PCE 1d).

PCE 2 Dispersal and nonbreeding habitat

All program areas have the potential to impact riparian corridors and upland areas that might be used as dispersal habitat, even though some impacts may be short term.

Overall, essentially all program areas are likely to have some negative impacts to CLF primary constituent elements of critical habitat. However, it is important to note that LMP implementation would not necessarily have these impacts across all CLF critical habitat on the ASNFs.

Cumulative Effects and Climate Change

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur within the action area of impacts for a listed species. State activities include CLF survey and stocking of CLF into new sites by AZGFD. Highway maintenance along State Highway 78 could introduce materials or pollutants into Coal Creek. Little is known of activities associated with private land upstream of occupied habitat in Campbell Blue Creek or nearby private land at Sierra Blanca Reservoir. Activities could include wells and septic systems and roads that could influence water quantity and quality within CLF habitat.

The implications of climate change and variability for CLF could include reduce water quantity and quantity and increased water temperatures. With potential for higher intensity of storms, there could be the possibility that individual CLF or habitat could be washed out or eroded away, especially in upslope or upstream areas where there has been high severity fire with limited recovery. There is also the potential for higher intensity of storms and flood impacts along streams at more frequent intervals and at greater intensities resulting in continued threats to CLF and habitat.

CLF and Critical Habitat
Summary of Effects and Determinations

Overall LMP direction is to maintain or restore desired conditions for watersheds and riparian areas. Objectives 2, 4, 5, 6, 7, 8, 18 and 38 have the potential to maintain or improve riparian habitat conditions, including within CLF dispersal habitat. Objectives 11 and 13 have the potential to reduce uncharacteristic wildfire from entering riparian areas and subsequent heavy flooding and debris flows that could eliminate CLF habitat. Objective 17 could help reduce the incidence of crayfish.

All objectives except 38 are likely to have short term detrimental effects. Standards and guidelines would require measures to limit the extent, level, and duration of potential short term effects and even preclude negative long term effects in the case where long term riparian degradation cannot be avoided. However, not all restoration and other activity implementation effects would be mitigated to a level that can be equated to or considered insignificant and/or discountable. Therefore, LMP implementation **may affect and is likely to adversely** affect the Chiricahua leopard frog, and it **may affect and is likely to adversely affect** critical habitat for the species.

Narrow-headed gartersnake *Thamnophis rufipunctatus*

Endangered Species Act Status:	Proposed threatened, July 10, 2013
Recovery Plan:	None
Critical Habitat:	Proposed, July 10, 2013
Determination of Effects (Species-Proposed):	Not Likely to Jeopardize
Determination Critical Habitat (Proposed):	Not Likely to Adversely Modify
Determination of Effects (Species-Listed):	May Affect, Likely to Adversely Affect

Determination Critical Habitat (Designated):	May Affect, Likely to Adversely Affect

Northern Mexican gartersnake *Thamnophis eques megalops*

Endangered Species Act Status:	Proposed threatened, July 10, 2013
Recovery Plan:	None
Critical Habitat:	Proposed, July 10, 2013
Determination of Effects (Species-Proposed):	Not Likely to Jeopardize
Determination Critical Habitat (Proposed):	Not Likely to Adversely Modify
Determination of Effects (Species-Listed):	May Affect, Likely to Adversely Affect
Determination Critical Habitat (Designated):	May Affect, Likely to Adversely Affect

For brevity, the narrow-headed gartersnake is referred to as NHGS throughout the document and the northern Mexican gartersnake is referred to as NMGS throughout the document. Because the life history, threats, and species status are similar for both gartersnakes on the ASNFs, the analyses for these two species are combined with notations where they and the analyses differ.

Natural History, Distribution, and Status of these Species Range-wide

Life history, distribution, status of these two species range-wide along with listing factors are found in documents located on the USFWS website http://www.fws.gov/southwest/es/arizona/N-HGartersnake.htm and http://www.fws.gov/southwest/es/arizona/MexGartersnake.htm (accessed 2014). An account of the taxonomy, biology, and reproductive characteristics of this species is found in the Proposed Rules for the proposal to list these gartersnakes as threatened and in the proposal for critical habitat (USFWS 2013, USFWS 2013). Vaughn (2014) also compiled information on both species from various sources. All these documents are incorporated by reference into this document.

Status and Threats within the Action Area

Comprehensive surveys for NMGS were conducted within the Gila River watershed in 2004 and 2005; however, sites on the ASNFs were not surveyed for this species.

Sites on the ASNFs have been surveyed more frequently for NHGS. Prior to about 2006, NHGS were found to be abundant in the Black River. In 2004 and 2005, NHGS were captured at three of seven historic sites: Black River below Wildcat Point, Blue River at the Box, and the confluence of the Blue River and Campbell Blue Creek. Each of these sites contained native and nonnative fish as well as crayfish (see fisheries portion of the BA).

Between 2007 and 2010, a total of 67 NHGS were observed in the Black River throughout reaches from Wildcat Point downstream to the ASNFs boundary. During this period, no NHGS were located in or near tributaries including the East and West Fork Black River nor in the Black River near the confluence of the East and West Forks.

The first record of NMGS on the ASNFs occurred on Campbell Blue Creek in 2000 when four snakes were found. In 2007, a total of eight NMGS were located on the Blue River, near Juan Miller Road and near its confluence with Campbell Blue Creek. In 2009, one NMGS was located on the Blue River at its confluence with Campbell Blue Creek.

Riparian vegetation within streams providing habitat where these two gartersnakes are known include montane willow riparian forest PNVT (Black River), cotton-willow riparian forest PNVT (lower

Campbell Blue Creek) and mixed broadleaf deciduous riparian forest PNVT (lower Blue River). Vegetation in the surrounding uplands along Eagle Creek, lower San Francisco River, and lower Blue River includes the Madrean pine-oak woodland and semi-desert grassland PNVTs. Upland vegetation along upper San Francisco, Black River, upper Blue River, and Campbell Blue Creek includes ponderosa pine, dry mixed conifer, and wet mixed conifer PNVTs.

The 2011 Wallow Fire resulted in siltation of habitat and decrease in fish prey species, but prey are rebounding based on observation and preliminary survey by Stephanie Coleman, ASNFs Fisheries Biologist, and AZGFD. In addition, native sucker and dace populations appear to be recovering post Wallow Fire in the Blue and Black Rivers. To assess presence of gartersnakes post fire, the AZGFD surveyed the Black River in 2012 with no observations. AZGFD surveys of the Black River were cancelled for 2013 due to widely fluctuating water flows. 2013 survey results in the Blue River and Campbell Blue Creek are pending.

Threats on the ASNFs and information about them include the following.

Nonnative species such as crayfish and nonnative spiny-rayed fish species occur throughout gartersnake habitat on the ASNFS (except not in upper San Francisco River and Campbell Blue Creek). These species may be impacting gartersnakes and their prey. There are just a few known sites where bullfrogs have been found on the ASNFs and their impact to gartersnakes is unknown. There are numerous ditch diversions along the Blue River, and one each on the Campbell Blue and Eagle Creek; these can alter flows or dewatering habitat but by how much is not known. In addition, spring diversions and groundwater pumping are common along the upper San Francisco River in the Alpine valley.

Roads concentrate flows which yields sediment into gartersnake riparian habitat. Heavily used dirt or gravel roads are adjacent to streams or within proposed critical habitat along Eagle Creek (forest road 217, level3), upper Blue River (forest road 281, level 3), and lower Campbell Blue Creek (forest road 30, level 2). US Highway 180 parallels then crosses upper San Francisco River and forest road 249 parallels a short portion of the same. Besides sediment from roads, fires and other activities can threaten the aquatic habitat and prey of these snakes. As noted above, large fires can resulted in sedimentation and decreased prey fish populations for these gartersnakes.

Livestock in riparian areas threatens vegetation and streambanks through trampling and sediment and all stream segments are suitable for livestock grazing. Although subject to change, livestock grazing is currently excluded from much of proposed critical habitat (see the following critical habitat section for specifics).

Drought and climate change may be threatening these species. Since 2000, persistent drought occurred frequently across the ASNFs with reduced stream flows and lowered levels in water bodies such as reservoirs, tanks, or cienegas. What has also occurred are limited, interspersed periods of higher than normal precipitation.

Potentially positive actions undertaken by the ASNFs include the following. Range analyses on the Alpine Ranger District for allotments in the Blue and Black River watersheds from 1995-2004 adjusted livestock numbers based on available forage and by setting forage use levels to provide for plant recovery and soil protection. In addition, as previously noted, livestock grazing has been currently removed from some streams. Substantial adjustments in annual livestock grazing on the Alpine Ranger District were made from 2001 through 2003 in response to drought; this has helped retain plant vigor especially in riparian areas.

Critical Habitat and Primary Constituent Elements

Critical habitat primary constituent elements are the physical or biological features essential to the conservation of the species that may require special management considerations or protection. Proposed critical habitat for NHGS on the ASNFs falls within three river subbasin units: Middle Gila River (Eagle Creek); San Francisco River (San Francisco River, Campbell Blue Creek, Blue River, and San Francisco River); and Upper Salt River (Black River). Proposed critical habitat for NMGS on the ASNFs falls within just one river subbasin unit: Upper Salt River (main stem Black River).

There is a total of about 152 acres of proposed critical habitat for NHGS on the ASNFs, primarily on Eagle Creek, San Francisco River, Black River, and Blue River. There is a total of just 18.8 acres of proposed critical habitat for NMGS on the ASNFs, all on the Black River. The 18.8 acres of NMGS proposed critical habitat on the Black River coincides exactly with proposed critical habitat for NHGS on the Black River.

Each of the gartersnakes has four similar primary constituent elements for proposed critical habitat. These are listed below for NHGS, followed by those for NMGS.

NHGS:

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

2) Adequate terrestrial space 600 ft (182.9 m) lateral extent to either side of bankfull stage) adjacent to designated stream systems with sufficient structural characteristics to support life-history functions such as gestation, immigration, emigration, and brumation.

3) A prey base consisting of viable populations of native fish species or soft-rayed, nonnative fish species.

4) An absence of nonnative fish species of the families Centrarchidae and Ictaluridae, bullfrogs (*Lithobates catesbeianus*), and/or crayfish (*Orconectes virilis*, *Procambarus clarki*[3], etc.), or occurrence of these nonnative species at low enough levels such that recruitment of narrow-headed gartersnakes and maintenance of viable native fish or soft-rayed, nonnative fish populations (prey) is still occurring.

NMGS:

1) Aquatic or riparian habitat that includes:

[3] The *Procambarus clarki* speces of crayfish is not found on the ASNFs.

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

2) Adequate terrestrial space 600 ft (182.9 m) lateral extent to either side of bankfull stage) adjacent to designated stream systems with sufficient structural characteristics to support life-history functions such as gestation, immigration, emigration, and brumation (extended inactivity).

3) A prey base consisting of viable populations of native amphibian and native fish species.

4) An absence of nonnative fish species of the families Centrarchidae and Ictaluridae, bullfrogs (*Lithobates catesbeianus*), and/or crayfish (*Orconectes virilis, Procambarus clarki*, etc.), or occurrence of these nonnative species at low enough levels such that recruitment of northern Mexican gartersnakes and maintenance of viable native fish or soft-rayed, nonnative fish populations (prey) is still occurring.

Species and Habitat Effects

In the individual program area discussions below, the implication of relevant desired conditions to NHGS and NMGS are noted. Potential impacts of each objective, standard, and guideline to these species and their habitat are described. Where applicable, management areas are addressed. A determination of effects is then made for that program area. Subsequent to all program areas, an overall determination of effects for the NHGS and NMGS and their proposed critical habitat from LMP implementation is provided in the Summary of Effects and Determinations section for each gartersnake.

As noted above, the NHGS and NMGS have similar but somewhat different life functions and habitat needs. Plan components are generally not definitive enough to differentiate among the finite requirements of these two species. Therefore, both snakes are analyzed together and impacts by program area apply to both species, unless otherwise noted.

Wildland Fire Management

There are two relevant desired conditions that guide management and activities here (see appendix A). Desired conditions 42 and 296 would direct management actions to restore fire to its historic role where large scale high severity fires were rare.

Based on FVS-FFE modeling, the risk of uncharacteristic wildfire would be reduced by one fire regime condition class in the Madrean pine-oak woodland and the dry mixed conifer forest PNVTs after 15 years. Trend would be improved in the ponderosa pine, wet mixed conifer and semi-desert grassland PNVTs. These upland improvements could reduce the likelihood of wildfire entering the riparian habitat of these

two gartersnakes. Prescribed fire and wildfire suppression could also result in short term impacts to gartersnake habitat (e.g., loss of logs and vegetation or increased runoff and ash or sediment), especially if burning is followed by an unexpected heavy rainfall event.

- GL 174 Firelines, helispots, and fire camps should be located to avoid disturbance to critical species and impacts to cultural resources.
- GL 175 Aerial retardant drops should avoid threatened, endangered, proposed, or candidate, or identified sensitive species and waterways.

Guidelines 174 and 175 have the potential to reduce the risk of fire suppression impacts to gartersnakes and their habitat.

Prescribed fire could, over the long term, reduce uncharacteristic wildfire and the associated risk of substantial or complete loss of riparian and floodplain habitat. However, activities associated with prescribed fire could also result in short term impacts to riparian and adjacent upland areas used by NHGS and NMGS. These impacts could include loss of vegetation and logs, increases in water temperature, and flows with ash or sediment impacting gartersnake aquatic prey. As such, this program area may affect and is likely to adversely affect NHGS and NMGS and their habitat.

Ecosystem/Vegetation Health

There are five relevant desired conditions that guide management and activities here (see appendix A). Desired conditions 4 and 44 would provide conditions to support genetic diversity so that species, especially aquatic ones, can adjust to changing climate and other conditions. Desired condition 46 would help provide upland soil cover conditions such that water flow and quality would be appropriate for NHGS and NMGS, where present. In addition, desired conditions 43 and 75 would help ensure native vegetation like willows and other woody riparian species are present that NHGS uses for basking.

- OBJ 11 Annually, treat 5,000 to 35,000 acres to reduce [forest PNVT] tree densities, restore natural fire regimes, promote species habitat and ecosystem health, reduce fire hazard, maintain desired conditions, initiate recovery from uncharacteristic disturbance, and provide forest products, leaving a desired mix of species with the range of desired densities that are resilient to changing climatic conditions.
- OBJ 13 Annually, treat or maintain 5,000 to 15,000 acres [woodland PNVTs] to promote a highly diverse structure.
- OBJ 14 Decrease or maintain the woody canopy cover [grassland PNVTs] at less than 10 percent by treating up to 25,000 acres annually.

Based on VDDT modeling of these three objectives, changes in conditions for PNVTs surrounding gartersnake habitat are shown in table 16. Modeling indicates that all PNVTs move toward desired conditions, i.e., become less departed from desired conditions, after 15 years of management under the LMP (although only slightly so for the wet mixed conifer PNVT).

Table 16. Movement toward DC after 15 and 50 years within PNVTs surrounding gartersnake habitat (based on VDDT modeling [a/])

PNVT	Current (%) departure from DC	Departure (%) at 15 years	Departure (%) at 50 years [b/]
Ponderosa pine forest	77	63	54
Dry mixed conifer forest	67	53	43

Wet mixed conifer forest	54	52	51
Madrean pine-oak woodland	61	47	38
Semi-desert grassland	79	68	58

[a/] Percentages are based on VDDT modeling of the *high* treatment acres for alternative B, the proposed LMP.

[b/] Assuming LMP direction would continue to be implemented to year 50; however, a new forest plan would be required before then which would be based on current conditions at that time.

Reduced departures after 15 years indicate that conditions (e.g., stand openness, herbaceous vegetation density and vigor, and reduced encroachment in grasslands) and disturbances (e.g., wildfire) are closer to desired and reference or historic conditions. Where restoration occurs upslope and upstream of gartersnake habitat, these objectives have the potential to increase ground cover to carry periodic cool ground fires and, with decreased crown densities, to reduce the risk of severe wildfires that can burn intensely enough to consume riparian areas that may be used by these gartersnakes. However, these activities have the potential to also result in short term impacts such as increased flows that might damage sections of shorelines.

- GL 23 Landscape scale restoration projects should be designed to spread out treatments spatially and/or temporally to reduce implementation impacts and allow reestablishment of vegetation and soil cover.
- GL 30 Ground-disturbing projects (including prescribed fire) which may degrade long term riparian conditions should be avoided.

Guideline 23 has the potential to help retain vegetation cover in some areas within landscape scale projects while allowing reestablishment of vegetation and soil cover in treated areas. By avoiding projects that could degrade riparian areas over the long term, guideline 30 could potentially help to protect down slope and downstream gartersnake habitat.

This program area could help improve upland conditions that contribute to more stabilized riparian habitat and adjacent habitat components used by gartersnakes. While guidelines could decrease short term impacts from thinning, burning projects or other activities, not all negative impacts would be reduced or eliminated. As such, this program area may affect and is likely to adversely affect these two gartersnakes and their habitat.

Rangeland Management

There are three relevant desired conditions that guide management and activities here (see appendix A). Healthy riparian soils with vigorous plant communities (DC 82) would contribute to non-fish prey base habitat (e.g., earthworms, salamanders) for NMGS. With greater cover in grasses and forbs, desired condition 170 would help contribute to lower intensity wildfires that allow vegetation providing ground cover to readily resprout, thereby limiting sediment flows into riparian areas. Where annual fluctuations and seasonality of forage production are considered, desired condition 278 would help to retain sufficient ground cover to reduce the ability of overland flow to debris and excessive sediment into the riparian habitat of NHGS and NMGS.

- ST 2 When drafting (withdrawing) water from streams or other water bodies, measures will be taken to prevent entrapment of fish and aquatic organisms and the spread of parasites or disease (e.g., Asian tapeworm, chytrid fungus, whirling disease).

- ST 3 Within each PNVT, vegetation management activities shall be designed to maintain or move plant composition towards a moderate to high plant community similarity as compared to site potential.
- ST 11 Projects and authorized activities shall be designed to reduce the potential for introduction of new species or spread of existing invasive or undesirable aquatic or terrestrial nonnative populations.

Standard 2 has the potential to help protect gartersnakes from introduction of nonnative predators (e.g., nonnative spiny-rayed fish). Standard 3 could potentially help ensure that plant composition representing healthy streambank vegetation supporting basking, foraging, and dispersal habitat is provided. Standard 11 has the potential to protect both gartersnakes from invasive predators like bullfrogs.

- GL 17 To prevent degradation of native species habitat and the incidental or accidental introduction of diseases or nonnative species, aquatic species should not be transferred through management activities from one 6th level HUC watershed to another.
- GL 32 Active grazing allotments should be managed to maintain or improve to desired riparian conditions.
- GL 132 Critical areas should be managed to address the inherent or unique site factors, condition, values, or potential conflicts.
- GL 133 Grazing use on seasonal allotments should be timed to the appropriate plant growth stage and soil moisture.
- GL 134 New livestock troughs, tanks, and holding facilities should be located out of riparian areas to reduce concentration of livestock in these areas. Existing facilities in riparian areas should be modified, relocated, or removed where their presence is determined to inhibit movement toward desired riparian or aquatic conditions.
- GL 136 Forage, browse, and cover needs of wildlife, authorized livestock, and wild horses should be managed in balance with available forage so that plants providing these needs remain at or move toward a healthy, persistent condition.
- GL 138 To minimize potential resource impacts from livestock, salt or nutritional supplements should not be placed within a quarter of a mile of any riparian area or water source. Salt or nutritional supplements should also be located to minimize herbivory impacts to aspen clones.
- GL 139 To prevent resource damage (e.g., streambanks) and disturbance to federally listed and sensitive wildlife species, trailing of livestock should not occur along riparian areas. Where no alternative route is available, approval may be granted where effective mitigation measures are implemented (e.g., timing of trailing, number of livestock trailed at one time).

Four guidelines have the potential to help protect or restore riparian habitat and the adjacent uplands that contribute to riparian conditions that support gartersnakes. This would be addressed by stocking in balance with available forage (GL 136), by proper timing of grazing relative to plant growth (GL 133), by requirements to improve habitat (GL 32), and by managing for the special concerns within riparian areas (GL 132) which are critical areas for livestock grazing management.

Guideline 17 has the potential to reduce the risk of introducing nonnative species such as bullfrogs that might modify habitat, compete with, and predate upon gartersnakes. Guidelines 134, 138, and 139 have the potential to reduce livestock impacts within riparian areas where gartersnakes or their habitat may be present through proper placement of water and salt and limits to livestock trailing. These three guidelines have the potential to improve riparian habitat and potentially facilitate gartersnake dispersal along riparian areas.

Following is a synopsis of where, within a gartersnake proposed critical habitat unit (pCHU), livestock grazing is currently authorized, although subject to change. Included are the main pastures and areas

authorized for grazing; smaller portions of pastures or other areas within pCHU are not shown. Note that the following does not include all suitable or potentially occupiable or dispersal gartersnake habitat.

- Main stem Black River pCHU for NMGS and NHGS - no livestock grazing (Sprucedale/Reno allotment).
- Campbell Blue River pCHU for NHGS – livestock grazing on the Upper Campbell Blue allotment in all pastures (1,403 acres); no livestock grazing on the Lower Campbell Blue allotment, nor on the Turkey Creek portion of the Coyote-Whitmer/Turkey Creek allotment.
- Lower San Francisco and Blue Rivers pCHU for NHGS - no livestock grazing (numerous grazing allotments).
- Upper San Francisco River pCHU for NHGS – livestock grazing on the Alpine allotment in the Luna Lake pasture (10 acres); livestock grazing upstream of the Alpine private land (except for a small segment of the river protected by a drift fence adjacent to private land) on the Williams Valley allotment in the Williams Valley pasture; livestock grazing on the Whitmer portion of the Coyote-Whitmer/Turkey Creek allotment in the Luna Lake Campground and Little Creek pastures (??acres).

This program area could impact gartersnakes and their habitat through livestock grazing or browsing of riparian, floodplain, and adjacent upland vegetation and through trampling of vegetation and small mammal burrows in the floodplain. Livestock grazing upslope and upstream from gartersnake habitat could impact downstream water quality through excessive sedimentation that affects development of gartersnake prey species. While standards and guidelines could limit the impacts associated with livestock management (e.g., trailing, salt), not all negative impacts would be reduced or eliminated. Hence there may be competition or conflict (FEIS pg. 462), but the specific impacts of livestock grazing would be analyzed in site specific NEPA analyses (FEIS pg. 470). As such, this program area may affect and is likely to adversely affect NHGS and NMGS and their habitat.

Watershed and Soil Management

There are nine relevant desired conditions that guide management and activities here (see appendix A). Desired condition 22 would provide vegetation and soil conditions above the floodplain that protect water quality and aquatic habitat. Desired condition 71 would help provide the pools and backwater habitat needed for these species and their dispersal. Desired condition 78 would provide mostly native vegetation free from invasive plants in gartersnake habitat. Floodplains and adjacent upland areas would have the logs, rocks, and debris needed by these gartersnakes for brumation periods (DC 83) while desired condition 81 would help stabilize streambanks and floodplains with sufficient ground cover. Desired conditions 292 and 293 would help ensure that water is available and not diminished for the needs of gartersnakes. Desired condition 299 would direct management to maintain or move toward satisfactory watershed conditions, including soil conditions (DC 77) which would help to contribute to improved riparian habitat.

- OBJ 2 Annually, enhance or restore an average of 350 acres within priority 6th level HUC watersheds, including treating the causes of State and federally designated impaired or threatened water to improve watershed condition and water quality.
- OBJ 4 Annually, enhance or restore 5 to 15 miles of stream and riparian habitat to restore structure, composition, and function of physical habitat for native fisheries and riparian-dependent species.
- OBJ 5 During the planning period, complete at least five projects (e.g., remove barriers, restore dewatered stream segments, or connect fragmented habitat) to provide for aquatic and riparian associated species and migratory species.
- OBJ 6 Annually, move 200 to 500 acres toward desired composition, structure, and function of streams, floodplains, and riparian vegetation.

- OBJ 38 Annually, prepare at least one instream flow water rights application until water acquisition needs are complete to sustain riparian areas, fish, wildlife, and water-based recreation.

Objective 2 has the potential to help improve water quality should this objective be implemented in NHGS habitat in lower Blue River and lower San Francisco River (below its confluence with the Blue River). Where restoration projects or activities occur within gartersnake habitat, objectives 4 and 6 could potentially improve habitat, although there would be short term implementation impacts such as ground disturbance by heavy equipment leading to runoff and excessive sediment. Objective 5 has the potential to retain and possibly expand gartersnake dispersal and prey base conditions. Objective 38 has the potential to help protect water and sustain riparian vegetation where instream flow applications are filed for within watersheds providing or potentially providing gartersnake habitat.

No regional VDDT models were developed to assess movement toward desired conditions with implementation of the first four objectives where they may be implemented within gartersnake habitat or watersheds. However, the Riparian Specialist Report (2014) estimates that improvement of 2 - 6% in overstory conditions may occur in riparian PNVTs across the ASNFs; otherwise, some overall movement toward desired conditions is expected, but this is not quantified.

- ST 32 Streams on NFS lands with high aquatic values and at risk from new water diversions shall be preserved and protected with instream flow water rights.
- ST 33 Groundwater withdrawals shall not measurably diminish surface water flows on NFS lands without an appropriate surface water right.

Standards 32 and 33 have the potential to help retain adequate water flows necessary to sustain gartersnakes and their prey.

- GL 8 Streamside management zones should be in place between streams and disturbed areas and/or road locations to maintain water quality and suitable stream temperatures for aquatic species.
- GL 9 As State of Arizona water rights permits (e.g., water impoundments, diversions) are issued, the base level of instream flow should be retained by the Apache-Sitgreaves NFs.
- GL 10 Constraints (e.g., maximum limit to which water level can be drawn down or minimum distance from a connected river, stream, wetland, or groundwater-dependent ecosystem) should be established for new groundwater pumping sites permitted on NFS lands in order to protect the character and function of water resources.
- GL 18 Sufficient water should be left in streams to provide for aquatic species and riparian vegetation.
- GL 19 Projects and activities should avoid damming or impounding free-flowing waters to provide streamflows needed for aquatic and riparian-dependent species.
- GL 82 Erosion control mitigation features should be implemented to protect significant resource values and infrastructure such as stream channels, roads, structures, threatened and endangered species, and cultural resources.

Guideline 8 has the potential to protect streams and adjacent upland areas from project or activity impacts such as ash from prescribed burns that can kill native amphibian and fish prey base for both species, especially for the NHGS. Guidelines 9, 10, 18, and 19 have the potential to help retain unregulated flows in gartersnake habitat. Erosion control measures (GL 82) could help protect gartersnake habitat after large scale disturbance events such as severe wildfire and flooding.

This program area could improve overall watershed and riparian conditions and could potentially help limit impacts to the riparian, floodplain, and nearby upland habitat components for both gartersnakes, but

primarily for the NHGS. While standards and guidelines could help limit impacts from restoration and other activities, e.g., prescribed burning, not all short term negative impacts would be reduced or eliminated. As such, this program area may affect and is likely to adversely affect these two gartersnakes and their habitats.

Engineering Program

There is one relevant desired condition that guides management and activities here (see appendix A). Desired condition 235 would direct that the location and design of roads not impede wildlife and fish movement; this could potentially aid dispersal of gartersnakes where they might encounter roads or culverts along riparian corridors.

- OBJ 7 Within the planning period, relocate, repair, improve, or decommission a minimum of 4 miles of National Forest System roads or trails that add sediment to streams, damage riparian vegetation, erode streambanks, cause gullies, and/or compact floodplain soils.
- OBJ 8 Annually, remove an average of 2 miles of unauthorized roads or trails that add sediment to streams, damage riparian vegetation, erode streambanks, cause gullies, and/or compact floodplain soils.

Through road removal within or across riparian areas, objectives 7 and 8 have the potential to improve riparian conditions where this type of restoration work takes place within NHGS habitat (NMGS habitat along the main stem Black River is unroaded).

- ST 15 Motorized vehicle travel shall be managed to occur only on the designated system of NFS roads and motorized trails and designated motorized areas.

Standard 15 has the potential to limit damage to soils and vegetation (e.g., structural complexity and diversity) from motorized vehicle use in riparian, floodplain, and adjacent upland areas where NHGS or NMGS might be present.

- GL 13 To protect water quality and aquatic species, heavy equipment and vehicles driven into a water body to accomplish work should be completely clean of petroleum residue. Water levels should be below the gear boxes of the equipment in use. Lubricants and fuels should be sealed such that inundation by water should not result in leaks.
- GL 33 Storage of fuels and other toxicants should be located outside of riparian areas to prevent spills that could impair water quality or harm aquatic species.
- GL 34 Equipment should be fueled or serviced outside of riparian areas to prevent spills that could impair water quality or harm aquatic species.
- GL 99 New roads, motorized trails, or designated motorized areas should be located to avoid meadows, wetlands, riparian areas, stream bottoms, sacred sites, and areas with high concentrations of significant archaeological sites. The number of stream crossings should be minimized or mitigated to reduce impacts to aquatic species.
- GL 100 As projects occur in riparian or wet meadow areas, unneeded roads or motorized trails should be closed or relocated, drainage restored, and native vegetation reestablished to move these areas toward their desired condition.
- GL 105 Roads and motorized trails should be designed and located so as to not impede terrestrial and aquatic species movement and connectivity.

While it is unlikely that equipment would be kept within gartersnake habitat or upstream of it, guidelines 13, 33, and 34 have the potential to avoid contaminations such as oil or salt in NHGS habitat.

Guidelines 99 and 100 have the potential to help prevent or reduce road impacts to riparian plant and other resources. These two guidelines, along with guideline 105, could potentially limit barriers to gartersnake movement along riparian areas.

This program area, primarily through the presence and maintenance of roads and motorized trail, could change water flow patterns and degrade water quality needed by gartersnake prey species. It could also help restore some riparian areas where these two gartersnakes may be present by road removals, although there would be short term impacts from restoration activities. While guidelines help support this improvement, not all negative impacts would be reduced or eliminated. As such, this program area may affect and is likely to adversely affect gartersnakes and their habitat.

Lands and Minerals Program

There are no desired conditions that guide management and activities in this program area relevant for the NHGS and the NMGS.

- ST 28 Special use authorizations for the collection of live species with limited distribution (e.g., some invertebrates, plants) shall include permit provisions to ensure the species persist onsite.
- ST 31 Special uses for water diversions shall maintain fish, wildlife, and aesthetic values and otherwise protect the environment.

Standard 28 has the potential to avoid overcollection of gartersnakes that might be authorized by special use permit. Standard 31 could potentially limit the amount of sediment from berm or ditch construction into NHGS habitat along Blue River and Eagle Creek that might be authorized by special use permit.

- GL 146 Streambed and floodplain alteration or removal of material should not occur if it prevents attainment of riparian, channel morphology, or streambank desired conditions.
- GL 166 As applicable, issuance of special use authorizations should incorporate measures to reduce potential impacts to wildlife and avoid rare and unique habitats (e.g., bogs, fens).
- GL 206 Research special use authorizations should limit impacts to sensitive resources, unique features, and species within recommended RNAs [see management areas section below].

Guideline 146 could potentially limit changes in stream hydrologic features (e.g., pools, riffles) needed by gartersnakes and their prey caused by material removal from riparian and floodplain areas within and upstream of gartersnake habitat. Guideline 166 has the potential to limit impacts (e.g., shoreline trampling) associate with special use authorizations within gartersnake habitat. In addition, guideline 206 could also potentially reduce any impacts associated with special use permits issued within the Lower Campbell Blue recommended research natural area where the NHGS and NMGS could be present.

The minerals portion of this program area could impact riparian areas with removal of materials like gravel that might occur within or upstream of gartersnake habitat. Special use activities could impact these gartersnakes in a variety of ways (e.g., authorized gatherings near riparian areas such as scout camps). While standards and guidelines could limit impacts, not all negative impacts would be reduced or eliminated. As such, this program area may affect and is likely to adversely affect the NHGS and NFGS and their habitat.

Recreation and Wilderness Program

There is one relevant desired condition here. Desired condition 211 would provide for recreation that does not negatively impact wildlife habitat and populations. If the need develops, it would support future forest closure orders determined necessary for important gartersnake sites.

- OBJ 18 Annually, rehabilitate, stabilize, revegetate, or relocate an average of five dispersed campsites to improve recreation opportunities and/or protect the environment.

Objective 18 has the potential to improve dispersed campsites that are degrading associated riparian areas within or upslope or upstream of gartersnake habitat. It could also potentially result in short term implementation impacts until sites revegetate and stabilize.

- ST 13 Dispersed campsites shall not be designated in areas with sensitive soils or within 50 feet of streams, wetlands, or riparian areas to prevent vegetation and bank damage, soil compaction, additional sediment, or soil and water contamination.

Standard 13 has the potential to help preclude recreation impacts reduce trampling of streambanks and vegetation within gartersnake habitat and to support movements of gartersnakes through riparian areas.

- GL 95 Dispersed campsites should not be located on or adjacent to archaeological sites or sensitive wildlife areas.

Guideline 95 has the potential to preclude dispersed campsites within gartersnake habitat, thereby eliminating trampling and disturbance of habitat features like vegetation, woody debris, rocks, and litter.

This program area could impact gartersnakes and the habitat complexity primarily by concentrations of people and their animals (e.g., stock or pets) within their riparian area habitat. There could be some habitat improvement where campsites are rehabilitated but recreation at these sites could still impact gartersnake habitat. While standards and guidelines could limit impacts to shoreline or aquatic habitat, not all negative impacts would be reduced or eliminated. As such, this program area may affect and is likely to adversely affect these two gartersnakes and their habitat.

Wildlife, Fish, and Rare Plant Program

There are four relevant desired conditions that guide management and activities here (see appendix A). Desired condition 6 would direct management and activities to provide for habitat configuration and availability to allow for adjustments in movements in response to climate and to provide for genetic diversity, especially important for these widely spread but uncommon species. Desired conditions 7 and 32 would help maintain and support recovery of the NHGS and NMGS, if listed, including providing for habitat connectivity. Desired condition 35 would help protect gartersnakes from predation from nonnative species such as crayfish. A fifth desired condition (DC 7) would support recovery of these two gartersnakes, if listed under the ESA.

- OBJ 10 Annually, work with partners to reduce animal damage to native willows and other riparian species on an average of 5 miles of riparian habitat.
- OBJ 17 Annually, control or eradicate invasive species (e.g., tamarisk, bullfrogs) on at least 2 stream miles.

Objective 10 has the potential to help maintain or protect woody riparian species used for basking by the NHGS. Objective 17 has the potential to help protect both gartersnakes from invasive species such as bullfrogs which prey on juvenile and sub-adult gartersnakes where this objective is implemented within gartersnake habitat.

- ST 11 Projects and authorized activities shall be designed to reduce the potential for introduction of new species or spread of existing invasive or undesirable aquatic or terrestrial nonnative populations.

Standard 11 has the potential to reduce the risk of new or the spread of existing invasive or undesirable species, like crayfish, with gartersnake habitat.

- GL 15 Activities occurring within federally listed species habitat should apply habitat management objectives and species protection measures from recovery plans.
- GL 29 Project plans should include quantitative and/or qualitative objectives for implementation monitoring and effectiveness monitoring to assist in moving toward or maintaining desired conditions.
- GL 65 Activities occurring within federally listed species habitat should apply habitat management objectives and species protection measures from recovery plans.
- GL 67 Modifications, mitigations, or other measures should be incorporated to reduce negative impacts to plants, animals, and their habitats and to help provide for species needs, consistent with project or activity objectives.

Guideline 15 would help contribute to the recovery of NHGS and NMGS should they be listed and a recovery plan developed. Guideline 29 would require monitoring to provide feedback about project implementation effects or effectiveness of mitigation measures for these two gartersnakes, and would guide future management toward desired conditions. Guideline 65, by requiring activities comply with listed species recovery plans, would contribute to the recovery of these two gartersnake, if listed and once a recovery plan is developed. Guideline 67 would require project or activity mitigations or modification to reduce negative impacts such as loss of thermal cover that supports their fish prey base.

This program area could reduce impacts to gartersnakes through partnerships that limit impacts within terrestrial space (e.g., breakage or browsing of woody vegetation). However, surveys for gartersnakes and habitat assessments could result in short term impacts (e.g., some trampling of shoreline habitat or disturbance of woody debris or small mammal burrows). While guidelines could limit project and activity impacts, not all negative impacts are likely to be removed or eliminated. As such, this program area may affect and is likely to adversely affect these two gartersnakes and their habitat.

Community-Forest Intermix Management Area

This management area would receive more intensive treatments relative to reducing the risk of uncharacteristic wildfire. The Alpine community-forest intermix area contains NHGS riparian habitat. However, desired condition 314 directs that the integrity of riparian areas be maintained within treatments in this management area which would help provide consideration for the needs of this gartersnake.

Recommended Research Natural Area Management Area

A portion of proposed critical habitat for NHGS falls within the Lower Campbell Blue recommended research natural area which is not suitable for livestock grazing, energy development, communication sites, or timber (LMP chapter 4). Guidelines 204, 205, and 207 would require protection of this recommended management area resources including livestock fencing if necessary, although implementing such actions may have short term impacts to NHGS and its habitat.

Critical Habitat and Primary Constituent Elements

Effects to gartersnake stream, shoreline, and adjacent habitat discussed above would apply to proposed critical habitat for these species. Tables 17 and 18 show what program areas may impact specific proposed critical habitat primary constituent elements for each gartersnake.

Table 17. NHGS proposed critical habitat PCEs potentially impacted by program area

Program Area	Affected PCEs (by number) and Principle Mechanism
Wildland Fire Management	1, 2, 3, and 4. Impacts from ash flow or sedimentation, decreased prey base, loss of ogranic debris, rearrangement or removal of structural complexity, potential for pollutants and introduction of predators.
Ecosystem/Vegetation Health (Forest Products)	
Rangeland Management	
Watershed and Soil Management (Riparian Areas)	
Engineering	
Lands and Minerals (Special Uses)	
Recreation and Wilderness	1, 2, and 3. Impacts from sedimentation, rearrangement or removal of structural diversity, potential for polluntants, introduction of crayfish, bullfrogs, or nonnative spiny-rayed fish could occur.
Wildlife, Fish, and Rare Plants	1. Species survey impacts to aquatic/riparian vegetation and/or streambanks and from non objective habitat improvement projects.

Table 18. NMGS proposed critical habitat PCEs potentially impacted by program area

Program Area	Affected PCEs (by number) and Principle Mechanism
Wildland Fire Management	1, 2, 3, and 4. Impacts from ash flow, decreased prey base, loss of ogranic debris, rearrangement or removal of structural complexity, potential for pollutants and introduction of predators.
Ecosystem/Vegetation Health (Forest Products)	
Rangeland Management	
Watershed and Soil Management (Riparian Areas)	
Engineering	
Lands and Minerals (Special Uses)	
Recreation and Wilderness	1, 2, 3, and 4. Impacts from sedimentation, rearrangement or removal of structural complexity, potential for pollution, introduction of crayfish, bullfrogs, or nonnative spiny-rayed fish could occur.
Wildlife, Fish, and Rare Plants	1 and 2. Possible short term impacts from survey and habitat assessments and from habitat enhancement projects.

Because PCEs for both species are very similar they are addressed together as follows.

PCE 1 Stream / Aquatic or riparian habitat

All program areas have potential to disturb substrates and possibly water flow. This may result from survey or fishing/hiking through streams, oil from nearby roads or equipment, organics from nearby livestock grazing, or ash flow from prescribed burning.

PCE 2 Adequate space
While some terrestrial space (600 ft) is not grazed by livestock, yet some is grazed (see prior critical habitat and primary constituent elements section). Forest restoration activities and recreation are not precluded from this space.

PCE 3 Adequate native species prey base
Although addressed by guidelines, recreational fishing and fire suppression water drops could impact the prey base.

PCE 4 Absence or low level of nonnative fishes and/or crayfish
Although addressed by guidelines, the preclusion of spiny-rayed fish and crayfish during use of water in fire suppression may not be completely possible.

Overall, essentially all program areas may affect and are likely to negatively impact all gartersnake primary constituent elements of proposed critical habitat. However, it is important to note that LMP implementation would not necessarily have these impacts across all proposed critical habitat for the NHGS and NMGS on the ASNFs.

Cumulative Effects and Climate Change

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur within the action area of impacts for a listed species. Both state and private entity (e.g., university) surveys have and are likely to continue for these two gartersnakes. County maintenance along the Blue Road continues and is likely a major contributor of sediment into the river impacting habitat and NHGS prey base. Activities on private land on the San Francisco and Blue Rivers, the Campbell Blue and Eagle Creeks include roads, livestock grazing, wells, water diversions, and septic systems, all of which may impact water quantity and quality and downstream habitat. Recreation activities like fishing may move nonnative fish or crayfish into gartersnake habitat where these species may not currently occur.

The implications of climate change and variability for these two gartersnakes could include reduce water quantity and increased water temperatures. With potential for overall higher temperatures and drying trends, there could be the possibility for reduced water availability to sustain these species and their prey. With potential also for higher intensity of storms, there could also be the possibility that flood impacts along streams may occur at more frequent intervals and at greater intensities resulting in continued threats to these gartersnakes and their habitat.

NHGS and NMGS and Critical Habitat Summary of Effects and Determinations

Overall LMP direction is to maintain or restore desired conditions for watersheds and riparian areas. Objectives 2, 4, 5, 6, 7, 8, and 18 have the potential to maintain or improve riparian habitat conditions, including within CLF dispersal habitat. Objectives 11 and 13 could potentially reduce uncharacteristic wildfire and subsequent heavy flooding. Objective 17 could help reduce the incidence of crayfish and objective 38 has the potential to help sustain water flows.

All objectives except 38 are likely to have short term detrimental negative effects. Standards and guidelines would require measures to limit the extent, level, and duration of potential short term effects

(e.g., clean, sealed heavy equipment when working in water) and even preclude negative long term effects in the case where long term riparian degradation cannot be avoided. Therefore, LMP implementation is **not likely to jeopardize the continued existence** of the proposed threatened narrow-headed gartersnake, and it is **not likely to adversely modify** proposed critical habitat for the species. In addition, LMP implementation is **not likely to jeopardize the continued existence** of the proposed threatened northern Mexican gartersnake, and it is **not likely to adversely modify** proposed critical habitat for the species.

However, LMP implementation does not provide for mitigation of all potential effects to a level that can be equated to or considered insignificant and/or discountable. Therefore, if listed, it is determined that LMP implementation **may affect and is likely to adversely affect** the narrow-headed gartersnake and, if designated, it **may affect and is likely to adversely affect** critical habitat for this species. In addition, if listed, it is determined that the LMP **may affect and is likely to adversely affect** the northern Mexican gartersnake and, if designated, it **may affect and is likely to adversely affect** critical habitat for this species.

Three Forks Springsnail *Pyrgulopsis trivialis*

Endangered Species Act status:	Endangered, 2012
District Occurrence:	Alpine
Recovery plan:	No
Critical habitat:	Designated, 2012
Determination (Species-Listed):	May Affect, Likely to Adversely Affect
Determination Critical Habitat (Designated):	May Affect, Likely to Adversely Affect

For brevity, the Three Forks springsnail is referred to as TFSS throughout the document.

TFSS Specific Assumptions

- All designated critical habitat is assumed to be occupied although this may not be the case.
- Based on extensive surveys of springs in the East Fork Black River 6th code watershed, TFSS are assumed to occur only in the Three Forks area ("Three Forks"), the Boneyard Bog area (the "Bog"), and at springs along Boneyard Creek ("Boneyard Creek").

Natural History, Distribution, and Status of the Species Range-wide

Life history, distribution, status of the species range-wide and listing factors are found in documents located on the USFWS website http://www.fws.gov/southwest/es/arizona/Three_Forks_Snail.htm (accessed 2014). An account of the taxonomy, biology, and reproductive characteristics of this species is found in the Final Rule listing the TFSS as an endangered species with designation of critical habitat (USFWS 2012). Note that springsnails at several springs along Boneyard Creek and at Lopez Spring have now been confirmed as *Pyrgulopsis trivialis* (Myers and Varela-Romero 2013).

The 2012 Biological and Conference Opinion for the Continued Implementation of the Land and Resource Management Plan for the ASNFs (FWS 2012) provide information about the TFSS in Forest Service Southwestern Region 3. Vaughn (2014) also compiled information on the species from various sources. All these documents are incorporated by reference into this document.

Status and Threats within the Action Area

TFSS are known only from the ASNFs and only in limited locations within the East Fork Black River watershed. TFSS in "natural" habitat are located in shallow rheocrene spring heads and spring runs; they have also been recorded from old concrete tubs built on some of these springs. A rheocrene spring is a spring flowing out of the ground often forced out under pressure which directly forms a stream; i.e., a short shallow stream before entering main streams as is the case for TFSS springs. Private land (160 acres) occurs among TFSS sites. The ASNFs may possibly acquire 155.75 acres of this private land, most of which encompasses a wet meadow and the creek between the Bog and the Boneyard Creek TFSS sites. There would be a concomitant surrender of 2.14 acres of current NFS land on which a cabin is situated to adjoin the remaining private land (none of which is TFSS designated critical habitat).

Historically, the TFSS was known to occupy more than 28 sites in the springs assemblage at Three Forks along the Three Forks branch of the East Fork Black River and in the springs assemblage at the Bog located along Boneyard Creek. Three Forks and the Bog are both fen wetlands and are likely primarily fed by groundwater (fens are distinguished from bogs by alkaline water chemistry; true bogs have acidic water chemistry). In 2010, springsnails were also discovered in a series of shallow rheocrene springs along Boneyard Creek between the Bog and Three Forks (specifically from Lopez Spring upstream to the private land). The Three Forks site was the location of the Three Forks Civilian Conservation Corp (CCC) camp occupied in 1934 and 1935. Left on the site are old concrete tubs where TFSS were commonly found in the 1990s.

Vegetation at the Bog and at Three Forks is wetland/cienega riparian PNVT. In addition, small segments of montane willow riparian forest PNVT occur along Boneyard Creek. The current trend in most ASNFs riparian areas is trending away from desired riparian conditions including the Bog. The Three Forks site is at desired condition while Boneyard Creek is likely improving in riparian condition.

Upland vegetation surrounding TFSS riparian/wetland habitat consists of ponderosa pine, dry mixed conifer, and montane/subalpine grasslands PNVTs. There are few scattered, small pockets of spruce-fir forest PNVTs, along Boneyard Creek. Invasive bull thistle has been present at Three Forks for decades but has not impacted habitat for TFSS.

Past and present threats to TFSS and information on them included the following.

Livestock grazing once heavily impacted TFSS habitat. However, the TFSS Bog site, within the Nutrioso Summer allotment, has not been grazed by livestock since 1999 when a livestock fence was constructed excluding most, but not all, of the springs in this area based on consultation AESO/SE 2-21-00-F-286. The Three Forks and Boneyard Creek sites are within the Black River allotment. By a 2001 grazing decision with accompanying ESA informal consultation, the former site is no longer authorized for livestock grazing but the later site is allowed three weeks of grazing. However, livestock grazing had not been taking place on the Black River allotment for some time prior to 2001 (initially nonuse, currently the allotment is vacant of a permittee).

Vegetation trampling and soil sedimentation has come from other sources besides ungulates as well. The Three Forks site is a popular dispersed camping area; however, public entry into the Three Forks site has been prohibited by ASNFs Special Closure Order since 2001 except for research purposes with required mitigations. The special order was implemented to protect the unique waters and associated species of this area (e.g., TFSS, CLF, California floater). However, the public does access the nearby, adjacent, and parallel-flowing East Fork Black River for fishing and water play activities.

There have been other potentially influencing factors in the vicinity of the Three Forks site. Dust and likely sediment (under heavy precipitation events) from forest road 249, a forest arterial route has likely occurred on this heavily travelled road that parallels the Three Forks site. Up until several years ago,

magnesium-chloride was used as dust abatement. Currently lignin, a wood product, is being used for this purpose. However, in the next few years this road is scheduled for paving by the Federal Highways Administration. There are closed roads near the Bog and Three Forks sites.

Over about the last 15 years, crayfish have proliferated at Three Forks and the Bog sites. Invasion and proliferation of crayfish coincided with localized extirpation of TFSS from concrete spring boxes at Three Forks around 1999, although TFSS were still common elsewhere at Three Forks in 2000. However, by 2005 the population of springsnails within the entire Three Forks site was extirpated. Crayfish are also found along Boneyard Creek.

The 2011 Wallow Fire did not burn into Three Forks, the Bog, or Boneyard Creek but low to mostly high severity fire occurred on adjacent slopes. Resource advisors were present during this and the 2004 Three Forks Fire and no aerial retardant drops occurred at TFSS sites. The closest slurry drop occurred 0.65 miles northwest of Three Forks and the fisheries resource biologist could find no evidence of slurry in Three Forks or the Bog; however, undetectable drift of micro-drops cannot be ruled out. Even though straw waddles were placed above many spring runs to protect them from ash flows during the Wallow Fire, latter summer rains in 2011 on adjacent severely burned slopes resulted in heavy flooding up into some of the spring runs at the Bog.

Continuing threats to this species associated with management or activities on the ASNFs come from ungulates, potential wildfire, and potential springhead inundation. Some other factors threatening the TFSS existence include predation, overutilization (collection), climate change and drought, and endemism.

Ungulate impacts are still occurring at all TFSS sites from elk grazing and wallowing, especially at the Bog site. Sedimentation from livestock grazing in uplands adjacent to TFSS sites may be occurring at the Bog site from the adjacent Nutrioso Summer allotment. Except for an occasional violation, recreational foot traffic impacts have been eliminated at the Three Forks site (recreational impacts are minimal at other sites). Some incidental hiking and fishing occurs at the Bog and along Boneyard Creek. The threat of impacts from further large scale wildfires has likely been reduced by the results of the 2011 Wallow Fire.

While AZGFD has conducted repeated crayfish trapping and adult numbers may be down, young crayfish are still prevalent based on periodic personal observations, 2000 to present. The threat posed by crayfish is even more significant given the isolation and narrow endemism of this species. A native snail, *Physa gyrina*, occurs sympatrically with TFSS but does not appear to be of concern.

TFSS have been collected by university and other researchers under special use permit and, in 2011 before the Wallow Fire was contained, a salvage effort lead by AZGFD removed over 700 TFSS from the Bog and Boneyard Creek. These snails remain at Phoenix Zoo facilities. Drought and climate change have also been identified as threats to this species. Since 2000, persistent drought has been interspersed with limited periods of higher than normal precipitation on the ASNFs; however, any overt change in flows in springs and fens used by TFSS has not been detected.

Potentially positive actions for the species undertaken by the ASNFs include the following. The ASNFs has taken several measures over the years to protect TFSS and their habitat including livestock removal, a special closure order, staging resource advisors during fires, and placement of straw wattles and upland seeding post fire to protect spring sites from ash flows. A project to test the ability of CCC concrete spring box modifications to limit crayfish entry is planned by the AZGFD and funded by the National Wild Turkey Federation. A traffic pull-off on forest road 249 provides a permanent educational sign providing information about rare species at the Three Forks site (TFSS, CLF, and California floater). An

adjacent kiosk posts the closure order and other wildlife information (e.g., Mexican wolf, Bear Aware). Substantial annual reductions in numbers and time in pasture to livestock grazing were made on the Alpine Ranger District from 2001 through 2003 in response to drought; this has helped sustain plant vigor and reduced streambank damage.

Critical Habitat and Primary Constituent Elements

Critical habitat primary constituent elements are the physical or biological features essential to the conservation of the species that may require special management considerations or protection.

There are four primary constituent elements for the TFSS as follows.

1) Adequately clean spring water (free from contamination) emerging from the ground and flowing on the surface;
2) Periphyton (attached algae), bacteria, and decaying organic material for food;
3) Substrates that include cobble, gravel, pebble, sand, silt, and aquatic vegetation, for egg laying, maturing, feeding, and escape from predators; and
4) Either an absence of nonnative predators (crayfish) and competitors (snails) or their presence at low population levels.

Except for the lower ends of spring runs and some spring heads at the Bog, PCEs 1, 2, and 3 remain intact in most spring runs after the Wallow Fire. Elk wallowing continues to impact PCE 1 at the Bog.

Species and Habitat Effects

In the individual program area discussions below, the implication of relevant desired conditions to TFSS are noted. Potential impacts of each objective, standard, and guideline to the species and habitat are described. Where applicable, management areas are addressed. A determination of effects is then made for that program area. Subsequent to all program areas, an overall determination of effects for this species and its critical habitat from LMP implementation is provided in the Summary of Effects and Determinations section for TFSS.

Wildland Fire Management

There are two relevant desired conditions that guide management and activities here (see appendix A). Desired conditions 42 and 296 would direct management actions to help restore fire to its historic role such that where large scale high severity fires were rare.

Based on FVS-FFE modeling, the risk of uncharacteristic wildfire would be reduced by one fire regime condition class in the dry mixed conifer PNVT and the trend would be improving in the ponderosa pine PNVT after 15 years. Although there would be no change for montane/subalpine grasslands, the severity of fires in grasslands is not what it can be in forested PNVTs. These upland improvements could reduce the likelihood of wildfire entering riparian habitat and could result in reduced runoff from wildfires that do occur. Prescribed fire and wildfire suppression have the potential to result in short term impacts to TFSS habitat (e.g., ash or sediment bearing flows), especially if followed by an unpredicted heavy rainfall event.

- GL 82 Erosion control mitigation features should be implemented to protect significant resource values and infrastructure such as stream channels, roads, structures, threatened and endangered species, and cultural resources.

- GL 174 Firelines, helispots, and fire camps should be located to avoid disturbance to critical species and impacts to cultural resources.
- GL 175 Aerial retardant drops should avoid threatened, endangered, proposed, or candidate, or identified sensitive species and waterways.

Guideline 82 erosion control measures (e.g., straw waddles as used after the Wallow Fire) could potentially help protect TFSS from runoff after wildfire, as necessary. Guidelines 174 and 175 have the potential to reduce the risk of fire suppression impacts to TFSS and its habitat.

Prescribed fire could, over the long term, reduce uncharacteristic wildfire and the associated risk of substantial or complete loss of riparian and floodplain habitat. However, burning and associated activities (fireline building) could also result in short term impacts to habitat where they occur upslope and upstream of TFSS sites. These impacts could increase the ability of overland flow to carry sediment or ash and increase the chance of post fire flooding that inundates TFSS spring runs. As such, this program area may affect and is likely to adversely affect TFSS and its habitat.

Ecosystem/Vegetation Health

There are six relevant desired conditions that guide management and activities here (see appendix A). Desired conditions 1, 39, and 62 direct management actions to develop healthy ecosystems able to withstand disturbance, especially important for a species like TFSS with narrow endemism. Desired conditions 4 and 44 would provide conditions to help support genetic diversity so that species, especially aquatic ones, can adjust to changing climate and other conditions. These desired conditions would help maintain TFSS habitat and the surrounding PNVTs that support riparian and wetland systems. Desired conditions 43 and 75 would help ensure native vegetation composition dominates in the riparian/wetland habitat of TFSS.

- OBJ 11 Annually, treat 5,000 to 35,000 acres to reduce [forest PNVTs] tree densities, restore natural fire regimes, promote species habitat and ecosystem health, reduce fire hazard, maintain desired conditions, initiate recovery from uncharacteristic disturbance, and provide forest products, leaving a desired mix of species with the range of desired densities that are resilient to changing climatic conditions.
- OBJ 14 Decrease or maintain the woody canopy cover [grassland PNVTs] at less than 10 percent by treating up to 25,000 acres annually.

Based on VDDT modeling of these two objectives, changes in conditions for PNVTs adjacent to TFSS habitat are shown in table 19. Modeling indicates that these PNVTs move toward desired conditions, i.e., become less departed from desired conditions, after 15 years of LMP implementation.

Table 19. Movement toward DC after 15 and 50 years within PNVTs associated with TFSS (based on VDDT modeling [a/])

PNVT	Current (%) departure from DC	Departure (%) at 15 years	Departure (%) at 50 years [b/]
Ponderosa pine forest	77	63	54
Dry mixed conifer forest	67	56	48
Montane/subalpine grassland	No VDDT modeling developed for this PNVT		

[a/] Percentage is based on VDDT modeling of the *high* treatment acres for alternative B, the proposed LMP.

[b/] Assuming LMP direction would continue to be implemented to year 50; however, a new forest plan would be required

before then which would be based on current conditions at that time.

Reduced departures after 15 years indicate that conditions (e.g., stand openness, herbaceous vegetation density and vigor, reduced encroachment of grasslands) and disturbances (e.g., wildfire) are closer to desired and reference or historic conditions. Where restoration occurs upslope and upstream of TFSS habitat, these objectives have the potential to increase ground cover to carry periodic cool ground fires and, with decreased crown densities, to reduce the risk of severe wildfires that can burn intensely enough to consume riparian areas used by TFSS. However, these activities have the potential to also result in short term impacts such as increased over land water and sediment flow that could overtop the lowermost spring runs.

- GL 23 Landscape scale restoration projects should be designed to spread out treatments spatially and/or temporally to reduce implementation impacts and allow reestablishment of vegetation and soil cover.
- GL 30 Ground-disturbing projects (including prescribed fire) which may degrade long term riparian conditions should be avoided.

Guideline 23 has the potential to help retain vegetation cover in some areas while allowing reestablishment of vegetation and soil cover in treated areas. Where TFSS habitat might be within a landscape scale project, this guideline also has the potential to help limit high flows and sediment from entering spring run habitat. By avoiding projects that could degrade riparian areas over the long term, guideline 30 could potentially protect down slope and downstream TFSS habitat.

This program area could improve upland conditions that contribute to a more stabilized riparian habitat for TFSS. While guidelines could limit short term impacts from restoration thinning (equipment, soil disturbance, and sediment), not all negative impacts would be reduced or eliminated. As such, this program area may affect and is likely to adversely affect TFSS and its habitat.

Rangeland Management

There are two relevant desired conditions that guide management and activities here (see appendix A). Desired condition 202 would direct management and activities to address nonnative and invasive species that could harm native species such as the TFSS. Where annual fluctuations and seasonality of forage production are considered, desired condition 278 would help retain sufficient ground cover to the amount of overland flow, sediment, and organic matter into the riparian/wetland habitat of TFSS.

- ST 11 Projects and authorized activities shall be designed to reduce the potential for introduction of new species or spread of existing invasive or undesirable aquatic or terrestrial nonnative populations.

Standard 11 has the potential to help reduce impacts to TFSS from invasives. Actions might include crayfish removal such as has been conducted by AZGFD.

- GL 17 To prevent degradation of native species habitat and the incidental or accidental introduction of diseases or nonnative species, aquatic species should not be transferred through management activities from one 6th level HUC watershed to another.
- GL 32 Active grazing allotments should be managed to maintain or improve to desired riparian conditions.
- GL 132 Critical areas [e.g., riparian areas] should be managed to address the inherent or unique site factors, conditions, values, or potential conflicts associated with them.

- GL 134 New livestock troughs, tanks, and holding facilities should be located out of riparian areas to reduce concentration of livestock in these areas. Existing facilities in riparian areas should be modified, relocated, or removed where their presence is determined to inhibit movement toward desired riparian or aquatic conditions.
- GL 135 As areas are mechanically treated or burned, or after large disturbances, timing of livestock grazing should be modified as needed, in order to move toward desired conditions and to accomplish the objectives for the treatment.
- GL 136 Forage, browse, and cover needs of wildlife, authorized livestock, and wild horses should be managed in balance with available forage so that plants providing these needs remain at or move toward a healthy, persistent conditions.
- GL 138 To minimize potential resource impacts from livestock, salt or nutritional supplements should not be placed within a quarter of a mile of any riparian area or water source. Salt or nutritional supplements should also be located to minimize herbivory impacts to aspen clones.

Three guidelines could potentially help protect or restore riparian or wetland areas and the uplands that contribute to their condition in areas occupied by TFSS. This would be addressed by stocking in balance with available forage (GL 136), and by requirements to improve habitat (GL 32), and by managing for the special concerns within riparian areas (GL 132) which are critical areas for livestock grazing management.

Guideline 17 has the potential to reduce the risk of introducing nonnative species such as the New Zealand mudsnail that are already in Arizona and which can compete with native snails. Guidelines 134 and 138 could potentially reduce livestock impacts in riparian areas upslope and upstream from TFSS sites. Guideline 135 has the potential to reduce total runoff and sediment from areas where livestock grazing and projects such as thinning or burning might concurrently take place.

In total there are just over 17 acres of designated critical habitat for TFSS in three units: Boneyard Bog (5.28 acres), Boneyard Creek (5.79 acres), and Three Forks (6.04 acres). None of these areas are currently authorized for livestock grazing and all would fall within the Three Forks recommended research natural area which would preclude livestock grazing.

This program area could impact TFSS from grazing occurring upslope and upstream of occupied sites through water quality impacts (e.g., sedimentation, organic matter) even though the Three Forks recommended research natural area, which encompasses all TFSS sites and critical habitat, precludes livestock grazing. While guidelines could reduce the risk of invasives like crayfish, not all negative impacts would be reduced or eliminated. Hence there may be competition or conflict (FEIS pg. 462), but the specific impacts of livestock grazing would be analyzed in site specific NEPA analyses (FEIS p. 470). As such, this program area may affect and is likely to adversely affect TFSS and its habitat.

Watershed and Soil Management

There are five relevant desired conditions that guide management and activities here (see appendix A). Desired condition 22 would provide conditions above the floodplain that help protect water quality and aquatic habitat for desirable invertebrates such as TFSS (DC 30) while desired condition 81 would help stabilize streambanks and floodplains with sufficient ground cover. Desired conditions 292 and 293 would help ensure that water is available and not diminished to meet the needs of species such as TFSS.

OBJ 38 Annually, prepare at least one instream flow water rights application until water acquisition needs are complete to sustain riparian areas, fish, wildlife, and water-based recreation.

Where a water rights application is filed for within the Black River watershed, objective 38 has the potential to help sustain river flows that could be related to spring run output.

No regional riparian VDDT models were developed to assess movement toward desired conditions with LMP implementation for riparian PNVTs providing TFSS habitat. However, the Riparian Specialist Report estimates that improvement of 2 - 6% in overstory conditions may occur in riparian PNVTs across the ASNFs; otherwise, some overall movement toward desired conditions is expected, but this is not quantified. While removal of encroaching trees would help maintain the adjacent grassland PNVT, trees are a minor contributor to the current moderate departure from desired condition in this grassland PNVT.

- ST 33 Groundwater withdrawals shall not measurably diminish surface water flows on NFS lands without an appropriate surface water right.

Standard 33 has the potential to ensure that surface flows are not diminished by groundwater pumping which could otherwise seriously threaten the TFSS, especially if pumping occurs upstream of TFSS habitat.

- GL 2 Projects with ground-disturbing activities should be designed to minimize long and short term impacts to soil resources. Where disturbance cannot be avoided, project specific soil and water conservation practices should be developed.
- GL 3 Severely disturbed sites should be revegetated with native plant species when loss of long term soil productivity is predicted.
- GL 8 Streamside management zones should be in place between streams and disturbed areas and/or road locations to maintain water quality and suitable stream temperatures for aquatic species
- GL 10 Constraints (e.g., maximum limit to which water level can be drawn down or minimum distance from a connected river, stream, wetland, or groundwater-dependent ecosystem) should be established for new groundwater pumping sites permitted on NFS lands in order to protect the character and function of water resources.
- GL 18 Sufficient water should be left in streams to provide for aquatic species and riparian vegetation.
- GL 19 Projects and activities should avoid damming or impounding free-flowing waters to provide streamflows needed for aquatic and riparian-dependent species.
- GL 82 Erosion control mitigation features should be implemented to protect significant resource values and infrastructure such as stream channels, roads, structures, threatened and endangered species, and cultural resources.

Guidelines 2 and 8 could potentially minimize impacts to riparian/wetland areas and water quality. This could include streamside management zones that would encompass the rheocrene spring runs occupied by TFSS. Guidelines 10, 18, and 19 have the potential to protect water quality within TFSS habitat. Guideline 3 has the potential to help protect TFSS habitat by stabilizing burned upland areas. Erosion control measures such as noted in guideline 82 for landscape scale disturbances have the potential to help protect TFSS sites after large scale disturbance events such as severe wildfire and flooding.

This program area could improve overall watershed condition by increasing ground cover and density of vegetation, thereby reducing sediment into riparian/wetland areas and improving water quality where TFSS are found. While standards and guidelines could limit impacts from restoration, burning, and other activities, not all short term negative impacts would be reduced or eliminated. As such, this program area may affect and is likely to adversely affect TFSS and habitat.

Engineering Program

There are no desired conditions that guide management and activities here relevant for the TFSS.

- ST 15 Motorized vehicle travel shall be managed to occur only on the designated system of NFS roads and motorized trails and designated motorized areas.
- ST 18 Road maintenance and construction activities shall be designed to reduce sediment (e.g., water bars, sediment traps, grade dips) while first providing for user safety.

Standard 15 has the potential to reduce damage to soils and vegetation in the watershed above occupied TFSS habitat, thereby potentially reducing downstream effects (e.g., sediment flows or changes to stream hydrologic function). Standard 18 has the potential to help limit sediment and contaminants from entering the Three Forks area from forest road 249.

- GL 31 Wet meadows and cienegas should not be used for concentrated activities (e.g., equipment storage, forest product or mineral stockpiling, livestock handling facilities, special uses) that cause damage to soil and vegetation.
- GL 33 Storage of fuels and other toxicants should be located outside of riparian areas to prevent spills that could impair water quality or harm aquatic species.
- GL 34 Equipment should be fueled or serviced outside of riparian areas to prevent spills that could impair water quality or harm aquatic species.

While it is unlikely that equipment or other concentrating activities would occur within TFSS habitat, guidelines 31, 33, and 34 have the potential to help protect downstream TFSS habitat.

This program area, primarily through the presence and maintenance of roads, could result in concentrated runoff and sediment that might, under heavy precipitation events or snow melt, impact TFSS sites and habitat. Although there are standards and guidelines that limit road related limit impacts, not all negative impacts would be reduced or eliminated. As such, this program area may affect and is likely to adversely affect TFSS and it habitat.

Lands and Minerals Program

There are no desired conditions that guide management and activities here relevant for the TFSS.

- ST 28 Special use authorizations for the collection of live species with limited distribution (e.g., some invertebrates, plants) shall include permit provisions to ensure the species persist onsite.
- ST 31 Special uses for water diversions shall maintain fish, wildlife, and aesthetic values and otherwise protect the environment.

Standard 28 could potentially help to ensure that collections of TFSS specimens authorized by special use permit do not risk loss of the species from onsite. Authorizations for water diversions (standard 31) have the potential to help maintain wildlife habitat which would include water flows for TFSS.

- GL 146 Streambed and floodplain alteration or removal of material should not occur if it prevents attainment of riparian, channel morphology, or streambank desired conditions.
- GL 166 As applicable, issuance of special use authorizations should incorporate measures to reduce potential impacts to wildlife and avoid rare and unique habitats (e.g., bogs, fens).
- GL 206 Research special use authorizations should limit impacts to sensitive resources, unique features, and species within recommended RNAs [see management areas section below].

While mineral material removal is unlikely within the riparian area of occupied TFSS habitat, guideline146 could potentially limit material removal from riparian areas upstream of TFSS. Guideline 166 could potentially limit impacts associated with special use activities (e.g., nearby group camps). In addition, guideline 206 could also potentially reduce impacts associated with special use permits issued within the Three Forks recommended research natural area where TFSS occur.

The minerals portion of this program area could impact riparian areas where removal of materials like gravel might occur within the watershed upstream of TFSS and where special use activities could impact the TFSS in a variety of ways (e.g., trampling of vegetation and streambanks). While there are standards and guidelines that could limit the impact impacts, not all negative impacts would be reduced or eliminated. As such, this program area may affect and is likely to adversely affect TFSS and its habitat.

Recreation and Wilderness Program

There is one relevant desired condition that guides management and activities here. Desired condition 211 would provide for recreation that does not negatively impact wildlife habitat and populations. It would support the current forest closure order (and its continuing application) preventing public entry into the sensitive Three Forks area. It would also support additional closures, if needed, at the other TFSS sites.

- OBJ 18 Annually, rehabilitate, stabilize, revegetate, or relocate an average of five dispersed campsites to improve recreation opportunities and/or protect the environment.

Objective 18 has the potential to improve degraded dispersed campsites upslope and upstream of TFSS habitat. It may also result in short term implementation impacts from rehabilitation activities until sites revegetate and stabilize.

- ST 13 Dispersed campsites shall not be designated in areas with sensitive soils or within 50 feet of streams, wetlands, or riparian areas to prevent vegetation and bank damage, soil compaction, additional sediment, or soil and water contamination.

Standard 13 could potentially preclude recreation impacts to TFSS (e.g., camping next to spring runs) at the Boneyard Creek and Bog sites.

- GL 7 Streams, streambanks, shorelines, lakes, wetlands, and other bodies of water should be protected from detrimental changes in water temperature and sediment to protect aquatic species and riparian habitat.

Guideline 7 could potentially protect TFSS habitat from any project or activity impacts.

- GL 95 Dispersed campsites should not be located on or adjacent to archaeological sites or sensitive wildlife areas.

Guideline 95 has the potential to preclude dispersed campsites at the Bog or along Boneyard Creek, thereby helping to prevent trampling of stream bank and spring runs.

This program area could impact TFSS habitat by increasing levels of recreation in TFSS habitat resulting in trampled vegetation, streambanks, and spring runs. There could be some habitat improvement where campsites are rehabilitated but recreation at these sites could still impact TFSS. While standards and guidelines could limit impacts, not all negative impacts would be reduced or eliminated. As such, this program area may affect and is likely to adversely affect TFSS and its habitat.

Wildlife, Fish, and Rare Plant Program

There are four relevant desired conditions that guide management and activities here (see appendix A). Desired condition 32 would direct management and activities to provide habitat that contributes to the recovery of TFSS. Desired conditions 35 and 203 would provide that nonnative invasive plants and animals have limited impact on TFSS. Desired condition 199 would direct that collection of rare species does not negatively impact their abundance.

- OBJ 17 Annually, control or eradicate invasive species (e.g., tamarisk, bullfrogs) on at least 2 stream miles.

Objective 17 has the potential to help limit predation of TFSS by crayfish where this objective is implemented within TFSS habitat.

- GL 15 Activities occurring within federally listed species habitat should apply habitat management direction and species protection measures from recovery plans.
- GL 29 Project plans should include quantitative and/or qualitative objectives for implementation monitoring and effectiveness monitoring to assist in moving toward or maintaining desired conditions.
- Guideline 65, by requiring activities comply with listed species recovery plans, would contribute to the recovery of the NMMJM, if listed and once a recovery plan is developed.
- GL 67 Modifications, mitigations, or other measures should be incorporated to reduce negative impacts to plants, animals, and their habitats and to help provide for species needs, consistent with project or activity objectives.
- GL 75 Rare and unique features (e.g., talus slopes, cliffs, canyon slopes, caves, fens, bogs, sinkholes) should be protected from damage or loss to retain their distinctive ecological functions and maintain viability of associated species.
- GL 76 The needs of localized species (e.g., New Mexico meadow jumping mouse, Bebb willow, White Mountains paintbrush) should be considered and provided for during project activities to ensure their limited or specialized habitats are not lost or degraded.

Guideline 15 would help contribute to the recovery of TFSS once a recovery plan is developed. Guideline 29 would require monitoring to provide feedback about project implementation effects or effectiveness of mitigation measures for TFSS, and would guide future management toward desired conditions. Guideline 65, by requiring activities comply with listed species recovery plans, would contribute to the recovery of the TFSS once a recovery plan is developed. Guidelines 67 and 75 would require that the needs of TFSS be addressed or impacts mitigated to ensure persistence of TFSS. This would include retaining sufficient water and protection of their unique spring/wetland habitat. Guideline 76 would require protection of the specialized rheocrene spring run habitat of the TFSS.

This program area could reduce impacts to TFSS through removal of crayfish that both compete with and predate upon TFSS, although these activities could result in short term disturbance of spring run substrates and periphyton. While guidelines for mitigations or modifications could limit project and activity impacts, not all negative impacts would be reduced or eliminated. As such, this program area may affect and is likely to adversely affect these two gartersnakes and their habitat.

Recommended Research Natural Area Management Area

The 30-acre Three Forks special closure order area falls within the Three Forks recommended research natural area which is not suitable for livestock grazing, energy development, communication sites, or timber (LMP chapter 4). Desired condition 358 would help support continuing implementation of the

Three Forks closure area. Desired condition 357 would provide opportunities for research and educational activities while protecting the values within the Three Forks recommended research natural area. Guidelines 204, 205, and 207 would require protection of this recommended management area resources, including livestock fencing if necessary, although implementing such actions may have short term impacts to TFSS and its habitat.

Critical Habitat and Primary Constituent Elements

Effects to TFSS habitat discussed above would apply to proposed critical habitat for these species. Table 20 shows which program areas may impact specific critical habitat PCEs for TFSS.

Table 20. TFSS critical habitat PCEs potentially impacted by program area

Program Area	Affected PCEs (by number) and Principle Mechanism
Wildland Fire Management	1 and 3. Sediment or ash from management and activities upslope and upstream of occupied TFSS. While special uses such as research activities would have mitigating measures, impacts to TFSS and to water quality and substrates could occur.
Ecosystem/Vegetation Health (Forest Products)	
Rangeland Management	
Watershed and Soil Management (Riparian Areas)	
Engineering	
Lands and Minerals (Special Uses)	
Recreation and Wilderness	1,2, and 3. Recreation use in all but the Three Forks area could impact habitat through trampling or potentially introduce disease or predators.
Wildlife, Fish, and Rare Plants	1 and 2. Possible short term impacts to spring run substrates or periphyton from survey efforts.

PCE 1 Adequately clean spring water

All program areas are likely to have activities that may generate sediment upslope or upstream of TFSS critical habitat including wildlife surveys which could cause limited vegetation trampling and disturb substrate within critical habitat.

PCE 2 Periphyton

Within critical habitat, fishing or hiking along Boneyard Creek or the Bog and wildlife surveys could have the potential to trample or disturb periphyton and other food stuff needed by TFSS. Activities or projects upslope or upstream of could contribute sediment downstream to TFSS critical habitat.

PCE 3 Substrates

Ash from prescribed fires and sediment from projects, activities, and roads, could fill clean substrates needed by TFSS for feeding, egg laying, and escape from predators. While limited by standards and guidelines, not all potential negative effects would be eliminated.

PCE 4 Nonnative predators and competitors
While there is a standard to limit the introduction or spread of invasive species from projects or activities, elimination of all nonnative predators (crayfish) is not likely.

Overall, essentially all program areas are likely to have some negative impacts to TFSS primary constituent elements of critical habitat. However, it is important to note that LMP implementation would not necessarily have these impacts across all TFSS critical habitat on the ASNFs.

Cumulative Effects and Climate Change

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur within the action area of impacts for a listed species. Given the limited distribution and mobility of this species, there are limited sources of cumulative effects. Activities associated the nearby private land at Sierra Blanca Lake are unknown; they could include a well or septic system and the wetland meadow has been grazed at times by livestock trespassing on private land. These and an access road could influence water amount and quality within TFSS habitat. TFSS survey and removal of individual TFSS specimens has been conducted by AZGFD and university associated individuals.

The implications of climate change and variability for TFSS could include impacts to spring and fen hydrology, including reduced and/or warmer flows. With potential for higher intensity of storms, there could be the possibility that flooding along streams may occur at more frequent intervals and at greater intensities resulting in continued threats to TFSS and their spring run habitat.

TFSS and Critical Habitat
Summary of Effects and Determinations

Overall LMP direction is to maintain or restore desired conditions for PNVTs and riparian areas, including implementation of objectives to improve riparian areas within the East Fork Black River watershed. Some objectives (OBJ 11, 17, 18, and 38) have the potential to maintain or improved riparian habitat conditions although, except for objective 38, such actions could also have short term impacts to TFSS habitat. Required standards and guidelines are designed to limit the extent, level, and duration of potential short term effects and even preclude negative long term effects in the case where long term riparian degradation cannot be avoided. However, LMP implementation does not provide for mitigation of all potential effects to a level that can be equated to or considered insignificant and/or discountable. Therefore, LMP implementation **may affect and is likely to adversely affect** the Three Forks springsnail, and it **may affect and is likely to affect** critical habitat for the species.

FISH

Apache Trout *Oncorhynchus apache*

Endangered Species Act Status:	Threatened, 1975
District Occurrence:	Alpine and Springerville
Recovery Plan:	2009 (second revision)
Critical Habitat:	No
Determination of Effect (Species):	May Affect, Likely to Adversely Affect

Natural History, Distribution, and Status of the Species Range-wide

Information relative to the life history, distribution, status of the species range-wide and listing factors are located on the FWS website http://www.fws.gov/southwest/ApacheTrout.htm. The literature cited within the most recent revision (second) of the recovery plan (FWS 2009), contains a thorough list of references for this species. This literature, along with the recently completed five year review (FWS 2010), were considered and used in the preparation of this document; and are incorporated by reference into this document.

Status and Threats within the Action Area

Existing and potential Apache trout recovery populations identified within the recovery plan occur on the ASNFs and White Mountain and San Carlos Apache Tribal lands in Arizona within the historic range of the species. Existing and potential recovery populations on the ASNFs identified within the recovery plan and included within this analysis are Bear Wallow Creek, Centerfire/Boggy/Wildcat Creeks, Conklin Creek, Coyote/Mamie Creeks, East Fork Little Colorado River (and Lee Valley Creek), Fish Creek, Hayground Creek, Mineral Creek, Snake Creek, Soldier Creek, South Fork Little Colorado River, Stinky Creek, West Fork Black River, and West Fork Little Colorado River. The reasons for listing and threats to the species can be found within the recovery plan, and the final rule for the reclassification of Apache trout from an endangered to a threatened species (FWS 1975). Threats to the species at the time of listing included the destruction, modification, and curtailment of its habitat or range; logging operations and the associated erosion, siltation, and increases in water temperatures; and the introduction of nonnative trout species that hybridize and compete with the Apache trout. In addition to the threats identified at the time of listing and down listing; additional threats have been identified in the five-year review (FWS 2010) and include wildfire, post-fire flooding, drought, and barrier failures. All of these threats continue for all of the existing and potential recovery populations, and are addressed in the LMP through various plan decisions and components.

The 14 existing and potential recovery populations being considered here cover approximately 110,000 acres and 82 miles of stream. Recent habitat condition and population information has been collected, but this information is not yet available, as it is still being analyzed by the AZGFD. Habitat and population surveys were first conducted in the late 1980s and continued into the 1990s; and they documented riparian and habitat conditions within Apache trout streams have been negatively impacted thru past management, and most (approximately 70% of reaches surveyed) were not meeting minimum standards at that time set by the forest plan. Over the last 25 years, the AZGFD in conjunction with the ASNFs, have implemented considerable efforts on recovery projects to improve the status of the species. These projects on the ASNFs were covered under two Environmental Analyses (1994 and 2002); and included aquatic and riparian habitat improvements, barrier construction and maintenance, chemical treatments to remove nonnative fish, and the subsequent introductions of Apache trout. Recovery actions on the ASNFs continue, and more detailed and specific information can found within the annual progress reports prepared by the AZGFD. While considerable actions to recover the species have been made, there have been several setbacks to the recovery efforts due to barrier failures, lack of efficacy during chemical treatments, and the lack of genetically pure Apache trout to place into historical habitats. Additionally, substantial impacts resulting from the Wallow Fire (2011) have occurred to watersheds, riparian and aquatic habitat, and constructed artificial barriers necessary for Apache trout recovery.

Existing and potential recovery streams are in various phases of restoration and recovery, and all extant populations are likely low in numbers. Most streams are currently unoccupied or require additional recovery actions for various reasons (*e.g.*, hybridization, barrier failure and nonnative species), and additional information is available in the progress reports that have been prepared by the AZGFD covering 2002 through 2011. Eleven of the 14 Apache trout watersheds and their associated riparian areas and aquatic habitats have been substantially impacted (39-100% of the watershed burned) by the Wallow Fire. Mineral Creek was the only watershed not impacted from the Wallow Fire. Below are brief

summaries of the 14 watersheds, while more specific impacts of the Wallow Fire (*i.e.*, burn severity acres) are contained within the wildland fire management section.

The Bear Wallow Creek watershed currently being managed for Apache trout recovery includes approximately 14,267 acres, and is located primarily within the Bear Wallow Wilderness above an artificial barrier. Past impacts to this watershed have primarily occurred from livestock grazing, the loss of the ecological role of fire from alterations in vegetation and fire suppression, and timber harvest and roads outside of the wilderness. Current threats are most likely associated with wildland fire (uncharacteristic and unplanned), altered watershed and aquatic habitat conditions from the Wallow Fire, recreational activities, nonnative trout species, and the ability to construct and maintain an effective artificial barrier. A second artificial barrier was recently completed downstream of the forest boundary on San Carlos Apache Tribal land. Both barriers are likely currently ineffective in isolating the population from the nonnative trout species below, and the current population present is considered hybridized and will be removed in the future.

The Centerfire/Boggy/Wildcat Creeks watershed consists of approximately 14,865 acres above a constructed barrier on Centerfire Creek. The watershed has primarily been impacted by livestock grazing, loss of the ecological role of fire from fire suppression and vegetation alterations, and timber harvest and roads. Current threats are most likely associated with wildland fire (uncharacteristic and unplanned), ungulate grazing, roads, altered watershed and aquatic habitat conditions from the Wallow Fire, nonnative trout species, and the ability to construct and maintain an effective artificial barrier. The population currently present within this stream is considered hybridized, and could be removed (chemically treated) and replaced with pure Apache trout in the future.

The Conklin Creek population is being managed above an artificial barrier (modified culvert on Forest Road 25), and the watershed consists of approximately 4,747 acres. The barrier has recently undergone modifications to improve its efficacy, and the stream currently contains no Apache trout. The watershed has primarily been impacted by livestock grazing, loss of the ecological role of fire from fire suppression and vegetation alterations, and timber harvest and roads. Current threats are most likely associated with wildland fire (uncharacteristic and unplanned), ungulate grazing, roads, altered watershed and aquatic habitat conditions from the Wallow Fire, nonnative trout species, and the ability to construct and maintain an effective artificial barrier.

The Coyote/Mamie Creek watershed consists of approximately 7,768 acres above an artificial barrier (constructed in 1994), with minimal threats from nonnative fish species downstream due to the intermittent characteristics of the drainage at and downstream of the barrier. This pure population has persisted since the late 1960s, although current population numbers are likely very low. The watershed has primarily been impacted by livestock grazing, loss of the ecological role of fire from fire suppression and vegetation alterations, and timber harvest and roads. Current threats are most likely associated with wildland fire (uncharacteristic and unplanned), ungulate grazing, roads, and altered watershed and aquatic habitat conditions from the Wallow Fire.

The East Fork Little Colorado River and Lee Valley Creek (and reservoir) occur above two artificial barriers on the East Fork Little Colorado River. The watershed consists of approximately 7,719 acres. This system is unique in that Lee Valley Creek is a tributary to the East Fork Little Colorado River, but the spillway to Lee Valley Reservoir drains into the West Fork Little Colorado River. The current population within the East Fork Little Colorado River is limited to the stream above Coulter Dam, and has been recently stocked with Apache trout, and it is likely their numbers are still relatively low. Apache trout were stocked into Lee Valley Creek above Lee Valley Reservoir in 2004 after chemically treating the stream to remove nonnative trout, and their current status within the stream is unknown. The watershed has primarily been impacted by livestock grazing, loss of the ecological role of fire from fire

suppression and vegetation alterations, and timber harvest and roads. Current threats are most likely associated with wildland fire (uncharacteristic and unplanned), ungulate grazing, roads, recreation, altered watershed and aquatic habitat conditions from the Wallow Fire, nonnative trout species, and the ability to construct and maintain an effective artificial barrier.

The Fish Creek watershed consists of approximately 15,852 acres above an artificial barrier about three-quarters of a mile upstream of the confluence with the Black River. Approximately 250 Apache trout from the upper portion of the West Fork Black River were stocked into Fish Creek in 2006 and 2007. The Wallow Fire resulted in approximately 48% of the watershed burned under high severity conditions, resulting in the loss of the artificial barrier under post fire flooding. The watershed has primarily been impacted by livestock grazing, loss of the ecological role of fire from fire suppression and vegetation alterations, and timber harvest and roads. Current threats are most likely associated with wildland fire (uncharacteristic and unplanned), ungulate grazing, roads, recreation activities, altered watershed and aquatic habitat conditions from the Wallow Fire, nonnative trout species, and the ability to construct and maintain an artificial fish barrier.

The Hayground Creek population occurs above a constructed barrier that is located approximately one-quarter mile upstream of the confluence with the West Fork Black River. Hayground Creek watershed consists of approximately 3,321 acres. Apache trout were stocked into this stream in 2005 after it was chemically treated to remove nonnative fish. At the present the artificial barrier is not effective, and nonnative trout are now present within the stream, and the introduction of Apache trout has likely not been successful. The watershed has primarily been impacted by livestock grazing, loss of the ecological role of fire from fire suppression and vegetation alterations, and timber harvest and roads. Current threats are most likely associated with wildland fire (uncharacteristic and unplanned), ungulate grazing, roads, altered watershed and aquatic habitat conditions from the Wallow Fire, nonnative trout species, and the ability to construct and maintain an artificial barrier.

Mineral Creek is located on the north end of the Springerville Ranger District above an artificial barrier, and its watershed consists of 5,469 acres. Apache trout were introduced into this stream in the late 1960s, and the artificial barrier was constructed in 1982. Although this was the only Apache trout recovery stream that was not impacted by the Wallow Fire; this population has always been small, and current numbers are likely low. The watershed has primarily been impacted by livestock grazing, loss of the ecological role of fire from fire suppression and vegetation alterations, and timber harvest and roads. Current threats are most likely associated with wildland fire (uncharacteristic and unplanned), ungulate grazing, roads, and recreational activities.

Snake Creek is a tributary to the Black River and has an artificial barrier (watershed = 5607 acres) that is currently ineffective in preventing the upstream movement of nonnative trout from downstream. It was chemically treated to remove nonnative fish in 2003, and speckled dace were stocked in 2004. A survey conducted by AZGFD in 2007 did not find any speckled dace, and collected brown trout and rainbow/Apache hybrid trout. The watershed has primarily been impacted by livestock grazing, loss of the ecological role of fire from fire suppression and vegetation alterations, and timber harvest and roads. Current threats are most likely associated with wildland fire (uncharacteristic and unplanned), ungulate grazing, roads, altered watershed and aquatic habitat conditions from the Wallow Fire, nonnative trout species, and the ability to construct and maintain an artificial barrier.

Soldier Creek is a tributary to Reservation Creek and the portion of its watershed on the ASNFs is approximately 220 acres. The majority of the watershed is upstream of the ASNFs on the White Mountain Apache Reservation. A natural barrier occurs on Soldier Creek approximately 150 meters upstream of its confluence with Reservation Creek; a pure population of Apache trout is present above

this barrier. This population has been a source of Apache trout to stock into other streams for recovery efforts.

The South Fork Little Colorado River has two artificial barriers within the lower two miles of the stream on the ASNFs. The watershed is approximately 15,581 acres, and the stream was chemically treated in 2007 and 2008 to remove nonnative fish. Apache trout were stocked, but were heavily impacted by the Wallow Fire in 2011; and if they are persisting, they are likely present in low numbers. The watershed has primarily been impacted by livestock grazing, loss of the ecological role of fire from fire suppression and vegetation alterations, and timber harvest and roads. Current threats are most likely associated with wildland fire (uncharacteristic and unplanned), ungulate grazing, recreational activities, roads, and altered watershed and aquatic habitat conditions from the Wallow Fire.

Stinky Creek is a tributary to the West Fork Black River, and its watershed is approximately 2,118 acres. The artificial barrier on this steam is approximately one-quarter mile upstream of its confluence, and has not been effective in preventing upstream movement of nonnative trout. Barrier improvements have been ongoing, and the stream is being monitored by AZGFD. Apache trout are not currently present within this stream. The watershed has primarily been impacted by livestock grazing, loss of the ecological role of fire from fire suppression and vegetation alterations, and timber harvest and roads. Current threats are most likely associated with wildland fire (uncharacteristic and unplanned), ungulate grazing, roads, altered watershed and aquatic habitat conditions from the Wallow Fire, nonnative trout species, and the ability to construct and maintain an artificial barrier.

The West Fork Black River population is located above two artificial barriers approximately 0.5 miles downstream of the Forest Road 116 crossing of the stream. Burro and Thompson Creeks are tributaries that flow into the West Fork Black River above the barriers. The watershed consists of approximately 7,236 acres, and Apache trout were stocked into this system in 1997 after chemical removal of the nonnative trout. Some brook and brown trout have since been collected upstream of the barriers and on the portion of the West Fork Black River on White Mountain Apache Tribal lands. This population has been a source of Apache trout to stock into other streams for more recent recovery efforts. The watershed has primarily been impacted by livestock grazing, loss of the ecological role of fire from fire suppression and vegetation alterations, and timber harvest and roads. Current threats are most likely associated with wildland fire (uncharacteristic and unplanned), ungulate grazing, recreational activities, roads, altered watershed and aquatic habitat conditions from the Wallow Fire, nonnative trout species, and the ability to construct and maintain an artificial barrier. Planning is currently underway for the extension of this population downstream approximately 8-9 miles. Construction of an artificial barrier could occur as early as 2015, with a chemical treatment to remove nonnative fish occurring in 2016, and the introduction of Apache trout following in 2017.

The West Fork Little Colorado River population is located above two artificial barriers, and consists of approximately 5,215 acres. The barriers were constructed in 2004, but have not been effective in precluding the movement of nonnative trout above them. This stream was chemically treated to remove nonnative trout, and was stocked with Apache trout in 2008; additionally, catchable Apache trout are stocked weekly during the summer at Sheeps Crossing on this stream (Highway 273) as it is a very popular recreational fishery. The watershed has primarily been impacted by livestock grazing, loss of the ecological role of fire from fire suppression and vegetation alterations, and timber harvest and roads. Current threats are most likely associated with wildland fire (uncharacteristic and unplanned), ungulate grazing, recreational activities, roads, altered watershed and aquatic habitat conditions from the Wallow Fire, nonnative trout species, and the ability to construct and maintain an effective artificial barrier.

Critical Habitat and Primary Constituent Elements

For Apache trout no critical habitat has been designated. The current recovery plan identifies streams for the management and recovery of Apache trout on the ASNFs. These are the 14 watersheds discussed above and included below for analysis purposes and presentation of GIS data for existing conditions; along with data relative to decisions associated with the LMP, and potential impacts from implementation of the LMP from the various program areas. For discussion and analysis purposes, the 14 streams are referred to as populations; although most of them are not currently occupied by pure Apache trout, or have conditions that meet recovery criteria. These populations (also referred to as watersheds and/or drainage areas) were considered as the contiguous streams and uplands that drain into the recovery stream. These populations are referred to by the name of the lowermost (highest stream order) stream within the drainage area, and these drainage areas may not always be consistent with the corresponding 6th Hydrologic Unit Code boundaries; as the lowermost point within the drainage area is usually determined by the location of an artificial barrier.

Species and Habitat Effects

Wildland Fire Management

Both fire and mechanical treatments would be used to move vegetation toward desired conditions. These treatments are used to change the character of the vegetation that would result in lower risk of uncharacteristic fire and a return of wildfire to a more natural role. The desired condition is to move toward or maintain vegetation conditions in Fire Regime Condition Class (FRCC) 1. FRCC is a metric that quantifies how departed a system is from historical conditions in relation to fire, the role fire historically played in the system, and the vegetative structure. Under the LMP, approximately 48,500 acres would be treated annually across all of the PNVTs; approximately 60% (28900 acres) would be treated by fire and approximately 40% (19600 acres) would be treated mechanically. The current conditions for FRCC on the ASNFs are 14% FRCC 1, 14% FRCC 2, and 72% FRCC 3. Under the LMP, the FRCC conditions across the ASNFs will improve after 15 years to 24% FRCC 1, 41% FRCC 2, and 35% to FRCC 3.

Table 21 displays the percent for the three FRCCs by watersheds. There are only two of the 14 Apache trout recovery populations that have any portions of their watersheds in FRCC 1, and these two have low amounts (2.5 and 7.7 percent). FRCC is a measure of the difference in structure between current and reference conditions. Low (FRCC 1) is considered to be within the natural (historical) range of variability, while moderate (FRCC 2) and high (FRCC 3) departures are outside historical range. Vegetation in FRCC 1 is more resilient and resistant and less likely to lose key ecosystem components (e.g., native species, large trees, soil) after a disturbance, and fire behavior and other associated disturbances are similar to those that occurred prior to the exclusion of fire. It is expected that through implementation of the LMP the acres of FRCC 1 and FRCC 2 will increase, and the acres of FRCC 3 will decrease within Apache trout watersheds.

Table 21. Fire Regime Condition Class (FRCC) for Apache Trout watersheds

Drainage Areas	FRCC 1 (% area)	FRCC 1 (acres)	FRCC 2 (% area)	FRCC 2 (acres)	FRCC 3 (% area)	FRCC 3 (acres)
Bear Wallow Creek	0	0	71.8	10,239	28.2	4,028
Centerfire Creek	0	0	8.8	1,307	91.2	13,558
Conklin Creek	0	0	92.2	4,275	7.8	372
Coyote Creek	7.7	597	41.9	3,261	50.3	3,909
East Fork Little Colorado River	0	0	92.1	7,112	7.3	564
Fish Creek	0	0	88.6	1,959	11.9	1,893
Hayground Creek	0	0	64.8	2,151	35.2	1,170

Mineral Creek	0	0	73.8	4,038	26.2	1,432
Snake Creek	0	0	65.9	3,693	34.1	1,914
Soldier Creek	0	0	0	0	100	220
South Fork Little Colorado River	2.5	382	41.6	6,481	54.8	8,538
Stinky Creek	0	0	81.4	1,724	18.6	395
West Fork Black River	0	0	84.8	6,139	15.2	1,097
West Fork Little Colorado River	0	0	95.0	4,956	5	259

As stated above, wildfire and post-fire flooding have been identified as threats to Apache trout. Over the last 75+ years, alterations to vegetation (e.g., livestock grazing and timber harvest activities), along with the suppression of wildfire has resulted in the disruption of the ecological role of fire in maintaining ecosystems. This has resulted in uncharacteristic impacts from wildfire on watersheds and aquatic habitat and species. Table 22 displays the burn severity impacts associated with the Wallow Fire that occurred in 2011. Mineral Creek was the only stream that was not impacted on the ASNFs. Most of the Apache trout watersheds had negative impacts to their watersheds, riparian areas, and aquatic habitats. The extent and rates of recovery for these watersheds will depend on many factors; these include future environmental factors and conditions (e.g., ongoing drought, monsoonal activity and intensity, wildfire), and the ongoing and future actions associated with management activities. While recovery from the Wallow Fire cannot be determined, it is likely that risk associated with altered hydrologic and aquatic habitat conditions will remain for a considerable amount of time; along with the continued risk associated with wildfire on areas not impacted by the Wallow Fire.

Table 22. Wallow Fire (2011) Burn Severity and Total Percent within Apache Trout watersheds

	Burn Severity (%)			
Watershed	**High**	**Moderate**	**Low**	**Total**
Bear Wallow Creek	17.1	12.6	37.7	67.5
Centerfire Creek	10.7	15.1	58.9	84.6
Conklin Creek	26.8	17.8	40.4	85
Coyote Creek	9	5.5	4.1	18.6
East Fork Little Colorado River	4.2	5.3	41.8	51.3
Fish Creek	47.8	14.1	22.3	84.2
Hayground Creek	15.7	20.4	36.5	72.6
Mineral Creek	0	0	0	0
Snake Creek	12.1	16.7	58.3	87.1
Soldier Creek	0.2	14.4	84.9	99.5
South Fork Little Colorado River	10.2	27.9	55.2	93.3
Stinky Creek	20.8	12.2	26	59
West Fork Black River	7	7.7	24.1	38.7
West Fork Little Colorado River	0.8	0.7	4.9	6.5

As mentioned above, the ecological role that wildfire has played in maintaining ecosystem structure, function, and process has been altered over time. Past fire suppression and management activities on the ASNFs have resulted in landscape scale conditions that can result in uncharacteristic and sometimes severe impacts from wildfire. Table 23 displays the amount of impacts (acres and percent) to Apache trout watersheds that have occurred over the last 10 and 25 years. As can be seen from Table 23, almost all of the wildfire (does not include prescribed fire) within Apache trout watersheds has occurred within the last ten years. This more recent (last ten years) higher level of wildfire activity has resulted from altered vegetation conditions, long-term drought, and the increased use of wildfire being managed for

resource benefits. This increased level of wildfire activity is likely to continue until improvements occur in vegetative structure and function, and drought conditions improve.

Table 23. Fire acres (unplanned≥100) within Apache Trout watersheds (last 10 and 25 years)

	10 Years				25 Years			
Drainage	Acres Burned	Percent Burned	Acres Unburned	Percent Unburned	Acres Burned	Percent Burned	Acres Unburned	Percent Unburned
Bear Wallow Creek	18,198	127.5	0	0	18,273	128.1	0	0
Centerfire Creek	14,885	100.1	0	0	15,032	101.1	0	0
Conklin Creek	4,747	100	0	0	4,747	100	0	0
Coyote Creek	2,295	29.5	5,472	70.5	2,295	29.5	5,472	70.5
East Fork Little Colorado River	4,917	63.7	2,802	36.3	4,917	63.7	2,802	36.3
Fish Creek	16,010	101	0	0	16,010	101	0	0
Hayground Creek	3,303	99.4	18	0.6	3,303	99.4	18	0.6
Mineral Creek	0	0	5,469	100	0	0	5,469	100
Snake Creek	6,274	111.9	0	0	6,274	111.9	0	0
Soldier Creek	225	102.1	0	0	225	102.1	0	0
South Fork Little Colorado River	15,581	100	0	0	15,670	100.6	0	0
Stinky Creek	1,521	71.8	597	28.2	1,521	71.8	597	28.2
West Fork Black River	5,313	73.4	1945	26.9	5,313	73.4	1945	26.9
West Fork Little Colorado River	671	12.9	4,543	87.1	671	12.9	4,543	87.1

The Fire program will be highly integrated with the vegetation (PNVTs) treatments, resulting in improvements in both FRCCs and PNVTs across the ASNFs. Three desired conditions (41, 42, and 296) located under the "all PNVTs" section of the LMP relate to the Fire program. Desired condition 41 states, "Natural processes and human and natural disturbances (e.g., planned and unplanned fire ignitions, mechanical vegetation treatments) provide desired overall tree density, structure, species composition, coarse woody debris, and nutrient cycling. Desired condition 42 states, "Fire (prescribed fire and use of wildland fire) maintains and enhances resources and, as nearly as possible, is allowed to function in its natural ecological role." Desired condition 296 states, "Wildland fires burn within the range of frequency and intensity of natural fire regimes. Uncharacteristic high-severity fires rarely occur and do not burn at the landscape scale." Collectively these desired conditions could potentially result in long term improvements for Apache trout (e.g., watershed and hydrologic conditions, water quality, riparian and aquatic habitat conditions). Improvements in FRCC conditions within Apache trout watersheds can reduce threats associated with wildfire and post-fire flooding. Uncharacteristic wildfire can result in the long-term loss and alteration of riparian and aquatic habitat, along with alterations in watershed and hydrologic conditions that will not provide for the recovery of Apache trout.

The greatest improvements in FRCC conditions will occur within the dry mixed conifer forest, Madrean pine-oak woodland, and the Great Basin grassland PNVT types (see Table 24 below). For most of the Apache trout watersheds these three PNVTs comprise relatively low amounts of the total area; however, the Hayground and Soldier creek watersheds both have high amounts, 34 and 51 percent respectively. Therefore, the greatest potential improvements in FRCC and PNVT conditions are most likely to occur within the Hayground and Soldier creek populations of Apache trout. Additionally, some improvements could potentially occur throughout the other Apache trout watersheds and across all the PNVT types; although these will likely only occur to the extent that restoration activities under the proposed action are specifically directed on these areas.

While the management of prescribed fire has the potential to have long term beneficial impacts through restoration of vegetation conditions and natural fire regimes, short term impacts associated with project implementation could result. Activities associated with fire can impact Apache trout by altering water quality and increasing sedimentation into streams, resulting in altered habitat conditions and reduced food resources and abundance. Guideline (23) under the all PNVTs section of the LMP states, "Landscape scale restoration projects should be designed to spread out treatments spatially and/or temporally to reduce implementation impacts and allow reestablishment of vegetation and soil cover."; and this guideline should help reduce and minimize any potential negative impacts from implementation of prescribed fire activities.

Wildland fire has been identified as a threat to Apache trout, and has had substantial impacts on 13 of the 14 watersheds on the ASNFs, especially from the recently occurring Wallow Fire. Potential long term improvements in Apache trout habitat that may result by moving towards desired conditions, especially improvements in FRCCs and PNVTs, will likely contribute to recovery and restoration of the watersheds and aquatic habitats of the Apache trout on the ASNFs, while reducing potential impacts from uncharacteristic fire and the associated increases in ash and sedimentation. Short term project implementation impacts are likely to occur associated with implementation of the fire program; however, their duration and extent can be minimized through guidelines and project specific mitigation measures. Although mitigation of impacts are likely to occur, based on past actions and the limitations of potential mitigation measures, impacts to Apache trout are not at a level where they can be considered insignificant or discountable. Therefore, this program area may affect and is likely to adversely affect Apache trout.

Ecosystem/Vegetation Health

The LMP has recognized the need to address the maintenance and improvement of ecosystem health. Thirteen of the 14 PNVTs on the ASNFs vary (sometimes substantially) in structure, composition, function, and natural disturbance processes from desired conditions. All 14 PNVTs are key components in sustaining aquatic ecosystems and providing for recovery of Apache trout. The desired conditions for the PNVTs will result in resilient, functioning ecosystems; and in conjunction with the objectives, will guide future vegetation management activities, including burning and mechanical treatments, to maintain or move towards desired conditions. Table 24 displays the acres and percentage of each PNVT for each of the 14 Apache trout watersheds on the ASNFs. These data show how the PNVTs can vary considerably between the Apache trout watersheds, and show the complexity of the watersheds and the potential difficulties in maintaining, improving and restoring these areas for Apache trout recovery.

Table 24. PNVTs for Apache Trout watersheds

	Cottonwood-Willow Riparian Forest	Dry Mixed Conifer Forest	Interior Chaparral	Madrean Pine-Oak Woodlands	Mixed Broadleaf Deciduous Riparian Forest	Montane Willow Riparian Forest	Montane/Subalpine Grasslands	Piñon-Juniper Woodland	Ponderosa Pine Forest	Semi-desert Grassland	Great Basin Grassland	Spruce-Fir Forest	Wet Mixed Conifer Forest	Wetland/Cienega Riparian Areas	Water
Bear Wallow Creek: Total = 14267 acres															

	Cottonwood-Willow Riparian Forest	Dry Mixed Conifer Forest	Interior Chaparral	Madrean Pine-Oak Woodlands	Mixed Broadleaf Deciduous Riparian Forest	Montane Willow Riparian Forest	Montane/Subalpine Grasslands	Piñon-Juniper Woodland	Ponderosa Pine Forest	Semi-desert Grassland	Great Basin Grassland	Spruce-Fir Forest	Wet Mixed Conifer Forest	Wetland/Cienega Riparian Areas	Water
Acres	--	1,103	--	1,871	--	76	--	--	978	--	--	279	9,918	42	--
Percent	--	7.7	--	13.1	--	0.5	--	--	6.9	--	--	2	69.5	0.3	--
Centerfire Creek: Total = 14865 acres															
Acres	--	2,987	--	--	--	179	46	--	10,392	--	--	--	824	436	--
Percent	--	20.1	--	--	--	1.2	0.3	--	69.9	--	--	--	5.5	2.9	--
Conklin Creek: Total = 4747 acres															
Acres	--	--	--	--	--	22	--	--	350	--	--	--	4,296	79	--
Percent	--	--	--	--	--	0.5	--	-	7.4	--	--	--	90.5	1.7	--
Coyote Creek: Total = 7768 acres															
Acres	11	--	--	--	--	--	392	597	3,327	--	582	554	2,101	203	--
Percent	0.1	--	--	--	--	--	5	7.7	42.8	--	7.5	7.1	27.1	2.6	--
East Fork Little Colorado River: Total = 7719 acres															
Acres	--	564	--	--	--	--	2,390	--	--	--	--	944	2,675	1,103	43
Percent	--	7.3	--	--	--	--	31	--	--	--	--	12.2	34.7	14.3	0.6
Fish Creek: Total = 15852 acres															
Acres	--	241	--	--	--	--	--	--	1,652	--	--	1,295	12,234	431	--
Percent	--	1.5	--	--	--	--	--	--	10.4	--	--	8.2	77.2	2.7	--
Hayground Creek: Total = 3321 acres															
Acres	--	1,137	--	--	--	25	446	--	8	--	--	245	1,099	361	--
Percent	--	34.2	--	--	--	0.8	13.4	--	0.2	--	--	7.4	33.1	10.9	--
Mineral Creek: Total = 5469 acres															
Acres	--	746	--	--	--	--	1,294	--	680	--	5	--	2,427	316	--
Percent	--	13.6	--	--	--	--	23.7	--	12.4	--	0.1	--	44.4	5.8	--
Snake Creek: Total = 5607 acres															
Acres	--	--	--	110	--	31	--	--	1,774	--	--	--	3,669	24	--
Percent	--	--	--	2	--	0.5	--	--	31.7	--	---	--	65.4	0.4	--
Soldier Creek: Total = 220 acres															
Acres	--	113	--	--	--	--	--	--	107	--	--	--	--	--	--
Percent	--	51.3	--	--	--	--	--	--	48.7	--	--	--	--	--	--
South Fork Little Colorado River: Total = 15581 acres															
Acres	-	3,141	--	--	--	114	3,270	382	5,283	--	--	--	2,348	864	180

	Cottonwood-Willow Riparian Forest	Dry Mixed Conifer Forest	Interior Chaparral	Madrean Pine-Oak Woodlands	Mixed Broadleaf Deciduous Riparian Forest	Montane Willow Riparian Forest	Montane/Subalpine Grasslands	Piñon-Juniper Woodland	Ponderosa Pine Forest	Semi-desert Grassland	Great Basin Grassland	Spruce-Fir Forest	Wet Mixed Conifer Forest	Wetland/Cienega Riparian Areas	Water
Percent	-	20.2	--	--	--	0.7	21	2.5	33.9	--	--	--	15.1	5.5	1.2
Stinky Creek: Total = 2118 acres															
Acres	-	395	--	--	--	--	28	--	--	--	--	--	1,535	161	--
Percent	-	18.6	--	--	--	--	1.3	--	--	--	--	--	72.5	7.6	--
West Fork Black River: Total = 7236 acres															
Acres	-	1,097	--	--	--	-	2,219	-	-	-	-	261	3,150	509	-
Percent	-	15.2	--	--	--	-	30.7	-	-	-	-	3.6	43.5	7	-
West Fork Little Colorado River: Total = 5215 acres															
Acres	-	259	-	--	--	--	491	--	--	--	--	2,940	1,232	293	--
Percent	-	5	-	--	--	--	9.4	--	--	--	--	56.4	23.6	5.6	--

There are ten desired conditions and three objectives associated with this program area relevant to Apache trout within the ecosystem health, PNVTs, and forest products sections of the LMP (see appendix A).

- OBJ 11 (All forested PNVTS) Annually, treat 5,000 to 35,000 acres to reduce tree densities, restore natural fire regimes, promote species habitat and ecosystem health, reduce fire hazard, maintain desired conditions, initiate recovery from uncharacteristic disturbance, and provide forest products, leaving a desired mix of species with the range of desired densities that are resilient to changing climatic conditions.
- OBJ 13 (All woodland PNVTS) Annually, treat or maintain 5,000 to 15,000 acres to promote a highly diverse structure.
- OBJ 14 (Grasslands) Decrease or maintain the woody canopy cover at less than 10 percent by treating up to 25,000 acres annually.

The vegetation (PNVTs) treatments will be integrated with both the Fire and Forest Products programs, resulting in improvements in both PNVTs departure and FRCC conditions across the ASNFs. The desired conditions (1, 2, 3, 39, 40, 46, 48 and 61) located under the "overall ecosystem health" and "all PNVTs" sections of the LMP relate to this program and the watershed and landscape scale conditions for Apache trout. The three objectives (11, 13, and 14) provide for a maximum total treatment level of 75,000 acres per year, which will improve the overall departure condition for the eight modeled PNVTs from their current rating of 64 (high departure) to 44 (moderate departure) over the planning period. Collectively these desired conditions could potentially result in long term improvements for Apache trout (e.g., watershed and hydrologic conditions, water quality, riparian and aquatic habitat conditions, risk of uncharacteristic fire) and aquatic habitats within all 14 watersheds on the ASNFs. The extent to which treatments will benefit Apache trout will depend on the extent and emphasis that is placed on project activities within the species watersheds and habitats. The LMP does not direct how much of each

objective treatment will be within each of the forested PNVTs or riparian PNVTs (i.e., the LMP does not direct any or how much of objective treatments will occur in any species habitat).

The greatest improvements in PNVT departure will occur within the Dry Mixed Conifer Forest, Madrean Pine-Oak Woodland, Ponderosa Pine Forest, and the Great Basin Grassland PNVT types. For the Centerfire Creek, Coyote Creek, Hayground Creek, Soldier Creek, and South Fork Little Colorado River drainage areas these four PNVTs comprise relatively high amounts of the total area, allowing for the greatest potential for watershed improvements to occur. Restoring and maintaining PNVTs would likely improve the potential to retain or return the necessary ecological processes and patterns necessary to make these ecosystems sustainable, resilient, and healthy. Impacts to the uplands, streams, and riparian areas, along with potential and recent impacts associated with fire, are threats to Apache trout and their habitat on the ASNFs. The landscape and watershed scale restoration actions have the potential to reduce the current large scale threats, especially those associated with uncharacteristic fire, and improve both the upland and riparian conditions for Apache trout and their aquatic habitat.

While the management of vegetation and PNVTs has the potential to have long term beneficial impacts through restoration of vegetation conditions and natural fire regimes; short term impacts associated with project implementation could result, especially those associated with the Forest Products program. There are three objectives that provide for the use of forest products on an annual basis: 122,000 CCF (hundred cubic feet) from suitable timberlands for wood products, 94,000 CCF for firewood, and 5,000 permits for Christmas trees. Suitable timberlands are lands to be managed for timber production on a regulated basis. Suitable timber lands are likely to have greater impacts compared to other lands due to the greater emphasis on mechanical vegetation treatments and the associated infrastructure (e.g., roads, landings) and continued scheduled (re)entries over time. "Nonsuitable" and "fire only" timber lands may have vegetation treatments and provide forest products; but they will likely only receive one entry during the planning period, and the amount of access and roads needed are substantially less than "suitable" timber lands.

The Bear Wallow Creek, Conklin Creek, Coyote Creek, East Fork Little Colorado River, Fish Creek, Soldier Creek, West Fork Black River, and West Fork Little Colorado River drainage areas have relatively low acres of suitable timber lands (Table 25); while Centerfire Creek, Hayground Creek, Mineral Creek, Snake Creek, South Fork Little Colorado River, and Stinky Creek have relatively high amounts of acres (Table 25). Of these six streams, only two (Mineral and South Fork little Colorado) currently have pure populations of Apache trout; and both populations currently have low numbers of fish and marginal habitat conditions. Therefore, any potential impacts resulting from the management of suitable timber lands will likely occur within the Centerfire, Hayground, Mineral, Snake, South Fork Little Colorado and Stinky creek watersheds of Apache trout.

Table 25. Treatment Type [suitable timber, nonsuitable timber, and fire only lands] acres by Apache Trout watersheds

Drainage	Suitable Timber	Nonsuitable Timber	Fire Only
Bear Wallow Creek	645 acres (4.5%)	2774 acres (19.4%)	10848 acres (76.0%)
Centerfire Creek	12961 acres (87.2%)	1607 acres (10.8%)	297 acres (2%)
Conklin Creek	1047 acres (22.1%)	3675 acres (77.4%)	26 acres (0.6%)
Coyote Creek	2064 acres (26.6%)	2805 acres (36.1%)	2899 acres (37.3%)
East Fork Little Colorado River	762 acres (9.9%)	3864 acres (50.1%)	3092 acres (40.1%)
Fish Creek	4726 acres (29.8%)	7575 acres (47.8%)	3551 acres (22.4%)
Hayground Creek	1903 acres (57.3%)	993 acres (29.9%)	425 acres (12.8%)
Mineral Creek	3787 acres (69.2%)	1398 acres (25.6%)	285 acres (5.2%)

Snake Creek	2891 acres (51.6%)	2561 acres (45.7%)	155 acres (2.8%)
Soldier Creek	0 acres (0%)	220 acres (100%)	0 acres (0%)
South Fork Little Colorado River	7064 acres (45.3%)	7424 acres (47.7%)	1093 acres (7%)
Stinky Creek	1668 acres (78.8%)	283 acres (13.4%)	167 acres (7.9%)
West Fork Black River	2590 acres (35.8%)	3923 acres (54.2%)	723 acres (10%)
West Fork Little Colorado River	10 acres (0.2%)	1441 acres (27.6%)	3764 acres (72.2%)

Activities associated with suitable/unsuitable/fire only timberland treatments can impact Apache trout by altering watershed, hydrologic, riparian, and aquatic habitat conditions; degrading water quality and increasing sedimentation into streams, and reducing food resources and abundance necessary for Apache trout. There are two specific guidelines that address these potential impacts. Guideline (GL 23) under the all PNVTs section of the LMP states, "Landscape scale restoration projects should be designed to spread out treatments spatially and/or temporally to reduce implementation impacts and allow reestablishment of vegetation and soil cover." Guideline (GL 130) in the Forest Products section states, "Permits issued for forest products should include stipulations to protect resources." These guidelines should minimize impacts to habitat conditions for Apache trout by mitigating potential negative impacts resulting from treatments, although potential effects may still occur.

Conditions within the uplands, riparian, and streams; along with fire, have been identified as threats to the Apache trout, and continue to threaten habitat conditions for all 14 watersheds on the ASNFs. Potential long term improvements in Apache trout habitat may result by moving towards desired conditions, especially improvements in PNVTs and risk associated with fire. This change will likely contribute to recovery and restoration of the watersheds and recovery habitats for the Apache trout on the ASNFs, while reducing potential impacts from uncharacteristic fire and the associated increases in ash and sedimentation. Short term project implementation impacts are likely to occur associated with implementation of the vegetation treatment and forest products programs; however, their duration and extent can be minimized through guidelines and project-specific mitigation measures. Given the extent of these treatments, it is not reasonable to conclude that impacts associated with LMP implementation can be considered insignificant or discountable. Therefore, this program area may affect and is likely to adversely affect Apache trout.

Rangeland Management Program

Rangeland management program activities include administering livestock grazing consistent with NEPA decisions, ESA consultation requirements, and guidance in LMP. Additional Program activities include implementation and effectiveness monitoring of individual allotments, development of structural and non-structural improvements to facilitate better livestock management and to improve wildlife habitat and watershed conditions, control of invasive weeds, and the authorization of grazing consistent with the LMP through site specific allotment NEPA. The LMP determined that most of the ASNFs is suitable for livestock grazing. Suitability is the appropriateness of applying certain resource management practices to a particular area of land, in consideration of relevant social, economic, and ecological factors. Table 26 displays the livestock grazing suitability acres for each of the Apache trout watersheds.

Table 26. Livestock grazing suitability for Apache Trout watersheds

Drainage Areas	Suitable (percent)	Suitable (acres)	Unsuitable (percent)	Unsuitable (acres)
Bear Wallow Creek	100	14,267	0	0
Centerfire Creek	75	11,148	25	3,717
Conklin Creek	100	4,747	0	0
Coyote Creek	100	7,768	0	0

East Fork Little Colorado River	84.6	7,300	5.4	418
Fish Creek	79.1	12,542	20.9	3,311
Hayground Creek	80.6	2,677	19.4	644
Mineral Creek	100	5,469	0	0
Snake Creek	100	5,607	0	0
Soldier Creek	100	220	0	0
South Fork Little Colorado River	100	15,581	6.7	142
Stinky Creek	6.7	142	93.3	1,976
West Fork Black River	46.6	3,370	53.4	3,866
West Fork Little Colorado River	100	5215	0	0

All but one (Stinky Creek) of the Apache trout watersheds have substantial portions of their watersheds that have been determined to be suitable for livestock grazing. While a determination of suitability does not necessarily result in livestock grazing on that area, current management provides for livestock grazing across most of the ASNFs. Livestock grazing can impact watersheds and hydrologic conditions by altering vegetation and ground cover, soil compaction, and water quality. Current range condition on the ASNFs is reflective of past and ongoing grazing activities, and landscape scale conditions have not changed significantly since the 1980s. Table 27 below displays the current range conditions for each of the Apache trout watersheds; with some watersheds containing some areas in excellent and good conditions, but most of the acres fall within lesser conditions (i.e., fair, poor, very poor, and no capacity).

Table 27. Range Condition for Apache Trout watersheds

Range Condition	Acres	Percent
Bear Wallow Creek		
Excellent	--	--
Good	--	--
Fair	95	0.7
Poor	1,065	7.5
Very Poor	--	--
No capacity	13,108	91.9
Centerfire Creek		
Excellent	--	--
Good	--	--
Fair	855	5.8
Poor	12,502	84.1
Very Poor	--	--
No capacity	1,508	10.1
Conklin Creek		
Excellent	--	--
Good	--	--
Fair	277	5.8
Poor	885	18.6
Very Poor	39	0.8
No capacity	3,547	74.7
Coyote Creek		
Excellent	--	--
Good	65	0.8
Fair	2,803	36.1
Poor	1,460	18.8
Very Poor	--	---
No capacity	2,195	28.3
East Fork Little Colorado River		
Excellent	9	0.1

Good	5,214	67.5
Fair	1,376	5.8
Poor	332	4.3
Very Poor	--	--
No capacity	691	9
Fish Creek		
Excellent	--	--
Good	13	0.08
Fair	1,320	8.3
Poor	2,019	12.7
Very Poor	365	2.3
No capacity	12,135	76.6
Hayground Creek		
Excellent	--	--
Good	30	0.9
Fair	553	16.7
Poor	1,222	36.8
Very Poor	--	--
No capacity	1,515	45.6
Mineral Creek		
Excellent	--	--
Good	1,356	24,8
Fair	192	3.5
Poor	1,684	30.8
Very Poor	2,094	38.3
No capacity	142	2.6
Snake Creek		
Excellent	--	--
Good	--	--
Fair	601	10.7
Poor	1,773	31.6
Very Poor	65	1.2
No capacity	3,169	56.5
Soldier Creek		
Excellent	--	--
Good	--	--
Fair	--	--
Poor	--	--
Very Poor	107	48.6
No capacity	113	51.4
South Fork Little Colorado River		
Excellent	102	0.7
Good	5,675	36.4
Fair	5,249	33.7
Poor	2,324	14.9
Very Poor	--	-
No capacity	1,991	12.8
Stinky Creek		
Excellent	--	--
Good	195	9.2
Fair	1,780	84
Poor	20	0.9
Very Poor	--	--

No capacity	123	5.8
West Fork Black River		
Excellent	--	--
Good	2,752	38
Fair	962	13.3
Poor	55	0.8
Very Poor	--	--
No capacity	3,467	47.9
West Fork Little Colorado River		
Excellent	--	--
Good	967	18.5
Fair	606	11.6
Poor	--	--
Very Poor	--	--
No capacity	3,642	69.8

Given the long history of domestic livestock grazing activities on the ASNFs, considerable amounts of infrastructure have been developed through site specific management. The most common types of range developments associated with livestock grazing activities include fencing, water developments, and corrals. These range developments can impact watersheds, riparian areas, and aquatic habitats. Fencing can result in the concentration of grazing animals, impacting vegetation, soils, and aquatic habitat where this occurs. Pit tanks occur on drainages and can alter hydrologic conditions, and can act as vectors (along with livestock) for the movement and introduction of invasive or undesirable species. Corrals are often located adjacent to streams and springs, and impacts to water quality and vegetation can result from the concentrated use in these areas. Table 28 displays the primary range developments within the Apache trout watersheds; and while these developments can help to disperse impacts across livestock grazing allotments, higher levels of these developments are likely to result in greater risks to Apache trout from livestock grazing actions.

Table 28. Range developments in Apache Trout watersheds

Watershed	Feature	Number within Watershed
Bear Wallow Creek	Corral (points)	--
	Pit Tank (points)	--
	Constructed Fence (miles)	25.4
Centerfire Creek	Corral (points)	---
	Pit Tank (points)	19
	Constructed Fence (miles)	39.6
Conklin Creek	Corral (points)	--
	Pit Tank (points)	2
	Constructed Fence (miles)	5.4
Coyote Creek	Corral (points)	--
	Pit Tank (points)	3
	Constructed Fence (miles)	17.7
East Fork Little Colorado River	Corral (points)	1
	Pit Tank (points)	24
	Constructed Fence (miles)	20.7
Fish Creek	Corral (points)	--

	Pit Tank (points)	10
	Constructed Fence (miles)	24.1
Hayground Creek	Corral (points)	--
	Pit Tank (points)	12
	Constructed Fence (miles)	10.2
Mineral Creek	Corral (points)	--
	Pit Tank (points)	10
	Constructed Fence (miles)	14.6
Snake Creek	Corral (points)	--
	Pit Tank (points)	7
	Constructed Fence (miles)	4.2
Soldier Creek	Corral (points)	--
	Pit Tank (points)	--
	Constructed Fence (miles)	0.6
South Fork Little Colorado River	Corral (points)	--
	Pit Tank (points)	36
	Constructed Fence (miles)	20.7
Stinky Creek	Corral (points)	--
	Pit Tank (points)	--
	Constructed Fence (miles)	5.2
West Fork Black River	Corral (points)	--
	Pit Tank (points)	7
	Constructed Fence (miles)	17
West Fork Little Colorado River	Corral (points)	--
	Pit Tank (points)	--
	Constructed Fence (miles)	7.9

While there are no relevant desired conditions associated with the livestock grazing and invasive species programs, there are two objectives associated with the invasive species program that are relevant to the analysis. These two objectives (16 and 17) propose to annually "contain, control, or eradicate invasive species (e.g., musk thistle, Dalmatian toadflax) on 500 to 3,500 acres", and "control or eradicate invasive species (*e.g*., tamarisk, bullfrogs) on at least 2 stream miles." Invasive and nonnative species have been identified as threats to Apache trout populations on the ASNFs. These two objectives could potentially improve both the riparian and aquatic habitat for the Apache trout by restoring vegetation and aquatic species composition to historical conditions, or to levels that are low enough to allow for the persistence of Apache trout.

While the invasive species program has the potential to have some long term benefits to Apache trout and their habitat, the possibility exists for impacts to Apache trout through implementation of this program and the livestock grazing program. One standard and seven guidelines have been included in the LMP that may address potential impacts to Apache trout.

- ST 4 Vegetation treatments shall include measures to reduce the potential for introduction of invasive plants and animals and damage from nonnative insects and diseases.

- GL 32 Active grazing allotments should be managed to maintain or improve to desired riparian conditions.
- GL 78 Projects and activities should not transfer water between drainages or between unconnected water bodies within the same drainage to avoid spreading disease and aquatic invasive species.
- GL 79 Project areas should be monitored to ensure there is no introduction or spread of invasive species.
- GL 81 Pesticide use should minimize impacts on nontarget plants and animals.
- GL 134 New livestock troughs, tanks, and holding facilities should be located out of riparian areas to limit concentration of livestock in these areas. Existing facilities in riparian areas should be modified, relocated, or removed where their presence is determined to inhibit movement toward desired riparian or aquatic conditions.
- GL 138 To minimize potential resource impacts from livestock, salt or nutritional supplements should not be placed within a quarter of a mile of any riparian area or water source. Salt or nutritional supplements should also be located to minimize herbivory impacts to aspen clones.
- GL 139 To prevent resource damage (e.g., streambanks) and disturbance to federally listed and sensitive wildlife species, trailing of livestock should not occur along riparian areas. Where no alternative route is available, approval may be granted where effective mitigation measures are implemented (e.g., timing of trailing, number of livestock trailed at one time).

While the invasive species program has the potential to have long term benefits and impacts through restoration of vegetation conditions, riparian areas, and aquatic habitats; activities associated with the livestock grazing program can impact Apache trout by degrading upland and watershed conditions and function, altering riparian vegetation and function, and reducing water quality and increasing sedimentation into streams. The standards and guidelines listed above may reduce potential impacts; but given that the majority of the Apache trout watersheds are suitable for livestock grazing, have range conditions that are mostly fair and poor, and have considerable amounts of infrastructure (e.g., fences and tanks); it is reasonable to conclude that implementation of the LMP will result in impacts to Apache trout and their recovery habitat. Given past actions, and the inherent limitations relative to minimizing impacts from livestock grazing activities, it cannot be concluded that impacts associated with this program are either insignificant or discountable. Therefore, this program area may affect and is likely to adversely affect Apache trout.

Watershed and Soil Management

The Watershed Program seeks to maintain or improve watershed conditions and maintain good water quality and quantity. It is cross-program in orientation in that it seeks to mitigate impacts from other program activities as well. The guidance for the Watershed Program can be used to fill in the gaps for other programs with inadequate guidance. Abundant guidance is provided in the LMP to assist the LMP in minimizing or reducing potential impacts to the Apache trout. There are a total of 15 desired conditions (see appendix A) and six objectives associated with this program area.

- OBJ 1 During the planning period, improve the condition class on at least 10 priority 6th level HUC watersheds by removing or mitigating degrading factors.
- OBJ 2 Annually, enhance or restore an average of 350 acres within priority 6th level HUC watersheds, including treating the causes of State designated impaired or threatened waters (Arizona Department of Environmental Quality, 2012) to improve watershed condition and water quality.
- OBJ 6 Annually, restore 200 to 500 acres toward desired composition, structure, and function of streams, floodplains, and riparian vegetation.

- OBJ 9 Within the planning period, enhance or restore 5 to 25 wet meadows or cienegas to proper hydrologic function and native plant and animal species composition.
- OBJ 10 Annually, work with partners to reduce animal damage to native willows and other riparian species on an average of 5 miles of riparian habitat.
- OBJ 38 Annually, prepare at least one instream flow water rights application until water acquisition needs are complete to sustain riparian areas, fish, wildlife, and water-based recreation.

The watershed and riparian desired conditions, objectives, and treatments will likely be integrated with the Fire, Ecosystem Health, and Wildlife Fish and Rare Plant programs; potentially resulting in improvements in watershed condition and function, and riparian conditions across the ASNFs. The desired conditions (9, 12, 15, 21, 22, 67 - 72, 74, 77, 80, and 84) located under the "watershed" and "riparian areas" sections of the LMP relate to this program and the watershed and landscape scale conditions for the Apache trout and its habitat. The six objectives (1, 2, 6, 9, 10, and 38) provide for a treatment level of approximately 1,000 - 10,000 acres per year, which will improve the overall conditions for the six code watersheds and riparian areas receiving treatments. Collectively these desired conditions and objectives could potentially result in long term improvements for Apache trout (e.g., watershed and hydrologic conditions, water quality, riparian and aquatic habitat conditions, soils) and their recovery habitats within all 14 watersheds on the ASNFs.

Restoring and maintaining watersheds and riparian areas would likely improve the potential to retain or return the necessary ecological processes and functions necessary to make these ecosystems sustainable, resilient, and healthy. Impacts to the uplands, streams, and riparian areas; along with potential and recent impacts associated with fire are threats to the Apache trout and their recovery on the ASNFs. The landscape and watershed scale restoration actions have the potential to reduce the current threats; especially those associated with watershed and hydrologic conditions, and improve both the upland (soils) and riparian conditions for Apache trout and their aquatic habitat.

While the management of watersheds and riparian areas has the potential to have long term beneficial impacts through restoration of hydrologic conditions and functions; short term impacts associated with project implementation could result, especially those associated with the use of mechanized equipment. There are six specific guidelines that address these potential impacts.

- GL 2 Projects with ground-disturbing activities should be designed to minimize long and short term impacts to soil resources. Where disturbance cannot be avoided, project specific soil and water conservation practices should be developed.
- GL 6 Projects with ground-disturbing activities should be designed to minimize long and short term impacts to water resources. Where disturbance cannot be avoided, project specific soil and water conservation practices and BMPs should be developed.
- GL 30 Ground-disturbing projects (including prescribed fire) which may degrade long term riparian conditions should be avoided.
- GL 33 Storage of fuels and other toxicants should be located outside of riparian areas to prevent spills that could impair water quality or harm aquatic species.
- GL 34 Equipment should be fueled or serviced outside of riparian areas to prevent spills that could impair water quality or harm aquatic species.
- GL 35 Construction or maintenance equipment service areas should be located and treated to prevent gas, oil, or other contaminants from washing or leaching into streams.

Conditions in the uplands, riparian areas, and streams have been identified as threats to Apache trout, and have had impacts on all 14 of their watersheds on the ASNFs. Potential long term improvements in Apache trout habitat may result by moving towards desired conditions, especially improvements in

watersheds and risk associated with degraded riparian areas. Improvements will likely contribute to recovery and restoration of the watersheds and recovery habitats of the Apache trout on the ASNFs, while reducing potential impacts from uncharacteristic watershed and hydrologic conditions. Short term project implementation impacts are likely to occur during site specific project implementation; however, their duration and extent can be minimized through guidelines and project specific mitigation measures and best management practices. Potential short term impacts primarily include increases in sedimentation, soil compaction, alterations in hydrologic conditions and functions, and changes in water quality. Mitigation measures are implemented at the project level, and site specific conditions and project activities and timing will determine their efficacy. Although most projects could be mitigated, it is likely over the planning period that some projects will result in impacts that could not be considered at the level of insignificant or discountable. Therefore, this program area may affect and is likely to adversely affect Apache trout.

Engineering Program

The current motorized transportation system is comprised of 765 miles of roads open only to highway legal vehicles (maintenance level 3 through 5), 2,067 miles of roads open to all motorized vehicles (maintenance level 2), 3,372 miles of roads closed to all motorized vehicles (maintenance level 1), and 156 miles of trails open to motorized vehicles less than 50 inches wide. The LMP includes plan objectives to annually maintain 20% of passenger vehicle roads, 10% of high clearance roads, and 20% of both motorized and nonmotorized trails. Road crossing information for the Apache trout watersheds are presented below in Table 29. Although the various types of crossings (e.g., culverts, bridges) cannot be determined at the watershed scale, most of the crossings across the ASNFs are culverts. Route miles and densities were also calculated for the 14 Apache trout watersheds (see Table 30). This information is separated by closed, open, and non-motorized routes; and represents the most recent data from the Forest Transportation Atlas, which does not include unauthorized routes.

Table 29. Route (motorized and nonmotorized) Crossings in Apache Trout watersheds

Watershed	Number Crossings*
Bear Wallow Creek	53
Centerfire Creek (Centerfire/Boggy/Wildcat Creek)	101
Conklin Creek	16
Coyote Creek (Coyote/Marnie Creek)	19
East Fork Little Colorado River (East Fork Little Colorado River/Lee Valley Creek)	17
Fish Creek	98
Hayground Creek	13
Mineral Creek	5
Snake Creek	20
Soldier Creek	-
South Fork Little Colorado River	59
Stinky Creek	10
West Fork Black River	15
West Fork Little Colorado River	15

*All route crossings on all drainages within the watershed are included in this number.

Table 30. Route miles and densities for closed (decommissioned and ML1) and open (ML2-5 and motorized trails) and nonmotorized within Apache Trout watersheds

Watershed	Route Type	Route Miles	Density (miles / square mile)
Bear Wallow Creek	Closed	15	0.68

Bear Wallow Creek	Open	17.2	0.77
Bear Wallow Creek	Non-motorized	17.3	0.77
Bear Wallow Creek	**Total**	**49.5**	**2.2**
Centerfire Creek	Closed	71.9	3.1
Centerfire Creek	Open	26.1	1.1
Centerfire Creek	Non-motorized	0	0
Centerfire Creek	**Total**	**29.1**	**3.9**
Conklin Creek	Closed	27.3	3.7
Conklin Creek	Open	1.8	0.25
Conklin Creek	Non-motorized	0	0
Conklin Creek	**Total**	**29.1**	**3.9**
Coyote Creek	Closed	12.8	1.1
Coyote Creek	Open	7.8	0.64
Coyote Creek	Non-motorized	0.1	0.01
Coyote Creek	**Total**	**20.7**	**1.7**
East Fork Little Colorado River	Closed	8.7	0.72
East Fork Little Colorado River	Open	11.6	1
East Fork Little Colorado River	Non-motorized	9.6	0.8
East Fork Little Colorado River	**Total**	**29.9**	**2.5**
Fish Creek	Closed	69.3	2.8
Fish Creek	Open	33.6	1.4
Fish Creek	Non-motorized	17.9	0.72
Fish Creek	**Total**	**120.8**	**4.9**
Hayground Creek	Closed	11.3	2.2
Hayground Creek	Open	4.6	0.89
Hayground Creek	Non-motorized	0	0
Hayground Creek	**Total**	**16**	**3.1**
Mineral Creek	Closed	9.2	1.1
Mineral Creek	Open	17.8	2.1
Mineral Creek	Non-motorized	0	0
Mineral Creek	**Total**	**26.9**	**3.2**
Snake Creek	Closed	29.9	3.4
Snake Creek	Open	12	1.37
Snake Creek	Non-motorized	0	0
Snake Creek	**Total**	**41.9**	**4.8**
Soldier Creek	Closed	0.6	1.7
Soldier Creek	Open	0	0
Soldier Creek	Non-motorized	0	0
Soldier Creek	**Total**	**0.6**	**1.7**
South Fork Little Colorado River	Closed	40.7	1.7
South Fork Little Colorado River	Open	23.8	1
South Fork Little Colorado River	Non-motorized	6.9	0.29
South Fork Little Colorado River	**Total**	**71.5**	**2.9**

Stinky Creek	Closed	11.7	3.5
Stinky Creek	Open	3.4	1.0
Stinky Creek	Non-motorized	0	0
Stinky Creek	**Total**	**15.1**	**4.6**
West Fork Black River	Closed	13.1	1.2
West Fork Black River	Open	22.6	2
West Fork Black River	Non-motorized	3.9	0.35
West Fork Black River	**Total**	**39.6**	**3.5**
West Fork Little Colorado River	Closed	4.4	0.54
West Fork Little Colorado River	Open	4.2	0.5
West Fork Little Colorado River	Non-motorized	14.4	1.8
West Fork Little Colorado River	**Total**	**23**	**2.8**

While desired conditions do not exist for the Engineering program; there are two objectives within the riparian section of the LMP that relate to roads.

- OBJ 7 Within the planning period, relocate, repair, improve, or decommission a minimum of 4 miles of National Forest System roads or trails that add sediment to streams, damage riparian vegetation, erode streambanks, cause gullies, and/or compact floodplain soils.
- OBJ 8 Annually, remove an average of 2 miles of unauthorized roads or trails that sediment to streams, damage riparian vegetation, erode streambanks, cause gullies, and/or impact floodplain soils.

These two objectives could potentially result in long term improvements for Apache trout and their aquatic habitats by reducing sedimentation associated with degraded and/or unauthorized roads and trails. Restoring and rehabilitating these sites could potentially improve water quality, habitat conditions, and the macroinvertebrate food base needed by Apache trout. All 14 of the Apache trout watersheds could potentially benefit from implementation of these objectives, as road and trail densities within most of the watersheds for this species are relatively high.

Roads and road construction and maintenance can result in the destruction and alteration of riparian and aquatic habitat, increases in sedimentation, and water quality degradation. Roads can also act as vectors and increase the risk for the transportation or introduction of disease and invasive species, especially where low water crossings exist. The engineering program contains one standard and one guideline that may help minimize some threats to Apache trout and their habitat. The standard (ST 18) states, "Road maintenance and construction activities shall be designed to reduce sediment (e.g., water bars, sediment traps, grade dips) while first providing for user safety." The guideline (GL 103) states, "Roads and motorized trails removed from the transportation network should be treated in order to avoid future risk to hydrologic function and aquatic habitat." The water resources section of the LMP also has a guideline (GL 8) that specifies that "streamside management zones should be in place between streams and disturbed areas and/or road locations to maintain water quality and suitable stream temperatures for aquatic species." These standards and guidelines, combined with the objectives to reduce impacts from roads, could potentially improve habitat conditions for Apache trout over the long term by primarily reducing sedimentation and improving water quality.

Roads have been identified as a threat to Apache trout, and have had impacts to all 14 watersheds on the ASNFs. Roads crossing and roads located adjacent to streams can remove and alter riparian vegetation, impact stream channel functions and processes, and alter and degrade aquatic habitat through changes in water quality and increases in sedimentation to the stream. Potential long term improvements in Apache

trout habitat that may result by reducing road densities and impacts within riparian areas have the potential to contribute to recovery and restoration of the watersheds, riparian areas, and aquatic habitats of the Apache trout on the ASNFs. Short term project implementation impacts are likely to occur associated with implementation of the engineering/roads program; however, their duration and extent can be minimized through standards, guidelines, and project specific mitigation measures. Although there are standards and guidelines to potentially limit impacts from roads, motorized trails, and other projects; it is not likely that all the potential negative effects such as increased runoff and sedimentation could be eliminated to the extent they could be considered insignificant or discountable. Therefore, this program area may affect and is likely to adversely affect Apache trout.

Lands and Minerals Program

In 2011, there were 454 existing rights-of-way and special use permits for a variety of uses on the ASNFs. A majority of these are categorized as lands permits (381) versus recreation permits (73). It is likely that some of these special use permits and authorizations are located within the watersheds of the Apache trout on the ASNFs; although, how they potentially impact Apache trout and their habitat is not known. Across the entire ASNFs there are 16 lands special use permits for reservoirs/dams, 10 for irrigation ditches, 15 for water conveyance, and 36 for water transmission. Reservoirs do present considerable threats to maintaining, and restoring Apache trout and its recovery habitat. Reservoirs/dams currently impact most of the Apache trout populations; while recreational fisheries are important, the nonnative trout associated with reservoirs in the Black and Little Colorado watersheds are threats to recovering Apache trout populations in these watersheds.

While special use permits have the potential to have some long term benefits to Apache trout and their habitat (i.e., artificial barriers and livestock/elk exclosures), the possibility exists for impacts to Apache trout through implementation of the lands and special uses programs. Land exchanges, (e.g. Black River Land Exchange, parcel acquisition on the West Fork Black River) can be beneficial for aquatic habitat and fish species. One standard and one guideline have been included in the LMP to address potential impacts to Apache trout within the "water uses" and "minerals and geology" sections. The standard (ST 31) under the waters uses section states, "Special uses for water diversions shall maintain fish, wildlife, and aesthetic values and otherwise protect the environment." The guideline (GL 146) within the "water uses" section of the LMP states, "Streambed and floodplain alteration or removal of material should not occur if it prevents attainment of riparian, channel morphology, or streambank desired conditions." Although these two plan components may minimize and reduce potential impacts, the possibility exists for impacts to Apache trout through the implementation of the LMP for these programs. As it cannot be concluded that these impacts are reduced to the level where they can be considered insignificant or discountable; therefore, this program area may affect and is likely to adversely affect Apache trout.

Recreation and Wilderness Program

There are over 30 reservoirs and lakes and more than 1,000 miles of streams on the ASNFs, more than any other national forest in the Southwestern Region. Reservoirs and streams and adjacent areas are highly desirable for many types of recreational activities. The user demands and concentrated uses in these areas can result in impacts to these areas that can alter vegetation, riparian areas, water quality, and aquatic habitat.

There is one relevant desired condition (DC 219) within the LMP in the dispersed recreation section that states, "Water-based settings are available and the associated recreation opportunities (e.g., canoeing, fishing, waterfowl hunting) do not degrade aquatic resources." Recreation sites and developments and their associated uses and activities can present threats to maintaining, restoring and recovering the Apache trout and its habitat. Recreational sites and activities can impact Apache trout by degrading upland and

watershed conditions and function, altering riparian vegetation and function, and reducing water quality and increasing sedimentation into streams. Additionally, invasive and nonnative species have been identified as a threat to Apache trout; and the concentration of recreational activities within and adjacent to riparian areas and streams can increase the risk of introductions and spread of invasive or undesirable plants and animals, potentially impacting Apache trout populations.

There is one reelvant standard (ST 13) within the dispersed recreation section of the LMP that states, "Dispersed campsites shall not be designated in areas with sensitive soils or within 50 feet of streams, wetlands, or riparian areas to prevent vegetation and bank damage, soil compaction, additional sediment, or soil and water contamination" Although this plan component may minimize and reduce potential impacts, the possibility exists for impacts to Apache trout from the recreation program through the implementation of the LMP. Although activities are 50 feet away, over time impacts to the stream and riparian vegetation may result as use occurs; and risk associated with the potential to move or introduce nonnative species till exists. Therefore, this program area may affect and is likely to adversely affect Apache trout.

Wildlife, Fish, and Rare Plant Program

This program area involves a variety of activities conducted by the ASNFs and its partners, including inventory and monitoring, habitat assessments, habitat improvements through land treatments and structures, species reintroductions, development of conservation strategies, administrative studies, collaboration with research, and information and education. The guidance for the WFRP Program can be used to fill in the gaps for other programs with inadequate guidance. Guidance is provided in the LMP to assist the LMP in minimizing or reducing potential impacts to the Apache trout. There are a total of 15 desired conditions (see appendix A) and two objectives associated with this program area.

- OBJ 4 Annually, enhance or restore 5 to 15 miles of stream and riparian habitat to restore structure, composition, and function of physical habitat for native fisheries and riparian-dependent species.
- OBJ 5 During the planning period, complete at least five projects (e.g., remove barriers, restore dewatered stream segments, or connect fragmented habitat) to provide for aquatic and riparian associated species and migratory species.

The WFRP desired conditions, objectives, and treatments will likely be integrated with the Watershed and Soils and Ecosystem/Vegetation Health programs; potentially resulting in improvements in watershed condition and function, riparian conditions, and aquatic habitats across the ASNFs. The desired conditions (4, 7, 20, 23, 24, 26, 27, and 30 - 37) located under the "aquatic habitat and species" section of the LMP relate to the threats/risks and potential recovery and restoration needs for the Apache trout. The two objectives (4 and 5) provide for a treatment level of approximately 5-15 miles per year, which will improve the overall aquatic habitat conditions for the streams and riparian areas receiving treatments. Collectively these desired conditions and objectives could potentially result in long term improvements for the Apache trout (e.g., aquatic habitat conditions, water quality and stream temperature improvements, riparian and aquatic habitat structure and function) and their aquatic habitats.

Restoring and maintaining aquatic habitats and riparian areas would likely improve the potential to retain or return the necessary ecological processes and functions necessary to make these ecosystems sustainable, resilient, and healthy. Impacts to the watershed, streams, and riparian areas, along with potential and recent impacts associated with fire are threats to Apache trout and their recovery on the ASNFs. The aquatic habitat and species restoration actions have the potential to reduce the current threats; especially those associated with uncharacteristic fire, competition and hybridization with nonnative species, and altered and degraded aquatic habitat condition, structure, and function.

While the management of watersheds and riparian areas has the potential to have long term beneficial impacts through restoration of hydrologic conditions and functions; short term impacts associated with project implementation could result, especially those associated with the use of mechanical treatments (includes all treatments except fire) and the potential to transfer or inadvertently move invasive or nonnative species. There is one standard and eight specific guidelines that address potential impacts.

- ST 2 When drafting (withdrawing) water from streams or other water bodies, measures will be taken to prevent entrapment of fish and aquatic organisms and the spread of parasites or disease (e.g., Asian tapeworm, chytrid fungus, whirling disease).

- GL 7 Streams, streambanks, shorelines, lakes, wetlands, and other bodies of water should be protected from detrimental changes in water temperature and sediment to protect aquatic species and riparian habitat.
- GL 8 Streamside management zones should be in place between streams and disturbed areas and/or road locations to maintain water quality and suitable stream temperatures for aquatic species. (#8)
- GL 13 To protect water quality and aquatic species, heavy equipment and vehicles driven into a water body to accomplish work should be completely clean of petroleum residue. Water levels should be below the gear boxes of the equipment in use. Lubricants and fuels should be sealed such that inundation by water should not result in leaks.
- GL 15 Activities occurring within federally listed species habitat should apply habitat management direction and species protection measures from recovery plans.
- GL 17 To prevent degradation of native species habitat and the incidental or accidental introduction of diseases or nonnative species, aquatic species should not be transferred through management activities from one 6th level HUC watershed to another.
- GL 18 Sufficient water should be left in streams to provide for aquatic species and riparian vegetation.
- GL 19 Projects and activities should avoid damming or impounding free-flowing waters to provide streamflows needed for aquatic and riparian-dependent species.
- GL 21 When new water diversions are created or existing water diversions are reanalyzed, measures should be taken to prevent entrapment of fish and aquatic organisms.

Altered aquatic habitat conditions have been identified as a threat to Apache trout, and changes over the last century have impacted the 14 watersheds on the ASNFs. Potential long term improvements in Apache trout habitat that may result by moving towards desired conditions, especially improvements in aquatic habitats, and risks associated with the unintentional transfer and movement of invasive and nonnative species; will likely contribute to recovery and restoration of the streams and aquatic habitats of the Apache trout on the ASNFs. Short term impacts are likely to occur associated with project implementation; however, their duration and extent can be minimized through guidelines and project specific mitigation measures and best management practices. While standards and guidelines would help eliminate most impacts to Apache trout and its habitat, it is still likely that some impacts associated with this program area may affect, and are likely to adversely affect Apache trout.

Cumulative Effects and Climate Change

The only private land that occurs within any of the 14 watersheds populations is a parcel that is approximately 160 acres and is located on the West Fork Black River just upstream of the Forest Road 116 crossing. This parcel has been part of an ongoing land exchange project, and is now under ownership of the ASNFs (although escrow is undergoing final review by the Regional Office). Lands adjacent to the western boundary of the Apache National Forest are White Mountain Apache and San Carlos Apache tribal lands. Numerous streams along this boundary have their headwaters located on tribal lands before

they enter and flow onto the ASNFs. These streams that are relevant to Apache trout recovery include West Fork Little Colorado River, East Fork Little Colorado River, West Fork Black River, Thompson Creek, Stinky Creek, and Soldier Creek. Tribal land activities are not specifically known, but have likely included impacts similar to those on ASNFs lands; although likely much reduced in their extent and intensity, and probably limited to timber harvest, livestock grazing, and the management and introduction of nonnative fish species. Past and ongoing management actions by AZGFD, especially relative to nonnative aquatic species, have resulted in the current and continued impacts to 12 of the 14 Apache trout recovery watersheds and their aquatic habitat.

Changes associated with climate variation and change to riparian areas and aquatic habitats present some of the most important challenges for management of the Apache trout on the ASNFs. Predictions include reduced precipitation and water in riparian areas, increased water losses from elevated evapotranspiration rates, altered high flow events with increased frequencies of high intensity convectional storms, increases in drought severity during summer low flows, and increasing temperatures in small streams and tributaries that further limit habitat during seasonal low flows. Key climate change factors potentially impacting riparian areas and aquatic habitat on the ASNFs include increases in frequency of extreme weather events and increases in wildfire risks. These key climate change factors are addressed directly or indirectly through the LMP (desired conditions, objectives, and management strategies); by enhancing adaption of ecosystems through anticipating and planning for disturbances from intense storms, reducing vulnerability by maintaining and restoring resilient native ecosystems, and increasing water conservation and planning for reductions in upland water supplies. Increases in high intensity storms and flooding will continue to threaten Apache trout and its habitat; improvements in PNVTs, FRCCs, watersheds, and riparian and aquatic habitats could potentially reduce these impacts.

Apache Trout
Summary and Determination of Effects

Based on the information above, it has been determined that the LMP **may affect**, and is **likely to adversely affect** the Apache trout. While most desired conditions and objectives have the potential to result in long term beneficial effects, several activities under several programs could result in short term adverse effects to Apache trout. Most program areas contain guidance (e.g., standards and guidelines) that are designed to reduce and minimize the extent and duration of any potential short and long term negative effects; however, implementation of the LMP does not provide that the mitigation of effects can be equated to or considered at the level of insignificant and/or discountable.

Gila Chub *Gila intermedia*

Endangered Species Act Status:	Endangered, 2005
District Occurrence:	Clifton
Recovery Plan:	No
Critical Habitat:	Yes
Determination of Effect (Species):	May Affect, Likely to Adversely Affect
Determination of Effect (Critical Habitat):	May Affect, Likely to Adversely Affect

Natural History, Distribution, and Status of the Species Range-wide

Information relative to the life history, distribution, and status of the species range-wide are located on the FWS website http://www.fws.gov/southwest/GilaChub.htm. Most of the available information for this species has been summarized and reviewed within the Proposed and Final Rules for the "Listing Gila

Chub as Endangered With Critical Habitat" completed in 2002 and in 2009, respectively. This literature was considered and used in the preparation of this document; and are incorporated by reference into this document.

Threats and Status of the Species within the Action Area

Gila chub was listed with critical habitat by the U. S. Fish and Wildlife Service as endangered in 2005 (FWS 2005). Threats to the Gila chub include introduction of nonnative aquatic competitors and predators (fish, bullfrogs, crayfish), continued water use for development purposes, and habitat degradation due to improper land management on the watershed. Erosion from roads or off bare ground on the watersheds can fill in the deep pools needed by the species, thus degrading the habitat. Where it is still present, populations are often small, fragmented, and at risk from known and potential threats and from random events such as drought, flood events, and wildfire.

Gila chub potentially occur within in six streams on the ASNFs: Eagle Creek, East Eagle Creek, Dix Creek, Left Prong Dix Creek, Right Prong Dix Creek, and Harden Cienega Creek. These six streams are considered to be three distinct populations: Dix Creek, Eagle/East Eagle Creek, and Harden Cienega Creek. The Eagle/East Eagle Creek population is located within the upper portion of this watershed, and Eagle creek drains off the ASNFs before entering the Gila River approximately 21.5 miles downstream of the forest boundary. Dix Creek and Harden Cienega Creek are located south of the San Francisco River, and both flow north directly into the San Francisco River. The Dix Creek Watershed is entirely within the ASNFs, while the upper portion of the Harden Cienega Watershed is located in New Mexico on the Gila National Forest.

The most recent sampling 2005 and 2006, and Gila chub were collected in all three populations. On June 2-3, 2005, AZGFD surveyed portions of Left Prong Dix Creek and Harden Cienega. Approximately one-half mile of Left Prong Dix Creek was surveyed from the 84 Road upstream, and 81 Gila chub were collected. Sampling within Harden Cienega Creek began approximately one mile upstream of the confluence with the San Francisco River, and continued for about one-third of a mile; a total of 16 Gila chub were collected. On June 12-15, 2006, Arizona State University sampled eight sites on the upper portion of Eagle Creek. A total of 85 Gila chub were collected; 26 at the Honeymoon Camp site, 57 at the first road crossing downstream of Honeymoon, and 2 at the second road crossing downstream of Honeymoon. The watersheds of the three populations being analyzed here cover approximately 92,705 acres and 33 miles of stream.

The Dix Creek watershed currently being managed for Gila chub recovery (i.e., critical habitat) includes approximately 22,272 acres and is located entirely on the ASNFs. The watershed has primarily been impacted from livestock grazing, loss of the ecological role of fire from fire suppression and alterations to vegetation, and roads. The lowermost portion of the watershed at the confluence with the San Francisco River contains approximately 150 acres in private ownership. Impacts associated with the private lands are not specifically known, but are likely similar to those on the ASNFs, as well as water developments and diversions. The Eagle/East Eagle Creeks watershed consists of approximately 56,830 acres, and is defined by the lowermost designation of critical habitat on Eagle Creek. The watershed has primarily been impacted by livestock grazing, loss of the ecological role of fire from fire suppression and vegetation alterations, timber harvest, recreation, roads, and the Wallow Fire; and numerous parcels of private lands along Eagle Creek have associated developments that have impacted the riparian and aquatic habitat conditions (e.g., water use and diversions, livestock operations, roads and infrastructure developments). The Harden Cienega Creek watershed consists of approximately 13,604 acres on the ASNFs, with the upper portion of the watershed occurring on the Gila National Forest. The watershed has primarily been impacted from livestock grazing, the loss of the ecological role of fire by fire suppression and alterations in vegetation, and roads.

Critical Habitat and Primary Constituent Elements

Critical habitat was designated for the Gila chub on November 2, 2005. Critical habitat on the ASNFs was designated in six streams for the three separate populations as follows:

- Eagle Creek and East Eagle Creek for 39.2 kilometers (24.4 miles) of creek extending from the confluence of Eagle Creek with an unnamed tributary upstream to its confluence with East Eagle Creek, and including East Eagle Creek to its headwaters just south of Highway 191.

- Harden Cienega Creek for 22.6 kilometers (14.0 miles), beginning from its confluence with the San Francisco River and continuing upstream to its headwaters. Approximately 50% (7 miles) is located on the ASNFs.

- The Dix Creek critical habitat includes the portion of the creek beginning 1 mile upstream from the confluence with the San Francisco River at a natural rock barrier and continuing upstream for 0.9 kilometers (0.6 miles) to the confluence of the right and left forks of Dix Creek. The critical habitat also includes the Left Prong Dix Creek as it continues upstream 2.0 kilometers (1.2 miles), and the Right Prong Dix Creek as it continues upstream 4.8 kilometers (3.0 miles).

The primary constituent elements for designated critical habitat consist of the following:

1. Perennial pools, areas of higher velocity between pools, and areas of shallow water among plants or eddies all found in headwaters, springs, and cienegas, generally of smaller tributaries.
2. Water temperatures for spawning ranging from 17 to 24 °C (62.6 to 75.2 °F), and seasonally appropriate temperatures for all life stages (varying from approximately 10 °C to 30 °C).
3. Water quality with reduced levels of contaminants, including excessive levels of sediments adverse to Gila chub health, and adequate levels of pH (e.g. ranging from 6.5 to 9.5), dissolved oxygen (e.g. ranging from 3.0 to 10.0) and conductivity (e.g. 100 to 1000 mmhos).
4. Food base consisting of invertebrates (e.g. aquatic and terrestrial insects), and aquatic plants (e.g. diatoms and filamentous green algae).
5. Sufficient cover consisting of downed logs in the water channel, submerged aquatic vegetation, submerged large tree root wads, undercut banks with sufficient overhanging vegetation, large rocks and boulders with overhangs, a high degree of streambank stability, and a healthy, intact riparian vegetation community.
6. Habitat devoid of nonnative aquatic species detrimental to Gila chub or habitat in which detrimental nonnatives are kept at a level that allows Gila chub to continue to survive and reproduce.
7. Streams that maintain a natural flow pattern including periodic flooding.

Certain areas within the exterior boundaries of the critical habitat are excluded and not considered as part of critical habitat. These areas include existing paved roads; bridges; parking lots; dikes; levees; diversion structures; railroad tracks; railroad trestles; water diversion canals outside of natural stream channels; active gravel pits; cultivated agricultural land; and residential, commercial, and industrial developments. These developed areas do not contain any of the primary constituent elements and do not provide habitat or biological features essential to the conservation of the Gila chub, and generally will not contribute to the species recovery.

Species and Habitat Effects

For discussion and analysis purposes, the species has been grouped by watersheds. These watersheds were determined by the lowermost point of critical habitat, and include all the contiguous streams and

uplands that drain into critical habitat. These watersheds are referred to by the name of the lowermost (highest stream order) stream within the drainage area; for the Gila chub there are three watersheds considered here; Dix Creek, Eagle Creek, and Harden Cienega Creek. These three watersheds may not always be consistent with the various Hydrologic Unit Code boundaries, as the lowermost point within the drainage area can be determined by several factors (e.g., the downstream end of critical habitat, the downstream end of occupied habitat, the ASNFs boundary). Given that all of the habitat occupied by and/or being managed for Gila chub is contained within designated critical habitat, impacts and potential effects associated with implementation of the LMP apply equally to the species and/or its critical habitat, as they are synonymous.

Wildland Fire Management

Both fire and mechanical treatments would be used to move vegetation toward desired conditions. These treatments are used to change the character of the vegetation that would result in lower risk of uncharacteristic fire and a return of wildfire to a more natural role. The desired condition is to move toward or maintain vegetation conditions in Fire Regime Condition Class (FRCC) 1. FRCC is a metric that quantifies how departed a system is from historical conditions in relation to fire, the role fire historically played in the that system, and the vegetative structure. Under the LMP, annually approximately 48,500 acres would be treated across all of the PNVTs; and approximately 60% (28900 acres) would be treated by fire, and approximately 40% (19600 acres) would be treated mechanically. The current conditions for FRCC are 14% FRCC 1, 14% FRCC 2, and 72% FRCC 3. Under the LMP, the FRCC conditions after 15 years will improve to 24% FRCC 1, 41% FRCC 2, and 35% to FRCC 3.

Table 31 displays the percent for the three FRCCs by watersheds. Only one (Eagle Creek) of the three Gila chub watersheds has a significant (29%) portion of the watershed in FRCC 1, and the other two have very low amounts (0.6 and 1.1 percent). FRCC is a measure of the difference in structure between current and reference conditions. Low (FRCC 1) is considered to be within the natural (historical) range of variability, while moderate (FRCC 2) and high (FRCC 3) departures are outside historical range. Vegetation in FRCC 1 is more resilient and resistant and less likely to lose key ecosystem components (e.g., native species, large trees, soil) after a disturbance, and fire behavior and other associated disturbances are similar to those that occurred prior to the exclusion of fire. It is expected that through implementation of the LMP the acres of FRCC 1 and FRCC 2 will increase, and the acres of FRCC 3 will decrease within the three Gila chub watersheds.

Table 31. Fire Regime Condition Class (FRCC) for Gila Chub watersheds

Watershed	FRCC 1 (% area)	FRCC 1 (acres)	FRCC 2 (% area)	FRCC 2 (acres)	FRCC 3 (% area)	FRCC 3 (acres)
Dix Creek	0.6	123	0	0	99.5	22,149
Eagle Creek	29.3	16,635	3.1	1,732	67.7	38,463
Harden Cienega Creek	1.1	151	1.3	182	97.6	13,271

Wildfire and flooding have been identified as threats to the Gila chub. Over the last 75+ years, alterations to vegetation (e.g., livestock grazing and timber harvest activities), along with the suppression of wildfire has resulted in the disruption of the ecological role of fire in maintaining ecosystems. This has resulted in uncharacteristic impacts from wildfire on watersheds and aquatic habitat and species. Table 32 displays the burn severity impacts associated with the Wallow Fire that occurred in 2011. Eagle Creek was the only steam with any acres within the Wallow Fire, and relatively low amounts of the watershed (11%) and critical habitat (0.9%) were impacted.

Table 32. Wallow Fire Burn Severity and Total Percent within Gila Chub watersheds and Critical Habitat

	Watershed				Critical Habitat (200 m corridor)			
	High	Moderate	Low	Total	High	Moderate	Low	Total
Eagle Creek	1.7	1.7	7.7	11.1	--	0.1	0.8	0.9

The ecological role that wildfire has played in maintaining ecosystem structure, function, and process has been altered over time. Past fire suppression and management activities on the ASNFs have resulted in landscape scale conditions that can result in uncharacteristic and sometimes severe impacts from wildfire. Table 33 displays the amount of impacts (acres and percent) to Gila chub watersheds that have occurred over the last 10 and 25 years. As can be seen from Table 33, almost all of the wildfire within Gila chub watersheds has occurred within the last ten years. This more recent (last ten years) higher level of wildfire activity has resulted from altered vegetation conditions, long-term drought, and the increased use of wildfire being managed for resource benefits. This increased level of wildfire activity is likely to continue until improvements occur in vegetative structure and function, and drought conditions improve.

Table 33. Fire acres (unplanned≥100) within Gila Chub watersheds (last 10 years and last 25 years)

	10 Years				25 Years			
Watershed	Acres Burned	Percent Burned	Acres Unburned	Percent Unburned	Acres Burned	Percent Burned	Acres Unburned	Percent Unburned
Dix Creek	3,085	13.8	19,187	86.2	3,136	14.1	19,171	86.1
Eagle Creek	37,950	66.8	26,012	45.8	40,040	70.5	26,004	45.8
Harden Cienega Creek	0	0	13,604	100	0	0	13,604	100

The Wildfire Management program will be highly integrated with the vegetation (PNVT) treatments, resulting in improvements in both FRCC and PNVTs across the ASNFs. Three desired conditions (41, 42, and 296) are located under the "all PNVTs" section of the LMP relate to the Fire program. Desired condition 41 states, "Natural processes and human and natural disturbances (e.g., planned and unplanned fire ignitions, mechanical vegetation treatments) provide desired overall tree density, structure, species composition, coarse woody debris, and nutrient cycling. Natural fire regimes are restored. Uncharacteristic fire behavior is minimal or absent on the landscape." Desired condition 42 states, "Fire (prescribed fire and use of wildland fire) maintains and enhances resources and, as nearly as possible, is allowed to function in its natural ecological role." Desired condition 296 states, "Wildland fires burn within the range of frequency and intensity of natural fire regimes." Uncharacteristic high-severity fires rarely occur and do not burn at the landscape scale." Collectively these desired conditions could potentially result in long term improvements for the Gila chub (e.g., watershed and hydrologic conditions, water quality, riparian and aquatic habitat conditions) and critical habitat (PCEs 2, 3, 4, and 5) .

The greatest improvements in FRCC conditions will occur within the Dry Mixed Conifer Forest, Madrean Pine-Oak Woodland, and the Great Basin Grassland PNVT types. Table 34 below contains all the PNVT information for the three Gila chub watersheds. For the Dix Creek watershed these three PNVTs comprise approximately 70% of the total area, and for the Eagle Creek watershed they comprise approximately 62%. The Harden Cienega Creek watershed only contains one of these three PNVTs, and has 29% of its area covered by Madrean Pine-Oak Woodland. Therefore, potential improvements in FRCC and PNVT conditions are most likely to occur within the Dix Creek and Eagle Creek populations of Gila chub, and to a lesser extent within the Harden Cienega Creek population.

While the management of prescribed fire has the potential to have long term beneficial impacts through restoration of vegetation conditions and natural fire regimes, short term impacts associated with project implementation could result. Activities associated with prescribed fire can impact Gila chub by altering water quality and increasing sedimentation into streams, resulting in altered habitat conditions and reduced food resources and abundance. While there are no specific Wildland Fire Management program

standards or guidelines relevant to the Gila chub, guideline (23) under the all PNVTs section of the LMP states, "Landscape scale restoration projects should be designed to spread out treatments spatially and/or temporally to reduce implementation impacts and allow reestablishment of vegetation and soil cover." This guideline could help reduce or minimize short term impacts that may result from prescribed fire activities.

Wildland fire has been identified as a threat to the Gila chub, and has had some impacts on all three populations on the ASNFs, especially over the last ten years. Potential long term improvements in Gila chub habitat that may result by moving towards desired conditions, especially improvements in FRCC and PNVTs, will likely contribute to recovery and restoration of the watersheds and critical habitats of the Gila chub on the ASNFs, while reducing potential impacts from uncharacteristic fire and the associated increases in ash and sedimentation. Short term project implementation impacts are likely to occur associated with implementation of the fire program; however, their duration and extent can be minimized through guidelines and project specific mitigation measures. Although mitigation of impacts will occur, based on past actions and the limitations of potential mitigation measures and timing of activities; impacts to Gila chub from this program area may affect and are likely to adversely affect both the Gila chub and its designated critical habitat.

Ecosystem/Vegetation Health

The LMP has recognized the need to address the maintenance and improvement of ecosystem health. Thirteen of the 14 PNVTs on the ASNFs vary (sometimes substantially) in structure, composition, function, and natural disturbance processes from desired conditions. PNVTs are key components in sustaining terrestrial and aquatic ecosystems, and providing for recovery of the Gila chub. The desired conditions for the PNVTs will result in resilient, functioning ecosystems; and in conjunction with the objectives, will guide future vegetation management activities, including burning and mechanical treatments, to maintain or move towards desired conditions. Table 24 displays the acres and percentage of each PNVT for each of the 3 Gila chub watersheds on the ASNFs. These data show how the PNVTs can vary considerably between the Gila chub watersheds, and show the complexity of the watersheds and the potential difficulties in maintaining, improving, and restoring these areas for Gila chub recovery.

Table 34. PNVTs for Gila Chub watersheds

	Cottonwood-Willow Riparian Forest	Dry Mixed Conifer Forest	Interior Chaparral	Madrean Pine-Oak Woodlands	Mixed Broadleaf Deciduous Riparian Forest	Montane Willow Riparian Forest	Montane/Subalpine Grasslands	Piñon-Juniper Woodland	Ponderosa Pine Forest	Semi-desert Grassland	Great Basin Grassland	Spruce-Fir Forest	Wet Mixed Conifer Forest	Wetland/Cienega Riparian Areas	Water
Dix Creek: Total = 22272 acres															
Acres	--	--	--	15,489	123	--	--	--	--	6,660	--	--	--	--	--
Percent	--	--	--	69.5	0.6	--	--	--	--	29.9	--	--	--	--	--
Eagle Creek: Total = 158168 acres															
Acres	76	3,492	15,541	28,143	1,095	--	--	--	4,535	2,293	---	--	1,653	--	--
Percent	0.13	6.2	27.4	49.5	1.9	--	--	--	8	4	--	--	2.9	--	--
Harden Cienega Creek: Total = 13604 acres															
Acres	182	--	--	3,986	151	--	--	--	--	9,285	--	--	--	--	--
Percent	1.3	--	--	29.3	1.1	--	--	--	--	68.3	--	--	--	--	--

There are ten desired conditions (see appendix A) and three objectives associated with this program area relevant to Gila chub within the ecosystem health, PNVTs, and forest products sections of the LMP.

- OBJ 11 (All forested PNVTs) Annually, treat 5,000 to 35,000 acres to reduce tree densities, restore natural fire regimes, promote species habitat and ecosystem health, reduce fire hazard, maintain desired conditions, initiate recovery from uncharacteristic disturbance, and provide forest products, leaving a desired mix of species with the range of desired densities that are resilient to changing climatic conditions.
- OBJ 13 (All woodland PNVTs) Annually, treat or maintain 5,000 to 15,000 acres to promote a highly diverse structure.
- OBJ 14 (grasslands) Decrease or maintain the woody canopy cover at less than 10 percent by treating up to 25,000 acres annually.

The vegetation (PNVTs) treatments will be integrated with both the Fire and Forest Products programs, resulting in improvements in both PNVTs departure and FRCC conditions across the ASNFs. The desired conditions (1, 2, 3, 39, 40, 46, 48 and 61) located under the "overall ecosystem health" and "all PNVTs" sections of the LMP relate to this program and the watershed and landscape scale conditions for the Gila chub. The three objectives (11, 13, and 14) provide for a maximum total treatment level of 75,000 acres per year, which will improve the overall departure condition for the eight modeled PNVTs from their current rating of 64% (high departure) to 44% (moderate departure) over the planning period. Collectively these desired conditions could potentially result in long term improvements for the Gila chub (e.g., watershed and hydrologic conditions, water quality, riparian and aquatic habitat conditions, risk of uncharacteristic fire) and their critical habitats (PCEs 2, 3, 4, and 5) within all three populations on the ASNFs.

The greatest improvements in PNVT departure will occur within the Dry Mixed Conifer Forest, Madrean Pine-Oak Woodland, Ponderosa Pine Forest, and the Great Basin Grassland PNVT types. For the Dix Creek watershed these four PNVTs comprise approximately 70% of the total area, and for the Eagle

Creek watershed area they comprise approximately 64%. The Harden Cienega Creek watershed only contains one of these four PNVTs, and has 29% of its area covered by Madrean Pine-Oak Woodland. Therefore, potential improvements in PNVT conditions are most likely to occur within the Dix Creek and Eagle Creek populations of Gila chub, and to a lesser extent within the Harden Cienega watershed. Restoring and maintaining PNVTs would likely improve the potential to retain or return the necessary ecological processes and patterns necessary to make these ecosystems sustainable, resilient, and healthy. Impacts to the uplands, streams, and riparian areas; along with potential and recent impacts associated with fire, are threats to the Gila chub and their persistence on the ASNFs. The landscape and watershed scale restoration actions have the potential to reduce the current large scale threats, especially those associated with uncharacteristic fire, and improve both the upland and riparian conditions for the Gila chub and their designated critical habitat (PCEs 5 and 7).

While the management of vegetation and PNVTs has the potential to have long term beneficial impacts through restoration of vegetation conditions and natural fire regimes; short term impacts associated with project implementation could result, especially those associated with the Forest Products program. There are three objectives that provide for the use of forest products on an annual basis; 122,000 CCF (hundred cubic feet) from suitable timberlands for wood products, 94,000 CCF for firewood, and 5,000 permits for Christmas trees. Suitable timberlands are lands to be managed for timber production on a regulated basis. Suitable timber lands are likely to have greater impacts compared to other lands due to the greater emphasis on mechanical vegetation treatments and the associated infrastructure (e.g., roads, landings) and continued scheduled entries over time. "Nonsuitable" and "fire only" timber lands may have vegetation treatments and provide forest products; but they will likely only receive one entry during the planning period, and the amount of access and roads needed are substantially less than "suitable" timber lands.

The Dix Creek, Eagle Creek, and Harden Cienega drainage areas have no or very few acres of suitable timber lands; 0%, 0.4% and 0% respectively (see Table 35). Therefore, any potential impacts resulting from the management of suitable timber lands could likely only occur within the Eagle Creek population of Gila chub.

Table 35. Treatment Type [suitable timber, nonsuitable timber, and fire only lands] acres by Gila Chub watersheds

Watershed	Suitable Timber	Nonsuitable Timber	Fire Only
Dix Creek	0 acres (0%)	12647 acres (56.8%)	9625 acres (43.2%)
Eagle Creek	239 acres (0.4%)	29022 acres (51.1%)	27569 acres (48.5%)
Harden Cienega Creek	0 acres (0%)	9197 acres (67.6%)	4406 acres (32.4%)

Activities associated with suitable/unsuitable/fire only timberland treatments can impact Gila chub by altering watershed, hydrologic, riparian, and aquatic habitat conditions; degrading water quality and increasing sedimentation into streams, and reducing food resources and abundance necessary for the Gila chub. There are two specific guidelines that address these potential impacts. Guideline (GL 23) under the all PNVTs section of the LMP states, "Landscape scale restoration projects should be designed to spread out treatments spatially and/or temporally to reduce implementation impacts and allow reestablishment of vegetation and soil cover." Guideline (GL 130) in the Forest Products section states, "Permits issued for forest products should include stipulations to protect resources." These guidelines can minimize and reduce potential impacts resulting from treatments by reducing their intensity over space and time, although it is likely that some level of impacts will still occur.

Conditions in the uplands, riparian, and streams, along with fire, have been identified as a threat to the Gila chub. Potential long term improvements in Gila chub populations that may result by moving towards desired conditions, especially improvements in PNVTs and risk associated with uncharacteristic fire; will likely contribute to recovery and restoration of the watersheds and critical habitats of the Gila

chub on the ASNFs, while reducing potential impacts from uncharacteristic fire and the associated increases in ash and sedimentation. Short term project implementation impacts are likely to occur associated with implementation of the vegetation treatment and forest products programs; however, their duration and extent can be minimized through guidelines and project specific mitigation measures. Although impacts may be reduced, short term impacts are likely to occur that cannot be considered insignificant or discountable. Therefore, this program area may affect, and is likely to adversely affect Gila chub and its critical habitat.

Rangeland Management

Program activities include administering livestock grazing consistent with: NEPA decisions, ESA consultation requirements, and guidance in LMP. Additional Program activities include implementation and effectiveness monitoring of individual allotments, development of structural and non-structural improvements to facilitate better livestock management and to improve wildlife habitat and watershed conditions, control of invasive weeds, and the authorization of grazing consistent with LMP through site specific allotment NEPA. The LMP determined that most of the ASNFs is suitable for livestock grazing. Suitability is the appropriateness of applying certain resource management practices to a particular area of land, in consideration of relevant social, economic, and ecological factors. Table 36 displays the livestock grazing suitability acres for each of the Gila chub watersheds.

Table 36. Livestock grazing suitability in Gila Chub watersheds and critical habitat

	Watersheds				Critical Habitat			
	Suitable (percent)	Suitable (acres)	Unsuitable (percent)	Unsuitable (acres)	Suitable (percent)	Suitable (acres)	Unsuitable (percent)	Unsuitable (acres)
Dix Creek	100	22,272	0	0	100	384	0	0
Eagle Creek	100	56,830	0	0	100	1,526	0	0
Harden Cienega Creek	100	13,604	0	0	100	675	0	0

All of the Gila chub watersheds and all of critical habitat have been determined to be suitable for livestock grazing. While a determination of suitability does not necessarily result in livestock grazing on that area, current management provides for livestock grazing across most of the ASNFs. Livestock grazing can impact watersheds and hydrologic conditions by altering vegetation and ground cover, soil compaction, and water quality. Current range condition on the ASNFs is reflective of past and ongoing grazing activities, and landscape scale conditions have not changed significantly since the 1980s. Table 37 displays the current range conditions for each of the Gila chub watersheds and their critical habitat, with most of the acres falling in fair and poor range condition.

Table 37. Range Condition in Gila Chub watersheds and critical habitat

	Watershed		Critical Habitat	
Range Condition	**Acres**	**Percent**	**Acres**	**Percent**
Dix Creek				
Excellent	-	-	-	-
Good	259	1.2	-	-
Fair	11,423	51.3	-	-
Poor	5,200	23.3	288	75
Very Poor	0	0	-	-
No capacity	5,391	24.2	96	25
Eagle Creek				
Excellent	-	-	-	-
Good	782	1.4	-	-

Fair	22,021	38.7	390	25.6
Poor	16,891	29.7	636	41.7
Very Poor	-	-	-	-
No capacity	17,136	30.2	501	32.8
Harden Cienega Creek – No Data				

Given the long history of domestic livestock grazing activities on the ASNFs, considerable amounts of infrastructure has been developed through site specific management. The most common types of range developments associated with livestock grazing activities include fencing, water developments, and corrals. These range developments can impact watersheds, riparian areas, and aquatic habitats. Fencing can result in the concentration of grazing animals, impacting vegetation, soils, and aquatic habitat where this occurs. Pit tanks occur on drainages and can alter hydrologic conditions, and can act as vectors (along with livestock) for the movement and introduction of invasive or undesirable species. Corrals are often located adjacent to streams and springs, and impacts to water quality and vegetation can result from the concentrated use in these areas. Table 38 displays the primary range developments within the Gila chub watersheds and critical habitat; and while these developments can help to disperse impacts across livestock grazing allotments, higher levels of these developments are likely to result in greater risks to the Gila chub from livestock grazing actions.

Table 38. Range developments in Gila Chub watersheds and critical habitat

Watershed	Feature	Watershed	Critical Habitat (200 m corridor)
Dix Creek	Corral (points)	14	1
Dix Creek	Pit Tank (points)	37	-
Dix Creek	Constructed Fence (miles)	21.2	0.3
Eagle Creek	Corral (points)	19	2
Eagle Creek	Pit Tank (points)	37	2
Eagle Creek	Constructed Fence (miles)	97.5	8.3
Harden Cienega Creek	Corral (points)	-	-
Harden Cienega Creek	Pit Tank (points)	44	-
Harden Cienega Creek	Constructed Fence (miles)	-	-

While there are no relevant desired conditions associated with the livestock grazing and invasive species, there are two objectives associated with the invasive species program that are relevant to the Gila chub. These two objectives (16 and 17) propose to annually "contain, control, or eradicate invasive species (e.g., musk thistle, Dalmatian toadflax) on 500 to 3,500 acres", and "control or eradicate invasive species (e.g., tamarisk, bullfrogs) on at least 2 stream miles." Invasive and nonnative species have been identified as threats to the Gila chub; and these two objectives could potentially improve both the riparian and aquatic habitat for the Gila chub by restoring vegetation and aquatic species composition to historical conditions, or to levels that are low enough to allow for Gila chub to survive and reproduce (PCE 6).

While the invasive species program has the potential to have some long term benefits to Gila chub and their critical habitat (e.g., tamarisk removal on Eagle Creek), the possibility exists for impacts to Gila chub through implementation of this program and the livestock grazing program. One standard and seven guidelines have been included in the LMP that may address potential impacts to Gila chub.

- ST 4 Vegetation treatments shall include measures to reduce the potential for introduction of invasive plants and animals and damage from nonnative insects and diseases.

- GL 32 Active grazing allotments should be managed to maintain or improve to desired riparian conditions.
- GL 78 Projects and activities should not transfer water between drainages or between unconnected water bodies within the same drainage to avoid spreading disease and aquatic invasive species.
- GL 79 Project areas should be monitored to ensure there is no introduction or spread of invasive species.
- GL 81 Pesticide use should minimize impacts on nontarget plants and animals.
- GL 134 New livestock troughs, tanks, and holding facilities should be located out of riparian areas to limit concentration of livestock in these areas. Existing facilities in riparian areas should be modified, relocated, or removed where their presence is determined to inhibit movement toward desired riparian or aquatic conditions.
- GL 138 To minimize potential resource impacts from livestock, salt or nutritional supplements should not be placed within a quarter of a mile of any riparian area or water source. Salt or nutritional supplements should also be located to minimize herbivory impacts to aspen clones.
- GL 139 To prevent resource damage (e.g., streambanks) and disturbance to federally listed and sensitive wildlife species, trailing of livestock should not occur along riparian areas. Where no alternative route is available, approval may be granted where effective mitigation measures are implemented (e.g., timing of trailing, number of livestock trailed at one time).

While the invasive species program has the potential to have long term benefits and impacts through restoration of vegetation conditions, riparian areas, and aquatic habitats; activities associated with the livestock grazing program can impact Gila chub by degrading upland and watershed conditions and function, altering riparian vegetation and function, and reducing water quality and increasing sedimentation into streams. The standards and guidelines listed above may reduce potential impacts; but given that all of the Gila chub watersheds areas are suitable for livestock grazing, have range conditions that are mostly fair and poor, and have considerable amounts of range developments (e.g., fences and tanks); it is reasonable to conclude that implementation of the LMP will result in impacts to the Gila chub and their critical habitat. Given past actions, and the inherent limitations relative to minimizing impacts from livestock grazing activities, it is not reasonable to conclude impacts associated with this program area will be insignificant or discountable. Therefore, this program area may affect and is likely to adversely affect Gila chub and its critical habitat.

Watershed and Soil Management

The Watershed Program seeks to maintain or improve watershed conditions and maintain good water quality. It is cross-program in orientation in that it seeks to mitigate impacts from other program activities as well. The guidance for the Watershed Program can be used to fill in the gaps for other programs with inadequate guidance. Abundant guidance is provided in the LMP to assist the LMP in minimizing or reducing potential impacts to the Gila chub. There are a total of 15 desired conditions (see appendix A) and six objectives associated with this program area.

- OBJ 1 During the planning period, improve the condition class on at least 10 priority 6th level HUC watersheds by removing or mitigating degrading factors.
- OBJ 2 Annually, enhance or restore an average of 350 acres within priority 6th level HUC watersheds, including treating the causes of State designated impaired or threatened waters (Arizona Department of Environmental Quality, 2012) to improve watershed condition and water quality.
- OBJ 6 Annually, restore 200 to 500 acres toward desired composition, structure, and function of streams, floodplains, and riparian vegetation.
- OBJ 9 Within the planning period, enhance or restore 5 to 25 wet meadows or cienegas to proper hydrologic function and native plant and animal species composition.

- OBJ 10 Annually, work with partners to reduce animal damage to native willows and other riparian species on an average of 5 miles of riparian habitat.
- OBJ 38 Annually, prepare at least one instream flow water rights application until water acquisition needs are complete to sustain riparian areas, fish, wildlife, and water-based recreation.

The watershed and riparian desired conditions, objectives, and treatments will likely be integrated with the Fire, Ecosystem Health, and Wildlife Fish and Rare Plant programs; potentially resulting in improvements in watershed condition and function, and riparian conditions across the ASNFs. The desired conditions (9, 12, 15, 21, 22, 67 - 72, 74, 77, 80, and 84) located under the "watershed" and "riparian areas" sections of the LMP relate to this program and the watershed and landscape scale conditions for the Gila chub. The six objectives (1, 2, 6, 9, 10 and 38) provide for a treatment level of approximately 1,000 - 10,000 acres per year, which will improve the overall conditions for the six code watersheds and riparian areas receiving treatments. Collectively these desired conditions and objectives could potentially result in long term improvements for the Gila chub (e.g., watershed and hydrologic conditions, water quality, riparian and aquatic habitat conditions, soils) and their critical habitats (PCEs 2, 3, 5, and 7) within all three populations on the ASNFs.

Restoring and maintaining watersheds and riparian areas would likely improve the potential to retain or return the necessary ecological processes and functions necessary to make these ecosystems sustainable, resilient, and healthy. Impacts to the uplands, streams, and riparian areas; along with potential and recent impacts associated with fire are threats to the Gila chub and their persistence on the ASNFs. The landscape and watershed scale restoration actions have the potential to reduce the current threats; especially those associated with watershed and hydrologic conditions, and improve both the upland (soils) and riparian conditions for the Gila chub and their designated critical habitat (PCEs 3, 5, and 7).

While the management of watersheds and riparian areas has the potential to have long term beneficial impacts through restoration of hydrologic conditions and functions; short term impacts associated with project implementation could result, especially those associated with the use of mechanized equipment; which are likely to have increased levels of ground disturbance, vegetation removal, and soil compaction. There are six specific guidelines that address these potential impacts.

- GL 2 Projects with ground-disturbing activities should be designed to minimize long and short term impacts to soil resources. Where disturbance cannot be avoided, project specific soil and water conservation practices should be developed.
- GL 6 Projects with ground-disturbing activities should be designed to minimize long and short term impacts to water resources. Where disturbance cannot be avoided, project specific soil and water conservation practices and BMPs should be developed.
- GL 30 Ground-disturbing projects (including prescribed fire) which may degrade long term riparian conditions should be avoided.
- GL 33 Storage of fuels and other toxicants should be located outside of riparian areas to prevent spills that could impair water quality or harm aquatic species.
- GL 34 Equipment should be fueled or serviced outside of riparian areas to prevent spills that could impair water quality or harm aquatic species.
- GL 35 Construction or maintenance equipment service areas should be located and treated to prevent gas, oil, or other contaminants from washing or leaching into streams.

Conditions in the uplands, riparian areas, and streams are potential threats to the Gila chub, and all of these have had some impacts in all three populations on the ASNFs. Potential long term improvements in Gila chub habitat may result by moving towards desired conditions, especially improvements in watersheds (i.e., Objective 1 - to restore ten watersheds during the planning period) and risk associated

with degraded riparian areas; and will likely contribute to recovery and restoration of the watersheds and critical habitats of the Gila chub on the ASNFs, while reducing potential impacts from uncharacteristic watershed and hydrologic conditions. Short term impacts are likely to occur associated with project implementation; however, their duration and extent can be minimized through guidelines and project-specific mitigation measures and best management practices. Potential short term impacts primarily include increases in sedimentation, soil compaction, alterations in hydrologic conditions and functions, and changes in water quality. Mitigation measures are implemented at the project level, and site specific conditions and project activities and timing will determine their efficacy. Although most projects could be mitigated, it is likely over the planning period that some projects will result in impacts that could not be considered at the level of insignificant or discountable. Therefore this program area may affect, and is likely to adversely affect Gila chub and its critical habitat.

Engineering Program

The motorized transportation system is comprised of 765 miles of roads open only to highway legal vehicles (maintenance level 3 through 5), 2,067 miles of roads open to all motorized vehicles (maintenance level 2), 3,372 miles of roads closed to all motorized vehicles (maintenance level 1), and 156 miles of trails open to motorized vehicles less than 50 inches wide. The miles of open motorized transportation system includes roads with access restricted on a seasonal basis for public safety and to minimize resource damage. The LMP includes plan objectives to annually maintain 20% of passenger vehicle roads, 10% of high clearance roads, and 20% of both motorized and nonmotorized trails. Road crossing information for the Gila chub watersheds are presented below in Table 39. Although the various types of crossings (e.g., culverts, bridges) cannot be accurately determined at the watershed scale, most of the crossings across the ASNFs are culverts. Route miles and densities were also calculated for the three Gila chub watersheds (Table 40). This information is separated by closed, open, and non-motorized routes; and represents the most recent data from the Forest Transportation Atlas, which does not include unauthorized routes.

Table 39. Route (motorized and nonmotorized) Crossings in Gila Chub watersheds and critical habitat

Watershed		Critical Habitat	
Dix Creek	38	Dix Creek	4
Eagle Creek	397	Eagle Creek	112

Table 40. Route Miles and Densities for Closed (decommissioned and ML1) and Open (ML 2-5 and motorized trails) and Nonmotorized in Gila Chub watersheds and critical habitat

		Watershed		Critical Habitat	
Watershed	Route Type	Route Miles	Density (miles / square mile)	Route Miles	Density (miles / square mile)
Dix Creek	Closed	7.1	0.2	0.08	0.14
Dix Creek	Open	20.2	0.6	1	1.6
Dix Creek	Non-motorized	0.6	0.02	0	0
Dix Creek	**Total**	**27.9**	**0.8**	**1.1**	**1.8**
Eagle Creek	Closed	10.5	0.1	0.2	0.08
Eagle Creek	Open	42.3	0.5	4.0	1.7
Eagle Creek	Non-motorized	97.3	1.1	13.4	5.6
Eagle Creek	**Total**	**150.1**	**1.7**	**17.6**	**7.4**
Harden Cienega Creek	Closed	9.2	0.4	--	--
Harden Cienega Creek	Open	14.8	0.7	--	--
Harden Cienega Creek	Non-motorized	0	0	--	--

Harden Cienega Creek	**Total**	**24**	**1.1**	**--**	**--**

While desired conditions do not exist for the Engineering program; there are two objectives within the riparian section of the LMP that relate to roads.

- OBJ 7 Within the planning period, relocate, repair, improve, or decommission a minimum of 4 miles of National Forest System roads or trails that add sediment to streams, damage riparian vegetation, erode streambanks, cause gullies, and/or compact floodplain soils.
- OBJ 8 Annually, remove an average of 2 miles of unauthorized roads or trails that sediment to streams, damage riparian vegetation, erode streambanks, cause gullies, and/or impact floodplain soils.

These two objectives could potentially result in long term improvements for the Gila chub and their critical habitats by reducing sedimentation associated with degraded and/or unauthorized roads and trails. Restoring and rehabilitating these sites could potentially improve water quality, habitat conditions, and the macroinvertebrate food base needed by the Gila chub. All three Gila chub populations could potentially benefit from implementation of these objectives, as road and trail densities within critical habitat for this species is relatively high in Dix and Eagle creeks; and major roads occur within or adjacent to most of the critical habitat for this species in Eagle Creek, and this accounts for the high route density (7.4 miles/square mile) within critical habitat in Eagle Creek. Roads and trails occurring within the floodplain can have substantial impacts to the functioning of riparian areas and vegetation, sedimentation inputs into the stream, and negative impacts to water quality, and the loss of aquatic habitats.

Roads and road construction and maintenance can result in the destruction and alteration of riparian and aquatic habitat, increases in sedimentation, and water quality degradation. Roads can also act as vectors and increase the risk for the transportation or introduction of disease and invasive/undesirable species, especially where crossings exist. The engineering program contains one standard and one guideline that may help minimize some threats to Gila chub. The standard (18) states, "Road maintenance and construction activities shall be designed to reduce sediment (e.g., water bars, sediment traps, grade dips) while first providing for user safety." The guideline (103) states, "Roads and motorized trails removed from the transportation network should be treated in order to avoid future risk to hydrologic function and aquatic habitat." The water resources section of the LMP also has a guideline (8) that specifies that "streamside management zones should be in place between streams and disturbed areas and/or road locations to maintain water quality and suitable stream temperatures for aquatic species." These standards and guidelines, combined with the objectives to reduce impacts from roads; could potentially improve habitat conditions for the Gila chub over the long term by reducing sedimentation and impacts to aquatic habitat.

Erosion from roads has been identified as a threat to the Gila chub, and has had impacts on all three populations on the ASNFs. Roads crossing and adjacent to streams can remove and alter riparian vegetation, impact stream channel function and structure, and alter and degrade aquatic habitat through changes in water quality and increases in sedimentation. Potential long term improvements in Gila chub habitat may result by reducing road densities and impacts within riparian areas; and have the potential to contribute to recovery and restoration of the watersheds, riparian areas, and critical habitats of the Gila chub on the ASNFs. Short term project implementation impacts are likely to occur associated with implementation of the engineering/roads program; however, their duration and extent can be minimized through standards, guidelines, and project specific mitigation measures. Although there are standards and guidelines to potentially limit impacts from roads, motorized trails, and other projects; it is not likely that all the potential negative effects such as increased runoff and sedimentation could be eliminated to the

extent they could be considered insignificant or discountable. Therefore, this program area may affect and is likely to adversely affect Gila chub and its critical habitat.

Lands and Minerals Program

In 2011, there were 454 existing rights-of-way and special use permits for a variety of uses on the ASNFs. A majority of these are categorized as lands permits (381) versus recreation permits (73). It is likely that some of these special use permits and authorizations are located within the watersheds and critical habitats of the three Gila chub populations, although site-specific details are not known. Across the entire ASNFs there are 16 lands special use permits for reservoirs/dams, 10 for irrigation ditches, 15 for water conveyance, and 36 for water transmission. Water uses for development purposes has been identified as a threat to maintaining, restoring, and recovering the Gila chub and its critical habitat. Reservoirs/dams currently do not impact any of the Gila chub populations, while water diversions and uses are likely impacting the Dix Creek and Eagle Creek populations; primarily associated with private land inholdings and parcels on these streams, although some may originate on the ASNFs.

The possibility exists for impacts to Gila chub through implementation of the lands and special uses programs. One standard and one guideline have been included in the LMP to address potential impacts to Gila chub within the "water uses" and "minerals and geology" sections. The standard (31) under the waters uses section states, "Special uses for water diversions shall maintain fish, wildlife, and aesthetic values and otherwise protect the environment." The guideline within the "water uses" section of the LMP states, "Streambed and floodplain alteration or removal of material should not occur if it prevents attainment of riparian, channel morphology, or streambank desired conditions." Although these two plan components may minimize and reduce potential impacts, the possibility exists for effects to the Gila chub through the implementation of the LMP for this program. It cannot be concluded that effects will be reduced to the level of insignificant or discountable; therefore, this program area may affect and is likely to adversely affect Gila chub and its critical habitat.

Recreation and Wilderness Programs

There are over 30 reservoirs and lakes and more than 1,000 miles of streams on the ASNFs, more than any other national forest in the Southwestern Region. Reservoirs and streams and adjacent areas are highly desirable for many types of recreational activities. The user demands and concentrated use in these areas can result in impacts that can alter vegetation, riparian areas, water quality, and aquatic habitat.

There is only one desired condition (DC 219) within the LMP in the dispersed recreation section that states, "Water-based settings are available and the associated recreation opportunities (e.g., canoeing, fishing, waterfowl hunting) do not degrade aquatic resources." Recreation sites and developments along with their associated uses and activities may impact Gila chub and its critical habitat. Table 41 displays the acres of recreational sites within Gila chub watersheds and critical habitat. While the desired condition (219) may help reduce some impacts associated proposed sites, the potential to address impacts associated with developed sites will be limited. These sites and developments and their associated uses and activities do present threats to maintaining, restoring and recovering the Gila chub and its habitat. Recreational sites and activities can impact Gila chub by degrading upland and watershed conditions and function, altering riparian vegetation and function, and reducing water quality and increasing sedimentation into streams. Additionally, nonnative aquatic predators and competitors have been identified as threats to the Gila chub; and the concentration of recreational activities within and adjacent to riparian areas and streams can increase the risk of introductions and spread of invasive or undesirable plants and animals, potentially impacting Gila chub populations on the ASNFs.

Table 41. Recreation Site acres in Gila Chub watersheds and critical habitat

	Watershed		Critical Habitat (200 m)	
Watershed	**Acres**	**Percent**	**Acres**	**Percent**
Eagle Creek	5	0.01	--	--

There is only one standard (ST 13) within the dispersed recreation section of the LMP that states, "Dispersed campsites shall not be designated in areas with sensitive soils or within 50 feet of streams, wetlands, or riparian areas to prevent vegetation and bank damage, soil compaction, additional sediment, or soil and water contamination". Although this plan component may minimize and reduce potential impacts, the possibility exists for effects to the Gila chub from the recreation program through the implementation of the LMP. Although activities are 50 feet away, over time impacts to the stream and riparian vegetation may result as use occurs; and risk associated with the potential to move or introduce nonnative species still exists. Therefore, this program area may affect and is likely to adversely affect Gila chub and its critical habitat.

Wildlife, Fish, and Rare Plants Program

The Wildlife, Fish and Rare Plants (WFRP) Program involves a variety of activities conducted by the USFS and its partners, including inventory and monitoring, habitat assessments, habitat improvements through land treatments and structures, species reintroductions, development of conservation strategies, administrative studies, collaboration with research, and information and education. The guidance for the WFRP Program can be used to fill in the gaps for other programs with inadequate guidance. Abundant guidance is provided in the LMP to assist the LMP in minimizing or reducing potential impacts to Gila chub. There are a total of 15 desired conditions (see appendix A) and two objectives associated with this program area.

- OBJ 4 Annually, enhance or restore 5 to 15 miles of stream and riparian habitat to restore structure, composition, and function of physical habitat for native fisheries and riparian-dependent species.
- OBJ 5 During the planning period, complete at least five projects (e.g., remove barriers, restore dewatered stream segments, or connect fragmented habitat) to provide for aquatic and riparian associated species and migratory species.

The WFRP desired conditions, objectives, and treatments will likely be integrated with the Watershed and Soils and Ecosystem/Vegetation Health programs; potentially resulting in improvements in watershed condition and function, riparian conditions, and aquatic habitats across the . The desired conditions (4, 7, 20, 23, 24, 26, 27, and 30 - 37) located under the "aquatic habitat and species" section of the LMP relate to the threats/risks and potential recovery and restoration needs for the Gila chub. The two objectives (4 and 5) provide for a treatment level of approximately 5 – 15 miles per year, which will improve the overall aquatic habitat conditions for the streams and riparian areas receiving treatments. Collectively these desired conditions and objectives could potentially result in long term improvements for the Gila chub (e.g., aquatic habitat conditions, water quality and stream temperature improvements, riparian and aquatic habitat structure and function) and their critical habitats (PCEs 2, 3, and 5) within all three populations on the ASNFs.

Restoring and maintaining aquatic habitats and riparian areas would likely improve the potential to retain or return the necessary ecological processes and functions necessary to make these ecosystems sustainable, resilient, and healthy. Impacts to the watershed, streams, and riparian areas, along with potential and recent impacts associated with fire and flooding are threats to the Gila chub and their persistence on the ASNFs. The aquatic habitat and species restoration actions have the potential to reduce

the current threats; especially those associated with altered and degraded aquatic habitat condition, structure, and function.

While the management of watersheds and riparian areas has the potential to have long term beneficial impacts through restoration of hydrologic conditions and functions; short term impacts associated with project implementation could result, especially those associated with the use of mechanized equipment and the potential to transfer or inadvertently move invasive or nonnative species. There is one standard and eight specific guidelines that address these potential impacts.

- ST 2 When drafting (withdrawing) water from streams or other water bodies, measures will be taken to prevent entrapment of fish and aquatic organisms and the spread of parasites or disease (e.g., Asian tapeworm, chytrid fungus, whirling disease).

- GL 7 Streams, streambanks, shorelines, lakes, wetlands, and other bodies of water should be protected from detrimental changes in water temperature and sediment to protect aquatic species and riparian habitat.
- GL 8 Streamside management zones should be in place between streams and disturbed areas and/or road locations to maintain water quality and suitable stream temperatures for aquatic species.
- GL 13 To protect water quality and aquatic species, heavy equipment and vehicles driven into a water body to accomplish work should be completely clean of petroleum residue. Water levels should be below the gear boxes of the equipment in use. Lubricants and fuels should be sealed such that inundation by water should not result in leaks.
- GL 15 Activities occurring within federally listed species habitat should apply habitat management direction and species protection measures from recovery plans.
- GL 17 To prevent degradation of native species habitat and the incidental or accidental introduction of diseases or nonnative species, aquatic species should not be transferred through management activities from one 6th level HUC watershed to another.
- GL 18 Sufficient water should be left in streams to provide for aquatic species and riparian vegetation.
- GL 19 Projects and activities should avoid damming or impounding free-flowing waters to provide streamflows needed for aquatic and riparian-dependent species.
- GL 21 When new water diversions are created or existing water diversions are reanalyzed, measures should be taken to prevent entrapment of fish and aquatic organisms.

Degraded aquatic habitat conditions has been identified as a threat to the Gila chub, and changes over the last century have had impacts on all three populations on the ASNFs. Potential long term improvements in Gila chub habitat that may result by moving towards desired conditions, especially improvements in aquatic habitats and risks associated with the unintentional transfer and movement of nonnative species; will likely contribute to recovery and restoration of the streams for Gila chub and its critical habitats (PCEs 1, 4, 5, and 6) of the Gila chub on the ASNFs. Short term impacts are likely to occur associated with project implementation; however, their duration and extent can be minimized through guidelines and project specific mitigation measures and best management practices. While standards and guidelines will help to eliminate some impacts, it is likely that they will not be reduced to a level that can be considered insignificant or discountable. Therefore, this program area may affect and is likely to adversely affect Gila chub and its critical habitat.

Cumulative Effects and Climate Change

There are eight privately owned parcels located on and adjacent to Eagle Creek, and collectively comprise approximately 750 acres. There is one private parcel approximately one-half mile below the lowermost

designated critical habitat on Dix Creek, and is approximately 150 acres. There are no private lands within the Harden Cienega Creek watershed on the ASNFs. Specific activities associated with these private lands are not known; but have likely included livestock and agricultural uses, water developments and diversions, and road and infrastructure developments.

Lands located along the western boundary of the Apache National Forest are San Carlos Apache tribal lands. Numerous streams along this boundary have their headwaters located on tribal lands before they enter and flow onto the ASNFs (i.e., Eagle and East Eagle Creeks). Tribal land activities are not specifically known, but have likely included impacts similar to those on the ASNFs; although likely reduced in their extent and intensity, and probably limited to timber harvest, livestock grazing, and the management and introduction of nonnative fish species. Past and ongoing management actions by AZGFD, especially relative to nonnative aquatic species, have resulted in the current and continued impacts to the three Gila chub populations and their critical habitat.

Changes associated with climate variation and change to riparian areas and aquatic habitats present some of the most important challenges for management of the Gila chub and other aquatic species on the ASNFs. Predictions include reduced precipitation and water in riparian areas, increased water losses from elevated evapotranspiration rates, altered high flow events with increased frequencies of high intensity convectional storms, increases in drought severity during summer low flows, and increasing temperatures in small streams and tributaries that further limit habitat during seasonal low flows. Key climate change factors potentially impacting riparian areas and aquatic habitat on the ASNFs include increases in frequency of extreme weather events and increases in wildfire risks. These key climate change factors are addressed directly or indirectly through the LMP (desired conditions, objectives, and management strategies); by enhancing adaption of ecosystems through anticipating and planning for disturbances from intense storms, reducing vulnerability by maintaining and restoring resilient native ecosystems, and increasing water conservation and planning for reductions in upland water supplies. Increases in high intensity storms and flooding will continue to threaten Gila chub and its critical habitat; improvements in PNVTs, FRCCs, watersheds, and riparian and aquatic habitats could potentially reduce these impacts.

Critical Habitat and Primary Constituent Elements

Effects to designated critical habitat may occur by similar means presented for the species, and all PCEs are likely to be affected. Specific mechanisms affecting PCEs include the potential of introducing sediments to streams, disrupting substrates, and altered habitat components associated with the stream and riparian corridor and vegetation. Critical habitats adversely affected include Dix Creek, Left Prong Dix Creek, Right Prong Dix Creek, Eagle Creek, and Harden Cienega Creek. Table 42 summarizes which program areas may impact specific critical habitat PCEs in either a positive or negative manner.

Table 42. Gila Chub critical habitat PCEs potentially impacted by program area

Program Area	Affected PCEs (by number) and Principle Mechanism
Wildland Fire Management	1, 2, 3, 4, and 7. Increased sediment and reduced water quality, altered riparian and aqautic habitat conditions, reduced fire risk.
Ecosystem/Vegetation Health (Forest Products)	1, 2, 3, 4, 5, and 7. Reduced water quality and increased sedimentation, improvements in riparian and PNVTs, reduced fire risk.
Rangeland Management	1, 2, 3, 4, and 5. Impacts to water quality, increassed sediment to streams, impacts to riparian and aquatic habitats.

Watershed and Soil Management (Riparian Areas)	2, 3, 4, 5, and 7. Improvements to watersheds and hydrologic conditions, reduced sedimentation.
Engineering	1, 3, 4, and 6. Impacts to water quality and increased levels of sedimentation, reduced road densities, riparian improvements.
Lands and Minerals (Special Uses)	3, 5, 6, and 7. Impacts to water quality and quantity, watersheds, and riparian areas; increased risk of invasive and nonnative species.
Recreation and Wilderness	2, 3, 5, and 6. Altered water quality, impacts to riparian vegetation, increased invasive species risk.
Wildlife, Fish, and Rare Plants	1, 2, 3, 4, 5, 6, and 7. Improved riparian and aquatic habitat conditions, reduced risk of nonnative aquatic species.

PCE 1 Perennial pools…generally of smaller tributaries
Wildland Fire Management could increase sedimentation rates into streams, and subsequently pools needed by Gila chub. Improvements in FRCCs could reduce risk associated with uncharacteristic fire that can introduce excessive amounts of sediment and ash into the stream. The Ecosystem/Vegetation Health program can improve ecosystem structure and function, and improve vegetation resiliency to disturbance by PNVT treatments. Short-term impacts could result from mechanical treatments and associated ground disturbance. Rangeland Management could reduce pool quality through increases in sedimentation. The Watershed and Soils program could improve pool quality by reducing sediment production through watershed restoration and improvement projects. These projects could have short-term impacts, especially those using mechanical equipment and adjacent to riparian areas. The Engineering Program could increase sediment into streams from activities associated with roads management. Objectives to improve and close roads within riparian areas could reduce sediment into streams and improve pool quality. The Lands and Minerals program can impact water temperature through actions that could remove or reduce portions of streamflows. Recreational activities along streams and within riparian areas can increase water temperatures by vegetation removal, soil compaction, and ground disturbance. The WFRP program through implementation of restoration projects could improve pools and riparian vegetation, although potential short-term impacts may also occur.

PCE 2 Water temperatures...appropriate for all life stages
Wildland Fire Management could increase water temperature by removing and altering both upland and riparian vegetation. Improvements in FRCCs could reduce risk associated with uncharacteristic fire that can degrade and alter riparian condition and remove riparian vegetation. Restoration projects and activities could have short term impacts that could increase water temperatures with increased runoff from ground disturbance and compaction. The Ecosystem/Vegetation Health program can improve ecosystem structure and function, and improve vegetation resiliency to disturbance within riparian PNVTs; which could improve stream temperatures. Short-term impacts could result from mechanical treatments and associated ground disturbance. Rangeland Management could reduce water temperatures through removal and alteration of riparian vegetation. The Watershed and Soils program could improve water temperatures by reducing degrading factors through watershed restoration and improvement projects. These projects could have short-term impacts, especially those using mechanical equipment and adjacent to riparian areas. The Engineering Program could increase water temperatures by altering drainage density and hydrologic conditions from activities associated with roads management. Objectives to improve and close roads within riparian areas could reduce water temperatures by restoring these areas to more natural conditions. The WFRP program could improve water temperatures through implementation of restoration projects for riparian areas and vegetation, although potential short-term impacts may also occur.

PCE 3 Water quality with reduced levels of contaminants…

Wildland Fire Management could increase sedimentation rates into streams from prescribed fire activities. Improvements in FRCCs could reduce risk associated with uncharacteristic fire that can introduce excessive amounts of sediment and ash into the stream. The Ecosystem/Vegetation Health program can improve ecosystem structure and function, and improve vegetation resiliency to disturbance by riparian PNVT treatments. Short-term impacts could result from mechanical treatments and associated ground disturbance, and these can impact water quality and sediment production. Rangeland Management can increase sediment production within the watershed, and increases in sedimentation can result from riparian area and stream channel impacts. The Watershed and Soils program could improve conditions by reducing sediment production through watershed restoration and improvement projects. These projects could have short-term impacts, especially those using mechanical equipment and adjacent to riparian areas. The Engineering Program could impact water quality by increasing sediment into streams from activities associated with roads management. Objectives to improve and close roads within riparian areas could reduce sediment into streams and improve water quality. Recreational activities along streams and within riparian areas can alter water quality and increase sedimentation by vegetation removal, soil compaction, and ground disturbance. The WFRP program through implementation of restoration projects could improve water quality by implementing restoration actions, although potential short-term impacts may also occur.

PCE 4 Food base consisting of invertebrates and aquatic plants
Wildland Fire Management could impact the aquatic food base by increasing sedimentation and altering water quality from prescribed fire activities. Improvements in FRCCs could reduce risk associated with uncharacteristic fire that can introduce excessive amounts of sediment and ash into the stream. The Ecosystem/Vegetation Health program can improve ecosystem structure and function, and improve vegetation resiliency to disturbance by riparian PNVT treatments. Short-term impacts could result from mechanical treatments and associated ground disturbance; and these can impact water quality and sediment production, altering the macroinvertebrate community and aquatic vegetation. Rangeland Management can increase sediment production and alter water quality within the watershed, potentially impacting invertebrate production within the stream channel. The Watershed and Soils program could improve conditions by reducing sediment production through watershed restoration and improvement projects. These projects could have short-term impacts, especially those using mechanical equipment and adjacent to riparian areas. The Engineering Program could impact water quality by increasing sediment into streams from activities associated with roads management. Objectives to improve and close roads within riparian areas could reduce sediment into streams and improve water quality. Recreational activities along streams and within riparian areas can alter water quality and increase sedimentation by vegetation removal, soil compaction, and ground disturbance; resulting in changes to the food base for Gila chub. The WFRP program through implementation of restoration projects could improve the food base for the Gila chub by improving water quality and reducing sediment from implementing restoration actions, although potential short-term impacts may also occur.

PCE 5 Sufficient cover... and a healthy, intact riparian vegetation community
Wildland Fire Management can remove and alter vegetation within riparian and along stream banks from prescribed fire activities. Improvements in FRCCs could reduce risk associated with uncharacteristic fire that can impact riparian areas and reduce stream bank stability. The Ecosystem/Vegetation Health program can improve ecosystem structure and function, and improve vegetation resiliency to disturbance by riparian PNVT treatments; resulting in improvements to riparian vegetation and stream bank stability. Rangeland Management can remove and alter riparian areas and vegetation, this along with trampling can result in the loss of bank stability and stream channel impacts. The Watershed and Soils program could improve hydrologic conditions through watershed restoration and improvement projects. These projects could have short-term impacts, especially those using mechanical equipment and adjacent to riparian areas. Recreational activities along streams and within riparian areas can alter vegetation and result in the loss of stream bank stability vegetation removal, soil compaction, and ground disturbance. The WFRP

program through implementation of restoration projects could improve water quality by implementing restoration actions, although potential short-term impacts may also occur.

PCE 6 Habitat devoid of nonnative aquatic species …that allows Gila chub…to survive and reproduce
The Engineering Program could increase the risk associated with the introduction of nonnative aquatic species from roads and activities associated with roads management. Objectives to improve and close roads within riparian areas could reduce the potential and opportunity to introduce nonnative aquatic species into streams. The Lands and Minerals program can increase the potential for introductions of nonnative aquatic species as a result of special use permits that allow or result in activities that occur and/or move between reservoirs, riparian areas, and streams. Recreational activities along reservoirs, riparian areas, and streams can increase the risk and opportunity to move or transport nonnative aquatic species between these bodies of water. The WFRP program through implementation of restoration projects could improve aquatic habitats by eliminating or reducing aquatic nonnative species, although potential short-term impacts may also occur.

PCE 7 Streams that maintain a natural flow pattern including periodic flooding
Wildland Fire Management can potentially alter stream flow patterns from prescribed fire activities. Improvements in FRCCs could reduce risk associated with uncharacteristic fire that can introduce excessive amounts of sediment and ash resulting from post fire flooding. The Ecosystem/Vegetation Health program can improve ecosystem structure and function, and improve vegetation resiliency to disturbance by PNVT treatments; which can help restore and improve flow patterns within the watershed to more natural conditions. The Watershed and Soils program could improve stream flow patterns to more historical conditions by reducing and removing degrading factors through watershed restoration and improvement projects. These projects could have short-term impacts, especially those using mechanical equipment and adjacent to riparian areas. The Engineering Program could impact stream flow patterns through changes in drainage densities and hydrologic conditions from roads and activities associated with roads management. Objectives to improve and close roads within the watersheds and riparian areas of Gila chub could improve stream flow patterns where roads have altered hydrologic conditions and floodplains. The WFRP program through implementation of restoration projects could provide for more natural flow patterns by implementing restoration actions that improve stream channel structure and function, although potential short-term impacts may also occur.

The direction and plan components within the LMP for the Wildland Fire Management, Ecosystem/Vegetation Health, Rangeland Management, Watershed and Soils Management, Engineering, Lands and Minerals, Recreation and Wilderness, and WFRP programs are not sufficient to avoid certain activities that may adversely impact critical habitat. The potential effects from most programs can be minimized by standards and guidelines, especially those within the Watershed and Soils Management and the WFRP programs. While the potential impacts would be reduced by the standards and guidelines, they may not be completely constrained through implementation of the LMP. Although LMP implementation could potentially impact all the PCEs for critical habitat, it is not believed that these impacts would occur at a level that would preclude any of the PCEs from functioning in their role for the conservation of the species. Therefore, implementation of the LMP for all program areas may affect, and are likely to adversely affect Gila chub critical habitat.

Gila Chub
Summary of Effects and Determinations

Based on the information above, it has been determined that the LMP **may affect**, and is **likely to adversely affect** the Gila chub and its designated critical habitat. While most desired conditions and objectives have the potential to result in beneficial effects, several activities under several programs could result in adverse effects to Gila chub. Most program areas contain guidance (e.g., standards and

guidelines) that are designed to reduce and minimize the extent and duration of any potential short and long term negative effects; however, implementation of the LMP does not provide for mitigation of all potential effects to a level that can be equated to or considered as insignificant and/or discountable.

Gila Trout *Oncorhynchus gilae*

Endangered Species Act Status:	Threatened, 2006
District Occurrence:	Alpine and Clifton
Recovery Plan:	2003
Critical Habitat:	No
Determination of Effect (Species):	May affect, likely to adversely affect

Natural History, Distribution, and Status of the Species Range-wide

Information relative to the life history, distribution, status of the species range-wide and listing factors are located on the FWS website http://www.fws.gov/southwest/Gila_Trout.htm. The literature cited within the most recent revision (third) of the recovery plan (FWS 2003), contains a thorough list of references for this species. This literature, along with the more recently completed final rule for the reclassification from endangered to threatened (FWS 2006), were considered and used in the preparation of this document; and are incorporated by reference into this document.

Threats and Status of the Species within the Action Area

Discussion with the reasons for listing and threats to the species can be found within the recovery plan, and the final rule "Reclassification of the Gila Trout From Endangered to Threatened; Special Rule for Gila Trout in New Mexico and Arizona" published in the Federal Register in 2006. Threats to the species include: the destruction, modification, and curtailment of its habitat or range; livestock grazing; fire; timber harvest operations and the associated erosion, siltation, and increases in water temperatures; and the introduction of nonnative trout species that hybridize and compete with the Gila trout.

The most recent version of the recovery plan has identified eight streams on the ASNFs for potential Gila trout introduction. These include one stream within the Eagle Creek drainage (Chitty Creek), and seven streams within the Blue River drainage (Castle/Buckalou Creek, Coleman Creek, Grant Creek, KP Creek, Lanphier Creek, McKittrick Creek, and Raspberry Creek). Raspberry Creek is the only stream that could potentially have Gila trout present, as they were introduced into this stream in 2000. The 8 populations being considered here cover approximately 53,113 acres and 33 miles of streams. The AZGFD surveyed a portion (one mile) of Raspberry Creek in 2011 (AZGFD 2011). No fish were observed or captured in the electrofishing efforts. The current status is unknown, but if Gila trout have persisted, it is likely their numbers are very low. This post Wallow Fire monitoring effort also surveyed portions of Castle, Buckalou, Coleman, Grant, and KP creeks; and the Wallow Fire has likely impacted some reaches of all of these streams.

Species and Habitat Effects

For Gila trout no critical habitat has been designated. The current recovery plan identifies potential restoration streams for the management and recovery of Gila trout on the ASNFs. These are the eight watersheds discussed above and included below for analysis purposes and presentation of GIS data for existing conditions; along with data relative to decisions associated with the LMP, and potential impacts from implementation of the LMP from the various program areas. For discussion and analysis purposes,

the eight streams are referred to as populations; although they are not currently occupied by Gila trout, or have conditions that meet recovery criteria. These populations (also referred to as watersheds and/or drainage areas) were considered as the contiguous streams and uplands that drain into the recovery stream. These populations are referred to by the name of the lowermost (highest stream order) stream within the drainage area, and these drainage areas may not always be consistent with the corresponding 6th Hydrologic Unit Code boundaries.

Wildland Fire Management

Both fire and mechanical treatments would be used to move vegetation toward desired conditions. These treatments are used to change the character of the vegetation that would result in lower risk of uncharacteristic fire and a return of wildfire to a more natural role. The desired condition is to move toward or maintain vegetation conditions in Fire Regime Condition Class (FRCC) 1. FRCC is a metric that quantifies how departed a system is from historical conditions in relation to fire, the role fire historically played in the that system, and the vegetative structure. Under the LMP, annually approximately 48,500 acres would be treated across all of the PNVTs; and approximately 60% (28900 acres) would be treated by fire, and approximately 40% (19600 acres) would be treated mechanically. The current conditions for FRCC on the ASNFs are 14% FRCC 1, 14% FRCC 2, and 72% FRCC 3. Under the LMP, the FRCC conditions across the ASNFs will improve after 15 years to 24% FRCC 1, 41% FRCC 2, and 35% to FRCC 3.

Table 43 displays the percent for the three FRCCs by watersheds. Five of the eight Gila trout potential restoration streams have portions of their watersheds in FRCC 1, and most fall within FRCC 2 and FRCC 3. FRCC is a measure of the difference in structure between current and reference conditions. Low (FRCC 1) is considered to be within the natural (historical) range of variability, while moderate (FRCC 2) and high (FRCC 3) departures are outside historical range. Vegetation in FRCC 1 is more resilient and resistant and less likely to lose key ecosystem components (e.g., native species, large trees, soil) after a disturbance; and fire behavior and other associated disturbances are similar to those that occurred prior to the exclusion of fire. It is expected that through implementation of the LMP the acres of FRCC 1 and FRCC 2 will increase, and the acres of FRCC 3 will decrease within Gila trout watersheds.

Table 43. Fire Regime Condition Class (FRCC) for Gila Trout watersheds

Watershed	FRCC 1 (% area)	FRCC 1 (acres)	FRCC 2 (% area)	FRCC 2 (acres)	FRCC 3 (% area)	FRCC 3 (acres)
Castle Creek	0	0	29.9	1,243	76	3,926
Chitty Creek	29.7	601	18.7	367	51.1	1,053
Coleman Creek	0	0	41.5	3,413	58.6	4,821
Grant Creek	0	0	70.6	5,668	29.4	2,362
KP Creek	10.9	1,217	42.2	4,729	47	5,264
Lanphier Creek	1.5	105	4.3	296	94.1	6431
McKittrick Creek	15.2	841	1.5	83	83.3	4,620
Raspberry Creek	43.2	2,623	1.2	75	55.6	3,374

As stated above, fire has been identified as a threat to Gila trout. Over the last 75+ years, alterations to vegetation (e.g., livestock grazing and timber harvest activities), along with the suppression of wildfire has resulted in the disruption of the ecological role of fire in maintaining ecosystems. This has resulted in uncharacteristic impacts from wildfire on watersheds and aquatic habitat and species. Table 44 displays the burn severity impacts associated with the Wallow Fire that occurred in 2011. Lanphier Creek was the only stream that was not impacted on the ASNFs. Most of the Gila trout watersheds had negative impacts to their watersheds, riparian areas, and aquatic habitats. The extent and rates of recovery for these watersheds will depend on many factors; these include future environmental factors and conditions (e.g.,

ongoing drought, monsoonal activity and intensity, wildfire), and the ongoing and future actions associated with management activities. While recovery from the Wallow Fire cannot be determined, it is likely that risk associated with altered hydrologic and aquatic habitat conditions will remain for a considerable amount of time; along with the continued risk associated with wildfire on areas not impacted by the Wallow Fire.

Table 44. Wallow Fire Burn Severity and Total Percent within Gila Trout watersheds

	Burn Severity (%)			
Watershed	**High**	**Moderate**	**Low**	**Total**
Castle Creek	9.9	11.4	73.7	95
Chitty Creek	7.4	17.8	39.6	64.7
Coleman Creek	40.9	15.1	40.6	96.6
Grant Creek	3.4	11.3	26.7	41.3
KP Creek	6.9	29.9	50.8	87.6
Lanphier Creek	0	0	0	0
McKittrick Creek	2.2	19.8	54.8	76.8
Raspberry Creek	3.4	19.9	47	70.3

The ecological role that wildfire has played in maintaining ecosystem structure, function, and process has been altered over time. Past fire suppression and management activities on the ASNFs have resulted in landscape scale conditions that can result in uncharacteristic and sometimes severe impacts from wildfire. Table 45 displays the amount of impacts (acres and percent) to Gila trout watersheds that have occurred over the last 10 and 25 years. As can be seen from Table 45, almost all of the wildfire within Gila trout watersheds has occurred within the last ten years. This more recent (last ten years) higher level of wildfire activity has resulted from altered vegetation conditions, long-term drought, and the increased use of wildfire being managed for resource benefits. This increased level of wildfire activity is likely to continue until improvements occur in vegetative structure and function, and drought conditions improve.

Table 45. Fire acres (≥100) within Gila Trout watersheds (last 10 years and last 25 years)

	10 Years				25 Years			
Watershed	**Acres Burned**	**Percent Burned**	**Acres Unburned**	**Percent Unburned**	**Acres Burned**	**Percent Burned**	**Acres Unburned**	**Percent Unburned**
Castle Creek	5,187	100.4	0	0	5,218	101	0	0
Chitty Creek	3,977	196.7	0	0	3,977	196.7	0	0
Coleman Creek	8,235	100	0	0	8,235	100	0	0
Grant Creek	13,843	172.4	20	0.3	14,228	177.2	20	0.3
KP Creek	20,398	182	0	0	20,544	183.3	0	0
Lanphier Creek	1,728	25.3	5,106	74.7	1,792	26.2	5,101	74.7
McKittrick Creek	9,042	163.1	470	8.5	9,042	163.1	470	8.5
Raspberry Creek	9,126	150.3	0	0.1	9,126	150.3	0	0.1

The Wildland Fire program will be highly integrated with the vegetation (PNVT) treatments, resulting in improvements in both FRCC and PNVTs across the ASNFs. Three desired conditions (41, 42, and 296) located under the "all PNVTs" section of the LMP relate to the Fire program. Desired condition 41 states, "Natural processes and human and natural disturbances (e.g., planned and unplanned fire ignitions, mechanical vegetation treatments) provide desired overall tree density, structure, species composition, coarse woody debris, and nutrient cycling. Natural fire regimes are restored. Uncharacteristic fire behavior is minimal or absent on the landscape." Desired condition 42 states, "Fire (prescribed fire and use of wildland fire) maintains and enhances resources and, as nearly as possible, is allowed to function in its natural ecological role." Desired condition 296 states, "Wildland fires burn within the range of frequency and intensity of natural fire regimes. Uncharacteristic high-severity fires rarely occur and do not burn at the landscape scale." Collectively these desired conditions could potentially result in long

term improvements for the Gila trout (e.g., watershed and hydrologic conditions, water quality, riparian and aquatic habitat conditions). Improvements in FRCC conditions within Gila trout watersheds can reduce threats associated with wildfire and post-fire flooding and ash flows. Uncharacteristic wildfire can result in the long-term loss and alteration of riparian and aquatic habitat, along with alterations in watershed and hydrologic conditions that will not provide for the recovery of Gila trout.

The greatest improvements in FRCC conditions will occur within the Dry Mixed Conifer Forest, Madrean Pine-Oak Woodland, and the Great Basin Grassland PNVT types (see Table 46 below). For the Chitty Creek watershed the Dry Mixed Conifer Forest comprises approximately 52% of the total area, and for Lanphier Creek drainage area the (Dry Mixed Conifer Forest and Madrean Pine-Oak Woodland) comprise approximately 58%, and for McKittrick Creek the Dry Mixed Conifer Forest and Madrean Pine-Oak Woodland are 81%. Therefore, the greatest potential improvements in FRCC and PNVT conditions are most likely to occur within these three Gila trout watersheds. Additionally, some improvements could potentially occur throughout the other Gila trout watersheds and across all the PNVT types; although these will likely only occur to the extent that restoration activities under the proposed action are specifically directed on these areas.

While the management of prescribed fire has the potential to have long term beneficial impacts through restoration of vegetation conditions and natural fire regimes, short term impacts associated with project implementation could result. Activities associated with fire can impact Gila trout by altering water quality and increasing sedimentation into streams, resulting in altered habitat conditions and reduced food resources and abundance. Guideline (23) under the all PNVTs section of the LMP states, "Landscape scale restoration projects should be designed to spread out treatments spatially and/or temporally to reduce implementation impacts and allow reestablishment of vegetation and soil cover."; and this guideline should help reduce and minimize any potential negative impacts from implementation of prescribed fire activities.

Wildland fire has been identified as a threat to the Gila trout, and has had impacts to all eight watersheds on the ASNFs, especially over the last ten years and from the recently occurring Wallow Fire. Potential long term improvements in Gila trout habitat that may result by moving towards desired conditions, especially improvements in FRCC and PNVTs, will likely contribute to recovery and restoration of the watersheds and aquatic habitats of the Gila trout on the ASNFs; while reducing potential impacts from uncharacteristic fire and the associated increases in ash and sedimentation. Short term project implementation impacts are likely to occur associated with implementation of the fire program; however, their duration and extent can be minimized through guidelines and project specific mitigation measures. Although the mitigation of impacts is likely to occur, based on past actions and the limitation of potential mitigation measures, impacts to Gila trout are not at a level where they can be considered insignificant or discountable. Therefore, this program area may affect and is likely to adversely affect Gila trout.

Ecosystem/Vegetation Health and Forest Products

The LMP has recognized the need to address the maintenance and improvement of ecosystem health. Thirteen of the 14 PNVTs on the ASNFs vary (sometimes substantially) in structure, composition, function, and natural disturbance processes from desired conditions. All 14 PNVTs are key components in sustaining terrestrial and aquatic ecosystems and providing for recovery of Gila trout. The desired conditions for the PNVTs will result in resilient, functioning ecosystems; and in conjunction with the objectives, will guide future vegetation management activities, including burning and mechanical treatments, to maintain or move towards desired conditions. Table 46 displays the acres and percentage of each PNVTs for each of the eight Gila trout watersheds on the ASNFs. These data show how the PNVTs can vary considerably between the Gila trout watersheds, and show the complexity of the

watersheds and the potential difficulties in maintaining, improving and restoring these areas for Gila trout recovery.

Table 46. PNVTs for Gila Trout watersheds

	Cottonwood-Willow Riparian Forest	Dry Mixed Conifer Forest	Interior Chaparral	Madrean Pine-Oak Woodlands	Mixed Broadleaf Deciduous Riparian Forest	Montane Willow Riparian Forest	Montane/Subalpine Grasslands	Piñon-Juniper Woodland	Ponderosa Pine Forest	Semi-desert Grassland	Great Basin Grassland	Spruce-Fir Forest	Wet Mixed Conifer Forest	Wetland/Cienega Riparian Areas	Water
Castle Creek: Total = 5169 acres															
Acres	43	732	--	398	--	--	--	--	2,796	--	--	279	1,112	88	--
Percent	0.8	14.2	--	7.7	--	--	--	--	54.1	--	--	2	21.5	1.7	--
Chitty Creek: Total = 2022 acres															
Acres	--	1,053	595	--	6	--	--	--	--	--	--	--	367	--	--
Percent	-	52.1	29.4	--	0.3	--	--	--	--	--	--	--	18.2	--	--
Coleman Creek: Total = 8235 acres															
Acres	--	2,281	--	--	--	29	--	--	2,511	--	--	--	3,290	123	--
Percent	--	27.7	--	--	--	0.4	--	--	30.5	--	--	--	40	1.5	--
Grant Creek: Total = 8030 acres															
Acres	--	1,194	--	1,168	--	--	--	--	3,327	--	--	1,254	4,359	55	--
Percent	--	14.9	--	14.5	--	--	--	--	42.8	--	--	15.6	54.3	0.7	--
KP Creek: Total = 11210 acres															
Acres	--	1,288	1,144	3,896	74	--	--	--	--	79	--	2,551	2,150	38	--
Percent	--	11.5	10.2	34.8	0.7	--	--	--	--	0.7	--	22.7	19.2	0.3	--
Lanphier Creek: Total = 6832 acres															
Acres	228	2,866	3	1,109	--	--	--	102	2,456	--	--	--	69	--	--
Percent	3.3	42	0.04	16.2	--	--	--	1.5	35.9	--	--	--	1	--	--
McKittrick Creek: Total = 5544 acres															
Acres	--	335	801	4,149	40	--	--	--	--	136	--	9	74	--	--
Percent	--	6.0	14.4	74.8	0.7	--	---	--	--	2.5	--	0.2	1.3	--	--
Raspberry Creek: Total = 6072 acres															
Acres	--	1,228	2,554	1,450	69	--	--	--	675	--	21	70	5	--	--
Percent	--	20.2	42.1	23.9	1.1	--	--	--	11.1	--	0.3	1.2	0.08	--	--

There are ten desired conditions and three objectives associated with this program area relevant to Gila trout within the ecosystem health, PNVTs, and forest products sections of the LMP (see appendix A).

- OBJ 11 [forest PNVTs] Annually, treat 5,000 to 35,000 acres to reduce tree densities, restore natural fire regimes, promote species habitat and ecosystem health, reduce fire hazard, maintain desired

conditions, initiate recovery from uncharacteristic disturbance, and provide forest products, leaving a desired mix of species with the range of desired densities that are resilient to changing climatic conditions.

- OBJ 13 [woodland PNVTs] Annually, treat or maintain 5,000 to 15,000 acres to promote a highly diverse structure.
- OBJ 14 [grassland PNVTs] Decrease or maintain the woody canopy cover at less than 10 percent by treating up to 25,000 acres annually.

The vegetation (PNVTs) treatments will be integrated with both the Fire and Forest Products programs, resulting in improvements in both PNVTs departure and FRCC conditions across the ASNFs. The desired conditions (1, 2, 3, 39, 40, 46, 48 and 61) located under the "overall ecosystem health" and "all PNVTs" sections of the LMP relate to this program and the watershed and landscape scale conditions for the Gila trout. The three objectives (11, 13, and 14) provide for a maximum total treatment level of 75,000 acres per year, which will improve the overall departure condition for the eight modeled PNVTs from their current rating of 64% (high departure) to 44% (moderate departure) over the planning period. Collectively these desired conditions could potentially result in long term improvements for the Gila trout (e.g., watershed and hydrologic conditions, water quality, riparian and aquatic habitat conditions, risk of uncharacteristic fire) and their aquatic habitats within all eight populations on the ASNFs. The extent to which treatments will benefit Gila trout will depend on the extent and emphasis that is place on project activities within the species watersheds and habitats. The LMP does not direct how much of each objective treatment will be within each of the forested PNVTs or riparian PNVTs (i.e., the LMP does not direct any or how much of the objective treatments will occur in any species habitat).

The greatest improvements in PNVT departure will occur within the Dry Mixed Conifer Forest, Madrean Pine-Oak Woodland, and the Great Basin Grassland PNVT types. For all of the Gila trout drainage areas these three PNVTs occur in relatively high concentrations within the Chitty, Lanphier, McKittrick, and Raspberry creek watersheds. Therefore, potential improvements in PNVT conditions are most likely to occur within these four watersheds, and to a lesser extent within the Castle, Coleman, Grant, and KP creek watersheds. Restoring and maintaining PNVTs would likely improve the potential to retain or return the necessary ecological processes and patterns necessary to make these ecosystems sustainable, resilient, and healthy. Impacts to the uplands, streams, and riparian areas; along with potential and recent impacts associated with fire; are threats to the Gila trout and their persistence on the ASNFs. The landscape and watershed scale restoration actions have the potential to reduce the current large scale threats; especially those associated with uncharacteristic fire, and improve both the upland and riparian conditions for the Gila trout and their aquatic habitat.

While the management of vegetation and PNVTs has the potential to have long term beneficial impacts through restoration of vegetation conditions and natural fire regimes; short term impacts associated with project implementation could result, especially those associated with the Forest Products program. There are three objectives that provide for the use of forest products on an annual basis; 122,000 CCF from suitable timberlands for wood products, 94,000 CCF for firewood, and 5,000 permits for Christmas trees. Suitable timberlands are lands to be managed for timber production on a regulated basis. Suitable timber lands are likely to have greater impacts compared to other lands due to the greater emphasis on mechanical vegetation treatments and the associated infrastructure (e.g., roads, landings) and continued scheduled entries over time. "Nonsuitable" and "fire only" timber lands may have vegetation treatments and provide forest products; but they will likely only receive one entry during the planning period, and the amount of access and roads needed are substantially less than "suitable" timber lands.

The Chitty Creek, Grant Creek, KP Creek, Lanphier Creek, McKittrick, and Raspberry Creek watersheds have very few acres of suitable timber lands; while the Castle Creek and Coleman Creek have considerable suitable timber lands, 67% and 63% respectively (Table 47). Therefore, any potential

impacts resulting from the management of suitable timber lands will likely occur within the Castle Creek and Coleman Creek watersheds of Gila trout. Activities associated with suitable/unsuitable timberland treatments can impact Gila trout by altering watershed, hydrologic, riparian, and aquatic habitat conditions; degrading water quality and increasing sedimentation into streams, and reducing food resources and abundance necessary for the Gila trout. There are two specific guidelines that address these potential impacts. One guideline (GL 23) under the all PNVTs section of the LMP states, "Landscape scale restoration projects should be designed to spread out treatments spatially and/or temporally to reduce implementation impacts and allow reestablishment of vegetation and soil cover." Another guideline (GL 130) in the Forest Products section states, "Permits issued for forest products should include stipulations to protect resources."

Table 47. Treatment Type [suitable timber, nonsuitable timber, and fire only lands] acres by Gila Trout watershed

Watershed	Suitable Timber	Nonsuitable Timber	Fire Only
Castle Creek	3480 acres (67.3%)	1170 acres (22.6%)	519 acres (10.1%)
Chitty Creek	87 acres (4.3%)	1340 acres (66.3%)	595 acres (29.4%)
Coleman Creek	5221 acres (63.4%)	2891 acres (35.1%)	123 acres (1.5%)
Grant Creek	29 acres (0.4%)	57 acres (0.7%)	7944 acres (98.9%)
KP Creek	1063 acres (9.5%)	124 acres (1.1%)	10023 acres (89.4%)
Lanphier Creek	0 acres (0%)	0 acres (0%)	6832 acres (100%)
McKittrick Creek	0 acres (0%)	0 acres (0%)	5544 acres (100%)
Raspberry Creek	2 acres (0.04%)	182 acres (3%)	5888 acres (97%)

Activities associated with suitable/unsuitable/fire only timberland treatments can impact Gila trout by altering watershed, hydrologic, riparian, and aquatic habitat conditions; degrading water quality and increasing sedimentation into streams, and reducing food resources and abundance necessary for the Gila trout. There are two specific guidelines that address these potential impacts. One guideline (23) under the all PNVTs section of the LMP states, "Landscape scale restoration projects should be designed to spread out treatments spatially and/or temporally to reduce implementation impacts and allow reestablishment of vegetation and soil cover." Another guideline (130) in the Forest Products section states, "Permits issued for forest products should include stipulations to protect resources."

Conditions in the uplands, riparian, and streams, along with fire; has been identified as a threat to the Gila trout, and are currently impacting all eight watersheds on the ASNFs. Potential long term improvements in Gila trout habitat that may result by moving towards desired conditions, especially improvements in PNVTs and risk associated with fire; will likely contribute to recovery and restoration of the watersheds and aquatic habitats of the Gila trout on the ASNFs, while reducing potential impacts from uncharacteristic fire and the associated increases in ash and sedimentation. Short term project implementation impacts are likely to occur associated with implementation of the vegetation treatment and forest products programs; however, their duration and extent can be minimized through guidelines and project specific mitigation measures. Given the extent of these treatments, it is not reasonable to conclude that impacts associated with implementation of the LMP can be considered insignificant or discountable. Therefore, this program area may affect and is likely to adversely affect Gila trout.

Rangeland Management Program

Program activities include administering livestock grazing consistent with NEPA decisions, ESA consultation requirements, and guidance in the LMP. Additional Program activities include implementation and effectiveness monitoring of individual allotments, development of structural and non-structural improvements to facilitate better livestock management and to improve wildlife habitat and watershed conditions, control of invasive weeds, and the authorization of grazing consistent with the LMP

through site specific allotment NEPA. The LMP determined that most of the ASNFs lands are suitable for livestock grazing. Suitability is the appropriateness of applying certain resource management practices to a particular area of land; in consideration of relevant social, economic, and ecological factors. Table 48 displays the livestock grazing suitability acres for each of the Gila trout watersheds.

Table 48. Livestock grazing suitability in Gila Trout watersheds

Watershed	Suitable (percent)	Suitable (acres)	Unsuitable (percent)	Unsuitable (acres)
Castle Creek	99.9	5,163	0.1	6
Chitty Creek	100	2,022	0	0
Coleman Creek	100	8,234	0	0
Grant Creek	100	8,030	0	0
KP Creek	100	11,210	0	0
Lanphier Creek	100	6,832	0	0
McKittrick Creek	100	5,544	0	0
Raspberry Creek	100	6,072	0	0

All of the Gila trout watersheds have substantial portions of their watersheds that have been determined to be suitable for livestock grazing. While a determination of suitability does not necessarily result in livestock grazing on that area, current management provides for livestock grazing across most of the ASNFs. Livestock grazing can impact watersheds and hydrologic conditions by altering vegetation and ground cover, soil compaction, and water quality. Current range condition on the ASNFs is reflective of past and ongoing grazing activities, and landscape scale conditions have not changed significantly since the 1980s. Table 49 below displays the current range conditions for each of the Gila trout watersheds; with most of the watersheds containing areas in fair, poor, very poor, and no capacity conditions.

Table 49. Range Condition in Gila Trout watersheds (acres)

Range Condition	Acres	Percent
Castle Creek		
Excellent	--	--
Good	--	--
Fair	1,572	30.4
Poor	2,033	39.3
Very Poor	--	--
No capacity	1,564	30.3
Chitty Creek		
Excellent	--	--
Good	--	--
Fair	93	4.6
Poor	484	23.9
Very Poor	--	--
No capacity	1445	71.5
Coleman Creek		
Excellent	--	--
Good	--	--
Fair	882	10.7
Poor	2,813	35.2
Very Poor	67	0.8
No capacity	4,322	52.5
Grant Creek		
Excellent	--	--
Good	--	--
Fair	47	0.6

Poor	1,714	21.3
Very Poor	240	3
No capacity	6,029	75.1
KP Creek		
Excellent	--	--
Good	--	--
Fair	48	0.4
Poor	1,248	11.1
Very Poor	142	1.3
No capacity	9,772	87.2
Lanphier Creek		
Excellent	--	--
Good	--	--
Fair	3,254	47.6
Poor	1,244	18.2
Very Poor		
No capacity	2,320	34
McKittrick Creek		
Excellent	--	--
Good	--	--
Fair	46	0.8
Poor	458	8.3
Very Poor	49	0.9
No capacity	4,992	90
Raspberry Creek		
Excellent	--	--
Good	--	--
Fair	1,238	20.4
Poor	251	4.1
Very Poor	--	--
No capacity	4,583	75.5

Given the long history of domestic livestock grazing activities on the ASNFs, considerable amounts of infrastructure have been developed through site specific management. The most common types of range developments associated with livestock grazing activities include fencing, water developments, and corrals. These range developments can impact watersheds, riparian areas, and aquatic habitats. Fencing can result in the concentration of grazing animals, impacting vegetation, soils, and aquatic habitat where this occurs. Pit tanks occur on drainages and can alter hydrologic conditions, and can act as vectors (along with livestock) for the movement and introduction of invasive or undesirable species. Corrals are often located adjacent to streams and springs, and impacts to water quality and vegetation can result from the concentrated use in these areas. Table 50 displays the primary range developments within the Gila trout watersheds; and while these developments can help to disperse impacts across livestock grazing allotments, higher levels of these developments are likely to result in greater risks to Gila trout from livestock grazing actions.

Table 50. Constructed Features in Gila Trout watersheds

Watershed	Feature	Number within Watershed
Castle Creek	Corral (points)	2
	Pit Tank (points)	3
	Constructed Fence (miles)	15.7
Chitty Creek	Corral (points)	--

	Pit Tank (points)	--
	Constructed Fence (miles)	4.9
Coleman Creek	Corral (points)	2
	Pit Tank (points)	12
	Constructed Fence (miles)	20.1
Grant Creek	Corral (points)	2
	Pit Tank (points)	--
	Constructed Fence (miles)	4.9
KP Creek	Corral (points)	2
	Pit Tank (points)	3
	Constructed Fence (miles)	8.7
Lanphier Creek	Corral (points)	2
	Pit Tank (points)	--
	Constructed Fence (miles)	3.1
McKittrick Creek	Corral (points)	3
	Pit Tank (points)	--
	Constructed Fence (miles)	6.3
Raspberry Creek	Corral (points)	1
	Pit Tank (points)	--
	Constructed Fence (miles)	11.6

While there are no relevant desired conditions associated with the livestock grazing and invasive species programs, there are two objectives associated with the invasive species program that are relevant to the Gila trout. These two objectives (16 and 17) propose to annually "contain, control, or eradicate invasive species (e.g., musk thistle, Dalmatian toadflax) on 500 to 3,500 acres", and "control or eradicate invasive species (e.g., tamarisk, bullfrogs) on at least 2 stream miles." Invasive and nonnative species have been identified as threats to all of the Gila trout populations on the ASNFs; and these two objectives could potentially improve both the riparian and aquatic habitat for the Gila trout by restoring vegetation and aquatic species composition to historical conditions, or to levels that are low enough to allow for the persistence of Gila trout.

While the invasive species program has the potential to have some long term benefits to Gila trout and their habitat, the possibility exists for impacts to Gila trout through implementation of this program and the livestock grazing program. One standard and seven guidelines have been included in the LMP that may address potential impacts to Gila trout.

- ST 4 Vegetation treatments shall include measures to reduce the potential for introduction of invasive plants and animals and damage from nonnative insects and diseases.

- GL 32 Active grazing allotments should be managed to maintain or improve to desired riparian conditions.
- GL 78 Projects and activities should not transfer water between drainages or between unconnected water bodies within the same drainage to avoid spreading disease and aquatic invasive species.
- GL 79 Project areas should be monitored to ensure there is no introduction or spread of invasive species.
- GL 81 Pesticide use should minimize impacts on nontarget plants and animals.

- GL 134 New livestock troughs, tanks, and holding facilities should be located out of riparian areas to limit concentration of livestock in these areas. Existing facilities in riparian areas should be modified, relocated, or removed where their presence is determined to inhibit movement toward desired riparian or aquatic conditions.
- GL 138 To minimize potential resource impacts from livestock, salt or nutritional supplements should not be placed within a quarter of a mile of any riparian area or water source. Salt or nutritional supplements should also be located to minimize herbivory impacts to aspen clones.
- GL 139 To prevent resource damage (e.g., streambanks) and disturbance to federally listed and sensitive wildlife species, trailing of livestock should not occur along riparian areas. Where no alternative route is available, approval may be granted where effective mitigation measures are implemented (e.g., timing of trailing, number of livestock trailed at one time).

While the invasive species program has the potential to have long term benefits and impacts through restoration of vegetation conditions, riparian areas, and aquatic habitats. Allotment infrastructure (e.g., fences and tanks) and maintenance activities associated with the livestock grazing program can impact Gila trout by degrading upland and watershed conditions and function, altering riparian vegetation and function, and reducing water quality and increasing sedimentation into streams. Increases in the amounts of infrastructure can increase these impacts, as well as increase the potential to transfer and introduce invasive species. The standards and guidelines (e.g., grazing allotments should be managed to maintain or improve desired riparian conditions) listed above may reduce potential impacts; but given that the majority of the all of the watershed areas are suitable for livestock grazing, have range conditions that are mostly fair and poor, and have considerable amounts of infrastructure (e.g., fences and tanks); it is reasonable to conclude that implementation of the LMP will result in impacts to the Gila trout and their habitat. Given past actions, and the inherent limitations relative to minimizing impacts from livestock grazing activities, it cannot be concluded that impacts associated with this program are either insignificant or discountable. Therefore, this program area may affect and is likely to adversely affect Gila trout.

Watershed and Soil Program

The Watershed Program seeks to maintain or improve watershed conditions and maintain good water quality and quantity. It is cross-program in orientation in that it seeks to mitigate impacts from other program activities as well. The guidance for the Watershed Program can be used to fill in the gaps for other programs with inadequate guidance. Abundant guidance is provided in the LMP to assist the LMP in minimizing or reducing potential impacts to Gila trout. There are a total of 15 desired conditions (see appendix A) and six objectives associated with this program area.

- OBJ 1 During the planning period, improve the condition class on at least 10 priority 6th level HUC watersheds by removing or mitigating degrading factors.
- OBJ 2 Annually, enhance or restore an average of 350 acres within priority 6th level HUC watersheds, including treating the causes of State designated impaired or threatened waters (Arizona Department of Environmental Quality, 2012) to improve watershed condition and water quality.
- OBJ 6 Annually, restore 200 to 500 acres toward desired composition, structure, and function of streams, floodplains, and riparian vegetation.
- OBJ 9 Within the planning period, enhance or restore 5 to 25 wet meadows or cienegas to proper hydrologic function and native plant and animal species composition.
- OBJ 10 Annually, work with partners to reduce animal damage to native willows and other riparian species on an average of 5 miles of riparian habitat.
- OBJ 38 Annually, prepare at least one instream flow water rights application until water acquisition needs are complete to sustain riparian areas, fish, wildlife, and water-based recreation.

The watershed and riparian desired conditions, objectives, and treatments will likely be integrated with the Fire, Ecosystem Health, and Wildlife Fish and Rare Plant programs; potentially resulting in improvements in watershed condition and function, and riparian conditions across the ASNFs. The desired conditions (9, 12, 15, 21, 22, 67-72, 74, 77, 80, and 84) located under the "watershed" and "riparian areas" sections of the LMP relate to this program and the watershed and landscape scale conditions for the Gila trout. The six objectives (1, 2, 6, 9, 10 and 38) provide for a treatment level of approximately 1,000 - 10,000 acres per year, which will improve the overall conditions for the six code watersheds and riparian areas receiving treatments. Collectively these desired conditions and objectives could potentially result in long term improvements for the Gila trout (e.g., watershed and hydrologic conditions, water quality, riparian and aquatic habitat conditions, soils) and their aquatic habitat within all of the watersheds on the ASNFs.

Restoring and maintaining watersheds and riparian areas would likely improve the potential to retain or return the necessary ecological processes and functions necessary to make these ecosystems sustainable, resilient, and healthy. Impacts to the uplands, streams, and riparian areas; along with potential and recent impacts associated with fire are threats to the Gila trout and their persistence on the ASNFs. The landscape and watershed scale restoration actions have the potential to reduce the current threats; especially those associated with watershed and hydrologic conditions, and improve both the upland (soils) and riparian conditions for the Gila trout and their potential restoration streams on the ASNFs.

While the management of watersheds and riparian areas has the potential to have long term beneficial impacts through restoration of hydrologic conditions and functions; short term impacts associated with project implementation could result, especially those associated with the use of mechanized equipment. There are six specific guidelines that address these potential impacts.

- GL 2 Projects with ground-disturbing activities should be designed to minimize long and short term impacts to soil resources. Where disturbance cannot be avoided, project specific soil and water conservation practices should be developed.
- GL 6 Projects with ground-disturbing activities should be designed to minimize long and short term impacts to water resources. Where disturbance cannot be avoided, project specific soil and water conservation practices and BMPs should be developed.
- GL 30 Ground-disturbing projects (including prescribed fire) which may degrade long term riparian conditions should be avoided.
- GL 33 Storage of fuels and other toxicants should be located outside of riparian areas to prevent spills that could impair water quality or harm aquatic species.
- GL 34 Equipment should be fueled or serviced outside of riparian areas to prevent spills that could impair water quality or harm aquatic species.
- GL 35 Construction or maintenance equipment service areas should be located and treated to prevent gas, oil, or other contaminants from washing or leaching into streams.

Conditions in the uplands, riparian areas, and streams; have been identified as threats to the Gila trout, and have impacted all eight watersheds on the ASNFs. Potential long term improvements in Gila trout habitat that may result by moving towards desired conditions, especially improvements in watersheds and risk associated with degraded riparian areas; and will likely contribute to recovery and restoration of the watersheds and potential restoration streams for the Gila trout on the ASNFs, while reducing potential impacts from uncharacteristic watershed and hydrologic conditions. Short term project implementation impacts are likely to occur associated with project implementation; however, their duration and extent can be minimized through guidelines and project specific mitigation measures and best management practices. Potential short term impacts primarily include increases in sedimentation, soil compaction, alterations in hydrologic conditions and functions, and changes in water quality. Mitigation measures are

implemented at the project level, and site specific conditions and project activities and timing will determine their efficacy. Although most projects could be mitigated, it is likely over the planning period that some projects will result in impacts that could not be considered at the level of insignificant or discountable. Therefore, this program area may affect and is likely to adversely affect Gila trout.

Engineering Program

The current motorized transportation system is comprised of 765 miles of roads open only to highway legal vehicles (maintenance level 3 through 5), 2,067 miles of roads open to all motorized vehicles (maintenance level 2), 3,372 miles of roads closed to all motorized vehicles (maintenance level 1), and 156 miles of trails open to motorized vehicles less than 50 inches wide. The miles of open motorized transportation system includes roads with access restricted on a seasonal basis for public safety and to minimize resource damage. The LMP includes plan objectives to annually maintain 20% of passenger vehicle roads, 10% of high clearance roads, and 20% of both motorized and nonmotorized trails. Road crossing information for the Gila trout watersheds are presented below in Table 51. Although the various types of crossings (e.g., culverts, bridges) cannot be determined at the watershed scale, most of the crossings across the ASNFs are culverts. Route miles and densities were also calculated for the eight Gila trout watersheds (see Table 52). This information is separated by closed, open, and non-motorized routes; and represents the most recent data from the Forest Transportation Atlas, which does not include unauthorized routes.

Table 51. Route (motorized and nonmotorized) Crossings in Gila Trout watersheds

Watershed	Number Crossings
Castle Creek	22
Chitty Creek	16
Coleman Creek	43
Grant Creek	80
KP Creek	56
Lanphier Creek	33
McKittrick Creek	6
Raspberry Creek	42

Table 52. Route miles and densities for closed (decommissioned and ML1) and open (ML2-5 and motorized trails) and nonmotorized in Gila Trout watersheds

Watershed	Route Type	Route Miles	Density (miles / square mile)
Castle Creek	Closed	9	1.1
Castle Creek	Open	9.5	1.2
Castle Creek	Non-motorized	0.6	0.07
Castle Creek	**Total**	**19.1**	**2.4**
Chitty Creek	Closed	0.7	0.2
Chitty Creek	Open	0.4	0.13
Chitty Creek	Non-motorized	2.1	0.68
Chitty Creek	**Total**	**3.3**	**1**
Coleman Creek	Closed	42.7	3.3
Coleman Creek	Open	21.7	1.7
Coleman Creek	Non-motorized	0	0
Coleman Creek	**Total**	**64.3**	**5**

Grant Creek	Closed	0.1	0.01
Grant Creek	Open	0	0
Grant Creek	Non-motorized	20.2	1.6
Grant Creek	**Total**	**20.4**	**1.6**
KP Creek	Closed	4	0.22
KP Creek	Open	9.9	0.51
KP Creek	Non motorized	21	1.2
KP Creek	**Total**	**33.9**	**1.9**
Lanphier Creek	Closed	0	00
Lanphier Creek	Open	0	0
Lanphier Creek	Non-motorized	15.9	1.5
Lanphier Creek	**Total**	**15.9**	**1.5**
McKittrick Creek	Closed	0	0
McKittrick Creek	Open	0	0
McKittrick Creek	Non-motorized	2.2	0.26
McKittrick Creek	**Total**	**2.2**	**0.26**
Raspberry Creek	Closed	0	0
Raspberry Creek	Open	0.7	0.07
Raspberry Creek	Non-motorized	7.1	0.75
Raspberry Creek	**Total**	**7.8**	**0.8**

While there are no relevant desired conditions for the Engineering program, there are two objectives within the riparian section of the LMP that relate to roads.

- OBJ 7 Within the planning period, relocate, repair, improve, or decommission a minimum of 4 miles of National Forest System roads or trails that add sediment to streams, damage riparian vegetation, erode streambanks, cause gullies, and/or compact floodplain soils.
- OBJ 8 Annually, remove an average of 2 miles of unauthorized roads or trails that sediment to streams, damage riparian vegetation, erode streambanks, cause gullies, and/or impact floodplain soils.

These two objectives could potentially result in long term improvements for Gila trout and their aquatic habitat by reducing sedimentation associated with degraded and/or unauthorized roads and trails. Restoring and rehabilitating these sites could potentially improve water quality, habitat conditions, and the macroinvertebrate food base needed by the Gila trout. All eight Gila trout populations could potentially benefit from implementation of these objectives, as road and trail densities for some populations (i.e., Castle and Coleman creeks) are relatively high.

Roads and road construction and maintenance can result in the destruction and alteration of riparian and aquatic habitat, increases in sedimentation, and water quality degradation. Roads can also act as modes of transport for disease transmission and invasive species introduction from one site to another, especially where low water crossings exist. The Engineering program contains one standard and one guideline that may help minimize some threats to Gila trout habitat. The standard (18) states, "Road maintenance and construction activities shall be designed to reduce sediment (e.g., water bars, sediment traps, grade dips) while first providing for user safety." The guideline (103) states, "Roads and motorized trails removed from the transportation network should be treated in order to avoid future risk to hydrologic function and aquatic habitat." The water resources section of the LMP also has a guideline (8) that specifies that "streamside management zones should be in place between streams and disturbed areas and/or road locations to maintain water quality and suitable stream temperatures for aquatic species." These

standards and guidelines, combined with the objectives to reduce impacts from roads, could potentially improve habitat conditions for the Gila trout over the long term by primarily reducing sedimentation and improving water quality.

Roads associated with timber harvest activities have been identified as a threat to the Gila trout, and have had substantial impacts on two (Castle and Coleman creeks) of the eight watersheds on the ASNFs. Roads crossing and located adjacent to streams can remove and alter riparian vegetation, impact stream channel functions and processes, and alter and degrade aquatic habitat through changes in water quality and increases in sedimentation to the stream. Potential long term improvements in Gila trout habitat may result by reducing road densities and impacts within riparian areas; have the potential to contribute to recovery and restoration of the watersheds, riparian areas, and aquatic habitats of the Gila trout on the ASNFs. Short term project implementation impacts are likely to occur associated with implementation of the engineering/roads program; however, their duration and extent can be minimized through standards, guidelines, and project specific mitigation measures. Although there are standards and guidelines to potentially limit impacts from roads, motorized trails, and other projects; it is not likely that all the potential negative effects such as increased runoff and sedimentation could be eliminated to the extent they could be considered insignificant or discountable. Therefore, this program area may affect and is likely to adversely affect Gila trout.

Lands and Minerals Program

In 2011, there were 454 existing rights-of-way and special use permits for a variety of uses on the ASNFs. A majority of these are categorized as lands permits (381) versus recreation permits (73). It is likely that some of these special use permits and authorizations are located within the watersheds of the Gila trout on the ASNFs; although, how they potentially impact Gila trout and their habitat is not known. Across the entire ASNFs there are 16 lands special use permits for reservoirs/dams, 10 for irrigation ditches, 15 for water conveyance, and 36 for water transmission. Reservoirs do not present a threat to restoring Gila trout and its potential restoration habitat. One irrigation ditch is known to occur on the lower portion of Lanphier Creek, which could impact this potential restoration stream.

While special use permits have the potential to have some long term benefits to Gila trout and their habitat (e.g., artificial barriers), the possibility exists for impacts to Gila trout through implementation of the lands and special uses programs. Land exchanges can also be beneficial for aquatic habitat and fish species. One standard and one guideline have been included in the LMP to address potential impacts to Apache trout within the "water uses" and "minerals and geology" sections. The standard (ST 31) under the waters uses section states, "Special uses for water diversions shall maintain fish, wildlife, and aesthetic values and otherwise protect the environment." The guideline (GL 146) within the "water uses" section of the LMP states, "Streambed and floodplain alteration or removal of material should not occur if it prevents attainment of riparian, channel morphology, or streambank desired conditions." Although these two plan components may minimize and reduce potential impacts, the possibility exists for impacts to Gila trout through the implementation of the LMP for these programs. As it cannot be concluded that these impacts are reduced to the level where they can be considered insignificant or discountable; this program area may affect, and is likely to adversely affect Gila trout.

Recreation and Wilderness Programs

There are over 30 reservoirs and lakes and more than 1,000 miles of streams on the ASNFs, more than any other national forest in the Southwestern Region. Reservoirs and streams and adjacent riparian areas are highly desirable for many types of recreational activities. The user demands and concentrated use in these areas can result in impacts that can alter vegetation, riparian areas, water quality, and aquatic habitat.

There is only one desired condition (DC 219) within the LMP in the dispersed recreation section that states, "Water-based settings are available and the associated recreation opportunities (e.g., canoeing, fishing, waterfowl hunting) do not degrade aquatic resources." Recreation sites and developments along with their associated uses and activities can potentially impact Gila trout restoration streams. Table 53 displays the existing acres of recreational sites within Gila trout watersheds. While the desired condition (219) may help reduce some impacts associated with future sites, the potential to address impacts associated with developed sites will be limited. These sites and developments and their associated uses and activities do present threats to maintaining, restoring and recovering the Gila trout and its potential restoration streams. Recreational sites and activities can impact Gila trout by degrading upland and watershed conditions and function, altering riparian vegetation and function, and reducing water quality and increasing sedimentation into streams. Additionally, invasive and nonnative species have been identified as threats to the Gila trout; and the concentration of recreational activities within and adjacent to riparian areas and streams can increase the risk of introductions and spread of invasive or undesirable plants and animals, potentially impacting Gila trout restoration streams on the ASNFs.

Table 53. Recreation site polygons within Gila Trout watersheds

Watershed	Acres	Percent
Grant Creek	7	0.09
KP Creek	19	0.17

There is only one standard (ST 13) within the dispersed recreation section of the LMP that states, "Dispersed campsites shall not be designated in areas with sensitive soils or within 50 feet of streams, wetlands, or riparian areas to prevent vegetation and bank damage, soil compaction, additional sediment, or soil and water contamination" Although this plan component may minimize and reduce potential impacts, the possibility exists for effects to the Gila trout from the recreation program through the implementation of the LMP. Although activities are 50 feet away, over time impacts to the stream and riparian vegetation may result as use occurs; and risk associated with the potential to move or introduce nonnative species still exists. Therefore, this program area may affect and is likely to adversely affect Gila trout.

Wildlife, Fish, and Rare Plants Program

This program area involves a variety of activities conducted by the ASNFs and its partners, including inventory and monitoring, habitat assessments, habitat improvements through land treatments and structures, species reintroductions, development of conservation strategies, administrative studies, collaboration with research, and information and education. The guidance for the WFRP Program can be used to fill in the gaps for other programs with inadequate guidance. Guidance is provided in the LMP to assist the LMP in minimizing or reducing potential impacts to the Gila trout. There are a total of 15 desired conditions (see appendix A) and two objectives associated with this program area.

- OBJ 4 Annually, enhance or restore 5 to 15 miles of stream and riparian habitat to restore structure, composition, and function of physical habitat for native fisheries and riparian-dependent species.
- OBJ 5 During the planning period, complete at least five projects (e.g., remove barriers, restore dewatered stream segments, or connect fragmented habitat) to provide for aquatic and riparian associated species and migratory species.

The WFRP desired conditions, objectives, and treatments will likely be integrated with the Watershed and Soils and Ecosystem/Vegetation Health programs; potentially resulting in improvements in watershed condition and function, riparian conditions, and aquatic habitats across the ASNFs. The desired conditions above (4, 7, 20, 23, 24, 26, 27, and 30-37) located under the "aquatic habitat and species"

section of the LMP relate to the threats/risks and potential recovery and restoration needs for the Gila trout. The two objectives (4 and 5) provide for a treatment level of approximately 5–15 miles per year, which will improve the overall aquatic habitat conditions for the streams and riparian areas receiving treatments. Collectively these desired conditions and objectives could potentially result in long term improvements for the Gila trout (e.g., aquatic habitat conditions, water quality and stream temperature improvements, riparian and aquatic habitat structure and function) and their restoration streams on the ASNFs.

Restoring and maintaining aquatic habitats and riparian areas would likely improve the potential to retain or return the necessary ecological processes and functions necessary to make these ecosystems sustainable, resilient, and healthy. Impacts to the watershed, streams, and riparian areas, along with potential and recent impacts associated with fire are threats to the Gila trout and their recovery. The aquatic habitat and species restoration actions have the potential to reduce the current threats; especially those associated with uncharacteristic fire, competition and hybridization with nonnative species, and altered and degraded aquatic habitat condition, structure, and function.

While the management of watersheds and riparian areas has the potential to have long term beneficial impacts through restoration of hydrologic conditions and functions; short term impacts associated with project implementation could result, especially those associated with the use of mechanized treatments and the potential to transfer or inadvertently move invasive or nonnative species. There is one standard and eight specific guidelines that address these potential impacts.

- ST 2 When drafting (withdrawing) water from streams or other water bodies, measures will be taken to prevent entrapment of fish and aquatic organisms and the spread of parasites or disease (e.g., Asian tapeworm, chytrid fungus, whirling disease).

- GL 7 Streams, streambanks, shorelines, lakes, wetlands, and other bodies of water should be protected from detrimental changes in water temperature and sediment to protect aquatic species and riparian habitat.
- GL 8 Streamside management zones should be in place between streams and disturbed areas and/or road locations to maintain water quality and suitable stream temperatures for aquatic species.
- GL 13 To protect water quality and aquatic species, heavy equipment and vehicles driven into a water body to accomplish work should be completely clean of petroleum residue. Water levels should be below the gear boxes of the equipment in use. Lubricants and fuels should be sealed such that inundation by water should not result in leaks.
- GL 15 Activities occurring within federally listed species habitat should apply habitat management direction and species protection measures from recovery plans.
- GL 17 To prevent degradation of native species habitat and the incidental or accidental introduction of diseases or nonnative species, aquatic species should not be transferred through management activities from one 6th level HUC watershed to another.
- GL 18 Sufficient water should be left in streams to provide for aquatic species and riparian vegetation.
- GL 19 Projects and activities should avoid damming or impounding free-flowing waters to provide streamflows needed for aquatic and riparian-dependent species.
- GL 21 When new water diversions are created or existing water diversions are reanalyzed, measures should be taken to prevent entrapment of fish and aquatic organisms.

Altered aquatic habitat conditions have been identified as a threat to the Gila trout, and changes over the last century have impacted all of the potential restoration streams on the ASNFs. Potential long term improvements in Gila trout habitat that may result by moving towards desired conditions, especially

improvements in aquatic habitats, and risks associated with the unintentional transfer and movement of invasive and nonnative species; will likely contribute to recovery and restoration of the streams and recovery habitats of the Gila trout on the ASNFs. Short term impacts are likely to occur associated with project implementation; however, their duration and extent can be minimized through guidelines and project specific mitigation measures and best management practices. While standards, guidelines, and BMPs would help eliminate most impacts to Gila trout; it is still likely that some impacts associated with this program area may affect, and are likely to adversely affect Gila trout.

Cumulative Effects and Climate Change

The only private lands that occur within any of the eight populations are two parcels that occur on the lowermost portions of KP and Lanphier creeks. Specific activities associated with these private lands are not known; but have likely included livestock and agricultural uses, water developments and diversions, and road and infrastructure developments. Past and ongoing management actions by AZGFD within the watersheds, especially relative to nonnative aquatic species, have contributed to the current and continued threats to all of the eight Gila trout potential restoration streams.

Changes associated with climate variation and change to riparian areas and aquatic habitats present some of the most important challenges for management of the Gila trout on the ASNFs. Predictions include reduced precipitation and water in riparian areas, increased water losses from elevated evapotranspiration rates, altered high flow events with increased frequencies of high intensity convectional storms, increases in drought severity during summer low flows, and increasing temperatures in small streams and tributaries that further limit habitat during seasonal low flows. Key climate change factors potentially impacting riparian areas and aquatic habitat on the ASNFs include increases in frequency of extreme weather events and increases in wildfire risks. These key climate change factors are addressed directly or indirectly through the LMP (desired conditions, objectives, and management strategies); by enhancing adaption of ecosystems through anticipating and planning for disturbances from intense storms, reducing vulnerability by maintaining and restoring resilient ecosystems, and increasing water conservation and planning for reductions in upland water supplies. Increases in high intensity storms and flooding will continue to threaten Gila trout and its habitat; improvements in PNVTs, FRCCs, watersheds, and riparian and aquatic habitats could potentially reduce these impacts.

Gila Trout
Summary and Determination of Effects

Based on the information above, it has been determined that the LMP **may affect**, and is **likely to adversely affect** the Gila trout. While most desired conditions and objectives have the potential to result in beneficial effects, several activities under several programs could result in adverse effects to Gila trout. Most program areas contain guidance (e.g., standards and guidelines) that are designed to reduce and minimize the extent and duration of any potential short and long term negative effects; however, implementation of the LMP does not provide that the mitigation of effects can be equated to or considered at the level of insignificant and/or discountable.

Little Colorado Spinedace *Lepidomeda vittata*

Endangered Species Act Status:	Threatened, 1987
District Occurrence:	Alpine, Black Mesa, and Springerville
Recovery Plan:	1998
Critical Habitat:	Yes
Determination of Effect (Species):	May Affect, Likely to Adversely Affect

Determination of Effect (Critical Habitat): May Affect, Likely to Adversely Affect

Natural History, Distribution, and Status of the Species Range-wide

Information relative to the life history, distribution, and status of the species range-wide are located on the FWS website http://www.fws.gov/southwest/Little.htm. The literature cited within the recovery plan (FWS 1998) contains a thorough list of references for this species. This literature, along with the more recently completed five year review (FWS 2008) were considered and used in the preparation of this document; and are incorporated by reference into this document.

Status and Threats within the Action Area

Most of the existing and potential Little Colorado spinedace recovery streams or populations occur on or downstream of the ASNFs and within the Coconino National Forest. Existing populations on the ASNFs are within Nutrioso Creek and one of its tributaries, Rudd Creek. Two introductions have occurred on the ASNFs; in 2007 in West Chevelon Creek, and in 2013 in Willow Creek. Potential recovery streams on the ASNFs also include the upper portion of Chevelon Creek above Chevelon Canyon Dam and Lake. Leonard Canyon is the boundary between the ASNFs and the Coconino National Forest, and it is currently occupied by spinedace within its lower reach.

Past threats and declines of this species have resulted from habitat alterations and loss due to impoundment, removal of water from streams, channelization, grazing, road building, urban growth, and other human activity. Their decline is also related to the introduction and spread of exotic predatory and competitive fish species, and the use of ichthyotoxins in many of its native streams. Current threats identified within the recovery plan include changes in stream flow patterns, declines in water quality and quantity, modifications of watersheds (logging, dams, road construction), manipulations of fish populations (use of chemicals and other factors) and interactions with introduced fishes and other aquatic species. Threats to the species identified within the five-year review include habitat loss and fragmentation, habitat and riparian destruction, watershed disturbances, water development, drought, and the continued effects of invasive aquatic species.

Within the action area existing populations of Little Colorado spinedace occur in Leonard Canyon, Nutrioso Creek, Rudd Creek, Willow Creek, and West Chevelon Creek on the ASNFs. All of these streams are contained within three watersheds that all drain into the Little Colorado River: the Nutrioso Creek, Chevelon Creek, and East Clear Creek Watersheds. Recent impacts to the species are due to drought, nonnative species, and alteration of natural hydrographs in occupied habitat. Livestock and wild ungulate grazing have also been identified as contributing to poor watershed conditions which exacerbate the effects of drought and result in diminished habitat quality. Fuels reduction and forest restoration projects and wildland fire have also contributed to altered hydrographs and sediment loads in streams occupied by spinedace.

The Leonard Canyon watershed includes approximately 9,063 acres, and is located along the western boundary of the ASNFs. The Nutrioso Creek population occurs above and below Nelson Reservoir, and the watershed consists of approximately 88,035 acres. The upper Chevelon Creek watershed consists of approximately 163,797 acres. This stream currently does not have any Little Colorado spinedace within the ASNFs boundaries, but they do occur downstream of the ASNFs within designated critical habitat (~42 miles). Chevelon Creek above Chevelon Canyon Reservoir has been identified as a refugia and introduction site for this species and this may occur sometime in the future. The West Chevelon Creek population occurs above the 100 road within the upper portion of the watershed, and consists of approximately 7,803 acres. The Willow Creek watershed contains 59,190 acres; and as with West

Chevelon Creek, the potential for the establishment of long-term populations within these two streams is currently unknown.

Critical Habitat and Primary Constituent Elements

Critical habitat occurs on the ASNFs within the lower seven miles of Nutrioso Creek on the Springerville Ranger District, from Nelson Reservoir Dam downstream to the ASNFs boundary. Primary constituent elements for critical habitat include clean, permanent flowing water, with pools and a fine gravel or silt-mud substrate.

Species and Habitat Effects

For discussion and analysis purposes, the species has been grouped by watersheds. These watersheds are referred to by the name of the lowermost (highest stream order) stream within the drainage area; for the Spinedace there are four watersheds considered here; Chevelon Creek, Leonard Canyon, Nutrioso Creek, West Chevelon Creek and Willow Creek. These four watersheds may not always be consistent with the various Hydrologic Unit Code boundaries, as the lowermost point within the drainage area can be determined by several factors (e.g., the downstream end of critical habitat, the downstream end of occupied habitat, the ASNFs boundary).

Wildland Fire Management

Both fire and mechanical treatments would be used to move vegetation toward desired conditions. These treatments are used to change the character of the vegetation that would result in lower risk of uncharacteristic fire and a return of wildfire to a more natural role. The desired condition is to move toward or maintain vegetation conditions in Fire Regime Condition Class (FRCC) 1. FRCC is a metric that quantifies how departed a system is from historical conditions in relation to fire, the role fire historically played in the that system, and the vegetative structure. Under the LMP, annually approximately 48,500 acres would be treated across all of the PNVTs; and approximately 60% (28900 acres) would be treated by fire, and approximately 40% (19600 acres) would be treated mechanically. The current conditions for FRCC on the ASNFs are 14% FRCC 1, 14% FRCC 2, and 72% FRCC 3. Under the LMP, the FRCC conditions on the ASNFs after 15 years will improve to 24% FRCC 1, 41% FRCC 2, and 35% to FRCC 3.

Table 54 displays the percent for the three FRCCs by watersheds. Only one (Nutrioso Creek) of the five Spinedace watersheds has a significant (26%) portion of the watershed in FRCC 1, with the other four having lower amounts. FRCC is a measure of the difference in structure between current and reference conditions. Low (FRCC 1) is considered to be within the natural (historical) range of variability, while moderate (FRCC 2) and high (FRCC 3) departures are outside historical range. Vegetation in FRCC 1 is more resilient and resistant and less likely to lose key ecosystem components (e.g., native species, large trees, soil) after a disturbance, and fire behavior and other associated disturbances are similar to those that occurred prior to the exclusion of fire. It is expected that through implementation of the LMP the acres of FRCC 1 and FRCC 2 will increase, and the acres of FRCC 3 will decrease within the five Spinedace watersheds.

Table 54. Fire Regime Condition Class (FRCC) for LC Spinedace Watersheds

Watershed	FRCC 1 (% area)	FRCC 1 (acres)	FRCC 2 (% area)	FRCC 2 (acres)	FRCC 3 (% area)	FRCC 3 (acres)
Chevelon Creek	18.3	30009	1.9	3134	79.5	130158
Leonard Canyon	1.5	132	16.5.8	1498	81.8	7417
Nutrioso Creek	26.3	23191	23.9	21059	49.6	43630

West Chevelon Creek	0	0	22.7	1774	77.3	6029
Willow Creek	4.9	2908	20.7	12249	74.3	43962

Habitat alterations associated with wildfire and flooding are threats to the Spinedace. Over the last 75+ years, alterations to vegetation (e.g., livestock grazing and timber harvest activities), along with the suppression of wildfire has resulted in the disruption of the ecological role of fire in maintaining ecosystems. This has resulted in uncharacteristic impacts from wildfire on watersheds and aquatic habitat and species. Table 32 displays the burn severity impacts associated with the Wallow Fire that occurred in 2011. Nutrioso Creek was the only watershed with any acres within the Wallow Fire, and relatively low amounts of the critical habitat (0.6%) were impacted.

Table 55. Wallow Fire Burn Severity and Total (Percent) within LC Spinedace Watersheds and Critical habitat

	Burn Severity (%)			
	High	Moderate	Low	Total
Nutrioso Creek (Drainage Area)	18.6	12.2	24.6	55.4
Nutrioso Creek (Critical habitat)	0	0	0.6	0.6

The ecological role that wildfire has played in maintaining ecosystem structure, function, and process has been altered over time. Past fire suppression and management activities on the ASNFs have resulted in landscape scale conditions that can result in uncharacteristic and sometimes severe impacts from wildfire. Table 56 displays the amount of impacts (acres and percent) to Spinedace watersheds that have occurred over the last 10 and 25 years. As can be seen from Table 56, almost all of the wildfire within Spinedace watersheds has occurred within the last ten years. This more recent (last ten years) higher level of wildfire activity has resulted from altered vegetation conditions, long-term drought, and the increased use of wildfire being managed for resource benefits. This increased level of wildfire activity is likely to continue until improvements occur in vegetative structure and function, and drought conditions improve.

Table 56. Fire acres (≥100) within LC Spinedace watersheds (last 10 years and last 25 years)

	10 Years				25 Years			
Watershed	Acres Burned	Percent Burned	Acres Unburned	Percent Unburned	Acres Burned	Percent Burned	Acres Unburned	Percent Unburned
Chevelon Creek	22841	13.9	141339	86.3	23994	14.6	140313	85.7
Leonard Canyon	127	1.4	8935	98.6	526	5.8	8536	94.2
Nutrioso Creek	63412	72	24623	28	64114	72.8	24088	27.4
West Chevelon Creek	2468	31.6	5335	68.4	2468	31.6	5335	68.4
Willow Creek	687	1.2	58503	98.8	687	1.2	58503	98.8

The Wildfire Management Program will be highly integrated with the vegetation (PNVT) treatments, resulting in improvements in both FRCC and PNVTs across the ASNFs. Three desired conditions (DC 41, 42, and 296) located under the "all PNVTs" section of the LMP relate to the Fire program. Desired condition 41 states, "Natural processes and human and natural disturbances (e.g., planned and unplanned fire ignitions, mechanical vegetation treatments) provide desired overall tree density, structure, species composition, coarse woody debris, and nutrient cycling. Natural fire regimes are restored. Uncharacteristic fire behavior is minimal or absent on the landscape." Desired condition 42 states, "Fire (prescribed fire and use of wildland fire) maintains and enhances resources and, as nearly as possible, is allowed to function in its natural ecological role." Desired condition 296 states, "Wildland fires burn within the range of frequency and intensity of natural fire regimes. Uncharacteristic high-severity fires rarely occur and do not burn at the landscape scale." Collectively these desired conditions could

potentially result in long term improvements for Spinedace (e.g., watershed and hydrologic conditions, water quality, riparian and aquatic habitat conditions) and critical habitat (PCEs 1, 2, and 3).

The greatest improvements in FRCC conditions will occur within the Dry Mixed Conifer Forest, Madrean Pine-Oak Woodland, and the Great Basin Grassland PNVT types. For the Leonard Canyon watershed these PNVTs comprise approximately 26% of the total area, and for the Nutrioso Creek watershed they comprise approximately 30%. The other two watersheds contain considerably lesser amounts of these PNVTs. Therefore, potential improvements in FRCC and PNVT conditions are most likely to occur within the Leonard Canyon and Nutrioso Creek watersheds; and to a lesser extent within Rudd, West Chevelon, and Willow creek watersheds of Spinedace.

While the management of prescribed fire has the potential to have long term beneficial impacts through restoration of vegetation conditions and natural fire regimes, short term impacts associated with project implementation could result. Activities associated with fire can impact Spinedace by altering water quality and increasing sedimentation into streams, resulting in altered habitat conditions and reduced food resources and abundance. While there are no specific Wildland Fire program standards or guidelines relevant to the Spinedace, a guideline (23) under the all PNVTs section of the LMP states, "Landscape scale restoration projects should be designed to spread out treatments spatially and/or temporally to reduce implementation impacts and allow reestablishment of vegetation and soil cover." This guideline could help reduce or minimize short term impacts that may result from prescribed fire activities.

Habitat alterations associated with Wildland Fire has the potential to threaten the recovery of Spinedace and has had impacts on the populations on the ASNFs. Potential long term improvements in Spinedace habitat that may result by moving towards desired conditions, especially improvements in FRCC and PNVTs, will likely contribute to recovery and restoration of the watersheds and critical habitat (PCEs 1 and 2) of the Spinedace on the ASNFs; while reducing potential impacts from uncharacteristic fire and the associated increases in ash and sedimentation. Short term project implementation impacts are likely to occur associated with implementation of the fire program; however, their duration and extent can be minimized through guidelines and project specific mitigation measures. Although mitigation of impatcts will occur, based on past actions and the limitations of potential mitigation measures and timing of activities; impacts to Spinedace from this program area may affect and are likely to adversely affect both the Spinedace and its critical habitat.

Ecosystem/Vegetation Health and Forest Products

The LMP has recognized the need to address the maintenance and improvement of ecosystem health. Thirteen of the 14 PNVTs on the ASNFs vary (sometimes substantially) in structure, composition, function, and natural disturbance processes from desired conditions. All 14 PNVTs are key components in sustaining terrestrial and aquatic ecosystems and providing goods and services. The desired conditions for the PNVTs will result in resilient, functioning ecosystems; and in conjunction with the objectives, will guide future vegetation management activities, including burning and mechanical treatments, to maintain or move towards desired conditions. Table 57 displays the acres and percentage of each PNVT the Spinedace watersheds on the ASNFs. These data show how the PNVTs can vary considerably between the watersheds, and show the complexity of the watersheds and the potential difficulties in maintaining, improving, and restoring these areas for Spinedace recovery.

Table 57. PNVTs for LC Spinedace watersheds

	Cottonwood-Willow Riparian Forest	Dry Mixed Conifer Forest	Interior Chaparral	Madrean Pine-Oak Woodlands	Mixed Broadleaf Deciduous Riparian Forest	Montane Willow Riparian Forest	Montane/Subalpine Grasslands	Piñon-Juniper Woodland	Ponderosa Pine Forest	Semi-desert Grassland	Great Basin Grassland	Spruce-Fir Forest	Wet Mixed Conifer Forest	Wetland/Cienega Riparian Areas	Water
Chevelon Creek: Total = 163797 acres															
Acres	2367	18387	--	--	--	286	--	30009	107850	--	3636	--	766	--	--
Percent	1.5	11.2	--	--	--	0.2	--	18.3	65.8	--	2.2	--	0.5	--	--
Leonard Canyon: Total = 9063 acres															
Acres	167	2375	--	--	--	--	--	132	5041	--	--	--	1331	--	--
Percent	1.8	26.2	--	--	--	--	--	1.5	55.6	--	--	--	14.7	--	--
Nutrioso Creek: Total = 88035 acres															
Acres	85	8327	--	--	--	861	2529	23191	16501	--	17941	2071	15303	1072	106
Percent	0.1	9.5	--	--	--	1	2.9	26.3	18.7	--	20.4	2.4	17.4	1.2	0.1
West Chevelon Creek: Total = 7803 acres															
Acres	70	800	--	--	--	--	--	--	5229	--	--	--	1704	--	--
Percent	1.8	10.3	--	--	--	--	--	--	67	--	--	--	21.8	--	--
Willow Creek: Total = 59190 acres															
Acres	616	5780	--	--	--	424	--	2908	37758	--	--	--	11632	--	--
Percent	1	9.8	--	--	--	0.7	--	4.9	63.8	--	--	--	19.7	--	--

There are ten desired conditions (see appendix A) and three objectives associated with this program area relevant to Spinedace within the ecosystem health, PNVTs, and forest products sections of the LMP.

- OBJ 11 (All Forested PNVTs) Annually, treat 5,000 to 35,000 acres to reduce tree densities, restore natural fire regimes, promote species habitat and ecosystem health, reduce fire hazard, maintain desired conditions, initiate recovery from uncharacteristic disturbance, and provide forest products, leaving a desired mix of species with the range of desired densities that are resilient to changing climatic conditions.
- OBJ 13 (all Foodland PNVTs) Annually, treat or maintain 5,000 to 15,000 acres to promote a highly diverse structure
- OBJ 14 (Grasslands) Decrease or maintain the woody canopy cover at less than 10 percent by treating up to 25,000 acres annually.

The vegetation (PNVTs) treatments will be integrated with both the Wildland fire and Ecosystem/Vegetation Health program areas, resulting in improvements in both PNVTs departure and FRCC conditions across the ASNFs. The desired conditions (1, 2, 3, 39, 40, 46, 48, and 61) located under the "overall ecosystem health" and "all PNVTs" sections of the LMP relate to this program and the watershed and landscape scale conditions for the Spinedace. The three objectives (11, 13, and 14) provide for a maximum total treatment level of 75,000 acres per year, which will improve the overall

departure condition for the eight modeled PNVTs from their current rating of 64% (high departure) to 44% (moderate departure) over the planning period. Collectively these desired conditions could potentially result in long term improvements for the Spinedace (e.g., watershed and hydrologic conditions, water quality, riparian and aquatic habitat conditions, risk of uncharacteristic fire) and its critical habitat (PCEs 2 and 3) and occupied habitat within all the watersheds on the ASNFs.

The greatest improvements in PNVT departure will occur within the Dry Mixed Conifer Forest, Madrean Pine-Oak Woodland, and the Great Basin Grassland PNVT types. The Leonard Canyon, Chevelon Creek, and West Chevelon Creek watersheds have relatively high amounts of these PNVTs; approximating 82%, 79%, and 77% respectively, and for the Nutrioso Creek watershed they comprise approximately 49%. Therefore, potential improvements in PNVT conditions are most likely to occur within the Leonard Canyon, Chevelon Creek, and West Chevelon Creek populations of Spinedace; and to a lesser extent within the Rudd and Willow creek watersheds. Restoring and maintaining PNVTs would likely improve the potential to retain or return the necessary ecological processes and patterns necessary to make these ecosystems sustainable, resilient, and healthy. Impacts to the uplands, streams, and riparian areas; along with potential and recent impacts associated with fire are threats to the Spinedace and their persistence on the ASNFs. The landscape and watershed scale restoration actions have the potential to reduce the current large scale threats; especially those associated with uncharacteristic fire, and improve both the upland and riparian conditions for the Spinedace and its designated critical habitat (PCEs 2 and 3).

While the management of vegetation and PNVTs has the potential to have long term beneficial impacts through restoration of vegetation conditions and natural fire regimes; short term impacts associated with project implementation could result, especially those associated with the Ecosystem/Vegetation Health program. There are three objectives that provide for the use of forest products on an annual basis; 122,000 CCF from suitable timberlands for wood products, 94,000 CCF for firewood, and 5,000 permits for Christmas trees. Suitable timberlands are lands to be managed for timber production on a regulated basis. Suitable timber lands are likely to have greater impacts compared to other lands due to the greater emphasis on mechanical vegetation treatments and the associated infrastructure (e.g., roads, landings) and continued scheduled entries over time. "Nonsuitable" and "fire only" timber lands may have vegetation treatments and provide forest products; but they will likely only receive one entry during the planning period, and the amount of access and roads needed are less than "suitable" timber lands.

The Nutrioso Creek watershed has the lowest amount of suitable timber lands at approximately 21%; while the Leonard Canyon, Chevelon Creek, West Chevelon Creek, and Willow Creek have much higher amounts (Table 58). Therefore, any potential impacts resulting from the management of suitable timber lands will likely occur within the Leonard Canyon, Chevelon Creek, West Chevelon Creek, and Willow Creek watersheds of Spinedace.

Table 58. Treatment Type [suitable timber, nonsuitable timber, and fire only lands] acres by LC Spinedace watershed

Watershed	Suitable Timber	Nonsuitable Timber	Fire Only
Chevelon Creek	87945 acres (53.7%)	67592 acres (41.3%)	8260 acres (4.8%)
Leonard Canyon	4586 acres (50.6%)	4461 acres (49.2%)	16 acres (0.2%)
Nutrioso Creek	18649 acres (21.2%)	52373 acres (59.5%)	17012 acres (19.3%)
West Chevelon Creek	6214 acres (79.6%)	1589 acres (20.4%)	0 acres (0%)
Willow Creek	39937 acres (67.5%)	14553 acres (24.6%)	4700 acres (7.9%)

Activities associated with suitable/unsuitable timberland treatments can impact Spinedace by altering watershed, hydrologic, riparian, and aquatic habitat conditions; degrading water quality and increasing sedimentation into streams, and reducing food resources and abundance necessary for the Spinedace.

There are two specific guidelines that address these potential impacts. Guideline (GL 23) under the all PNVTs section of the LMP states, "Landscape scale restoration projects should be designed to spread out treatments spatially and/or temporally to reduce implementation impacts and allow reestablishment of vegetation and soil cover." Guideline (GL 130) in the Forest Products section states, "Permits issued for forest products should include stipulations to protect resources." These guidelines can minimize and reduce potential impacts resulting from treatments by reducing their intensity over space and time, although it is likely that some level of impacts will still occur.

Conditions in the uplands, riparian, and streams have been identified as a threat to the Spinedace, and have had impacts on all of the watersheds on the ASNFs. Potential long term improvements in Spinedace habitat that may result by moving towards desired conditions, especially improvements in PNVTs and risk associated with fire; will likely contribute to recovery and restoration of the watersheds and critical habitat (PCEs 2 and 3) of the Spinedace on the ASNFs, while reducing potential impacts from uncharacteristic fire and the associated increases in ash and sedimentation. Short term project implementation impacts are likely to occur associated with implementation of the vegetation treatment and forest products programs; however, their duration and extent can be minimized through guidelines and project specific mitigation measures. Although impacts may be reduced, sort term impacts are likely to occur that cannot be considered insignificant or discountable. Therefore, this program are may affect, and is likely to adversely affect Spinedace and its critical habitat.

Rangeland Management

Program activities include administering livestock grazing consistent with NEPA decisions, ESA consultation requirements, and guidance in LMP. Additional program activities include implementation and effectiveness monitoring of individual allotments, development of structural and non-structural improvements to facilitate better livestock management and to improve wildlife habitat and watershed conditions, control of invasive weeds, and the authorization of grazing consistent with LMP through site specific allotment NEPA. The LMP determined that most of the ASNFs is suitable for livestock grazing. Suitability is the appropriateness of applying certain resource management practices to a particular area of land, in consideration of relevant social, economic, and ecological factors. Table 59 displays the livestock grazing suitability acres for each of the Spinedace watersheds.

Table 59. Livestock grazing suitability in LC Spinedace watersheds and critical habitat

	Watershed				Critical Habitat			
	Suitable (percent)	Suitable (acres)	Unsuitable (percent)	Unsuitable (acres)	Suitable (percent)	Suitable (acres)	Unsuitable (percent)	Unsuitable (acres)
Chevelon Creek	77.9	127597	22.1	80214	N/A	N/A	N/A	N/A
Leonard Canyon	73.6	6669	8.9	7820	N/A	N/A	N/A	N/A
Nutrioso Creek	91.9	80214	8.9	7820	3.5	17	96.5	472
West Chevelon Creek	26.6	2073	73.4	5730	N/A	N/A	N/A	N/A
Willow Creek	80.7	47791	19.3	11399	N/A	N/A	N/A	N/A

Most of the Spinedace watersheds have been determined to be suitable for livestock grazing; although relatively low amounts are suitable for West Chevelon Creek watershed and Nutrioso Creek critical habitat. While a determination of suitability does not necessarily result in livestock grazing on that area, current management provides for livestock grazing across most of the ASNFs. Livestock grazing can

impact watersheds and hydrologic conditions by altering vegetation and ground cover, soil compaction, and water quality. Current range condition on the ASNFs is reflective of past and ongoing grazing activities, and landscape scale conditions have not changed significantly since the 1980s. Table 60 displays the current range conditions for each of the Spinedace watersheds and their critical habitat, with most of the acres falling in fair and poor range condition.

Table 60. Range Condition in LC Spinedace watersheds and critical habitat

	Watershed		Critical Habitat	
Range Condition	**Acres**	**Percent**	**Acres**	**Percent**
Chevelon Creek				
Excellent	--	--	--	--
Good	356	0.2	--	--
Fair	2132	1.3	--	--
Poor	110185	67.3	--	--
Very Poor	50714	31	--	--
No capacity	10	0	--	--
Leonard Canyon				
Excellent		--	--	--
Good		--	--	--
Fair	19	0.2	--	--
Poor	5119	56.5	--	--
Very Poor	3903	43.1	--	--
No capacity	--	--	--	--
Nutrioso Creek				
Excellent	--	--	--	--
Good	3929	20.4	--	--
Fair	16782	19.1	8	1.6
Poor	34582	39.3	7	1.4
Very Poor	2360	2.7	--	--
No capacity	28373	32.2	475	97.1
West Chevelon Creek				
Excellent	--	--	--	--
Good	--	--	--	--
Fair	56	0.7	--	--
Poor	5732	73.5	--	--
Very Poor	2000	25.6	--	--
No capacity	--	--	--	--
Willow Creek				
Excellent	--	--	--	--
Good	--	--	--	--
Fair	127	0.2	--	--
Poor	38660	65.3	--	--
Very Poor	20326	34.3	--	--
No capacity	23	0.1	--	--

Given the long history of domestic livestock grazing activities on the ASNFs, considerable amounts of infrastructure has been developed through site specific management. The most common types of range developments associated with livestock grazing activities include fencing, water developments, and corrals. These range developments can impact watersheds, riparian areas, and aquatic habitats. Fencing can result in the concentration of grazing animals, impacting vegetation, soils, and aquatic habitat where this occurs. Pit tanks occur on drainages and can alter hydrologic conditions, and can act as vectors (along with livestock) for the movement and introduction of invasive or undesirable species. Corrals are often located adjacent to streams and springs, and impacts to water quality and vegetation can result from

the concentrated use in these areas. Table 61 displays the primary range developments within the Spinedace watersheds and critical habitat; and while these developments can help to disperse impacts across livestock grazing allotments, higher levels of these developments are likely to result in greater risks to the Spinedace from livestock grazing actions.

Table 61. Constructed Features in LC Spinedace watersheds and critical habitat

Watershed	Feature	Total Watershed	Critical Habitat (200 m corridor)
Chevelon Creek	Corral (points)	--	--
Chevelon Creek	Pit Tank (points)	156	--
Chevelon Creek	Constructed Fence (miles)	103.3	--
Leonard Canyon	Corral (points)	--	--
Leonard Canyon	Pit Tank (points)	32	--
Leonard Canyon	Constructed Fence (miles)	21.7	--
Nutrioso Creek	Corral (points)	1	--
Nutrioso Creek	Pit Tank (points)	58	--
Nutrioso Creek	Constructed Fence (miles)	165.8	0.6
West Chevelon Creek	Corral (points)	--	--
West Chevelon Creek	Pit Tank (points)	8	--
West Chevelon Creek	Constructed Fence (miles)	9.1	
Willow Creek	Corral (points)	--	--
Willow Creek	Pit Tank (points)	140	--
Willow Creek	Constructed Fence (miles)	79.1	--

While there are no relevant desired conditions associated with the livestock grazing and invasive species, there are two objectives associated with the invasive species program that are relevant to the Spinedace. These two objectives (OBJ 16 and OBJ 17) propose to annually "contain, control, or eradicate invasive species (e.g., musk thistle, Dalmatian toadflax) on 500 to 3,500 acres", and "control or eradicate invasive species (e.g., tamarisk, bullfrogs) on at least 2 stream miles." Invasive and nonnative species have been identified as threats to the Spinedace populations on the ASNFs; and these two objectives could potentially improve both the riparian and aquatic habitat for the Spinedace by restoring vegetation and aquatic species composition to historical conditions, or to levels that are low enough to allow for the persistence of Spinedace.

While the invasive species program has the potential to have some long term benefits to Spinedace and their habitat, the possibility exists for impacts to Spinedace through implementation of this program and the livestock grazing program. There is one standard and seven guidelines that have been included in the LMP that may address potential impacts to Spinedace.

- ST 4 Vegetation treatments shall include measures to reduce the potential for introduction of invasive plants and animals and damage from nonnative insects and diseases.

- GL 32 Active grazing allotments should be managed to maintain or improve to desired riparian conditions.
- GL 78 Projects and activities should not transfer water between drainages or between unconnected water bodies within the same drainage to avoid spreading disease and aquatic invasive species.

- GL 79 Project areas should be monitored to ensure there is no introduction or spread of invasive species.
- GL 81 Pesticide use should minimize impacts on nontarget plants and animals.
- GL 134 New livestock troughs, tanks, and holding facilities should be located out of riparian areas to limit concentration of livestock in these areas. Existing facilities in riparian areas should be modified, relocated, or removed where their presence is determined to inhibit movement toward desired riparian or aquatic conditions.
- GL 138 To minimize potential resource impacts from livestock, salt or nutritional supplements should not be placed within a quarter of a mile of any riparian area or water source. Salt or nutritional supplements should also be located to minimize herbivory impacts to aspen clones.
- GL 139 To prevent resource damage (e.g., streambanks) and disturbance to federally listed and sensitive wildlife species, trailing of livestock should not occur along riparian areas. Where no alternative route is available, approval may be granted where effective mitigation measures are implemented (e.g., timing of trailing, number of livestock trailed at one time).

While the invasive species program has the potential to have long term benefits and impacts through restoration of vegetation conditions, riparian areas, and aquatic habitats; activities associated with the livestock grazing program can impact Spinedace by degrading upland and watershed conditions and function, altering riparian vegetation and function, and reducing water quality and increasing sedimentation into streams. The standards and guidelines listed above may reduce potential impacts; but given that all most of the Spinedace watersheds are suitable for livestock grazing, have range conditions that are mostly fair and poor, and have considerable amounts of range developments (e.g., fences and tanks); it is reasonable to conclude that implementation of the LMP will result in impacts to the Spinedace and their critical habitat. Given past actions, and the inherent limitations relative to minimizing impacts from livestock grazing activities, it is not reasonable to conclude impacts associated with this program area will be insignificant or discountable. Therefore, this program area may affect, and is likely to adversely affect Spinedace and its critical habitat.

Watershed and Soil Management

The Watershed and Soil Management program for all NFs seeks to maintain or improve watershed conditions and maintain good water quality. It is cross-program in orientation in that it seeks to mitigate impacts from other program activities as well. The guidance for the Watershed and Soil Management program can be used to fill in the gaps for other programs with inadequate guidance. Abundant guidance is provided in the LMP to assist the LMP in minimizing or reducing potential impacts to Spinedace. There are a total of 15 desired conditions (see appendix A) and six objectives associated with this program area that are relative to this analysis.

- OBJ 1 During the planning period, improve the condition class on at least 10 priority 6th level HUC watersheds by removing or mitigating degrading factors.
- OBJ 2 Annually, enhance or restore an average of 350 acres within priority 6th level HUC watersheds, including treating the causes of State designated impaired or threatened waters (Arizona Department of Environmental Quality, 2012) to improve watershed condition and water quality.
- OBJ 6 Annually, restore 200 to 500 acres toward desired composition, structure, and function of streams, floodplains, and riparian vegetation.
- OBJ 9 Within the planning period, enhance or restore 5 to 25 wet meadows or cienegas to proper hydrologic function and native plant and animal species composition.
- OBJ 10 Annually, work with partners to reduce animal damage to native willows and other riparian species on an average of 5 miles of riparian habitat.

- OBJ 38 Annually, prepare at least one instream flow water rights application until water acquisition needs are complete to sustain riparian areas, fish, wildlife, and water-based recreation.

The watershed and riparian desired conditions, objectives, and treatments will likely be integrated with the Wildfire and Ecosystem/Vegetation Health, and Wildlife Fish and Rare Plant programs; potentially resulting in improvements in watershed condition and function, and riparian conditions across the ASNFs. The desired conditions (9, 12, 15, 21, 22, 67-72, 74, 77, 80, and 84) located under the "watershed" and "riparian areas" sections of the LMP relate to this program and the watershed and landscape scale conditions for the Spinedace. The six objectives (1, 2, 6, 9, 10, and 38) provide for a treatment level of approximately 1,000 - 10,000 acres per year, which will improve the overall conditions for the six code watersheds and riparian areas receiving treatments. Collectively these desired conditions and objectives could potentially result in long term improvements for the Spinedace (e.g., watershed and hydrologic conditions, water quality, riparian and aquatic habitat conditions, soils) and its critical habitat (PCEs 1, 2, and 3) on the ASNFs.

Restoring and maintaining watersheds and riparian areas by reducing or eliminating degrading factors would likely improve the potential to retain or return the necessary ecological processes and functions necessary to make these ecosystems sustainable, resilient, and healthy. The landscape and watershed scale restoration actions have the potential to reduce the current threats; especially those associated with watershed and hydrologic conditions, and improve both the upland (soils) and riparian conditions for the Spinedace and its designated critical habitat (PCEs 1 and 2).

While the management of watersheds and riparian areas has the potential to have long term beneficial impacts through restoration of hydrologic conditions and functions; short term impacts associated with project implementation could result, especially those associated with the use of mechanical treatments; which are likely to have increased levels of ground disturbance, vegetation removal, and soil compaction. There are six specific guidelines that address these potential impacts in the LMP.

- GL 2 Projects with ground-disturbing activities should be designed to minimize long and short term impacts to soil resources. Where disturbance cannot be avoided, project specific soil and water conservation practices should be developed.
- GL 6 Projects with ground-disturbing activities should be designed to minimize long and short term impacts to water resources. Where disturbance cannot be avoided, project specific soil and water conservation practices and BMPs should be developed.
- GL 30 Ground-disturbing projects (including prescribed fire) which may degrade long term riparian conditions should be avoided.
- GL 33 Storage of fuels and other toxicants should be located outside of riparian areas to prevent spills that could impair water quality or harm aquatic species.
- GL 34 Equipment should be fueled or serviced outside of riparian areas to prevent spills that could impair water quality or harm aquatic species.
- GL 35 Construction or maintenance equipment service areas should be located and treated to prevent gas, oil, or other contaminants from washing or leaching into streams.

Conditions in the uplands, riparian areas, and streams; have been identified as threats to the Spinedace, and have had impacts on all of the watersheds on the ASNFs. Potential long term improvements in Spinedace habitat that may result by moving towards desired conditions, especially improvements in watersheds and risk associated with degraded riparian areas; will likely contribute to recovery and restoration of the watersheds and critical habitat (PCEs 2 and 3) of the Spinedace on the ASNFs, while reducing potential impacts from uncharacteristic watershed and hydrologic conditions. Short term project implementation impacts are likely to occur associated with project implementation; however, their

duration and extent can be minimized through guidelines and project specific mitigation measures and best management practices. Potential short term impacts primarily include increases in sedimentation, soil compaction, alterations in hydrologic conditions and functions, and changes in water quality. Mitigation measures are implemented at the project level, and site specific conditions and project activities and timing will determine their efficacy. Although most projects could be mitigated, it is likely over the planning period that some projects will result in impacts that could not be considered at the level of insignificant or discountable. Therefore this program area may affect, and is likely to adversely affect Spinedace and its critical habitat.

Engineering Program

The motorized transportation system is comprised of 765 miles of roads open only to highway legal vehicles (maintenance level 3 through 5), 2,067 miles of roads open to all motorized vehicles (maintenance level 2), 3,372 miles of roads closed to all motorized vehicles (maintenance level 1), and 156 miles of trails open to motorized vehicles less than 50 inches wide. The miles of open motorized transportation system includes roads with access restricted on a seasonal basis for public safety and to minimize resource damage. The LMP includes plan objectives to annually maintain 20% of passenger vehicle roads, 10% of high clearance roads, and 20% of both motorized and nonmotorized trails. Road crossing information for the Spinedace watersheds and critical habitat are presented below in Table 62. Although the various types of crossings (e.g., culverts, bridges) cannot be accurately determined at the watershed scale, most of the crossings across the ASNFs are culverts. Route miles and densities were also calculated for the Spinedace watersheds and critical habitat (Table 63). This information is separated by closed, open, and non-motorized routes; and represents the most recent data from the Forest Transportation Atlas, which does not include unauthorized routes.

Table 62. Route (motorized and nonmotorized) Crossings in LC Spinedace watersheds and critical habitat

Watershed		Critical Habitat (200 m)	
Chevelon Creek	401	Chevelon Creek	N/A
Leonard Canyon	16	Leonard Canyon	N/A
Nutrioso Creek	297	Nutrioso Creek	15
West Chevelon Creek	21	West Chevelon Creek	N/A
Willow Creek	194	Willow Creek	N/A

Table 63. Route Miles and Densities for Closed (decommissioned and ML1) and Open (ML 2-5 and motorized trails) and Nonmotorized for LC Spinedace

		Total Watershed		Critical Habitat	
Watershed	Route Type	Route Miles	Density (miles / square mile)	Route Miles	Density (miles / square mile)
Chevelon Creek	Closed	448.5	1.8	--	--
Chevelon Creek	Open	332.7	1.3	--	--
Chevelon Creek	Non-motorized	19.4	0.08	--	--
Chevelon Creek	**Total**	**800.7**	**3.1**	**--**	**--**
Leonard Canyon	Closed	54	3.8	--	--
Leonard Canyon	Open	26.2	1.8	--	--
Leonard Canyon	Non-motorized	0.4	0.03	--	--
Leonard Canyon	**Total**	**80.5**	**5.7**	**--**	**--**
Nutrioso Creek	Closed	190.1	1.4	1.2	1.6
Nutrioso Creek	Open	129.8	0.9	2.4	3.2

Nutrioso Creek	Non-motorized	14.3	0.1	0	0
Nutrioso Creek	**Total**	**334.2**	**2.4**	**3.6**	**4.8**
West Chevelon Creek	Closed	17.5	1.4	--	--
West Chevelon Creek	Open	28.4	2.3	--	--
West Chevelon Creek	Non-motorized	0	0	--	--
West Chevelon Creek	**Total**	**45.8**	**3.8**	**--**	**--**
Willow Creek	Closed	306.6	3.3	--	--
Willow Creek	Open	202	2.0	--	--
Willow Creek	Non-motorized	4.8	0.1	--	--
Willow Creek	**Total**	**513.4**	**5.3**	**--**	**--**

While no relevant desired conditions exist for the Engineering program; there are two objectives within the riparian section of the LMP that relate to roads.

- OBJ 7 Within the planning period, relocate, repair, improve, or decommission a minimum of 4 miles of National Forest System roads or trails that add sediment to streams, damage riparian vegetation, erode streambanks, cause gullies, and/or compact floodplain soils.
- OBJ 8 Annually, remove an average of 2 miles of unauthorized roads or trails that sediment to streams, damage riparian vegetation, erode streambanks, cause gullies, and/or impact floodplain soils.

These two objectives could potentially result in long term improvements for the Spinedace and their critical habitat by reducing sedimentation associated with degraded and/or unauthorized roads and trails. Restoring and rehabilitating these sites could potentially improve water quality, habitat conditions, and the macroinvertebrate food base needed by the Spinedace. All the Spinedace watersheds could potentially benefit from implementation of these objectives, as road and trail densities within these watersheds and occupied and critical habitat for this species are relatively high.

Roads and road construction and maintenance can result in the destruction and alteration of riparian and aquatic habitat, increases in sedimentation, and water quality degradation. Roads can also act as vectors and increase the risk for the transportation or introduction of disease and invasive/undesirable species, especially where crossings exist. The engineering program contains one standard and one guideline that may help minimize some threats to Spinedace. The standard (18) states, "Road maintenance and construction activities shall be designed to reduce sediment (e.g., water bars, sediment traps, grade dips) while first providing for user safety." The guideline (103) states, "Roads and motorized trails removed from the transportation network should be treated in order to avoid future risk to hydrologic function and aquatic habitat." The water resources section of the LMP also has a guideline (8) that specifies that "streamside management zones should be in place between streams and disturbed areas and/or road locations to maintain water quality and suitable stream temperatures for aquatic species." These standards and guidelines, combined with the objectives to reduce impacts from roads; could potentially improve habitat conditions for the Spinedace over the long term by reducing sedimentation and impacts to aquatic habitat.

Erosion from roads has been identified as a threat to Spinedace, and has had impacts on all the watersheds on the ASNFs. Roads crossing and adjacent to streams can remove and alter riparian vegetation, impact stream channel function and structure, and alter and degrade aquatic habitat through changes in water quality and increases in sedimentation. Potential long term improvements in Spinedace habitat may result by reducing road densities and impacts within riparian areas; and have the potential to contribute to recovery and restoration of the watersheds, riparian areas, and critical habitat of the Spinedace on the

ASNFs. Although it is believed beneficial impacts will occur from road closures and removal, where and how these activities will be specifically determined is not within the LMP; and will occur to the extent that restoration and watershed improvements occur within Spinedace watersheds, occupied habitats, and critical habitat. Short term project implementation impacts are likely to occur associated with implementation of the engineering/roads program; however, their duration and extent can be minimized through standards, guidelines, and project specific mitigation measures. Although there are standards and guidelines to potentially limit impacts from roads, motorized trails, and other projects; it is not likely that all the potential negative effects such as increased runoff and sedimentation could be eliminated to the extent they could be considered insignificant or discountable. Therefore, this program area may affect and is likely to adversely affect Spinedace and its critical habitat.

Lands and Minerals Program

In 2011, there were 454 existing rights-of-way and special use permits for a variety of uses on the ASNFs. A majority of these are categorized as lands permits (381) versus recreation permits (73). It is likely that some of these special use permits and authorizations are located within the watersheds and critical or occupied on the ASNFs, although how they potentially impact Spinedace and their habitat is not specifically known. Across the entire ASNFs there are 16 lands special use permits for reservoirs/dams, 10 for irrigation ditches, 15 for water conveyance, and 36 for water transmission. These uses do present considerable threats to maintaining, restoring and recovering the Spinedace and its habitat. Reservoirs/dams currently impact both the Chevelon Creek and Nutrioso Creek populations, while water diversions and uses are likely impacting the Nutrioso Creek population; primarily associated with private land inholdings and parcels on Nutrioso Creek.

The possibility exists for impacts to Spinedace through implementation of the lands and special uses programs. One standard and one guideline have been included in the LMP to address potential impacts to Spinedace within the "water uses" and "minerals and geology" sections. The standard (ST 31) under the waters uses section states, "Special uses for water diversions shall maintain fish, wildlife, and aesthetic values and otherwise protect the environment." The guideline (GL 146) within the "water uses" section of the LMP states, "Streambed and floodplain alteration or removal of material should not occur if it prevents attainment of riparian, channel morphology, or streambank desired conditions." Although these two plan components may minimize and reduce potential impacts, the possibility exists for effects to Spinedace and its critical habitat (PCEs 1, 2, and 3) through the implementation of the LMP for these programs. It cannot be concluded that effects will be reduced to the level of insignificant or discountable; therefore, this program area may affect and is likely to adversely affect Spinedace and its critical habitat.

Recreation and Wilderness Programs

There are over 30 reservoirs and lakes and more than 1,000 miles of streams on the ASNFs, more than any other national forest in the Southwestern Region. Reservoirs and streams and adjacent areas are highly desirable for many types of recreational activities. The user demands and concentrated use in these areas can result in impacts that can alter vegetation, riparian areas, water quality, and aquatic habitat.

There is only one desired condition (DC 219) within the LMP in the dispersed recreation section that states, "Water-based settings are available and the associated recreation opportunities (e.g., canoeing, fishing, waterfowl hunting) do not degrade aquatic resources." Recreation sites and developments along with their associated uses and activities may impact Spinedace and its critical habitat. Table 64 displays the acres of recreational sites within Spinedace watersheds and critical habitat. While the desired condition (219) may help reduce some impacts (e.g., ground disturbance and compaction, vegetation removal, impacts to water quality) associated proposed sites, the potential to address impacts associated

with developed sites will be limited. These sites and developments and their associated uses and activities do present threats to maintaining, restoring and recovering the Spinedace and its habitat. Recreational sites (e.g., developed campgrounds, dispersed campsites, access roads, trailheads, and trails), and activities (e.g., recreating, hiking, fishing, camping, hunting) can impact Spinedace by degrading upland and watershed conditions and function, altering riparian vegetation and function, and reducing water quality and increasing sedimentation into streams.

Table 64. Recreation Site Polygons in LC Spinedace watersheds and critical habitat

	Watershed Total		Critical Habitat (200 m)	
Watershed	**Acres**	**Percent**	**Acres**	**Percent**
Chevelon Creek	2278	1.4	--	--
Nutrioso Creek	220	0.3	10	2.1
West Chevelon Creek	194	2.5	--	--
Willow Creek	391	0.7	--	--

There is only one standard (ST 13) within the dispersed recreation section of the LMP that states, "Dispersed campsites shall not be designated in areas with sensitive soils or within 50 feet of streams, wetlands, or riparian areas to prevent vegetation and bank damage, soil compaction, additional sediment, or soil and water contamination". Although this plan component may minimize and reduce potential impacts, the possibility exists for effects to the Spinedace from the recreation program through the implementation of the LMP. Although activities are 50 feet away, over time impacts to the stream and riparian vegetation may still result as use occurs; and risk associated with the potential to move or introduce nonnative species still exists. Therefore, this program area may affect and is likely to adversely affect Spinedace and its critical habitat.

Wildlife, Fish, and Rare Plant Program

The Wildlife, Fish and Rare Plant program (WFRP) involves a variety of activities conducted by the USFS and its partners, including inventory and monitoring, habitat assessments, habitat improvements through land treatments and structures, species reintroductions, development of conservation strategies, administrative studies, collaboration with research, and information and education. The guidance for the WFRP can be used to fill in the gaps for other programs with inadequate guidance. Abundant guidance is provided in the LMP to assist the LMP in minimizing or reducing potential impacts to the Spinedace. There are a total of 15 desired conditions (see appendix A) and two objectives associated with this program area relative to this analysis.

- OBJ 4 Annually, enhance or restore 5 to 15 miles of stream and riparian habitat to restore structure, composition, and function of physical habitat for native fisheries and riparian-dependent species.
- OBJ 5 During the planning period, complete at least five projects (e.g., remove barriers, restore dewatered stream segments, or connect fragmented habitat) to provide for aquatic and riparian associated species and migratory species.

The WFRP desired conditions, objectives, and treatments will likely be integrated with the Watershed and Soils and Ecosystem/Vegetation Health programs; potentially resulting in improvements in watershed condition and function, riparian conditions, and aquatic habitats across the ASNFs. The desired conditions (4, 7, 20, 23, 24, 26, 27, and 30-37) located under the "aquatic habitat and species" section of the LMP relate to the threats/risks and potential recovery and restoration needs for the Spinedace. The two objectives (4 and 5) provide for a treatment level of approximately 5-15 miles per year, which will improve the overall aquatic habitat conditions for the streams and riparian areas receiving treatments. Collectively these desired conditions and objectives could potentially result in long term improvements

for the Spinedace (e.g., aquatic habitat conditions, water quality and stream temperature improvements, riparian and aquatic habitat structure and function) and its critical habitat (PCEs 1, 2, and 3) on the ASNFs.

Restoring and maintaining aquatic habitats and riparian areas would likely improve the potential to retain or return the necessary ecological processes and functions necessary to make these ecosystems sustainable, resilient, and healthy. Impacts to the watershed, streams, and riparian areas, along with potential and recent impacts associated with fire are threats to the Spinedace and their persistence on the ASNFs. The aquatic habitat and species restoration actions have the potential to reduce the current threats; especially those associated with altered and degraded aquatic habitat condition, structure, and function.

While the management of watersheds and riparian areas has the potential to have long term beneficial impacts through restoration of hydrologic conditions and functions; short term impacts associated with project implementation could result, especially those associated with the use of mechanized equipment and the potential to transfer or inadvertently move invasive or nonnative species. There is one standard and eight specific guidelines that address these potential impacts to Spinedace.

- ST 2 When drafting (withdrawing) water from streams or other water bodies, measures will be taken to prevent entrapment of fish and aquatic organisms and the spread of parasites or disease (e.g., Asian tapeworm, chytrid fungus, whirling disease).

- GL 7 Streams, streambanks, shorelines, lakes, wetlands, and other bodies of water should be protected from detrimental changes in water temperature and sediment to protect aquatic species and riparian habitat.
- GL 8 Streamside management zones should be in place between streams and disturbed areas and/or road locations to maintain water quality and suitable stream temperatures for aquatic species.
- GL 13 To protect water quality and aquatic species, heavy equipment and vehicles driven into a water body to accomplish work should be completely clean of petroleum residue. Water levels should be below the gear boxes of the equipment in use. Lubricants and fuels should be sealed such that inundation by water should not result in leaks.
- GL 15 Activities occurring within federally listed species habitat should apply habitat management direction and species protection measures from recovery plans.
- GL 17 To prevent degradation of native species habitat and the incidental or accidental introduction of diseases or nonnative species, aquatic species should not be transferred through management activities from one 6^{th} level HUC watershed to another.
- GL 18 Sufficient water should be left in streams to provide for aquatic species and riparian vegetation.
- GL 19 Projects and activities should avoid damming or impounding free-flowing waters to provide streamflows needed for aquatic and riparian-dependent species.
- GL 21 When new water diversions are created or existing water diversions are reanalyzed, measures should be taken to prevent entrapment of fish and aquatic organisms.

Altered aquatic habitat conditions have been identified as a threat to the Spinedace, and changes over the last century have had impacts on all watersheds on the ASNFs. Potential long term improvements in Spinedace habitat that may result by moving towards desired conditions, especially improvements in aquatic habitats, and risks associated with the unintentional transfer and movement of invasive and nonnative species; will likely contribute to recovery and restoration of the streams and critical habitat (PCEs 1 and 2) on the ASNFs. Short term impacts are likely to occur associated with project implementation; however, their duration and extent can be minimized through guidelines and project

specific mitigation measures and best management practices. While standards, guidelines, and BMPs would help eliminate most impacts to Spinedace; it is still likely that some impacts associated with this program area may affect, and are likely to adversely affect Spinedace and its critical habitat.

Cumulative Effects and Climate Change

Various amounts of private and state lands occur within the watersheds considered here, with the Nutrioso Creek being the greatest, with approximately 9,000 acres. Specific activities associated with these private lands are not known; but have likely included livestock and agricultural uses, water developments and diversions, and road and infrastructure developments. Past and ongoing management actions by AZGFD within the watersheds, especially relative to nonnative aquatic species, have contributed to the current and continued threats to all of the Spinedace streams.

Changes associated with climate variation and change to riparian areas and aquatic habitats present some of the most important challenges for management of the Spinedace on the ASNFs. Predictions include reduced precipitation and water in riparian areas, increased water losses from elevated evapotranspiration rates, altered high flow events with increased frequencies of high intensity convectional storms, increases in drought severity during summer low flows, and increasing temperatures in small streams and tributaries that further limit habitat during seasonal low flows. Key climate change factors potentially impacting riparian areas and aquatic habitat on the ASNFs include increases in frequency of extreme weather events and increases in wildfire risks. These key climate change factors are addressed directly or indirectly through the LMP (desired conditions, objectives, and management strategies); by enhancing adaption of ecosystems through anticipating and planning for disturbances from intense storms, reducing vulnerability by maintaining and restoring resilient native ecosystems, and increasing water conservation and planning for reductions in upland water supplies. Increases in high intensity storms and flooding will continue to threaten Spinedace and its critical habitat; improvements in PNVTs, FRCCs, watersheds, and riparian and aquatic habitats could potentially reduce these impacts.

Little Colorado Spinedace and Critical Habitat Summary of Effects and Determinations

Effects to designated critical habitat may occur by similar means presented for the species, and can be found above in the same program area sections. PCEs likely to be affected by the LMP include 1(clean permanently flowing water), 2 (pools), and 3 (fine gravel or silt-mud substrates). Primary effects include the potential of introducing sediments to streams, disrupting substrates and streamflow, and altered habitat components associated with the stream and riparian corridor and vegetation. Table 65 summarizes the potential impacts (positive and/or negative) to the PCEs by program area.

Table 65. LC Spinedace critical habitat potentially impacted by program area

Program Area	Affected PCEs (by number) and Principle Mechanism
Wildland Fire Management	1 and 2 (changes to water quality and turbidity, increased sedimentation, reduced fire risk, improved FRCCs)
Ecosystem/Vegetation Health (Forest Products)	1, 2, and 3 (increased sedimentation, improved PNVTs and FRCCs, reduced fire risk)
Rangeland Management	1, 2, and 3 (increased sedimentation and impacts to water quality)
Watershed and Soil Management (Riparian Areas)	1, 2, and 3 (improvements to watersheds and hydrologic functions and conditions)

Engineering	1 and 3 (altered rates of sedimetntation and impacts to water quality)
Lands and Minerals (Special Uses)	1, 2, and 3 (impacts to water quality and quantity)
Recreation and Wilderness	1 and 3 (impacts to water qualtiy and habitat conditions)
Wildlife, Fish, and Rare Plants	1, 2, and 3 (improvements to water quality and aquatic habitat conditions)

PCE 1 Clean permanently flowing water
Wildland Fire Management could increase sedimentation rates into streams from prescribed fire activities. Improvements in FRCCs could reduce risk associated with uncharacteristic fire that can introduce excessive amounts of sediment and ash into the stream. The Ecosystem/Vegetation Health program can improve ecosystem structure and function, and improve vegetation resiliency to disturbance by riparian PNVT treatments. Short-term impacts could result from mechanical treatments and associated ground disturbance, and these can impact water quality and sediment production. Rangeland Management can increase sediment production within the watershed, and increases in sedimentation can result from riparian area and stream channel impacts. The Watershed and Soils program could improve conditions by reducing sediment production through watershed restoration and improvement projects. These projects could have short-term impacts, especially those using mechanical equipment and adjacent to riparian areas. The Engineering Program could impact water quality by increasing sediment into streams from activities associated with roads management. Objectives to improve and close roads within riparian areas could reduce sediment into streams and improve water quality. Recreational activities along streams and within riparian areas can alter water quality and increase sedimentation by vegetation removal, soil compaction, and ground disturbance. The WFRP program through implementation of restoration projects could improve water quality by implementing restoration actions, although potential short-term impacts may also occur.

PCE 2 Pools
Wildland Fire Management could increase sedimentation rates into streams, and subsequently pools needed by Spinedace. Improvements in FRCCs could reduce risk associated with uncharacteristic fire that can introduce excessive amounts of sediment and ash into the stream. The Ecosystem/Vegetation Health program can improve ecosystem structure and function, and improve vegetation resiliency to disturbance by riparian PNVT treatments. Short-term impacts could result from mechanical treatments and associated ground disturbance. Rangeland Management could reduce pool quality through increases in sedimentation. The Watershed and Soils program could improve pool quality by reducing sediment production through watershed restoration and improvement projects. These projects could have short-term impacts, especially those using mechanical equipment and adjacent to riparian areas. The Engineering Program could increase sediment into streams from activities associated with roads management. Objectives to improve and close roads within riparian areas could reduce sediment into streams and improve pool quality. The WFRP program through implementation of restoration projects could improve pools and riparian vegetation, although potential short-term impacts may also occur.

PCE 3 Fine gravel or silt-mud substrates
Wildland Fire Management could increase sedimentation rates into streams from prescribed fire activities. Improvements in FRCCs could reduce risk associated with uncharacteristic fire that can introduce excessive amounts of sediment and ash into the stream. The Ecosystem/Vegetation Health program can improve ecosystem structure and function, and improve vegetation resiliency to disturbance by riparian PNVT treatments. Short-term impacts could result from mechanical treatments and associated ground disturbance, and these can impact water quality and sediment production. Rangeland Management can

increase sediment production within the watershed, and increases in sedimentation can result from riparian area and stream channel impacts. The Watershed and Soils program could improve conditions by reducing sediment production through watershed restoration and improvement projects. These projects could have short-term impacts, especially those using mechanical equipment and adjacent to riparian areas. The Engineering Program could impact water quality by increasing sediment into streams from activities associated with roads management. Objectives to improve and close roads within riparian areas could reduce sediment into streams and improve water quality. Recreational activities along streams and within riparian areas can alter water quality and increase sedimentation by vegetation removal, soil compaction, and ground disturbance. The WFRP program through implementation of restoration projects could improve water quality by implementing restoration actions, although potential short-term impacts may also occur.

The direction and plan components within the LMP for the Wildland Fire Management, Ecosystem/Vegetation Health, Rangeland Management, Watershed and Soils Management, Engineering, Lands and Minerals, Recreation and Wilderness, and WFRP programs are not sufficient to avoid certain activities that may adversely impact critical habitat. The potential effects from most programs can be minimized by standards and guidelines, especially those within the Watershed and Soils Management and the WFRP programs. While the potential impacts would be reduced by the standards and guidelines, they may not be completely constrained through implementation of the LMP. Although LMP implementation could potentially impact all the PCEs for critical habitat, it is not believed that these impacts would occur at a level that would preclude any of the PCEs from functioning in their role for the conservation of the species.

Based on the information above, it has been determined that implementation of the LMP **may affect**, and is **likely to adversely affect** Spinedace and its designated critical habitat. While most desired conditions and objectives have the potential to result in beneficial effects, several activities under several programs could result in adverse effects to the Spinedace. Most program areas contain guidance (e.g., standards and guidelines) that are designed to reduce and minimize the extent and duration of any potential short and long term negative effects; however, implementation of the LMP (i.e., all plan components and decisions) does not provide for the mitigation of all potential effects to a level that can be equated to or considered as insignificant and/or discountable.

Loach Minnow *Tiaroga cobitis*

Endangered Species Act Status:	Endangered, 2012
District Occurrence:	Alpine, Clifton, and Springerville
Recovery Plan:	1991
Critical Habitat:	Designated 2012
Determination of Effect (Species):	May Affect, Likely to Adversely Affect
Determination of Effect (Critical Habitat):	May Affect, Likely to Adversely Affect

Natural History, Distribution, and Status of the Species Range-wide

Information relative to the life history, distribution, status of the species range-wide and listing factors are located on the FWS website http://www.fws.gov/southwest/Loach.htm. The literature cited within the recovery plan (FWS 1991), contains a thorough list of references for this species. This literature, along with the more recently completed final rule for the endangered status and designation of critical habitat for spikedace and loach minnow (FWS 2012), were considered and used in the preparation of this document; and are incorporated by reference into this document.

Status and Threats within the Action Area

The loach minnow is currently listed as an endangered species. In 2012 a final rule was published to change the status to endangered and designate critical habitat for both spikedace and loach minnow. Both historic and present landscapes surrounding loach minnow habitats have been impacted to varying degrees by domestic livestock grazing, mining, agriculture, timber harvest, recreation, development, or impoundments. These activities degrade loach minnow habitats by altering flow regimes, increasing watershed and channel erosion and, thus, sedimentation, and adding contaminants to streams and rivers. As a result, these activities may affect loach minnow through mortality, interference with reproduction, and reduction of invertebrate food supplies.

Within the ASNFs, loach minnow has been known to occur in the Three Forks area of the East Fork Black River; throughout the Blue River, lower Campbell Blue Creek, Eagle Creek, and the San Francisco River. All the populations listed above are experiencing low abundance and can be attributed to many factors. Recent surveys (present to last 25 years) have not documented the presence of this species within the East Fork Black River, Eagle Creek, or the San Francisco River populations; and it is likely that these populations may no longer occur on the ASNFs, or occur in numbers that are too low to detect. Recent surveys on the Blue River have documented the continued presence of this species in this system, and this population is likely more stable than the others on the ASNFs; although it has recently been impacted by the Wallow Fire. Planning is currently underway for the construction of an artificial barrier on the lower portion of the West Fork of the Black River; which could potentially provide for the introduction of loach minnow above, although potential habitat may be limited. This introduction could occur as early as 2017.

Approximately 110 miles of critical habitat was designated for loach minnow in the Blue River (45.3 miles), Campbell Blue Creek (6 miles), Little Blue Creek (3.1 miles), Eagle Creek (12.1 miles), East Fork Black River (11.9 miles), North Fork East Fork Black River (4.4 miles), Boneyard Creek (1.4 miles), Coyote Creek (2.1 miles), and the San Francisco River (23.7 miles) within the ASNFs.

The Loach Minnow Recovery Plan was completed in September 1991; and identified dams, water diversion, watershed deterioration, channelization, and introduction of non-native predatory and competitive fishes as major threats to the species. A "5-Year Review: Summary and Evaluation" was recently completed by the USFWS in August 2012; it identified prolonged drought, anticipated effects of climate change, and the increasing abundance and expanding range of competitive and predatory nonnative fishes as increasing the threat of extinction for the species.

Primary Constituent Elements of Critical Habitat

The current critical habitat was designated and the primary constituent elements for loach minnow were finalized in the 2012 final rule (FWS 2012). The final rule identified the known physical and biological features (primary constituent elements) essential to the conservation of the loach minnow; and the primary constituent elements essential to the conservation of the loach minnow are:

1. Habitat to support all egg, larval, juvenile, and adult loach minnow which includes: a) Perennial flows with a steam depth of generally less than 1 m (3.3 ft.), and with slow to swift flow velocities between 0 and 80 cm per second (0.0 and 31.5 in. per second); (b) Appropriate microhabitat types including pools, runs, riffles, and rapids over sand, gravel, cobble, and rubble substrates with low or moderate amounts of fine sediment and substrate embeddedness; (c) Appropriate stream habitats with a low stream gradient of less than 2.5 percent and are at elevations below 2500 m (8,202 ft.); and (d) Water temperatures in the general range of 8.0 to 25.0 °C (46.4 to 77 °F).
2. An abundant aquatic insect food base consisting of mayflies, true flies, black flies, caddisflies, stoneflies, and dragonflies.

3. Streams with no or no more than low levels of pollutants.
4. Perennial flows, or interrupted stream courses that are periodically dewatered but that serve as connective corridors between occupied or seasonally occupied habitat and through which the species may move when the habitat is wetted.
5. No nonnative aquatic species or levels of nonnative aquatic species that are sufficiently low to allow persistence of loach minnow.
6. Streams with a natural, unregulated flow regime that allows for periodic flooding or, if flows are modified or regulated, a flow regime that allows for adequate river functions, such as flows capable of transporting sediments.

Designated critical habitat for the loach minnow within and/or downstream of the ASNFs from the final rule includes:

Salt River Subbasin

East Fork Black River. Approximately 11.9 miles from the confluence with the West Fork Black River upstream to the confluence with an unnamed tributary approximately 0.51 miles downstream of the Boneyard Creek confluence .

North Fork East Fork Black River. Approximately 4.4 miles of the North Fork East Fork Black River extending from the confluence with East Fork Black River upstream to the confluence with an unnamed tributary.

Boneyard Creek. Approximately 1.4 miles extending from the confluence with the East Fork Black River upstream to the confluence with an unnamed tributary.

Coyote Creek. Approximately 2.1 miles from the confluence with East Fork Black River upstream to an unnamed tributary.

Eagle Creek Subbasin

Eagle Creek. Approximately 16.5 miles from the Freeport McMoRan diversion dam upstream to the confluence of East Eagle Creek.

San Francisco River Subbasin

San Francisco River. Approximately 117.7 miles of the San Francisco River extending from the confluence with the Gila River in upstream to the confluence with the Tularosa River in New Mexico.

Blue River Subbasin

Blue River. Approximately 50.6 miles from the confluence with the San Francisco River upstream to the confluence of Campbell Blue and Dry Blue creeks.

Campbell Blue Creek. Approximately 7.7 miles from the confluence of Dry Blue and Campbell Blue Creeks to the confluence with Coleman Canyon.

Little Blue Creek. Approximately 3.1 miles from the confluence with the Blue River upstream to the mouth of a unnamed canyon.

Pace Creek. Approximately 0.8 miles from the confluence with Dry Blue Creek upstream to a barrier falls.

Dry Blue Creek. Approximately 3.0 miles from the confluence with Campbell Blue Creek upstream to the confluence with Pace Creek.

The Final Rule also identifies special management considerations that may be required for the different essential features of critical habitat. For the East Fork Black River population (Salt River subbasin) essential features of critical habitat may require special management or protection from the residual effects of past livestock grazing and impacts to uplands, riparian vegetation, and the stream; and competition with and predation by nonnative aquatic species. For Eagle Creek essential features may require special management considerations or protection due to competition with and predation by nonnative aquatic species; residual effects of past livestock grazing and impacts to uplands, riparian vegetation, and the stream; mining activities in the uplands; moderate to severe drought; road construction

and maintenance within and adjacent to the stream channel, and the indirect effect of wildfires that have occurred in the watershed since 2007. For the San Francisco River essential features may require special management considerations or protection due to residual impacts from past livestock grazing and impacts to uplands, riparian vegetation, and the stream; water diversions; competition with and predation by nonnative aquatic species; road construction and maintenance; channelization, and moderate drought. Essential features in the Blue River subbasin may require special management considerations or protection due to residual impacts of past livestock grazing and impacts to uplands, riparian vegetation, and the stream; moderate to severe drought; and competition with and predation by nonnative aquatic species. Campbell Blue Creek and portions of the Blue River watersheds were burned during the Wallow Fire in 2011, and increased ash and sedimentation within the active stream may be ongoing issues in these streams.

Species and Habitat Effects

For discussion and analysis purposes, the species have been grouped into watersheds. These watersheds were determined by the lowermost point of critical habitat, and include all the contiguous streams and uplands that drain into critical habitat. These populations are referred to by the name of the lowermost (highest stream order) stream within the watershed; for the loach minnow there are three watersheds considered here: Eagle Creek, East Fork Black River, and the San Francisco River. These three watersheds may not always be consistent with the various Hydrologic Unit Code boundaries, as the lowermost point within the drainage area can be determined by several factors (e.g., the downstream end of critical habitat, the ASNFs boundary). Given that all of the habitat occupied by and/or being managed for the loach minnow is contained within designated critical habitat, impacts and potential effects associated with implementation of the LMP apply equally to the species and/or its critical habitat, as they are synonymous. If the potential future introduction of loach minnow into the West Fork Black River were to occur, this stream is currently not designated critical habitat.

Wildfire Management Program

Both fire and mechanical treatments would be used to move vegetation toward desired conditions. These treatments are used to change the character of the vegetation that would result in lower risk of uncharacteristic fire and a return of wildfire to a more natural role. The desired condition is to move toward or maintain vegetation conditions in Fire Regime Condition Class (FRCC) 1. FRCC) is a metric that quantifies how departed a system is from historical conditions in relation to fire, the role fire historically played in the that system, and the vegetative structure. Under the LMP, annually approximately 48,500 acres would be treated across all of the PNVTs; and approximately 60% (28900 acres) would be treated by fire, and approximately 40% (19600 acres) would be treated mechanically. The current conditions for FRCC on the ASNFs are 14% FRCC 1, 14% FRCC 2, and 72% FRCC 3. Under the LMP, the FRCC conditions on the ASNFs after 15 years will improve to 24% FRCC 1, 41% FRCC 2, and 35% to FRCC 3.

Table 66 displays the percent for the three FRCCs by watersheds. Only one (Eagle Creek) of the watersheds has a significant (20%) portion of the watershed in FRCC 1, and the other two have very low amounts. FRCC is a measure of the difference in structure between current and reference conditions. Low (FRCC 1) is considered to be within the natural (historical) range of variability, while moderate (FRCC 2) and high (FRCC 3) departures are outside historical range. Vegetation in FRCC 1 is more resilient and resistant and less likely to lose key ecosystem components (e.g., native species, large trees, soil) after a disturbance, and fire behavior and other associated disturbances are similar to those that occurred prior to the exclusion of fire. It is expected that through implementation of the LMP the acres of FRCC 1 and FRCC 2 will increase, and the acres of FRCC 3 will decrease within the loach minnow watersheds.

Table 66. Fire Regime Condition Class (FRCC) for Loach Minnow watersheds

Watershed	FRCC 1 (% area)	FRCC 1 (acres)	FRCC 2 (% area)	FRCC 2 (acres)	FRCC 3 (% area)	FRCC 3 (acres)
San Francisco River	7.4	36,517	5.8	28,700	86.8	429,713
Eagle Creek	19.6	31,005	1.1	1,757	79.3	125,406
East Fork Black River	0	0	54.5	38,943	44.4	31,753

Indirect impacts associated with fire and flooding have been identified as threats to the loach minnow. Over the last 75+ years, alterations to vegetation (e.g., livestock grazing and timber harvest activities), along with the suppression of wildfire has resulted in the disruption of the ecological role of fire in maintaining ecosystems. This has resulted in uncharacteristic impacts from wildfire on watersheds and aquatic habitat and species. Table 67 displays the burn severity impacts associated with the Wallow Fire that occurred in 2011. Most of the impacts occurred within the East Fork Black River watershed and critical habitat, with very minor impacts to Eagle Creek and the San Francisco River.

Table 67. Wallow Fire Burn Severity (%) within Loach Minnow watersheds and critical habitat

	Watershed				Critical Habitat (200 m corridor)			
	High	Moderate	Low	Total	High	Moderate	Low	Total
San Francisco River	2.8%	3.5%	10.3%	16.7%	0.8%	1.0%	4.6%	6.5%
Eagle Creek	0.6%	0.6%	2.8%	4.0%	No acres burned			
East Fork Black River	12.7%	12.4%	55.1%	80.2%	1.6%	7.3%	35.9%	44.9%

The ecological role that wildfire has played in maintaining ecosystem structure, function, and process has been altered over time. Past fire suppression and management activities on the ASNFs have resulted in landscape scale conditions that can result in uncharacteristic and sometimes severe impacts from wildfire. Table 68 displays the amount of impacts (acres and percent) to loach minnow watersheds that have occurred over the last 10 and 25 years. As can be seen from Table 68, almost all of the wildfire within loach minnow watersheds has occurred within the last ten years. This more recent (last ten years) higher level of wildfire activity has resulted from altered vegetation conditions, long-term drought, and the increased use of wildfire being managed for resource benefits. This increased level of wildfire activity is likely to continue until improvements occur in vegetative structure and function, and drought conditions improve.

Table 68. Fire acres (>100) within Loach Minnow watersheds (last 10 years and last 25 years)

	10 Years				25 Years			
Watershed	Acres Burned	Percent Burned	Acres Unburned	Percent Unburned	Acres Burned	Percent Burned	Acres Unburned	Percent Unburned
San Francisco River	172,259	34.8	355,718	71.9	185,084	37.4	346,111	69.9
Eagle Creek	39,374	24.9	126,025	79.7	41,464	26.2	126,018	79.7
East Fork Black River	77,478	*108.4	1,839	2.6	77,478	*108.4	1,839	2.6
*When the same acres have burned more than one time, the result can be more than 100% of the area burned.								

The Wildfire Management Program will be highly integrated with the vegetation (PNVT) treatments, resulting in improvements in both FRCC and PNVTs across the ASNFs. Three desired conditions (DC 41, 42, and 296) located under the "all PNVTs" section of the LMP relate to the Fire program. Desired condition 41 states, "Natural processes and human and natural disturbances (e.g., planned and unplanned

fire ignitions, mechanical vegetation treatments) provide desired overall tree density, structure, species composition, coarse woody debris, and nutrient cycling. Natural fire regimes are restored. Uncharacteristic fire behavior is minimal or absent on the landscape." Desired condition 42 states, "Fire (prescribed fire and use of wildland fire) maintains and enhances resources and, as nearly as possible, is allowed to function in its natural ecological role." Desired condition 296 states, "Wildland fires burn within the range of frequency and intensity of natural fire regimes. Uncharacteristic high-severity fires rarely occur and do not burn at the landscape scale." Collectively these desired conditions could potentially result in long term improvements for the loach minnow (e.g., watershed and hydrologic conditions, water quality, riparian and aquatic habitat conditions) and its critical habitat (PCEs 1, 2, 3, and 4).

The greatest improvements in FRCC conditions will occur within the Dry Mixed Conifer Forest, Madrean Pine-Oak Woodland, and the Great Basin Grassland PNVT types. For the San Francisco River drainage area these PNVTs comprise approximately 78% of the total area, and for the Eagle Creek drainage area they comprise approximately 73%. The East Fork Black River watershed has 31% of its area covered by Dry Mixed Conifer Forest. Therefore, potential improvements in FRCC and PNVT conditions are most likely to occur within the San Francisco and Eagle Creek populations of loach minnow, and to a lesser extent within the East Fork Black River watershed.

While the management of prescribed fire has the potential to have long term beneficial impacts through restoration of vegetation conditions and natural fire regimes, short term impacts associated with project implementation could result. Activities associated with fire can impact loach minnows by altering water quality and increasing sedimentation into streams, resulting in altered habitat conditions and reduced food resources and abundance. While there are no specific Wildland Fire Management program standards or guidelines specific to loach minnow, a guideline (23) under the all PNVTs section of the LMP states, "Landscape scale restoration projects should be designed to spread out treatments spatially and/or temporally to reduce implementation impacts and allow reestablishment of vegetation and soil cover." This guideline could help reduce or minimize short term impacts that may result from prescribed fire activities.

Wildland fire has been identified as a threat to the loach minnow, and has impacted all the watersheds, especially over the last ten years. Potential long term improvements in loach minnow habitat that may result by moving towards desired conditions, especially improvements in FRCC and PNVTs, will likely contribute to recovery and restoration of the watersheds and critical habitats of the loach minnow on the ASNFs, while reducing potential impacts from uncharacteristic fire and the associated increases in ash and sedimentation. Short term project implementation impacts are likely to occur associated with implementation of the fire program; however, their duration and extent can be minimized through guidelines and project specific mitigation measures. Although mitigation of impacts will occur, based on past actions and the limitations of potential mitigation measures and timing of activities; impacts from this program area may affect, and are likely to adversely affect both the loach minnow and its critical habitat.

Ecosystem/Vegetation Health and Forest Products

The LMP has recognized the need to address the maintenance and improvement of ecosystem health. Thirteen of the 14 PNVTs on the ASNFs vary (sometimes substantially) in structure, composition, function, and natural disturbance processes from desired conditions. All 14 PNVTs are key components in sustaining terrestrial and aquatic ecosystems and providing goods and services. The desired conditions for the PNVTs will result in resilient, functioning ecosystems; and in conjunction with the objectives, will guide future vegetation management activities, including burning and mechanical treatments, to maintain or move towards desired conditions. Table 69 displays the acres and percentage of each PNVT for each

of the loach minnow watersheds on the ASNFs. These data show how the PNVTs can vary considerably between the watersheds, and show the complexity of the watersheds and the potential difficulties in maintaining, improving, and restoring these areas for loach minnow recovery.

Table 69. PNVTs for Loach Minnow watersheds

	Cottonwood-Willow Riparian Forest	Dry Mixed Conifer Forest	Interior Chaparral	Madrean Pine-Oak Woodlands	Mixed Broadleaf Deciduous Riparian Forest	Montane Willow Riparian Forest	Montane/Subalpine Grasslands	Piñon-Juniper Woodland	Ponderosa Pine Forest	Semi-desert Grassland	Great Basin Grassland	Spruce-Fir Forest	Wet Mixed Conifer Forest	Wetland/Cienega Riparian Areas	Water
San Francisco River Total acres = 494,930															
Acres	3,419	19,021	26,923	295,112	6,411	224	374	3,182	47,760	67,595	--	4,273	19,874	759	--
Percent	0.70	3.80	5.40	59.60	1.30	0.05	0.08	0.60	9.70	13.70	--	0.90	4.00	0.20	--
Eagle Creek Total acres = 158,168 acres															
Acres	101	3,496	27,894	86,767	3,111	--	--	--	6,454	28,789	--	3	1,653	--	--
Percent	0.06	2.2	17.6	54.9	2.0	--	--	--	4.0	18.2	--	0.0	1.0	--	--
East Fork Black River Total acres = 71,460 acres															
Acres	--	22,086	--	--	--	341	19,521	--	9,326	--	--	4,273	15,491	3,931	764
Percent	--	30.9	--	--	--	0.5	27.3	--	13.1	--	--	0.9	21.7	5.5	1.1

There are ten desired conditions (see appendix A) and three objectives associated with this program area relevant to this analysis for loach minnow within the ecosystem health, PNVTs, and forest products sections of the LMP.

- OBJ 11 (All Forested PNVTs) Annually, treat 5,000 to 35,000 acres to reduce tree densities, restore natural fire regimes, promote species habitat and ecosystem health, reduce fire hazard, maintain desired conditions, initiate recovery from uncharacteristic disturbance, and provide forest products, leaving a desired mix of species with the range of desired densities that are resilient to changing climatic conditions.
- OBJ 13 (All Woodland PNVTs) Annually, treat or maintain 5,000 to 15,000 acres to promote a highly diverse structure.
- OBJ 14 (Grasslands) Decrease or maintain the woody canopy cover at less than 10 percent by treating up to 25,000 acres annually.

The vegetation (PNVTs) treatments will be integrated with both the Wildfire and Ecosystem/Vegetation Health programs, resulting in improvements in both PNVTs departure and FRCC conditions across the ASNFs. The desired conditions (1, 2, 3, 39, 40, 46, 48, and 61) located under the "overall ecosystem health" and "all PNVTs" sections of the LMP relate to this program and the watershed and landscape scale conditions for the loach minnow. The three objectives (11, 13, and 14) provide for a maximum total treatment level of 75,000 acres per year, which will improve the overall departure condition for the eight modeled PNVTs from their current rating of 64% (high departure) to 44% (moderate departure) over the

planning period. Collectively these desired conditions could potentially result in long term improvements for the loach minnow (e.g., watershed and hydrologic conditions, water quality, riparian and aquatic habitat conditions, risk of uncharacteristic fire) and their critical habitats (PCEs 2, 3, 4, and 6) on the ASNFs.

The greatest improvements in PNVT departure will occur within the Dry Mixed Conifer Forest, Madrean Pine-Oak Woodland, and the Great Basin Grassland PNVT types. For the San Francisco River watershed these PNVTs comprise approximately 87% of the total area, and for the Eagle Creek watershed they comprise approximately 79%. The East Fork Black River watershed only contains one of these PNVTs, and has 31% of its area covered by Dry Mixed Conifer Forest. Therefore, potential improvements in PNVT conditions are most likely to occur within the San Francisco and Eagle Creek watersheds, and to a lesser extent within The East Fork Black River. Restoring and maintaining PNVTs would likely improve the potential to retain or return the necessary ecological processes and patterns necessary to make these ecosystems sustainable, resilient, and healthy. Impacts to the uplands, streams, and riparian areas; along with potential and recent impacts associated with fire are threats to the loach minnow and their persistence on the ASNFs. The landscape and watershed scale restoration actions have the potential to reduce the current large scale threats; especially those associated with uncharacteristic fire, and improve both the upland and riparian conditions for the loach minnow and their designated critical habitat (PCEs 2, 3, and 4).

While the management of vegetation and PNVTs has the potential to have long term beneficial impacts through restoration of vegetation conditions and natural fire regimes; short term impacts associated with project implementation could result. Activities associated with prescribed fire can impact loach minnows by altering water quality and increasing sedimentation into steams, resulting in altered habitat conditions and reduce food sources and abundance. There are three objectives that provide for the use of forest products on an annual basis; 122,000 CCF from suitable timberlands for wood products, 94,000 CCF for firewood, and 5,000 permits for Christmas trees. Suitable timberlands are lands to be managed for timber production on a regulated basis. Suitable timber lands are likely to have greater impacts compared to other lands due to the greater emphasis on mechanical vegetation treatments and the associated infrastructure (e.g., roads, landings) and continued scheduled entries over time.

The San Francisco River and Eagle Creek drainage areas have very few acres of suitable timber lands; 0.2% and 5.8% respectively; while the East Fork of the Black River has 54% (see Table 70). Therefore, any potential impacts resulting from the management of suitable timber lands will likely occur primarily within the East Fork Black River watershed of the loach minnow.

Table 70. Treatment Type [suitable timber, nonsuitable timber, and fire only lands] acres by Loach Minnow watersheds

Watershed	Suitable Timber	Nonsuitable Timber	Fire Only
San Francisco River	27,340 acres (5.8%)	116,598 acres (23.6%)	350,993 acres (70.9%)
Eagle Creek	240 acres (0.2%)	73,477 acres (46.5%)	84,451 acres (53.4%)
East Fork Black River	38,566 acres (54%)	23,218 acres (32.5%)	9,676 acres (13.5%)

Activities associated with suitable/unsuitable timberland treatments can impact loach minnows by altering watershed, hydrologic, riparian, and aquatic habitat conditions; degrading water quality and increasing sedimentation into streams, and reducing food resources and abundance necessary for the loach minnow. There are two specific guidelines that address these potential impacts. Guideline (GL 23) under the all PNVTs section of the LMP states, "Landscape scale restoration projects should be designed to spread out treatments spatially and/or temporally to reduce implementation impacts and allow reestablishment of vegetation and soil cover." Guideline (GL 130) in the Forest Products section states, "Permits issued for

forest products should include stipulations to protect resources." These guidelines can minimize and reduce potential impacts resulting from treatments by reducing their intensity over space and time, although it is likely that some level of impacts will still occur.

Conditions of the uplands, riparian, and streams, along with indirect impacts form fire have been identified as threats to the loach minnow. Potential long term improvements in loach minnow habitat that may result by moving towards desired conditions, especially improvements in PNVTs and risk associated with fire; will likely contribute to recovery and restoration of the watersheds and critical habitats (PCEs 2, 3, and 4) of the loach minnow on the ASNFs, while reducing potential impacts from uncharacteristic fire and the associated increases in ash and sedimentation. Short term project implementation impacts are likely to occur associated with implementation of the vegetation treatment and forest products programs; however, their duration and extent can be minimized through guidelines and project specific mitigation measures. Although impacts may be reduced, short term impacts are likely to occur that cannot be considered insignificant or discountable. Therefore, this program area may affect, and is likely to adversely affect loach minnow and its critical habitat.

Rangeland Management

Program activities include administering livestock grazing consistent with NEPA decisions, ESA consultation requirements, and guidance in LMP. Additional program activities include implementation and effectiveness monitoring of individual allotments, development of structural and non-structural improvements to facilitate better livestock management and to improve wildlife habitat and watershed conditions, control of invasive weeds, and the authorization of grazing consistent with LMP through site specific allotment NEPA. The LMP determined that most of the ASNFs is suitable for livestock grazing. Suitability is the appropriateness of applying certain resource management practices to a particular area of land, in consideration of relevant social, economic, and ecological factors. Table 71 displays the livestock grazing suitability acres for each of the loach minnow watersheds and critical habitat.

Table 71. Livestock grazing suitability in Loach Minnow watersheds and critical habitats

	Watershed				Critical Habitat			
	Suitable (percent)	Suitable (acres)	Unsuitable (percent)	Unsuitable (acres)	Suitable (percent)	Suitable (acres)	Unsuitable (percent)	Unsuitable (acres)
San Francisco River	99.7	493,521	0.3	1,410	91	5,675	0.9	562
Eagle Creek	100	158,168	0	0	100	980	0	0
East Fork Black River	92.5	66,124	7.5	5,336	83.3	1,197	16.7	239

Most of the loach minnow watersheds and critical habitat have been determined to be suitable for livestock grazing. While a determination of suitability does not necessarily result in livestock grazing on that area, current management provides for livestock grazing across most of the ASNFs. Livestock grazing can impact watersheds and hydrologic conditions by altering vegetation and ground cover, soil compaction, and water quality. Current range condition on the ASNFs is reflective of past and ongoing grazing activities, and landscape scale conditions have not changed significantly since the 1980s. Table 72 displays the current range conditions for each of the loach minnow watersheds and their critical habitat, with most of the acres falling in good, fair, and poor range condition.

Table 72. Range Condition in Loach Minnow watersheds and critical habitat

	Watershed		Critical Habitat	
Range Condition	**Acres**	**Percent**	**Acres**	**Percent**
San Francisco River				
Excellent	--	--	--	--
Good	23,552	5.1	960	18
Fair	81,856	17.6	679	12.8
Poor	128,445	27.5	1,602	30.1
Very Poor	9,472	2.0	133	2.5
No capacity	222,919	47.8	1,947	33.6
Eagle Creek				
Excellent	--	--	--	--
Good	4,611	2.9	--	--
Fair	52,140	33.0	289	29.7
Poor	58,101	36.8	525	54
Very Poor	223	0.1	--	--
No capacity	42,885	27.1	159	16.3
East Fork Black River				
Excellent	5	0	--	--
Good	14,422	20.4	29	2
Fair	15,303	21.6	82	5.7
Poor	24,876	35.2	325	22.6
Very Poor	214	0.3	--	--
No capacity	15,866	22.4	1,001	69.7

Given the long history of domestic livestock grazing activities on the ASNFs, considerable amounts of infrastructure have been developed through site specific management. The most common types of range developments associated with livestock grazing activities include fencing, water developments, and corrals. These range developments can impact watersheds, riparian areas, and aquatic habitats. Fencing can result in the concentration of grazing animals, impacting vegetation, soils, and aquatic habitat where this occurs. Pit tanks occur on drainages and can alter hydrologic conditions, and can act as vectors (along with livestock) for the movement and introduction of invasive or undesirable species. Corrals are often located adjacent to streams and springs, and impacts to water quality and vegetation can result from the concentrated use in these areas. Table 73 displays the primary range developments within the loach minnow watersheds and critical habitat; and while these developments can help to disperse impacts across livestock grazing allotments, higher levels of these developments are likely to result in greater risks to the loach minnow from livestock grazing actions.

Table 73. Constructed Features in Loach Minnow watersheds and critical habitat

Watershed	Feature	Watershed Total	Critical Habitat (200 m corridor)
San Francisco River	Corral (points)	130	1
San Francisco River	Pit Tank (points)	329	--
San Francisco River	Constructed Fence (miles)	596.7	23
Eagle Creek	Corral (points)	52	2
Eagle Creek	Pit Tank (points)	160	--
Eagle Creek	Constructed Fence (miles)	285.1	11.0
East Fork Black River	Corral (points)	2	--
East Fork Black River	Pit Tank (points)	128	--
East Fork Black River	Constructed Fence (miles)	129.4	1.3

While there are no relevant desired conditions associated with the livestock grazing and invasive species, there are two objectives associated with the invasive species program that are relevant to the loach minnow. These two objectives (OBJ 16 and OBJ 17) propose to annually "contain, control, or eradicate invasive species (e.g., musk thistle, Dalmatian toadflax) on 500 to 3,500 acres", and "control or eradicate invasive species (e.g., tamarisk, bullfrogs) on at least 2 stream miles." Invasive and nonnative species have been identified as threats to the loach minnow; and these two objectives could potentially improve both the riparian and aquatic habitat for the loach minnow by restoring vegetation and aquatic species composition to historical conditions, or to levels that are low enough to allow for the persistence of loach minnow (PCEs 1 and 5).

While the invasive species program has the potential to have some long term benefits to loach minnow and their habitat (i.e., tamarisk removal on the Blue River in 2012), the possibility exists for impacts to loach minnow through implementation of this program and the livestock grazing program. One standard and seven guidelines have been included in the LMP that may address potential impacts to loach minnow.

- ST 4 Vegetation treatments shall include measures to reduce the potential for introduction of invasive plants and animals and damage from nonnative insects and diseases.

- GL 32 Active grazing allotments should be managed to maintain or improve to desired riparian conditions.
- GL 78 Projects and activities should not transfer water between drainages or between unconnected water bodies within the same drainage to avoid spreading disease and aquatic invasive species.
- GL 79 Project areas should be monitored to ensure there is no introduction or spread of invasive species.
  GL 81 Pesticide use should minimize impacts on nontarget plants and animals.
- GL 134 New livestock troughs, tanks, and holding facilities should be located out of riparian areas to limit concentration of livestock in these areas. Existing facilities in riparian areas should be modified, relocated, or removed where their presence is determined to inhibit movement toward desired riparian or aquatic conditions.
- GL 138 To minimize potential resource impacts from livestock, salt or nutritional supplements should not be placed within a quarter of a mile of any riparian area or water source. Salt or nutritional supplements should also be located to minimize herbivory impacts to aspen clones.
- GL 139 To prevent resource damage (e.g., streambanks) and disturbance to federally listed and sensitive wildlife species, trailing of livestock should not occur along riparian areas. Where no alternative route is available, approval may be granted where effective mitigation measures are implemented (e.g., timing of trailing, number of livestock trailed at one time).

While the invasive species program has the potential to have long term benefits and impacts through restoration of vegetation conditions, riparian areas, and aquatic habitats; activities associated with the livestock grazing program can impact loach minnows by degrading upland and watershed conditions and function, altering riparian vegetation and function, and reducing water quality and increasing sedimentation into streams. The standards and guidelines listed above may reduce potential impacts; but given that the majority of the watersheds are suitable for livestock grazing, have range conditions that are fair and poor, and have considerable amounts of infrastructure (e.g., fences and tanks); it is reasonable to conclude that implementation of the LMP will result in impacts to the loach minnow and their critical habitat (PCEs 1, 2, and 3). Given past actions, and the inherent limitations relative to minimizing impacts from livestock grazing activities, it is not reasonable to conclude impacts associated with this program area will be insignificant or discountable. Therefore, this program area may affect and is likely to adversely affect the loach minnow and its critical habitat.

Watershed and Soil Management

The Watershed and Soil Management program seeks to maintain or improve watershed conditions and maintain good water quality. It is cross-program in orientation in that it seeks to mitigate impacts from other program activities as well. The guidance for the Watershed and Soil Management program can be used to fill in the gaps for other programs with inadequate guidance. Abundant guidance is provided in the LMP to assist the LMP in minimizing or reducing potential impacts to the loach minnow. There are a total of 15 desired conditions (see appendix A) and six objectives associated with this program area with relevance for this analysis.

- OBJ 1 During the planning period, improve the condition class on at least 10 priority 6th level HUC watersheds by removing or mitigating degrading factors.
- OBJ 2 Annually, enhance or restore an average of 350 acres within priority 6th level HUC watersheds, including treating the causes of State designated impaired or threatened waters (Arizona Department of Environmental Quality, 2012) to improve watershed condition and water quality.
- OBJ 6 Annually, restore 200 to 500 acres toward desired composition, structure, and function of streams, floodplains, and riparian vegetation.
- OBJ 9 Within the planning period, enhance or restore 5 to 25 wet meadows or cienegas to proper hydrologic function and native plant and animal species composition.
- OBJ 10 Annually, work with partners to reduce animal damage to native willows and other riparian species on an average of 5 miles of riparian habitat.
- OBJ 38 Annually, prepare at least one instream flow water rights application until water acquisition needs are complete to sustain riparian areas, fish, wildlife, and water-based recreation.

The watershed and riparian desired conditions, objectives, and treatments will likely be integrated with the Wildfire and Ecosystem/Vegetation Health, and WFRP programs; potentially resulting in improvements in watershed condition and function, and riparian conditions across the ASNFs. The desired conditions (9, 12, 15, 21, 22, 67-72, 74, 77, 80, and 84) located under the "watershed" and "riparian areas" sections of the LMP relate to this program and the watershed and landscape scale conditions for the loach minnow. The six objectives (1, 2, 6, 9, 10, and 38) provide for a treatment level of approximately 1,000 - 10,000 acres per year, which will improve the overall conditions for the six code watersheds and riparian areas receiving treatments. Collectively these desired conditions and objectives could potentially result in long term improvements for the loach minnow (e.g., watershed and hydrologic conditions, water quality, riparian and aquatic habitat conditions, soils) and their critical habitats (PCEs 2, 3, and 4).

Restoring and maintaining watersheds and riparian areas would likely improve the potential to retain or return the necessary ecological processes and functions necessary to make these ecosystems sustainable, resilient, and healthy. Alterations to the uplands, streams, and riparian areas; along with potential and recent impacts associated with fire are threats to the loach minnow and their persistence on the ASNFs. The landscape and watershed scale restoration actions have the potential to reduce the current threats; especially those associated with watershed and hydrologic conditions, and improve both the upland (soils) and riparian conditions for the loach minnow and their designated critical habitat (PCEs 2, 3, and 4).

While the management of watersheds and riparian areas has the potential to have long term beneficial impacts through restoration of hydrologic conditions and functions; short term impacts associated with project implementation could result, especially those associated with the use of mechanical treatments. There are six specific guidelines that address these potential impacts.

- GL 2 Projects with ground-disturbing activities should be designed to minimize long and short term impacts to soil resources. Where disturbance cannot be avoided, project specific soil and water conservation practices should be developed.
- GL 6 Projects with ground-disturbing activities should be designed to minimize long and short term impacts to water resources. Where disturbance cannot be avoided, project specific soil and water conservation practices and BMPs should be developed.
- GL 30 Ground-disturbing projects (including prescribed fire) which may degrade long term riparian conditions should be avoided.
- GL 33 Storage of fuels and other toxicants should be located outside of riparian areas to prevent spills that could impair water quality or harm aquatic species.
- GL 34 Equipment should be fueled or serviced outside of riparian areas to prevent spills that could impair water quality or harm aquatic species.
- GL 35 Construction or maintenance equipment service areas should be located and treated to prevent gas, oil, or other contaminants from washing or leaching into streams.

Alterations to watersheds, riparian areas, and streams have been identified as threats to the loach minnow, and have occurred within all the watersheds on the ASNFs. Potential long term improvements in loach minnow habitat that may result by moving towards desired conditions, especially improvements in watersheds and risk associated with degraded riparian areas; will likely contribute to recovery and restoration of the watersheds and critical habitats of the loach minnow on the ASNFs, while reducing potential impacts from uncharacteristic watershed and hydrologic conditions. Short term project implementation impacts are likely to occur associated with project implementation; however, their duration and extent can be minimized through guidelines and project specific mitigation measures and best management practices. Potential short term impacts primarily include increases in sedimentation, soil compaction, alterations in hydrologic conditions and functions, and changes in water quality. Mitigation measures are implemented at the project level, and site specific conditions and project activities and timing will determine their efficacy. Although most projects could be mitigated, it is likely over the planning period that some projects will result in impacts that could not be considered at the level of insignificant or discountable. Therefore this program area may affect, and is likely to adversely affect loach minnow and its critical habitat.

Engineering Program

The motorized transportation system is comprised of 765 miles of roads open only to highway legal vehicles (maintenance level 3 through 5), 2,067 miles of roads open to all motorized vehicles (maintenance level 2), 3,372 miles of roads closed to all motorized vehicles (maintenance level 1), and 156 miles of trails open to motorized vehicles less than 50 inches wide. The LMP includes plan objectives to annually maintain 20% of passenger vehicle roads, 10% of high clearance roads, and 20% of both motorized and nonmotorized trails. Road crossing information for the loach minnow watersheds and critical habitats are presented below in Table 74. Although the various types of crossings (e.g., culverts, bridges) cannot be accurately determined at the watershed scale, most of the crossings across the ASNFs are culverts. Route miles and densities were also calculated for the three loach minnow watersheds (Table 75). This information is separated by closed, open, and non-motorized routes; and represents the most recent data from the Forest Transportation Atlas, which does not include unauthorized routes.

Table 74. Route (motorized and nonmotorized) Crossings in Loach Minnow Watersheds and critical habitat

Watershed Total		Critical Habitat	
San Francisco River	1591	San Francisco River	184
Eagle Creek	573	Eagle Creek	15
East Fork Black River	298	East Fork Black River	44

Table 75. Route Miles and Densities for Closed (decommissioned and ML1) and Open (ML 2-5 and motorized trails) and Nonmotorized for the Loach Minnow

		Watershed Total		Critical Habitat	
Watershed	**Route Type**	**Route Miles**	**Density (miles / square mile)**	**Route Miles**	**Density (miles / square mile)**
San Francisco River	Closed	199.1	0.26	1.2	0.12
San Francisco River	Open	269.5	0.35	25.4	2.6
San Francisco River	Non-motorized	398.1	0.52	18.2	1.9
San Francisco River	**Total**	**866.9**	**1.1**	**44.7**	**4.6**
Eagle Creek	Closed	19.9	0.08	0.27	0.08
Eagle Creek	Open	140.3	0.57	4.0	1.7
Eagle Creek	Non-motorized	133.5	0.54	13.4	5.6
Eagle Creek	**Total**	**293.7**	**1.2**	**17.6**	**7.4**
East Fork Black River	Closed	216	1.9	0.63	0.28
East Fork Black River	Open	144.9	1.3	8.22	3.7
East Fork Black River	Non-motorized	12.8	0.1	5.49	2.4
East Fork Black River	**Total**	**373.7**	**3.3**	**14.3**	**6.4**

While there are no relevant desired conditions for the Engineering program; there are two objectives within the riparian section of the LMP that relate to roads.

- OBJ 7 Within the planning period, relocate, repair, improve, or decommission a minimum of 4 miles of National Forest System roads or trails that add sediment to streams, damage riparian vegetation, erode streambanks, cause gullies, and/or compact floodplain soils.
- OBJ 8 Annually, remove an average of 2 miles of unauthorized roads or trails that sediment to streams, damage riparian vegetation, erode streambanks, cause gullies, and/or impact floodplain soils.

These two objectives could potentially result in long term improvements for the loach minnow and their critical habitats by reducing sedimentation associated with degraded and/or unauthorized roads and trails. Restoring and rehabilitating these sites could potentially improve water quality, habitat conditions, and the macroinvertebrate food base needed by the loach minnow. All watersheds could potentially benefit from implementation of these objectives, as road and trail densities within critical habitat for this species are relatively high, especially in Eagle Creek and the East Fork Black River; and major roads occur within or adjacent to most of the critical habitat for this species in Eagle Creek, and this accounts for the high route density (7.4 miles/square mile) within critical habitat in Eagle Creek. Roads and trails occurring within the floodplain can have substantial impacts to the functioning of riparian areas and vegetation, sedimentation inputs into the stream, and negative impacts to water quality, and the loss of aquatic habitats.

Roads and road construction and maintenance can result in the destruction and alteration of riparian and aquatic habitat, increases in sedimentation, and water quality degradation. Roads can also act as modes of transport for disease transmission and invasive species introduction from one site to another, especially where low water crossings exist. The engineering program contains one standard and one guideline that may help minimize some impacts to loach minnow habitat. The standard (ST 18) states, "Road maintenance and construction activities shall be designed to reduce sediment (e.g., water bars, sediment traps, grade dips) while first providing for user safety." The guideline (GL 103) states, "Roads and motorized trails removed from the transportation network should be treated in order to avoid future risk to

hydrologic function and aquatic habitat." The water resources section of the LMP also has a guideline (GL 8) that specifies that "streamside management zones should be in place between streams and disturbed areas and/or road locations to maintain water quality and suitable stream temperatures for aquatic species." These standards and guidelines, combined with the objectives to reduce impacts from roads, could potentially improve critical habitat conditions (PCEs 1, 2, and 3) for the loach minnow for the long term by primarily reducing sedimentation and improving water quality.

Erosion from roads has been identified as a threat to loach minnow, and roads have impacted all the watersheds on the ASNFs. Roads crossing and adjacent to streams can remove and alter riparian vegetation, impact stream channel function and structure, and alter and degrade aquatic habitat through changes in water quality and increases in sedimentation. Potential long term improvements in loach minnow habitat may result by reducing road densities and impacts within riparian areas; and have the potential to contribute to recovery and restoration of the watersheds, riparian areas, and critical habitats of the loach minnow on the ASNFs. Short term project implementation impacts are likely to occur associated with implementation of the engineering/roads program; however, their duration and extent can be minimized through standards, guidelines, and project specific mitigation measures. Although there are standards and guidelines that potentially limit impacts from roads, motorized trails, and other projects; it is not likely that all the potential negative effects such as increased runoff and sedimentation, could be eliminated to the extent they could be considered insignificant or discountable. Therefore, this program area may affect and is likely to adversely affect loach minnow and its critical habitat.

Lands and Minerals Program

In 2011, there were 454 existing rights-of-way and special use permits for a variety of uses on the ASNFs. A majority of these are categorized as lands permits (381) versus recreation permits (73). It is likely that many special use permits and authorizations are located within the watersheds and critical habitats of the loach minnow on the ASNFs, although how they potentially impact loach minnow and their habitat is not specifically known. There are 16 lands special use permits for reservoirs/dams, 10 for irrigation ditches, 15 for water conveyance, and 36 for water transmission. These uses do present considerable threats to maintaining, restoring and recovering the loach minnow and its habitat. Reservoirs/dams currently only impact the East Fork Black River population, while water diversions and uses are likely impacting the San Francisco River and Eagle Creek populations; primarily associated with private land inholdings and parcels on the Blue River and Eagle Creek, although some may originate on the ASNFs.

While special use permits have the potential to have some long term benefits to loach minnow and their habitat (i.e., recently completed Blue River barrier); the possibility exists for impacts to loach minnow through implementation of the lands and special uses programs. One standard and one guideline have been included in the LMP to address potential impacts to loach minnow within the "water uses" and "minerals and geology" sections. The standard (31) under the waters uses section states, "Special uses for water diversions shall maintain fish, wildlife, and aesthetic values and otherwise protect the environment." The guideline (146) within the "water uses" section of the LMP states, "Streambed and floodplain alteration or removal of material should not occur if it prevents attainment of riparian, channel morphology, or streambank desired conditions." Although these two plan components may minimize and reduce potential impacts, the possibility exists for effects to the loach minnow through the implementation of the proposed plan for these programs. It cannot be concluded that effects will reduced to the level where they can be considered insignificant or discountable; therefore, this program area may affect and is likely to adversely affect the loach minnow and its critical habitat.

Recreation and Wilderness Programs

There are over 30 reservoirs and lakes and more than 1,000 miles of streams on the ASNFs, more than any other national forest in the Southwestern Region. Reservoirs and streams and adjacent areas are highly desirable for many types of recreational activities. The user demands and concentrated use in these areas can result in impacts that can alter vegetation, riparian areas, water quality, and aquatic habitat.

There is only one desired condition (DC 219) within the LMP in the dispersed recreation section that states, "Water-based settings are available and the associated recreation opportunities (e.g., canoeing, fishing, waterfowl hunting) do not degrade aquatic resources." While this may help reduce some impacts associated with these sites, the potential to address impacts associated with developed sites will be limited. While the "recreation site acres" existing condition data are minimal in their extent on the ASNFs, they are concentrated within critical habitat for all three of the loach minnow populations. Table 76 displays the acres of recreational sites within loach minnow watersheds and critical habitat. There are seven trailheads and two campgrounds on the Blue River, four trailheads and one campground on Eagle Creek, and six campgrounds on the East Fork Black River. These sites and developments and their associated uses and activities do present considerable threats to maintaining, restoring and recovering the loach minnow and its habitat. Recreational sites and activities can impact loach minnows by degrading upland and watershed conditions and function, altering riparian vegetation and function, and reducing water quality and increasing sedimentation into streams. Additionally, invasive and nonnative species have been identified as threats to the loach minnow; and the concentration of recreational activities within and adjacent to riparian areas and streams can increase the risk of introductions and spread of invasive or undesirable plants and animals, potentially impacting loach minnow populations in the East Fork Black River, San Francisco River, and Eagle Creek.

Table 76. Recreation Site Polygons (acres) in Loach Minnow watersheds

	Watershed Total		Critical Habitat (200 m)	
Watershed	**Acres**	**Percent**	**Acres**	**Percent**
San Francisco River	58	0.01	14	0.22
Eagle Creek	5	0	-	-
East Fork Black River	3,789	5.3	111	7.7

There is only one relevant standard (ST13) within the dispersed recreation section of the LMP that states, "Dispersed campsites shall not be designated in areas with sensitive soils or within 50 feet of streams, wetlands, or riparian areas to prevent vegetation and bank damage, soil compaction, additional sediment, or soil and water contamination" Although this plan component may minimize and reduce potential impacts, the possibility exists for effects to the loach minnow (PCEs 2, 3, 4, and 5) from the recreation program through the implementation of the LMP. Although activities are 50 feet away, over time impacts to the stream and riparian vegetation may still result as use occurs; and risk associated with the potential to move or introduce nonnative species still exists. Therefore, this program area may affect and is likely to adversely affect loach minnow and its critical habitat.

Wildlife, Fish, and Rare Plant Program

The Wildlife, Fish and Rare Plant program (WFRP) involves a variety of activities conducted by the USFS and its partners, including inventory and monitoring, habitat assessments, habitat improvements through land treatments and structures, species reintroductions, development of conservation strategies, administrative studies, collaboration with research, and information and education. The guidance for the WFRP can be used to fill in the gaps for other programs with inadequate guidance. Abundant guidance is

provided in the LMP to assist the LMP in minimizing or reducing potential impacts to the loach minnow. There are a total of 15 desired conditions (see appendix A) and two objectives associated with this program area relative to the analysis.

- OBJ 4 Annually, enhance or restore 5 to 15 miles of stream and riparian habitat to restore structure, composition, and function of physical habitat for native fisheries and riparian-dependent species.
- OBJ 5 During the planning period, complete at least five projects (e.g., remove barriers, restore dewatered stream segments, or connect fragmented habitat) to provide for aquatic and riparian associated species and migratory species.

The WFRP desired conditions, objectives, and treatments will likely be integrated with the Watershed and Soils and Ecosystem/Vegetation Health programs; potentially resulting in improvements in watershed condition and function, riparian conditions, and aquatic habitats across the ASNFs. The desired conditions (4, 7, 20, 23, 24, 26, 27, and 30-37) located under the "aquatic habitat and species" section of the LMP relate to the threats/risks and potential recovery and restoration needs for the loach minnow. The two objectives (4 and 5) provide for a treatment level of approximately 5-15 miles per year, which will improve the overall aquatic habitat conditions for the streams and riparian areas receiving treatments. Collectively these desired conditions and objectives could potentially result in long term improvements for the loach minnow (e.g., aquatic habitat conditions, water quality and stream temperature improvements, riparian and aquatic habitat structure and function) and their critical habitats (PCEs 2, 3, and 5).

Restoring and maintaining aquatic habitats and riparian areas would likely improve the potential to retain or return the necessary ecological processes and functions necessary to make these ecosystems sustainable, resilient, and healthy. Alterations to the watersheds, streams, and riparian areas, along with potential and recent impacts associated with fire are threats to the loach minnow and their persistence on the ASNFs. The aquatic habitat and species restoration actions have the potential to reduce the current threats; especially those associated with altered and degraded aquatic habitat condition, structure, and function.

While the management of watersheds and riparian areas has the potential to have long term beneficial impacts through restoration of hydrologic conditions and functions; short term impacts associated with project implementation could result, especially those associated with the use of mechanized equipment and the potential to transfer or inadvertently move invasive or nonnative species. There is one standard and eight specific guidelines that address these potential impacts.

- ST 2 When drafting (withdrawing) water from streams or other water bodies, measures will be taken to prevent entrapment of fish and aquatic organisms and the spread of parasites or disease (e.g., Asian tapeworm, chytrid fungus, whirling disease).

- GL 7 Streams, streambanks, shorelines, lakes, wetlands, and other bodies of water should be protected from detrimental changes in water temperature and sediment to protect aquatic species and riparian habitat.
- GL 8 Streamside management zones should be in place between streams and disturbed areas and/or road locations to maintain water quality and suitable stream temperatures for aquatic species.
- GL 13 To protect water quality and aquatic species, heavy equipment and vehicles driven into a water body to accomplish work should be completely clean of petroleum residue. Water levels should be below the gear boxes of the equipment in use. Lubricants and fuels should be sealed such that inundation by water should not result in leaks.

- GL 15 Activities occurring within federally listed species habitat should apply habitat management direction and species protection measures from recovery plans.
- GL 17 To prevent degradation of native species habitat and the incidental or accidental introduction of diseases or nonnative species, aquatic species should not be transferred through management activities from one 6th level HUC watershed to another.
- GL 18 Sufficient water should be left in streams to provide for aquatic species and riparian vegetation.
- GL 19 Projects and activities should avoid damming or impounding free-flowing waters to provide streamflows needed for aquatic and riparian-dependent species.
- GL 21 When new water diversions are created or existing water diversions are reanalyzed, measures should be taken to prevent entrapment of fish and aquatic organisms.

Altered aquatic habitat conditions have been identified as a threat to the loach minnow, and changes over the last century have impacted all the watersheds on the ASNFs. Potential long term improvements in loach minnow habitat that may result by moving towards desired conditions, especially improvements in aquatic habitats, and risks associated with the unintentional transfer and movement of invasive and nonnative species; will likely contribute to recovery and restoration of the streams and critical habitats (PCEs 2, 3, and 5) of the loach minnow on the ASNFs. Short term impacts are likely to occur associated with project implementation; however, their duration and extent can be minimized through guidelines and project specific mitigation measures and best management practices. While standards, guidelines, and BMPs will help to eliminate and reduce some impacts, it is likely that they will not be reduced to a level that can be considered insignificant or discountable. Therefore, this program area may affect and is likely to adversely affect loach minnow and its critical habitat.

Cumulative Effects and Climate Change

Various amounts of private lands occur primarily within the Campbell Blue, Blue River, Eagle Creek, and San Francisco River watersheds analyzed here. Specific activities associated with these private lands are not known; but have likely included livestock and agricultural uses, water developments and diversions, and road and infrastructure developments. Past and ongoing management actions by AZGFD have resulted in the current and increasing threat to the loach minnow and its critical habitat from predatory and nonnative species.

Changes associated with climate variation and change to riparian areas and aquatic habitats present some of the most important challenges for management of the loach minnow and its critical habitat. Predictions include reduced precipitation and water in riparian areas, increased water losses from elevated evapotranspiration rates, altered high flow events with increased frequencies of high intensity convectional storms, increases in drought severity during summer low flows, and increasing temperatures in small streams and tributaries that further limit habitat during seasonal low flows. Key climate change factors potentially impacting riparian areas and aquatic habitat on the ASNFs include increases in frequency of extreme weather events and increases in wildfire risks. These key climate change factors are addressed directly or indirectly through the LMP (desired conditions, objectives, and management strategies); by enhancing adaption of ecosystems through anticipating and planning for disturbances from intense storms, reducing vulnerability by maintaining and restoring resilient native ecosystems, and increasing water conservation and planning for reductions in upland water supplies. Increases in high intensity storms and flooding will continue to threaten loach minnow and its critical habitat; improvements in PNVTs, FRCCs, watersheds, and riparian and aquatic habitats could potentially reduce these impacts.

Loach Minnow and Critical Habitat

Summary of Effects and Determinations

Effects to designated critical habitat may occur by similar means presented for the species, and in the same watersheds. All PCEs are likely to be affected by the LMP; and primary effects include the potential of introducing sediments to streams, disrupting substrates, and altered habitat components associated with the stream and riparian corridor and vegetation. Critical habitats adversely affected include East Fork Black River, North Fork of the East Fork Black River, Coyote Creek, Eagle Creek, Campbell Blue Creek, Blue River, and the San Francisco River. Table 77 summarizes the potential impacts (negative and/or positive) to the PCEs by program area.

Table 77. Loach Minnow critical habitat PCEs potentially impacted by program area

Program Area	Affected PCEs (by number) and Principle Mechanism
Wildland Fire Management	1, 2, 3, 4, 5, and 6 (increases in sediment, impacts to water quality, improved FRCC and PNVTs, reduced fire risk)
Ecosystem/Vegetation Health (Forest Products)	1, 2, 3, 4, 5, and 6 (reduced water qualtiy, increases in sediment, impacts to riparian areas, improvenents in watersheds and PNVTs, reduced fire risk)
Rangeland Management	1, 2, 3, 4, and 5 (degraded riparian and aqautic condtions, decreased water quality, reduced invasive species)
Watershed and Soil Management (Riparian Areas)	1, 2, 3, 4, and 6 (improved watershed and hydrologic conditions)
Engineering	1, 2, 3, 5, and 6 (changes in sedimentation and water quality, reduced road densitites)
Lands and Minerals (Special Uses)	1, 2, 3, 4, 5, and 6 (impacts to water quantity and quality, changes to watersheds and hydrologic conditions)
Recreation and Wilderness	1, 3, and 5 (impacts to watersheds and riparain areas, reduced water quality, increases in invasive species)
Wildlife, Fish, and Rare Plants	1, 2, 3, 4, 5, and 6 (water quality and temperature improvements, riparian and aquatic habitat improvements, invasive species reduced)

PCE 1 Habitat to support all life stages of loach minnow…
Wildland Fire Management could increase sedimentation rates into streams, and subsequently riffles needed by loach minnow. Improvements in FRCCs could reduce risk associated with uncharacteristic fire that can introduce excessive amounts of sediment and ash into the stream. The Ecosystem/Vegetation Health program can improve ecosystem structure and function, and improve vegetation resiliency to disturbance by riparian PNVT treatments. Short-term impacts could result from mechanical treatments and associated ground disturbance. Rangeland Management could reduce habitat and riffle quality through increases in sedimentation. The Watershed and Soils program could improve habitat and riffle quality by reducing sediment production through watershed restoration and improvement projects. These projects could have short-term impacts, especially those using mechanical equipment and adjacent to riparian areas. The Engineering Program could increase sediment into streams from activities associated with roads management. Objectives to improve and close roads within riparian areas could reduce sediment into streams and improve riffle quality. The Lands and Minerals program can impact water temperature through actions that could remove or reduce portions of streamflows. Recreational activities along streams and within riparian areas can increase water temperatures by vegetation removal, soil compaction, and ground disturbance. The WFRP program through implementation of restoration projects could improve habitat (riffles) and riparian vegetation, although potential short-term impacts may also occur.

PCE 2 An abundant aquatic insect food base…
Wildland Fire Management could impact the aquatic food base by increasing sedimentation and altering water quality from prescribed fire activities. Improvements in FRCCs could reduce risk associated with uncharacteristic fire that can introduce excessive amounts of sediment and ash into the stream. The Ecosystem/Vegetation Health program can improve ecosystem structure and function, and improve vegetation resiliency to disturbance by riparian PNVT treatments. Short-term impacts could result from mechanical treatments and associated ground disturbance; and these can impact water quality and sediment production, altering the macroinvertebrate community and aquatic vegetation. Rangeland Management can increase sediment production and alter water quality within the watershed, potentially impacting invertebrate production within the stream channel. The Watershed and Soils program could improve conditions by reducing sediment production through watershed restoration and improvement projects. These projects could have short-term impacts, especially those using mechanical equipment and adjacent to riparian areas. The Engineering Program could impact water quality by increasing sediment into streams from activities associated with roads management. Objectives to improve and close roads within riparian areas could reduce sediment into streams and improve water quality. Recreational activities along streams and within riparian areas can alter water quality and increase sedimentation by vegetation removal, soil compaction, and ground disturbance; resulting in changes to the food base for the loach minnow. The WFRP program through implementation of restoration projects could improve the food base for the loach minnow by improving water quality and reducing sediment from implementing restoration actions, although potential short-term impacts may also occur.

PCE 3 Streams with no or no more than low levels of pollutants
Wildland Fire Management could increase sedimentation rates into streams from prescribed fire activities. Improvements in FRCCs could reduce risk associated with uncharacteristic fire that can introduce excessive amounts of sediment and ash into the stream. The Ecosystem/Vegetation Health program can improve ecosystem structure and function, and improve vegetation resiliency to disturbance by riparian PNVT treatments. Short-term impacts could result from mechanical treatments and associated ground disturbance, and these can impact water quality and sediment production. Rangeland Management can increase sediment production within the watershed, and increases in sedimentation can result from riparian area and stream channel impacts. The Watershed and Soils program could improve conditions by reducing sediment production through watershed restoration and improvement projects. These projects could have short-term impacts, especially those using mechanical equipment and adjacent to riparian areas. The Engineering Program could impact water quality by increasing sediment into streams from activities associated with roads management. Objectives to improve and close roads within riparian areas could reduce sediment into streams and improve water quality. Recreational activities along streams and within riparian areas can alter water quality and increase sedimentation by vegetation removal, soil compaction, and ground disturbance. The WFRP program through implementation of restoration projects could improve water quality by implementing restoration actions, although potential short-term impacts may also occur.

PCE 4 Perennial flows…
Wildland Fire Management can potentially alter stream flow patterns from prescribed fire activities. Improvements in FRCCs could reduce risk associated with uncharacteristic fire that can introduce excessive amounts of sediment and ash resulting from post fire flooding. The Ecosystem/Vegetation Health program can improve ecosystem structure and function, and improve vegetation resiliency to disturbance by PNVT treatments; which can help restore and improve perennial flow patterns within the watershed to more natural conditions. The Watershed and Soils program could improve perennial flow patterns to more historical conditions by reducing and removing degrading factors through watershed restoration and improvement projects. These projects could have short-term impacts, especially those using mechanical equipment and adjacent to riparian areas. The Engineering Program could impact

perennial flow patterns through changes in drainage densities and hydrologic conditions from roads and activities associated with roads management. Objectives to improve and close roads within the watersheds and riparian areas of loach minnow could improve perennial flows where roads have altered hydrologic conditions and floodplains. The WFRP program through implementation of restoration projects could provide for more natural flow patterns and improve perennial flows by implementing restoration actions that improve stream channel structure and function, although potential short-term impacts may also occur.

PCE 5 No nonnative aquatic species or levels that are sufficiently low to allow persistence…
The Engineering Program could increase the risk associated with the introduction of nonnative aquatic species from roads and activities associated with roads management. Objectives to improve and close roads within riparian areas could reduce the potential and opportunity to introduce nonnative aquatic species into streams. The Lands and Minerals program can increase the potential for introductions of nonnative aquatic species as a result of special use permits that allow or result in activities that occur and/or move between reservoirs, riparian areas, and streams. Recreational activities along reservoirs, riparian areas, and streams can increase the risk and opportunity to move or transport nonnative aquatic species between these bodies of water. The WFRP program through implementation of restoration projects could improve aquatic habitats by eliminating or reducing aquatic nonnative species, although potential short-term impacts may also occur.

PCE 6 Streams with a natural, unregulated flow regime…
Wildland Fire Management can potentially alter stream flow patterns from prescribed fire activities. Improvements in FRCCs could reduce risk associated with uncharacteristic fire that can introduce excessive amounts of sediment and ash resulting from post fire flooding. The Ecosystem/Vegetation Health program can improve ecosystem structure and function, and improve vegetation resiliency to disturbance by PNVT treatments; which can help restore and improve flow patterns within the watershed to more natural conditions. The Watershed and Soils program could improve stream flow patterns to more historical conditions by reducing and removing degrading factors through watershed restoration and improvement projects. These projects could have short-term impacts, especially those using mechanical equipment and adjacent to riparian areas. The Engineering Program could impact stream flow patterns through changes in drainage densities and hydrologic conditions from roads and activities associated with roads management. Objectives to improve and close roads within the watersheds and riparian areas of loach minnow could improve stream flow patterns where roads have altered hydrologic conditions and floodplains. The WFRP program through implementation of restoration projects could provide for more natural flow patterns by implementing restoration actions that improve stream channel structure and function, although potential short-term impacts may also occur.

The direction and plan components within the LMP for the Wildland Fire Management, Ecosystem/Vegetation Health, Rangeland Management, Watershed and Soils Management, Engineering, Lands and Minerals, Recreation and Wilderness, and WFRP programs are not sufficient to avoid certain activities that may adversely impact critical habitat. The potential effects from most programs can be minimized by standards and guidelines, especially those within the Watershed and Soils Management and the WFRP programs. While the potential impacts would be reduced by the standards and guidelines, they may not be completely constrained through implementation of the LMP. Although LMP implementation could potentially impact all the PCEs for critical habitat, it is not believed that these impacts would occur at a level that would preclude any of the PCEs from functioning in their role for the conservation of the species. Therefore, implementation of the LMP for all program areas may affect and are likely to adversely affect loach minnow and its critical habitats.

Based on the information above, it has been determined that implementation of the LMP **may affect**, and is **likely to adversely affect** the loach minnow and its designated critical habitat. While most desired

conditions and objectives have the potential to result in beneficial effects, several activities under several programs could result in adverse effects to the loach minnow. Most program areas contain guidance (e.g., standards and guidelines) that are designed to reduce and minimize the extent and duration of any potential short and long term negative effects; however, implementation of the LMP does not provide for the mitigation of all potential effects to a level that can be equated to or considered as insignificant and/or discountable.

Roundtail Chub *Gila robusta*

Endangered Species Act Status:	Candidate
District Occurrence:	Alpine, Black Mesa, and Clifton
Recovery Plan:	No
Critical Habitat:	No
Determination of Effect (Species - Proposed):	Not Likely to Jeopardize
Determination of Effect (Critical Habitat - Proposed):	Not Likely to Adversely Modify
Determination of Effect (Species - Listed):	May Affect, Likely to Adversely Affect
Determination of Effect (Critical Habitat - Designated):	May Affect, Likely to Adversely Affect

Natural History, Distribution, and Status of the Species Range-wide

Information relative to the life history, distribution, status of the species range-wide and listing factors are located on the FWS website http://www.fws.gov/southwest/Roundtail.htm. Most of the available information for this species has been summarized and reviewed within both the Range-wide and Arizona statewide conservation agreements for this species that were completed in 2006. Additionally, in 2009 a 12-month finding on a petition to list a distinct population segment of the roundtail chub was published (FWS 2009). This literature was considered and used in the preparation of this document, and is incorporated by reference into this document.

Status and Threats within the Action Area

The most recent sampling on the ASNFs streams occurred in 2005 and 2009, and roundtail chub were collected in all three populations. In August 2005, AZGFD surveyed portions of Chevelon Creek and Black River. Sampling within Chevelon Creek collected roundtail chub at Chevelon and Durfee crossings. Sampling within the Black River collected roundtail chub approximately five miles upstream of Forest Road 25, and about one mile below the 25 road. On October 27-29, 2009, a multiple agency effort sampled Eagle Creek on the ASNFs north of the confluence with Sheep Wash. A total of 79 roundtail chub were collected and were taken to Bubbling Ponds State Fish Hatchery. The watersheds being analyzed here cover approximately 543,293 acres and potentially 45 miles of occupied habitat. In 2012 roundtail chub were introduced into the Blue River on the ASNFs, and it will likely take several years to determine if a population becomes established.

Species and Habitat Effects Analysis

For discussion and analysis purposes, the species have been grouped into watersheds. These populations were considered as the contiguous streams and uplands that drain into occupied habitat. These populations are referred to by the name of the lowermost (highest stream order) stream within the watershed; for the roundtail chub there are three watersheds considered here; Black River, Chevelon Creek, and Eagle Creek. These three watersheds may not always be consistent with the various

Hydrologic Unit Code boundaries, as the lowermost point within the drainage area can be determined by several factors (e.g., the downstream end of occupied habitat, the ASNFs boundary).

Wildland Fire Management

Fire and mechanical treatments would be used to move vegetation toward desired conditions. These treatments are used to change the character of the vegetation that would result in lower risk of uncharacteristic fire and a return of wildfire to a more natural role. The desired condition is to move toward or maintain vegetation conditions in Fire Regime Condition Class (FRCC) 1. FRCC is a metric that quantifies how departed a system is from historical conditions in relation to fire, the role fire historically played in the that system, and the vegetative structure. Under the LMP, annually approximately 48,500 acres would be treated across all of the PNVTs; and approximately 60% (28900 acres) would be treated by fire, and approximately 40% (19600 acres) would be treated mechanically. The current conditions for FRCC on the ASNFs are 14% FRCC 1, 14% FRCC 2, and 72% FRCC 3. Under the LMP, the FRCC conditions on the ASNFs after 15 years will improve to 24% FRCC 1, 41% FRCC 2, and 35% to FRCC 3.

Table 78 displays the percent of FRCCs by watersheds. Only Chevelon and Eagle creeks have portions of their watersheds in FRCC 1. FRCC is a measure of the difference in structure between current and reference conditions. Low (FRCC 1) is considered to be within the natural (historical) range of variability, while moderate (FRCC 2) and high (FRCC 3) departures are outside historical range. Vegetation in FRCC 1 is more resilient and resistant and less likely to lose key ecosystem components (e.g., native species, large trees, soil) after a disturbance, and fire behavior and other associated disturbances are similar to those that occurred prior to the exclusion of fire. It is expected that through implementation of the LMP the acres of FRCC 1 and FRCC 2 will increase, and the acres of FRCC 3 will decrease within the roundtail chub watersheds.

Table 78. Fire Regime Condition Class (FRCC) for Roundtail Chub watersheds

Watershed	FRCC 1 (% area)	FRCC 1 (acres)	FRCC 2 (% area)	FRCC 2 (acres)	FRCC 3 (% area)	FRCC 3 (acres)
Black River	0	0	48.8	104,115	50.9	108,646
Eagle Creek	19.6	31,005	1.1	1,757	79.3	125,406
Chevelon Creek	17.5	30,009	1.1	1,757	79.4	136,188

Wildfire and flooding can impact roundtail chub by altering aquatic habitat conditions. Over the last 75+ years, alterations to vegetation (e.g., livestock grazing and timber harvest activities), along with the suppression of wildfire has resulted in the disruption of the ecological role of fire in maintaining ecosystems. This has resulted in uncharacteristic impacts from wildfire on watersheds and aquatic habitat and species. Table 79 displays the burn severity impacts associated with the Wallow Fire that occurred in 2011. The Black River watershed was substantially impacted by the Wallow Fire, with a very small amount occurring within the Eagle Creek watershed.

Table 79. Wallow Fire Burn Severity (%) within Roundtail Chub watersheds

	Drainage Areas			
	High	Moderate	Low	Total
Black River	19.3	12.6	50.2	82.1
Eagle Creek	0.6	0.6	2.8	4.0

The ecological role that wildfire has played in maintaining ecosystem structure, function, and process has been altered over time. Past fire suppression and management activities on the ASNFs have resulted in landscape scale conditions that can result in uncharacteristic and sometimes severe impacts from wildfire.

Table 80 displays the amount of impacts (acres and percent) to roundtail chub watersheds that have occurred over the last 10 and 25 years. As can be seen from Table 80, almost all of the wildfire within roundtail chub watersheds has occurred within the last ten years. This more recent (last ten years) higher level of wildfire activity has resulted from altered vegetation conditions, long-term drought, and the increased use of wildfire being managed for resource benefits. This increased level of wildfire activity is likely to continue until improvements occur in vegetative structure and function, and drought conditions improve.

Table 80. Fire acres (≥100) within Roundtail Chub drainage areas (last 10 years and last 25 years)

	10 Years				25 Years			
Drainage	Acres Burned	Percent Burned	Acres Unburned	Percent Unburned	Acres Burned	Percent Burned	Acres Unburned	Percent Unburned
Black River	222,918	104.4	5,145	2.4	224,571	105.2	5,145	2.4
Eagle Creek	39,374	24.9	126,025	79.7	41,464	26.2	126,018	79.7
Chevelon Creek	25,309	14.7	146,675	85.5	26,462	15.4	145,648	84.9

Wildland fire management will be highly integrated with the vegetation (PNVT) treatments, resulting in improvements in both FRCC and PNVTs across the ASNFs. Three desired conditions (41, 42, and 296) located under the "all PNVTs" section of the LMP relate to the Fire program. Desired condition 41 states, "Natural processes and human and natural disturbances (e.g., planned and unplanned fire ignitions, mechanical vegetation treatments) provide desired overall tree density, structure, species composition, coarse woody debris, and nutrient cycling. Natural fire regimes are restored. Uncharacteristic fire behavior is minimal or absent on the landscape." Desired condition 42 states, "Fire (prescribed fire and use of wildland fire) maintains and enhances resources and, as nearly as possible, is allowed to function in its natural ecological role." Desired condition 296 states, "Wildland fires burn within the range of frequency and intensity of natural fire regimes. Uncharacteristic high-severity fires rarely occur and do not burn at the landscape scale." Collectively these desired conditions could potentially result in long term improvements for the roundtail chub (e.g., watershed and hydrologic conditions, water quality, riparian and aquatic habitat conditions).

The greatest improvements in FRCC conditions will occur within the Dry Mixed Conifer Forest, Madrean Pine-Oak Woodland, and the Great Basin Grassland PNVT types. For the Black River watershed these PNVTs comprise approximately 20% of the total area, and for the Chevelon Creek watershed they comprise approximately 13%. The Eagle Creek drainage has the most acreage of these PNVTs, as 57% of its area is covered by these PNVTs. Therefore, potential improvements in FRCC and PNVT conditions are most likely to occur within the Eagle Creek watershed, and to a lesser extent within the Black River and Chevelon Creek watersheds.

While the management of prescribed fire has the potential to have long term beneficial impacts through restoration of vegetation conditions and natural fire regimes, short term impacts associated with project implementation could result. Activities associated with Fire can impact roundtail chub by altering water quality and increasing sedimentation into streams, resulting in altered habitat conditions and reduced food resources and abundance. While there are no relevant Fire program standards or guidelines, a guideline (23) under the all PNVTs section of the LMP states, "Landscape scale restoration projects should be designed to spread out treatments spatially and/or temporally to reduce implementation impacts and allow reestablishment of vegetation and soil cover." This guideline would help reduce and minimize short term impacts that could result from prescribed fire activities.

Potential long term improvements in roundtail chub habitat that may result by moving towards desired conditions, especially improvements in FRCC and PNVTs, will likely contribute to recovery and

restoration of the watersheds and aquatic habitats of the roundtail chub on the ASNFs, while reducing potential impacts from uncharacteristic fire and the associated increases in ash and sedimentation. Short term project implementation impacts are likely to occur associated with implementation of the fire program; however, their duration and extent can be minimized through guidelines and project specific mitigation measures. Although mitigation of impacts will occur, based on the limitations of potential mitigation measures and timing of activities; impacts to roundtail chub from the program area may affect, and are likely to adversely affect the roundtail chub.

Ecosystem/Vegetation Health and Forest Products

The LMP has recognized the need to address the maintenance and improvement of ecosystem health. Thirteen of the 14 PNVTs on the ASNFs vary (sometimes substantially) in structure, composition, function, and natural disturbance processes from desired conditions. All 14 PNVTs are key components in sustaining terrestrial and aquatic ecosystems and providing goods and services. The desired conditions for the PNVTs will result in resilient, functioning ecosystems; and in conjunction with the objectives, will guide future vegetation management activities, including burning and mechanical treatments, to maintain or move towards desired conditions. PNVTs are key components in sustaining terrestrial and aquatic ecosystems, and providing for restoration of the roundtail chub. Table 81 displays the acres and percentage of each PNVT for each of the roundtail chub watersheds on the ASNFs. These data show how the PNVTs can vary considerably between the roundtail chub watersheds, and show the complexity of the watersheds and the potential difficulties in maintaining, improving, and restoring these areas for roundtail chub recovery.

Table 81. PNVTs for Roundtail Chub watersheds

	Cottonwood-Willow Riparian Forest	Dry Mixed Conifer Forest	Interior Chaparral	Madrean Pine-Oak Woodlands	Mixed Broadleaf Deciduous Riparian Forest	Montane Willow Riparian Forest	Montane/Subalpine Grasslands	Piñon-Juniper Woodland	Ponderosa Pine Forest	Semi-desert Grassland	Great Basin Grassland	Spruce-Fir Forest	Wet Mixed Conifer Forest	Wetland/Cienega Riparian Areas	Water
Black River: Total = 213525 acres															
Acres	4	41,167	--	480	--	--	24,903	--	64,885	--	--	3,243	68,413	7,552	--
Percent	0	19.3	--	0.2	--	--	11.7	--	30.4	--	--	1.5	32	3.5	--
Eagle Creek: Total = 158168 acres															
Acres	101	3,496	27,894	86,767	3,111	--	--	--	6,454	28,789	--	3	1,653	--	--
Percent	0.06	2.2	17.6	54.9	2.0	--	--	--	4.0	18.2	--	0	1.0	--	--
Chevelon Creek: Total = 171600 acres															
Acres	2,438	19,187	--	-	--	286	--	30,009	113,079	--	3,636	--	2,470	--	--
Percent	1.4	11.2	--	-	--	0.2	--	17.5	65.9	--	2.1	--	1.4	--	--

There are ten desired conditions (see appendix A) and three objectives associated with this program area relevant to roundtail chub within the ecosystem health, PNVTs, and forest products sections of the LMP.

- OBJ 11 (All Forested PNVTs) Annually, treat 5,000 to 35,000 acres to reduce tree densities, restore natural fire regimes, promote species habitat and ecosystem health, reduce fire hazard, maintain desired conditions, initiate recovery from uncharacteristic disturbance, and provide forest products, leaving a desired mix of species with the range of desired densities that are resilient to changing climatic conditions.
- OBJ 13 (All Woodland PNVTs) Annually, treat or maintain 5,000 to 15,000 acres to promote a highly diverse structure.
- OBJ 14 (Grasslands) Decrease or maintain the woody canopy cover at less than 10 percent by treating up to 25,000 acres annually. (#14, Grasslands)

The vegetation (PNVTs) treatments will be integrated with both the Wildfire and Ecosystem/Vegetation Health program areas, resulting in improvements in both PNVTs departure and FRCC conditions across the ASNFs. The desired conditions (1, 2, 3, 39, 40, 46, 48, and 61) located under the "overall ecosystem health" and "all PNVTs" sections of the LMP relate to this program and the watershed and landscape scale conditions for the roundtail chub. The three objectives (11, 13, and 14) provide for a maximum total treatment level of 75,000 acres per year, which will improve the overall departure condition for the eight modeled PNVTs from their current rating of 64% (high departure) to 44% (moderate departure) over the planning period. Collectively these desired conditions could potentially result in long term improvements for the roundtail chub (e.g., watershed and hydrologic conditions, water quality, riparian and aquatic habitat conditions, risk of uncharacteristic fire) and their aquatic habitats.

The greatest improvements in PNVT departure will occur within the Dry Mixed Conifer Forest, Madrean Pine-Oak Woodland, and the Great Basin Grassland PNVT types. For the Black River watershed these PNVTs comprise approximately 50% of the total area, and for the Eagle Creek watershed they comprise approximately 61%. The Chevelon Creek watershed contains the most, and has 79% of its area covered by these PNVTs. Therefore, potential improvements in PNVT conditions are likely to occur within all of these watersheds over the planning period. Restoring and maintaining PNVTs would likely improve the potential to retain or return the necessary ecological processes and patterns necessary to make these ecosystems sustainable, resilient, and healthy. Impacts to the uplands, streams, and riparian areas; along with potential and recent impacts associated with fire, are threats to roundtail chub habitat and their persistence on the ASNFs. The landscape and watershed scale restoration actions have the potential to reduce the current large scale threats, especially those associated with uncharacteristic fire, and improve both the upland and riparian conditions for the roundtail chub.

While the management of vegetation and PNVTs has the potential to have long term beneficial impacts through restoration of vegetation conditions and natural fire regimes; short term impacts associated with project implementation could result, especially those associated with the Ecosystem/Vegetation Health and program area. There are three objectives that provide for the use of forest products on an annual basis; 122,000 CCF from suitable timberlands for wood products, 94,000 CCF for firewood, and 5,000 permits for Christmas trees. Suitable timberlands are lands to be managed for timber production on a regulated basis.

Suitable timber lands are likely to have greater impacts compared to other lands due to the greater emphasis on mechanical vegetation treatments and the associated infrastructure (e.g., roads, landings) and continued scheduled entries over time. The Eagle Creek watershed has very few acres of suitable timber lands, while the Black River and Chevelon Creek watersheds areas have approximately 55% (Table 82). Therefore, any potential impacts resulting from the management of suitable timber lands will most likely occur within the Black River and Chevelon Creek watersheds.

Table 82. Treatment Type [suitable timber, nonsuitable timber, and fire only lands] acres by Roundtail Chub watersheds

Watershed	Suitable Timber	Nonsuitable Timber	Fire Only
Black River	116484 acres (54.6%)	72249 acres (33.8%)	24792 acres (11.6%)
Eagle Creek	240 acres (0.2%)	73477 acres (46.5%)	84451 acres (53.4%)
Chevelon Creek	94159 acres (54.9%)	69181 acres (40.3%)	8260 acres (4.8%)

Activities associated with suitable/unsuitable timberland treatments can impact roundtail chub by altering watershed, hydrologic, riparian, and aquatic habitat conditions; degrading water quality and increasing sedimentation into streams, and reducing food resources and abundance necessary for the roundtail chub. There are two specific guidelines that address these potential impacts. Guideline (GL 23) under the all PNVTs section of the LMP states, "Landscape scale restoration projects should be designed to spread out treatments spatially and/or temporally to reduce implementation impacts and allow reestablishment of vegetation and soil cover." Guideline (GL 130) in the Forest Products section states, "Permits issued for forest products should include stipulations to protect resources." While these guidelines can minimize the potential impacts from treatments by reducing their intensity over space and time, it is still likely that some level of impacts could still occur.

Altered conditions in the uplands, riparian, and streams can impact the roundtail chub; and watersheds on the ASNFs have had impacts from past actions that have likely resulted in population declines of the species. Potential long term improvements in roundtail chub habitat that may result by moving towards desired conditions, especially improvements in PNVTs and risk associated with fire; will likely contribute to recovery and restoration of the watersheds and aquatic habitats of the roundtail chub on the ASNFs, while reducing potential impacts from uncharacteristic fire and the associated increases in ash and sedimentation. Short term project implementation impacts are likely to occur associated with implementation of the vegetation treatment and forest products programs; however, their duration and extent can be minimized through guidelines and project specific mitigation measures. Although impacts may be reduced, short term impacts cannot be determined to be at the level where they would be considered insignificant or discountable. Therefore, this program area may affect and is likely to adversely affect roundtail chub.

Rangeland Management

Program activities include administering livestock grazing consistent with NEPA decisions, ESA consultation requirements, and guidance in the LMP. Additional Program activities include implementation and effectiveness monitoring of individual allotments, development of structural and non-structural improvements to facilitate better livestock management and to improve wildlife habitat and watershed conditions, control of invasive weeds, and the authorization of grazing consistent with the LMP through site specific allotment NEPA. The LMP determined that most of the ASNFs is suitable for livestock grazing. Suitability is the appropriateness of applying certain resource management practices to a particular area of land, in consideration of relevant social, economic, and ecological factors. Table 83 displays the livestock grazing suitability acres for each of the roundtail chub watersheds.

Table 83. Livestock grazing suitability in Roundtail Chub watersheds

Drainage Areas	Suitable (percent)	Suitable (acres)	Unsuitable (percent)	Unsuitable (acres)
Black River	83.2	177,640	16.8	35,885
Eagle Creek	100	158,168	0	0
Chevelon Creek	75.6	129,671	24.4	41,930

Most of the roundtail chub watersheds have been determined to be suitable for livestock grazing. While a determination of suitability does not necessarily result in livestock grazing on that area, current

management provides for livestock grazing across most of the ASNFs. Livestock grazing can impact watersheds and hydrologic conditions by altering vegetation and ground cover, soil compaction, and water quality. Current range condition on the ASNFs is reflective of past and ongoing grazing activities, and landscape scale conditions have not changed significantly since the 1980s. Table 84 displays the current range conditions for each of the roundtail chub watersheds and their critical habitat, with most of the acres falling in fair, poor, and very poor range condition.

Table 84. Range Condition within Roundtail Chub watersheds

Range Condition	Acres	Percent
Black River		
Excellent	-	-
Good	18,434	8.6
Fair	41,206	19.3
Poor	73,932	34.6
Very Poor	3,141	1.5
No capacity	75,335	35.3
Eagle Creek		
Excellent	-	-
Good	4,611	2.9
Fair	52,140	33.0
Poor	58,101	36.8
Very Poor	223	0.1
No capacity	42,885	27.1
Chevelon Creek		
Excellent	-	-
Good	356	0.2
Fair	2,188	1.3
Poor	115,917	67.6
Very Poor	52,714	30.7
No capacity	-	-

Given the long history of domestic livestock grazing activities on the ASNFs, considerable amounts of infrastructure has been developed through site specific management. The most common types of range developments associated with livestock grazing activities include fencing, water developments, and corrals. These range developments can impact watersheds, riparian areas, and aquatic habitats. Fencing can result in the concentration of grazing animals, impacting vegetation, soils, and aquatic habitat where this occurs. Pit tanks occur on drainages and can alter hydrologic conditions, and can act as vectors (along with livestock) for the movement and introduction of invasive or undesirable species. Corrals are often located adjacent to streams and springs, and impacts to water quality and vegetation can result from the concentrated use in these areas. Table 85 displays the primary range developments within the roundtail chub watersheds; and while these developments can help to disperse impacts across livestock grazing allotments, higher levels of these developments are likely to result in greater risks to the roundtail chub from livestock grazing actions.

Table 85. Constructed Features within Roundtail Chub watersheds

Watershed	Feature	Total Number within Watershed
Black River	Corral (points)	9
	Pit Tank (points)	266
	Constructed Fence (miles)	414.6
Eagle Creek	Corral (points)	52

	Pit Tank (points)	160
	Constructed Fence (miles)	285.1
Chevelon Creek	Corral (points)	--
	Pit Tank (points)	164
	Constructed Fence (miles)	112.4

While there are no relevant desired conditions associated with the livestock grazing and invasive species, there are two objectives associated with the invasive species program that are relevant to the roundtail chub. These two objectives (OBJ 16 and OBJ 17) propose to annually "contain, control, or eradicate invasive species (e.g., musk thistle, Dalmatian toadflax) on 500 to 3,500 acres", and "control or eradicate invasive species (e.g., tamarisk, bullfrogs) on at least 2 stream miles." Invasive and nonnative species have been identified as threats to the roundtail chub; and these two objectives could potentially improve both the riparian and aquatic habitat for the roundtail chub by restoring vegetation and aquatic species composition to historical conditions, or to levels that are low enough to allow for the persistence of roundtail chub.

While the invasive species program has the potential to have some long term benefits to roundtail chub and their habitat, the possibility exists for impacts to roundtail chub through implementation of this program and the livestock grazing program. One standard and seven guidelines have been included in the LMP that may address potential impacts.

- ST 4 Vegetation treatments shall include measures to reduce the potential for introduction of invasive plants and animals and damage from nonnative insects and diseases.

- GL 32 Active grazing allotments should be managed to maintain or improve to desired riparian conditions.
- GL 78 Projects and activities should not transfer water between drainages or between unconnected water bodies within the same drainage to avoid spreading disease and aquatic invasive species.
- GL 79 Project areas should be monitored to ensure there is no introduction or spread of invasive species.
- GL 81 Pesticide use should minimize impacts on nontarget plants and animals.
- GL 134 New livestock troughs, tanks, and holding facilities should be located out of riparian areas to limit concentration of livestock in these areas. Existing facilities in riparian areas should be modified, relocated, or removed where their presence is determined to inhibit movement toward desired riparian or aquatic conditions.
- GL 138 To minimize potential resource impacts from livestock, salt or nutritional supplements should not be placed within a quarter of a mile of any riparian area or water source. Salt or nutritional supplements should also be located to minimize herbivory impacts to aspen clones.
- GL 139 To prevent resource damage (e.g., streambanks) and disturbance to federally listed and sensitive wildlife species, trailing of livestock should not occur along riparian areas. Where no alternative route is available, approval may be granted where effective mitigation measures are implemented (e.g., timing of trailing, number of livestock trailed at one time).

While the invasive species program has the potential to have long term benefits and impacts through restoration of vegetation conditions, riparian areas, and aquatic habitats; activities associated with the livestock grazing program can impact roundtail chub by altering/degrading upland and watershed conditions and function, altering riparian vegetation and function, and reducing water quality and increasing sedimentation into streams. The standards and guidelines listed above may reduce potential impacts; but given that the majority of the watersheds are suitable for livestock grazing and have range

conditions that are mostly fair/poor/very poor, and have considerable amounts of infrastructure (e.g., fences and tanks); it is reasonable to conclude that implementation of the LMP will result in impacts to the roundtail chub and their occupied habitat. Given past actions, and the limitations relative to minimizing impacts from livestock grazing activities, it is not reasonable to conclude impacts associated with this program area will be insignificant or discountable. Therefore, this program area may affect and is likely to adversely affect the roundtail chub.

Watershed and Soil Management

The Watershed and Soils Management program seeks to maintain or improve watershed conditions and maintain good water quality. It is cross-program in orientation in that it seeks to mitigate impacts from other program activities as well. The guidance for the Watershed Program can be used to fill in the gaps for other programs with inadequate guidance. Abundant guidance is provided in the LMP to assist the LMP in minimizing or reducing potential impacts to roundtail chub. There are a total of 15 desired conditions (see appendix A) and six objectives associated with this program area.

- OBJ 1 During the planning period, improve the condition class on at least 10 priority 6th level HUC watersheds by removing or mitigating degrading factors.
- OBJ 2 Annually, enhance or restore an average of 350 acres within priority 6th level HUC watersheds, including treating the causes of State designated impaired or threatened waters (Arizona Department of Environmental Quality, 2012) to improve watershed condition and water quality.
- OBJ 6 Annually, restore 200 to 500 acres toward desired composition, structure, and function of streams, floodplains, and riparian vegetation.
- OBJ 9 Within the planning period, enhance or restore 5 to 25 wet meadows or cienegas to proper hydrologic function and native plant and animal species composition.
- OBJ 10 Annually, work with partners to reduce animal damage to native willows and other riparian species on an average of 5 miles of riparian habitat.
- OBJ 38 Annually, prepare at least one instream flow water rights application until water acquisition needs are complete to sustain riparian areas, fish, wildlife, and water-based recreation.

The watershed and riparian desired conditions, objectives, and treatments will likely be integrated with the Wildland Fire, Ecosystem/Vegetation Health, and WFRP programs; potentially resulting in improvements in watershed condition and function, and riparian conditions across the ASNFs. The desired conditions (9, 12, 15, 21, 22, 67-72, 74, 77, 80, and 84) located under the "watershed" and "riparian areas" sections of the LMP relate to this program and the watershed and landscape scale conditions for the roundtail chub. The six objectives (1, 2, 6, 9, 10, and 38) provide for a treatment level of approximately 1,000 - 10,000 acres per year, which will improve the overall conditions for the six code watersheds and riparian areas receiving treatments. Collectively these desired conditions and objectives could potentially result in long term improvements for the roundtail chub (e.g., watershed and hydrologic conditions, water quality, riparian and aquatic habitat conditions, soils) and their occupied habitats within the ASNFs.

Restoring and maintaining watersheds and riparian areas would likely improve the potential to retain or return the necessary ecological processes and functions necessary to make these ecosystems sustainable, resilient, and healthy. Impacts to the uplands, streams, and riparian areas; along with potential and recent impacts associated with fire are threats to the roundtail chub and their habitat on the ASNFs. The landscape and watershed scale restoration actions have the potential to reduce the current threats; especially those associated with watershed and hydrologic conditions, and improve both the upland (soils) and riparian conditions for the roundtail chub and their occupied habitat.

While the management of watersheds and riparian areas has the potential to have long term beneficial impacts through restoration of hydrologic conditions and functions; short term impacts associated with project implementation could result, especially those associated with the use of mechanized equipment. There are six specific guidelines that address these potential impacts.

- GL 2 Projects with ground-disturbing activities should be designed to minimize long and short term impacts to soil resources. Where disturbance cannot be avoided, project specific soil and water conservation practices should be developed.
- GL 6 Projects with ground-disturbing activities should be designed to minimize long and short term impacts to water resources. Where disturbance cannot be avoided, project specific soil and water conservation practices and BMPs should be developed.
- GL 30 Ground-disturbing projects (including prescribed fire) which may degrade long term riparian conditions should be avoided.
- GL 33 Storage of fuels and other toxicants should be located outside of riparian areas to prevent spills that could impair water quality or harm aquatic species.
- GL 34 Equipment should be fueled or serviced outside of riparian areas to prevent spills that could impair water quality or harm aquatic species.
- GL 35 Construction or maintenance equipment service areas should be located and treated to prevent gas, oil, or other contaminants from washing or leaching into streams.

Potential long term improvements in roundtail chub habitat that may result by moving towards desired conditions, especially improvements in watersheds and risk associated with degraded riparian areas. Impacts are likely to occur associated with project implementation; however, their duration and extent can be minimized through guidelines and project specific mitigation measures and best management practices. Potential short term impacts primarily include increases in sedimentation, soil compaction, alterations in hydrologic conditions and functions, and changes in water quality. Mitigation measures are implemented at the project level, and site specific conditions and project activities and timing will determine their efficacy. Although most projects could be mitigated, it is likely over the planning period that some projects will result in impacts that could not be considered at the level of insignificant or discountable. Therefore this program area may affect, and is likely to adversely affect roundtail chub.

Engineering Program

The motorized transportation system is comprised of 765 miles of roads open only to highway legal vehicles (maintenance level 3 through 5), 2,067 miles of roads open to all motorized vehicles (maintenance level 2), 3,372 miles of roads closed to all motorized vehicles (maintenance level 1), and 156 miles of trails open to motorized vehicles less than 50 inches wide. The miles of open motorized transportation system includes roads with access restricted on a seasonal basis for public safety and to minimize resource damage. The LMP includes plan objectives to annually maintain 20% of passenger vehicle roads, 10% of high clearance roads, and 20% of both motorized and nonmotorized trails. Road crossing information for the roundtail chub watersheds are presented below in Table 86. Although the various types of crossings (e.g., culverts, bridges) cannot be accurately determined at the watershed scale, most of the crossings across the ASNFs are culverts. Route miles and densities were also calculated for the three roundtail chub watersheds (Table 87). This information is separated by closed, open, and non-motorized routes; and represents the most recent data from the Forest Transportation Atlas, which does not include unauthorized routes.

Table 86. Route (motorized and nonmotorized) Crossings within Roundtail Chub watersheds

Watershed	Number Crossings
Black River	1,136

Chevelon Creek	422
Eagle Creek	573

Table 87. Route miles and densities for closed (decommissioned and ML1) and open (ML2-5 and motorized trails) and nonmotorized within Roundtail Chub watersheds

Watershed	Route Type	Route Miles	Density (miles / square mile)
Black River	Closed	771.5	2.3
Black River	Open	401.6	1.2
Black River	Non-motorized	7.1	0.2
Black River	**Total**	**1,244.3**	**3.7**
Eagle Creek	Closed	19.9	0.08
Eagle Creek	Open	140.3	0.57
Eagle Creek	Non-motorized	133.5	0.54
Eagle Creek	**Total**	**293.7**	**1.2**
Chevelon Creek	Closed	466	1.7
Chevelon Creek	Open	361.1	1.3
Chevelon Creek	Non-motorized	19.4	0.07
Chevelon Creek	**Total**	**846.5**	**3.2**

While there are no relevant desired conditions for the Engineering program; there are two objectives within the riparian section of the LMP that relate to roads.

- OBJ 7 Within the planning period, relocate, repair, improve, or decommission a minimum of 4 miles of National Forest System roads or trails that add sediment to streams, damage riparian vegetation, erode streambanks, cause gullies, and/or compact floodplain soils.
- OBJ 8 Annually, remove an average of 2 miles of unauthorized roads or trails that sediment to streams, damage riparian vegetation, erode streambanks, cause gullies, and/or impact floodplain soils.

These two objectives could potentially result in long term improvements for the roundtail chub by reducing sedimentation associated with degraded and/or unauthorized roads and trails. Restoring and rehabilitating these sites could potentially improve water quality, habitat conditions, and the macroinvertebrate community needed by the roundtail chub. All the roundtail chub populations could potentially benefit from implementation of these objectives, as road and trail densities within occupied habitats for this species is relatively high; and a major road occurs within or adjacent to some of the habitat for this species in Eagle Creek. Roads and trails occurring within the floodplain can have substantial impacts to the functioning of riparian areas and vegetation, sedimentation inputs into the stream, and negative impacts to water quality, and the loss of aquatic habitats.

Roads and road construction and maintenance can result in the destruction and alteration of riparian and aquatic habitat, increases in sedimentation, and water quality degradation. Roads can also act as modes of transport for disease transmission and invasive species introduction from one site to another, especially where low water crossings exist. The engineering program contains one standard and one guideline that may help minimize some threats to roundtail chub habitat. The standard (ST 18) states, "Road maintenance and construction activities shall be designed to reduce sediment (e.g., water bars, sediment traps, grade dips) while first providing for user safety." The guideline (GL 103) states, "Roads and motorized trails removed from the transportation network should be treated in order to avoid future risk to hydrologic function and aquatic habitat." The water resources section of the LMP also has a guideline (8) that specifies that "streamside management zones should be in place between streams and disturbed areas

and/or road locations to maintain water quality and suitable stream temperatures for aquatic species." These standards and guidelines, combined with the objectives to reduce impacts from roads, could potentially improve habitat conditions for the roundtail chub over the long term by primarily reducing sedimentation and improving water quality.

As mentioned above roads can have negative impacts to roundtail chub habitat on the ASNFs. Potential long term improvements in roundtail chub habitat that may result by reducing road densities and impacts within riparian areas have the potential to contribute to the recovery and restoration of the watersheds, riparian areas, and aquatic habitat of the roundtail chub on the ASNFs. Short term project implementation impacts are likely to occur associated with implementation of the engineering/roads program; however, their duration and extent can be minimized through standards, guidelines, and project specific mitigation measures. Although there are standards and guidelines to potentially limit impacts from roads, motorized trails, and other projects; it is not likely that all the potential negative effects such as increased runoff and sedimentation could be eliminated to the extent they could be considered insignificant or discountable. Therefore, this program area may affect and is likely to adversely affect the roundtail chub.

Lands and Minerals Program

In 2011, there were 454 existing rights-of-way and special use permits for a variety of uses on the ASNFs. A majority of these are categorized as lands permits (381) versus recreation permits (73). It is likely that some special use permits and authorizations are located within the watersheds and occupied habitats of the roundtail chub on the ASNFs, although how they may potentially impact roundtail chub and their habitat is not known. There are 16 lands special use permits for reservoirs/dams, 10 for irrigation ditches, 15 for water conveyance, and 36 for water transmission. These uses do present threats to maintaining, restoring and recovering the roundtail chub and its habitat. Reservoirs/dams currently impact the Black River and Chevelon Creek populations, while water diversions and uses are likely impacting the Eagle Creek population; primarily associated with private land inholdings and parcels on Eagle Creek, although some may originate on the ASNFs.

The possibility exists for impacts to roundtail chub through implementation of the lands and special uses programs. One standard and one guideline have been included in the LMP to address potential impacts to roundtail chub within the "water uses" and "minerals and geology" sections. The standard (ST 31) under the waters uses section states, "Special uses for water diversions shall maintain fish, wildlife, and aesthetic values and otherwise protect the environment." The guideline within the "water uses" section of the LMP states, "Streambed and floodplain alteration or removal of material should not occur if it prevents attainment of riparian, channel morphology, or streambank desired conditions." Although these two plan components may minimize and reduce potential impacts, the possibility exists for effects to the roundtail chub through the implementation of the LMP for this program area. As it cannot be concluded that potential effects will be insignificant or discountable, this program area may affect and is likely to adversely affect the roundtail chub.

Recreation and Wilderness Programs

There are over 30 reservoirs and lakes and more than 1,000 miles of streams on the ASNFs, more than any other national forest in the Southwestern Region. Reservoirs, streams, and adjacent areas are highly desirable for many types of recreational activities. The user demands and concentrated use in these areas can result in impacts that can alter vegetation, riparian areas, water quality, and aquatic habitat.

There is only one desired condition (DC 219) within the LMP in the dispersed recreation section that states, "Water-based settings are available and the associated recreation opportunities (e.g., canoeing, fishing, waterfowl hunting) do not degrade aquatic resources." Recreation sites and developments along

with their associated uses and activities may impact the roundtail chub and its habitat. Table 88 displays the acres of recreational sites within roundtail chub watersheds. While the desired condition (219) may help reduce potential impacts associated proposed sites, the potential to address impacts associated with developed sites will be limited. These sites and developments and their associated uses and activities do present threats to maintaining, restoring and recovering the roundtail chub and its habitat. Recreational sites and activities can impact roundtail chub by degrading upland and watershed conditions and function, altering riparian vegetation and function, and reducing water quality and increasing sedimentation into streams. Additionally, nonnative aquatic predators and competitors have been identified as threats to the roundtail chub; and the concentration of recreational activities within and adjacent to riparian areas and streams can increase the risk of introductions and spread of invasive or undesirable plants and animals, potentially impacting roundtail chub populations on the ASNFs.

Table 88. Recreation site polygons within Roundtail Chub watersheds

Drainage	Acres	Percent
Black River	6,492	3
Eagle Creek	5	0
Chevelon Creek	2,472	1.4

There is only one standard (ST 13) within the dispersed recreation section of the LMP and it states, "Dispersed campsites shall not be designated in areas with sensitive soils or within 50 feet of streams, wetlands, or riparian areas to prevent vegetation and bank damage, soil compaction, additional sediment, or soil and water contamination" Although this plan component may minimize and reduce potential impacts from dispersed campsites, the possibility exists for effects to the roundtail chub from the recreation program through the implementation of the LMP. It cannot be concluded that effects will be reduced to the level of insignificant or discountable; therefore, this program area may affect and is likely to adversely affect roundtail chub.

Wildlife, Fish, and Rare Plant Program

The Wildlife, Fish and Rare Plant program (WFRP) involves a variety of activities conducted by the USFS and its partners, including inventory and monitoring, habitat assessments, habitat improvements through land treatments and structures, species reintroductions, development of conservation strategies, administrative studies, collaboration with research, and information and education. The guidance for the WFRP can be used to fill in the gaps for other programs with inadequate guidance. Abundant guidance is provided in the LMP to assist the LMP in minimizing or reducing potential impacts to the roundtail chub. There are a total of 15 desired conditions (see appendix A) and two objectives associated with this program area.

- OBJ 4 Annually, enhance or restore 5 to 15 miles of stream and riparian habitat to restore structure, composition, and function of physical habitat for native fisheries and riparian-dependent species.
- OBJ 5 During the planning period, complete at least five projects (e.g., remove barriers, restore dewatered stream segments, or connect fragmented habitat) to provide for aquatic and riparian associated species and migratory species.

The watershed and riparian desired conditions, objectives, and treatments will likely be integrated with the Watershed and Ecosystem Health programs; potentially resulting in improvements in watershed condition and function, riparian conditions, and aquatic habitats across the ASNFs. The desired conditions (4, 7, 20, 23, 24, 26, 27, and 30-37) located under the "aquatic habitat and species" section of the LMP relate to the threats/risks and potential restoration needs for the roundtail chub. The two objectives (4 and 5) provide for a treatment level of approximately 5-15 miles per year, which will improve the overall aquatic habitat conditions for the streams and riparian areas receiving treatments.

Collectively these desired conditions and objectives could potentially result in long term improvements for the roundtail chub (e.g., aquatic habitat conditions, water quality and stream temperature improvements, riparian and aquatic habitat structure and function) and their occupied habitats on the ASNFs.

Restoring and maintaining aquatic habitats and riparian areas would likely improve the potential to retain or return the necessary ecological processes and functions necessary to make these ecosystems sustainable, resilient, and healthy. Altered watershed, stream, and riparian areas, along with potential and recent impacts associated with fire can have negative impacts to the roundtail chub and their habitat on the ASNFs. The aquatic habitat and species restoration actions have the potential to reduce the current threats; especially those associated with altered and degraded aquatic habitat conditions, structure, and function.

While the management of watersheds and riparian areas has the potential to have long term beneficial impacts through restoration of hydrologic conditions and functions; short term impacts associated with project implementation could result, especially those associated with the use of mechanized equipment and the potential to transfer or inadvertently move invasive or nonnative species. There is one standard and eight specific guidelines that address these potential impacts.

- ST 2 When drafting (withdrawing) water from streams or other water bodies, measures will be taken to prevent entrapment of fish and aquatic organisms and the spread of parasites or disease (e.g., Asian tapeworm, chytrid fungus, whirling disease).

- GL 7 Streams, streambanks, shorelines, lakes, wetlands, and other bodies of water should be protected from detrimental changes in water temperature and sediment to protect aquatic species and riparian habitat.
- GL 8 Streamside management zones should be in place between streams and disturbed areas and/or road locations to maintain water quality and suitable stream temperatures for aquatic species. (#8)
- GL 13 To protect water quality and aquatic species, heavy equipment and vehicles driven into a water body to accomplish work should be completely clean of petroleum residue. Water levels should be below the gear boxes of the equipment in use. Lubricants and fuels should be sealed such that inundation by water should not result in leaks.
- GL 15 Activities occurring within federally listed species habitat should apply habitat management direction and species protection measures from recovery plans.
- GL 17 To prevent degradation of native species habitat and the incidental or accidental introduction of diseases or nonnative species, aquatic species should not be transferred through management activities from one 6^{th} level HUC watershed to another.
- GL 18 Sufficient water should be left in streams to provide for aquatic species and riparian vegetation.
- GL 19 Projects and activities should avoid damming or impounding free-flowing waters to provide streamflows needed for aquatic and riparian-dependent species.
- GL 21 When new water diversions are created or existing water diversions are reanalyzed, measures should be taken to prevent entrapment of fish and aquatic organisms.

Altered aquatic habitat condition has been identified as a threat to the roundtail chub, and changes over the last century have occurred on the ASNFs. Potential long term improvements in roundtail chub habitat that may result by moving towards desired conditions; especially improvements in aquatic habitats, and risks associated with the unintentional transfer and movement of invasive and nonnative species will likely contribute to recovery and restoration of the streams and occupied habitats of the roundtail chub on the ASNFs. Impacts are likely to occur associated with project implementation; however, their duration

and extent can be minimized through guidelines and project specific mitigation measures and best management practices. While standards and guidelines will help to eliminate some impacts, it is likely that they will not be reduced to a level that can be considered insignificant or discountable. Therefore, this program area may affect and is likely to adversely affect the roundtail chub.

Cumulative Effects and Climate Change

There are privately owned parcels within all the watersheds being analyzed. Specific activities associated with these private lands are not known; but have likely included livestock and agricultural uses, water developments and diversions, and road and infrastructure developments. Lands located along the western boundary of the Apache National Forest are San Carlos Apache tribal lands. Numerous streams along this boundary have their headwaters located on tribal lands before they enter and flow onto the ASNFs (i.e., Eagle Creek). Tribal land activities are not specifically known, but have likely included impacts similar to those on ASNFs system lands; although likely much reduced in their extent and intensity, and probably limited to timber harvest, livestock grazing, and the management and introduction of nonnative fish species. Past and ongoing management actions by AZGFD and on adjacent tribal lands, have resulted in the current and increasing threat to roundtail chub and their habitat form nonnative species.

Changes associated with climate variation and change to riparian areas and aquatic habitats present some of the most important challenges for management of the roundtail chub on the ASNFs. Predictions include reduced precipitation and water in riparian areas, increased water losses from elevated evapotranspiration rates, altered high flow events with increased frequencies of high intensity convectional storms, increases in drought severity during summer low flows, and increasing temperatures in small streams and tributaries that further limit habitat during seasonal low flows. Key climate change factors potentially impacting riparian areas and aquatic habitat on the ASNFs include increases in frequency of extreme weather events and increases in wildfire risks. These key climate change factors are addressed directly or indirectly through the LMP (desired conditions, objectives, and management strategies); by enhancing adaption of ecosystems through anticipating and planning for disturbances from intense storms, reducing vulnerability by maintaining and restoring resilient native ecosystems, and increasing water conservation and planning for reductions in upland water supplies. Increases in high intensity storms and flooding will continue to threaten roundtail chub and its habitat; while improvements in PNVTs, FRCCs, watersheds, and riparian and aquatic habitats could potentially reduce these impacts.

Summary of Effects and Determinations

Based on the information above, it has been determined that the LMP may affect the roundtail chub and its occupied habitat. If the roundtail chub were to become a proposed species, the LMP is **not likely to jeopardize** the species. If critical habitat were proposed for the roundtail chub, the LMP is **not likely to adversely modify** proposed critical habitat for the species. If the species were to become listed with designated critical habitat, the LMP **may affect**, and is **likely to adversely affect** roundtail chub and its designated critical habitat. While most desired conditions and objectives have the potential to result in beneficial effects, several activities under several programs could result in adverse effects to the roundtail chub. Most program areas contain guidance (e.g., standards and guidelines) that are designed to reduce and minimize the extent and duration of any potential short and long term negative effects; however, implementation of the LMP does not provide for the mitigation of all potential effects to a level that can be equated to or considered as insignificant and/or discountable.

Spikedace *Meda fulgida*

Endangered Species Act Status: Endangered, 2012

District Occurrence:	Alpine and Clifton
Recovery Plan:	1991
Critical Habitat:	Designated 2012
Determination of Effect (Species):	May Affect, Likely to Adversely Affect
Determination of Effect (Critical Habitat):	May Affect, Likely to Adversely Affect

Natural History, Distribution, and Status of the Species Range-wide

Information relative to the life history, distribution, status of the species range-wide and listing factors are located on the FWS website http://www.fws.gov/southwest/Spikedace.htm. The literature cited within the recovery plan (FWS 1990), contains a thorough list of references for this species. This literature, along with the more recently completed final rule for the endangered status and designation of critical habitat for spikedace and loach minnow (FWS 2012), were considered and used in the preparation of this document; and are incorporated by reference into this document.

Status and Threats within the Action Area

The majority of historic native habitat for the spikedace has been drastically altered or destroyed by human uses of the rivers, streams, and watersheds. Causes of such alterations and degradation include damming, water diversion, channel down-cutting, excessive groundwater pumping, lowering water tables, channelization, riparian vegetation destruction, erosion, mining, grazing, and other watershed disturbances. An increasing threat to spikedace includes the introduction and spread of nonnative species that compete with or predate upon spikedace.

Resource activities that affect water quality, such as removal of riparian vegetation, sedimentation, or control of water levels, can affect spikedace habitat quality. All of these have impacted the ASNFs to varying degrees. The only documentation of spikedace on the ASNFs has been in Eagle Creek, although the San Francisco River was likely historical habitat that would have been occupied by the species. The species is still considered by some to be present within Eagle Creek on the ASNFs, even though it has not been collected for over 20 years. Approximately 48 miles of designated critical habitat for spikedace occurs on the ASNFs, which includes Eagle Creek, San Francisco River, and the Blue River and several of its tributaries. An introduction of spikedace into the Blue River occurred in 2012, and it is assumed for this analysis that during the planning period introductions will continue to occur throughout all or some of the designated critical habitat.

Primary Constituent Elements of Critical Habitat

The current critical habitat was designated and the primary constituent elements for spikedace were finalized in 2012 (FWS 2012). The known physical and biological features (primary constituent elements) identified as essential to the conservation of the spikedace; and the primary constituent elements essential to the conservation of the spikedace are:

1. Habitat to support all egg, larval, juvenile, and adult spikedace. This habitat includes perennial flows with a steam depth of generally less than 1 m (3.3 ft.), and with slow to swift flow velocities between 5and 80 cm per second (1.9 and 31.5 in. per second). Appropriate stream microhabitat types include glides, runs, riffles, the margins of pools and eddies, and backwater components over sand, gravel, and cobble substrates with low or moderate amounts of fine sediment and substrate embeddedness. Appropriate habitat will have a low gradient of less than 1.0 percent, at elevations below 2100 m (6,890 ft.). Water temperatures in the general range of 8.0 to 28.0 °C (46.4 to 82.4 °F).

2. An abundant aquatic insect food base consisting of mayflies, true flies, black flies, caddisflies, stoneflies, and dragonflies.
3. Streams with no or no more than low levels of pollutants.
4. Perennial flows, or interrupted stream courses that are periodically dewatered but that serve as connective corridors between occupied or seasonally occupied habitat and through which the species may move when the habitat is wetted.
5. No nonnative aquatic species or levels of nonnative aquatic species that are sufficiently low as to allow persistence of spikedace.
6. Streams with a natural, unregulated flow regime that allows for periodic flooding or, if flows are modified or regulated, a flow regime that allows for adequate river functions, such as flows capable of transporting sediments.

Designated critical habitat for the spikedace within and/or downstream of the ASNFs from the most recent "Final Rule" includes (FWS 2012):

Eagle Creek Subbasin

Eagle Creek. Approximately 16.5 miles from the Freeport McMoRan diversion dam upstream to the confluence of East Eagle Creek.

San Francisco River Subbasin

San Francisco River. Approximately 117.7 miles of the San Francisco River extending from the confluence with the Gila River in upstream to the confluence with the Tularosa River in New Mexico.

Blue River Subbasin

Blue River. Approximately 50.6 miles from the confluence with the San Francisco River upstream to the confluence of Campbell Blue and Dry Blue creeks.

Campbell Blue Creek. Approximately 7.7 miles from the confluence of Dry Blue and Campbell Blue Creeks to the confluence with Coleman Canyon.

Little Blue Creek. Approximately 3.1 miles from the confluence with the Blue River upstream to the mouth of a unnamed canyon.

Pace Creek. Approximately 0.8 miles from the confluence with Dry Blue Creek upstream to a barrier falls.

Dry Blue Creek. Approximately 3.0 miles from the confluence with Campbell Blue Creek upstream to the confluence with Pace Creek.

The Final Rule also identifies special management considerations that may be required for the different essential features of critical habitat. For Eagle Creek essential features may require special management considerations or protection due to competition with and predation by nonnative aquatic species; residual effects of past livestock grazing and impacts to uplands, riparian vegetation, and the stream; mining activities in the uplands; moderate to severe drought; road construction and maintenance within and adjacent to the stream channel, and the indirect effect of wildfires that have occurred in the watershed since 2007. For the San Francisco River essential features may require special management considerations or protection due to residual impacts from past livestock grazing and impacts to uplands, riparian vegetation, and the stream; water diversions; competition with and predation by nonnative aquatic species; road construction and maintenance; channelization, and moderate drought. Essential features in the Blue River subbasin may require special management considerations or protection due to residual impacts of past livestock grazing and impacts to uplands, riparian vegetation, and the stream; moderate to severe drought; and competition with and predation by nonnative aquatic species. Campbell Blue Creek and portions of the Blue River watersheds were burned during the Wallow Fire in 2011, and increased ash and sedimentation within the active stream may be ongoing issues in these streams.

Species and Habitat Effects Analysis

For discussion and analysis purposes, each species have been grouped into watersheds. These watersheds were considered as the contiguous streams and uplands that drain into critical habitat. These populations are referred to by the name of the lowermost (highest stream order) stream within the drainage area; for the spikedace there are two watersheds considered here; Eagle Creek and the San Francisco River. These two drainage areas may not always be consistent with the various Hydrologic Unit Code boundaries, as the lowermost point within the drainage area can be determined by several factors (e.g., the downstream end of critical habitat, the downstream end of occupied habitat, the ASNFs boundary). Given that all of the habitat occupied by and/or being managed for the spikedace is contained within designated critical habitat, impacts and potential effects associated with implementation of the LMP apply equally to the species and/or its critical habitat, as they are synonymous.

Wildland Fire Management

Both fire and mechanical treatments would be used to move vegetation toward desired conditions. These treatments are used to change the character of the vegetation that would result in lower risk of uncharacteristic fire and a return of wildfire to a more natural role. The desired condition is to move toward or maintain vegetation conditions in Fire Regime Condition Class (FRCC) 1. FRCC is a metric that quantifies how departed a system is from historical conditions in relation to fire, the role fire historically played in the that system, and the vegetative structure. Under the LMP, annually approximately 48,500 acres would be treated across all of the PNVTs; and approximately 60% (28900 acres) would be treated by fire, and approximately 40% (19600 acres) would be treated mechanically. The current conditions for FRCC on the ASNFs are 14% FRCC 1, 14% FRCC 2, and 72% FRCC 3. Under the LMP, the FRCC conditions on the ASNFs after 15 years will improve to 24% FRCC 1, 41% FRCC 2, and 35% to FRCC 3.

Table 89 displays the percent of FRCCs by watersheds. FRCC is a measure of the difference in structure between current and reference conditions. Low (FRCC 1) is considered to be within the natural (historical) range of variability, while moderate (FRCC 2) and high (FRCC 3) departures are outside historical range. Vegetation in FRCC 1 is more resilient and resistant and less likely to lose key ecosystem components (e.g., native species, large trees, soil) after a disturbance, and fire behavior and other associated disturbances are similar to those that occurred prior to the exclusion of fire. It is expected that through implementation of the LMP the acres of FRCC 1 and FRCC 2 will increase, and the acres of FRCC 3 will decrease within spikedace watersheds.

Table 89. Fire Regime Condition Class (FRCC) for Spikedace Watersheds

Watersheds	FRCC 1 (% area)	FRCC 1 (acres)	FRCC 2 (% area)	FRCC 2 (acres)	FRCC 3 (% area)	FRCC 3 (acres)
San Francisco River	7.4	36,517	5.8	28,700	86.8	429,713
Eagle Creek	19.6	31,005	1.1	1,757	79.3	125,406

Indirect impacts associated with fire and flooding have been identified as threats to spikedace. Over the last 75+ years, alterations to vegetation (e.g., livestock grazing and timber harvest activities), along with the suppression of wildfire has resulted in the disruption of the ecological role of fire in maintaining ecosystems. This has resulted in uncharacteristic impacts from wildfire on watersheds and aquatic habitat and species. Table 90 displays the burn severity impacts associated with the Wallow Fire that occurred in 2011. Most of the impacts occurred within the San Francisco River watershed and critical habitat, with very minor impacts to Eagle Creek.

Table 90. Wallow Fire Burn Severity (%) within Spikedace watersheds and critical habitat

	Watershed Total				Critical Habitat (200 m corridor)			
	High	Moderate	Low	Total	High	Moderate	Low	Total
San Francisco River	2.8%	3.5%	10.3%	16.7%	0.8%	1.0%	4.6%	6.5%
Eagle Creek	0.6%	0.6%	2.8%	4.0%	No acres burned			

The ecological role that wildfire has played in maintaining ecosystem structure, function, and process has been altered over time. Past fire suppression and management activities on the ASNFs have resulted in landscape scale conditions that can result in uncharacteristic and sometimes severe impacts from wildfire. Table 91 displays the amount of impacts (acres and percent) to spikedace watersheds that have occurred over the last 10 and 25 years. As can be seen from Table 91, almost all of the wildfire within spikedace watersheds has occurred within the last ten years. This more recent (last ten years) higher level of wildfire activity has resulted from altered vegetation conditions, long-term drought, and the increased use of wildfire being managed for resource benefits. This increased level of wildfire activity is likely to continue until improvements occur in vegetative structure and function, and drought conditions improve.

Table 91. Fire acres (≥100) within Spikedace drainage areas (last 10 years and last 25 years)

	10 Years				25 Years			
Drainage	Acres Burned	Percent Burned	Acres Unburned	Percent Unburned	Acres Burned	Percent Burned	Acres Unburned	Percent Unburned
San Francisco River	172,259	34.8	355,718	71.9	185,084	37.4	346,111	69.9
Eagle Creek	39,374	24.9	126,025	79.7	41,464	26.2	126,025	79.7

The Wildfire Management program will be highly integrated with the vegetation (PNVT) treatments, resulting in improvements in both FRCC and PNVTs across the ASNFs. Three desired conditions (41, 42, and 296) located under the "all PNVTs" section of the LMP relate to the Fire program. Desired condition 41 states, "Natural processes and human and natural disturbances (e.g., planned and unplanned fire ignitions, mechanical vegetation treatments) provide desired overall tree density, structure, species composition, coarse woody debris, and nutrient cycling. Natural fire regimes are restored. Uncharacteristic fire behavior is minimal or absent on the landscape." Desired condition 42 states, "Fire (prescribed fire and use of wildland fire) maintains and enhances resources and, as nearly as possible, is allowed to function in its natural ecological role." Desired condition 296 states, "Wildland fires burn within the range of frequency and intensity of natural fire regimes. Uncharacteristic high-severity fires rarely occur and do not burn at the landscape scale." Collectively these desired conditions could potentially result in long term improvements for the spikedace (e.g., watershed and hydrologic conditions, water quality, riparian and aquatic habitat conditions).

The greatest improvements in FRCC conditions will occur within the Dry Mixed Conifer Forest, Madrean Pine-Oak Woodland, and the Great Basin Grassland PNVT types. For the San Francisco River drainage area these PNVTs comprise approximately 78% of the total area, and for the Eagle Creek drainage area they comprise approximately 73%. Therefore, potential improvements in FRCC and PNVT conditions are likely to occur within the San Francisco and Eagle Creek watersheds of spikedace.

While the management of prescribed fire has the potential to have long term beneficial impacts through restoration of vegetation conditions and natural fire regimes, short term impacts associated with project implementation could result. Activities associated with prescribed fire can impact spikedace critical habitat (PCEs 1, 2, and 3) by altering water quality and increasing sedimentation into streams, resulting in altered habitat conditions and reduced food resources and abundance. While there are no specific Wildland Fire Management program standards or guidelines relevant to spikedace, a guideline (GL 23) under the all PNVTs section of the LMP states, "Landscape scale restoration projects should be designed

to spread out treatments spatially and/or temporally to reduce implementation impacts and allow reestablishment of vegetation and soil cover." This guideline could help reduce or minimize short term impacts that could result from prescribed fire activities.

Wildland fire has been identified as a threat to the spikedace, and has impacts on the two watersheds on the ASNFs, especially over the last ten years. Potential long term improvements in spikedace habitat that may result by moving towards desired conditions, especially improvements in FRCC and PNVTs, will likely contribute to recovery and restoration of the watersheds and critical habitats of the spikedace on the ASNFs; while reducing potential impacts from uncharacteristic fire and the associated increases in ash and sedimentation. Short term project implementation impacts are likely to occur associated with implementation of the fire program; however, their duration and extent can be minimized through guidelines and project specific mitigation measures. Although mitigation of impacts will occur, based on past actions and the limitations of potential mitigation measures and timing of activities; impacts to spikedace from this program area may affect and are likely to adversely affect both the species and its critical habitat.

Ecosystem/Vegetation Health and Forest Products

The LMP has recognized the need to address the maintenance and improvement of ecosystem health. Thirteen of the 14 PNVTs on the ASNFs vary (sometimes substantially) in structure, composition, function, and natural disturbance processes from desired conditions. All 14 PNVTs are key components in sustaining terrestrial and aquatic ecosystems and providing goods and services. The desired conditions for the PNVTs will result in resilient, functioning ecosystems; and in conjunction with the objectives, will guide future vegetation management activities, including burning and mechanical treatments, to maintain or move towards desired conditions. Table 92 displays the acres and percentage of each PNVT for each of the spikedace watersheds on the ASNFs. These data show how the PNVTs can vary considerably between the watersheds, and show the complexity of the watersheds and the potential difficulties in maintaining, improving, and restoring these areas for spikedace recovery.

Table 92. PNVTs for Spikedace watersheds

	Cottonwood-Willow Riparian Forest	Dry Mixed Conifer Forest	Interior Chaparral	Madrean Pine-Oak Woodlands	Mixed Broadleaf Deciduous Riparian Forest	Montane Willow Riparian Forest	Montane/Subalpine Grasslands	Piñon-Juniper Woodland	Ponderosa Pine Forest	Semi-desert Grassland	Great Basin Grassland	Spruce-Fir Forest	Wet Mixed Conifer Forest	Wetland/Cienega Riparian Areas	Water
San Francisco River Total acres = 494,930															
Acres	3,419	19,021	26,923	295,112	6,411	224	374	3,182	47,760	67,595	--	4,273	19,874	759	--
Percent	0.70	3.80	5.40	59.60	1.30	0.05	0.08	0.60	9.70	13.70	--	0.90	4.00	0.20	--
Eagle Creek Total acres = 158,168 acres															
Acres	101	3,496	27,894	86,767	3,111	--	--	--	6,454	28,789	--	3	1,653	--	--
Percent	0.06	2.2	17.6	54.9	2.0	--	--	--	4.0	18.2	--	0.0	1.0	--	--

There are ten desired conditions (see appendix A) and three objectives associated with this program area relevant to this analysis within the ecosystem health, PNVTs, and forest products sections of the LMP.

- OBJ 11 (All Forested PNVTs) Annually, treat 5,000 to 35,000 acres to reduce tree densities, restore natural fire regimes, promote species habitat and ecosystem health, reduce fire hazard, maintain desired conditions, initiate recovery from uncharacteristic disturbance, and provide forest products, leaving a desired mix of species with the range of desired densities that are resilient to changing climatic conditions.
- OBJ 13 (All Woodland PNVTs) Annually, treat or maintain 5,000 to 15,000 acres to promote a highly diverse structure.
- Obj 14 (Grasslands) Decrease or maintain the woody canopy cover at less than 10 percent by treating up to 25,000 acres annually.

The vegetation (PNVTs) treatments will be integrated with both the Wildland Fire and Forest Products programs, resulting in improvements in both PNVTs departure and FRCC conditions across the ASNFs. The desired conditions (1, 2, 3, 39, 40, 46, 48, and 61) located under the "overall ecosystem health" and "all PNVTs" sections of the LMP relate to this program and the watershed and landscape scale conditions for spikedace. The three objectives (11, 13, and 14) provide for a maximum total treatment level of 75,000 acres per year, which will improve the overall departure condition for the eight modeled PNVTs from their current rating of 64% (high departure) to 44% (moderate departure) over the planning period. Collectively these desired conditions could potentially result in long term improvements for the spikedace (e.g., watershed and hydrologic conditions, water quality, riparian and aquatic habitat conditions, risk of uncharacteristic fire) and their critical habitats (PCEs 2, 3, and 6) on the ASNFs.

The greatest improvements in PNVT departure will occur within the Dry Mixed Conifer Forest, Madrean Pine-Oak Woodland, and the Great Basin Grassland PNVT types. For the San Francisco River watershed these PNVTs comprise approximately 87% of the total area, and for the Eagle Creek watershed they comprise approximately 80%. Therefore, potential improvements in PNVT conditions are likely to occur within the San Francisco and Eagle Creek watersheds of spikedace. Restoring and maintaining PNVTs would likely improve the potential to retain or return the necessary ecological processes and patterns necessary to make these ecosystems sustainable, resilient, and healthy. Alterations to the watersheds, streams, and riparian areas; along with potential and recent impacts associated with fire, are threats to the spikedace and their persistence and recovery on the ASNFs. The landscape and watershed scale restoration actions have the potential to reduce the current large scale threats, especially those associated with uncharacteristic fire, and improve both the upland and riparian conditions for the spikedace and their designated critical habitat (PCEs 3, 4, and 6).

While the management of vegetation and PNVTs has the potential to have long term beneficial impacts through restoration of vegetation conditions and natural fire regimes; short term impacts associated with project implementation could result, especially those associated with the Ecosystem/Vegetation Health and Forest Products programs. There are three objectives that provide for the use of forest products on an annual basis; 122,000 CCF from suitable timberlands for wood products, 94,000 CCF for firewood, and 5,000 permits for Christmas trees.

Suitable timberlands are lands to be managed for timber production on a regulated basis. Suitable timber lands are likely to have greater impacts compared to other lands due to the greater emphasis on mechanical vegetation treatments and the associated infrastructure (e.g., roads, landings) and continued scheduled entries over time. The San Francisco River and Eagle Creek drainage areas have very few acres of suitable timber lands (Table 93); therefore, any potential impacts resulting from the management of suitable timber lands are low, and would likely occur only within the Eagle Creek watershed of spikedace.

Table 93. Treatment Type [suitable timber, nonsuitable timber, and fire only lands] acres by Spikedace watersheds

Watershed	Suitable Timber	Nonsuitable Timber	Fire Only
San Francisco River	27,340 acres (5.8%)	116,598 acres (23.6%)	350,993 acres (70.9%)
Eagle Creek	240 acres (0.2%)	73,477 acres (46.5%)	84,451 acres (53.4%)

Activities associated with suitable/unsuitable timberland treatments can impact spikedace by altering watershed, hydrologic, riparian, and aquatic habitat conditions; degrading water quality and increasing sedimentation into streams, and reducing food resources and abundance necessary for the spikedace. There are two specific guidelines that address these potential impacts. Guideline (23) under the all PNVTs section of the LMP states, "Landscape scale restoration projects should be designed to spread out treatments spatially and/or temporally to reduce implementation impacts and allow reestablishment of vegetation and soil cover." Guideline (130) in the Forest Products section states, "Permits issued for forest products should include stipulations to protect resources." These guidelines can minimize and reduce potential impacts resulting from treatments by reducing their intensity over space and time, although it is still likely that some level of impacts will still occur.

Altered watershed conditions, riparian, and streams, along with fire; have been identified as threats to the spikedace, and have impacted both watersheds on the ASNFs. Potential long term improvements in spikedace habitat that may result by moving towards desired conditions, especially improvements in PNVTs and risk associated with fire; will likely contribute to recovery and restoration of the watersheds and critical habitats (PCEs 3 and 4) of the spikedace on the ASNFs; while reducing potential impacts from uncharacteristic fire and the associated increases in ash and sedimentation. Short term project implementation impacts are likely to occur associated with implementation of the vegetation treatment and forest products programs; however, their duration and extent can be minimized through guidelines and project specific mitigation measures. Although impacts may be reduced, short term impacts are likely to still occur and cannot be considered insignificant or discountable. Therefore, this program area may affect, and is likely to adversely affect spikedace and its critical habitat.

Rangeland Management

Program activities include administering livestock grazing consistent with NEPA decisions, ESA consultation requirements, and guidance in the LMP. Additional program activities include implementation and effectiveness monitoring of individual allotments, development of structural and non-structural improvements to facilitate better livestock management and to improve wildlife habitat and watershed conditions, control of invasive weeds, and the authorization of grazing consistent with the LMP through site specific allotment NEPA. The LMP determined that most of the ASNFs is suitable for livestock grazing. Suitability is the appropriateness of applying certain resource management practices to a particular area of land, in consideration of relevant social, economic, and ecological factors. Table 94 displays the livestock grazing suitability acres for each of the spikedace watersheds and critical habitat.

Table 94. Livestock grazing suitability within Spikedace watersheds and critical habitat

	Watersheds				Critical Habitat			
	Suitable (percent)	Suitable (acres)	Unsuitable (percent)	Unsuitable (acres)	Suitable (percent)	Suitable (acres)	Unsuitable (percent)	Unsuitable (acres)
San Francisco River	99.7	493,521	0.3	1,410	91	5,675	0.9	562
Eagle Creek	100	158,168	0	0	100	980	0	0

Most all of the spikedace watersheds and critical habitat have been determined to be suitable for livestock grazing. While a determination of suitability does not necessarily result in livestock grazing on that area, current management provides for livestock grazing across most of the ASNFs. Livestock grazing can impact watersheds and hydrologic conditions by altering vegetation and ground cover, soil compaction, and water quality. Current range condition on the ASNFs is reflective of past and ongoing grazing activities, and landscape scale conditions have not changed significantly since the 1980s. Table 95 displays the current range conditions for each of the spikedace watersheds and their critical habitat, with most of the acres falling in good, fair, poor, and no capacity range condition.

Table 95. Range Condition within Spikedace drainage areas

	Drainage Areas		Critical Habitat	
Range Condition	**Acres**	**Percent**	**Acres**	**Percent**
San Francisco River				
Excellent	--	--	--	--
Good	23,552	5.1	960	18
Fair	81,856	17.6	679	12.8
Poor	128,445	27.5	1,602	30.1
Very Poor	9,472	2.0	133	2.5
No capacity	222,919	47.8	1,947	33.6
Eagle Creek				
Excellent	--	--	--	--
Good	4,611	2.9	--	--
Fair	52,140	33.0	289	29.7
Poor	58,101	36.8	525	54
Very Poor	223	0.1	--	--
No capacity	42,885	27.1	159	16.3

Given the long history of domestic livestock grazing activities on the ASNFs, considerable amounts of infrastructure have been developed through site specific management. The most common types of range developments associated with livestock grazing activities include fencing, water developments, and corrals. These range developments can impact watersheds, riparian areas, and aquatic habitats. Fencing can result in the concentration of grazing animals, impacting vegetation, soils, and aquatic habitat where this occurs. Pit tanks occur on drainages and can alter hydrologic conditions, and can act as vectors (along with livestock) for the movement and introduction of invasive or undesirable species. Corrals are often located adjacent to streams and springs, and impacts to water quality and vegetation can result from the concentrated use in these areas. Table 96 displays the primary range developments within spikedace watersheds and critical habitat; and while these developments can help to disperse impacts across livestock grazing allotments, higher levels of these developments are likely to result in greater risks to the spikedace from livestock grazing actions.

Table 96. Constructed Features within Spikedace watersheds and critical habitats

Watershed	Feature	Watershed Total	Critical Habitat (200 m corridor)
San Francisco River	Corral (points)	130	1
San Francisco River	Pit Tank (points)	329	--
San Francisco River	Constructed Fence (miles)	596.7	23
Eagle Creek	Corral (points)	52	2
Eagle Creek	Pit Tank (points)	160	--
Eagle Creek	Constructed Fence (miles)	285.1	11.0

While there are no relevant desired conditions associated with the livestock grazing and invasive species, there are two objectives associated with the invasive species program that are relevant to the spikedace. These two objectives (OBJ 16 and OBJ 17) propose to annually "contain, control, or eradicate invasive species (e.g., musk thistle, Dalmatian toadflax) on 500 to 3,500 acres", and "control or eradicate invasive species (e.g., tamarisk, bullfrogs) on at least 2 stream miles." Invasive and nonnative species have been identified as threats to both of the spikedace watersheds on the ASNFs; and these two objectives could potentially improve both the riparian and aquatic habitat for the spikedace by restoring vegetation and aquatic species composition to historical conditions, or to levels that are low enough to allow for the persistence of spikedace (PCE 5).

While the invasive species program has the potential to have some long term benefits to spikedace and their habitat (i.e., tamarisk removal on the Blue River in 2012), the possibility exists for impacts to spikedace through implementation of this program and the livestock grazing program. One standard and seven guidelines have been included in the LMP that may address potential impacts.

- ST 4 Vegetation treatments shall include measures to reduce the potential for introduction of invasive plants and animals and damage from nonnative insects and diseases.

- GL 32 Active grazing allotments should be managed to maintain or improve to desired riparian conditions.
- GL 78 Projects and activities should not transfer water between drainages or between unconnected water bodies within the same drainage to avoid spreading disease and aquatic invasive species.
- GL 79 Project areas should be monitored to ensure there is no introduction or spread of invasive species.
- GL 81 Pesticide use should minimize impacts on nontarget plants and animals.
- GL 134 New livestock troughs, tanks, and holding facilities should be located out of riparian areas to limit concentration of livestock in these areas. Existing facilities in riparian areas should be modified, relocated, or removed where their presence is determined to inhibit movement toward desired riparian or aquatic conditions.
- GL 138 To minimize potential resource impacts from livestock, salt or nutritional supplements should not be placed within a quarter of a mile of any riparian area or water source. Salt or nutritional supplements should also be located to minimize herbivory impacts to aspen clones.
- GL 139 To prevent resource damage (e.g., streambanks) and disturbance to federally listed and sensitive wildlife species, trailing of livestock should not occur along riparian areas. Where no alternative route is available, approval may be granted where effective mitigation measures are implemented (e.g., timing of trailing, number of livestock trailed at one time).

While the invasive species program has the potential to have long term benefits and impacts through restoration of vegetation conditions, riparian areas, and aquatic habitats; activities associated with the livestock grazing program can impact spikedace by degrading upland and watershed conditions and function, altering riparian vegetation and function, and reducing water quality and increasing sedimentation into streams. The standards and guidelines listed above may reduce potential impacts; but given that the majority of the watersheds are suitable for livestock grazing, have range conditions that include significant amounts of fair and poor, and have considerable amounts of infrastructure (e.g., fences and tanks); it is reasonable to conclude that implementation of the LMP will result in impacts to the spikedace and their critical habitat (PCEs 1, 2, and 3). Given past actions, and the limitations relative to minimizing impacts from livestock grazing activities, it is not reasonable to conclude impacts associated with this program area will be insignificant or discountable. Therefore, this program area may affect and is likely to adversely affect spikedace and its critical habitat.

Watershed and Soil Management

The Watershed and Soil Management program seeks to maintain or improve watershed conditions and maintain good water quality. It is cross-program in orientation in that it seeks to mitigate impacts from other program activities as well. The guidance for the Watershed Program can be used to fill in the gaps for other programs with inadequate guidance. Abundant guidance is provided in the LMP to assist in minimizing or reducing potential impacts to spikedace. There are a total of 15 desired conditions (see appendix A) and six objectives associated with this program area relative to the analysis.

- OBJ 1 During the planning period, improve the condition class on at least 10 priority 6th level HUC watersheds by removing or mitigating degrading factors.
- OBJ 2 Annually, enhance or restore an average of 350 acres within priority 6th level HUC watersheds, including treating the causes of State designated impaired or threatened waters (Arizona Department of Environmental Quality, 2012) to improve watershed condition and water quality.
- OBJ 6 Annually, restore 200 to 500 acres toward desired composition, structure, and function of streams, floodplains, and riparian vegetation.
- OBJ 9 Within the planning period, enhance or restore 5 to 25 wet meadows or cienegas to proper hydrologic function and native plant and animal species composition.
- OBJ 10 Annually, work with partners to reduce animal damage to native willows and other riparian species on an average of 5 miles of riparian habitat.
- OBJ 38 Annually, prepare at least one instream flow water rights application until water acquisition needs are complete to sustain riparian areas, fish, wildlife, and water-based recreation.

The watershed and riparian desired conditions, objectives, and treatments will likely be integrated with the Wildland Fire and Ecosystem/Vegetation Health, and WFRP programs; potentially resulting in improvements in watershed condition and function, and riparian conditions across the ASNFs. The desired conditions above (9, 12, 15, 21, 22, 67-72, 74, 77, 80, and 84) located under the "watershed" and "riparian areas" sections of the LMP relate to this program and the watershed and landscape scale conditions for the spikedace. The six objectives (1, 2, 6, 9, 10, and 38) provide for a treatment level of approximately 1,000 - 10,000 acres per year, which will improve the overall conditions for the six code watersheds and riparian areas receiving treatments. Collectively these desired conditions and objectives could potentially result in long term improvements for spikedace (e.g., watershed and hydrologic conditions, water quality, riparian and aquatic habitat conditions, soils) and their critical habitats (PCEs 1, 3, 4, and 6) on the ASNFs.

Restoring and maintaining watersheds and riparian areas would likely improve the potential to retain or return the necessary ecological processes and functions necessary to make these ecosystems sustainable, resilient, and healthy. Past impacts to the uplands, streams, and riparian areas; along with potential and recent impacts associated with fire are threats to spikedace and their persistence on the ASNFs. The landscape and watershed scale restoration actions have the potential to reduce the current threats; especially those associated with watershed and hydrologic conditions, and improve both the upland (soils) and riparian conditions for the spikedace and their designated critical habitat (PCEs 3 and 4).

While the management of watersheds and riparian areas has the potential to have long term beneficial impacts through restoration of hydrologic conditions and functions; short term impacts associated with project implementation could result, especially those associated with the use of mechanical treatments. There are six specific guidelines that address these potential impacts.

- GL 2 Projects with ground-disturbing activities should be designed to minimize long and short term impacts to soil resources. Where disturbance cannot be avoided, project specific soil and water conservation practices should be developed.

- GL 6 Projects with ground-disturbing activities should be designed to minimize long and short term impacts to water resources. Where disturbance cannot be avoided, project specific soil and water conservation practices and BMPs should be developed.
- GL 30 Ground-disturbing projects (including prescribed fire) which may degrade long term riparian conditions should be avoided.
- GL 33 Storage of fuels and other toxicants should be located outside of riparian areas to prevent spills that could impair water quality or harm aquatic species.
- GL 34 Equipment should be fueled or serviced outside of riparian areas to prevent spills that could impair water quality or harm aquatic species.
- GL 35 Construction or maintenance equipment service areas should be located and treated to prevent gas, oil, or other contaminants from washing or leaching into streams.

Watershed, riparian, and stream conditions that have been altered from historical conditions can reduce the ability of spikedace to persist and recover on the ASNFs. Potential long term improvements in spikedace habitat that may result by moving towards desired conditions, especially improvements in watersheds and risk associated with degraded riparian areas; will likely contribute to recovery and restoration of the watersheds and critical habitats (PCEs 1, 3, and 6) of the spikedace on the ASNFs; while reducing potential impacts from uncharacteristic watershed and hydrologic conditions. Short term impacts are likely to occur associated with project implementation; however, their duration and extent can be minimized through guidelines and project specific mitigation measures and best management practices. Although most projects could be mitigated, it is likely that over the planning period some will result in impacts that could not be considered either insignificant or discountable. Therefore, this program area may affect and is likely to adversely affect spikedace and its critical habitat.

Engineering Program

The motorized transportation system is comprised of 765 miles of roads open only to highway legal vehicles (maintenance level 3 through 5), 2,067 miles of roads open to all motorized vehicles (maintenance level 2), 3,372 miles of roads closed to all motorized vehicles (maintenance level 1), and 156 miles of trails open to motorized vehicles less than 50 inches wide. The miles of open motorized transportation system includes roads with access restricted on a seasonal basis for public safety and to minimize resource damage. The LMP includes plan objectives to annually maintain 20% of passenger vehicle roads, 10% of high clearance roads, and 20% of both motorized and nonmotorized trails. Road crossing information for the spikedace watersheds and critical habitats are presented below in Table 97. Although the various types of crossings (e.g., culverts, bridges) cannot be accurately determined at the watershed scale, most of the crossings across the ASNFs are culverts. Route miles and densities were also calculated for the spikedace watersheds and critical habitat (Table 98). This information is separated by closed, open, and non-motorized routes; and represents the most recent data from the Forest Transportation Atlas, which does not include unauthorized routes.

Table 97. Route (motorized and nonmotorized) Crossings in Spikedace watersheds and critical habitats

Watershed Totals		Critical Habitat	
San Francisco River	1591	San Francisco River	184
Eagle Creek	573	Eagle Creek	15

Table 98. Route Miles and Densities for Closed (decommissioned and ML1) and Open (ML 2-5 and motorized trails) and Nonmotorized within Spikedace watersheds and critical habitat

		Watershed Totals		Critical Habitat	
Watershed	Route Type	Route	Density (miles	Route	Density (miles

		Miles	/ square mile)	Miles	/ square mile)
San Francisco River	Closed	199.1	0.26	1.2	0.12
San Francisco River	Open	269.5	0.35	25.4	2.6
San Francisco River	Non-motorized	398.1	0.52	18.2	1.9
San Francisco River	**Total**	**866.9**	**1.1**	**44.7**	**4.6**
Eagle Creek	Closed	19.9	0.08	0.27	0.08
Eagle Creek	Open	140.3	0.57	4.0	1.7
Eagle Creek	Non-motorized	133.5	0.54	13.4	5.6
Eagle Creek	**Total**	**293.7**	**1.2**	**17.6**	**7.4**

While there are no relevant desired conditions for the Engineering program; there are two objectives within the riparian section of the LMP that relate to roads.

- OBJ 7 Within the planning period, relocate, repair, improve, or decommission a minimum of 4 miles of National Forest System roads or trails that add sediment to streams, damage riparian vegetation, erode streambanks, cause gullies, and/or compact floodplain soils.
- OBJ 8 Annually, remove an average of 2 miles of unauthorized roads or trails that sediment to streams, damage riparian vegetation, erode streambanks, cause gullies, and/or impact floodplain soils.

These two objectives could potentially result in long term improvements for the spikedace and their critical habitats by reducing sedimentation associated with degraded and/or unauthorized roads and trails. Restoring and rehabilitating these sites could potentially improve water quality, habitat conditions, and the macroinvertebrate food base needed by spikedace. All watersheds could potentially benefit from implementation of these objectives, as road and trail densities within critical habitats for this species are relatively high; and major roads occur within or adjacent to most of the critical habitat for this species in Eagle Creek, and this accounts for the high route density (7.4 miles/square mile) within critical habitat in Eagle Creek. Roads and trails occurring within the floodplain can have substantial impacts to the functioning of riparian areas and vegetation, sedimentation inputs into the stream, and negative impacts to water quality, and the loss of aquatic habitats.

Roads and road construction and maintenance can result in the destruction and alteration of riparian and aquatic habitat, increases in sedimentation, and water quality degradation. Roads can also act as modes of transport for disease transmission and invasive species introduction from one site to another, especially where low water crossings exist. The engineering program contains one standard and one guideline that may help minimize some threats to spikedace habitat. The standard (ST 18) states, "Road maintenance and construction activities shall be designed to reduce sediment (e.g., water bars, sediment traps, grade dips) while first providing for user safety." The guideline (GL 103) states, "Roads and motorized trails removed from the transportation network should be treated in order to avoid future risk to hydrologic function and aquatic habitat." The water resources section of the LMP also has a guideline (GL 8) that specifies that "streamside management zones should be in place between streams and disturbed areas and/or road locations to maintain water quality and suitable stream temperatures for aquatic species." These standards and guidelines, combined with the objectives to reduce impacts from roads, could potentially improve critical habitat conditions (PCEs 2 and 3) for spikedace over the long term by primarily reducing sedimentation and improving water quality.

Erosion associated with roads can negatively impact spikedace, and are currently impacting watershed conditions on the ASNFs. Roads crossing and adjacent to streams can remove and alter riparian vegetation, impact stream channel function and structure, and alter and degrade aquatic habitat through changes in water quality and increases in sedimentation. Potential long term improvements in spikedace habitat may result by reducing road densities and impacts within riparian areas; and have the potential to

contribute to recovery and restoration of the watersheds, riparian areas, and critical habitats of the spikedace on the ASNFs. Short term project implementation impacts are likely to occur associated with implementation of the engineering/roads program; however, their duration and extent can be minimized through standards, guidelines, and project specific mitigation measures. Although there are standards and guidelines that potentially limit impacts from roads, motorized trails, and other projects; it is not likely that all the potential negative effects such as increased runoff and sedimentation, could be eliminated to the extent they could be considered insignificant or discountable. Therefore, this program area may affect and is likely to adversely affect spikedace and its critical habitat.

Lands and Minerals Program

In 2011, there were 454 existing rights-of-way and special use permits for a variety of uses on the ASNFs. A majority of these are categorized as lands permits (381) versus recreation permits (73). It is likely that many special use permits and authorizations are located within the watersheds of the spikedace on the ASNFs, although how they potentially impact spikedace and their habitat is not specifically known. Over the entire ASNFs there are 16 lands special use permits for reservoirs/dams, 10 for irrigation ditches, 15 for water conveyance, and 36 for water transmission. These uses do present threats to maintaining, restoring and recovering the spikedace and its habitat. While reservoirs/dams are not currently impacting the spikedace, water diversions and uses are likely impacting the San Francisco River and Eagle Creek; although primarily associated with private land inholdings and parcels on the Blue River and Eagle Creek, some may originate on the ASNFs.

While special use permits have the potential to have some long term benefits to spikedace and their critical habitat (i.e., recently completed Blue River barrier); the possibility exists for impacts to spikedace through implementation of the lands and special uses programs. One standard and one guideline have been included in the LMP to address potential impacts to spikedace within the "water uses" and "minerals and geology" sections. The standard (31) under the waters uses section states, "Special uses for water diversions shall maintain fish, wildlife, and aesthetic values and otherwise protect the environment." The guideline (146) within the "water uses" section of the LMP states, "Streambed and floodplain alteration or removal of material should not occur if it prevents attainment of riparian, channel morphology, or streambank desired conditions." Although these two plan components may minimize and reduce potential impacts, the possibility exists for effects to the spikedace through the implementation of the LMP for this program area. It cannot be concluded that effects will reduced to the level where they can be considered insignificant or discountable; therefore, this program area may affect and is likely to adversely affect the spikedace and its critical habitat.

Recreation and Wilderness Programs

There are over 30 reservoirs and lakes and more than 1,000 miles of streams on the ASNFs, more than any other national forest in the Southwestern Region. Reservoirs and streams and adjacent areas are highly desirable for many types of recreational activities. The user demands and concentrated use in these areas can result in impacts that can alter vegetation, riparian areas, water quality, and aquatic habitat.

There is only one relevant desired condition (DC 219) within the LMP in the dispersed recreation section that states, "Water-based settings are available and the associated recreation opportunities (e.g., canoeing, fishing, waterfowl hunting) do not degrade aquatic resources." While this may help reduce some impacts associated with these sites, the potential to address impacts associated with developed sites will be limited. While the "recreation site acres" existing condition data are minimal in their extent on the ASNFs, they can disparately impact riparian areas. Table 99 displays the acres of recreational sites within spikedace watersheds and critical habitat. There are seven trailheads and two campgrounds on the Blue

River, and four trailheads and one campground on Eagle Creek. These sites and developments and their associated uses and activities do present threats to maintaining, restoring and recovering the loach minnow and its habitat. Recreational sites and activities can impact spikedace by degrading upland and watershed conditions and function, altering riparian vegetation and function, and reducing water quality and increasing sedimentation into streams. Additionally, invasive and nonnative species have been identified as threats to the spikedace; and the concentration of recreational activities within and adjacent to riparian areas and streams can increase the risk of introductions and spread of invasive or undesirable plants and animals, potentially impacting aquatic habitat in the San Francisco River and Eagle Creek.

Table 99. Recreation Site Polygons (acres) within Spikedace watersheds and critical habitat

	Watershed Total		Critical Habitat (200 m)	
Watershed	**Acres**	**Percent**	**Acres**	**Percent**
San Francisco River	58	0.01	14	0.22
Eagle Creek	5	0	-	-

There is only one standard (ST 13) within the dispersed recreation section of the LMP that states, "Dispersed campsites shall not be designated in areas with sensitive soils or within 50 feet of streams, wetlands, or riparian areas to prevent vegetation and bank damage, soil compaction, additional sediment, or soil and water contamination" Although this plan component may minimize and reduce potential impacts, the possibility exists for effects to the spikedace and its critical habitat (PCEs 3, 4, 5, and 6) from the recreation program through the implementation of the LMP. Although activities are 50 feet away, over time impacts to the stream and riparian vegetation may still result as use occurs; and risk associated with the potential to move or introduce nonnative species still exists. Therefore, this program area may affect and is likely to adversely affect spikedace its critical habitat.

Wildlife, Fish, and Rare Plant Program

The Wildlife, Fish and Rare Plant Program (WFRP) involves a variety of activities conducted by the USFS and its partners, including inventory and monitoring, habitat assessments, habitat improvements through land treatments and structures, species reintroductions, development of conservation strategies, administrative studies, collaboration with research, and information and education. The guidance for the WFRP can be used to fill in the gaps for other programs with inadequate guidance. Abundant guidance is provided in the LMP to assist the LMP in minimizing or reducing potential impacts to spikedace. There are a total of 15 desired conditions (see appendix A) and two objectives associated with this program area relative to the analysis.

- OBJ 4 Annually, enhance or restore 5 to 15 miles of stream and riparian habitat to restore structure, composition, and function of physical habitat for native fisheries and riparian-dependent species.
- OBJ 5 During the planning period, complete at least five projects (e.g., remove barriers, restore dewatered stream segments, or connect fragmented habitat) to provide for aquatic and riparian associated species and migratory species.

The WFRP desired conditions, objectives, and treatments will likely be integrated with the Watershed and Soils and Ecosystem/Vegetation Health programs; potentially resulting in improvements in watershed condition and function, riparian conditions, and aquatic habitats across the ASNFs. The desired conditions above (4, 7, 20, 23, 24, 26, 27, and 30-37) located under the "aquatic habitat and species" section of the LMP relate to the threats/risks and potential recovery and restoration needs for the spikedace. The two objectives (4 and 5) provide for a treatment level of approximately 5-15 miles per year, which will improve the overall aquatic habitat conditions for the streams and riparian areas

receiving treatments. Collectively these desired conditions and objectives could potentially result in long term improvements for the spikedace (e.g., aquatic habitat conditions, water quality and stream temperature improvements, riparian and aquatic habitat structure and function) and their critical habitats on the ASNFs.

Restoring and maintaining aquatic habitats and riparian areas would likely improve the potential to retain or return the necessary ecological processes and functions necessary to make these ecosystems sustainable, resilient, and healthy. Altered watershed, stream, and riparian conditions are threats to the spikedace and their persistence on the ASNFs. The aquatic habitat and species restoration actions have the potential to reduce the current threats; especially those associated with uncharacteristic fire, competition and predation by nonnative species, and altered and degraded aquatic habitat condition, structure, and function.

While the management of watersheds and riparian areas has the potential to have long term beneficial impacts through restoration of hydrologic conditions and functions; short term impacts associated with project implementation could result, especially those associated with the use of mechanized equipment and the potential to transfer or inadvertently move invasive or nonnative species. There is one standard and eight specific guidelines that address these potential impacts.

- ST 2 When drafting (withdrawing) water from streams or other water bodies, measures will be taken to prevent entrapment of fish and aquatic organisms and the spread of parasites or disease (e.g., Asian tapeworm, chytrid fungus, whirling disease).

- GL 7 Streams, streambanks, shorelines, lakes, wetlands, and other bodies of water should be protected from detrimental changes in water temperature and sediment to protect aquatic species and riparian habitat.
- GL 8 Streamside management zones should be in place between streams and disturbed areas and/or road locations to maintain water quality and suitable stream temperatures for aquatic species.
- GL 13 To protect water quality and aquatic species, heavy equipment and vehicles driven into a water body to accomplish work should be completely clean of petroleum residue. Water levels should be below the gear boxes of the equipment in use. Lubricants and fuels should be sealed such that inundation by water should not result in leaks.
- GL 15Activities occurring within federally listed species habitat should apply habitat management direction and species protection measures from recovery plans.
- GL 17 To prevent degradation of native species habitat and the incidental or accidental introduction of diseases or nonnative species, aquatic species should not be transferred through management activities from one 6^{th} level HUC watershed to another.
- GL 18 Sufficient water should be left in streams to provide for aquatic species and riparian vegetation.
- GL 19 Projects and activities should avoid damming or impounding free-flowing waters to provide streamflows needed for aquatic and riparian-dependent species.
- GL 21 When new water diversions are created or existing water diversions are reanalyzed, measures should be taken to prevent entrapment of fish and aquatic organisms.

Altered aquatic habitat conditions have been identified as threats to spikedace, and changes over the last century have had substantial impacts on watersheds on the ASNFs. Potential long term improvements in spikedace habitat that may result by moving towards desired conditions, especially improvements in aquatic habitats, and reducing risks associated with the unintentional transfer and movement of invasive and nonnative species; will likely contribute to recovery and restoration of the streams and critical habitats of the spikedace on the ASNFs. Short term project implementation impacts are likely to occur

associated with project implementation; however, their duration and extent can be minimized through guidelines and project specific mitigation measures and best management practices. While standards and guidelines will help to eliminate most impacts, it is likely that in some cases they cannot be reduced to the level of either insignificant or discountable. Therefore, this program area may affect and is likely to adversely affect spikedace and its critical habitat.

Cumulative Effects and Climate Change

Various amounts of private lands occur within the Campbell Blue, Blue River, Eagle Creek, and San Francisco River watersheds analyzed here. Specific activities associated with these private lands are not known; but have likely included livestock and agricultural uses, water developments and diversions, and road and infrastructure developments. Past and ongoing management actions by AZGFD and tribal lands have resulted in the current and increasing threat to the spikedace and its critical habitat from predatory and nonnative species.

Changes associated with climate variation and change to riparian areas and aquatic habitats present some of the most important challenges for management of the spikedace and its critical habitat. Predictions include reduced precipitation and water in riparian areas, increased water losses from elevated evapotranspiration rates, altered high flow events with increased frequencies of high intensity convectional storms, increases in drought severity during summer low flows, and increasing temperatures in small streams and tributaries that further limit habitat during seasonal low flows. Key climate change factors potentially impacting riparian areas and aquatic habitat on the ASNFs include increases in frequency of extreme weather events and increases in wildfire risks. These key climate change factors are addressed directly or indirectly through the LMP (desired conditions, objectives, and management strategies); by enhancing adaption of ecosystems through anticipating and planning for disturbances from intense storms, reducing vulnerability by maintaining and restoring resilient native ecosystems, and increasing water conservation and planning for reductions in upland water supplies. Increases in high intensity storms and flooding will continue to threaten spikedace and its critical habitat; and improvements in PNVTs, FRCCs, watersheds, and riparian and aquatic habitats could potentially reduce these impacts.

Spikedace and Critical Habitat
Summary of Effects and Determinations

Effects to designated critical habitat may occur by similar means presented for the species, and in the same watersheds. PCEs likely to be affected by the LMP include 1, 2, 3, 4, 5, and 6. Primary effects include the potential of introducing sediments to streams, disrupting substrates, and altered habitat components associated with the stream and riparian corridor and vegetation. Critical habitats adversely affected include Eagle Creek, Campbell Blue Creek, Blue River, Little Blue Creek, and the San Francisco River. Table 100 summarizes the potential impacts, either positive or negative, to the PCEs by program area.

Table 100. Spikedace critical habitat PCEs potentially impacted by program area

Program Area	Affected PCEs (by number) and Principle Mechanism
Wildland Fire Management	1, 2, 3, 4, 5, and 6 (increases in sedimentation, changes to water quality, imporved FRCC and PNVT conditions, reduced fire risk)
Ecosystem/Vegetation Health (Forest Products)	1, 2, 3, 4, 5, and 6 (reductions in water quality, altered riparian habitat, improvements in watersheds and PNVTs, reduced fire risk)

Rangeland Management	1, 2, 3, 4, and 5 (degraded riparian and aquatic conditions, decreased water quality, reduced invasive species)
Watershed and Soil Management (Riparian Areas)	1, 2, 3, 4, and 6 (improved watershed and hydrologic function and condtion)
Engineering	1, 2, 3, 5, and 6 (altered water quality and sedimentation, reduced road densities)
Lands and Minerals (Special Uses)	1, 2, 3, 4, 5, and 6 (impacts to water quantity and quality, altered watershed and hydrologic condition)
Recreation and Wilderness	1, 3, and 5 (watershed and riparian impacts, impacts to water quality, increased invasive species)
Wildlife, Fish, and Rare Plants	1, 2, 3, 4, 5, and 6 (improvements in water quality, riparian, and aquatic habitat; reduced invasive species)

PCE 1 Habitat to support all life stages of spikedace…
Wildland Fire Management could increase sedimentation rates into streams, and subsequently into habitat used by spikedace. Improvements in FRCCs could reduce risk associated with uncharacteristic fire that can introduce excessive amounts of sediment and ash into the stream. The Ecosystem/Vegetation Health program can improve ecosystem structure and function, and improve vegetation resiliency to disturbance by riparian PNVT treatments. Short-term impacts could result from mechanical treatments and associated ground disturbance. Rangeland Management could reduce habitat quality through increases in sedimentation. The Watershed and Soils program could improve habitat quality by reducing sediment production through watershed restoration and improvement projects. These projects could have short-term impacts, especially those using mechanical treatments and adjacent to riparian areas. The Engineering Program could increase sediment into streams from activities associated with roads management. Objectives to improve and close roads within riparian areas could reduce sediment into streams and improve aquatic habitat quality. The Lands and Minerals program can impact water temperature through actions that could remove or reduce portions of streamflows. Recreational activities along streams and within riparian areas can increase water temperatures by vegetation removal; and cause soil compaction, ground disturbance, and vegetation loss. The WFRP program through implementation of restoration projects could improve aquatic habitat and riparian vegetation, although potential short-term impacts may also occur.

PCE 2 An abundant aquatic insect food base…
Wildland Fire Management could impact the aquatic food base by increasing sedimentation and altering water quality from prescribed fire activities. Improvements in FRCCs could reduce risk associated with uncharacteristic fire that can introduce excessive amounts of sediment and ash into the stream. The Ecosystem/Vegetation Health program can improve ecosystem structure and function, and improve vegetation resiliency to disturbance by riparian PNVT treatments. Short-term impacts could result from mechanical treatments and associated ground disturbance; and these can impact water quality and sediment production, altering the macroinvertebrate community and aquatic vegetation. Rangeland Management can increase sediment production and alter water quality within the watershed, potentially impacting invertebrate production within the stream channel. The Watershed and Soils program could improve conditions by reducing sediment production through watershed restoration and improvement projects. These projects could have short-term impacts, especially those using mechanical equipment and adjacent to riparian areas. The Engineering Program could impact water quality by increasing sediment into streams from activities associated with roads management. Objectives to improve and close roads within riparian areas could reduce sediment into streams and improve water quality. Recreational activities along streams and within riparian areas can alter water quality and increase sedimentation by vegetation removal, soil compaction, and ground disturbance; resulting in changes to the food base for the

spikedace. The WFRP program through implementation of restoration projects could improve the food base for the spikedace by improving water quality and reducing sediment from implementing restoration actions, although potential short-term impacts may also occur.

PCE 3 Streams with no or no more than low levels of pollutants
Wildland Fire Management could increase sedimentation rates into streams from prescribed fire activities. Improvements in FRCCs could reduce risk associated with uncharacteristic fire that can introduce excessive amounts of sediment and ash into the stream. The Ecosystem/Vegetation Health program can improve ecosystem structure and function, and improve vegetation resiliency to disturbance by riparian PNVT treatments. Short-term impacts could result from mechanical treatments and associated ground disturbance, and these can impact water quality and sediment production. Rangeland Management can increase sediment production within the watershed, and increases in sedimentation can result from riparian area and stream channel impacts. The Watershed and Soils program could improve conditions by reducing sediment production through watershed restoration and improvement projects. These projects could have short-term impacts, especially those using mechanical equipment and adjacent to riparian areas. The Engineering Program could impact water quality by increasing sediment into streams from activities associated with roads management. Objectives to improve and close roads within riparian areas could reduce sediment into streams and improve water quality. Recreational activities along streams and within riparian areas can alter water quality and increase sedimentation by vegetation removal, soil compaction, and ground disturbance. The WFRP program through implementation of restoration projects could improve water quality by implementing restoration actions, although potential short-term impacts may also occur.

PCE 4 Perennial flows…
Wildland Fire Management can potentially alter stream flow patterns from prescribed fire activities. Improvements in FRCCs could reduce risk associated with uncharacteristic fire that can introduce excessive amounts of sediment and ash resulting from post fire flooding. The Ecosystem/Vegetation Health program can improve ecosystem structure and function, and improve vegetation resiliency to disturbance by PNVT treatments; which can help restore and improve perennial flow patterns within the watershed to more natural conditions. The Watershed and Soils program could improve perennial flow patterns to more historical conditions by reducing and removing degrading factors through watershed restoration and improvement projects. These projects could have short-term impacts, especially those using mechanical equipment and adjacent to riparian areas. The Engineering Program could impact perennial flow patterns through changes in drainage densities and hydrologic conditions from roads and activities associated with roads management. Objectives to improve and close roads within the watersheds and riparian areas of spikedace could improve perennial flows where roads have altered hydrologic conditions and floodplains. The WFRP program through implementation of restoration projects could provide for more natural flow patterns and improve perennial flows by implementing restoration actions that improve stream channel structure and function, although potential short-term impacts may also occur.

PCE 5 No nonnative aquatic species or levels that are sufficiently low to allow persistence…
The Engineering Program could increase the risk associated with the introduction of nonnative aquatic species from roads and activities associated with roads management. Objectives to improve and close roads within riparian areas could reduce the potential and opportunity to introduce nonnative aquatic species into streams. The Lands and Minerals program can increase the potential for introductions of nonnative aquatic species as a result of special use permits that allow or result in activities that occur and/or move between reservoirs, riparian areas, and streams. Recreational activities along reservoirs, riparian areas, and streams can increase the risk and opportunity to move or transport nonnative aquatic species between these bodies of water. The WFRP program through implementation of restoration

projects could improve aquatic habitats by eliminating or reducing aquatic nonnative species, although potential short-term impacts may also occur.

PCE 6 Streams with a natural, unregulated flow regime…
Wildland Fire Management can potentially alter stream flow patterns from prescribed fire activities. Improvements in FRCCs could reduce risk associated with uncharacteristic fire that can introduce excessive amounts of sediment and ash resulting from post fire flooding. The Ecosystem/Vegetation Health program can improve ecosystem structure and function, and improve vegetation resiliency to disturbance by PNVT treatments; which can help restore and improve flow patterns within the watershed to more natural conditions. The Watershed and Soils program could improve stream flow patterns to more historical conditions by reducing and removing degrading factors through watershed restoration and improvement projects. These projects could have short-term impacts, especially those using mechanical equipment and adjacent to riparian areas. The Engineering Program could impact stream flow patterns through changes in drainage densities and hydrologic conditions from roads and activities associated with roads management. Objectives to improve and close roads within the watersheds and riparian areas of spikedace could improve stream flow patterns where roads have altered hydrologic conditions and floodplains. The WFRP program through implementation of restoration projects could provide for more natural flow patterns by implementing restoration actions that improve stream channel structure and function, although potential short-term impacts may also occur.

The direction and plan components within the LMP for the Wildland Fire Management, Ecosystem/Vegetation Health, Rangeland Management, Watershed and Soils Management, Engineering, Lands and Minerals, Recreation and Wilderness, and WFRP programs are not sufficient to avoid certain activities that may adversely impact critical habitat. The potential effects from most programs can be minimized by standards and guidelines, especially those within the Watershed and Soils Management and the WFRP programs. While the potential impacts would be reduced by the standards and guidelines, they may not be completely constrained through implementation of the LMP. Although LMP implementation could potentially impact all the PCEs for critical habitat, it is not believed that these impacts would occur at a level that would preclude any of the PCEs from functioning in their role for the conservation of the species.

Based on the information above, it has been determined that the LMP **may affect**, and is **likely to adversely affect** spikedace and its critical habitat. While most desired conditions and objectives have the potential to result in beneficial effects, several activities under several programs could result in adverse effects to the spikedace. Most program areas contain guidance (e.g., standards and guidelines) that are designed to reduce and minimize the extent and duration of any potential short and long term negative effects; however, implementation of the LMP does not provide for the mitigation of all potential effects to a level that can be equated to or considered insignificant and/or discountable.

Appendix A.

ASNFs LMP Decisions: Desired Conditions, Objectives, Standards and Guidelines – May 30, 2014

Plan Section	Scale (where applicable)	Component Number	Desired Condition (DC), Objective (OBJ), Standard (ST), and Guideline (GL) [footnote]
Overall Ecosystem Health	Landscape	DC 1	Ecological components (e.g., soil, vegetation, water) are resilient to disturbances including human activities, and natural ecological disturbances (e.g., climate variability, fire, drought, wind, insects, disease, pathogens).
Overall Ecosystem Health	Landscape	DC 2	Natural ecological disturbances return to their characteristic roles within the ecosystem. Fire, in particular, is restored to a more natural function.
Overall Ecosystem Health	Landscape	DC 3	Natural ecological cycles (i.e., hydrologic, energy, nutrient) facilitate shifting of plant communities, structure, and ages across the landscape. Ecotone shifts are influenced at both the landscape and watershed scale by ecological processes. The mosaic of plant communities and the variety within the communities are resilient to disturbances.
Overall Ecosystem Health	Landscape	DC 4	Ecological conditions for habitat quality, distribution, and abundance contribute to self-sustaining populations of native and desirable nonnative plants and animals that are healthy, well distributed, connected, and genetically diverse. Conditions provide for the life history, distribution, and natural population fluctuations of the species within the capability of the landscape.
Overall Ecosystem Health	Landscape	DC 5	Large blocks of habitat are interconnected, allowing for behavioral and predator-prey interactions, and the persistence of metapopulations and highly interactive wildlife species across the landscape. Ecological connectivity extends through all plant communities.
Overall Ecosystem Health	Landscape	DC 6	Habitat configuration and availability allows wildlife populations to adjust their movements (e.g., seasonal migration, foraging) in response to climate change and promote genetic flow between wildlife populations.
Overall Ecosystem Health	Landscape	DC 7	Habitat quality, distribution, and abundance exist to support the recovery of federally listed species and the continued existence of all native and desirable nonnative species.
Overall Ecosystem Health	Landscape	DC 8	Healthy ecosystems provide a wide range of ecosystem services.
Overall Ecosystem Health	Landscape	DC 9	Watersheds exhibit high geomorphic, hydrologic, and biotic integrity relative to their natural potential condition.
Overall Ecosystem Health	--	OBJ 1	During the planning period, improve the condition class on at least 10 priority 6th level HUC watersheds by removing or mitigating degrading factors [2].
Air	Landscape	DC 10	Air quality related values, including high quality visual conditions, are maintained within the Class I airshed over Mount Baldy Wilderness.
Air	Landscape	DC 11	Class II airsheds meet State of Arizona air quality standards including those for visibility and public health.
Air	--	GL 1	During extended periods of burning, smoke should be monitored, in cooperation with the Arizona Department of Environmental Quality, for levels that may have impacts to human health from fine particulates.
Soil	Landscape	DC 12	Ecological and hydrologic functions are not impaired by soil compaction.
Soil	Mid-Scale	DC 13	Soil condition rating is satisfactory [4].
Soil	Mid-Scale	DC 14	Soils are stable within their natural capability. Vegetation and litter limit accelerated erosion (e.g., rills, gullies, root exposure, topsoil loss) and contribute to soil deposition and development.

Plan Section	Scale (where applicable)	Component Number	Desired Condition (DC), Objective (OBJ), Standard (ST), and Guideline (GL) [footnote]
Soil	Mid-Scale	DC 15	Soils provide for diverse native plant species [5]. Vegetative ground cover (herbaceous vegetation and litter) is distributed evenly across the soil surface to promote nutrient cycling, water infiltration, and to maintain natural fire regimes.
Soil	Mid-Scale	DC 16	Biological soil crusts (e.g., mosses, lichens, algae, liverworts) are present and reestablished if potential exists.
Soil	Fine Scale	DC 17	Soil loss rates do not exceed tolerance soil loss rates [6].
Soil	Fine Scale	DC 18	Logs and other woody material are distributed across the surface to maintain soil productivity [7].
Soil	Fine Scale	DC 19	Vegetation and litter is sufficient to maintain and improve water infiltration, nutrient cycling, and soil stability.
Soil	--	OBJ 2	Annually, enhance or restore an average of 350 acres within priority 6th level HUC watersheds, including treating the causes of State and federally designated impaired or threatened water to improve watershed condition and water quality.
Soil	--	OBJ 3	During the planning period, update the Terrestrial Ecosystem Survey to reflect current conditions and concepts.
Soil	--	GL 2	Projects with ground-disturbing activities should be designed to minimize long and short term impacts to soil resources. Where disturbance cannot be avoided, project specific soil and water conservation practices should be developed.
Soil	--	GL 3	Severely disturbed sites should be revegetated with native plant species when loss of long term soil productivity is predicted.
Soil	--	GL 4	Locally collected seed should be used where available and cost effective. Seeds should be tested to ensure they are free from noxious weeds and invasive nonnative plants at a State certified seed testing laboratory before acceptance and mixing.
Soil	--	GL 5	Coarse woody debris retention and/or creation should be used as needed to help retain long term soil productivity.
Water Resources	4th and 5th HUC Watershed Scale	DC 20	Water quality, stream channel stability, and aquatic habitats retain their inherent resilience to natural and other disturbances.
Water Resources	4th and 5th HUC Watershed Scale	DC 21	Water resources maintain the capability to respond and adjust to disturbances without long term adverse changes.
Water Resources	4th and 5th HUC Watershed Scale	DC 22	Vegetation and soil conditions above the floodplain protect downstream water quality, quantity, and aquatic habitat.
Water Resources	6th HUC Watershed Scale	DC 23	Instream flows provide for channel and floodplain maintenance, recharge of riparian aquifers, water quality, and minimal temperature fluctuations.
Water Resources	6th HUC Watershed Scale	DC 24	Streamflows provide connectivity among fish populations and provide unobstructed routes critical for fulfilling needs of aquatic, riparian dependent, and many upland species of plants and animals.
Water Resources	6th HUC Watershed Scale	DC 25	Water quantity meets the needs for forest administration and authorized activities (e.g., livestock grazing, recreation, firefighting, domestic use, road maintenance).

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Water Resources	6th HUC Watershed Scale	DC 26	Stream channels and floodplains are dynamic and resilient to disturbances. The water and sediment balance between streams and their watersheds allow a natural frequency of low and high flows.
Water Resources	6th HUC Watershed Scale	DC 27	Stream condition is sufficient to withstand floods without disrupting normal stream characteristics (e.g., water transport, sediment, woody material) or altering stream dimensions (e.g., bankfull width, depth, slope, sinuosity).
Water Resources	6th HUC Watershed Scale	DC 28	Floodplains are functioning and lessen the impacts of floods on human safety, health, and welfare.
Water Resources	6th HUC Watershed Scale	DC 29	Water quality meets or exceeds Arizona State standards or Environmental Protection Agency water quality standards for designated uses.
Water Resources	6th HUC Watershed Scale	DC 30	Water quality meets the needs of desirable aquatic species such as the California floater, northern and Chiricahua leopard frog, and invertebrates that support fish populations.
Water Resources	--	ST 1	Consistent with existing water rights, water diversions or obstructions shall at all times allow sufficient water to pass downstream to preserve minimum levels of waterflow that maintain aquatic life and other purposes of national forest establishment.
Water Resources	--	GL 6	Projects with ground-disturbing activities should be designed to minimize long and short term impacts to water resources. Where disturbance cannot be avoided, project specific soil and water conservation practices and BMPs should be developed.
Water Resources	--	GL 7	Streams, streambanks, shorelines, lakes, wetlands, and other bodies of water should be protected from detrimental changes [11] in water temperature and sediment to protect aquatic species and riparian habitat.
Water Resources	--	GL 8	Streamside management zones should be in place between streams and disturbed areas and/or road locations to maintain water quality and suitable stream temperatures for aquatic species.
Water Resources	--	GL 9	As State of Arizona water rights permits (e.g., water impoundments, diversions) are issued, the base level of instream flow should be retained by the Apache-Sitgreaves NFs.
Water Resources	--	GL 10	Constraints (e.g., maximum limit to which water level can be drawn down or minimum distance from a connected river, stream, wetland, or groundwater-dependent ecosystem) should be established for new groundwater pumping sites permitted on NFS lands in order to protect the character and function of water resources.
Water Resources	--	GL 11	Short term impacts in watersheds containing Outstanding Arizona Waters may be allowed when long term benefits to water quality, riparian areas, and aquatic resources would occur.
Water Resources	--	GL 12	Treated wastewater may be used to provide wetland habitats.
Water Resources	--	GL 13	To protect water quality and aquatic species, heavy equipment and vehicles driven into a water body to accomplish work should be completely clean of petroleum residue. Water levels should be below the gear boxes of the equipment in use. Lubricants and fuels should be sealed such that inundation by water should not result in leaks.
Aquatic Habitat and	4th and 5th	DC 31	Streams and aquatic habitats support native fish and/or other aquatic species providing the quantity and quality of aquatic

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Species	HUC Watershed Scale		habitat within reference conditions [12].
Aquatic Habitat and Species	4th and 5th HUC Watershed Scale	DC 32	Habitat conditions contribute to the recovery of federally listed species.
Aquatic Habitat and Species	4th and 5th HUC Watershed Scale	DC 33	Streamflows, habitat, and water quality support native aquatic and riparian-dependent species and habitat.
Aquatic Habitat and Species	6th HUC Watershed Scale	DC 34	Habitat and ecological conditions are capable of providing for self-sustaining populations of native, riparian dependent plant and animal species.
Aquatic Habitat and Species	6th HUC Watershed Scale	DC 35	Native fish, reptile, amphibian, and invertebrate populations are free from or minimally impacted by nonnative plants and animals.
Aquatic Habitat and Species	6th HUC Watershed Scale	DC 36	Aquatic species habitat conditions provide the resiliency and redundancy necessary to maintain species diversity and metapopulations.
Aquatic Habitat and Species	6th HUC Watershed Scale	DC 37	Desirable nonnative fish species provide recreational fishing in waters where those opportunities are not in conflict with the recovery of native species.
Aquatic Habitat and Species	6th HUC Watershed Scale	DC 38	Wetlands are hydrologically functioning and have sufficient (composing 50 percent of the wetland) emergent vegetation and macroinvertebrate populations to support resident and migratory wetland dependent species.
Aquatic Habitat and Species	--	OBJ 4	Annually, enhance or restore 5 to 15 miles of stream and riparian habitat to restore structure, composition, and function of physical habitat for native fisheries and riparian-dependent species.
Aquatic Habitat and Species	--	OBJ 5	During the planning period, complete at least five projects (e.g., remove barriers, restore dewatered stream segments, or connect fragmented habitat) to provide for aquatic and riparian associated species and migratory species.
Aquatic Habitat and Species	--	ST 2	When drafting (withdrawing) water from streams or other water bodies, measures will be taken to prevent entrapment of fish and aquatic organisms and the spread of parasites or disease (e.g., Asian tapeworm, chytrid fungus, whirling disease).
Aquatic Habitat and Species	--	GL 14	Management and activities should not contribute to a trend toward the Federal listing of a species.
Aquatic Habitat and Species	--	GL 15	Activities occurring within federally listed species habitat should apply habitat management direction and species protection measures from recovery plans.

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Aquatic Habitat and Species	--	GL 16	PLACEHOLDER
Aquatic Habitat and Species	--	GL 17	To prevent degradation of native species habitat and the incidental or accidental introduction of diseases or nonnative species, aquatic species should not be transferred through management activities from one 6th level HUC watershed to another.
Aquatic Habitat and Species	--	GL 18	Sufficient water should be left in streams to provide for aquatic species and riparian vegetation.
Aquatic Habitat and Species	--	GL 19	Projects and activities should avoid damming or impounding free-flowing waters to provide streamflows needed for aquatic and riparian-dependent species.
Aquatic Habitat and Species	--	GL 20	The needs of rare and unique species associated with wetlands, fens, bogs, and springs should be given priority consideration when developing these areas for waterfowl habitat and other uses.
Aquatic Habitat and Species	--	GL 21	When new water diversions are created or existing water diversions are reanalyzed, measures should be taken to prevent entrapment of fish and aquatic organisms.
All PNVTs	Landscape	DC 39	Each PNVT contains a mosaic of vegetative conditions, densities, and structures. This mosaic occurs at a variety of scales across landscapes and watersheds. The distribution of physical and biological conditions is appropriate to the natural disturbance regimes affecting the area.
All PNVTs	Landscape	DC 40	The vegetative conditions and functions are resilient to the frequency, extent, and severity of ecological disturbances (e.g., fire, insects and disease, flood, climate variability). The landscape is a functioning ecosystem that contains all its components, processes, and better able to cope with climate change.
All PNVTs	Landscape	DC 41	Natural processes and human and natural disturbances (e.g., wildland fire, mechanical vegetation treatments) provide desired overall tree density, structure, species composition, coarse woody debris, and nutrient cycling. Natural fire regimes are restored. Uncharacteristic fire behavior is minimal or absent on the landscape.
All PNVTs	Landscape	DC 42	Wildfire maintains and enhances resources and, as nearly as possible, is allowed to function in its natural ecological role.
All PNVTs	Landscape	DC 43	Native plant communities dominate the landscape.
All PNVTs	Landscape	DC 44	The range of species genetic diversity remains within native vegetation and animal populations, thus enabling species to adapt to changing environmental and climatic conditions.
All PNVTs	Landscape	DC 45	Vegetative connectivity provides for species dispersal, genetic exchange, and daily and seasonal movements across multiple spatial scales.
All PNVTs	Landscape	DC 46	Vegetation characteristics (e.g., density, litter) provide favorable conditions for waterflow and quality.
All PNVTs	Landscape	DC 47	Organic soil cover and herbaceous vegetation protect soil, facilitate moisture infiltration, and contribute to plant and animal diversity and ecosystem function.
All PNVTs	Landscape	DC 48	Diverse vegetation structure, species composition, densities, and seral states provide quality habitat for native and desirable nonnative plant and animal species throughout their life cycle and at multiple spatial scales. Landscapes provide for the full range of ecosystem diversity at multiple scales, including habitats for those species associated with late seral states and old growth forests.
All PNVTs	Landscape	DC 49	Old growth is dynamic in nature and occurs in well-distributed patches that spatially shift across forest and woodland landscapes over time.

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All PNVTs	Landscape	DC 50	Old or large trees, multistoried canopies, large coarse woody debris, and snags provide the structure, function, and associated vegetation composition as appropriate for each forested and woodland PNVTs.
All PNVTs	Landscape	DC 51	Vegetation conditions allow for transition zones or ecotones between riparian areas, forests, woodlands, shrublands, and grasslands. Transition zones may shift in time and space due to changing site conditions from disturbances (e.g., fire, climate variability).
All PNVTs	Landscape	DC 52	Insect and disease populations are at endemic levels with occasional outbreaks. A variety of seral states usually restricts the scale of localized insect and disease outbreaks.
All PNVTs	Landscape	DC 53	Disjunct populations of Chihuahua pine, Arizona cypress, and Rocky Mountain maple are present with the ability to reproduce on capable sites.
All PNVTs	Landscape	DC 54	Herbivory is in balance with available forage (i.e., grazing and browsing by authorized livestock, wild horses, and wildlife do not exceed available forage production within established use levels).
All PNVTs	Landscape	DC 55	Shrub components contain a diverse array of native vegetation that is well distributed across the landscape to provide nutritional needs for browsers.
All PNVTs	Landscape	DC 56	Vegetation provides products—such as wood fiber or forage—to help meet local and regional needs in a manner that is consistent with other desired conditions on a sustainable basis within the capacity of the land.
All PNVTs	Landscape	DC 57	Ecosystem services are available as forests, woodlands, grasslands, and riparian communities successfully adapt to a changing and variable climate.
All PNVTs	Mid-Scale	DC 58	Stand densities and species compositions are such that vegetation conditions are resilient under a variety of potential future climates.
All PNVTs	Mid-Scale	DC 59	Vegetation conditions provide hiding and thermal cover in contiguous blocks for wildlife. Native plant species are present in all age classes and are healthy, reproducing, and persisting.
All PNVTs	Mid-Scale	DC 60	Vegetative ground cover (herbaceous vegetation and litter cover) is optimized [15] to protect and enrich soils and promote water infiltration. There is a diverse mix of cool and warm season grasses and desirable forbs species.
All PNVTs	Mid-Scale	DC 61	Grasses, forbs, shrubs, and litter are abundant and continuous to support natural fire regimes.
All PNVTs	Mid-Scale	DC 62	The composition, density, structure, and mosaic of vegetative conditions reduce uncharacteristic wildfire hazard to local communities and forest ecosystems.
All PNVTs	Fine Scale	DC 63	Rare or unique plant communities (e.g., agaves, Chihuahuan pine) are intact and persisting.
All PNVTs	Fine Scale	DC 64	Herbaceous vegetation amount and structure (e.g., plant density, height, litter, seed heads) provides habitat to support wildlife and prey species.
All PNVTs	Fine Scale	DC 65	Some isolated infestations of mistletoe provide for a diversity of habitat components (e.g., food, nesting, cover) for a variety of species such as owls, squirrels, and some birds and insects.
All PNVTs	--	ST 3	Within each PNVT, vegetation management activities shall be designed to maintain or move plant composition towards a moderate to high plant community similarity as compared to site potential.
All PNVTs	--	ST 4	Vegetation treatments shall include measures to reduce the potential for introduction of invasive plants and animals and damage from nonnative insects and diseases.

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All PNVTs	--	GL 22	During project design and implementation, precautions should be taken to reduce the potential for damage to residual vegetation in order to prevent premature or excessive mortality.
All PNVTs	--	GL 23	Landscape scale restoration projects should be designed to spread treatments out spatially and/or temporally within the project area to reduce implementation impacts and allow reestablishment of vegetation and soil cover.
All PNVTs	--	GL 24	Restoration methods, such as thinning or prescribed fire, should leave a mosaic of untreated areas within the larger treated project area to allow recolonization of treated areas by plants, small mammals and insects (e.g., long-tailed voles, fritillary butterflies).
All PNVTs	--	GL 25	Wildfire may be used to meet desired resource conditions, maintain or promote desired vegetation species, and enable natural fires to return to their historic role.
All PNVTs	--	GL 26	Insect and disease infected trees should be removed to prevent spread beyond endemic levels.
All PNVTs	--	GL 27	Green slash and decked logs should be managed, in a timely manner, to make them unfavorable bark beetle habitat.
All PNVTs	--	GL 28	Project implementation should include bark beetle monitoring within and adjacent to all active slash-creating projects to help prevent beetle outbreak.
All PNVTs	--	GL 29	Project plans should include quantitative and/or qualitative objectives for implementation monitoring and effectiveness monitoring to assist in moving toward or maintaining desired conditions.
Riparian Areas	Landscape	DC 66	Natural ecological disturbances (e.g., flooding, scouring) promote a diverse plant structure consisting of herbaceous, shrub, and tree species of all ages and size classes necessary for the recruitment of riparian-dependent species.
Riparian Areas	Landscape	DC 67	Riparian-wetland conditions maintain water-related processes (e.g., hydrologic, hydraulic, geomorphic). They also maintain the physical and biological community characteristics, functions, and processes.
Riparian Areas	Mid-Scale	DC 68	Stream (lotic) riparian-wetland areas have vegetation, landform, and/or large coarse woody debris to dissipate stream energy associated with high waterflow.
Riparian Areas	Mid-Scale	DC 69	Streams and their adjacent floodplains are capable of filtering, processing, and storing sediment; aiding floodplain development; improving floodwater retention; and increasing groundwater recharge.
Riparian Areas	Mid-Scale	DC 70	Vegetation and root masses stabilize streambanks, islands, and shoreline features against the cutting action of water.
Riparian Areas	Mid-Scale	DC 71	Ponding and channel characteristics provide habitat, water depth, water duration, and the temperatures necessary for maintaining populations of riparian-dependent species and for their dispersal.
Riparian Areas	Mid-Scale	DC 72	Beavers occupy capable stream reaches and help promote the function and stability of riparian areas.
Riparian Areas	Mid-Scale	DC 73	Lentic riparian areas (e.g., wet meadows, fens, bogs) have vegetation and landform present to dissipate wind action, wave action, and overland flow from uplands.
Riparian Areas	Mid-Scale	DC 74	Wetland riparian areas are capable of filtering sediment and aiding floodplain development that contribute to water retention and groundwater recharge.
Riparian Areas	Mid-Scale	DC 75	Willows (e.g., Bebb, Geyer, Arizona, Goodding's) are reproducing with all age classes present, where the potential exists.
Riparian Areas	Mid-Scale	DC 76	The spatial extent of wetlands is maintained [20].
Riparian Areas	Mid-Scale	DC 77	Soil compaction from forest activities (e.g., vehicle use, recreation, livestock grazing) does not negatively impact riparian areas.
Riparian Areas	Mid-Scale	DC 78	Riparian vegetation consists mostly of native species that support a wide range of vertebrate and invertebrate species and are

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			free of invasive plant and animal species.
Riparian Areas	Mid-Scale	DC 79	Diversity and density of riparian forest vegetation provides for breeding, escape, hiding, and resting cover for wildlife and provides travelways between other habitat areas and seasonal ranges.
Riparian Areas	Fine Scale	DC 80	The ecological function of riparian areas is resilient to animal and human use.
Riparian Areas	Fine Scale	DC 81	Riparian obligate species within wet meadows, along streambanks, and active floodplains provide sufficient [15] vegetative ground cover (herbaceous vegetation and litter cover) to protect and enrich soils, trap sediment, mitigate flood energy, stabilize streambanks, and provide for wildlife and plant needs.
Riparian Areas	Fine Scale	DC 82	Riparian soil productivity is optimized as described by the specific TES map unit[15] as indicated by the vigor of the herbaceous vegetation community. Based on species composition, ungrazed plant heights [21] range from 10 inches to 36 inches.
Riparian Areas	Fine Scale	DC 83	Floodplains and adjacent upland areas provide diverse habitat components (e.g., vegetation, debris, logs) as necessary for migration, hibernation, and brumation (extended inactivity) specific to the needs of riparian-obligate species (e.g., New Mexico meadow jumping mouse, Arizona montane vole, narrow-headed gartersnake).
Riparian Areas	Fine Scale	DC 84	Large coarse woody debris provides stability to riparian areas and stream bottoms lacking geologic control (e.g., bedrock) or geomorphic features (e.g., functioning floodplains, stream sinuosity, width/depth ratio).
Riparian Areas	Fine Scale	DC 85	Vegetation is structurally diverse, often dense, providing for high bird species diversity and abundance, especially neotropical migratory birds. It includes large trees and snags in the cottonwood-willow and mixed broadleaf deciduous riparian forests to support species such as beaver, yellow-billed cuckoo, bald eagles, Arizona gray squirrel, and various bat species.
Riparian Areas	--	OBJ 6	Annually, move 200 to 500 acres toward desired composition, structure, and function of streams, floodplains, and riparian vegetation.
Riparian Areas	--	OBJ 7	Within the planning period, relocate, repair, improve, or decommission a minimum of 4 miles of National Forest System roads or trails that add sediment to streams, damage riparian vegetation, erode streambanks, cause gullies, and/or compact floodplain soils.
Riparian Areas	--	OBJ 8	Annually, remove an average of 2 miles of unauthorized roads or trails that add sediment to streams, damage riparian vegetation, erode streambanks, cause gullies, and/or compact floodplain soils.
Riparian Areas	--	OBJ 9	Within the planning period, enhance or restore 5 to 25 wet meadows or cienegas to proper hydrologic function and native plant and animal species composition.
Riparian Areas	--	OBJ 10	Annually, work with partners to reduce animal damage to native willows and other riparian species on an average of 5 miles of riparian habitat.
Riparian Areas	--	GL 30	Ground-disturbing projects (including prescribed fire) which may degrade long term riparian conditions should be avoided.
Riparian Areas	--	GL 31	Wet meadows and cienegas should not be used for concentrated activities (e.g., equipment storage, forest product or mineral stockpiling, livestock handling facilities, special uses) that cause damage to soil and vegetation.
Riparian Areas	--	GL 32	Active grazing allotments should be managed to maintain or improve to desired riparian conditions.
Riparian Areas	--	GL 33	Storage of fuels and other toxicants should be located outside of riparian areas to prevent spills that could impair water quality or harm aquatic species.
Riparian Areas	--	GL 34	Equipment should be fueled or serviced outside of riparian areas to prevent spills that could impair water quality or harm

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			aquatic species.
Riparian Areas	--	GL 35	Construction or maintenance equipment service areas should be located and treated to prevent gas, oil, or other contaminants from washing or leaching into streams.
All Forested PNVTs	--	OBJ 11	Annually, treat 5,000 to 35,000 acres to reduce tree densities, restore natural fire regimes, promote species habitat and ecosystem health, reduce fire hazard, maintain desired conditions, initiate recovery from uncharacteristic disturbance, and provide forest products, leaving a desired mix of species with the range of desired densities that are resilient to changing climatic conditions.
All Forested PNVTs	--	ST 5	Regulated timber harvest activities shall occur only on those lands classified as suitable for timber production.
All Forested PNVTs	--	ST 6	If individual harvest openings created by even-aged silvicultural practices are proposed that would exceed 40 acres, then National Forest Management Act (NFMA) requirements regarding public notification and regional forester approval shall be followed. These requirements do not apply to the size of areas harvested because of natural catastrophic conditions such as, but not limited to, fire, insect and disease attacks, or windstorms.
All Forested PNVTs	--	ST 7	On lands suitable for timber production, timber harvest activities shall only be used when there is reasonable assurance of restocking within 5 years after final regeneration harvest. This also applies where wildland fire is used to create openings for tree regeneration purposes on suitable timber lands. Restocking level is prescribed in a site specific silvicultural prescription for a project treatment unit and is determined to be adequate depending on the objectives and desired conditions for the plan area. In some instances, such as when lands are harvested or prescribed burned to create openings for firebreaks and vistas or to prevent encroaching trees, it is appropriate not to restock.
All Forested PNVTs	--	ST 8	On lands suitable for timber production, even-aged stands shall have reached or surpassed culmination of mean annual increment (95 percent of culmination of mean annual increment of growth, as measured by cubic volume) prior to regeneration harvest, unless the following conditions have been identified during project development: (1) when such harvesting would assist in reducing fire hazard within the wildland-urban interface, or (2) when harvesting of stands will trend landscapes toward vegetation desired conditions (e.g., uneven-aged structure).
All Forested PNVTs	--	ST 9	Harvesting systems shall be selected based on their ability to meet desired conditions and not strictly on their ability to provide the greatest dollar return.
All Forested PNVTs	--	ST 10	Clearcutting shall be used only where it is the optimum method for meeting desired conditions.
All Forested PNVTs	--	GL 36	Where current forests are lacking proportional representation of late seral states and species composition on a landscape scale, old growth characteristics should be retained or encouraged to the greatest extent possible within the scope of meeting other desired conditions (e.g., reduce impacts from insects and disease, reduce the threat of uncharacteristic wildfire).
All Forested PNVTs	--	GL 37	Healthy southwestern white pine should be retained to maintain the wide range of genetic variability that contributes to resistance against the nonnative white pine blister rust disease.
All Forested PNVTs	--	GL 38	Tree species that are less susceptible to root disease should be retained within areas of root disease infection to reduce spread of disease.
All Forested PNVTs	--	GL 39	On single species dominated sites, uneven-aged management may be used where less than 20 percent of the host tree species—or less than 25 percent of the area—is infected by dwarf mistletoe. Thinning and under-burning may be used to keep dwarf mistletoe levels from increasing. Even-aged management or deferral should be considered when greater than 20 percent of the

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			host species, or 25 percent of the area, is infected with dwarf mistletoe.
All Forested PNVTs	--	GL 40	On single species dominated sites, thinning should not be attempted where more than 80 percent of the host species—or 90 percent of the area—is infected with dwarf mistletoe. Regeneration and/or deferral may be used in these cases. However, in the Community-Forest Intermix Management Area additional treatment options may be used.
All Forested PNVTs	--	GL 41	On mixed species dominated sites, even-aged management or deferral should be used instead of uneven-aged management where more than 50 percent of conifer trees (excluding white fir) are infected by dwarf mistletoe.
All Forested PNVTs	--	GL 42	When thinning dwarf mistletoe infected sites, as much mistletoe should be removed as possible without sacrificing the healthiest, most desirable trees for the particular site (in some situations, this may involve retaining some trees in the upper canopy that are lightly infected to meet multiple resource objectives).
All Forested PNVTs	--	GL 43	Where a seed cut treatment (even-aged method to promote natural seedling establishment) is applied for dwarf mistletoe control, it should be followed within 10 years of seedling establishment by a final removal treatment or other effective means to prevent further infection.
All Forested PNVTs	--	GL 44	Where a site specific analysis indicates the need to reduce fire-kill of desired residual trees, fuel continuity and/or loading should be reduced before use of prescribed fire.
All Forested PNVTs	--	GL 45	Trees, snags, and logs immediately adjacent to active red squirrel cone caches, Abert's squirrel nests, and raptor nests should be retained to maintain needed habitat components and provide tree groupings.
All Forested PNVTs	--	GL 46	Hiding cover, approach cover (by waters), and travel corridor cover should be provided where needed by wildlife.
Ponderosa Pine	Landscape	DC 86	The ponderosa pine forest is a mosaic of structural states ranging from young to old trees. Forest structure is variable but uneven-aged and open in appearance. Sporadic areas of even-aged structure may be present on 10 percent or less of the landscape to provide structural diversity.
Ponderosa Pine	Landscape	DC 87	The forest arrangement consists of individual trees, small clumps, and groups of trees interspersed within variably-sized openings of grasses, forbs, and shrubs. Vegetation associations are similar to reference conditions. The size, shape, and number of trees per group and the number of groups per area vary across the landscape. Tree density may be greater in some locations, such as north-facing slopes and canyon bottoms.
Ponderosa Pine	Landscape	DC 88	The ponderosa pine forest is composed predominantly of vigorous trees, but declining, top-killed, lightning-scarred, and fire-scarred trees provide snags and coarse woody debris. Snags and coarse woody debris are well distributed throughout the landscape. Ponderosa pine snags are typically 18 inches or greater in diameter and average 1 to 2 per acre.
Ponderosa Pine	Landscape	DC 89	Coarse woody debris, including logs, ranges from 3 to 10 tons per acre. Logs average 3 per acre within the forested area of the landscape.
Ponderosa Pine	Landscape	DC 90	Where it naturally occurs, Gambel oak is present with all age classes represented. It is reproducing to maintain or expand its presence on capable sites across the landscape. Large Gambel oak snags are typically 10 inches or larger in diameter and are well distributed.
Ponderosa Pine	Landscape	DC 91	Grasses, forbs, shrubs, needles, leaves, and small trees support the natural fire regime. The larger proportion (60 percent or greater) of soil cover is composed of grasses and forbs as opposed to needles and leaves.
Ponderosa Pine	Landscape	DC 92	Old growth occurs throughout the landscape, in small, discontinuous areas consisting of clumps of old trees, or occasionally individual old trees. Other old growth components are also present including dead trees (snags), downed wood (coarse woody

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			debris), and/or structural diversity. The location of old growth shifts on the landscape over time as a result of succession and disturbance (tree growth and mortality).
Ponderosa Pine	Landscape	DC 93	Frequent, low to mixed severity fires (fire regime I), occurring approximately every 2 to 17 years, are characteristic in this PNVT.
Ponderosa Pine	Mid-Scale	DC 94	Ponderosa pine forest is characterized by variation in the size and number of tree groups depending on elevation, soil type, aspect, and site productivity. The more biologically productive sites contain more trees per group and more groups per area, resulting in less space between groups. Openings typically range from 10 percent in more biologically productive sites to 70 percent in the less productive sites. Tree density within forested areas ranges from 20 to 80 square feet basal area per acre.
Ponderosa Pine	Mid-Scale	DC 95	The tree group mosaic comprises an uneven-aged forest with all age classes, size classes, and structural stages present. Occasionally, patches of even-aged forest structure are present (less than 50 acres). Disturbances sustain the overall age and structural distribution.
Ponderosa Pine	Mid-Scale	DC 96	Fires burn primarily on the forest floor and do not spread between tree groups as crown fire.
Ponderosa Pine	Mid-Scale	DC 97	Forest structure in the wildland-urban interface (WUI) may have smaller, more widely spaced groups of trees than in the non-WUI areas.
Ponderosa Pine	Mid-Scale	DC 98	Northern goshawk post-fledging family areas (PFAs) may contain 10 to 20 percent higher basal area in mid-aged to old tree groups than northern goshawk foraging areas and the surrounding forest.
Ponderosa Pine	Mid-Scale	DC 99	Northern goshawk nest areas have forest conditions that are multi-aged and dominated by large trees with relatively denser canopies than the surrounding forest.
Ponderosa Pine	Fine Scale	DC 100	Trees typically occur in irregularly shaped groups and are variably spaced with some tight clumps. Tree crowns in the mid- to old-aged groups are interlocking or nearly interlocking providing for species such as Abert's squirrel.
Ponderosa Pine	Fine Scale	DC 101	Openings surrounding tree groups are variably shaped and composed of a grass, forb, and shrub mix. Some openings may contain individual trees.
Ponderosa Pine	Fine Scale	DC 102	Trees within groups are of similar or variable ages and may contain species other than ponderosa pine. Tree groups are typically less than 1 acre and average ½ acre. Mid- to old-aged tree groups consist of approximately 2 to 40 trees with interlocking canopies.
Ponderosa Pine	Fine Scale	DC 103	Where Gambel oak occurs, the majority are single trunk trees over 8 inches in diameter with full crowns.
Ponderosa Pine	--	GL 47	Where Gambel oak or other native hardwood trees and shrubs are desirable to retain for diversity, treatments should improve vigor and growth of these species.
Ponderosa Pine	--	GL 48	Where consistent with project or activity objectives, canopy cover should be retained on the south and southwest sides of small, existing forest openings that are naturally cooler and moister. These small (generally one-tenth to one-quarter acre) shaded openings provide habitat conditions needed by small mammals, plants, and insects (e.g., Merriam's shrew, Mogollon clover, four-spotted skipperling butterfly). Where these openings naturally occur across a project area, these conditions should be maintained on an average of 2 or more such openings per 100 acres.
Dry Mixed Conifer	Landscape	DC 104	The dry mixed conifer forest is a mosaic of conditions composed of structural states ranging from young to old trees. Forest structure and density are similar to ponderosa pine forest. Forest appearance is variable but uneven-aged and open. Sporadic areas of even-aged structure may be present on 10 percent or less of the landscape to provide structural diversity.

Plan Section	Scale (where applicable)	Component Number	Desired Condition (DC), Objective (OBJ), Standard (ST), and Guideline (GL) [footnote]
Dry Mixed Conifer	Landscape	DC 105	The forest arrangement consists of small clumps and groups of trees interspersed within variably-sized openings of grass, forb, and shrub vegetation associations similar to reference conditions. Size, shape, number of trees per group, and number of groups per area are variable across the landscape. Where they naturally occur, groups of Gambel oak are healthy and maintained or increased. Tree density may be greater in some locations, such as north-facing slopes and canyon bottoms.
Dry Mixed Conifer	Landscape	DC 106	The dry mixed conifer forest is composed predominantly of vigorous trees, but declining, top-killed, lightning-scarred, and fire-scarred trees provide snags and coarse woody debris. Snags and coarse woody debris are well distributed throughout the landscape. Snags are typically 18 inches in diameter or greater and average 3 per acre.
Dry Mixed Conifer	Landscape	DC 107	Coarse woody debris, including logs, ranges from 5 to 15 tons per acre. Logs average 3 per acre within the forested area of the landscape.
Dry Mixed Conifer	Landscape	DC 108	Southwestern white pine is present with the ability to reproduce on capable sites.
Dry Mixed Conifer	Landscape	DC 109	PLACEHOLDER
Dry Mixed Conifer	Landscape	DC 110	Grasses, forbs, shrubs, needles, leaves, and small trees support the natural fire regime. The larger proportion (60 percent or greater) of soil cover is composed of grasses and forbs as opposed to needles and leaves.
Dry Mixed Conifer	Landscape	DC 111	Old growth occurs throughout the landscape, in small, discontinuous areas consisting of clumps of old trees, or occasionally individual old trees. Other old growth components are also present including dead trees (snags), downed wood (coarse woody debris), and/or structural diversity. The location of old growth shifts on the landscape over time as a result of succession and disturbance (tree growth and mortality).
Dry Mixed Conifer	Landscape	DC 112	Frequent, low to mixed severity fires (fire regime I) occurring every 10 to 22 years are characteristic in this PNVT.
Dry Mixed Conifer	Mid-Scale	DC 113	The dry mixed conifer forest is characterized by a variety of size and number of tree groups depending on elevation, soil type, aspect, and site productivity. The more biologically productive sites contain more trees per group and more groups per area, resulting in less space between groups. Openings typically range from 10 percent in more biologically productive sites to 50 percent in less productive sites. Tree density within forested areas ranges from 30 to 100 square feet basal area per acre.
Dry Mixed Conifer	Mid-Scale	DC 114	The mosaic of tree groups is composed of uneven-aged forest. All age classes and structural stages are present. Occasionally, there are small patches (less than 50 acres) of even-aged forest present. Disturbances sustain the overall age and structural distribution.
Dry Mixed Conifer	Mid-Scale	DC 115	Fire burns primarily on the forest floor and does not spread between tree groups as crown fire.
Dry Mixed Conifer	Mid-Scale	DC 116	Forest structure in the wildland-urban interface (WUI) may have smaller, more widely spaced groups of trees than in the non-WUI areas.
Dry Mixed Conifer	Mid-Scale	DC 117	Northern goshawk post-fledging family areas (PFAs) may contain 10 to 20 percent higher basal area in mid-aged to old tree groups than northern goshawk foraging areas and the surrounding forest.
Dry Mixed Conifer	Mid-Scale	DC 118	Northern goshawk nest areas have forest conditions that are multi-aged but are dominated by large trees with relatively denser canopies than the surrounding forest.
Dry Mixed Conifer	Fine Scale	DC 119	Trees typically occur in irregularly-shaped groups and are variably spaced with some tight clumps. Tree crowns in the mid- to old-aged groups are interlocking or nearly interlocking providing for species such as red squirrel.
Dry Mixed Conifer	Fine Scale	DC 120	Openings surrounding tree groups are composed of a grass, forb, and shrub mix. Some openings may contain individual trees or snags.

Plan Section	Scale (where applicable)	Component Number	Desired Condition (DC), Objective (OBJ), Standard (ST), and Guideline (GL) [footnote]
Dry Mixed Conifer	Fine Scale	DC 121	Trees within groups are of similar or variable ages and one or more species. Tree group sizes typically are less than 5 acres, but often less than 1 acre, and at the mature and old stages consist of approximately 2 to 50 trees.
Dry Mixed Conifer	Fine Scale	DC 122	Where Gambel oak occurs, the majority are single trunk trees over 8 inches in diameter with full crowns.
Dry Mixed Conifer	--	GL 49	Where Gambel oak or other native hardwood trees and shrubs are desirable to retain for diversity, treatments should improve vigor and growth of these species.
Dry Mixed Conifer	--	GL 50	Where consistent with project or activity objectives, canopy cover should be retained on the south and southwest sides of small, existing forest openings that are naturally cooler and moister. These small (generally one-tenth to one-quarter acre) shaded openings provide habitat conditions needed by small mammals, plants, and insects (e.g., Merriam's shrew, Mogollon clover, four-spotted skipperling butterfly). Where these openings naturally occur across a project area, these conditions should be maintained on an average of 2 or more such openings per 100 acres.
Wet Mixed Conifer	Landscape	DC 123	The wet mixed conifer forest is a mosaic of structural stages and seral states ranging from young to old trees. The landscape arrangement is an assemblage of variably sized and aged groups and patches of trees and other vegetation associations similar to reference conditions.
Wet Mixed Conifer	Landscape	DC 124	All seral states are present across the landscape, with each state characterized by distinct dominant species composition, biological and physical conditions, and enough of each state is present to develop into the next state progressively over time.
Wet Mixed Conifer	Landscape	DC 125	Canopies are more closed than dry mixed conifer. An understory, consisting of native grass, forbs, and/or shrubs, is present.
Wet Mixed Conifer	Landscape	DC 126	The wet mixed conifer forest is composed predominantly of vigorous trees, but declining, top-killed, lightning-scarred, and fire-scarred trees provide snags and coarse woody debris. Snags and coarse woody debris are well distributed throughout the landscape. The number of snags and logs and amount of coarse woody debris varies by seral state ranging from 8 to more than 16 tons per acre.
Wet Mixed Conifer	Landscape	DC 127	Old growth occurs over large, continuous areas. Old growth components include old trees, dead trees (snags), downed wood (coarse woody debris), and/or structural diversity. The location of old growth shifts on the landscape over time as a result of succession and disturbance (tree growth and mortality).
Wet Mixed Conifer	Landscape	DC 128	Mixed severity fire (fire regime III) is characteristic of this forest. High severity fires (fire regimes IV and V) rarely occur.
Wet Mixed Conifer	Mid-Scale	DC 129	The size and number of groups and patches vary depending on disturbance, elevation, soil type, aspect, and site productivity. Patch sizes vary but are frequently hundreds of acres and rarely thousands of acres. Groups of tens of acres or less are relatively common. There is a mosaic of primarily even-aged groups and patches, which vary in size, species composition, and age. Grass, forb, and shrub openings created by disturbances may comprise 10 to 100 percent of the area depending on the type of disturbance.
Wet Mixed Conifer	Mid-Scale	DC 130	Uneven-aged groups and patches, comprising about 20 percent of this PNVT, provide for species such as the black bear and red-faced warbler that need multistoried canopies with dense low- to mid-canopy layers.
Wet Mixed Conifer	Mid-Scale	DC 131	Tree density ranges from 30 to 180 square feet basal area per acre depending upon time since disturbance and seral states of groups and patches.
Wet Mixed Conifer	Mid-Scale	DC 132	There are 20 or more snags greater than 8 inches in diameter per acre and 1 to 5 of those snags are 18 inches or greater in diameter.
Wet Mixed Conifer	Mid-Scale	DC 133	Coarse woody debris, including logs, varies by seral state, ranging from 5 to 20 tons per acre for early-seral states; 20 to 40 tons

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			per acre for mid-seral states; and may be as high as 35 tons per acre, or greater, for late-seral states. These conditions also provide an abundance of fungi including mushrooms and truffles used by small mammals.
Wet Mixed Conifer	Mid-Scale	DC 134	Forested PNVTs in the wildland-urban interface (WUI) are dominated by early-seral, fire-adapted species growing in an overall more open condition than the surrounding forest. These conditions result in fires that burn primarily on the forest floor and rarely spread as crown fire.
Wet Mixed Conifer	Mid-Scale	DC 135	Mixed (fire regime III) and high (fire regime IV) severity fires in this PNVT, occurring every 22 to 150 years along with other disturbances, maintain desired overall tree density, structure, species composition, coarse woody debris, and nutrient cycling. High severity fires do not exceed patches of 1,000 acres of mortality. Other smaller disturbances occur more frequently.
Wet Mixed Conifer	Mid-Scale	DC 136	Northern goshawk post-fledging family areas (PFAs) may contain 10 to 20 percent higher basal area in mid-aged to old tree groups than northern goshawk foraging areas and the surrounding forest.
Wet Mixed Conifer	Mid-Scale	DC 137	Northern goshawk nest areas have forest conditions that are multi-aged but are dominated by large trees with relatively denser canopies than the surrounding forest.
Wet Mixed Conifer	Fine Scale	DC 138	In mid-aged and older forests, trees are typically variably spaced with crowns interlocking (grouped and clumped trees) or nearly interlocking providing for species such as red squirrel. Trees within groups can be of similar or variable species and ages.
Wet Mixed Conifer	Fine Scale	DC 139	Small openings are present as a result of disturbances (e.g., wind, disease).
Spruce-Fir	Landscape	DC 140	The spruce-fir forest is a mosaic of structural stages and seral states ranging from young to old trees and is composed of multiple species. The landscape arrangement is an assemblage of variably sized and aged groups and patches of trees and other vegetation similar to reference conditions.
Spruce-Fir	Landscape	DC 141	Tree canopies in this forest are closed. An understory, consisting of native grass, forbs, and/or shrubs, is present in early seral states and is replaced by trees in later seral states.
Spruce-Fir	Landscape	DC 142	The spruce-fir forest is composed predominantly of vigorous trees, but declining top-killed, lightning-scarred, and fire-scarred trees provide snags and coarse woody debris. Snags and coarse woody debris are well distributed throughout the landscape.
Spruce-Fir	Landscape	DC 143	Corkbark fir is present with the ability to reproduce on late-seral sites appropriate for the species.
Spruce-Fir	Landscape	DC 144	Old growth occurs over large, continuous areas. Old growth components include old trees, dead trees (snags), downed wood (coarse woody debris), and/or structural diversity. The location of old growth shifts on the landscape over time as a result of succession and disturbance (tree growth and mortality).
Spruce-Fir	Landscape	DC 145	In the spruce-fir PNVT, mixed to high severity fires (fire regimes III and IV) occur infrequently.
Spruce-Fir	Mid-Scale	DC 146	The size and number of groups and patches vary depending on disturbance, elevation, soil type, aspect, and site productivity. Patch sizes vary but are mostly hundreds of acres and rarely thousands of acres. There may be frequent small disturbances resulting in groups of tens of acres or less. A mosaic of primarily even-aged groups and patches, which vary in size, species composition, and age is present. Grass, forb, and shrub openings created by disturbances may comprise 10 to 100 percent of the area depending on time since disturbances. Aspen is occasionally present in large patches.
Spruce-Fir	Mid-Scale	DC 147	Uneven-aged groups and patches, comprising about 20 percent of this PNVT, provide for species such as the MacGillivray's warbler and Swainson's thrush that need multistoried canopies with dense low- to mid-canopy layers.
Spruce-Fir	Mid-Scale	DC 148	Tree density ranges from 30 to 250 square feet basal area per acre, depending upon disturbance and seral states of the groups

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			and patches.
Spruce-Fir	Mid-Scale	DC 149	In general, there are 13 to 30 snags greater than 8 inches in diameter per acre and 1 to 3 of those snags are 18 inches or greater in diameter.
Spruce-Fir	Mid-Scale	DC 150	Coarse woody debris, including logs, varies by seral state, ranging from 5 to 30 tons per acre for early-seral states; 30 to 40 tons per acre for mid-seral states; and 40 tons per acre or greater for late-seral states. These conditions also provide an abundance of fungi including mushrooms and truffles used by small mammals.
Spruce-Fir	Mid-Scale	DC 151	The wildland-urban interface (WUI) is comprised primarily of grass/forb/shrub vegetation. Structures in the WUI are surrounded by grassy openings with very few or no trees. These conditions result in ground fires.
Spruce-Fir	Mid-Scale	DC 152	Mixed and high severity fires (fire regime III and IV)—occurring every 150 to 400 years—along with other disturbances maintain desired overall tree density, structure, species composition, coarse woody debris, and nutrient cycling.
Spruce-Fir	Mid-Scale	DC 153	Northern goshawk post-fledging family areas (PFAs) may contain 10 to 20 percent higher basal area in mid-aged to old tree groups than northern goshawk foraging areas and the surrounding forest.
Spruce-Fir	Mid-Scale	DC 154	Northern goshawk nest areas have forest conditions that are multi-aged but are dominated by large trees with relatively denser canopies than the surrounding forest.
Spruce-Fir	Fine Scale	DC 155	Mid-aged to old trees grow tightly together with interlocking crowns. Trees are of the same size and/or age class in early group/patch development. In late development, they may be multilayered.
Spruce-Fir	Fine Scale	DC 156	Small openings are present as a result of localized disturbances (e.g., wind, disease).
Aspen	Landscape	DC 157	Areas of aspen occur across the forested landscape and are successfully regenerating and being recruited into older and larger size classes. Size classes have a natural distribution, with the greatest number of stems in the smaller size classes.
Aspen	Mid-Scale	DC 158	Aspen may comprise 10 to 100 percent of the area depending on disturbance (e.g., fire, insects, silvicultural treatments) in multistoried patches.
Aspen	Mid-Scale	DC 159	As an early seral species, aspen reproduction and recruitment benefit from low severity surface fires in association with ponderosa pine and dry mixed conifer PNVTs, and mixed-severity fires in association with wet mixed conifer and spruce-fir PNVTs.
Aspen	--	OBJ 12	Aspen dominated and codominated acres within forested PNVTs, representing a range of age classes, are maintained on at least 50,000 acres during the planning period.
Aspen	--	GL 51	To preclude concentrated herbivore impacts, new surface water development should not be constructed within proximity to aspen stands (approximately a quarter of a mile).
Aspen	--	GL 52	Restoration of aspen clones should occur where aspen is over mature or in decline to maintain a sustainable presence of this species at the landscape level.
Aspen	--	GL 53	When managing for early seral states, competing conifers should be removed from aspen stands when needed to increase aspen longevity and increase diversity of aspen age classes.
Aspen	--	GL 54	Aspen restoration and retention efforts should include measures to ensure viability of the aspen stand.
All Woodland PNVTs	--	OBJ 13	Annually, treat or maintain 5,000 to 15,000 acres to promote a highly diverse structure.
All Woodland PNVTs	--	GL 55	Mechanical restoration of woodlands should emphasize individual tree removal to limit ground disturbance.

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All Woodland PNVTs	--	GL 56	Tree species that are less susceptible to root disease should be retained within areas of root disease infection to reduce spread of disease.
All Woodland PNVTs	--	GL 57	Treatments should leave single or small groups of medium to large trees that are widely spaced with expanses of herbaceous vegetation and coarse woody debris. This would provide for soil productivity, traditional uses (e.g., piñon nut gathering), and wildlife needs such as foraging habitat for migratory birds (e.g., black-throated gray warbler, pinyon jay) and other birds.
All Woodland PNVTs	--	GL 58	Hiding cover, approach cover (by waters), and travel corridor cover should be provided where needed by wildlife.
Madrean Pine-Oak	Landscape	DC 160	A mix of desired species [15], ages, heights, and groupings of trees create a mosaic across the landscape.
Madrean Pine-Oak	Landscape	DC 161	The majority of this woodland has an open canopy consisting of large trees and an herbaceous understory, with some groups of closed canopy. Overall, canopy cover is 10 to 50 percent.
Madrean Pine-Oak	Landscape	DC 162	Snags, averaging 1 to 2 per acre, and older trees are scattered across the landscape. Coarse woody debris averages 1 to 5 tons per acre.
Madrean Pine-Oak	Landscape	DC 163	Understory vegetation includes evergreen oaks, mountain mahogany, grasses, and forbs.
Madrean Pine-Oak	Landscape	DC 164	Ground cover consists of perennial grasses and forbs that frequently carry fire through the landscape.
Madrean Pine-Oak	Landscape	DC 165	Grasses, forbs, shrubs, needles, leaves, and small trees support the natural fire regime. The larger proportion (60 percent or greater) of soil cover is composed of grasses and forbs as opposed to needles and leaves.
Madrean Pine-Oak	Landscape	DC 166	Fires are typically of low or occasionally moderate severity (fire regime I) and occur every 5 to 20 years.
Madrean Pine-Oak	Mid-Scale	DC 167	Some large patches in the Madrean pine-oak woodland are closed canopy, have multiple age classes, large trees, and old growth-like characteristics (e.g., numerous snags, large coarse woody debris) in order to provide for wildlife such as Mexican spotted owl and black bear that need denser habitat.
Madrean Pine-Oak	Mid-Scale	DC 168	The size and number of groups and patches vary depending on disturbance, elevation, soil type, aspect, and site productivity. Patch sizes vary but are mostly tens of acres, with rare disturbances of hundreds of acres. There may be frequent small disturbances resulting in groups and patches of tens of acres or less. A mosaic of groups and patches of trees, primarily even-aged, that are variable in size, species composition, and age, is present. Grass, forb, and shrub openings created by disturbance may comprise 10 to 100 percent of the area depending on the disturbances.
Madrean Pine-Oak	Mid-Scale	DC 169	Woodland densities range from 15 to 50 square feet basal area per acre.
Madrean Pine-Oak	Mid-Scale	DC 170	Grasses, forbs, shrubs, leaves, needles, and small trees maintain the natural fire regime with a greater proportion of the soil cover as grasses and forbs as opposed to leaves and needles.
Madrean Pine-Oak	Fine Scale	DC 171	Single large trees or small groups are widely spaced between large expanses of herbaceous vegetation and shrubs.
Madrean Pine-Oak	--	GL 59	Where Mexican spotted owls are found nesting in canyons or on north slopes within the Madrean pine-oak woodland, adjacent treatments should be modified to meet the needs of foraging owls.
Piñon-Juniper – Savanna	Landscape	DC 172	The piñon-juniper savanna is open in appearance with trees occurring as individuals or in small groups and ranging from young to old. Overall, tree canopy cover is 10 to 15 percent, but may range up to 30 percent.
Piñon-Juniper – Savanna	Landscape	DC 173	Scattered shrubs and a continuous herbaceous understory, including native grasses, forbs, and annuals, are present to support a natural fire regime.
Piñon-Juniper –	Landscape	DC 174	Vegetative ground cover (herbaceous vegetation and litter cover) is optimized as defined by the specific TES map unit [15] under

Plan Section	Scale (where applicable)	Component Number	Desired Condition (DC), Objective (OBJ), Standard (ST), and Guideline (GL) [footnote]
Savanna			consideration to protect and enrich soils and promote water infiltration.
Piñon-Juniper – Savanna	Landscape	DC 175	Grasses, forbs, shrubs, needles, leaves, and small trees support the natural fire regime. The larger proportion (60 percent or greater) of soil cover is composed of grasses and forbs as opposed to needles and leaves.
Piñon-Juniper – Savanna	Landscape	DC 176	Old growth occurs in isolated locations scattered throughout the landscape, as individual old trees or as clumps of old trees. Other old growth components may also be present including dead trees (snags), downed wood (coarse woody debris), and/or structural diversity.
Piñon-Juniper – Savanna	Landscape	DC 177	Fires are low to mixed severity (fire regime I), occurring every 1 to 35 years.
Piñon-Juniper – Persistent Woodland	Landscape	DC 178	A mix of desired species [15], ages, heights, and groupings of trees create a mosaic across the landscape.
Piñon-Juniper – Persistent Woodland	Landscape	DC 179	Tree canopy cover is closed (greater than 30 percent), shrubs are sparse to moderate, and herbaceous cover is patchy.
Piñon-Juniper – Persistent Woodland	Landscape	DC 180	Snags, averaging one to two per acre, and older trees with dead limbs and tops are scattered across the landscape. Coarse woody debris averages 2 to 5 tons per acre.
Piñon-Juniper - Persistent Woodland	Landscape	DC 181	Old growth includes old trees, dead trees (snags), downed wood (coarse woody debris), and/or structural diversity. The location of old growth shifts on the landscape over time as a result of succession and disturbance (tree growth and mortality).
Piñon-Juniper - Persistent Woodland	Landscape	DC 182	Fire is less frequent and more variable than in the savanna due to patchiness of ground cover. The fires that do occur are mixed to high severity (fire regimes II, III, IV, and V).
Piñon-Juniper - Persistent Woodland	Mid-Scale	DC 183	Grass and forb cover is maximized, based on site capability, to protect and enrich soils.
Grasslands	Landscape	DC 184	Perennial herbaceous species dominate and include native grasses, grass-like plants (sedges and rushes), and forbs, and in some locations, a diversity of shrubs.
Grasslands	Landscape	DC 185	Vegetative ground cover (herbaceous vegetation and litter cover) is optimized (as defined by the TES map unit [15] under consideration) to prevent accelerated erosion, dissipate rainfall, facilitate the natural fire regimes, and provide wildlife and insect habitat. Ungrazed herbaceous vegetation heights [21] range from 7 to 32 inches [22] depending on grassland type.
Grasslands	Landscape	DC 186	Herbaceous vegetation and litter provides for and maintains the natural fire regime (fire regime I and II). In semi-desert grasslands, the natural fire return interval is approximately every 2 to 10 years. In Great Basin grasslands the natural fire return interval is approximately every 10 to 30 years. In montane/subalpine grasslands it ranges from approximately 2 to 400 years, depending on the adjacent forested PNVT.
Grasslands	Landscape	DC 187	Landscapes associated with montane/subalpine grasslands vary from natural appearing where human activities do not stand out (high scenic integrity) to unaltered where only natural ecological changes occur (very high scenic integrity).
Grasslands	Mid-Scale	DC 188	Woody (tree and shrub) canopy cover is less than 10 percent.
Grasslands	Mid-Scale	DC 189	Prairie dogs are present and support healthy grassland soil development and the diversity of associated species (e.g., western burrowing owl).
Grasslands	Fine Scale	DC 190	Average herbaceous vegetation heights [22] vary by grassland PNVT and yearly weather conditions. Ungrazed herbaceous vegetation heights [21] range from 7 to 29 inches in Great Basin grasslands, 7 to 26 inches in montane/subalpine grasslands, and

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			10 to 32 inches in semi-desert grasslands.
Grasslands	Fine Scale	DC 191	During the critical pronghorn fawning period (May through June [24]), cool season grasses and forbs provide nutritional forage; while shrubs and standing grass growth from the previous year provide adequate hiding cover (10 to 18 inches) to protect fawns from predation.
Grasslands	--	OBJ 14	Decrease or maintain the woody canopy cover at less than 10 percent by treating up to 25,000 acres annually.
Grasslands	--	GL 60	Restoration treatment of grasslands should result in a woody canopy cover of less than 10 percent; more than one treatment may be required.
Grasslands	--	GL 61	Mechanical restoration of grasslands should emphasize individual tree removal to limit soil disturbance.
Grasslands	--	GL 62	New fence construction or reconstruction where pronghorn antelope may be present should have a barbless bottom wire which is 18 inches from the ground to facilitate movement between pastures and other fenced areas. Pole and other types of fences should also provide for pronghorn antelope passage where they are present.
Grasslands	--	GL 63	Pronghorn antelope fence and other crossings should be installed along known movement corridors to prevent habitat fragmentation.
Interior Chaparral	--	DC 192	In the early seral state, chaparral contains an herbaceous component in the understory. Later seral states are dense, nearly impenetrable thickets with considerable leaf litter. Standing dead material may accumulate in areas that have not burned for several decades. Chaparral is in a constant state of transition from early to late seral state and back again, with fire being the major ecological process.
Interior Chaparral	--	DC 193	Ground cover consists primarily (85 to 95 percent) of shrub litter (e.g., small stems, leaves).
Interior Chaparral	--	DC 194	The majority (85 to 95 percent) of chaparral is closed canopy with some openings of grasses and forbs.
Interior Chaparral	--	DC 195	High severity fires occur every 35 to 100 years (fire regime IV) in a mosaic pattern.
Wildlife and Rare Plants	Landscape	DC 196	Habitat conditions contribute to the recovery of federally listed species.
Wildlife and Rare Plants	Landscape	DC 197	Habitat is well distributed and connected.
Wildlife and Rare Plants	Mid-Scale	DC 198	Wildlife are free from harassment and disturbance at a scale that impacts vital functions (e.g., breeding, rearing young) that could affect persistence of the species.
Wildlife and Rare Plants	Fine Scale	DC 199	Collection of animals and plants does not negatively impact species abundance.
Wildlife and Rare Plants	Fine Scale	DC 200	Localized rare plant and animal communities are intact and functioning.
Wildlife and Rare Plants	--	OBJ 15	Annually, improve wildlife connectivity by removing at least five unneeded structures (e.g., fence).
Wildlife and Rare Plants	--	GL 64	Management and activities should not contribute to a trend toward the Federal listing of a species.
Wildlife and Rare Plants	--	GL 65	Activities occurring within federally listed species habitat should apply habitat management objectives and species protection measures from recovery plans.
Wildlife and Rare Plants	--	GL 66	PLACEHOLDER
Wildlife and Rare Plants	--	GL 67	Modifications, mitigations, or other measures should be incorporated to reduce negative impacts to plants, animals, and their habitats and to help provide for species needs, consistent with project or activity objectives.
Wildlife and Rare Plants	--	GL 68	A minimum of six nest areas (known and replacement) should be located per northern goshawk territory. Northern goshawk nest and replacement nest areas should be located around active nests, in drainages, at the base of slopes, and on northerly

Plan Section	Scale (where applicable)	Component Number	Desired Condition (DC), Objective (OBJ), Standard (ST), and Guideline (GL) [footnote]
			(northwest to northeast) aspects. Nest areas should be 25 to 30 acres each in size.
Wildlife and Rare Plants	--	GL 69	Northern goshawk post-fledging family areas (PFAs) of approximately 420 acres in size should be designated around the nest sites.
Wildlife and Rare Plants	--	GL 70	During treatments, snags should be retained in the largest diameter classes available as needed to meet wildlife or other resource needs.
Wildlife and Rare Plants	--	GL 71	Cool and/or dense vegetation cover should be provided for species needing these habitat components (e.g., Goodding's onion, black bear, White Mountains chipmunk, western yellow-billed cuckoo).
Wildlife and Rare Plants	--	GL 72	Active raptor nests should be protected from treatments and disturbance during the nesting season to provide for successful reproduction. Specifically for northern goshawk nest areas, human presence should be minimized during nesting season of March 1 through September 30.
Wildlife and Rare Plants	--	GL 73	Any action likely to cause a disturbance and take to bald and golden eagles in nesting and young rearing areas should be avoided per the Bald and Golden Eagle Protection Act.
Wildlife and Rare Plants	--	GL 74	Prairie dog controls [27] should not be authorized except when consistent with approved State of Arizona Gunnison's prairie dog conservation strategies.
Wildlife and Rare Plants	--	GL 75	Rare and unique features (e.g., talus slopes, cliffs, canyon slopes, caves, fens, bogs, sinkholes) should be protected from damage or loss to retain their distinctive ecological functions and maintain viability of associated species.
Wildlife and Rare Plants	--	GL 76	The needs of localized species (e.g., New Mexico meadow jumping mouse, Bebb willow, White Mountains paintbrush) should be considered and provided for during project activities to ensure their limited or specialized habitats are not lost or degraded.
Wildlife and Rare Plants	--	GL 77	Constructed features should be maintained to standard or removed when no longer needed.
Invasive Species	Landscape	DC 201	Invasive species (both plant and animal) are nonexistent or in low occurrence to avoid negative impacts to ecosystems.
Invasive Species	Mid-Scale	DC 202	Undesirable nonnative species are absent or present only to the extent that they do not adversely affect ecosystem composition, structure, or function, including native species populations or the natural fire regime.
Invasive Species	Mid-Scale	DC 203	Introduction of additional invasive species rarely occurs and is detected at an early stage.
Invasive Species	--	OBJ 16	Annually, contain, control, or eradicate invasive species (e.g., musk thistle, Dalmatian toadflax) on 500 to 3,500 acres.
Invasive Species	--	OBJ 17	Annually, control or eradicate invasive species (e.g., tamarisk, bullfrogs) on at least 2 stream miles.
Invasive Species	--	ST 11	Projects and authorized activities shall be designed to reduce the potential for introduction of new species or spread of existing invasive or undesirable aquatic or terrestrial nonnative populations.
Invasive Species	--	GL 78	Projects and activities should not transfer water between drainages or between unconnected water bodies within the same drainage to avoid spreading disease and aquatic invasive species.
Invasive Species	--	GL 79	Project areas should be monitored to ensure there is no introduction or spread of invasive species.
Invasive Species	--	GL 80	Treatment of invasive species should be designed to effectively control or eliminate them; multiple treatments may be needed.
Invasive Species	--	GL 81	Pesticide use should minimize impacts on nontarget plants and animals.
Landscape Scale Disturbance Events	Landscape	DC 204	The Apache-Sitgreaves NFs landscapes retain the resiliency to survive landscape scale disturbance events.
Landscape Scale	--	ST 12	Threats to human safety and property shall be promptly addressed following landscape scale disturbance and mitigated through

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Disturbance Events			measures such as signing, temporary closures, or treatment.
Landscape Scale Disturbance Events	--	GL 82	Erosion control mitigation features should be implemented to protect significant resource values and infrastructure such as stream channels, roads, structures, threatened and endangered species, and cultural resources.
Landscape Scale Disturbance Events	--	GL 83	Felling of hazard trees (either dead or alive) should be limited to those which could hit a road, recreation site, building, or other infrastructure to protect places where humans, vehicles, or developments would most likely be present.
Landscape Scale Disturbance Events	--	GL 84	Projects and activities (e.g., revegetation, mulching, lop and scatter) should be designed to stabilize soils and restore nutrient cycling, if needed, and establish movement toward the desired conditions for the affected PNVT(s).
Landscape Scale Disturbance Events	--	GL 85	Where conifer seed sources are lost or poorly distributed, and/or deciduous tree species are not adequately resprouting, artificial regeneration (e.g., planting, seeding) should be used to promote the movement toward desired conditions, provided adequate site conditions exist.
Landscape Scale Disturbance Events	--	GL 86	Management should emphasize long term reestablishment of native deciduous trees, shrubs, and herbaceous vegetation to maintain ecosystem diversity.
Landscape Scale Disturbance Events	--	GL 87	An adequate number and size of snags and logs, appropriate for the affected PNVT, should be retained individually and in clumps to provide benefits for wildlife and coarse woody debris for soil and other resource benefits.
Landscape Scale Disturbance Events	--	GL 88	Projects and activities should include both short and long term provisions for scenic integrity, especially in sensitive foreground areas (high and very high scenic integrity).
Overall Recreation Opportunities	--	DC 205	The Apache-Sitgreaves NFs offer a spectrum of recreation settings and opportunities varying from primitive to rural and dispersed to developed, with an emphasis on the natural appearing character of the forests.
Overall Recreation Opportunities	--	DC 206	Inventoried roadless areas (IRAs) maintain their overall roadless character.
Overall Recreation Opportunities	--	DC 207	Recreation activities occur within the ability of the land to support them and with minimal user conflicts.
Overall Recreation Opportunities	--	DC 208	Recreation enhances the quality of life for local residents (e.g., social interaction, physical activity, connection with nature), provides tourist destinations, and contributes monetarily to local economies.
Overall Recreation Opportunities	--	DC 209	Recreation opportunities provide for a variety of skill levels, needs, and desires in partnership with recreation permit holders, private entities, volunteer groups, community groups, and State, Federal, and tribal governments.
Overall Recreation Opportunities	--	DC 210	Visitors can easily access information about recreation activities and safe and proper use of the Apache-Sitgreaves NFs.
Overall Recreation Opportunities	--	DC 211	Recreation use does not negatively affect wildlife habitat and populations. Negative interactions between people and wildlife are minimized.
Overall Recreation Opportunities	--	DC 212	The Apache-Sitgreaves NFs are free from vandalism and refuse.
Overall Recreation Opportunities	--	DC 213	Recreation use does not negatively affect the use and character of cultural resources.
Overall Recreation	--	DC 214	"Leave No Trace" principles are practiced.

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Opportunities			
Overall Recreation Opportunities	--	GL 89	Recreation related project-level decisions and implementation activities should be consistent with mapped classes and setting descriptions in the recreation opportunity spectrum (ROS).
Overall Recreation Opportunities	--	GL 90	Developed and dispersed recreation sites and other authorized activities should not be located in places that prevent wildlife or livestock access to available water.
Overall Recreation Opportunities	--	GL 91	Food and other items that attract wildlife should be managed to prevent reliance on humans and to reduce human-wildlife conflicts.
Overall Recreation Opportunities	--	GL 92	Constructed features should be maintained to standard or removed when no longer needed.
Dispersed Recreation	--	DC 215	Dispersed recreation opportunities (e.g., hunting, fishing, hiking, camping) are available and dispersed recreation sites (e.g., campsites, trailheads, vistas, parking areas) occur in a variety of ROS classes throughout the forests.
Dispersed Recreation	--	DC 216	Facilities for dispersed recreation activities are appropriate for the ROS class and scenic integrity objective of the location and are designed to the minimum necessary to protect natural and cultural resources.
Dispersed Recreation	--	DC 217	Wildlife viewing areas are dispersed throughout the forests and provide opportunities to view waterfowl, migratory birds, elk, and other species.
Dispersed Recreation	--	DC 218	Access, parking, regulations, orientation, and safety information are in place to provide safe and enjoyable dispersed recreation opportunities.
Dispersed Recreation	--	DC 219	Water-based settings are available and the associated recreation opportunities (e.g., canoeing, fishing, waterfowl hunting) do not degrade aquatic resources.
Dispersed Recreation	--	DC 220	Winter nonmotorized areas provide a variety of nonmotorized recreation opportunities in a quiet, natural setting (including groomed and ungroomed ski trails). Noise from motorized use is uncommon in areas away from main road corridors.
Dispersed Recreation	--	DC 221	Winter motorized areas provide a variety of motorized recreation opportunities with a variety of challenges including areas open to cross-country, over-snow motorized use, some with groomed or ungroomed trails.
Dispersed Recreation	--	DC 222	Roads and trails provide a variety of opportunities to view natural landscapes and wildlife.
Dispersed Recreation	--	OBJ 18	Annually, rehabilitate, stabilize, revegetate, or relocate an average of five dispersed campsites to improve recreation opportunities and/or protect the environment.
Dispersed Recreation	--	OBJ 19	Within the planning period, work with the AZGFD, ADOT, and other partners to provide at least 10 new wildlife viewing opportunities.
Dispersed Recreation	--	ST 13	Dispersed campsites shall not be designated in areas with sensitive soils or within 50 feet of streams, wetlands, or riparian areas to prevent vegetation and bank damage, soil compaction, additional sediment, or soil and water contamination.
Dispersed Recreation	--	GL 93	In dispersed areas, the priority for facilities or minor developments should be access and protection of the environment, rather than the comfort or convenience of the visitors.
Dispersed Recreation	--	GL 94	Timing restrictions on recreation uses should be considered to reduce conflicts with wildlife needs or soil moisture conditions.
Dispersed Recreation	--	GL 95	Dispersed campsites should not be located on or adjacent to archaeological sites or sensitive wildlife areas.
Developed Recreation	--	DC 223	Developed recreation sites provide opportunities for people to camp, obtain information, and participate in day-use activities

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			(e.g., picnic areas, fishing piers, scenic overlooks, wildlife viewing sites).
Developed Recreation	--	DC 224	Facilities are maintained, accessible, and complement the forests' natural character. Facilities range from primitive to highly developed, with an emphasis on blending the facilities with the landscape.
Developed Recreation	--	DC 225	Forest vegetation in developed sites is healthy (species, size, and age) and complements recreational activities, scenery, and human safety.
Developed Recreation	--	DC 226	Developed campgrounds are places where structures and human caused vegetation changes may be seen but they do not dominate the view or attract attention (low to moderate scenic integrity). Human activities in the areas visible from campgrounds (foreground to middle ground, 300 feet to 4 miles) should not attract attention or stand out, and the landscapes should appear natural (moderate to high scenic integrity).
Developed Recreation	--	DC 227	Developed campgrounds provide roaded natural or roaded modified recreation opportunities.
Developed Recreation	--	OBJ 20	Within the planning period, reduce the developed recreation deferred maintenance backlog at plan approval by 10 percent.
Developed Recreation	--	OBJ 21	Within the planning period, accessible and wildlife-proof trash facilities should be provided in all developed sites where trash is collected.
Developed Recreation	--	ST 14	Where trash facilities are provided, they shall be bear resistant.
Developed Recreation	--	GL 96	Developed recreation sites should not be constructed unless validated with a capacity analysis.
Motorized Opportunities	--	DC 228	A maintained road and motorized trail system is in place and provides for safety and access for the use (e.g., recreation, minerals, vegetation treatment, fire protection) of the Apache-Sitgreaves NFs.
Motorized Opportunities	--	DC 229	Users have opportunities for motorized access and travel on a system of designated NFS roads, motorized trails, and motorized areas.
Motorized Opportunities	--	DC 230	The transportation system provides a variety of recreation opportunities including varying degrees of difficulty, from OHV trails to paved scenic byways, while limiting resource and/or user conflicts.
Motorized Opportunities	--	DC 231	NFS roads, motorized trails, and motorized areas are easily identified on the ground (e.g., well marked).
Motorized Opportunities	--	DC 232	The road and trail system is accessible from local communities, State, county, and local public roads and trails.
Motorized Opportunities	--	DC 233	Loop trails exist for motorized trail users.
Motorized Opportunities	--	DC 234	Tread Lightly!® principles are commonly practiced.
Motorized Opportunities	--	DC 235	The location and design of roads and trails does not impede wildlife and fish movement.
Motorized Opportunities	--	OBJ 22	Annually, maintain at least 20 percent of the passenger vehicle and 10 percent of the high-clearance vehicle NFS roads.
Motorized Opportunities	--	OBJ 23	Annually, maintain at least 20 percent of NFS motorized trails.
Motorized Opportunities	--	ST 15	Motorized vehicle travel shall be managed to occur only on the designated system of NFS roads and motorized trails [28] and designated motorized areas [29].
Motorized Opportunities	--	ST 16	Unless specifically authorized, motorized cross-country travel shall be managed to occur only in designated motorized areas.
Motorized Opportunities	--	ST 17	Temporary road construction shall minimize the impacts to resource values and facilitate road rehabilitation. Temporary roads shall be rehabilitated following completion of the activities for which they were constructed.
Motorized Opportunities	--	ST 18	Road maintenance and construction activities shall be designed to reduce sediment (e.g., water bars, sediment traps, grade dips)

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			while first providing for user safety.
Motorized Opportunities	--	GL 97	New motorized trails or additions to existing trails should include destinations and loops to provide for a variety of opportunities.
Motorized Opportunities	--	GL 98	New roads or motorized trails should be located to avoid Mexican spotted owl protected activity centers, northern goshawk post-fledging family areas, and other wildlife areas as identified; seasonal restrictions may be an option.
Motorized Opportunities	--	GL 99	New roads, motorized trails, or designated motorized areas should be located to avoid meadows, wetlands, riparian areas, stream bottoms, sacred sites, and areas with high concentrations of significant archaeological sites. The number of stream crossings should be minimized or mitigated to reduce impacts to aquatic species.
Motorized Opportunities	--	GL 100	As projects occur in riparian or wet meadow areas, unneeded roads or motorized trails should be closed or relocated, drainage restored, and native vegetation reestablished to move these areas toward their desired condition.
Motorized Opportunities	--	GL 101	As projects occur, roads or motorized trails that contribute to negative impacts on cultural resources should be closed or relocated.
Motorized Opportunities	--	GL 102	As projects occur, redundant roads or motorized trails should be removed to reduce degradation of natural resources.
Motorized Opportunities	--	GL 103	Roads and motorized trails removed from the transportation network should be treated in order to avoid future risk to hydrologic function and aquatic habitat.
Motorized Opportunities	--	GL 104	Trail markings (e.g., signs) should be designed to complement the character of the surrounding lands.
Motorized Opportunities	--	GL 105	Roads and motorized trails should be designed and located so as to not impede terrestrial and aquatic species movement and connectivity.
Motorized Opportunities	--	GL 106	As projects occur, existing meadow crossings should be relocated or redesigned, as needed, to maintain or restore hydrologic function using appropriate tools such as French drains and elevated culverts.
Motorized Opportunities	--	GL 107	After management activities occur in areas with high potential for cross-country motorized vehicle use, methods (e.g., barriers, signing) should be used to control unauthorized motorized use.
Nonmotorized Opportunities	--	DC 236	Nonmotorized opportunities are available in a variety of settings that provide differing levels of challenge and seclusion.
Nonmotorized Opportunities	--	DC 237	Blocks of forest land accessible from populated areas are available for nonmotorized opportunities. These areas are free from the sights and sounds of motorized recreation.
Nonmotorized Opportunities	--	DC 238	Opportunities for primitive recreation are available.
Nonmotorized Opportunities	--	DC 239	A maintained and environmentally sound nonmotorized trail network is in place, providing for user safety and access to locations of interest for a variety of uses.
Nonmotorized Opportunities	--	DC 240	Nonmotorized trails are defined and marked.
Nonmotorized Opportunities	--	DC 241	Destination and loop trails exist for nonmotorized users.
Nonmotorized	--	OBJ 24	Annually, maintain at least 20 percent of nonmotorized trails.

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Opportunities			
Nonmotorized Opportunities	--	GL 108	Trail markings (e.g., signs, blazes) should be designed to complement the character of the surrounding lands.
Nonmotorized Opportunities	--	GL 109	New nonmotorized routes should avoid meadows, wetlands, riparian areas, stream bottoms, sacred sites, and areas with high concentrations of significant archaeological sites. The number of stream crossings should be minimized or mitigated to reduce impacts to aquatic habitat.
Nonmotorized Opportunities	--	GL 110	To maintain nonmotorized user opportunities, nonmotorized trails should not be colocated on open motorized routes.
Nonmotorized Opportunities	--	GL 111	New trails and trail relocations should be designed and located so as to not impede terrestrial and aquatic species movement and connectivity.
Nonmotorized Opportunities	--	GL 112	Meadow crossings should be designed or redesigned to maintain or restore hydrologic function using appropriate tools such as French drains and elevated culverts.
Scenic Byways	--	DC 242	Viewsheds along scenic byways provide natural appearing landscapes and enhance recreation tourism that supports local communities.
Scenic Byways	--	DC 243	The intrinsic qualities identified for each scenic byway remain intact.
Scenic Byways	--	DC 244	Scenic byways exhibit natural appearing landscapes where human activities do not stand out in the foreground, up to one-half mile (high scenic integrity).
Scenic Byways	--	DC 245	Scenic byways provide roaded natural recreation opportunities.
Scenic Byways	--	GL 113	Visual impacts from vegetation treatments, recreation uses, range developments, and other structures should blend with the overall landscape character along scenic byways.
Scenic Byways	--	GL 114	Signs, kiosks, and other exhibits should provide interpretive, education, and safety information along scenic byways and in adjacent recreation sites.
National Recreation Trails	--	DC 246	The Blue Ridge NRT provides a nonmotorized trail opportunity where visitors can experience the scenic qualities of the area.
National Recreation Trails	--	DC 247	The General George Crook and Eagle NRTs provide nonmotorized trail opportunities where visitors can experience the historic and scenic qualities of the area.
National Recreation Trails	--	DC 248	The immediate foreground (0 to 200 feet) views from the NRTs vary from natural appearing landscapes where human activities do not stand out (high scenic integrity) to unaltered landscapes where generally only ecological changes occur (very high scenic integrity).
National Recreation Trails	--	OBJ 25	Within 5 years of plan approval, initiate the process for the regional forester to remove the NRT designation from the Escudilla trail in conformance with Forest Service Manual 2353.57 – Management of National Recreation Trails.
National Recreation Trails	--	ST 19	Visual impacts from vegetation treatments, wildland fire, recreation uses, range developments, and other structures will blend with the overall landscape character along national recreation trails.
National Recreation Trails	--	GL 115	Trail markings (e.g., signs, blazes) should be designed to complement the character of the surrounding lands.
National Recreation Trails	--	GL 116	National recreation trails should be managed for nonmotorized or mechanized travel where permitted; however, the General George Crook and Eagle NRTs may have motorized travel where the trail coincides with a designated road or motorized trail.

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National Recreation Trails	--	GL 117	New developments which do not support use of, or enhance, a national recreation trail should not be placed within the visual corridor of the trail.
National Recreation Trails	--	GL 118	The General George Crook National Recreation Trail should be managed to preserve evidence of historic roadway and landscape character, including related historic trees, markers, gravesites, and water holes within a 200-foot corridor.
Eligible and Suitable Wild and Scenic Rivers	--	DC 249	Eligible and suitable wild river segments display unaltered landscapes where generally only ecological changes occur (very high scenic integrity) and provide primitive and/or semiprimitive nonmotorized recreation opportunities.
Eligible and Suitable Wild and Scenic Rivers	--	DC 250	Eligible and suitable scenic river segments display landscapes which vary from slightly altered where human activities may be seen but do not attract attention (moderate scenic integrity) to natural appearing where human activities do not stand out (high scenic integrity) and provide semiprimitive nonmotorized, semiprimitive motorized, and/or roaded natural recreation opportunities.
Eligible and Suitable Wild and Scenic Rivers	--	DC 251	Eligible and suitable recreational river segments display landscapes which vary from moderately altered where human activities are evident (low scenic integrity) to slightly altered where human activities may be seen but do not attract attention (moderate scenic integrity) and provide primitive, semiprimitive nonmotorized, semiprimitive motorized, and/or roaded natural recreation opportunities.
Eligible and Suitable Wild and Scenic Rivers	--	ST 20	Each eligible river's free-flowing condition, outstandingly remarkable values, and classification shall be sustained until further study is conducted.
Eligible and Suitable Wild and Scenic Rivers	--	ST 21	Each suitable river's free-flowing condition, outstandingly remarkable values, and classification shall be maintained until congressional action is completed.
Scenic Resources	--	DC 252	The Apache-Sitgreaves NFs appear predominantly natural, and human activities do not dominate the landscape.
Scenic Resources	--	DC 253	The natural and cultural features of the landscapes that provide a "sense of place" are intact.
Scenic Resources	--	DC 254	Landscapes possess vegetation patterns and compositions that are naturally variable in appearance and contribute to scenic values.
Scenic Resources	--	DC 255	Visitors have opportunities to experience important scenic elements including fall colors, rolling grasslands, picturesque vistas, and green riparian corridors.
Scenic Resources	--	DC 256	Lakes (reservoirs) and surrounding lands (¼ mile from the shore) provide landscapes which vary from slightly altered where human activities may be seen but do not attract attention (moderate scenic integrity) to natural appearing where human activities do not stand out (high scenic integrity).
Scenic Resources	--	DC 257	The scenic vistas associated with canyons and other landforms retain their scenic integrity.
Scenic Resources	--	DC 258	The vistas—both from and onto—the Mogollon Rim exhibit landscapes which vary from natural appearing where human activities do not stand out (high scenic integrity) to unaltered where generally only ecological changes occur (very high scenic integrity).
Scenic Resources	--	OBJ 26	Annually, accomplish an average of five projects to enhance scenic resources (e.g., restore grasslands and aspen, remove unnecessary fences, close and rehabilitate unneeded gravel/cinder pits).
Scenic Resources	--	GL 119	Constructed features and landscape alterations should be designed to complement the natural setting.
Scenic Resources	--	GL 120	Projects or activities in primitive and semiprimitive recreation opportunity spectrum (ROS) classes should be designed to maintain a predominately natural appearing environment.

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Conservation Education	--	DC 259	The Apache-Sitgreaves NFs provide opportunities for adults and children to explore and learn about ecosystems.
Conservation Education	--	DC 260	Forest visitors have access to information about topics of concern related to the Apache-Sitgreaves NFs (e.g., ecosystem restoration, unmanaged recreation, uncharacteristic wildfire), including appropriate visitor behavior (e.g., follow forest orders, pack out trash, appropriate sanitation, wildfire prevention).
Conservation Education	--	DC 261	Forest visitors have access to information about the features of the Apache-Sitgreaves NFs, its ecosystems, multiple uses, and other management aspects of the forests.
Conservation Education	--	DC 262	Interpretive information (e.g., ecology, wildlife, cultural resources, unique geologic features, Forest Service mission) is available to forest visitors at Apache-Sitgreaves NFs visitor centers, administrative offices, recreation sites, and along major forest roadways.
Lands	--	DC 263	The Apache-Sitgreaves NFs exist in a pattern that promotes efficient management which consists of large contiguous tracts of NFS lands.
Lands	--	DC 264	Residents and visitors are aware of Forest Service regulations and respect common property boundaries.
Lands	--	DC 265	The construction or placement of fences and gates, structures, signs, or other private personal property on NFS land (occupancy trespass) rarely occurs. Disposal of personal property (e.g., dumping) rarely occurs on NFS lands.
Lands	--	OBJ 27	Annually, survey and post on average 2 to 5 miles of unposted NFS boundary.
Lands	--	OBJ 28	Annually, maintain on average 2 to 5 miles of property boundary posting and corner monuments.
Lands	--	OBJ 29	Annually, resolve an average of three existing trespass cases.
Lands	--	GL 121	Access points to NFS land from adjacent non-NFS developments and subdivisions should be limited and provide all residents (not just edge lot owners) common entry points. Individual access points should be discouraged to minimize the development of unauthorized roads or trails.
Lands	--	GL 122	Land exchanges should not result in the creation of isolated NFS parcels surrounded by other ownerships.
Lands	--	GL 123	Land acquisitions and exchanges should evaluate, and possibly include, associated beneficial encumbrances (e.g., water rights, mineral rights, easements, instream flow).
Cultural Resources	--	DC 266	Significant cultural resources (i.e., archaeological, historic, traditional cultural properties (TCPs), and known American Indian sacred sites) are preserved and protected for their cultural importance and are free from adverse impacts.
Cultural Resources	--	DC 267	Heritage programs, interpretive presentations, brochures, or displays are available to provide opportunities for public use, understanding, and enjoyment of the Apache-Sitgreaves NFs' cultural resources.
Cultural Resources	--	DC 268	Eligible and historically-significant [31] cultural properties are listed on the National Register of Historic Places (NRHP).
Cultural Resources	--	OBJ 30	Every 2 years or according to Southwestern Region Heritage Program standards, National Register sites and priority cultural resources are inspected.
Cultural Resources	--	OBJ 31	During the planning period, nominate at least five eligible cultural resources for inclusion in the NRHP.
Cultural Resources	--	OBJ 32	Annually, provide a Passport in Time (PIT) or other education project to provide opportunities for the public to learn about the Apache-Sitgreaves NFs' past and cultural resources.
Cultural Resources	--	OBJ 33	Annually, complete a minimum of 100 acres of nonproject cultural inventory to expand existing knowledge about the nature, location, and management needs of the forests' cultural resources.

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Cultural Resources	--	ST 22	Human remains shall not intentionally be excavated for educational purposes (e.g., research, field schools).
Cultural Resources	--	ST 23	Contracts, permits, or leases that have the potential to affect cultural resources shall include appropriate clauses specifying site protection responsibilities and liabilities for damage.
Cultural Resources	--	GL 124	Activities that have the potential to adversely affect cultural resources should be discouraged in areas with a high concentration of significant archaeological sites or in areas of cultural or religious significance [32] to American Indians.
Cultural Resources	--	GL 125	Avoidance or protection measures should be the preferred method to prevent or minimize adverse effects to cultural resources listed in, nominated to, eligible for, or unevaluated for the NRHP.
Cultural Resources	--	GL 126	Historic facilities that are eligible for the NRHP should be managed to retain their integrity.
American Indian Rights and Interests	--	DC 269	Members of affiliated tribes have access to gather forest resources and products for traditional cultural purposes32 (e.g., medicinal plants, boughs, basket materials, pollen, plants and minerals for pigments).
American Indian Rights and Interests	--	DC 270	Traditionally used resources are not depleted and are available for future generations.
American Indian Rights and Interests	--	DC 271	Sacred sites and significant TCPs are accessible and free of adverse impacts allowing for culturally affiliated tribes to gather traditional forest products and conduct ceremonies.
American Indian Rights and Interests	--	DC 272	All sacred objects, human remains, funerary objects, and objects of cultural patrimony removed from lands of Apache-Sitgreaves NFs have been repatriated to the appropriate tribe.
American Indian Rights and Interests	--	OBJ 34	Over the planning period, a minimum of five MOUs are renewed or established with tribes associated with the Apache-Sitgreaves NFs.
American Indian Rights and Interests	--	GL 127	Significant TCPs and sacred sites, that are known to be utilized by tribes for traditional use and religious ceremonies, should be managed to preserve the character and use of the site.
American Indian Rights and Interests	--	GL 128	Activities and uses should be administered in a manner that is sensitive to traditional American Indian beliefs and cultural practices.
American Indian Rights and Interests	--	GL 129	Human remains and religious objects recovered from excavations conducted on the forests should be repatriated within 5 years in compliance with the Native American Graves Protection and Repatriation Act of 1990 (Public Law 101-601).
Forest Products	--	DC 273	The Apache-Sitgreaves NFs provide a sustainable supply of forest products (e.g., small roundwood, sawlogs, biomass, firewood, cones, Christmas trees, wildings) to businesses and individuals within the capability of the land.
Forest Products	--	DC 274	The collection of live plants, mushrooms, and other forest products does not impact species persistence onsite.
Forest Products	--	OBJ 35	Annually, prepare and offer up to an average of 122,000 CCF [34] from suitable timberlands resulting from sustainable harvest to provide wood products to businesses and individuals.
Forest Products	--	OBJ 36	Annually, provide up to 94,000 CCF (119,380 cords) [34] of firewood for personal and commercial use.
Forest Products	--	OBJ 37	Annually, provide an average of 5,000 permits for Christmas trees.
Forest Products	--	ST 24	Authorizations to cut, collect, or use forest products for any personal, commercial, or scientific purpose (i.e., permits, contacts, agreements) shall include provisions to ensure the needs of wildlife, which depend upon those forest products, will continue to be met (e.g., fungi and cone collection with respect to overwinter forage needs of squirrels).
Forest Products	--	GL 130	Permits issued for forest products should include stipulations to protect resources.

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Livestock Grazing	--	DC 275	Livestock grazing contributes to the social, economic, and cultural diversity and stability of rural communities.
Livestock Grazing	--	DC 276	Livestock grazing and associated activities contribute to healthy, diverse plant communities, satisfactory condition soils, and wildlife habitat.
Livestock Grazing	--	DC 277	Range developments for livestock minimize impacts to wildlife and blend with the natural environment.
Livestock Grazing	--	DC 278	Livestock grazing is in balance with available forage (i.e., grazing and browsing by authorized livestock, wild horses, and wildlife do not exceed available forage production within established use levels).
Livestock Grazing	--	DC 279	Livestock grazing and associated activities do not negatively impact cultural resources.
Livestock Grazing	--	ST 25	New or reconstructed fencing shall allow for wildlife passage, except where specifically intended to exclude wildlife (e.g., elk fencing).
Livestock Grazing	--	ST 26	New livestock watering facilities shall be designed to allow wildlife access and escape.
Livestock Grazing	--	GL 131	During maintenance of existing watering facilities, escape ramps that are ineffective or missing should be replaced.
Livestock Grazing	--	GL 132	Critical areas should be managed to address the inherent or unique site factors, conditions, values, or potential conflicts associated with them.
Livestock Grazing	--	GL 133	Grazing use on seasonal allotments should be timed to the appropriate plant growth stage and soil moisture.
Livestock Grazing	--	GL 134	New livestock troughs, tanks, and holding facilities should be located out of riparian areas to reduce concentration of livestock in these areas. Existing facilities in riparian areas should be modified, relocated, or removed where their presence is determined to inhibit movement toward desired riparian or aquatic conditions.
Livestock Grazing	--	GL 135	As areas are mechanically treated or burned, or after large disturbances, timing of livestock grazing should be modified as needed, in order to move toward desired conditions and to accomplish the objectives for the treatment.
Livestock Grazing	--	GL 136	Forage, browse, and cover needs of wildlife, authorized livestock, and wild horses should be managed in balance with available forage so that providing for these needs remain at or move toward a healthy, persistent state.
Livestock Grazing	--	GL 137	Efforts (e.g., temporary fencing, increased herding, herding dogs) should be made to prevent transfer of disease from domestic sheep and goats to bighorn sheep wherever bighorn sheep occur. Permit conversions to domestic sheep or goats should not be allowed in areas adjacent to or inhabited by bighorn sheep.
Livestock Grazing	--	GL 138	To minimize potential resource impacts from livestock, salt or nutritional supplements should not be placed within a quarter of a mile of any riparian area or water source. Salt or nutritional supplements should also be located to minimize herbivory impacts to aspen clones.
Livestock Grazing	--	GL 139	To prevent resource damage (e.g., streambanks) and disturbance to federally listed and sensitive wildlife species, trailing of livestock should not occur along riparian areas. Where no alternative route is available, approval may be granted where effective mitigation measures are implemented (e.g., timing of trailing, number of livestock trailed at one time).
Livestock Grazing	--	GL 140	Constructed features should be maintained to standard or removed when no longer needed.
Livestock Grazing	--	GL 141	New range developments should be located to minimize impacts to scenic resources and reduce the potential for vandalism and livestock-vehicle conflicts. Range developments should be designed in consideration of public safety, especially in areas of concentrated recreation use.
Minerals and Geology	--	DC 280	Mineral developments, including pits, mines, equipment, and associated structures, do not dominate the scenic landscape.

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Minerals and Geology	--	DC 281	Mineral materials (e.g., gravel, cinders) are available for road maintenance activities for the Forest Service transportation system, public road system, and ADOT use.
Minerals and Geology	--	DC 282	Mineral materials (e.g., cinders, decorative stone) are available to support resource management needs, personal use, and commercial pursuits.
Minerals and Geology	--	DC 283	Lands where past mineral development or exploration has occurred are returned to stable conditions and vegetated with native species.
Minerals and Geology	--	DC 284	Abandoned mine lands do not endanger people or the environment.
Minerals and Geology	--	DC 285	Naturally occurring geological features (e.g., caves, sinkholes) remain intact to support wildlife habitat, recreation opportunities, and unique vegetation.
Minerals and Geology	--	DC 286	Both caves and abandoned mines are available for roosting bats, reducing the potential for displacement, abandonment of young, and possible mortality.
Minerals and Geology	--	DC 287	Archaeological, geological, and biological features of caves and abandoned mines are not adversely affected by visitors.
Minerals and Geology	--	GL 142	Key cultural sites, research natural areas, and administrative and recreation sites with an investment in facilities should be withdrawn from mineral entry to protect resources and existing infrastructure.
Minerals and Geology	--	GL 143	Mineral material resource sites should be located where economical and the scenic integrity objectives can be met. Adverse visual impacts should be minimized.
Minerals and Geology	--	GL 144	Existing designated mineral material collection areas and community pits should be utilized to the maximum before new areas are developed. Additional mineral material development should balance private and community needs while providing for sustainable administrative use.
Minerals and Geology	--	GL 145	Abandoned mine lands or unneeded mineral material pits should be restored, closed, or rehabilitated to provide for resource protection and public health and safety.
Minerals and Geology	--	GL 146	Streambed and floodplain alteration or removal of material should not occur if it prevents attainment of riparian, channel morphology, or streambank desired conditions.
Minerals and Geology	--	GL 147	To reduce disturbances from human activities and prevent the spread of disease, bat gates should be constructed and installed in cave and mine entrances used as shelter for bats within 3 years of discovery when there are no conflicts with cultural resources.
Minerals and Geology	--	GL 148	Caves and abandoned mines that are used by bats should be managed to prevent disturbance to species and spread of disease (e.g., white-nose syndrome).
Minerals and Geology	--	GL 149	Active mineral operations should be managed to deter public motorized vehicle travel for public safety.
Minerals and Geology	--	GL 150	Oil and geothermal leases should contain the "no surface occupancy" restriction in designated [36] or recommended special areas (e.g., recommended wilderness, primitive area, eligible or suitable wild and scenic rivers corridors, research natural areas, botanical area, and wild horse territory), sacred sites, American Indian TCPs, and properties on the National Register of Historic Places to protect the unique character of these areas.
Minerals and Geology	--	GL 151	Common variety mineral activities should not be permitted in designated or recommended special areas or Chevelon Canyon to protect the unique character of these areas.
Special Uses	--	DC 288	Energy developments and other special uses are not major features on the landscape and should not attract attention (moderate

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			scenic integrity).
Special Uses	--	DC 289	Lands where special use activities have occurred show little evidence of impacts.
Special Uses	--	DC 290	Communications sites display landscapes which vary from moderately altered where human activities are evident (low scenic integrity) to slightly altered where human activities may be seen but do not attract attention (moderate scenic integrity).
Special Uses	--	ST 27	Noxious plants and nonnative invasive species monitoring and control shall be included in contracts, permits, and agreements.
Special Uses	--	ST 28	Special use authorizations for the collection of live species with limited distribution (e.g., some invertebrates, plants) shall include permit provisions to ensure the species persist onsite.
Special Uses	--	ST 29	New communications sites or energy developments shall not be authorized on traditional cultural properties.
Special Uses	--	GL 152	Special use authorizations should include provisions that limit encumbrances of NFS land.
Special Uses	--	GL 153	The number of communications sites, energy developments, and energy corridors should be minimized to limit encumbrances of NFS land.
Special Uses	--	GL 154	New communications permittees and equipment should be located or colocated within designated communications sites as identified in appendix C [of the LMP].
Special Uses	--	GL 155	New communications sites, energy developments, and energy corridors should be located to minimize impacts to scenery, special areas, and species.
Special Uses	--	GL 156	Commercial use of Forest Service administrative communications sites should be discouraged to avoid potential use conflicts or communication interference.
Special Uses	--	GL 157	High power antenna/towers should not be authorized except for the existing antenna/tower located on Porter Mountain. Upon termination of the high power permit, or in the case of inoperability, this communications site should be managed as low power.
Special Uses	--	GL 158	Existing energy corridors should be used to their capacity with compatible upgraded power lines before evaluating new routes.
Special Uses	--	GL 159	Environmental disturbance should be minimized by colocating pipelines, power lines, fiber optic lines, and communications facilities.
Special Uses	--	GL 160	Power pole installation or replacement under special use authorization should include raptor protection devices in open habitat such as large meadows and grasslands. Raptor protection devices should be installed on existing poles where raptors have been killed.
Special Uses	--	GL 161	The use of underground utilities should be favored to avoid potential conflicts with resources (e.g., scenic integrity, wildlife, wildfire, heritage).
Special Uses	--	GL 162	Water use associated with special use authorizations should be in accordance with Arizona State Statutes and should have a decreed water right or a valid claim.
Special Uses	--	GL 163	If structural degradation occurs to recreational residences, (re)construction should be discouraged.
Special Uses	--	GL 164	Target ranges may be appropriate in the General Forest or Community-Forest Intermix Management Areas because of the wide spectrum of recreation opportunities that can be provided in these areas. Other management areas should be avoided.
Special Uses	--	GL 165	Constructed features should be maintained to standard or removed when no longer needed.
Special Uses	--	GL 166	As applicable, issuance of special use authorizations should incorporate measures to reduce potential impacts to wildlife and

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			avoid rare and unique habitats (e.g., bogs, fens).
Special Uses	--	GL 167	Commercial outfitters and guides should not be authorized to use developed campgrounds so those sites remain available for noncommercial forest visitors.
Special Uses	--	GL 168	Commercial outfitters and guides may be authorized use of range developments when there is no conflict with allotment management.
Special Uses	--	GL 169	Large group and recreation event special uses should not be authorized within wilderness, recommended wilderness, primitive area, wildlife quiet areas, eligible "wild" river corridors, riparian and wetland areas, cultural resource sites, Phelps Cabin Botanical Area, Phelps Cabin Research Natural Area, or recommended research natural areas to protect the unique character of these areas.
Water Uses	--	DC 291	Water developments contribute to fish, wildlife, and riparian habitat as well as scenic and aesthetic values.
Water Uses	--	DC 292	Apache-Sitgreaves NFs water rights are secure and contribute to livestock, recreation, wildlife, and administrative uses.
Water Uses	--	DC 293	Surface water is not diminished by groundwater pumping.
Water Uses	--	DC 294	Dams, diversions, or other water control structures are designed, maintained, and operated to conserve water resources.
Water Uses	--	OBJ 38	Annually, prepare at least one instream flow water rights application until water acquisition needs are complete to sustain riparian areas, fish, wildlife, and water-based recreation.
Water Uses	--	ST 30	Forest Service water rights must be put to beneficial use and that use documented and consistent with ADWR regulations.
Water Uses	--	ST 31	Special uses for water diversions shall maintain fish, wildlife, and aesthetic values and otherwise protect the environment.
Water Uses	--	ST 32	Streams on NFS lands with high aquatic values and at risk from new water diversions shall be preserved and protected with instream flow water rights.
Water Uses	--	ST 33	Groundwater withdrawals shall not measurably diminish surface water flows on NFS lands without an appropriate surface water right.
Water Uses	--	GL 170	Constructed features should be maintained to -- or removed when no longer needed.
Wildland Fire Management	--	DC 295	Human life, property, and natural and cultural resources are protected within and adjacent to NFS lands.
Wildland Fire Management	--	DC 296	Wildland fires burn within the range of frequency and intensity of natural fire regimes. Uncharacteristic high-severity fires rarely occur and do not burn at the landscape scale.
Wildland Fire Management	--	DC 297	Wildland fire maintains and enhances resources and functions in its natural ecological role.
Wildland Fire Management	--	DC 298	For all PNVTs, the composition, cover, structure, and mosaic of vegetative conditions reduce uncharacteristic wildfire hazard to local communities and forest ecosystems.
Wildland Fire Management	--	GL 171	Wildland fire may be used to meet PNVT desired conditions and enable natural fire regimes.
Wildland Fire Management	--	GL 172	Human-induced impacts (e.g., smoke production, suppression actions) to natural processes, resources, or infrastructure attributable to wildland fire activities should be managed towards achieving objectives as identified in the applicable decision document.

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Wildland Fire Management	--	GL 173	Resources and infrastructure (e.g., fences, roads, stock tanks) that are lost or damaged by prescribed fire, use of wildland fire, or any suppression activities should be stabilized and rehabilitated.
Wildland Fire Management	--	GL 174	Firelines, helispots, and fire camps should be located to avoid disturbance to critical species and impacts to cultural resources.
Wildland Fire Management	--	GL 175	Aerial retardant drops should avoid threatened, endangered, proposed, or candidate, or identified sensitive species and waterways [37].
General Forest	--	DC 299	Watershed condition rating is at satisfactory.
General Forest	--	DC 300	Landscapes in the General Forest Management Area vary from moderately altered where human activities are evident (low scenic integrity) to natural where generally only ecological changes occur (very high scenic integrity).
General Forest	--	DC 301	Recreation opportunities range from semiprimitive nonmotorized to rural.
Community-Forest Intermix	--	DC 302	The Community-Forest Intermix Management Area is composed of smaller groups of trees that are spaced more widely than other forested areas. These conditions result in fires that burn primarily on the forest floor and rarely spread as crown fire.
Community-Forest Intermix	--	DC 303	There is legal and adequate access to public lands for resource management and recreation.
Community-Forest Intermix	--	DC 304	As a result of forest management, most wildfires are low to mixed severity surface fires resulting in limited loss of structures or ecosystem function.
Community-Forest Intermix	--	DC 305	Residents and visitors are knowledgeable regarding wildfire protection of their homes and property, defensible space, and appropriate uses of the forests.
Community-Forest Intermix	--	DC 306	These areas provide a safer firefighting environment than the general forest.
Community-Forest Intermix	--	DC 307	Native grasses, forbs, shrubs, and litter (i.e., fine fuels) are abundant enough to maintain and support natural fire regimes, protect soils, and support water infiltration.
Community-Forest Intermix	--	DC 308	The composition, density, structure, and mosaic of vegetative conditions reduce uncharacteristic wildfire hazard to local communities and forest ecosystems.
Community-Forest Intermix	--	DC 309	Ponderosa pine and dry mixed conifer forest structure is similar to forestwide conditions or is composed of smaller and more widely spaced tree groups than in the general forest.
Community-Forest Intermix	--	DC 310	Wet mixed conifer and spruce-fir PNVTs are growing in an overall more open condition than the wet mixed conifer PNVT outside of the Community-Forest Intermix Management Area. These conditions result in fires that burn primarily on the forest floor and rarely spread as crown fire.
Community-Forest Intermix	--	DC 311	Where potential occurs, pure deciduous stands (e.g., aspen, Gambel oak) act as natural firebreaks and enhance scenery.
Community-Forest Intermix	--	DC 312	Grasslands have less than 10 percent woody canopy cover.
Community-Forest Intermix	--	DC 313	Piñon-juniper stands have open canopy conditions.

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Community-Forest Intermix	--	DC 314	The integrity of riparian areas is maintained.
Community-Forest Intermix	--	DC 315	Vandalism and pilfering of cultural resources are uncommon.
Community-Forest Intermix	--	DC 316	Landscapes in the Community-Forest Intermix Management Area vary from moderately altered where human activities are evident (low scenic integrity) to natural appearing where human activities do not stand out (high scenic integrity).
Community-Forest Intermix	--	DC 317	Recreation opportunities range from roaded natural to rural.
Community-Forest Intermix	--	GL 176	Unauthorized infrastructure should be removed.
Community-Forest Intermix	--	GL 177	To reduce fire hazard and spread of insects and disease onto adjacent lands, slash should be treated (e.g., removal, pull back, relocation, burned) as soon as possible.
Community-Forest Intermix	--	GL 178	Where more than 80 percent of the host species or 90 percent of the area is infected with dwarf mistletoe (if regeneration or deferred treatment is not feasible), then thinning from below and/or prescribed fire should be used as needed for fire hazard reduction.
Community-Forest Intermix	--	GL 179	Due to the greater values to be protected (e.g., homes, property), basal areas should be at the lower end of the desired range and openings should occur at the higher end of the desired range (as described in the applicable PNVT desired conditions).
Community-Forest Intermix	--	GL 180	Retention of fire-resistant tree species (e.g., ponderosa pine, Douglas-fir, pure aspen) should be emphasized in the wet mixed conifer and spruce-fir forested PNVTs to reduce fire hazard.
High Use Developed Recreation Area	--	DC 318	Facilities are well maintained and provide for accessibility, user safety, comfort, and convenience, as well as protection of resources.
High Use Developed Recreation Area	--	DC 319	Visitors can expect to see a wide range of human activities and development (including roads, trails, interpretive sites, campgrounds, trailheads, fences, and day-use facilities).
High Use Developed Recreation Area	--	DC 320	The evidence of management activities is common.
High Use Developed Recreation Area	--	DC 321	The surrounding landscape is natural appearing, pastoral, or historic with variations created by the recreational facilities.
High Use Developed Recreation Area	--	DC 322	Trails are well marked and may include features such as loop systems or interpretive information.
High Use Developed Recreation Area	--	DC 323	Recreation opportunities range from semiprimitive motorized to rural.
High Use Developed Recreation Area	--	GL 181	Roads, facilities, and signing should be designed to blend with surroundings.
High Use Developed Recreation Area	--	GL 182	Management should focus on operation and maintenance, safety, aesthetics, and control of noxious weeds and nonnative invasive species.

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Energy Corridor	--	DC 324	Energy corridors serve a public benefit by providing for a reliable supply of energy essential to local, regional, and national economies.
Energy Corridor	--	DC 325	Vegetative conditions and land uses within the energy corridor facilitate the operation and maintenance of the associated facilities and infrastructure.
Energy Corridor	--	DC 326	Vegetation consists predominantly of grasses, forbs, shrubs, low-growing trees, and sapling-sized trees.
Energy Corridor	--	ST 34	Obsolete or unused facilities within energy corridors shall be removed and the areas rehabilitated.
Energy Corridor	--	GL 183	Energy corridors should be managed as nonmotorized areas to avoid conflicts with corridor operations and maintenance needs, although operations and maintenance activities may use motorized equipment.
Energy Corridor	--	GL 184	To limit impacts to undisturbed areas, new utilities (e.g., power lines, telephone lines, gas lines) should be colocated within existing corridors whenever technically feasible, within existing rights-of-way (including road rights-of-way), or follow major transportation routes.
Energy Corridor	--	GL 185	Within and adjacent to energy corridors, vegetation should be managed similarly to the Community-Forest Intermix Management Area so that facilities stay operational and reduce the hazards of human-caused damage, damage from wildland fire, and falling trees.
Energy Corridor	--	GL 186	Clearing of vegetation along rights-of-way, facilities, and permitted sites should be limited to that which achieves desired conditions, abates an identified hazard to the facility, or for operational efficiency and weed control.
Energy Corridor	--	GL 187	Trees and shrubs in riparian areas should only be removed when there is an imminent threat to facilities and, in these cases, trees should be left for large coarse woody debris recruitment to the stream and riparian system.
Energy Corridor	--	GL 188	When planning and implementing vegetation treatments (e.g., corridor maintenance), vegetation within riparian zones that provides rooting strength important for bank stability should be encouraged.
Energy Corridor	--	GL 189	As utility facilities are maintained or replaced, relocation of corridors outside of riparian areas should be considered to reduce potential impacts to these ecologically sensitive areas.
Energy Corridor	--	GL 190	Invasive plant species should be aggressively controlled within energy corridors to prevent or minimize spread.
Wild Horse Territory	--	DC 327	Grazing is in balance with available forage (i.e., grazing and browsing by authorized livestock, wild horses, and wildlife do not exceed established use levels).
Wild Horse Territory	--	DC 328	Horse numbers within the territory are aligned with the appropriate management level [2] as described in the "Heber Wild Horse Territory Management Plan."
Wild Horse Territory	--	DC 329	The Wild Horse Territory Management Area contains landscapes that vary from moderately altered where human activities are evident (low scenic integrity) to natural appearing where human activities do not stand out (high scenic integrity).
Wild Horse Territory	--	DC 330	Recreation opportunities range from semiprimitive nonmotorized to roaded natural.
Wild Horse Territory	--	GL 191	When wild horse populations exceed the appropriate management level, horses should be removed in accordance with the "Heber Wild Horse Territory Management Plan" (when completed).
Wildlife Quiet Area	--	DC 331	WQAs provide blocks of core habitat to meet wildlife life stage requirements during the breeding, rearing, and in some cases, the critical wintering period.
Wildlife Quiet Area	--	DC 332	WQAs contribute to preserving natural behaviors and processes that sustain wildlife populations associated with each WQA

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			(see below).
Wildlife Quiet Area	--	DC 333	WQAs provide for wide ranging predators and big game species, are large enough for a range of species, and provide for population and genetic exchange.
Wildlife Quiet Area	--	DC 334	WQAs lack disturbance from motorized vehicles, resulting in less stress to wildlife.
Wildlife Quiet Area	--	DC 335	WQAs provide undisturbed, nonmotorized hunting opportunities.
Wildlife Quiet Area	--	DC 336	WQAs provide semiprimitive nonmotorized recreation opportunities, including relatively quiet recreation opportunities close to or adjacent to intensively used areas.
Wildlife Quiet Area	--	DC 337	Landscapes in WQAs vary from slightly altered where human activities may be seen but do not attract attention (moderate scenic integrity) to natural appearing where human activities do not stand out (high scenic integrity).
Wildlife Quiet Area	--	DC 338	Willow Springs Horse Trap and Beaver-Turkey Ridge WQAs provide quiet areas for big game amid the intensive recreation uses on the Black Mesa Ranger District.
Wildlife Quiet Area	--	DC 339	Bear Springs and Cottonwood Seep WQAs provide quality travel, hiding, and thermal cover along the Mogollon Rim for a wide variety of species ranging from turkeys to mountain lions. The WQAs provide an abundance of browse species important for deer and elk.
Wildlife Quiet Area	--	DC 340	Woolhouse WQA on the Lakeside Ranger District provides high quality winter range for pronghorn antelope and elk within a busy and heavily used wildland-urban interface.
Wildlife Quiet Area	--	DC 341	The Hulsey Bench WQA on the Alpine Ranger District provides Mexican spotted owl, northern goshawk, elk, deer, turkey, and bear refuge habitat.
Wildlife Quiet Area	--	DC 342	The Open Draw WQA on the Alpine Ranger District provides high quality foraging and young rearing habitat for deer, elk, turkey, and bear.
Wildlife Quiet Area	--	DC 343	Middle Mountain WQA provides refuge for northern goshawk, turkey, deer, elk, and Mexican spotted owl amid extensive dispersed recreation on the Alpine Ranger District.
Wildlife Quiet Area	--	DC 344	Upper Coyote Creek WQA on the Alpine Ranger District provides high quality habitat, especially undisturbed young rearing habitat, for deer, elk, turkey, and bear.
Wildlife Quiet Area	--	DC 345	St. Peters Dome WQA on the Springerville Ranger District provides high quality spruce-fir habitat for dusky grouse, bear, and other high elevation species.
Wildlife Quiet Area	--	GL 192	All WQAs should be managed to preclude snowmobile use to minimize disturbance during the critical winter period.
Wildlife Quiet Area	--	GL 193	WQA boundaries should be signed to identify the areas and educate the public about their purpose.
Wildlife Quiet Area	--	GL 194	Fences surrounding and within WQAs should be inspected and improved to allow wildlife movement within and outside of the areas. Fences should be removed if no longer needed.
Wildlife Quiet Area	--	GL 195	Hiding cover and travelways for wildlife should be maintained to provide for security and connectivity of habitat.
Wildlife Quiet Area	--	GL 196	Restoration treatments should consider the needs of wildlife (e.g., calving/fawning areas, wallows, game crossings) to minimize potential impacts to the species and their habitat.
Natural Landscape	--	DC 346	Succession, fire, insects, disease, floods, and other natural processes and disturbance events primarily shape the composition, structure, and landscape patterns of the vegetation (although management activities may also have a minor influence).

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Natural Landscape	--	DC 347	These areas contribute to ecosystem and species diversity and sustainability; serve as habitat for plants and animals; and offer wildlife corridors, reference areas, primitive and semiprimitive nonmotorized recreation opportunities, and places for people seeking natural scenery and solitude.
Natural Landscape	--	DC 348	Inventoried roadless areas (IRAs) maintain their overall roadless character.
Natural Landscape	--	DC 349	Roads and human structures may be present, although uncommon.
Natural Landscape	--	DC 350	Landscapes vary from natural appearing where human activities do not stand out (high scenic integrity) to natural where generally only ecological changes occur (very high scenic integrity), except as described below.
Natural Landscape	--	DC 351	Developed campgrounds, picnic areas, trailheads, and roads passable by passenger cars provide roaded natural recreation opportunities. Landscapes within and immediately adjacent to these features remain scenic. They may be slightly altered where human activities may be seen but do not attract attention (moderate scenic integrity) to natural appearing where human activities do not stand out (high scenic integrity).
Natural Landscape	--	DC 352	While emphasizing semiprimitive nonmotorized and primitive recreation opportunities, motorized travel may occur on existing roads and motorized trails.
Natural Landscape	--	DC 353	Natural landscapes contribute to preserving natural behaviors and processes that sustain wildlife populations.
Natural Landscape	--	ST 35	New mineral material pits shall not be authorized.
Natural Landscape	--	GL 197	Limited cross-country motorized vehicle use may be authorized for administrative purposes.
Natural Landscape	--	GL 198	Temporary road construction and motorized equipment may be used in order to achieve ecological desired conditions.
Natural Landscape	--	GL 199	Existing roads should be maintained to the minimum standard to meet the objective maintenance level.
Natural Landscape	--	GL 200	Unneeded mineral material pits should be closed, recontoured, and revegetated.
Research Natural Area	--	DC 354	The Phelps Cabin RNA provides opportunities for research, study, observation, monitoring, and educational activities that maintain the natural conditions for which the area was established.
Research Natural Area	--	DC 355	The Phelps Cabin RNA, outside of Mount Baldy Wilderness, exhibits landscapes that vary from natural appearing where human activities do not stand out (high scenic integrity) to natural where generally only ecological changes occur (very high scenic integrity).
Research Natural Area	--	DC 356	Recreation opportunities, although not encouraged, are semiprimitive nonmotorized.
Research Natural Area	--	ST 36	The Phelps Cabin RNA will be surveyed and posted with boundary signs within the planning period.
Research Natural Area	--	ST 37	The Phelps Cabin RNA will be managed for nonmotorized access within the area; exceptions may be made for permitted research use.
Research Natural Area	--	GL 201	Management measures should be used (e.g., fencing) to protect unique features.
Research Natural Area	--	GL 202	To minimize impacts to unique and sensitive plant species, recreational activities (other than use on the designated trail) should not be encouraged.
Research Natural Area	--	GL 203	Research special use authorizations should limit impacts to sensitive resources, unique features, and species within the RNA.
Recommended Research Natural Area	--	DC 357	The recommended RNAs provide opportunities for research, study, observation, monitoring, and educational activities that maintain the natural conditions for which the area was recommended.
Recommended Research	--	DC 358	The Three Forks Closure Area (30 acres) of the recommended Three Forks RNA is free from human trampling and other

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Natural Area			disturbances to protect very sensitive and unique species, such as the Three Forks springsnail, California floater, New Mexico meadow jumping mouse, Chiricahua leopard frog, and loach minnow.
Recommended Research Natural Area	--	DC 359	The recommended Three Forks, Campbell Blue, Corduroy, and Sandrock RNAs, outside of any eligible or suitable wild and scenic river corridor, exhibit unaltered appearing landscapes where human activities do not stand out (high scenic integrity).
Recommended Research Natural Area	--	DC 360	The recommended Thomas Creek RNA exhibits slightly altered landscapes where human activities may be seen but do not attract attention (moderate scenic integrity).
Recommended Research Natural Area	--	DC 361	The recommended Phelps Cabin RNA addition (currently the Phelps Cabin Botanical Area), outside of any eligible or suitable wild and scenic river corridor, exhibit unaltered appearing landscapes where human activities do not stand out (high scenic integrity).
Recommended Research Natural Area	--	DC 362	Natural conditions prevail in the recommended Phelps Cabin RNA addition while providing an opportunity for interpretation, education, and research.
Recommended Research Natural Area	--	DC 363	Unique plant species, including willows, paintbrushes, and gentians, thrive in the recommended Phelps Cabin RNA addition.
Recommended Research Natural Area	--	GL 204	To minimize impacts to unique and sensitive plant and animal species, recreational activities should not be encouraged.
Recommended Research Natural Area	--	GL 205	If necessary, recommended RNAs should be fenced to manage unique features.
Recommended Research Natural Area	--	GL 206	Research special use authorizations should limit impacts to sensitive resources, unique features, and species within recommended RNAs.
Recommended Research Natural Area	--	GL 207	Recommended RNAs should be managed for nonmotorized access within the area to minimize ground disturbances and protect the resources which make these areas unique.
Wilderness and Primitive Area	--	DC 364	Ecological conditions are affected primarily by natural ecological processes, with the appearance of little or no human intervention.
Wilderness and Primitive Area	--	DC 365	Fire functions as a natural ecological process.
Wilderness and Primitive Area	--	DC 366	There is little evidence of human developments and little or no evidence of camping activity, unauthorized trails, trash, or other human impacts on the environment.
Wilderness and Primitive Area	--	DC 367	Visitor use does not affect wilderness characteristics.
Wilderness and Primitive Area	--	DC 368	Wilderness boundaries are posted and visible to visitors.
Wilderness and Primitive Area	--	DC 369	There are unconfined opportunities for exploration, solitude, risk, and challenge. The nonmotorized trail system enhances the wilderness character. Where there is public demand, outfitters and guides provide services to visitors seeking a wilderness experience.
Wilderness and Primitive Area	--	DC 370	Bear Wallow Wilderness provides outstanding opportunities for solitude and isolation. Encounters with small groups or individuals are infrequent.

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Wilderness and Primitive Area	--	DC 371	Within Mount Baldy and Escudilla Wilderness areas, trails concentrate use and provide access to popular destinations. Encounters with other users may occur.
Wilderness and Primitive Area	--	DC 372	Wilderness areas maintain natural landscapes where generally only ecological changes occur (very high scenic integrity) and provide primitive and/or semiprimitive nonmotorized recreation opportunities.
Wilderness and Primitive Area	--	DC 373	Wilderness contributes to preserving natural behaviors and processes that sustain wildlife populations.
Wilderness and Primitive Area	--	ST 38	Party size of 12 persons and/or 12 head of stock for hiking and riding groups in Mount Baldy Wilderness shall not be exceeded. A party size of 6 persons for overnight camping shall not be exceeded.
Wilderness and Primitive Area	--	ST 39	Party size of 12 persons and/or 15 head of stock for hiking and riding groups in Escudilla and Bear Wallow Wilderness and the Blue Range Primitive Area shall not be exceeded.
Wilderness and Primitive Area	--	ST 40	Objective(s) and strategies for all wildfires shall be identified.
Wilderness and Primitive Area	--	ST 41	Fire management activities shall be conducted in a manner compatible with the overall wilderness management --s (minimum impact suppression tactics).
Wilderness and Primitive Area	--	ST 42	Human-caused disturbed areas that do not complement wilderness characteristics will be rehabilitated to a natural appearance, using species or other materials native to the area.
Wilderness and Primitive Area	--	GL 208	New trail construction may be considered if the objective is enhancement of the wilderness character (e.g., increase solitude opportunities, restore naturalness).
Wilderness and Primitive Area	--	GL 209	Trail maintenance should be coordinated around anticipated visitor high-use periods to minimize encounters.
Wilderness and Primitive Area	--	GL 210	Trails that have minimal use, detract from the wilderness character, or cannot practically be maintained or reconstructed should be obliterated.
Wilderness and Primitive Area	--	GL 211	Prescribed fire should be considered to reduce the risks and consequences of uncharacteristic wildfire within wilderness or escaping from wilderness by reducing unnatural fuel accumulations, if necessary to meet wilderness fire management objectives. Naturally occurring wildfires should be allowed to perform, as much as possible, their natural ecological role within wilderness.
Wilderness and Primitive Area	--	GL 212	Fire camps, helispots, and other temporary facilities should be located outside the wilderness boundary to protect wilderness character.
Wilderness and Primitive Area	--	GL 213	Firelines and spike camps (i.e., a remote camp usually near a fireline) should not be constructed adjacent to trails or camp areas to protect wilderness values.
Wilderness and Primitive Area	--	GL 214	Grazing of pack stock should not occur except as authorized by the district ranger when adequate forage is available.
Primitive Area	--	DC 374	The Blue Range Primitive Area and presidential recommended additions maintain natural landscapes where generally only ecological changes occur (very high scenic integrity) and provide primitive recreation opportunities, except along the existing road (36 CFR 293.17(a)).
Recommended Wilderness	--	DC 375	Recommended wilderness areas display natural landscapes where generally only ecological changes occur (very high scenic

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			integrity) and provide primitive or semiprimitive nonmotorized recreation opportunities.
Recommended Wilderness	--	DC 376	Recommended wilderness contributes to preserving natural behaviors and processes that sustain wildlife populations.
Recommended Wilderness	--	ST 43	Objective(s) and strategies for all wildfires shall be identified.
Recommended Wilderness	--	ST 44	Fire management activities shall be conducted in a manner compatible with maintaining wilderness characteristics (minimum impact suppression tactics).
Recommended Wilderness	--	ST 45	Human-caused disturbed areas that do not complement wilderness characteristics shall be rehabilitated to a natural appearance, using plant species or other materials native to the area.
Recommended Wilderness	--	GL 215	The wilderness characteristics of each recommended wilderness should remain intact until a congressional decision on wilderness designation is made. Characteristics include naturalness, opportunities for solitude, opportunities for primitive recreation, and identified special features.
Recommended Wilderness	--	GL 216	Only nonmotorized travel may occur in recommended wilderness. However, motorized use associated with grazing allotments may occur and should be limited to that needed to carry out required management practices as authorized.
Recommended Wilderness	--	GL 217	Prescribed fire should be considered to reduce the risks and consequences of uncharacteristic wildfire by reducing unnatural fuel accumulations, if necessary to meet fire management objectives. Naturally occurring fires should be allowed to perform, as much as possible, their natural ecological role.
Recommended Wilderness	--	GL 218	Fire camps, helispots, and other temporary facilities should be located outside the recommended wilderness to protect wilderness values.

[FOOTNOTES - as number in the Land Management Plan for the Apache-Sitgreaves National Forests by chapter]
Chapter 2
[2] Degrading factors include, but are not limited to, actions that cause or maintain high departure from historic vegetation conditions, unsatisfactory or impaired soil condition, nonfunctioning riparian areas, impaired species habitat, occurrence of invasive species, and unstable road and trail conditions.
[4] Satisfactory soil condition exists when indicators signify that soil function is being sustained and soil is functioning properly and normally. The ability of soil to maintain resource values and sustain outputs is high.
[5] Species composition and cover amounts and the amount of vegetation and litter needed for soil protection are described by ecological unit in the "Terrestrial Ecosystem Survey for the Apache-Sitgreaves National Forests" (Laing et al., 1987, as amended).
[6] Tolerance soil loss rates are the maximum rates that soil can erode and not reduce long term soil productivity. These were established for each terrestrial ecosystem mapping unit component and are described in the "Terrestrial Ecosystem Survey for the Apache-Sitgreaves National Forests" (Laing et al., 1987, as amended).
[7] The amount of woody material varies by PNVT; see vegetation desired conditions.
[11] Detrimental changes are described in species-specific literature (e.g., recovery plans, listing and critical habitat designations, conservation strategies).
[12] Reference conditions are described in species-specific literature and research.
[15] Based on the site capability as defined by the specific map unit under consideration in the "Terrestrial Ecosystem Survey for the Apache-Sitgreaves National Forests" (Laing et al., 1987 as amended).
[20] The spatial extent of wetlands is delineated in the 2011 RMAP (Regional Riparian Mapping Project) found in the forests' GIS database.
[21] Plant height source material: Vine 1960; Hermann 1970, 1975; Hitchcock and Chase 1971; McDougall 1973; Correll and Correll 1975; Gould 1977; Martin and Hutchins 1980; Benson and Darrow 1981; Hickman 1993; Cronquist et al., 1997; Ruyle and Young 1997; Welsh et al., 1997; Hurd et al., 1998; Barkworth et al., 2003, 2007; Flora of North America 2008; and Springer et al., 2009.
[22] Measured on ungrazed plants as an indicator of vigor.
[24] Fawning may extend through mid-July in the high elevation montane/subalpine grasslands.
[27] Controls do not include State authorized hunting.
[28] The system of NFS roads and motorized trails is identified in the I-WEB database.
[29] In 2012, there are no areas designated for motorized cross-country travel.

[31] Significance as defined by the National Historic Preservation Act and 36 CFR 60.
[32] Sacred sites as defined in E.O. 13007, traditional cultural properties as defined in National Register Bulletin 38, traditional cultural purposes as defined in the 2008 Farm Bill Section 8102, Subtitle B.
[34] CCF = 100 cubic feet
[34] CCF = 1.27 cords
[36] Designated wilderness is withdrawn from leasing and mineral entry.
[37] See the Nationwide Aerial Application of Fire Retardant on National Forest System Land. Final Environmental Impact Statement. USDA Forest Service for species-specific information.

Chapter 3

[2] The Interior Board of Land Appeals (IBLA) has defined the appropriate management level as the "optimum" number of wild horses (or burros) which results in a thriving natural ecological balance and avoids a deterioration of the range. (109 IBLA 119; also reference Dahl vs. Clark, supra at 592). It is usually expressed as a range of numbers. From http://www.blm.gov/nv/st/en/prog/ wh_b/ appropriate_management.html

Appendix B. Species with No Effect Determinations

Lesser long-nosed bat *Leptonycteris curasoae yerbabuenae*

Endangered Species Act Status:	Endangered, 1988 Warranted finding to downlist to Threatened (Fed. Reg. Sept. 9, 2013)
District Occurrence:	Alpine and Clifton (potential habitat)
Recovery plan:	1997
Critical habitat:	None
Determination of Effect (Species):	No effect

For brevity, the lesser long-nosed bat is referred to as LLNB throughout the document. Note that the lesser long-nosed bat was known as the Sanborn's bat at the time of its listing.

Natural History, Distribution, and Status of the Species Range-wide

Life history, distribution, status of the species range-wide and listing factors are found in documents located on the FWS website http://www.fws.gov/southwest/es/arizona/Lesser.htm (accessed 2014). An account of the taxonomy, biology, and reproductive characteristics of this species is found in three documents: the Final Rule listing the LLNB as an endangered species (FWS 1988); in the Recovery Plan (FWS 1997); and the 5-Year Review (FWS 2007). The 1988 final rule found that listing of critical habitat was not prudent because maps or descriptions of critical habitat could increase LLNB vulnerability to disturbance. On September 9, 2013, the USFWS found that substantial information indicates that downlisting and reclassifying the LLNB from endangered to threatened may be warranted and they are therefore initiating a review of the status of this species to determine if these actions are warranted.

The 2012 Biological and Conference Opinion for the Continued Implementation of the Land and Resource Management Plan for the ASNFs (FWS 2012) provide information about the LLNB in FS Southwestern Region 3. Vaughn (2014) also compiled information on the species from various sources. All these documents are incorporated by reference into this document.

Status and Threats within the Action Area

There are no known systematic bat surveys on the ASNFs below the Mogollon Rim. The closest known location for LLNB on NFS lands is the southern end of the Penaleño Mountains in Gillespie Wash (Mount Graham area) on the Safford RD, 50 air miles southwest of the southernmost ASNFS boundary.

If LLNB were to occur on the ASNFs they would likely be located in areas with elevations of 7,300 feet or less, probably during August and September when LLNB depend more on agaves. This includes The Clifton Ranger District below the Mogollon Rim and the Blue River up and onto the Alpine Ranger District.

PNVTs where they may be found are semi-desert grasslands (107,000 acres) and Madrean pine-oak woodland (395,000 acres). These PNVTs are where agave forage plants used by LLNB most commonly occur on the ASNFs. The two agaves on the ASNFs are the higher elevational and more cold hardy of agave species in Arizona. They are Palmer's agave or Palmer's century plant

(*Agave palmeri*) and Parry's agave (*A. parryi* and *A. parryi* ssp. *parryi*). Both species of agave are known LLNB forage plants providing both nectar and pollen. No systematic inventory for these plants has been conducted on the ASNFs.

Agaves "bolt" (send up flowering/seed stalks) in mid to late summer. Based on personal observations below the Mogollon Rim (during field data work from 2006 to 2008, including the midscale vegetation assessment) on the Clifton Ranger District, agaves are not uncommon and they are likely to be found in patches scattered across the landscape, often on rockier areas with moderate to steep slopes or under juniper or piñon trees. Large scale wildfires in 2003, 2004, and 2011 resulted in some areas entirely burned of all vegetation; however, these areas are primarily at elevations above about 7,000 feet.

Topographically, this area is bisected by many canyons and rim rock areas containing generally small caves and extensive crevasses. While there is no inventory of mines or exploratory adits, the Clifton Ranger District has been historically explored for minerals on a limited and scattered basis.

The five year review for this species addresses threats to the species and habitat where the bat is found in southern Arizona and calls for more of a focus on ecosystem health relative to forage needs. Bat disturbance and roost damage by recreationists or, not on the ASNFs, activities associated with illegal border activities was identified. Uncharacteristic wildfire was identified as being able to affect bats through short term smoke impacts and possibly longer term changes in roost microclimates (e.g., changes in air flow or hydrological patterns).

LLNB are nomadic allowing them to adapt to varying availability of food sources, especially in years where their summer food source (columnar cacti) fail to bloom. While LLNB can forage long distances, they prefer to forage as close to the roost site as possible. Therefore, fire, grazing, urban development, and agave harvesting can impact their forage resources. While the latter two are not occurring on the ASNFs, most of the semi-desert grassland and Madrean pine-oak woodland PNVTs on the ASNFs are grazed. Since about 2005, prescribed fire has been used on the Clifton Ranger District to treat about 88,000 acres and use of wildland fire has occurred on about 13,000 acres (rough estimates provided by R. Lever, former Clifton R.D. fire management officer). Fire and grazing can affect flowering or kill agaves.

Other threats include the following. Predation of LLNB by owls and snakes occurs but is not significant. Since 2000, persistent drought occurred frequently across the ASNFs and some dieback of vegetation, e.g., piñon trees, has been observed. However, infrequent, intermittent and higher-than-normal precipitation has occurred on the ASNFs as well during this period. Other threats not likely on the ASNFs include wind energy development and white-nose syndrome. Because the typical roost temperature for LLNB is higher by 6º C than the optimal temperature for growth of the *Pseudogymnoascus destructans* fungus and because LLNB do not hibernate, it is thought that the risk of exposure to white-nose syndrome may be reduced.

Potentially positive actions for the species undertaken by the ASNFs include the following. Because the LLNB is not known on the ASNFs, there have been no specific actions relative to this species. However, range analyses on the Alpine Ranger District for allotments in the Blue River watershed from 1995-1997, adjusted livestock numbers based on available forage and by setting forage use levels to provide for plant recovery and soil protection. While it has not been specifically monitored, this may reduce the likelihood of livestock grazing on agave stalks. Substantial annual reductions to livestock grazing in terms of numbers and time in pasture were

made from 2001 through 2003 on the Alpine Ranger District in response to drought; this has helped retain plant vigor in forage plants. On the Clifton Ranger District where livestock foraging on agave stalks is observed, grazing is primarily yearlong and allotment analyses are ongoing.

Species and Habitat Effects

Were the LLNB to be present on the ASNFs, some potential impacts of program areas are briefly noted below.

LMP direction under the wildlife fire management, ecosystem/vegetation health, and watershed and soils program areas would help maintain or restore the Madrean pine-oak and semi-desert grassland PNVTs that contain LLNB foraging plants. In moving toward desired conditions in these PNVTs, colonies of agave could be impacted with project implementation (burning, crushing by equipment, etc.). Rangeland management and the engineering program areas could impact agaves by grazing or possibly by roads. The recreation and the lands and minerals program areas could potentially disturb roosting bats in caves. Various standards and guidelines would help to mitigate impacts associated with management and activities. Some of these include landscape scale treatments spread out to limit vegetation impacts over time and space; authorized grazing use in balance with available forage; and installation of bat gates where the need is identified.

Most of the acreage in PNVTs that could provide habitat for LLNB below the Mogollon Rim falls within the natural landscape management area. Here management and activities are to have a minor influence upon the composition, structure, and landscape patterns of vegetation and where there is an emphasis for ecosystem and species diversity while preserving natural behaviors and processes that sustain wildlife populations.

Cumulative Effects and Climate Change

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur within the action area of impacts for a listed species. Little specific information is available on those lands that might impact LLNB. Further development of lands currently in native vegetation will likely occur and agriculture may increase in the Gila Valley around Safford. State, private, and tribal lands are expected to continue to be grazed by livestock where land is not developed for human uses, and expansion of Freeport McMoRan's Morenci mine will continue.

The implications of climate change and variability for plants and animals are that their populations will shift even in the absence of human influence. For the LLNB, this might result in effects on phenology and changes in the date of flowering and associated pollination and in food-chain disruptions.

LLNB No Effect Determination

Habitat components (columnar cacti and caves) on the ASNFs below the Mogollon Rim are limited and scattered. While there have been no surveys for LLNB on the ASNFs, surveys east of Globe, AZ and south of the Gila National Forest, NM have not detected this species and AZGFD considers the ASNFs outside of the range of LLNB (McIntire 2014). Therefore, because the species is not known to be or is not likely present on the ASNFs and because implementation of

the LMP is not expected to affect the bat outside of the ASNFs, there would be **no effect** to the lesser long-nosed bat with implementation of the LMP.

Razorback Sucker *Xyrauchen texanus*

Endangered Species Act Status:	Endangered, 1991
District Occurrence:	Downstream of Clifton
Recovery Plan:	1998
Critical Habitat:	Yes
Determination of Effect (Species):	No Effect
Determination of Effect (Critical Habitat):	No Effect

Natural History, Distribution, and Status of the Species Range-wide

Information relative to the life history, distribution, status of the species range-wide and listing factors are located on the FWS website http://www.fws.gov/southwest/Razorback.htm. The literature cited within the recovery plan (FWS 1998), contains a thorough list of references for this species. This literature, along with the more recently completed "Recovery Goals" amendment and supplement to the Razorback Sucker recovery plan (FWS 2002), were considered and used in the preparation of this document; and are incorporated by reference into this document.

Range wide decline of the razorback sucker has been associated with major changes in its riverine ecosystems, primarily through the construction and operation of dams. There are more than 10 dams along the lower Colorado River and its major tributaries, the Gila, Verde, and Salt Rivers. These dams have dewatered, cooled, or impounded most of the lower basin system so that little natural riverine habitat exists today. The construction of dams and diversions has also prevented migration. The species decline is also attributed to predation and competition with introduced nonnative fishes (i.e., green sunfish, warmouth, channel catfish, flathead catfish, threadfin shad, smallmouth bass, and largemouth bass).

Status and Threats within the Action Area

Razorback sucker were introduced into Eagle Creek and the Blue River on the ASNFs in the 1980s. There are no historical records of this species occurring in either of these streams, although it is possible that they could have occurred historically within the San Francisco River on the ASNFs. From 1983 through 1989, approximately 335,500 Razorback Suckers were introduced into Eagle Creek within and downstream of the ASNFs. Within the Blue River on the ASNFs from 1986 through 1989, approximately 167,500 Razorback Suckers were introduced. Only 5-10 individuals were ever recaptured, and these recaptures occurred during the stocking years of 1983 to 1989; and they are no longer considered to be present within either of these streams on or downstream of the ASNFs boundary. Additionally, the reach (~125 miles) of designated critical habitat downstream of the ASNFs, as well as the entire Gila River within Arizona, is not occupied by the species. After leaving the ASNFs, both Eagle Creek and the San Francisco River enter this portion of critical habitat, approximately 21.5 miles downstream of the ASNFs boundary.

Primary Constituent Elements of Critical Habitat

Fifteen river reaches covering about 49% of the historic habitat of the razorback sucker (2,775 km; 1,724 miles) are designated critical habitat within the Colorado River Basin. The Gila River

from the Arizona-New Mexico state line to Coolidge Dam is included within this designation. Three primary constituent elements have been identified for Razorback Sucker critical habitat; water, physical habitat, and the biological environment. The water element includes consideration of water quality and quantity. Water quality is defined by parameters such as temperature, dissolved oxygen, environmental contaminants, nutrients, turbidity, and others. Water quantity refers to the amount of water that must reach specific locations at a given time of year to maintain biological processes and to support the various life stages of the species. The physical habitat elements include areas of the Colorado River system that are or could be suitable habitat for spawning, nursery, rearing, and feeding, as well as corridors between such areas.

Species and Habitat Effects Analysis

The Razorback Sucker does not occur on the ASNFs, and does not have the habitat components and elements required by the species. Eagle Creek and the San Francisco River drain and exit the southernmost portion of the ASNFs; and after flowing for approximately 21.5 miles they each enter the Gila River, which is designated critical habitat for the Razorback Sucker. These two streams that drain off the ASNFs are heavily impacted by activities (e.g., Morenci Mine, water diversions) that occur on private lands. Therefore; because the species is not present on the ASNFs and because implementation of the LMP is not expected to affect the critical habitat that is 21.5 miles downstream of the ASNFs, there would be no effect to the Razorback Sucker with implementation of the LMP.

Cumulative Effects and Climate Change

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur within the action area of impacts for a listed species. Little specific information is available on those lands that might impact Razorback Sucker. Further development of lands will likely occur and agriculture may increase in the Gila Valley around Safford. State, private, and tribal lands are expected to continue to be grazed by livestock where land is not developed for human uses, and expansion of Freeport McMoRan's Morenci mine will continue.

Predictions for climate change and variability include reduced precipitation and water in riparian areas, increased water losses from elevated evapotranspiration rates, altered high flow events with increased frequencies of high intensity convectional storms, increases in drought severity during summer low flows, and increasing temperatures in small streams and tributaries that further limit habitat during seasonal low flows. Key climate change factors potentially impacting riparian areas and aquatic habitat on the ASNFs include increases in frequency of extreme weather events and increases in wildfire risks. These key climate change factors are addressed directly or indirectly through the LMP (desired conditions, objectives, and management strategies); by enhancing adaption of ecosystems through anticipating and planning for disturbances from intense storms, reducing vulnerability by maintaining and restoring resilient native ecosystems, and increasing water conservation and planning for reductions in upland water supplies. While improvements may occur on the ASNFs that reduce impacts from climate change, as stated above, once streams leave the ASNFs they are subject to alterations and diversions that will determine their ability to adjust to climate variability.

Razorback Sucker No Effect Determination

Because the species is not known to occur on the ASNFs and because implementation of the LMP is not expected to affect the designated critical that occurs approximately 21.5 miles downstream

of the ASNFs, it has been determined that there would be **no effect** to the Razorback Sucker and its designated critical habitat with implementation of the LMP.