

Four Forest Restoration Initiative, Rim Country EIS

Terrestrial Wildlife Specialist Report

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for:
Rim Country EIS

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Terrestrial Wildlife

This section includes key effects and conclusions for terrestrial and plant threatened, endangered, and proposed species and critical habitat listed under the Endangered Species Act of 1973, as amended, Forest Service Southwestern Region Sensitive Species, forest management indicator species, and migratory birds. The Terrestrial Wildlife Report (Schofer et al. 2022) and Botany and Weeds Report (Crisp 2022) are incorporated by reference. Aquatic species were analyzed separately in the Aquatics Report (Paroz and Coleman 2022).

See the specialist reports (project record) for detailed information on methodology, analysis assumptions, best available science and data, habitats, populations, and effects that are not repeated in this section.

Affected Environment

Vegetation Cover Types Within the Project Area

The cover types in the Rim Country project area possess key habitat features outside of the natural range of variation (NRV). These forests have less structural diversity due to more acres occurring as even-aged forest compared to historical conditions (see Silviculture Report). Structure is also limited by the abundance of young and mid-aged trees and the decrease in mature and old-growth trees. These conditions do not meet Land Management Plan direction for the ratio of age-classes interspersed across the landscape.

Ponderosa pine commonly grows in pure stands and is currently found in even-aged and uneven-aged structural conditions across the area. The open park-like stands characteristic of the reference conditions for ponderosa pine forests promoted greater diversity and fire resilience than the dense stands of today. Ponderosa pine forests within the project are generally denser and more continuous than in reference conditions and accumulations of forest litter and woody debris are much higher than would have occurred under the historic disturbance regime (Brown et al, 2003). Lack of fire disturbance has led to increased tree density and fuel loads that increase the risk of uncharacteristically intense wildfire and drought-related mortality. When fires occur under current conditions, they tend to kill a lot of trees, including the large and old trees. These trees take longer to replace, moving the forest further from desired conditions, and increasing the time it would take to return to desired conditions. There is a high risk of insect and/or disease outbreak, which is also a function of increased tree density. The abundance of younger, continuous forest reduces canopy gaps. The loss of solar radiation reaching the forest floor, along with infilling of meadows, savannas, and grasslands, reduces understory vegetation. Habitat structure within the project area can determine the presence or absence of wildlife species.

Many wildlife species select habitat provided by large and old trees, including bark gleaners (e.g., pygmy nuthatches and hairy woodpeckers which are both MIS), cavity nesters (e.g., MSO which is a threatened species), communal roosting species (e.g., Allen's lappet-browed bats, a sensitive species), and larger/heavier nesting species (e.g., northern goshawks, a MIS and sensitive species). Simplifying structure and declines of habitat features like aspen, Gambel oak, and the herbaceous community reduce habitat for an array for wildlife species from multiple trophic levels, including invertebrate communities and larger carnivores.

Springs, Riparian Areas, and Stream Channels

Approximately 360 springs have been inventoried by the Spring Stewardship Institute within the Rim Country Project analysis area. Of these 360 springs, 214 have survey information, 138 are unverified, and 8 were verified. Information regarding historic flow or water quality from these springs is minimal.

Many riparian streams in the Rim Country project area, particularly within the Rodeo-Chediski Fire area, are currently non-functioning or functioning-at-risk, with accelerated erosion and increased peak flows.

There are approximately 360 miles of fish-bearing streams in the Rim Country project area. These streams provide habitat for 12 native fish and two gartersnakes, including seven federally-listed species and four Regional Forester sensitive species (see the Aquatics specialist report).

Desired conditions for riparian streams are that they are capable of filtering sediment, capturing and/or transporting bedload (aiding floodplain development, improving flood-water retention, improving or maintaining water quality), and providing ground water recharge within their natural potential. Their necessary physical and biological components provide habitat for a diverse community of plant and wildlife species including cover, forage, available water, microclimate, and nesting/breeding/transport habitat. Stream habitats and aquatic species depend upon perennial streams or reaches and their habitat is maintained by the watershed, soil, and riparian conditions within the ecosystem.

All proposed riparian treatments would also improve or maintain stream habitat by restoring watershed function or resiliency. Upland treatments in watersheds may also improve water infiltration rates and increase subsurface flows higher in the stream system that provide cool perennial water to streams and help to maintain stream temperatures.

Desired conditions for streams and aquatic habitats are to support native fish and other aquatic species, providing the quantity and quality of aquatic habitat within the natural range of variation. This includes increasing habitat complexity such as pools and large woody debris, reducing downcutting and sedimentation, improving riparian areas that provide channel stability and leaf litter, and providing stream shading to maintain water temperatures.

Assumptions and Methodology

Best Available Science

This analysis is based on best available scientific information. Data sources include research and life history literature and technical reports (see Literature Cited section of the Terrestrial Wildlife Specialist Report), Land Management Plan standards and guidelines, participation of researchers and managers from other agencies (as cited in this report), approved survey protocols, professional judgment, and the integration of other specialist reports for this project (Silviculture, Fire and Air Quality, Soils and Watershed, and Transportation) to determine effects on wildlife species and their habitats (see project record for additional information). The Rim Country interdisciplinary team developed spatially-defined databases for use in a Geographic Information System (GIS) from which the majority of the data and information contained in this report were derived. This database includes variables related to forest structure and forest health (i.e., wildlife habitat such as snags, downed logs, tree density, size classes, and species, old growth, wildlife habitat classifications, and understory biomass index (see project record for additional information). See the Silviculture, Fire Ecology, and Air Quality Reports for details on the

metrics used in this report and their respective modeling approaches, definitions, and assumptions.

Climate Change

The Climate Change Vulnerability Assessment (CCVA) for the Coconino National Forest and Rim Country project area (USDAFS 2017) identifies 45 percent is at high or very high vulnerability. At the ERU level, 50 percent of the mixed conifer was rated as very high vulnerability or risk of type conversion. Eighty-eight percent of the ponderosa pine ERUs were rated as high vulnerability.

The change in understory structure and palatability affects a wide array of wildlife from elk to arthropods, including a suite of prey species for goshawks and MSO. Climate change is predicted to lead to changes in fire patterns, increased evaporation and drought stress, reduced snowpack, alteration of hydrologic timing and quantity, and even lead to species extinctions (Marlon et al. 2009, USFWS Climate Change website, 2021 <https://www.fws.gov/home/climatechange/>).

Certain habitats are more vulnerable to a changing climate. For example, springs are a valuable natural water source for a variety of birds and mammals, particularly in arid environments. These areas may offer critical refugia for rare and narrow endemic species. However, many springs in the Rim Country project area are sensitive to variable precipitation and likely to dry up during prolonged drought. Along with increases in summer temperatures, climate change effects may make it harder for some riparian and wetland species to survive and challenge efforts to reintroduce some species into their historic range (Committee on Environment and Natural Resources 2008).

Climate change represents a clear threat to the ponderosa pine forests of northern Arizona. The uncharacteristic structure now common in these forests exacerbates these risks. By managing for resistant and resilient ecosystems, promoting landscape connectivity, and implementing concepts of adaptive management, land and resource managers can respond to new information and changing conditions related to climate change (Furniss et al. 2010). Endangered, threatened, candidate, and sensitive species in the Rim Country area are at particular risk. The Forest Service Southwestern Region and the 4FRI National Forests have developed guidance for addressing climate change which is broad and general in scope and which relies on adaptive management as climate change science evolves. Recent work locally that focused on the 4FRI landscape supported these findings. Implementation of the proposed Rim Country activities would be in alignment with these recommendations.

Spatial and Temporal Scales

Effects on species and their habitats were evaluated at multiple scales. Depending on the species and specific analysis, this could include the site (based on stand data), watershed, ERU, and/or individual forest. Data used was generated from modeling identified in the Silviculture Report. The timeframe for short-term effects is after treatment (Twenty years), representing conditions after all tree cutting and tree removal occurs, followed by prescribed fire in ten years, during treatment and after twenty years. The timeframe for short-term effects associated with aspen treatment is when tree cutting is complete and after 10 years of treatment (when one prescribed fire has been conducted). The timeframe for long-term effects is 30 years after treatment.

Details on modeling to evaluate the potential for undesirable fire behavior and effects and the departure from historical fire regimes can be found in the Fire Ecology and Air Quality Report.

Details regarding habitat associated with springs and riparian restoration are in the Soils and Watershed Report.

Whenever possible, species-specific habitat and locality data were used. Additionally, data queried by potential natural vegetation type (PNVT) and Land Management Plan management area (Tonto NF) or desired conditions (Coconino and Apache Sitgreaves NF's) were used to help with analysis of effects on species' habitats.

Data is typically rounded to the nearest 10 acres, mile, or percentage. Most values have been rounded from their actual decimal values. Totals were calculated before any values were rounded in order to give the most accurate sum. Any apparent inconsistency between the total values reported in a table and a sum resulting from adding up individual values in a table typically accounts for a discrepancy of about 1 percent in the case of rounding percentages or miles, and fewer than 2 acres in the case of rounding acres. Similarly, rounding may have been applied to text discussions and calculated variables reported in tables.

Roads for Hauling Forest Materials in Wildlife Habitat

The Transportation Report assumes that nearly all of the existing roads in the Rim Country project area may at some point in time be used to provide access for a variety of restoration activities, including hauling of forest products resulting from mechanical treatments. Mileage of existing system roads by maintenance level (ML) is shown in Table 1 of the Transportation Report. Nearly all Forest System roads within the project area are ML1, 2 or 3 roads. This analysis addresses temporarily opening existing closed roads (ML 1) to utilize them for the time period that they are needed to provide access for restoration work. These roads shall be closed upon completion of work in the area they access and returned to a closed status (ML1).

It is proposed in the Tonto Travel Management DEIS that 354 miles of ML2 roads be converted to motorized trails. These have received minimal maintenance over the years and their current condition is not anticipated to improve (narrowing, roughening up, or otherwise modifying the road as it's redefined to a motorized trail). Full size vehicles would be authorized to use these routes under Tonto Travel Management and they would be managed as motorized trails. A motorized trail is defined as "a route 50 inches or less in width or a route over 50 inches wide that is identified and managed as a trail." It is anticipated that pre-haul maintenance is all that would be needed in the future to prepare the motorized trails for use to access areas to be treated.

The Condition-based management Approach for Mechanical Treatments

Appendix D of the FEIS contains the Condition-based Management approach for mechanical treatments. The proposed approach builds on the methods used in the 1st 4FRI EIS, but expands upon it to give the desired flexibility in mechanical treatments in areas with or without other management constraints (such as Mexican spotted owl (MSO) and goshawk (NOGO) habitat, or sensitive soils).

Analysis Methods to Evaluate Environmental Consequences from Alternatives on Mexican Spotted Owl Habitat

Key features of MSO habitat described in the Recovery Plan include Primary Constituent Elements of habitat important to the MSO such as:

1. A range of tree sizes and ages with a preponderance of trees greater than 12 inches in diameter,

2. basal area and density of pine,
3. Canopy cover and structure,
4. Tree sizes suggestive of uneven-aged management, and
5. Large dead trees (snags) with a diameter of 12 inches or greater.

MSO populations are influenced by prey availability. Key features of prey habitat include:

1. High volume of fallen trees (mid-point diameter of 12 inches or greater) and other woody debris
2. Plant species richness, including woody species
3. Residual plant cover to maintain fruits, seeds, and regeneration to provide needs of MSO prey species, and
4. Other improvements to prey habitat
5. Primary Constituent Elements Related to Canyon Habitat (one or more of the following):
6. Presence of water (often providing cooler air temperature and often higher humidity than surrounding areas.
7. Clumps or stringers of mixed conifer, pine-oak, pinyon-juniper, and/or riparian vegetation:
8. Canyon walls containing crevices, ledges, or caves: and.
9. High percentage of ground litter and woody debris.

These forest structure elements are reflected in the evaluation criteria and are used to describe the existing condition of the habitat and the effects of the proposed activities according to FVS modeling over a thirty-year period from the existing condition in the existing condition, to ten years and twenty years into the future, after the proposed treatments have occurred.

1. Acres treated and improved by habitat/vegetation type by alternative within MSO habitat type (protected and recovery habitats).
2. Changes in basal area by tree size-classes to show effects from uneven-aged management by alternative within MSO habitats.
3. Changes in Trees Per Acre (TPA >18 inches) with desired condition of 12 or more per acre in mixed conifer and Ponderosa pine-oak cover types.
4. Changes in Canopy Cover and increases of large tree size classes > 18 inches DBH by alternative in MSO habitats.

To analyze the effects of alternatives on snags, downed logs, and coarse woody debris the following habitat variables were modeled and reviewed:

1. Change in number of snags per acre with a diameter of 12 inches and greater by alternative in MSO habitats (average number of snags 12-18 inches, 18-24 inches, and greater than 24 inches in diameter).
2. Change in tons per acre of coarse woody debris surface fuel three inches or greater.

To analyze the effects of alternatives on understory to provide MSO prey habitat measures in MSO Habitats the following variables were modeled and reviewed:

1. Snags per acre > 12" (average of snags 12-18", 18-24", and greater than 24") and coarse woody debris in MSO habitats.

2. Changes in tons per acre of shrub and herbaceous biomass (to maintain fruits, seeds, and regeneration to provide needs of MSO prey species) in MSO habitats.

To analyze the effects of fire by alternative in MSO habitats the following variables were modeled and reviewed:

1. Changes in tons per acre by alternative of total surface fuel.
2. Changes in potential fire behavior (fire hazard index) by alternative in MSO habitats.
3. Changes in risk of crown fire by alternative and MSO habitats.

Wildlife Species Analyzed in This Report

A diverse assemblage of wildlife was identified for analysis for the proposed Rim Country Project, including species listed under the ESA, Forest Service sensitive species, MIS, and migratory birds. Species that are evaluated here are ones known to occur within or have habitat within or adjacent to the project area. Each species from the above groups (i.e., ESA, MIS, etc.) that occurs or has the potential to occur within the project area was analyzed according to the applicable law, regulation, or policy. In some cases, surveys for these species have confirmed their presence in or near the project area. In cases where a species has not been detected, the presence of suitable habitat indicates they could be present and therefore their presence was assumed under this analysis. Aquatic threatened, endangered, and sensitive species and MIS are addressed in the Aquatics Report, except for frogs. Sensitive plant species are addressed in the Botany Report. The effects on MSO are also analyzed in a separate Biological Assessment for the purpose of ESA Section 7 consultation with the FWS.

The following list of federally threatened, endangered, and proposed species is adopted from the USFWS web page (<http://www.fws.gov/southwest/es/arizona>), accessed on March 22, 2021). This list includes all federally threatened, endangered, candidate, and proposed species in the counties in the Rim Country project area. For the purpose of this analysis, only those federally-listed threatened, endangered, and candidate species and their critical habitat are analyzed (Table 1). In addition, Forest Service sensitive species that are known to or have the potential to occur within the Rim Country project area are also analyzed. Species that are not present or do not have potential habitat in the project area were dismissed from further analysis as the project would have no effects on these species (Table 2) project would have no effects on these species.

Table 1. Threatened, Endangered, and Forest Service Sensitive (TES) Species Evaluated

Common Name	Scientific Name	Status ¹
Amphibians		
Northern leopard frog	<i>Lithobates pipiens</i>	S
Lowland leopard frog	<i>Lithobates yavapaiensis</i>	S
Birds		
Mexican spotted owl	<i>Strix occidentalis lucida</i>	T
Western yellow-billed cuckoo	<i>Coccyzus americanus occidentalis</i>	T
Bald eagle	<i>Haliaeetus leucocephalus</i>	S
Golden Eagle	<i>Aquila chrysaetos</i>	S
Northern goshawk	<i>Accipiter gentilis</i>	S
American peregrine falcon	<i>Falco peregrinus anatum</i>	S

Burrowing owl (western)	<i>Athene cunicularia hypugaea</i>	S
Mammals		
Mexican wolf	<i>Canis lupus baileyi</i>	E/10j
Navajo Mogollon vole	<i>Microtus mexicanus Navaho</i>	S
Western red bat	<i>Lasiurus blossevillii</i>	S
Spotted bat	<i>Euderma maculatum</i>	S
Allen's lappet-browed bat	<i>Idionycteris phyllotis</i>	S
Pale Townsend's big-eared bat	<i>Corynorhinus townsendii pallescens</i>	S

1. Status: E = Federally Endangered; T = Federally Threatened; E/10j population = Endangered/Experimental population (section (10)(j) of the ESA; Eagle Protection Act = Bald and Golden Eagle Protection Act; S = Forest Service Sensitive.

Table 2. Threatened, Endangered, Candidate, Sensitive, and Management Indicator Species Not Addressed in this Analysis.

Common Name	Scientific Name	Rationale for Dropping	Status ¹
Birds (3)			
Southwestern willow flycatcher	<i>Empidonax traillii extimus</i>	Neither the species nor its habitat occurs in the project area	E
Yuma clapper rail	<i>Rallus longirostris yumanensis</i>	Neither the species nor its habitat occurs in the project area	E
California condor	<i>Gymnogyps californianus</i>	Neither the species nor its habitat occurs in the project area	E
Amphibian (1)			
Chiricahua leopard frog	<i>(Lithobates [Rana] chiricahuensis</i>	Addressed in the Aquatics Specialist Report	T
Reptiles (2)			
Narrow-headed gartersnake ²	<i>Thamnophis rufipunctatus</i>	Addressed in the Aquatics Specialist Report	T
Northern Mexican gartersnake ²	<i>Thamnophis eques megalops</i>	Not Addressed in the Terrestrial Wildlife Species Report	T
Mammals (2)			
New Mexico meadow jumping mouse	<i>Zapus hudsonius luteus</i>	Neither the species nor its habitat occurs in the project area	E
Springerville silky pocket mouse	<i>Perognathus flavus goodpasteri</i>	Neither the species nor its habitat occurs in the project area	S
Insects (1)			
Aquatic insects ²	Various species	Not Addressed in the Terrestrial Wildlife Species Report	S/MIS
Fish (6)	6 Species	Addressed in the Aquatics Specialist Report	T and E

1. Status: E = Federally Endangered; T = Federally Threatened; E/10j population = Endangered/Experimental population (section (10)(j) of the ESA; P = Federally Proposed; S = Forest Service Sensitive; MIS= Management Indicator Species; 2. Analyzed in the Aquatics Specialist Report

Federally-listed Threatened, Endangered, Proposed and Candidate Species and Critical Habitat

Mexican Spotted Owl (MSO)

Listing Status

The MSO was listed as a threatened species under the ESA in March 1993 (USDI FWS 1993). A detailed account of the taxonomy, biology, and reproductive characteristics of the MSO is found in the Final Rule listing the MSO as a threatened species (USDI FWS 1993), in the Recovery Plan (USDI FWS 1995), and in the Revised Recovery Plan (USDI FWS 2012). Information on MSO in the Upper Gila Mountain Recovery Unit (UGM) is also summarized in Ganey et al. (2011). The information provided in these documents is incorporated here by reference as summarized below.

The FWS recommends recovery actions concentrate on recovery units with the highest owl populations (USDI FWS 2012). The UGM supports over half the known population of MSOs (Ganey et al. 2011). Owls appear to be more continuously distributed in the UGM, relative to other Recovery Units, and the central location of the UGM within the overall range of the MSO facilitates gene flow across their range (Figure 8). Therefore this Ecosystem Management Unit is important to the overall range-wide stability of MSOs. The FWS also recommends recovery actions concentrate on recovery units where significant threats exist and that management should emphasize alleviating the greatest threats and be tailored to the needs of the area under analysis (USDI FWS 2012). The UGM is at significant risk of uncharacteristically high-severity wildfire (USDI FWS 2012). Lands managed by the Forest Service account for 42 percent of the UGM, putting the agency in a position to aid in the recovery of the species in part by decreasing the threat of high-severity fire in MSO habitat.

Modeling and Habitat Evaluation

The 2012 Revised Recovery Plan and individual Land Management Plans describe the different levels of MSO habitat management, including protected, recovery, and other forest and woodland types. The stated objectives for managers are to ensure a sustained level of owl nest/roost habitat well distributed across the landscape and create replacement owl nest/roost habitat where appropriate while achieving a diversity of stand conditions across the landscape to ensure habitat for a diversity of prey species.

Protected areas include: PACs established around all known MSO sites located during surveys and management activities since 1989 and reserved lands which include wilderness, research natural areas, wild and scenic rivers, and congressionally recognized wilderness study areas. Prescribed fire is allowed in these areas where appropriate. PACs are 600 acres or more and typically include one or more nest sites. Core areas are 100 acres or larger, designated to encompass known nest or roost sites or the best nesting and roosting habitat available within PACs. In the absence of a known nest, the activity center should be defined as a roost grove commonly used during breeding. In the absence of a known nest or roost, the activity center should be defined as the best nest/roost habitat.

Recovery habitats include all mixed-conifer, pine-oak, and riparian forests outside of protected areas. Recovery areas should be managed to ensure a sustained level of owl nest/roost habitat well distributed across the landscape. Replacement nest/roost habitat should be created where appropriate within recovery habitat while still providing a variety of stand conditions across the landscape to ensure habitat for a diversity of prey species.

While the respective Land Management Plans provide managers with guidelines for achieving the objectives of designated MSO habitat, readers must turn to the Recovery Plan itself for the biological and ecological intent of these designations. The latter provides the context for applying the guidelines and informs management planners and decision makers as to the intended function of the habitat. Treatments in MSO habitat under Rim Country were designed to meet Land Management Plan direction, as amended. Accordingly, much of the following discussion on existing conditions and the environmental effects of proposed Rim Country activities in MSO habitat follow the detail and context described in the Mexican Spotted Owl Recovery Plan; that is, Land Management Plan direction would be met by design, but the effects on owls are assessed relative to the biology and ecology of the species as described in the Recovery Plan.

Species Distribution in the Project Area

Protected Activity Centers

A total of 214 PACs (120,522 acres) occur in the Rim Country project area, with 98 on the Coconino, 63 on the Apache-Sitgreaves NF's and 53 PACs on the Tonto NF (figure 1 and table 3). An additional 39,748 acres either fall outside of the Rim Country boundary area (11,269 acres) or occur in other project areas (28,479 acres). These acres will be treated as those projects planned and consulted with USFWS, except for the PACs that are in the Clint's Well, Upper Beaver Creek; and Rim Lakes project areas. These are included in this analysis for the MSO to accommodate for recent PAC boundary changes conducted with FWS in these project areas and to allow for prescribed fire within nest cores. Twenty-nine of these PACs would have some other type of restoration (riparian, wet meadow, grassland, aspen, etc. see Actions common to Alternatives 2 and 3 below). In the Rim Country project area up to 93,346 acres in PACs are proposed for other thinning and/or burning, or other restoration activities in Alternatives 2 and 3 (see Effects Analysis sections below). Working closely with the FWS and wildlife biologists from all three national forests, we reviewed each PAC for treatment needs. PACs were assessed in terms of dominant forest type (e.g., pine-oak, mixed conifer, or canyons), habitat structure, available demographic data (based on ongoing occupancy surveys or past research), topographic attributes (e.g., aspect and slope), human access, designated wilderness boundaries, recent and ongoing projects affecting PAC habitat, fire history, status of current habitat, and whether mechanical treatments could move the habitat toward the desired conditions described in the Recovery Plan. It was agreed no mechanical treatments would occur in core areas.

Once the status of the PAC was determined, potential mechanical treatments were considered in terms of whether they could:

1. Decrease the amount of time required for growing/increasing tree height and diameter;
2. Decrease overall tree density while maintaining the density of large trees, and
3. Increase canopy base height to improve flight zone (i.e., improve owl foraging ability) and also reduce the threat of surface fires becoming crown fires.

It was determined that 11 of the 214 PACs assessed did not need mechanical treatments, and that mechanical treatments were possible in 11,258 acres of PACs. Hand Thinning Only (HTO) is proposed on 1,190 acres in an additional 5 PACs. These PACs will be prescribed burned in their entirety totaling an additional 80,898 acres. The project area has 148 miles of General Stream restoration and 23 miles of Heavy Mechanical habitat that is proposed in PACs where this could

occur. (In Core areas General stream restoration is proposed on 23.3 miles and Heavy Mechanical Stream Restoration is 4.9 miles). The project area has 1,819 acres of Riparian and 101 acres of Wet Meadow Riparian habitat proposed in PACs where this could occur. The project area has 15 acres of Grassland Restoration (Lake Mountain and Schell Springs) and 258 acres of Wet Meadow Restoration that is proposed in PACs where this could occur. PACs were not considered for treatment if they were treated in previous projects, or if their habitat was not suitable for Rim Country treatments (some occur in designated wilderness or canyons, were previously burned, have conditions inside and outside the PAC that do not need active management, or there is not enough information to identify a need for treatment).

Recovery Habitat

Following Recovery Plan direction, individual Land Management Plans direct managers to conduct a districtwide or larger landscape analysis to ascertain whether minimum recommendations for nest/roost habitat exist across the forest. One of the strengths of landscape-scale planning is the ability to compare habitat across ecological scales as encouraged in the Recovery Plan.

Working closely with the FWS and wildlife biologists from the three national forests, we reviewed recovery habitats in the greater Rim Country area. Meetings held among wildlife biologists from the FWS, each NF, and members of the Rim Country team began in October, 2016. We placed emphasis on developing future nesting and roosting habitat on all three of the Rim Country NF's, which support some of the highest numbers of resident owl pairs in the Region.

A new recovery layer was created within the Rim Country project area, including designation of recovery nest/roost and foraging habitat as described in the Recovery Plan. This landscape-scale approach better meets the goal of providing continuous replacement nesting and roosting habitat over space and time, as described in the Recovery Plan.

Pine-oak habitat on the Tonto contains mostly ponderosa pine-Gambel oak to the east and pine – evergreen oak to the west. PACs and recovery habitats on the Tonto NF could not all be characterized as pine-oak or mixed conifer and so required queries using additional criteria. A geophysical model (GM) was used to identify recovery habitats based on slope and aspect. We also assumed that most canyons and drainages would contain some ponderosa pine.

The results of the queries were reviewed in meetings with biologists with on-the-ground familiarity of the Tonto, Coconino and A-S NFs. This review was to ensure that stands also provided the best functional habitat.

The strategy in designating recovery foraging and nest/roost habitat was to provide well-distributed habitat to aid in dispersal and seasonal movements of owls across the landscape, including strategically located blocks that could potentially function as future PACs (i.e., “ensure a sustained level of owl nest/roost habitat” and “[c]reate replacement owl nest/roost habitat where appropriate” per the amended Land Management Plans). Blocks of habitat were also designated with the intent of providing “stepping-stones” to facilitate owl dispersal and connect areas capable of supporting future nesting and roosting habitat, per the Recovery Plan, to support landscape connectivity for MSOs. Some small, scattered stands of isolated habitat occurring in a matrix of non-MSO habitat would not be expected to support nesting owls or provide

connectivity and were dropped from further consideration. In other words, results from the above criteria were assessed in terms of ecological function in addition to meeting query criteria.

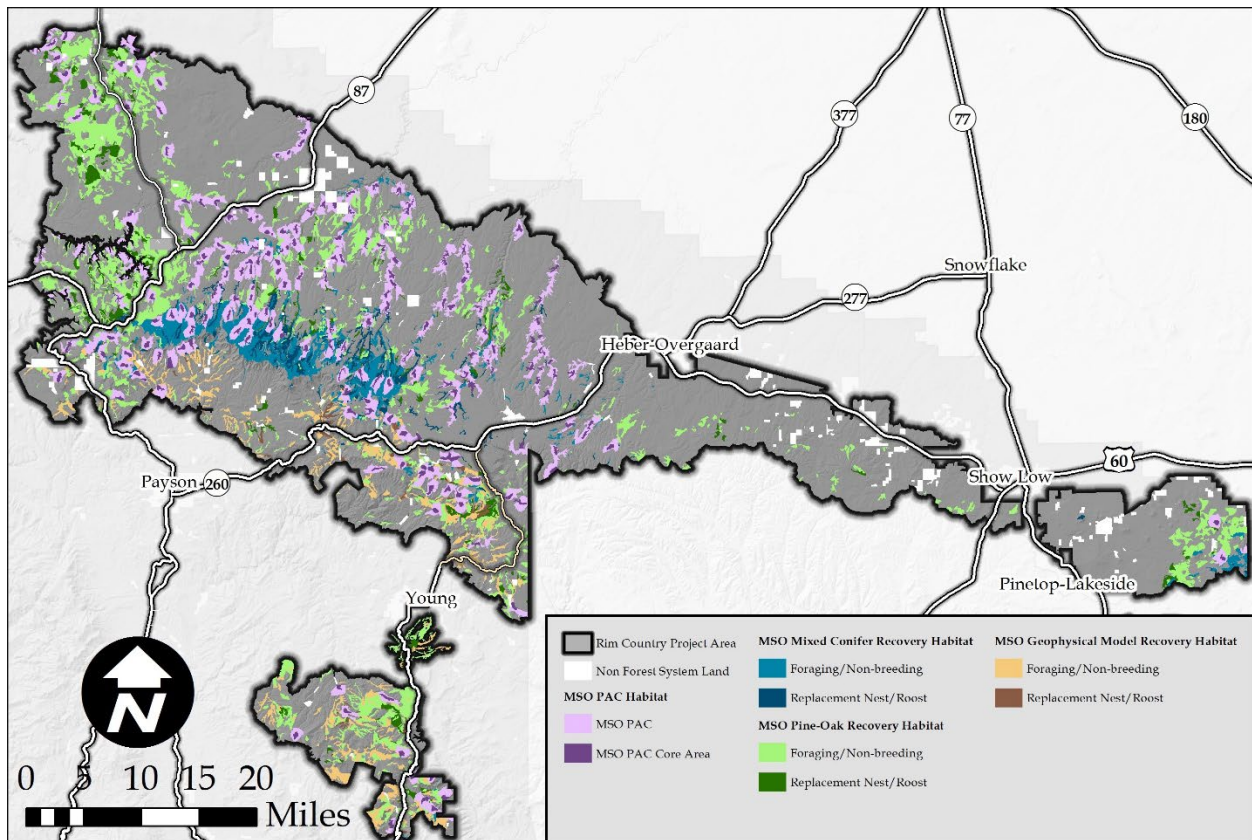
Proximity to PAC habitat was also an evaluation criterion. We sought to either augment PAC habitat or designate recovery habitat in previously undesignated pine-oak stands. Fire potential was also considered in developing the spatial configuration of MSO habitat on the landscape. Predominant winds are from the southwest, so we rarely identified additional owl habitat southwest of existing PACs unless stands were on northerly aspects. Because of the fire potential, areas southwest of PACs were reevaluated for treatments that would reduce the risk of high-severity fires entering PACs. A final emphasis was placed on removing stands misclassified as recovery habitat.

Habitat criteria for nest/roost habitat was met for 36,691 acres and 182,965 acres was designated as other recovery habitat as defined in the Recovery Plan (see table below). All of the mixed conifer in the project area is recovery habitat.

Table 3. Acres of Mexican Spotted Owl (MSO) Habitat

	Coconino	Apache-Sitgreaves	Tonto	Grand Total
MSO Protected Activity Centers	49,991 (98 PACs)	39,716 (63 PACs)	30,816 (53 PACs)	120,522 (214 PACs)
Mixed Conifer Recovery Habitat Total	24,632	18,622	4,069	47,322
Foraging/Non-Breeding	18,490	12,229	2,940	33,658
Replacement Nest/Roost	6,142	6,393	1,129	13,664
% Replacement Nest/Roost	25%	34%	28%	29%
Pine-Oak Recovery Habitat Total	71,661	32,255	34,408	138,324
Foraging/Non-Breeding	61,016	28,250	29,419	118,685
Replacement Nest/Roost	10,644	4,005	4,989	19,639
% Replacement Nest/Roost	15%	12%	14%	14%
Geophysical Model Recovery Habitat Total	N/A	N/A	34,011	34,011
Foraging/Non-Breeding	N/A	N/A	30,622	30,622
Replacement Nest/Roost	N/A	N/A	3,389	3,389
% Replacement Nest/Roost	N/A	N/A	10%	10%
Total Replacement Nest/Roost	16,786	10,398	9,506	36,691
Total Foraging Non-Breeding	79,506	40,478	62,981	182,965
Total MSO Recovery Habitat	96,293	50,876	72,487	219,657
Total MSO Habitat	146,284	90,592	103,303	340,179

Figure 01. Mexican spotted owl habitat



Critical Habitat and Primary Constituent Elements in the Project Area

MSO critical habitat was designated by the FWS in 2004 (USDI FWS 2004). Critical habitat is defined as protected and recovery habitats within designated areas which contain the primary constituent elements (PCEs) necessary for conservation of the species (USDI FWS 2004). Critical habitat can include non-MSO habitat, including federally-managed lands that do not function as owl habitat and private and state lands. Protected and recovery MSO habitat within designated critical habitat must be managed to maintain or enhance primary constituent habitat elements. PCEs in pine-oak forest provide for MSO habitat needs including, but not limited to nesting, roosting, foraging, dispersing, and elements of prey habitat (USDI FWS 2004). A detailed list of PCEs can be found in the Evaluation Criteria section below.

Two critical habitat units occur partially or completely within the Rim Country project area (figure below). They encompass 686,287 acres of Forest Service land, including mixed-conifer forest, but do not include State, private, Naval Observatory, or certain wildland-urban interface areas (11,650 acres). A total of 266,275 acres of MSO habitat occurs within the CHUs in the Rim Country project area. Approximately 410,000 acres do not have PCEs for MSO Critical habitat so are not analyzed for effects.

Alternative 2 and 3 treat different amounts of this habitat (see analysis below). Fire modeling in MSO Critical Habitat used the complete acres, regardless of ownership/management, on 686,287 acres.

Figure 02. Mexican Spotted Owl Critical Habit Units

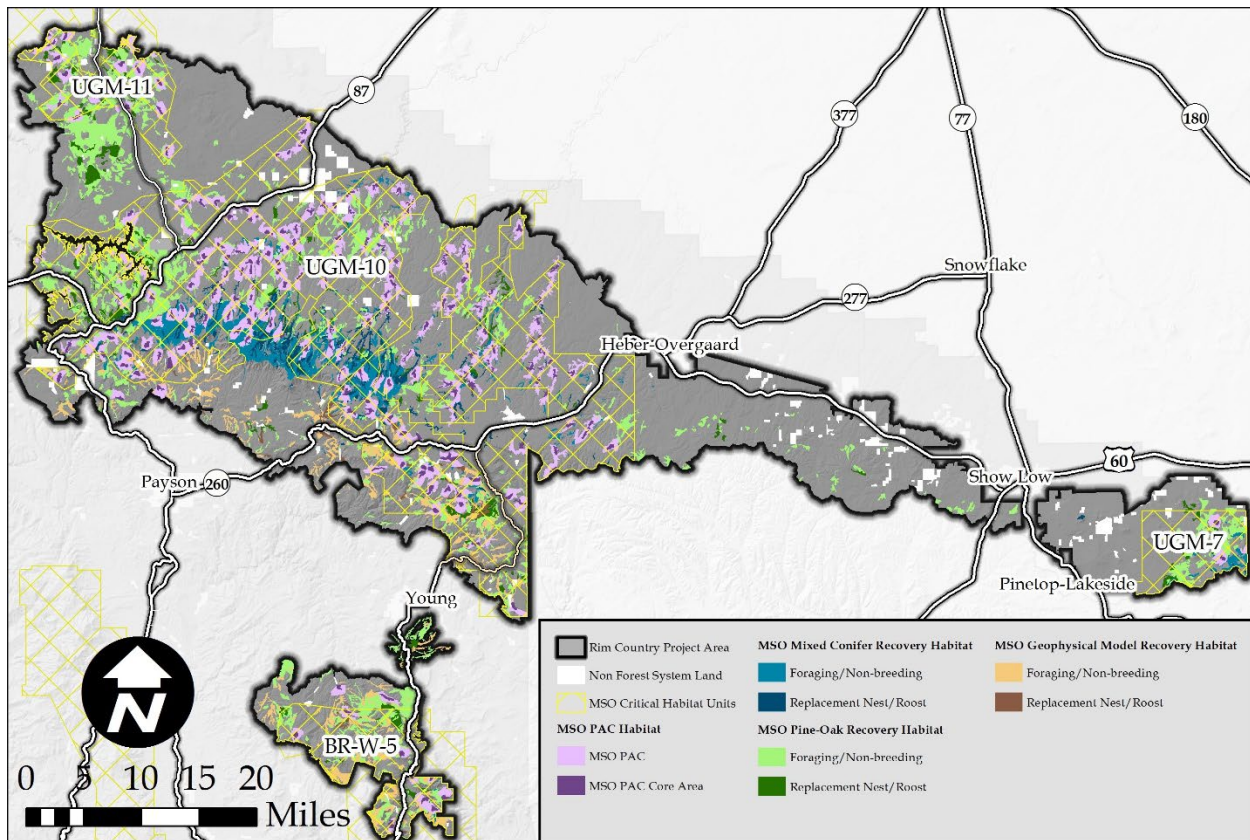


Table 04. MSO Protected and Recovery Habitat within Critical habitat within the Rim Country project area

	BR-W-5	UGM-10	UGM-11	UGM-7	Grand Total
MSO PAC	4,853	96,160	9,007	1,578	111,599
MSO Recovery Habitat	20,340	109,381	14,711	10,243	154,676
<i>MSO Recovery Replacement Nest/Roost</i>	2,150	20,640	2,464	951	26,205
<i>MSO Recovery Foraging/Non-Breeding</i>	18,191	88,741	12,247	9,293	128,470
Non-MSO Habitat	29,781	333,132	21,658	23,788	408,359
Grand Total	54,974	538,673	45,376	35,610	674,634

In Rim Country all of UGM-10, small portions of UGM-7 and UGM-11 are in the project boundary. In Basin and Range West, all of BRW-5 is in the project area.

In the Upper Gila Mountains Ecological Management Unit (UGM EMU) Federal lands encompass 67% of the UGM EMU. The revised MSO recovery plan states that of the 688 known owl sites in this EMU, 684 are designated on FS-administered land. One hundred ninety-three (193) PACS (93% of the PACs in the project area) occur within the project area in this EMU.

In the Basin and Range West EMU Federal lands encompass 40% of the BRW EMU. Of the 174 owl sites in this EMU, most occur on FS administered lands (89%) with the majority of these sites on the Coronado NF within wilderness which is outside of the Rim Country planning area.

Fourteen (14) PACS (07% of the PACs in the project area) occur within the project area in this EMU.

As with the Analyses above for Protected and Recovery habitats for the MSO, the following evaluation criteria were used to compare environmental consequences for alternatives in critical habitat:

- Impacts to PCEs related to forest structure
1. Changes in BA by tree size-classes to show uneven aged management by alternative within MSO Habitats.
 2. Percent Canopy cover in MSO habitats.
 - Impacts to PCEs related to dead standing trees (snags)
 1. Change in numbers per acre of snags, with a diameter of 12-18 inches (Average of Snags 12-18 "DBH) and
 2. greater than 18" by alternative in MSO Habitats (Average of Snags greater than 18" DBH).
 - Impacts to PCEs related to maintenance of adequate prey species (Course Woody Debris and Understory (to maintain fruits, seeds, and regeneration to provide needs of MSO prey species in MSO Habitats).
 1. Coarse woody debris (CWD) surface fuel 3" or greater in tons per acre in MSO habitats.
 2. Changes in tons per acre shrub biomass and,
 3. Changes in tons per acre herbaceous biomass.

To analyze the effects of fire by Alternatives MSO Habitats the following variables were modeled and reviewed:

1. Changes in tons per acre by alternative of total surface fuel.
2. Changes in potential fire behavior (Fire Hazard Index) by alternative in MSO habitats.
 3. Changes in risk of crown fire by alternative and MSO habitats

Critical habitat includes a subset of both protected and recovery habitat, as defined in the Recovery Plan. Designated Critical habitat in the project area consists of 106,108 acres of protected habitat (PACs) and 160,041 acres of Recovery habitat (table 4-25).

Recommendations from the plan are to treat up to 20 percent of any non-core area acres in any EMU mechanically over ten years. Collectively, in subunits (UGM 7, 10, 11, and collectively in BR-W-5) mechanical thinning will not exceed 20 percent of non-core areas in any one EMU over 10 years. Primary Constituent Elements (PCEs) of MSO habitat and prey base were incorporated into the analyses, allowing for an effects determination to the MSO Critical Habitat in the Rim Country project area.

Western Yellow-billed Cuckoo (WYBCU)

Listing Status

The western distinct population segment of the yellow-billed cuckoo was listed as a threatened species under the ESA on October 3, 2014 (USFWS 2013, 2014b; 78 FR 61622, 79 FR 59992). Within the population segment (see Figure 1 at 79 FR 59994, in the final listing rule (79 FR 59992; 2014b)), the habitat areas used by the species for nesting are located from southern British Columbia, Canada, to southern Sinaloa, Mexico, and may occur from sea level to 7,000 feet (ft.) (2,154 meters (m)) in elevation (or slightly higher in western Colorado, Utah, and Wyoming). Critical habitat for the yellow-billed cuckoo population segment was proposed on August 15, encompassing 546,335 acres across the western United States (USFWS 2014a; 79 FR 48548). The discussions of the status of this species in these documents are incorporated herein by reference. A revised proposed rule was completed in April of 2021. (USDI FWS 2021).

Range and Life History

In Arizona, the species was a common resident in the (chiefly lower) Sonoran zones of southern, central, and western Arizona (Phillips et al. 1964). The yellow-billed cuckoo now nests primarily in the central and southern parts of the state, as well as at revegetation sites along the lower Colorado River (MacFarland and Horst 2015; USFWS 2013, 2014a, 2014b, McNeil et al. 2013). In the Southwest, the Western yellow-billed cuckoo (WYBC) usually occurs in association with large blocks of mature riparian cottonwood-willow woodlands and dense mesquite associations (USFS 2021). Habitat features of the WYBC indicate a preference for areas with a closed canopy and a sub-canopy layer (USFS 2021). Dense understory foliage appears to be an important factor in nest site selection, while cottonwood trees are an important foraging habitat in areas where the species has been studied in California (USFS 2021). Nesting west of the Continental Divide occurs almost exclusively close to water (USFWS 2013).

Species Distribution in the Project Area

The western distinct population of the yellow-billed cuckoo is not known to occur in the project area. No critical habitat areas have been identified within the Rim Country project area for the cuckoo, though critical habitat units are seven miles east and south of the project area.

There have been no systematic surveys for the WYBCU on the ASNFs; however, there are some incidental known occurrences, all of them on the Apache side. The cottonwood-willow riparian forest cover type occurrence on the Sitgreaves side of the ASNFs is not likely to provide habitat extensive enough for nesting. On the Tonto NF, in previous years there have been detections of cuckoos in Rye Creek on the Payson-Tonto Basin border near Rye and Gisela creeks. For example there were several detections including protocol level surveys along Lower Tonto Creek (2017, 2018) and it is feasible that birds may move up to the Gisela area as some suitable habitat occurs there and the species has breeding pairs lower down on the creek (Tony Bush, personal communication, 11/28/2018). Cuckoos have also been found along the Verde River and Cherry Creek (Tonto Basin portion). It is possible that cuckoos could be present in some of the drainages in the Rim Country footprint. While many of these riparian reaches are narrow, it is possible that birds are using these areas. Narrow drainages with linear or scattered reaches of riparian trees can be cuckoo habitat. Intermittent and ephemeral reaches with water for at least part of the summer may also be cuckoo habitat (Susan Sferra USFWS, Personal Communication, 2018). In the project area it is estimated that there is approximately 14,500 acres of available habitat.

Critical Habitat and Primary Constituent Elements in the Project Area

The Rim Country Project area does not contain critical habitat for Yellow-billed Cuckoos.

Mexican Wolf

Listing Status

The Mexican wolf, *Canis lupus baileyi*, is an endangered subspecies of gray wolf protected by the Endangered Species Act (80 FR 2488, January 16, 2015) (ESA). On January 12, 1998, the U.S. Fish and Wildlife Service published an Endangered Species Act section 10(j) rule for the Mexican wolf that provided for the designation of specific populations of listed species in the United States as “experimental populations”. The Mexican wolf has been reintroduced on national forests in Arizona and New Mexico. These wolves have been designated as a non-essential experimental population, pursuant to section 10(j) of the Endangered Species Act as amended.

Wording from the USFWS 2014 EIS for the proposed revision to the Regulations for the Non essential experimental population of the Mexican Wolf.

Disturbance-causing land-use activity means any activity on Federal lands within a 1-mi (1.6-km) radius around release pens when Mexican wolves are in them, around active dens between April 1 and July 31, and around active Mexican wolf rendezvous sites between June 1 and September 30, that the Service determines could adversely affect reproductive success, natural behavior, or persistence of Mexican wolves. Such activities may include, but are not limited to— timber or wood harvesting, prescribed fire, mining or mine development, camping outside designated campgrounds, livestock husbandry activities (e.g. livestock drives, roundups, branding, vaccinating, etc.), off-road vehicle use, hunting, and any other use or activity with the potential to disturb wolves. The following activities are specifically excluded from this definition:

- (i) Lawfully present livestock and use of water sources by livestock;
- (ii) Livestock drives if no reasonable alternative route or timing exists;
- (iii) Vehicle access over established roads to non-Federal land where legally permitted activities are ongoing if no reasonable alternative route exists;
- (iv) Use of lands within the National Park or National Wildlife Refuge Systems as safety buffer zones for military activities and Department of Homeland Security border security activities;
- (v) Fire-fighting activities associated with wildfires; and
- (vi) Any authorized, specific land use that was active and ongoing at the time Mexican wolves chose to locate a den or rendezvous site nearby.

Thinning and burning projects have the potential to affect wolves, especially when reproduction and denning activities are disrupted. The Forest Service will work closely with the wolf field team to identify sensitive areas and avoid temporal disruptions that could negatively affect Mexican wolves.

Range and Life History

The Mexican wolf is a top predator native to the southwestern United States and Mexico that lives in packs and requires large amounts of forested terrain with adequate ungulate (deer and elk) populations to support the pack. Predator eradication programs in the mid to late 1800's to mid-1900's resulted in the near extinction of the Mexican wolf. Extinction was averted with the inception of a captive breeding program founded with seven Mexican wolves.

In the United States, Mexican wolves were reintroduced to the wild in 1998 in the Mexican Wolf Experimental Population Area, an area designated for Mexican wolf reintroduction in Arizona and New Mexico. The Mexican wolf population in this population area has exhibited robust growth in recent years. As of December 31, 2016, a population of at least 113 wild Mexican wolves inhabited the population area, the largest population size reached to date (USFWS 2017).

The threats to the Mexican wolf have generally remained consistent over time, including human-caused mortality and related legal protections, extinction risk due to small population size, and loss of genetic diversity (USFWS 2017).

Species Distribution in the Project Area

Figure 3 shows areas of potential wolf habitat and includes parts of the Rim Country planning area classified as high quality. The closest pack and denning is the Cerro Trigo Pack, which mainly occupies the Springerville Ranger District and occasionally crosses into the Lakeside Ranger District near the Rim Country project area in 2019 and 2020. Radio-collared wolves on the Black Mesa District of the Apache-Sitgreaves NF have recently been located within the Rim Country boundary (USFS 2017), before returning to the east. In 2018, another lone male passed through Rim Country from the Gila Wilderness in NM to the Kaibab NF west of Flagstaff. Also in 2018, uncollared wolves were confirmed in the Heber/Overgaard area. Given wolves' capacity for long-distance dispersals (Mech et al 1995), we could reasonably predict that more individuals could occur within the Rim Country project area during the planning and implementation of the project. Coordination between the Forest Service and the Inter-Agency Field Team (IFT) will occur before phases of implementation to verify wolf occurrences in projects area.

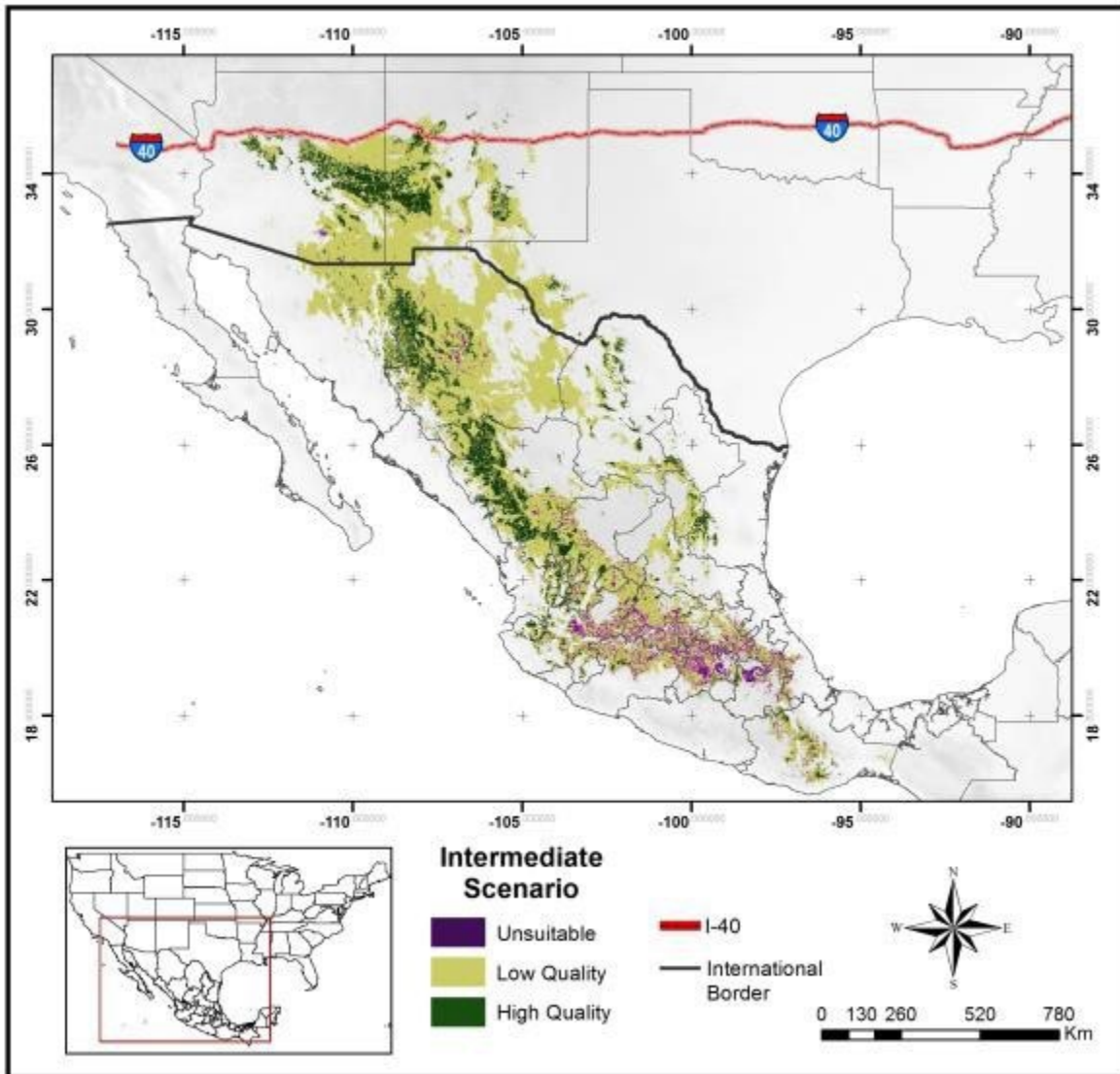


Figure 03. Focal area for Mexican wolf recovery strategy, including the MWEPA in the United States, and the Sierra Madre Occidental in Mexico

Forest Service Sensitive Species

Sensitive species are defined as “those plant and animal species identified by a Regional Forester for which population viability is a concern, as evidenced by: (a) significant current or predicted downward trends in population numbers or density, or (b) significant current or predicted downward trends in habitat capability that would reduce a species’ existing distribution (FSM 2670.5(19)).” It is the policy of the Forest Service regarding sensitive species to: (1) assist states in achieving their goals for conservation of endemic species; (2) as part of the National Environmental Policy Act process, review programs and activities, through a biological evaluation, to determine their potential effect on sensitive species; (3) avoid or minimize effects on species whose viability has been identified as a concern; (4) if effects cannot be avoided, analyze the significance of potential adverse effects on the population or its habitat within the area of concern and on the species as a whole (the line officer, with project approval authority,

makes the decision to allow or disallow effects, but the decision must not result in loss of species viability or create significant trends toward Federal listing); and (5) establish management objectives in cooperation with the state when projects on National Forest System lands may have a significant effect on sensitive species population numbers or distributions. Establish objectives for Federal candidate species, in cooperation with the FWS and state of Arizona (FSM 2670.32).

The most recent Regional Forester's Sensitive Species list was transmitted to Forest Supervisor's in September 2013 and is the basis for the species used for this analysis. If survey information was not available, the assumption was made that potential habitat was occupied. The presence of species carried forward for analysis was determined by consulting forest records, results of surveys conducted on the forest, and use of the FAAWN database (Patton 2011) and NRM.

Thirteen RFSS occur within the project area. Descriptions of these species and further information can be found in the Wildlife Specialist Report. The Northern Goshawk and analysis for this species is included below because key issues were raised by the public regarding treatment in goshawk habitat.

Northern Goshawk (NOGO)

This analysis addresses policy requirements and responds to key issues raised by the public including Issue 2, Treatments in Goshawk Habitat and Issue 3, Large Tree Retention. Indicators include changes in the amount and/or quality of goshawk nesting and post-fledging family area (PFA) habitat. Specific measures include:

1. Acres treated by habitat/vegetation type by alternative in PFAs and areas outside of PFAs.
2. Changes in tree size-classes by alternative in PFAs and areas outside of PFAs.
3. Percent canopy cover by alternative in PFAs and areas outside of PFAs.
4. Number per acre of snags logs, and tons per acre coarse woody debris in PFAs and areas outside of PFAs.
5. Changes in percent shrub and herbaceous biomass (to maintain fruits, seeds, and regeneration to provide needs of goshawk prey species) in PFAs and areas outside of PFAs.
6. Changes in potential fire behavior (Fire Hazard Index) by alternative in PFAs.
7. Changes in risk of crown fire by alternative in PFAs.

This report utilizes and incorporates by reference the vegetation cover type and vegetation existing condition information provided in the Silviculture Report and the respective forestwide MIS reports.

Land Management Plan Compliance and Analysis Framework

Land Management Plan direction for northern goshawks applies to goshawk habitat outside of Mexican spotted owl habitat. In ponderosa pine forest, one or the other set of guidance applies and Mexican spotted owl guidance takes precedence in areas of overlap.

Habitat Strata and Scales of Analysis

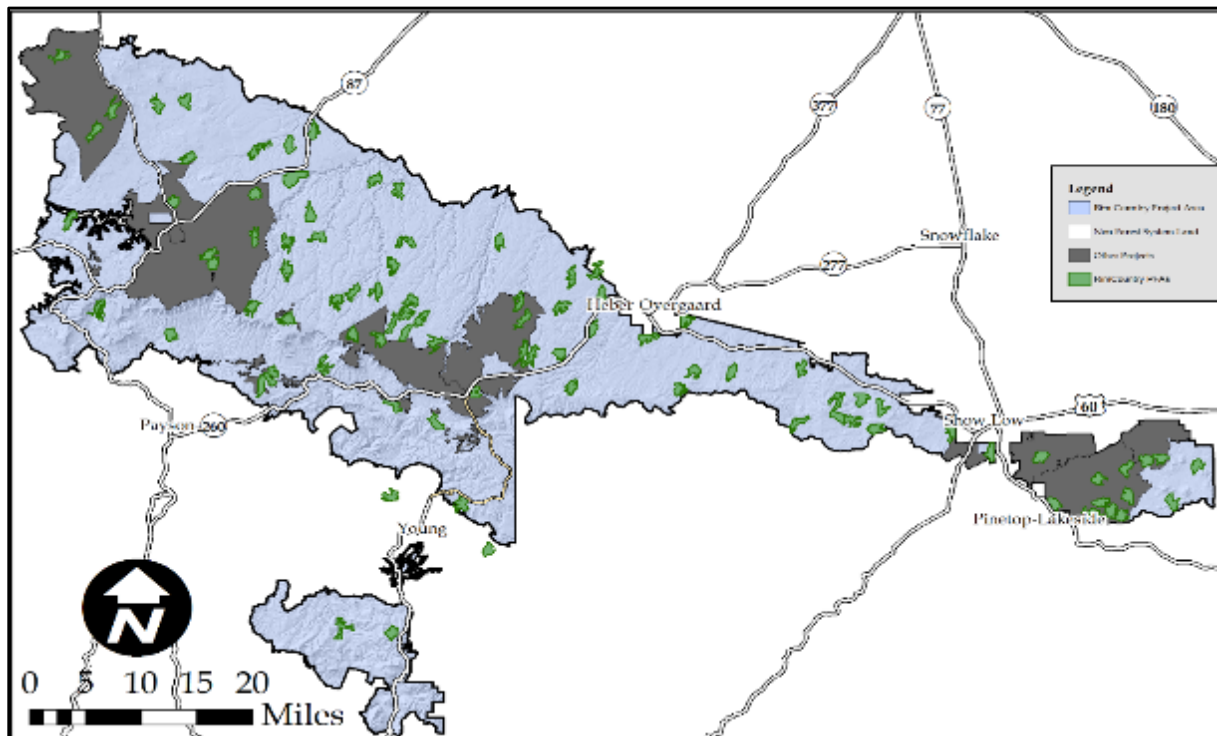
PFAs are about 600 acres in size (including the nest areas, replacement nest areas, and habitat most likely to be used by fledglings during early development). PFAs were considered occupied.

The Coconino Revised Land Management Plan (2018), Tonto Land Management Plan (1985), and A-S Revised Land Management Plan (2015) have direction to include a minimum of six nest areas and replacement nest areas within each PFA. Nest areas would be about 25 to 30 acres in size (minimally 30 acres (Coconino NF)), and based on active nest sites followed by the most recently used historical nest sites.

Goshawks and Rim Country

There are 106 PFAs on the Coconino, Tonto, and A-S National Forests, totaling 55,608 acres in the Rim Country project area. Of these acres, 22,320 are within other project areas ((see figure below) Approximately 35,549 acres of PFA habitat would be treated with mechanical thinning and/or prescribed fire in the proposed action. A PFA was only counted once if a portion of that PFA occurs on more than one forest. The figure below shows the distribution of goshawk PFAs in the Rim Country project area. The Rim Country Flexible Toolbox Approach for Mechanical Treatments identifies PFAs as areas where special prescriptions will promote habitat variables needed by this species.

Figure 04. Goshawk PFAs



Lowland Leopard Frog

Species Distribution in the Rim Country project area

Lowland leopard frogs are located 10 miles south of the project area boundary on the Tonto NF in House Spring adjacent to the Fort Apache Indian Reservation (Akins Personal Communication, 2018). Elevational range of the species is 1,810 meters. There are not numerous suitable habitat locations below the Mogollon rim in 4FRI footprint. Historic records for lowland leopard frogs are from Spring Creek, Verde River, Josephine Tunnel (private land), Oak Creek including the canyon, and Fossil Creek. Unsurveyed but suitable locations below the rim are

numerous and include perennial streams (Red Tank Draw), various springs (Russell, Holly), and numerous earthen livestock tanks below the rim.

Northern Leopard Frog (NLF)

Species Distribution in the Rim Country project area

Historically, the northern leopard frog was well-distributed across northern and central Arizona, including wetlands in wooded areas and meadows above and below the Mogollon Rim, as well as in more open and arid country on the Colorado Plateau. Northern leopard frogs have declined, often dramatically, across the western United States and southwestern Canadian Provinces. Arizona is no exception. On the Apache-Sitgreaves NF, historic sightings show observations from the 1990s in various stock tanks five to 10 miles south of Heber. In 2004 a NLF was observed in Black Canyon. This was the last NLF observed on the Black Mesa Ranger District of the A-S NF. Northern leopard frogs were reintroduced by AZGFD to Turkey Creek on Black Mesa September 2018.

The last known stronghold of the species in Arizona is a complex of cattle tanks (33 occupied by NLF in 2017 in the project area) and a lake below the Mogollon Rim Ranger District of the Coconino National Forest, approximately 5 miles north of the project area (see Wildlife Specialist Report).

These occupied sites are within or near the northwest corner of the Rim Country project area. Few other populations exist. In 2006, it was reestablished to four refugia sites in the House Rock Valley. In the White Mountains on and near the Apache-Sitgreaves National Forest, a refugia population was established at the AZGFD office in Pinetop. Reintroduction efforts are underway using frogs from Lyman Lake, a site where frogs were thought to be extirpated but were observed with a subset captured and placed in the refugia in 2014. This population disappeared from the refugia in 2018. The AZGFD released NLFs to Turkey Creek on the A-S in 2018. Historic sites lack any shoreline cover, are gone, or have unacceptable water quality. Other sites being considered include the Double Cabin area and near Wiggins Crossing. Other sites are also being considered and no final decision has been made. Northern leopard frogs were reintroduced by AZGFD to Turkey Creek on the Black Mesa Ranger District in September 2018. The biggest challenges are water availability and horse effects. Some tanks that used to be suitable for frogs may have been impacted by horses but there are other sites in the horse territory that have not been impacted and are still suitable. In 2018 frogs were translocated from the House Rock Wildlife Area north of the Colorado River and east of the Kaibab Plateau. AZGFD also translocated frogs to the Pinetop Wetlands in hopes they will breed during the spring of 2019 (Groebner, personal communication, 12/13/2018).

Bald Eagle

The FWS removed the bald eagle in the lower 48 States of the United States from the Federal List of Endangered and Threatened Wildlife as of August 8, 2007 (USDI FWS 2007). Eagles are currently protected under the Golden and Bald Eagle Protection Act and are a Forest Service sensitive species.

The FWS recommends using the Conservation Assessment and Strategy for Bald Eagles in Arizona (Driscoll et al. 2006) in conjunction with the Bald Eagle National Management Guidelines (USDI FWS 2007) to protect bald eagles in Arizona. These guidelines were incorporated into the Rim Country as design features or mitigation.

Bald eagles in central Arizona prefer to nest on cliff ledges or pinnacles or in tall trees (USDI FWS 1982). Bald eagles are habitat generalists and opportunistic feeders, typically taking the easiest and most abundant prey, regardless of whether it is dead or alive (Joshi 2009). They mainly forage on waterfowl and fish found along major streams; however, they do hunt in the uplands and forage on various mammal species, especially in the winter.

Nesting

Bald eagle numbers in Arizona have increased since 2008, with the number of breeding areas recorded increasing from 56 in 2008 to 92 in 2021. Active breeding areas increased from 44 in 2008 to 62 in 2021. The number of young fledged has increased from 53 in 2008 to 55 in 2020. Nesting success is partially attributed to the AZGFD Bald Eagle Nest Watch Program and to Forest Service closures around nest sites (Show Low Lake and Chevelon Canyon on the Apache-Sitgreaves NF).

There are seven nesting pairs of bald eagles within or near the project area.

Table 05. Bald eagle nests in the Project Area

Breeding Area	Location. Forest, Ranger District	Status in 2019. Recent Nesting History
Fool Hollow Lake	A-S, Lakeside	Nest failed in 2017. Successful nest in 2018, 1 fledged. Nest failed in 2019. Nest in 2021, 1 young in nest, April 7, 2021.
Chevelon Canyon Lake	A-S, Black Mesa	Successful Nest in 2016, 2 Fledged. Nest fell in 2017. Nest failed in 2018. Nest failed in 2019.
76	Tonto, Tonto Basin RD	Active. Successful Nest in 2016, 2 Fledged. Nest successful in 2017, 2 fledged. Successful nest in 2018, 1 fledged. Nest successful in 2019, 1 fledged. Nest in 2021, 1 young in nest, April 7, 2021.
Silver Creek	Private, Adjacent to Tonto NF, Payson	Active. 2 Fledged in 2015. Nest successful in 2017, 1 fledged. Nest successful in 2018, 2 fledged. Nest successful in 2019, 1 fledged. Nest in 2021, 1 egg in nest.
Show Low Lake	A-S, Lakeside	Nest successful in 2017, 2 fledged. Nest successful in 2018, 1 fledged. Active. Nest failed in 2019. Nest in 2021, 1 young in nest, April 7, 2021
Woods Canyon	A-S, Black Mesa	Active. 1 Fledged in 2016 and 1 fostered from Show Low Lake. Fledged 1 in 2018. Nest successful in 2019, fledged 1. Nest in 2021, 1 egg in nest.
O.W. / Canyon Creek	Tonto, Pleasant Valley	First nest attempt in 2018, nest

Breeding Area	Location. Forest, Ranger District	Status in 2019. Recent Nesting History
		failed. Nest failed in 2019. Occupied in 2021.

Wintering

Bald eagles occurring on the Coconino and Apache-Sitgreaves NFs are primarily winter visitors. Bald eagles overwintering in northern Arizona are primarily migratory individuals that breed in the northern U.S. and Canada (Grubb et al. 1989). There is a wintering population of eagles at the Buckhead Mesa Landfill which is leased by the Tonto NF. They are often seen scavenging on carrion, including large and small mammals, or around some of the waters supporting fish and waterfowl. The AZGFD provided important wintering bald eagle habitat areas to consider for the Rim Country analysis. These included the Lakeside Ranger District of the A-S's various lakes: Mogollon Plateau: Lower Lake Mary Road; Rattlesnake Canyon: Lake Mountain, Verde River Valley, Wingfield Mesa, Mogollon Plateau, Jack's Canyon; Mogollon Plateau: Slim Jim Ridge; Mogollon Rim: West Chevelon Canyon; Chevelon Canyon Lake; Mogollon Rim: Cottonwood Wash; Sierra Anchas: Dupont Canyon; Willow Springs Lake; and the Buckhead Mesa Landfill. Small to moderate-sized groups of bald eagles (typically two to 48) roost in clumps of large trees in protected locations such as drainages and hillsides (Grubb and Kennedy 1982, Dargan 1991, Grubb 2003). Bald eagle winter night roosts typically consist of clumps of large (average d.b.h. of 30 inches) trees on steep slopes that tend to occur on east-facing aspects (Joshi 2009). Group sites are typically in stands of ponderosa pine trees of less than an acre up to 43 acres, most often on north or northeast-facing slopes close to daytime foraging areas (Dargan 1991). Day roosts are often trees or snags near water or roadways. Bald eagles are highly mobile in the winter and can fly great distances in search of aquatic or terrestrial prey and suitable nighttime roosting habitat.

Golden Eagle

There is a golden breeding site observed in 2016, 0.3 miles from the project area in the Hells Gate Wilderness on Pleasant Valley Ranger District of the Tonto NF. Golden Eagle nesting within the Rim Country project area has also been recorded on the eastern boundary on the Verde River, outside of the project area on Deadman's Mesa and approximately 2 miles north of the project area on the Tonto NF, Pleasant Valley Ranger District. South of the project area in the Sierra Anchas, 7 Golden Eagle historic and active nest sites are within 1-3 miles of the project area. Approximately three miles north of Rim Country on the A-S NF, Black Mesa District there is an active nest site (2015) North of Heber, AZ. in Black Canyon and another NE of Chevelon Crossing. There is a historic nest site from the late 1990s on the Lakeside Ranger District.

American Peregrine Falcon

There are 25 confirmed nesting pairs of peregrine falcons within the project area. Known nest locations, tall cliffs, open waters, and meadows provide potential habitat within the project area. Land Management Plan guidelines prohibit activities that can potentially disturb peregrine falcons in the vicinity of occupied nesting habitat between March 1 and August 15.

Western Burrowing Owl

Burrowing owls are found in flat, open, low-stature grasslands, sparsely vegetated desert shrub, and edges of human disturbed land. These owls take over burrows of prairie dogs and ground squirrels, and dens of coyote, fox and badger. They are also known to use artificial burrows. These owls also need perches, such as mounds and fence posts. They primarily eat insects and small mammals, but are known to take other small-sized species. Breeding Bird Atlas surveys confirmed nesting from approximately 100 feet elevation near Gladsden to 6,600 feet elevation in a prairie dog colony near Flagstaff however burrowing owls have not been confirmed within the project area. Similar to prairie dogs, burrowing owls are associated with the Great Basin/Colorado Plateau grassland and steppe, montane subalpine, and semi-desert grasslands. There are 31,293 acres of grassland habitat within the project area that provide potential habitat for prairie dogs and consequently, burrowing owls. There is no specific Land Management Plan direction for burrowing owls or prairie dogs; however, guidelines for mountain grassland are to evaluate the need to maintain and improve meadows by eliminating competing conifers, stabilizing gullies to restore waters tables, and reseeded with desirable species.

Sulphur-bellied Flycatcher

These flycatchers primarily nest (in snags) in the sky islands of SE AZ, but have been found as far west as the Baboquivari Mountains and locally north to the Sierra Anchas. E-Bird shows one record from Pine Creek, which is adjacent to the project area. There is a 1997 breeding record from as far north as Oak Creek Canyon near West Fork. They typically nest from 4,500 to 6,000 feet in elevation (Corman and Wise-Gervais 2005).

Navajo Mogollon Vole

Hoffmeister (1986) delineated the range for this vole from the Navajo Mountain southward to the western part of the Mogollon Plateau, extending from near Mormon Lake westward toward the town of Williams and up to the Tusayan Ranger District. They live in a variety of habitats from 3,800 to 9,700 feet in elevation, including ponderosa pine forest and montane subalpine grasslands. Whether or not Navajo Mogollon voles are found in forests, shrublands, or grasslands, they are associated with grassy vegetation (Hoffmeister 1971). They select drier habitats than long-tailed voles, which typically occupy moister habitats (Hoffmeister 1971). They occur within open forests and in larger grassland areas such as Garland and Government Prairies on the Williams Ranger District (Ganey and Chambers 2011). They typically nest underground with runways leading from the burrow entrance out to their foraging areas. They preferentially forage on cool season or C-3 photosynthesis grasses (Chambers and Doucett 2008, Ganey and Chambers 2011). Other grasses can also provide food and voles rely on other herbaceous species for cover. In a study evaluating understory vegetative cover, clumpy tree distribution, decreased pine basal area and snags greater than 16 inches in diameter were identified as strong drivers for Mogollon vole occupancy (Kalies et al. 2010). There are over 689,503 acres of ponderosa pine and 31,293 acres of grassland within the project area.

Western Red Bat

The western red bat is thought to be a summer resident of northern Arizona. It primarily occurs along riparian corridors among oaks, sycamores, and cottonwoods at low elevations, but may occur up to 7,200 feet where it roosts in dense clumps of foliage. In the Grand Canyon, Hoffmeister (1971) reports they were only known from the bottom of the canyon near Phantom Ranch and along Bright Angel Creek. Summer habitat associations include coniferous forest

(Western Bat Working Group 2005a). Although generally solitary, western red bats forage in close association with one another in summer and may migrate in groups. They typically feed along forest edges or in small openings. Large lepidopterans are considered main prey items, but homopterans, coleopterans, hymenopterans, and dipterans have also been reported in their diets (Western Bat Working Group 2005a). On rare occasion, red bats have been documented near Kachina Village, upper West Clear Creek Wilderness, and Page Springs Fish Hatchery. The latter two locations are outside of the project area. One bat was radio-tracked near Kachina Village within the project area and roosted in a clump of Gambel oak in dry ponderosa pine forest (Chambers personal comm. 2010). They roost primarily in the foliage of trees or shrubs but occasionally use caves. Given they are an uncommon summer resident on the Coconino NF, they could conceivably be a rare visitor on the Apache-Sitgreaves and Tonto NF as well. Recent (2018) NaBAT data has confirmed red bat recordings on the Tonto inside the project area.

Land Management Plan guidelines state rare and unique features (e.g., talus slopes, cliffs, canyon slopes, caves, fens, bogs, sinkholes) should be protected from damage or loss in order to retain their distinctive ecological functions and maintain viability of associated species.

Both caves and abandoned mines are available for roosting bats, reducing the potential for displacement, abandonment of young, and possible mortality. 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). Potential foraging habitat within the project area includes 689,503 acres of ponderosa pine and 31,923 acres of grassland. Roosting habitat may occur along the 777 miles of riparian habitat.

Allen's Lappet-browed Bat

Allen's lappet-browed bat is known to occur in a wide variety of habitats in the southwestern U.S. and Mexico. They are known to occur within the Rim Country area (Patton 2014). In Arizona, Allen's lappet-browed bats have been found in ponderosa pine, pinyon-juniper, Mexican woodland, white-fir forests, and Mohave Desert scrub. They are often associated with water. Hoffmeister (1986) documents Allen's lappet-browed bats occupying mine shafts or rocky areas and cliffs for roosts. A study conducted within the project area documented lappet-browed bats using snags for maternity roosts. It appears that males segregate during the maternity season and use cliff habitat, while females typically select taller snags with sloughing bark closer to forest roads for raising their pups (Solvesky and Chambers 2009). While snags are not a long-lasting form of forest structure, snags with sloughing bark are even more ephemeral. Female roosts were all within ponderosa pine forest. Allen's lappet-browed bats feed on flying insects, often over open waterbodies (including stock tanks) and wetlands where flying insects are abundant. However, foraging habitat can be diverse and includes ponderosa pine forest, forest openings, wet soils, and diverse herbaceous ground cover. They occur across the ponderosa pine belt on the Tonto, Coconino and Apache-Sitgreaves NFs and have been documented in the project area. Potential habitat within the project area is 689,503 acres of ponderosa pine and 114,753 acres of pinyon-juniper.

Pale Townsend's Big-eared Bat

Townsend's big-eared bat occurs across a broad range in western North America. A 2007 bat roost inventory and monitoring project documented Townsend's big-eared bats on both the Apache-Sitgreaves and Coconino NFs (Solvesky and Chambers 2007). The Tonto NF has records from the 1990s but they are outside the project area, and 2018 recordings from NaBAT

near the project area. Pale Townsends are known to occur near and likely within the project area. They use a wide range of habitats, including ponderosa pine forest. Townsend's big-eared bats typically roost in rock structures (e.g., caves, mines, and lava tubes), and abandoned buildings, but will also use hollow trees. Pale Townsend's big-eared bats are apparently secure, although loss of cave and mine habitat may be causing a decline in numbers and there is concern over loss of genetic variability within populations (Western Bat Working Group 2005b). Townsend's big-eared bats are sensitive to disturbance and roost sites have been abandoned because of human recreation. They feed on flying insects and often forage over waterbodies and wetlands where flying insects are abundant. The species is a moth specialist with over 90 percent of their diet composed of lepidopterans. They travel long distances while foraging and use edge habitat adjacent to or within forest habitat (Western Bat Working Group 2005b). Habitat features potentially benefiting prey species include pools, stock tanks, wet ground, herbaceous ground cover, and edge habitat. Potential habitat includes 689,503 acres of ponderosa pine and 31,293 acres of grassland within the project area.

Spotted Bat

Historic records suggest that the spotted bats are widely distributed, rare across their range, but can be locally abundant. The historic range of the spotted bat includes Mexico and the Southwest and north up to Canada. In Arizona, spotted bats commonly roost singly in crevices in rocky cliffs and they have also been found in caves (Chambers, pers. comm. 2009). Cliff habitat and surface water are characteristic of localities where they occur. Spotted bats are lepidopteran specialists and will forage in upland meadows. Meadows, openings, and open forests with diverse herbaceous ground cover provide habitat for prey species. There are 689,503 acres of ponderosa pine and 31,293 acres of grassland within the project area.

Forest Service Management Indicator Species

The Tonto National Forest is the only Forest with MIS. The Apache-Sitgreaves and the Coconino National Forests revised their plans and established focal species that are analyzed when plan revisions occur and not on specific projects. The proposed project would affect ponderosa pine, mixed conifer, aspen, pinyon-juniper, grassland/savannah, ephemeral streams, and spring habitats. MIS or their respective habitat components that do not occur within the proposed Rim Country project area will not be analyzed in this report. The presence of species carried forward for analysis was determined by surveys conducted on the forests and the FAAWN (Forest Attributes and Wildlife Needs) database (Patton 2011).

Sixteen MIS whose distribution across the Tonto NF encompasses part of the project area are included in the terrestrial effects analysis. The analysis is also based on Land Management Plan direction and projected changes in quality habitat under the alternatives.

Table 06. Terrestrial Management Indicator Species (MIS) or Focal Species Analyzed

Management Indicator Species	Forest(s)	Key MIS Habitat Component Indicator	Habitat within Project Area
Northern goshawk (<i>Accipiter gentilis</i>)	Tonto	Late-seral ponderosa pine	Ponderosa pine
Pygmy nuthatch (<i>Sitta pygmaea</i>)	Tonto	Late-seral ponderosa pine	Ponderosa pine
Turkey (<i>Meleagris gallopavo merriami</i>)	Tonto	Late-seral ponderosa pine, mixed conifer	Ponderosa pine

Management Indicator Species	Forest(s)	Key MIS Habitat Component Indicator	Habitat within Project Area
Rocky Mountain elk (Cervus elaphus)	Tonto	Early seral ponderosa pine, mixed conifer, and spruce-fir	Ponderosa pine, mixed conifer
Hairy woodpecker (Picoides villosus)	Tonto	Snags in ponderosa pine, mixed conifer and spruce-fir	Snags in ponderosa pine
Abert's squirrel (Sciurus aberti)	Tonto	Early seral ponderosa pine	Ponderosa pine
Violet green swallow (Tachycineta thalassina)	Tonto	Ponderosa pine; mixed conifer cavities	Ponderosa pine; Mixed conifer
Ash-throated flycatcher (Myiarchus cinerascens)	Tonto	Pinyon-juniper woodland	Pinyon-juniper
Gray vireo (Vireo vicinior)	Tonto	Pinyon-juniper woodland	Pinyon-juniper
Townsend's solitaire (Myadestes townsendi)	Tonto	Pinyon-juniper woodland	Pinyon-juniper
Juniper (Plain) titmouse (Baeolophus ridgwayi)	Tonto	Pinyon-juniper woodland	Pinyon-juniper
Northern (Common) Flicker (Colaptes auratus)	Tonto	Pinyon-Juniper woodland (snags)	Pinyon-Juniper
Arizona gray squirrel (Sciurus arizonensis)	Tonto	Riparian-High Elevation (3000 ft. plus)	General Riparian
Western bluebird (Sialia mexicana)	Tonto	Forest openings in ponderosa pine/mixed conifer type	Ponderosa pine-oak, mixed conifer
Western wood peewee (Contopus sordidulus)	Tonto	Riparian-High Elevation	Riparian tall overstory
Black hawk (Buteogallus anthracinus)	Tonto	Riparian-High Elevation	Riparian tall overstory

Information on species, their population trends, and habitat trends presented in this report is incorporated into the wildlife specialist report. Analysis of MIS for the Tonto NF Forestwide MIS report (USDA FS 2005) is also incorporated by reference. For more in depth discussions of habitat types and species selection as well as forest wide population trends, see the Wildlife Specialist Report. (USDA FS 2005).

Table 7. Priority Bird Species Analyzed under the Migratory Bird Treaty Act.

APIF High Priority Species USFS and FWS Birds of Conservation Concern¹ by Habitat	Important Habitat Features and Life History Considerations
Ponderosa Pine Forest (includes Ponderosa pine- Gambel oak)	
Northern goshawk	See "Sensitive Species" section for effects on pine habitat and to the species.
Flammulated owl	Secondary cavity nester. Most closely associated with open ponderosa pine forest. Almost exclusively insectivorous.
Olive-sided flycatcher	Also found in mixed conifer. Multi-level, mature forest, fairly open canopy, prefers tree "groupiness" that creates forest edges and openings. Dead branches are used for perches while foraging. Often occur at edge of early post-burned areas for foraging and singing. Live mature pines for nesting. Snags are an important habitat feature.
Cordilleran flycatcher	Prefers moist and shaded forest for breeding habitat. Nest sites include rock crevices, hollows formed by scars in trunks, exposed tree roots, cavities in

APIF High Priority Species USFS and FWS Birds of Conservation Concern ¹ by Habitat	Important Habitat Features and Life History Considerations
	<p>small trees, and in forks of small branches. Most abundant in stands with greater than 50 percent canopy cover. Habitat strategy is to maintain dense canopy closure in mid- to late-successional stages of dense, shady forest with an understory of oak and sufficient dead and down trees for nesting.</p>
Grace's warbler	<p>Prefers ponderosa pine forest, sometimes with a scrub oak component. Considered a mature pine obligate. Feeds in the upper portions of robust pines on branches; nests found in trees from 20 to 60 feet (6 to 18 meters) above the ground. Prefers mature ponderosa pine savanna; open meadow; and uneven-aged ponderosa pine, including other tree species with an oak understory. Research notes pine forests that mimic naturally open parklands with stands of large, mature trees, will eventually benefit this species.</p>
Olive warbler	<p>Found primarily in open ponderosa pine forest, including those forests with a Gambel oak component. Distribution extends along the Mogollon Rim, but also occur in southeastern Arizona.</p>
Lewis's woodpecker	<p>Uses open pine savanna habitat. Breeding habitat includes open canopy, bushy understory offering ground cover, dead or down woody material, available perches and abundant insects. Logged or burned pine forests are also preferred habitat for breeding. Diet varies with seasonal abundance of food items, primarily selects free-living (non-wood boring) insects, acorns and other nuts, and fruit.</p>
Purple martin	<p>Open canopy; often prefers habitat near open water; nests in tree cavities excavated by woodpeckers Open mid-story cover and open understory cover. Prefers high snag density and tall snags adjacent to open areas.</p>
Cassin's finch	<p>Nesting preference is for open coniferous forests. Dry, relatively open mature ponderosa pine forest. Nests tend to be placed greater than 16 feet above ground, often out on lateral branches or near the trunk within about 3 feet of tree tops.</p>
Mixed Conifer	
Olive-sided flycatcher	<p>Multi-level, mature forest, fairly open canopy, prefers tree "groupiness" that creates forest edges and openings. Dead branches are used for perches while foraging. Often occur at edge of early post-burned areas for foraging and singing. Live mature pines for nesting. Snags are an important habitat feature.</p>
Aspen	
Red-naped sapsucker	<p>Preferred nest sites are live trees with heart-rot, which facilitates excavation and leaves the nest cavity enclosed in harder surrounding wood. Will also use dead trees for nesting. Minimum d.b.h. for nest tree is 10 inches and minimum height is usually 15 feet. Manage for groups of aspen stands of different age classes, in a larger forest complex, to ensure continual availability of older trees and snags for nesting. Use fire or silvicultural treatments to ensure continual regeneration of new stands.</p>
Pinyon-Juniper Woodland	
Gray vireo	<p>Uses open mature pinyon-juniper woodlands, typically with a broadleaf shrub component. Nests low in a small tree or shrub 2 to 6 feet above ground. Fire can be used to maintain existing habitat matrix and to prevent stands from becoming too dense.</p>
Pinyon jay	<p>Pinyon cone crop is important factor for successful breeding. Needs mature trees for cone production Nests are typically 3 to 26 feet high and tend to be south-facing. Pairs will re-nest up to 5 times in a breeding season if earlier nesting</p>

APIF High Priority Species USFS and FWS Birds of Conservation Concern¹ by Habitat	Important Habitat Features and Life History Considerations
	attempts fail.
Juniper titmouse	Recovery to pinyon-juniper woodlands. Uses late successional pinyon-juniper woodlands. Tends to favor areas with a high density of dead limbs and high degree of ground cover. An obligate secondary cavity nester. Nest cavity height ranges from 4 to 15 feet above ground. Nest tree d.b.h. ranges from 5 to 18 inches.
Black-throated gray warbler	Primarily associated with pinyon pine and juniper woodlands in northern Arizona. Canopy cover of 13 to 26 percent in mid to late successional woodlands. Breeding habitat is frequently characterized by a brushy undergrowth of scrub oak, ceanothus, manzanita, or mountain mahogany. Nests are typically placed on a horizontal tree branch or near the main stem of a shrub. Nest height varies from 2 to 15 feet above ground.
Gray Flycatcher	Most common in larger and taller stands of pinyon pine and/or juniper with open understory. May need some ground cover to support insect populations for foraging. Nests are placed primarily 2 to 11 feet high in a shrub or crotch of a juniper or pinyon pine.
High Elevation or Semidesert Grasslands	
Swainson's hawk	Stick nests constructed in scattered, lone trees within grasslands. Typical nest trees in Arizona are cottonwood, juniper, mesquite, ironwood and oak. Primary feeds on insects. They also eat small mammals, lizards, and snakes, especially during breeding season. Prefer open grassland for foraging, shrubs/brushy areas are not preferred habitat.
Ferruginous hawk	Ferruginous Hawks nest in isolated trees or small groves of trees, and on other elevated sites such as rock outcrops, buttes, large shrubs, haystacks, and low cliffs. Nests are situated adjacent to open areas such as grassland or shrub steppe. These hawks are closely associated with prairie dog colonies, especially in winter.
Burrowing owl	See "Sensitive Species" section for effects on nesting habitat and to the species.
Grasshopper sparrow	Prefers pure grassland habitat without trees or woody shrubs. Requires abundant thatch and dry grass for concealment. Apparent low site-fidelity. May avoid recently burned grassland sites for greater than or equal to 2 years after burning. Nests are often partially domed with dry grass and placed in a depression on the ground at the base of vegetation so the rim is nearly flush to the ground. This species often raises two broods per year. Primarily feeds on insects during the breeding seasons. Grass seeds are important in colder months when insect activity is low.
Bendire's thrasher	Prefers relatively open grassland with large scattered shrubs and/or trees (cholla, junipers, or sagebrush are usually present); may use dense vegetated washes or riparian areas. Breeds in relatively open, degraded grasslands with a moderate to dense shrub component. Nests below 6,000 feet elevation, typically 2 to 5 feet above ground in semi-desert shrubs, cacti, or trees.
Chestnut-collared Longspur	Primary Habitat: Semidesert Grassland. Breeds on short-grass plains and prairies. Winters in open cultivated fields. This species is a winter resident only (non-breeding) in Arizona.
Lark Bunting	Primary Habitat: Semidesert Grassland, Desert Communities. Habitat is plains, prairies, meadows and sagebrush. This species only winters and migrates in Arizona in cultivated lands, brushy areas, and desert.

APIF High Priority Species USFS and FWS Birds of Conservation Concern ¹ by Habitat	Important Habitat Features and Life History Considerations
Cottonwood Willow Riparian Forest	
Common black-hawk	Wooded streams. Almost always found near water. In United States, breeds in tall trees (especially cottonwoods) along streams with more or less permanent water flow and with relative lack of human disturbance.
Bell's Vireo	Primary Habitat: Cottonwood Willow Riparian Forest. Habitat is dense, low, shrubby vegetation, generally early successional stages in riparian areas, brushy fields, young second-growth forest or woodland, scrub oak, coastal chaparral, and mesquite brushlands, often near water in arid regions. Nest is an open bag-like or basket-like cup of grass, straw-like stems, and plant fibers. Suspended from forks of low branches of small trees or shrubs.
Elf Owl	Primary Habitat: Cottonwood Willow Riparian Forest. The Elf Owl is the smallest owl in the world and perhaps the most abundant raptor in upland deserts of Arizona and Sonora, Mexico. Holes in Arizona sycamores (<i>Platanus wrightii</i>) are used most often (81% of 32 nests) in canyon riparian habitat, Arizona. Bent, A. C. 1938b. Life histories of North American Birds of Prey (Part 2). Orders Falconiformes and Strigiformes. Bull. U.S. Nat. Mus. (170):viii-482. CloseLigon, J. D. 1968d. The biology of the Elf Owl (). Misc. Publ., Mys. Zool., Univ. Mich. no. 136. Close
Lucy's Warbler	Primary Habitat: Cottonwood Willow Riparian Forest. Breeds in riparian mesquite woodlands. Nest in cavity, well woven of twigs, weed stalks, straw, mesquite leaf stems, lined with fine bark, plant fibers, hair, and feathers. Nest placed behind loose bark of tree or in cavities in trees or cactus. Also in abandoned Verdin nests.
Yellow Warbler	Primary Habitat: Cottonwood Willow Riparian Forest; Mixed Deciduous Riparian Forest. Yellow Warblers spend the breeding season in thickets and other disturbed or regrowing habitats, particularly along streams and wetlands. Yellow Warblers build their nests in the vertical fork of a bush or small tree such as willow, hawthorn, raspberry, white cedar, dogwood, and honeysuckle.
Montane Willow Riparian Forest	
Lincoln's Sparrow	Primary Habitat: Montane Willow Riparian Forest (breeding). In mountainous regions during the summer months, Lincoln's Sparrows are most common in wet meadows dotted with dense patches of willows, alders, sedges, and corn lily. At lower elevations they use patches of aspens, cottonwoods, and willows as well as shrubby areas near streams. Lincoln's Sparrows are ground nesters. The female builds a nest on the ground or just above the ground inside a willow or birch shrub that is surrounded by a thick cover of sedges and flowering plants such as corn lily and buttercup.
MacGillivray's Warbler	Primary Habitat: Montane Willow Riparian Forest, Aspen and Maple, Mixed Conifer. Habitat is in clear-cuts in coniferous forest, mixed deciduous forest, and riparian areas and thickets. Requires dense understory. Nest is an open cup of coarse grass and other plant fiber, placed at or near ground level under dense shrub cover.
Brewer's Blackbird	Primary Habitat: Wetlands, Montane/Subalpine Grasslands, Montane Willow Riparian Forest. Brewer's Blackbirds live across the western half of North America, from below sea level in southern California to more than 8,000 feet in the Rocky Mountains. They occur in a huge variety of natural habitats – grasslands, marshes, meadows, woodland, coastal scrub, chaparral, and sagebrush – as well as many human-created habitats. Brewer's Blackbirds nest in colonies of a few to more than 100 pairs. In some years this means you might find colonies in low shrubs; other years the same birds might nest in treetops. The birds typically nest in shrubs or trees near water, but may also nest in reeds and cattails or, occasionally, on the ground or in tree cavities.
Wood Duck	Primary Habitat: Cottonwood Willow Riparian Forest. Wood Ducks thrive in

APIF High Priority Species USFS and FWS Birds of Conservation Concern ¹ by Habitat	Important Habitat Features and Life History Considerations
	bottomland forests, swamps, freshwater marshes, and beaver ponds. In Arizona they are winter migrants only.
Desert Communities	
Phainopepla	Primary Habitat: Desert Communities. Habitat is desert, riparian woodlands, and chaparral. Nest is a small, shallow, woven cup of twigs and fibers, placed on a tree limb or fork, or in a clump of mistletoe, typically 2-5 m (6.6-16.4 ft.) above ground.
Open Habitats	
Savannah Sparrow	Primary Habitat: Open habitats project-wide. On both their summer and winter ranges, Savannah Sparrows live in grasslands with few trees, including meadows, pastures, grassy roadsides, sedge wetlands, and cultivated fields planted with cover crops like alfalfa. Savannah Sparrows hide their nests amid a thick thatch of the prior season's dead grasses in densely vegetated areas. The nest is usually on the ground or low in grasses, goldenrod, saltmarsh vegetation, or low shrubs such as blueberry, blackberry, rose, and bayberry.
Shrub Species	
Virginia's Warbler	Primary Habitat: Many; shrub component important. Virginia's Warblers breed in open pinyon-juniper and oak woodlands often on steep slopes with shrubby ravines throughout most of their range. They also use dense thickets of mountain mahogany in southern Idaho and mixed-evergreen forests on the Mogollon Rim in Arizona. Typically they select a nest spot on the ground beneath a root or rock, or at the base of clumps of grass, oaks, or New Mexico locusts to provide concealment. They frequently nest on a steep slope, placing the nest on the downslope side of a clump of vegetation.

1. APIF = Arizona Partners in Flight; FWS = U.S. Fish and Wildlife Service

A discussion of habitats and bird species found in these habitats is included in the Wildlife specialist report.

Important Bird Areas

The Mogollon Rim Snowmelt Draws Important Bird Area is the only one within the project area. It covers approximately 72,162 acres and encompasses drainages located within eight kilometers of the edge of the Mogollon Rim, an abrupt cliff that represents the southern extension of the Colorado Plateau. This edge of the Rim has a narrow band of moist vegetation (especially maples) associated with greater precipitation formed by the upward deflection of air at the rim face. The habitat of this bird area includes ponderosa pine, white fir, Douglas fir, southwestern white pine, quaking aspen, and Gambel oak. Young plants of these canopy trees, plus canyon maple and New Mexico locust, dominate the understory woody species.

See the Arizona Important Bird Areas Program website for more information at <http://aziba.org>.

About 45,673 acres of habitat would be treated within the project area, equaling about 61 percent of the Important Bird Area. While most acres proposed for treatment are within ponderosa pine habitat, treatments in the Important Bird Area would also occur in mixed conifer, aspen and oak/maple habitats. In addition, road decommissioning, restoration of springs, and over 30 miles of riparian restoration activities are proposed within the area.

Other Species of Concern

Locally Important Species

The Land Management Plans of the Rim Country forests provide desired conditions and guidelines for the protection of locally important species on each of the forests. Most of the terrestrial species considered rare and endemic on the forests are outside the Rim Country project area. No further documentation is required for the following species except for the Arizona black rattlesnakes and Arizona toad (see wildlife specialist report).

Environmental Consequences

Environmental consequences consist of species analyses, beginning with federally threatened and endangered species followed by Forest Service sensitive species, management indicator species, migratory birds, and effects on Important Bird Areas. Following the analysis of direct and indirect effects for each species group is a review of cumulative effects.

Effects from Climate Change

Alternative 1

Alternative 1 would not prevent, delay, or ameliorate predicted effects from climate change. The dense forest conditions resulting from Alternative 1 are at a high risk to density-related and bark beetle mortality and have limited resilience to survive and recover from potential large-scale fire events and the interactions of these influences with climate change. Under drier and warmer weather conditions, the potential effects of these risks on the ecosystem would be increased. Individual tree growth would be limited to the point of stagnation. As tree density increases, many areas would experience higher mortality. Species requiring closed canopy forest conditions or old or large tree, snag, and log structure would be negatively affected in the long term. Patches of open forest, savanna, and meadow and grassland habitats would potentially increase in the long term as groups of dense forest succumb to the above mortality agents.

Alternatives 2 and 3

Risks associated with dense forest conditions would be reduced and resilience to the effects from large-scale disturbance under drier and warmer conditions would be improved by implementing the proposed treatments. Individual tree growth rates would improve, creating and retaining more large and old trees. Habitat elements associated with closed canopy forest conditions would be reduced, but would be more sustainable. Risk from insects, fire, and their interactions with climate would be reduced. Because of law, regulation, and policy, more closed canopy habitat would be available than what likely occurred historically. Ensuring the growth and retention of large trees would maintain large snag and log structure across the forest over time. Open forest, meadow, savanna, and grassland habitats would be enhanced and habitat effectiveness increased as encroaching trees were removed and habitat for grassland and pollinator species became less fragmented. These habitats would remain stable in the long term. The increased acres of mechanical and prescribed fire under Alternative 2 would realize the most benefit in terms of forest health and resiliency. The limited acres of treatment under Alternative 3 would be expected to maintain higher fuel loadings, resulting in more limited gains in forest resiliency due to increased flame lengths, lower canopy base height, and persistent ladder fuels. Alternative 3 would retain the densest forests and therefore achieve the least in terms of large tree growth rates and resilience.

Cable Operations

Mechanical thinning methods include conventional ground-based harvest, cable operations, and hand thinning. Cable operations is a system of transporting logs from stump to landing by means of suspended steel cables. This method is usually preferred on steep slopes where conventional ground-based harvesting cannot be carried out effectively. Cable operations generally reduce the need for the construction of temporary roads.

Alternative 2 proposes up to 54,609 acres that could use cable operations, and Alternative 3 proposes up to 40,298 acres. No cable operations are proposed in MSO PACs. Effects to other wildlife species from cable operations will be short-term increased noise and activity, followed by long-term benefits of restoration of habitat. Benefits expected are increased foraging opportunities for ungulates, increased movement due to restoring over encroached forest habitat, and reduction of high severity wildfire risk.

Federally Listed Threatened, Endangered, Proposed, and Candidate Species and Critical Habitat

Mexican Spotted Owl(Threatened)

Analysis Methods to Evaluate Environmental Consequences to the MSO from Alts 1-3

FVS Modeling Methods

Analysis for the MSO in this report focuses on three components:

1. **Vegetation Changes:** Forest Vegetation Simulator (FVS) modeling in MSO habitat types (Protected, Recovery, and Critical habitat) with habitat components important to the MSO compared over time (20 years of implementation) from Rim Country.
2. **Wildfire Risk:** We analyzed surface fuel loads in MSO habitat types through time using FVS modeling. We also analyzed 2 fire models using Fire Hazard index and Risk of Crown Fire.
3. **Direct and Indirect effects:** Effects from Activities associated with Rim Country implementation (mechanical removal of vegetation, hand thinning, prescribed burning, and comprehensive habitat restoration).

Key features of MSO habitat described in the Recovery Plan include elements of habitat important to the MSO such as:

- a range of tree sizes and ages with a preponderance of trees greater than 12 inches d.b.h.,
- BA of Pine-oak and mixed conifer cover types
- canopy cover
- tree sizes suggestive of uneven-aged management, and
- large dead trees (snags) with a diameter of 12 inches or greater.

MSO populations are influenced by prey availability. Key features of prey habitat include:

- high volume of fallen trees (mid-point diameter of 12 inches or greater) and other woody debris
- plant species richness, including woody species

- residual plant cover to maintain fruits, seeds, and regeneration to provide needs of MSO prey species, and
- other improvements to prey habitat

Forest Vegetation System (FVS) Modeling of Habitat Variables Important to the MSO

These forest structure elements are reflected in the evaluation criteria and are used to describe the existing condition of the habitat and to analyze the effects of the proposed activities according to FVS modeling over a twenty-year period from Existing Condition.

- Changes in BA by tree size-classes to show uneven aged management with an emphasis on promoting conditions for large trees by from the proposed action within MSO Habitats.
- Percent Canopy cover in MSO habitats. A linear regression from BA was used to estimate canopy cover (Shephard et al, in Parker et al. 2002).
- Changes to Trees Per Acre >18", and increases of large tree size classes > 18 inches diameter at breast height by alternative in Mexican spotted owl habitats.

To analyze the effects of Alternatives to dead standing trees (Snags) with a diameter of 12 inches or greater, the following habitat variables were modeled and reviewed:

1. Change in numbers per acre of snags, with a diameter of 12-18 inches (Average of Snags 12-18" DBH) and
2. Change in numbers per acre of snags, with a diameter greater than 18" by alternative in MSO Habitats (Average of Snags greater than 18" DBH).

To analyze the effects of Alternatives to provide for MSO prey habitat measures in MSO Habitats the following variables were modeled and reviewed:

1. Coarse woody debris (CWD) surface fuel 3" or greater in tons per acre in MSO habitats.
2. Changes in tons per acre shrub biomass and,
3. Changes in tons per acre herbaceous biomass.

Key FVS habitat variables important to the MSO and its prey base are included in the table below.

Table 08 Key FVS Habitat Variables Modeled Important to the MSO

FVS Model Habitat Attributes Used in this Analysis.	Description	Relevance to the MSO (Desired Condition from the 2012 MSO Recovery Plan) White Papers and Land Management Plans)	Link to FVS Habitat Variable to Positive Effects to the MSO
Average of BA	Basal Area (ft ² /ac)	Promote Larger Trees for Nest/Roost options and prey base habitat. Minimum 110 P-O Minimum 120 MC *2012 Revised MSO Recovery plan	Average basal area would, maintain or exceed the minimum 2012 Revised Recovery Plan recommendations.
Trees Per Acre >18"	# TPA > 18" in Mixed Conifer and Ponderosa Pine Cover Types	*2012 Revised MSO Recovery plan (Table c3)	Minimum 12 TPA >18" TPA > 18" would, maintain or exceed the minimum 2012 Revised Recovery Plan recommendations.

FVS Model Habitat Attributes Used in this Analysis.	Description	Relevance to the MSO (Desired Condition from the 2012 MSO Recovery Plan) White Papers and Land Management Plans)	Link to FVS Habitat Variable to Positive Effects to the MSO
Average of SNAG 12-18"	# snags 12-18" per acre	Promote snags for Nest/Roost options and prey base habitat.	Snags per acre are maintained or increase over time which will benefit the MSO by promoting larger trees for nest/roost opportunities and promote prey base habitat.
Average of SNAG >18"	# snags >18" per acre	Promote snags for Nest/Roost options and prey base habitat. 1-2 snags ≥ 18" per acre P-O 3 snags ≥ 18" per acre MC * A-S 2017, Coconino 2017 and Tonto Draft 2018 Land Management Plans *2012 Revised MSO Recovery plan	Snags per acre are maintained or increase over time which will benefit the MSO by promoting larger trees for nest/roost opportunities and promote prey base habitat.
CANOPY COVER	% canopy cover	To provide a thermal environment for nesting and roosting and prey base habitat: Minimum 40% P-O Minimum 60% MC *2012 Revised MSO Recovery plan	Canopy cover remains above the 2012 MSO Recovery Plan Revision minimum desired condition for Pine-oak (40%) and mixed conifer (60%) cover types. This will provide a thermal environment for nesting and roosting as well as promote prey base habitat.
Average of Surface Fuel TPA (tons per acre)	total surface fuel (tons per acre)	Important to carry surface fire. *2012 Revised MSO Recovery plan	Surface fuels will be maintained enough to carry surface fire as per the 2012 MSO Revised Recommendations.
Average of CWD 3"+ TPA	coarse woody debris, surface fuel 3"+ (tons per acre)	Promote for prey species habitat. 3-10 TPA P-O 5-15 TPA MC * A-S 2017, Coconino 2017 and Tonto Draft 2018 Land Management Plans	CWD will be maintained enough to carry surface fire as per the 2012 MSO Revised Recommendations.
Average of Surface Herb TPA	Herbaceous biomass (tons per acre)	Promote for prey species habitat. *2012 Revised MSO Recovery plan	Herbaceous biomass increases as result of treatment over time benefitting and promoting prey species habitat.
Average of Surface Shrub TPA	Shrub Biomass (tons per acre)	Promote for prey species habitat. *2012 Revised MSO Recovery plan	The shrub layer is increased or maintained from treatment over time to provide habitat and be

FVS Model Habitat Attributes Used in this Analysis.	Description	Relevance to the MSO (Desired Condition from the 2012 MSO Recovery Plan) White Papers and Land Management Plans)	Link to FVS Habitat Variable to Positive Effects to the MSO
			maintained for prey base species.
Average of ALL_BA1	BA 0-1"	Bring Closer to NRV. * A-S 2017, Coconino 2017 and Tonto Draft 2018 Land Management Plans	Promote this age class closer to NRV.
Average of ALL_BA2	BA 1-5"	Bring Closer to NRV. * A-S 2017, Coconino 2017 and Tonto Draft 2018 Land Management Plans	Promote this age class closer to NRV.
Average of ALL_BA3	BA 5-12"	Bring Closer to NRV. * A-S 2017, Coconino 2017 and Tonto Draft 2018 Land Management Plans	Promote this age class closer to NRV. Where this age class is highly departed from NRV treatment would benefit the MSO and MSO CH by reducing fire risk form overstocked forests of this age class.
Average of ALL_BA4	BA 12-18"	Bring Closer to NRV. Minimum 30% * A-S 2017, Coconino 2017 and Tonto Draft 2018 Land Management Plans *2012 Revised MSO Recovery plan	Promote this age class closer to NRV. This age class will stay above the minimum recovery plan recommendation of 30% BA/acre after 20 years of treatment as a result of treatment.
Average of ALL_BA5	BA 18-24"	Promote increases in this size class. To bring it closer to NRV. These will become large snags in the future. Minimum 30% Combined with Average of ALL_BA6 * A-S 2017, Coconino 2017 and Tonto Draft 2018 Land Management Plans *2012 Revised MSO Recovery plan	Large trees in the 19-24" age class (and combined with ALL_BA6 age class) will increase and trees greater than 24" will also increase from the existing condition, and will stay above the minimum recovery plan recommendation of 30% BA/acre after 20 years of treatment. This will benefit the MSO by providing nesting and roosting opportunities, promoting prey base habitat, and promoting large trees which will become large snags over the long-term.
Average of ALL_BA6	BA 24"+	Promote increases in this size class. To bring it closer to NRV. These will become large snags in the future. Minimum 30% Combined with Average of ALL_BA5	See above

FVS Model Habitat Attributes Used in this Analysis.	Description	Relevance to the MSO (Desired Condition from the 2012 MSO Recovery Plan) White Papers and Land Management Plans)	Link to FVS Habitat Variable to Positive Effects to the MSO
		* A-S 2017, Coconino 2017 and Tonto Draft 2018 Land Management Plans *2012 Revised MSO Recovery plan	

Fire Modeling Methods

To analyze the effects of fire by Alternatives MSO Habitats the following variables were modeled and reviewed:

1. Changes in tons per acre from the proposed action of total surface fuel (from FVS model runs) in MSO habitats (Protected PAC which includes the nest core areas, Recovery Nest/Roost, Recovery Foraging-Dispersal, and MSO Critical Habitat).
2. Changes in potential fire behavior (Fire Hazard Index) modeled from the proposed action in MSO habitats.
3. Risk of crown fire modeled from the proposed action in MSO habitats.

Existing Condition

Fire

Fire Hazard Index

Changes in potential fire behavior (Fire Hazard Index) in MSO habitat types was modeled by the fire ecologist (see Fire Ecology and Air Quality Report) under existing conditions in 214 PACs on 120,522 acres. Approximately 70,328 acres (62%) of the PACs in the project area show a Moderate, High, or Extreme need for treatment categories of FHI (see table below). Of these acres modeled 51,002 acres (45%) have a High or Extreme need for treatment and will experience higher severity wildfire than would occur in a natural fire regime if no action is taken.

In Nest/Roost Recovery Habitat the fire hazard index modeled 38,092 acres. Approximately 22,628 acres (60%) of the Nest/Roost Recovery habitat in the project area show a Moderate, High, or Extreme need for treatment categories of FHI (see table below). Of these acres modeled 15,869 acres (42%) have a High or Extreme need for treatment and will experience higher severity wildfire than would occur in a natural fire regime if no action is taken.

In Foraging/Non-breeding Recovery Habitat the fire hazard index modeled 183,706 acres. Approximately 84,363 acres (46%) of the Foraging/Non/breeding Recovery Habitat in the project area show a Moderate, High, or Extreme need for treatment categories of FHI (see table below). Of these acres modeled 51,210 acres (28%) have a High or Extreme need for treatment and will experience higher severity wildfire than would occur in a natural fire regime if no action is taken.

The potential for wildfire activity that would result in more severe effects on ecosystem components than that which should occur in a natural fire regime is illustrated by this analysis.

The fire hazard index would be greatly reduced in the action alternatives (see the Analysis for the MSO by Alternatives section).

Table 09 Fire Hazard Index Modeled in MSO Habitat Types in the Existing Condition

MSO Habitat Type	Very Low Need For Treatment	%	Low Need for Treatment	%	Moderate Need for Treatment	%	High Need for Treatment	%	Extreme Need For Treatment	%
Protected PAC 116,385 Acres	24,174	21	21,883	17	19,326	17	33,633	30	17,369	15
Recovery Nest/Roost 38,092 Acres	10,188	26	5,278	14	6,759	18	10,209	27	5,660	15
Recovery Foraging/Non-breeding 183,706 Acres	63,848	35	35,495	19	33,153	18	40,001	22	11,209	6
MSO Critical habitat 686,283 Acres	248,081	36	149,957	22	106,741	16	144,749	21	36,756	5

Crown Fire

Risk of crown fires in MSO habitat types (see table and figure below) were also modeled under existing conditions in PACs by the fire ecologist.

Two hundred and seven (207) PACs were modeled, totaling 116,385 acres. The 7 new PACs were not modeled for fire. Of these 58,765 acres (51%) could experience active or conditional crown fire. Active crown fire in PACs in the existing condition total 44,833 acres (39%) of this habitat type in the project area that would experience high severity crown fire if no action is taken.

In Nest/Roost Recovery Habitat, crown fire potential modeled 38,093 acres, with 18,275 acres (48%) that have the potential to experience active or conditional crown fire. Active crown fire in Nest/Roost Recovery Habitat in the existing condition total 5,658 acres (15%) of this habitat type modeled in the project area that would experience high severity crown fire if no action is taken.

In Foraging/Non-breeding Habitat, crown fire potential modeled 183,706 acres, with 63,737 acres (34%) that could experience active or conditional crown fire. Active crown fire in Foraging/Non-breeding Recovery Habitat in the existing condition total 50,162 acres (27%) of this habitat type modeled in the project area that would experience high severity crown fire if no action is taken.

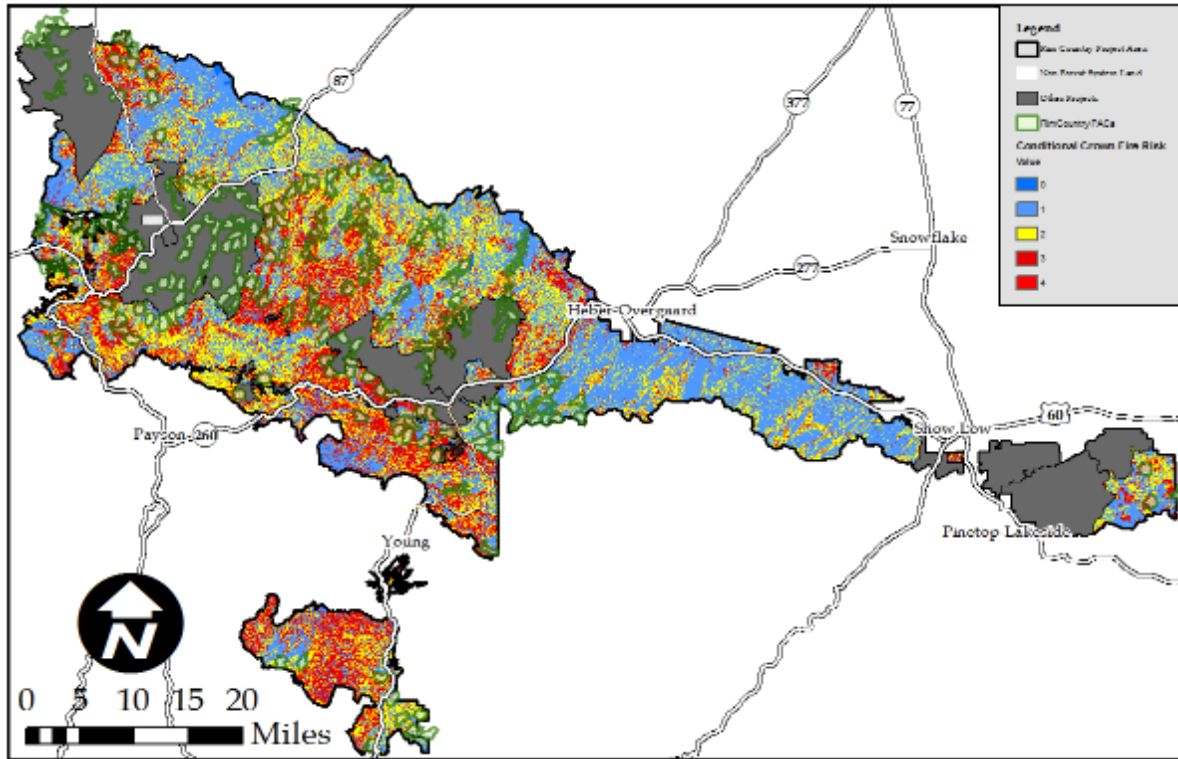
As with the fire hazard index analysis above, the potential for wildfire activity that would result in more severe effects on ecosystem components than that which should occur in a natural fire

regime is illustrated by this analysis. The risk of crown fire would be greatly reduced in the action alternatives (see Analysis for the MSO by Alternatives section below).

Table 10. Risk of crown fire modeled in MSO habitat types in the existing condition

MSO Habitat Type	Active Crown Fire Acres	%	Conditional Crown Fire Acres	%	Passive Crown Fire Acres	%	Surface Fire Acres	%	Non-Burnable Acres	%
Protected PAC 116,385 Acres Modeled	44,833	39	13,932	12	35,523	31	20,945	18	1,152	1
Recovery Nest/Roost 38,092 Acres Modeled	14,683	39	3,592	9	11,706	31	8,038	21	73	0.1
Recovery Foraging-Non-Breeding 183,706 Acres Modeled	50,162	27	13,575	7	81,959	45	37,019	20	991	0.5
MSO Critical Habitat 686,283 Acres Modeled	186,772	27	55,870	8	288,437	42	148,946	22	6,258	1

Figure 05. Risk of crown fire in MSO PACs in the existing condition



Alternative 1 – No Action

This alternative proposes no restoration treatments, but habitat variables are modeled the same as for Alternatives 2 and 3. The no action alternative includes no new mechanical treatments or prescribed fire in Rim Country in any habitat, including ponderosa pine, pine-oak, aspen, meadows, springs, riparian areas, and streams. No road construction, maintenance, or decommissioning would occur within the project area. None of the associated wildlife habitats would be restored or moved toward restoration.

Table 11. FVS Modeled Effects on Key Habitat Variables in PACs from No Action Alternative

PACs MC = 16,481 Acres Modeled PO = 56,180 Acres Modeled	Existing Condition	No Action 10 Years	No Action 20 Years
Avg of Trees per Acre MC	1291	1170	1057
Avg of Trees per Acre PO	1276	1130	990
Avg of Basal Area MC	173	185	196
Avg of Basal Area PO	144	155	163
Avg of Stand Density Index MC	398	414	425
Avg of Stand Density Index PO	339	353	362
Avg of Quadratic Mean Diameter in Inches MC	6	6	7
Avg of Quadratic Mean Diameter in Inches PO	6	6	7
Avg of SNAG 12-18 MC	4	3	3
Avg of SNAG 12-18 PO	2	3	3
Avg of SNAG 18-24 MC	2	1	1

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Avg of SNAG 18-24 PO	1	1	1
Avg of SNAG \geq 24 MC	1	1	1
Avg of SNAG \geq 24 PO	0	0	0
Percent CANCOV Regression from BA MC	74	76	78
Percent CANCOV Regression from BA PO	69	71	73
Avg of Surface Fuel tons per acre MC	29	33	35
Avg of Surface Fuel tons per acre PO	20	23	25
Avg of Coarse Woody Debris 3"+ tons per acre MC	10	12	14
Avg of Coarse Woody Debris 3"+ tons per acre PO	8	9	10
Avg of Herbaceous tons per acre MC	0.21	0.21	0.20
Avg of Herbaceous tons per acre PO	0.21	0.21	0.21
Average of Shrubs tons per acre MC	0.40	0.37	0.34
Average of Shrubs tons per acre PO	0.23	0.23	0.23
Avg of ALL BA1 0-1" MC	1	1	1
Avg of ALL BA1 0-1" PO	1	1	1
Avg of ALL BA2 1-5" MC	15	15	14
Avg of ALL BA2 1-5" PO	13	16	18
Avg of ALL BA3 5-12" MC	49	51	52
Avg of ALL BA3 5-12" PO	47	47	47
Avg of ALL BA4 12-18" MC	51	52	56
Avg of ALL BA4 12-18" PO	42	46	48
Avg of ALL BA5 18-24" MC	30	38	43
Avg of ALL BA5 18-24" PO	22	25	28
Avg of ALL BA6 24" + MC	26	29	32
Avg of ALL BA6 24" + PO	18	20	22

Protected Habitat Alternative 1

Forest Structure

Table 12. FVS Model Results in PACs, Alternative 1

PACs including Nest Core Areas Mixed Conifer = 18,180 Acres Modeled Pine-Oak = 64,165 Acres Modeled	Existing Condition	No Action 10 Years	No Action 20 Years	Desired Condition
Average of BA Mixed Conifer	158	171	185	Minimum 120
Average of BA Pine-Oak	144	155	164	Minimum 110
Average of TPA >18" Mixed Conifer	18	21	24	Minimum 12 TPA >18"
Average of TPA >18" Pine-Oak	14	16	17	Minimum 12 TPA >18"
Average of Snags 12-18" Mixed Conifer	3	3	3	Promote snags for Nest/Roost and prey base
Average of Snags 12-18" Pine-Oak	2	3	3	Promote snags for Nest/Roost and prey base

PACs including Nest Core Areas Mixed Conifer = 18,180 Acres Modeled Pine-Oak = 64,165 Acres Modeled	Existing Condition	No Action 10 Years	No Action 20 Years	Desired Condition
Average of Snags >18" Mixed Conifer	3	2	2	3 Per acre in MC
Average of Snags >18" Pine-Oak	1	1	1	1-2 per acre PO
Average of Canopy Cover Mixed Conifer	66	71	74	Minimum 60 %
Average of Canopy Cover Pine-Oak	65	69	71	Minimum 40 %
Average of Surface Fuel TPA Mixed Conifer	26	30	32	Maintain to promote surface fire
Average of Surface Fuel TPA Pine-Oak	19	23	25	Maintain to promote surface fire
Average of Surface_ge3 Mixed Conifer	9	11	13	Maintain to promote surface fire 5-15 TPA
Average of Surface_ge3 Pine-Oak	8	9	10	Maintain to promote surface fire 3-10 TPA
Average of Surface_Herb Mixed Conifer	0.21	0.20	0.19	Increases for prey species habitat
Average of Surface_Herb Pine-Oak	0.21	0.21	0.21	Increases for prey species habitat
Average of Surface_Shruh Mixed Conifer	0.36	0.34	0.31	Shrub biomass increases for prey habitat
Average of Surface_Shruh Pine-Oak	0.24	0.24	0.24	Shrub biomass increases for prey habitat

In PACs after 20 years of no management average BA, $TPA > 18''$, and canopy cover increases. With no action, PACs would show an increase in coarse woody debris and snags greater than 12 inches in diameter. While creation of large snags would continue, the decreasing numbers of large trees through time would maintain a deficit of large snags 20 years into the future. Pulses of large snag creation may occur at any time because of fire, insects, and disease. Increases in large snags as an outcome of stochastic events would result in decreases of large trees.

Small mammal habitat would be maintained through time in terms of logs and coarse woody debris (cover for prey species) under this alternative. However, accumulated coarse woody debris could decrease MSO habitat effectiveness (Roberts et al. 2010). Herbaceous biomass in tons per acre (food for prey species) and shrub biomass in tons per acre (cover for prey species) would decrease in both the short term and long term under Alternative 1. However, canopy development combined with a lack of fire and increased needle accumulation would cause a continued decline in understory through time. The continued loss and fragmentation of understory vegetation would limit invertebrate populations, including pollinators. If this pattern continued over time, a cascading effect could occur as arthropod species richness and abundance declines, increasing the rate of decline in understory biomass and potentially causing an additive effect to MSO prey species. Combined decreases in understory vegetation and associated arthropod communities could affect MSO directly (lack of flying insects as prey) and indirectly (food availability for prey species such as mice, voles, birds, and bats). Understory vegetation would remain at low levels of productivity and would continue to decrease through time, except in areas where fire, insect, or disease opened the canopy.

While the No Management Alternative appears to have some benefits for habitat variables important to the MSO, surface fuel loading is increased by 6 tons per acre in PAC habitat in each cover type, mixed conifer and Pine-oak. This places the PACs in Rim Country 4 FRI at a much higher risk of severe effects from wildfire (see analysis below).

Table 13. MSO PAC Mixed Conifer Basal Areas by Tree Size Class, Alternative 1

Tree Size Class	Basal Area Existing Condition	% of BA Existing Condition	Basal Area No Action after 10 years	% of BA No Action after 10 years	Basal Area No Action after 20 years	% of BA No Action after 20 years
BA1 0-1"	1	1%	1	0%	1	0%
BA2 1-5"	13	8%	15	9%	19	10%
BA3 5-12"	46	29%	47	27%	47	25%
BA4 12-18"	46	29%	48	28%	50	27%
BA5 and BA6 >18"	52	33%	61	36%	69	37%
Total BA	158		171		185	

Table 14. MSO PAC Pine-Oak Basal Areas by Tree Size Class, Alternative 1

Tree Size Class	Basal Area Existing Condition	% of BA Existing Condition	Basal Area No Action after 10 years	% of BA No Action after 10 years	Basal Area No Action after 20 years	% of BA No Action after 20 years
BA1 0-1"	1	1%	1	0%	1	0%
BA2 1-5"	13	8%	16	9%	17	9%
BA3 5-12"	46	29%	46	27%	47	26%
BA4 12-18"	44	28%	47	27%	49	27%
BA5 and BA6 >18"	40	25%	45	26%	50	27%
Total BA	144		155		164	

The average of all basal areas, from the sapling Size Class 1 to old growth Size Class 6 shows that intermediate-sized trees in both cover types, mixed conifer and Pine-oak (Size Class 3 with a basal area of 5 to 12 inches and Size Class 4 with a basal area of 12 to 18 inches) would be predominant on the landscape and vastly departed from the natural range of variation and would not be lowered to the desired condition, a result of no treatments after 20 years.

Nest/Roost Recovery Habitat Alternative 1

Forest Structure

Table 15. FVS Model Results in Nest/Roost Recovery Habitat, Alternative 1

MSO Recovery Replacement Nest/Roost Mixed Conifer = 12,849 Acres Modeled Pine-Oak = 13,422 Acres Modeled Geophysical Model = 3,388 Acres Modeled	Existing Condition	No Action 10 Years	No Action 20 Years	Desired Condition
Average of BA Mixed Conifer	178	190	200	Minimum 120
Average of BA Pine-Oak	158	166	171	Minimum 110
Average of BA Geophysical Model	190	196	199	
Average of TPA >18" Mixed Conifer	24	28	32	Minimum 12 TPA >18"
Average of TPA >18" Pine-Oak	20	23	25	Minimum 12 TPA >18"
Average of TPA >18" Geophysical Model	18	20	22	
Average of Snags 12-18" Mixed Conifer	4	4	4	Promote Snags in this Class
Average of Snags 12-18" Pine-Oak	3	4	4	Promote Snags in this Class
Average of Snags 12-18" Geophysical Model	3	3	3	Promote Snags in this Class
Average of Snags >18" Mixed Conifer	2	2	3	3 Per acre in MC
Average of Snags >18" Pine-Oak	1	1	2	1-2 per acre PO
Average of Snags >18" Geophysical Model	1	1	1	
Average of Canopy Cover Mixed Conifer	73	75	76	> 60%
Average of Canopy Cover Pine-Oak	70	72	73	> 40%
Average of Canopy Cover Geophysical Model	76	76	77	> 40%
Average of Surface Fuel TPA Mixed Conifer	28	32	35	Maintain to promote surface fire
Average of Surface Fuel TPA Pine-Oak	18	23	25	Maintain to promote surface fire
Average of Surface Fuel TPA Geophysical Model	23	26	28	Maintain to promote surface fire
Average of Surface_ge3 Mixed Conifer	9	11	13	Maintain to promote surface fire 5-15 TPA
Average of Surface_ge3 Pine-Oak	6	7	9	Maintain to promote surface fire 3-10 TPA
Average of Surface_ge3 Geophysical Model	10	11	13	
Average of Surface_Herb Mixed Conifer	0.20	0.20	0.20	Increases for prey species habitat
Average of Surface_Herb Pine-Oak	0.21	0.21	0.21	Increases for prey species habitat
Average of Surface_Herb Geophysical Model	0.20	0.20	0.20	Increases for prey species habitat
Average of Surface_Shrub Mixed Conifer	0.37	0.33	0.31	Shrub biomass increases for prey species habitat
Average of Surface_Shrub Pine-Oak	0.21	0.21	0.22	Shrub biomass increases for prey species habitat
Average of Surface_Shrub Geophysical Model	0.24	0.24	0.25	Shrub biomass increases for prey species habitat

In Nest/Roost Recovery Habitat after 20 years of no management average BA TPA $\geq 18''$, and canopy cover increases. Snags are maintained or decreased. Course woody debris increases, and the shrub and herbaceous layers are maintained or decreased. While the No Management Alternative appears to have some benefits for habitat variables important to the MSO, surface fuel loading is increased by 8 tons per acre in Nest/Roost Recovery Habitats habitat in each cover type, mixed conifer and Pine-oak. This places the Nest/Roost Recovery Habitat in Rim Country 4 FRI at a much higher risk of severe effects from wildfire (see analysis below).

Table 16. MSO Nest/Roost Recovery Habitat Mixed-Conifer Basal Areas by Tree Size Class. Alternative 1

Tree Size Class	Basal Area Existing Condition	% of BA Existing Condition	Basal Area No Action after 10 years	% of BA No Action after 10 years	Basal Area No Action after 20 years	% of BA No Action after 20 years
BA1 0-1"	1	0%	1	0%	0	0%
BA2 1-5"	13	8%	13	8%	14	8%
BA3 5-12"	42	26%	42	24%	41	22%
BA4 12-18"	56	36%	57	33%	55	30%
BA5 and BA6 >18"	66	42%	78	45%	89	48%
Total BA	178		190		200	

Table 17. MSO Nest/Roost Recovery Habitat Pine-Oak Basal Areas by Tree Size Class. Alternative 1

Tree Size Class	Basal Area Existing Condition	% of BA Existing Condition	Basal Area No Action after 10 years	% of BA No Action after 10 years	Basal Area No Action after 20 years	% of BA No Action after 20 years
BA1 0-1"	1	0%	1	0%	0	0%
BA2 1-5"	9	6%	11	6%	12	7%
BA3 5-12"	40	25%	39	23%	38	20%
BA4 12-18"	52	33%	51	30%	51	28%
BA5 and BA6 >18"	56	35%	64	37%	70	38%
Total BA	158		166		171	

Table 18. MSO Recovery Replacement Nest/Roost Geophysical Model Basal Area by Tree Size Class. Alternative 1

Tree Size Class	Basal Area Existing Condition	% of BA Existing Condition	Basal Area No Action after 10 years	% of BA No Action after 10 years	Basal Area No Action after 20 years	% of BA No Action after 20 years
BA1 0-1"	1	1%	1	0%	1	0%

Tree Size Class	Basal Area Existing Condition	% of BA Existing Condition	Basal Area No Action after 10 years	% of BA No Action after 10 years	Basal Area No Action after 20 years	% of BA No Action after 20 years
BA2 1-5"	13	9%	14	8%	15	8%
BA3 5-12"	55	35%	54	31%	52	28%
BA4 12-18"	61	39%	62	36%	62	34%
BA5 and BA6 >18"	60	38%	65	38%	69	37%
Total BA	190		196		199	

In Nest/Roost Recovery Habitat the average of all basal areas, from the sapling Size Class 1 to old growth Size Class 6 shows that intermediate-sized trees in all cover types, mixed conifer, Pine-oak, and for acres identified using the Geophysical model (Size Class 3 with a basal area of 5 to 12 inches and Size Class 4 with a basal area of 12 to 18 inches) would be predominant on the landscape and vastly departed from the natural range of variation and would not be lowered to the desired condition, a result of no treatments after 20 years.

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Foraging/Non-Breeding Recovery Habitat Alternative 1

Forest Structure

Foraging/Non-breeding Recovery Habitat FVS Model Results and Basal Areas by Size Classes (Alt1)

Table 19. FVS Model Results in Foraging/Non-breeding Recovery Habitat. Alternative 1

MSO Recovery Foraging/Non-breeding Mixed Conifer = 24,924 Acres Modeled Pine-Oak = 86,615 Acres Modeled Geophysical Model = 30,364 Acres Modeled	Existing Condition	No Action 10 Years	No Action 20 Years	Desired Condition
Average of BA Mixed Conifer	151	165	177	120 (table c1 in MSORP)
Average of BA Pine-Oak	137	147	155	110 (table c1 in MSORP)
Average of BA Geophysical Model	163	170	175	
Average of TPA >18" Mixed Conifer	16	19	22	Minimum 12 TPA >18"
Average of TPA >18" Pine-Oak	13	15	17	Minimum 12 TPA >18"
Average of TPA >18" Geophysical Model	13	14	15	
Average of SG1218 Mixed Conifer	3	3	3	Promote Snags
Average of SG1218 Pine-Oak	2	2	3	Promote Snags
Average of SG1218 Geophysical Model	2	2	2	Promote Snags
Average of Snags >18" Mixed Conifer	2	2	2	3 Per acre in MC

MSO Recovery Foraging/Non-breeding Mixed Conifer = 24,924 Acres Modeled Pine-Oak = 86,615 Acres Modeled Geophysical Model = 30,364 Acres Modeled	Existing Condition	No Action 10 Years	No Action 20 Years	Desired Condition
Average of Snags >18" Pine-Oak	1	1	1	1-2 per acre PO
Average of Snags >18" Geophysical Model	1	1	1	
Average of Canopy Cover Mixed Conifer	69	71	73	> 60%
Average of Canopy Cover Pine-Oak	66	68	70	> 40%
Average of Canopy Cover Geophysical Model	71	72	73	
Average of Surface_Total Mixed Conifer	23	27	31	Maintain to promote surface fire
Average of Surface_Total Pine-Oak	16	19	22	Maintain to promote surface fire
Average of Surface_Total Geophysical Model	18	21	23	Maintain to promote surface fire
Average of Surface Fuel TPA Mixed Conifer	8	10	12	Maintain to promote surface fire 5-15 TPA
Average of Surface Fuel TPA Pine-Oak	5	6	7	Maintain to promote surface fire 3-10 TPA
Average of Surface Fuel TPA Geophysical Model	6	7	8	
Average of Surface_Herb Mixed Conifer	0.21	0.20	0.20	Increases for prey species habitat
Average of Surface_Herb Pine-Oak	0.21	0.21	0.21	Increases for prey species habitat
Average of Surface_Herb Geophysical Model	0.19	0.19	0.19	Increases for prey species habitat
Average of Surface_Shrub Mixed Conifer	0.29	0.28	0.26	Increases for prey species habitat
Average of Surface_Shrub Pine-Oak	0.21	0.22	0.22	Increases for prey species habitat
Average of Surface_Shrub Geophysical Model	0.27	0.27	0.26	Increases for prey species habitat

In Foraging/Non-breeding Recovery Habitat after 20 years of no management average BA TPA $\geq 18''$, and canopy cover increases. Snags are maintained or decreased. Course woody debris increases, and the shrub and herbaceous layers are maintained or decreased. While the No Management Alternative appears to have some benefits for habitat variables important to the MSO, surface fuel loading is increased by 8 tons per acre in Foraging/Non-breeding Recovery Habitat in each cover type, mixed conifer, Pine-oak, and for acres identified using the Geophysical model. This places the Foraging/Non-breeding Recovery Habitat in Rim Country 4 FRI at a much higher risk of severe effects from wildfire (see analysis below).

Table 20. MSO Recovery Replacement Foraging/Non-breeding Mixed Conifer Basal Area by Tree Size Class. Alternative 1

Tree Size Class	Basal Area Existing Condition	% of BA Existing Condition	Basal Area No Action after 10 years	% of BA No Action after 10 years	Basal Area No Action after 20 years	% of BA No Action after 20 years
BA1 0-1"	1	1%	1	0%	1	0%
BA2 1-5"	15	9%	17	10%	19	11%
BA3 5-12"	44	28%	44	26%	42	23%
BA4 12-18"	48	30%	51	30%	53	29%
BA5 and BA6 >18"	44	28%	53	31%	61	33%
Total BA	151		165		177	

Table 21. MSO Recovery Replacement Foraging/Non-breeding Pine-oak Basal Area by Tree Size Class. Alternative 1

Tree Size Class	Basal Area Existing Condition	% of BA Existing Condition	Basal Area No Action after 10 years	% of BA No Action after 10 years	Basal Area No Action after 20 years	% of BA No Action after 20 years
BA1 0-1"	1	0%	1	0%	1	0%
BA2 1-5"	11	7%	13	7%	14	8%
BA3 5-12"	46	29%	45	26%	45	24%
BA4 12-18"	44	28%	48	28%	50	27%
BA5 and BA6 >18"	35	22%	41	24%	47	25%
Total BA	137		147		155	

Table 22. MSO Recovery Replacement Foraging/Non-breeding Geophysical Model Basal Area by Tree Size Class

Tree Size Class	Basal Area Existing	% of BA Existing	Basal Area No Action after 10 years	% of BA No Action after 10 years	Basal Area No Action after 20 years	% of BA No Action after 20 years
BA1 0-1"	1	1%	1	1%	1	0%
BA2 1-5"	16	10%	16	10%	17	9%
BA3 5-12"	62	39%	61	36%	60	33%
BA4 12-18"	47	29%	50	29%	52	28%
BA5 and BA6 >18"	38	24%	42	24%	45	25%

Tree Size Class	Basal Area Existing	% of BA Existing	Basal Area No Action after 10 years	% of BA No Action after 10 years	Basal Area No Action after 20 years	% of BA No Action after 20 years
Total BA	163		170		175	

In Foraging/Non-breeding Recovery Habitat the average of all basal areas, from the sapling Size Class 1 to old growth Size Class 6 shows that intermediate-sized trees in all cover types, mixed conifer, Pine-oak, and for acres identified using the Geophysical model (Size Class 3 with a basal area of 5 to 12 inches and Size Class 4 with a basal area of 12 to 18 inches) would be predominant on the landscape and vastly departed from the natural range of variation and would not be lowered to the desired condition, a result of no treatments after 20 years.

Fire Effects (Alt 1)

Surface Fuel loading Results of FVS Models (Alt1)

Surface fuel loading in MSO Protected Habitat (see table above) would increase under Alternative 1, No Action, moving from an existing 26 tons per acre in MC and 19 tons per acre in P-O to 32 tons per acre in MC and 25 in P-O after 20 years of no management. Land Management Plans call for fuel loading in Tons Per Acre (TPA) of 5-15 tons in Mixed Conifer and 3-10 TPA in Ponderosa pine oak cover types. The FVS modeling shows that after 20 years of no treatment these fuel loads are more than double the desired conditions in this habitat type. Increased surface fuel loading will place the PACs at a much higher risk of uncharacteristically severe wildfire than would naturally occur.

Surface fuel loading in MSO Nest/Roost Recovery Habitat (see table above) would be increased under Alternative 1, moving from 28 tons per acre in MC, 18 in P-O, and 23 GM to 35 tpa in MC, 25 tpa in P-O and 28 GM after 20 years of no management. The FVS modeling shows that after 20 years of no treatment these fuel loads are more than double the desired conditions in this habitat type. Increased surface fuel loading will place the Nest/Roost Recovery Habitat at a much higher risk of uncharacteristically severe wildfire.

Surface fuel loading in MSO Foraging/Non-breeding Recovery habitat (see table above) would be reduced under The Proposed Action, moving from an existing condition of 23 tons per acre in MC, 16 tpa in P-O, and 18 tpa GM to 31 tons per acre in MC, and 22 tpa in P-O and 23 in GM after 20 years of no management. The FVS modeling shows that after 20 years of no treatment these fuel loads are more than double the desired conditions in this habitat type. Increased surface fuel loading will place the Foraging/Non-breeding Recovery Habitat at a much higher risk of uncharacteristically severe wildfire.

Fire Hazard Index Model Results in MSO Habitat (Alt1)

Table 23. Fire Hazard Index Comparison for acres from the No Action Alternative with Percentages of Total Habitat Modeled in the Project Area for Fire Risk in Wildlife Habitat

MSO Habitat Type	Very Low Need For Treatment in Acres	%	Low Need for Treatment in Acres	%	Moderate Need for Treatment in Acres	%	High Need for Treatment in Acres	%	Extreme Need for Treatment in Acres	%
Protected PAC 116,385 Acres Modeled	17529	15	23463	20	17286	15	35922	31	22185	19
Recovery Nest/Roost 38,092 Acres Modeled	6686	18	7543	20	5792	14	11223	30	6848	18
Recovery Foraging/Non-Breeding 183,706 Acres Modeled	46488	25	46771	25	29869	16	47069	26	13509	8
MSO Critical habitat 686,283 Acres modeled	184677	27	189802	28	93646	14	172053	25	46106	6

The Moderate, High, and Extreme Need for Treatment categories of FHI are increased from alternative 1 in PACs from the existing condition of 70,328 acres (62%) to 75,393 acres (65%). The High and Extreme Need for Treatment categories are increased from 51,002 acres (45%) of all PACs modeled in the existing condition to 58,107 acres (50%) from alternative 1.

In Nest/Roost recovery habitat the Moderate, High, and Extreme Need for Treatment categories of FHI are increased from alternative 1 from 22,628 acres (60%) from the existing condition to 23,863 acres (62%). The High and Extreme Need for Treatment categories are increased from 15,869 acres (42%) of all Nest/Roost Recovery Habitat modeled in the existing condition to 18,071 acres (48%) from alternative 1.

In Foraging/Non-breeding MSO Recovery Habitat the Moderate, High, and Extreme Need for Treatment categories of FHI are increased from 84,363 acres (46%) in the existing condition to 90,447 acres (50%) from alternative 1. The High and Extreme Need for Treatment categories are increased from 51,210 acres (28%) of all Foraging/Non-breeding Recovery Habitat modeled in the existing condition to 60,578 acres (34%) from alternative 1.

Risk of Crown Fire Model Results in MSO Habitat (Alt1)

Table 24. Active and Conditional Crown Fire Assessment from The No Action Alternative MSO Habitat (with Percentages of Total habitat Modeled in the Project Area)

MSO Habitat Type	Active Crown Fire Acres	%	Conditional Crown Fire Acres	%	Passive Crown Fire Acres	%	Surface Fire Acres	%	Non-Burnable Acres	%
Protected PAC 116,385 Acres Modeled	56795	49	5410	5	38420	32	14619	13	1141	01
Recovery Nest/Roost 38,092 Acres Modeled	18287	48	1061	3	13948	36	4729	12	68	1
Recovery Foraging-Non-Breeding 183,706 Acres Modeled	63527	35	4073	2	93139	50	22012	12	954	>1
MSO Critical Habitat 686,283 Acres Modeled	237826	35	19856	3	324072	47	98597	14	5933	>1

In PACs, the potential for active and conditional crown fire is increased in Alternative 1 compared to the existing condition from 58,765 acres (51%) to 62,205 acres (51%) of this habitat type in the project area that would experience high severity crown fire as a result of no management. Active crown fire risk is increased from 39% of all PAC habitat in the project area to 49%.

In Nest/Roost Recovery Habitat the potential for active and conditional crown fire is increased in Alternative 1 compared to the existing condition from 18,275 acres (48%) to 19,358 acres (51%) after 20 years of no action. Active crown fire risk is increased from 39% of all Nest/Roost Recovery Habitat in the project area to 48%.

In Foraging/Non-breeding Recovery Habitat the potential for active and conditional crown fire is increased in Alternative 1 compared to the existing condition from 63,737 acres (34%) to 67,600 acres (37%) after 20 years of no action. Active crown fire risk is increased from 27% of all Foraging/Non-breeding Recovery Habitat in the project area to 35%.

Other Habitat Effects

Springs, Riparian and Stream Habitat, Grasslands, Savannas, Meadows, and Aspen. No springs or riparian habitat would be restored. One hundred eighty-four (184) springs and associated prey habitat would remain in degraded condition within the project area, with many included in PACs. Similarly, wildlife habitat associated with almost 171 miles of riparian stream

channels would remain in degraded condition within MSO habitat. The grasses, forbs, and shrubs that could potentially occupy these sites would remain absent or limited in both species richness and abundance.

No grassland, savanna, or meadow treatments would occur, resulting in nearly 350 acres in PACs and over 60,390 acres (proposed in Alternative 2) of this important habitat continuing to degrade as a result of pine tree encroachment in MSO habitat. This would represent a decline in the quantity and quality of habitat for grassland associated species, including obligate migratory and sensitive avian species. As food and cover decline for small mammals, potential source populations of important MSO prey species would be expected to decline in the long term. Overall, the landscape would move toward homogeneity as ponderosa pine continued to compromise or eliminate these key sources of heterogeneity.

Unique wildlife habitat features associated with 1,230 acres of aspen would decline or vanish as losses continued. Conifer trees would gradually succeed aspen trees through competition for space, light, and water, which is a major cause of aspen decline (Johnson 2010). Associated declines in regional avifauna would occur as a result of habitat loss (Griffis-Kyle and Beier 2003). The rate of avian decline could increase as habitat changes favored nest predators (Johnson 2010). Understory biomass, which provides the food and cover to support MSO prey species (e.g., small mammals, birds, and arthropods), would decrease exponentially as conifer cover increased (Stam et al. 2008).

The effects of these microhabitats are greater than their combined total acres. This is particularly relevant when these patches of heterogeneity occur in PACs where MSOs disproportionately forage during the nesting season.

Roads. Under the no action alternative, no new restoration activities would take place and no additional use of existing roads would occur. Current rates of public and administrative use would continue. Maintenance to provide public and administrative access would continue, contingent upon funding. No increase in road maintenance to accommodate restoration activities would occur. No temporary roads would be constructed, but also no road decommissioning, unless they are analyzed under separate NEPA analysis.

Direct and Indirect Effects

With no treatments occurring, there would be no direct increase or decrease in habitat quality of MSO protected, recovery, or critical habitat in the short term. In the long term, MSO habitat quality would decrease as a result of declines in forest health and resiliency.

The lack of mechanical thinning and low-severity prescribed fire would allow the current forest trajectory to continue. Dense forests would maintain closed canopy conditions but continue to exhibit reduced growth rates. The abundance of young and mid-aged forest would continue to dominate the landscape because of stagnating growth rates and competition-induced mortality of large trees. Gambel oak, aspen, and meadows would decline as pine encroachment continued. Spring function would decline as would reaches of riparian habitat channels. Competition for limited water and nutrients would continue and would increase in time as snow pack decreased with developing climate change.

This alternative would not reduce the threat of high-severity fire, which is a primary concern for the recovery of this species. Surface fuels would continue to increase and understory vegetation decrease or remain the same. Alternative 1 would not contribute to improving forest health or

vegetation diversity and composition, sustaining old forest structure over time, or moving forest structure toward the desired conditions.

No additional disturbance from noise, smoke, or other aspects of implementation activities would occur under this alternative.

Effects Common to Both Action Alternatives

Environmental consequences are described by MSO habitat type (e.g., protected and recovery) and designated critical habitat. Proposed treatments are similar across MSO habitat types, although the degree to which they are implemented would vary depending on specific stand conditions. Modeled results are based on stand-specific outputs and represent the variability in treatment implementation. The objectives of the treatments are to increase tree growth rates, retain large pine and oak trees, and increase forest resiliency. Recovery nest/roost habitat would be managed to maintain or achieve nest/roost conditions sooner than if they were not treated. Forest conditions in nest/roost habitat would remain at or above nest/roost values after treatments as shown in Table C.3 of the Recovery Plan.

The objective of the Rim Country treatments in MSO habitat is to improve forest structure for owls as defined in the Recovery Plan per the Condition-based Management Approach for Mechanical Treatments (Appendix D). This is different from an emphasis on fuels reduction. Large trees would be retained, and targeting mid-aged trees would improve the health, growth rates, and sustainability of large trees. Certain habitat and stand structures warrant additional consideration. For example, some MSO habitat and certain stand conditions require consideration of additional management constraints before prescribing treatments. PACs exhibit a variety of topographic and forest conditions and occupied PACs can already be considered successful nesting habitat. Mechanical treatments in PACs would be designed to maintain or improve the characteristics that make each PAC effective at providing habitat while also making them resilient to disturbance. Consideration should be given to:

1. increasing the number of large trees
2. creating additional foraging habitat for MSO
3. the fire hazard index in the PAC and whether it is in wildland-urban interface (WUI)
4. restoration and protection of other resource values nearby, such as perennial water
5. protecting other values at risk

Treating areas near PACs should be considered in order to improve resiliency in the PACs themselves. PACs should be treated with consideration of the larger landscape and not just separate entities. Specific treatments in PACs would be determined prior to implementation and in consultation with U.S. Fish and Wildlife Service (FWS) personnel. In nest/roost recovery habitat, the Condition-based Management Approach for Mechanical Treatments (Appendix D) states that, though recovery nest/roost habitat is distinct from PACs, their management objectives are similar. Any treatment proposed in MSO nest/roost recovery habitat should be designed specifically to maintain or accelerate the trajectory of these stands towards desired habitat conditions in the foreseeable future. Achieving management objectives within MSO foraging or other recovery habitat can be addressed with the condition-based management approach. Stands in recovery habitat would be assigned a treatment using the decision matrices; however, additional management direction would be applied such as maintaining increased basal area (40-110 BA for pine-oak and 40-135 BA for mixed conifer). This additional guidance is included in the project design features to ensure resource protection (see Appendix C).

Habitat Restoration in MSO Habitat

A total of 214 PACs (120,522 acres) occur in the Rim Country project area. An additional 39,748 acres either fall outside of the Rim Country boundary area (11,269 acres) or occur in other project areas (28,479 acres). These 39,748 acres will be treated as those projects planned and consulted with USFWS, except for the PACs that are in the Clint's Well, Upper Beaver Creek; and Rim Lakes project areas. These are included in this analysis for the MSO to accommodate for recent PAC boundary changes conducted with FWS in these project areas and to allow for prescribed fire within nest cores.

The 4 FRI planning team met with FWS to understand how acres of protected habitat would be selected for mechanical treatments. We worked with district wildlife biologists, fire/fuels specialists, silviculture and timber specialists from all three national forests, we reviewed each PAC for treatment needs. PACs were assessed in terms of dominant forest type (e.g., pine-oak, mixed conifer, or canyons), habitat structure, available demographic data (based on ongoing occupancy surveys or past research), topographic attributes (e.g., aspect and slope), human access, designated wilderness boundaries, recent and ongoing projects affecting PAC habitat, fire history and risk from wildfire modeling, status of current habitat, and whether mechanical treatments could move the habitat toward the desired conditions described in the Recovery Plan. No mechanical or hand treatments would occur in core areas.

Once the status of the PAC was determined, potential mechanical treatments were considered in terms of whether they could:

- Decrease the amount of time required for growing/increasing tree height and diameter;
- Decrease overall tree density while maintaining the density of large trees, and
- Increase canopy base height to improve flight zone (i.e., improve owl foraging ability) and also reduce the threat of surface fires becoming crown fires.
- In MSO PAC habitat mechanical treatment is proposed for Alternative 2, on 11,258 acres (10% of total PAC habitat in the project area) acres (table below). Hand thinning is proposed on 1,190 acres in Alternative 2. Alternative 3 has fewer acres proposed (see table below).
- Prescribed fire only is proposed on 80,898 (67%) acres of the 120,522 total acres in PACs in Alternative 2 in the 4 FRI footprint. Alternative 3 has fewer acres proposed (see table below).

Facilitative Operations using mechanical and fire treatments in Pinon-juniper cover type to support the use of prescribed fire in mixed-conifer and Ponderosa pine oak habitat is proposed on 140 acres in PAC habitat. This includes mastication/chipping; lop and scatter; thinning/limbing; and moving, rearranging, or removal of jackpots or excessive surface fuels. These areas are designed to improve safety, improve treatment effectiveness, expand burn windows, decrease undesirable fire behavior and effects, and minimize disturbance from fireline construction. Design features will be practiced reducing effects to the habitat and the species where this occurs (see analysis of effects section for Comprehensive Restoration).

Severe Disturbance areas will use a combination of restoration treatments: reforestation, prescribed fire, lopping/scattering, mastication, and other mechanical methods to identify treatments that would be effective in restoring the fuel structure that produces the types of fire to which ponderosa pine is adapted. Approximately 130 acres area proposed in PAC habitat for

Severe Disturbance treatments. Design features will be practiced reducing effects to the habitat and the species where this occurs (see analysis of effects section for Comprehensive Restoration).

Rim Country Comprehensive Restoration Activities Proposed within MSO PACs and Core Areas
Approximately 2,192 (less than 2% of total PAC habitat in the project area) acres with mechanical treatment are proposed for comprehensive restoration. Comprehensive restoration includes removing tree(s), tree canopy, or shrub encroachment of upland species with hand thinning, mechanical thinning, or prescribed fire. Comprehensive restoration using mechanical equipment in MSO habitat will follow Design Features to reduce effects to the owl and its habitat and to follow MSO Recovery Plan recommendations to promote desired conditions.

Grassland and Meadow Restoration: Mechanical vegetation treatments to remove conifer encroachment. Methods include ground-based logging systems and hand thinning to restore and sustain these habitat types. The project area has 15 acres of Grassland Restoration and 246 acres of Wet Meadow Restoration that is proposed in PACs where this could occur. Design features will be practiced reducing effects to the habitat and the species where this occurs (see analysis of effects section for Comprehensive Restoration).

Riparian and Wet Meadow Restoration: Mechanical Vegetation and prescribed fire treatments to remove encroachment using ground-based logging systems, hand thinning, and prescribed fire. Planting desirable riparian species may occur using methods ranging from planting by hand (e.g., dibble or hoedad) to a skid-steer with an auger. The project area has 1,819 acres of Riparian and 101 acres of Wet Meadow Riparian habitat proposed in PACs where this could occur. Design features will be practiced reducing effects to the habitat and the species where this occurs (see analysis of effects section for Comprehensive Restoration).

Stream Restoration: The need for stream restoration is to achieve desired conditions as defined by Land Management Plans, species recovery plans or watershed restoration action plans. Desired conditions for streams and aquatic habitats would support native fish and other aquatic species, providing the quantity and quality of aquatic habitat within the natural range of variation. This includes increasing habitat complexity such as pools and large woody debris, reducing downcutting and sedimentation, improving riparian areas that provide channel stability and leaf litter, and stream shading to maintain water temperatures. General stream restoration includes all stream restoration techniques, mechanical restoration is a subset of these methods that involve heavy equipment use. The project area has 148.2 miles of General Stream restoration and 23.3 miles of Heavy Mechanical habitat that is proposed in PACs where this could occur. (In Core areas General stream restoration is 23.3 miles and HMSR is 4.9 miles). Design features will be practiced reducing effects to the habitat and the species where this occurs (see analysis of effects section for Comprehensive Restoration).

Skid Trails, and or Tracked Harvesters

Skid trails could be needed in PACs and recovery habitats in order to accomplish thinning treatments; however, all would be rehabilitated after harvesting. Ground disturbance from skid trails can cause indirect effects from the loss of vegetation through compaction and rutting and exposure of bare mineral soil. Harvest activities with skid trails could adversely affect the prey

base on a short-term basis by affecting individuals of prey species due to disturbance of prey species' habitat. As analyzed by the Rim Country soil scientist,

“Mechanical thinning of the ponderosa pine forests of Arizona has been occurring since the 1980s mainly through whole tree harvesting on slopes less than 40 percent. Typical equipment used for such harvesting includes rubber-tired feller bunchers and rubber-tired skidders with tracked dozers used for piling of slash. The amount of disturbance as a percentage of a typical harvest unit (i.e., area included in a thinning contract) affected by compaction, rutting, and/or exposure of bare mineral soil from this type of harvesting has been estimated to be roughly 15 percent associated with feller-buncher and skidding operations, three percent associated with machine piling of slash, three percent associated with landings, and three percent associated with temporary roads (MacDonald 2013).”

Design features have been incorporated to minimize disturbance from heavy machinery operations, and thus would generally minimize compaction, rutting, and/or exposure of bare mineral soil in these areas.

Roads

Alternative 2 and 3 are the same in terms of roads proposed to haul material. The main difference is that in Alternative 3 temporary roads would be reduced from 330 to 170 miles. It is assumed that nearly all, if not all system roads within the project area could be utilized at some point in time to carry out restoration activities.

Road Maintenance- Roads that would be utilized for restoration work and hauling of forest products would likely see pre-haul maintenance if needed to make the roads passable to truck traffic, as well as maintenance during hauling and post haul maintenance. This maintenance would be in addition to a forest's regular schedule of maintenance.

Road Decommissioning- Under this alternative up to 200 miles of system road on the Coconino and Apache-Sitgreaves NFs could be decommissioned. The Tonto NF Travel Management EIS has identified approximately 290 miles of road within the Rim Country project area for decommissioning. In addition to system road decommissioning, up to 800 miles of unauthorized roads on all three forests may be decommissioned under this alternative.

Temporary Roads - Under Alternative 2 up to 330 miles of temporary road could be utilized to facilitate harvest activities. Under Alternative 3 up to 170 miles of temporary road could be utilized to facilitate harvest activities. These temporary roads may be new construction or also utilize existing unauthorized roads. Temporary roads would be decommissioned when harvesting and related restoration work is completed in the area that they access.

Mechanical Thinning and Prescribed Burning

Alternatives 2 and 3 would follow Land Management Plan direction, including implementing guidelines from the revised MSO Recovery Plan (USDI FWS 2012). Cover types may have all or some of the direction for MSO habitats, depending on location and stand structure. The objective of Rim Country treatments in MSO habitat is to improve forest structure for owls as defined in the Recovery Plan and in the Condition-based Management Approach for Mechanical Treatments (Appendix D of the FEIS).

In MSO PACs: Potentially thin and burn to improve structure, maintain and develop large trees, and reduce risk of high-severity fire in PACs. No mechanical treatments, but fire may be

implemented, in 100-acre core areas. Outside core areas, trees may be thinned and/or prescribed fire implemented where feasible to improve forest structure and minimize undesirable fire effects. Promote irregular tree spacing to create canopy gaps more conducive to treatment with prescribed fire, retain old growth attributes, protect large oaks, and ensure snags and coarse woody debris post-fire. Develop treatments in consultation with FWS.

In MSO Recovery Habitat: Follow Table C3 in revised MSO Recovery Plan for potential future nest/roost habitat and provide for owl daily movements, dispersal, and foraging habitat.

In MSO Recovery Habitat outside of potential future Nest/Roost: follow Land Management Plan guidance. Intent is to continue to develop replacement Nest/Roost where possible, otherwise treat to develop a diverse mix of heterogeneous stand structures and densities to provide for owl dispersal and foraging. Design Features have been added to mitigate disturbance to the MSO from these activities (Appendix C).

Because of planning and timing restrictions, noise disturbance to owls is not expected in PAC habitat where the majority of foraging is done by nesting owls. Owls foraging outside PACs during nesting season could potentially be displaced by thinning activities and increased truck traffic. Owls could also be displaced by harvest activities and increased truck traffic outside the nesting season. Displaced owls could be more vulnerable to predation.

Vehicular traffic would not simultaneously increase across the entire implementation area, but harvest-related traffic increases would occur in localized areas somewhere on the landscape for every year of implementation. Most traffic is expected to occur during diurnal hours when MSO activity would be minimal. However, hauling of materials from harvest locations to highways could occur at night when owls are active. Once harvest activities are complete, traffic is expected to return to pre-harvest levels.

The amount of traffic increases the risk of collisions between owls and trucks. There have been documented instances of spotted owls being hit by vehicles on paved and unpaved roads. Although little information is available on the frequency or conditions related to the risk of collisions, the assumption is being made that, because of the scale of increase in truck traffic, the risk of collisions with owls would increase. The threat of collisions would be reduced below existing conditions in the long-term as a result of road decommissioning.

Protected Habitat

Table 25. Proposed Treatments in Rim Country in PACs

Proposed Treatments	PAC Category: Prescribed Fire Only (39 PACs)	PAC Category: Mechanical & Prescribed Fire (33 PACs)	PAC Category: Mechanical & Prescribed Fire & Comprehensive (43 PACs)	PAC Category: Prescribed Fire & Comprehensive (62 PACs)	PAC Category: Comprehensive Restoration Only (26 PACs)	PAC Category: No Proposed Treatments (11 PACs)	Total Acres by Treatment
Prescribed Fire Only Total	17,228	12,098	17,650	33,922			80,898
Facilitative Operations Prescribed Fire Only	1,315	299	907	6,245			8,764
Prescribed Fire Only	15,913	11,800	16,743	27,677			72,133
Mechanical/Hand Thin & Prescribed Fire Total		5,468	6,980				12,448
Facilitative Operations Mechanical		140					140
PAC - Hand Thin		747	443				1,190
PAC – Mechanical		4,526	6,462				10,987
Severe Disturbance Area Treatment		55	75				130
Comprehensive Restoration (Prescribed Fire Only) Total			292	850	214		1,356
Grassland Prescribed Fire Only				43			43
Riparian Prescribed Fire Only			286	777	185		1,249

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Proposed Treatments	PAC Category: Prescribed Fire Only <i>(39 PACs)</i>	PAC Category: Mechanical & Prescribed Fire <i>(33 PACs)</i>	PAC Category: Mechanical & Prescribed Fire & Comprehensive <i>(43 PACs)</i>	PAC Category: Prescribed Fire & Comprehensive <i>(62 PACs)</i>	PAC Category: Comprehensive Restoration Only <i>(26 PACs)</i>	PAC Category: No Proposed Treatments <i>(11 PACs)</i>	Total Acres by Treatment
Wet Meadow & Riparian Prescribed Fire Only			3	16	13		32
Wet Meadow Prescribed Fire Only			3	14	16		33
Comprehensive Restoration (Mechanical & Prescribed Fire) Total			671	921	600		2,192
Grassland Restoration			3	12			15
Riparian Restoration			617	827	376		1,819
Wet Meadow & Riparian Restoration			6	22	73		101
Wet Meadow Restoration			46	60	152		258
No Proposed Treatments	717	111	97	1,269	14,955	6,478	23,628
Grand Total	17,945	17,678	25,690	36,962	15,769	6,478	120,522

Implementation in MSO habitat will follow these guidelines:

- Silvicultural prescriptions will follow the Revised Recovery Plan recommendations with the goal to improve habitat for the MSO and provide protection from high severity wildfire.
- No trees $\geq 18''$ will be cut in PACs or nest/roost recovery habitat unless it is a hazard to operators.
- Prescribed burning is the only treatment that will occur in nest core areas. All the core areas in PACs proposed for treatment will be treated with prescribed fire without mechanical treatment as per the revised MSO Recovery Plan recommendations (USDI 2012).

The number of PACs proposed for treatments and the acreage displayed is not additive. Some PACs have multiple types of treatments (mechanical equipment for thinning, comprehensive restoration prescribed burning).

As many as seventy seven (77) PACs on (11,258 acres) have mechanical treatments with prescribed fire to thin and remove vegetation proposed in them from Rim Country, or for hand thinning to remove vegetation on 1,190 acres (12,448 total acres; table 4-8). District specialists including Wildlife Biologists, Timber Specialists, Silviculture Specialists, and Fire Specialists reviewed the PACs to determine the priority status from risk of wildfire (High, Medium, Low, and No Risk/Inaccessible) and a temporal rating, indicating when the PAC would most likely have treatments implemented (Temporal Rating (1= 1-5 years 2= 5-10 years 3= 10-20 years)).

The environmental baseline condition for each of these PACs describing thinning and burning actions from the past 20 years, including wildfires in the PACs and 1/2-mile buffer around the PACs, are described and mapped in the PAC Atlas descriptions (the PAC atlas is not publically available because it includes nesting and roosting locations). The PACs in the project area are included in the proposed action and baseline condition maps. These 77 PACs with mechanical treatment and 5 with Hand Thinning Only (HTO) proposed also have a narrative in the descriptions of treatment, describing specific activities with a justification for why managers feel treatments are necessary to protect and promote MSO habitat.

Five (5) PACS have hand thinning and prescribed fire proposed (1,190 acres). Four (4) of these also have Comprehensive Restoration proposed within the PAC.

Eight-eight (88 PACs 2,192 acres) are not included in the Atlas descriptions as 62 have mechanical equipment proposed for comprehensive restoration and prescribed burning with the other 26 having mechanical equipment for comprehensive restoration without prescribed burning proposed for 4 FRI (table 4-6). Design features will be practiced reducing effects to the habitat and the species where this occurs (see analysis of effects section for Comprehensive Restoration).

Prescribed burning only (no mechanical treatment prior to burning) is proposed in portions of 177 PACs (80,898 acres; 67% of the total PAC acres in the project area) as the implementation tool, including the PAC core areas. An additional 1,356 acres would use prescribed fire only for

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comprehensive restoration in 26 PACs (table 4-6). These “fire only” PACs are included in the analyses of effects to the MSO and MSO Critical Habitat. Additionally, eleven (11) PACs (6,478 acres) do not have any 4 FRI related activities proposed and are only included in the analyses of effects to the MSO and MSO Critical Habitat because they are in the project area.

New PACs Added Post-Analyses in 2021

Seven (7) new PACs were found and added to the project area after the FVS and fire modeling were completed. Three are in Pine Canyon on the Tonto NF, and 4 are on the A-S NF. Consultation for the mechanical treatment proposed in these 7 PACs is handled in the Addendum to the Rim Country BA (Christina Akins consultation with USFW, 2021, 3 PACs in Pine Canyon), and through updated consultation on the Rim Lakes and Nagel NEPA (Suzanne Derosier consultation, with USFW, 2021 for 4 new PACs. These documents have been added to the project record. In addition to the 7 new PACs the A-S revised the boundaries and core areas of 3 additional PACs included in previous analyses (Double Cabin, Long Tom, and Waters Draw). Prescribed burning in the PACs core areas, as well as comprehensive restoration in the 7 new and 3 altered PACs are being consulted upon through Rim Country BA addendum The tables below summarize the new PAC acres and core areas and what is proposed in them. The third table below shows the 3 altered PACs on the A-S with a crosswalk of what has changed in them from the initial analyses.

Table 26. Summary of new PAC and core area acres

PAC Name	PAC Outside Core Area	PAC Core Area	PAC Total
A-S New PACs	2,104	471	2,575
Cliff Springs - 030104040	576	111	687
Elk Rub - 030105027	535	133	668
Noisy - 030104038	477	127	604
Rancho - 030104039	516	100	616
Tonto New PACs	1,393	100	1,493
Dripping Springs - 031204029	390	100	491
LoMia - 031204031	549	TBD	549
Parsnip - 031204030	454	TBD	454
Grand Total	3,497	571	4,068

Table 27. Proposed treatments for new PACs

Proposed Treatment by PAC	Alt2	Alt3
Total for New PACs on A-S	2,575	2,575
Cliff Springs - 030104040	687	687
Facilitative Operations Prescribed Fire Only	6	6
Prescribed Fire Only	681	681
Elk Rub - 030105027	668	668

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Proposed Treatment by PAC	Alt2	Alt3
Facilitative Operations Prescribed Fire Only	626	
Riparian Prescribed Fire Only	9	9
Riparian Restoration	34	34
N/A		626
Noisy – 030104038	604	604
Facilitative Operations Prescribed Fire Only	49	49
Prescribed Fire Only	521	521
Riparian Prescribed Fire Only	12	12
Riparian Restoration	22	22
N/A		0
Rancho - 030104039	616	616
Facilitative Operations Prescribed Fire Only	78	
Prescribed Fire Only	516	
Riparian Restoration	8	8
Wet Meadow & Riparian Restoration	3	3
Wet Meadow Restoration	12	12
N/A		594
Total for New PACs on Tonto	1,493	1,493
Dripping Springs - 031204029	491	491
PAC – Mechanical	87	87
Prescribed Fire Only	404	404
LoMia – 031204031	549	549
PAC – Mechanical	172	172
Prescribed Fire Only	377	377
Riparian Restoration	0	0
Parsnip – 031204030	454	454
PAC – Mechanical	54	54
Prescribed Fire Only	389	389
Riparian Restoration	11	11

Table 28. Cross walk of change to the 3 PACs on the A-S

PAC Name and ID	Updated PAC Outside Core Area	Updated PAC Core Area	Updated PAC Total	Previous PAC Outside Core Area	Previous PAC Core Area	Previous PAC Total	Net Change PAC Outside Core Area	Net Change PAC Core Area	Net Change PAC Total
Double Cabin – 030104003	469	131	600	498	103	600	-28	28	0
Long Tom – 030105013	577	105	682	510	113	622	67	-7	60
Waters	500	123	623	503	110	613	-3	13	10

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PAC Name and ID	Updated PAC Outside Core Area	Updated PAC Core Area	Updated PAC Total	Previous PAC Outside Core Area	Previous PAC Core Area	Previous PAC Total	Net Change PAC Outside Core Area	Net Change PAC Core Area	Net Change PAC Total
Draw – 030104030									
Total	1,546	359	1,905	1,510	325	1,836	36	34	70

Proposed Treatments in MSO Recovery Habitat

In MSO Nest/Roost recovery habitat mechanical treatment with prescribed fire is proposed for 27,078 acres (71% of the total 38,092 Nest/Roost recovery habitat within the project area); which includes 25,442 acres of mechanical treatment implementing a silvicultural treatment that follows recovery plan recommendations for MSO Nest/Roost habitat, and 1,636 acres of Comprehensive Restoration proposed. Prescribed fire only is proposed on an additional 3,174 acres (table below).

In MSO Foraging/Non-breeding recovery habitat mechanical treatment with prescribed fire is proposed for 129,343 acres (70% of the 183,686 total Foraging/Non-breeding recovery habitat within the project area); which includes 125,998 acres of mechanical treatment following MSO Recovery Plan recommendations and 3,345 acres of Comprehensive Restoration proposed. Prescribed fire only is proposed on an additional 7,802 acres (table below).

Effects Analyses for Nest/Roost and Foraging/Non-breeding recovery habitat is included below in Analysis of Effects to the MSO, Vegetation Changes. Forest Vegetation System (FVS) model runs are discussed with effects modeled 10- and 20-years post treatment for habitat variables important to the MSO and MSO Critical habitat.

Table 29. Proposed Rim Country treatments in MSO Recovery Habitat from Alternative 2

MSO Recovery Habitats by Treatment	MSO Recovery Foraging/Non-Breeding	MSO Recovery Replacement Nest/Roost	Grand Total
Pine-Oak	86,615	13,422	100,037
Facilitative Operations Mechanical	115		115
Facilitative Operations Prescribed Fire Only	2		2
Grassland Restoration	321	71	391
MSO Recovery - Replacement Nest/Roost		12,000	12,000
Prescribed Fire Only	2,658	508	3,165
Riparian Prescribed Fire Only	8	68	76
Riparian Restoration	718	571	1,289
Stand Improvement - High Site	4,837		4,837
Stand Improvement - Moderate Site	8,354		8,354
Stand Improvement - Low Site	4,452		4,452
Uneven-aged - High Site	29,130		29,130
Uneven-aged - Moderate Site	27,451		27,451

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MSO Recovery Habitats by Treatment	MSO Recovery Foraging/Non-Breeding	MSO Recovery Replacement Nest/Roost	Grand Total
Uneven-aged - Low Site	8,234		8,234
Wet Meadow & Riparian Prescribed Fire Only		148	148
Wet Meadow & Riparian Restoration	49	4	52
Wet Meadow Restoration	287	53	340
Mixed Conifer	24,924	12,849	37,773
Facilitative Operations Mechanical	1,463	577	2,039
Facilitative Operations Prescribed Fire Only	661	606	1,267
MSO Recovery - Replacement Nest/Roost		9,156	9,156
Prescribed Fire Only	4,373	1,803	6,175
Riparian Prescribed Fire Only	25	21	46
Riparian Restoration	501	511	1,012
Stand Improvement - High Site	1,020		1,020
Stand Improvement - Moderate Site	735		735
Stand Improvement - Low Site	650		650
Uneven-aged - High Site	7,604		7,604
Uneven-aged - Moderate Site	5,826		5,826
Uneven-aged - Low Site	1,702		1,702
Wet Meadow & Riparian Prescribed Fire Only	75		75
Wet Meadow & Riparian Restoration	29	32	62
Wet Meadow Restoration	259	143	401
Geophysical Model	30,364	3,388	33,751
Facilitative Operations Mechanical	2,925	222	3,148
MSO Recovery - Replacement Nest/Roost		2,864	2,864
Riparian Restoration	1,194	301	1,495
Severe Disturbance Area Treatment	248		248
Stand Improvement - High Site	616		616
Stand Improvement - Moderate Site	2,139		2,139
Stand Improvement - Low Site	611		611
Uneven-aged - High Site	9,545		9,545
Uneven-aged - Moderate Site	10,989		10,989
Uneven-aged - Low Site	2,092		2,092
Wet Meadow & Riparian Restoration	5		5
Grand Total	141,902	29,659	171,561

Cable Operations In Mexican Spotted Owl Recovery habitat

No cable operations will be used in PACs. Cable operations could occur in MSO Recovery habitat.

Table 30. Potential Areas for Cable Operations in Critical Habitat, Alternative 2

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Habitat	Coconino	Sitgreaves	Tonto	Grand Total
MSO Recovery Mixed Conifer	488	1,200	2,433	4,121
MSO Recovery Replacement Nest/Roost	185	252	846	1,282
MSO Recovery Foraging/Non-Breeding	304	949	1,587	2,839
MSO Recovery Pine-Oak	1,184	1,085	11,505	13,774
MSO Recovery Replacement Nest/Roost	205	292	1,985	2,482
MSO Recovery Foraging/Non-Breeding	978	793	9,520	11,291
MSO Recovery Geophysical Model			13,091	13,091
MSO Recovery Replacement Nest/Roost			1,281	1,281
MSO Recovery Foraging/Non-Breeding			11,810	11,810
Grand Total	1,672	2,285	27,028	30,985

Table 31. Potential Areas for Cable Operations in Critical Habitat, Alternative 3

Habitat	Coconino	Sitgreaves	Tonto	Grand Total
MSO Recovery Mixed Conifer	477	458	2,291	3,227
MSO Recovery Replacement Nest/Roost	185	126	791	1,102
MSO Recovery Foraging/Non-Breeding	293	333	1,500	2,125
MSO Recovery Pine-Oak	868	415	7,092	8,376
MSO Recovery Replacement Nest/Roost	143	78	1,378	1,599
MSO Recovery Foraging/Non-Breeding	726	338	5,714	6,777
MSO Recovery Geophysical Model			10,429	10,429
MSO Recovery Replacement Nest/Roost			1,261	1,261
MSO Recovery Foraging/Non-Breeding			9,168	9,168
Grand Total	1,346	873	19,812	22,032

Effects will be short-term reduction of understory in the areas under the cables. Long-term benefits of wildfire severity reduction will offset the short-term disturbance to the habitat.

Cable Operations In Mexican Spotted Owl Critical Habitat

Effects are the same as in Recovery Habitat above.

Table 32. Potential Area for Cable Operations in MSO Critical habitat, Alternative 2

Habitat	BR-W-5	UGM-10	UGM-11	UGM-7	Grand Total
MSO Recovery Mixed Conifer	87	5,030	1	551	5,669
MSO Recovery Replacement Nest/Roost		2,435		30	2,465
MSO Recovery Foraging/Non-Breeding	87	2,595	1	521	3,204
MSO Recovery Pine-Oak	3,746	6,028	21	205	10,001
MSO Recovery Replacement Nest/Roost	647	1,905			2,552
MSO Recovery Foraging/Non-Breeding	3,099	4,123	21	205	7,449
MSO Recovery Geophysical Model	3,640	5,685			9,325
MSO Recovery Replacement Nest/Roost	89	765			855

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MSO Recovery Foraging/Non-Breeding	3,550	4,920			8,470
Non-MSO Habitat	4,246	12,742	7	357	17,351
Grand Total	11,718	29,486	29	1,113	42,346

Table 33. Potential Areas for Cable Operations in MSO CH

Habitat	BR-W-5	UGM-10	UGM-11	UGM-7	Grand Total
MSO Recovery Mixed Conifer		2,606	1	247	2,853
MSO Recovery Replacement Nest/Roost		1,023		19	1,042
MSO Recovery Foraging/Non-Breeding		1,583	1	227	1,811
MSO Recovery Pine-Oak	2,479	4,698	21	118	7,317
MSO Recovery Replacement Nest/Roost	299	1,300			1,599
MSO Recovery Foraging/Non-Breeding	2,179	3,399	21	118	5,718
MSO Recovery Geophysical Model	2,393	5,538			7,932
MSO Recovery Replacement Nest/Roost	70	765			835
MSO Recovery Foraging/Non-Breeding	2,324	4,773			7,097
Non-MSO Habitat	2,263	10,234	5	71	12,573
Grand Total	7,135	23,077	27	436	30,675

In-woods Processing Sites

Twelve processing sites are proposed for use in the Rim Country project area (table 4-2 and figure 4-1). These are in addition to the processing sites included in the CC Cragin Watershed Restoration Project (figure 1). No processing sites are located on the Apache-Sitgreaves NF. Processing site location and siting considerations included the following: flat uplands less than 5% slope; more than 200 feet distant ephemeral and intermittent stream channels (except for two sites), more than 300 feet from meadows, springs and karst features; more than 0.25 miles from MSO PACs, more than 0.25 miles from system hiking trails, campgrounds and group event recreation sites; and more than 0.25 miles from private lands, residences or offices. Processing sites were located to provide for a buffer of 100 or 300 feet from Forest roads and state highways to provide for visual screening from Concern Level 1 and 2 travel ways. Site boundaries are approximate and may be further modified during implementation and layout.

Table 34. Processing Sites Analyzed in Rim Country.

Site Name	Acres
FR 117, 1321	4
FR 137, 96	18
FR 145A, 9615X	7
FR 288, 2781	4
FR 294, 294D	18
3238, 512	20
FR 582, Hwy 87	5
FR 609, 1938	7
FR 74, 64	8
FR 81, 81E	7
9364L, FH 3	21
9731G, Hwy 87	9
Total (12)	128

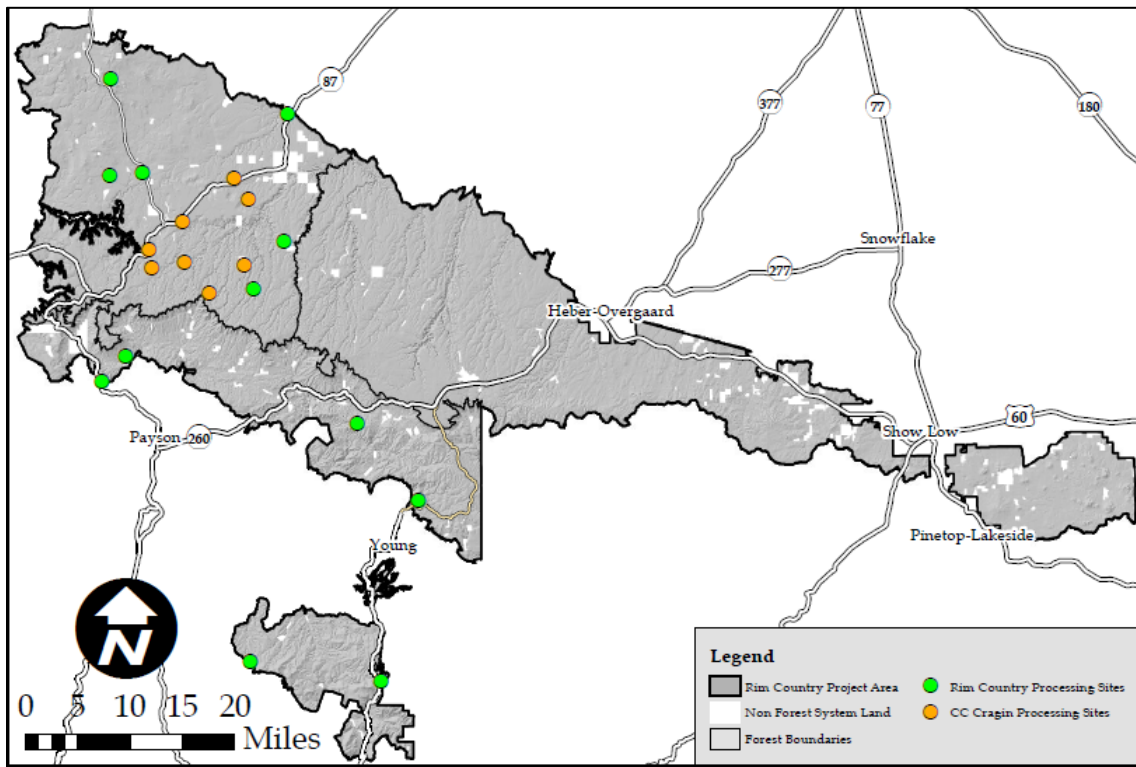


Figure 6. In-Woods Processing Sites in the Rim Country 4 FRI Project Area

The twelve processing site areas may be used as part of the 4FRI project over its implementation period from 10 to 20 years. Continuous use processing sites are those where use is expected to be continuous on a regular basis for 10-20 years. These sites typically consist of the larger sites 10-15 acres in area that are located close to major highways. Sites originally developed and operated as continuous use would frequently change to intermittent use or occasional use following initial harvest activities in the area. Intermittent use processing sites are those where use is expected to be shorter term and used for one or multiple timber sale or stewardship contract periods lasting from 3-10 years.

Design features for processing sites including: allowed operations and facilities, authorization, construction, operation, maintenance, rehabilitation, closure and monitoring are found in Appendix C, and include examples such as:

- Shape and/or feather the edges of treatment areas to avoid abrupt changes between treated and untreated areas. Standing trees and shrubs around processing sites shall be left in strategic locations to serve as screening to sensitive viewsheds.
- All constructed features including but not limited to fencing, office trailers, sanitation facilities, fuel storage containers or temporary structures shall be designed to blend with surrounding environment. Color of proposed above ground features shall be non-reflective and treated to be forest service brown or for a rusty appearance, or as approved by FS landscape architect or other FS official.

- No ground disturbance from in-woods processing site development or operation would occur within 1/4 miles of Mexican spotted owl PAC or northern goshawk PFAs, unless a wildlife biologist determines this restriction is unnecessary (Unless subsequent finalized revised Land Management Plan Species of Conservation Concern determinations do not include northern goshawk).

The processing of biomass at up to twelve different sites within or immediately adjacent to the project area may involve such tasks as drying and debarking of logs; chipping stems, bark, and limbs; cutting logs; sorting logs; producing wood cants (logs sawn flat on one to four sides); scaling and weighing logs; and creating poles from suitable sized logs. Equipment that may be used at processing sites includes circular or band saws, various sizes and types of front-end loaders, log loaders, chippers of several types, mechanized cut to length systems, associated conveyers and log sorting bunks for accumulation and storage of logs, as well as electric motors and gas or diesel generators to provide power. Aboveground fuel storage tanks may be necessary to provide on-site fuel to equipment.

The twelve biomass processing sites that have been proposed range in size from 5 to 21 acres. These sites were screened so as to be located outside of meadows where some of the most productive forest soils are found, and in relatively flat areas. The siting of processing sites in relatively flat areas would minimize the need for extensive site grading.

In order to facilitate the types of tasks and equipment that may be used at these sites, they would typically have to be cleared and grubbed (i.e., vegetative cover and trees removed) resulting in displacement of top soil and exposure of subsoil. The operation of equipment on these sites would result in compaction of the soil, reducing the ability of soils to infiltrate water. Areas of exposed soil would have to be covered with aggregate to minimize erosion and facilitate use of the site. The aggregate surfacing would cover the surface soil where it is not graded, and would protect the soil productivity. Various permits would need to be obtained for fuel storage, industrial site use and stormwater pollution prevention. These permits would help to minimize effects on soil productivity and function. Aboveground fuel storage tanks would have to be manufactured, installed, and operated in accordance with Federal, state, and local requirements. For example, a permit for installation of an aboveground storage tank would have to be obtained through the Arizona State Fire Marshall's Office (<https://www.dfbls.az.gov/ofm/AGST.aspx>). Additionally, the processing sites would likely be regulated as industrial sites subject to permitting under Arizona Department of Environmental Quality's (ADEQ) Multi-Sector General Permit (MSGP) program. This permit program requires that certain industrial facilities, including those involved in the types of activities that would likely occur at the processing sites, implement control measures and develop site-specific stormwater pollution prevention plans (SWPPP) to comply with Arizona Pollutant Discharge Elimination System (AZPDES) requirements. Among other things, the SWPPP would have to identify best management practices that minimize non-point source water pollution including measures to minimize or prevent soil erosion and contamination.

Following completion of use of processing sites and removal of all equipment and materials, operators would conduct site rehabilitation including but not necessarily limited to removal of aggregate, restoration of pre-disturbance site grades, decompaction of soil for seedbed preparation, and seeding and mulching of the site with native grasses and forbs.

Rock Pits

In order to provide adequate sources of road surfacing material, rock pits would be needed to be utilized and expanded within the project area (table 35, figure 07). The situation is different on all 3 forests within Rim Country (see below for a description of each NF). All rock pits are either greater than ¼ mile away from an MSO PAC or would have seasonal operating restrictions (see design features below). All rock pits are located outside of goshawk PFAs. Design features (Appendix C), would protect other wildlife species and natural resources from disturbance at rock pits.

Coconino- Pit expansion and new pit creation was previously analyzed for 8 pits within the Rim Country project area under the previous NEPA analysis, (Rock Pits Environmental Assessment Coconino and Kaibab National Forest June 2016). This work has already been analyzed for effects to natural resources and wildlife and requires no further analysis under Rim Country. In addition existing pits may have material removed from them but not expanded. All of the pits that could potentially have material removed from them as a part of work involved with Rim Country are shown in the figure.

Apache- Sitgreaves- The Black Mesa and Lakeside districts of the Apache-Sitgreaves are within the Rim Country project area. Surfacing material needs within the Lakeside district are met by a large county operated pit under special use permit and other commercial sources. No additional pit expansion or operations are proposed on the Lakeside district.

On the Black Mesa District 11 existing pits are proposed for expansion. The location of these pits are shown on the attached map. In order to allow for potential future material needs, all pits are proposed for a 30 percent expansion of their current foot print. Current acreage and proposed future acreage are shown in the table below.

Table 35. Apache-Sitgreaves, Black Mesa Ranger District rock pit expansion

Pit Name	Current Acreage	Possible Increase in Acreage	Possible Future Total Acreage	Maximum Expansion in Feet from Existing Pit
34T	14	4	18	500
213	7	2	9	500
Pias Farm	6	2	8	500
115	7	2	9	500
717E	2	1	3	400
34B	2	1	4	500
Promontory	16	5	21	700
Carr Lake	12	4	16	600
Brookbank	1	1	2	400
Borrow	12	4	16	600
Cottonwoods Wash	6	2	8	500
Total	85	28	114	N/A

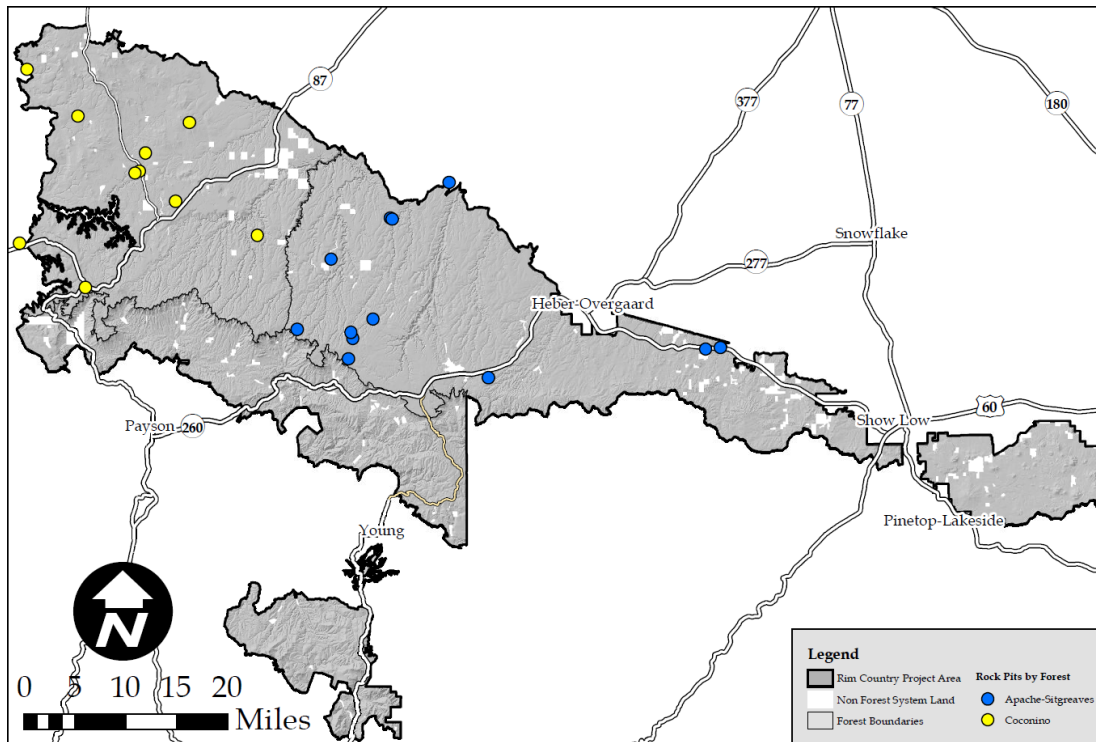


Figure 07. Rim Country Rock Pits on the Coconino and A-S

Rock pits average 11.2 acres in size (range = 3.9 to 23.8 acres). It is expected that proposed rock pit sites would include some level of activity (for approximately 3-8 weeks every 2-5 years) for up to twenty years. All 11 rock pits on the Black Mesa District of the Apache-Sitgreaves NF would have expansion to the existing disturbance footprint.

The materials from the rock pits may be used for a variety of road maintenance activities, from general maintenance of primary roads to construction or rehabilitation of temporary roads (which had been authorized under other NEPA decisions). The proposed development and reclamation of rock pits would include hauling of equipment and aggregate materials to and from the pits for use in general and project-specific road maintenance, road repair, and erosion control.

Pits may also be used by other organizations such as county, city, or state entities, when consistent with the provisions in the “Disposal of Mineral Material” regulations at 36 CFR 228 Subpart C.1 Many projects using aggregate materials cannot be predicted because they are needs-based (e.g., spot gravelling roads for general maintenance after a monsoon storm), or are scheduled in a way that allows for continual adjustment (e.g. permitting county access to a pit that can be used for maintenance of county roads).

The Rim Country proposed action incorporates a number of design features to limit the potential effects from rock pit development, operation, and hauling to wildlife and other resources (Appendix C).

- Rock pits within ½ mile of MSO recovery and protected habitat would be surveyed to protocol to determine occupancy by owls before operations are initiated, unless a wildlife biologist determines this restriction is unnecessary.

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- No ground disturbance from rock pit development or operation would occur in known PACs, or within 1/4 miles of nests and roosts during the nesting season, unless a wildlife biologist determines this restriction is unnecessary.
- Material hauling from rock pits in or within 1/4 miles of occupied PACs would occur outside of the Mexican spotted owl nesting season unless a wildlife biologist determines this restriction is unnecessary.
- Pit development and operation within occupied northern goshawk PFAs may occur when surveys have indicated there are no active nests. If surveys identified an occupied nest, all operational activities and hauling would be avoided March 1 - September 30th unless a wildlife biologist determines this restriction is unnecessary.
- Prior to reinitiating operations in rock pits where standing water is pooled, a biologist will determine if aquatic surveys for sensitive or threatened species should occur.
- Protect active raptor nest sites from disturbance by project-related activities by restricting activities during nesting season as specified in the applicable Land Management Plan, or as determined by a local wildlife biologist. Known nest trees for any raptor species will be prepped, as needed, to avoid negative impacts to survival or successful reproduction, prior to implementing management activities, including prescribed fire.

Tonto- The Tonto NF plans to meet all road surface material needs from local commercial sources and no pit operations or expansion on Forest Service lands are proposed under Rim Country on the Tonto Forest.

Alternative 2. The Modified Proposed Action

Vegetation Changes

Treatments in MSO habitat were modeled using FVS by the 4FRI Silvicultural Specialist. Tables below show habitat variables in pine-oak, and mixed conifer cover types, as well as using the Geophysical Model (Tonto NF Recovery Habitats) important to the MSO with modeled results in the existing condition, 10 years into the future, and 20 years into the future post treatment to show effects from treatments through time.

MSO Protected Habitat

Table 36. FVS Modeling of Key Habitat Variables for the MSO in Mixed Conifer and Pine-Oak Protected from Alternative 2, 10, and 20 Years Post Treatment from Alternative 2

PACs including Nest Core Areas Mixed Conifer = 18,180 Acres Modeled Pine-Oak = 64,165 Acres Modeled	Existing Condition	Proposed Action 10 Years	Proposed Action 20 Years	Desired Condition
Average of BA Mixed Conifer	158	126	125	Minimum 120
Average of BA Pine-Oak	144	116	111	Minimum 110
Average of TPA >18" Mixed Conifer	18	19	20	Minimum 12 TPA >18"
Average of TPA >18" Pine-Oak	14	15	16	Minimum 12 TPA >18"
Average of Snags	3	6	5	Promote snags for

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PACs including Nest Core Areas Mixed Conifer = 18,180 Acres Modeled Pine-Oak = 64,165 Acres Modeled	Existing Condition	Proposed Action 10 Years	Proposed Action 20 Years	Desired Condition
12-18" Mixed Conifer				Nest/Roost and prey base
Average of Snags 12-18" Pine-Oak	2	5	5	Promote snags for Nest/Roost and prey base
Average of Snags >18" Mixed Conifer	3	3	3	3 Per acre in MC
Average of Snags >18" Pine-Oak	1	2	2	1-2 per acre PO
Average of Canopy Cover Mixed Conifer	66	60	61	Minimum 60 %
Average of Canopy Cover Pine-Oak	65	60	58	Minimum 40 %
Average of Surface Fuel Mixed Conifer	26	25	25	Maintain to promote surface fire
Average of Surface Fuel Pine-Oak	19	19	19	Maintain to promote surface fire
Average of CWD Mixed Conifer	9	11	11	Maintain to promote surface fire 5-15 TPA
Average of CWD Pine-Oak	8	9	9	Maintain to promote surface fire 3-10 TPA
Average of Surface_Herb Mixed Conifer	0.21	0.24	0.25	Herbaceous biomass increases over time for prey species habitat
Average of Surface_Herb Pine-Oak	0.21	0.22	0.23	Herbaceous biomass increases over time for prey species habitat
Average of Surface_Shrub Mixed Conifer	0.36	0.56	0.64	Shrub biomass increases over time for prey species habitat
Average of Surface_Shrub Pine-Oak	0.24	0.24	0.22	Shrub biomass increases over time for prey species habitat

In PACs after 20 years post treatment average BA is reduced for both mixed conifer and ponderosa pine-oak cover types. In Mixed conifer average BA of trees DBH moves from 158 to 125 after 20 years of treatments in PACs. Pine-oak average BA is reduced from 144 in the existing condition to 111. Silvicultural prescriptions will promote growth of large trees and managers should seek to maintain BAs above the minimum recovery plan recommendations or seek to increase BA averages. Trees Per Acre (TPA) were modeled in PAC habitat to show effects from implementation over twenty years. Results show that TPA in mixed conifer cover type increases trees greater than 18 inches from 18 TPA in the existing condition to 20 TPA after two decades of implementation. Results show that in Ponderosa pine-Oak cover type TPA increases trees greater than 18 inches from 14 TPA in the existing condition to 16 TPA after two

decades of implementation. Results from both cover types will exceed minimum Recovery Plan Recommendations of 12 per acre. A linear regression from BA was used to estimate canopy cover (Shephard et al, in Parker et al. 2002). These estimates indicate that treatments would align with MSO Recovery Plan recommendations in mixed conifer with canopy cover 61%, and in pine oak, with canopy cover higher than the recommended 40%, measuring 58% from the Proposed Action.

Shrub and herbaceous biomass would also be maintained or increase in the Proposed Action. FVS modeling shows 20 years post treatment will reduce risk of crown fire and the fire hazard index, while increasing coarse woody debris, downed logs, and snags $\geq 12''$ (with 3 snags $\geq 18''$ in mixed conifer and 1-2 snags per acre $\geq 18''$ in Pine oak cover type) in MSO protected habitat.

Table 37. PAC, Mixed Conifer Cover Type for Tree Size Classes FVS Model from Alternative 2, 10, and 20 Years Post Treatment

Tree Size Class	Basal Area Existing	% of BA Existing	Basal Area Proposed Action after 10 years	% of BA Proposed Action after 10 years	Basal Area Proposed Action after 20 years	% of BA Proposed Action after 20 years
1 (0-1")	1	1%	0	0%	0	0%
2 (1-5")	13	8%	6	5%	3	2%
3 (5-12")	46	29%	29	23%	27	21%
4 (12-18")	46	29%	36	28%	35	28%
5 and (6 >18")	52	33%	55	44%	61	48%
Total BA	158		126		125	

Table 38. PAC, Ponderosa Pine-Oak Cover Type for Tree Size Classes FVS Model from Alternative 2, 10, and 20 Years Post Treatment

Tree Size Class 1-6	Basal Area Existing	% of BA Existing	Basal Area Proposed Action after 10 years	% of BA Proposed Action after 10 years	Basal Area Proposed Action after 20 years	% of BA Proposed Action after 20 years
1 (0-1")	1	1%	0	0%	0	0%
2 (1-5")	13	8%	6	4%	4	3%
3 (5-12")	46	29%	29	23%	23	18%
4 (12-18")	44	28%	39	31%	38	30%
5 and (6 >18")	40	25%	42	34%	47	37%
Total BA	144		116		111	

In mixed conifer 20 years post treatment trees 12-18" DBH are decreased by 1% going from 29% in the existing condition to 28%. which stays near MSO Recovery Plan minimum recommendations of 30%. In the pine-oak cover type in PACs trees 12-18" DBH go from 27% in the existing condition to 30% after 20 years of treatment which meets MSO Recovery Plan minimum recommendations of 30%. In mixed conifer cover type trees > 18" will go from 33% in the existing condition to 48% of the trees in PACs greater than 18" after 20 years post treatment. In the pine oak cover type trees >18" go from 25% total trees greater than 18" in the existing condition to 37% total of trees in the PAC greater than 18" DBH after 20 years post treatment.

Treatment in PACs will be consistent with recovery plan management recommendations and

desired conditions which includes a diversity of trees with the goal of having trees ≥ 16 " DBH contributing $\geq 50\%$ of the stand BA (Table C.2 from the Revised MSO Recovery Plan, 2012). In the mixed conifer cover type trees > 18 " DBH represent 48% of all trees in the PAC larger than 18" after 20 years post treatment. In the Ponderosa Pine-Oak cover type trees > 18 " DBH represent 37% of all trees in the PAC. Combined with the 12-18" age class (30% of trees in the PAC in this size class) it is likely that trees > 16 " DBH are near 50% or greater. This will provide for all life history needs (nesting, roosting, foraging) by emphasizing large trees, and should provide for large snags and logs (Ganey et al. 2003).

MSO Nest/Roost Recovery Habitat

The table below shows the FVS modeled effects from vegetation treatments by alternative to key MSO habitat variables in pine-oak, mixed conifer, and for acres that were identified by using the geophysical model for Other Forest Cover Type/Canyon Habitat with pine and conifer stringers (Tonto NF) in Nest/Roost Recovery Habitat. In MSO Nest/Roost recovery habitat, the treatments would maintain or increase most habitat variables important to the MSO while treating and ultimately conserving these conditions over time.

Preserving MSO habitat by using thinning and burning treatments, while promoting large trees and reducing risk of fire hazard index and crown fire, is one of the main objectives of the action alternatives in Rim Country (returning resiliency to the forested ecosystem).

Trees Per Acre (TPA) in Nest Roost Recovery habitat were modeled to show effects from implementation over twenty years. Results show that TPA in mixed conifer cover type increases trees greater than 18 inches from 24 TPA in the existing condition to 26 TPA after two decades of implementation. Results show that in Ponderosa pine-Oak cover type show TPA increases trees greater than 18 inches from 20 TPA in the existing condition to 23 TPA after two decades of implementation. In acres modeled using the geophysical model FVS model results show TPA increases trees greater than 18 inches from 18 TPA in the existing condition to 20 TPA after two decades of implementation. Results from both cover types and from the acres selected using the geophysical model will exceed minimum Recovery Plan Recommendations of 12 per acre.

Shrub and herbaceous biomass would also be maintained or increase in the Proposed Action. FVS modeling shows 20 years post treatment will reduce risk of crown fire and the fire hazard index (decreasing fuel loading), while increasing coarse woody debris, downed logs, and snags ≥ 12 " (with 3 snags ≥ 18 " in mixed conifer and 2 snags per acre ≥ 18 " in Pine oak cover type) after 20 years post treatment in MSO Nest/Roost recovery habitat.

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Table 39. FVS Modeling of Key Habitat Variables for the MSO in Mixed Conifer, Pine-Oak, and acres identified using the Geophysical Model (Tonto NF) in Nest/Roost Recovery Habitat from Alternative 2, 10, and 20 Years Post Treatment

MSO Recovery Replacement Nest/Roost Mixed Conifer = 12,849 Acres Modeled Pine-Oak = 13,422 Acres Modeled Geophysical Model = 3,388 Acres Modeled	Existing Condition	Proposed Action 10 Years Post Treatment	Proposed Action 20 Years Post Treatment	Desired Condition
Average of BA Mixed Conifer	178	121	122	Minimum 120
Average of BA Pine-Oak	158	111	110	Minimum 110
Average of BA Geophysical Model	190	107	103	
Average of TPA >18" Mixed Conifer	24	24	26	Minimum 12 TPA >18"
Average of TPA >18" Pine-Oak	20	22	23	Minimum 12 TPA >18"
Average of TPA >18" Geophysical Model	18	18	20	
Average of Snags 12-18" Mixed Conifer	4	5	3	Promote Snags in this Class
Average of Snags 12-18" Pine-Oak	3	5	4	Promote Snags in this Class
Average of Snags 12-18" Geophysical Model	3	5	4	Promote Snags in this Class
Average of Snags >18" Mixed Conifer	2	3	3	3 Per acre in MC
Average of Snags >18" Pine-Oak	1	2	2	1-2 per acre PO
Average of Snags >18" Geophysical Model	1	2	2	
Average of Canopy Cover Mixed Conifer	73	62	62	> 60%
Average of Canopy Cover Pine-Oak	70	61	61	> 40%
Average of Canopy Cover Geophysical Model	76	60	59	> 40%
Average of Surface Fuel Mixed Conifer	28	23	22	Maintain to promote surface fire
Average of Surface Fuel Pine-Oak	18	17	17	Maintain to promote surface fire
Average of Surface Fuel Geophysical Model	23	19	18	Maintain to promote surface fire
Average of CWD Mixed Conifer	9	10	10	Maintain to promote surface fire 5-15 TPA

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MSO Recovery Replacement Nest/Roost Mixed Conifer = 12,849 Acres Modeled Pine-Oak = 13,422 Acres Modeled Geophysical Model = 3,388 Acres Modeled	Existing Condition	Proposed Action 10 Years Post Treatment	Proposed Action 20 Years Post Treatment	Desired Condition
Average of CWD Pine-Oak	6	7	8	Maintain to promote surface fire 3-10 TPA
Average of CWD Geophysical Model	10	11	11	
Average of Surface_Herb Mixed Conifer	0.20	0.25	0.25	Herbaceous biomass increases over time for prey species habitat
Average of Surface_Herb Pine-Oak	0.21	0.24	0.24	Herbaceous biomass increases over time for prey species habitat
Average of Surface_Herb Geophysical Model	0.20	0.25	0.23	Herbaceous biomass increases over time for prey species habitat
Average of Surface_Shrub Mixed Conifer	0.37	0.69	0.73	Shrub biomass increases over time for prey species habitat
Average of Surface_Shrub Pine-Oak	0.21	0.18	0.18	Shrub biomass increases over time for prey species habitat
Average of Surface_Shrub Geophysical Model	0.24	0.31	0.31	Shrub biomass increases over time for prey species habitat

The overall effect of treatments in nest/roost recovery habitat, 20 years post treatment, would be to increase large trees (see tables below). In the existing condition, trees in 12-18” DBH size class in the mixed conifer cover type decrease from 36% to 24%. In the pine-oak cover type trees in the 12-18’ age class go from 33% in the existing condition to 25%. From the acres identified using the Geophysical model for the Tonto trees 12-18” decrease from 39% in the existing condition to 22% after 20 years of treatment. Silvicultural prescriptions in all MSO cover types should seek to increase this age class, contradicting these negative model results whenever possible. While this size class is reduced in the modeling the data indicates that trees greater than 18” DBH are well above minimum recovery plan recommendations in all cover types. In the mixed conifer cover type trees > 18” DBH go from 42% total trees in Nest/Roost recovery habitat in this size class in the existing condition to 63% of all trees of these age classes in this cover type after 20 years post treatment. In the pine-oak cover type trees >18” DBH go from 36% total of trees in Nest/Roost recovery habitat in this age class to 53%. From the acres identified by

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using the geophysical model FVS results for trees greater than 18" DBH go from 38% total to 52% 20 years post treatment.

All treatments in nest/roost recovery habitat will follow MSO Recovery Habitat recommendations for a diversity of trees with the goal of having trees ≥ 16 " DBH contributing $\geq 50\%$ of the stand BA (Table C.2) from the Revised MSO Recovery Plan (2012). For each cover type; mixed conifer; Ponderosa pine-oak. and from acres identified using the Geophysical Model (Other Forest Cover type/Canyon Habitat trees greater than 18" DBH represent 63% (in mixed conifer), 53% in Ponderosa Pine-Oak, and 52% in Other Forest Cover Types (Canyon Habitat; Geophysical Model). This will provide for all life history needs (nesting, roosting, foraging) by emphasizing large trees, and should provide for large snags and logs (Ganey et al. 2003).

Table 40. Nest/Roost Recovery Habitat Tree Size Classes and Percentages in Mixed Conifer Cover from Alternative 2, , 10, and 20 years Post Treatment

Tree Size Class 1-6	Tree Size Class	Basal Area Existing	% of BA Existing	Basal Area Proposed Action after 10 years Post Treatment	% of BA Proposed Action after 10 years Post Treatment	Basal Area Proposed Action after 20 years Post Treatment	% of BA Proposed Action after 20 years Post Treatment
1 (0-1")	BA1 0-1"	1	0%	0	0%	0	0%
2 (1-5")	BA2 1-5"	13	8%	2	2%	1	1%
3 (5-12")	BA3 5-12"	42	27%	16	13%	13	10%
4 (12-18")	BA4 12-18"	56	36%	33	26%	30	24%
5 and (6 >18")	BA5 and BA6 >18"	66	42%	70	57%	78	63%
Total BA	Total BA	178		121		122	

Table 41. Nest/Roost Recovery Habitat Tree Size Classes and Percentages in Ponderosa Pine-Oak Cover from Alternative 2, 10, and 20 years Post Treatment

Tree Size Class 1-6	Tree Size Class	Basal Area Existing	% of BA Existing	Basal Area Proposed Action after 10 years Post Treatment	% of BA Proposed Action after 10 years Post Treatment	Basal Area Proposed Action after 20 years Post Treatment	% of BA Proposed Action after 20 years Post Treatment
1 (0-1")	BA1 0-1"	1	0%	0	0%	0	0%
2 (1-5")	BA2 1-5"	9	6%	2	1%	1	1%
3 (5-12")	BA3 5-12"	40	25%	16	13%	12	10%
4 (12-18")	BA4 12-18"	52	33%	33	27%	30	25%
5 and (6 >18")	BA5 and BA6 >18"	56	36%	60	49%	66	53%
Total BA	Total BA	158		111		109	

Table 32. Nest/Roost Recovery Habitat Tree Size Classes and Percentages from acres identified using the Geophysical Model (Other Forest Type/Canyon Habitat) from Alternative 2, , 10, and 20 years post treatment

Tree Size Class 1-6	Tree Size Class	Basal Area Existing	% of BA Existing	Basal Area Proposed Action after 10 years Post Treatment	% of BA Proposed Action after 10 years Post Treatment	Basal Area Proposed Action after 20 years Post Treatment	% of BA Proposed Action after 20 years Post Treatment
1 (0-1")	BA1 0-1"	1	1%	0	0%	0	0%

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Tree Size Class 1-6	Tree Size Class	Basal Area Existing	% of BA Existing	Basal Area Proposed Action after 10 years Post Treatment	% of BA Proposed Action after 10 years Post Treatment	Basal Area Proposed Action after 20 years Post Treatment	% of BA Proposed Action after 20 years Post Treatment
2 (1-5")	BA2 1-5"	13	9%	1	1%	1	0%
3 (5-12")	BA3 5-12"	55	35%	15	12%	11	9%
4 (12-18")	BA4 12-18"	61	39%	31	25%	28	22%
5 and (6 >18")	BA5 and BA6 >18"	60	38%	60	49%	63	52%
Total BA	Total BA	190		107		103	

Surface fuel loading in MSO Nest/Roost Recovery Habitat would be reduced under The Proposed Action, moving from 28 tons per acre in MC, 18 in P-O, and 23 GM to 22 tpa in MC and 17 tpa in P-O and 18 (GM) after 20 years post treatment.

MSO Foraging/Non-breeding Recovery Habitat

The table below shows the modeled effects from vegetation treatments by alternative to key MSO habitat variables in pine-oak, mixed conifer, and using the geophysical model (Tonto NF) in MSO Foraging/Non-breeding Recovery Habitat.

Table 42. FVS Modeling of Key Habitat Variables for the MSO in Mixed Conifer, Pine-Oak, and from acres identified by using the Geophysical Model (Tonto NF) in Foraging/Non-breeding Recovery Habitat from Alternative 2, , 10, and 20 years post treatment

MSO Recovery Foraging/Non-breeding Mixed Conifer = 24,924 Acres Modeled Pine-Oak = 86,615 Acres Modeled Geophysical Model = 30,364 Acres Modeled	Existing Condition	Proposed Action 10 Years Post Treatment	Proposed Action 20 Years Post Treatment	Desired Condition
Average of BA Mixed Conifer	151	81	81	120 (table c1 in MSORP)
Average of BA Pine-Oak	137	69	67	110 (table c1 in MSORP)
Average of BA Geophysical Model	163	62	58	-
Average of TPA >18" Mixed Conifer	16	15	17	Minimum 12 TPA >18"
Average of TPA >18" Pine-Oak	13	12	14	Minimum 12 TPA >18"
Average of TPA >18" Geophysical Model	13	11	12	
Average of SG1218 Mixed Conifer	3	4	3	Promote Snags
Average of SG1218 Pine-Oak	2	4	3	Promote Snags
Average of SG1218 Geophysical Model	2	5	4	Promote Snags
Average of Snags	2	2	2	3 Per acre in MC

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MSO Recovery Foraging/Non-breeding Mixed Conifer = 24,924 Acres Modeled Pine-Oak = 86,615 Acres Modeled Geophysical Model = 30,364 Acres Modeled	Existing Condition	Proposed Action 10 Years Post Treatment	Proposed Action 20 Years Post Treatment	Desired Condition
>18" Mixed Conifer				
Average of Snags >18" Pine-Oak	1	2	2	1-2 per acre PO
Average of Snags >18" Geophysical Model	1	3	2	-
Average of Canopy Cover Mixed Conifer	69	51	51	> 60%
Average of Canopy Cover Pine-Oak	66	48	47	> 40%
Average of Canopy Cover Geophysical Model	71	45	42	-
Average of Surface Fuel Mixed Conifer	23	17	16	Maintain to promote surface fire
Average of Surface Fuel Pine-Oak	16	12	12	Maintain to promote surface fire
Average of Surface Fuel Geophysical Model	18	12	12	Maintain to promote surface fire
Average of CWD Mixed Conifer	8	8	8	Maintain to promote surface fire 5-15 TPA
Average of CWD Pine-Oak	5	6	6	Maintain to promote surface fire 3-10 TPA
Average of CWD Geophysical Model	6	7	7	-
Average of Surface_Herb Mixed Conifer	0.21	0.26	0.26	Herbaceous biomass increases over time for prey species habitat
Average of Surface_Herb Pine-Oak	0.21	0.25	0.25	Herbaceous biomass increases over time for prey species habitat
Average of Surface_Herb Geophysical Model	0.19	0.26	0.26	Herbaceous biomass increases over time for prey species habitat
Average of Surface_Shrub Mixed Conifer	0.29	0.62	0.67	Shrub biomass increases over time for prey species habitat
Average of Surface_Shrub Pine-Oak	0.21	0.20	0.17	Shrub biomass increases over time for prey species habitat
Average of	0.27	0.36	0.34	Shrub biomass

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MSO Recovery Foraging/Non-breeding Mixed Conifer = 24,924 Acres Modeled Pine-Oak = 86,615 Acres Modeled Geophysical Model = 30,364 Acres Modeled	Existing Condition	Proposed Action 10 Years Post Treatment	Proposed Action 20 Years Post Treatment	Desired Condition
Surface_Shrub Geophysical Model				increases over time for prey species habitat

Foraging/Non-breeding Recovery habitat, treatments would maintain or increase most habitat variables beneficial to the MSO, its critical habitat, and its prey species, while conserving these conditions over time (see table above). These treatments would preserve Foraging/Non-breeding Recovery habitat by thinning and burning while promoting large trees and reducing the fire hazard index and the risk of crown fire. These estimates indicate that treatments would align with MSO Recovery Plan recommendations. Trees Per Acre (TPA) in Foraging-Nonbreeding Recovery habitat were modeled to show effects from implementation over twenty years. Results show that TPA in mixed conifer cover type increases trees greater than 18 inches from 16 TPA in the existing condition to 17 TPA after two decades of implementation. Results show that in Ponderosa pine-Oak cover type show TPA increases trees greater than 18 inches from 13 TPA in the existing condition to 14 TPA after two decades of implementation. In acres modeled using the geophysical model FVS model results show TPA increases trees greater than 18 inches from 13 TPA in the existing condition to 12 TPA after two decades of implementation. Results from both cover types and from the acres selected using the geophysical model will exceed or meet minimum Recovery Plan Recommendations of 12 per acre.

Shrub and herbaceous biomass would also be maintained or increase in the Proposed Action. FVS modeling shows 20 years of treatments will reduce risk of crown fire and the fire hazard index (decreasing fuel loading), while increasing coarse woody debris, downed logs, and snags $\geq 12''$ (with 3 snags $\geq 18''$ in mixed conifer and 2 snags per acre $\geq 18''$ in Pine oak cover type) after 20 years of treatment in MSO Foraging/Non-breeding recovery habitat. Reductions in surface fuel and creation of interspaces and uneven aged management would conserve MSO Foraging/Non-breeding Recovery habitat over time. Fuel loads, the fire hazard index, and the risk of crown fire would be greatly reduced as a result of treatment (see Fire Effects below).

Table 43. Foraging/Non-breeding Recovery habitat Tree Size Classes and Percentages in Mixed Conifer Cover Type from Alternative 2, Condition, 10, and 20 years Post Treatment

Tree Size Class 1-6	Tree Size Class	Basal Area Existing	% of BA Existing	Basal Area Proposed Action after 10 years Post Treatment	% of BA Proposed Action after 10 years Post Treatment	Basal Area Proposed Action after 20 years Post Treatment	% of BA Proposed Action after 20 years Post Treatment
1 (0-1")	BA1 0-1"	1	1%	0	0%	0	0%
2 (1-5")	BA2 1-5"	15	9%	2	2%	2	1%
3 (5-12")	BA3 5-12"	44	28%	12	10%	8	7%

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4 (12-18")	BA4 12-18"	48	30%	23	18%	21	17%
5 and (6 >18")	BA5 and BA6 >18"	44	28%	44	36%	50	40%
Total BA	Total BA	151		81		81	

Table 44. Foraging/Non-breeding Recovery habitat Tree Size Classes and Percentages in Pine-Oak Cover Type from Alternative 2, , 10, and 20 years Post Treatment

Tree Size Class 1-6	Tree Size Class	Basal Area Existing	% of BA Existing	Basal Area Proposed Action after 10 years Post Treatment	% of BA Proposed Action after 10 years Post Treatment	Basal Area Proposed Action after 20 years Post Treatment	% of BA Proposed Action after 20 years Post Treatment
1 (0-1")	BA1 0-1"	1	0%	0	0%	0	0%
2 (1-5")	BA2 1-5"	11	7%	1	1%	1	1%
3 (5-12")	BA3 5-12"	46	30%	11	9%	7	6%
4 (12-18")	BA4 12-18"	44	28%	21	17%	19	15%
5 and (6 >18")	BA5 and BA6 >18"	35	22%	36	29%	40	32%
Total BA	Total BA	137		69		67	

Table 45. Foraging/Non-breeding Recovery habitat Tree Size Classes and Percentages from acres identified by using the Geophysical Model (Other Forest Cover Type/Canyon habitat) from Alternative 2, , 10, and 20 years Post Treatment

Tree Size Class	Basal Area Existing	% of BA Existing	Basal Area Proposed Action after 10 years Post Treatment	% of BA Proposed Action after 10 years Post Treatment	Basal Area Proposed Action after 20 years Post Treatment	% of BA Proposed Action after 20 years Post Treatment
Tree Size Class 1-6	1	1%	0	0%	0	0%
1 (0-1")	16	10%	0	0%	0	0%
2 (1-5")	62	39%	8	7%	5	4%
3 (5-12")	47	30%	18	15%	16	13%
4 (12-18")	38	24%	35	28%	36	29%
5 and (6 >18")	163		62		58	

Trees in size 12-18" DBH decrease from the existing condition in both cover types and from acres identified by using the geophysical model 20 years post treatment. In mixed conifer cover type trees 12-18" DBH go from 30% in the existing condition to 17%, 20 years post treatment. In pine-oak trees 12-18" DBH go from 28% to 15% of trees in this size class. In acres identified by using the geophysical model trees 12-18" DBH decrease from 30% to 13% of all trees in Foraging/Non-breeding recovery habitat of this size class. Silvicultural prescriptions should be designed to increase this size class to contradict the model results. Large trees in the 19-24" age class in mixed conifer cover type (and combined with ALL_BA6 age class >24 inches DBH) will increase from the existing condition 28% total of trees >18" in Foraging/Non-breeding recovery habitat. Trees 19-24" and greater in mixed conifer cover type will represent 40% total of all trees in these size classes in Foraging/Dispersal recovery habitat after 20 years post treatment. In pine-oak cover type trees > 18" DBH increase from the existing condition of 22%

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total to 32% total of trees >18” DBH in Foraging/Non-breeding recovery habitat after 20 years post treatment. From the acres identified by using the geophysical model trees >18” DBH go from 24% of all trees in Foraging/Non-breeding recovery habitat in the existing condition to 29% after 20 years post treatment. The Proposed Action moves this habitat type closer to desired condition for the MSO. Trees > 18” DBH increase from the Proposed Action in both cover types and on acres identified by using the geophysical model. By providing for large trees, woody debris, snags, shrubs and hardwoods the MSO Foraging/Non-breeding recovery habitat in the project area will develop into Nesting and Roosting habitat over time.

Fire Effects

Surface Fuel Loading

Surface fuel loading in MSO Protected Habitat would slightly increase under the Proposed Action, moving from an existing 25 tons per acre in MC and 19 tons per acre in P-O to 26 tons per acre in MC and 19 in P-O after 20 years of treatment. Timber management will decrease these modeled results by removing the majority of cut material.

Surface fuel loading in MSO Nest/Roost Recovery Habitat would be reduced under Alternative 2, moving from 28 tons per acre in MC, 18 in P-O, and 23 GM to 22 tpa in MC and 17 tpa in P-O and 18 GM after 20 years of treatment.

Surface fuel loading in MSO Foraging/Non-breeding Recovery habitat would be reduced under The Proposed Action, moving from an existing condition of 23 tons per acre in MC, 16 tpa in P-O, and 18 tpa GM to 16 tons per acre in MC, and 12 tpa in P-O and GM in after 20 years of treatment.

Fire Hazard Index

Table 46. Fire Hazard Index Comparison for acres from the Proposed Action with Percentages of Total Habitat Modeled in the Project Area for Fire Risk in Wildlife Habitat

MSO Habitat Type	Very Low Need For Treatment in Acres	%	Low Need for Treatment in Acres	%	Moderate Need for Treatment in Acres	%	High Need for Treatment in Acres	%	Extreme Need for Treatment in Acres	%
Protected PAC 116,385 Acres Modeled	37,636	33	21,165	18	25,752	22	25,932	22	5,899	5
Recovery Nest/Roost 38,092 Acres Modeled	16,717	44	7,260	19	7,334	19	6,132	16	648	2
Recovery Foraging/Non-Breeding 183,706 Acres Modeled	108,970	59	32,433	18	30,594	17	11,059	6	651	0.4

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MSO Critical habitat 686,283 Acres modeled	422,262	62	96,060	14	96,017	14	62,977	9	8,967	1
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The Moderate, High, and Extreme Need for Treatment categories of FHI are decreased from alternative 2 in PACs from the existing condition of 70,328 acres (62%) to 57,583 acres (49%). The High and Extreme Need for Treatment categories are reduced from 51,002 acres (45%) of all PACs modeled in the existing condition to 31,831 acres (27%) after alternative 2 is implemented.

In Nest/Roost recovery habitat the Moderate, High, and Extreme Need for Treatment categories of FHI are decreased from alternative 2 from 22,628 acres (60%) from the existing condition to 14,114 acres (37%). The High and Extreme Need for Treatment categories are reduced from 15,869 acres (42%) of all Nest/Roost Recovery Habitat modeled in the existing condition to 6,780 acres (18%) after alternative 2 is implemented.

In Foraging/Non-breeding MSO Recovery Habitat the Moderate, High, and Extreme Need for Treatment categories of FHI are decreased from 84,363 acres (46%) in the existing condition to 42,304 acres (23%) after alternative 2 is implemented. The High and Extreme Need for Treatment categories are reduced from 51,210 acres (28%) of all Foraging/Non-breeding Recovery Habitat modeled in the existing condition to 11,710 acres (6.4%) after alternative 2 is implemented.

Risk of Crown Fire

Table 47. Active and Conditional Crown Fire Assessment from the Proposed Action Wildlife Habitat (with Percentages of Total habitat Modeled in the Project Area)

MSO Habitat Type	Active Crown Fire Acres	%	Conditional Crown Fire Acres	%	Passive Crown Fire Acres	%	Surface Fire Acres	%	Non-Burnable Acres	%
Protected PAC 116,385 Acres Modeled	32,092	28	6,726	6	28,726	25	47,700	41	1,142	1
Recovery Nest/Roost 38,092 Acres Modeled	5,658	15	2,118	6	14,129	37	16,120	42	68	0.1
Recovery Foraging-Non-Breeding 183,706 Acres Modeled	10,987	6	4,319	2	107,166	58	60,280	33	954	0.5
MSO Critical Habitat 686,283 Acres Modeled	82,614	12	13,280	2	330,434	48	254,022	37	5,933	1

In PACs, the potential for active and conditional crown fire is decreased in Alternative 2 compared to the existing condition from 58,765 acres (51%) to 38,818 acres (34%) of this habitat type in the project area that would experience high severity crown fire as a result of implementing the proposed action. Active crown fire risk is reduced from 39% of all PAC habitat in the project area to 28%.

In Nest/Roost Recovery Habitat the potential for active and conditional crown fire is decreased in Alternative 2 compared to the existing condition from 18,275 acres (48%) to 7,776 acres (21%) after implementing the proposed action. Reducing active and conditional crown fires by this magnitude is a benefit to the MSO that would preserve Nest/Roost Recovery Habitat over time. Active crown fire risk is reduced from 39% of all Nest/Roost Recovery Habitat in the project area to 14%.

In Foraging/Non-breeding Recovery Habitat the potential for active and conditional crown fire is decreased in Alternative 2 compared to the existing condition from 63,737 acres (34%) to 15,306 acres (08%) after implementing the proposed action. Reducing active and conditional crown fires by this magnitude is a benefit to the MSO that would preserve Foraging/Non-breeding Recovery Habitat over time. Active crown fire risk is reduced from 27% of all Nest/Roost Recovery Habitat in the project area to 06%.

Effects from Implementation Activities

This large-scale restoration project proposes treatments in all MSO habitat types. While design features have been included to minimize disturbance affects to the species, it is possible that individual owls could be disturbed by thinning and burning operations. The effects of the proposed thinning are anticipated to result in direct effects to the owl as discussed below. The Forests intend to avoid activities within PACs during the breeding season unless the PAC is surveyed to protocol and determined to be unoccupied with concurrence from the USFWS. Actions that could affect the MSO through implementation were reviewed in the Effects Pathways Matrix.

Activity

Mechanical Removal of Vegetation; Noise

Heavy machinery used to thin, pile, grind and remove vegetation in MSO habitat could directly disturb individual owls through noise. Adult and Juvenile owls could experience harassment if MSO remain in the area during the winter/non-breeding season. Literature examining noise disturbance in regard to MSO is extensively reviewed in the 1st 4FRI wildlife specialist reports in the MSO analyses. In Rim Country, noise disturbance from project activities may affect foraging MSO, but are not expected to affect nesting or roosting owls due to design features intended to restrict all implementation to outside of the breeding season with 1/4 mile buffers from the PAC boundary and due to project planning. Numerous design features have been added to minimize disturbance to the MSO from implementation (Appendix C). Effects to individual owls would be a reduction in fitness (Tempel and R.J. Gutiérrez. 2003, Damiani et al. Undated). Seasonal Nest/Roost restrictions should avoid effects to nesting/roosting MSO, however individuals that overwinter in the PAC could still be disturbed through noise.

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Upland Mechanical Removal of Vegetation; Habitat Alteration

No mechanical treatment will occur in MSO core areas. Heavy machinery will have direct and indirect effects to MSO through habitat alteration by changing acres of habitat on 11,258 acres in PACs, 23,813 acres in nest/roost recovery habitat, and 130,271 acres of Foraging/Non-breeding recovery habitat that would have short term negative impacts to plant cover but long term beneficial effects through improvement of habitat resilience, structure and function.. This could result in short term (1-2 years) negative effects of slight alterations in MSO habitat (removal of small encroached trees and decreasing fuel load) with long term beneficial effects as silvicultural prescriptions will reduce fuel loading and increase habitat variables important to the MSO (see FVS modeling and Vegetation Changes section above). Removing heavily encroached areas (or areas with high small diameter tree density) of MSO habitat will reduce risk of high severity wildfire and promote large trees and snags, shrub and herbaceous vegetation, with small openings created (0.5-2 acres). Short-term affects to MSO habitat are expected to occur as a result of restoration thinning activities (1-2 years after treatment) with long-term benefits occurring as vegetation responds to prescribed treatments. Forest structure and habitat for prey base (FVS modeling) are extensively analyzed above, by MSO habitat type under the Proposed Action, discussing these long-term improvements. Short term affects are considered to be minimized by design features; however it is possible that individual MSO could be disturbed either directly or indirectly from these activities due to the large spatial and temporal size of the Rim Country project.

Included in the 11,258 acres of mechanical equipment 130 acres of that are proposed for Severe Disturbance Areas treatments in MSO Protected habitat. Mechanical equipment would be used to reduce over encroached small diameter trees, mostly under 12 inches DBH. Approximately 248 acres of Severe Disturbance Areas treatments are proposed in MSO Nest/Roost Recovery habitat.

In PACs in the Rim Country project area 140 acres of mechanical equipment for facilitative operations is proposed. Approximately 5,302 acres of Facilitative Operations using mechanical equipment is proposed in MSO Recovery Habitat. The above activities proposed for of Facilitative Operations, and Severe Disturbance Areas using heavy mechanical equipment could directly affect owls through noise disturbance, and both directly and indirectly from habitat alteration. This could affect individual non-breeding owls as seasonal restrictions are in place as design features. In addition, these proposed acres are very small and long-term benefits to, and preservation of MSO habitat by implementation of the proposed action will result from treatments.

Under the Proposed Action, there would be indirect effects from the modification of vegetation. Burning, thinning and the associated ground disturbance could adversely affect the prey base on a short-term basis by impacting individuals of prey species due to disturbance of prey species' habitat and harm from fire. However, over the long- term, an increased diversity of vegetative structural stages and improved understory vegetation with improved plant species richness would increase prey species, resulting in indirect beneficial impacts (see FVS modeling above).

Mechanical Removal of Vegetation; Hauling

Hauling on existing roads, and skid trails is another activity that will potentially effect owls. In

the short-term, road work and particularly hauling materials off forest increases the risk of collisions between MSOs and vehicles involved in forest harvest activities. There are documented mortalities of MSOs from collisions with moving vehicles (Delaney, and Grubb. 2003), including unpaved forest roads (USDI 2012a). Little information is available on how frequently collisions might occur and what conditions might relate to owls being more or less vulnerable. Birds migrating or dispersing through unfamiliar terrain may be at higher risk than resident birds (USDI 2012a). While collisions are not typically analyzed in vegetation manipulation projects, we felt the scale of the Rim Country project area in terms of time, area, and intensity of road traffic warranted this consideration.

Haul routes may cause noise disturbance to nesting owls and logging trucks could potentially hit owls, causing injury or death. Most logging traffic would occur during day time hours when owls are not as mobile; however there could be occasions when trucks are operating at times when owls would be foraging in the area during the late afternoon or early morning. As owls can be active during crepuscular hours and could, on occasion, forage during daylight, which increases the risk of noise disturbance from road activities to individual foraging MSOs. In addition, hauling of forest materials is also likely to occur at night. Disturbance to foraging owls would be site-specific and could cause owls to shift to areas that provide undisturbed foraging opportunities.

Hauling would require trucks to drive the posted speed limit on National Forest roads and to restrict breeding season hauling within 1/4 mile of the PAC boundaries and/or show that through analysis, no adverse effects would occur to owls from hauling.

Task orders would be issued to implement work in defined portions of the Rim Country project area on a yearly basis. Work would be spread across the treatment area and implementation would occur in an incremental manner as new annual task orders are issued. Vehicular activities resulting from harvest operations would increase current traffic levels well above existing conditions in portions of the treatment area on an annual basis for the duration of the project. This would typically create an increase in risk of collisions in localized areas for about 2-4 years before operations would shift to other areas. The level of short-term risk cannot be quantified, i.e., there is no defined relationship between open road miles or vehicle use and collisions with owls. Nevertheless, whatever the current risk level is, it would likely increase with implementation of the Rim Country project. This localized, short-term risk would continue to move around the landscape for the duration of Rim Country-related harvest activities, although not all harvest and related actions would overlap with MSO habitat. Once harvest activities are complete, about 500 miles of road would be decommissioned, decreasing the risk of collisions across the implementation area over the long-term.

Upland Mechanical Removal of Vegetation; Skid Trails, Road Maintenance, and Temporary Road Construction Road maintenance and construction would have short-term negative effects to habitat from up to 330 miles of new temporary or existing non-system roads project wide. Some increased sediment movement is expected to occur as a result, though design features will minimize these effects. These would be decommissioned after restoration activities are completed. No temporary roads or cable yarding in PACs are proposed so no effects to the MSO from this activity are included here.

Long-term beneficial effects are expected from the decommissioning of 490 miles of existing roads and up to 800 miles of unauthorized roads in the project area. No road decommissioning activities would occur during the breeding season in PACs.

Owls can be active during crepuscular hours and could, on occasion, forage during daylight, increasing the risk of noise disturbance from road or skid trail activities to individual foraging MSOs. In addition, hauling of forest materials is also likely to occur at night. Disturbance to foraging owls would be site-specific and could cause owls to shift to areas that provide undisturbed foraging opportunities. There could be energetic costs and increased risk of predation associated with displacement of foraging owls.

Transportation-related activities have timing and ¼ mile distance restrictions in or near PACs and core areas. The intent and expectation is to avoid all mechanized equipment in core areas and avoid working in PACs with a 1/4-mile buffer during the nesting season. Hauling would require trucks to drive the posted speed limit on all forest system roads. We expect to avoid noise disturbance to nesting and roosting owls as a result of preplanning, project design features, and mitigation. Foraging owls could be affected by noise, but based on research related to mechanical noise disturbance, we do not expect adverse effects. However, history has shown that timelines and circumstances can change in ongoing projects. It is not unreasonable to anticipate unforeseen circumstances leading to a need to conduct road work or hauling within a PAC during the breeding season. The risk of this occurring is exasperated by the spatial and temporal scales of the project. While this is not the intent of the project, if exceptions were to occur they would be limited in number and scale and the USFWS would be notified.

Upland Hand Thinning

Hand Thinning in PACs would occur through fire preparation where needed, to keep fire effects to low severity ground fire in PACs. This action is designed to modify fire behavior, not stand structure. Some preparation by removing small diameter fuels will occur where district fire and fuels specialists have determined on 1,190 acres in PACs. Direct effects from fire crews or contracted crews disturbing nonbreeding MSO are possible, with small acres of indirect effects from habitat alteration from low severity prescribed fire. These effects are not likely to disturb breeding or juvenile MSOs as design features add seasonal restrictions. These activities will proceed in the Rim Country project area provided surveys show that the owls are non-nesting, or a PAC is ¼ mile away and it is determined the pair will not be disturbed. Overwintering MSO who remain in the PAC area could be disturbed by these activities in the short-term, though this is not likely to cause reduction in foraging or fitness.

Prescribed Burning of Vegetation; Habitat Alteration

In MSO PAC habitat mechanical treatment is proposed for 11,258 (10% of total PAC habitat in the project area) acres with an additional 2,192 (2%) acres with mechanical treatment proposed for comprehensive restoration. All of these acres will have prescribed fire after thinning treatments. Prescribed fire only is proposed on 80,898 (67%) acres in the 4 FRI footprint. In MSO recovery habitat 10,016 acres are proposed for prescribed fire only treatments with an additional 345 acres using prescribed fire only for riparian and wet meadow restoration (table 4-

9).

Where there are no roads, trails, or natural barriers, new fireline could be built to protect resources. Building fireline would occur outside the breeding season. No fireline will be built in core areas. Potential effects of fireline construction include effects to habitat such as erosion or loss of cover for prey species. Fireline “trails” (social trails) could increase recreation and access in PACs, increasing disturbance and potential loss of snags and logs. Building fireline would occur outside the breeding season. Firelines in PACs will be rehabilitated where resource specialists determine it would benefit the MSO and MSO habitat.

Under the Proposed Action, there would be indirect effects from the modification of vegetation. Throughout the project, during broadcast burning activities, torching may occur within treatment areas. This torching is expected to create small openings of less than an acre in size, however a change in the stand structure from this type of event would not be detectable on a stand basis. Torching would mimic gap processes that occur under natural conditions (historic wildfire, windfall, and historic pest and disease outbreaks). Broadcast burning would decrease coarse woody debris in all protected and recovery habitat treatments; however, levels would range from 3-10 tons/acre in Pine Oak habitat, and 5-15 tons/acre in Mixed Conifer which would meet Land Management Plan requirements. Woody debris and snags are habitat for small mammals. Indirect effects of reducing woody debris due through broadcast burning would decrease prey base abundance on a short-term basis for approximately one year (Jenness 2000). This decrease in small mammal prey base could be compounded during drought years when the prey base is lower due to a lack of food for these animals. However, herbaceous vegetation typically responds favorably to broadcast burning, and an increase in forage for small mammals is expected, outside of drought conditions. This in turn would have a corresponding increase in the small mammal prey base (Jenness 2000).

Whenever possible prescribed burning would be applied to the entire PAC area, including the core, in conjunction with prescribed burning across the project area. When this approach is feasible the Forest Service would not separate prescribed burning of PACs from the surrounding project area. This strategy minimizes disturbance from fire containment actions (handline construction as existing roads could be used as fireline) and the prescribed fire operations that would be needed to safely burn through MSO habitat. This also provides flexibility for fire managers to minimize burn severity (e.g. backing fire down slope) within core areas.

Prescribed burning will result in short term alteration of habitat through fire effects though these will likely be minimal across most of the project area. Direct effects from prescribed burning could be noise disturbance or harassment of non-breeding owls from fire crews. Indirect effects are changes in small acres of nesting and roosting habitat from fire effects. Individual owls overwintering in PACs could be affected by mid-story vegetation changes, though these would be in the short term from prescribed fire, likely 1-2 years. This could result in short term reduced feeding success and fitness of individual MSOs, with long term benefits of protecting the PAC from severe wildfire while promoting habitat variables important to the MSO.

Prescribed Burning of Vegetation: Smoke

There are 92,817 acres of PACs in the Rim Country project area that could be burned using

prescribed fire over the life of the project. Fire experts on the three National Forests associated with Rim Country indicated smoke associated with prescribed fire typically does not settle into low-lying areas for more than 2 or 3 nights. Limited smoke within PACs represents an aspect of the evolutionary environment for wildlife in northern Arizona and, as such, should result in negligible effects to MSO (Horton and Mannan 1988). However, first-entry burns would include fuel loads above historical levels, causing quantities of smoke greater than what would likely have occurred during frequent fire return intervals. As a result, uncharacteristically dense smoke could settle into PACs during initial burn operations. Dense smoke from first-entry burns (i.e., areas that have not burned in 20 or more years) settling into core areas early in the season (March through June) could affect brooding females. This is unlikely to occur because of the design features: seasonal restrictions to limit prescribed burning and thinning in PACs to outside of the breeding season and the ¼ mile buffer to restrict noise from PACs and core areas during the breeding season.

Despite the possibilities discussed above, smoke is not expected to be a disturbance to MSOs for several reasons. Settling smoke has long been an issue that fire experts address on this landscape. This has led to knowledge of smoke patterns and developing ignition techniques to minimize undesirable smoke effects. In addition, smoke from prescribed fire would comply with Arizona Department of Environmental Quality requirements (ADEQ). Smoke effects are regulated and permits are required by ADEQ before burning is initiated. Air quality requirements specify management actions would meet air quality standards. ADEQ considers the cumulative effects of smoke emissions from multiple jurisdictions prior to approving daily prescribed fire activities. This mitigates the potential for severe smoke effects from multiple prescribed fire projects across the treatment area. Given the planning, design features, and ignition techniques, smoke from prescribed fire would not be expected to result in adverse effects to MSO. However, this cannot be guaranteed and adverse effects to owls could occur if smoke unexpectedly settled into PACs for three or more days and nights.

Smoke could result in decreased air quality to individual MSOs who overwinter in the PACs. This disturbance will affect non-breeding individual MSO disturbed if smoke settles. This is minimized by seasonal restrictions on burning in PACs and careful planning from district fire and fuels specialists so smoke will not settle in PACs during the breeding season. If surveys show absence or non-nesting in specific PACs flexibility to burn during the breeding season given these specific survey results could occur in coordination with USFWS.

Comprehensive Habitat Restoration: Heavy Mechanical Equipment

Mechanical thinning is also proposed as part of grassland, wet meadow, and riparian restoration (comprehensive restoration) to remove conifer encroachment and meet desired conditions. In addition, mechanical equipment may be utilized for stream and spring restoration. There are up to 2,099 acres of mechanical thinning proposed for comprehensive restoration and 4,981 acres of Recovery Habitat (1,636 acres in Nest/Roost Recovery habitat and 3,345 in Foraging/Non-breeding Recovery habitat) proposed for mechanical thinning for comprehensive restoration. Comprehensive restoration utilizes the same Design Features of MSO PAC timing restrictions so that implementation will occur outside of the breeding season or in PACs where protocol surveys do not locate owls during the breeding season of activity (with concurrence from USFWS). Timing restrictions and mechanical equipment ¼ mile buffers from occupied PACs during the

breeding season should minimize disturbance effects to the MSO from comprehensive habitat restoration implementation in PACs.

Design features related to mechanical vegetation treatments in the uplands (described in the sections above: Vegetation Changes and Effects from Implementation Activities, Removal of Vegetation in Uplands) are expected to minimize the potential effects. Wildlife Design Features that reduce effects to the MSO and its habitat from mechanical thinning activities which include managing for Basal Area (WL001-002) coordinating management to reduce potential disturbance and minimize the frequency and duration of operations within and immediately adjacent to these areas (WL003), and provide seasonal breeding season restrictions (WL005-007). The Large and Old Tree Implementation plans include sideboards that would leave these trees on the landscape. The proposal seeks to remove encroaching small diameter conifer trees with the majority of trees taken below 12" diameter at breast height where applicable in MSO habitat to promote habitat variables that are considered beneficial to the owl (see proposed action).

Up to 148.2 miles of General Stream restoration and 23.3 miles of Heavy Mechanical habitat is proposed in PACs with potentially 23.3 miles of general and 4.9 miles of heavy mechanical In Core areas. General stream treatments include methods that could either be implemented by hand or using machinery such as driving a vehicle to a site, pneumatic post pounder, or gas-powered auger. Heavy mechanical treatments are those that require machinery such as a trackhoe or front-end loader. Both implementation types could have effects to MSO through noise and habitat alteration, though Design Features should minimize disturbance to nesting owls (see above). These methods generally occur within the stream channel and floodplains. Projects utilizing heavy machinery are likely to be larger in scope than those utilizing only hand methods. In addition, there is often a temporal difference in the realization of positive effects from the various methods. Though disturbance may be initially higher with heavy machinery, project effects are often less noticeable soon after the project is completed. Projects that utilize hand methods often take a more natural approach and require several seasons of flow events or vegetation growth to produce measurable improvements to habitats. Hand thinning in PACs will be considered where applicable to reduce effects where these activities would occur, or where access with heavy machinery is not feasible.

Short term effects to the MSO from Comprehensive Restoration mechanical thinning activities will generally include temporary reduction of riparian vegetation cover in the project area and change of channel structure. These impacts are considered short-term and the results will benefit riparian habitat by thinning encroached systems which will also benefit the MSO. Design features will reduce disturbances to the owl as breeding owls will not be disturbed. Non-breeding owls that could remain in the area could be disturbed by noise and general implementation activities (presence of machinery), though beneficial impacts of general stream treatments can be immediate and long-term.

Multiple project design features are included in the project to reduce adverse impacts where feasible given the nature of these methods. Reducing heavy equipment impacts are addressed in AQ008, AQ024, AQ032-34, SW060-61, SW073-74, SW076, SW079 to reduce direct impacts and sedimentation. Reducing impacts to riparian vegetation is covered by AQ014, AQ035,

AQ037, SI001, SI003, SI023, and SW008-9 while protecting stream shade is included in AQ037-38. There also design features for site rehabilitation (SW065-66) and stockpiling materials from uplands for use in streams (AQ021).

The above activities proposed in MSO habitat for Comprehensive Restoration using heavy mechanical equipment could directly affect owls through noise disturbance, and both directly and indirectly from habitat alteration. This could affect individual non-breeding owls as seasonal restrictions are in place as design features. The Design Features listed above will reduce effects to the MSO and its habitat from implementation activities. Short term negative effects through habitat alteration are largely outweighed by the beneficial long-term effects of comprehensive restoration to restore diverse habitat characteristics to places that have lost them or need restoration.

Determination of Effects to the MSO from Alternative 2

Direct and indirect effects from project actions within PACs and recovery habitat will be short term. Long-term benefits will conserve MSO habitat over time. Effects are summarized below:

- There would be 11,333 acres of vegetation treatments using mechanical equipment in protected 25,442 acres in nest/roost recovery habitat and 125,998 acres of Foraging/Non-breeding recovery habitat that would have short term negative impacts to plant cover but long term beneficial effects through improvement of habitat resilience, structure and function. Approximately 1,190 acres is proposed for hand thinning in PACs. Cable operations in MSO Recovery Habitat (5,045 acres in Nest/Roost Recovery, and 25,941 acres in Foraging-Non-breeding Recovery) will have short-term effects to the understory under the cables, with long-term beneficial effects.
- Approximately 2,099 acres in PACs and 4,981 acres of MSO Recovery habitat (1,636 N/R and 3,345 F/Nb) are proposed for Comprehensive restoration. Breeding season restrictions in PACs and ¼ mile buffers from PACs for heavy mechanical equipment operation will minimize effects to breeding owls. Foraging owls or individuals who do not leave the PAC during the winter could be disturbed during restoration activities. These short-term disturbances are outweighed by long term benefits of conserving MSO habitat.
- Noise associated with thinning and burning activities could disturb non-breeding MSO who remain in the area during the breeding season.
- Hauling would not occur within 0.25 mile of PACs and nest cores. If hauling is needed during the breeding season within or adjacent (within ¼ mile) to PACs, the Forest Service will work with the USFWS to minimize the effects to individuals.
- Fire Hazard Index and risk of Crown Fire would be reduced in MSO habitats reducing the potential loss of habitat to wildfire.
- Burning activities on as much as 92,817 acres in PAC habitat would be coordinated with the district biologists and would be designed to limit smoke during the breeding season. Pile burning would be completed in the winter and initial entry prescribed burning would be completed in the fall/winter within PACs.
- By managing for resistant and resilient ecosystems, promoting landscape connectivity, and implementing concepts of adaptive management, land and resource management can respond to new information and changing conditions related to climate change that have

the potential to increase ecosystem risks. Risks associated with dense forest conditions would be reduced and forest resiliency large scale disturbance under drier and warmer conditions would be improved by implementing the treatments proposed under the Proposed Action. Individual tree growth would improve, resulting in larger average tree sizes. Species requiring habitat elements associated with closed canopy forest conditions or old or large tree, snag, and log structure would be more sustainable as forest resiliency is improved.

Based on the above analysis the project’s activities the Proposed Action of the Rim Country project **may affect, is likely to adversely affect the Mexican Spotted-owl.**

Alternative 3 – Focused Alternative

Vegetation Changes

Treatments in MSO habitat were modeled using FVS by the 4FRI Silvicultural Specialist. Tables below show habitat variables in pine-oak, and mixed conifer cover types, as well as using the Geophysical Model (Tonto NF Recovery Habitats) important to the MSO with modeled results in the existing condition, 10 years into the future, and 20 years into the future post treatment to show effects from treatments through time.

MSO Protected Habitat

Table 48. FVS Modeling of Key Habitat Variables for the MSO in Mixed Conifer and Pine-Oak Protected Habitat, 10, and 20 Years Post Treatment for Alternative 3

PACs including Nest Core Areas Mixed Conifer = 18,180 Acres Modeled Pine-Oak = 64,165 Acres Modeled	Existing Condition	Alternative 3 10 Years	Alternative 3 20 Years	Desired Condition
Average of BA Mixed Conifer	158	133	135	Minimum 120
Average of BA Pine-Oak	144	122	121	Minimum 110
Average of TPA >18" Mixed Conifer	18	19	21	Minimum 12 TPA >18"
Average of TPA >18" Pine-Oak	14	15	16	Minimum 12 TPA >18"
Average of Snags 12-18" Mixed Conifer	3	6	4	Promote snags for Nest/Roost and prey base
Average of Snags 12-18" Pine-Oak	2	5	5	Promote snags for Nest/Roost and prey base
Average of Snags >18" Mixed Conifer	3	3	3	3 Per acre in MC
Average of Snags >18" Pine-Oak	1	2	2	1-2 per acre PO
Average of Canopy Cover Mixed Conifer	66	62	64	Minimum 60 %
Average of Canopy Cover Pine-Oak	65	62	61	Minimum 40 %
Average of Surface	26	26	26	Maintain to promote

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PACs including Nest Core Areas Mixed Conifer = 18,180 Acres Modeled Pine-Oak = 64,165 Acres Modeled	Existing Condition	Alternative 3 10 Years	Alternative 3 20 Years	Desired Condition
Fuel Mixed Conifer				surface fire
Average of Surface Fuel Pine-Oak	19	20	20	Maintain to promote surface fire
Average of CWD Mixed Conifer	9	11	11	Maintain to promote surface fire 5-15 TPA
Average of CWD Pine-Oak	8	9	9	Maintain to promote surface fire 3-10 TPA
Average of Surface_Herb Mixed Conifer	0.21	0.23	0.23	Herbaceous biomass increases over time for prey species habitat
Average of Surface_Herb Pine-Oak	0.21	0.22	0.22	Herbaceous biomass increases over time for prey species habitat
Average of Surface_Shrub Mixed Conifer	0.36	0.50	0.57	Shrub biomass increases over time for prey species habitat
Average of Surface_Shrub Pine-Oak	0.24	0.24	0.23	Shrub biomass increases over time for prey species habitat

In PACs after 20 years post treatment from Alternative 3, average BA is reduced for both mixed conifer and ponderosa pine-oak cover types. In Mixed conifer average BA of trees DBH moves from 158 to 133 after 20 years of treatments in PACs. Pine-oak average BA is reduced from 144 in the existing condition to 111. Silvicultural prescriptions will promote growth of large trees and managers should seek to maintain BAs above the minimum recovery plan recommendations or seek to increase BA averages. Trees Per Acre (TPA) were modeled in PAC habitat to show effects from implementation over twenty years. Results show that TPA in mixed conifer cover type increases trees greater than 18 inches from 18 TPA in the existing condition to 21 TPA after two decades of implementation. Results show that in Ponderosa pine-Oak cover type TPA increases trees greater than 18 inches from 14 TPA in the existing condition to 16 TPA after two decades of implementation. Results from both cover types will exceed minimum Recovery Plan Recommendations of 12 per acre. A linear regression from BA was used to estimate canopy cover (Shephard et al, in Parker et al. 2002). These estimates indicate that treatments would align with MSO Recovery Plan recommendations in mixed conifer with canopy cover 64%, and in pine oak 61% from treatments proposed in Alternative 3.

Shrub and herbaceous biomass would also be maintained or increase in the Alternative 3. FVS modeling shows 20 years post treatment will reduce risk of crown fire and the fire hazard index, while increasing coarse woody debris, downed logs, and snags $\geq 12''$ (with 3 snags $\geq 18''$ in mixed conifer and 1-2 snags per acre $\geq 18''$ in Pine oak cover type) in MSO protected habitat.

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Table 49. PAC, Mixed Conifer Cover Type for Tree Size Classes FVS Model, 10, and 20 Years Post Treatment from Alternative 3

Tree Size Class	Basal Area Existing	% of BA Existing	Basal Area Alternative 3 after 10 years	% of BA Alternative 3 after 10 years	Basal Area Alternative 3 after 20 years	% of BA Alternative 3 after 20 years
1 (0-1")	1	1%	0	0%	0	0%
2 (1-5")	13	8%	8	6%	5	4%
3 (5-12")	46	29%	32	24%	31	23%
4 (12-18")	46	29%	37	28%	37	28%
5 and (6 >18")	52	33%	56	42%	62	46%
Total BA	158		133		135	

Table 50. PAC, Ponderosa Pine-Oak Cover Type for Tree Size Classes FVS Model, 10, and 20 Years Post Treatment from Alternative 3

Tree Size Class 1-6	Basal Area Existing	% of BA Existing	Basal Area Alternative 3 after 10 years	% of BA Alternative 3 after 10 years	Basal Area Alternative 3 after 20 years	% of BA Alternative 3 after 20 years
1 (0-1")	1	1%	0	0%	0	0%
2 (1-5")	13	8%	8	6%	7	5%
3 (5-12")	46	29%	31	24%	27	20%
4 (12-18")	44	28%	40	30%	40	30%
5 and (6 >18")	40	25%	43	32%	47	35%
Total BA	144		122		121	

In mixed conifer 20 years post treatment trees 12-18" DBH are decreased by 1% going from 29% in the existing condition to 28%. which stays near MSO Recovery Plan minimum recommendations of 30%. In the pine-oak cover type in PACs trees 12-18" DBH go from 27% in the existing condition to 30% after 20 years of treatment from alternative 3 which meets MSO Recovery Plan minimum recommendations of 30%. In mixed conifer cover type trees > 18" will go from 33% in the existing condition to 46% of the trees in PACs greater than 18" after 20 years post treatment. In the pine oak cover type trees >18" go from 25% total trees greater than 18" in the existing condition to 35% total of trees in the PAC greater than 18" DBH after 20 years post treatment from Alternative 3.

Treatment in PACs will be consistent with recovery plan management recommendations and desired conditions which includes a diversity of trees with the goal of having trees ≥ 16 " DBH contributing $\geq 50\%$ of the stand BA (Table C.2 from the Revised MSO Recovery Plan, 2012). In the mixed conifer cover type trees > 18" DBH represent 48% of all trees in the PAC larger than 18" after 20 years post treatment. In the Ponderosa Pine-Oak cover type trees > 18" DBH represent 37% of all trees in the PAC. Combined with the 12-18" age class (30% of trees in the PAC in this size class) it is likely that trees >16" DBH are near 50% or greater. This will provide for all life history needs (nesting, roosting, foraging) by emphasizing large trees, and should provide for large snags and logs (Ganey et al. 2003).

MSO Nest/Roost Recovery Habitat

Recovery habitat is proposed for fewer acres than in Alternative 2 (see Table below), but would still see various treatment types.

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Table 51. MSO Recovery Habitats by Treatment from Alternative 3

MSO Recovery Habitats by Treatment	MSO Recovery Foraging/ Non-Breeding	MSO Recovery Replacement Nest/Roost	Grand Total
Pine-Oak	49,104	8,703	57,807
Facilitative Operations Mechanical	95		95
Facilitative Operations Prescribed Fire Only			0
Grassland Restoration	321	71	391
MSO Recovery - Replacement Nest/Roost		7,558	7,558
Prescribed Fire Only	348	231	579
Riparian Prescribed Fire Only	8	68	76
Riparian Restoration	718	571	1,289
Stand Improvement - High Site	3,166		3,166
Stand Improvement - Moderate Site	3,969		3,969
Stand Improvement - Low Site	2,118		2,118
Uneven-aged - High Site	17,151		17,151
Uneven-aged - Moderate Site	17,307		17,307
Uneven-aged - Low Site	3,567		3,567
Wet Meadow & Riparian Prescribed Fire Only		148	148
Wet Meadow & Riparian Restoration	49	4	52
Wet Meadow Restoration	287	53	340
Mixed Conifer	17,768	10,327	28,096
Facilitative Operations Mechanical	1,332	577	1,908
Facilitative Operations Prescribed Fire Only	8	38	47
MSO Recovery - Replacement Nest/Roost		8,841	8,841
Prescribed Fire Only	412	165	577
Riparian Prescribed Fire Only	25	21	46
Riparian Restoration	501	511	1,012
Stand Improvement - High Site	888		888
Stand Improvement - Moderate Site	673		673
Stand Improvement - Low Site	609		609
Uneven-aged - High Site	5,779		5,779
Uneven-aged - Moderate Site	5,653		5,653
Uneven-aged - Low Site	1,525		1,525
Wet Meadow & Riparian Prescribed Fire Only	75		75

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MSO Recovery Habitats by Treatment	MSO Recovery Foraging/ Non-Breeding	MSO Recovery Replacement Nest/Roost	Grand Total
Wet Meadow & Riparian Restoration	29	32	62
Wet Meadow Restoration	259	143	401
Geophysical Model	23,110	3,083	26,193
Facilitative Operations Mechanical	1,633	222	1,854
MSO Recovery - Replacement Nest/Roost		2,560	2,560
Riparian Restoration	1,194	301	1,495
Severe Disturbance Area Treatment	248		248
Stand Improvement - High Site	467		467
Stand Improvement - Moderate Site	1,638		1,638
Stand Improvement - Low Site	558		558
Uneven-aged - High Site	7,314		7,314
Uneven-aged - Moderate Site	8,448		8,448
Uneven-aged - Low Site	1,605		1,605
Wet Meadow & Riparian Restoration	5		5
Grand Total	89,982	22,114	112,096

The table below shows the FVS modeled effects from vegetation treatments in Alternative 3 to key MSO habitat variables in pine-oak, mixed conifer, and for acres that were identified by using the geophysical model for Other Forest Cover Type/Canyon Habitat with pine and conifer stringers (Tonto NF) in Nest/Roost Recovery Habitat. In MSO Nest/Roost recovery habitat, the treatments would maintain or increase most habitat variables important to the MSO while treating and ultimately conserving these conditions over time.

Trees Per Acre (TPA) in Nest Roost Recovery habitat were modeled in Alternative 3 to show effects from implementation over twenty years. Results show that TPA in mixed conifer cover type increases trees greater than 18 inches from 24 TPA in the existing condition to 26 TPA after two decades of implementation. Results show that in Ponderosa pine-Oak cover type show TPA increases trees greater than 18 inches from 20 TPA in the existing condition to 24 TPA after two decades of implementation. In acres modeled using the geophysical model FVS model results show TPA increases trees greater than 18 inches from 18 TPA in the existing condition to 20 TPA after two decades of implementation. Results from both cover types and from the acres selected using the geophysical model will exceed minimum Recovery Plan Recommendations of 12 per acre.

Preserving MSO habitat by using thinning and burning treatments, while promoting large trees and reducing risk of fire hazard index and crown fire, is one of the main objectives of the action alternatives in Rim Country (returning resiliency to the forested ecosystem).

Surface fuel loading in MSO Nest/Roost Recovery Habitat would be reduced under Alternative

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3, moving from 28 tons per acre in MC, 18 in P-O, and 23 GM to 23 tpa in MC and 19 tpa in P-O and 18 (GM) after 20 years post treatment (table 4-15).

Shrub and herbaceous biomass would also be maintained or increase in Alternative 3. Fire modeling shows 20 years post treatment will reduce risk of crown fire and the fire hazard index (decreasing fuel loading), while increasing coarse woody debris, downed logs, and snags $\geq 12''$ (with 3 snags $\geq 18''$ in mixed conifer and 2 snags per acre $\geq 18''$ in Pine oak cover type) after 20 years post treatment in MSO Nest/Roost recovery habitat.

Table 52. FVS Modeling of Key Habitat Variables for the MSO in Mixed Conifer, Pine-Oak, and acres identified using the Geophysical Model (Tonto NF) in Nest/Roost Recovery Habitat, 10, and 20 Years Post Treatment from Alternative 3

MSO Recovery Replacement Nest/Roost Mixed Conifer = 12,849 Acres Modeled Pine-Oak = 13,422 Acres Modeled Geophysical Model = 3,388 Acres Modeled	Existing Condition	Alternative 3 10 Years Post Treatment	Alternative 3 20 Years Post Treatment	Desired Condition
Average of BA Mixed Conifer	178	126	129	Minimum 120
Average of BA Pine-Oak	158	123	123	Minimum 110
Average of BA Geophysical Model	190	112	107	
Average of Snags 12-18" Mixed Conifer	4	4	3	Promote Snags in this Class
Average of TPA >18" Mixed Conifer	24	24	26	Minimum 12 TPA >18"
Average of TPA >18" Pine-Oak	20	22	24	Minimum 12 TPA >18"
Average of TPA >18" Geophysical Model	18	19	20	
Average of Snags 12-18" Pine-Oak	3	5	4	Promote Snags in this Class
Average of Snags 12-18" Geophysical Model	3	5	4	Promote Snags in this Class
Average of Snags >18" Mixed Conifer	2	3	3	3 Per acre in MC
Average of Snags >18" Pine-Oak	1	2	2	1-2 per acre PO
Average of Snags >18" Geophysical Model	1	2	2	
Average of Canopy Cover Mixed Conifer	73	62	63	> 60%
Average of Canopy Cover Pine-Oak	70	63	63	> 40%
Average of Canopy Cover Geophysical Model	76	61	60	> 40%

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MSO Recovery Replacement Nest/Roost Mixed Conifer = 12,849 Acres Modeled Pine-Oak = 13,422 Acres Modeled Geophysical Model = 3,388 Acres Modeled	Existing Condition	Alternative 3 10 Years Post Treatment	Alternative 3 20 Years Post Treatment	Desired Condition
Average of Surface Fuel Mixed Conifer	28	24	23	Maintain to promote surface fire
Average of Surface Fuel Pine-Oak	18	18	19	Maintain to promote surface fire
Average of Surface Fuel Geophysical Model	23	19	18	Maintain to promote surface fire
Average of CWD Mixed Conifer	9	10	10	Maintain to promote surface fire 5-15 TPA
Average of CWD Pine-Oak	6	7	8	Maintain to promote surface fire 3-10 TPA
Average of CWD Geophysical Model	10	11	11	
Average of Surface_Herb Mixed Conifer	0.20	0.25	0.25	Herbaceous biomass increases over time for prey species habitat
Average of Surface_Herb Pine-Oak	0.21	0.23	0.23	Herbaceous biomass increases over time for prey species habitat
Average of Surface_Herb Geophysical Model	0.20	0.25	0.23	Herbaceous biomass increases over time for prey species habitat
Average of Surface_Shrub Mixed Conifer	0.37	0.66	0.68	Shrub biomass increases over time for prey species habitat
Average of Surface_Shrub Pine-Oak	0.21	0.19	0.19	Shrub biomass increases over time for prey species habitat
Average of Surface_Shrub Geophysical Model	0.24	0.31	0.31	Shrub biomass increases over time for prey species habitat

The overall effect of treatments in nest/roost recovery habitat, 20 years post treatment from Alternative 3, would be to increase large trees (see tables). In the existing condition, trees in 12-18" DBH size class in the mixed conifer cover type decrease from 36% to 23%. In the pine-oak cover type trees in the 12-18' age class go from 33% in the existing condition to 25%. From the acres identified using the Geophysical model for the Tonto trees 12-18" decrease from 39% in the existing condition to 22% after 20 years of treatment from Alternative 3. Silvicultural prescriptions in all MSO cover types should seek to increase this age class, contradicting these

negative model results whenever possible. While this size class is reduced in the modeling the data indicates that trees greater than 18” DBH are well above minimum recovery plan recommendations in all cover types. In the mixed conifer cover type trees > 18” DBH go from 42% total trees in Nest/Roost recovery habitat in this size class in the existing condition to 58% of all trees of these age classes in this cover type after 20 years post treatment. In the pine-oak cover type trees >18” DBH go from 36% total of trees in Nest/Roost recovery habitat in this age class to 50%. From the acres identified by using the geophysical model FVS results for trees greater than 18” DBH go from 38% total to 52% 20 years post treatment from Alternative 3.

All treatments in nest/roost recovery habitat will follow MSO Recovery Habitat recommendations for a diversity of trees with the goal of having trees ≥ 16 ” DBH contributing $\geq 50\%$ of the stand BA (Table C.2) from the Revised MSO Recovery Plan (2012). For each cover type; mixed conifer; Ponderosa pine-oak. and from acres identified using the Geophysical Model (Other Forest Cover type/Canyon Habitat trees greater than 18” DBH represent greater than or equal to 50%. This will provide for all life history needs (nesting, roosting, foraging) by emphasizing large trees, and should provide for large snags and logs (Ganey et al. 2003).

Table 53. Nest/Roost Recovery Habitat Tree Size Classes and Percentages in Mixed Conifer Cover Type, 10, and 20 years Post Treatment from Alternative 3

Tree Size Class 1-6	Tree Size Class	Basal Area Existing	% of BA Existing	Basal Area Alternative 3 after 10 years Post Treatment	% of BA Alternative 3 after 10 years Post Treatment	Basal Area Alternative 3 after 20 years Post Treatment	% of BA Alternative 3 after 20 years Post Treatment
1 (0-1")	BA1 0-1"	1	0%	0	0%	0	0%
2 (1-5")	BA2 1-5"	13	8%	3	3%	3	2%
3 (5-12")	BA3 5-12"	42	27%	19	14%	16	12%
4 (12-18")	BA4 12-18"	56	36%	34	25%	31	23%
5 and (6 >18")	BA5 and BA6 >18"	66	42%	70	53%	78	58%
Total BA	Total BA	178		126		129	

Table 54. Nest/Roost Recovery Habitat Tree Size Classes and Percentages in Ponderosa Pine-Oak Cover Type, 10, and 20 years Post Treatment from Alternative 3

Tree Size Class 1-6	Tree Size Class	Basal Area Existing	% of BA Existing	Basal Area Alternative 3 after 10 years Post Treatment	% of BA Alternative 3 after 10 years Post Treatment	Basal Area Proposed Action after 20 years Post Treatment	% of BA P Alternative 3 after 20 years Post Treatment
1 (0-1")	BA1 0-1"	1	0%	0	0%	0	0%
2 (1-5")	BA2 1-5"	9	6%	3	3%	3	2%
3 (5-12")	BA3 5-12"	40	25%	21	16%	18	14%
4 (12-18")	BA4 12-18"	52	33%	37	27%	34	25%
5 and (6 >18")	BA5 and BA6 >18"	56	36%	62	46%	67	50%
Total BA	Total BA	158		123		123	

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Table 55. Nest/Roost Recovery Habitat Tree Size Classes and Percentages from acres identified using the Geophysical Model (Other Forest Type/Canyon Habitat), 10, and 20 years post treatment from Alternative 3

Tree Size Class 1-6	Tree Size Class	Basal Area Existing	% of BA Existing	Basal Area Alternative 3 after 10 years Post Treatment	% of BA Alternative 3 after 10 years Post Treatment	Basal Area Alternative 3 after 20 years Post Treatment	% of BA Alternative 3 after 20 years Post Treatment
1 (0-1")	BA1 0-1"	1	1%	0	0%	0	0%
2 (1-5")	BA2 1-5"	13	9%	1	1%	1	1%
3 (5-12")	BA3 5-12"	55	35%	17	13%	13	10%
4 (12-18")	BA4 12-18"	61	39%	33	25%	29	22%
5 and (6 >18")	BA5 and BA6 >18"	60	38%	60	45%	63	47%
Total BA	Total BA	190		112		107	

MSO Foraging/Non-breeding Recovery Habitat

The table below shows the modeled effects from vegetation treatments from Alternative 3 treatments to key MSO habitat variables in pine-oak, mixed conifer, and using the geophysical model (Tonto NF) in MSO Foraging/Non-breeding Recovery Habitat.

Table 56. FVS Modeling of Key Habitat Variables for the MSO in Mixed Conifer, Pine-Oak, and from acres identified by using the Geophysical Model (Tonto NF) in Foraging/Non-breeding Recovery Habitat, 10, and 20 years post treatment from Alternative 3

MSO Recovery Foraging/Non-breeding Mixed Conifer = 24,924 Acres Modeled Pine-Oak = 86,615 Acres Modeled Geophysical Model = 30,364 Acres Modeled	Existing Condition	Alternative 3 10 Years Post Treatment	Alternative 3 20 Years Post Treatment	Desired Condition
Average of BA Mixed Conifer	151	94	97	120 (table c1 in MSORP)
Average of BA Pine-Oak	137	96	98	110 (table c1 in MSORP)
Average of BA Geophysical Model	163	82	79	-
Average of TPA >18" Mixed Conifer	16	15	17	Minimum 12 TPA >18"
Average of TPA >18" Pine-Oak	13	13	14	Minimum 12 TPA >18"
Average of TPA >18" Geophysical Model	13	12	12	
Average of SG1218 Mixed Conifer	3	4	3	Promote Snags
Average of SG1218 Pine-Oak	2	3	3	Promote Snags
Average of SG1218 Geophysical Model	2	5	3	Promote Snags
Average of Snags >18" Mixed Conifer	2	2	2	3 Per acre in MC
Average of Snags >18" Pine-Oak	1	1	1	1-2 per acre PO
Average of Snags >18" Geophysical Model	1	2	2	-
Average of Canopy Cover Mixed Conifer	69	54	55	> 60%
Average of Canopy Cover Pine-Oak	66	55	55	> 40%
Average of Canopy Cover Geophysical Model	71	50	48	-
Average of Surface Fuel Mixed Conifer	23	19	18	Maintain to promote surface fire
Average of Surface Fuel Pine-Oak	16	14	15	Maintain to promote surface fire
Average of Surface Fuel Geophysical Model	18	14	13	Maintain to promote surface fire
Average of CWD Mixed Conifer	8	9	8	Maintain to promote

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MSO Recovery Foraging/Non-breeding Mixed Conifer = 24,924 Acres Modeled Pine-Oak = 86,615 Acres Modeled Geophysical Model = 30,364 Acres Modeled	Existing Condition	Alternative 3 10 Years Post Treatment	Alternative 3 20 Years Post Treatment	Desired Condition
				surface fire 5-15 TPA
Average of CWD Pine-Oak	5	6	6	Maintain to promote surface fire 3-10 TPA
Average of CWD Geophysical Model	6	7	7	-
Average of Surface_Herb Mixed Conifer	0.21	0.25	0.25	Herbaceous biomass increases over time for prey species habitat
Average of Surface_Herb Pine-Oak	0.21	0.24	0.24	Herbaceous biomass increases over time for prey species habitat
Average of Surface_Herb Geophysical Model	0.19	0.25	0.25	Herbaceous biomass increases over time for prey species habitat
Average of Surface_Shruh Mixed Conifer	0.29	0.56	0.59	Shrub biomass increases over time for prey species habitat
Average of Surface_Shruh Pine-Oak	0.21	0.20	0.19	Shrub biomass increases over time for prey species habitat
Average of Surface_Shruh Geophysical Model	0.27	0.33	0.31	Shrub biomass increases over time for prey species habitat

Foraging/Non-breeding Recovery habitat, treatments would maintain or increase most habitat variables beneficial to the MSO, its critical habitat, and its prey species, while conserving these conditions over time (see table above). These treatments would preserve Foraging/Non-breeding Recovery habitat by thinning and burning while promoting large trees and reducing the fire hazard index and the risk of crown fire. These estimates indicate that treatments would align with MSO Recovery Plan recommendations. Trees Per Acre (TPA) in Foraging-Nonbreeding Recovery habitat were modeled for Alternative 3 to show effects from implementation over twenty years. Results show that TPA in mixed conifer cover type increases trees greater than 18 inches from 18 TPA in the existing condition to 17 TPA after two decades of implementation. Results show that in Ponderosa pine-Oak cover type show TPA increases trees greater than 18 inches from 13 TPA in the existing condition to 14 TPA after two decades of implementation. In acres modeled using the geophysical model FVS model results show TPA increases trees greater than 18 inches from 13 TPA in the existing condition to 12 TPA after two decades of implementation. Results from both cover types and from the acres selected using the geophysical model in Alternative 3 will exceed or meet minimum Recovery Plan Recommendations of 12 per acre.

Shrub and herbaceous biomass would also be maintained or increase in the Proposed Action. FVS modeling shows 20 years of treatments will reduce risk of crown fire and the fire hazard index (decreasing fuel loading), while increasing coarse woody debris, downed logs, and snags $\geq 12''$ (with 3 snags $\geq 18''$ in mixed conifer and 2 snags per acre $\geq 18''$ in Pine oak cover type) after 20 years of treatment in MSO Foraging/Non-breeding recovery habitat. Reductions in surface fuel and creation of interspaces and uneven aged management would conserve MSO Foraging/Non-breeding Recovery habitat over time. Fuel loads, the fire hazard index, and the

risk of crown fire would be greatly reduced as a result of treatment from Alternative 3 (see Fire Effects below).

Table 57. Foraging/Non-breeding Recovery habitat Tree Size Classes and Percentages in Mixed Conifer Cover Type, 10, and 20 years Post Treatment from Alternative 3

Tree Size Class 1-6	Tree Size Class	Basal Area Existing	% of BA Existing	Basal Area Alternative 3 after 10 years Post Treatment	% of BA Alternative 3 after 10 years Post Treatment	Basal Area Alternative 3 after 20 years Post Treatment	% of BA Alternative 3 after 20 years Post Treatment
1 (0-1")	BA1 0-1"	1	1%	0	0%	0	0%
2 (1-5")	BA2 1-5"	15	9%	5	4%	6	4%
3 (5-12")	BA3 5-12"	44	28%	17	13%	14	11%
4 (12-18")	BA4 12-18"	48	30%	27	20%	26	19%
5 and (6 >18")	BA5 and BA6 >18"	44	28%	44	33%	50	37%
Total BA	Total BA	151		94		97	

Table 58. Foraging/Non-breeding Recovery habitat Tree Size Classes and Percentages in Pine-Oak Cover Type, 10, and 20 years Post Treatment from Alternative 3

Tree Size Class 1-6	Tree Size Class	Basal Area Existing	% of BA Existing	Basal Area Alternative 3 after 10 years Post Treatment	% of BA Alternative 3 after 10 years Post Treatment	Basal Area Alternative 3 after 20 years Post Treatment	% of BA Alternative 3 after 20 years Post Treatment
1 (0-1")	BA1 0-1"	1	0%	0	0%	0	0%
2 (1-5")	BA2 1-5"	11	7%	5	4%	5	4%
3 (5-12")	BA3 5-12"	46	30%	24	18%	21	16%
4 (12-18")	BA4 12-18"	44	28%	30	23%	30	22%
5 and (6 >18")	BA5 and BA6 >18"	35	22%	37	28%	41	31%
Total BA	Total BA	137		96		98	

Table 59. Foraging/Non-breeding Recovery habitat Tree Size Classes and Percentages from acres identified by using the Geophysical Model (Other Forest Cover Type/Canyon habitat), 10, and 20 years Post Treatment from Alternative 3

Tree Size Class	Basal Area Existing	% of BA Existing	Basal Area Alternative 3 after 10 years Post Treatment	% of BA Alternative 3 after 10 years Post Treatment	Basal Area Alternative 3 after 20 years Post Treatment	% of BA Alternative 3 after 20 years Post Treatment
BA1 0-1"	1	1%	0	0%	0	0%
BA2 1-5"	16	10%	3	3%	3	2%
BA3 5-12"	62	39%	18	14%	16	12%
BA4 12-18"	47	29%	24	18%	22	16%
BA5 and BA6 >18"	38	24%	36	27%	38	28%
Total BA	163		82		79	

Trees in size 12-18" DBH decrease from the existing condition in both cover types and from

acres identified by using the geophysical model 20 years post treatment. In mixed conifer cover type trees 12-18" DBH go from 30% in the existing condition to 19%, 20 years post treatment from Alternative 3. In pine-oak trees 12-18" DBH go from 28% to 22% of trees in this size class. In acres identified by using the geophysical model trees 12-18" DBH decrease from 30% to 16% of all trees in Foraging/Non-breeding recovery habitat of this size class. Silvicultural prescriptions should be designed to increase this size class to contradict the model results. Large trees in the 19-24" age class in mixed conifer cover type (and combined with ALL_BA6 age class >24 inches DBH) will increase from the existing condition 28% total of trees >18" in Foraging/Non-breeding recovery habitat. Trees 19-24" and greater in mixed conifer cover type will represent 40% total of all trees in these size classes in Foraging/Dispersal recovery habitat after 20 years post treatment. In pine-oak cover type trees > 18" DBH increase from the existing condition of 22% total to 32% total of trees >18" DBH in Foraging/Non-breeding recovery habitat after 20 years post treatment. From the acres identified by using the geophysical model trees >18" DBH go from 24% of all trees in Foraging/Non-breeding recovery habitat in the existing condition to 28% after 20 years post treatment. Alternative 3 moves this habitat type closer to desired condition for the MSO. Trees > 18" DBH increase from the Proposed Action in both cover types and on acres identified by using the geophysical model. By providing for large trees, woody debris, snags, shrubs and hardwoods the MSO Foraging/Non-breeding recovery habitat in the project area will develop into Nesting and Roosting habitat over time.

Fire Effects

Surface Fuel Loading

Surface fuel loading in MSO Protected Habitat would slightly increase under Alternative 3, remaining at 26 tons per acre in MC and 20 in P-O after 20 years of treatment. Timber management will decrease these modeled results by removing the majority of cut material.

Surface fuel loading in MSO Nest/Roost Recovery Habitat would be reduced under Alternative 3, moving from 28 tons per acre in MC, 18 in P-O, and 23 GM to 23 tpa in MC and 19 tpa in P-O and 18 GM after 20 years of treatment.

Surface fuel loading in MSO Foraging/Non-breeding Recovery habitat would be reduced under Alternative 3, moving from an existing condition of 23 tons per acre in MC, 16 tpa in P-O, and 18 tpa GM to 18 tons per acre in MC, and 15 tpa in P-O and 13 tpa in GM after 20 years of treatment.

Fire Hazard Index

The potential for wildfire activity that would result in more severe effects on ecosystem components than that which should occur in a natural fire regime is illustrated by this analysis. The fire hazard index would be reduced from Alternative 3.

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Table 60. Fire Hazard Index Comparison for acres from Alternative 3 with Percentages of Total Habitat Modeled in the Project Area for Fire Risk in Wildlife Habitat

MSO Habitat Type	Very Low Need For Treatment in Acres	%	Low Need for Treatment in Acres	%	Moderate Need for Treatment in Acres	%	High Need for Treatment in Acres	%	Extreme Need for Treatment in Acres	%
Protected PAC 116,385 Acres Modeled	38883	33	31493	27	20364	17	18693	16	6952	6
Recovery Nest/Roost 38,092 Acres Modeled	16597	44	10405	27	6358	17	3086	8	1646	4
Recovery Foraging/Non-Breeding 183,706 Acres Modeled	85302	46	60137	32	22774	12	12014	7	3478	2
MSO Critical habitat 686,283 Acres modeled	337856	49	193767	28	95347	14	46343	7	12971	2

The Moderate, High, and Extreme Need for Treatment categories of FHI are decreased from alternative 2 in PACs from the existing condition of 70,328 acres (62%) to 46,009 acres (39%). The High and Extreme Need for Treatment categories are reduced from 51,002 acres (45%) of all PACs modeled in the existing condition to 25,645 acres (22%) after alternative 3 is implemented.

In Nest/Roost recovery habitat the Moderate, High, and Extreme Need for Treatment categories of FHI are decreased from alternative 2 from 22,628 acres (60%) from the existing condition to 11,090 acres (29%). The High and Extreme Need for Treatment categories are reduced from 15,869 acres (42%) of all Nest/Roost Recovery Habitat modeled in the existing condition to 4,732 acres (12%) after alternative 3 is implemented.

In Foraging/Non-breeding MSO Recovery Habitat the Moderate, High, and Extreme Need for Treatment categories of FHI are decreased from 84,363 acres (46%) in the existing condition to 38,266 acres (21%) after alternative 3 is implemented. The High and Extreme Need for Treatment categories are reduced from 51,210 acres (28%) of all Foraging/Non-breeding Recovery Habitat modeled in the existing condition to 15,492 acres (9%) after alternative 3 is implemented.

Crown Fire

The risk of crown fire is reduced under Alternative 3, from the existing condition. But not as much as in Alternative 2.

As with the fire hazard index analysis above, the potential for wildfire activity that would result in more severe effects on ecosystem components than that which should occur in a natural fire

regime is illustrated by this analysis. The potential of crown fire would be greatly reduced in the Alternative 3 (see below).

Table 61 Active and Conditional Crown Fire Assessment from Alternative 3 Wildlife Habitat (with Percentages of Total habitat Modeled in the Project Area)

MSO Habitat Type	Active Crown Fire Acres	%	Conditional Crown Fire Acres	%	Passive Crown Fire Acres	%	Surface Fire Acres	%	Non-Burnable Acres	%
Protected PAC 116,385 Acres Modeled	38932	33	4054	4	36491	31	35767	30	1142	1
Recovery Nest/Roost 38,092 Acres Modeled	8650	23	1179	3	15962	42	12234	32	68	>1
Recovery Foraging-Non-Breeding 183,706 Acres Modeled	28528	15	2680	2	115737	63	35806	19	954	>1
MSO Critical Habitat 686,283 Acres Modeled	131541	19	12480	2	377918	55	158411	23	5933	>1

In PACs, the potential for active and conditional crown fire is decreased in Alternative 3 compared to the existing condition from 58,765 acres (51%) to 42,986 acres (37%) of this habitat type in the project area that would experience high severity crown fire as a result of implementing Alternative 3. Active crown fire risk is reduced from 39% of all PAC habitat in the project area to 33%.

In Nest/Roost Recovery Habitat the potential for active and conditional crown fire is decreased in Alternative 2 compared to the existing condition from 18,275 acres (48%) to 9,829 acres (26%) after implementing Alternative 3. Active crown fire risk is reduced from 39% of all Nest/Roost Recovery Habitat in the project area to 23%.

In Foraging/Non-breeding Recovery Habitat the potential for active and conditional crown fire is decreased in Alternative 2 compared to the existing condition from 63,737 acres (34%) to 31,208 acres (17%) after implementing Alternative 3. Active crown fire risk is reduced from 27% of all Nest/Roost Recovery Habitat in the project area to 15%.

In MSO Critical Habitat the potential for active and conditional crown fire is decreased in Alternative 3 compared to the existing condition from 242,642 acres (35%) to 144,020 acres (21%) after implementing the proposed action. Active crown fire risk is reduced from 27% of all MSO Critical Habitat in the project area to 19%.

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Effects from Implementation Activities on the MSO (Alt3).

Alternative 3 would treat fewer acres in Rim Country. The direct and indirect effects would be similar to Alternative 2. Alternative 3 includes the same number of miles and acres of riparian and other habitat restoration, while reducing the total number of acres thinned and treated with prescribed burning. In PACs, 24,045 fewer acres would be thinned and burned. In Recovery Nest/Roost Habitat, 7,545 fewer acres would be treated in Alternative 3. In Foraging/Non-breeding MSO Recovery Habitat 51,920 545 fewer acres would be treated in Alternative 3. Savannah treatments in Alternative 3 would be reduced by 15,190 acres, providing less restoration to benefit the MSO prey base. Cable operations in MSO Recovery Habitat (3,962 acres in Nest/Roost Recovery, and 18,072 acres in Foraging-Non-breeding Recovery) will have short-term effects to the understory under the cables, with long-term beneficial effects.

The same analysis for Alternative 2 regarding disturbance from implementation activities applies to Alternative 3, with less acres treated. While disturbance effects would be lessened slightly with Alternative 3, the long-term effects and risk of habitat degradation from stand-altering wildfire or insect infestations would be greater.

Determination of Effect for the MSO (Alt3)

Based on the above analysis, Alternative 3 **may affect, is likely to adversely affect the Mexican spotted owl.**

Cumulative Effects

Because of the size of the Rim Country project area and the large portion of the western Upper Gila Mountain Recovery Unit and a portion of the Basin and Range Recovery Unit that it occupies, the project area itself was considered adequate for assessing habitat effects on PACs. Due to the potential for disturbance to owls, the cumulative effects analysis boundary was extended 0.5 mile beyond the project area periphery to account for the spatial component of this analysis. Cumulative effects include the effects of Alternative 1. The temporal component in this analysis was defined as 10 years for short-term effects and 30 years for long-term effects.

The effects from projects before 2000 are incorporated into existing conditions. Aspects of existing conditions that are a result of these early projects include a deficit in large trees and snags and even-aged conditions. Pre-2000 projects also had heavy selection pressure for preferred tree genetics to provide healthy trees with good form. This latter effect resulted from harvested areas being regenerated from planting stock or from the selected reserve trees left in seed tree harvest units (Higgins, personal communications 2006). Wildlife habitat in the form of nesting, feeding, and loafing sites was reduced by selecting for disease-free trees with symmetric shapes, eliminating fork-top trees, trees with unusual branching patterns, and replanting with selected genetic stock from nurseries.

Alternative 1 – No Action

Alternative 1 would not contribute to the improvement of either forest structure or prey habitat within MSO habitat. The contributions of past, ongoing, and reasonably foreseeable actions would affect habitat for MSO and their prey, but no cumulative effects would result from Rim Country (i.e., no change would occur either spatially and temporally to alter these effects of other actions on the landscape).

Maintaining existing conditions would extend the current deficit of trees greater than 24 inches in diameter. Current numbers of trees per acre greater than or equal to 18 inches in diameter, already below Land Management Plan and Recovery Plan direction, would likely be maintained due to increases in mortality rates resulting from competition. Slow to stagnating tree growth rates would prolong the time required for mid-aged trees to grow into mature trees. Replacement of mid-aged trees by younger trees would occur at low rates because of current deficits in small size classes, delaying, limiting, or preventing the long-term attainment of desired conditions for mature and old-growth forest. Ponderosa pine is not a shade-adapted species. Therefore, consistently dense canopy cover would delay or prevent development of multi-storied and uneven-aged forest structure in the long term. Growth could be further suppressed and mortality rates increased if climate patterns continue toward hotter and drier growing conditions. Within-stand mortality resulting from competition for rooting space, water, and nutrient availability, vulnerability to insects and disease, and fire could lead to patches of more open conditions. This could reduce potential nesting and roosting habitat even in locations where individual trees might benefit and eventually grow into larger size classes.

Pine-oak habitat would remain outside the natural range of variation in terms of tree densities and age-class distribution under Alternative 1. Loss of large diameter oak would continue, as would the suppression of young oak by competing pine trees. Total basal area in oak may decline over time and would likely remain below desired conditions. Dense forest structure could increase the risk of insect and disease outbreaks occurring and increase the scale at which they occur. Stochastic events outside the natural range of variation could continue to slow or prevent development of new MSO nesting and roosting habitat.

Limited road closures would allow continued access to most of the existing roads footprint and would maintain the same threat to large snag persistence. Ecosystem function would continue to decline with continued tree encroachment into spring, channel, meadow, and aspen habitats.

The ability to retain sustainable and resilient ecosystems would be further compromised by vulnerability to high-severity fires. The overt threat of high-severity fire could limit options for treating uncharacteristic fuel loads through the use of unplanned ignitions, compounding the risk of high-severity fire through time. By not treating outside of MSO habitat, the risk of high-severity fire remains high from ignitions starting outside of pine-oak habitats as well as fire igniting within MSO habitat.

Determination of Effect

Based on the above analysis, Alternative 1 of the Rim Country Project **may affect, is likely to adversely affect the Mexican spotted-owl.**

Alternative 2 – Modified Proposed Action

Restoration treatments would contribute toward improving MSO forest health and vegetation diversity and composition under Alternative 2. This would aid in sustaining old forest structure over time and moving forest structure toward desired conditions.

Projects with treatments occurring specifically in MSO habitat include prescribed fire and mechanical thinning with prescribed fire in protected habitat and restricted habitat (See Cumulative Effects Past Projects). Most projects in protected habitat used 18-inch diameter limits and some used up to 24-inch diameter limits in other recovery habitat. Treatments in MSO

habitat in reasonably foreseeable projects include thinning and burning restoration and fuels reduction treatments, such as those being developed for the C.C. Cragin Watershed Protection, Rim Lakes Forest Restoration, Larson Forest Restoration, and the Upper Beaver Creek Watershed Fuels Reduction projects. For these projects, Gambel oak is not targeted for removal, but prescribed fire would likely top-kill small diameter oak, potentially decreasing oak basal area in the short term. However, design features should ensure retention of large-diameter oak and small oak commonly sprout vigorously after fire. The total basal area of Gambel oak is not expected to change substantially in the long term.

Created canopy gaps should benefit MSO prey species, and the reduction in small trees should open the space between ground-level and canopy base height, improving MSO flight paths for foraging. However, diameter limits that retain mid-aged trees commonly prevent the development of complex forest structure and decrease inherent habitat heterogeneity.

Changes would be expected in MSO prey habitat. Reductions would be expected in coarse woody debris, logs, and snags, commonly decreasing structure in prey habitat in the short term. Burn prescriptions and ignition techniques should limit these losses. Burned snags would fall and provide logs, and trees killed by fire would become snags. However, the longevity of fire-killed snags is less than that of snags formed by other processes. Maintenance burning should provide pulses of snags and logs through time. Less coarse woody debris would be expected in the short term as a result of prescribed fire. Thinning and burning should increase tree growth rates, and self-pruning of lower tree branches should replenish coarse woody debris in the long term. Improving growing conditions would decrease density-related mortality of larger and older trees. Improving recruitment into larger tree size classes would improve MSO habitat and the ability to provide large snags that remain on the landscape longer than smaller diameter or fire-created snags. The combination of thinning and burning should improve species richness in the herbaceous understory, increase plant abundance, and improve fruit and seed production.

Current and reasonably foreseeable projects represent areas omitted from the Rim Country planning effort because some degree of planning was already in progress or they occur outside of ponderosa pine forest. Treatments in these areas would reduce the fire threat for MSO habitat within the respective project area, as well as reducing the threat of high-severity fire starting in these areas and burning habitat outside the project areas. Given the diameter limits employed and the generally low intensity of the treatments in MSO habitat, decreases in the risk of high-severity fire and improvements to understory vegetation and prey habitat are expected to be short term, before canopies expand and intercept light, rain, and snow, thereby reducing understory response in the long term.

Cumulative effects from reasonably foreseeable projects could include disturbance from noise and potentially from smoke. Implementation of the CC Cragin Watershed Restoration Project (on the Mogollon Rim Ranger District) and Flagstaff Watershed Protection Project (the San Francisco Peaks and Mormon Mountain), reopening or developing rock pits (Coconino and Apache-Sitgreaves), and other restoration work, such as in the Beaver Creek Rim Lakes and Larsen projects (Mogollon Rim), could cumulatively degrade but retain MSO habitat, including PACs and recovery habitat, in the short and long terms. However, the risk of high-severity fire eliminating MSO habitat would be reduced in the short and long terms.

Because current and reasonably foreseeable projects represent areas omitted from the Rim Country project area, overlap in the spatial component of cumulative effects would largely be avoided. Although smoke and noise can cross project boundaries, both largely disperse with distance. However, some areas where smoke settles could be at further risk of effects on owls. Other restoration projects such as the C.C. Cragin Watershed Protection Project could cumulatively increase effects on owls in PACs adjacent to shared boundaries.

Many current and reasonably foreseeable projects would overlap temporally. All or most PAC treatments would have timing restrictions, preventing treatments during the breeding season. Also, the most common PAC treatment would be prescribed fire, which would be managed to be similar to the owl's evolutionary environment.

Given the various stages of planning and implementation, most project effects would be dispersed both spatially and temporally. Projects in MSO habitat are typically designed to improve habitat, or to degrade elements of habitat structure while retaining habitat function, resulting in a decrease in risk of high-severity fire. Cumulative effects would likely increase disturbance to individual MSOs from noise or smoke in the short term. Effects would not be expected on fecundity because of timing restrictions. Given restoration project objectives, the scale of the cumulative effects area, the distribution of MSO habitat across the project area, and the length of time over which treatments would be implemented (20 or more years), cumulative effects would not be expected to negatively affect MSO population in the long term. Overall, treatments in MSO habitat should move forest conditions toward desired conditions and decrease the risk of habitat loss to large-scale high-severity fire.

Determination of Effect

Based on the above analysis, Alternative 2 of the Rim Country Project **may affect, is likely to adversely affect the Mexican spotted owl.**

Alternative 3 – Focused Alternative

Alternative 3 would treat fewer acres in Rim Country. The direct and indirect effects would be similar to Alternative 2. Alternative 3 includes the same number of miles and acres of riparian and other habitat restoration, while reducing the total number of acres thinned and treated with prescribed burning. In PACs, 24,045 fewer acres would be thinned and burned. In Recovery Nest/Roost Habitat, 7,545 fewer acres would be treated in Alternative 3. In Foraging/Non-breeding MSO Recovery Habitat 51,920 fewer acres would be treated in Alternative 3. Savannah treatments in Alternative 3 would be reduced by 15,190 acres, providing less restoration to benefit the MSO prey base.

The same analysis for Alternative 2 regarding disturbance from implementation activities applies to Alternative 3, with less acres treated. While disturbance effects would be lessened slightly with Alternative 3, the long-term effects and risk of habitat degradation from stand-altering wildfire or insect infestations would be greater.

Determination of Effect

Based on the above analysis, Alternative 3 **may affect, is likely to adversely affect the Mexican spotted owl.**

Mexican Spotted Owl Critical Habitat

Alternative 1

With no management, MSO Critical Habitat will continue to move away from desired condition. The FVS model runs that cover 20 years, with one thinning and 2 prescribed burns over the lifetime of the project indicate that while average BA of mixed conifer and Ponderosa pine cover types increases, trees in the intermediate size classes 3 and 4 will encroach forests even more than they do today. This will increase fuel loads beyond desired conditions and the threat of high severity wildfire is increased (see below).

In MSO Critical Habitat the Moderate, High, and Extreme Need for Treatment categories of FHI are increased from 288,246 acres (42%) in the existing condition to 311,805 acres (45%) from alternative 1. The High and Extreme Need for Treatment categories are reduced from 181,505 acres (26%) of all MSO Critical Habitat modeled in the existing condition to 218,159 acres (31%) from alternative 1.

In MSO Critical Habitat the potential for active and conditional crown fire is increased in Alternative 1 compared to the existing condition from 242,642 acres (35%) to 257,682 acres (38%) after 20 years of no management. Active crown fire risk is increased from 27% of all MSO Critical Habitat in the project area to 35%.

Determination of Effect for MSO Critical Habitat (Alt1)

Based on the above analysis, Alternative 3 **may affect, is likely to adversely affect Mexican spotted owl Critical Habitat.**

Alternative 2

Under the Proposed Action, mechanical treatments would occur in portions of all MSO Critical Habitat except for core areas which would be burned only.

Table 62. Proposed Treatments in MSO Critical Habitat by UGM, Alternative 2 (The Proposed Action)

Proposed Treatment by EMU	BR-W-5	UGM-10	UGM-11	UGM-7	Grand Total
Facilitative Operations Mechanical	1,972	1,449	3	71	3,496
Facilitative Operations Prescribed Fire Only	745	7,487	33	22	8,287
Grassland Prescribed Fire Only		37	6		43
Grassland Restoration		18	37	14	69
MSO Recovery - Replacement Nest/Roost	1,983	14,257	891	753	17,885
PAC - Hand Thin		1,006		176	1,182
PAC – Mechanical	190	8,278	1,124	430	10,022
Prescribed Fire Only	3,863	59,408	7,817	950	72,039
Riparian Prescribed Fire Only	16	1,226	3		1,245
Riparian Restoration	287	3,924	36		4,247

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Severe Disturbance Area Treatment		378			378
Stand Improvement - High Site	1,334	2,778	330	358	4,801
Stand Improvement - Moderate Site	1,607	5,044	767	794	8,211
Stand Improvement - Low Site	671	1,551	307	614	3,142
Uneven-aged - High Site	8,006	21,673	1,541	1,889	33,109
Uneven-aged - Moderate Site	3,580	24,340	2,333	3,155	33,408
Uneven-aged - Low Site	930	3,124	1,073	2,288	7,415
Wet Meadow & Riparian Prescribed Fire Only		255			255
Wet Meadow & Riparian Restoration	10	177			187
Wet Meadow Prescribed Fire Only		32			32
Wet Meadow Restoration		707	13	130	849
Grand Total	25,194	157,150	16,315	11,645	210,304

Total treatments in MSO habitat include 542,462 210,304 acres of mechanical thinning and low severity prescribed fire (about 79 % of the total MSO CH habitat in the treatment area). Low-severity prescribed fire would be applied to all MSO habitats. No trees greater than 24 inches DBH. would be cut in MSO habitat. Trees up to 18 inches DBH could be thinned in PACs. Treatments in recovery nest/roost habitat are designed to move forests toward nest/roost conditions. Treatments in nest/roost habitat would not lower forest structure values below the minimum nest/roost levels described in the Land Management Plans and in Table C.3 of the Revised Recovery Plan (USDI FWS 2012b). It is assumed that mechanical treatments and two low-severity fires would occur within the project's 20-year timeline.

Mechanical thinning and low-severity prescribed fire would take place at different times in different locations. MSO habitat could be affected by mechanical treatments in one area while prescribed fire occurs in another area in the same period. It is expected implementation of the entire project would require 20 or more years to complete.

Forest Structure

Primary Constituent Elements Related to Forested Structure:

A range of tree species composed of different tree sizes reflecting different ages of trees, 30 – 45 percent of which are large trees (12 inches dbh or more).

Under the Proposed Action the Rim Country 4 FRI project FVS Modeling from treatments over the next 20 years indicate that most Forest Structure as it pertains to Primary Constituent Elements important to MSO Critical Habitat are preserved or increased through time (tables 4-10-4-21). Modeling FVS indicates trees per acre are reduced from the existing condition because of treatment after 20 years. Reducing TPA closer to NRV protects MSO habitat and restores conditions for the MSO by managing for a less dense, and encroached forested condition. TPA in MSO habitat was shown to maintain or increase trees greater than 18 inches DBH to greater than 12 per acre, as per the revised MSO Recovery Plan recommendations (see analysis for the MSO above by habitat type). Openings created by bringing these size classes into desired condition would provide habitat for a variety of prey species and would slow or reduce fire severity by breaking the continuity of dense tree canopies and ladder fuels.

Average of all basal areas from tree size classes saplings 1 to old growth 6 show that intermediate sized trees (Size Class 3 with BA 5-12 inches) is predominant on the landscape in the existing condition and vastly departed from the Natural Range of Variation; (NRV) is lowered closer to desired condition as a result of treatment in 20 years. For example in PACs (tables 4-11 - 4-13) and in recovery habitat (tables 4-14 – 4-21) average of all BA4 (12-18”, BA5 (18-24 inches) and BA6 (24 inches or greater) age classes in mixed conifer and pine oak habitat, and by using the Geophysical model all increase over time as a result of treatment. In the existing condition trees greater than 12” dbh represent 64% of trees in this age class in MSO CH. Forest Vegetation System (FVS) modeling predicts that after 20 years of treatment trees ≥ 12 ” dbh will increase to an average of 68% of all trees in MSO critical habitat. Modeling predicts basal area average is decreased from the existing condition in 20 years. Increasing BA Size classes for older trees and reducing medium aged over abundant size classes to NRV benefits the MSO as above through reduction of over encroached forest conditions. Further, this would increase vertical and horizontal habitat heterogeneity providing roosting options, thermal and hiding cover for the MSO and habitat for a variety of prey species. By emphasizing for large trees, this should also provide for MSO life history needs (nesting and roosting) and provide for large snags and logs (Ganey 1999 and Ganey and Vojta.2007).

Shade canopy created by the trees branches covering 40% or more of the ground.

In MSO critical habitat percent average of canopy cover is reduced from the existing condition while still remaining at 60% or higher in protected and Nest/Roost recovery habitat (tables 4-11 and 14), and 47% or higher in Foraging/Non-breeding recovery habitat (table 4-18). Retaining canopy cover allows for a thermal environment needed for nesting and roosting conditions for the MSO while allowing for prey base and for species that require interlocking crown habitat. Design Features would preserve the recommended habitat conditions in critical habitat wherever possible while protecting this habitat from severe fire intensity or stand replacing effects from crown fire (see Fire Effects for The Proposed Action below).

Large dead trees (snags) with a dbh of 12 inches or more.

Snags

In MSO CH, Standing snags, increase from the existing condition of 1.6 snags per acre ≥ 12 ” as a result of treatments under the Proposed Action (tables 4-11, 4-14, and 4-18). Snags per acre ≥ 12 ” increases to 2.6 per acre in in MSO CH from the Proposed Action. This Primary Constituent Element important to the MSO and MSO prey species is increased over time under the Proposed Action. In addition increasing key habitat elements for the MSO such as snags of various sizes to provide for nesting and roosting and for prey habitat follows guidance from the MSO Revised Recovery Plan (2012). This is a long-term benefit to the MSO because of treatment from the Proposed Action.

Primary Constituent Elements Related to Maintenance of Adequate Prey Species

High volumes of fallen trees and other woody debris.

Coarse Woody Debris

Coarse Woody Debris in MSO CH increases from the existing condition (21 tons per acre) as a result of treatments in the Proposed Action to 23 tons per acre (tables 4-11, 4-14, and 4-18). This will increase prey base habitat which will benefit the MSO in its CH.

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

Mixed conifer and ponderosa pine would be expected to respond favorably to thinning and broadcast burning treatments. The overall reduction of tree density along with creating openings in many areas would have the effect of exposing the forest floor to more sunlight and increasing understory diversity.

Plant species richness would increase following thinning and/or burning treatments that result in small, localized canopy gaps. Although MSO nest cores would remain relatively dense, MSO PAC treatments would provide for 10 percent openings across treatment areas from 0.1 – 2.5 acres in size. In recovery habitat openings would occupy about 10-20 percent of the treatment area. The openings would help to promote plant species richness. The creation of openings in mixed conifer would allow for early seral species such as aspen and pine to regenerate and would have the effect of helping to maintain uneven-aged characteristics.

Design Features are included focusing on retaining Gambel oaks and other hardwoods and coniferous species but some short-term loss of plant diversity could occur during thinning operations, prescribed fires, or road relocation/maintenance/rehabilitation. In MSO recovery habitat, design features would manage for large oaks by removing conifers up to 18 inches dbh that do not meet the “old tree” definition within 30 feet of oak 10 inches diameter at root collar or larger.

Adequate levels of residual plant cover to maintain fruits, seeds, and allow plant regeneration

Understory

Herbaceous biomass in tons per acre increases slightly over the 20-year FVS model from treatments under the Proposed Action (tables 4-11, 4-14, and 4-18). Herbaceous biomass in tons per acre increases from 0.22 tpa in the existing condition to 0.25 tpa after 20 years of treatment from the Proposed Action. Treatments under the Proposed Action for Shrub Biomass in tons per acre also increase as a result of treatments from the Proposed Action (from 0.28 tpa in the existing condition to 0.43 tpa after 20 years of treatment from the Proposed Action). Increases in shrub and herbaceous biomass is more pronounced in some MSO habitat types. For example, in protected habitat the mixed conifer shrub biomass moves from 0.40 tpa in the existing condition to 0.73 tpa after 20 years of treatment. Increasing these PCEs important to prey base for the MSO is an added benefit to treatments in MSO CH from this alternative.

Cable operations in MSO Critical Habitat from Alternative 2 could reduce understory under the cables in the short-term, with long term benefits (see Effects common to both Alternatives Section) on 42,346 acres.

Fire Analysis from the Proposed Action

Surface fuel loading in MSO Critical Habitat is reduced from the existing condition (50 tons per acre) to 38 tons per acre from the Proposed Action, over the 20 years modeled in FVS (tables 4-09, 4-12, and 4-16).

In MSO Critical Habitat the fire hazard index modeled 686,283 acres (tables 4-20 and 4-21). Approximately 288,246 acres (42%) of the MSO Critical habitat in the project area show a

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Moderate, High, or Extreme need for treatment categories of FHI (see table below). Of these acres modeled 181,505 acres (26%) have a High or Extreme need for treatment and will experience higher severity wildfire than would occur in a natural fire regime if no action is taken.

In MSO Critical Habitat the Moderate, High, and Extreme Need for Treatment categories of FHI are decreased from 288,246 acres (42%) in the existing condition to 167,961 acres (24%) after alternative 2 is implemented. The High and Extreme Need for Treatment categories are reduced from 181,505 acres (26%) of all MSO Critical Habitat modeled in the existing condition to 71,964 acres (10%) after alternative 2 is implemented.

In MSO Critical Habitat, crown fire potential modeled 686,283 acres (tables 4-22 and 4-23), with 242,642 acres (35%) that could experience active or conditional crown fire if no action is taken. Active crown fire in MSO Critical Habitat in the existing condition total 186,772 acres (27%) of this habitat type modeled in the project area that would experience high severity crown fire if no action is taken.

In MSO Critical Habitat the potential for active and conditional crown fire is decreased in Alternative 2 compared to the existing condition from 242,642 acres (35%) to 95,894 acres (14%) after implementing the proposed action. Reducing active and conditional crown fires by this magnitude is a benefit to the MSO that would preserve MSO Critical Habitat over time. Active crown fire risk is reduced from 27% of all MSO Critical Habitat in the project area to 12% after alternative 2 is implemented.

Determination of Effect for MSO Critical Habitat (Alt2)

Based on the above analysis, Alternative 3 **may affect, is likely to adversely affect Mexican spotted owl Critical Habitat.**

Alternative 3

Alternative 3 would treat fewer acres in Rim Country. The direct and indirect effects would be similar to Alternative 2. Alternative 3 includes the same number of miles and acres of riparian and wet meadow restoration, while reducing the total number of acres thinned and treated with prescribed burning. In MSO Critical Habitat, 203,077 fewer acres would be thinned and burned. Savannah treatments in Alternative 3 would be reduced by 3,450 acres, providing less restoration to benefit the MSO prey base.

The same analysis for Alternative 2 regarding effects from implementation activities to MSO Critical Habitat applies to Alternative 3, with less acres treated. While disturbance effects would be lessened slightly with Alternative 3, the long-term effects and risk of habitat degradation from stand-altering wildfire or insect infestations would be greater (see below).

Table 63. Proposed Treatments in MSO Critical Habitat, Alternative 3

Proposed Treatments by EMU	BR-W-5	UGM-10	UGM-11	UGM-7	Grand Total
Facilitative Operations Mechanical	1,070	1,389	3		2,463
Facilitative Operations Prescribed Fire Only	178	2,799	19	22	3,018
Grassland Prescribed Fire Only		37	6		43

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Grassland Restoration		18	37	14	69
MSO Recovery - Replacement Nest/Roost	573	12,800	456	128	13,957
PAC - Hand Thin		414		167	581
PAC – Mechanical	188	7,452	674	350	8,664
Prescribed Fire Only	1,325	47,388	2,309	737	51,758
Riparian Prescribed Fire Only	16	1,226	3		1,245
Riparian Restoration	287	3,924	36		4,247
Severe Disturbance Area Treatment		323			323
Stand Improvement - High Site	788	2,573	5	120	3,486
Stand Improvement - Moderate Site	463	4,083	77	74	4,697
Stand Improvement - Low Site	121	1,105	62	535	1,823
Uneven-aged - High Site	4,135	19,348	756	578	24,816
Uneven-aged - Moderate Site	1,518	20,454	1,217	742	23,930
Uneven-aged - Low Site	725	2,226	515	1,112	4,578
Wet Meadow & Riparian Prescribed Fire Only		255			255
Wet Meadow & Riparian Restoration	10	177			187
Wet Meadow Prescribed Fire Only		32			32
Wet Meadow Restoration		707	13	130	849
Grand Total	11,395	128,730	6,189	4,708	151,023

Forest conditions in MSO Critical Habitat from Alternative 3 are similar to Alternative 2, with fewer acres treated. Surface fuel is reduced from the existing condition while still promoting large trees and snags, coarse woody debris, and herb and shrub understory. Analysis for the effects to primary constituent elements of MSO Critical Habitat are the same as in Alternative 2. Short-term negative effects to habitat from implementation will occur, though highly mitigated with design features, leading to long-term benefits to the habitat as a result of restoration treatments. Cable operations in MSO Critical Habitat from Alternative 3 could reduce understory under the cables in the short-term, with long term benefits (see Effects common to both Alternatives Section) on 33,745 acres.

In MSO Critical Habitat the Moderate, High, and Extreme Need for Treatment categories of FHI are decreased from 288,246 acres (42%) in the existing condition to 154,661 acres (23%) after alternative 3 is implemented. The High and Extreme Need for Treatment categories are reduced from 181,505 acres (26%) of all MSO Critical Habitat modeled in the existing condition to 59,314 acres (9%) after alternative 3 is implemented.

In MSO Critical Habitat the potential for active and conditional crown fire is decreased in Alternative 3 compared to the existing condition from 242,642 acres (35%) to 144,020 acres (21%) after implementing the proposed action. Active crown fire risk is reduced from 27% of all MSO Critical Habitat in the project area to 19%.

Determination of Effect for MSO Critical Habitat (Alt3)

Based on the above analysis, Alternative 3 **may affect, is likely to adversely affect Mexican spotted owl Critical Habitat.**

Western Yellow-billed Cuckoo

Alternative 1 – No Action

Under Alternative 1, habitat conditions for wildlife would largely remain in their current condition. Thinning and prescribed fire would still occur as a result of current and reasonably foreseeable projects. However, the landscape would continue to move away from desired conditions (see Affected Environment above and in the Silviculture and Fire Specialist reports). Alternative 1 would have no direct effect on the Yellow-billed Cuckoo; however there would be substantial indirect effects. Dense forest conditions would still occur and the high fire hazard potential would persist. Large crown-wildfires could adversely affect potential habitat by destroying understory and overstory vegetation. As a result overland flow would increase, and soil erosion would increase with potentially high sediment loads. Water quality and riparian conditions would be adversely affected on a wide-scale basis (See Hydrology Report), resulting in indirect adverse effects.

Under Alternative 1, there would be no restoration of springs and riparian areas. These areas would continue to exhibit downward trends in functional condition or remain in static condition for the foreseeable future (See Hydrology Report), resulting in degradation of potential habitat for cuckoos.

Denser forest conditions produce lower values in understory biomass (pounds per acre). Under Alternative 1, understory biomass would continue to decline over the next 40 years. Limited cover around tanks and riparian areas as well as the limited herbaceous understory across the project area, would continue to reduce the likelihood that cuckoos would successfully locate and nest in these areas.

Determination of Effect

Alternative 1 may **affect** and is likely to adversely affect the western yellow-billed cuckoo.

Alternative 2 – Modified Proposed Action

Prescribed fire and mechanical thinning projects have occurred and are expected to continue in habitat used by western yellow-billed cuckoo on national forests where cuckoos occur. Therefore, proposed fire and non-fire treatments may directly and indirectly affect cuckoos by removing suitable habitat and displacing breeding or foraging birds, and/or by disturbing cuckoos where suitable habitat is not displaced, but within the vicinity of project activities.

These kinds of projects could have short-term adverse effects on western yellow-billed cuckoo habitat by reducing cover, affecting water quality, and reducing prey abundance. Implementation of proposed activities and associated fire and smoke can alter cuckoo behavior by creating visual, noise, and physiological disturbance. Yellow-billed cuckoos may exhibit avoidance, ranging from less than a day where visual and noise disturbance is temporary to more than one breeding season where breeding and foraging habitat have been removed. If cuckoos are present at the time of thinning or prescribed burning activities, individuals could abandon their roosting and nesting sites. If nests are abandoned, young or eggs would be lost. Any individuals present in or adjacent to treated areas could also experience effects from the loss of prey availability, fire, and visual, noise, and smoke disturbance. The effects could range from habitat use changes, activity pattern changes, increased stress responses, decreased foraging efficiency and success, reduced reproductive success, increased predation risk, and intraspecific diminished

communication (NoiseQuest n.d. [2012]; Pater et al. 2009). These responses could vary depending on the nature of the disturbance, but would be expected to decrease as the distance from the activity increases.

Although design features are included in this alternative to mitigate effects from treatments, adverse effects on cuckoos and habitat are still likely to occur during migration and the early part of the breeding season. Prescribed burning just prior to arrival would reduce the available foraging habitat and prey species to cuckoos. Cuckoo home ranges are large, usually at least 50 acres in size. As such, effects on cuckoos and habitat from thinning and prescribed fire might occur within cuckoo riparian breeding habitat and adjacent foraging habitat up to 0.5 mile away.

Prescribed fire, and to a lesser extent mechanical thinning, would also benefit cuckoos by maintaining long-term ecosystem function on these fire-adapted landscapes. Thinning and fire would promote seral stage diversity and reduce fuel build-up that might otherwise result in a stand-replacing, high-severity fire. The regenerating and resprouting trees, shrubs, and herbaceous vegetation resulting from fire would increase the insect production needed by cuckoos to raise young.

Prescribed burning would occasionally use riparian drainages as control lines where no natural physical barriers, roads, trails, or openings can be used. Design features described above would ensure that effects on riparian habitat would be spread across the landscape and temporally separated. In this way, there would never be a case over the lifespan of the project that a single riparian drainage would be treated along its entire length.

Determination of Effect

Implementation of Alternative 2 **May affect, is Likely to Adversely Affect** the Yellow-billed Cuckoo.

Reasoning:

- Prescribed burning in cuckoo riparian habitat might occur during migration and the early part of nesting season (May 15 – July 1), but it would not occur during the height of the breeding season (July 1 – September 30).
- Treatment in cuckoo riparian and adjacent foraging habitat prior to the breeding season might promote tree resprouting, herbaceous growth, and insect production during the monsoon when cuckoos are nesting.
- Low to moderate burn severity would target ground cover and dense shrubs in cuckoo riparian habitat.
- Although cuckoos might be adversely affected by loss of habitat and disturbance in the short-term in cuckoo riparian and adjacent foraging habitat, the proposed activities would benefit cuckoos long term by reducing the risk of a high-intensity fire that would destroy breeding and foraging habitat.

While Western yellow-billed cuckoos might be disturbed by proposed activities occurring in riparian and adjacent habitat while they are present (May 15 – September 30), design features in Appendix C and above contain several measures that would avoid or minimize the adverse effects of the proposed activities, including on cuckoo breeding and foraging habitat. Although suitable habitat occurs in the project area, the habitat is at the species outer limits (higher

elevation with smaller reaches of riparian habitat) and may not support a breeding population of cuckoos.

Alternative 3 – Focused Alternative

Direct and indirect effects for Alternative 3 would be the same as with Alternative 2. Alternative 3 includes the same number of miles and acres of riparian restoration, while reducing the total number of forested acres thinned and treated with prescribed burning. Alternative 3 would treat fewer acres in Rim Country. Project design features have been developed (included in Alternative 2 analysis for the Western yellow-billed cuckoo above) to reduce the potential of effects on nesting and foraging cuckoo habitat.

Determination of Effect

Implementation of Alternative 3 **May affect, is Likely to Adversely Affect** the Yellow-billed Cuckoo.

Cumulative Effects

The area analyzed for cumulative effects for Yellow-billed Cuckoo is within the project area's riparian corridors and a 0.5-mile buffer. Cumulative effects include effects of Alternative 1. This alternative would continue to result in indirect effects on the Yellow-billed Cuckoo. Degradation of habitat facilitated by this alternative would cumulatively combine with other forest activities, high-impact recreational use, livestock grazing, habitat loss and degradation on private lands. Synergistic effects of climate change would continue to fragment key riparian habitat.

Climate change, in combination with drought cycles, is likely to exacerbate existing threats to the western yellow-billed cuckoo's habitat in the southwestern United States, now and into the foreseeable future. Increased and prolonged drought associated with changing climatic patterns would result in continued warming and drying of riparian habitats, would likely alter vegetation structure and composition, and would reduce the amount and quality of nesting and foraging habitat for yellow-billed cuckoos in the action area. However, implementation of restoration projects such as Rim Country should help to mitigate some of the long-term effects from climate change on western yellow-billed cuckoo habitat.

Mexican Wolf

Alternative 1 – No Action

Under Alternative 1, habitat conditions for wildlife would largely remain in their current condition. Thinning and prescribed fire would still occur as a result of current and reasonably foreseeable projects. However, the landscape would continue to move away from desired conditions (see Affected Environment above and in the Silviculture and Fire Ecology and Air Quality Reports). Alternative 1 would have no direct effect on Mexican wolves. Dense forest conditions would still occur and the high fire hazard potential would persist. Large crown fires could adversely affect potential habitat by destroying understory and overstory vegetation.

Under Alternative 1, there would be no restoration of springs and riparian areas. These areas would continue to exhibit downward trends in functional condition or remain in static condition for the foreseeable future (see Water and Riparian Resource Report), resulting in degradation of conditions for potential prey species.

Determination of Effect

Alternative 1 would have **No Effect** to the Mexican wolf.

Alternative 2 – Modified Proposed Action

The Rim Country Project lies within the Blue Range Wolf Recovery Area where Mexican wolf denning has not occurred. The Mexican wolf has not been reported denning in or near the Rim Country project area, though dispersing adults have moved through the area and could potentially den in the project area in the future.

If conflicts occur, the Forest Service would work with the Mexican Wolf Field Team to arrive at a solution. Actions taken on the other Ranger Districts where wolves occur included placing temporary restrictions around a wolf den site.

Dispersing reintroduced Mexican wolves might be disturbed during implementation of thinning and prescribed fire. Due to the mobility of the species, reintroduced wolves are likely able to avoid areas receiving treatment. Direct effects from thinning operations would not be expected to affect denning wolves because of the added design feature to limit disturbance.

Thinning and management-ignited fire alters prey species habitat to various degrees. Especially in areas that sustain low to moderate-intensity burns, there would be an eventual, relatively short-term increase in forage and browse used by some prey species.

Determination of Effect

Potential effects on the Mexican wolf reintroduction project from the Rim Country Project have been analyzed and found to be insignificant and discountable. Wolves have long endured in fire-adapted ecosystems and the implementation of this alternative would not adversely affect the reintroduction effort. Communication with the Interagency Field Team would allow project managers to avoid treatment in close proximity to dens, or during the wolf denning season.

By definition, a non-essential experimental population is not crucial to the continued existence of the species. Therefore, no management activities associated with the Rim Country Project would affect this 10(j) population so designated that could lead to a jeopardy determination for the entire species. The management activities associated with the Rim Country Project in the 10(j) area with Mexican wolves are **not likely to jeopardize the continued existence of the Mexican wolf.**

Alternative 3 – Focused Alternative

The direct and indirect effects from Alternative 3 would be similar to those from Alternative 2. Alternative 3 includes the same number of miles and acres of riparian restoration, while reducing the total number of acres thinned and treated with prescribed burning. Alternative 3 treat fewer acres in the Rim Country project area. A design feature was included (see Alternative 2 analysis above) to reduce the potential of effects on denning wolves.

Determination of Effect

Implementation of Alternative 3 is **not likely to jeopardize the continued existence of the Mexican wolf.**

Cumulative Effects

The cumulative effects analysis area for the wolf is the project area and a 10-mile buffer outside of the project boundary to include dispersing animals.

Cumulative effects would include the effects of Alternative 1. Degradation of habitat facilitated by this alternative would combine with other forest management activities, high-impact recreational use, livestock grazing, and habitat loss and degradation on private lands. Synergistic effects from climate change would continue to fragment habitat.

Dispersing reintroduced Mexican wolves might be disturbed during implementation of thinning and prescribed fire. Due to the mobility of the species, reintroduced wolves are likely able to avoid areas receiving treatment. Direct effects from thinning operations would not be expected to affect denning wolves because of the added design feature to limit disturbance.

Thinning and management-ignited fire alters prey species habitat to various degrees. Especially in areas that sustain low to moderate-intensity burns, there would be an eventual, relatively short-term increase in forage and browse used by some prey species.

The proposed activities to reintroduce fire, and improve ecosystem/vegetation health, watersheds, and soils could potentially improve wolf prey habitat conditions related to forage and cover, although there could be associated short-term disturbance effects. While design features could limit effects, not all negative effects would be reduced or eliminated.

Rangeland management and road work could disturb Mexican wolves through activities such as road 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. These associated activities could also expose Mexican wolves to harm by increasing motor vehicle traffic and the presence of vulnerable livestock.

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

Forest Service Sensitive Species

Northern Goshawk

Fire hazard index and risk of crown fire was modeled in PFAs under existing conditions. Of the 41,590 acres modeled 11,731 acres (28%) of the PFAs in the project that could potentially experience high or extreme severity wildfire. The risk of crown fire was modeled in PFAs based on the existing condition. Approximately 14,978 acres (36 percent) of PFAs in the Rim Country project area are at risk of experiencing active or conditional crown fire.

In Lands Outside of PFAs fire modeling was modeled on 832,077 acres, representing pine and mixed conifer cover types available in the project area outside of established PFAs. The FHI for Lands Outside of PFAs in the existing condition indicate that of the acres modeled 215,704 acres (26%) are at a High or Extreme need for treatment. The risk of crown fire was modeled in Lands Outside of PFAs based on the existing condition. Approximately 459,806 acres (56 percent) of

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Lands Outside of PFAs in the Rim Country project area are at risk of experiencing active or conditional crown fire.

Table 64. FHI In Goshawk PFAs and Land Outside of PFAs Existing Condition

Land Type	Very Low Need For Treatment in Acres	%	Low Need for Treatment in Acres	%	Moderate Need for Treatment in Acres	%	High Need for Treatment in Acres	%	Extreme Need for Treatment in Acres	%
PFA 41,590 Acres Modeled	15,824	38	8,361	20	5,675	14	9,149	22	2,582	6
LOPFA 832,077 Acres Modeled	305,936	37	78,546	9	231,890	28	193,602	23	22,102	3

Table 65. Risk of Crown Fire In Goshawk PFAs and Land Outside of PFAs Existing Condition

Land Type	Active Crown Fire Acres	%	Conditional Crown Fire Acres	%	Passive Crown Fire Acres	%	Surface Fire Acres	%	Non-Burnable Acres	%
PFA 41,590 Acres Modeled	12,877	31	2,101	5	18,811	45	7,757	19	43	<1
LOPFA 832,077 Acres Modeled	396,422	48	63,384	8	69,420	8	285,323	34	17527	2

Alternative 1 – No Action

Direct and Indirect Effects

Direct effects are those caused by the management activities and occur at the same time and place. There would not be any direct effects on the northern goshawk from Alternative 1 because there would be no additional management activities occurring.

Indirect effects are those effects caused by the action and are later in time and/or further removed in distance. The physical changes to the quantity and quality of the goshawk’s habitat and that of its prey species are indirect effects and are addressed here and in the Management Indicator Species analysis. Following are site-specific details regarding the effects of the no action alternative.

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Vegetation Changes

Under the no action alternative, most of the overall landscape would move toward desired conditions more slowly than the other alternatives, while some areas may not move toward desired conditions at all (see tables below). Post-fledging family areas (PFA) and lands outside PFAs (LOPFAs) would have less age-class diversity than either of the action alternatives. Specifically, it would have the lowest proportion in grass-forb-shrubs, seedlings, and saplings; the highest proportion in mid-aged forest; and the lowest proportion in the older age classes.

Table 66. Habitat Variables Modeled and Analyzed for Treatment by Alternative 1 in PFAs

Inside PFAs	Existing Condition	No Action 10 Years	No Action 20 Years
Average of BA	134	146	155
Average of Snags 12-18"	2	2	2
Average of Snags >18"	1	1	1
Average of Canopy Cover	64	67	69
Average of Surface_Total	17	20	22
Average of Surface_ge3	6	7	8
Average of Surface_Herb	0.21	0.21	0.21
Average of Surface_Shrub	0.25	0.25	0.24

PFA

In PFAs the FVS modeling of the effects of treatments on Northern goshawk by alternative show that the The average of all basal area and canopy cover would continue to increase slightly. Mid-aged forest (BA3, 5-12 inches, and BA4, 12-18 inches) would continue to dominate the landscape and represent a huge shift in the Natural Range of Variation of the forested ecosystem. Trees greater than 18” increase from 27% of all trees in these age classes in the existing condition to 31% as a result of no treatment after 20 years from Alternative 1.

Snags of all size classes important to prey species would remain the same after 20 years of no management. Coarse woody debris and downed logs important to prey species would increase over 20 years. The herbaceous and shrub layers would show no improvement over time under Alternative 1.

Table 67. FVS BA by Size Class in PFA Habitat for Alternative 1

Tree Size Class	Basal Area Existing	% of BA Existing	Basal Area No Action after 10 years	% of BA No Action after 10 years	Basal Area No Action after 20 years	% of BA No Action after 20 years
BA1 0-1"	0	0%	0	0%	0	0%
BA2 1-5"	12	9%	13	9%	13	8%
BA3 5-12"	44	33%	44	31%	46	29%
BA4 12-18"	41	30%	45	31%	47	30%
BA5 and BA6 >18"	37	27%	43	29%	49	31%
Total BA	134		146		155	

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Lands Outside Of PFA (LOPFA)

The three Land Management Plans have guidance to manage toward uneven-age stand conditions. In LOPFAs, Alternative 1 would have the slowest progress of all alternatives toward having age classes in uneven-aged (desired) condition.

Table 68. Habitat Variables Modeled and Analyzed for Treatment by Alternative 1 in Land Outside of PFAs (LOPFA).

Outside PFAs	Existing Condition	No Action 10 Years	No Action 20 Years
Average of BA	121	133	143
Average of Snags 12-18"	2	2	2
Average of Snags >18"	1	1	1
Average of Canopy Cover	59	63	66
Average of Surface_Total	15	18	20
Average of Surface_ge3	5	6	7
Average of Surface_Herb	0.22	0.22	0.21
Average of Surface_Shrub	0.25	0.25	0.24

In LOPFAs, FVS modeling of effects on Northern Goshawk by alternative shows that the average of all basal area and canopy cover would continue to increase. Mid-aged forest (BA3, 5-12 inches, and BA4, 12-18 inches) would continue to dominate the landscape and represent a huge shift in the Natural Range of Variation of the forested ecosystem. Trees greater than 18" increase from 24% of all trees in these age classes in the existing condition to 28% as a result of no treatment after 20 years from Alternative 1. Snags of all size classes important to prey species would continue to increase very slightly. Coarse woody debris and downed logs important to prey species would increase over 20 years. Herbaceous and shrub layers would show no improvement over time under Alternative 1.

Table 69. Basal Area Size Classes Alternative 1, Outside PFAs

Tree Size Class	Basal Area Existing	% of BA Existing	Basal Area No Action after 10 years	% of BA No Action after 10 years	Basal Area No Action after 20 years	% of BA No Action after 20 years
BA1 0-1"	1	0%	1	0%	0	0%
BA2 1-5"	11	8%	13	9%	15	10%
BA3 5-12"	39	29%	40	27%	41	26%
BA4 12-18"	38	28%	42	29%	44	28%
BA5 and BA6 >18"	32	24%	37	26%	43	28%
Total BA	121		133		143	

Fuel loads in average of tons per acre increase from 17 tons per acre in the existing condition to 22 tons per acre after 20 years under alternative 1.

Fire hazard index and risk of crown fire was modeled in PFAs as a result of Alternative 1, No Action. Of the 41,590 acres modeled 13,459 acres (33%) of the PFAs in the project area could potentially experience high severity wildfire. This is increased from 28% in the existing condition. The risk of crown fire was

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modeled in PFAs as a result of Alternative 1, No Action. Approximately 15,950 acres (39%) of PFAs in the Rim Country project area are at risk of experiencing active or conditional crown fire, which is increased from 36% in the existing condition.

In Lands Outside of PFAs Fire hazard index and Risk Of Crown Fire was modeled to understand the results of each Alternative. From Alternative 1, No Action the FHI and risk of crown fire increases. The High and Extreme need for treatment categories of FHI increase to 231,579 (28% of PFAs in the Project area) from 26% in the existing condition. The Risk of Active and Conditional Crown Fire in Lands Outside of PFAs is increased from the existing condition from 56% to 60% on 468,923 acres.

Table 70. FHI In Goshawk PFAs and Land Outside of PFAs Alternative 1

Land Type	Very Low Need For Treatment in Acres	%	Low Need for Treatment in Acres	%	Moderate Need for Treatment in Acres	%	High Need for Treatment in Acres	%	Extreme Need for Treatment in Acres	%
PFA 41,590 Acres Modeled	12,239	29	10,838	26	5,055	12	10,703	26	2,756	7
LOPFA 832,077 Acres Modeled	293,797	35	79,533	10	227,169	27	205,518	25	26,061	3

Table 71. Risk of Crown Fire In Goshawk PFAs and Land Outside of PFAs Alternative 1

Land Type	Active Crown Fire Acres	%	Conditional Crown Fire Acres	%	Passive Crown Fire Acres	%	Surface Fire Acres	%	Non-Burnable Acres	%
PFA 41,590 Acres Modeled	14,911	36	1,039	3	20,495	49	5,103	12	43	<1
LOPFA 832,077 Acres Modeled	405,528	50	63,395	10	68,331	10	227,519	28	17,304	2

Cumulative Effects from Alternative 1

The cumulative effects analysis boundary is defined as the project area and a one-half mile buffer around the outside of the project boundary and includes effects for a period of 20 years beginning with implementation of the Rim Country Project. The No Action Alternative would maintain the current fire risk to northern goshawk habitat and adjacent forest lands. The cumulative effects of

the No Action Alternative would be to increase the number of acres of National Forest System lands that are vulnerable to severe fire effects, as dense forest conditions would continue to place goshawk habitat and adjacent habitat at risk of stand-replacing fire. The fire hazard would increase over time as vegetation would continue to grow, fuels continue to accumulate, and the effects from climate change persist, thus continuing to have negative effects on northern goshawk.

Determination of Effect

Alternative 1 **may affect individual goshawks but is not likely to cause a trend toward federal listing or loss of viability.**

Effects Common to Alternatives 2 and 3

Because goshawks are potential predators of spotted owls and survey crews could represent a disturbance to nesting and roosting owls, PACs and a 0.5-mile buffer beyond PAC boundaries would be excluded from surveys to avoid harassment of nesting owls.

Mechanical Treatments

Habitat features that appear to be important to a variety of goshawk prey species would be retained or improved with Alternatives 2 and 3 (see analysis under each alternative in this report and the Silviculture Report,). These habitat features include snags, downed logs, large trees, openings and associated herbaceous and shrubby vegetation, interspersed, and canopy cover (Reynolds et al. 1992, USDI FWS 1998, Squires and Kennedy 2006). Design (Appendix C of the FEIS) criteria specific to these features.

- Unless subsequent finalized revised Land Management Plan Species of Conservation Concern determinations do not include northern goshawk, in northern goshawk nest stands, burn plans covering areas with nesting goshawks and/or known nest trees would include mitigations to minimize smoke effects on nesting birds and nest trees would be protected.
- Unless subsequent finalized revised Land Management Plan Species of Conservation Concern determinations do not include northern goshawk, fuels in goshawk nesting areas would be evaluated and, if necessary, would be manipulated outside of the breeding period (March 1 to September 30) to ensure low severity fire effects from prescribed fire.
- Unless subsequent finalized revised Land Management Plan Species of Conservation Concern determinations do not include northern goshawk, in northern goshawk post-fledging family areas (PFAs), thinning activities would not occur in occupied PFAs during the breeding season (March 1 September 30) unless the protocol surveys indicate non-nest or infer absence. Timing restrictions may also be waived if the district biologist, in coordination with USFWS determines actions within 0.25 mile will not disturb nesting birds.
- Unless subsequent finalized revised Land Management Plan Species of Conservation Concern determinations do not include northern goshawk, hauling will not occur within

northern goshawk PFAs during the breeding season (March 1 through September 30) unless surveys determine the PFA is not nesting, or the nest is 1/4 mile away, topographically isolated, or as determined by a wildlife biologist.

- Unless subsequent finalized revised Land Management Plan Species of Conservation Concern determinations do not include northern goshawk, in northern goshawk PFAs, spring, riparian and stream restoration projects would not occur during the breeding season (March 1 to September 30) if occupied. However, work could potentially occur on an individual basis through coordination with the District biologist.
- Unless subsequent finalized revised Land Management Plan Species of Conservation Concern determinations do not include northern goshawk, in northern goshawk PFAs road construction, obliteration, relocation, and maintenance would not occur during the breeding season (March 1 to September 30). Timing restrictions may be waived if protocol surveys indicate non-breeding or infer absence. Timing restrictions may also be waived if the district biologist, in coordination with USFWS determines actions within 0.25 mile will not disturb nesting birds.

Noise disturbance from logging trucks was monitored for nesting goshawks in a study on the Apache-Sitgreaves NF. The study was coordinated between the Apache-Sitgreaves NF, Rocky Mountain Research Station, U.S. Army, and a private sound consultant. Results from this field-based, controlled experiment found no evidence of negative effects from truck noise. Observed goshawk response to logging truck noise was limited to, at most, looking in the direction of the hauling road (Grubb et al. 2012). However, the Apache-Sitgreaves has a guideline that states:

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.

A study on the Kaibab National Forest in Northern Arizona found no movement or flush responses from nesting northern goshawk from as near as 78 meters away from passing logging trucks (Grubb et al. 2013).

Disturbance from hauling would vary based on which nest site is selected during the time that hauling occurs. Therefore, road disturbance, even with thousands of truck trips, may cause little or no disturbance.

Road work and use of haul roads could increase the potential for goshawk collision with vehicles. Little information is available on how frequently collisions might occur and what conditions might increase or lessen the vulnerability of goshawks.

A speed limit of 25 miles per hour would be implemented for vehicles passing through PFAs to reduce the hazard of collisions. Given the adult goshawk's natural agility in flight and the size and noise of the large trucks and chip vans, adult goshawks would be expected to avoid colliding with log trucks passing through the PFA. Newly fledged goshawks still developing their flight skills may have a slightly higher potential for colliding with a large truck, but the reduced speed

of the trucks and natural agility of goshawks should minimize this potential. Birds migrating or dispersing through unfamiliar terrain may be at higher risk than resident birds.

Vehicle activity would alternate throughout the Rim Country landscape as different contracts are issued and would concentrate in particular areas while the work is being conducted. Activity would be expected to increase well above existing traffic levels for about two years until operations shift to other areas.

In summary, hauling of wood products or road gravel would be unlikely to cause noise disturbance to nesting goshawks or result in collisions, but there is the potential to disrupt reproduction and rearing of young by, at most, one or two pair of goshawks and might result in the injury or death of one or more young. This risk would be lowered with a lower speed limit.

Prescribed Fire

The Land Management Plans allow for wildfire to occur within PFAs during and outside the breeding season, although human disturbance should be limited during the breeding season so that goshawk reproductive success is not affected by human activities. Low-intensity ground fires are allowed at any time, but high-intensity crown fires are not acceptable in PFAs or nest areas.

The effects from burning would be influenced by the life history of the goshawk at the time of the fire, as well as several fire-related factors including pre-fire fuel loading and structure, the season when the fire occurs, fire intensity, and fuel consumption. Burning effects would also be related to how similar burning conditions are to the natural fire regime. Knapp et al (2009) provide a good overview of the ecological effects of prescribed fire season.

Goshawks and their prey could be directly affected by the heat, flames, and smoke of a fire or indirectly by habitat modification. Animals that live in fire-adapted ponderosa pine forests have presumably developed behavioral adaptations to escape fires or find refugia and allow populations to persist (Knapp et al 2009).

Incubating adults or young goshawks unable to fly could inhale smoke from prescribed fires. Smoke could result in an extended absence of the adults during brooding or when the chicks are very young. This could result in increased vulnerability to predators or to unfavorable weather, or reduced feeding. Smoke is likely to be worse during first-entry burning, under conditions where fuels have built up to unnatural levels due to years of fire suppression. Smoke would be expected to be more within the range of natural variation after a first-entry burn and to have less intensity or duration. There would be a low likelihood of loss of nest trees or goshawks due to the heat, flames, or smoke of a prescribed fire with the design features for this project.

Other design criteria have been identified to reduce disturbance-related effects on northern goshawks in Alternatives 2 and 3 (Appendix C of the FEIS).

- In northern goshawk post-fledging family areas (PFAs), thinning activities would not occur in occupied PFAs during the breeding season unless the district biologist can document that effects would not trend to listing or loss of viability.
- In goshawk habitat outside of Mexican spotted owl protected activity centers (PACs):

Goshawk surveys will be done prior to thinning activities where applicable and with management guidelines (USFS Letter to the File, March, 2017). Surveys will include areas ½ mile beyond treatment boundaries and exclude a ¼ mile buffer beyond PAC boundaries.

- Fuels in goshawk nesting areas would be evaluated and, if necessary, would be manipulated outside of the breeding period (March 1 to September 30) to ensure low-severity fire effects from prescribed fire.
- In northern goshawk post-fledging family areas (PFAs), spring, riparian and stream restoration projects would not occur during the breeding season (March 1 to September 30) if occupied. However, work could potentially occur on an individual basis through coordination with the District biologist if specific analysis has documented that effects will not trend to listing or loss of viability.
- In northern goshawk nest stands, burn plans covering areas with nesting goshawks and/or known nest trees would include mitigations to minimize smoke effects on nesting birds and nest trees would be protected.
- Burn Plans and Ignition Techniques: Apply fire prescriptions to maintain Land Management Plan levels of coarse woody debris.
- Burn Plans: Ensure that the potential cumulative effects from multiple fires burning in a given area do not produce negative effects on local wildlife; coordinate burning between administrative units and between wildlife and fire management to minimize potential disturbance.

Wildfire Modeling

Fire hazard index (FHI) was modeled for one treatment and two prescribed burns in 58,337 acres of PFAs within the project area. FHI by alternative for the high and extreme categories is in table 55.

Potential for crown fire was also modeled in PFAs and Ponderosa Pine habitat type in the project area by alternative with acres and percentages included in table 55.

Design Features to Reduce Disturbance

Design features, best management practices, and mitigation have been developed to reduce the magnitude of short-term direct effects from disturbance in alternatives 2 and 3.

The following design criteria have been identified to reduce disturbance-related effects to northern goshawks in both action alternatives.

- Fuels in goshawk nesting areas will be evaluated and if necessary, will be manipulated outside of the breeding period (March 1 to September 30) to ensure low-severity fire effects from prescribed fire.
- Hauling will not occur within post-fledging family areas (PFAs) during the breeding season (March 1 through September 30) unless monitoring determines the PFA is not occupied, or the nest is 1/4 mile away, topographically isolated, or as determined by a wildlife biologist.

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- In northern goshawk PFAs, road construction, obliteration, relocation, and maintenance would not occur during the breeding season (March 1 to September 30) if occupied or as determined by a wildlife biologist.
- Pit development and operation within occupied northern goshawk PFAs may occur when surveys have indicated there are no active nests. If surveys identified an occupied nest, all operational activities and hauling would be avoided March 1 – September 30th.
- In Mexican spotted owl protected activity centers (PACs), recovery nest/roost, goshawk post-fledging family areas, no old trees would be cut during the rehabilitation of temporary roads.

Alternative 2 - Proposed Action

Direct and Indirect Effects

There are 106 PFAs on the Coconino, Tonto, and Apache-Sitgreaves National Forests, totaling 55,608 acres in the Rim Country project area. Approximately 35,549 acres of PFA habitat would be treated with mechanical thinning and/or prescribed fire in the proposed action. Cable operations could occur on 676 acres on goshawk PFAs from Alternative 2.

PFA

Table 72. PFA FVS Vegetation Changes, Alternative 2

Inside PFAs	Existing Condition	Alternative 2 10 Years	Alternative 2 20 Years
Average of BA	134	76	76
Average of Snags 12-18"	2	4	3
Average of Snags >18"	1	2	2
Average of Canopy Cover	64	47	47
Average of Surface_Total	17	13	12
Average of Surface_ge3	6	6	6
Average of Surface_Herb	0.21	0.25	0.25
Average of Surface_Shrub	0.25	0.31	0.32

Mid-aged forest (BA3, 5-12 inches, and BA4, 12-18 inches) would be treated to attain the desired condition, reducing these size classes to better represent uneven-aged management. Trees greater than 18" increase from 27% of all trees in these age classes to 57% as a result of treatment after 20 years from Alternative 2. Snags of all size classes important to prey species would continue to increase. Coarse woody debris and downed logs important to prey species would increase over 20 years. Also important to goshawk prey species, herbaceous and shrub layers would increase over time under Alternative 2.

Table 73. Tree BA Size Classes, Alternative 2. Inside PFAs

Tree Size Class	Basal Area Existing	% of BA Existing	Basal Area Alternative 2 after 10 years	% of BA Alternative 2 after 10 years	Basal Area Alternative 2 after 20 years	% of BA Alternative 2 after 20 years
BA1 0-1"	0	0%	0	0%	0	0%
BA2 1-5"	12	9%	2	2%	1	1%
BA3 5-12"	44	33%	13	18%	10	14%
BA4 12-18"	41	30%	22	29%	21	28%

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BA5 and BA6 >18"	37	27%	39	51%	43	57%
Total BA	134		76		76	

Lands Outside of PFAs (LOPFA)

Table 74. Vegetation Changes from FVS Modeling Outside of PFAs, Alternative 2

Outside PFAs	Existing Condition	Alternative 2 10 Years	Alternative 2 20 Years
Average of BA	121	63	62
Average of Snags 12-18"	2	3	3
Average of Snags >18"	1	2	2
Average of Canopy Cover	59	39	38
Average of Surface_Total	15	11	11
Average of Surface_ge3	5	5	5
Average of Surface_Herb	0.22	0.26	0.26
Average of Surface_Shrub	0.25	0.29	0.27

In LOPFAs the FVS modeling on 758,581 acres of Ponderosa Pine habitat shows the average of all basal area and canopy cover would decrease. Mid-aged forest (BA3, 5-12 inches, and BA4, 12-18 inches) would be greatly reduced under Alternative 2, bringing the age class distribution to desired condition after 20 years of treatment. Trees greater than 18" increase from 24% of all trees in these age classes to 48% as a result of treatment after 20 years from Alternative 2. Cable operations could occur on 45,992 acres on goshawk foraging habitat from Alternative 2.

Snags of all size classes important to prey species would continue to increase from existing conditions. Coarse woody debris and downed logs important to prey species would increase over 20 years modeled. Herbaceous and shrub layers, also important for prey species, would be increased under Alternative 2.

Table 75. Tree BA Size Classes, Alternative 2. Outside PFAs

Tree Size Class	Basal Area Existing	% of BA Existing	Basal Area Alternative 2 after 10 years	% of BA Alternative 2 after 10 years	Basal Area Alternative 2 after 20 years	% of BA Alternative 2 after 20 years
BA1 0-1"	1	0%	0	0%	0	0%
BA2 1-5"	11	8%	2	2%	1	1%
BA3 5-12"	39	29%	11	14%	8	10%
BA4 12-18"	38	28%	18	24%	17	23%
BA5 and BA6 >18"	32	24%	32	43%	36	48%
Total BA	121		63		62	

Fire Effects

In both PFAs and in Ponderosa Pine habitat outside of PFAs fuel loads in average of tons per acre decrease significantly from the existing condition to less than 10 tons per acre after 20 years under Alternative 2.

Fire hazard index and risk of crown fire was modeled in PFAs as a result of Alternative 2, The Proposed Action. Of the 41,590 acres modeled 2,832 acres (7%) of the PFAs in the project area could potentially experience high or extreme severity wildfire. This is decreased from 28% in the existing condition. The risk of crown fire was modeled in PFAs as a result of Alternative 2, The Proposed Action. Approximately 5,071 acres (12%) of PFAs in the Rim Country project area are at risk of experiencing active or conditional crown fire, which is decreased from 36% in the existing condition.

In Lands Outside of PFAs Fire hazard index and Risk Of Crown Fire was modeled to understand the results of each Alternative. From Alternative 2, The Proposed Action the FHI and risk of crown fire decreases. The High and Extreme need for treatment categories of FHI decreases to 147,717 (17% of LOPFAs in the Project area) from 26% in the existing condition. The Risk of Active and Conditional Crown Fire in Lands Outside of PFAs is decreased from the existing condition from 56% to 38% on 311,384 acres.

Table 76. FHI In Goshawk PFAs and Land Outside of PFAs Alternative Two (Proposed Action)

Land Type	Very Low Need For Treatment in Acres	%	Low Need for Treatment in Acres	%	Moderate Need for Treatment in Acres	%	High Need for Treatment in Acres	%	Extreme Need for Treatment in Acres	%
PFA 41,590 Acres Modeled	29,097	70	4,722	11	4,939	12	2,564	6	268	<1
LOPFA 832,077 Acres Modeled	429,100	52	45,649	6	209,611	25	125,631	15	22,086	2

Risk of Crown Fire was modeled in PFAs for alternative 2. Alternative 2 would result in 30,732 acres (78 percent) of PFAs in the Rim Country Project area with the potential to experience crown fire. Active crown fire is reduced from 15,626 acres (40 percent) in alternative 1 to 1,583 (04 percent) acres that would experience active crowning under Alternative 2. Table 68. Risk of Crown Fire In Goshawk PFAs and Land Outside of PFAs Alternative Two (Proposed Action)

Table 78. Risk of Crown Fire In Goshawk PFAs and Land Outside of PFAs Alternative Two (Proposed Action)

Land Type	Active Crown Fire Acres	%	Conditional Crown Fire Acres	%	Passive Crown Fire Acres	%	Surface Fire Acres	%	Non-Burnable Acres	%
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PFA 41,590 Acres Modeled	4,597	11	474	1	23,412	56	13,064	31	43	<1
LOPFA 832,077 Acres Modeled	305,888	37	5,496	<1	57,480	7	445,908	54	17,304	2

Cumulative Effects

Cumulative Effects from Alternatives 2 and 3

For alternatives 2 and 3, the majority of acreage identified as part of the cumulative effects analysis occurs in LOPFA habitat. The majority of past, current, and foreseeable future treatment acres are prescribed fire only (as seen in the Total Acres of Prescribed Fire Only, Current and Future Foreseeable Projects (table 62) in the cumulative effects section). However, most of the alternative treatments are mechanical thin with prescribed fire. Alternative 2 cumulatively has the most treatment acres whereas alternative 3 has the fewest.

Restoration treatments would contribute toward improving forest health, vegetation diversity, and vegetation composition in goshawk habitat under alternatives 2 and 3. This would aid in sustaining old forest structure over time and moving forest structure toward desired conditions.

Project treatments primarily decreased the number of trees less than 14 inches d.b.h. The degree of treatment intensity is highly variable, with some projects not cutting trees greater than 12 inches d.b.h. and others looking to lower the threat of high-severity fire in goshawk habitat. The overall ratio of trees greater than 12 inches d.b.h. is likely to increase as a result of removing smaller trees and increasing the growth and survivability of larger trees. Total BA of pine would decrease in the short term, but because the focus is on small trees, BA might not substantially change. Overall BA would be expected to increase in the long term.

Gambel oak is not targeted for removal, but prescribed fire would likely top-kill small diameter oak, potentially decreasing oak BA in the short term. However, design features should ensure retention of large diameter oak and small oak commonly sprout vigorously after fire. The total BA of Gambel oak is not expected to change substantially in the long term. Created canopy gaps, interspaces, and tree groups should benefit prey species and thinning should hasten tree growth, improving goshawk habitat.

Changes are expected in goshawk prey habitat. Decreases would occur in CWD, logs, and snags, commonly decreasing structure in prey habitat in the short term. Burn prescriptions and ignition techniques should limit these losses. Burned snags fall and provide logs, and trees killed by fire would become snags. However, the longevity of fire-killed snags is less than that of snags formed from other processes. However, maintenance burning should provide pulses of snags and logs through time. Less CWD is expected to be present in the short term as a result of prescribed fire. Thinning and burning should increase tree growth rates and self-pruning of lower tree

branches should replenish CWD in the long term. Improving growing conditions should decrease density-related mortality of larger and older trees. Improving recruitment into the larger size classes would improve goshawk habitat and the ability to provide large snags that remain on the landscape longer than smaller diameter or fire-created snags. The combination of thinning and burning should improve species richness in the herbaceous understory, increase plant abundance, and improve fruit and seed production.

Current and reasonably foreseeable projects represent areas omitted from the 4FRI planning effort because some degree of planning was already in progress or they occur outside of ponderosa pine forest. Treating within these areas would reduce fire threat for goshawk habitat within the respective project area as well as reducing the threat of high-severity fire starting in these areas and burning habitat outside the areas. In addition, improvements to understory vegetation and prey habitat are expected to occur in goshawk habitat and be more persistent in the long term compared to more conservative treatments in MSO habitat that are employed because MSOs have different habitat requirements than goshawks.

Cumulative effects from reasonably foreseeable projects could include disturbance from noise and potentially from smoke but could collectively work to improve goshawk habitat, including PFAs, because the risk of high-severity fire eliminating goshawk habitat would be reduced in the short term and long term. Because current and reasonably foreseeable projects represent areas omitted from the 4FRI treatment area effort, overlap in the spatial component of cumulative effects would largely be avoided. Although smoke and noise can cross project boundaries, both largely disperse with distance. However, some areas where smoke settles could have longer duration short term effects. Other projects, such as the CC Cragin and Beaver Creek Watershed Protection and Fuels Reduction Projects could cumulatively increase impacts to goshawks in PFAs adjacent to shared boundaries.

Many current and reasonably foreseeable projects would overlap temporally. It is conceivable that actions would be occurring in PFAs in multiple locations within the 4FRI boundary. However, all or most PFA mechanical treatments or activities would have timing restrictions, postponing treatments until after the breeding season. Wild fire could occur at any time. Adult goshawks would be expected to adapt to fire because it inhabits ponderosa pine, which is a fire-adapted vegetation type in the southwest.

Given the various stages of planning or implementation, most project effects would be dispersed both spatially and temporally. Projects in goshawk habitat are typically designed to improve habitat, or to degrade elements of habitat structure while retaining habitat function, resulting in a decrease in risk of high-severity fire. Cumulative effects would likely increase disturbance to individual goshawks from noise or smoke in the short term. Impacts are not expected to affect fecundity because of timing restrictions. Given typical project objectives, the spatial scale of the cumulative effects area, the distribution of goshawk habitat across the project area, and the length of time over which treatments would be implemented (10 or more years), cumulative effects are not expected to negatively impact the goshawk population in the long term. Overall, treatments in goshawk habitat should move forest conditions toward desired conditions and decrease the risk of habitat loss to large-scale high-severity fire.

Determination of Effect

Considering direct, indirect, and cumulative effects, implementation of Alternative 2 **may affect individual goshawks, but is not likely to cause a trend toward federal listing or loss of viability.**

Alternative 3- Focused Alternative

Direct and Indirect Effects

PFA

Table 79. Vegetation Changes Modeled from FVS. Alternative 3

Inside PFAs	Existing Condition	Alternative 3 10 Years	Alternative 3 20 Years
Average of BA	134	92	95
Average of Snags 12-18"	2	3	3
Average of Snags >18"	1	2	2
Average of Canopy Cover	64	53	54
Average of Surface_Total	17	15	15
Average of Surface_ge3	6	7	7
Average of Surface_Herb	0.21	0.24	0.24
Average of Surface_Shrub	0.25	0.32	0.33

Mid-aged forest (BA3, 5-12 inches, and BA4, 12-18 inches) would be lowered from Alternative 3 treatments, though not to the desired conditions. Trees greater than 18” increase from 27% of all trees in these age classes to 46% as a result of treatment after 20 years from Alternative 3. Snags of all size classes important to prey species would continue to increase. Coarse woody debris and downed logs important to prey species would be maintained over 20 years. Herbaceous and shrub layers would be increased over time under Alternative 3. Cable operations could occur on 615 acres on goshawk PFAs from Alternative 3.

Table 80. Tree BA Size Classes in PFAs, Alternative 3

Tree Size Class	Basal Area Existing	% of BA Existing	Basal Area Alternative 3 after 10 years	% of BA Alternative 3 after 10 years	Basal Area Alternative 3 after 20 years	% of BA Alternative 3 after 20 years
BA1 0-1"	0	0%	0	0%	0	0%

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BA2 1-5"	12	9%	5	5%	5	5%
BA3 5-12"	44	33%	21	23%	19	20%
BA4 12-18"	41	30%	27	30%	27	29%
BA5 and BA6 >18"	37	27%	39	42%	44	46%
Total BA	134		92		95	

Lands Outside of PFAs (LOPFA)

Table 81. Vegetation Changes Modeled from FVS. Outside of PFAs, Alternative 3

Outside PFAs	Existing Condition	Alternative 3 10 Years	Alternative 3 20 Years
Average of BA	121	84	88
Average of Snags 12-18"	2	3	2
Average of Snags >18"	1	1	1
Average of Canopy Cover	59	48	49
Average of Surface_Total	15	13	13
Average of Surface_ge3	5	6	6
Average of Surface_Herb	0.22	0.24	0.24
Average of Surface_Shrub	0.25	0.29	0.28

In LOPFAs, FVS modeling shows that the mid-aged forest (BA3, 5-12 inches, and BA4, 12-18 inches) would be greatly reduced under Alternative 3, bringing these age classes closer to desired conditions after 20 years. Trees greater than 18" increase from 24% of all trees in these age classes to 39% as a result of treatment after 20 years from Alternative 3. Cable operations could occur on 35,772 acres on goshawk foraging habitat from Alternative 3.

Snags of all size classes important to prey species would continue to increase. Coarse woody debris and downed logs important to prey species would be maintained over 20 years. Herbaceous and shrub layers, also important for prey species, would be increased under Alternative 3.

Table 82. Tree BA Size Classes in LOPFAs, Alternative 3

Tree Size Class	Basal Area Existing	% of BA Existing	Basal Area Alternative 3 after 10 years	% of BA Alternative 3 after 10 years	Basal Area Alternative 3 after 20 years	% of BA Alternative 3 after 20 years
BA1 0-1"	1	0%	0	0%	0	0%

Rim Country Project FEIS, Wildlife Specialist Report

Tree Size Class	Basal Area Existing	% of BA Existing	Basal Area Alternative 3 after 10 years	% of BA Alternative 3 after 10 years	Basal Area Alternative 3 after 20 years	% of BA Alternative 3 after 20 years
BA2 1-5"	11	8%	6	6%	6	7%
BA3 5-12"	39	29%	20	21%	19	20%
BA4 12-18"	38	28%	25	27%	25	26%
BA5 and BA6 >18"	32	24%	33	36%	37	39%
Total BA	121		84		88	

Fire Effects

In both PFAs and in Ponderosa Pine habitat fuel loads in average of tons per acre decrease from 16 tons per acre in the existing condition to less than 14 tons per acre after 20 years under alternative 3.

Fire hazard index and risk of crown fire was modeled in PFAs as a result of Alternative 3, The Focused Alternative. Of the 41,590 acres modeled 2,206 acres (5%) of the PFAs in the project area could potentially experience high or extreme severity wildfire. This is decreased from 28% in the existing condition. The risk of crown fire was modeled in PFAs as a result of Alternative 3. Approximately 6,808 acres (17%) of PFAs in the Rim Country project area are at risk of experiencing active or conditional crown fire, which is decreased from 36% in the existing condition.

In Lands Outside of PFAs Fire hazard index and Risk Of Crown Fire was modeled to understand the results of each Alternative. From Alternative 3, the FHI and risk of crown fire decreases. The High and Extreme need for treatment categories of FHI decreases to 84,513 (11% of LOPFAs in the Project area) from 26% in the existing condition. The Risk of Active and Conditional Crown Fire in Lands Outside of PFAs is decreased from the existing condition from 56% to 47% on 387,660 acres.

Table 83. FHI In Goshawk PFAs and Land Outside of PFAs Alternative Three (Focused Alternative)

Land Type	Very Low Need For Treatment in Acres	%	Low Need for Treatment in Acres	%	Moderate Need for Treatment in Acres	%	High Need for Treatment in Acres	%	Extreme Need for Treatment in Acres	%
PFA 41,590 Acres Modeled	25,342	61	9,766	23	4,276	10	1,757	4	449	1
LOPFA 832,077 Acres Modeled	374,800	45	121,029	15	251,735	30	80,934	10	3,579	<1

Risk of Crown Fire was modeled in PFAs for alternative 2 (table 59). Alternative 2 would result in 30,732 acres (78 percent) of PFAs in the Rim Country Project area with the potential to experience crown fire. Active crown fire is reduced from 15,626 acres (40 percent) in alternative 1 to 1,583 (04 percent) acres that would experience active crowning under Alternative 2.

Risk of Crown Fire was modeled in PFAs for alternative 3 (table 55). Alternative 3 would result in a reduction over the existing condition from 23,270 acres (39 percent) to 11,421 acres (20 percent) of PFAs in the Rim Country Project area with the potential to experience crown fire.

Table 84. Risk of Crown Fire In Goshawk PFAs and Land Outside of PFAs Alternative Three (Focused Alternative)

Land Type	Active Crown Fire Acres	%	Conditional Crown Fire Acres	%	Passive Crown Fire Acres	%	Surface Fire Acres	%	Non-Burnable Acres	%
PFA 41,590 Acres Modeled	6,148	15	660	2	24,627	59	10,112	24	43	<1
LOPFA 832,077 Acres Modeled	356,244	43	31,416	4	67,818	8	359,295	43	17,304	2

Cumulative Effects

Same as in Alternative 2.

Determination of Effect

Considering direct, indirect, and cumulative effects, implementation of Alternative 3 **may affect individual goshawks, but is not likely to cause a trend toward federal listing or loss of viability.**

Northern Leopard Frog

Alternative 1 – No Action

Under Alternative 1, habitat conditions for wildlife would largely remain in their current condition. Thinning and prescribed fire would still occur as a result of current and reasonably foreseeable projects. However, the landscape would continue to move away from desired conditions. Alternative 1 would have no direct effects on northern leopard frogs; however, there would be substantial indirect effects. Dense forest conditions would still occur and the high fire hazard potential would persist. Large crown wildfires could adversely affect potential habitat by destroying understory and overstory vegetation. As a result, overland flow would increase and soil erosion would increase, with the potential for high sediment loads. Water quality and riparian conditions would be adversely affected on a wide-scale basis, resulting in indirect adverse effects.

Under Alternative 1, there would be no restoration of springs and riparian areas. These areas would continue to exhibit downward trends in functional condition or remain in static condition for the foreseeable future, resulting in degradation of potential habitat for frogs.

Denser forest conditions produce lower values in understory biomass (pounds per acre). Under Alternative 1, understory biomass would continue to decline over the next 40 years. Limited cover around tanks and riparian areas, as well as the limited herbaceous understory across the project area, would continue to reduce the likelihood that frogs would successfully disperse and feed while traveling between waters. The limited cover would also leave frogs vulnerable to predation.

Determination of Effect

Alternative 1 would have no effect on Northern leopard frogs.

Alternative 2 – Modified Proposed Action

Dispersing leopard frogs could be directly affected if they collide with mechanical equipment or if they could not find refugia during prescribed fire activities. All springs and riparian reaches would be surveyed prior to restoration activities. Design features would reduce the likelihood of direct effects on frogs from mechanical thinning, temporary road construction, spring and riparian restoration, road decommissioning, and prescribed fire.

Under the modified Proposed Action, dense forest conditions and surface fuel loading would be reduced. The likelihood of large crown wildfires adversely affecting potential habitat by destroying understory and overstory vegetation would be reduced from 327,867 acres (59 percent) of all ponderosa pine in the project area, to 129,762 acres (23 percent) from Alternative 2. Fire hazard index in grasslands would also be greatly reduced from treatments (from 5,000 acres in the existing condition to 138 acres in Alternative 2). As a result, overland flow would be stable, and soil erosion would not have the high sediment-loading potential. Water quality would be not adversely affected on a wide-scale basis, resulting in indirect beneficial effects.

Under Alternatives 2 and 3, springs, meadows, and aquatic habitat restoration would be implemented, benefiting NLFs. There would be short-term disturbance to vegetation during implementation of stream and spring restoration projects; however, restored vegetation would be expected to recover within one to three years. An important consideration for restoration of springs is to restore discharge from the spring source except where prescribed by existing water rights adjudicated. Alternatives 2 and 3 would allow discharge from springs to resume flow through their historic spheres of discharge. Spring and seep restoration would improve riparian vegetation increasing availability of food and reproductive sites for this species over the long term, resulting in direct beneficial effects on habitat. Restoration of aquatic habitats would improve cover and water flow that provides escape from predators and prevents water loss for migrating leopard frogs.

Reconstructing 40 miles of temporary roads along their original alignments would generally have limited effects on the physical habitat features along the roads. About 30 miles of road reconstruction would address safety concerns for hauling. The remaining miles (about 10) would relocate roads out of drainage bottoms. Relocated roads would include rehabilitation of the abandoned road segment. Disturbance associated with road traffic is not expected to change because this represents improvements to segments of existing road, not new road construction. If

each mile affects approximately three acres of habitat, then about 120 acres of breeding and dispersal habitat would be affected by road reconstruction.

Constructing temporary roads would disturb vegetation and reduce habitat quality for leopard frogs. Use of these roads by machinery and equipment could crush animals moving across the road. These effects may affect individuals but are expected to be short-term, occurring only during project implementation. Temporary roads would be decommissioned to eliminate use and vegetation would be restored over the long term.

Decommissioning roads would improve the quality of the habitat in those areas where the roads are decommissioned. While the physical structure and features of the habitat may not measurably change along the former road alignment, eliminating disturbance along the roadway would be expected to improve the quality of habitat and reduce the potential for frogs to be crushed by vehicles using these roads.

Implementation of the modified proposed action could increase the risk of spread of Chytrid fungus across the project area. Machinery and equipment used during implementation could transfer Chytrid fungus between waterbodies, increasing the occurrence of the pathogen in leopard frog habitats across the project area. Potential effects from Chytrid fungus that is spread by machinery and equipment would be minimized by requiring decontamination procedures to be followed when activities take place within wetted areas or moist perimeter of a tank or ephemeral stream (see design features). Therefore, minimal potential for spread would exist.

Under the modified proposed action, surface disturbance within proximity of suitable habitats would increase. Direct effects could result from crushing and trampling of migrating or basking individuals. The use of heavy machinery and increased levels of human activity and traffic are likely to increase sedimentation in the earthen livestock tanks in the vicinity, especially in those located downslope from treated areas. Effects from sedimentation on leopard frog habitats are extensive and varied. They include alterations in water quality and vegetation structure, that ultimately have detrimental effects on leopard frogs by decreasing rate of development, increasing vulnerability to predators, and reducing food availability.

Prescribed burning may result in mortality of leopard frogs. Early fall prescribed fire has the highest likelihood of affecting leopard frogs, as this is a time of year when they are migrating between suitable habitats. Leopard frogs may migrate en masse, and large numbers may therefore be susceptible to fire at one time. Prescribed burns would be coordinated with a wildlife biologist to insure protections for migrating frogs. In coordination with AZGFD, occupied and potential breeding sites have been identified and mapped and would be included in individual contract maps with a special water designation. Project design features have been developed to reduce the potential effects on these important breeding sites and frogs using and moving between these sites (see Appendix 5 in the Wildlife Specialist Report). Implementation of best management practices would curtail soil erosion and minimize the potential for inflow into potential northern leopard frog habitat.

Determination of Effect

Implementation of Alternative 2 may affect individual northern leopard frogs, but is not likely to cause a trend toward federal listing or loss of viability.

Alternative 3 – Focused Alternative

Alternative 3 treats fewer forest acres in Rim Country, but the direct and indirect effects would be similar to Alternative 2. Alternative 3 includes the same miles and acres of riparian and other habitat restoration, while reducing the total number of acres thinned and treated with prescribed burning. While short-term effects from disturbance would be slightly less in Alternative 3, the long-term effects on the risk of habitat degradation from stand-altering wildfire or insect infestations would be greater.

Determination of Effect

Implementation of Alternative 3 may affect individual northern leopard frogs, but is not likely to cause a trend toward federal listing or loss of viability.

Cumulative Effects

The cumulative effects analysis area for northern leopard frogs is the project area and a 0.25-mile buffer outside of the project boundary to include current and potential breeding sites. Cumulative effects include the effects of Alternative 1. This alternative would continue to result in indirect effects on northern leopard frogs. Degradation of habitat facilitated by this alternative would combine with other forest activities, high-impact recreational use, livestock grazing, and habitat loss and degradation on private lands. Synergistic effects from climate change would continue to fragment key aquatic and dispersal habitat.

Alternatives 2 and 3 would result in short-term direct and indirect effects on Northern leopard frogs (see above). The restoration of aquatic habitats included in this alternative would slow the combined effects from other forest activities, high-impact recreational use, livestock grazing, habitat loss and degradation on private lands. Implementing restoration of key aquatic and dispersal habitat would link, rather than fragment, these habitats, allowing for the needs of breeding and dispersing leopard frogs.

Bald Eagle

Alternative 1 – No Action

Under Alternative 1, current and reasonably foreseeable projects would still be implemented in the Rim Country project area. Wildfire modeling in the ponderosa pine habitat type by alternative show that of the 553,137 acres of ponderosa pine habitat type, 407,189 acres (81 percent) have the potential to experience high-severity wildfire under Alternative 1. Crown fire potential in ponderosa pine habitat from Alternative 1 could occur in 480,996 acres (87 percent) of this habitat type. Dense forest conditions would still occur across the project area, and the high fire hazard potential would continue to place potential bald eagle nesting, roosting, and foraging habitat at risk with respect to stand-replacing fire.

Tree densities would continue to be high, slowing or stagnating growth into larger diameter classes, thereby limiting the development of roosting and perching habitat. Meadows, grasslands, and savannas would continue to be encroached by trees, limiting potential foraging areas.

Determination of Effect

Alternative 1 may affect bald eagles, but is not likely to cause a trend toward federal listing or loss of viability.

Effects Common to Both Action Alternatives

Direct effects would be from activities that cause disturbances (smoke, auditory or visual) to bald eagles nesting or foraging within or adjacent to the project area. Under the action alternatives (the modified proposed action and the focused alternative), there would be no direct adverse effects on nesting eagles as project design features would eliminate disturbance near known nesting sites. No vegetation treatments would occur within 0.5 mile (2,500 feet), unless mitigated by topography, of an occupied bald eagle nest between March 1 and August 31. Drift smoke from prescribed fire would be expected. Concentrations of smoke that might settle in an area for more than one or two nights when a female is on the nest could have adverse effects on individuals. Prevailing southwest winds and the topography of the area typically act to lift smoke, carrying it away from ignition sites. Nests on cinder cones and other raised topographic features or in canyons immediately adjacent to the Mogollon Rim, are not expected to have smoke settle in them long enough to cause measurable effects on eagles because of the air movement in these landscape-scale features. Conversely, nests in small canyons or valleys might incur effects from dense smoke settling near nesting locations.

When smoke settles into low-lying areas it typically does not last more than one or two nights. Limited smoke at nest locations would be expected to expose adult eagles to negligible effects as this would repeat an aspect of their evolutionary environment (Horton and Mannan 1988, Prather et al. 2008). However, on occasion dense smoke may settle into specific nest locations. Dense smoke settling into nest areas early in the season (January through June) could disturb brooding females. If the female is flushed long enough to affect incubation, this could result in loss of viability of the eggs. Dense smoke settling for multiple consecutive nights could affect the developing lungs of nestlings. Unlike mammals, damaged avian lungs do not repair themselves through time (Rombout et al. 1991). Causing a female to discontinue incubating eggs or affecting the lung development of nestlings would constitute long-term adverse effects. Outside of these examples, smoke settling in nest locations would typically be short-term and not likely to cause adverse effects.

Alternatives 2 and 3 would exclude mechanical thinning treatments within a 300-foot buffer around confirmed nest and roost sites. Additionally, timing restrictions during the winter roosting season would provide protection from disturbance to roosting eagles. Potential roost treatments would be designed to maintain and develop roost characteristics such as large trees and snags, while reducing surface fuel loading and crown fire potential within the roost, increasing roosting habitat for eagles in the project area.

There would be no effect on nesting or roosting eagles; however, short-term disturbance to foraging bald eagles would occur during mechanical treatments, prescribed burning, hauling of wood products, and other project activities that may cause visual or auditory disturbance. Prescribed burning and mechanical treatment would occur annually; however, these are short-term effects and would be minimized due to activities being temporally and spatially separated. Prescribed burning effects would dissipate over time as first-entry burns would consume accumulated surface fuels, raising crown bulk height and reducing crown bulk density. In maintenance or second-entry burns in ponderosa pine cover types, fuel loads would be significantly lower and produce low-severity effects with fewer emissions. Disturbances would be localized, of short duration, and might affect individual birds but would not affect the overall distribution or reproduction of the species.

Indirect effects on the bald eagle include effects on eagle habitat, eagle prey species, or prey species habitat. No adverse effects on prey species or prey species habitat are anticipated. Indirect effects on habitat would occur from treatments that modify the number of trees in a group of suitable roost trees, as eagles prefer to roost in large trees in close proximity to each other. However, thinning would improve old tree longevity, resulting in beneficial effects. In RUs with documented bald eagle use, snags would slightly increase after treatment (2020) and continue to increase in the long term. Ignition techniques and site preparation would reduce potential mortality in these components from burning activities.

The modified proposed action (Alternative 2) would develop older larger tree size classes which could be used as future winter roost sites for bald eagles.

Determination of Effect

Alternatives 2 and 3 may affect individual bald eagles, but is not likely to cause a trend toward federal listing or loss of viability.

Cumulative Effects

The cumulative effects analysis area for bald eagles is the ponderosa pine habitat within the project area and a 0.5-mile buffer outside the project boundary. Cumulative effects include the effects from Alternative 1. Cumulative effects from Alternative 1 would be the greatest to wintering bald eagles. Continued dense forest conditions would limit the growth and sustainability of large trees, slowing development of potential winter roost areas. Other activities, including utility line and road construction and maintenance, high-impact recreation, and climate change, would combine to result in degradation of nesting and roosting habitat.

Short-term effects added to similar effects from nearby projects were considered. Implementation of other project activities could occur simultaneously; however, it is not anticipated that effects from those activities would combine with the effects from the Rim Country Project to produce negative effects. Both action alternatives would improve and develop quality potential nesting and roosting habitat by developing groups of large trees and snags that are more fire resistant. This positive effect would combine with similar effects from activities such as the Travel Management Rule efforts, which may decrease the frequency of disturbance on the majority of potential roost sites, and slightly counteract the effects from utility line and road construction and maintenance as well as short-term disturbances from vegetation management and prescribed fire.

Golden Eagle

Alternative 1 – No Action

There would be no direct effects on golden eagles as no habitat-altering activities or disturbance associated with project implementation would occur. Alternative 1 would not treat meadows, savannahs, or grasslands within the project area and trees would continue to encroach, reducing potential habitat for small mammals and consequently golden eagles. Tree densities would continue to be high, slowing growth into larger diameter classes and thereby limiting the development of larger diameter (18 inches or larger) trees important for nesting, roosting, and perching. Habitat conditions would remain in their current condition, notwithstanding natural processes. Dense forest conditions would still occur and the high fire hazard potential would

continue to place potential golden eagle breeding, nesting, and foraging habitat at risk with respect to stand-replacing fire.

Effects Common to Both Action Alternatives

Both action alternatives would have the same effects on eagles, with Alternative 2 thinning and treating more acres, but with the same potential effects from restoration activities. Direct effects would be from activities that cause disturbances (smoke, auditory, or visual) to golden eagles nesting or foraging within or adjacent to the project. Under the modified proposed action or focused alternative, there would be no direct adverse effects on nesting eagles as project design features would eliminate disturbance near known nesting sites. No vegetation treatments would occur within 0.5 mile (2,500 feet) of an occupied golden eagle nest (unless mitigated by topography) between March 1 and August 31. Drift smoke from prescribed fire would be expected in most places; concentrations of smoke that might settle in an area for more than one or two nights when a female is on the nest could have adverse effects on individuals. Prevailing southwest winds and the topography of the area typically act to lift smoke, carrying it away from ignition sites. Nests on cinder cones and other raised topographic features on the Mogollon Rim are not expected to have smoke settle in them long enough to cause measurable effects on eagles because of the air movement in these landscape-scaled features. Conversely, nests in areas occurring in small canyons or valleys may have dense smoke settle in nesting locations.

When smoke settles into low-lying areas, it typically does not last more than one or two nights. Limited smoke at nest locations would be expected to expose adult eagles to negligible effects as this would repeat an aspect of their evolutionary environment (Horton and Mannan 1988, Prather et al. 2008). However, on occasion dense smoke may settle into specific nest locations. Dense smoke settling into nest areas early in the season (March through June) could disturb brooding females. If the female is flushed long enough to affect incubation, this could result in loss of viability of the eggs. Dense smoke settling for multiple consecutive nights could affect the developing lungs of nestlings. Unlike mammals, damaged avian lungs do not repair themselves through time (Rombout et al. 1991). Causing the female to discontinue incubating eggs or affecting lung development of nestlings would result in long-term adverse effects. Outside of these examples, smoke settling in nest locations would typically be short-term and not likely to cause adverse effects.

Under the modified proposed action, mechanical treatments, prescribed burning, road construction and decommissioning, hauling of wood products, and other restoration activities may cause visual or auditory disturbance to foraging golden eagles. This disturbance would be localized, of short duration and low intensity, and would not be expected to substantially interfere with normal feeding behavior. Up to 40,000 acres of prescribed burning and 45,000 acres of mechanical treatment would occur annually; however, these would be short-term effects and would be minimized due to activities being spatially and temporally separated. Additionally, prescribed burning effects would dissipate over time, as first entry burns usually consume accumulated surface fuels, raising crown bulk height and reducing crown bulk density. In maintenance or second entry burns in ponderosa pine, fuel loads would be significantly lower and produce low-severity effects with fewer emissions.

Indirect effects on the golden eagle include effects on eagle habitat, eagle prey species, or prey species habitat. There are no anticipated adverse effects on prey species or their habitats.

Opening the canopy would provide improved visibility of and access to prey by golden eagles. Grassland and savanna treatments would maintain and improve foraging habitat on 36,340 acres of grassland and 17,590 acres of savanna habitat, improving prey species habitat by increasing availability of food for small mammals and resulting in an indirect beneficial effect.

Determination of Effect

Because of the design features included for both action alternatives to mitigate disturbance to eagles, the proposed treatments and activities **would not result in take** as defined in the Eagle Act for golden eagles.

Cumulative Effects

The cumulative effects analysis area for the golden eagle is the project area and within 0.5 mile of the project boundary. Continued pine tree encroachment into grasslands and private development in grasslands would result in cumulative effects with such activities as grazing and high-impact recreational use to limit meadow and grassland habitats. Prescribed burning in adjacent projects may result in short-term effects on habitat, but these are not expected to result in long-term cumulative effects and are expected to be localized in nature. This alternative would result in the most stress on meadow and grassland habitats and thus would have the greatest negative contribution to potential golden eagle habitat.

Under Alternatives 2 and 3, there would be no effect on nesting eagles; however, there is the potential for short-term disturbance to potential foraging habitat with long-term benefits. Short-term disturbance to foraging eagles would occur during thinning, hauling, temporary and permanent road construction, and prescribed burning activities that may cause eagles to forage in nearby areas for the duration of the activity. Other activities planned that may have similar effects include temporary disturbances caused by prescribed fire and thinning in adjacent projects, or effects on roosting habitat from utility infrastructure development and maintenance. These short-term effects added to similar effects from other activities were considered. Implementation of other fuel reduction and restoration activities could occur simultaneously; however, it is not anticipated that effects from those activities would combine with effects from the Rim Country Project to cause negative effects.

American Peregrine Falcon

Alternative 1 – No Action

In grasslands, savannas, and meadows, tree encroachment and surface litter accumulation would continue, continuing to negatively affect some prey habitats for peregrine falcons. Stability of key ecosystem components such as species composition, forest structure, soil characteristics, and hydrologic function would be at moderate to high risk of loss in the event of a disturbance such as a high-severity wildfire. This alternative would result in the most stress on meadow and grassland habitats and thus would have the greatest negative contribution to potential grassland habitat.

Determination of Effect

Under the No Action Alternative, there would be **no direct or indirect effects on peregrines**. There would be no change to the prey species base, and no change in falcon hunting patterns within associated forest structure.

Effects Common to Both Action Alternatives

Constructing and reconstructing roads along their original alignments, including temporary and relocated roads, would not have noticeable effects on the physical habitat features along the roads. Increased disturbance associated with the increased activity on the improved road conditions may decrease the habitat quality along the improved roads. Aquatic and other habitat restoration in Alternatives 2 and 3 would improve habitat. There would be short-term disturbance to vegetation during implementation of restoration projects. However, restored vegetation would be expected within one year following restoration activities.

Decommissioning of roads in Alternatives 2 and 3 would improve the quality of the habitat in those areas where roads are decommissioned. The physical structure and features of habitat for falcons and their prey would be improved along the former road alignment, and disturbance along the roadway would largely be eliminated, thereby improving the quality of habitat in the long term.

Constructing temporary roads would disturb vegetation and reduce available habitat for peregrine prey. This may affect individuals but is expected to be short term, occurring only during project implementation. Temporary roads would be obliterated to eliminate use and vegetation would be restored over the long term.

Alternative 2 – Modified Proposed Action

Under the modified proposed action, no direct effects from mechanical treatments, temporary road construction, prescribed burning, or spring, riparian habitat, and ephemeral stream restoration is expected. There are four peregrine eyries (nest locations) within the project area. All four are associated with one pair of peregrines. These eyries are located on cliff ledges in a rugged canyon. No thinning treatments are proposed in these areas though they often overlook woodlands, riparian areas, or other habitats supporting avian prey species in abundance, which describes most of the Mogollon Rim and Steeper canyons: a burn-only treatment is planned. Smoke from burning operations would be expected to drain away from the nest location, reducing the potential for birds to be exposed to heavy concentrations of smoke. This area is also designated as a Mexican spotted owl protected activity center; protection measures developed for the owl would also protect peregrines breeding in this area as their breeding season overlaps with the owl.

Mechanical treatments prescribed burning, hauling of wood products, and other project activities may cause visual or auditory disturbance to foraging peregrine falcons. Approximately 40,000 acres of prescribed burning and 45,000 acres of mechanical treatment would occur annually; however, these are short-term effects and would be minimized due to activities being temporally and spatially separated. This disturbance would be localized, of short duration and low intensity, and may affect individual birds, but would not affect the overall distribution or reproduction of the species.

While peregrines do not nest or forage in ponderosa pine forest, active management in portions of the pine forest could potentially affect prey base habitat such as meadows, grasslands, and savannas, which are commonly encroached by pine trees as a result of fire exclusion. Restoring these habitats toward historic conditions and increasing water yield across the forest to improve marsh, pond, or lake habitat could increase prey base for peregrine falcons, resulting in an indirect beneficial effect.

Determination of Effect

Alternative 2 may affect individual peregrine falcons but is not likely to cause a trend toward federal listing or loss of viability.

Alternative 3 – Focused Alternative

Alternative 3 treats fewer forest acres in Rim Country. The direct and indirect effects would be similar to Alternative 2. Alternative 3 includes the same miles and acres of riparian and other habitat restoration, while reducing the total number of acres thinned and treated with prescribed burning. While short term effects from disturbance would be lessened slightly in Alternative 3, long term effects of risk of habitat degradation from stand-altering wildfire or insect infestations are greater.

Determination of Effect

Alternative 3 may affect individual peregrine falcons but is not likely to cause a trend toward federal listing or loss of viability.

Cumulative Effects

The cumulative effects analysis area for peregrine falcons is grassland, savanna, and riparian habitat within the project area and within 0.5 mile outside the project boundary. The cumulative effects analysis includes the effects from Alternative 1. This alternative would result in cumulative effects on peregrine falcons by a continued reduction in the quality of foraging habitat due to a decrease in meadow, grassland, and savanna habitats. Additionally, the trend away from desired conditions in terms of tree numbers and densities would reduce water yield, potentially affecting marsh, pond, and lake habitats that are dependent upon seasonal precipitation. Increasing effects from climate change could add synergistic effects to decreasing water availability.

Under all alternatives, there would be an additive indirect effect from activities that modify vegetation. Those projects where thinning and burning are implemented could affect the prey base on a short-term basis by affecting individuals of prey species, by disturbing or harming prey species' habitat with fire. However, projects would be implemented at different times and in different locations, minimizing disturbances to the prey base.

Other past, present, and ongoing projects have implemented thinning and prescribed burning (39,000 acres) in grasslands, which would improve habitats for peregrine prey species in the long term.

Western Burrowing Owl

There are no documented nesting burrowing owls on the project area; however, potential nesting habitat does exist.

Alternative 1 – No Action

Tree encroachment and canopy development of existing trees would largely continue under Alternative 1. Denser forest conditions would produce lower values in understory biomass (pounds per acre). Understory biomass would continue to decline over the next 40 years under Alternative 1. This in turn would lead to less available habitat for prairie dogs and, consequently, burrowing owls. Vegetation would continue to grow and fuel would continue to accumulate,

continuing to have negative effects on prairie dog habitat and potential habitat for western burrowing owls. Acres of grassland in Fire Regime Condition Class 1 would decrease in the absence of any type of treatment, as woody species continue to encroach and species composition shifts in favor of less fire-adapted species. Grasslands in the project area are at high risk of losing key ecosystem components such as species composition, forest structure, soil characteristics, and hydrologic function in the event of high-severity fire. High fire severity potential would persist, and a large crown wildfire event would have the potential to affect many individuals.

This alternative would result in the most stress on meadow and grassland habitats and thus would have the greatest negative effects on potential western burrowing owl habitat.

Alternative 2 – Modified Proposed Action

Alternative 2 would restore about 54,000 acres of historic grassland and savannahs. Indirect effects on burrowing owls would include effects on owl habitat, owl prey species, or prey species habitat. Active management in some areas of ponderosa pine forest could potentially affect their habitat (e.g., meadows and grasslands are commonly encroached by pine trees as a result of fire exclusion). Restoring these habitats toward historic conditions could increase potential nesting and foraging habitat for western burrowing owls.

Meadow restoration treatments would improve and increase available habitat for prairie dogs, which would subsequently provide nesting habitat for burrowing owls. The modified proposed action would increase available habitat for prairie dogs with 54,000 acres of grassland, meadow, and savanna restoration treatments. Grassland treatments would not lead to a change in the percent of area with the potential for crown fire. Prescribed burning would result in the removal of cover and food; however, it is anticipated that meadows and open areas would rebound afterwards, with more vigorous herbaceous vegetation and healthier understory habitats for insects and small mammals, increasing food sources and resulting in an indirect beneficial effect for burrowing owls.

Determination of Effect

Alternative 2 would may affect individual burrowing owls but would improve potential future habitat for the species, is not likely to cause a trend toward federal listing or loss of viability.

Alternative 3 – Focused Alternative

Direct, indirect, and cumulative effects from Alternative 3 would be the same as those from Alternative 2.

Determination of Effect

Alternative 3 would may affect individual burrowing owls but would improve potential future habitat for the species, is not likely to cause a trend toward federal listing or loss of viability.

Cumulative Effects

The cumulative effects analysis area for burrowing owls encompasses the project area and the associated prairie dog complexes. Cumulative effects include the effects from Alternative 1. Alternative 1 would maintain the current risk to burrowing owl habitat and adjacent forest lands.

Alternative 1 would have a cumulative effect of reducing the number of grassland acres within the project area, as dense forest conditions would continue to place burrowing owl habitat and adjacent habitat at risk of tree encroachment. The fire hazard would increase over time as vegetation would continue to grow and fuel would continue to accumulate, continuing to have negative effects on burrowing owl habitat.

Cumulative activities such as implementing the Travel Management Rule are likely to decrease motorized use in grasslands, thus decreasing effects on prairie dog populations. This, combined with forest thinning and prescribed burning activities, could open up more habitat and increase grassland habitat connectivity. Short-term and localized effects from mechanical thinning and prescribed burning would result in disturbance, and the potential for collapse of burrows and displacement of prairie dogs. This effect may be cumulative with short-term effects from localized dispersed camping, wildfire, and wildfire suppression activities to temporarily displace prairie dog populations (and potentially burrowing owls) in limited areas.

Thinning 36,340 acres of grassland would add to treatment acres from this project to reduce tree densities in grasslands and connect open corridors across the project area, providing additional potential future habitat for burrowing owls.

Navajo Mogollon Vole

Alternative 1 – No Action

In Alternative 1, grasslands, meadows, and savannahs would not be rehabilitated. At the landscape scale, there would be no benefits to vole habitat. Favorable habitat would decrease over time as conifers encroach into meadows and canopy closure increases. Acres of grassland would decrease in the absence of any type of treatment, as woody species continue to encroach and species composition shifts in favor of less fire-adapted species. Acres of ponderosa pine with the likelihood of high-severity wildfire would continue to increase. Ponderosa pine in the project area would be at a high risk of losing key ecosystem components, should there be a disturbance event such as fire or extended drought (Fire Ecology and Air Quality Report). Ponderosa pine in the project area is at high risk of losing key ecosystem components such as species composition, forest structure, soil characteristics, and hydrologic function in the event of high-severity fire.

Wildfire modeling in the ponderosa pine habitat type by alternative show that of the 553,137 acres of ponderosa pine habitat type in the project area, 407,189 acres (81 percent) have the potential to experience high-severity wildfire under Alternative 1. Crown fire potential in ponderosa pine habitat from Alternative 1 could occur in 480,996 acres (87 percent) of this habitat type, affecting the surrounding grasslands, meadows, and savannahs.

Vegetation would continue to grow and fuel would continue to accumulate, continuing to have negative effects on vole habitat.

Determination of Effect

Alternative 1 will have no effect on the Navajo Mogollon voles, and is not likely to cause a trend toward federal listing or loss of viability.

Alternative 2 – Modified Proposed Action

Under the modified proposed action, thinning and prescribed burning activities might disturb individual voles, resulting in direct adverse effects. Prescribed burning would result in the

removal of cover and food; however it is anticipated that meadows and open areas would rebound afterwards, with more vigorous herbaceous vegetation and healthier understory habitats. Such activities would occur across the project area at different times; thereby reducing effects on this species. In addition, the effect would be short-term and would have no effect on the population viability of voles. However, fire exclusion has resulted in uncharacteristically dense forests and meadow and grassland encroachment. Forest treatments can indirectly affect potential vole habitat by restoring meadows and reducing uncharacteristic tree densities and patterns in ponderosa pine forest. Restoring meadows and creating openings in the forest would increase potential understory development, including bunch grasses and other plants with C3 photosynthetic pathways, providing preferred food sources for voles.

In addition to grassland, savannah, and meadow restoration treatments, Alternative 2 calls for a diverse range of mechanical treatments where canopy openness would vary from 10 to 90 percent, depending on localized site conditions. Opening the canopy would provide both habitat connectivity and habitat stepping stones, facilitating landscape movements of dispersing voles. Reducing stand density could potentially reverse the declining trend in C3 plants and increase habitat quality for Mogollon voles. Prescribed fire and mechanical treatments would improve the stability of key ecosystem elements such as species composition, forest structure, soils, and hydrologic function. Moving these habitats toward historic conditions could increase potential habitat quality and quantity and reduce the risk of uncharacteristic, high-severity wildfire. The reduction of ponderosa pine basal area, increased growth in the understory vegetation on the forest floor, and increases in snags would result in indirect beneficial effects on the vole.

Under Alternative 2, as many as 250 miles of closed roads could be decommissioned. Roads often encourage removal of snags as hazard trees and provide easy access for fuelwood cutting, potentially reducing snags along roadways. Ganey (personal communications 2012) found an inverse relationship between snags and roads, so the proposed decommissioning of roads means more snags would be available in the future within vole habitat.

Fence design would allow access to small mammals. In addition, about 10 miles of road segments would be moved out of drainage bottoms, further enhancing vole habitat.

Determination of Effects

Alternative 2 may affect the Navajo Mogollon vole, but is not likely to cause a trend toward federal listing or loss of viability.

Alternative 3 – Focused Alternative

The effects from this alternative would be similar to those from Alternative 2. The same grassland restoration acres are proposed. Fewer acres are proposed for thinning and burning and 15,000 fewer acres of savannah treatments are proposed.

Determination of Effects

Alternative 3 may affect the Navajo Mogollon vole, but is not likely to cause a trend toward federal listing or loss of viability.

Cumulative Effects

The cumulative effects analysis area for Navajo Mogollon voles is the project area. Cumulative effects include the effects from Alternative 1. Indirect effects on Navajo Mogollon vole habitat

would continue under this alternative. Cumulative effects from indirect effects on voles would occur from increased tree densities. This would result in limited herbaceous understory, affecting the ability of voles to successfully forage around and migrate between habitats. At the landscape scale, overstory development would continue to shift understory composition toward less digestible species (appendix 6). Encroachment into openings and species composition changes would also favor less fire-adapted species. Degradation and fragmentation of habitat facilitated by this alternative would combine with other forest activities, including high-impact recreational use, livestock grazing, use of non-jurisdictional roads, and habitat loss and degradation on private lands. Climate change would continue to fragment key nesting and foraging habitat. Grazing may result in short-term effects on habitat, which are expected to be localized in nature but are not expected to result in long-term cumulative effects. This alternative would result in the most stress on meadow, grassland, and ponderosa pine habitats and thus would have the greatest negative effect on potential Mogollon vole habitat.

Short-term effects added to similar effects from nearby projects were considered. Implementation of other project activities could occur simultaneously; however, it is not anticipated to cause cumulative negative effects. Both action alternatives would move these habitats toward historic conditions and could increase potential habitat quality and quantity, reducing the risk of uncharacteristic, high-severity wildfire. This positive effect, combined with similar effects from activities such as the Travel Management Rule efforts, may decrease the frequency of disturbance on the majority of potential breeding sites, slightly counteracting the effects from utility line and road construction and maintenance, and short-term disturbances from vegetation management and prescribed fire.

Short-term and localized effects from mechanical thinning, temporary road construction, and prescribed burning would result in the reduction of understory vegetation and soil compaction. This effect may combine with short-term cumulative effects from localized dispersed camping, wildfire and wildfire suppression activities, ungulate grazing, and drought from climate change to alter availability of both food and cover for voles and temporarily displace voles in a limited area. Livestock are managed in systems designed to allow forage a chance to recover from livestock grazing, reducing the potential for cumulative effects from their grazing. However, wild ungulates would continue to reduce vegetative understory and affect plant composition. Cumulative activities such as the Travel Management Rule are likely to decrease motorized use in grasslands and meadows, thus decreasing effects on vole habitat. This, combined with forest restoration activities, could open up more habitats or provide more contiguous swaths of grassland habitat key to supporting thriving vole populations.

Western Red Bat

Alternative 1 – No Action

With no treatments for the Rim Country Project, habitat quality would deteriorate for this species as overtopping ponderosa pine would lead to a decline in Gambel oak roosting habitat. The high fire hazard potential would persist, and a large, uncharacteristically severe wildfire event would have the potential to affect individuals. Acres of grassland in Fire Regime Condition Class 1 would decrease in the absence of treatments beyond the 13,440 acres of grassland thinning and burning resulting from current and reasonably foreseeable projects (see cumulative effects to all species section). At the landscape scale, woody species would continue to encroach into openings and species composition would shift in favor of less fire-adapted species. Ponderosa

pine cover types in the project area would be at a high risk of losing key ecosystem components, should there be a large-scale disturbance event. In the event of high-severity fire, these key ecosystem components include species composition, forest structure, soil characteristics, and hydrologic function. High fire severity potential would persist, and a large crown wildfire event would have the potential to affect many individuals.

Wildfire modeling in the ponderosa pine habitat type by alternative show that of the 553,137 acres of ponderosa pine habitat type in the project area, 407,189 acres (81 percent) have the potential to experience high-severity wildfire under Alternative 1. Crown fire potential in ponderosa pine habitat from Alternative 1 could occur in 480,996 acres (87 percent) of this habitat type, affecting the surrounding grasslands, meadows, and savannahs.

Although habitat would be provided for this species, most of the forested area within the project area is in a moderately closed or closed canopy condition. Favorable habitat would decrease over time as conifers encroach into meadows and canopy closure increases, resulting in indirect adverse effects. Under Alternative 1, limited acres of grasslands and forest opening would be restored, thus reducing foraging habitat for red bats. Gambel oak would continue to be overtopped by pine. Loss of mid- to large-diameter classes of oak from competition and from crown fire could reduce day roosts for red bats.

Water quality and riparian conditions would be adversely affected on a wide-scale basis, resulting in indirect adverse effects. Under Alternative 1, there would no restoration of springs and no restoration of ephemeral channels. These areas would continue to exhibit downward trends in functional condition or remain in static condition for the foreseeable future, resulting in degradation of potential habitat for western red bats.

Determination of Effect

Alternative 1 may affect western red bats, but is not likely to cause a trend toward federal listing or loss of viability.

Alternative 2 – Modified Proposed Action

Prescribed burning in riparian areas will be coordinated with wildlife biologists to determine presence of federally listed or sensitive species (plants or animals) as well as mitigations needed for rare or sensitive species in/near the work areas. Thinning and prescribed burning activities could potentially disturb red bats if they are roosting in trees and caves, or hibernating among leaf litter within the ponderosa pine treated area. Prescribed burning occurring when bats are rearing young (April–July) or in deep hibernation (mid-winter) could have negative effects on local populations. However, most prescribed burning would occur in the spring and fall, and burn plans within 0.5 mile of known roosts or hibernacula would be designed to limit smoke at critical times (April–July and mid-winter).

Prescribed burning might result in the loss of snags and Gambel oak which could affect roosting bats. However, mitigation including managing for retention of all snags 18 inches in diameter and ignition techniques would reduce the losses of these forest components. Recruitment snags would be provided by retaining trees 18 inches in diameter and greater with dead tops and lightning damage. Selective thinning designed to release oak from competition would help create and retain mid- to large-sized oak. The modified proposed action is expected to result in a slight

short-term decrease in snags followed by an increase over the long term. This short-term loss of snags is not expected to affect the overall distribution of western red bats on the forest.

Alternative 2 calls for a diverse range of mechanical treatments that would vary from 10 to 90 percent open depending on site conditions. Prescribed burning after mechanical treatments would result in the removal of cover and food. However, it is anticipated that meadows and open areas would rebound afterwards, with more vigorous herbaceous vegetation and healthier understory habitats. The reduction of dense forest canopy and increased growth in the herbaceous vegetation on the forest floor would result in indirect beneficial effects on bats. Forest conditions after treatment would improve bat habitat within the project area by increasing diversity and the density of understory vegetation, which provides habitat for prey populations, as many invertebrates are tied to specific understory plant species. Indirect benefits could potentially result from restoring meadows encroached by pine trees, and reducing uncharacteristic tree densities and patterns in the ponderosa pine forest that resulted from fire exclusion. These efforts would aid in restoring openings and edge habitat within the forest and improving understory vegetation that would benefit western red bats and their prey. Moving these habitats toward historic conditions would also increase the resilience of these habitats and decrease the risk of uncharacteristic, high-severity wildfire.

Under the modified proposed action, spring, seep, and ephemeral channel restoration would improve riparian vegetation, increasing availability of food for bats over the long term, resulting in indirect beneficial effects.

Determination of Effect

Alternative 2 may affect the western red bat, but is not likely to cause a trend toward federal listing or loss of viability.

Alternative 3 – Focused Alternative

The direct, indirect, and cumulative effects on the Western red bat from Alternative 3 would be the same as from Alternative 2.

Determination of Effect

Alternative 3 may affect the western red bat, but is not likely to cause a trend toward federal listing or loss of viability.

Cumulative Effects

The cumulative effects analysis area for western red bats is the project area; cumulative effects include the effects from Alternative 1. This alternative would continue to result in indirect effects on western red bats, which may combine with ongoing activities that have similar effects. Cumulative effects from indirect effects on western red bats would include increased ponderosa pine densities, resulting in fewer mid- to large-sized oak (i.e., a decrease in roosting habitat). Herbaceous understory would limit the availability of insects and consequently reduce prey for bats. There would also be reduced tree growth resulting in limited large trees, affecting the ability of bats to successfully forage and locate roost sites. Degradation of habitat facilitated by this alternative would cumulatively combine with other forest activities including high-impact recreational use, livestock grazing, use of non-jurisdictional roads, habitat loss and degradation on private lands, and climate change, which would continue to fragment key roosting and

foraging habitat. Prescribed burning treatments in adjacent projects and grazing may result in short-term effects on habitat, but these are not expected to result in long-term cumulative effects and are expected to be localized in nature. This alternative would result in the most stress on meadow, grassland and ponderosa pine habitats, and thus would have the greatest negative contribution to potential western red bat habitat.

Short-term disturbance to bats would occur during thinning, hauling, and prescribed burning activities and may cause disturbance in nearby areas for the duration of the activity. These short-term effects added to similar effects from other past, present, and reasonably foreseeable projects were considered. Implementation of other fuel reduction activities could occur simultaneously; however, it is not anticipated that effects from these projects would combine with effects from the Rim Country Project activities to cause a negative effect. Ungulate grazing within the project area would reduce understory vegetation, which would reduce plant availability to adult insects, a primary food source. Generally, grazing systems are managed on a rotation to allow forage a chance to recover from livestock grazing, reducing the potential for cumulative effects. However, wild ungulates would continue to reduce vegetative understory and affect plant composition in meadows and around waters.

Pale Townsend's Big-eared Bat

Alternative 1 – No Action

With no treatments for the Rim Country Project, habitat quality would deteriorate for this species as overtopping ponderosa pine would lead to a decline in roosting habitat. As tree densities increase, there would be less edge habitat, thereby reducing foraging opportunities. Seeps and springs would not be restored, which would continue to reduce the availability of riparian-associated host plants for noctuid moths on which the bat preys. High fire severity potential would persist, and a large, uncharacteristically severe wildfire event would have the potential to affect many individuals. Wildfire modeling in the ponderosa pine habitat type by alternative show that of the 553,137 acres of ponderosa pine habitat type in the project area, 407,189 acres (81 percent) have the potential to experience high-severity wildfire under Alternative 1. Crown fire potential in ponderosa pine habitat from Alternative 1 could occur in 480,996 acres (87 percent) of this habitat type, affecting the surrounding grasslands, meadows, and savannahs.

Fire intensity would continue to increase over time as vegetation would continue to grow and fuel would continue to accumulate, continuing to have negative effects on bat habitat. Acres of grassland would decrease in the absence of any type of treatment, as woody species continue to encroach and species composition shifts in favor of less fire-adapted species. Ponderosa pine cover types in the project area would be at a high risk of losing key ecosystem components, should there be a disturbance event, such as fire or extended drought (Fire Ecology and Air Quality Report). Key ecosystem components such as species composition, forest structure, soil characteristics and hydrologic function would be at a high risk of loss in the event of high-severity fire. High fire severity potential would persist, and a large crown wildfire event would have the potential to affect many individuals. Thirty-nine percent of the ponderosa pine and 12 percent of grassland habitat would support a crown fire. Marginal foraging habitat would still exist for this species; however, the high fire hazard potential would persist, and a large crown wildfire event could have the potential to affect individuals, resulting in indirect adverse effects.

Determination of Effect

Alternative 1 may affect pale Townsend's big-eared bats, but is not likely to cause a trend toward federal listing or loss of viability.

Alternative 2 – Modified Proposed Action

Forest management treatments potentially benefiting bats and their prey include group selection (small groups of trees removed for regeneration of new age classes resulting in a mosaic of roosting habitat, and small to medium gaps for foraging) and single tree selection (individual trees of all size classes removed fairly uniformly). These treatments maintain diverse forest structure and roost trees, create gaps that enhance edge habitat, and provide diverse vegetation structure increasing herbaceous vegetation important for bats' insect prey (Taylor 2006).

There are caves within 300 feet of the project boundary. Coconino Land Management Plan guidelines recommend a 300-foot buffer around cave entrances, sinkhole rims and drainages leading to these features. This is a design feature for all known caves within the project area for Alternatives 2 and 3. Design features were added to the project to reduce effects on bat roosts. This would eliminate the potential for damage to the cave from mechanized equipment or increased sedimentation and would eliminate disturbance to Townsend's bats if they are roosting in caves. This would eliminate the potential for damage to the cave from mechanized equipment or increased sedimentation, and would eliminate disturbance to Townsend's bats if they are roosting in caves.

Thinning and prescribed burning activities could potentially disturb Townsend's bats if they are roosting in trees within the ponderosa pine treated area. Prescribed burning occurring when bats are rearing young (April–July) or in deep hibernation (mid-winter) can have negative effects on local populations. However, most prescribed burning would occur in the spring and fall, and burning within 0.5 mile of known roosts or hibernacula or unsurveyed caves and mine shafts would be designed to limit smoke at critical times (April–May and mid-winter). Prescribed burning could also result in the loss of individual snags/hollow logs, which could affect roosting bats; however, mitigation including managing for retention of all snags 18 inches diameter and greater prior to prescribed burning would reduce the effects. The modified proposed action would be expected to result in a slight short-term increase in snags followed by a continued increase over the long term.

Prescribed burning would result in the removal of cover and food. However, it is anticipated that meadows and open areas would rebound afterwards, with more vigorous herbaceous vegetation and healthier understory habitats. Indirect effects would result from vegetation modification activities such as thinning and prescribed burning. These activities would disturb or remove understory vegetation, subsequently reducing availability of insects. These effects would be short-term and would be minimized due to activities being temporally and spatially separated. In contrast, reducing canopy closure, removing trees in and at the edges of meadows, restoring meadows, and prescribed burning would encourage the development of understory vegetation, and increase the amount of edge which would increase availability of food for the bat over the long term. Increasing diversity and density of understory vegetation provides habitat for prey populations. Many invertebrates are tied to specific understory plant species (Capinera 2010). Indirect benefits could potentially result from both restoring meadows encroached by pine trees and reducing uncharacteristic tree densities and patterns in the ponderosa pine forest that resulted

from fire exclusion. These efforts would aid in restoring openings and edge habitat within the forest and improving understory vegetation that would benefit pale Townsend's big-eared bats and their prey. Moving these habitats toward historic conditions would also increase the resilience of these habitats and decrease the risk of uncharacteristic, high-severity wildfire.

Under Alternative 2 there are up to 250 miles of closed roads that could be decommissioned. Roads often encourage removal of snags as hazard trees and provide easy access for fuelwood cutting potentially reducing snags along roadways. Ganey (personal communications, 2012) found an inverse relationship between snags and roads, so the proposed decommissioning of roads means more snags would be available in the future within Townsend's big-eared bat habitat, providing more roosting structures.

Under the proposed action, spring, seep, and channel restoration would improve riparian vegetation, increasing availability of food for noctuids and therefore Townsend's big-eared bats over the long term, resulting in indirect beneficial effects.

Determination of Effect

Alternative 2 may affect pale Townsend's big-eared bats, but is not likely to cause a trend toward federal listing or loss of viability.

Alternative 3 – Focused Alternative

The effects of Alternative 3 would be the same as Alternative 2. One documented cave roost is located within an AZGFD research site; however, these treatments are designed to provide tree groups up to 15 acres and can be designed to buffer cave locations as needed. Buffers are designed to eliminate potential sedimentation into the cave or damage from heavy machinery working over shallow passages. Alternative 3 has the same number of acres of grassland restoration treatments, while reducing savannah treatments by 15,000 acres.

Determination of Effect

Alternative 3 may affect pale Townsend's big-eared bats, but is not likely to cause a trend toward federal listing or loss of viability.

Cumulative Effects

The cumulative effects analysis area for pale Townsend's big-eared bats is the project area. Cumulative effects include the effects from Alternative 1. This alternative would continue to result in indirect effects on Townsend's big-eared bats, which may combine with ongoing activities that have similar effects. Cumulative effects from indirect effects on Townsend's big-eared bats would be limited to increased tree densities resulting in limited herbaceous understory; this would limit the availability of insects and, consequently, reduce prey for bats. Tree growth would be reduced, resulting in limited large trees, and consequently recruitment snags, affecting the ability of bats to successfully forage and locate roost sites. Degradation of habitat facilitated by this alternative would combine with the effects from other forest activities, including high-impact recreational use, livestock grazing, use of non-jurisdictional roads, habitat loss and degradation on private lands, and climate change, which would continue to fragment key roosting and foraging habitat. Prescribed burning treatments and grazing may result in short-term effects on habitat, but these are not expected to result in long-term cumulative effects and are expected to be localized in nature. This alternative would result in the most stress on

meadow, grassland, and ponderosa pine habitats and thus would have the greatest negative contribution to potential Townsend's big-eared bat habitat.

Short-term disturbance to bats would occur during thinning, hauling, and prescribed burning activities and may cause disturbance in nearby areas for the duration of the activity. These short-term effects added to similar effects from other past, present, and reasonably foreseeable projects were considered. Implementation of other fuel reduction project activities could occur simultaneously; however, they are not anticipated to combine with Rim Country activities to cause a negative effect. Ungulate grazing within the project area reduces understory vegetation, which reduces plant availability to adult insects, a primary food source. Generally, grazing systems are managed on a rotation to allow forage a chance to recover from livestock grazing, reducing the potential for cumulative effects. However wild ungulates would continue to reduce vegetative understory and affect plant composition in meadows and around waters. Implementation of the Travel Management Rule has reduced the number of roads near Townsend's big-eared bat roost locations.

Allen's Lappet-browed Bat

Alternative 1 – No Action

Under Alternative 1, only current and reasonably foreseeable projects would continue. Habitat would still exist for this species; however, the high fire hazard potential would persist, and a large, uncharacteristically severe wildfire event could have the potential to affect individuals and long-term suitability of habitat. Most of the forested area within the project area is in a moderately closed or closed canopy condition. Under Alternative 1, grasslands and forest openings would not be restored, thus recruitment of large snags would not meet forest objectives in the long term. Large-diameter trees would not maintain the numbers and distribution that would support large-diameter snags distributed across forested areas. There would be reduced foraging habitat for Allen's lappet-browed bats as conifers encroach into meadows and canopy closure increases, resulting in indirect adverse effects. High basal area and trees per acre counts would decrease or stagnate growth of large trees. Active competition-induced mortality would increase, decreasing future recruitment of large snags and decreasing future maternity roost sites.

Determination of Effect

Alternative 1 may affect Allen's lappet-browed bats, but is not likely to cause a trend toward federal listing or loss of viability.

Alternative 2 – Modified Proposed Action

Forest management treatments potentially benefiting bats and their prey include group selection (small groups of trees removed for regeneration of new age classes, which results in a mosaic of roosting habitat, and small to medium gaps for foraging) and single tree selection (individual trees of all size classes removed fairly uniformly). This would ensure a consistent source of large-diameter snags by maintaining recruitment of trees into larger size classes. These treatments would maintain diverse forest structure, including snags and gaps that enhance edge habitat, create diverse vegetation structure, and increase herbaceous vegetation important for bats' insect prey (Taylor 2006).

Thinning and prescribed burning activities could potentially disturb Allen's lappet-browed bats if they are roosting in trees within the ponderosa pine and pinyon juniper treated areas. Prescribed

burning occurring when bats are rearing young (April–July) or in deep hibernation (mid-winter) can have negative effects on local populations. However, most prescribed burning would occur in the spring and fall and burning within 0.5 mile of known roosts/hibernacula or unsurveyed caves and mine shafts would be designed to limit smoke at critical times (April–May and mid-winter).

Prescribed burning could also result in the loss of individual snags which could affect roosting bats; however, mitigation including managing for retention of all snags 18 inches in diameter and greater would reduce this effect. Recruitment snags would be provided by retaining and growing more trees 18 inches in diameter and greater. Selection of trees with dead tops and lightning damage would contribute to potential habitat. The modified proposed action is expected to result in a slight short-term increase in snags followed by a continuing increase over the long term, with incidental loss of snags greater than 18 inches in diameter.

Prescribed burning would result in the removal of cover and food. However, it is anticipated that meadows and open areas would rebound afterwards, with more vigorous herbaceous vegetation and healthier understory habitats. The reduction of dense forest canopy and increased growth in the herbaceous vegetation on the forest floor would result in indirect beneficial effects on bats. Forest conditions after treatment would improve bat habitat within the project area. Increasing diversity and density of understory vegetation provides habitat for prey populations. Many invertebrates are tied to specific understory plant species (Capinera 2010). Indirect benefits could potentially result from restoring meadows encroached by pine trees, as well as reducing uncharacteristic tree densities and patterns in the ponderosa pine forest resulting from fire exclusion. These efforts would aid in restoring openings and edge habitat within the forest and improving understory vegetation that would benefit Allen’s lappet-browed bats and their prey. Moving these habitats toward historic conditions would also increase resilience of these habitats and decrease the risk of uncharacteristic, high-severity wildfire.

Under Alternative 2 there are up to 250 miles of closed roads that could be decommissioned. Roads often encourage removal of snags as hazard trees and provide easy access for fuelwood cutting potentially reducing snags along roadways. Ganey (personal communications, 2012) found an inverse relationship between snags and roads, so the proposed decommissioning of roads means more snags would be available in the future within Allen’s lappet-browed bat habitat providing more roosting structures.

Under the modified proposed action, spring, seep, and channel restoration would improve riparian vegetation, increasing availability of food for bats over the long term, resulting in indirect beneficial effects.

Determination of Effect

Alternative 2 may affect Allen’s lappet-browed bats, but is not likely to cause a trend toward federal listing or loss of viability.

Alternative 3 – Focused Alternative

Alternative 3 treats fewer forest acres in Rim Country, but the direct and indirect effects would be similar to Alternative 2. Alternative 3 includes the same miles and acres of riparian and other habitat restoration, while reducing the total number of acres thinned and treated with prescribed burning. The same grassland restoration acres are proposed as in Alternative 2, but 15,000 fewer

acres in forest openings such as meadows and savannahs are proposed. While short-term effects from disturbance would be slightly less to Allen's lappet-browed bats in Alternative 3, the long-term effects on the risk of habitat degradation from stand-altering wildfire or insect infestations would be greater.

Determination of Effect

Alternative 3 may affect Allen's lappet-browed bats, but is not likely to cause a trend toward federal listing or loss of viability.

Cumulative Effects

The cumulative effects analysis area for Allen's lappet-browed bats is the project area; cumulative effects include the effects from Alternative 1. This alternative would continue to result in indirect effects on Allen's lappet-browed bats, which may combine with ongoing activities that have similar effects. Indirect effects on Allen's lappet-browed bats would be limited to increased tree densities and decreased tree growth rates. This would result in limited herbaceous understory, thereby limiting the availability of arthropod prey for bats. In addition, reduced tree growth would reduce large tree availability and, consequently, future recruitment of large snags. Combined, this would reduce foraging habitat and potential roost sites. Degradation of habitat under this alternative would be cumulative with other forest activities, including high-impact recreational use, livestock grazing, use of non-jurisdictional roads, habitat loss and degradation on private lands, and climate change. These would continue to fragment key roosting and foraging habitat. Prescribed burning treatments and grazing may result in short-term effects on habitat, but these are not expected to result in long-term cumulative effects and are expected to be localized in nature. This alternative would result in the most stress on meadow, grassland, and ponderosa pine habitats and thus would have the greatest negative contribution to potential Allen's lappet-browed bat habitat.

There might be potential short-term disturbance to potential foraging and roosting habitat with long-term benefits from the action alternatives. Short-term disturbance to bats would occur during thinning, hauling, and prescribed burning activities and may cause disturbance in nearby areas for the duration of the activity. Roosting and foraging habitat may be reduced in some areas in the short term. The alternatives would be expected to result in a slight short-term increase in snags (greater than 12 inches diameter) followed by a continued increase over the long term of large snags (greater than 18 inches diameter). These short-term effects added to similar effects from other past, present, and reasonably foreseeable projects were considered.

The Land Management Plans calls for an average of two large snags per acre in ponderosa pine forests, with large snags defined as 18 inches or larger in diameter and 30 feet tall or higher. However, research completed well after the Land Management Plan was signed suggests this specification may be unrealistic. Ganey (1999) found only 30 percent of ponderosa pine plots in unlogged sites met or exceeded Forest Service snag guidelines. Waskiewicz et al. (2007) found pine snag densities well below Forest Service guidelines in relatively undisturbed forests in northern Arizona. Fire promotes and beetles increase recruitment of large snags, but neither form of snag creation produces snags that remain a long time on the landscape compared to other snags (Chambers and Mast 2005, Chambers and Mast 2014). In 2011, Ganey and Vojta reported a 74 percent increase in ponderosa pine mortality from 2002 to 2007 compared to mortality between 1997 and 2002. This was likely the result of a drought-mediated pulse in tree mortality

(Ganey and Vojta 2011), meaning fewer large trees survived the drought period. These stochastic events are likely to continue (see the Climate Change section) and combined may elevate snag numbers over time, benefiting Allen's lappet-browed bats. However, these pulses in snag creation reduce the availability of large trees and reduce future large snag recruitment.

Implementation of other fuel reduction and restoration activities could occur simultaneously; however, it is not anticipated that these effects would be additive to cause negative effects. Other fuel reduction and restoration projects might result in decreased large snags (greater than 18 inches in diameter) into the future. However, decreasing the potential for large-scale wildfires, and designing projects to increase tree growth for more large trees and, consequently, more recruitment snags, would improve the ability of tree roosting bats to locate roost sites across the landscape.

Prescribed burning produces low-severity burns that would reduce surface fuels and cause periodic loss of snags. Other activities such as high-severity wildfire, construction and maintenance of utility corridors, management of snags along forest roads, and private land development would also reduce the number of snags available for roosting in the long term. Large snags would be preserved whenever possible and design features to maintain and, where possible, develop snags on the landscape are incorporated into all projects. Although individual trees may be lost, large snags would be maintained and developed across the landscape to provide roosting habitat for Allen's lappet-browed bats.

Ungulate grazing within the project area reduces understory vegetation, which reduces plant availability to adult insects, a primary food source. Generally grazing systems are managed on a rotation to allow forage a chance to recover from livestock grazing, reducing the potential for cumulative effects. However, wild ungulates would continue to reduce vegetative understory and affect plant composition in meadows and around water.

Spotted Bat

Alternative 1 – No Action

Under Alternative 1, only current and reasonably foreseeable projects would continue, as discussed in the cumulative effects to all species section. However, the high fire hazard potential would persist, and a large, uncharacteristically severe wildfire event would have the potential to affect individuals. Ponderosa pine forest in the project area would be at a high risk of losing key ecosystem components, should there be a disturbance event such as fire or extended drought (Fire Ecology and Air Quality Report). Key ecosystem components in ponderosa pine forest include species composition, forest structure, soil characteristics, and hydrologic function. High fire severity potential would persist, and a large crown wildfire event would have the potential to affect many individuals. Although habitat would be provided for this species, most of the forested area within the project area is in a moderately closed or closed canopy condition. Under Alternative 1, grasslands and forest openings would not be restored, thus there would be no benefits to bats. Favorable habitat would decrease over time as conifers encroach into meadows and canopy closure increases, resulting in indirect adverse effects. Wildfire modeling in the ponderosa pine habitat type by alternative show that of the 553,137 acres of ponderosa pine habitat type, 407,189 acres (81 percent) have the potential to experience high-severity wildfire under Alternative 1. Crown fire potential in ponderosa pine habitat from Alternative 1 could occur in 480,996 acres (87 percent) of this habitat type.

Determination of Effect

Alternative 1 may affect spotted bats, but is not likely to cause a trend toward federal listing or loss of viability.

Alternative 2 – Modified Proposed Action

Forest management treatments potentially benefiting bats and their prey include group selection (small groups of trees removed for regeneration of new age classes resulting in a mosaic of roosting habitat, and small to medium gaps for foraging) and single tree selection (individual trees of all size classes removed fairly uniformly). These treatments maintain diverse forest structure and roost trees, create gaps that enhance edge habitat, and provide diverse vegetation structure increasing herbaceous vegetation important for bats' insect prey (Taylor 2006).

Under the modified proposed action, thinning and prescribed burning activities could potentially disturb spotted bats if they are roosting in rock crevices in the ponderosa pine treated area. Prescribed burning occurring when bats are rearing young (April–July) or in deep hibernation (mid-winter) could have negative effects on local populations. However, most prescribed burning would occur in the spring and fall and burning within 0.5 mile of caves, mines, or cliff habitats would be designed to limit smoke at critical times (April–May and mid-winter).

Prescribed burning would result in the removal of cover and food; however, it is anticipated that meadows and open areas would rebound afterwards, with more vigorous herbaceous vegetation and healthier understory habitats. Indirect effects would result from vegetation modification activities such as thinning and prescribed burning. These activities would disturb or remove understory vegetation, subsequently reducing availability to insects. These effects would be short-term and would be minimized due to activities being temporally and spatially separated. In contrast, reducing canopy closure, removing trees in meadows, restoring meadows, and prescribed burning would encourage the development of understory vegetation, increasing availability of food for the bat over the long term.

Increasing the diversity and density of understory vegetation provides habitat for prey populations. Many lepidopterans are tied to specific understory plant species (Waltz and Covington 2004). Indirect benefits could potentially result from restoring meadows encroached by pine trees and reducing uncharacteristic tree densities and patterns in the ponderosa pine forest, a result of fire exclusion. These efforts would aid in restoring openings and edge habitat within the forest and improving understory vegetation that would benefit spotted bats and their prey. Moving these habitats toward historic conditions would also increase the resilience of these habitats and decrease the risk of uncharacteristic, high-severity wildfire. Under the modified proposed action, spring, seep, and channel restoration would improve riparian vegetation, increasing availability of food for bats over the long term, resulting in indirect beneficial effects.

Determination of Effect

Alternative 2 may affect spotted bats, but is not likely to cause a trend toward federal listing or loss of viability.

Alternative 3 – Focused Alternative

Alternative 3 treats fewer forest acres in Rim Country, but the direct and indirect effects would be similar to Alternative 2. Alternative 3 includes the same miles and acres of riparian and other

habitat restoration, while reducing the total number of acres thinned and treated with prescribed burning. The same grassland restoration acres are proposed as in Alternative 2, but 15,000 fewer acres in forest openings such as meadows and savannahs are proposed. While short-term effects from disturbance would be slightly less to spotted bats in Alternative 3, the long-term effects on the risk of habitat degradation from stand-altering wildfire or insect infestations would be greater.

Determination of Effect

Alternative 3 may affect spotted bats, but is not likely to cause a trend toward federal listing or loss of viability.

Cumulative Effects

The cumulative effects analysis area for spotted bat is the project area; cumulative effects include the effects from Alternative 1. The cumulative effects of Alternative 1 would be similar to the indirect effects discussed above. Alternative 1 would not create disturbance to roosting habitat nor would it improve foraging habitat within the project area. Therefore, there would be no cumulative effects from this alternative.

There could be potential short-term disturbance to potential foraging and roosting habitat with long-term benefits from the action alternatives. Short-term disturbance to bats would occur during thinning, hauling, and prescribed burning activities and may cause disturbance in nearby areas for the duration of the activity. These short-term effects, added to similar effects from other past, present, and reasonably foreseeable mechanical vegetation management and fuels reduction projects were considered. Implementation of these projects could occur simultaneously; however, it is not anticipated to accumulate to cause negative effects. Ungulate grazing in the project area reduces understory vegetation, which reduces plant availability to adult insects, a primary food source. Generally grazing systems are managed on a rotation to allow forage a chance to recover from livestock grazing, reducing the potential for cumulative effects. However, wild ungulates would continue to reduce vegetative understory and affect plant composition in meadows and around water.

Forest Service Management Indicator Species

Northern Goshawk

In Alternative 1, the quality of the habitat would deteriorate as canopies close and tree densities increase, and understory production decreases. Closed canopies associated with higher tree densities would not allow sunlight and water to reach the forest floor for understory vegetation to grow, or provide habitat for prey species including vegetative cover, nesting substrates, seeds and fruits, and grasses, forbs, and shrubs, as evidenced by the declining index of biomass production. In the long term, understory species richness would decline, reducing food and cover for prey species. Increased tree densities would increase competition among trees. Tree growth would decrease or stagnate and tree health decline due to competition for limited resources and space. Meanwhile, the lack of fire disturbance has led to increased tree density and fuel loads that increase the risk of uncharacteristically intense wildfire and drought-related mortality. When fires occur under current conditions, they tend to cause high tree mortality rates, including the large and old trees. These trees take longer to replace, moving the forest further from desired conditions, and increasing the time it would take to return to desired conditions. Another result

of increased tree density is increased risk of insect and/or disease outbreak. Mortality created by these outbreaks also contributes to increased fuel loads and the associated increase in the risk of uncharacteristically intense wildfire.

Alternatives 2 and 3 would not result in a type conversion of mixed conifer or Ponderosa pine habitat on the Tonto NF and therefore will have no effect to the population trend for Northern Goshawk. In Alternatives 2 and 3, the large tree habitat structure required for goshawk nesting (e.g., large, tall trees with large branches and adequate flight paths) would be more available across the landscape as the numbers of large trees increased, improving habitat for existing and future resident goshawks and potentially increasing recruitment into the population. Creating interspace between groups of trees would help support prey species. Trees used for nesting would be able to grow to larger size, retain more of their crowns, and live longer with less competition, thus providing higher quality habitat for nesting and foraging. Alternatives 2 and 3 would increase the long-term amount of late seral stage forest after treatment by more than doubling the amount of existing old trees.

The quality of the late seral stage ponderosa pine habitat would be expected to improve as stand conditions move closer toward historic conditions with more open understories, less competition among trees, and healthier forest conditions. Increasing the understory response would improve the quality of goshawk foraging habitat by providing more food and cover for prey species. The improved development of understory could also increase the diversity and amount of prey species available to goshawks.

Alternatives 2 and 3 would produce the largest increase in the quantity of late seral ponderosa pine habitat as well as the most improvement in the quality of habitat for northern goshawks and their prey species as all elements move toward desired future conditions. Overall, Alternatives 2 and 3 increase habitat quantity and improve habitat quality for northern goshawk and its prey species.

Pygmy Nuthatch

Alternative 1 would not result in an immediate change to the quantity or quality of habitat used by the pygmy nuthatch. Late-seral ponderosa pine would continue to be threatened by unnatural stand densities, creating risk for uncharacteristic, high-severity fire.

The U.S. Geological Survey study of climate effects on birds and reptiles (Van Riper et al. 2014) projected that the pygmy nuthatch's breeding range would decrease by 75 to 81 percent between 2010 and 2099, when an 83 percent agreement nest/roost was applied. The model accuracy was shown to be 78 percent accurate. Alternatives 2 and 3 should help prevent such a large-scale decrease in the breeding range. The alternatives would increase resiliency of ponderosa pine habitat to climate change.

Alternatives 2 and 3 would not result in a type conversion of mixed conifer or Ponderosa pine habitat on the Coconino NF and therefore will have no effect to the population trend for the Pygmy Nuthatch. The proposed treatments in Alternatives 2 and 3 would protect nesting habitat. The proposed thinning and burning activities would also create canopy openings, allowing sunlight to reach more tree boles and increasing the prey base for nuthatches. Thinning and burning treatments are designed to return forest structure and composition to within the NRV, which should benefit native wildlife species (Kalies et al. 2010), particularly bark-gleaning birds (George and Laudenslayer 2005). The vegetation design features for Alternatives

2 and 3 require that snags be managed to meet or move toward Land Management Plan requirements and to move toward desired conditions. Snags or hazard trees within a distance of twice their height from private land boundaries or along key roads may be felled. In all other areas, conifer snags greater than 12 inches in diameter would be maintained, with an emphasis on snags greater than 18 inches in diameter, except in cases of human health and safety. Live conifer trees with the potential to provide nesting habitat cavities, such as dead-top trees and lightning struck trees, would be favored for retention. Prescribed burns are designed to maintain desired forest structure, tree densities, snag densities, and coarse woody debris levels (Silviculture Report).

Pygmy Nuthatch Population Trend

The current forestwide trend is stable to slightly declining (USDA FS 2013).

Alternative 1 would likely continue the current forestwide population trend for the pygmy nuthatch of stable to slightly declining in the short term. With the likelihood of large scale stand-replacing wildfires in the future, it is possible that in the long term the forestwide population trend could change to decreasing.

Alternatives 2 and 3 would likely change the forestwide population trend to increasing in the long term due to an increase in late-seral habitat over a large area of ponderosa pine habitat. While pygmy nuthatches appear to have a localized population increase in areas where thinning and prescribed burns have occurred, the short-term effects might not be enough to move the species to an increasing trend. For the short term, these alternatives would likely continue the stable forestwide population trend, while moving toward an increasing trend.

Hairy woodpeckers

Alternative 1 would increase the amount of late-seral forest in the long term. The risk of a large-scale wildfire is high. While fires promote recruitment of large snags, a study conducted locally documented 40 percent of fire-killed snags falling within seven years (Chambers and Mast 2005). Over 80 percent of ponderosa pine snags created by high-severity fire fell within 10 - years after a fire (Chambers personal communications 2008, Mast personal communications 2008). In addition, patches that burn with high-severity in today's stand-replacing fires can reach several hundred hectares in size. Hairy woodpeckers do not use interior portions of larger burned areas, restricting much of their foraging to the edge habitat. The uncharacteristically large fires of recent years are less valuable to hairy woodpeckers than the smaller overstory-removing fires that occurred historically (USDA FS 2010a).

Alternatives 2 and 3 would not result in a type conversion of mixed conifer or Ponderosa pine habitat on the Coconino NF and therefore will have no effect to the population trend for Hairy Woodpeckers. Both action alternatives are designed to restore ponderosa pine forests closer to the natural range of variation. Live conifer trees with the potential to provide nesting habitat cavities such as dead-top trees and lightning struck trees would also be favored for retention. Prescribed fires would be designed to maintain desired forest structure, tree densities, snag densities, and coarse woody debris levels (Silviculture Report). Using the MSO and goshawk guidelines to direct management activities should have a positive effect on the species, as this prescription would result in forest structure that more closely resembles historic forests than those present today, including large trees and an abundance of snags (USDA FS 2010a).

Rocky Mountain Elk

The Tonto NF estimated 283,200 acres of habitat occur on that forest for Elk (Tonto NF, 2005). No treatment or limited treatments as per previous years of acres accomplished in this forest type would leave nearly 220,000 acres of this (77 %) untreated. Alternative 1 would not result in an immediate change to the quantity or quality of habitat used by elk on national forests. Alternative 1 would continue to provide large patches of trees with higher basal area, canopy density, and interlocking crowns, thereby providing thermal and hiding cover for elk. However, forage production would be limited under the forest canopies. Pine encroachment into grassy openings and meadows would continue to limit foraging habitat for elk under Alternative 1. Under Alternative 1, the current unnatural stand densities would threaten the sustainability of elk habitat over time by limiting understory production and creating a higher risk for uncharacteristic, high-severity fire.

Alternatives 2 and 3 would not result in a type conversion of mixed conifer or Ponderosa pine habitat on the Tonto NF and therefore will have no effect to the population trend for elk. These alternatives will promote thinning trees and prescribed burning in ponderosa pine that would open the canopy and decrease fine fuels on the forest floor. The Tonto NF estimated 283,200 acres of habitat occur on that forest for Elk (Tonto NF, 2005). The action alternatives could treat up to approximately 226,416 of this habitat on the Tonto NF, maintaining or improving the habitat quality of 80% of the available habitat on the Tonto NF. The result would be increased growth of herbaceous and shrub-level vegetation on these treated acres, which would provide increased forage in the long term. Reducing tree densities and ladder fuels would reduce available thermal and hiding cover for elk. However, thermal protection for elk would continue to be available in areas maintained at higher BA and canopy density.

Merriam's Turkey

The Tonto NF estimated 283,200 acres of habitat occur on that forest for turkey (Tonto NF, 2005). No treatment or limited treatments as per previous years of acres accomplished in this forest type would leave nearly 220,000 acres of this (77 %) untreated. Alternative 1 would not result in an immediate change to the quantity or quality of habitat used by turkey on the national forests in the project area. Alternative 1 would continue to provide large patches of trees with a higher basal area, higher canopy density, and more interlocking crowns, thereby providing thermal and hiding cover for turkey. However, overstory suppression of oak, grass, and forb diversity and productivity would continue to limit foraging habitat for turkey in Alternative 1. Tree encroachment into openings and meadows would also limit turkey foraging habitat. Late-seral ponderosa pine would continue to be threatened by unnatural stand densities, creating risk for uncharacteristic, high-severity fire.

Alternatives 2 and 3 would not result in a type conversion of mixed conifer or Ponderosa pine habitat on the Tonto NF and therefore will have no effect to the population trend for turkey. The Tonto NF estimated 283,200 acres of habitat occur on that forest for turkey (Tonto NF, 2005). The action alternatives could treat up to approximately 226,416 of this habitat on the Tonto NF, maintaining or improving the habitat quality of 80% of the available habitat on the Tonto NF. The proposed treatments in Alternatives 2 and 3 would protect nesting and roosting habitat. The proposed thinning and burning activities would create tree groups that are favored by turkeys and would also increase the understory production. Increasing the understory would

also increase plant and invertebrate abundance. Vegetation design features would protect most mast-producing Gambel oaks within the project area. Targeted removal of over-topping ponderosa pines would increase resiliency and persistence of large oaks. Design features also specifically address retaining medium to high canopy cover in stringers of large ponderosa pine trees in the pinyon-juniper transition zones. This is a habitat favored by roosting turkeys. Low-severity prescribed fire along ridges and slopes is expected to retain yellow pine and roosting cover above drainages in the pinyon- juniper transition zone. While turkeys are not grassland species, groups of large and old trees would be retained where they occur on mollic-integrate soils. The results of these treatments would be savanna conditions. This would add resilience to groups of large, old trees, potentially increasing turkey roost habitat. In addition, the open habitat conditions resulting from the grassland and savanna treatments would increase foraging habitat for adults and poults.

Abert's Squirrel

The Tonto NF estimated 283,200 acres of habitat occur on that forest for Abert's squirrels (Tonto NF, 2005). No treatment or limited treatments as per previous years of acres accomplished in this forest type would leave nearly 220,000 acres of this (77%) untreated. Alternative 1 would continue to provide large patches of trees with higher basal area, canopy density, and interlocking crowns, thereby providing wintering habitat for squirrels on national forests. However, Alternative 1 would threaten the long-term viability of squirrels. Under Alternative 1, the current unnatural stand densities would threaten the sustainability of squirrel habitat over time by reducing tree vigor and health, limiting pine cone production, and creating a risk for uncharacteristic, high-severity fire. Vigor and health of trees in the older age class categories are important for sustaining squirrel nesting habitat over time. Pine cone production is important for squirrel foraging and nutritional demands. Large-scale losses of squirrel habitat from uncharacteristically large, stand-replacing fire would affect squirrel populations across the project area.

Alternatives 2 and 3 would not result in a type conversion of mixed conifer or Ponderosa pine habitat on the Tonto NF and therefore will have no effect to the population trend for Abert's squirrels. The Tonto NF estimated 283,200 acres of habitat occur on that forest for Abert's squirrels (Tonto NF, 2005). The action alternatives could treat up to approximately 226,416 of this habitat on the Tonto NF, maintaining or improving the habitat quality of 80% of the available habitat on the Tonto NF. With rare exceptions, Alternatives 2 and 3 would not remove old growth trees, and there would be an emphasis on retention of large-diameter trees, which should benefit Abert's squirrels for nesting, winter cover, and cone production. Project design criteria include tree thinning using the goshawk guidelines. This should result in a mosaic of vegetation structural stages, interrupting canopy closure, and allowing more sunlight to reach the forest floor. The reduction in canopy connectedness would reduce safe travel routes for Abert's squirrels and expose them to higher rates of predation in treatments creating more higher degrees of openness,. These treatments would also expose more of the forest floor to direct sunlight which could remove the microsite habitat for mycorrhizal fungi production, thereby reducing an important food source for squirrels. However, Dodd et al. (2006) postulated that up to 75 percent of a forested landscape could be treated and still provide suitable squirrel habitat, if treatments were applied as a mosaic of patches and areas of optimal habitat were retained. The alternatives

are also designed to provide closed-canopy corridors to provide connectivity for squirrels and other species.

Alternatives 2 and 3 call for a diverse range of mechanical treatments to maintain forest habitat. Forest habitats would vary from 10 to 70 percent open, outside of grassland and savanna habitat, with variable basal area, trees per acre, and stand density index depending on site-specific conditions. Areas that would likely maintain a basal area and canopy cover high enough to support Abert's squirrels include MSO protected and recovery habitat, northern goshawk nest stands, other raptor nest sites, bald eagle roosts, buffers around caves and sinkholes, a portion of the older age class tree groups intended to support higher tree densities of mixed-age trees, and areas excluded from mechanical treatment such as wilderness or areas with slopes greater than 40 percent. As such, the patches of forest within the mosaic proposed by Alternatives 2 and 3 would vary in terms of Abert's squirrel habitat quality. A ratio of optimal to suboptimal patches that is skewed toward a more open condition would be less desirable to the squirrel and could lead to a short-term reduction in current squirrel populations. However, in the long term, post-treatment conditions would include tree growth and increased canopy connectedness, which should have a positive effect onto squirrel populations when viewed over longer time horizons.

Despite the proposed overall reduction in dense forest conditions, alternatives 2 and 3 would also provide for sustainable forests that include large, cone-bearing trees either as individual legacy trees or in groups, and clumps of mature and old-growth trees interspersed with patches suitable for fungi production. Canopy connectivity would be retained, but would no longer occur across so much of the landscape. In the long term, this should provide for more sustainable squirrel habitat over time because the risk of high-severity fire, and therefore long-term degradation or loss of squirrel habitat, would be significantly reduced (USDA FS 2010a). Landscape connectivity would be retained for canopy-dependent species.

Arizona Gray Squirrel

Alternative 1, No action could lead to a decreased species trend if effects from high-severity wildfire is encountered in high elevation riparian habitat across the project area.

Alternatives 2 and 3 would not result in a type conversion of riparian habitat on the Tonto NF and therefore will have no effect to the population trend for Arizona gray squirrels. The action alternatives would emphasize maintenance and restoration of healthy riparian ecosystems through conformance with LRMP's riparian Desired Conditions. Management strategies should move degraded riparian vegetation toward good condition as soon as possible. Damage to riparian vegetation, stream banks, and channels should be prevented. Alternatives 2 and 3 would improve riparian habitat and would likely assist in keeping the population stable.

Common Black Hawk

Alternative 1, No action could lead to a decreased species trend if effects from high-severity wildfire is encountered by riparian and cottonwood-willow vegetation type habitats across the project area.

Alternatives 2 and 3 propose 14,560 acres of Riparian restoration. Improvement of stream function is proposed for 777 miles across the project area through the action alternatives. Black-hawks could be disturbed by restoration activities, however design features to protect raptor nests have been included in the project record. This should minimize disturbance to the Common

Black-hawk, though it is possible that disturbance from thinning implementation and short-term noise and smoke disturbance is possible during thinning and broadcast burning operations, potentially leading to loss of egg viability or injury or death to nestlings. The removal of any eggs or fledglings would not result in a measurable negative effect to the Common Black-hawk population from any of the two action alternatives as the implementation of these acres would occur intermittently over space and time over the next 10 years. Long-term effects to the Common Black-hawk population would be positive as a result of habitat restoration. Alternatives 2 and 3 would improve riparian and cottonwood-willow vegetation types habitats and would likely assist in keeping the population stable.

Ash-throated Flycatcher

Alternative 1 could lead to a decreased species trend if high-severity wildfire is encountered in the pinyon-juniper vegetation type habitat across the project area.

Both action alternatives would include various levels of restoration implementation within pinyon-juniper. The alternatives could mechanically thin and burn 114,753 acres of pinyon-juniper. Most large trees would not be removed and pinyon-juniper woodlands would be managed for late-seral habitat, benefiting foraging and nesting habitat. Long-term benefits would include increasing understory development, managing for snag retention, and increasing habitat heterogeneity. Areas with currently dense conditions would be more open, leading to mixed long-term results for some species of birds. Unintentional take is expected to be minimized through the application of breeding season timing restrictions in Goshawk PFAs, deferral areas, and other design features. Alternatives 2 and 3 would improve the pinyon-juniper vegetation type habitat and would likely keep the population stable.

Gray Vireo

Alternative 1 could lead to a decreased species trend if high-severity wildfire is encountered in the pinyon-juniper vegetation type habitat across the project area.

Both action alternatives would include various levels of restoration implementation within pinyon-juniper. The alternatives could mechanically thin and burn 114,753 acres of pinyon-juniper. Most large trees would not be removed and pinyon-juniper woodlands would be managed for late-seral habitat, benefiting foraging and nesting habitat. However, mechanical treatment and burning could destroy nests if these activities occur during breeding season. Short-term noise and smoke disturbance is possible during thinning and broadcast burning operations, potentially leading to loss of egg viability or injury or death to nestlings. Not all treatments would occur during the breeding season. Unintentional take of eggs or nestlings would not result in a measurable negative effect to the Gray Vireo population from both of the action alternatives. Alternatives 2 and 3 would improve the pinyon-juniper vegetation type habitat and would likely assist in keeping the Gray Vireo population stable.

Juniper Titmouse

Alternative 1 could lead to a decreased species trend if high-severity wildfire is encountered in the pinyon-juniper vegetation type habitat across the project area.

Both action alternatives would include various levels of restoration implementation within pinyon-juniper. The alternatives could mechanically thin and burn 114,753 acres of pinyon-juniper. Most large trees would not be removed and pinyon-juniper woodlands would be

managed for late-seral habitat, benefiting foraging and nesting habitat. However, mechanical treatment and burning could destroy nests if these activities occur during breeding season. Short-term noise and smoke disturbance is possible during thinning and broadcast burning operations, potentially leading to loss of egg viability or injury or death to nestlings. Not all treatments would occur during the breeding season. Unintentional take of eggs or nestlings would not result in a measurable negative effect to the juniper titmouse population from either of the action alternatives.

Hairy Woodpecker

Alternative 1 would increase the amount of late-seral forests in the long term. The risk of a large-scale wildfire is high. While fires promote recruitment of large snags, a study conducted locally, documented 40 percent of fire-killed snags falling within 7 years (Chambers and Mast 2005). Over 80 percent of ponderosa pine snags created by high-severity fire fell within 10 -years after a fire (Chambers personal communications 2008, Mast personal communications 2008). In addition, patches that burn with high-severity in today's stand-replacing fires can reach several hundred hectares in size. Hairy woodpeckers do not use interior portions of larger burned areas, restricting much of their foraging to the edge habitat. The uncharacteristically large fires of recent years are less valuable to hairy woodpeckers than the smaller overstory-removing fires that occurred historically (USDA FS 2010a).

In alternatives 2 and 3 live conifer trees with the potential to provide nesting habitat cavities such as dead-top trees and lightning struck trees would be favored for retention. Prescribed fires would be designed to maintain desired forest structure, tree densities, snag densities, and coarse woody debris levels. Using the goshawk guidelines to direct management activities should have a positive effect on the species, as these prescriptions would result in forest structure that more closely resembles historic forests than those present today, including large trees and an abundance of snags (USDA FS 2010a).

Northern Flicker

Alternative 1 could lead to a decreased species trend if high-severity wildfire is encountered in the pinyon-juniper vegetation type habitat across the project area.

Both action alternatives would include various levels of restoration implementation within pinyon-juniper. The alternatives could mechanically thin and burn 114,753 acres of pinyon-juniper. Most large trees would not be removed and pinyon-juniper woodlands would be managed for late-seral habitat, benefiting foraging and nesting habitat. However, mechanical treatment and burning could destroy nests if these activities occur during breeding season. Short-term noise and smoke disturbance is possible during thinning and broadcast burning operations, potentially leading to loss of egg viability or injury or death to nestlings. Not all treatments would occur during the breeding season. Unintentional take of eggs or nestlings would not result in a measurable negative effect to the Northern flicker population from both action alternatives. Alternatives 2 and 3 would improve the pinyon-juniper vegetation type habitat and would likely assist in keeping the Northern flicker population stable.

Townsend's Solitaire

Alternative 1 could lead to a decreased species trend if high-severity wildfire is encountered in the pinyon-juniper vegetation type habitat across the project area.

Both action alternatives would include various levels of restoration implementation within pinyon-juniper. The alternatives could mechanically thin and burn 114,753 acres of pinyon-juniper. Most large trees would not be removed and pinyon-juniper woodlands would be managed for late-seral habitat, benefiting foraging and nesting habitat. However, mechanical treatment and burning could destroy nests if these activities occur during breeding season. Short-term noise and smoke disturbance is possible during thinning and broadcast burning operations, potentially leading to loss of egg viability or injury or death to nestlings. Not all treatments would occur during the breeding season. Unintentional take of eggs or nestlings would not result in a measurable negative effect to the Townsend's solitaire population from both of the action alternatives. Alternatives 2 and 3 would improve the pinyon-juniper vegetation type habitat and would likely assist in keeping the Townsend's solitaire population stable.

Violet-green Swallow

Alternative 1 would lead to a decreased species trend if high-severity wildfire is encountered in the ponderosa pine/snags vegetation type habitat across the project area.

Alternative 1 would not result in an immediate change to the quantity or quality of habitat used by Violet-green swallows. Late-seral ponderosa pine would continue to be threatened by unnatural stand densities, creating risk for uncharacteristic, high-severity fire.

The proposed treatments in Alternatives 2 and 3 would protect nesting habitat. The proposed thinning and burning activities would also create canopy openings, allowing sunlight to reach more tree boles and increasing the prey base for swallows. Thinning and burning treatments are designed to return forest structure and composition to within the natural range of variation, which should benefit native wildlife species (Kalies et al. 2010). The vegetation design features for Alternatives 2 and 3 require that snags be managed to meet or move toward Land Management Plan requirements and to move toward desired conditions. Snags or hazard trees within a distance of twice their height from private land boundaries or along key roads may be felled. In all other areas, conifer snags greater than 12 inches in diameter would be maintained, with an emphasis on snags greater than 18 inches in diameter, except in cases of human health and safety. Live conifer trees with the potential to provide nesting habitat cavities, such as dead-top trees and lightning struck trees, would be favored for retention. Prescribed burns are designed to maintain desired forest structure, tree densities, snag densities, and coarse woody debris levels.

Western Bluebird

Alternative 1 would lead to a decreased species trend if high-severity wildfire is encountered in the ponderosa pine open vegetation type habitat across the project area.

Alternative 1 would not result in an immediate change to the quantity or quality of habitat used by Western bluebirds. Late-seral ponderosa pine would continue to be threatened by unnatural stand densities, creating risk for uncharacteristic, high-severity fire.

The proposed treatments in Alternatives 2 and 3 would protect nesting habitat. The proposed thinning and burning activities would also create canopy openings, allowing sunlight to reach more tree boles and increasing the prey base for bluebirds. Thinning and burning treatments are designed to return forest structure and composition to within the natural range of variation, which should benefit native wildlife species (Kalies et al. 2010). The vegetation design features

for Alternatives 2 and 3 require that snags be managed to meet or move toward Land Management Plan requirements and to move toward desired conditions. Snags or hazard trees within a distance of twice their height from private land boundaries or along key roads may be felled. In all other areas, conifer snags greater than 12 inches in diameter would be maintained, with an emphasis on snags greater than 18 inches in diameter, except in cases of human health and safety. Live conifer trees with the potential to provide nesting habitat cavities, such as dead-top trees and lightning struck trees, would be favored for retention. Prescribed burns are designed to maintain desired forest structure, tree densities, snag densities, and coarse woody debris levels.

Western Wood Peewee

Alternative 1 would lead to a decreased species trend if effects from high-severity wildfire is encountered by forested areas adjacent to riparian vegetation type habitats across the project area.

Alternatives 2 and 3 propose 14,560 acres of riparian restoration. Improvement of stream function is proposed for 777 miles across the project area in both action alternatives. Restoration of approximately 900,000 acres of forested habitat could occur with Alternative 2 and approximately 474,000 acres in Alternative 3.

Western wood peewees could be disturbed by restoration activities. It is possible that disturbance from thinning implementation and short-term noise and smoke disturbance could occur during thinning and broadcast burning operations, potentially leading to loss of egg viability or injury or death to nestlings. The removal of any eggs or fledglings would not result in a measurable negative effect to the Western wood peewee population from any of the two action alternatives as the implementation of these acres would occur intermittently over space and time over the next 10 years. Long-term effects to the peewee population would be positive as a result of habitat restoration. Alternatives 2 and 3 would improve areas adjacent to riparian vegetation habitats and would likely assist in keeping the population stable.

Cumulative Effects Management Indicator Species

Some MIS are much more mobile than others. Therefore it is important to recognize habitat outside the project area as the affected environment for some animals. The cumulative effects analysis area varies by species. The analysis includes the combined effects from all activities within the area as evaluated for each alternative. For example, the Abert's squirrel typically does not travel far; they stay in ponderosa pine forest year-round instead of migrating to lower elevations for the winter. Therefore, its cumulative effects analysis area is the ponderosa pine habitat type within the project area. On the other hand, elk use much larger areas to mate, calve, graze, and overwinter, so the cumulative effects analysis area for elk includes habitat outside the project area.

The effects from projects that have already been implemented were used to help describe current conditions in the project area and will not be discussed in this section. Cumulative effects can be an integral part of the effects analysis for wildlife and are discussed for each species. The cumulative effects discussed have occurred since 2001 and are considered changes in existing condition. The timeframe considered is approximately 10 years in the future, at which time the majority of the actions proposed will have been completed and the vegetation response to these actions will have occurred.

Table 85. Cumulative effects analysis area by MIS species

Cumulative Effects Analysis Area	Species	Reason for Selection
Within project area	Pygmy nuthatch, turkey, Abert's squirrel, hairy woodpecker, red-naped sapsucker, juniper titmouse, Grace's warbler, western bluebird	Abert's squirrel use is focused on the area around their nest trees. Birds may move to other areas, but their nesting habitat is the most limiting factor for these species.
Project area plus 0.25-mile buffer around project area	Goshawk	The 0.25-mile buffer takes into account potential disturbances from activities within the project area.
Game management unit	Elk, mule deer, pronghorn	These species have wider mobility; GMUs are designed to encompass herd movements.

Alternative 1

The cumulative effects from the treatments occurring in current and within the reasonably foreseeable future are listed in the cumulative effects for all alternatives. These projects would improve the habitats of MIS species in the long term. Movement corridors and savanna treatments incorporated into ponderosa pine on the National Forests would benefit pronghorn and elk by creating forage and movement corridors. Other projects' restoration treatments would have limited effects on MIS species in the short term, but should improve habitat in the long term.

Fuelwood gathering would affect MIS species by removing snags and logs needed for nesting or prey species. The proposed activities could benefit elk, pronghorn, goshawk, squirrel, and song bird species locally by creating openings to support browse and improve landscape permeability.

Recreation would cause localized decreases in MIS habitat quality due to the loss of understory vegetation (trampling, removal) associated with camping; disturbance from motorized use and hikers. This would cause disturbance and displacement of MIS spatially and temporally, although many species have likely acclimated to areas with regular use. Species selected for riparian habitat such as the Common Black hawk and Arizona Gray Squirrel would continue to experience disturbance from recreation.

Right-of-way maintenance would benefit species that use open habitat like pronghorn, elk, and turkey by keeping liner strips of grassland open across the forest. These areas could also support prey species for goshawks. Right-of-way maintenance can also remove snags, logs, shrubs, and large trees, negatively affecting species tied to these habitat features such as the pygmy nuthatch, hairy woodpecker, western bluebird, northern flicker, and mule deer.

Development on private lands, particularly in the grassland and savanna habitats, would reduce habitat quantity and quality and affect movement corridors for pronghorn and elk.

Alternatives 2 and 3

The planned thinning and burning of ponderosa pine and mixed conifer habitat would help reduce small tree densities and help move habitat toward historical stand structures. These treatments would have the same benefits discussed in Alternative 1, but when added to the additional treatments in the alternatives, would provide for improvement across the landscape.

These treatments would affect the MSO, Northern goshawk, Pygmy nuthatch, Rocky Mountain elk, Merriam's turkey, Abert's squirrel, Violet-green swallow, Hairy woodpecker, Western bluebird, and Western wood peewee by improving their habitats in the long term. These species' forestwide habitat trends would be improved by thinning projects that retain and enhance the large tree component within the ponderosa pine forest and that help create and retain large snags.

The 36,340 acres of grassland restoration, 17,600 acres of ponderosa pine savanna treatments, and 6,760 acres of meadow treatments would benefit pronghorn and elk by creating forage and corridors for movement between areas.

Treatment is possible on up to 115,000 acres of pinyon-juniper habitat. Design features will preserve older trees in this habitat type so effects from treatments to these MIS populations (Ash-throated flycatcher, Gray vireo, Juniper titmouse, Northern flicker and Townsend's solitaire) are expected to be minimal.

Fuelwood gathering and travel management requirements together help determine where the public can legally collect fuelwood. Since off road travel is only allowed in fuelwood areas, this would limit how far the public can travel to collect fuelwood. This would likely leave more dead and down woody material in areas farther from roads. There would likely be less dead woody material available within fuelwood areas closer to roads. This could prevent achieving Land Management Plan requirements for snags, logs, and dead and down woody material near some roads. This would also limit how much fuelwood is removed away from roads and increase fuelwood removal along roads. Proposed treatments should help limit the amount of area not meeting forest requirements. This would affect the Northern goshawk, Pygmy nuthatch, Hairy woodpecker, Violet-green swallow, Northern flicker, and Juniper titmouse by removing snags that are needed for nesting or prey species.

The effects on MIS from ongoing and foreseeable activities, along with the proposed activities in Alternatives 2 and 3, are as follows: For all of the MIS species, the cumulative effects from these projects **would not adversely change the predicted forestwide habitat and population trends.**

Migratory Birds and Important Bird Areas

In the Mogollon Rim Snowmelt Draw Important Bird Area, the Rim Country Project would affect approximately 45,673 acres of ponderosa pine, aspen, pinyon-juniper, grasslands and savannas, ephemeral streams, and spring habitats. Mexican spotted owl protected, recovery, and critical habitats occur in the Important Bird Area. All design features associated with these habitat types would be followed as discussed in previous sections of this report.

Effects of the Proposed Activities on Migratory Birds

Currently, many migratory birds depend on habitats or habitat elements related to canopy openings, snags, and early seral conditions. Existing closed canopy forests limit or eliminate many of the necessary habitat components needed by these species, such as understory development sufficient to support abundant seeds, arthropods, and cover. The desired condition of closed canopy tree groups interspersed with open rooting space that supports herbaceous vegetation would provide key habitat components for these species of status as well as species adapted to closed-canopy forests. The ability to grow and maintain large trees would provide consistent development of future snags.

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Table 86. Long-term effects on migratory bird habitats from Alternatives 2 and 3

Species	Habitat Links	Long-Term Effect to Habitat
Northern Goshawk	Late-seral PIPO ¹ /Prey Habitat	Improved
Flammulated Owl	PIPO/openings/insects/snags	Improved
Cordilleran Flycatcher	PIPO/insects/ oak/dense forest	Mixed
Grace's Warbler	PIPO/openings/insects/	Improved
Olive Warbler	PIPO/openings/insects/	Improved
Lewis's Woodpecker	PIPO/openings/insects/snags	Improved
Purple Martin	PIPO/openings/insects/snags	Improved
Cassin's Finch	PIPO/openings/seeds	Improved
Common Nighthawk	PIPO/openings/insects/	Improved
Mexican Whip-poor-will	PIPO/openings/insects/	Improved
Olive-sided Flycatcher	MC/openings/insects/snags	Improved
Evening Grosbeak	MC/openings/seeds	Improved
Red-faced Warbler	MC/oak/willow/insects/	Improved
Band-tailed Pigeons	MC/oak/willow/seeds/	Improved
Red-naped sapsucker	Aspen	Improved
Black-chinned Sparrow	Interior Chaparral	Mixed
Gray Vireo	Pinyon-juniper	Improved
Pinyon Jay	Pinyon-juniper	Improved
Juniper titmouse	Pinyon-juniper	Mixed
Black-throated Gray Warbler	Pinyon-juniper	Improved
Gray Flycatcher	Pinyon-juniper	Improved
Swainson's Hawk	Open/Grassland	Improved
Ferruginous Hawk	Open/Grassland	Improved
Burrowing Owl (western)	Open/Grassland	Improved
Grasshopper Sparrow	Open/Grassland	Improved
Bendire's Thrasher	Open/Grassland	Improved
Chestnut-collared Longspur	Semidesert Grassland	Improved
Lark Bunting	Semidesert Grassland, Desert Communities	Improved
Common Black-Hawk	Cottonwood/willow/riparian forest.	Improved
Bell's Vireo	Cottonwood Willow Riparian Forest	Improved
Elf Owl	Cottonwood Willow Riparian Forest	Improved
Lucy's Warbler	Cottonwood Willow Riparian Forest	Improved
Yellow Warbler	Cottonwood Willow Riparian Forest; Mixed Deciduous Riparian Forest	Improved
Lincoln's Sparrow	Montane Willow Riparian Forest (breeding)	Improved
MacGillivray's Warbler	Montane Willow Riparian Forest, Aspen and Maple, Mixed Conifer	Improved
Brewer's Blackbird	Wetlands, Montane/Subalpine Grasslands, Montane Willow Riparian Forest	Improved
Wood Duck	Cottonwood Willow Riparian Forest	Improved
Phainopepla	Desert Communities	None
Savannah Sparrow	Open habitats project-wide	Improved

Important Bird Areas

Most of the major vegetation cover types within the Mogollon Rim Snowmelt Draw IBA would be affected by Alternatives 2 and 3. The habitat of this IBA includes Ponderosa pine, white fir, Douglas fir, southwestern white pine, quaking aspen, and Gambel oak. Young plants of these canopy trees, plus canyon maple and New Mexico locust dominate the understory woody species. While most of the acres treated are within ponderosa pine and dry mixed conifer habitats, treatments would also occur in savannah, meadows, aspen, and pinyon juniper habitats. In addition, 53 miles of road decommissioning, restoration of six springs, and 7.5 miles of ephemeral stream channel restoration activities are proposed within the IBA in Alternatives 2 and 3. Design features (Appendix 5) are included in the project to reduce effects on bird species.

Overall, treatment objectives are to help restore forests to their natural range of variation.

Project activities including road decommissioning and spring and stream channel restoration, would help restore the area to more natural conditions. This should improve habitat conditions for all bird species that use the project area. There could be some limited effects on the species due to activities that might occur during the breeding season. It is expected that the habitats for which the Important Bird Area was established would benefit from the proposed treatments.

Cumulative Effects on Migratory Birds

Because of their seasonal movement, the primary management concern for migratory birds is nesting habitat and, for bald eagles, winter roost sites and known nest sites. The cumulative effects analysis area for migratory birds is the project area. The effects from projects that have already been implemented were used to help describe current conditions of the project area and will not be discussed in this section. Ongoing and reasonably foreseeable activities are listed in the cumulative effects for all alternatives section. Cumulative effects discussed here include those that have occurred since 2001 and the effects of the Rim Country alternatives. The timeframe considered is approximately 20 years in the future, at which time the majority of the activities proposed will have been completed and the vegetation response to these actions will have occurred. For further analysis on cumulative effects to migratory birds see the wildlife specialist report.

Alternative 1

Resulting forest structure from planned thinning and burning of 195,405 acres of ponderosa pine habitat outside of the Rim Country boundary would result in habitat within the NRV. In the long term, wildlife species are less likely to be adversely affected by treatments that result in habitat conditions consistent with those of their evolutionary past and so are expected to respond positively to the ongoing and proposed thinning projects (Kalies et al. 2010). These treatments would improve habitat for most birds species associated with the ponderosa pine cover type in the long term (e.g., bark gleaners, woodpeckers, and flycatchers), but may negatively affect foliage gleaners in the short term (Patton and Gordon 1995, George and Laudenslayer 2005).

For further information about the cumulative effects to migratory birds from alternative 1 see the wildlife specialist report. The cumulative effects on the migratory birds could result in some incidental mortality caused by implementation activities. How much mortality would be proportional to how many acres are treated during the spring nesting season of April, May, June, and July. Seasonal restrictions would limit project implementation activities between March 1

and September 30 in goshawk PFAs and MSO PACs, which would reduce the potential for loss for birds in ponderosa pine habitat. Prescribed fire could also occur in the fall, outside of the spring nesting season. Since only a small percentage of habitats would be treated at any one time, the loss of eggs or nestlings would not result in a measurable negative effect on the migratory birds populations listed above.

Alternatives 2 and 3

Resulting forest structure from planned thinning and burning of 195,405 acres of ponderosa pine habitat outside of the Rim Country boundary would be habitat within the natural range of variation. In the long term, wildlife species are less likely to be adversely affected by treatments that result in habitat conditions consistent with those of their evolutionary past and so are expected to respond positively to the ongoing and proposed thinning projects (Kalies et al. 2010). These treatments would improve habitat for most birds species associated with the ponderosa pine cover type in the long term (e.g., bark gleaners, woodpeckers, and flycatchers), but may negatively affect foliage gleaners in the short term (Patton and Gordon 1995, George and Laudenslayer 2005). For further information about the cumulative effects to migratory birds from alternatives 2 and 3 see the wildlife specialist report.

The proposed project would treat between 42,486 to 43,863 acres of habitat within the Important Bird Area. This would cumulatively improve habitat condition within a broader area of the Important Bird Area.

The cumulative effects on migratory birds could result in some incidental mortality caused by project implementation activities. How much mortality would be proportional to how many acres are treated during the spring nesting season of April, May, June, and July. Seasonal restrictions would limit project implementation activities between March 1 and September 30 in goshawk nest areas and post-fledging family areas and within Mexican spotted owl protected activity centers, which would reduce the potential for loss of species in ponderosa pine habitat. Prescribed fire could also occur in the fall, outside of the spring nesting season. Since only a small percentage of habitats would be treated at any one time, the loss of eggs or nestlings would not result in a measurable negative effect on the migratory birds populations listed above.

Locally Important Species

Two locally important species that occur in the project area were identified by FS and USFW biologists. The Arizona toad and the Arizona Black Rattlesnake.

The project could affect individual animals. Snakes or toads could be hit by vehicles associated with project implementation. Activities related to implementation could disturb individuals or interfere with hunting or foraging. However, overall there would not be a measurable negative effect on these two species populations. Long-term habitat improvements would include improved habitat and a decrease in potential disturbance from road decommissioning.

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