United States Department of the Interior

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In Reply Refer To:
AESO/SE
22410-2005-F-0651

August 5, 2011

Mr. James Upchurch, Forest Supervisor
Coronado National Forest
300 West Congress, 6th Floor
Tucson, Arizona 85701

RE: Biological Opinion: Pinaleño Ecosystem Restoration Project

Dear Mr. Upchurch:

Thank you for your request for formal consultation with the U.S. Fish and Wildlife Service (FWS) pursuant to section 7 of the Endangered Species Act of 1973 (16 U.S.C. 1531-1544), as amended (Act). Your request was dated November 19, 2009, and received by us on November 27, 2009. At issue are impacts that may result from the proposed Pinaleño Ecosystem Restoration Project planned to occur in the Pinaleño Mountains of the Safford Ranger District in Graham County, Arizona. The proposed action is likely to adversely affect the Mount Graham red squirrel (*Tamiasciurus hudsonicus grahamensis*) (MGRS), Mexican spotted owl (*Strix occidentalis lucida*) (MSO), and MSO Critical Habitat (CH).

In your letter and subsequent comments on the draft biological opinion, you requested our concurrence that the proposed action may affect, but is not likely to adversely affect, MGRS CH, the Apache trout (*Oncorhyncus apache*), and the Gila trout (*Oncorhyncus gilae*). We concur with your determinations and our rationale is provided in Appendix A.

This biological opinion is based on information provided in your October 30, 2009, biological assessment, the project proposal, telephone conversations, meetings among our staffs, field investigations, and other sources of information. Literature cited in this biological opinion is not a complete bibliography of all literature available on the species of concern, special use permits and effects, or on other subjects considered in this opinion. A complete administrative record of this consultation is on file at our Arizona Ecological Services Office. We encourage you to coordinate the review of the document with the Arizona Game and Fish Department. Additionally, in keeping with our trust responsibilities to American Indian Tribes, we suggest you coordinate this consultation with all Tribes in Arizona, and any other entities that may be affected.

Mr. James Upchurch, Forest Supervisor

CONSULTATION HISTORY

August 26, 2003:	Coronado National Forest (CNF) led a field trip to the Pinaleño Mountains to begin discussions of how to treat high fuel load areas within MGRS and MSO habitat in order to limit the size of possible future fires.
November 4, 2003:	CNF led a field trip focused on the structure protection aspect of this project.
August 5, 2004:	CNF provided a status paper regarding Mt. Graham forest health and fuel reduction projects.
August 25, 2004:	CNF provided us with a project initiation letter for the Pinaleño Ecosystem Restoration Project.
September 2-30, 2004:	We exchanged e-mails regarding issues surrounding threatened and endangered species within the proposed project boundary.
October 12, 2004:	CNF held a meeting to focus on refining the proposed action.
October 15, 2004:	CNF held a meeting to discuss the proposed action and mitigation measures for threatened and endangered species.
December 15, 2004:	CNF held a meeting to discuss the proposed action and alternatives.
January 11, 2005:	CNF held a meeting to discuss the proposed action.
February 10, 2005:	CNF held a meeting to discuss issues regarding the MSO.
March 9, 2005:	CNF held a meeting to discuss updates to the proposed action and the timeline and status of documents.
March 30, 2005:	CNF held a meeting to discuss the proposed action and public scoping notice.
June 8, 2005:	CNF led a two-day field trip and meeting to discuss the proposed action.
July 20, 2005:	CNF held a meeting to discuss fire evaluation criteria.
October 6, 2005:	CNF held an open house in Tucson, Arizona to discuss the proposed action.
October 13, 2005:	CNF held an open house in Safford, Arizona to discuss the proposed action.

October 14 and 15, 2005:	CNF led field trips for the public to sites in the Pinaleño Mountains where treatments were planned.
November 18, 2005:	CNF held a meeting to discuss the open houses, field trips, and new comments from the public.
February 9, 2006:	CNF held a meeting to discuss changes to the project boundaries, treatments, and alternatives.
May 19, 2006:	CNF held a meeting to discuss the proposed action and current information on the MGRS.
November 29-December 1, 2006:	CNF held a meeting with the National Environmental Policy Act (NEPA) Interdisciplinary Team assigned to this project.
January 10, 2007:	CNF held a meeting with the Arizona Game and Fish Department and us to discuss the NEPA Interdisciplinary Team recommendations.
January 11-16, 2007:	We continued to discuss these recommendations with CNF via e-mail.
January 21, 2007:	Biologists from CNF, FWS, and Arizona Game and Fish Department made recommendations regarding impacts to the MGRS due to the proposed action.
August 3, 2007:	CNF informed us that the NEPA analysis of the proposed action was about to begin.
April 7, 2008:	CNF held a Line Officer Briefing to discuss the proposed action and alternatives.
June 2, 2009:	CNF informed us that the draft Environmental Impact Statement for the proposed action would be published on June 19 and provided us with a copy of this document.
November 19, 2009:	CNF requested formal consultation with us regarding the effects of the proposed action on threatened and endangered species.
December, 2009-June, 2010:	CNF provided us additional information related to the effects of the proposed action on threatened and endangered species.
June 23, 2010:	We requested an extension to complete consultation based on our discussions with CNF.
September, 2010-March, 2011:	CNF provided us additional information related to the effects of the proposed action on threatened and endangered species.

May 5, 2011: We provided CNF with our draft biological opinion on the effects of the proposed action.

June 7, 2011: We received CNF's comments on our draft biological opinion.

July 27, 2011: We modified the MGRS monitoring section after discussion with CNF.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The purpose of the 5,752-acre Pinaleño Ecosystem Restoration Project is to initiate forest restoration to provide long-term protection to the MGRS and its habitat. Recent field observations of fuel loading and forest stand examinations indicate that the Pinaleño forest ecosystem is 1) susceptible to stand-replacing fires and fire mortality; 2) heavily stocked with a large number of small diameter trees, although is also substantially stocked with mature and old trees throughout most of the area (in particular Douglas-fir); 3) dominated by or moving toward dominance by fire intolerant, shade tolerant species (such as white fir); 4) at a high risk from Douglas-fir beetle; and 5) generally infected by dwarf mistletoe at a low to moderate level, with some areas that are highly infected (U.S Forest Service 2009). By changing forest composition, structure, and density, the project is expected to reduce future insect and disease infestations, reduce the potential for severe wildland fires that could destroy MGRS habitat, and provide for the maturation and sustainability of future MGRS habitat. Researchers, biologists, foresters, and wildland fire management experts collaborated to develop wildlife design features for each forest stand to fulfill this purpose, which also included creating midden protection zones (described below) within which no treatment will occur.

The proposed action comprises vegetation treatments and proposed amendments to the Forest Plan necessary for the project to be implemented. Vegetation treatments will include implementation of both silvicultural prescriptions (on 2,353 acres) and fuel reduction (on 2,898 acres, including the 2,353 acres of silvicultural treatments) in each of two areas designated as "forest restoration areas" and "important wildlife areas" (described below). Removal of woody material from treatment locations includes methods common to both. Forest Plan amendments will include those necessary to allow firewood and Christmas tree harvest in the project area and to allow visual quality objectives to be relaxed in the short term. A transportation system to transport removed material will be needed to accomplish project objectives. Road improvement work needed for removing and treating timber stands 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. The entire project is expected to take 10-15 years to complete (C. Wilcox, U.S. Forest Service, pers. comm. 2010). Annual reviews by interagency and private biologists (review committee) will occur to assess the effects of the project and to determine if alterations to treatments are required.

Vegetation Treatments

The proposed action prescribes 59 different combinations of vegetation treatments. These combinations follow two general treatment strategies referred to as "important wildlife areas" and "forest restoration areas" (Figure 1, note that all figures are at the end of the document.). The treatment strategy in important wildlife areas is designed to initiate forest restoration and improvement of degraded MGRS habitat. In forest restoration areas, more aggressive treatments will be implemented to restore forest conditions and create future MGRS habitat, while at the same time decreasing wildland fire susceptibility around areas containing known middens and MSO core areas. In addition, midden protection zones and buffered middens are designated, within which no treatments will occur.

Modifications to the general treatment strategies (i.e., Prescriptions 1-7 below) for the most part address forest stands that have been previously affected by either wildland fire or insect outbreaks. These stands contain large numbers of dead trees, or snag pockets, that require different treatments from the general treatment strategies because often there are few to no live trees left in these forest stands. In one case (Prescription 6), the general treatment was modified because the remote nature of the forest stands makes it impossible for any treatment to occur other than one that can be accomplished by hand crews. Stand conditions and the treatment strategies necessary to meet the purpose of the proposed action were assessed and developed by a silviculturist using fire severity maps from the Clark Peak and Nuttall-Complex wildland fires, insect infestation information, and walk-throughs of each forest stand.

Wildlife design features that apply to specific stands (or units) are detailed in the project record by unit number. These design features were created using recommendations in the MGRS and MSO Recovery Plans and current research information, and will apply to the entire project area. These features were developed by biologists from the U.S. Forest Service, FWS, and Arizona Game and Fish Department, who looked at every unit individually to determine which units required special treatment based upon proximity to midden protection zones and MSO Protected Activity Centers (PACs) and core areas. These design features include:

1) 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.)

2) Allow regeneration of all tree species by leaving enough trees smaller than the diameter cut limit to meet the MSO Recovery Plan recommendations of 150 ft^2 or 170 ft^2 basal area (BA) per acre. (Not all trees in a stand smaller than the proposed cut limit will be removed, since meeting the 150 ft^2 and 170 ft^2 BA per acre targets in the MSO Recovery Plan will require leaving a significant number of trees smaller than the proposed cut limits.)

3) In all areas where treatments are planned, conduct pre-implementation sweeps for MGRS (see Mount Graham Red Squirrel Monitoring section below) and MSO nests (see Mexican Spotted Owl Monitoring section below).

4) In areas where it would be most effective, require methylcyclohexenone (MCH) pheromone treatment after broadcast burning in mixed-conifer stands. MCH is a natural pheromone used specifically for the control and management of Douglas-fir and spruce

beetles, and can be useful in preventing beetle infestation in the event a Douglas-fir tree is damaged during a prescribed burn. (Douglas-fir currently provides an extremely important food source for MGRS.)

5) Treat no more than 50 percent of the units within important wildlife areas within the first five years to allow monitoring to occur and changes to be made to treatment design, if determined to be necessary by the review committee.

6) No mechanical treatments (e.g., use of chainsaws or machinery) or prescribed burning will be conducted between March 1 and August 31 (the MSO breeding season). Preparing stands for treatment (e.g., marking trees) and monitoring activities may occur within a PAC or core area during the breeding season.

Midden Protection Zones

As a means to protect areas with active MGRS middens, biologists established midden protection zones encompassing approximately 2,049 acres within the 5,752-acre project area. No treatment will occur within these zones. Midden protection zones were created using the MGRS Recovery Plan, current research information, and maps of active and "removed" MGRS middens. "Removed" middens are those that, over the course of formal population surveys, have been visited multiple times, the last three of which have documented the midden as having "disappeared" (there is no longer any visible evidence that a midden was present, and the midden is only identified by the presence of a tag and the flagging used to locate the site). These "removed" middens indicate areas that at one time provided habitat for MGRS, but currently do not appear to provide habitat. Midden protection zones were delineated around all known middens (except for two isolated middens) that had not been "removed" from the database, so these zones encompass all active middens into areas that will not be treated under this proposal. Middens within these protection zones have at least a 92-foot buffer from treatment areas. The 92-foot buffer was selected based on Wood *et al*. (2007)'s research, which identifies this buffer as the best indicator of occupied midden locations (see Status of the Species section below). Eight other middens that fall outside of midden protection zones will be given a 200-foot buffer, which is greater than the 184-foot buffer suggested by Wood *et al*. (2007) as the area that best determines midden sites at the scale of MGRS territories. These biologists concluded these buffers would adequately protect habitat elements surrounding the active middens themselves, while still allowing some level of treatment around midden protection zones and buffered middens to reduce the threat that future wildland fire, insect or disease outbreaks, or both, could eliminate remaining occupied MGRS habitat.

Important Wildlife Areas

General Prescription

The important wildlife area treatment strategy is proposed in areas that contain "removed" MGRS middens (see description above), MSO core areas (a 100-acre area containing the best habitat surrounding the nest), or both. The treatment strategy in these areas is designed to initiate forest restoration and to restore degraded MGRS habitat. This treatment will occur on

approximately 701 acres and is a combination of group selection, variable density thinning, and thinning from below.

Group selection involves subdividing each stand into five size/age classes (not counting the grass-forb/seedling stage) with the classes based on the vegetation structural stage (VSS) size-class breaks. These include a seedling/sapling stage, a young forest stage, a mid-aged forest stage, a mature stage, and an old stage of stand development. Groups will range in size from 0.25 to 1.25 acres. Under this system, an uneven-aged stand is created that is composed of varying-sized, even-aged groups within each of the VSS classes described above.

Variable density thinning is a thinning regime in which the post-thinning tree density is deliberately varied throughout the stand so that in any one stand, one can find groups of trees thinned to a more wide spacing (open canopy groups) and groups that are thinned to a close spacing or not thinned at all (closed canopy groups). About two thirds of the stand areas will be in closed canopy groups, with the remaining one third in open canopy groups located primarily around aspen clones, ponderosa pine patches, relics of ponderosa pine patches (areas where stumps of ponderosa pine are evident but regeneration has not occurred because of competition with numerous small, shade-tolerant trees), or old-growth Douglas-fir patches. Thinning around these target species will enhance the growth and vigor of shade-intolerant trees (such as ponderosa pine) and old trees (such as Douglas-fir).

Thinning from below in this project essentially means that larger trees are favored for retaining over smaller trees, the result of which generally will be to reduce stand understories, making the stands more open and reducing fire hazard. Other factors that will influence which trees will be removed and which will be left are: 1) disease presence, and 2) species preference. This means that, on occasion, smaller, less-diseased trees may be retained while larger, more-diseased trees are removed, and smaller trees of a more preferred species (e.g., Douglas-fir, which is a fire-resistant species that provides an important food source for MGRS; ponderosa pine, which is a fire-resistant species that used to be present in greater numbers in the Pinaleño Mountains but is disappearing from the landscape) may be retained while larger trees of a less preferred species (e.g., white fir, which is a fire-intolerant species that currently is extremely abundant) will be removed. Favoring some species (like ponderosa pine, which comprises less than five percent of the trees within areas that will be treated) will add to the diversity of the mixed-conifer forest, but it should be noted that the three most common species within the project area, which are Douglas-fir, white fir, and southwestern white pine, will continue to predominate even after the proposed action is completed. These three species provide important food sources for MGRS and will comprise at least 80 percent of the stands post treatment (C. Wilcox, U.S. Forest Service, pers. comm. 2010). Important wildlife area treatments will be limited to a maximum diameter at breast height (dbh) cut of nine inches and a minimum live 170 ft^2 BA per acre stand stocking level. See "Removal Methods" section below for methodologies that will be used to accomplish this prescription. These treatments will create forest stands that are diverse in structure and stocking level, but not as much as those created by the forest restoration area treatments (see below). See Figure 2 for locations of silvicultural prescriptions within important wildlife areas (both general and modified prescription treatments).

In summary, the specific design features for all important wildlife areas (including modified prescriptions, below) are:

1) Using a group-selection method, the stands will be subdivided into five size/age classes. The size/age classes will be based upon the vegetation structural stage size class breaks.
2) Individual groups will range in size from 0.25 to 1.25 acre.
3) Live and dead trees up to 9-inches dbh will be cut; however, enough dead trees will be left to meet the snag quota (6 snags/acre).
4) Average stand stocking will be reduced to about 170 ft^2 live BA per acre.
5) Thinning will be variable density, in which some groups within the matrix will be thinned to a wide spacing (approximately one-third), and some groups will be thinned to a close spacing or not thinned at all (approximately two-thirds). When averaged together, the BA for the stand will meet the minimum 170-ft^2 per acre MSO Recovery Plan recommendation.
6) Heavily thinned groups will be placed around aspen clones, ponderosa pine patches, relics of ponderosa pine patches, and old-growth Douglas-fir patches. This will enhance the growth and vigor of or regenerate these components, as well as reduce bark beetle risk to the conifers.

Additionally, conservation measures (called wildlife design features) specific to the important wildlife areas were developed by biologists from the U.S. Forest Service, FWS, and Arizona Game and Fish Department who looked at every unit individually to determine which units required special treatment based upon proximity to midden protection zones and MSO core areas. These design features were created to enhance habitat features for MGRS and minimize impacts to MSO while still providing some level of wildland fire protection to these areas and adjacent midden protection zones. The design features developed for important wildlife areas include:

1) Retain ALL logs greater than 16 inches in diameter. If there are not at least six logs per acre greater than 16 inches, then leave 12-inch logs. If there are still not six logs per acre, then stack logs or leave slash piles at a density of at least two per acre.
2) Retain ALL snags (and all live trees) greater than nine inches.
3) Along any portion of Swift Trail Road, Riggs Lake Road, or Bible Camp Road that is within 150 feet of a MSO core area, do not create a road buffer of 150-feet by pruning.
4) In MSO core areas, if the unit is prescribed for underburning, the unit must first contain all CH physical and biological features per microhabitat monitoring. The microhabitat monitoring protocol is discussed below under MSO Monitoring.

5) After treatment is applied (allowing for snag and log retention based on the site prescription), remove or treat slash within one year (if pile and burn is part of the prescription, complete this during the cool season, October to March).

6) Prior to prescribed burning, create a black-line or hand-line along all boundaries with midden protection zones and buffered middens. Burnout from the midden protection zone and buffered middens (if possible), and rehabilitate the lines after the burn.

7) In areas where skid trails will be created, rehabilitate all roads through 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 the skid trails to allow for MGRS travel ways.

8) Rehabilitate landing piles and landing zones left after removal operations.

Modified Treatments (Note: Prescription numbers appear to be out of order in this biological opinion, but reflect the Prescription numbers from the Biological Assessment and draft Environmental Impact Statement. The Prescriptions in this biological opinion were rearranged to facilitate discussion of the treatments from those with no treatment [midden protection zones] to those with the most treatment [Forest Restoration Area]. Additionally, due to modifications in implementation that occurred after the Biological Assessment and draft Environmental Impact Statement were completed, Prescriptions 2 and 6 are identical and Prescriptions 3 and 5 no longer exist.)

Prescription 6. Reduce dead trees less than 18-inches dbh in snag pockets (0.25 to 1.25-acre group size) to six snags/acre. No live tree thinning.

This treatment will occur on approximately 42 acres within the project area that have been heavily affected by insect outbreaks and/or wildland fire, resulting in snag pockets in which few, if any, live trees are present, so no live tree thinning will occur. In these treatments, dead trees less than 18-inches dbh will be removed from snag pockets, retaining a minimum of six of the largest and soundest snags available per acre within the pockets. Species that tend to have snag longevity (such as Douglas-fir) will be favored for retention over those tree species that do not (such as aspen). Outside of the snag pockets, all dead trees up to 9-inches dbh will be cut. Following tree cutting, down woody material will be reduced to less than 15 tons per acre throughout the area (should a wildland fire come through the area, flame lengths produced by this amount of down, woody material are such that they can be handled by hand crews during fire suppression activities). See "Removal Methods" section below for methodologies that will be used to accomplish this prescription.

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 9-inches dbh.

This treatment will occur on approximately 62 acres within the project area that have been heavily affected by insect outbreaks and/or wildland fire, resulting in snag pockets containing some live trees. In these treatments, dead trees less than 18-inches dbh will be removed from snag pockets, retaining a minimum of six of the largest and soundest snags available per acre

within the pockets. Species that tend to have long snag longevity (such as Douglas-fir) will be favored for retention over those tree species that do not (such as aspen). Outside of the snag pockets, dead trees up to 9-inches dbh will be cut. Live trees less than 9-inches dbh will be thinned as described above for the "Important Wildlife Area - General Prescription" treatment. Following tree cutting, down woody material will be reduced to less than 15 tons per acre throughout the area (should a wildland fire come through the area, flame lengths produced by this amount of down, woody material are such that they can be handled by hand crews during fire suppression activities). See section entitled "Removal Methods" below for methodologies that will be used to accomplish this prescription.

Forest Restoration Areas

General Prescription

Forest restoration area treatments occur outside of areas with known MGRS middens (including both active and "removed" middens) and MSO core areas, but can occur within portions of PACs that fall within the project area. These areas surround important wildlife areas and midden protection zones and allow more aggressive treatments to restore forest conditions and create future MGRS habitat, while at the same time decreasing wildland fire susceptibility around areas containing known middens and MSO cores. These treatments will occur on approximately 1,344 acres and are a combination of group selection, variable density thinning, and thinning from below (see Important Wildlife Areas – General Prescription above for a description of these techniques).

Forest restoration area treatments will be limited to a maximum dbh cut of 18 inches and a minimum 150-ft^2 live BA per acre stand-stocking level. See "Removal Methods" section below for methodologies that will be used to accomplish this prescription. These treatments will create forest stands that are very diverse in structure and stocking level. See Figure 2 for locations of silvicultural prescriptions within forest restoration areas (both general and modified prescription treatments).

In summary, the specific design features for all forest restoration areas (including modified prescriptions, below) are:

1) Using a group selection method, stands will be subdivided into five size/age classes (not counting the grass-forb/seedling stage). The size/age classes will be based upon the VSS size class breaks.

2) Trees up to 18 inches dbh may be cut.

3) Average stand stocking will be reduced to about 150-ft^2 BA live trees per acre.

4) Thinning will be variable density, in which some groups within the stand are thinned to a wide spacing (approximately one-third of the stand), and some groups are thinned to a close spacing or not thinned at all (approximately two-thirds of the stand). When averaged together, the BA for the stand will meet the minimum 150-ft^2 BA live trees per acre MSO Recovery Plan recommendation.

5) Heavily thinned groups will be located around aspen clones, ponderosa pine patches, and relics of ponderosa pine patches, or old growth Douglas-fir patches. This will enhance the growth and vigor of or regenerate these components, as well as reduce bark beetle risk to the conifers.

Additionally, conservation measures (called wildlife design features) specific to forest restoration areas were developed by biologists from the U.S. Forest Service, FWS, and Arizona Game and Fish Department who looked at every unit individually to determine which units required special treatment based upon proximity to midden protection zones and MSO core areas. These design features were created to enhance and create future habitat features for MGRS and minimize impacts to MSO while still providing a higher level of wildland fire protection to these areas. The design features they developed for forest restoration areas include:

1) Retain a minimum of six of the largest logs per acre. If six logs per acre are not available, using felled snags as logs will be considered (if broadcast burning is part of the treatment, snags will be felled after the burn is completed).

2) Retain six of the largest snags per acre.

3) After treatment is applied (allowing for snag and log retention based on the site prescription), remove or treat slash within one year (if pile and burn is part of the prescription, complete this during the cool season, October to March).

4) Prior to prescribed burning, create a black-line or hand-line along all boundaries with midden protection zones and buffered middens. Burnout from the midden protection zone and buffered middens (if possible), and rehabilitate the lines after the burn.

5) In areas where skid trails will be created, all roads will be rehabilitated through 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 the skid trails to allow for MGRS travel ways.

6) Rehabilitate landing piles and landing zones left after removal operations.

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. General prescription thinning in remainder.

This treatment will occur on approximately 65 acres within the project area that have been heavily affected by insect outbreaks and/or wildland fire, resulting in snag pockets containing some live trees. In these treatments, dead trees less than 18-inches dbh will be removed from snag pockets, retaining a minimum of six of the largest and soundest snags available per acre within the pocket. Species that tend to have snag longevity (such as Douglas-fir) will be favored for retention over those tree species that do not (such as aspen). Outside of the snag pockets, dead trees up to 9-inches dbh will be cut. Live trees less than 18-inches dbh will be thinned as

described above for the "Forest Restoration Areas - General Prescription" treatment. Following tree cutting, down woody material will be reduced to less than 15 tons per acre throughout the area (should a wildland fire come through the area, flame lengths produced by this amount of down, woody material are such that they can be handled by hand crews during fire suppression activities). See "Removal Methods" below for methodologies that will be used to accomplish this prescription.

Prescription 2. Reduce dead trees less than 18-inches dbh in snag pockets (0.25 to 1.25-acre group size) to six snags/acre. No live tree thinning.

This treatment will occur on approximately 61 acres within the project area that have been heavily affected by insect outbreaks and/or wildland fire, resulting in snag pockets in which few, if any, live trees are present, so no live tree thinning will occur. In these treatments, dead trees less than 18-inches dbh will be removed from snag pockets, retaining a minimum of six of the largest and soundest snags available per acre within the pockets. Species that tend to have snag longevity (such as Douglas-fir) will be favored for retention over those tree species that do not (such as aspen). Outside of the snag pockets, all dead trees up to 9-inches dbh will be cut. Following tree cutting, down woody material will be reduced to less than 15 tons per acre throughout the area (should a wildland fire come through the area, flame lengths produced by this amount of down, woody material are such that they can be handled by hand crews during fire suppression activities). See section entitled "Removal Methods" below for methodologies that will be used to accomplish this prescription.

Prescription 4. Thin trees less than 12-inches dbh.

This treatment will occur on approximately 47 acres within the project area. Because of the remote nature of these acres, this treatment was designed so that it could be accomplished using only hand crews (no heavy equipment). In these treatments, live trees less than 12-inches dbh will be thinned as described above for the "Forest Restoration Areas - General Prescription" treatment, except that no live or dead trees greater than 12-inches dbh will be cut. No material will be removed from these forest stands.

Fuel Reduction Treatments

In addition to the proposed silvicultural treatments (Figure 2), complementary fuels reduction treatments are proposed to meet the project needs. Fuel loading within treated areas is estimated at approximately 57 tons per acre, with some units ranging up to 100 tons per acre. These tonnages are considered moderately heavy and could contribute to increased fire line intensity, torching, crowning, and spotting, making wildland fires in these areas difficult to suppress. In some units, the fuel treatments will occur concurrently with the proposed silvicultural treatments (2,353 acres), and in other treatment units, the fuel treatments are the only proposed treatments (545 acres). Figure 3 shows the fuels treatment locations, while Table 1 displays proposed fuels treatment activity combinations and acreage. Definitions used in this section are found below the table.

Table 1. Proposed fuels treatment activity combinations and acres.

Fuels Treatment Activity Combinations	Acres
Hand cut, pile, and burn steep slopes; followup underburn	35
Lop and scatter	124
Lop and scatter; hand cut, pile, and burn	433
Lop and scatter; hand cut, pile, and burn; followup underburn	495
Lop and scatter; underburn	1,318
Masticate	330
Masticate; hand cut, pile, and burn steep slopes; followup underburn	74
Underburn	89
Total	2,898

Hand Cut, Pile, and Burn

Debris created by pruning, or tree thinning will be piled by hand and burned during conditions when risk of fire spread is low, and when smoke will be adequately dispersed. Where this treatment does not follow a silvicultural treatment involving thinning of live trees, then small standing dead trees less than 9-inches dbh, existing downed material, and pruned tree limbs (occasionally) will be treated. 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. In addition to treatment units for which this activity is prescribed, it will also be applied within all treatment units along the Swift Trail (State Road 366, FS Road 803), Riggs Lake Road (FS Road 287), and Bible Camp Road (FS Road 508). Along these roads, fuels will be cut, piled, and burned for a distance of up to 150 feet from the road edge. These treatments will not occur within midden protection zones or in MSO core areas (a 100-acre area surrounding the nest).

Lop and Scatter

Down trees and tree limbs will be cut by hand and the material dispersed to reduce fuel concentrations. Where this treatment does not follow a silvicultural treatment, only small standing dead trees less than 9-inches dbh and existing down material will be treated.

Masticate

Standing and down trees as prescribed under the silvicultural treatments will be chopped, shredded, or chunked up by machine, and left onsite.

Underburn

Fuels will be reduced by prescribed burning with a low-intensity and low-severity burn.

Pruning

Although not displayed in the tables above, trees will be pruned adjacent to the Swift Trail (State Road 366, FS Road 803), Riggs Lake Road (FS Road 287), and Bible Camp Road (FS Road 508)

to reduce fire risk along these public travel routes. Trees will be pruned to a height of 10 feet above the ground, or up to one-third of the tree height, whichever is less. Pruning distance from the road will be up to 150 feet from the road edge. This treatment will be applied only in the proposed treatment units along these roads and not in midden protection zones, buffered middens, or MSO core areas that are adjacent to or bisected by these roads.

Removal Methods and Transportation

Trees will be removed from some treatment units (approximately 2,512 acres) and taken to collection points (landings) by a variety of methods and combinations of those methods (Figure 4 and Table 2). The removal method proposed for a treatment unit depends upon a number of factors, including topography, availability of road access, cost, and resource protection needs. Once material is removed from treatment units and taken to landings, it will be processed into sawlogs, firewood, or chips, and trucked from the project area or made available to the public. Some material may be piled and burned at the landing site. Descriptions of each removal method follow the table.

Table 2. Proposed removal methods and the number of acres associated with each (definitions follow).

Removal Methods	Acres
Whole-tree yard; hand cut; remove by cable	8
Whole-tree yard; hand cut; remove by ground-based equipment	16
Whole-tree yard; hand cut; remove by skyline	933
Whole-tree yard; machine or hand cut; remove by ground-based equipment	804
Whole-tree yard; machine or hand cut; remove by cable	46
Whole-tree yard; machine or hand cut; remove by skyline	32

Whole-tree Yard

Thinned trees will be transported from stump to the collection point or processing site (landing) with tops and limbs attached. Trees may be carried or dragged on the ground.

Hand Cut

Trees will be cut using hand-carried machines (e.g., chain saws) to the desired stocking and will either be removed from the site, piled and burned, or scattered in the site.

Machine Cut

Thinned trees will be cut by a ground-based machine such as a track-mounted feller-buncher and removed from the site.

Remove by Cable

Thinned trees will be pulled from the site to landings by a ground-based machine equipped with a grapple or cable (chokers and winch). No lateral skidding or material suspension will be required.

Remove by Ground-based Equipment

Thinned trees will be transported from the site to landings with a ground-based machine such as a skidder or forwarder.

Remove by Skyline

Thinned trees will be transported from the site to landings by a skyline cable system. The stump end of trees being removed will be suspended, but in most cases the trees will not be fully suspended and ground contact will occur.

As described above, most of the fuel reduction and removal methods have some amount of soil and vegetation disturbance associated with them to be able to complete the activity. Table 3 below shows the total area of each activity, as well as the amount of soil and vegetation disturbance that will occur in association with it (including landing areas). A description of road improvement and temporary road construction follows the table.

Table 3. Acres of soil and vegetation disturbed by removal methods and transportation.

Activity	Total Treated Area	Disturbed Acres
Ground-based skid	820 acres	98
Cable skid	54 acres	3
Skyline skid	965 acres	48
Haul road improvement	10.8 miles	6.5
Unclassified road improvement	0.48 mile	6.1
Temporary road construction	3.3 miles	6.0
Mastication	368 acres	44
Pile burning	283 acres	28
Total		240

Haul Road and Unclassified Road Improvement

The project area has about 38 miles of existing roads, including National Forest System Roads (such as Web Peak Road 88) and unclassified roads (such as 38-01). Approximately 14.9 miles of existing system roads will be used for hauling sawlogs, small round wood, and chips, requiring approximately 12.6 acres of improvement. Existing roads that are now closed but are needed for hauling will be improved and maintained for fuel removal operations. After operations are complete on these closed roads, drainage will be restored and the roadbeds will be seeded and closed again. Roads that are now used as trails will be restored and retained for trail use after operations. Hauling will be restricted to dry conditions. Hauling operations on native surface roads (including the unpaved portion of Swift Trail) will be stopped if road use is causing rutting of the road surface, ponding of water on the road, failure of any drainage structure, or any other action occurs that increases sediment delivery to a stream. Hauling will not be permitted during periods of daily alternating freezing and thawing over a several day period, but will be allowed on completely frozen or snow-covered roads. See Figure 4 for the location of these roads.

Temporary Road Construction

Temporary roads are authorized by contract, permit, lease, other written authorization or emergency operation not intended to be a part of the forest transportation system and not necessary for long-term resource management. Approximately 6.0 acres of temporary roads will be constructed for timber harvest operations and will be obliterated and restored by scarifying or subsoiling to reduce soil compaction, and planted to re-establish vegetation cover. Woody debris will be placed on the roadbed clearing to discourage off-road vehicle use and to restore soil organic material after operations are complete. Construction and restoration work will generally be done within one season. Twelve-foot-wide temporary roads will be adequate for equipment needed to harvest the small diameter timber proposed for removal. See Figure 4 for the location of these roads.

Implementation Schedule

The action is anticipated to extend over at least 10 years following an implementation schedule that focuses treatments in areas that will protect select occupied MGRS habitat and then treats areas of restoration away from currently occupied habitat (Figure 5). Depending on weather conditions and fuel moisture, however, which affect the prescription required for prescribed underburns, the action may take up to 15 years. This treatment strategy will allow pre- and post-implementation monitoring (see below) in units around midden protection zones before additional units are implemented. This strategy will enable resource managers to adapt implementation based upon information derived from project monitoring. Initial treatments are also designed to reduce fire threats from the southern exposures of the mountain, which are considered the most urgent fire threats to occupied MGRS habitat. The analysis area was divided into 10 general implementation blocks approximately 300 acres each in size.

Project Monitoring

Monitoring will be conducted to estimate whether project objectives for forest health and restoration, MGRS habitat restoration, and MSO microhabitat have been adequately met.

Forest Health and Restoration Monitoring

Meeting project objectives for forest health will be ensured indirectly during project implementation. During timber marking and thinning operations, marking and thinning activities will be monitored periodically to ensure that they are meeting silvicultural prescription, tree marking guidelines, and contract specifications. Measures such as tree density and tree species selection will be related to forest health objectives for increasing tree growth and vigor and reducing bark beetle risk. Tree species selection and the removal of mistletoe-infected trees will be related to forest health objectives for retarding the spread of the parasite.

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Selected stands will be sampled following all treatment activities to quantify stand attributes such as ladder fuels, crown base heights, species composition, and stand density to assess whether forest health objectives concerning tree growth and vigor, reducing bark beetle risk, and increasing resiliency to fire effects were met. Photo points will be established in selected stands within each forest type (primarily mixed conifer) to compare fuel conditions before and after treatment.

Additionally, Coronado National Forest personnel will informally monitor insect and disease activity in treated and untreated stands annually to qualitatively assess whether project forest health objectives were met. Annual forest health aerial detection surveys will continue to be conducted in the area to monitor insect and disease activity, as well.

Mount Graham Red Squirrel Monitoring

Pre- and Post-implementation Area Sweeps

With assistance from FWS as workload and resources permit, all areas will be surveyed prior to the onset of work, and again after all work is completed. While the majority of MGRS-occupied areas have been delineated on maps and protected from entry, solitary middens have been known to occur within other areas of the Pinaleño Mountains. Each implementation block, as well as a 400-ft buffer into any adjacent Midden Protection Zone, will be thoroughly surveyed prior to thinning/burning work. Any active or inactive middens found within an area to be treated (outside of a Midden Protection Zone) will be marked and provided a 92-foot radius buffer in important wildlife areas, and a 200-foot radius buffer in forest restoration areas, within which no treatment will occur.

These buffers are based on research by Wood *et al*. (2007), who used satellite imagery to examine three different-sized areas around middens to determine which size best predicted use by MGRS when compared to randomly selected locations. They chose a 33-foot buffer distance to mimic previous field studies (Smith and Mannan1994, Koprowski *et al*. 2005) and to reflect microclimate conditions at the midden. They also selected 92-foot and 184-foot buffers to represent the smallest and largest known red squirrel territories reported in the literature (Steele 1998) to evaluate whether midden sites are selected at a larger scale. They identified that midden-site selection best occurred on a 92-foot plot around middens, with strong selection on 184-foot plots as well, indicating that selection for midden sites occurs at a larger scale rather than only at a microclimate level immediately surrounding a midden. MGRS territories are generally larger than the area encompassed by these buffer sizes (see Status of the Species and Effects of the Action for a discussion of territory size); however, Wood *et al*. (2007)'s study suggests that these buffers are sufficient to include the characteristics necessary for midden establishment and persistence, which is a key element essential for the animal's survival (Brown 1986). Middens at both the 92-foot and 184-foot scale are more likely to be located in areas with a high number of healthy trees and correspondingly high seedfall.

The 400-ft buffer extending into adjacent Midden Protection Zones was selected to determine if treatments are affecting nearby middens, including those beyond the 200-ft buffer being used in forest restoration areas to allow any potential take as defined under the LRMP to be documented. After all work within an implementation block is completed, the block and 400-ft buffer(s) will

be re-surveyed to determine midden activity and new midden establishment. While new and existing middens may be located and provided a buffer by field crews preparing an implementation block for treatment, midden activity should be determined by a qualified biologist (e.g., one who has participated in at least two mountain-wide surveys), preferably during the fall, which is the season when midden activity is easiest to detect.

Crew Briefings

All implementation crews will be informed about the presence of MGRS, instructed on how to identify a squirrel midden, and given contact information for the local district. Should any midden be found after implementation has begun, work will halt in the area immediately and contact will be made to the Forest Service district biologist. The midden will be marked, given a buffer according to the guidelines above, and the biologist will contact the FWS.

Monitoring Squirrel Ratio (Red Squirrel vs. Abert's Squirrel Presence)

The proposed project is designed, in part, to change the amount of forest canopy and its distribution throughout the project area. There is the potential for this change in canopy to benefit Abert's squirrels (*Sciurus aberti*). Abert's squirrels are non-native to the area; they were introduced in the 1940s and 1950s to provide hunting opportunities. They may be competing with endangered MGRS for food resources (Edelman and Koprowski 2005), possibly including kleptoparasitism (stealing) of cones cached by MGRS in their middens (Edelman *et al*. 2005). As such, there is a need to evaluate whether this project favors Abert's squirrels, which could be detrimental to MGRS.

Monitoring will begin before treatments and proceed throughout implementation of this project. Monitoring will involve using "hair tubes," a method that has been used successfully to detect presence/absence or determine abundance indices of squirrel species (Gurnell *et al*. 2004). Hair tubes are a remote sampling technique that detects squirrels by attracting them to an open cylinder containing suitable bait held within the tube. Fur from squirrels that enter a hair tube adheres to double-sided tape that is fixed to the inside of the device. Hair samples are then analyzed in a laboratory to identify the species.

In this monitoring effort, tubes will be approximately 12 inches long and 4 inches in diameter. They will be placed 328 ft (100 m) apart and will be spread over each treatment block (Figure 5) prior to implementation of treatments within that block. The hair tubes will be monitored before, during, and after treatment to detect changes in the presence, absence, and abundance of MGRS and Abert's squirrels within the treated area. Additionally, MGRS middens within Midden Protection Zones adjacent to each treatment area will also be monitored for occupancy before, during, and after implementation. It is expected that changes in abundance of 15 percent or greater of both MGRS and Abert's squirrels within these areas will be detected using hair tubes and midden occupancy monitoring.

Monitoring information will be reviewed annually by the review committee to determine if changes (both positive and negative) in MGRS and/or Abert's squirrel abundance are occurring. If monitoring detects a decrease in MGRS abundance of ≥15 percent or equivalent increase in Abert's squirrels in any area, the Forest Service will stop working and coordinate with the review committee to determine if these changes are due to treatments benefiting Abert's squirrels at the expense of native red squirrels. If it is determined they are, the Forest Service and review committee will modify the treatments accordingly.

Research Efforts Conducted by the University of Arizona

The University of Arizona Mt. Graham Red Squirrel Monitoring Program (RSMP) has conducted research efforts since 1989 on established study areas within MGRS habitat to document aspects of MGRS population biology and food resources. These study areas will serve as "control" plots for treatment areas to assist in determining the effects of the proposed project. Additionally, the Forest Service has funded RSMP to implement research to determine if MGRS:

- move into new areas,
- persist in new areas,
- survive in or near treated areas,
- abandon areas in or near treatments,
- increase or decrease home range size,
- increase or decrease population size around treated areas, and/or
- increase or decrease juvenile recruitment.

Resulting information will provide a basis for ongoing treatment or, should it prove necessary, modifying treatments to reduce harmful impacts or increase benefits to MGRS. No standards have yet been proposed in the above bulleted study objectives that would trigger adaptive management. Instead, the review committee will consider all available information and cooperatively determine changes that should be made to treatment design. Such changes could include a reduction of the number of trees removed, an increase in the number of woodpiles left scattered throughout the area, etc.

Ongoing Interagency Squirrel Surveys

Ongoing surveys of a subsample of MGRS middens within the known occupied areas of the Pinaleño Mountains will continue. Although the surveys do not provide the finely tuned data needed to respond quickly for adaptive management, continued surveying of population trends will give us added information about the status of the species. In addition, ongoing survey and monitoring data provide valuable data for completing population viability analysis (PVA) models, which are thought to be essential to predict the potential for this subspecies to persist in the wild (U.S. Fish and Wildlife Service 1993a).

Pre-implementation Area Surveys

All areas will be surveyed prior to the onset of work. While the majority of owl nesting areas have been delineated on maps and protected from larger-diameter cutting, it is possible that new nest areas could be found during the implementation phase. Each implementation block will be thoroughly surveyed prior to thinning/burning work, and any large tree nests will be surveyed and observed at night in order to rule out or confirm MSO activity. If an active owl nest is found, the area will immediately be withheld from larger-diameter cutting, and the nest tree will be protected within a 200-foot buffer in which no treatment will occur, and surrounded with a 100-acre core area in which only trees less than 9-inches dbh will be removed, leaving enough smaller-diameter trees to meet the live 170-ft^2 BA per acre Recovery Plan recommendation. No treatments will occur in the 100-acre core areas during the MSO breeding season.

Crew Briefings

All implementation crews will be informed about the presence of MSO, instructed on how to identify a spotted owl, and given contact information for the local district. Should any MSO be found after implementation has begun, work will immediately halt in the area, the location marked, and the area swept for nest sites. If a nest site is found, the area will be given a buffer as described above, and contact will be made with the FWS.

Surveys According to MSO Monitoring Protocol

All PACs in the Pinaleño Mountains were designated based on a MSO sighting, vocal response, or both. PACs that do not have designated core areas are those that were delineated based only on a vocal response, but a MSO has never been sighted within the PAC. These PACs may or may not contain nest sites. Eighteen PACs occur within the action area, of which 13 have designated core areas surrounding either a nest site or a group of sightings or roost sites (see Environmental Baseline for MSO and Table 4). In one case (Moonshine PAC), the core area was designated based on aerial imagery and terrain, and did not involve an owl sighting. With the exception of one PAC (Moonshine) that is too steep to safely survey, surveys will occur in all PACs within the action area at least once every three years, with six to 10 PACs being surveyed every year on a rotating basis. Surveys will continue in this fashion throughout implementation of the project and for two years afterward. PACs proposed for treatment early in the project design will be the first to be surveyed. Each year, four surveys of each PAC will be conducted, leading to a determination of pair occupancy, single occupancy, or absence. In PACs where pairs are located, attempts will be made to locate nests and/or observe the number of juveniles/fledglings that can be attributed to each pair.

Long-term (15 years) monitoring of the PACs within the action area will contribute to the recovery of MSO by providing information regarding the effects of treatments within PACs and core areas, both positive and negative. Annual review by the review committee of MSO survey data, the implementation schedule in and around PACs, and extent of treatment occurring within PACs and cores will occur to determine if treatments are negatively impacting MSO within the action area. The level of adverse effects (other than length of disturbance and extent of

treatment, as mentioned above) that would trigger a change in management has not yet been determined. Instead, the review committee will consider all available information and cooperatively determine changes that should be made to treatment design. Such changes could include a reduction of the number of trees removed, a change in the timing of treatments, etc.

Microhabitat Monitoring

This measure will involve implementation of the MSO Microhabitat Monitoring Protocol designed by the MSO Recovery Team in conjunction with the USDA Rocky Mountain Research Station and Region 3 of the Forest Service. The number of plots used is generally based on an estimate of one plot per 20 acres of treatment, with a maximum of 200 plots. According to this protocol, 200 microhabitat plots (the maximum number allowable) should be established within protected and restricted areas for the MSO. The Recovery Plan (U.S. Fish and Wildlife Service 1995) defined protected areas for the MSO to include PACs and all areas in mixed-conifer forest with slopes of greater than 40 percent where timber harvest had not occurred in the past 20 years. Restricted areas for the MSO are unoccupied areas that could potentially provide nesting and roosting habitat now and into the future. Most of the action area that will be treated through the Pinaleño Ecosystem Restoration Project (2,898 acres) is within MSO PACs, and therefore almost the entire area to be treated would normally follow the guidelines provided in the Recovery Plan for protected areas (as opposed to restricted areas). The proposed action is unusual in that treatments are planned for areas inside MSO core areas, which, in accordance with the recommendations in the Recovery Plan, would normally be deferred from treatment. Furthermore, treatment areas within PACs will have a higher dbh cut limit than the guidelines recommend. Because eight core areas of 100-acres each have been identified that fall within or partially within the project boundary, an additional 40 plots will be placed within the core areas, spaced throughout those cores so that areas inside and outside the project boundary (in cases where a core falls partially within the project boundary) are both included in monitoring efforts. Per the protocol, monitoring should be conducted prior to implementation in each treatment block, and then repeated within three years of treatment for post-treatment assessment. Because of the size and sensitivity of the area being treated, monitoring will take place within one year post-treatment so that results can be assessed and recommendations made in an adaptive manner. Monitoring will use forest inventory standards to ensure repeatability of measurements from year to year.

Additional Wildlife Monitoring Requirements

Northern Goshawks

Known nests of northern goshawks are monitored yearly, using site visits to known nest sites and callback surveys. These birds are known predators of MGRS, and as such, monitoring their continued presence and nest success will provide information to land managers about potential predators of the endangered subspecies this project was designed to protect. Continued monitoring will allow some assessment of whether the species is being affected positively or negatively by the proposed action.

MOUNT GRAHAM RED SQUIRREL

Mr. James Upchurch, Forest Supervisor

STATUS OF THE SPECIES

In 1987, we listed the MGRS as endangered (52 FR 20994) (U.S. Fish and Wildlife Service 1987). The final rule 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 red squirrels might also suffer due to resource competition with the introduced Abert's squirrel. In 1990, we designated CH for the MGRS (55 FR 425) (U.S. Fish and Wildlife Service 1990). We finalized the first MGRS Recovery Plan in 1993 (U.S. Fish and Wildlife Service 1993a); it is currently undergoing revision.

Mount Graham red squirrels are small, grayish-brown arboreal rodents with a rusty to yellowish tinge along the back (Spicer *et al.* 1985). Their tails are fluffy and the ears are slightly tufted in winter (Spicer *et al.* 1985). In summer, a thin, black lateral line separates the upper parts from the whitish underparts. The cheek teeth number 16 (P1/1, M3/3), are low-crowned and tuberculate (with small knob-like processes), and the skull is rounded with the postorbital process present (Hoffmeister 1986). The species ranges from 10.8 – 15.4 (mean=13.3) inches in total length and from 3.7 – 6.3 (mean=5.4) inches in tail length (Hoffmeister 1986, Gurnell 1987). Average adult weight from nine specimens was 236.4 grams (Froehlich 1990). Hoffmeister (1986) found no sexual dimorphism in measurements of adult MGRS.

First described in 1894 by J. A. Allen, the MGRS type specimen is from the Pinaleño Mountains. Allen (1894) designated it as a separate subspecies based on pelage (fur) differences and its isolation for at least 10,000 years from other red squirrel populations. The MGRS is slightly smaller than the Mogollon red squirrel (*T. h. mogollonensis*) of northern Arizona in body measurements including total body, hind foot, and skull length (Hoffmeister 1986). The skull is also narrower postorbitally than that of *T. h. mogollonensis.*

Although Hoffmeister (1986) thought the subspecies was not strongly differentiated from the Mogollon red squirrel, he (1986) and Hall (1981) retained the subspecies designation. Research with protein electrophoresis (Sullivan and Yates 1995), mitochondrial DNA (Riddle *et al.* 1992), and microsatellite loci (Fitak and Culver 2009) have provided data that, in conjunction with morphological and ecological considerations, demonstrate that the MGRS is a distinct population. Sullivan and Yates (1995) and Riddle *et al*. (1992) state it deserves subspecific status. Fitak and Culver (2009) state it is highly differentiated from other red squirrels found in the neighboring White Mountains.

MGRS inhabit a narrow selection of habitats in the high-elevation areas that support primarily Engelmann spruce (*Picea engelmanii*) and corkbark fir (*Abies lasiocarpa* var. *arizonica*); in the mixed-conifer stands dominated by Douglas fir (*Pseudotsuga menziesii*), with white fir (*Abies concolor*) and Mexican white pine (*Pinus strobiformis*) sub-dominants; and in the ecotone life zone between these community types. The squirrels apparently do not inhabit pure stands of ponderosa pine (*Pinus ponderosa*) (U.S. Fish and Wildlife Service 1993a). In recent years, these forests have experienced significant ecological changes in the Pinaleño Mountains, many of which are dramatic and detrimental to the survival of the red squirrel. Large, stand-replacing fires in 1996 and 2004 affected approximately 35,000 acres of forested area. Extended drought

has created severe physiological stress on trees, especially in the higher elevation forest types. Tree diseases are present on the mountain and appear to be increasing in scale and intensity. Outbreaks of forest insects, including defoliators, bark beetles, and phloem feeders, have contributed to substantial additional tree mortality. In 2005, trees near all 1,251 documented red squirrel territories showed signs of insect damage. In a recent habitat analysis conducted by James Hatten (U.S. Geological Survey) using satellite imagery from June 2008, it appears that only 6,427 acres of MGRS habitat currently exist in the Pinaleño Mountains, compared to 13,257 acres in 1993 (unpub. data; see Hatten 2009 for a description of the methodology used in this analysis). This represents a habitat loss of over 50 percent in the past 18 years. With the loss of most of the higher-elevation habitat in the spruce-fir due to wildland fire and insect damage, red squirrels now occur primarily in the mixed-conifer forest on the mountain but also in remaining patches of spruce-fir. The potential for large-scale fires to occur in the remaining habitat of the MGRS remains very high.

Threats facing MGRS include loss of habitat due to native and exotic insect infestations (Koprowski *et al.* 2005), direct mortality and loss of habitat and middens due to large-scale wildland fires (Koprowski *et al.* 2006), loss of habitat due to human factors (e.g., disturbance, conversion to roads, trails, and/or recreation sites, permitted special uses, etc.; U.S. Fish and Wildlife Service 1993), loss or reduction of food sources due to drought, predation, and apparent dietary and territory competition with Abert's squirrel, which was introduced in the 1940s by the Arizona Game and Fish Department (Edelman *et al.* 2005). Additionally, current climate change models suggest that a 10 to 20 year (or longer) drought is anticipated in the Southwest (Swetnam and Betancourt 1998, Woodhouse and Overpeck 1998, McCabe *et al.* 2004, Seager *et al*. 2007). While this drought is apparently within natural historical variation (Swetnam and Betancourt 1998), mean annual temperatures are forecasted to rise 5-8 ^{0}F in the 21st century (Intergovernmental Panel on Climate Change 2007), which in turn are predicted to be accompanied by a more arid climate (Seager *et al.* 2007), increasing insect outbreaks in Southwestern forests, and increasing wildland fires (Betancourt 2004). Increasing levels of drought, insect outbreaks, and wildland fires will likely directly impact MGRS's already limited habitat and food resources, decreasing our ability to recover this subspecies.

MGRS create middens, which are areas that consist of piles of cone scales in which squirrels cache live, unopened cones as an over-wintering food source. Placement of these middens tends to be in areas with high canopy closure near food sources (e.g. Douglas fir, corkbark fir, and Engelmann spruce). 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. They also seem to prefer areas with large snags or downed logs that provide cover and safe travel routes, especially in winter, when open travel across snow exposes them to increased predation. Wood *et al*. (2007) used satellite imagery to examine three different-sized areas around middens to determine which size best predicted use by MGRS when compared to randomly selected locations. They chose a 33-foot buffer distance to mimic previous field studies (Smith and Mannan1994, Koprowski *et al*. 2005) and to reflect microclimate conditions at the midden that are appropriate for cone storage. They also selected 92-foot and 184-foot buffers to represent the smallest and largest known red squirrel territories reported in the literature (Steele 1998) to evaluate whether midden sites are selected at a larger scale and encompass landscape features farther away from the midden itself (e.g., large cone-producing trees). They identified that site selection best occurred on a 92-foot plot around

middens, with strong selection on 184-foot plots as well. This indicates 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. They determined that middens at both the 92-foot and 184-foot scale were more likely to be located in areas with a high number of healthy trees and correspondingly high seedfall.

The red squirrel is highly territorial (Smith 1968), and the concept of one squirrel per midden is widely accepted and used for MGRS management (Vahle 1978). Occasionally, conditions arise where more than one squirrel occupies a midden or a MGRS uses more than one midden (Froehlich 1990, Koprowski *et al*. 2003, 2004), but these are likely exceptional cases and usually seem to occur when food is either extremely abundant or rare. Home range sizes (see below) and 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). Juvenile survivorship has not been measured directly, but the extreme natal dispersal distances they must travel to find available habitat may translate to decreased juvenile survival and recruitment (Munroe *et al*. 2009).

MGRS home-range sizes (in which they spend 95 percent of their time) are three to ten times greater than reported for other populations of red squirrels (Koprowski *et al*. 2008), annually averaging 5.9 acres for females and 24.5 acres for males (Koprowski, draft MGRS Recovery Team Meeting Minutes, March 16, 2006). Core areas, which are the areas in which individuals spend 50 percent of their time, annually average 1.7 acres for females and 6.9 acres for males (Koprowski, draft MGRS Recovery Team Meeting Minutes, March 16, 2006). Both males and females can be found farther from their middens in summer than in any other season. Male MGRS maintain discrete core areas in all seasons except for summer (when they likely are looking for scarce females). Female MGRS, on the other hand, minimize overlap throughout their home-range during all seasons. The expansion of MGRS home-ranges in summer is perhaps because during fall, winter, and spring, MGRS need to invest energy in defending their middens where food supplies are concentrated. In summer, cached food stocks are depleted and new, widely dispersed, food sources (such as mushrooms and ripening cones) become available, which, along with mate searching, could explain some of the increases in range size during this time of year (Koprowski *et al*. 2008).

Observations indicate that MGRS eat: (1) conifer seeds from closed cones, (2) above-ground and below-ground macro-fungi and rusts, (3) pollen (pistillate) cones and cone buds, (4) cambium of conifer twigs, (5) bones, and (6) berries and seeds from broadleaf trees and shrubs. Each food is used seasonally; pollen and buds in the spring, bones by females during lactation, fungi in the spring and late summer, and closed cones low in lipids in the early summer. Closed, live-cut cones high in lipids are stored for winter-time use (Smith 1968).

Mount Graham red squirrels eat seeds and store live cones from Englemann spruce, white fir, Douglas-fir, corkbark fir, and white pine. Midden surveys indicate that Engelmann spruce and Douglas-fir are the most common tree species supplying MGRS food. Douglas-fir, generally a consistent cone producer (Finely 1969), is important in the Pinaleño Mountains, especially in areas where it co-exists with Engelmann spruce, which is more prone to cone crop failure. Use of ponderosa pine seeds or caching ponderosa pine cones by MGRS is extremely limited, probably due to microclimatic considerations. Cone caching and consumption of cone seeds by

red squirrels have been reported in more northerly latitudes (Hatt 1943, Finley 1969, Ferner 1974). Miller (1991) found that nutritional values of seeds from several conifer species in the Pinaleño Mountains vary seasonally and by tree species.

Additionally, Miller (1991) analyzed the nutritional content of the three above-ground species of mushrooms eaten by red squirrels. Percent crude protein and percent digestible protein were higher than all conifer seeds except Engelmann spruce in summer (Miller 1991). Truffle protein content also was as high as some conifer seeds per unit weight (Smith 1968). Mushrooms and truffles may take less effort to eat than extracting seeds from cones. Combined with information on nutritional values, this may explain in part the relative importance of fungi in the diet.

Depending on climatic conditions and growing seasons, red squirrels throughout North America generally breed from February through July (Koprowski 2005a). Female MGRS give birth to fewer young (reported means=2.35 and 2.15) compared to other red squirrels (reported means=3.69 and 3.72) (Rushton *et al*. 2006 and Munroe *et al*. 2009, respectively). Nests can be in a tree hollow, a hollow snag, a downed log, or among understory branches of a sheltered canopy. Nests may be built in natural hollows or abandoned cavities made by other animals, such as woodpeckers, and enlarged by squirrels (U.S. Fish and Wildlife Service 1993a) and can be anywhere from zero to over 2,000 feet away from the midden (Red Squirrel Monitoring Program, unpub. data). Froehlich (1990) found that MGRS built 60 percent of their nests in snags, 18 percent in hollows or cavities in live trees, and 18 percent in logs or underground. Only four percent of nests were bolus grasses built among branches of trees. Slightly different proportions were found by Morrell *et al*. (2009), who noted 67 percent of the MGRS nests within their study area were located in tree cavities, 27 percent were bolus nests, and seven percent were ground nests. Leonard and Koprowski (2009) found that MGRS appear to favor cavity nests over bolus nests (also called dreys), whereas the nearest population of red squirrels in the White Mountains, the Mogollon red squirrel, used predominantly dreys. They speculate that localized processes such as slightly elevated temperatures and isolation may be responsible for the disparity between these two subspecies. In the Pinaleño Mountains, snags are important for cone storage as well as nest location. Both nests and stored cones have been found in the same log or snag.

Maximum longevity for the red squirrel in the wild is reported to be 10 years (Walton 1903) and 9 years in captivity (Klugh 1927), although 3-5 years is more typical (Munroe *et al*. 2009). Annual adult mortality of MGRS appears to be higher than for red squirrels throughout North America (47 percent vs. 34.73 percent) (Rushton *et al*. 2006). Annual juvenile mortality has not been studied directly, but as previously mentioned, Munroe *et al*. (2009) suggest it could be higher than other populations of red squirrels due to the extreme natal dispersal distance required to establish a new territory. Studies of radio-collared animals suggest predation accounts for a large majority of mortality in red squirrels (Kemp and Keith 1970, Rusch and Reeder 1978, Stuart-Smith and Boutin 1995a&b, Kreighbaum and Van Pelt 1996, Wirsing *et al.* 2002); however, the availability of alternative prey for predators (Stuart-Smith and Boutin 1995a), availability of food for red squirrels (Halvorson and Engeman 1983, Wirsing *et al.* 2002), and variation in vigilance and use of open areas by individual squirrels (Stuart-Smith and Boutin 1995b) have been suggested to predispose some animals to higher susceptibility to predation. Indications are that 75 to 80 percent of the mortality experienced by MGRS is due to predation,

most of which is caused by raptors (Koprowski, draft MGRS Recovery Team Meeting Minutes, March 16, 2006).

Mammalian predators of MGRS include mountain lions, black bear, bobcat, coyote, and gray fox (Hoffmeister 1956, U.S. Forest Service 1988). On Mt. Graham, a bobcat was observed stalking a red squirrel (Schauffert *et al.* 2002) and a gray fox captured an adult female squirrel (24 Feb 2003, Koprowski, unpubl. data). Avian predators of red squirrels likely include goshawks, red-tailed hawks, MSO, great horned owls, and Cooper's hawks (U.S. Forest Service 1988, Schauffert *et al.* 2002). On Mt. Graham, Kreighbaum and Van Pelt (1996) reported that four juvenile red squirrels were killed by raptors during natal dispersal. Additionally, a MSO was documented killing one juvenile red squirrel near the natal nest (Schauffert *et al.* 2002).

Rangewide, multi-agency red squirrel surveys, based on a sample of middens throughout the range of the MGRS, have been conducted since 1986. In 1998, the surveys were expanded from a single survey per year to two surveys per year, one in fall and one in spring, but beginning in 2009, it was determined a single survey in the fall would be adequate. The numbers are derived by simple formulas that use the percent of active middens in each vegetation type found in the random sample and the number of known middens in each vegetation type. The estimate uses only those middens where activity is certain. Midden surveys show increasing numbers of MGRS into 1998-2000, with peaks over 500, after which the population declined. Population estimates dropped 42 percent in 2001 as compared to 1998-2000; since that time, population estimates have remained fairly stable, varying from 199 to 346. The last survey (conducted in Fall 2010) resulted in a conservative estimate of 214 MGRS.

The Red Squirrel Monitoring Program at the University of Arizona (UA) was established by the Arizona Idaho Conservation Act (AICA 1988) to monitor effects of the Mount Graham International Observatory (MGIO) on the MGRS. As part of that program, Koprowski *et al.* (2005) monitored all middens in 624 acres surrounding the MGIO from 1989-2002. Middens were visited monthly from 1989-1996 and quarterly thereafter. From 1994-2002, the mixed conifer forest within their study area supported 54-83 middens, while the spruce-fir forest contained 120-224 middens. The population trend in the mixed conifer forest was found to be relatively stable from 1994-2001; however, by 2002, only two occupied middens were found in the spruce-fir forest. Population declines in the spruce-fir forest corresponded with a period of insect damage and wildland fires that began in 1996 and had devastated that forest type by 2002. Census data collected by the Red Squirrel Monitoring Program indicate a more dramatic decline than do the data of the multi-agency surveys (which have shown fairly stable populations since Fall 2001 after a steep decline from 1998-2000). The differences in the results are likely due to differences of scale. The Red Squirrel Monitoring Program has focused on a subset of the mountain in which impacts of fire and insect damage have been pronounced in the spruce-fire forest, whereas the multi-agency surveys sample the population range wide.

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 catastrophic 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 Pinaleño 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 Pinaleños. Although the MGRS population persisted through that event and may persist through the current habitat-altering event, small populations can exhibit genetic or demographic problems that further compromise the ability of the subspecies to survive. Recent genetic analysis (Fitak and Culver 2009) indicates the average relatedness among MGRS individuals is over 90 percent, which is near the value of identical twins and indicates potential impacts from inbreeding depression. 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.

Recovery Plan

The objective of the MGRS Recovery Plan (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) BA of live and dead trees of at least 275 ft^2 per acre.

3) Groupings of 0.078 acres of large dominant trees greater than or equal to 16-inches 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, and is expected to be finalized in 2012. It should be noted that the above characteristics were measured within a 33-foot radius (0.07 acre) surrounding midden locations (Mannan and Smith 1991). As described previously, current research indicates that MGRS territories are much larger than this, averaging 5.9 acres for females and 24.5 acres for males (Koprowski, draft

MGRS Recovery Team Meeting Minutes, March 16, 2006), and that 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). Research continues to be conducted to further refine our understanding of MGRS habitat characteristics.

Mount Graham Red Squirrel Critical Habitat

On January 5, 1990, we designated approximately 1,900 acres as Mount Graham Red Squirrel Critical Habitat (55 FR 425-429) (U.S. Fish and Wildlife Service 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 AICA has the same boundary as the designated CH boundary surrounding Hawk and Plain View peaks (about 1,700 acres), but does not include CH on Heliograph or Webb Peaks. Unfortunately, most of the habitat in the Refugium and in CH has been devastated by wildland fire and insect damage. There remains a small, unknown amount of habitat in the Refugium (A. Casey, U.S. Forest Service, pers. comm. 2008).

ENVIRONMENTAL BASELINE – Mount Graham Red Squirrel

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

The action area means 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). For purposes of the MGRS analysis, we have determined the action area encompasses the entire MGRS range and critical habitat located in the Pinaleño Mountains. The mixed-conifer forest within the action area mainly consists of Douglas-fir, southwestern white pine, ponderosa pine, corkbark fir, white fir, quaking aspen, and Engelmann spruce, and occurs at differing aspects and elevations from above 7,750 feet to approximately 10,000 feet. Much of the spruce-fir within the action area was damaged or destroyed by insect outbreaks and wildland fire.

A. Status of the Species within the Action Area – Mount Graham Red Squirrel

Based on the latest survey information (Fall 2010), there are 1,288 known midden locations within the action area, of which 909 (71 percent) have been "removed." "Removed" middens are those that, over the course of formal population surveys, have been visited multiple times, the last three of which have documented the midden as having "disappeared" (there is no longer any visible evidence that a midden was present, and the midden is only identified by the presence of a tag and the flagging used to locate the site). "Removed" middens appear to occur in areas that at one time provided habitat for MGRS, but currently do not. Many of them are within areas that have been heavily impacted by insect outbreaks and/or wildland fire. Ninety-four "removed" middens (10 percent of all "removed" middens) fall in areas that will be treated through the proposed action. Of these, 91 are in important wildlife areas and three are in forest restoration areas.

There are 379 known midden locations within the action area that have not been "removed," meaning there is still some evidence that the midden is there, whether or not it is currently occupied. Activity at these middens appears to typically cycle between active and inactive states, as indicated by midden surveys formally conducted since 1986. However, for purposes of our analysis, we consider all middens that have not been "removed" as active and occupied. All of these middens are within either a midden protection zone or buffer, or fall outside the project area (seven middens fall outside midden protection zones but occur in areas that will be treated, including five within important wildlife areas and two within forest restoration areas). Other middens that have not yet been found may be present within the action area, and if they occur in the project area, will be given appropriate buffers or included in a nearby midden protection zone, if possible.

As discussed in the Status of the Species, it appears that only 6,427 acres of MGRS habitat currently exist in the Pinaleño Mountains, compared to 13,257 acres in 1993 (Hatten, unpub. data; see Hatten 2009 for a description of the methodology used in this analysis). This represents a habitat loss of over 50 percent in the past 18 years. Most of the active MGRS middens (76 percent) fall within areas defined as habitat through this analysis, while most of the "removed" middens do not (41 percent). According to the draft Environmental Impact Statement (dEIS) for the project, the BA of live and dead trees within the area currently is approximately 218.4 ft^2 per acre and 46.3 ft^2 per acre, respectively. Combined, this totals approximately 265 ft^2 BA per acre on average across the project area. Percent canopy cover across the project area is currently modeled at 54 percent (U.S. Forest Service 2009).

B. Factors Affecting the Species within the Action Area – Mount Graham Red Squirrel

Most of the action area has supported significant recreational use by researchers, hikers, campers, birders, wildlife and plant collectors, fuel wood collectors, and hunters. Past and present research and monitoring activities (permitted under section 10(a)(1)(A) enhancement of survival permits) include pre-baiting, trapping, handling, marking, and using radio-telemetry to track MGRS. Additionally, an annual mountain-wide survey is conducted each fall, during which a sample of middens is visited to determine MGRS occupancy. Summerhome owners and sometimes their pets inhabit the action area near Old Columbine, and use the forest lands surrounding their cabins for a variety of activities. The forested lands surrounding Old

Columbine are very steep and rough, and recent information indicates that most residents remain close to their respective summerhome area (S. Wallace, U.S. Forest Service, pers. comm. 2007). Some residents (and likely a few of their visitors) may hike a short distance uphill on designated trails, but the elevation, the steep and rugged terrain, and the general age and abilities of the resident population make it unlikely these people use the trails very much or leave the trail for the forest (A. Casey, U.S. Forest Service, pers. comm. 2007). Because no new summerhomes or additions will be permitted, the number of people using these portions of the action area is expected to remain at current levels (S. Wallace, U.S. Forest Service, pers. comm. 2007). On August 18, 2008, we issued a biological opinion on the renewal of the Mt. Graham Summerhome Special Use Permits, in which we anticipated incidental take of up to two red squirrels, one of which is within the action area (consultation #22410-2007-F-0163).

Other portions of the action area, as defined in the Environmental Baseline section above, are posted for speed limits on the roads and types of permitted activities at the sites. Bear-proof garbage containers are provided at public sites (especially picnic areas, camp sites, and Riggs Lake) and are serviced regularly by Forest Service personnel. Surveys for MGRS middens have documented active and inactive middens in the surrounding forest that supports denser, interlocking canopy and a cooler, moister climatic regime deeper into the forest than that found on the edge of roads and trails mountain-wide. A few middens are known to be visible from some portions of some hiking trails, and some are very close to the edges of Forest roads, but we believe they remain relatively inconspicuous to the typical forest user. While roads and trails have a drying effect on the immediate forest edge, middens tend to be far enough away from these edges to remain active over time. No formal study has been conducted on edge effects of trails and roads on midden persistence.

In 2001, the Pinaleño Ecosystem Management Demonstration Project (PEM) was initiated to reduce heavy fuel loads on up to 1,100 acres roughly between Jesus Goudy Trailhead and Shannon Campground. For this project, we anticipated incidental take of three squirrels due to harm from potential burning or damaging a midden or harassment due to smoke and work-related noise (consultation #2-21-98-F-282). Both PEM and the special uses area hazardous fuel treatments (consultation #02-21-05-I-0818), which we concurred was not likely to adversely affect squirrels, were designed and coordinated with other resource protection agencies, including the FWS and Arizona Game and Fish Department, to reduce fuel loading, increase forest health, and encourage return of the natural fire cycle. Treatments completed under PEM provided firefighters safer areas to combat wildland fire during the Nuttall-Gibson Complex Fire in 2004 (see below). MGRS have persisted in and continue to inhabit areas treated through PEM, the design of which is similar to the Important Wildlife Area – General Prescription treatment described in this proposed action. PEM treatments included removing trees up to nine-inches dbh; retaining large (16-inches dbh at the midpoint) logs, or, if few large logs exist, then leaving all 12-inch dbh logs, averaging between two to six per acre; retaining large snags, averaging between two to six per acre; and reducing the fuel load to between five and 25 tons per acre. PEM did not outline a threshold level for BA after treatment, nor did it incorporate group selection and variable density thinning. Instead, about 75 to 85 percent of the small live trees (nine-inches dbh or less) were cut, piled, and burned. This created a more even-aged stand than the one that will be created in Important Wildlife Areas through group selection and variable density thinning (C. Wilcox, U.S. Forest Service, pers. comm., 2010). It also likely resulted in an understory similar to, or slightly more open than, the understory that will be evident after

Important Wildlife Areas are treated (A. Casey, U.S. Forest Service, pers. comm., 2010).

Two large wildland fire events – the Clark Peak Fire and the Nuttall-Gibson Complex Fire – have dramatically affected the extent and quality of MGRS habitat in recent years. The Clark Peak fire was a human-caused fire that started on April 24, 1996 in the Riggs Lake area at the northwestern end of the mountain range. The fire was contained at about 6,500 acres on May 9. On June 9, 1999, we issued a biological opinion on the effects of suppression activities during the fire (consultation #2-21-96-F-286). The opinion concluded that suppression was not likely to have jeopardized the continued existence of the MGRS, nor did it result in destruction or adverse modification of CH. However, 15 MGRS were thought to have been taken incidentally. The Nuttall-Gibson Complex Fire began as two small, separate fires: the Gibson Fire, which started on June 22, 2004, and the Nuttall Fire, which started June 26, 2004. Both fires were caused by lightning strikes. This fire burned approximately 29,900 acres in areas of oak woodland, ponderosa pine, mixed-conifer, and spruce-fir forest. On June 8, 2007, we issued a biological opinion on the effect of suppression activities during the fire (consultation #02-21-04-M-0299). The opinion concluded that suppression was not likely to have jeopardized the continued existence of the MGRS, nor did it result in destruction or adverse modification of CH, although one squirrel was thought to have been incidentally taken due to suppression activities.

On June 10, 2005, we issued a programmatic biological and conference opinion on the Continued Implementation of the Land and Resource Management Plans (LRMPs) for the Eleven National Forests and National Grasslands of the Southwestern Region (#2-22-03-F-366), including the Coronado National Forest LRMP. The opinion concluded that implementation of the Coronado National Forest portion of the LRMP did not rise to the level of jeopardy for the species, nor did it destroy or adversely modify designated CH, although up to 10 percent of the middens outside CH (called refugia in the opinion) could be incidentally taken, as measured through abandonment and/or physical alteration of middens.

In a May 22, 2006 letter from the MGRS Recovery Team (Recovery Team) to Dr. Benjamin Tuggle (then Acting Regional Director), the Recovery Team recommended capturing up to 16 MGRS from the wild to establish a captive breeding pilot program. Dr. Tuggle provided written approval to investigate a captive propagation program in a letter to Dr. William Matter (Recovery Team Leader) dated June 14, 2006. The project would involve trapping and transporting squirrels, holding them in captivity, and releasing progeny back into the wild. This project is currently under consultation.

C. Status of Critical Habitat within the Action Area – Mount Graham Red Squirrel

All of MGRS designated CH (approximately 1,900 acres) falls within the action area. The main attribute of CH at the time of designation was the existing dense stands of mature (about 300 years old) spruce-fir forest. Unfortunately, most of the designated CH has been devastated by wildland fire and insect damage since the late 1990s. According to a recently completed habitat analysis (Hatten, unpub. data; see Hatten 2009 for a description of the methodology), only 276 acres (15 percent) within the designated CH boundary currently provide habitat for MGRS. Habitat that remains within the CH boundary is likely comprised of mixed-conifer stands that were included at the time CH was designated (C. Wilcox, U.S. Forest Service, pers. comm.,

2010). Only 19 (five percent) of all active middens fall within designated CH, while 331 (36 percent) of all "removed" middens are within designated CH.

D. Factors affecting Critical Habitat in the Action Area – Mount Graham Red Squirrel

As noted in the Status of the Species section above, insect destruction and high-severity wildland fire remain the biggest factors affecting MGRS CH within the action area.

EFFECTS OF THE ACTION – Mount Graham Red Squirrel

Effects of Vegetation Treatments on MGRS and Its Habitat

All active middens within the project boundary will be protected either by including them in midden protection zones, or establishing a 92- or 200-ft radius buffer around them. In all cases, no treatments will occur in the vicinity of middens. Protection zones were designed in conjunction with representatives of the Arizona Game and Fish Department, FWS, and U.S. Forest Service, with input from University of Arizona squirrel researchers. These protection zones were defined based on all known active midden sites at the time (meaning those that had not been "removed" as of Fall 2005); and they provide at least a 92-foot radius around all middens located in the project boundary where no treatments will occur. The 92-foot radius was selected based on Wood *et al*. (2007)'s research, which identifies this area around a midden as best including both microclimate conditions and landscape features necessary for midden site selection when compared to the conditions and features surrounding randomly selected locations. Any new middens that are discovered during pre-implementation sweeps will be incorporated into a nearby midden protection zone (if possible) or given a 92- or 200-foot buffer. The 92-ft buffer will be placed around middens found within Important Wildlife Areas, while the 200-ft buffer will be placed around middens found within Forest Restoration Areas. This larger buffer around middens in Forest Restoration Areas was chosen to provide the midden and individual MGRS greater protection from the larger-diameter tree removal prescribed in these stands. It 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 (see discussion above under Status of the Species for further explanation). The 184-ft radius buffer was rounded up to 200 ft to provide slightly greater protection to middens and MGRS found within these areas. No treatments will occur within the protection zones or buffers. This should avoid direct effects to MGRS middens due to vegetation treatments. However, as noted in the Status of the Species, the average annual home-range (5.9 to 24.5 acres) and core area (1.7 to 6.9 acres) used by female and male MGRS will not be fully encompassed by either the 92-foot (0.6 acres) or 200-foot (2.9 acres) buffers. Therefore, habitat within home ranges and core areas, but outside of the 92-foot midden protection zones will, in some cases be treated, affecting the MGRS that occupy those areas. However, because many middens are within clusters of midden protection zones, the effective buffers are often much greater than 92 feet, and home ranges of MGRS occurring within those midden clusters will not experience any treatments.

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 39 percent of the nesting locations were within 92 feet of the midden, and 62 percent were within 200 feet of the midden. In the case of the former dataset, approximately 21 and 31 percent of the maternity and non-maternity nests, respectively, were within 92 feet of the midden. Approximately 44 percent of both maternity and non-maternity nests were within 200 feet of the midden. It is therefore expected that many 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 seven percent of the nest trees (both cavities and dreys) in the mixed-conifer forest can be less than nine-inches dbh. Based on these findings, it is likely 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.

Even with midden protection zones and individually buffered middens, MGRS could be disturbed by human presence and mechanical noise. 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 carolinesis*). 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 (personal observation), but human presence does not appear to influence survivorship, as the same red squirrel will occupy a territory even after multiple visits and multiple capture events (e.g., as observed by Koprowski 2005b and Koprowski *et al*. 2008). Because human presence and mechanical disturbance will not occur within at least 92 ft (within Important Wildlife Areas) and 200 ft (within Forest Restoration Areas, where a larger diameter of cut may occur) of active red squirrel middens, we expect that disturbance will be minimized, with the exception of disturbance that could occur around nests that may occur within treated areas. The use of implementation blocks (Figure 5) during each year of the project should allow reprieve to areas of the mountain in which work is

not being conducted, as the direct effects of noise and human activity in each particular area will occur within approximately two to five years (e.g., silvicultural treatments and removal may occur one year, with fuels treatment occurring the next year, and underburning would occur subsequently when prescription conditions are met). Blocks have been designed so that while some areas adjacent to midden protection zones are treated early in the project, they are followed by treatments in areas not adjacent to midden protection zones to allow time for monitoring to take place. No more than 50 percent of the stands within Important Wildlife Areas will be treated within the first five years of the project to allow annual reviews by interagency and private biologists (the review committee) to assess the effects of the project, and to determine if additional alterations to treatments should be incorporated. 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.

Indirect effects to individuals include the potential for an increase in aerial 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. Vegetation 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 either the 92-foot or 200-foot buffers. 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.

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. 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 Abert's squirrels can reduce cone crops up to 75 percent in local areas, so even a small increase in the Abert's squirrel population could lead to a decline in available food resources for MGRS, forage competition, and possible decreased MGRS survival rates in areas or at times when food resources are limiting (Koprowski, draft Recovery Team Meeting Minutes, March 16, 2006). Additionally, Abert's squirrels have been documented kleptoparasitizing cones from MGRS middens, although infrequently (Edelman *et al*. 2005). Abert's squirrels were thought to be ponderosa pine obligates (Brown 1986), but have been found using both mixed-conifer and spruce-fir forests in the Pinaleño Mountains (Hutton *et al*. 2002).

To determine if Abert's squirrels may impact MGRS due to the proposed action, monitoring will start before treatments begin and proceed throughout implementation of this project. Monitoring involving "hair tubes" (Gurnell *et al*. 2004) will be used (see Description of the Proposed Action), which is expected to detect changes in Abert's squirrel and MGRS abundance $\geq$15

percent. If results indicate a decrease of ≥15 percent in MGRS or equivalent increase in Abert's squirrels in any one treatment block, the project will be halted and the review committee will be convened to determine if these changes are due to treatments benefiting Abert's squirrels at the expense of MGRS. If the review committee determines that they are, the U.S. Forest Service and review committee will modify the treatments accordingly. This monitoring and review should ameliorate the potential negative effect that could occur due to an increase in Abert's squirrels, but, until modifications can be determined (if necessary) that will off-set this effect, we anticipate that an increase in Abert's squirrel abundance may affect the MGRS population.

Short-term effects to MGRS habitat due to vegetation treatments may occur. Many middens occur within clusters of midden protection zones and are far enough away from treatments that the entire home range of these MGRS will remain untreated. For MGRS with middens closer to the edges of midden protection zones and those occupying buffered middens, treatments could alter characteristics within the home ranges of these individuals. In particular, the proposed action is calculated to reduce the percent canopy cover from 54 percent to 43 percent within the 10 to 15-year implementation period (using remotely sensed data and the Forest Vegetation Simulator (FVS) modeling program), after which it should increase to 48 percent canopy cover over the next 30 years. The MGRS Recovery Plan recommends overhead canopy closure of 80 percent or greater. Additionally, the proposed action is calculated to reduce the average BA per acre of live and dead trees within the treated areas from approximately 265 ft^2 to 213 ft^2 (in Important Wildlife Areas, including 170 ft^2 per acre of live trees) and 193 ft^2 (in Forest Restoration Areas, including 150 ft^2 per acre of live trees). The Recovery Plan recommends a BA of 275 ft^2 per acre for both live and dead trees. The implications of these forest conditions are discussed below.

The MGRS Recovery Plan identifies excellent MGRS habitat as stands that, among other characteristics, achieve at least 80 percent canopy closure, a level of canopy cover that, according to the FVS model, is not achieved even today. It is important to note that a number of methods can be used to measure and model percent canopy cover. These methods often do not produce the same values and, therefore, are not directly comparable because they measure and model two different parameters. The first method is to measure "canopy closure," which is the proportion of the sky hemisphere obscured by vegetation when viewed from a single point (Figure 7). The second method is to measure "canopy cover," which is the proportion of the forest floor covered by the vertical projection of tree crowns (Figure 8). The instruments used to measure "canopy closure" and "canopy cover" are different, and each method can produce a different result even at the same location. Canopy closure can be measured using a spherical densiometer, which is the method that was used to calculate the 80 percent canopy closure recommended in the MGRS Recovery Plan (Mannan and Smith 1991). This measurement technique has been found to be difficult to use without a great deal of variation and bias that substantially overestimates forest cover while at the same time being insensitive to substantial variations in forest cover (Cooke *et al*. 1995). On the other hand, FVS models canopy cover, and has been found to produce values less than all other methods for canopy cover (Fiala *et al*. 2006). Therefore, even though the proposed action will change the canopy structure over the life of the project, it is impossible to compare the canopy cover estimates from FVS modeling to the canopy closure estimate as recommended in the MGRS Recovery Plan because of the different methods used to generate these estimates. The most that can be said regarding the 80 percent canopy closure recommendation is that it represents "high" canopy cover and likely is an

overestimate of the amount of canopy cover that is actually present. The Southwestern Region of the U.S. Forest Service (using FVS modeling) currently classifies a closed (or "high") canopy as 60 percent or greater, with 30 to 60 percent canopy cover considered moderate (Vandendriesche 2010). On average, stands within the project area currently do not meet the closed canopy standard using FVS modeling (54 percent), but rather fall into the moderate canopy cover category, where they will remain after treatment (43 percent). It is difficult to anticipate the effects of this average reduction in canopy cover, as current conditions will remain unchanged in some areas (i.e., midden protection zones and around buffered middens), while others will be affected to greater and lesser extents (i.e., Forest Restoration Areas and Important Wildlife Areas).

The BA of both live and dead trees will also be reduced by the proposed action. The Recovery Plan indicates at least 275 ft^2 per acre of live and dead trees are required to meet the excellent quality habitat parameter. The BA of both live and dead trees throughout the stands within the project area is currently estimated at 265 ft^2 per acre (U.S. Forest Service 2009). Based on FVS modeling of the BA in Blocks B and C of PEM, however, it appears that areas with similar BAs to those being proposed in Important Wildlife Areas and Forest Restoration Areas will continue to provide habitat for MGRS, as squirrels continue to inhabit these blocks and build new middens within them (see below). Additionally, Koprowski and Blount (2010) studied the 81-acre portion of PEM in the Merrill Peak area (Blocks B and C), which is the area containing the greatest number and density of MGRS within PEM. These Blocks were treated beginning in 2005 and were completed by May 2006, excluding a 50-foot radius buffer around each midden. Unfortunately, these Blocks were also impacted by the Nuttall Complex wildland fire (2004), confounding the effects of the PEM treatment itself. According to Koprowski and Blount (2010), occupancy for middens in Blocks B and C varied considerably over the course of monitoring (2003 to 2009), with a steep decline occurring in Fall 2004 shortly after the Nuttall Complex wildland fire (from approximately 65 percent to 25 percent occupancy). Occupancy during and shortly after PEM treatments (Spring and Fall 2006) was approximately 30 and 15 percent, respectively, and in Fall 2007 was about 20 percent. Zero percent occupancy was documented in Fall 2008, which corresponds to a mountain-wide cone crop failure of the true firs (white and corkbark) and Douglas-fir due to freezing temperatures and snow storms that occurred in late spring of that year (C. Wilcox, U.S. Forest Service, pers. comm. 2010). Blocks B and C are dominated by Douglas-fir, and were therefore severely impacted by this failure (Froehlich and Smith 1990, as cited in Koprowski and Blount 2010; C. Wilcox, U.S. Forest Service, pers. comm. 2010). A decline was also noted in Koprowski and Blount (2010)'s long-term monitoring site near Columbine that year, which spans both mixed-conifer and spruce-fir forest (firs in the spruce-fir forest were impacted by the cone crop failure, but spruce trees produced cones that year). The Columbine site was not treated through PEM. In 2009, a year with a good cone crop (C. Wilcox, U.S. Forest Service, pers. comm. 2010), occupancy within Blocks B and C increased to between 30 and 35 percent, which is slightly less than the approximately 35 percent occupancy noted in Koprowski and Blount's (2010) Columbine site. Although the precise effects of PEM cannot be determined, the above data and observations suggest that changes in midden occupancy observed in Blocks B and C within PEM corresponded mostly with fire and cone crop failure, and less so by the PEM treatments. Additionally, one new midden was found while Block B was being treated (October 2005) and two have been found in the same Block post-treatment (May 2006 and September 2009) (Arizona Game and Fish Department, unpublished data). Forest Vegetation Simulator modeling

(FVS modeling – see below) of the post-treatment live BA of the stands in which these middens were found indicates the average live BA surrounding the midden found in 2005 was approximately 155 ft^2 per acre, while the average live BA surrounding the middens found in 2006 and 2009 was approximately 174 ft^2 per acre (C. Wilcox, U.S. Forest Service, pers. comm. 2010).

Treatments in Important Wildlife Areas will be similar to PEM, with the exception of group selection and variable density thinning, which will create a more variable understory and should benefit MGRS more than a uniform understory (e.g., providing a mosaic of tree age classes and densities). MGRS are occupying PEM-treated areas, and, as demonstrated in the area surrounding Merrill Peak, are establishing new middens post-treatment. In particular, two middens have been found in a stand with a modeled average live BA of 174 ft^2 per acre, which is similar to the live BA prescription in the Important Wildlife Areas of 170 ft^2 per acre. Treatments proposed in Forest Restoration Areas (1,344 acres), which could potentially affect MGRS more than Important Wildlife Area treatments, will occur outside of almost all known midden locations, with the exception of three "removed" middens and two active middens (with 200-foot buffers). One midden was created in a PEM-treated stand averaging 155 ft^2 per acre of live BA, which is similar to the live 150 ft^2 per acre prescribed in the Forest Restoration Areas, indicating this threshold of live BA may still provide the habitat requirements necessary for midden establishment. Additionally, middens in Important Wildlife Areas and Forest Restoration Areas will be provided a 92- and 200-foot buffer, respectively, instead of the 50-foot buffer provided in PEM, further minimizing potential effects due to treatment. Annual review of monitoring data by the review committee will be conducted to provide input into the effects of the treatments on MGRS.

In summary, the proposed action includes establishing midden protection zones and buffers based on recent research (Wood *et al*. 2007) around all middens, which will leave the canopy closure and BA of live and dead trees untouched within these areas. Treatments in areas outside the zones and buffers, while reducing canopy closure and BA, 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). These protective measures, plus the results of monitoring in treated areas of the PEM project, suggest that while treatments will change the forest structure of areas surrounding midden protection zones, we do not anticipate these treatments will preclude MGRS from occupying treated areas.

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 18 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 (Arizona Game and Fish Department, 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. It is estimated that the fuel loads and stand densities that currently exist within the action area are much greater than historical forest conditions (U.S. Forest Service 2009),

which can lead to increased susceptibility to insect outbreaks (as evidenced by the four insect outbreaks that have occurred since 1996) and stand-replacing wildland fires (as evidenced by the 1996 Clark Peak and 2004 Nuttall Complex wildland fires). Recent articles specific to MGRS and its habitat recommend forest management practices that promote forest health (e.g., Merrick *et al*. 2007, Wood *et al*. 2007) and reduce the threat of high-severity wildland fire (e.g., Koprowski *et al*. 2005, Koprowski *et al*. 2006).

To determine the impact of the proposed action on future fire behavior, forest stands and fuel loading were examined in the project area and processed through the Forest Vegetation Simulator and Fire and Fuels Extension (FVS/FFE) model, the outputs of which were then applied as appropriate through the FlamMap model to display potential flame length; fire line intensity; and surface, passive, and active crown fire types over the project area. Additionally, data from LANDFIRE, which uses satellite imagery to map the land and its vegetation, were also used in evaluating the assumptions used in the FlamMap model. FlamMap is widely used by the National Park Service, U.S. Forest Service, and other Federal and state land management agencies in support of fire management activities (http://firemodels.fire.org/content/view/14/28/, accessed 03/15/2010).

Based on modeling through FlamMap, proposed vegetation and fuel reduction treatments will decrease the likelihood of wildland fires being as destructive as the Nuttall Complex wildland fire by reducing the susceptibility of the treated area to high-severity, stand-replacing fire (defined as flame lengths greater than 11 feet) from 79 percent to 33 percent (USDA 2009). Treatments will also decrease the likelihood of active (from 13 to four percent) and passive (from 72 to 53 percent) crown fires, as well as favoring conditions that will support the surface fires (from 15 to 43 percent) to which the mixed conifer forest was adapted prior to fire suppression. In areas and conditions where fire must be suppressed, the proposed action will reduce the occurrence of fire with flame lengths that exceed those that can be fought with direct attack (greater than 11 feet), as well as reduce the intensity and severity of burn-out operations when indirect attack is necessary to fight wildfire. Additionally, the need for aerial retardant applications is lessened, which bring noise disturbance and potential toxins into MGRS habitat, and, as such, should offset this threat somewhat in the future. According to the silviculture specialist report (Amell 2008) and the fire and fuels specialist report (Hall 2008), initial treatments will reduce the density of the forest, canopy cover, fire behavior, and fuel loading for approximately 30 years following treatment, at which point forest conditions and fire risk will begin returning to current levels without further treatment. It should be noted, however, that these models did not account for changes in climate that are likely to occur over the next 30 years. How climate change will affect the forest at the scale of the treated area is not certain, although it is likely that improving forest health and resilience through the proposed action will help the mixed conifer forest better cope as precipitation and temperatures change. Therefore, we believe that the proposed vegetation treatments will benefit the MGRS and its habitat over the long-term.

Effects of Fuels Reduction Treatments on MGRS and Its Habitat

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 prescribed burning activities (including pile burning and underburns) and mastication, and the impact these activities have on soils.

Approximately 28 acres of ground surface will be disturbed by pile burning (Table 3). Debris created by pruning or tree thinning will be piled by hand and burned (or removed) 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 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 in midden protection zones or buffers, meaning all middens will be buffered from this activity by at least a 92- or 200-foot buffer.

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 (C. Wilcox, U.S. Forest Service, pers. comm.). Piles will be no larger than previously burned piles, and often will be smaller, thereby reducing the effects to soils and seeds even further. Therefore, we anticipate this activity will not negatively affect MGRS and its habitat.

Besides pile burning, underburns are prescribed to reduce fuels on 2,011 acres within the action area (Table 1). Four active middens are within stands that will be treated with underburns (these will be buffered, see below). Prescribed underburns will be managed to produce a low-intensity, low-severity burn during conditions when live fuel moisture is at 100 percent (reducing the chance that live trees will catch fire), 1000-hour (three-inches dbh or greater) fuel moisture is at 15 percent (minimizing the potential that large logs or snags will burn), wind speeds 20 feet above the ground are eight miles per hour or less (reducing the chance a surface fire could ignite a crown fire), and air temperatures are 70 degrees Fahrenheit or less (reducing the drying effect caused by high temperatures). Additionally, wildlife design features applying to Forest Restoration Areas recommend felling snags to create logs (in areas where logs are lacking) after underburning has been completed, ensuring that logs in these areas will not be consumed by fire during underburning activities. All midden protection zones, the seven active middens mentioned above, and any new middens that are found will be provided a 92- or 200-foot buffers and then either black-lined or hand-lined prior to prescribed burning to prevent fire from escaping into them. Black-lining accomplishes this by creating a perimeter of burned fuels around sensitive areas, while hand-lining involves using hand tools to scrape away vegetation in

a path about 18 inches wide down to mineral soil. Both black-lines and hand-lines will be rehabilitated after the burn is completed. These measures should minimize the potential for embers to cause midden damage or scorch mature trees, while at the same time reducing small ground fuels without endangering MGRS or their middens. If possible, fires will be lit from the black-line or hand-line surrounding midden protection zones and buffers to burn into the rest of the stand, further reducing the potential for fire to escape into midden areas.

Indirect effects to MGRS and its habitat within prescribed burn areas are unlikely. Koprowski *et al*. (2006) determined that MGRS survival during the Nuttall-Gibson Complex wildland fire suggests they can survive significant ground fires, as long as the midden is not damaged or destroyed in the process. They go on to state that MGRS remain vulnerable to crown fires that reach the canopy, and recommend forest management practices that reduce the risk of crown fire, thereby minimizing the likelihood of negative impacts by wildland fire on MGRS. Because all middens will be protected within midden protection zones or buffers, and because all prescribed underburns will be managed to produce low-intensity, low-severity burns, we anticipate this activity will not negatively affect MGRS and its habitat.

Approximately 44 acres of vegetation and soil will be disturbed from the equipment used during mastication (Table 3). These acres all fall outside of midden protection zones and buffered middens. When compared to pile burning, mastication may somewhat improve soil structure and result in less soil disturbance than the burning of slash piles (Owen *et al*. 2009). Therefore, we anticipate this activity will not negatively affect MGRS and its habitat.

Effects of Removal Methods and Transportation of Wood Byproducts on MGRS and Its Habitat

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.

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. According to the Biological Assessment, however, traffic remains low, with average daily traffic counts from years 2003, 2004, and 2005 showing 60, 90, and 100 vehicles per day, respectively. A total of eight road-killed squirrels has been reported, with two being the most reported in any one year (both 1989 and 2004), although the total number of MGRS killed on the road is likely greater due to

irregular monitoring and the rapidity at which dead animals are removed from the road by scavengers.

According to the transportation and operations specialist report in U.S. Forest Service (2009), 843,068 total haul miles will be traveled to remove wood byproducts from the project area. The Biological Assessment states that this translates 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, is that traffic related to implementation of the project will add approximately one to two additional vehicles per day to the existing traffic. This is an increase of one to two percent over current traffic levels (an average of 84 vehicles per day). Due to this increase, the potential for MGRS to be killed due to roadkill events is expected to increase proportionally.

Vegetation and soil will be disturbed on approximately 149 acres due to ground-based, cable, and skyline skidding activities, including landings (areas where material is piled for removal off the mountain) (Table 3). We expect the effects of each kind of skidding activity to be similar. Skid trails and landings will be rehabilitated by ripping or scarifying (breaking up soil to a shallow depth) where soils are compacted, cross drained or re-contoured, and seeded with a certified weed-free seed mix after operations are complete (U.S. Forest Service 2009). Skid trails will be blocked with logs or trees, large rocks, and woody debris, or re-contoured where effective to prevent motorized travel after operations are complete. Brush will be dragged across the trail, and downed trees will be placed perpendicular to and across the skid trails to allow for MGRS travel ways. These measures will reduce the effects of skidding activities on MGRS and its habitat, although 149 acres of habitat (outside of midden protection zones and buffered areas) will temporarily be affected until herbaceous and shrub cover is established and soil disturbance has blended back into the landscape.

Approximately 6.0 acres of temporary roads will be constructed through the proposed action. After operations are complete, these roads will be obliterated and restored by scarifying or subsoiling (plowing) to reduce soil compaction, and planting to re-establish vegetation cover. Woody debris will be placed on the roadbed clearing to discourage off-road vehicle use and to restore soil organic material after operations are complete. Construction and restoration work will generally be done within one season. This activity will temporarily affect 6.0 acres of habitat until herbaceous and shrub cover is established and soil disturbance has blended back into the landscape.

Approximately 12.6 acres of existing roads will be improved. Existing closed roads that are now used as trails will be restored as trails and retained for trail use after operations are complete. Haul roads that are now closed will be improved and maintained for fuel removal operations. After operations are complete the road will be closed again after drainage has been restored and the roadbed has been re-seeded. This activity will temporarily affect 12.6 acres of habitat until herbaceous and shrub cover is established and soil disturbance has blended back into the landscape.

Effects of Research and Monitoring Activities on MGRS and Its Habitat

Hair Tube Study

Monitoring will begin before treatments and proceed throughout implementation of this project. Monitoring will involve using "hair tubes," a method that has been used successfully to detect presence/absence or determine abundance indices of squirrel species (Gurnell *et al*. 2004). Hair tubes are a remote sampling technique that detects squirrels by attracting them to an open cylinder containing suitable bait held within the tube. Fur from squirrels that enter a hair tube adheres to double-sided tape that is fixed to the inside of the device. Hair samples are then analyzed in a laboratory to identify the species.

Potential effects to MGRS from the hair tube study include disturbance due to human presence and supplementing food resources (i.e., using bait). Effects of disturbance due to human presence are discussed above. In terms of supplementing food resources, Layne (1954) reported that once red squirrels learn about a food source, the animals will return regularly to it and be recaptured. Linduska (1950) noted that yearly fluctuations in the trapability of red squirrels correlated with a shortage of natural foods. Sullivan (1990) found that with supplemental feeding, red squirrel populations were three to four times higher than control populations, and that food resources were likely the driving force behind population fluctuations. Additionally, he found that once food was withdrawn, population densities gradually approached those of the control. It appears that red squirrels will take advantage of, and even benefit from, additional food resources when available. Therefore, the effects of baiting the track plate stations are likely to be slightly beneficial to the MGRS population.

Research and Monitoring Activities

Authorized take anticipated to occur as a result of research and monitoring activities is covered under Dr. John Koprowski's section 10(a)(1)(A) enhancement of survival permit that is currently in place (TE041875).

Summary of Effects to MGRS and Its Habitat

The proposed action reflects the collective expertise of Federal, state, and private wildlife biologists (including MGRS experts), silviculturists, and forest managers, who have worked together for over seven years to develop a proposed action that will protect remaining MGRS habitat and promote the subspecies' recovery. It is understood that high-severity, stand-replacing wildland fire currently poses the greatest threat to the persistence and recovery of MGRS, and that taking no action to reduce this threat may ultimately lead to the subspecies' extinction if another stand-replacing fire should burn through remaining habitat, an eventuality that, in the absence of this project, becomes more and more likely with time and continued climate change. The MGRS Recovery Plan states that fires that kill mature tree stands of trees are of concern, and that high-severity wildland fires pose a significant threat to MGRS survival. Two such fires have occurred since the Recovery Plan was finalized in 1993, and, when combined with damage to the spruce-fir forest due to insects and drought, have resulted in a 50 percent reduction in MGRS habitat since that time. Should the habitat trends of the past 18 years continue, MGRS may experience irreversible declines.

Temporary impacts to MGRS reproduction, population, and distribution are anticipated due to the proposed action mainly through potential competition with Abert's squirrels and potential increases in predation. However, the proposed action is not expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of MGRS, and, over the long-term, is expected to benefit MGRS and its habitat. The proposed action has been designed to protect remaining MGRS habitat, re-create habitat features in areas where middens have disappeared, reduce the threat of high-severity fire within remaining habitat, and promote forest health by reducing stocking levels and competition between trees for limited resources. Treatments are conservative in that no-treatment buffers will be established at all known active midden sites in the project area. Treatments are also designed to not alter forest characteristics beyond that which define MGRS habitat suitability, while still providing improved forest health and reduced stand-replacing fire risk. Although our knowledge of the habitat characteristics needed for occupancy by MGRS is imperfect, the treatments were designed with the best information available and the best expert opinion with the intent of allowing continued occupancy by MGRS in treated areas. The PEM project areas, with treatments similar to those proposed in the Important Wildlife Area – General Prescription treatment of Pinaleño Ecosystem Restoration Plan, have thus far continued to support MGRS, suggesting our predictions are correct.

Additionally, monitoring of the MGRS and adaptive management will provide a further check on potential adverse effects – if the project is adversely affecting MGRS to a degree greater than anticipated here, treatments will be adjusted until those effects are reduced to acceptable levels. Monitoring will begin prior to project implementation, and research studies will be designed to determine the potential adverse effects of forest treatments. Changes to the proposed action based on the annual review of this monitoring and research information will be incorporated into treatment design, so that the project can adapt to include the latest information while continuing to protect and re-create MGRS habitat. Adaptively managing the treatments in this way will minimize the short-term effects of the project, while ultimately benefitting MGRS in the long-term by protecting its limited remaining habitat, and re-creating habitat in areas where it has been lost.

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 BO. 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 that could occur along Swift Trail. These could include paving the remaining portion of the road up to Riggs Lake, which 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.

CONCLUSION – Mount Graham Red Squirrel

After reviewing the current status of the MGRS, the environmental baseline for the action area, the effects of the proposed action on the squirrel, and the cumulative effects, it is our biological opinion that the action, as described, is not likely to jeopardize the continued existence of MGRS.

Our findings are based on the following:

- The primary threat to MGRS is loss of habitat through wildland fire. The proposed action is anticipated to reduce this threat for up to 30 years.

- 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.

- Midden protection zones and buffers surround all active middens 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 are found, they will be protected by a 92-foot buffer (in Important Wildlife Areas) or a 200-foot buffer (in Forest Restoration Areas) to minimize the potential for harm to occur to MGRS, their nests, and/or their middens and the immediate surrounding 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 for Important Wildlife Area – General Prescription treatments in Pinaleño Ecosystem Restoration Plan. 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 CH. These components are identified in the Recovery Plan as being necessary if the subspecies is to persist in the Pinaleño Mountains (U.S. Fish and Wildlife Service 1993a).

- 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 has been the major factor that, over time, has pushed this species nearer to extinction. We believe implementation of the 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 described 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

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 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, 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 adherence 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 Forest Service must report the progress of the action and its impact on the species as specified in the incidental take statement. [50 CFR §402.14(i)(3)].

AMOUNT OR EXTENT OF TAKE – Mount Graham Red Squirrel

We anticipate incidental take in the form of loss of occupied nests with litters, competition with Abert's squirrels, increases in predation, and loss due to roadkill as described in the Effects of the Proposed Action that will result in up to a 15 percent decline in the abundance of MGRS within treated areas during project implementation (through year 15). The incidental take as described

here will not exceed the incidental take as described in the Coronado National Forest portion of the LRMP biological opinion, which concluded that up to 10 percent of the middens outside CH (called refugia in the opinion) could be incidentally taken, as measured through abandonment and/or physical alteration of middens. No physical alteration of middens will occur due to the proposed action (they are all buffered or within Midden Protection Zones); therefore, no individual middens will be affected by the proposed action.

Additionally, a potential 15 percent decline in abundance within treated areas is a different measure at a different scale than abandonment of 10 percent of the middens outside CH, and, as the proposed action will occur within a subset of the area outside CH, incidental take due to the proposed action will be less than that anticipated in the LRMP opinion. Hair-tube monitoring will provide the data needed to detect changes in abundance of MGRS (incidental take measurement for PERP), and pre-and post-implementation sweeps and midden-activity monitoring of treated areas (as well as a 400-ft buffer into adjacent Midden Protection Zones) will provide information about midden activity (incidental take measurement for the LRMP). This information, in addition to input from the MGRS review committee, will be compared to mountain-wide population trends to determine if these changes reflect effects of the proposed action, or are due to large-scale habitat changes across the range of MGRS. Additional data, as available, will also be considered, such as current cone or mushroom crops, location of potential predators (e.g., proximity of goshawk nests to middens), etc. As monitoring data are analyzed and adaptive management is applied, we expect take to decrease as the project is implemented.

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 species.

REASONABLE AND PRUDENT MEASURES AND TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, you must comply with the following terms and conditions, which implement the reasonable and prudent measures described below. The terms and conditions are non-discretionary.

As described previously, the Forest Service has included numerous conservation measures within the proposed action, which therefore are not included as reasonable and prudent measures in this biological opinion. However, the following reasonable and prudent measures, with their accompanying terms and conditions, are necessary and appropriate to minimize incidental take of MGRS:

1. You shall buffer any MGRS nest trees that are found in important wildlife areas and forest restoration areas.

    A. Should MGRS nest trees be discovered during pre-implementation sweeps of treatment blocks, you shall provide a no-treatment buffer similar to one that would be created around a newly discovered midden. In important wildlife areas, a 92-foot radius buffer, and in forest restoration areas, a 200-foot radius buffer shall be established around MGRS nest trees.

2. You shall submit annual reports documenting project implementation, results, effects, and incidental take to the FWS and review committee for the life of the project.

    A. Reporting of monitoring results and complete records of all incidental take that occurs during the life of the project will be included in the Forest Service's Endangered Species Act Report submitted annually to the FWS. If appropriate, a separate report containing this information may be submitted to the review committee.

    B. Should the FWS or a member of the review committee determine further discussion is required based on the results included in any annual report, you shall convene a meeting accordingly.

Review requirement: These reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize incidental take that might otherwise result from the proposed action. If, during the course of the action, the level of incidental take described above under 'Amount or Extent of Incidental Take' is exceeded, such incidental take would represent new information requiring review of the reasonable and prudent measures provided. Specifically, if hair-tube monitoring detects a >15 percent decrease in the MGRS population within the action area at any time from year one through the end of project activities (year 15), or incidental take occurs from an activity not identified herein, you shall immediately notify the FWS and request reinitiation of consultation, pursuant to 50 CFR 402.16a.

CONSERVATION RECOMMENDATIONS

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

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.

We recommend that you acquire LiDAR data covering the entire project area after the proposed action is complete to fully assess changes in BA, forest structure, and other key habitat components important to MGRS when compared to the LiDAR data you acquired in 2008.

MEXICAN SPOTTED OWL

STATUS OF THE SPECIES

The MSO was listed as a threatened species in 1993 (U.S. Fish and Wildlife Service 1993b). The primary threats to the species were cited as even-aged timber harvest and stand-replacing wildland fire, although grazing, recreation, and other land uses were also mentioned as possible

factors influencing the MSO population. The Fish and Wildlife Service appointed the Mexican Spotted Owl Recovery Team in 1993, which produced the Recovery Plan for the Mexican Spotted Owl (Recovery Plan) in 1995 (U.S. Fish and Wildlife Service 1995). The FWS released a Draft Revised Recovery Plan for review on June 23, 2011. Critical habitat was designated for the MSO in 2004 (U.S. Fish and Wildlife Service 2004).

A detailed account of the taxonomy, biology, and reproductive characteristics of the MSO is found in the Final Rule listing the MSO as a threatened species (U.S. Fish and Wildlife Service 1993b) and in the Recovery Plan (U.S. Fish and Wildlife Service 1995). The information provided in those documents is included herein by reference. Although the MSO's entire range covers a broad area of the southwestern United States and Mexico, the MSO does not occur uniformly throughout its range. Instead, it occurs in disjunct localities that correspond to isolated forested mountain systems, canyons, and in some cases steep, rocky canyon lands. Surveys have revealed that the species has an affinity for older, uneven-aged forest, and the species is known to inhabit a physically diverse landscape in the southwestern United States and Mexico.

The U.S. range of the MSO has been divided into six recovery units (RU), as discussed in the Recovery Plan. The primary administrator of lands supporting the MSO in the United States is the Forest Service. Most owls have been found within Forest Service Region 3 (which includes 11 National Forests in Arizona and New Mexico). Forest Service Regions 2 and 4 (which includes two National Forests in Colorado and three in Utah) support fewer owls. According to the Recovery Plan, 91 percent of MSO known to exist in the United States between 1990 and 1993 occurred on lands administered by the Forest Service. Currently, 1,065 PACs are established on Forest Service lands in Arizona and New Mexico, of which 107 PACs occur on the Coronado National Forest (U.S. Forest Service 2011).

Historical and current anthropogenic uses of MSO 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 MSO nesting, roosting, and foraging habitat, and may cause disturbance during the breeding season. Livestock and wild ungulate grazing is prevalent throughout Region 3 National Forest lands and is thought to have a negative effect on the availability of grass cover for prey species. Recreation impacts are increasing on all forests, especially in meadow and riparian areas. There is anecdotal information and research that indicates that owls in heavily used recreation areas are much more erratic in their movement patterns and behavior. Fuels reduction treatments, though critical to reducing the risk of severe wildland fire, can have short-term adverse effects to MSO through habitat modification and disturbance. As the human population grows, especially in Arizona, small communities within and adjacent to National Forest System lands are being developed. This trend may have detrimental effects to MSO by further fragmenting habitat and increasing disturbance during the breeding season. West Nile Virus also has the potential to adversely impact the MSO. The virus has been documented in Arizona, New Mexico, and Colorado, and preliminary information suggests that owls may be highly vulnerable to this disease (Courtney *et al*. 2004). Unfortunately, due to the secretive nature of owls and the lack of intensive monitoring of banded birds, we will most likely not know when owls contract the disease or the extent of its impact to MSO range-wide.

Currently, high-intensity, stand-replacing fires are influencing ponderosa pine and mixed conifer

forest types in Arizona and New Mexico. Uncharacteristic, high-severity, stand-replacing wildland fire is probably the greatest threat to MSO within the action area. As throughout the West, fire severity and size have been increasing within this geographic area. Landscape level fires, such as the Rodeo-Chediski Fire (2002) and currently the Wallow Fire (2011), have resulted in the loss of thousands of acres of occupied and potential MSO habitat across significant portions of its range.

Global climate change may also be a threat to the MSO and synergistically result in increased effects to habitat from fire, fuels reduction treatments, and other factors discussed above. Studies have shown that since 1950, the snowmelt season in some watersheds of the western U.S. has advanced by about 10 days (Dettinger and Cayan 1995, Dettinger and Diaz 2000, Stewart *et al*. 2004). Such changes in the timing and amount of snowmelt are thought to be signals of climate-related change in high elevations (Smith *et al*. 2000, Reiners *et al*. 2003). The impact of climate change is the intensification of natural drought cycles and the ensuing stress placed upon high-elevation montane habitats (International Panel on Climate Change 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, invertebrate, and vertebrate populations within coniferous forests and canyon habitats that effect ecosystem function and process.

A reliable estimate of the numbers of owls throughout its entire range is not currently available (U.S. Fish and Wildlife Service 1995) and the quality and quantity of information regarding numbers of MSO vary by source. U.S. Fish and Wildlife Service (1991) reported a total of 2,160 owls throughout the United States. Fletcher (1990) calculated that 2,074 owls existed in Arizona and New Mexico. However, Ganey *et al.* (2000) estimates approximately 2,950 ± 1,067 (SE) MSOs in the Upper Gila Mountains RU alone. The Forest Service Region 3 most recently reported a total of approximately 1,025 PACs established on National Forest System (NFS) lands in Arizona and New Mexico (B. Barrera, pers. comm. June 18, 2007). The FS Region 3 data are the most current compiled information available to us; however, survey efforts in areas other than NFS lands have resulted in additional sites being located in all Recovery Units.

Researchers studied MSO population dynamics on one study site in Arizona (n = 63 territories) and one study site in New Mexico (n = 47 territories) from 1991 through 2002. The Final Report, titled "Temporal and Spatial Variation in the Demographic Rates of Two Mexican Spotted Owl Populations" (Gutierrez et al. 2003), found that reproduction varied greatly over time, while survival varied little. The estimates of the population rate of change (Λ=Lambda) indicated that the Arizona population was stable (mean Λ from 1993 to 2000 = 0.995; 95 percent Confidence Interval = 0.836, 1.155) while the New Mexico population declined at an annual rate of about 6 percent (mean Λ from 1993 to 2000 = 0.937; 95 percent Confidence Interval = 0.895, 0.979). The study concludes that spotted owl populations could experience great (>20 percent) fluctuations in numbers from year to year due to the high annual variation in recruitment. However, due to the high annual variation in recruitment, the MSO is then likely very vulnerable to actions that impact adult survival (e.g., habitat alteration, drought, etc.) during years of low recruitment.

Since the owl was listed, we have completed or have in draft form a total of approximately 229 formal consultations for the MSO. These formal consultations have identified incidences of anticipated incidental take of MSO in 439 PACs over the course of 18 years. The form of this

incidental take is almost entirely harm or harassment, rather than direct mortality, and many of these actions have resulted in single or short-term disturbance to owls that has not resulted in long-term harassment, habitat degradation, or habitat loss. These consultations have primarily dealt with actions proposed by Forest Service Region 3. However, in addition to actions proposed by Forest Service Region 3, we have also reviewed the impacts of actions proposed by the Bureau of Indian Affairs, Department of Defense (including Air Force, Army, and Navy), Department of Energy, National Park Service, and Federal Highway Administration. These proposals have included timber sales, road construction, fire/ecosystem management projects (including prescribed natural and management ignited fires), livestock grazing, recreation activities, utility corridors, military and sightseeing overflights, and other activities. Only two of these projects (release of site-specific owl location information and existing forest plans) have resulted in biological opinions that the proposed action would likely jeopardize the continued existence of the MSO. The jeopardy opinion issued for existing Forest Plans on November 25, 1997 was rendered moot as a non-jeopardy/no adverse modification BO was issued the same day.

In 1996, we issued a biological opinion on FS Region 3 adoption of the Recovery Plan recommendations through an amendment to their Land and Resource Management Plans (LRMPs). In this non-jeopardy biological opinion, we anticipated that approximately 151 PACs would be affected by activities that would result in incidental take of MSOs. In addition, on January 17, 2003, we completed a reinitiation of the 1996 Forest Plan Amendments biological opinion, which anticipated the additional incidental take of five MSO PACs in Region 3 due to the rate of implementation of the grazing standards and guidelines, for a total of 156 PACs. Consultation on individual actions under these biological opinions anticipated incidental take in the form of harm and/or harassment of owls associated with 243 PACs on Region 3 NFS lands. FS Region 3 reinitiated consultation on the LRMPs on April 8, 2004. On June 10, 2005, the FWS issued a revised biological opinion on the amended LRMPs. We anticipated that while the Region 3 Forests continue to operate under the existing LRMPs, take is reasonably certain to occur to an additional 10 percent of the known PACs on NFS lands. We expect that continued operation under the plans will result in harm to 49 PACs and harassment to another 49 PACs. To date, consultation on individual actions under the amended Forest Plans, as accounted for under the June 10, 2005, biological opinion has resulted in the incidental take of owls associated with 52 PACs over approximately five years. However, because some of this incidental take has been in the form of short-term harassment that has occurred and is no longer on-going, we are continuing to track incidental take in 45 PACs associated with actions covered under the 2005 LRMP BO (21 harm, 24 harass). Prior to the 2011 fire season, incidental take associated with Forest Service fire suppression actions, which was not included in the LRMP proposed action, has resulted in the incidental take of owls associated with 27 PACs (6 harm, 21 harassment).

Mexican spotted owl critical habitat

The final MSO critical habitat rule (U.S. Fish and Wildlife Service 2004) designated approximately 8.6 million acres of critical habitat in Arizona, Colorado, New Mexico, and Utah, mostly on Federal lands (U.S. Fish and Wildlife Service 2004). Within this larger area, critical habitat is limited to areas that meet the definition of protected and restricted habitat, as described in the Recovery Plan. Protected habitat includes all known owl sites and all areas within mixed conifer or pine-oak habitat with slopes greater than 40 percent where timber harvest has not

occurred in the past 20 years. Restricted habitat includes mixed conifer forest, pine-oak forest, and riparian areas outside of protected habitat.

The physical and biological features for proposed MSO critical habitat were determined from studies of their habitat requirements and information provided in the Recovery Plan (U.S. Fish and Wildlife Service 1995). Since owl habitat can include both canyon and forested areas, physical and biological features were identified in both areas. The physical and biological features which occur for the MSO within mixed-conifer, pine-oak, and riparian forest types that provide for one or more of the MSO's habitat needs for nesting, roosting, foraging, and dispersing are in areas defined by the following features for forest structure and prey species habitat:

Physical and biological features related to forest structure include:

- 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 diameter-at-breast height (dbh) of 12 inches or more;

- A shade canopy created by the tree branches covering 40 percent or more of the ground; and,

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

Physical and biological features related to the maintenance of adequate prey species include:

- 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 forest habitat attributes 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 characteristics may also be observed in younger stands, especially when the stands contain remnant large trees or patches of large trees. Certain forest management practices may also enhance tree growth and mature stand characteristics where the older, larger trees are allowed to persist.

Recovery Plan

The MSO Recovery Plan (which is currently in revision) provides a long-term strategy for conserving the species with the ultimate goal of improving its status to the point that it can be removed from the list of threatened species at some point in the future. It outlines three general strategies for management that provide varying levels of habitat protection depending on the owl's needs and habitat use. These strategies included PACs, restricted areas, and other forest and woodland types, all of which have different recommended management prescriptions. The

plan also recommends monitoring, and suggests research necessary to answer key questions relevant to conservation techniques and priorities actions. All suggested actions are outlined in an implementation schedule that identifies timing, responsible parties, and estimated costs of each action.

The range of the MSO is divided into six recovery units in the U.S. and five in Mexico based on various factors, including biotic communities, MSO regional ecology, and management considerations. If the recovery criteria are met in each recovery unit, the species should be considered for delisting. The recovery criteria are:

1. The population in the three most populated recovery units must be stable or increasing after 10 years of monitoring.

2. Scientifically valid habitat monitoring protocols are designed and implemented to assess (a) gross changes in habitat quantity across the range of the MSO, and (b) habitat modifications and habitat trajectories within treated stands.

3. A long-term management plan is in place to ensure appropriate management for the MSO and its habitat.

ENVIRONMENTAL BASELINE – Mexican Spotted Owl

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

The action area means 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). For purposes of the MSO analysis, we have determined the action area includes any PACs that are designated wholly, partially, or within 0.5 mile of areas that will be treated through this project, as well as all of the MSO CH in the Pinaleño Mountains, as this is the area that will benefit by reduced risk of high-severity fire. The mixed-conifer forest within the action area mainly consists of Douglas-fir, southwestern white pine, ponderosa pine, corkbark fir, white fir, quaking aspen, and Engelmann spruce, and occurs at differing aspects and elevations from above 7,750 feet to approximately 10,000 feet.

A. Status of the Species within the Action Area – Mexican Spotted Owl

The Pinaleño Ecosystem Restoration Project analysis area for the MSO is within the Basin and Range – West Recovery Unit (RU). The Basin and Range – West RU encompasses a small portion of New Mexico and the majority of southern Arizona and is the second largest RU in the United States. Land ownership within this RU is a mosaic of public and private lands, with the MSO primarily occupying Forest Service lands. The action area also falls within the MSO CH unit Basin and Range – West 8 (BR-W-8), which is centered on the Pinaleño Mountains. There

are approximately 107,838 total acres within BR-W-8. The unit contains forested habitats and steep, forested canyon habitats (but not canyon habitat as described in the MSO CH rule). There are approximately 2,898 acres of critical habitat that will be treated through the proposed action, of which 2,217 acres are currently designated as PACs.

Table 4: Summary table of MSO PACs and core areas that may be affected by the Pinaleño Ecosystem Restoration Project.

PAC Name	PAC No.	Acres in PAC/core area	% PAC/core area burned in Clark Peak	% PAC burned in Nuttall/% moderate- to high-severity burn	% core area burned in Nuttall/% moderate- to high-severity burn	Acres/% of PAC to be treated	Acres/% of core area to be treated
Riggs Lake	0504003	691/89*	50/85	9/2	2/2	0/0	0/0
Chesley Flat	0504004	681/110	75/89	8/4	3/2	91/13	0/0
Lefthand Canyon	0504005	639/ unknown	0	100/13	No core delineated	25/4	No core delineated
Webb Peak	0504006	613/109	56/100	5/1	0/0	164/27	0/0
Mill Site	0504007	754/126	0	18/0	0/0	72/10	0/0
Ash Creek	0504008	612/109	0	46/2	44/0	52/8	0/0
Grant Vista	0504009	623/84*	83/17	0/0	0/0	110/18	0/0
Goudy Canyon	0504010	622/ unknown	100	0/0	No core delineated	0/0	No core delineated
Moonshine	0504011	628/83*	80/25	0/0	0/0	0/0	0/0
Grant Hill	0504012	674/75*	<1/0	0/0	0/0	176/26	0/0
Upper Cunningham	0504013	808/120	7/1	0/0	0/0	316/39	12/10
Treasure Park	0504014	734/70*	0	0/0	0/0	308/42	35/50
Hagens Point	0504015	643/85*	0	1/<1	0/0	0/0	0/0
Heliograph	0504016	612/89*	0	48/7	0/0	372/61	47/53
Marijilda	0504017	636/ unknown	0	100/70	No core delineated	4/1	No core delineated
Eagle Rock	0504019	667/ unknown	0	100/88	No core delineated	0/0	No core delineated
Wet Canyon	0504020	604/ unknown	0	94/22	No core delineated	0/0	No core delineated
Lower Cunningham	0504023	711/112	3/1	0/0	0/0	520/73	69/62

* These core areas do not meet the 100-acre minimum size as recommended in the Recovery Plan and as required by the 1996 Forest Plan Amendments. Core areas in the Pinaleño Mountains were delineated in forested habitat surrounding known nesting/roosting locations using aerial imagery, and, for these core areas, 100 acres of appropriate forested habitat surrounding the nesting/roosting locations were not available.

There are 18 MSO PACs and 13 core areas (based on known nesting sites or a group of roosting locations) designated partially or within 0.5 mile of the treated area (Table 4). For purposes of our analysis all 18 are considered to be occupied. Thirteen owl PACs and four owl core areas fall partially within the area that will be treated through the proposed action.

B. Factors Affecting the Species within the Action Area – Mexican Spotted Owl

Historically, logging was a significant human activity affecting MSO habitat in the Pinaleño Mountains. By 1973, most accessible and marketable timber had been cut, severely affecting the age structure and density of many stands (U.S. Fish and Wildlife Service 1993a). Commercial logging has ceased, but the action area still supports significant recreational use by hikers, campers, birders, wildlife and plant collectors, fuel wood collectors, and hunters, as well as use by researchers and biological monitoring. Additionally, summer-home owners and sometimes their pets inhabit the action area and use the forest lands surrounding their cabins for a variety of activities, including those mentioned above. The Mount Graham International Observatory does not lie within a PAC, although a portion of the dirt road leading to it winds through the Grant Vista PAC and core area. Additionally, both the Clark Peak and Nuttall Complex wildland fires impacted MSO habitat. Fire intensity (no to low, moderate, and high) was mapped for the Nuttall Complex wildland fire, but not for the Clark Peak wildland fire. PEM treated areas within two PACs (Webb Peak and Chesley Flat). Factors affecting each PAC within the action area are discussed in detail below.

Riggs Lake PAC (#0504003)

The first known occupancy of the 691-acre Riggs Lake PAC was by a pair in 1990. Since then it has been surveyed every year except 1999-2002 (and informally monitored in 1996). The PAC was consistently occupied through 1997, after which it was either not surveyed or owls were not detected for all but three years. The most recent occupancy record was of a male in 2007. An 89-acre core area surrounding nesting and/or roosting locations has been delineated. Approximately 10 percent of this PAC (including two percent of its core area) falls within the perimeter of the 2004 Nuttall Complex wildland fire, with 48 acres categorized as no to low-intensity burn, nine acres as moderate-intensity burn, and six acres as high-intensity burn. Additionally, approximately 50 percent of this PAC and 85 percent of its core area fall within the 1996 Clark Peak wildland fire perimeter. This PAC encompasses all of Riggs Lake Campground, and several hiking trails wind through this PAC. The Swift Trail follows the northeastern-facing boundary of this PAC.

Chesley Flat PAC (#0504004)

The first known occupancy of the 681-acre Chesley Flat PAC was by a pair in 1990. It was inconsistently monitored until 2001, after which monitoring occurred every year except 2005. Most recently a single owl was documented in 2008 and 2009. A 110-acre core area surrounding nesting and/or roosting locations has been delineated. Approximately nine percent of this PAC (including three percent of its core area) falls within the perimeter of the 2004 Nuttall Complex wildland fire, with 27 acres categorized as no to low-intensity burn and 26 acres as moderate-intensity burn. Additionally, approximately 75 percent of this PAC and 89 percent of its core

area fall within the 1996 Clark Peak wildland fire perimeter. About 100 acres of the Chesley Flat PAC (excluding the core area) was treated with a combination of treatments through PEM, including broadcast burning. The Swift Trail winds through the eastern and northern portion of this PAC.

Lefthand Canyon PAC (#0504005)

The first known occupancy of the 639-acre Lefthand Canyon PAC was by a pair in 1990. It has only been surveyed three times since, with a single owl documented in 1997 and no owls detected in 2006 and 2007. A core area surrounding nesting and/or roosting locations has not been delineated. This PAC falls entirely within the perimeter of the 2004 Nuttall Complex wildland fire, with 557 acres categorized as no to low-intensity burn and 82 acres as moderate-intensity burn. None of the Lefthand Canyon PAC burned during the 1996 Clark Peak wildland fire. There is one hiking trail that bisects through the middle of this PAC.

Webb Peak PAC (#0504006)

The first known occupancy of the 613-acre Webb Peak PAC was by a pair in 1990. Since then it has been monitored all but four years. Most recently a single owl was documented in 2007. A 109-acre core area surrounding nesting and/or roosting locations has been delineated. Approximately five percent of this PAC falls within the perimeter of the 2004 Nuttall Complex wildland fire, with 32 acres categorized as no to low-intensity burn. Additionally, approximately 56 percent of this PAC and 100 percent of its core area fall within the 1996 Clark Peak wildland fire perimeter. Approximately 470 acres of the Webb Peak PAC were thinned from below, cut, piled, and burned through PEM, although none of it was broadcast burned. The Swift Trail cuts through the middle of this PAC, which also encompasses Soldier Creek Campground, which has one hiking trail heading south from it.

Mill Site PAC (#0504007)

The first known occupancy of the 754-acre Mill Site PAC was by a pair in 1990. It has been surveyed inconsistently since, with a pair most recently occupying the PAC in 2005 and 2006 (one young was fledged in 2006). No owls were found in 2007, and the PAC has not been surveyed since. A 126-acre core area surrounding nesting and/or roosting locations has been delineated. Approximately 22 percent of this PAC falls within the perimeter of the 2004 Nuttall Complex wildland fire, with 134 acres categorized as no to low-intensity burn. None of the Mill Site PAC burned during the 1996 Clark Peak wildland fire. The dirt road to the Bible Camp cuts through the southeastern corner of this PAC, and two hiking trails cut through the middle and western portions of the PAC.

Ash Creek PAC (#0504008)

The first known occupancy of the 612-acre Ash Creek PAC was by a female in 1990. It has been surveyed inconsistently since, with a pair and one fledged young detected in 2007. The PAC has not been surveyed since 2007. A 109-acre core area surrounding nesting and/or roosting locations has been delineated. Approximately 47 percent of this PAC (including 44 percent of its

core area) falls within the perimeter of the 2004 Nuttall Complex wildland fire, with 266 acres categorized as no to low-intensity burn and 14 acres as moderate-intensity burn. None of the Ash Creek PAC burned during the 1996 Clark Peak wildland fire. The Bible Camp lies within this PAC and a hiking trail cuts across the middle.

Grant Vista PAC (#0504009)

The first known occupancy of the 623-acre Grant Vista PAC was by a male in 1990. Since then it has been monitored on and off, but has been consistently monitored since 2006. The most recent surveys indicate a pair occupied the PAC in 2008 and 2009, fledging one young both years. An 84-acre core area surrounding nesting and/or roosting locations has been delineated. None of this PAC burned during the 2004 Nuttall Complex wildland fire, although approximately 83 percent of this PAC and 17 percent of its core area fall within the 1996 Clark Peak wildland fire perimeter. Swift Trail winds through this PAC, including a portion of the core area. A portion of the dirt road that leads up to the Mount Graham International Observatory winds along the eastern boundary of the core area.

Goudy Canyon PAC (#0504010)

The first known occupancy of the 622-acre Goudy Canyon PAC was by a pair in 1990. It has only been monitored one time since, in 1997, and no owls were detected. A core area surrounding nesting and/or roosting locations has not been delineated. None of this PAC burned during the 2004 Nuttall Complex wildland fire, but 100 percent of it falls within the perimeter of the 1996 Clark Peak wildland fire. One hiking trail winds through the eastern portion of this PAC.

Moonshine PAC (#0504011)

The first survey of the 628-acre Moonshine PAC occurred in 1997, during which no owls were detected. It has not been surveyed since. An 83-acre core area surrounding nesting and/or roosting locations has been delineated on aerial imagery and terrain, but did not involve an owl sighting. None of this PAC was burned during the 2004 Nuttall Complex wildland fire, although approximately 80 percent of this PAC and 25 percent of its core area fall within the 1996 Clark Peak wildland fire perimeter. One hiking trail cuts through the middle of this PAC.

Grant Hill PAC (#0504012)

The first known occupancy of the 674-acre Grant Hill PAC was by a pair in 1990. Since then it has been monitored only four times, with the most recent surveys documenting a single owl in both 2007 and 2008. It was not monitored in 2009. A 75-acre core area surrounding nesting and/or roosting locations has been delineated. None of this PAC was burned during the 2004 Nuttall Complex wildland fire, although a very small portion (less than one percent) falls within the 1996 Clark Peak wildland fire perimeter. Two dirt roads cut through portions of this PAC.

Upper Cunningham PAC (#0504013)

The first known occupancy of the 808-acre Upper Cunningham PAC was by a male in 1990. Since then it has been monitored all but seven years, the most recent of which documented a pair in 2006 (that fledged two young) and a single owl in both 2007 and 2008. It was not monitored in 2009. A 120-acre core area surrounding nesting and/or roosting locations has been delineated. None of this PAC was burned during the 2004 Nuttall Complex wildland fire, although approximately seven percent (not within the core area) falls within the 1996 Clark Peak wildland fire perimeter. The Swift Trail winds through the southern and western portions of this PAC, and several dirt roads (that are kept locked and used mostly as hiking trails) meander around the PAC, including a portion of the core area.

Treasure Park PAC (#0504014)

The first known occupancy of the 734-acre Treasure Park PAC was by a pair in 1991. It was intermittently monitored until 2006, after which it was monitored every year. No owls were detected in this PAC from 2006-2008, but a pair was documented in 2009. A 70-acre core area surrounding nesting and/or roosting locations has been delineated. None of this PAC was burned during either the 2004 Nuttall Complex or 1996 Clark Peak wildland fires. Swift Trail crosses a very small portion at the northern end of this PAC, and two dirt roads and a hiking trail occur in the northern half of the PAC.

Hagens Point PAC (#0504015)

The first known occupancy of the 643-acre Hagens Point PAC was by a pair in 1992. Since then it has been monitored all but seven years, with the most recent surveys documenting a pair that fledged two young in 2006, a single owl in 2007, a pair in 2008, and no owls detected in 2009. An 85-acre core area surrounding nesting and/or roosting locations has been delineated. Approximately one percent of this PAC is within the perimeter of the 2004 Nuttall Complex wildland fire, with three acres categorized as no to low-intensity burn and two acres as moderate-intensity burn. None of the Hagens Point PAC burned during the 1996 Clark Peak wildland fire. The Swift Trail runs through the eastern portion of this PAC.

Heliograph PAC (#0504016)

The first known occupancy of the 612-acre Heliograph PAC was by a male in 1991. Since then it has been monitored all but four years, with the most recent surveys documenting a male in 2007 and a single owl in both 2008 and 2009. An 89-acre core area surrounding nesting and/or roosting locations has been delineated. Approximately 50 percent of this PAC is within the perimeter of the 2004 Nuttall Complex wildland fire, with 257 acres categorized as no to low-intensity burn, 31 acres as moderate-intensity burn, and nine acres as high-intensity burn. None of the Heliograph PAC burned during the 1996 Clark Peak wildland fire. The Swift Trail winds through a portion of this PAC (including the core area), which also encompasses Shannon Campground, the radio towers on Heliograph Peak, and the road leading up to them.

Marijilda PAC (#0504017)

The first known occupancy of the 636-acre Marijilda PAC was by a female in 1990. It has not been monitored since then. A core area surrounding nesting and/or roosting locations has not been delineated. All of this PAC is within the perimeter of the 2004 Nuttall Complex wildland fire, with 189 acres categorized as no to low-intensity burn, 404 acres as moderate-intensity burn, and 44 acres as high-intensity burn. None of the Marijilda PAC burned during the 1996 Clark Peak wildland fire.

Eagle Rock PAC (#0504019)

The first known occupancy of the 667-acre Eagle Rock PAC was by a pair in 1990. It has only been monitored twice since then, most recently in 2006 when a pair was documented. A core area surrounding nesting and/or roosting locations has not been delineated, as the pair was detected aurally and nesting and/or roosting locations were not found. All of this PAC is within the perimeter of the 2004 Nuttall Complex wildland fire, with 78 acres categorized as no to low-intensity burn, 435 acres as moderate-intensity burn, and 153 acres as high-intensity burn. None of the Eagle Rock PAC burned during the 1996 Clark Peak wildland fire.

Wet Canyon PAC (#0504020)

The first known occupancy of the 604-acre Wet Canyon PAC was by a pair in 1990. Since then it has been monitored inconsistently, with the most recent surveys documenting a pair that fledged two young in 2006 and no owls detected in 2007. It was not monitored in 2008 or 2009. A core area surrounding nesting and/or roosting locations has not been delineated, as the owls and fledglings that were detected in 2006 were seen foraging and nesting and/or roosting locations were not found. Approximately 95 percent of this PAC is within the perimeter of the 2004 Nuttall Complex wildland fire, with 434 acres categorized as no to low-intensity burn, 131 acres as moderate-intensity burn, and four acres as high-intensity burn. None of the Wet Canyon PAC burned during the 1996 Clark Peak wildland fire.

Lower Cunningham PAC (#0504023)

The first known occupancy of the 711-acre Lower Cunningham PAC was by a pair in 1990. Since then it has been inconsistently monitored, with the most recent surveys documenting a single owl in 2007 and a pair in 2008. It was not monitored in 2009. A 112-acre core area surrounding nesting and/or roosting locations has been delineated. None of this PAC was burned during the 2004 Nuttall Complex wildland fire, although approximately three percent (not including the core area) falls within the 1996 Clark Peak wildland fire perimeter. The Swift Trail and several dirt roads cut through portions of this PAC, which also encompasses the Hospital Flat Campground. Most of the campground is within the core area.

C. Status of Mexican Spotted Owl Critical Habitat within the Action Area

There are 107,838 acres of MSO CH designated in the Pinaleño Mountains, which also comprise the BR-W-8 CH unit. The entire 5,752-acre action area falls within MSO CH, of which

approximately 2,898 acres will be treated through the proposed action. This represents 5.3 percent and 2.7 percent of the MSO CH in this CH unit, respectively, and less than 0.01 percent of all designated CH across the range of the MSO (total of 8.6 million acres). Mexican spotted owl CH within the action area has been affected by factors detailed in the Environmental Baseline section for the Mount Graham Red Squirrel, above.

D. Factors affecting Mexican Spotted Owl Critical Habitat in the Action Area

The same factors that affect the species in the action area also affect CH (see above).

EFFECTS OF THE ACTION – Mexican Spotted Owl

Effects of the action mean the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated and interdependent with that action that will be added to the environmental baseline. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration. The direct and indirect effects of the proposed action include impacts from forest health and fuel treatments (thinning and burning) that will aid in restoring understory and overstory vegetation health and diversity and reduce the risk of stand-replacing wildland fire.

Project activities are planned to reduce the risk of severe, stand-replacing wildland fire in MSO PACs and core area habitat as recommended in the Recovery Plan (U.S. Fish and Wildlife Service 1995). However, even projects with projected long-term benefits may reduce habitat quality for wildlife in the short-term. The project will be implemented over the next 10 to 15 years, and then it will take some period of time for longer-term project benefits to be realized. In the short-term, direct and indirect effects to the MSO and its habitat may include disturbance, the loss of key habitat components, and reduced high-severity wildland fire risk. Direct and indirect effects to CH may include the loss or modification of biological and physical features and reduced high-severity wildland fire risk. This section will describe the potential effects of the project to MSO and how actions implemented under the proposed action may result in short-term adverse effects to the species and its habitat; however, we also expect that the proposed action will reduce the potential for stand-replacing wildland fire and provide increased protection to existing and future MSO habitat.

PACs within the treated area, including core habitat alteration

There are four MSO PACs within the project area in which treatment will occur, including within the core area. Effects within each are described below.

<u>Upper Cunningham PAC (#0504013)</u>

Approximately 316 acres (39 percent) of the Upper Cunningham PAC are proposed for treatment in Implementation Blocks two and seven, including General Prescriptions of the Important Wildlife Area and Forest Restoration Area treatments. Approximately 10 percent of the core area will be treated (Important Wildlife Area General Prescription). Approximately 235 acres

within the PAC will be treated with underburning, much of which will occur near the core area (but not within the core area). Pile burning will occur on 136 acres, 95 acres of which will also be treated with underburning. All activities except preparing stands for treatment and monitoring will occur outside of the MSO breeding season.

Effects from silvicultural treatments within this PAC may be significant. Trees up to nine-inches dbh may be removed in the core area, while trees up to 18-inches dbh may be removed from the PAC. These diameter limits do not follow the recommendations for Protected Habitat (including PACs) in the Recovery Plan (U.S. Fish and Wildlife Service 1995). When nesting in trees, MSO typically place their nests in large trees, whereas roost sites can be in either large or small trees. Hence, roost sites are more likely to be affected by silvicultural treatments than nest trees. To further reduce the likelihood of adverse effects, PACs and core areas will be swept prior to activity to look for nest trees, and known nest trees will be protected with a 200-foot buffer in which no treatment will occur, reducing the likelihood that either nest trees or nearby roost trees may be felled. Some roost trees outside of this 200-foot buffer may still be felled (U.S. Fish and Wildlife Service 1995).

Thinning these dense stands is expected to reduce fuel loading, break-up canopy connectivity to some extent, and remove ladder fuels, thereby reducing the potential for active canopy fires. To minimize the impact of these silvicultural treatments, group selection of trees based on VSS size-classes and variable density thinning will be applied so that approximately one third of the groups of trees within a stand will have a more wide spacing, while approximately two thirds will have a close spacing (or not be thinned at all). Group sizes will vary between 0.25 acres and 1.25 acres. This should create a variably aged stand within the PAC that is anticipated to benefit MSO in the long-term. Additionally, a minimum average live tree BA of 150- and 170-ft^2 per acre will be maintained in Forest Restoration Areas units (which will occur in the PAC) and Important Wildlife Areas units (which will occur in the core area), respectively. These BA thresholds are recommended in the Recovery Plan for Restricted Habitat, and should, over the long-term, improve MSO habitat. All large snags and logs within the core area will be retained, and 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 MSO prey species habitat.

The extent to which MSO are preyed upon is unknown, although avian predators may be a common cause of mortality for MSO (U.S. Fish and Wildlife Service 1995). Thinning potentially could benefit predators and competitors, such as great horned owls, at the expense of MSO. One study, however, found that MSO concentrated their use in stands with $\geq$ 40 percent canopy cover, whereas great horned owls used areas with < 40 percent canopy cover (Ganey *et al*. 1997). The proposed action should maintain a level of canopy cover sufficient for MSO use in both the short- and long-term, as it is expected to reduce canopy cover from 54 percent to 43 percent within the 10 to 15-year implementation period, after which it should increase to 48 percent canopy cover over the next 30 years. This reduces the likelihood that an increase in predation upon or competition with MSO due to a reduction in canopy cover will occur.

Effects from prescribed burning in the PAC may be significant. Controlled burning is expected to reduce the risk of wildland fire by reducing accumulations of fuels, but it also can significantly modify and/or destroy the key habitat components that comprise MSO habitat. All

proposed burning will follow a prescription incorporating wildlife design features intended to limit effects to key habitat components (e.g., protection of logs, snags, and large trees). These include felling snags to create logs after underburning is completed; burning during conditions when live fuel moisture is at 100 percent (reducing the chance that live trees will catch fire) and 1000-hour (three-inches dbh or greater) fuel moisture is at 15 percent (minimizing the potential that large logs or snags will burn); and, in core areas, underburning only if the unit first contains all of the CH physical and biological features (per microhabitat monitoring). Additionally, pile burning of fuels will reduce the fuel load in some units prior to underburning activities. These efforts likely will minimize the loss of large snags and logs, although we anticipate there will be some measurable loss of these key habitat components. The reduction in snags and logs could affect prey availability at the burn unit scale and potential nest trees (snags). However, burns are likely going to create a mosaic of burned and unburned areas, thin the understory, and create small (≤0.25 acre) openings, but not change the overall structure of MSO habitat within the project area. The mosaic effect created by burned and unburned areas and by opening up small patches of forest within the PAC is expected to increase herbaceous plant species diversity and, in turn, assist in the production and maintenance of the MSO prey base.

Smoke created from underburning may affect MSO. Smoke tends to settle into low-lying areas during the nighttime and could potentially affect owls in this PAC. Effects would be short-term (3 to 5 days), as all prescribed underburns will be managed to produce a low-intensity, low-severity burn during conditions when fuel moisture is high (minimizing the potential that large trees, snags, or logs will burn), wind speeds 20 feet above the ground are eight miles per hour or less (reducing the chance a surface fire could ignite a crown fire), and air temperatures are 70 degrees Fahrenheit or less (reducing the drying effect caused by high temperatures).

All treatments and burning will occur outside of the MSO breeding season, and therefore nesting MSO should not be disturbed by these activities. However, nesting owls may be disturbed by small crews of people conducting stand preparation activities (e.g., marking trees) and monitoring within and near the core area, which may occur from 5 to 10 days during the breeding season. Swarthout and Steidl (2001) found that MSO modified their behavior (e.g., increased perch height) and/or flushed in response to recreationists (hikers). Based on their results, they recommended placing buffer zones (conservative buffer = 180 feet; less conservative buffer = 40 feet) around known roosting sites to minimize impacts. In a study to assess the effects of hikers on the behavior of nesting MSO, Swarthout and Steidl (2003) noted that female MSOs decreased the amount of time they handled prey by 57% and decreased the amount of time they performed daytime maintenance activities by 30% while hikers were present. In addition, hikers caused both female and male owls to increase the frequency of contact vocalizations. Birds may respond to disturbance during the breeding season by abandoning their nests or young; by altering their behavior such that they are less attentive to the young, which increases the risk of the young being preyed upon or disrupting feeding patterns; or by exposing young to adverse environmental stress (Knight and Cole 1995). There is also evidence that disturbance during years of a diminished prey base can result in lost foraging time which, in turn, may cause some raptors to leave an area or not to breed at all (Knight and Cole 1995). Topographic screening between the area of disturbance and the bird's location creates a noise buffer, and may assist in the reduction of noise disturbance (Knight and Cole 1995).

Treatments will occur during Implementation Blocks two and seven, meaning disturbance may occur within this PAC for 7 to 11 years (treatments within one implementation block will be completed in two to five years).

Treasure Park PAC (#0504014)

Approximately 333 acres (45 percent) of the Treasure Park PAC are proposed for treatment in Implementation Block three, including General Prescriptions of the Important Wildlife Area and Forest Restoration Area treatments and a Modified Prescription of the Forest Restoration Area treatment (fuels reduction treatment only). Approximately 50 percent of the core area will be treated (Important Wildlife Area General Prescription). Approximately 293 acres within the PAC will be treated with underburning, much of which will occur near the core area (but not within the core area). Pile burning will occur on less than one acre. All activities except preparing stands for treatment and monitoring will occur outside of the MSO breeding season.

Effects from silvicultural treatments, prescribed burning, and noise within this PAC may be significant, and are similar to those described in paragraphs two through six under the Upper Cunningham PAC analysis, above. Treatments will occur during Implementation Block three, meaning disturbance may occur within this PAC for two to five years (treatments within one implementation block will be completed in two to five years).

Heliograph PAC (#0504016)

Approximately 375 acres (61 percent) of the Heliograph PAC is proposed for treatment in Implementation Blocks three and four, including both General and Modified Prescriptions of the Important Wildlife Area and Forest Restoration Area treatments (Prescription 1 and fuels reduction treatment only). Approximately 53 percent of the core area will be treated (Important Wildlife Area General Prescription). Approximately 261 acres within the PAC will be treated with underburning, much of which will occur both within and near the core area. An additional 64 acres will be treated with pile burning. All activities except preparing stands for treatment and monitoring will occur outside of the MSO breeding season.

Effects from silvicultural treatments, prescribed burning, and noise within this PAC may be significant, and are similar to those described in paragraphs two through six under the Upper Cunningham PAC analysis, above. Treatments will occur during Implementation Blocks three and four, meaning disturbance may occur within this PAC for three to seven years (treatments within one implementation block will be completed in two to five years).

Lower Cunningham PAC (#0504023)

Approximately 528 acres (74 percent) of the Lower Cunningham PAC are proposed for treatment in Implementation Blocks two, three, and seven, including the General Prescriptions of the Important Wildlife Area and Forest Restoration Area treatments and a Modified Prescription of the Forest Restoration Area treatment (fuels reduction treatment only). Approximately 62 percent of the core area will be treated (Important Wildlife Area General Prescription). Approximately 261 acres within the PAC will be treated with underburning, none of which will

occur in the core area. Pile burning will occur on 194 acres, 31 acres of which will also be treated with underburning. All activities except preparing stands for treatment and monitoring will occur outside of the MSO breeding season.

Effects from silvicultural treatments, prescribed burning, and noise within this PAC may be significant, and are similar to those described in paragraphs two through six under the Upper Cunningham PAC analysis, above. Treatments will occur during Implementation Blocks two, three, and seven, meaning disturbance may occur within this PAC for 7 to 11 years (treatments within one implementation block will be completed in two to five years).

PACs within the treated area, no core habitat alteration

There are eight MSO PACs that occur within the project area in which treatment will occur (no treatment will occur within the core area). Effects within each are described below.

Chesley Flat PAC (#0504004)

Approximately 91 acres (13 percent) of the Chesley Flat PAC are proposed for treatment in Implementation Blocks one, six, and eight, including both General and Modified Prescriptions of Important Wildlife Area and Forest Restoration Area treatments (Prescription 2 and fuels reduction treatment only). None of the core area will be treated. Approximately 78 acres within the PAC will be treated with underburning, including approximately 37 acres that will also be piled and burned. All activities except preparing stands for treatment and monitoring will occur outside of the MSO breeding season.

Direct and indirect effects from the proposed action within this PAC will be minimal. All treatments and burning will occur outside of the MSO breeding season, and therefore nesting MSO should not be disturbed by these activities. Nesting owls may be disturbed by small crews of people for 5 to 10 days conducting stand preparation activities (e.g., marking trees) and monitoring near the core area, both of which may occur during the breeding season, but as none of the core area will be treated, we expect this disturbance to be minimal. Trees up to 18-inches dbh may be removed, which does not follow the recommendations for Protected Habitat (including PACs) in the Recovery Plan (U.S. Fish and Wildlife Service 1995). Thinning these dense stands is expected to reduce fuel loading, break-up canopy connectivity to some extent, and remove ladder fuels, thereby reducing the potential for active canopy fires. To minimize the impact of these silvicultural treatments, group selection of trees based on VSS size-classes and variable density thinning will be applied so that approximately one third of the groups of trees within a stand will have a more wide spacing, while approximately two thirds will have a close spacing (or not be thinned at all). This should create a variably aged stand within the PAC that is anticipated to benefit MSO in the long-term. Additionally, a minimum live tree BA of 150- and 170-ft^2 per acre will be maintained in Forest Restoration Areas and Important Wildlife Areas, respectively. These BA thresholds are recommended in the Recovery Plan for Restricted Habitat, and should, over the long-term, improve MSO habitat. All large snags and logs within the Important Wildlife Area will be retained, and a minimum of six large snags and logs, each, will be retained or created (i.e., felling snags to create logs) in the Forest Restoration Area, which should maintain and improve MSO prey species habitat.

Smoke created from underburning may affect non-nesting MSO. Smoke tends to settle into low-lying areas during the nighttime and could potentially affect owls in this PAC. Effects would be short-term (3 to 5 days), as all prescribed underburns will be managed to produce a low-intensity, low-severity burn during conditions when fuel moisture is high (minimizing the potential that large trees, snags, or logs will burn), wind speeds 20 feet above the ground are eight miles per hour or less (reducing the chance a surface fire could ignite a crown fire), and air temperatures are 70 degrees Fahrenheit or less (reducing the drying effect caused by high temperatures).

Lefthand Canyon PAC (#0504004)

Approximately 25 acres (four percent) along the southern edge of the Lefthand Canyon PAC are proposed for treatment in Implementation Blocks six and eight using the Important Wildlife Area General Prescription treatment. Pile burning will occur on 16 acres, with underburning occurring on the remaining nine acres. All activities except preparing stands for treatment and monitoring will occur outside of the MSO breeding season. No core area has been designated within this PAC.

Direct and indirect effects from the proposed action within the PACs will be minimal. Trees up to nine-inches dbh may be removed, which follows the recommendations for Protected Habitat (including PACs) in the Recovery Plan (U.S. Fish and Wildlife Service 1995); therefore, silvicultural treatments should not affect the owls within this PAC. The core area is unknown, which means some nesting or roosting trees could be impacted. However, the PAC will be swept prior to activity to look for nest trees, and known nest trees will be protected with a 200-foot buffer in which no treatment will occur. They will also be surrounded by a 100-acre core area within which only trees up to nine-inches dbh may be cut. This reduces the likelihood that either nest trees or nearby roost trees may be felled, although some roost trees outside of the 200-foot buffer may still be cut, as owls roost in both large and small trees (U.S. Fish and Wildlife Service 1995).

Treatments will occur during Implementation Blocks six and eight, meaning disturbance may occur within this PAC for 4 to 8 years (treatments within one implementation block will be completed in two to five years).

Webb Peak PAC (#0504006)

Approximately 167 acres (27 percent) of the Webb Peak PAC are proposed for treatment in Implementation Blocks one, eight, and ten, including both General and Modified Prescriptions of Important Wildlife Area and Forest Restoration Area treatments (Prescriptions 1, 2, 6, 7, and fuels reduction treatment only). None of the core area will be treated. Almost all treated acres within the PAC will be underburned, with approximately 100 of these acres also being piled and burned prior to underburning. All activities except preparing stands for treatment and monitoring will occur outside of the MSO breeding season.

Direct and indirect effects from the proposed action within the PAC may occur, and are similar

to those described in paragraphs two and three under the Chesley Flat PAC analysis, above. Because 27 percent of this PAC is proposed for treatment, it is likely that stand preparation activities will take longer to complete (up to the full 10 days); therefore, the potential for disturbance due to the presence of people within the PAC is greater. Treatments will occur during Implementation Blocks one, eight, and ten, meaning disturbance may occur within this PAC for 11 to 15 years (treatments within one implementation block will be completed in two to five years).

Mill Site PAC (#0504007)

Approximately 72 acres (ten percent) along the southern edge of the Mill Site PAC are proposed for treatment in Implementation Blocks five and ten, including both General and Modified Prescriptions of Important Wildlife Area and Forest Restoration Area treatments (Prescriptions 1 and fuels reduction treatment only). None of the core area will be treated. Pile burning will occur on 26 acres, with underburning planned for three of those acres. All activities except preparing stands for treatment and monitoring will occur outside of the MSO breeding season.

Direct and indirect effects from the proposed action within this PAC will be minimal, and are similar to those described in paragraphs two and three under the Chesley Flat PAC analysis, above. Treatments will occur during Implementation Blocks five and ten, meaning disturbance may occur within this PAC for 7 to 11 years (treatments within one implementation block will be completed in two to five years).

Ash Creek PAC (#0504008)

Approximately 52 acres (eight percent) in the western portion of the Ash Creek PAC are proposed for treatment in Implementation Block ten, including the General Prescription of the Important Wildlife Area treatment and a Modified Prescription of the Forest Restoration Area treatment (Prescription 4). None of the core area will be treated. Pile burning will occur on 46 acres and no underburning will occur. All activities except preparing stands for treatment and monitoring will occur outside of the MSO breeding season.

Direct and indirect effects from the proposed action within this PAC will be minimal, and are similar to those described in paragraphs two and three under the Chesley Flat PAC analysis, above, except that only trees up to 12-inches dbh may be removed (instead of up to 18-inches dbh). Treatments will occur during Implementation Block ten, meaning disturbance may occur within this PAC for two to five years (treatments within one implementation block will be completed in two to five years).

Grant Vista PAC (#0504009)

Approximately 110 acres (18 percent) of the Grant Vista PAC are proposed for treatment in Implementation Blocks one and two, including the General Prescription of the Forest Restoration Area treatment and Modified Prescriptions of Important Wildlife Area and Forest Restoration Area treatments (Prescription 2 and fuels reduction treatment only). None of the core area will be treated. All acres will be piled and burned, with approximately 88 acres also treated with

underburning. All activities except preparing stands for treatment and monitoring will occur outside of the MSO breeding season.

Direct and indirect effects from the proposed action within this PAC will be minimal, and are similar to those described in paragraphs two and three under the Chesley Flat PAC analysis, above. Treatments will occur during Implementation Blocks one and two, meaning disturbance may occur within this PAC for three to six years (treatments within one implementation block will be completed in two to five years).

Grant Hill PAC (#0504012)

Approximately 176 acres (26 percent) in the northeastern portion of the Grant Hill PAC are proposed for treatment in Implementation Block three, including General Prescriptions of Important Wildlife Area and Forest Restoration Area treatments and a Modified Prescription of the Forest Restoration Area treatment (Prescription 4). None of the core area will be treated. All activities except preparing stands for treatment and monitoring will occur outside of the MSO breeding season.

Direct and indirect effects from the proposed action within the PAC may occur, and are similar to those described in paragraphs two and three under the Chesley Flat PAC analysis, above. Because 26 percent of this PAC is proposed for treatment, it is likely that stand preparation activities will take longer to complete (up to the full 10 days); therefore, the potential for disturbance due to the presence of people within the PAC is greater. Treatments will occur during Implementation Block three, meaning disturbance may occur within this PAC for two to five years (treatments within one implementation block will be completed in two to five years).

Marijilda PAC (#0504017)

Approximately four acres (one percent) along the southern edge of the Marijilda PAC is proposed for treatment in Implementation Block four using a Modified Prescription of the Forest Restoration Area treatment (fuels reduction treatment only). No core area has been designated within this PAC. Underburning is proposed for all four acres. All activities except preparing stands for treatment and monitoring will occur outside of the MSO breeding season.

Direct and indirect effects from the proposed action within this PAC will be minimal. The only treatment that will occur within this PAC is a fuels reduction treatment involving lop-and-scatter and follow-up underburn. No silvicultural treatment will occur, making it unlikely that a nest or roost tree will be impacted within this PAC. Smoke created from underburning may affect MSO, as described in paragraph three under the Chesley Flat PAC analysis, above.

PACs that will not be treated but occur within 0.5 mile of a treated area

Six PACs fall within 0.5 mile of a treated area but will not be treated themselves, including Riggs Lake, Goudy Canyon, Moonshine, Hagens Point, Eagle Rock, and Wet Canyon. Of these, only Riggs Lake, Moonshine, and Hagens Point have a designated core area. No mechanical treatments (e.g., using chainsaws or machinery) within 0.5 mile of these PACs will occur from

March 1 through August 31 (the MSO breeding season). Preparing stands for treatment (e.g., marking trees) and monitoring within 0.5 mile of these PACs may occur during the breeding season.

Disturbance due to proximity of activity and noise from treatments within 0.5 mile of the Riggs Lake, Goudy Canyon, Moonshine, Hagens Point, Eagle Rock, and Wet Canyon PACs may occur, but is likely to have minimal impact. The Moonshine, Hagens Point, Eagle Rock, and Wet Canyon PACs have topographic screening from proposed thinning units that lead us to believe noise impacts will be reduced (Knight and Cole 1995). Additionally, all treatments will occur outside of the MSO breeding season, reducing impacts from noise disturbance on the owls in these PAC. Because these PACs are not being treated, no disturbance due to preparation or monitoring (which would be similar to hikers walking through the area) is expected.

Smoke tends to settle into low-lying areas during the nighttime and could potentially affect owls associated with all six PACs located in and adjacent to treated areas. Effects would be short-term (3 to 5 days), as all prescribed underburns will be managed to produce a low-intensity, low-severity burn during conditions when live fuel moisture is at 100 percent (reducing the chance that live trees will catch fire), 1000-hour (three-inches dbh or greater) fuel moisture is at 15 percent (minimizing the potential that large logs or snags will burn), wind speeds 20 feet above the ground are eight miles per hour or less (reducing the chance a surface fire could ignite a crown fire), and air temperatures are 70 degrees Fahrenheit or less (reducing the drying effect caused by high temperatures).

Summary of effects to Mexican Spotted Owl

In summary, 12 of 18 PACs fall partially within areas that will be treated through the proposed action, and 6 of 18 are within 0.5 mile of treated areas. Individuals associated with the 6 PACs within 0.5 mile of treated areas are unlikely to be significantly impacted by the proposed action due to topographic screening and nearby treatments occurring outside of the breeding season. Individuals associated with 6 of the 12 PACs that fall partially within the treated areas are not likely to be significantly impacted due to the small number of acres proposed for treatment and scheduling of treatments outside of the breeding season. Individuals associated with 2 of the 12 PACs that fall partially within the treated area may be harassed due to the larger number of acres proposed for treatment, which will require more days to mark trees within the PAC (and therefore potentially more disturbance due to human presence during the breeding season). Individuals associated with 4 of the 12 PACs that are partially within the treated area may be adversely affected by silvicultural treatments, fuel removal (including pile burning and underburning), and disturbance.

For these reasons, temporary impacts to MSO reproduction, numbers, and distribution within the Pinaleño Mountains are expected as a result of the proposed action due to habitat alteration and disturbance. However, the proposed action is not expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of MSO relative to the Basin and Range – West RU, and, ultimately, will improve forest health and reduce the likelihood of high-severity fire, which is the primary threat to MSO habitat in the Pinaleño Mountains. Monitoring of MSO and implementing adaptive management will provide a further check on potential

adverse effects, as changes to the proposed action based on the annual review of this monitoring will be incorporated into treatment design.

Effects to Mexican Spotted Owl Critical Habitat

As stated above, approximately 2,898 acres of mixed-conifer MSO CH will be treated under the proposed action, representing 3.4 percent of the 107,838 acres designated as MSO CH in the Pinaleño Mountains (and BR-W-8) and less than 0.01 percent of all designated CH across the range of the MSO. Canyon habitat and associated physical and biological features, as defined in the critical habitat rule (U.S. Fish and Wildlife Service 2004), will not be affected by the proposed action.

The Recovery Plan (U.S. Fish and Wildlife Service 1995) encourages land management agencies to conduct fuels reduction projects within MSO habitat and provides guidelines for these actions that will aid in reducing fuels, but still maintain habitat and minimize effects to MSO. These guidelines were designed to protect MSO habitat over the long-term by reducing the likelihood of stand-replacing crown fire; however, short-term effects from fuels reduction treatments can adversely affect the physical and biological features of MSO critical habitat directly or indirectly by altering their habitat and/or prey. Broadcast burning and mechanical thinning may affect designated critical 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 MSO prey species' habitat, affecting the abundance and composition of prey species. Although these activities may have adverse effects to MSO 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 (Block *et al*. 2005).

The wildlife design features identified in this document and the Biological Assessment will be fully implemented by the Forest Service as part of their proposed action. These features will help minimize or avoid adverse impacts to the function and conservation role of MSO CH. Without these features, the negative effects to the function and conservation role of MSO CH would likely be greater.

Biological and physical features were identified by the FWS in the final rule designating CH (U.S. Fish and Wildlife Service 2004). The importance of each of these components to MSO habitat is described in the final rule (U.S. Fish and Wildlife Service 2004) and the Recovery Plan (U.S. Fish and Wildlife Service 1995). The information provided in those documents is included herein by reference. The expected effects on the biological and physical features of MSO CH as a result of the Pinaleño Ecosystem Restoration Project are summarized below by forest structure and prey species habitat.

Forest Structure

Range of trees species, tree size, 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 a trunk diameter of 12 inches or more when measured at 4.5 feet from the ground: In forested CH, a range of tree species, composed of different tree sizes reflecting different ages of trees, 30% to 45% of which are large trees with dbh of 12 inches or more, is desired. Diversity in tree-size distributions is typical of MSO habitat and provides the vertical structure that is thought to be important to owls (Seamans and Gutierrez 1995). The Forest Service will strive to retain all live trees > 18-inches dbh in MSO protected habitat (protected habitat comprises all known owl sites and all areas within mixed conifer or pine-oak habitat with slopes greater than 40 percent where timber harvest has not occurred in the past 20 years). Reductions in this feature may occur following prescribed burning and could result in impacts to the size and species structure of MSO CH. This impact to tree species diversity and loss of certain sized trees will result in a short-term adverse effect to this physical and biological feature. Large, live trees are an important element of MSO habitat, and owl use is often correlated with a medium-to-large tree component (U.S. Fish and Wildlife Service 1995). Large trees and snags take many years to develop and are very difficult to replace, even over the long-term. However, the Forest Service proposes several wildlife design features to minimize these effects, including: 1) before any underburning can occur in a core area, the unit must first contain all CH physical and biological features per microhabitat monitoring, 2) felling snags to create logs after underburning has been completed, and 3) burning under conditions when a low-intensity, low-severity burn can be maintained. These efforts should aid in reducing effects to large trees. In addition, over the long-term the fuels reduction and removal of some excess biomass should increase the vigor and resiliency of large trees throughout the project area.

A shade canopy created by the tree branches covering 40 percent or more of the ground: The Forest Service expects that shade canopy will be reduced following thinning and burning treatments. However, they do not expect canopy cover (as shown in Figure 8) to fall below 42 percent, and, due to variable density thinning, expect much of the area will remain at 50 percent or greater (C. Wilcox, U.S. Forest Service, pers. comm. 2011). Ganey *et al*. (2003) found that 32 out of 34 MSO roosting stands had canopy cover > 40 percent, and 75 percent of stands used for roosting had canopy cover > 60 percent. Following implementation of the project, canopy cover will be at the lower end of habitat used by MSO for nesting or roosting (a reduction from 54 to 42 percent, then increasing to 48 percent by 2048). Over time, we would expect canopy cover to increase even more, particularly in those stands treated with the Important Wildlife Area treatment and Prescription 7 of the Forest Restoration Area treatment (i.e., core areas and some parts of PACs), which maintains a BA of live trees of 170-ft^2 per acre. We do not expect reduction of canopy cover in protected habitat to be significantly different from what the Forest Service predicts. We would expect that some small reduction (5 to 10%) may actually aid in increasing the understory herbaceous and forb production, which will benefit MSO prey species.

It is unknown how this reduction in canopy cover will benefit predators of and competitors with MSO, as the extent to which MSO are preyed upon is unknown, although avian predators may be a common mortality factor of MSO (U.S. Fish and Wildlife Service 1995). In a study of one predator/competitor (the great horned owl), however, Ganey *et al*. (1997) found that MSO

concentrated their use in stands with ≥ 40 percent canopy cover, whereas great horned owls used areas with < 40 percent canopy cover. Therefore, we do not expect the reduction in canopy cover to benefit great horned owls at the expense of MSO in either the short- or long-term. It is unknown how this change in canopy cover may influence other predators of and competitors with MSO, but monitoring will keep us apprised of unanticipated effects, and adaptive management will be employed to address these effects.

Large, dead trees (snags) with a dbh of at least 12 inches: Large snags would most likely be reduced following proposed prescribed burning. The Forest Service will attempt to minimize this loss through the wildlife design features as described above. However, it is likely that following burning treatments, upwards of 30% of this habitat component may be lost (Randall-Parker and Miller 2000) within treated MSO habitat, resulting in short-term adverse effects to this biological feature.

Maintenance of adequate prey species

High volumes of fallen trees and other woody debris: Fallen trees and woody debris will likely be reduced by the proposed burning treatments (pile burning and underburning). Large logs will be retained, although some loss is expected. Where few logs exist, snags will be felled to create logs after underburning is complete. Loss of large logs will result in short-term adverse effects to this physical and biological feature. Ensuring a 1000-hour fuel moisture of at least 15 percent should help prevent their loss.

A wide range of tree and plant species, including hardwoods: We do not expect that this physical and biological feature will be adversely affected by the proposed action, as all hardwoods of all sizes will be retained, unless removal is necessary for use as staging/landing sites or for equipment passage. Plant species richness will likely increase following thinning and/or burning treatments that result in small, localized canopy gaps. Proposed wildlife design features and burning techniques should aid in maintaining hardwoods.

Adequate levels of residual plant cover to maintain fruits and seeds, and allow plant regeneration: Short-term decrease in plant cover will result from fire-related activities and possibly mechanical thinning. We expect long-term increases in residual plant cover because treatments will provide conditions suitable for increased herbaceous plant growth by removing a thick layer of dead plant debris within treated areas. The mosaic effect created by burned and unburned areas and by opening up small patches of forest within protected habitat is also expected to increase herbaceous plant species diversity and, in turn, assist in the production and maintenance of the MSO prey base. The function and conservation role of this biological feature will not be compromised by the proposed action.

Summary of Effects to Critical Habitat

In summary, several MSO CH biological and physical features may be adversely affected by the proposed action. Impacts will occur to forest structure through changes in tree species diversity, loss of certain sized trees, and loss of large snags. A reduction in the high volume of fallen trees and other woody debris and a short-term decrease in residual plant cover will result, affecting the

maintenance of adequate prey species. However, we find that the effects to the function and conservation role of CH relative to the Basin and Range – West RU and CH Unit, and to the entire designation, will be temporary and occur in a relatively very small area. Moreover, the project will improve forest health and reduce the likelihood of high-severity fire, which is the primary threat to MSO habitat in the Pinaleño Mountains. Therefore, we conclude that the biological and physical features of MSO CH will continue to serve the intended conservation role for the species, will not reduce appreciably the likelihood of both the survival and recovery of MSO, and will benefit over the long-term from implementation of the Pinaleño Ecosystem Restoration Project.

CUMULATIVE EFFECTS – Mexican Spotted Owl and Critical Habitat

Cumulative effects include the effects of future State, Tribal, local or private actions that are reasonably certain to occur in the action area considered in this BO. 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 that could occur along Swift Trail. These could include paving the remaining portion of the road up to Riggs Lake, which could increase both the speed and number of vehicles through this part of the action area. An increase in traffic and vehicle speeds could impact MSO by increasing noise disturbance and disrupting breeding and foraging patterns.

CONCLUSION – Mexican Spotted Owl and Critical Habitat

After reviewing the current status of the MSO, the environmental baseline for the action area, the effects of the proposed action on the MSO, and the cumulative effects, it is our biological opinion that the action, as described, is neither likely to jeopardize the continued existence of the MSO, nor result in destruction or adverse modification of CH.

We present this conclusion for the MSO for the following reasons:

1. Though treatments in CH may result in the temporary loss of some physical and biological features, and treatments in protected habitat (all known owl sites and all areas within mixed conifer or pine-oak habitat with slopes greater than 40 percent where timber harvest has not occurred in the past 20 years) may reduce key habitat components, the proposed action will increase the long-term viability of MSO habitat by enhancing forest health and reducing the threat of high-severity, stand-replacing wildland fire.

2. Temporary impacts to the reproduction, number, and distribution of MSO in the Pinaleño Mountains are expected due to habitat alteration and disturbance. The proposed activities may change the structure of MSO and prey species' habitat (as

discussed on page 71). However, the proposed action is not expected to reduce appreciably the likelihood of both the survival and recovery of MSO relative to the Basin and Range – West RU or the BR-W-8 CH unit, and, ultimately, will improve forest health and reduce the likelihood of high-severity fire, which is the primary threat to MSO habitat in the Pinaleño Mountains. Therefore, MSO reproduction, numbers, and distribution will likely improve over the long-term.

3. The proposed treatments do not entirely conform to the recommendations in the MSO Recovery Plan; however, the adverse effects are outweighed by the longer-term benefits in regard to forest health and ameliorating the threat of high-severity, stand-replacing fire.

4. The project has conservation measures built into it that reduce potential adverse effects to the MSO and its habitat.

5. The effects, as measured in acres and numbers of owls affected, are small within the context of either the Basin and Range –West RU (one of 11 recovery units), or the species as a whole.

The conclusions of this biological opinion are based on full implementation of the project as described 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

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, 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 adherence 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 Forest Service must report the progress of the action and its impact on the species as specified in the incidental take statement. [50 CFR §402.14(i)(3)].

AMOUNT OR EXTENT OF TAKE ANTICIPATED – Mexican Spotted Owl

For the purpose of evaluating incidental take of MSO from the action under consultation, incidental take can be anticipated as the harm and harassment of birds to such a degree that the birds are considered lost as viable members of the population and thus "taken." They may fail to breed, fail to successfully rear young, raise less fit young, or desert the area because of disturbance or because habitat no longer meets the owl's needs.

In past Biological Opinions, we used the management territory to quantify incidental take thresholds for the MSO (see Biological Opinions provided to the Forest Service from August 23, 1993 through 1995). The current section 7 consultation policy provides for incidental take if an activity compromises the integrity of a PAC. Actions outside PACs will generally not be considered to result in incidental take, except in cases when areas that may support owls have not been adequately surveyed.

Using available information as summarized within this document, we have identified conditions of possible incidental take for the MSO associated with implementation of the Pinaleño Ecosystem Restoration Project within the Upper Cunningham, Treasure Park, Heliograph, Lower Cunningham, Webb Peak, and Grant Hill PACs. Based on the best available information concerning the MSO, habitat needs of the species, the project description, and information furnished by the Forest Service, incidental take is anticipated for the MSO as a result of disturbance from field crews during the breeding season, predicted high levels of noise from the proposed action within these occupied areas (outside of the breeding season), and, in some cases (see below), habitat degradation (removal of MSO habitat components to the extent that feeding, breeding, or sheltering is not likely), including in some core areas, over a period of up to 15 years. Though we believe that the Forest Service has proposed wildlife design features that will minimize adverse effects to MSO within these PACs, the proposed action is not consistent with the Recovery Plan or the 1996 Forest Plan Amendments. We do not anticipate incidental take for the MSO within the Chesley Flat, Lefthand Canyon, Mill Site, Ash Creek, Grant Vista, Moonshine, Marijilda, Riggs Lake, Goudy Canyon, Hagens Point, Eagle Rock, and Wet Canyon PACs because of topographic screening, the small number of acres being treated, and treatments occurring outside of the breeding season.

We anticipate incidental take of one pair of MSOs and/or associated eggs/juveniles in each of the PACs listed below in the form of:

1) Harm and harassment due to chronic (greater than eight breeding seasons) disturbance within and/or immediately adjacent to the PACs and habitat degradation, including core habitat alteration, in:

    a. Upper Cunningham PAC (#0504013)
    b. Lower Cunningham PAC (#0504023)

2) Harm and harassment due to long-term (three to eight breeding seasons) disturbance within or immediately adjacent to the PACs and habitat degradation, including core habitat alteration, in:

    a. Treasure Park PAC (#0504014)
    b. Heliograph PAC (#0504016)

3) Harassment due to chronic (greater than eight breeding seasons) disturbance within and/or immediately adjacent to the PACs in:

    a. Webb Peak PAC (#0504006)

4) Harassment due to long-term (three to eight breeding seasons) disturbance within or immediately adjacent to the PACs and habitat degradation in:

    a. Grant Hill PAC (#0504012)

In summary, we anticipate that the proposed action is reasonably certain to result in incidental take of 6 pairs (4 harm; 2 harass) and associated juveniles of MSO associated with 6 PACs over the life of the project. We anticipate that the take of MSO will be difficult to detect because finding a dead or impaired specimen is unlikely. However, the long-term (three to eight years) or chronic (greater than eight years) disturbance that will affect the reproductive success and survival of MSO within these PACs can be used as a surrogate for incidental take, if actual numbers of owls incidentally taken cannot be determined.

Determining whether incidental take has been exceeded will be accomplished in these ways: 1) if additional owls are discovered and are taken by the action; 2) the length of time that disturbance within or immediately adjacent to each PAC exceeds that anticipated in this consultation or 3) the effects of treatment occurring within PACs and cores as described exceeds that anticipated in our analysis.

EFFECT OF THE TAKE – Mexican Spotted Owl

In this biological opinion we determine that this level of anticipated take is not likely to result in jeopardy to the species considered herein.

REASONABLE AND PRUDENT MEASURES WITH TERMS AND CONDITIONS

The Forest Service has included a number of conservation measures described previously that serve to minimize the effects of incidental take. However, the following reasonable and prudent measure and the associated term and condition is necessary and appropriate to minimize take of MSO:

1. You shall submit annual reports documenting project implementation, results, effects, and incidental take to the FWS for the life of the project.

A. Reporting of monitoring results, progress in implementing the project as proposed, and complete records of all incidental take detected during the life of the project will be tracked yearly and included in the Forest Service's Endangered Species Act report submitted annually to the FWS (both the Tucson suboffice and the MSO lead in the Flagstaff suboffice). In regard to incidental take, the following shall be monitored and reported: 1) the length of time of disturbance within or immediately adjacent to each PAC, 2) the extent of treatment occurring within PACs and cores, and 3) numbers of MSO injured, killed, or otherwise incidentally taken as a result of the proposed action, where such a determination can be made.

Review requirement: The reasonable and prudent measure, with its implementing term and condition, is designed to minimize 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 Arizona Ecological Services Office the need for possible modification of the reasonable and prudent measures.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to use 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 CH, to help implement Recovery Plans, or to develop information.

We recommend that the Forest Service work with us to continue to improve prescribed burning techniques and determine means by which more key habitat components/physical and biological features of MSO habitat may be retained following fuels reduction treatments.

We recommend that the Forest Service acquire additional LiDAR data after the proposed action is complete to fully assess changes (when compared to LiDAR data from 2008) in key habitat components/physical and biological features of MSO habitat.

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, (2450 W. Broadway Rd, Suite 113, Mesa, Arizona, 85202, telephone: 480/967-7900) 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.

REINITIATION NOTICE

This concludes formal consultation on the proposed Pinaleño Ecosystem Restoration Project outlined in your November 19, 2009 request and supplemental documents. 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 CH 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 CH not considered in this opinion; or (4) a new species is listed or CH 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.

Additionally, if additional MSO or PACs are found within the action area; or a prescribed fire escapes, the effects of which exceed those as analyzed in this opinion; reinitiation of formal consultation may be required.

For further information, please contact Marit Alanen at (520) 670-6150 (x234) or Scott Richardson (520) 670-6150 (x242) of my staff. Please refer to consultation number 22410-2005-F-0651 in future correspondence concerning this project.

Sincerely,

/s/ Debra Bills for Steven L. Spangle
Field Supervisor

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Honorable President, Fort McDowell Yavapai Nation, Fountain Hills, AZ
Honorable Chairman, Fort Mohave Indian Tribe, Needles, CA
Honorable Governor, Gila River Indian Community, Sacaton, AZ
Honorable Chairwoman, Havasupai Tribe, Supai, AZ
Honorable Chairman, Hopi Tribe, Kykotsmovi, AZ
Honorable Chairman, Hualapai Tribe, Peach Springs, AZ
Honorable Chairman, Kaibab Band of Paiute Indians, Fredonia, AZ
Honorable President, Navajo Nation, Window Rock, AZ
Honorable Chairman, Pascua Yaqui Tribe, Tucson, AZ
Honorable President, Quechan Tribe, Yuma, AZ
Honorable President, Salt River Pima-Maricopa Indian Community, Scottsdale, AZ
Honorable Chairman, San Carlos Apache Tribe, San Carlos, AZ
Honorable President, San Juan Southern Paiute Tribe, Tuba City, AZ
Honorable Chairman, Tohono O'odham Nation, Sells, AZ
Honorable Chairman, Tonto Apache Tribe, Payson, AZ
Honorable Chairman, White Mountain Apache, Whiteriver, AZ
Honorable Chairman, Yavapai-Apache Nation, Camp Verde, AZ
Honorable President, Yavapai-Prescott Indian Tribe, Prescott, AZ
Honorable President, Mescalero Apache Tribe, Mescalero, NM
Honorable Governor, Pueblo of Zuni, Zuni, NM

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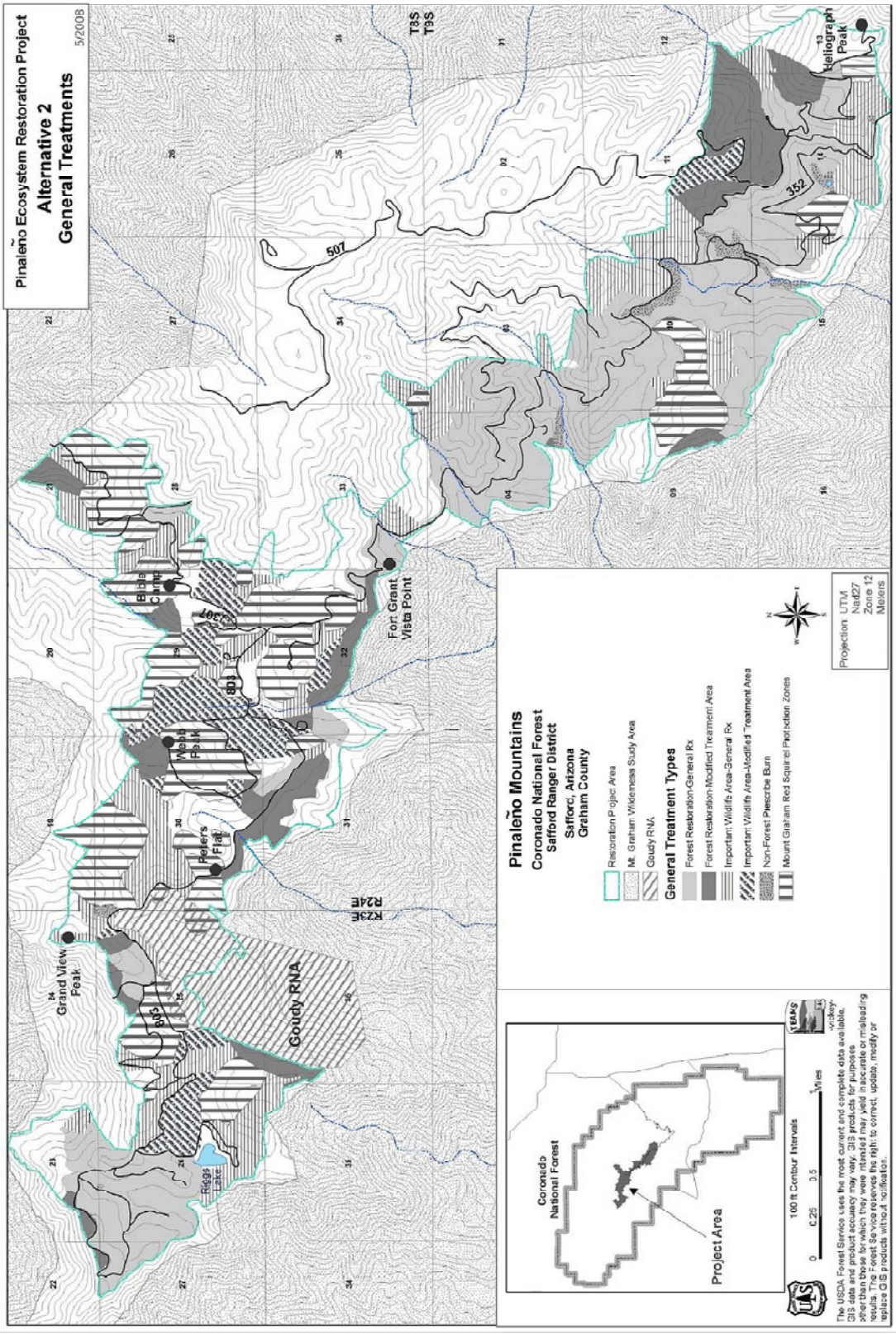

Figure 1. Proposed treatments for the Pinaleño Ecosystem Restoration Project including General and Modified Prescriptions for both Forest Restoration Areas and Important Wildlife Areas. Note the Mount Graham Red Squirrel Protection Zones (i.e., midden protection zones), which encompass almost all active middens, will not be treated. See the Description of the Proposed Action for descriptions of the proposed General and Modified Prescriptions within each area. Rx means prescription.

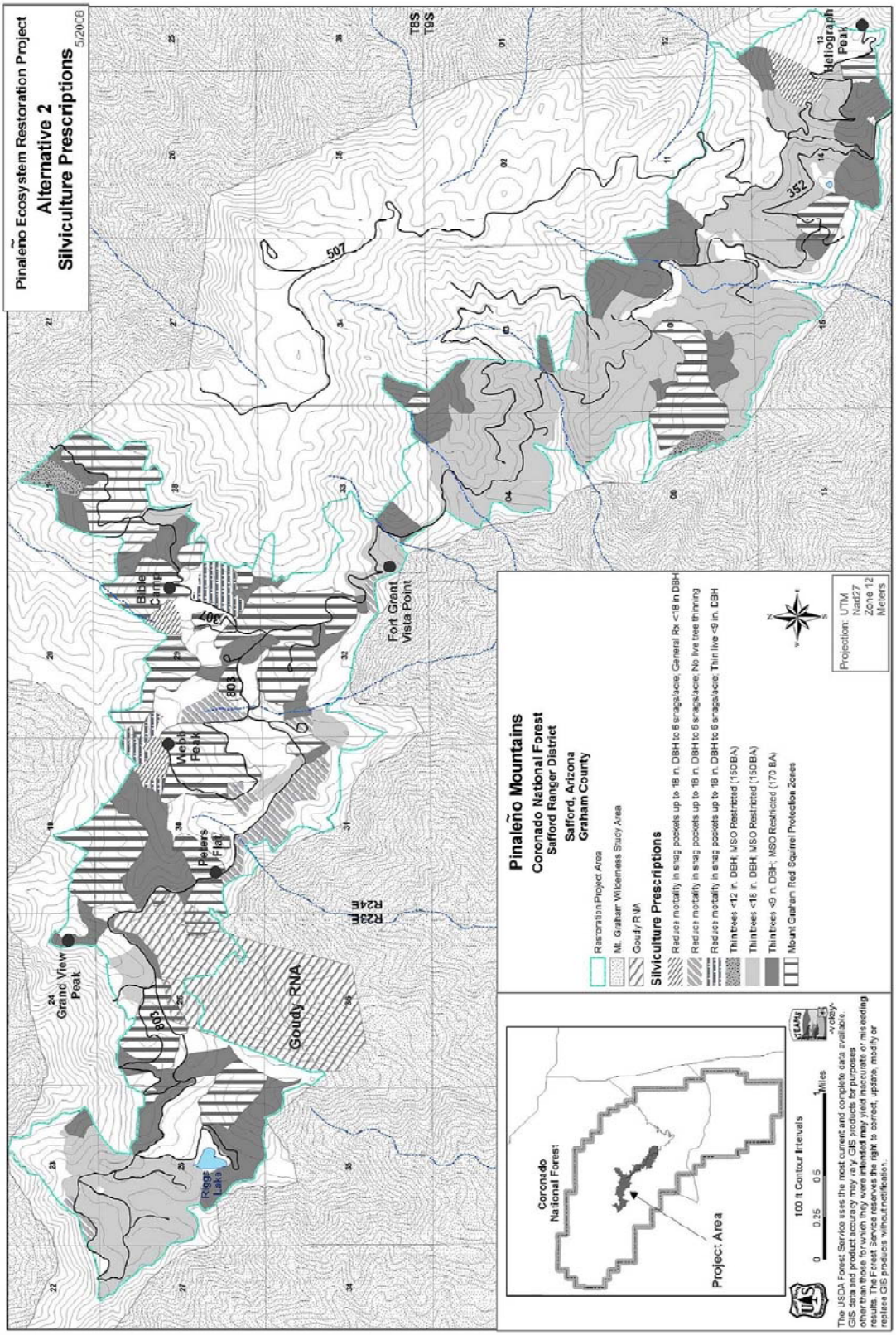

Figure 2. Proposed silvicultural treatments for the Pinaleño Ecosystem Restoration Project. Note the Mount Graham Red Squirrel Protection Zones (i.e., midden protection zones), which encompass almost all active middens, will not be treated.

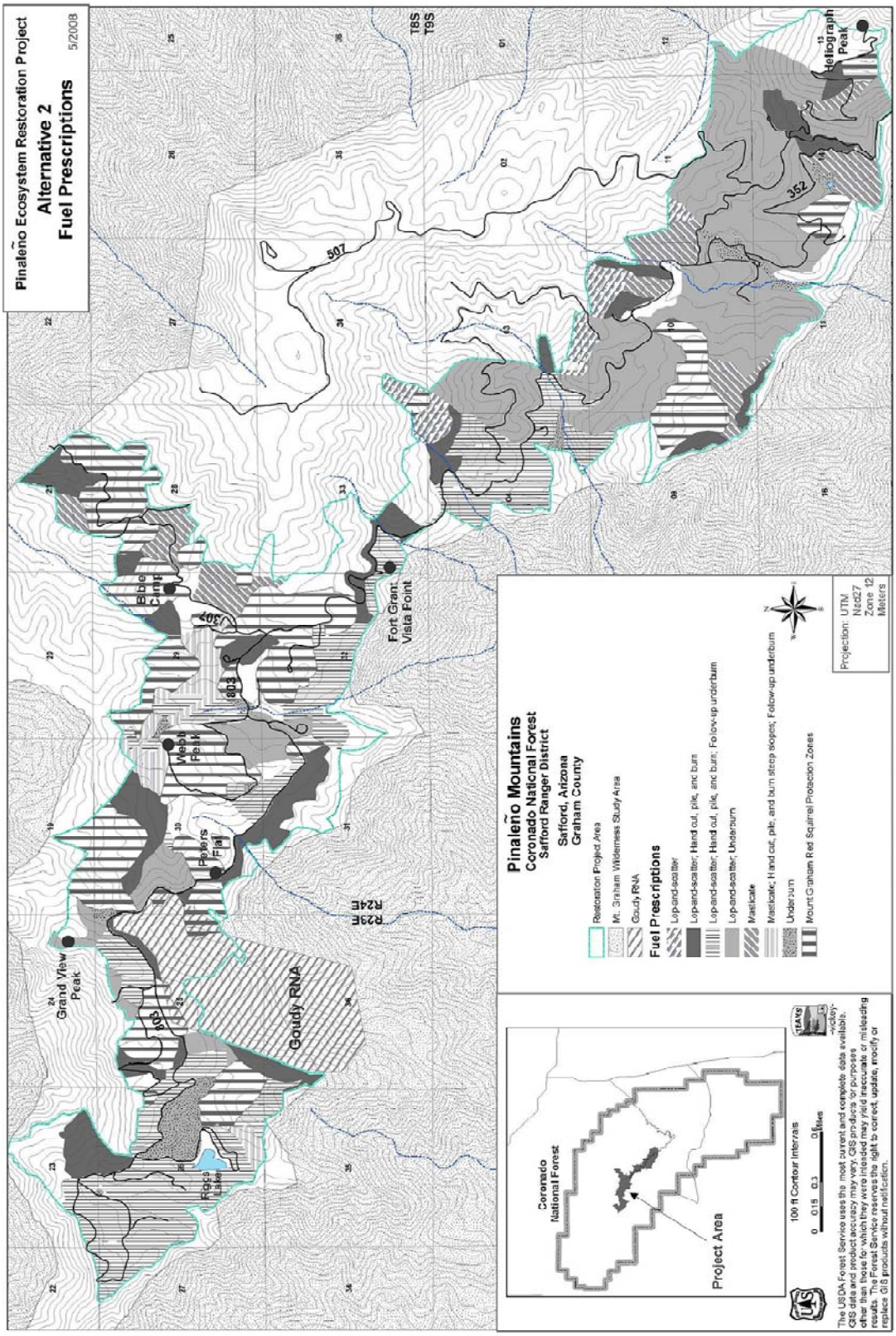

Figure 3. Proposed fuel reduction treatments for the Pinaleño Ecosystem Restoration Project. Note the Mount Graham Red Squirrel Protection Zones (i.e., midden protection zones), which encompass almost all active middens, will not be treated.

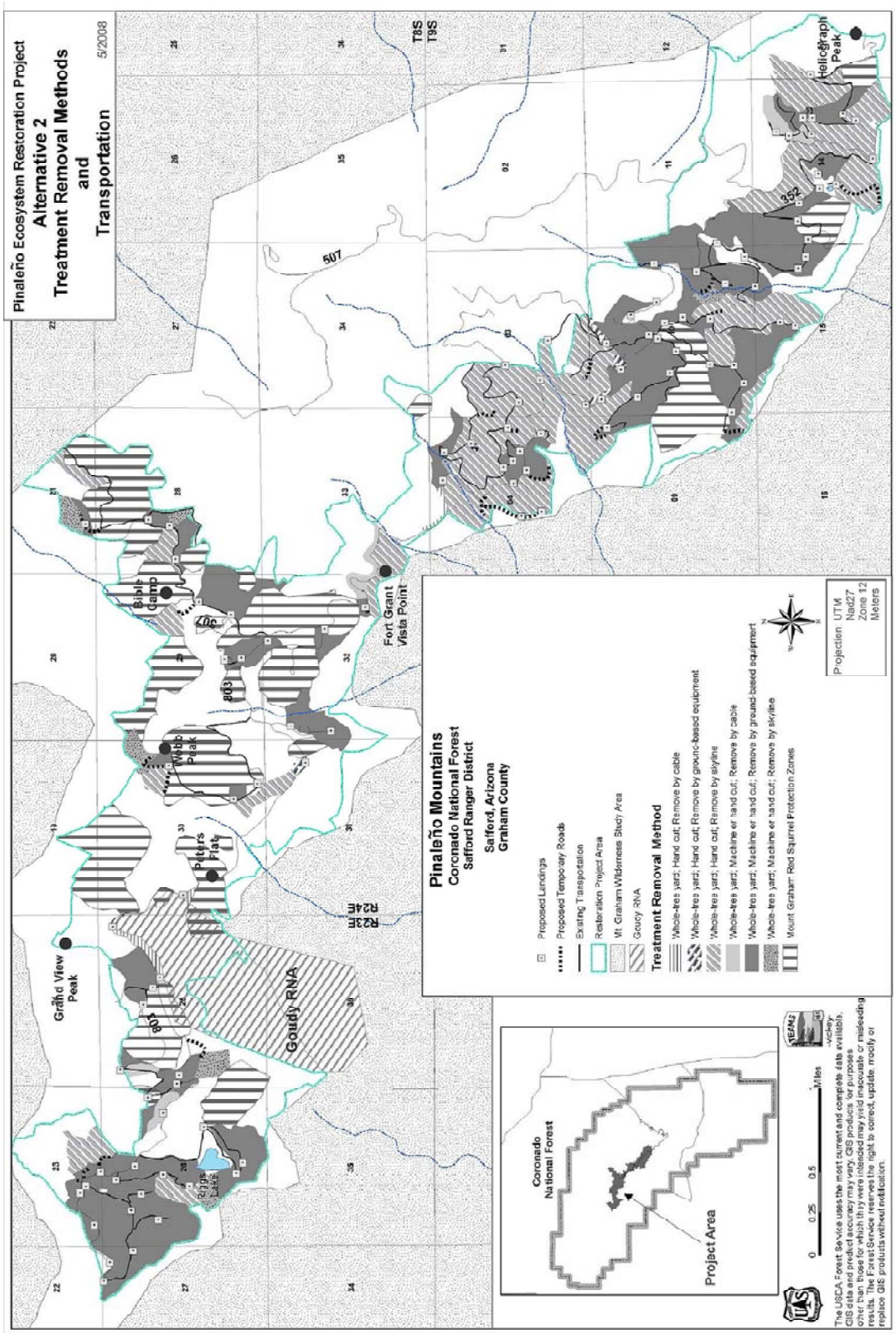

Figure 4. Proposed removal methods and transportation system for the Pinaleño Ecosystem Restoration Project. Note the Mount Graham Red Squirrel Protection Zones (i.e., midden protection zones), which encompass almost all active middens, will not be treated.

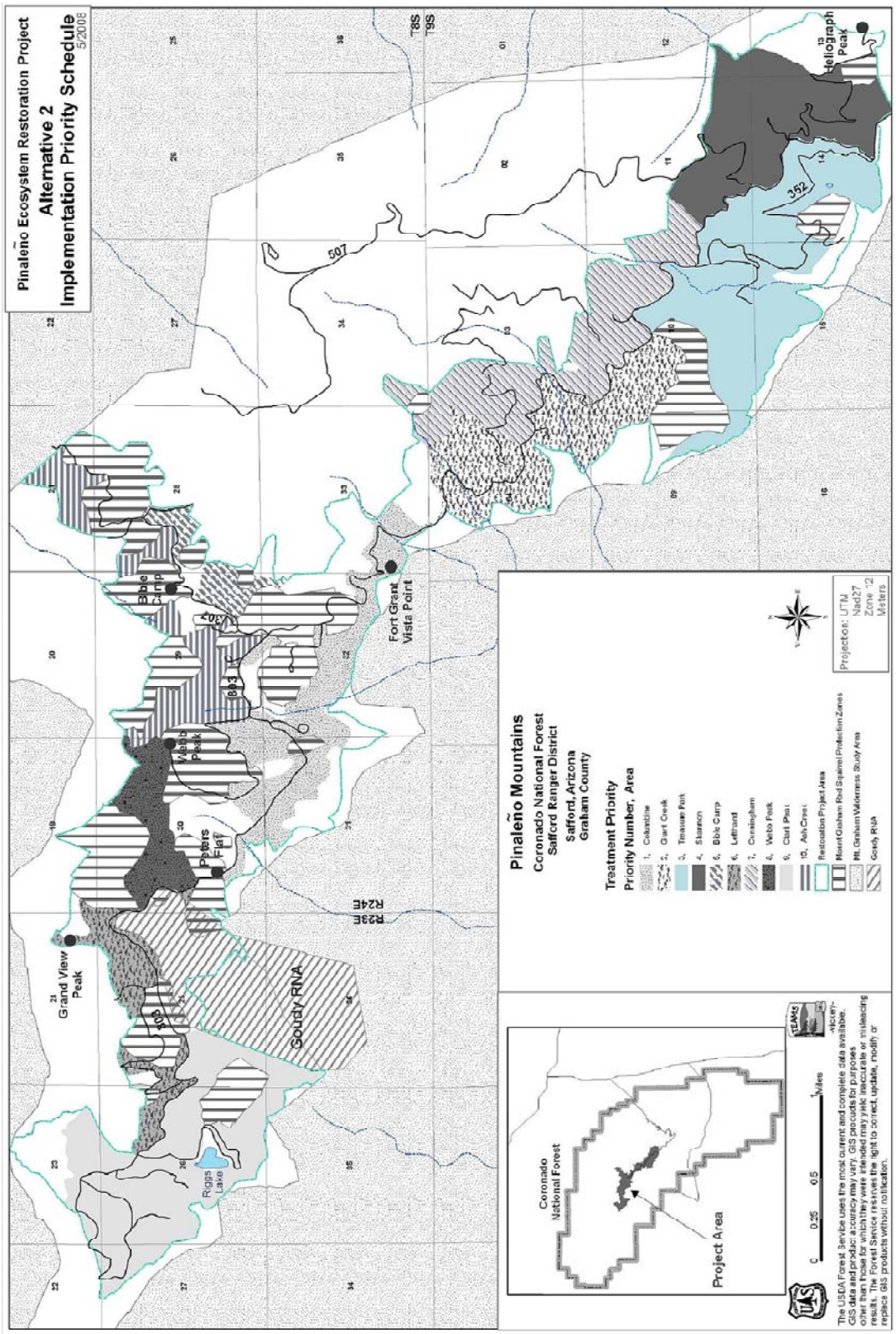

Figure 5. Treatment blocks designed for the Pinaleño Ecosystem Restoration Project. Numbers in the legend refer to the year of treatment over the course of 10 years. Mount Graham Red Squirrel Protection Zones refer to midden protection zones that will not be treated.

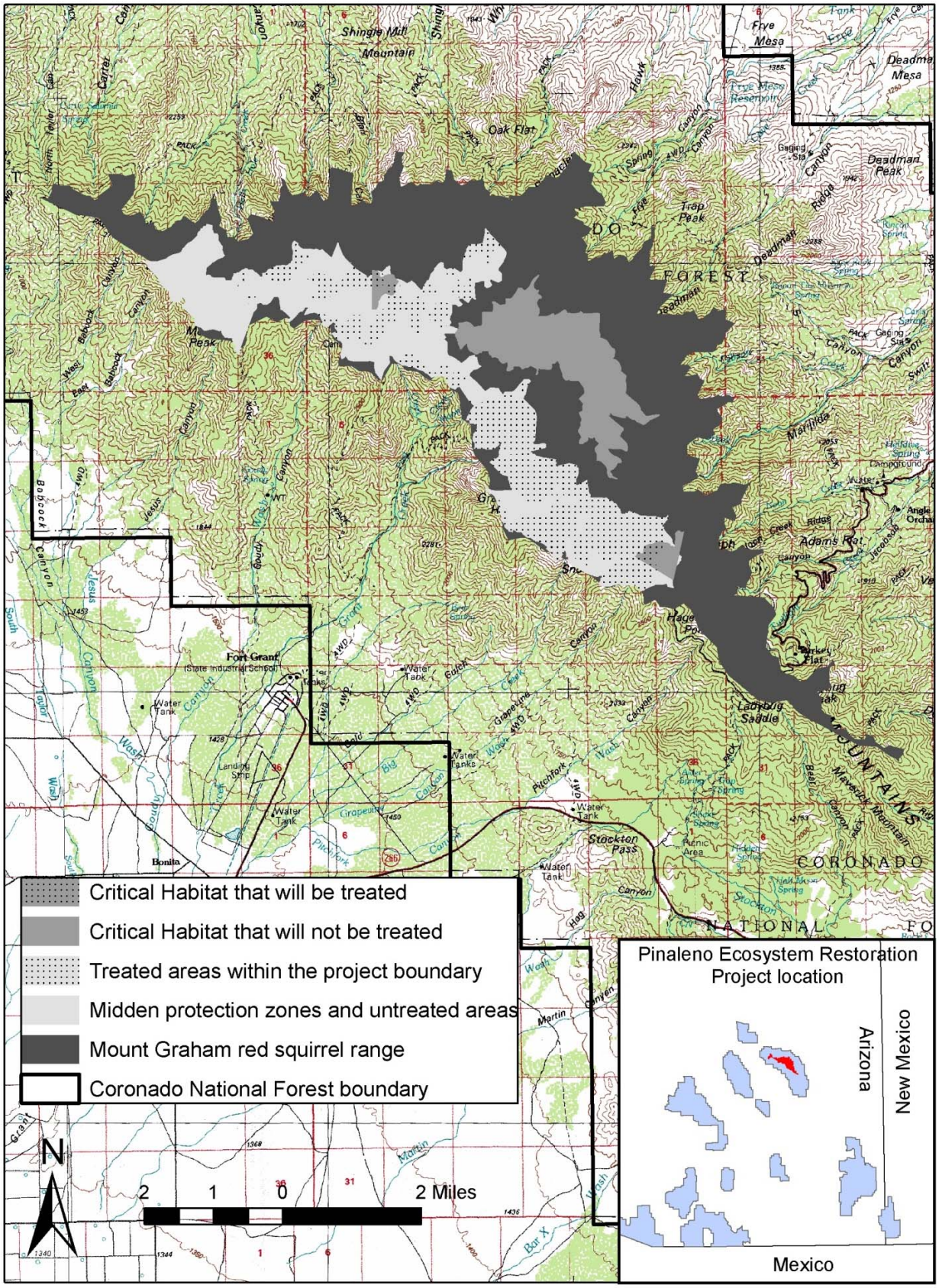

Figure 6. Boundary of the Pinaleño Ecosystem Restoration Project relative to the Mt. Graham red squirrel historical range and designated Critical Habitat boundary.

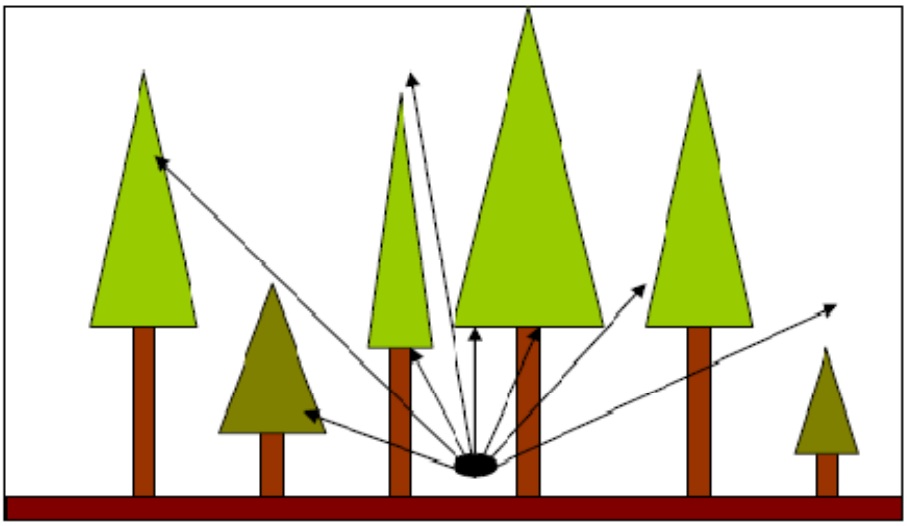

Figure 7. Illustration of canopy closure, or the proportion of the sky hemisphere obscured by vegetation when viewed from a single point.

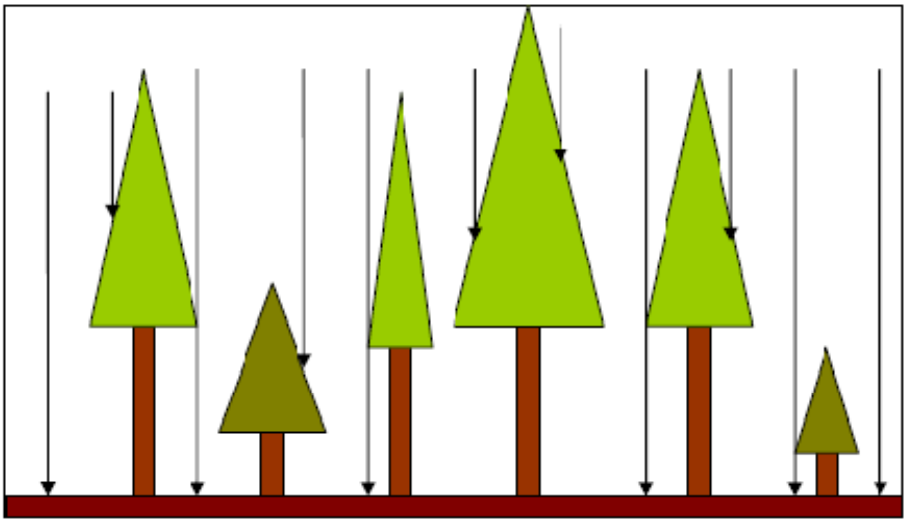

Figure 8. Illustration of canopy cover, or the proportion of the forest floor covered by the vertical projection of tree crowns.

APPENDIX A
CONCURRENCE

Mount Graham Red Squirrel Critical Habitat

We concur with your determination that this project may affect, but is not likely to adversely affect, MGRS CH for the following reasons:

- Of the approximately 96 acres (about five percent) of MGRS CH that fall within a treated area, none currently provide the mature spruce-fir biological and physical feature that was present at the time of CH designation. At the time of designation, this vegetation association provided habitat for the highest density squirrel concentration in the Pinaleño Mountains. However, four different, wide-spread insect infestations beginning in the mid-1990s, followed by high-severity wildland fire, killed the majority of trees within this area. Therefore, no biological and physical features will be impacted, and the short-term effects due to the proposed action will not affect the survival and recovery of MGRS.

- The proposed action includes treatments that will preserve or create habitat elements such as snags and logs, and we anticipate long-term beneficial effects to CH will occur due to increased forest health and a reduction in catastrophic fire risk. Therefore, the long-term effects of the proposed action are expected to be beneficial and contribute to the conservation of the species.

Apache and Gila trout

We concur with your determination that this project may affect, but is not likely to adversely affect, the Apache trout in Grant Creek and the Gila trout in Ash, Frye, and Marijilda creeks for the following reasons:

- Minimum 150-foot streamside protection zones and Best Management Practices will be employed to prevent rilling and channelized flow, and to prevent sediment from entering the channels. Therefore, the short-term effects due to the proposed action are insignificant and discountable, and will not affect the survival and recovery of the Apache and Gila trout.

- The proposed action will reduce the risk of high-severity wildland fire, which can contribute significant amounts of sediment to streams through large post-fire erosion events. Therefore, the long-term effects of the proposed action are expected to be beneficial.