



United States Department of the Interior

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In reply refer to:

AESO/SE
22410-2005-F-0651-R001

September 5, 2019

Mr. Kerwin Dewberry, Forest Supervisor
Coronado National Forest
300 West Congress Street
Tucson, Arizona 85701

RE: Pinaleño Ecosystem Restoration Project

Dear Mr. Dewberry:

Thank you for your request for formal consultation with the U.S. Fish and Wildlife Service (FWS or USFWS) pursuant to section 7 of the Endangered Species Act of 1973 (16 U.S.C. § 1531-1544), as amended (Act). We received your May 24, 2019, request for consultation the same day via electronic mail. At issue are effects that may result from the revised proposed Pinaleño Ecosystem Restoration Project (PERP) located in Townships 8 and 9 South, Ranges 23 and 24 East on the Safford Ranger District of the Coronado National Forest in Graham County, Arizona. The proposed action may affect the endangered Mount Graham red squirrel (*Tamiasciurus hudsonicus grahamensis*; also MGRS, red squirrel), and the threatened Mexican spotted owl (*Strix occidentalis lucida*; also MSO, owl, spotted owl) and its critical habitat.

In your letter, you requested our concurrence that the proposed action “may affect, but is not likely to adversely affect” Mount Graham red squirrel designated critical habitat and the threatened Gila trout (*Oncorhynchus gilae*). We concur with your determinations and include our rationales in Appendix A.

You also determined that the action would have “no effect” on the endangered jaguar (*Panthera onca*), endangered Mexican gray wolf (*Canis lupus baileyi*), threatened Western yellow-billed cuckoo (*Coccyzus americanus occidentalis*), and threatened northern Mexican gartersnake (*Thamnophis eques megalops*). “No effect” determinations do not require our review; therefore, we will not address these species further.

We based this biological opinion on information provided in the May biological assessment (BA), 2019 Supplemental Information Report for the Pinaleño Ecosystem Restoration Project,

telephone conversations, field investigations, and other sources of information. Literature cited in this biological opinion (BO) is not a complete bibliography of all literature available on the species of concern, forest management and its effects, or on other subjects considered in this opinion. A complete record of this consultation is on file at this office.

Consultation History

- May 24, 2019: The Forest Service initiated formal consultation.
- June 7, 2019: We issued a 30-day letter.
- August 16, 2019: We sent the draft BO to the Forest Service.
- August 24, 2019: We received and addressed your comments on the draft BO.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The Pinaleno Ecosystem Restoration Project (PERP) lies within the Pinaleno Mountains, a mountain range in southeastern Arizona of over 300 square miles. The Forest Service signed the National Environmental Policy Act (NEPA) Record of Decision (ROD) for PERP on October 31, 2011, which authorized vegetation treatments on approximately 5,754 acres. On a landscape scale, the project goal is to reduce the risk of and increase the resistance to wide-scale disturbance events from wildfire, insects, and disease. In addition, the Forest Service (or FS) and FWS designed the project to protect and improve the long-term sustainability of the habitat for the endangered Mount Graham red squirrel (or MGRS, red squirrel).

In 2017, the Frye Fire burned through a substantial portion of the project area. When the fire occurred, the Forest Service had completed approximately 277 acres of treatment, and 213 acres were in the process of being completed or still required fuels treatments. The Frye Fire burned at multiple fire severities through the project area. In some areas of high severity, post-fire conditions rendered proposed forest management treatments unnecessary or outside of the scope and range of effects analyzed previously from the PERP ROD. In total, the Forest Service will not treat the remaining 4,106 acres authorized under the PERP ROD. Instead, post-Frye Fire, the Forest Service now proposes to treat 1,648 acres, an approximately 70 percent decrease in treatment area (Figure 1). The Forest Service intends to complete these treatments within five years. See Table 1 for a treatment breakdown by unit.

All actions include resource-specific design criteria that guide the way the Forest Service will implement actions to minimize or reduce anticipated effects. The design criteria have not changed from the Final Environmental Impact Statement (FEIS) except where the Forest Service noted changes in the 2019 Supplemental Information Report (SIR). We provide a list of the updated Conservation Measures below.

Changes to the PERP ROD Proposed Action from the 2019 SIR are as follows:

- Utilize roughly 19 miles of roads under the modified proposed action, of which two miles are new temporary roads and three miles are currently closed roads. This is a reduction of what the Forest Service proposed within the FEIS/ROD, where they proposed roughly 33 miles of roads for use, of which 4.5 miles were new temporary roads. In some cases, existing roads might need to be maintained or widened. The typical width of a Forest Service Road is 12-14 feet. Road width and conditions would need to allow safe equipment access.
- Modify the FEIS “minimum 150 ft² per acre basal area stand stocking level for General Restoration Areas and a minimum 170 ft² per acre basal area stand stocking level for Important Wildlife Areas” to a basal area range of 130-170 ft² per acre for both areas to maintain an average 150 ft² target across all stands. This allows the residual basal area to consist of more large trees rather than thick stands of small trees.
- Conduct hand cut, pile, and burn treatments in lieu of all mastication. For all units

previously identified as “lop and scatter; under-burn or masticate,” revised treatments replace under-burn or masticate with hand cut, pile, and burn treatments.

- Remove the broadcast burn treatment from all units due to issues associated with size and layout of units and due to the effects of the Frye Fire.
- Include a project design feature to avoid all areas mapped at high/moderate soil burn severity within the project treatment footprint. However, in consideration of GIS mapping limitations, some areas mapped at high or moderate burn severity (particularly on the edges of polygons) may have burned at lower burn severities. Therefore, following field evaluation of site conditions, they may allow access to these edge areas if post-fire recovery has progressed at a rate indicative of a low or very low soil burn severity. On these sites, vegetation should be typical of early successional growth that we observe in low or very low burn severity areas of similar sites. There should also be no evidence of erosion coming off these planned access areas. Operators will keep disturbance to the minimum required to complete project objectives.
- Include a project design feature that erosion coming onto project areas from uphill areas that burned more severely must be addressed/controlled through straw wattles, water bars, mulch, erosion control structures, or other methods prior to access to reduce the potential for amplifying erosion problems downslope through site disturbance. Erosion control materials shall be certified weed free and biodegradable.
- Include a project design feature that if currently closed roads cross through areas evaluated on-site to be high/moderate severity areas, operations will only use the roads if they have remained in a compacted and un-remediated state since closure.
- Include a project design feature to plan project operations to minimize temporary roads, skid trails, and other ground disturbance to minimize effects to soil, water, and riparian resources.
- Modify project design feature M15 to state: “Operate equipment when soil compaction, displacement, erosion, and sediment runoff would be minimized. Avoid ground equipment operations on unstable or wet soils, and on steep slopes (over 40%).”
- Modify the project design feature to include 200-ft buffers around all known MGRS nest trees and middens.
- Conduct project implementation within Protected Activity Centers (PACs), but outside of nest/roost core areas, during the owl breeding season (March 1-August 31).
- The Forest Service analyzed the original project under the their old Land and Resource Management Plan, which incorporated language from the 1995 Recovery Plan for the Mexican spotted owl. The modified proposed action incorporates recommendations and information from the 2012 Mexican spotted owl Recovery Plan, First Revision (USFWS 2012).

Silvicultural Treatments

Forest Restoration Area - General Prescription

This treatment is a combination of variable density thinning, thinning from below, and group selection. Within the confines of an 18-inch maximum-cut diameter-at-breast-height (DBH) limit and an average 150 ft² per acre basal area stand-stocking level target, the thinning treatments aim to create forest stands that are diverse in structure and tree stocking levels. Large trees would be favored for retention, but prescriptions will aim to maintain a diversity of age classes. See Figure 1 for locations of prescription treatments.

- Using a group selection method, foresters subdivided stands into five size/age classes (not counting the grass-forb/seedling stage). The Forest Service based the size/age classes upon the vegetative structural stage (VSS) size class breaks.
- Treatments may remove trees up to 18 inches DBH to reduce fuel loading to an acceptable level, but large trees would be favored for retention.
- Post-treatment, the average stand stocking will be 130-170-ft² basal area with an average of 150 ft².
- The thinning would be variable density, in which the operator will thin some groups within the stand to a wide spacing, and some groups to a close spacing, and some groups they would not thin at all. In general, the widely spaced group density would range from 25-45% of the maximum stand density index (SDI) for Douglas fir (*Pseudotsuga menziesii*). The closed canopy groups would average greater than 45% maximum SDI for Douglas fir.
- Heavily thinned groups would be located around aspen (*Populus tremuloides*) clones, ponderosa pine (*Pinus ponderosa* var. *brachyptera*), and relics of ponderosa pine patches, or old growth Douglas-fir patches. This would enhance the growth and vigor of, or regenerate these components, as well as reduce bark beetle risk to the conifers.
- The ratio of closed canopy to open canopy groups would be 2 to 1.

Forest Restoration Areas - Modified Treatments

Prescription 1. Reduce dead trees less than 18 inches DBH in snag pockets (0.25 to 1.25-acre group size) to six snags/acre, with general prescription thinning in the remainder of the unit. In these treatments, dead trees less than 18 inches DBH would be removed from groups of large numbers of dead trees (snag pockets) 0.25 to 1.25 acres in size. The Forest Service will maintain a minimum of six of the largest and soundest snags available within the groups. Tree species that tend to have snag longevity (such as Douglas fir) would be favored for retention over those tree species that do not (such as aspen). Outside of the snag pockets, operators will remove dead trees up to nine inches DBH. They will thin live trees less than 18 inches DBH as described above for the “Forest Restoration Treatment Area-General Prescription” treatment. Following tree cutting, operators will reduce down woody material to less than 15 tons per acre throughout the area.

Important Wildlife Treatment Area - General Prescription

This treatment would be a combination of variable density thinning, thinning from below, and group selection. Within the confines of a 9-inch maximum diameter cut limit and an average 150-ft² basal area stand stocking level target, the thinning treatments would create forest stands that are diverse in structure and stocking level, but not as much so as those created by the “Forest Restoration” treatments. See Figure 1 for locations of these treatment areas. Specific guidelines for the treatment would be:

- Using a group-selection method, the forester would subdivide stands into five size/age classes. They would base the size/age classes upon the VSS size class breaks. Individual groups would range in size from 0.25 to 1.25 acre.
- Treatments would remove trees up to nine inches DBH, leaving six snags per acre.
- Treatments would reduce average stand stocking to about 130-170-ft² basal area with an average of 150 ft².
- The thinning would be variable density, in which the operator will thin some groups within the stand to a wide spacing, and some groups to a close spacing, and some groups they would not thin at all. In general, the widely spaced group density would range from 25-45% of the maximum SDI for Douglas fir. The closed canopy groups would average greater than 45% maximum SDI for Douglas fir.
- Heavily thinned groups (130-ft² basal area) would be located around aspen clones, ponderosa pine patches, relics of ponderosa pine patches, and old-growth Douglas-fir patches. This would enhance the growth and vigor of, or regenerate these components, as well as reduce bark beetle risk to the conifers. In other areas, large trees would be favored to remain and continue to grow larger (170-ft² basal area).
- The ratio of closed canopy to open canopy groups would be 2 to 1.

Important Wildlife Treatment Area - Modified Treatments

Prescription 7. Reduce dead trees in snag pockets (0.25 to 1.25-acre group size) up to 18 inches DBH to six snags/acre. Thin live trees less than nine inches DBH. These treatments would remove dead trees less than 18 inches DBH from groups of large numbers of dead trees (snag pockets) of 0.25 to 1.25 acres in size. Treatments would retain a minimum of six of the largest and soundest snags available per acre within the groups. Species that tend to have long snag longevity (such as Douglas fir) would be favored for retention over those tree species that do not (such as aspen). Outside of the snag pockets, operators would remove dead trees up to nine inches DBH and would thin live trees less than nine inches DBH (as described above for the “Important Wildlife Treatment Area-General Prescription”). Following tree cutting, operators would reduce down woody material to less than 15 tons per acre throughout the area.

Fuels Reduction Treatments

In addition to the proposed silvicultural treatments, the Forest Service proposes complementary fuels reduction treatments to meet project objectives. In some units, the fuel treatments would occur concurrently with the proposed silvicultural treatments, and in other treatment units, fuel treatments are the only proposed treatments.

Hand Cut, Pile, and Burn

Operators would pile woody debris created by tree removal. The Forest Service will burn these piles during the cool season under conditions when risk of fire spread is low, and smoke will disperse adequately. Where this treatment does not follow a silvicultural treatment involving thinning of live trees, operators may hand cut snags less than nine inches DBH and existing downed material, and prune tree limbs (occasionally). Piles will be up to 6 feet high and 8 feet in diameter. Operators will place hand piles away from downed logs greater than 16 inches DBH, and to prevent tree scorch, they will place the piles as far from the canopy drip line of trees as possible. Along roads, they will cut, pile and burn fuels up to 150 feet from the road edge.

Removal Methods

Operators will remove trees and take them to collection points (landings) by a variety of methods and combinations of those methods. The removal method proposed for a treatment unit depends upon several factors, including topography, availability of road access, cost, and resource protection needs. Once they take material to the landings, they will process it into saw logs, firewood, or chips, and it will be trucked from the project area; or it will be made available to the public on site. Operators may also pile some material at the landing site to be burned by the Forest Service.

Potential Removal Methods

- Whole-tree yarding: Operators will transport thinned trees from the stump to the landing. They may carry trees or drag them on the ground to the processing site (landing).
- Hand Cut: Operators would cut trees using chain saws. They would remove the trees from the site, pile and burn material.
- Remove by Ground-based Equipment with Cable: Operators would use ground-based machines (skidder or tractor) equipped with a grapple or cable (chokers and winch) to pull thinned trees to landings. Ground contact by dragged material would occur.
- Remove by Ground-based Equipment and Cable (second option): Operators would use a combination of a ground-based machine equipped with a grapple or cable (chokers and winch) for short distances and a small cable yarder or jammer (operating from existing roads or trails) for skidding trees to the landings. No lateral skidding or material suspension would be required.
- Remove by Skyline: Operators would use a skyline cable system to transport thinned trees to landings. The stump end of would be suspended, but in most cases the trees would not be fully suspended, and ground contact would occur.
- Remove by Ground-based Equipment: Operators would use a ground-based machine, such as a skidder or forwarder, to transport thinned trees from the site to landings.

- Machine Cut: Operators would cut and remove trees using a ground-based machine, such as a track-mounted feller-buncher.

Conservation Measures

The Forest Service included the following wildlife conservation measures from the original BO in this revised proposed action or they are the result of discussions during re-consultation meetings and are new to the project. The Forest Service removed some wildlife conservation measures from the proposed action, due to site condition changes post-Frye Fire or due to changes in the proposed action, which preclude them. All other project design features for other resources (e.g., watershed, recreation, etc.) that were included in the PERP ROD the Forest Service will still be implemented, as applicable.

Project-wide Measures

- The Forest Service will conduct surveys for MGRS in all units pre-implementation. The Forest Service will buffer any known or discovered middens/nests by 200 feet in which no tree removal or project implementation activities may occur. Any activities within those buffers must be further coordinated and discussed on a case-by-case basis with FWS. FWS will then provide an email granting permission to proceed and will include any other considerations.
- The Forest Service will retain all hardwoods of all sizes (primarily aspen), unless removal is necessary for use as staging/landing sites or for equipment passage. Larger, cavity-containing aspen are particularly important as MGRS nesting locations in mixed-conifer forest.
- The Forest Service will conduct pre- and post-implementation MSO surveys. Post-implementation surveys will occur for three years. The Forest Service will buffer existing and newly found MSO nest trees by 200 feet so as not to change the habitat around known nest trees. Treatment within MSO core areas will be limited to the removal nine inch DBH or smaller trees outside of the MSO-breeding season (March 1 through August 31). Treatment of stands, preparing stands for treatment (e.g., marking trees), and protocol survey activities may occur within MSO core areas during the breeding season. However, no treatments shall occur in cores during the breeding season. Pile burning can occur in core areas outside the breeding season. These activities will be coordinated with the District Biologist and the FWS to reduce disturbance as much as possible to MSOs.
- The Forest Service will work with the FWS to designate new and/or redraw existing PACs during the fall/winter 2019/2020.
- The Forest Service will inform implementation crews of the presence of MGRS and MSO, instruct them how to identify a MGRS midden and MSO, and provide crews contact information for district staff. If crews find a non-buffered MGRS midden during implementation, work will halt until the midden can be marked and buffered and the District Biologist will contact FWS. If crews locate an MSO during the breeding season and outside the core area, they will halt all work. The FS will contact the FWS and we will discuss what needs to be done (e.g., additional survey to determine status, modification of the nest/roost core, etc.). Treatment will not occur in the adjusted nest/roost core during the breeding season, but may continue in the remaining PAC.

Crews will treat the core area outside the owl-breeding season and the Forest Service will place a 200-ft. buffer around the newly located nest/roost site.

- After treatment (allowing for snag and log retention based on the site prescription), crews will remove or treat slash within one year. If pile and burn is part of the prescription, crews will complete this during the cool season when appropriate weather and fuel conditions occur to successfully burn the pile while meeting resource objectives. Pile burning will not occur in within 200 feet of known MGRS middens or nests or within MSO cores during the breeding season.
- Treatments will allow regeneration of all tree species by leaving enough trees smaller than the diameter cut limit to allow for a diversity of species and age-classes in the future.
- In areas where operators create skid trails, they (or the Forest Service) will rehabilitate all roads through re-contouring, reseeding, dragging brush across the trail, and blocking further entry for public use. They may place downed trees perpendicular to and across the skid trails to allow for MGRS travel ways.
- Operators or the Forest Service will rehabilitate landing piles and landing zones left after removal operations.

Measures specific to Forest Restoration Areas

- Retain a minimum of six of the largest logs per acre.
- Retain six of the largest snags per acre.

Measures specific to Important Wildlife Areas

- Retain six logs greater than 16 inches DBH per acre. If there are not at least six logs per acre greater than 16 inches at large end, then leave six of the largest logs per acre.
- Retain snags (and all live trees) greater than nine inches DBH.

Action Area

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

The modified proposed action will treat approximately 1,648 acres of mixed conifer and spruce-fir in the upper elevations of the Pinaleño Mountains. These areas mainly consist of Douglas-fir, southwestern white pine (*Pinus strobiformis*), ponderosa pine, corkbark fir (*Abies lasiocarpa* var. *arizonica*), white fir (*Abies concolor*), quaking aspen, and Engelmann spruce (*Picea engelmannii*). We define the project area as the proposed treatment units and associated transportation routes. We define the action area as a larger area within 0.5 mile of the project area in which the short-term effects of implementation such noise disturbance, smoke, or downstream effects may occur. Although noise has the potential to affect several wildlife species within the action area, the noise levels at which different wildlife species are affected is largely unknown. However, researchers have conducted several studies to study the effects of noise on Mexican spotted owls, and the Forest Service used a reasonable threshold distance for minimizing noise effects to this species as a surrogate for all wildlife species assessed in this document, including MGRS. The

FWS guidance is to limit potentially disturbing activities in areas <0.25 mile from MSO PACs during the breeding season (Delaney et al. 1999).

STATUS OF THE SPECIES AND CRITICAL HABITAT—MOUNT GRAHAM RED SQUIRREL

The information in this section summarizes the rangewide status of each species that we considered in this BO. Further information on the status of these species can be found in the administrative record for this project, documents on our web page ([Arizona Ecological Services Office Documents by Species](#)), and in other references cited in each summary below.

The Mount Graham red squirrel (hereafter Mount Graham red squirrel, red squirrel, and MGRS) was listed as endangered in 1987 (52 FR 20994; USFWS 1987). In 1990, the USFWS designated critical habitat for the MGRS (55 FR 425; USFWS 1990). The FWS finalized the first MGRS Recovery Plan in 1993 (USFWS 1993); it is currently undergoing revision (USFWS 2011).

A detailed account of the taxonomy, biology, and reproductive characteristics of the Mount Graham red squirrel is found in the Final Rule listing the red squirrel as an endangered species (52 FR 20994), the original Recovery Plan (USFWS 1993), and in the draft Recovery Plan, First Revision (USFWS 2011). We include the information provided in those documents by reference.

MGRS are found only in the high-elevation forests of the Pinaleño Mountains (Hoffmeister 1986; Figure 1) in the Safford Ranger District of the Coronado National Forest in southeastern Arizona. As recently as the 1960s, the species ranged possibly as far east as Turkey Flat and as far west as West Peak, but it is now only located as far west as Clark Peak. A local extirpation occurred on West Peak, possibly due to a fire in the mid-1970s that both isolated the West Peak subpopulation from the rest of the range and destroyed red squirrel habitat. Suitable habitat on West Peak is thought to currently exist (Hatten 2009), but no systematic surveys have been conducted there.

MGRS are highly territorial (C.C. Smith 1968) and create middens within their territory, which are areas that consist of piles of cone scales in which squirrels cache live, unopened cones as a food source for over-wintering and during times of cone failure (M.C. Smith 1968, Finley 1969, Steele and Koprowski 2001). Placement of these middens tends to be on gentler, non-southerly-facing slopes in healthier, older forested areas with higher canopy closure, basal area, and number of large live trees (Finley 1969, Zugmeyer and Koprowski 2009, Hatten 2014). This type of placement allows specific moisture levels to be maintained within the midden, thereby creating prime storage conditions for cones and other food items, such as mushrooms, acorns, and bones (Finley 1969, Brown 1984, Froehlich 1990, USFWS 1993, Rushton et al. 2006, Zugmeyer and Koprowski 2009). They also seem to prefer areas with snags, piles and tangles of downed timber, and a higher volume of logs that provide cover and safe travel routes, especially in winter, when open travel across snow exposes them to increased predation. There appears to be no differentiation in selection of midden sites based on sex (Alanen et al. 2009). Wood et al. (2007) determined that midden site selection occurs not only at the microclimate

level (where conditions are appropriate for cone storage), but also on a larger scale that encompasses other features found on the landscape, usually in areas with a high number of healthy trees and correspondingly high seedfall. Home-range sizes for MGRS range from 5.9 to 24.5 acres, which are 3 to 10 times greater than reported for other populations of red squirrels (Koprowski et al. 2008).

Within their territory, MGRS build nests in hollow trees, hollow snags, hollow logs, outside trees in nests of grass or foliose lichens (called dreys or bolus nests), or in holes in the ground (C.C. Smith 1968, Leonard and Koprowski 2009). Nests may be built in natural hollows or abandoned cavities made by other animals, such as woodpeckers, and enlarged by squirrels (USFWS 1993). Nest site selection by MGRS is strongly influenced by stand composition, particularly density of corkbark fir, mature (large) trees, and decaying logs (Merrick et al. 2007). The availability of larger snags and cavity-containing trees, especially aspen, is of particular importance for this population, as they provide preferred nesting locations (Merrick et al. 2007).

Juvenile dispersal distances of MGRS are significantly larger than other populations of red squirrels, suggesting forests in the Pinaleño Mountains are sub-optimal in comparison to other North American red squirrel habitat (Munroe et al. 2009). Natal dispersal distances of MGRS average 679.8 m (\pm 1,067.7 m), with a range between 0.0 m and 4,788.0 m and with males dispersing farther than females (Merrick and Koprowski 2016). Survivorship of dispersing MGRS was similar among years, between males and females, and for individuals irrespective of their dispersal distance, with the average length of time of survival of 233 ± 90 days, with 48.7 % surviving through their first winter (Merrick and Koprowski 2016).

The population size of MGRS throughout its range has been estimated and tracked since 1986 by an interagency team. Due to changes in analysis, population estimates before and after 1990 may not be comparable. Beginning in 1990, conservative population estimates ranged from 250 to almost 400 individuals through 1997 (Hatten 2014). Then from 1998-2000, midden surveys showed increasing numbers of MGRS, with peaks over 500, after which the population declined due to a decrease in habitat from multiple insect outbreaks and wildfires (discussed below). Population estimates dropped 42% in 2001 as compared to 1998-2000; from then until 2017, population estimates remained fairly stable, varying from 199 to 346. In summer of 2017, however, the Frye Fire burned through the majority of the squirrel's habitat and reduced the population estimate to 35 individuals that year. The last survey (conducted in Fall 2018) resulted in a conservative estimate of 67 MGRS (Arizona Game and Fish Department 2018).

The final rule (52 FR 20994) concluded that the MGRS was endangered because its range and habitat were reduced, and its habitat was threatened by a number of factors, including the (then) proposed construction of an astrophysical observatory, occurrences of high-severity wildland fires, proposed road construction and improvements, and recreational developments at high elevations on the mountain. The rule noted that the subspecies might also suffer due to resource competition with the introduced Abert's squirrel.

Since the final rule, many of these threats have been realized. In recent years, forests in the Pinaleño Mountains have experienced significant ecological changes, many of which are dramatic and detrimental to the survival of MGRS. Declines in habitat since the subspecies was

listed correspond with the 1996 Clark Peak Fire, multiple outbreaks of forest insects, and the 2004 Nuttall Complex Fire (Hatten 2014). Effects from fire can significantly reduce survivorship of individual squirrels with middens inside the fire boundary (Koprowski et al. 2006). In 2017, the Frye Fire affected the majority of habitat within the MGRS's range; the effects of this fire are still being analyzed. Tree diseases are also present on the mountain and appear to be increasing in scale and intensity, and outbreaks of forest insects have contributed to substantial additional tree mortality, particularly in the Engelmann spruce and corkbark fir populations. Human development, including road improvements to Swift Trail and the potential construction of up to four more telescopes in the future, may remove vegetation (USFWS 2011). Forest roads can act as barriers for MGRS regardless of traffic volume and have long-term impacts on animal space use (Chen and Koprowski 2016). Currently, ADOT maintains Swift Trail up to the road that leads to the telescopes, including grading the unpaved section and clearing snow in the winter. This has led to this unpaved section varying from 27 to 45 feet wide in some places (B. Woods 2019, pers. comm.). Additionally, adult and juvenile MGRS have the lowest survival and highest rates of mortality in any population of North American red squirrels (mean annual survival: adults=0.32, juveniles=0.26), with the majority of confirmed deaths due to avian predation (adults 65%, juveniles 75%) (Goldstein et al. 2018). Furthermore, resource competition with the non-native Abert's squirrel likely continues to impact MGRS (Steele and Koprowski 2001, Hutton et al. 2003, Edelman 2004, Edelman and Koprowski 2005, Edelman and Koprowski 2006, Rushton et al. 2006), and may subsidize a diverse avian predator guild in the area (Goldstein et al. 2018).

In addition to the above, long-term drought continues to threaten much of Arizona, including the southeastern portion of the state (Arizona Department of Water Resources 2019). Extended drought creates severe physiological stress on trees, especially in the higher elevation forest types. Localized projections suggest the southwestern U.S. may experience the greatest temperature increase of any area in the lower 48 states (Intergovernmental Panel on Climate Change [IPCC] 2007). Increasing temperatures in turn are predicted to be accompanied by a more arid climate (Seager et al. 2007), increasing insect outbreaks in Southwestern forests, and increasing wildfires (Betancourt 2004), all of which continue to threaten MGRS and its habitat.

Koprowski et al. (2005) characterized the decline of the MGRS in their study area as catastrophic. They note that in areas of high tree mortality in Alaska and Colorado, red squirrels did not completely disappear but rather persisted in residual stands of trees where conditions remained suitable. The ability of the MGRS to survive the current habitat decline is unknown; however, it apparently survived a similar situation in the late 1600s. Grissino-Mayer et al. (1995) sampled fire-scarred trees in four areas of the Pinaleno Mountains from Peter's Flat east to Mt. Graham. The oldest trees in the spruce-fir forest were about 300 years old. They found evidence for a widespread, stand-replacing fire in 1685 that probably eliminated much of the forest atop the Pinaleno Mountains. Although the MGRS population persisted through that event and may persist through current habitat-altering events, small populations can exhibit genetic or demographic problems that further compromise the ability of the subspecies to survive. The most recent genetic analysis indicates levels of genetic variation in the MGRS population are extremely low, and that the average relatedness among MGRS individuals is high, suggesting that the MGRS has either experienced multiple bottlenecks (including one possibly as a result of the fires and insect outbreaks beginning in 1996), or a single long-term bottleneck (Fitak et al.

2013). Low genetic variability in small populations is a concern because deleterious alleles are expressed more frequently, disease resistance might be compromised, and there is little capacity for evolutionary change in response to environmental change. Koprowski et al. (2005) recommended management actions to increase available habitat and population size in the near and distant future.

Critical Habitat

On January 5, 1990, we designated 1,919 acres as MGRS critical habitat (55 FR 425; USFWS 1990). Critical habitat includes three areas:

- 1) The area above 10,000 feet in elevation surrounding Hawk and Plain View peaks and a portion of the area above 9,800 feet;
- 2) the north-facing slopes of Heliograph Peak above 9,200 feet; and
- 3) the east-facing slope of Webb Peak above 9,700 feet.

The main attribute of these areas at that time was the existing dense stands of mature (about 300 years old) spruce-fir forest. The MGRS Refugium established by the Arizona-Idaho Conservation Act (1988) has the same boundary as the designated critical habitat boundary surrounding Hawk and Plain View peaks (about 1,700 acres), but does not include critical habitat on Heliograph or Webb Peaks. Unfortunately, most of the habitat in the Refugium and in critical habitat has been impacted by wildland fire and insect damage.

Recovery Planning

The objective of the MGRS Recovery Plan (USFWS 1993) is “to increase and stabilize the existing Mt. Graham red squirrel population by protecting existing habitat and restoring degraded habitats.” The Recovery Plan does not contain recovery criteria for MGRS, as the goal of the plan is to first increase and stabilize the population by providing sufficient habitat to maintain a population of squirrels that never fluctuates below 300 adults and is distributed throughout the Pinaleño Mountains. The actions needed to stabilize the population include: 1) protect and monitor the existing population and habitat; 2) determine life history and habitat parameters; 3) reclaim previously occupied habitat; and 4) integrate species and habitat protection actions for the Pinaleño Mountains. Appendix A of the MGRS Recovery Plan describes what, at that time, was considered to comprise excellent MGRS habitat, which includes:

- 1) Forest structure that consists of a nearly continuous multi-layered forest with overhead canopy closure greater than 80 percent.
- 2) Basal area of live and dead trees of at least 275 ft² per acre.
- 3) Groupings of 0.078 acres of large dominant trees greater than or equal to 16-inches diameter at breast height (dbh) associated with greater than or equal to five to eight logs and one to two standing snags greater than or equal to 16-inches dbh.
- 4) Four to six snags per acre that are greater than or equal to 16-inches dbh.
- 5) Maintaining as many logs as possible, especially those in the latter stages of decay.

Excellent MGRS habitat is defined as those areas possessing all of the above characteristics. Suitable habitat as defined in the Recovery Plan generally contains many, but not necessarily all, of the optimal characteristics. The Recovery Plan states that habitat requirements may be modified pending the results of further research and monitoring. The Plan is currently in revision; the Draft Mount Graham Red Squirrel Recovery Plan, First Revision is available [here](#). It should be noted that the above characteristics were measured within a 33-foot radius (0.07-acre) surrounding midden locations (Smith and Mannan 1994). As described previously, more recent research indicates that MGRS territories are much larger than this, up to 3 to 10 times greater than reported for other populations of red squirrels (Koprowski et al. 2008). Furthermore, midden-site selection best occurs using a 92-foot plot around middens, with strong selection using a 184-foot plot, as well (Wood et al. 2007). Therefore, MGRS appear to select midden sites and territories based on characteristics beyond those described above as excellent habitat (which were measured only near the midden) and that usually correspond to a high number of healthy trees and high seedfall (Wood et al. 2007), as well as healthier, older forests; higher, gentler slopes, with non-southerly aspects, especially northward; and outside of heavily burned areas (Hatten 2014). Research continues to be conducted to further refine our understanding of MGRS habitat characteristics.

Previous Consultations

Within Arizona, 13 projects have undergone formal section 7 consultation for effects to MGRS. See the [Arizona Ecological Services Office section 7 website](#) for these consultations.

ENVIRONMENTAL BASELINE—MOUNT GRAHAM RED SQUIRREL

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

Status of the species and critical habitat within the action area

The 2017 Frye Fire led to marked decline in the MGRS population: in 2016 the estimate was 252, whereas only 35 remained post-fire in 2017, which increased to 67 in 2018 (Arizona Game and Fish Department 2018). Within the action area, there are 33 known middens, including 24 within the Forest Restoration Units, 1 within a fuel treatment, 3 within an Important Wildlife Area Unit, and 5 adjacent to units within 200 feet. Assuming one midden is occupied by one squirrel (a common assumption when estimating red squirrel abundance), there are 33 MGRS within the action area. All of these middens have been active within the past three years and were included in the 2018 census. Post-Frye Fire, there are fewer MGRS and less habitat compared to the conditions previously analyzed; however, MGRS are still present in areas of low-intensity burn, are sometimes found in areas not known to be previously occupied, and are demonstrating new behaviors, like ground-caching, to adapt to midden loss. MGRS might

continue to be sensitive to additional changes to habitat, but they also have shown behavioral adaptability to persist post-fire and still occur in areas that experienced low-intensity fire effects.

According to the BA, the FS analyzed 2008 satellite imagery and estimated that 6,427 acres of MGRS habitat existed at that time. After the Frye Fire, the FS used fire intensity mapping (Rapid Assessment of Vegetation Condition after Wildfire, or RAVG) to quantify the loss of vegetation. Of the 6,427 acres of potential MGRS habitat, 22% burned with high intensity, 32% burned with moderate intensity, 32% burned with low intensity, and 14% remains unburned. Post-Frye fire, this acreage has decreased, and current research is ongoing to update the estimate of remaining MGRS habitat (University of Arizona 2019, as cited in the BA).

Critical habitat

Of the 1,919 acres of designated critical habitat for MGRS, approximately 1,596 acres (84%) were burned in 2017 by the Frye Fire, including 46% at high intensity, 21% at moderate intensity, and 33% at low intensity. As explained in the Status of the Species, most of the habitat within designated critical habitat boundaries was impacted by wildland fire and insect damage prior to the Frye Fire.

EFFECTS OF THE ACTION—MOUNT GRAHAM RED SQUIRREL

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

Silvicultural Treatments

Middens and Territories

Thirty-three known middens currently occur in or adjacent to proposed PERP treatment units. All of these, as well as any nests or new middens within the project boundary, will be protected by a 200-ft radius buffer within which no treatments will occur unless coordinated with FWS. Pre-implementation sweeps in each unit will help ensure that new middens and nests that develop during the five years of the project will be identified and buffered, as well. These buffered areas were originally designed in conjunction with representatives from the Arizona Game and Fish Department (AGFD), FWS, and FS, with input from University of Arizona squirrel researchers. The 200-ft radius buffer was selected based on Wood et al. (2007), who found that MGRS select midden sites and territories at both a 92- and 184-ft radius scale. The 184-ft radius buffer was rounded up to 200 ft to provide slightly greater protection to middens and MGRS found within the project area. This should avoid direct effects to MGRS middens from silvicultural treatments. However, as noted in the Status of the Species, the average annual

home-range (5.9 to 24.5 acres) used by MGRS will not be fully encompassed by the 200-ft (2.9 acres) buffer. Therefore, habitat within home ranges but outside of the 200-ft buffer will, in some cases, be treated, thereby potentially affecting MGRS that occupy those areas. However, MGRS have demonstrated persistence in areas previously treated through the Pinalaño Ecosystem Management (PEM) Demonstration Project and the completed or in-progress PERP treatment units (Bonnie Woods, Safford Ranger District Biologist, personal observation 2018; 2019). Therefore, while individuals may experience some effects within their territories, they are likely to be minimal.

Nests

While midden locations are usually easy to detect, not all nesting locations for this subspecies are known, and nests may not be obvious during pre-implementation sweeps. The Red Squirrel Monitoring Program has collected data on hundreds of MGRS nest sites, including a subset of data on the distances from female nest sites during the summer (both with and without litters) to the midden location, as well as a dataset containing the nesting locations of male, female, and co-nesting individuals within a six month bracket around co-nesting events across several seasons. They have found that nest locations can vary from being adjacent to the midden to being over 2,000 feet away. In the case of the latter dataset mentioned above, approximately 62 percent were within 200 feet of the midden. In the case of the former dataset, approximately 44 percent of both maternity and non-maternity nests were within 200 feet of the midden. It is therefore expected that some nest sites will fall within treated areas. Pre-implementation surveys in each block will reveal some of these nesting locations, where damage and disturbance can then be minimized.

Relatively few nests that fall within Important Wildlife Areas are likely to be damaged or destroyed due to the proposed action because of the nine-inch dbh cut limit imposed in these areas. Merrick et al. (2007) found the mean dbh of trees used by MGRS was 19.5 inches (standard error [SE] = 0.8 inches) for cavity nests and 11.4 inches (SE = 0.6 inches) for drey nest trees. However, they reported that the minimum dbh of a nest tree (both cavities and dreys) was 4.7 inches. Additionally, unpublished data from the Red Squirrel Monitoring Program indicates approximately 7% of the nest trees (both cavities and dreys) in the mixed-conifer forest can be less than 9-inches dbh. Based on these findings, it is possible that a small number of nest trees will be felled in these areas. In addition, other trees felled could topple onto nest trees, breaking branches or crowns, potentially resulting in damage to nests.

In Forest Restoration Areas, the chance of damaging or destroying a nest tree is more likely, as the general and modified prescriptions in these areas allow cutting trees and snags up to 18-inches dbh. Based on the distance-to-nest information discussed above, nests associated with middens that fall within 200 feet of a Forest Restoration Area have a 38 to 56 percent chance that they will be located within a treated area. Therefore, they could be affected by the treatment, and there is the potential for individuals to be harmed by falling trees or debris during the implementation phase of the proposed action.

Disturbance

Even with individually buffered middens, MGRS could be disturbed by the proposed action and might avoid treatment areas due to heavy equipment, chain saws, and human presence. Information regarding the effects of human presence and mechanical disturbance on red squirrels is lacking. Gabrielsen and Smith (1995) summarize previous studies related to physiological and behavioral responses of several wildlife species to humans and predators, including fox squirrels (*Sciurus niger*) and grey squirrels (*Sciurus carolinensis*). These species were found to slip around a tree out of sight if approached by a human or a dog, then flee if approached too closely. Mt. Graham red squirrels have been noted to react to the presence of people within their territory (FWS observation), but human presence does not appear to influence abundance (Gutzwiller and Riffell 2008) or survivorship, as the same red squirrel will occupy a territory even after multiple visits and multiple capture events (e.g., as observed by Koprowski 2005 and Koprowski et al. 2008). Additionally, the FS removed two hazard trees in 2018 within 10 feet of one midden; this MGRS was observed foraging just after the treatment was completed and currently is occupying this area (Bonnie Woods, Safford Ranger District Biologist, personal observation 2018; 2019). However, this individual lives near human disturbance and therefore may be habituated to noise and human presence more than individuals in more remote locations.

Because human presence and mechanical disturbance will not occur within at least 200 ft of active red squirrel middens, we expect that disturbance will be minimized, with two exceptions: 1) disturbance that could occur around unknown nests that may occur within treated areas, and 2) occasional disturbance that could occur within buffers requiring some treatment (after discussion with the FWS). Therefore, while we expect that disturbance due to human presence and mechanical disturbance will be minimal, there is some chance for young to be affected if a nest were to be abandoned, or to individuals if treatments need to encroach within a buffer.

Avian Predation

Indirect effects to individuals include the potential for an increase in avian predation of MGRS, as many of the resident and migratory raptor species are well-adapted to flight below the forest canopy, making squirrels easy prey. These include northern goshawks, peregrine falcons, sharp-shinned hawks and, occasionally, spotted and great-horned owls. As noted in the Status of the Species, the majority of confirmed deaths of MGRS are due to avian predation (adults 65%, juveniles 75%) (Goldstein et al. 2018). Silvicultural treatments and associated fuels reduction treatments will remove some canopy cover and ground cover, potentially increasing the success of raptor predation events, although wildlife design features ensure some cover (e.g., logs and snags) will remain in treated areas. As discussed above, much of the area within the home-range and core areas used by MGRS will not be fully encompassed by a 200-foot buffer. Additionally, nests can range from zero to over 2,000 feet away from a midden, increasing the chance that an individual MGRS could be depredated by a raptor as it travels through a treated area. Dispersing MGRS passing through treated areas will also be at greater risk due to some removal of canopy. Therefore, we anticipate that vegetation treatments may affect some MGRS individuals through an increase in successful raptor predation events.

Abert's Squirrels

Indirect effects to individuals also include a potential increase in competition with introduced Abert's squirrels for food resources. The proposed project is designed, in part, to change the amount of forest canopy and its distribution throughout the project area, and there is the potential for this change in canopy to benefit Abert's squirrels. In the Pinaleño Mountains, Abert's squirrels have been documented using areas classified as mixed conifer and spruce-fir as well as other vegetation types (Hutton et al. 2003, Edelman and Koprowski 2005), suggesting that the species is not as restricted to ponderosa pine forests as previously described (Edelman and Koprowski 2008). Competition between these two species for nests and nest trees is unlikely due to the dissimilarity in use of nest types and tree characteristics (Edelman et al. 2009), but at the landscape scale the considerable overlap between the two (Doumas et al. 2016) likely increases competition for food resources. In the Pinaleño Mountains, Abert's squirrels have been observed feeding on similar foods as eaten by MGRS (Froehlich 1990, Hutton et al. 2003, Edelman and Koprowski 2005). Based on limited available data, it is possible that Abert's squirrels may limit the number of conifer cones or fungi available for red squirrels, considering that in some local areas elsewhere they have reduced cone crops up to 75 percent (Edelman and Koprowski 2008 and sources cited therein). This suggests that even a small increase in the Abert's squirrel population could lead to a decline in available food resources for MGRS, particularly when food resources are limiting. Additionally, Abert's squirrels have been documented kleptoparasitizing cones from MGRS middens, although infrequently (Edelman et al. 2005).

To reduce competition between MGRS and Abert's squirrels, AGFD began funding an Abert's removal project in 2018 targeting areas where MGRS were found and progressively moving out from those locations. This project is ongoing, and should help reduce resource competition between the two species of tree squirrels, ultimately benefitting MGRS. Therefore, an increase in Abert's squirrels due to the proposed action is likely to be offset by the removal of the species in areas where competition with MGRS is most likely, although some competition will remain. We anticipate this project will continue through the five years of the proposed action.

Canopy Cover and Basal Area

Short-term effects to MGRS habitat due to silvicultural treatments may occur. For MGRS occupying buffered middens near treatments, treatments could alter characteristics within the home ranges of these individuals. For instance, the proposed action may temporarily reduce the canopy cover and average basal area of live and dead trees in some areas to levels below those recommended in the MGRS Recovery Plan, which recommends overhead canopy closure of 80 percent or greater and a basal area of 275 ft² per acre for both live and dead trees. The proposed action includes reducing the basal area of live trees to a range of 130-170 ft² per acre for both Important Wildlife Areas and Forest Restoration Areas, and to maintain an average 150-ft² target across all stands.

Wildlife conservation measures such as buffering 200 feet around middens and nests and leaving large logs and snags in treated areas will retain cover and cooler microsites within currently established MGRS territories. Canopy cover and basal area of live and dead trees within the

buffered areas will remain unchanged, and outside the buffered areas should be minimally affected by the proposed treatment because much of the treatment focuses on removing small to medium understory trees and will favor the retention of large trees (18" DBH or greater). Additionally, large logs and snags will be retained in treated areas, which maintain or create other habitat elements that are also considered important to MGRS. Group selection of trees based on size-classes and variable density thinning also will be applied so that approximately one-third of the groups of trees within a stand will have wide spacing, while approximately two-thirds will have a close spacing (or not be thinned at all). This should maintain an interlocking crown component and its associated higher canopy cover and relatively higher basal area within these sites, as well as create a variably aged stand anticipated to benefit MGRS in the long-term.

To this point, before the Frye Fire, MGRS were establishing and occupying new middens within PEM-treated areas (Koprowski and Blount 2010). In particular, two middens were found in a stand with a modeled average live basal area of 174 ft² per acre, which is similar to the higher prescription target for live basal area of 170 ft² per acre. Additionally, one midden was created in a PEM-treated stand averaging 155 ft² per acre of live basal area, which is similar to the average target prescription of 150 ft² per acre, indicating this threshold of live basal area seems to provide the habitat requirements necessary for midden establishment. Therefore, we do not anticipate these treatments will preclude MGRS from occupying treated areas.

Wildfire

In large part, long-term indirect effects of the proposed action on MGRS and its habitat are expected to be beneficial, as they were designed to create MGRS habitat, promote forest health, and ameliorate one of the main threats to the subspecies' persistence and current distribution – wildland fire. Wildland fire has resulted in direct mortality of MGRS, as well as damaged or destroyed habitat in forested areas, which has led to changes in MGRS distribution over the past 23 years. Research conducted during and shortly after the Nuttall-Gibson Complex Fire of 2004 indicates that high-severity fires may directly have caused mortality of squirrels (Koprowski et al. 2006), and census data collected in the spring of 2005 (AGFD, unpublished data) indicate that changes in habitat and loss of middens due to burning may also have reduced the population of red squirrels by destroying food items cached to last through the winter months. More recently, the Frye Fire of 2017 affected the majority of MGRS habitat on the mountain and reduced the population estimate to 35 individuals that year (which increased to 67 in 2018).

Thinning the stands is expected to reduce fuel loading, break-up canopy connectivity to some extent, and remove ladder fuels. These treatments should help reduce high-severity fire effects across broader forest landscapes and help protect MGRS and its habitat from future stand-replacing wildland fires and enhance landscape-level forest resiliency to climate variability and insect infestations. These proposed treatments are particularly important at this time to reduce heavy and fine fuel loading that resulted from the Frye Fire and limit the risk of future fires re-burning these areas at short intervals and high severities.

PERP treatments prior to the Frye Fire have shown their effectiveness in reducing wildfire effects on the landscape. Overstory thinning in 18 units was in process prior to the Frye Fire, with 10 percent of the acreage in 12 units thinned prior to the fire, and 25 percent of the acreage

thinned in 6 units. In the 12 units that were 10 percent thinned, an average of 66 percent of the trees were lost due to the fire, whereas in the 6 units that were 25 percent thinned, an average of 11 percent of trees were lost. Additionally, within the latter category, if some of the slash and understory vegetation had not been masticated (which created a layer of wood chips several inches to several feet thick in some areas), the average would have dropped to 5 percent loss in the stands. The results from these data indicate that silvicultural treatments designed through PERP are effective in reducing the threat of wildfire, and will likely even be more effective with the modification to replace mastication and underburning with pile burning.

Fuels Reduction Treatments

The effects of fuels reduction treatments on MGRS and its habitat are expected to be similar to the effects of vegetation treatments described above, particularly the indirect effects related to potential increases in aerial predation and competition with Abert's squirrels through changes in the amount of forest canopy and its distribution throughout the project area, as well as the long-term beneficial effects to MGRS and its habitat. Effects not described above include the short-term effects associated with pile burning and the impact this activity has on soils. Note that underburning and mastication are no longer part of the proposed action; therefore, they will not be analyzed here.

Pile Burning

Debris created by pruning or tree thinning will be piled by hand and burned (or removed) preferably within one year of treatment, with pile burning occurring during conditions when risk of fire spread is low and smoke will be adequately dispersed (October to March). Hand piles will be placed away from downed logs greater than 16-inches dbh, be up to 6 feet high and 8 feet in diameter, and, to prevent tree scorch, will be placed as far from the canopy drip line of trees as possible. This should help prevent MGRS from using slash piles before fuels reduction treatments for the forest stand are complete, and minimize the potential for embers to cause midden damage, scorch mature trees, or harm MGRS themselves. Pile burning will not occur within buffered midden and nest areas, meaning all known middens and nests will be buffered from this activity by at least 200 feet.

Indirect effects of pile burning can include changes to the biotic and abiotic properties of the ground beneath the piles due to damaging or destroying seeds and fungi and altering soil chemistry (Korb et al. 2004). These effects have not been observed after previous pile-burning activities in the Pinaleño Mountains (e.g., through PEM), however, and are not expected to occur due to the proposed action. Piles will be no larger than previously burned piles, and often will be smaller, thereby reducing the effects to soils and seeds even further. Additionally, pile burning can release nutrients back into the soil and reduce excessive fuel loading that can lead to stand replacing wildfire, thereby benefitting MGRS and its habitat. Pile burning is a more conservative and effective approach to reducing excessive fuels than under burning and mastication and allows for greater retention of needed habitat elements. Checking piles for MGRS use before burning will be coordinated with the FWS as an additional precaution. Therefore, we anticipate this activity will not negatively affect MGRS and its habitat.

Removal Methods and Transportation of Wood Byproducts

The effects of removal methods and transportation of wood byproducts on MGRS and its habitat are expected to be similar to those described in the vegetation treatments section above, particularly the indirect effects related to potential increases in aerial predation and competition with Abert's squirrels through changes in the amount of forest canopy and its distribution throughout the project area, as well as the long-term beneficial effects to MGRS and its habitat. Effects not described above include the short-term effects associated with the increased traffic due to the proposed action, and additional vegetation and soil disturbance through skidding activities and road improvement and construction.

Traffic

The proposed action may directly affect MGRS due to increases in traffic associated with this project. Current use of Swift Trail through MGRS habitat is limited to administrative access for Forest Service personnel, Mount Graham International Observatory personnel, and Arizona Department of Transportation personnel during the winter months (November 15 through April 15 yearly), in accordance with the Arizona-Idaho Conservation Act of 1988. Summerhome owners in the Columbine area may also visit their cabins once or twice during the winter for maintenance activities. During the remainder of the year, this mountain range is a popular recreation destination for those attempting to avoid lower elevation heat.

Mortality of MGRS outside the treatment buffers may occur due to vehicle traffic associated with the hauling of logs, moving of heavy equipment, and the daily driving to work sites. According to the transportation and operations specialist report for the original PERP proposal (U.S. Forest Service 2009), 843,068 total haul miles would have been traveled to remove wood byproducts from the project area. The 2009 Biological Assessment for that project stated that this translated to approximately 4,002 round trips of hauling vehicles up and down the Swift Trail area over the life of the project, or an average of 400 round trips per year. The result, based on two to six months of work per year, allowing for weather and equipment availability, would have been that traffic related to implementation of the project as originally designed would have added approximately one to two additional vehicles per day to the existing traffic. This was an increase of one to two percent over current traffic levels (an average of 84 vehicles per day). With the 70 percent decrease in the revised project's footprint (from 5,754 acres to 1,648 acres) this percentage is lower, although some degree of risk that a squirrel may be struck due to increased traffic from the proposed action still exists. The risk may be lessened by: 1) the primitive and winding nature of the roads in the action area which limit the speed at which vehicles move, and 2) the briefings on the identification and avoidance of MGRS that all personnel will receive. Therefore, the risk of MGRS mortality due to vehicle strikes, while unlikely, may occur due to an increase in traffic from the proposed action.

Removal Methods

Vegetation and soil will be disturbed due to ground-based, cable, and skyline skidding activities, including landings (areas where material is piled for removal off the mountain). We expect the effects of each kind of skidding activity to be similar. Ground disturbance and removal of

ground cover and downed material may temporarily alter MGRS habitat in these localized areas. The FS will rehabilitate skid trails and landing zones after removal operations are complete by re-contouring, re-seeding, dragging brush across the trail, and blocking further entry for public use. Downed trees will be placed perpendicular to and across skid trails to allow for MGRS travel ways. Additionally, ground equipment operations on unstable or wet soils and on steep slopes (over 40 percent) will be avoided to minimize soil compaction, displacement, erosion, and sediment runoff. If erosion into the project area is noted from uphill areas that burned severely, methods will be used to reduce amplification of erosion downslope such as straw wattles, water bars, mulch, erosion control structures, or other methods. Erosion control materials will be certified weed free and biodegradable. These measures will reduce the effects of skidding activities on MGRS and its habitat, although a small number of acres will temporarily be affected until herbaceous and shrub cover is established and soil disturbance has blended back into the landscape.

Roads

Disturbance to soils and existing ground cover and downed material will occur from reopening closed roads and building temporary new roads. Approximately 19 miles of roads will be used under the modified proposed action, of which two miles will be new temporary roads and three miles will be roads that are currently closed. This is a reduction of approximately 57 percent from the road use originally proposed in 2010, which included approximately 33 miles of roads including 4.5 miles of new temporary roads. Project operations will be planned to minimize the construction of temporary roads, which will be rehabilitated at the end of the project by re-contouring, re-seeding, dragging brush across the trail, and blocking further entry for public use. Additionally, in areas with high/moderate soil burn severity, currently closed roads will only be used if they have remained in a compacted and un-remediated state since closure, and roads will be reclosed after project completion. These measures will reduce the effects of roads on MGRS and its habitat, although a small number of acres will temporarily be affected until herbaceous and shrub cover is established and soil disturbance has blended back into the landscape.

Summary

In summary, the proposed action includes establishing 200-ft buffers based on research (Wood et al. 2007) around all known middens and nests, which will leave the canopy closure and basal area of live and dead trees untouched within these areas. Treatments in areas outside the buffers, while reducing canopy closure and basal area, were designed to maintain or create other habitat elements that are also considered important to MGRS (e.g., snags, logs, clumping of trees through group selection and variable density thinning). Many portions of the project area have never been known to support MGRS, despite meeting the broad physical characteristics of MGRS habitat. In some cases, stands may have a large number of logs and snags and high canopy cover, but the trees in some of these overstocked areas do not produce cones (the main MGRS food source) because of insects, mistletoe infestations, and disease. Treatment of these stands may improve the vigor of the trees, which may produce conditions where cone crops increase, thus benefiting the red squirrel. Additionally, the results of monitoring in treated areas of the PEM project suggest that while treatments may change the forest structure of areas

surrounding middens and known nests, we do not anticipate these treatments will preclude MGRS from occupying treated areas.

Furthermore, PERP treatments prior to the Frye Fire have shown their effectiveness in reducing wildfire effects on the landscape, and replacing mastication and underburning with pile burning will likely be even more effective. The revised treatments within the proposed action are anticipated to benefit MGRS in the long-term by reducing the risk of severe, stand-replacing wildland fire, as well as opening the tree canopy and thereby releasing understory vegetation for increased growth and furthering the development of large trees (Block et al. 2005).

CUMULATIVE EFFECTS—MOUNT GRAHAM RED SQUIRREL

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

The U.S. Forest Service manages almost all lands within the action area and administers projects and permits on those lands; thus, almost all activities that could potentially affect MGRS are Federal activities and subject to additional section 7 consultation under the Act. The exceptions are road improvements proposed by the Arizona Department of Transportation (ADOT) that could occur along Swift Trail. These could include selectively removing large trees that pose a hazard to drivers, as well as paving the road past the end of the existing pavement (and possibly other side roads, such as the road to the telescopes) that experience more traffic and thus generate dust (Arizona Department of Transportation 2011). This could increase both the speed and number of vehicles through this part of the action area. Greater speeds and numbers of vehicles could impact MGRS by injuring or killing individuals crossing the road, as well as potentially further disrupting dispersal patterns due to an increase in traffic, noise, and roadway width.

JEOPARDY AND ADVERSE MODIFICATION ANALYSIS—MOUNT GRAHAM RED SQUIRREL

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

Jeopardy Analysis Framework

Our jeopardy analysis relies on the following:

“Jeopardize the continued existence of” means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of

that species (50 CFR 402.02). The following analysis relies on four components: (1) Status of the Species, which evaluates the range-wide condition of the listed species addressed, the factors responsible for that condition, and the species' survival and recovery needs; (2) Environmental Baseline, which evaluates the condition of the species in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of the species; (3) Effects of the Action (including those from conservation measures), which determines the direct and indirect impacts of the proposed federal action and the effects of any interrelated or interdependent activities on the species; and (4) Cumulative Effects, which evaluates the effects of future, non-federal activities in the action area on the species. The jeopardy analysis in this biological opinion emphasizes the range-wide survival and recovery needs of the listed species and the role of the action area in providing for those needs. We evaluate the significance of the proposed Federal action within this context, taken together with cumulative effects, for the purpose of making the jeopardy determination.

Conclusion

After reviewing the current status of the Mount Graham red squirrel, the environmental baseline for the action area, the effects of the proposed revised Pinaleño Ecosystem Restoration Project and the cumulative effects, it is our biological opinion that the action, as proposed, is not likely to jeopardize the continued existence of the Mount Graham red squirrel. Critical habitat for this species has been designated but is not adversely affected by the proposed action, and no destruction or adverse modification of that critical habitat is anticipated. We base this conclusion on the following:

- The primary threat to MGRS is loss of habitat through wildland fire. The proposed action is anticipated to reduce this threat.
- Tree health should improve as a result of treatments, which may increase forest resistance to insect infestations and improve the cone crops available as food sources for MGRS.
- Buffers will surround all known active middens and nests within the project area, thereby preserving habitat components necessary for midden establishment and persistence in areas where MGRS are currently known to occur.
- Sweeps of treatment areas will be conducted prior to project implementation. If new middens or nests are found, they will be protected by a 200-foot buffer to minimize the potential for harm to occur to MGRS, their nests, and/or their middens and the immediate surrounding habitat. If treatments are necessary within any 200-foot buffer, the FS will coordinate with the FWS to minimize effects to MGRS and its habitat.
- Although habitat suitability in the short-term may be reduced, proposed treatments are not expected to reduce acreage of MGRS habitat. Treatments undertaken by the PEM project were similar to those proposed in the Pinaleño Ecosystem Restoration Project. MGRS still occupy those PEM treated areas.

- Implementation of this project begins the process of protecting existing occupied MGRS habitat, improving unoccupied areas with the goal of those areas being eventually occupied, and reducing the fire potential of treated areas, thereby preventing high-severity wildland fires from spreading into occupied areas, including critical habitat. These components are identified in the Recovery Plan as being necessary if the subspecies is to persist in the Pinaleño Mountains (USFWS 1993).
- The proposed action does not degrade our ability to recover MGRS, as the project was designed to maintain or create important habitat features as defined in the MGRS Recovery Plan and current research. Thus, the proposed project is expected to be beneficial to MGRS and their habitat over time.
- Although some uncertainty exists in regard to the effects of the action, monitoring and adaptive management are built into the proposed action, so if the effects to MGRS are greater than anticipated, treatments will be halted or modified as needed.

In conclusion, we believe the MGRS is critically endangered, and recent habitat loss caused by insect outbreaks, drought, and high-severity wildland fires (in particular the 2017 Frye Fire) has been the major factor that, over time, has pushed this species nearer to extinction. We believe implementation of the revised Pinaleño Ecosystem Restoration Project does not jeopardize the continued existence of the MGRS, and, over the long-term, will benefit this subspecies by reducing the threat of wildland fire, improving tree health and forest condition, and re-creating red squirrel habitat. We conclude that the implementation of this project will contribute to the likelihood of the survival and recovery of the MGRS throughout its range in the wild.

The conclusions of this biological opinion are based on full implementation of the project as presented in the Description of the Proposed Action section of this document, including any Conservation Measures that were incorporated into the project design.

INCIDENTAL TAKE STATEMENT—MOUNT GRAHAM RED SQUIRREL

Section 9 of the Act and Federal regulations pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. “Take” is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. “Harm” is further defined (50 CFR § 17.3) to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. “Harass” is defined (50 CFR § 17.3) as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. “Incidental take” is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act

provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary, and must be undertaken by the FS so that they become binding conditions of any grant or permit issued to a contractor or permittee, as appropriate, for the exemption in section 7(o)(2) to apply. The FS has a continuing duty to regulate the activity covered by this incidental take statement. If the FS (1) fails to assume and implement the terms and conditions or (2) fails to require the contractor or permittee to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the FS must report the progress of the action and its impact on the species to the FWS as specified in the incidental take statement [50 CFR § 402.14(i)(3)].

AMOUNT OR EXTENT OF TAKE—MOUNT GRAHAM RED SQUIRREL

The FWS anticipates up to 8 percent of the estimated MGRS population (measured using the conservative estimate generated during the annual Fall census) will be taken as a result of this proposed action (through 2023). The incidental take is expected to be in the form of harm through the loss of occupied nests with litters, competition with Abert's squirrels, increases in predation as described in the Effects of the Proposed Action, and up to one MGRS being injured or killed by a vehicle. Eight percent represents the average annual fluctuation (both positive and negative) of the estimated MGRS population from 2001 through 2016, a 16-year period during which the population was relatively stable and ranged from 214 to 299 individuals. It is reasonable to assume that the MGRS population will fluctuate within this 8 percent average due to the proposed action, although other events outside of proposed activities (e.g., wildfire, extended drought, poor cone crops) may cause the population estimate to exceed this average fluctuation. Should the population estimate decrease more than 8 percent from one year to the next, take may be exceeded, and the FS and FWS will work together to determine if extraneous factors such as wildfire or poor cone crops are contributing to the decrease, or if the decrease is due to the proposed action and therefore needs to be modified.

No physical alteration of middens will occur due to the proposed action (they are all buffered); therefore, no individual middens will be affected by the proposed action. Any further actions within a buffer will be discussed on a case-by-case basis with FWS in further detail, and FWS will provide an email granting permission to proceed and will include any other considerations.

EFFECT OF THE TAKE—MOUNT GRAHAM RED SQUIRREL

In this biological opinion, the FWS determines that this level of anticipated take is not likely to result in jeopardy to the MGRS for the reasons stated in the Conclusions section.

REASONABLE AND PRUDENT MEASURES—MOUNT GRAHAM RED SQUIRREL

The following reasonable and prudent measure(s) are necessary and appropriate to minimize take of MGRS:

1. The FS shall monitor incidental take resulting from the proposed action and report to the FWS the findings of that monitoring.

TERMS AND CONDITIONS—MOUNT GRAHAM RED SQUIRREL

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

The following term and condition implements reasonable and prudent measure #1 for MGRS:

- 1.1 The FS shall participate in the annual Fall MGRS census and shall submit this information in the Forest Service's Endangered Species Act Report submitted annually to the FWS, including the Arizona Ecological Services Field Office. The report shall summarize tasks accomplished under the conservation measures and terms and conditions. The report shall make recommendations for modifying or refining the conservation measures or project activities to enhance listed species protection or reduce needless hardship on the FS and its contractors or permittees. These reports also shall briefly document for the previous calendar year the conditions and locations of listed species observed, and, if any are found dead, suspected cause of mortality.
- 1.2 Should either FWS or FS determine further discussion is required based on the results included in any annual report, a meeting shall be convened accordingly.

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

Disposition of Dead or Injured Listed Species

Upon locating a dead, injured, or sick listed species initial notification must be made to the FWS's Law Enforcement Office, 4901 Paseo del Norte NE, Suite D, Albuquerque, NM 87113; 505-248-7889) within three working days of its finding. Written notification must be made

within five calendar days and include the date, time, and location of the animal, a photograph if possible, and any other pertinent information. The notification shall be sent to the Law Enforcement Office with a copy to this office. Care must be taken in handling sick or injured animals to ensure effective treatment and care, and in handling dead specimens to preserve the biological material in the best possible state.

CONSERVATION RECOMMENDATIONS—MOUNT GRAHAM RED SQUIRREL

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. We recommend that you continue to assist us in the implementation of the MGRS Recovery Plan and its revisions, including providing funding for carrying out key recovery actions under your authorities.

In order for the FWS to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the FWS requests notification of the implementation of any conservation recommendations.

STATUS OF THE SPECIES AND CRITICAL HABITAT—MEXICAN SPOTTED OWL

In 1993, the FWS listed the Mexican spotted owl (hereafter, referred to as Mexican spotted owl, spotted owl, owl, and MSO) as threatened under the Act (58 FR 14248) and designate critical habitat in 2004 (69 FR 53182). The FWS appointed the Mexican spotted owl Recovery Team in 1993 (USFWS 1993), which produced the Recovery Plan for the Mexican spotted owl in 1995 (USFWS 1995). The FWS released the final Mexican spotted owl Recovery Plan, First Revision (Recovery Plan) in December 2012 (USFWS 2012).

A detailed account of the taxonomy, biology, and reproductive characteristics of the Mexican spotted owl is found in the Final Rule listing the owl as a threatened species (58 FR 14248), the original Recovery Plan (USFWS 1995), and in the revised Recovery Plan (USFWS 2012). We include the information provided in those documents by reference.

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

In addition to this natural variability in habitat influencing owl distribution, human activities also vary across the owl's range. The combination of natural habitat variability, human influences on owls, international boundaries, and logistics of implementation of the Recovery Plan necessitates subdivision of the owl's range into smaller management areas. The 1995 Recovery Plan subdivided the owl's range into 11 "Recovery Units" (RUs): six in the United States and five in Mexico. In the revision of the Recovery Plan, we renamed RUs as "Ecological Management Units" (EMUs) to be in accord with current FWS guidelines. We divided the Mexican spotted owl's range within the United States into five EMUs: Colorado Plateau (CP), Southern Rocky Mountains (SRM), Upper Gila Mountains (UGM), Basin and Range-West (BRW), and Basin and Range-East (BRE) (USFWS 2012a, p. 9). Within Mexico, the Revised Recovery Plan delineated five EMUs: Sierra Madre Occidental Norte, Sierra Madre Occidental Sur, Sierra Madre Oriental Norte, Sierra Madre Oriental Sur, and Eje Neovolcanico.

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

We are currently working with the Southwestern Region of the Forest Service to conduct a pilot study for the population monitoring recommended in the revised Recovery Plan (USFWS 2012). The effort to conduct this work has occurred during the 2014-2019 breeding seasons on National Forest System (NFS) lands in Arizona and New Mexico. The Recovery Team, Forest Service, and the Bird Conservancy of the Rockies (BCR, contractor) are continuing to collect data and develop a strategy for incorporating additional lands (e.g., National Park Service, Bureau of Land Management, Department of Defense) into the monitoring. Currently, based on the work conducted by the Forest Service and BCR, we have a process for conducting rangewide population monitoring, but we need to develop the potential strategy and funding mechanisms for collecting rangewide habitat monitoring data.

The FWS cited two primary reasons for the original listing of the Mexican spotted owl in 1993: (1) The historical alteration of its habitat as the result of timber-management practices; and, (2) the threat of these practices continuing. We also identified the danger of stand-replacing fire as a looming threat at that time. Since publication of the original Recovery Plan (USFWS 1995), we have acquired new information on the biology, threats, and habitat needs of the Mexican spotted owl. Threats to its population in the U.S. (but likely not in Mexico) have transitioned from commercial-based timber harvest to the risk of stand-replacing wildland fire (USFWS 2012).

Recent forest management has moved away from a commodity focus and now emphasizes sustainable ecological function and a return toward pre-settlement fire regimes, both of which have potential to benefit the spotted owl. However, as stated in the revised Recovery Plan (USFWS 2012), there is much uncertainty regarding thinning and burning treatment effects and the risks to owl habitat with or without forest treatment as well. Therefore, efforts to reduce fire risk to owls should be designed and implemented to evaluate the effects of treatments on owls, and retention of or movement towards desired conditions.

Southwestern forests have experienced larger and more severe wildland fires from 1995 to the present, than prior to 1995. Climate variability combined with unhealthy forest conditions may also synergistically result in increased negative effects to habitat from fire. The intensification of natural drought cycles and the ensuing stress placed upon overstocked forested habitats could result in even larger and more severe fires in owl habitat.

Currently, high-severity, stand-replacing fires are influencing the persistence ponderosa pine and mixed conifer forest types in Arizona and New Mexico. Uncharacteristic wildland fire is probably the greatest threat to the Mexican spotted owl within the action area and fire severity and size have been increasing. Landscape level wildland fires, such as the Rodeo-Chediski Fire (2002), the Wallow Fire (2011), and the Whitewater-Baldy Complex (2012) have resulted in the loss of tens of thousands of acres of occupied and potential nest/roost habitat across significant portions of the Mexican spotted owl's range. Although owls will forage in severely burned areas, habitat is often lacking for nesting and roosting in these areas, particularly when high severity fire affects large patches of habitat (Jones et al. 2016). Fuels reduction treatments, though critical to reducing the risk of severe wildland fire, can have short-term adverse effects to owls through habitat modification and disturbance. As the human population grows in the southwestern United States, small communities within and adjacent to wildlands are being developed. This trend may have detrimental effects to spotted owls by further fragmenting habitat and increasing disturbance during the breeding season.

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

Historical and current anthropogenic uses of Mexican spotted owl habitat include both domestic and wild ungulate grazing, recreation, fuels reduction treatments, resource extraction (e.g., timber, oil, gas), and development. These activities have the potential to reduce the quality of owl nesting, roosting, and foraging habitat, and may cause disturbance during the breeding season. Livestock and wild ungulate grazing is prevalent throughout the range of the owl and

can have a negative effect on the availability of grass cover for prey species. Recreation effects are increasing throughout the Southwest, especially in meadow and riparian areas. There is anecdotal information and research that indicates that owls in heavily used recreation areas are much more erratic in their movement patterns and behavior.

Several fatality factors have been identified as particularly detrimental to the Mexican spotted owl, including predation, starvation, accidents, disease, and parasites. For example, West Nile Virus also has the potential to effect the Mexican spotted owl. We have not documented the virus in spotted owls in Arizona, New Mexico, and Colorado, and preliminary information suggests that owls may be highly vulnerable to this disease (Courtney et al. 2004). Unfortunately, due to the secretive nature of spotted owls and the lack of intensive monitoring of banded birds, we will most likely not know when owls contract the disease or the extent of its affect to the owl range-wide.

Critical Habitat

The FWS designated critical habitat for the Mexican spotted owl in 2004 on approximately 8.6 million acres (3.5 million hectares) of Federal lands in Arizona, Colorado, New Mexico, and Utah (69 FR 53182). Critical habitat includes only those areas in designated critical habitat units (CHUs) that meet the definition of protected (PAC and steep slopes, as defined) and restricted (now called “recovery”) habitat (unoccupied owl foraging, dispersal, and future nest/roost habitat) as defined in the 1995 Recovery Plan (USFWS 1995). The Primary Constituent Elements (PCEs) for Mexican spotted owl critical habitat were determined from studies of their habitat requirements and information provided in the Recovery Plan (USFWS 1995). Since owl habitat can include both canyon and forested areas, we identified PCEs for both areas. The PCEs identified for the owl within mixed-conifer, pine-oak, and riparian forest types that provide for one or more of the owl’s habitat needs for nesting, roosting, foraging, and dispersing are:

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

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

Mexican spotted owl critical habitat also includes some steep-walled rocky canyonlands that occur typically within the Colorado Plateau EMU, but also occur in other EMUs. This habitat does not occur within the action area of this consultation, so the PCEs are not included here or analyzed in this Biological Opinion.

Overall, the status of the owl and its designated critical habitat has not changed significantly range-wide in the U.S. (which includes Utah, Colorado, Arizona, New Mexico, and extreme southwestern Texas). What we mean by this is that the distribution of owls continues to cover the same area, and critical habitat is continuing to provide for the life history needs of the Mexican spotted owl throughout all of the EMUs located in the U.S. We do not have detailed information regarding the status of the Mexican spotted owl in Mexico, so we cannot make inferences regarding its overall status.

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

Previous Consultations

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

ENVIRONMENTAL BASELINE—MEXICAN SPOTTED OWL

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

Status of the species and critical habitat within the action area

The PERP analysis area lies entirely within the BRW EMU the Pinaleño Ecosystem Management Area (EMA) of the Coronado NF. The EMU consists of vegetation transitioning from desert scrubland and semi-desert grassland in the valleys upward to montane forests. The EMU contains forested habitats and steep, forested canyon habitats, but not canyon habitat as

described in the MSO final critical habitat rule. Montane vegetation includes interior chaparral, evergreen oak woodlands, and Madrean pine-oak woodlands at low and middle elevations, with ponderosa pine, mixed conifer, and spruce-fir forests at higher elevations. Topography is steep, and habitat is not continuous. Owls occupy a wide range of habitat types within the EMU.

We designate PACs around known owl nest/roost sites and they are a minimum of 600 acres in size (USFWS 2012). Within PACs, biologists draw a 100-acre nest core surrounding the nest or roost sites within a PAC. The Forest Service and FWS updated the PACs and cores in 2019 based on survey data. Eight PACs did not have recent owl information to establish core areas, and biologists are targeting these areas this 2019 breeding season to attempt to find nests and roosts for core designation.

Within the overall project area, there are 12 PACs totaling 6,878 acres, but not all of each PAC lies completely within the project area and only 11 of the 12 PACs include thinning and/or fuels reduction treatments. The BA lists the PACs and nest core acres within the project area in Table 4. Six more PACs are within 0.5 mile of proposed treatment areas. There are 298 acres of recovery (suitable but unoccupied) habitat within PERP that the Forest Service proposes to treat.

The PERP project area is located within Mexican spotted owl critical habitat unit (CHU) BRW 8. This unit is located southwest of Safford, Arizona and is centered on the Pinaleño Mountains and contains much of the owl habitat within that mountain range. This CHU encompasses approximately 17,791 total acres, but not all of this area is critical habitat. We consider only Federal lands that meet the definition of protected or recovery habitat within the CHU critical habitat, unless otherwise exempted. The original PERP ROD proposed the mechanical and prescribed burning treatment of 2,898 acres of primarily mixed conifer critical habitat. The modified proposed action as described in the PERP SIR will mechanically treat and pile burn approximately 1,648 acres of critical habitat. These acres completely overlap with the PAC and recovery habitat acres described above.

Based upon analyses completed by the Forest Service, current conditions are inhibiting the recruitment of old-growth trees, thereby not favoring the creation of large snags in stands and accumulation of large down logs on the forest floor over time. Current data for many of these areas indicates that there is an excess supply of coarse woody debris due to the exclusion of frequent, low-severity fire, which can increase the likelihood of high-severity fire within owl recovery habitat. In addition, the high number of smaller diameter (<12 inches DBH) trees per acre is preventing the development of a structurally and biologically diverse assemblage of tree and understory species. Lack of stand diversity excludes conditions that support a wide variety of prey species for spotted owls.

Factors affecting the species and critical habitat within the action area

The action area consists primarily of National Forest System (NFS) lands, and there are few State, tribal, or private actions affecting the Mexican spotted owl or its critical habitat. Key factors that have affected the owl within the action area are stand-replacing wildfire, fuels reduction and forest restoration projects, fire and fuels management, maintenance of vegetation

along roads and utility corridors, lands projects involving infrastructure repair/maintenance and management of permitted private inholdings, and recreation.

The PERP project area is of high scenic, cultural, wildlife, and recreational value. Public use of the project area is moderate, with uses including non-motorized trails, recreation residences, and camping. The area also has religious significance to several Native American tribes in the region.

Historically, logging was a significant human activity affecting MSO habitat in the Pinaleno Mountains. By 1973, the Forest Service cut most accessible and marketable timber, affecting the age structure and density of many stands (USFWS 1993). Since that time, commercial logging ceased, but the action area contains summer-home permittees, and recreational use by hikers, campers, birders, wildlife and plant collectors, fuel wood collectors, and hunters, as well as use by researchers and biological monitoring. The 1996 Clark Peak, the 2004 Nuttall Complex, and the 2017 Frye wildfires and their associated suppression activities resulted in loss and modification of owl habitat and disturbance effects to MSO within the action area.

The Forest Service began implementing treatments under PERP within six PACs prior to the 2017 Frye Fire (Grant Vista, Moonshine Creek, Grant Hill, Upper Cunningham, Treasure Park, and Lower Cunningham PACs). The Forest Service completed treatment on approximately 98 acres, and operators are currently treating 203 PAC acres within the PERP project area. The Forest Service and contractors are completing yearly surveys of MSO in the area. The BA includes information (Appendix A, BA) regarding specific factors affecting each PAC within the action area.

EFFECTS OF THE ACTION—MEXICAN SPOTTED OWL

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

The protection of PACs in the Pinaleno EMA require active management to reduce fuel loads in areas adjacent to or within PACs to reduce the potential of stand replacing fires. These treatments are strategic and intended to balance short- and long-term conservation of MSO habitat. The original PERP ROD proposed approximately 2,217 acres of treatment (mechanical and burning) in 12 PACs with treatment in four core areas. Since the ROD, the Forest Service thinned approximately 98 PAC acres, and 203 acres are currently in the process of treatment.

The revised project proposes to treat approximately 1,351 acres in 11 PACs (compared to previously proposed 2,217 acres in 12 PACs), with proposed treatment of approximately 87 acres within in six known cores areas (compared to previously proposed 163 acres in four core areas). Six additional PACS occur within 0.5 mile of the project. The acreage of treatment

within the cores has been reduced overall and now occurs on the edge areas of these known core areas. The increase in the treatment in the number core areas is not due to adding more treatment units, but rather the subsequent re-draw of the PAC nest cores post-wildfire resulted in adjustments of some existing core areas to ensure better nesting/roosting habitat protection and better represent recent owl locations.

There are approximately 298 acres of recovery habitat within the PERP project area that the Forest Service proposes for treatment in the modified proposed action. The modified proposed action will not include mastication or broadcast burning prescriptions in MSO habitat, but will include pile burning. Treatment actions, outside of core areas, may potentially occur during MSO breeding season (March 1 through August 31). This is due to the accelerated timeline, short work season on top of Mount Graham, and logistical limitations of the road and weather conditions at high altitude that require flexibility in timeframe implementation to occur as soon as possible.

The following is a discussion of the potential effects from activities associated with PERP on the Mexican spotted owl. Below we summarize the potential effects of thinning and fuels reduction treatments, pile burning, transportation, and disturbance (noise, smoke) on owls and their habitat.

Thinning/Fuels Reduction

The modified proposed vegetation thinning activities would treat approximately 1,351 acres of Mexican spotted owl PACs (see Table 4 in BA), moving the stand condition toward an uneven-aged structure using mechanical and hand thinning and pile burning. The PERP project might result in the short-term loss of key habitat components. Within PACs, treatments treating trees up to 18 inches DBH in the remaining portion of the PAC would remove trees used for foraging, roosting, and, possibly nesting. Mechanical thinning may affect habitat by reducing snags, downed logs, woody debris, multi-storied canopies, and dense canopy cover. In addition, the proposed activities may change the structure of owl prey species' habitat, affecting the abundance and composition of prey species. Although these activities may have adverse effects to spotted owl prey species and habitat in the short-term, the proposed treatments will benefit prey species and habitat in the long-term by reducing the risk of severe, stand-replacing wildland fire, as well as opening the tree canopy, thereby releasing understory vegetation for increased growth.

To minimize the effects of these silvicultural treatments, group selection of trees based on size-classes and variable density thinning will be applied so that approximately one third of the groups of trees within a stand will have wide spacing, while approximately two thirds will have a close spacing (or not be thinned at all). Group sizes will vary between 0.25 acre and 1.25 acres. This should create a variably aged stand with large trees within the PAC and improve habitat in the long-term. The modified proposed action will treat basal area to a range of 130-170 ft² per acre in all management areas to achieve an average 150 ft². The treatments in PACs will strive for creating conditions where >16 inch DBH trees comprise 50% of the stand basal area. These basal area thresholds will maintain interlocking crown component and the associated higher canopy cover. A minimum of six large snags and logs, each, per acre will be retained or created

(i.e., felling snags to create logs) in the PAC, which should maintain and improve owl prey species habitat.

For six PACs (Chesley Flat, Grant Vista, Lower Cunningham, Ash Creek, Treasure Park, and Grant Hill), treatments will occur within the PACs and within the core areas (87 acres). Treatments within cores will not occur during the breeding season (March 1 to August 31). Because we do not have good information regarding the effects of thinning in nest core areas, the Recovery Plan does not recommend mechanically treating or heavily hand thinning core areas. However, the Forest Service is proposing these treatments in order to improve the long-term sustainability of owl habitat in the action area.

However, because we have so little information on how to thin core areas and maintain owl habitat, the Forest Service has agreed to maintain a 200-foot “no treatment” buffer around known nest trees. In all cases but two, all known nest sites are already farther than 200 ft from any treatment unit (Table 5 in BA). In addition, thinning treatments within cores will focus on removing ladder fuels and will not remove trees greater than nine inches DBH. Therefore, although the PERP project might result in the short-term loss of some key habitat components; thinning of nine-inch DBH trees in the nest/roost core would not remove potential nest trees. The Forest Service will also buffer newly discovered nest sites by 200 feet as well. Conducting surveys prior to and during implementation will help locate nesting sites and prevent modifying the nest tree and nest grove.

The proposed action will mechanically treat fuels in recovery habitat. In some of the existing recovery habitat, key habitat components are present, but these areas are highly affected by past stand-replacing wildfires. Mexican spotted owls likely utilize these areas for foraging, but there is little existing potential nest/roost habitat within these areas. However, the Forest Service will treat stands with the most potential to grow more nest/roost components in the future in such a way to develop those components.

The treatments would create small canopy gaps within forested patches, which may provide habitat diversity for owl prey. A reduction in tree canopy cover from mechanical treatment will allow greater sunlight to the understory grasses and herbaceous layer. Increased plant production and diversity would support an increased prey base for foraging. Improved foraging success for the spotted owl improves its chances for survival and reproduction. The prescriptions will assist in creating stands with more mature and large DBH trees, while limiting the number of small and medium-sized trees that exceed desired forest conditions.

Pile Burning

Pile burning of treatment slash or excessive fuels will reduce the conditions needed for severe wildfire and release important nutrients back into the soil. Pile burning will occur in the cool season (outside MSO breeding season) in and adjacent to PACs and recovery habitat when appropriate weather conditions occur that will allow for good burning conditions and limited effect to sensitive resources. There could be some smoke effects, but they should be short lived. The smoke might settle at night after treatments but at significantly lower levels than would occur during a wildfire. Because of the steep, mountainous topography of the project area, the

air current lift is strong and smoke typically does not settle. We expect smoke effects to MSO to be insignificant and discountable because of the light smoke levels produced and the strong air currents on the mountain that limit the ability of the smoke to settle into low areas.

Transportation and Roads

As a part of this project, the Forest Service will conduct road improvement work. This work will include:

- Constructing temporary roads and rehabilitating the roads after use,
- Clearing encroaching vegetation on system roads,
- Opening and using closed system roads (and closing them again after use),
- Improving system roads where needed, and
- Maintaining system roads.

Depending upon where road construction and rehabilitation occurs, there may be effects to both key habitat components (removal of large trees to create or open a road) and noise due to road maintenance.

Hauling of logs by log trucks in or adjacent to PACs could lead to collisions with owls, particularly early in the morning or at dusk when the birds are foraging. Even though log trucks and other machinery will not be driving fast because of the primitive and winding road, a small increase in traffic due to logging operations is likely, particularly at pre-dawn and around sunset hours, when owls are most active. Although the BA states that traffic is generally light, and there is only one reported fatality of an owl due to collision in the past 5 years, there is an increased potential over the next few years for owls to collide with project-related vehicles.

Disturbance

We expect that implementation of PERP will result in disturbance effects during the breeding season to MSO as mechanical treatments could occur in 11 PACs, but outside of known core areas, during the owl breeding season. The intention of allowing activities during the breeding season within PACs would be speed completion of the project. Activities that could result in disturbance to nesting, roosting, and foraging Mexican spotted owls could be caused by thinning and pile burning, fuels reduction, road construction and maintenance, hauling harvested forest materials, and road rehabilitation.

There are a growing number of studies attempting to describe and quantify the effects of non-lethal disturbance on the behavior and reproduction of wildlife, and Mexican spotted owls in particular. Delaney et al. (1997) reviewed literature on the response of owls and other birds to noise and concluded the following: 1) raptors are more susceptible to disturbance-caused nest abandonment early in the nesting season; 2) birds generally flush in response to disturbance when distances to the source are less than approximately 200 ft and when sound levels are in excess of 95 dBA; and 3) the tendency to flush from a nest declines with experience or habituation to the noise, although the startle response cannot be completely eliminated by

habituation. Delaney et al. (1999) found that ground-based disturbances elicited a greater flush response than aerial disturbances. Delaney and Grubb (2004) determined that spotted owls are capable of hearing sounds from road maintenance equipment to a distance of at least 0.25 mile. Our guidance is to limit potentially disturbing activities to areas ≥ 0.25 mile from Mexican spotted owl nest sites during the breeding season (March 1 - August 31). This corresponds well with the Delaney et al.'s (1999) 0.25-mile threshold for alert responses to helicopter flights. In addition, Delaney et al. (1999) found that Mexican spotted owls did not flee from helicopters when caring for young at the nest, but fled readily during the post-fledgling period. Frid and Dill (2002) hypothesize that using predator risk-disturbance theory may explain this behavior, and perhaps the cost of an adult spotted owl fleeing during the nestling period may be higher than during the post-fledgling period.

Proposed treatments will occur either in or adjacent to PACs, core areas, and recovery habitat. Treatments may occur within the breeding season, but treatments in core areas would occur outside the breeding season. For five PACs (Rigg's Flatt, Webb Peak, Upper Cunningham, Mill Site, and Heliograph Peak), treatments during the breeding season are proposed to occur in the PAC, but no treatment units occur in the core areas. The percentage of PAC acreage treated will range from a minimum of 0.8% to 62% of the PAC area. Mechanical treatment during the breeding season in PACs may disturb nesting, roosting, or foraging owls; therefore, there is the potential for noise to affect MSO. There is a potential for owls to relocate because of noise disturbance during treatment activities. No mechanical treatments would occur within any of the six known nest cores during the breeding season (unless non-nesting is determined per FWS survey protocol), but treatments will occur across up to 11 PAC areas during the breeding season.

For the 6 PACs within 0.5 mile of a treatment area (Lefthand Canyon, Goudy Canyon, Hagen's Point, Marijilda Canyon, Wet Canyon, and Moonshine Creek), treatments within 0.5 mile of the PAC could occur during the breeding season, but effects will be limited due to the distance from ground-based disturbance and the intervening topography that will likely aid in attenuating noise.

Summary

The PERP has done an excellent job of including measures to protect the Mexican spotted owl and its habitat by deferring management activities in core areas during the breeding season, and attempting to minimize breeding season disturbance to Mexican spotted owls from proposed activities.

Even with these efforts, however, the proposed action will likely result in short-term adverse effects to owl and its habitat. There is likely to be short-term disturbance to breeding owls as thinning activities would occur during the breeding season in PACs (even with the substantial efforts included to minimize these effects), some loss of key habitat components (large trees, snags, and logs), and some degree of potential for direct fatality from vehicular collisions due an increase in project traffic. Implementation of the project should result in benefits to the owl through habitat enhancement and fire risk reduction.

Critical habitat

In our analysis of the effects of the action on critical habitat, we consider whether a proposed action will result in the destruction or adverse modification of critical habitat. In doing so, we must determine if the proposed action will result in effects that appreciably diminish the value of critical habitat for the recovery of a listed species. To determine this, we analyze whether the proposed action will adversely modify any of the PCEs that were the basis for determining the habitat to be critical. To determine if an action results in adverse modification of critical habitat, we must also evaluate the current condition of all designated CHUs, and the PCEs of those units, to determine the overall ability of all designated critical habitat to support recovery. Further, we must consider the functional role of each of the CHUs in recovery because, collectively, they represent the best available scientific information as to the recovery needs of the species.

Below, we describe the PCEs related to forest structure and maintenance of adequate prey species and the effects from implementation of PERP. We did not analyze the PCEs for steep-walled rocky canyonlands in this BO because this habitat does not occur within the action area.

The original PERP ROD proposed the mechanical and prescribed burning treatment of 2,898 acres of designated critical habitat, which was primarily comprised of mixed conifer. The modified proposed action as described in the PERP SIR will mechanically treat and pile burn approximately 1,648 acres of critical habitat.

Primary Constituent Elements related to forest structure:

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

Effect: We expect that actions implemented under the proposed project to retain the range of tree species (i.e., conifers and hardwoods associated with Mexican spotted owl habitat) and would not reduce the range of tree sizes needed to create the diverse forest and multi-layered forest canopy preferred by owls. In addition, these actions should aid in growing larger trees by reducing competition among trees for nutrients, sunlight, and moisture. Some loss of trees of all types and dbh size classes would occur during mechanical thinning. However, we expect that actions implemented under the PERP will maintain a range of tree species and sizes needed to maintain this PCE in PACs and recovery habitat across the treatment area because the Forest Service is implementing the Recovery Plan (USFWS 2012) guidelines that strive to retain large trees, appropriate canopy cover, and a diverse range of tree species. The treatments that will reduce key habitat components in the short-term are also designed to develop an uneven aged structure and to increase the number of large trees in critical habitat over time. This will result in long-term benefits to this PCE and owl habitat.

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

Effect: We expect that the proposed action will reduce tree shade canopy following thinning treatments. However, we do not expect canopy cover in Mexican spotted owl forested habitat to

be reduced below 40 percent because the Forest Service would retain multi-layered canopies where they occur in PAC and recovery habitat and patches of regeneration would be interspersed throughout the thinning treatment areas, which, over time would contribute to development of multi-layered canopy structure. We would expect that some reduction in existing canopy cover (5 to 10 percent) might actually aid in increasing understory herbaceous vegetation and forb production, which could benefit Mexican spotted owl prey species. Because recovery habitat would retain canopy closure of 40 percent or more with a goal of developing larger trees, the proposed action will not compromise the function and conservation role of this PCE.

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

Effect: There would be a loss of snags within areas logged by cable logging. Snags used by Mexican spotted owls for nesting are typically very old, large dbh, highly decayed snags with cavities. Snags with these characteristics tend to be limited in ponderosa pine and mixed conifer forests in northern Arizona (Ganey and Vojta 2004). In thinning treatments, the Forest Service will implement conservation measures to protect the largest and oldest snags. Therefore, although we anticipate there would be a measurable loss of snags due to implementation of the proposed action, efforts to protect this rare resource will minimize this loss, and the proposed action will not compromise the function and conservation role of this PCE.

Primary Constituent Elements related to maintenance of adequate prey species:

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

Effect: The proposed action will reduce fallen trees and woody debris as part of the fuels reduction portion of the project. The loss of larger logs could result in short-term adverse effects to this primary constituent element and could result in localized effects to prey species habitat. The Forest Service will minimize the loss of large logs through implementation of the conservation measures. In addition, current data for many of these areas indicates that there is an excess supply of coarse woody debris due to the exclusion of frequent, low-severity fire, which can increase the likelihood of high-severity fire within recovery habitat. Therefore, some removal of woody debris would result in an overall benefit to the function and conservation role of this PCE, though short-term adverse effects would likely occur within some areas.

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

Effect: We expect the action will positively affect this PCE. Plant species richness would increase following thinning treatments that result in small, localized canopy gaps. The PERP includes conservation measures that focus on retaining hardwood and coniferous species but some level of short-term loss could occur during logging operations or road construction/maintenance. However, the proposed action will not compromise the function and conservation role of this PCE.

In addition, although aspen is not a cover type Mexican spotted owl's use, it occurs in inclusions within PAC and recovery habitat. Treatments that improve aspen persistence will likely enhance Mexican spotted owl prey habitat, albeit in a relatively small area, within the CHU.

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

Effect: We expect long-term increases in residual plant cover because fuel treatments would provide conditions suitable for increased herbaceous plant growth by removing a thick layer of dead plant debris within treated areas and, in turn, assist in the production and maintenance of the Mexican spotted owl prey base. Therefore, the proposed would not compromise the function and conservation role of this PCE.

Effects of the action on the role of critical habitat in recovery

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

- The Forest Service within the project area has and continues to designate 600 acres surrounding known Mexican spotted owl nesting and roosting sites. We establish PACs around owl sites to protect and maintain occupied nest/roost habitat. Nesting and roosting habitat is rare across the range of the Mexican spotted owl, and by identifying these areas, which are also critical habitat, for increased protection, the Forest Service is aiding in recovery.
- The PERP has identified and is managing mixed conifer forests that have potential for becoming Mexican spotted owl recovery nest/roost replacement habitat, or are currently providing habitat for foraging, dispersal, or wintering habitats. Nesting and roosting habitat is a limiting factor for the owl throughout its range. By managing critical habitat for future nest/roost replacement habitat, the Forest Service is aiding in recovery.
- The PERP's intent is to integrate owl habitat objectives where possible into the proposed fuels reduction treatments with the overall goal to protect owl PACs and nest cores from high-severity wildland fire and to conduct actions to improve forest sustainability (e.g., thinning and fuels reduction). This management will ensure that Mexican spotted owl habitat continues to exist on the forest and that critical habitat will continue to retain its function for conservation and recovery of the owl.

Over the long-term, these actions should increase the sustainability and resiliency of Mexican spotted owl habitat (particularly through fuels and forest management actions). Therefore, we think that the implementation of the PERP will not diminish the conservation contribution of critical habitat to the recovery of the Mexican spotted owl.

CUMULATIVE EFFECTS—MEXICAN SPOTTED OWL

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

The U.S. Forest Service manages almost all lands within the action area and administers projects and permits on those lands; thus, almost all activities that could potentially affect MSO are Federal activities and subject to additional section 7 consultation under the Act. The exceptions are road improvements proposed by the Arizona Department of Transportation (ADOT) that could occur along Swift Trail. These could include selectively removing large trees that pose a hazard to drivers, as well as paving the road past the end of the existing pavement (and possibly other side roads, such as the road to the telescopes) that experience more traffic and thus generate dust (Arizona Department of Transportation 2011). This could increase both the speed and number of vehicles through this part of the action area. Greater speeds and numbers of vehicles could impact MSO by injuring or killing individuals that collide with them.

JEOPARDY AND ADVERSE MODIFICATION ANALYSIS—MEXICAN SPOTTED OWL

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

Jeopardy Analysis Framework

Our jeopardy analysis relies on the following:

“Jeopardize the continued existence of” means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR 402.02). The following analysis relies on four components: (1) Status of the Species, which evaluates the range-wide condition of the listed species addressed, the factors responsible for that condition, and the species’ survival and recovery needs; (2) Environmental Baseline, which evaluates the condition of the species in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of the species; (3) Effects of the Action (including those from conservation measures), which determines the direct and indirect effects of the proposed federal action and the effects of any interrelated or interdependent activities on the species; and (4) Cumulative Effects, which evaluates the effects of future, non-federal activities in the action area on the species. The jeopardy analysis in this biological opinion emphasizes the range-wide survival and recovery needs of the listed species and the role of the action area in providing for those needs. We evaluate the significance of the proposed Federal action within this context, taken together with

cumulative effects, for making the jeopardy determination.

Destruction/Adverse Modification Analysis Framework

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

Similar to our jeopardy analysis, our adverse modification analysis of critical habitat relies on the following four components: (1) the Status of Critical Habitat, which evaluates the range-wide condition of designated critical habitat in terms of [PCEs/PBFs], the factors responsible for that condition, and the intended recovery function of the critical habitat overall; (2) the Environmental Baseline, which evaluates the condition of the critical habitat in the action area, the factors responsible for that condition, and the recovery role of the critical habitat in the action area; (3) the Effects of the Action, which determine the direct and indirect effects of the proposed federal action and the effects of any interrelated or interdependent activities on the PCEs and how they will influence the recovery role of affected critical habitat units; and (4) Cumulative Effects, which evaluate the effects of future, non-federal activities in the action area on the PCEs and how they will influence the recovery role of affected critical habitat units.

Conclusion

After reviewing the current status of the Mexican spotted owl and its critical habitat, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is our biological opinion that the action, as proposed, is not likely to jeopardize the continued existence of the Mexican spotted owl and is not likely to destroy or adversely modify designated owl critical habitat. We base this conclusion on the following:

- The proposed PERP will strive to implement the Recovery Plan (USFWS 2012) and manage for Mexican spotted owl recovery on the Coronado NF.
- Desired conditions and guidelines in the PERP proposed action recognize the need to reduce the potential for landscape level, stand-replacing fire in the ponderosa pine-oak and mixed conifer forests that the Mexican spotted owl occupies. These efforts to improve forest condition and sustainability should reduce the risk of high severity fire and subsequently, reduce the loss of owl habitat, particularly nest/roost habitat.
- Based on the discussion provided in the Effects to Mexican Spotted Owl Critical Habitat section above, treatments conducted under PERP, will ensure that critical habitat in this CHU BRW 8 continues to serve its intended recovery and conservation role.

We base the conclusions of this biological opinion on full implementation of the project as presented in the Description of the Proposed Action section of this document, including any Conservation Measures that the Forest Service incorporated into the project design.

INCIDENTAL TAKE STATEMENT—MEXICAN SPOTTED OWL

Section 9 of the Act and Federal regulations pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. “Take” is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. “Harm” is further defined (50 CFR § 17.3) to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. “Harass” is defined (50 CFR § 17.3) as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. “Incidental take” is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary, and must be undertaken by the Forest Service so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, for the exemption in section 7(o)(2) to apply. The Forest Service has a continuing duty to regulate the activity covered by this incidental take statement. If the Forest Service (1) fails to assume and implement the terms and conditions or (2) fails to require the (applicant) to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the effect of incidental take, the [agency or applicant] must report the progress of the action and its effect on the species to the FWS as specified in the incidental take statement [50 CFR § 402.14(i)(3)].

AMOUNT OR EXTENT OF TAKE—MEXICAN SPOTTED OWL

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

We anticipate that the proposed action is reasonably certain to result in incidental take of Mexican spotted owls. However, it is difficult to quantify the number of individual owls

potentially taken because: (1) dead or impaired individuals are difficult to find and losses may be masked by seasonal fluctuations in environmental conditions; (2) the status of the species could change over time through immigration, emigration, and loss or creation of habitat; and (3) the species is secretive and we rarely have information regarding the number of owls occupying a PAC and/or their reproductive status. For these reasons, we will attribute incidental take at the PAC level. This fits well with our current section 7 consultation policy, which provides for incidental take if an activity compromises the integrity of an occupied PAC to an extent that we are reasonably certain that incidental take occurred (USFWS 1996). Actions outside PACs will generally not result in incidental take because we are not reasonably certain that Mexican spotted owls are nesting and roosting in areas outside of PACs. We may modify this determination in cases when areas that may support spotted owls are not adequately surveyed and we are reasonably certain spotted owls are present.

Based upon analyses of the effects of Forest Service projects within previous mechanical thinning and fuels reduction BOs, we anticipate the majority of incidental take for actions implemented under the PERP proposed action will be in the form of short-term harassment. Owls experiencing short-term harassment may fail to rear young in one or more breeding seasons, but will not likely desert the area because of a short-term disturbance (Delaney et al. 1999); harassment is measured as owls taken associated with a specific number of PACs. Incidental take in the form of harm is also anticipated, albeit at a lesser amount than take from harassment and is measured as the number of owls taken. For this project, harm would be the direct fatality of individual birds.

PERP will affect at least 11 PACs. The Forest Service could treat all 11 PACs during the owl-breeding season, and six of these PACs will include thinning treatments within the nest core area. However, it is most likely that thinning within the Heliograph Peak (115 acres), Lower Cunningham (390 acres), Treasure Park (355 acres), and Upper Cunningham (203 acres) PACs would occur during the breeding season due to the amount of acreage proposed for treatment.

Using available information as summarized within this document, we have identified conditions of incidental take for the Mexican spotted owl associated with implementation of the PERP. Based upon the potential for incidental take to occur as part of implementation of the project, we anticipate the following incidental take for the proposed action:

- We anticipate the take of one pair of Mexican spotted owls and/or associated eggs/juveniles in the form of harassment in up to three PACs per year (breeding season) due to a single (one breeding season) or short-term (one to three breeding seasons) disturbance (non-habitat altering action that disrupts or is likely to disrupt owl behavior within the PACs) or habitat alteration (e.g., short-term loss of key habitat components) associated with conducting thinning activities in PACs during the breeding season. We do not expect that each year, owls associated with three PACs may be taken as a result of short-term disturbance and/or habitat alteration; however, we think the potential is there in any given year depending upon the ability of the Forest Service to have multiple operators working on the project. The disturbance and short-term habitat modification generated by activities associated with PERP is likely to interrupt, impede, or disrupt normal behavior patterns to the point that breeding and feeding activities are affected

over the course of one to three breeding seasons. Incidental take is exceeded if owls associated within an individual PAC are harassed over the course of more than two breeding seasons or if owls associated with more than three PACs are harassed in one year (breeding season) because of this project.

- In addition, we anticipate the incidental take of two Mexican spotted owls in the form of harm and/or direct fatality due to vehicular collision during the five-year life of this project. Following the discovery of two fatalities, we will re-assess the project with the Forest Service and determine how to reduce fatalities.

EFFECT OF THE TAKE—MEXICAN SPOTTED OWL

In this biological opinion, the FWS determines that this level of anticipated take is not likely to result in jeopardy to the MSO, or destruction or adverse modification of MSO critical habitat for the reasons stated in the Conclusions section.

REASONABLE AND PRUDENT MEASURES—MEXICAN SPOTTED OWL

The following reasonable and prudent measures are necessary and appropriate to minimize take of spotted owls:

1. The Forest Service shall monitor incidental take resulting from the proposed action and report to the FWS the findings of that monitoring.

TERMS AND CONDITIONS—MEXICAN SPOTTED OWL

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

The following terms and conditions implement reasonable and prudent measure #1 for MSO:

- 1.1 The Forest Service shall survey the project area and other areas affected by the proposed action to ascertain take of individual owls and/or loss of its habitat that causes harm or harassment to the species. The Forest Service will conduct this monitoring in coordination with the FWS.
- 1.2 The Forest Service shall submit annual monitoring reports to the Arizona Ecological Services Field Office by March 1 beginning in 2020. These reports shall briefly document for the previous calendar year the effectiveness of the terms and conditions and locations of Mexican spotted owls. The report shall also summarize tasks accomplished under the conservation measures and terms and conditions.

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

Disposition of Dead or Injured Listed Species

Upon locating a dead, injured, or sick listed species initial notification must be made to the FWS's Law Enforcement Office, 4901 Paseo del Norte NE, Suite D, Albuquerque, NM 87113; 505-248-7889) within three working days of its finding. Written notification must be made within five calendar days and include the date, time, and location of the animal, a photograph if possible, and any other pertinent information. The notification shall be sent to the Law Enforcement Office with a copy to this office. Care must be taken in handling sick or injured animals to ensure effective treatment and care, and in handling dead specimens to preserve the biological material in the best possible state.

The Fish and Wildlife Service will not refer the incidental take of any migratory bird or bald eagle for prosecution under the Migratory Bird Treaty Act of 1918, as amended (16 U.S.C. § 703-712), or the Bald and Golden Eagle Protection Act of 1940, as amended (16 U.S.C. § 668-668d), if such take is in compliance with the terms and conditions (including amount and/or number) specified herein.

CONSERVATION RECOMMENDATIONS—MEXICAN SPOTTED OWL

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. We recommend that the Forest Service work with us to conduct Mexican spotted owl surveys over the next several years to attempt to determine how owls modify their territories in response to wildland fires on the Coronado NF. This information will aid us in understanding the short- and long-term effects of fire on the owl and its subsequent effect on the status of the species in the BRW EMU. Surveys should be coordinated with the FWS prior to implementation of any project.
2. We recommend that the Forest Service continue to work with us to design forest restoration treatments across the Coronado NF that protect existing spotted owl nest/roost habitat from high-severity, stand-replacing fire, and enhance existing or potential habitat to aid in sustaining Mexican spotted owl habitat across the landscape. PACs can be afforded substantial protection from wildland fire by emphasizing fuels reduction and

forest restoration in surrounding areas outside of PACs and nest/roost habitat.

In order for the FWS to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the FWS requests notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

This concludes formal consultation for the Pinaleño Ecosystem Restoration Project. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

In keeping with our trust responsibilities to American Indian Tribes, we encourage you to continue to coordinate with the Bureau of Indian Affairs in the implementation of this consultation and, by copy of this biological opinion, are notifying the following Tribes of its completion: Ak Chin Indian Community, Fort McDowell Yavapai Nation, Gila River Indian Community, Hopi Tribe, Mescalero Apache Tribe, Pascua Yaqui Tribe, Salt River Pima-Maricopa Indian Community, San Carlos Apache Tribe, Tohono O'odham Nation, Tonto Apache Tribe, White Mountain Apache Tribe, Yavapai-Apache Nation, Yavapai-Prescott Indian Tribe, and Pueblo of Zuni. We also encourage you to coordinate the review of this project with the Arizona Game and Fish Department.

We appreciate the Forest Service's efforts to identify and minimize effects to listed species from this project. Please refer to the consultation number, 22410-2005-F-0651-R001 in future correspondence concerning this project. Should you require further assistance or if you have any questions, please contact Marit Alanen (520-670-6150 x 234) or Julie McIntyre (520-670-6150 x 223).

Sincerely,

Jeffrey A. Humphrey
Field Supervisor

cc (electronic):

Field Supervisor, Fish and Wildlife Service, Phoenix, AZ
Assistant Field Supervisor, Fish and Wildlife Service, Tucson, AZ (Attn: Marit Alanen)
Assistant Field Supervisor, Fish and Wildlife Service, Flagstaff, AZ (Attn: Shaula Hedwall)
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Director, Cultural Preservation Office, Hopi Tribe, Kykotsmovi, AZ
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TABLES AND FIGURES

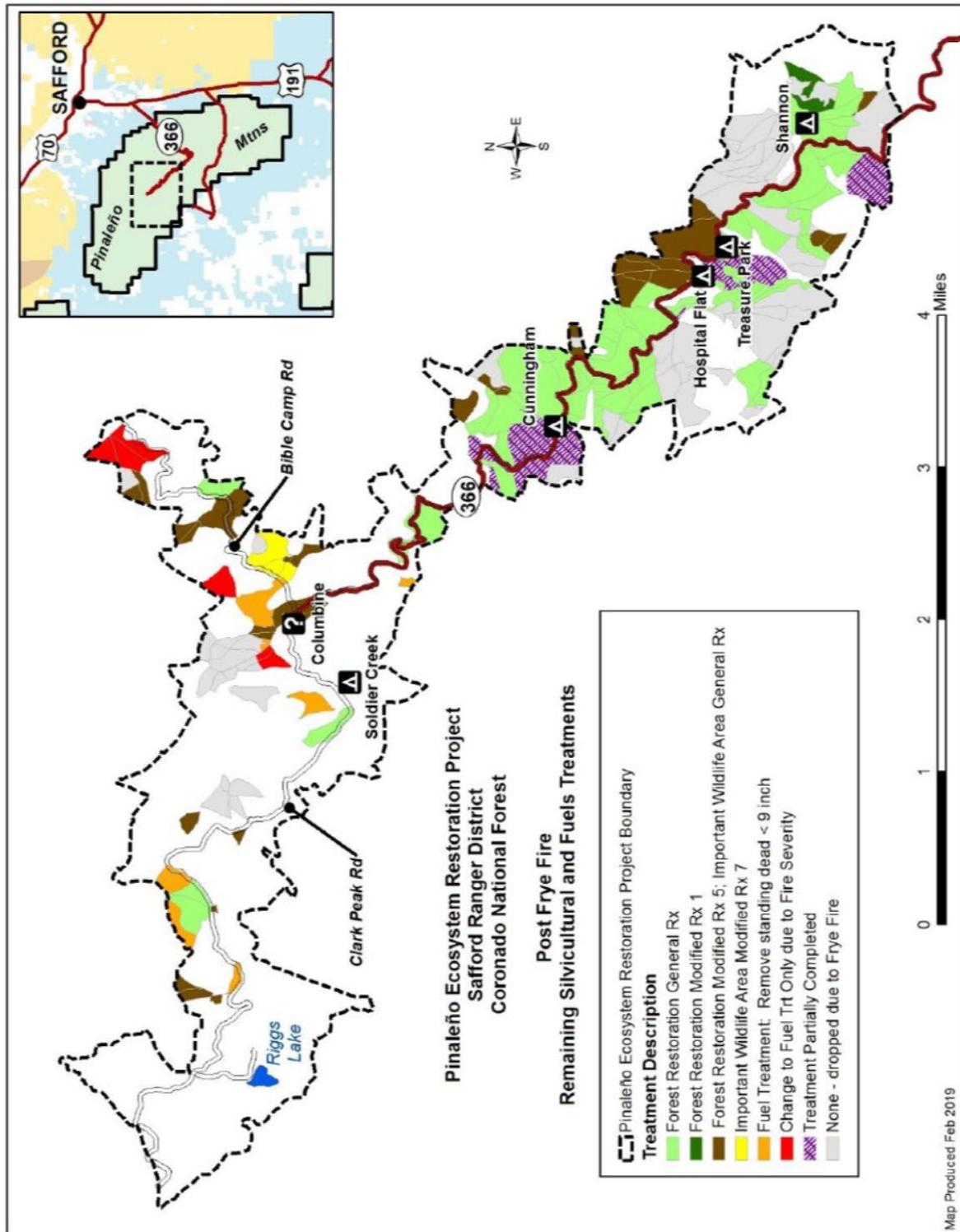


Figure 1. Post-Frye Fire remaining silvicultural and fuels treatment unit prescriptions.

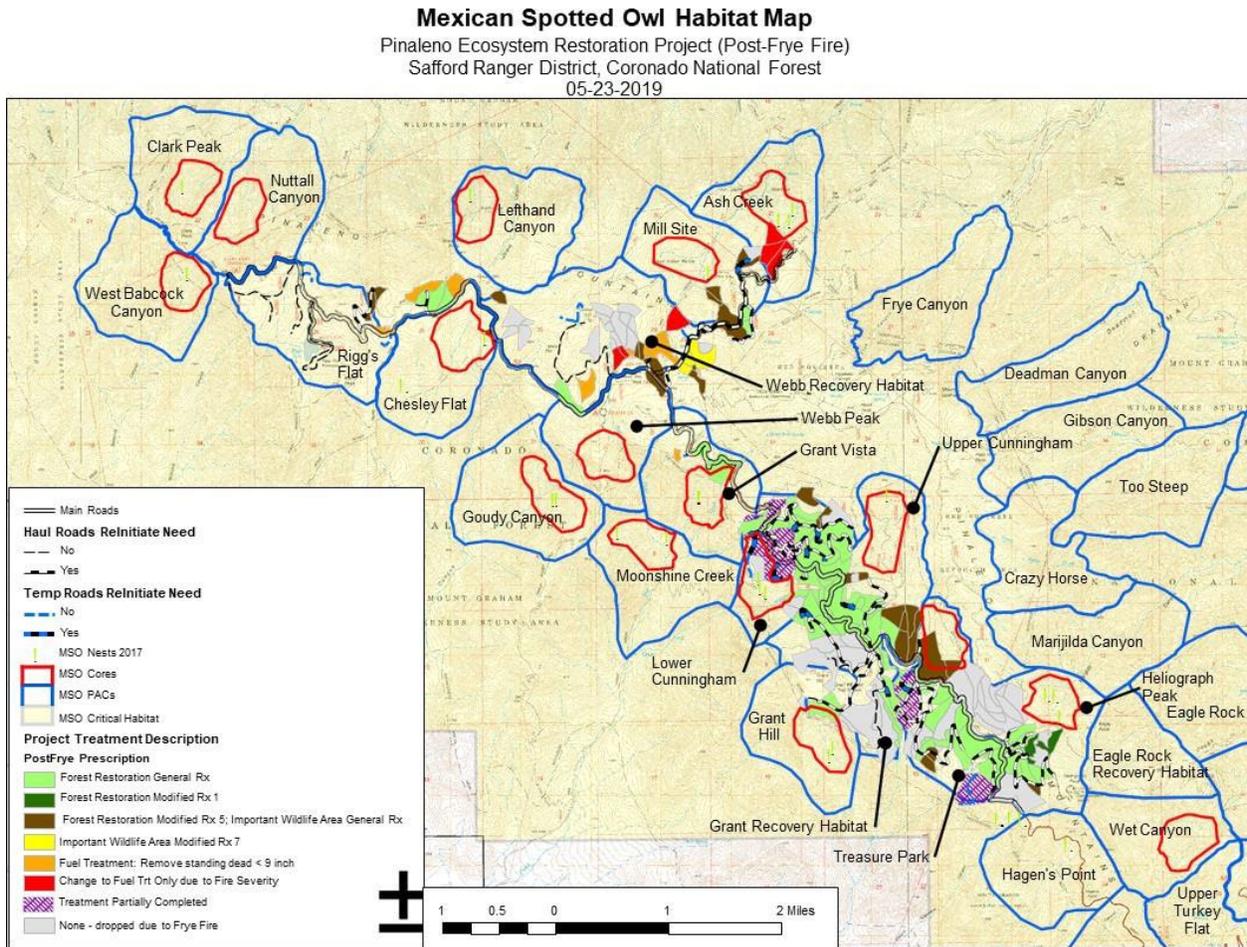


Figure 2. The PERP Modified Proposed Action and Current Mexican spotted owl PACs, cores, recovery habitat.

Table 1. Summary of post-Frye Fire Pinaleno Ecosystem Restoration Plan FEIS unit prescriptions and remaining acreage (acreage for the project as originally proposed was 5,754 acres).

Post-Frye Fire Prescription for Remaining Units	Number of Units/ Partial Units	Acres
Forest Restoration General Rx	72	887.0
Forest Restoration Modified Rx 1	2	25.0
Important Wildlife Area General Rx	32	321.1
Important Wildlife Area Modified Rx 7	3	37.0
Change to Fuel Treatment Only due to Soil Burn Severity	6	76.6
Remove Standing Dead < 9 inch	9	88.0
Treatment in Progress	14	213.3
Grand Total	138	1,648

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APPENDIX A: CONCURRENCES

This appendix contains our concurrences with your “may affect, not likely to adversely affect” determinations for endangered Mount Graham red squirrel (*Tamiasciurus hudsonicus grahamensis*) critical habitat and the threatened Gila trout (*Oncorhynchus gilae*).

Mount Graham red squirrel critical habitat

- The proposed action will treat approximately 37 acres within the 152-acre area of MGRS critical habitat on Heliograph Peak. This is approximately 1.9 percent of the total 1,919 acres of critical habitat designated for the subspecies. Some of this area has been affected by fire and insect outbreaks and does not currently contain the primary constituent element (PCE) of dense stands of mature (about 300 years old) spruce-fir forest, and no treatments will occur where the PCE remains. Therefore, effects to MGRS critical habitat are anticipated to be insignificant.

Gila trout

- Due to the effects of the 2017 Frye Fire, no Gila trout are currently found within the project area (B. Woods 2019, pers. comm.). The nearest location is in Frye Creek approximately one mile downstream from the project boundary where the FS and AGFD reintroduced Gila trout eggs in 2019. Placement of temporary roads and skid roads could minimally increase sediment into the watershed and potentially affect this downstream area. However, streamside protection zones (minimum 150 feet) and best management practices should prevent rilling and channelized flow and prevent fine sediment from entering channels from proposed treatments. Additionally, Forest Service personnel monitor projects for best management practices and erosion control measures to ensure that work is being conducted appropriately (B. Woods 2019, pers. comm.); therefore, if erosion is noted from uphill areas that were severely burned, erosion control methods such as straw wattles, water bars, mulch, erosion control structures, or other methods will be used to reduce this effect. Furthermore, treatments are anticipated to reduce the severity of future wildfires that may take place upstream, thereby reducing the amount of sedimentation that may occur and decreasing the likelihood of future flooding. Therefore, anticipated effects to the Gila trout are anticipated to be discountable, and, over the long-term, beneficial.