

BIOLOGICAL OPINION SUMMARY

Date of opinion: July 21, 1998

Action agency: Department of Defense, Arizona Army National Guard

Project: Camp Navajo Forest Ecosystem Restoration Project

Location: Coconino County

Listed species affected: Mexican spotted owl (*Strix occidentalis lucida*).

Biological Opinion: Non-jeopardy for the Mexican spotted owl.

Incidental take statement:

Level of take anticipated: No incidental take is anticipated.

Conservation recommendations: Five discretionary conservation recommendations are provided.

**United States Department of the Interior
U.S. Fish and Wildlife Service
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AESO/SE
2-21-98-F-225

July 21, 1998

Colonel Larry W. Triphahn
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Camp Navajo
P.O. Box 16123
Bellemont, Arizona 86015-6123

Dear Colonel Triphahn:

The U.S. Fish and Wildlife Service has reviewed the Final Biological Assessment and Evaluation for the proposed Camp Navajo Forest Ecosystem Restoration Project (Restoration Project) prepared by the Arizona Army National Guard and Northern Arizona University School of Forestry (April 4, 1998). Your April 9, 1998, request for formal consultation was received on April 13, 1998. This document represents the Service's biological opinion on the effects of the proposed Restoration Project on the Mexican spotted owl (*Strix occidentalis lucida*) (MSO) in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C.1531 *et seq.*).

According to the April 4, 1998, Final Biological Assessment and Evaluation (BAE) for the MSO, the Arizona Army National Guard (Guard) has determined that the proposed project "may affect, but is not likely to adversely effect" the MSO. The Guard indicated however, that the proposed treatments do not implement all of the recommendations of the MSO Recovery Plan (USDI 1995), and therefore, formal consultation was requested. Since critical habitat for the MSO was revoked (63 FR:14378), no conferencing or consultation is required for critical habitat for this species.

This biological opinion is based on information provided in the Final BAE for the MSO (April 14, 1998); Final Report of 1997 Camp Navajo Mexican Spotted Owl Inventory (SWCA September 26, 1997); Draft Final Report of 1998 Camp Navajo Mexican Spotted Owl Inventory (SWCA June 26, 1998); meetings with H.B. Smith, Northern Arizona University School of Forestry on November 19, 1997; a meeting with D. Hack and J. Morrow of the Guard, and M. Moore and P. Fule, Northern Arizona University School of Forestry on April 8, 1998, and; a site visit conducted on June 25, 1998. Literature cited in this biological opinion is not a complete bibliography of all

literature available on the MSO, the effects of forest management, or on other subjects considered the administrative record of this consultation is on file in the Arizona Ecological Services Office.

It is the Service's biological opinion that implementation of the Camp Navajo Forest Restoration Project is not likely to jeopardize the continued existence of the Mexican spotted owl.

CONSULTATION HISTORY

Informal consultation on the Restoration Project began on November 19, 1997, when Michele James of the Service's Flagstaff Suboffice met with H.B Smith to discuss the proposal and consultation issues. A Draft BAE dated February 25, 1998, was received at the Flagstaff Suboffice on March 3, 1998. The Service reviewed the Draft BAE and provided comments verbally on April 8, 1998, at a meeting held with D. Hack and J. Morrow of the Guard, and M. Moore and P. Fule of Northern Arizona University School of Forestry. The Service received an April 9, 1998, request for formal consultation for the MSO on April 13, 1998. The Guard determined that the proposed project "may affect, but is not likely to adversely affect" the MSO, but stated that formal consultation is requested because the proposed actions do not completely implement the recommendations of the MSO Recovery Plan (USDI 1995). A final BAE dated April 14, 1998, was received at the Flagstaff Suboffice on April 16, 1998. The Service responded with a letter on April 16, 1998, acknowledging the receipt of the Guard's request for formal consultation for the MSO. A site visit was conducted on June 25, 1998; in attendance were Michele James, H.B. Smith, D. Hack, and J. Morrow. On July 1, 1998, the Service received a copy of the Draft Final 1998 Camp Navajo Mexican Spotted Owl Inventory Report (SWCA June 26, 1998). Per a verbal request, on July 9, 1998, the Service provided John Morrow of Camp Navajo with a copy of the draft project description and conservation recommendations for review via facsimile. On July 17, 1998, these draft portions of the biological opinion were discussed in a conference call between the Guard, NAU, and the Service. The Guard decided to eliminate the mitigation measure of the BAE which states that burning will only be conducted in the fall (October-November). Instead, the Guard would like the flexibility to burn at any time of the year.

DESCRIPTION OF THE PROPOSED ACTION

The BAE states that the goal of the proposed Camp Navajo Ecosystem Restoration Project is to restore, enhance, and protect the Army National Guard's training area at Camp Navajo through ecological restoration of approximately 1,500 acres of ponderosa pine forest, located in the northwest corner of Camp Navajo. Camp Navajo is a Federal facility operated by the Arizona Army National Guard. The facility covers 28,425 acres, located approximately 10 miles west of Flagstaff, Arizona.

Euro-American settlement of northern Arizona began circa 1870. The BAE states that with settlement came the introduction of large numbers of domestic grazing animals, combined with road building, logging, and active fire suppression, which eliminated the presettlement

disturbance regime of frequent, low-intensity fires. Ponderosa pine forest density increased from an open, park-like structure to a dense, often stagnated thicket structure. The BAE indicates that live and dead fuels have increased to levels which can now support high-intensity crown fires. Similar changes in fire-adapted long-needled pine ecosystems have occurred throughout western North America. These systems are at risk from crown fire and insect outbreak and are basically unsustainable in the long term without restoration treatments. Extensive research documenting these changes includes studies by Cooper (1960), Covington and Moore (1994), and Covington *et al.* (1994, 1997). A site-specific study of ecological changes since Euro-American settlement at the Camp Navajo project area was carried out by Fule *et al.* (1997).

The concept of ecological restoration is based on "reestablishing to the extent possible the structure, function, and integrity of indigenous ecosystems and the sustaining habitats they provide" (Society for Ecological Restoration 1993). Conservation of old-growth and restoration of ecological conditions that fall within the long-term range of natural variability are recognized as important forest management concroposed restoration project is designed to emulate presettlement forest structure, treat accumulated forest floor fuels, and re-introduce frequent prescribed fires to restore natural ecosystem function.

The BAE indicates that the entire proposed Restoration Project constitutes a landscape-scale scientific experiment based on adaptive management principles. Scientists from Northern Arizona University (NAU) and Arizona Game & Fish (AGFD) are working together with Camp Navajo resource managers to test and monitor the restoration treatments. Because the proposed treatments will be implemented in stages, information learned from monitoring of early treatments will be used to refine or improve subsequent activities. The BAE indicates that the methods applied at Camp Navajo are the same as those used at other restoration sites in northern Arizona; the Camp Navajo project is therefore one replicate in a regional-scale experimental approach to forest restoration. The BAE indicates that this broad approach offers the best oppoons and advance the science and feasibility of restoring forest ecosystems.

The scientific studies associated with the restoration project include:

- Controlled restoration treatments applied in experimental blocks. Blocks are located in each stage of the restoration project. Each block consists of 20 to 40 acres, divided into randomly assigned treatment and control units. Permanent sampling plots are established in each unit to measure overstory and understory plant structure, forest floor biomass, and record permanent photo points. Ecophysiological changes in old-growth trees, soil chemistry and nutrient cycling, and small mammal responses (mice, voles, shrews) will also be measured on the experimental blocks.
- A permanent ecosystem monitoring plot network has been established across the project landscape, following procedures developed by the National Park Service and adapted to include dendroecological reconstruction of presettlement forest conditions. The monitoring plots cover the geographic areas, project stages, and forest types

included in the restoration project. The basic monitoring unit is a 20 X 50 meter permanent plot to measure overstory and understory plant structure, forest floor biomass, and record permanent photo points.

- A landscape-scale study of passerine bird and Abert's squirrel response to restoration treatments has been established by the Arizona Game and Fish Department (Rosenstock *et al.* 1997). Pre-treatment data will have been collected for two seasons prior to starting treatment activities. The study examines abundance, diversity, reproductive success, and habitat use by passerine birds, as well as Abert's squirrel population and habitat use. Large study sites (150 acres each) are included within the treatment area and in an adjacent control.
- A new ecological study of the impact of forest edges in the project area on bird and butterfly species will be initiated in 1998.

As stated previously, the project area will be treated in stages: The initial treatment site is approximately 105 acres in the south-central portion of the project area. Project activities are scheduled for the summer and fall of 1998. Approximately 76 acres of the 1998 treatment area will be thinned and burned. Ten acres of this area are included in the first experimental block; the adjacent 10-acre unit is the control. An additional 29 acres, which remains in presettlement-like forest structure, requires no thinning and will be burned only. In subsequent years, depending on funding and other factors, the remaining units identified as A (489 acres), B (555 acres), and C (412 acres) will be treated. Each treatment unit contains one experimental block and 5 permanent ecosystem monitoring plots. It is anticipated that unit A will be treated in fall of 1998 and summer of 1999. Treatment of the remaining units is expected to continue through the year 2002.

Within the perimeter of the 1,561 acre project area, 125 acres are non-forested. Grassy areas will be burned but will not have thinning. Mechanical equipment will not be used in grassy areas. In addition, a total of 87 acres are in four experimental control units. The control units are located in each of the four treatment units: the 1998 unit control is 10.8 acres; the unit A control is 24.5 acres; the unit B control is 28.5 acres; and the unit C control is 23.2 acres. After removing the grassy, control, and 1998 burn-only area (29 acres), the total remaining area of thinned and burned treatments is 1,320 acres.

The objective of the Restoration Project is to return forest structure to patterns emulating those of presettlement forests and fuels, as far as possible, in order to permit the re-introduction of prescribed fire in a manner consistent with fire's natural role. The thinning prescription is basewing the template of presettlement tree patterns. Therefore, the thinning varies between and within stands according to the density and spatial arrangement of living and dead presettlement trees of all species. The prescription provided in the BAE indicates that all living presettlement trees of any species will be retained, as well as replacement trees and all trees greater or equal to 22 inches dbh. Replacement trees will left where evidence of dead presettlement trees exists (stumps, snags, dead and downed trees, or stump holes of presettlement origin). Replacement

trees will be selected within a 30-60 foot radius of the dead presettlement tree. Where replacement trees over 16 inches dbh are available, 1.5 such trees will replace each presettlement remnant. Where replacements are below 16 inches dbh, 3 such trees will replace each presettlement remnant.

After treatment of the ponderosa pine, the area will be burned. After burning, all non-presettlement Gambel oak will be removed. Presettlement oak is defined as generally oak over 10 inches dbh. Replacement oak will be retained where evidence of dead presettlement oak is found. Replacement oak will consist of the two largest replacement trees within a 15 foot radius. The same will be done for presettlement juniper and pinyon.

The burn plan for the 1998 Restoration Units (105 acres) was provided in the BAE. The BAE indicates that similar burn plans will be completed for the burning of all remaining units. The objective of burning is to reduce the fuel loading from the current 15 tons per acre to less than 3 tons per acre. Moderate intensity burning will occur in areas where heavy accumulations are present on the ground. Areas devoid of slash will exhibit low to moderate fire intensities. Flame lengths will vary from 1 to 4.1 feet dependent upon fuel moistures. The driest fuel conditions allowed by the prescription are as follows: 1 hour= 4%; 10 hour=5%; 100 hour=8%. The burn plan states that burning will be conducted in the spring, fall or winter months, which conflicts with the mitigation measure described in the BAE which states that burning will only occur in the fall. The Service discussed this point with the Guard on July 17, 1998, and the Guard indicated that they would like to remove that mitigation measure from the proposed action. The Guard proposes to burn within the project area at any time of year. This change is reflected in Mitigation Measure 1, below. The burn plan also indicates that all snags will be lined. The BAE indicates that repeated burning at 4 to 7-year intervals in the future is intended to maintain the ecological role of frequent, low-intensity fires. It is unclear if the repeated burning is included in the proposed action, thus the Service has only considered the proposed action to consist of vegetative treatments and initial burning, which will take place through 2002.

The proposed activities may be summarized as: 1) removal of all non-presettlement and replacement trees (ponderosa pine, Gambel oak, juniper), retaining an average of 60 square feet of basal area per acre; 2) treatment of forest floor fuels to remove fuel accumulations from around the lower boles of presettlement trees, because these deep forest floors have been shown to produce tree-killing temperatures when they burn; 3) re-introduction of fire in prescription to the site. All areas will be broadcast burned, predominantly with backing fires in the fall season. The project area is used for summer cattle grazing; grazing use will be deferred during treatments and for a recovery period of two years. The understory plant community will be monitored and evaluated prior to resuming any grazing use.

The BAE indicates that proposed restoration treatment activities will be designed and scheduled to minimize possible negative effects to Mexican spotted owls. The BAE specifies that the following mitigation measures will be implemented:

1) Prescribed burning will be carried out at any time of the year, within the project area. All presettlement snags (generally pines > 15" dbh, oaks > 12" dbh) will be lined and protected. Broadcast burning will be conducted primarily with backing fires. No slash piling will be done. There are a few existing old slash piles, which will be lined and protected. All living presettlement trees will have fuels raked away from their boles to prevent heat girdling. Young oaks will be marked using the restoration prescription before burning, but actual thinning will be deferred until after burning to ensure residual tree survival.

2) Firelines will consist mostly of existing roads. Firelines will be secured and patrolled prior to burning to ensure that fire does not escape in pine-oak or mixed conifer habitat.

3) No new roads will be constructed and use of existing roads, as well as any skidding or other mechanical off-road operations, will be limited to dry or frozen weather conditions to prevent soil damage and erosion. Public access is tightly regulated at Camp Navajo, limited primarily to hunting. The Camp Navajo resource manager will control access and road use and will provide guidance to military users as to appropriate training activities during and after the treatments.

4) Livestock grazing of the project area has been suspended since 1994 and will be deferred until 2003, permitting the completion of treatment activities and a recovery period of two or more years. The understory plant community will be monitored and evaluated prior to resuming any grazing use.

5) Mexican spotted owl surveys will be carried out every other year within a mile of the project perimeter during the project period (surveys in 1997, 1998, then 2000 and 2002) and a PAC will be drawn if an owl(s) is found. Activities associated with the restoration thinning and initial burning are scheduled to be completed by 2002. However, surveys will be continued as needed to cover future prescribed burning which will occur at approximately 4-year intervals. Camp Navajo staff will consult with Service staff to determine appropriate surveying for the burning activity.

STATUS OF THE SPECIES

Species Description - Mexican spotted owl

A detailed account of the taxonomy, biology, and reproductive characteristics of the MSO is found in the Final Rule listing the MSO as a threatened species (USDI 1993a) and in the Final MSO Recovery Plan (USDI 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, much remains unknown about the species' distribution and ecology. This is especially true in Mexico where much of the MSO's range has not been surveyed. The MSO currently occupies a broad geographic area but does not occur uniformly throughout its

range. Instead, it occurs in disjunct localities that correspond to forested isolated mountain systems, canyons, and in some cases, steep, rocky canyon lands. The primary administrator of lands supporting MSO in the United States is the U.S. Forest Service. Most owls have been found within Forest Service Region 3 (including 11 National Forest in Arizona and New Mexico). Forest Service Regions 2 and 4 (including 2 National Forests in Colorado and 3 in Utah) support fewer owls. According to the Recovery Plan, 91% of MSO known to exist in the United States between 1990 and 1993 occurred on lands administered by the Forest Service.

Surveys have revealed that the species has an affinity for older, well-structured forest, and the species is known to inhabit a physically diverse landscape in the southwestern United States and Mexico. The range of the MSO has been divided into six Recovery Units (RUs), as discussed in the MSO Recovery Plan (USDI 1995). The Recovery Plan reports an estimate of owl sites. An owl "site" is defined as a visual sighting of at least one adult owl or a minimum of two auditory detections in the same vicinity in the same year. This information was reported for 1990-1993. The greatest known concentration of known owl sites in the United States occurs in the Upper Gila Mountains RU (55.9%), followed by the Basin and Range-East RU (16.0%), Basin and Range-West RU (13.6%), Colorado Plateau RU (8.2%), Southern Rocky Mountain-New Mexico RU (4.5%), and Southern Rocky Mountain-Colorado RU (1.8%). Owl surveys conducted from 1990 through 1993 indicate that the species persists in most locations reported prior to 1989.

A reliable estimate of the absolute numbers of MSO throughout its entire range is not available (USDI 1995) and the quality and quantity of information regarding numbers of MSO vary by source. USDI (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.

At the end of the 1995 field season, the Forest Service reported a total of 866 management territories (MTs) established in locations where at least a single MSO had been identified (U.S. Forest Service, *in litt.* November 9, 1995). The information provided at that time also included a summary of territories and acres of suitable habitat in each RU. Subsequently, a summary of all territory and monitoring data for the 1995 field season on Forest Service lands was provided to the Service on January 22, 1996. There were minor discrepancies in the number of MTs reported in the November and January data. For the purposes of this analysis we are using the more recent information. Table 1 displays the number of MTs and percentage of the total number of each Forest (U.S. Forest Service, *in litt.*, January 22, 1996).

Table 1. Number of management territories (MTs) as reported by the Forest Service (U.S. Forest Service, *in litt.*, January 22, 1996), percent of MTs as a proportion of the MTs in Forest Service Region 3, and the percent of suitable habitat surveyed in each Forest by National Forest (Fletcher and Hollis 1994).

National Forest	Number of MTs	Percent of MTs	Percent Suitable Habitat Surveyed
Apache-Sitgreaves	122	14.0	99
Carson	3	0.3	62
Cibola	43	5.0	41
Coconino	155	17.8	87
Coronado	108	12.4	49
Gila	197	22.7	50
Kaibab	6	0.7	96
Lincoln	126	14.5	90
Prescott	10	1.2	42
Santa Fe	33	3.8	44
Tonto	66	7.6	55
TOTAL	869	100	

The proposed Restoration Project area is located within the Upper Gila Mountains RU as defined by the MSO Recovery Plan (USDI 1995). This RU is a relatively narrow band bounded on the north by the Colorado Plateau RU and to the south by the Basin and Range West RU. The southern boundary of this RU includes the drainages below the Mogollon Rim in central and eastern Arizona. The eastern boundary extends to the Black, Mimbres, San Mateo, and Magdalena Mountain ranges of New Mexico. The northern and western boundaries extend to the San Francisco Peaks and Bill Williams Mountain north and east of Flagstaff, Arizona. This is a topographically complex area consisting of steep foothills and high plateaus dissected by deep forested drainages. This RU can be considered a "transition zone," because it is an interface between two major biotic regions: the Colorado Plateau and Basin and Range Provinces (Wilson 1969). Habitat within this RU is administered primarily by the Kaibab, Coconino, Apache-Sitgreaves, Tonto, Cibola, and Gila National Forests. The north half of the Fort Apache and northeast corner of the San Carlos Indian Reservations are located in the center of this RU and

contain an important habitat link between owl subpopulations at the western and eastern ends of the RU and the subpopulations directly south within the Basin and Range West RU.

This RU consists of deep forested drainages on the Mogollon Plateau. Vegetation generally consists of pinyon/juniper woodland, ponderosa pine/mixed conifer forest, some spruce/fir forest, and deciduous riparian forest in mid and lower elevation canyon habitat. Climate is characterized by cold winters and over half the precipitation falls during the growing season. Much of the mature stand component on the gentle slopes surrounding the canyons has been partially or completely harvested. Most of the forest habitat on steeper ground that may serve as MSO nesting habitat is in suitable condition. MSO are widely distributed and use a variety of habitats within this RU. Owls most commonly nest and roost in mixed-conifer forests dominated by Douglas fir and/or white fir and canyons with varying degrees of forest cover (Ganey and Balda 1989; USDI 1995). Owls also nest and roost in ponderosa pine-Gambel oak forest, where they are typically found in stands containing well-developed understories of Gambel oak (USDI 1995).

This RU contains the largest known concentration of MSO with approximately 55% of known MSO territories (USDI 1995). This RU is located near the center of the MSO's range within the United States and is contiguous to four of the other five RUs within the United States. Because of its central location and its large and relatively continuous spotted owl population, the MSO Recovery Team believes that the population in this RU could be uniquely important to the overall stability and persistence of the MSO population in the United States. Specifically, this population could serve as the source population, providing immigrants to smaller, more isolated populations in other RUs. Although the Recovery Team has no data on dispersal patterns or movements between RUs, the Recovery Team believes that this population should be maintained at current levels and with at least the current level of connectivity within the RU (USDI 1995). Significant discontinuities that develop in the MSO's distribution within this RU, and the loss of habitat to support the local sub-populations, may compromise the recovery of the species.

ENVIRONMENTAL BASELINE

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 which are contemporaneous with the consultation process. The environmental baseline defines the current status of the species and its habitat to provide a platform to assess the effects of the action now under consultation.

Project Location

The project area is composed of 1,561 acres of ponderosa pine (*Pinus ponderosa*) and ponderosa pine-Gambel oak (*Quercus gambelii*) forest in the northwest corner of the Camp Navajo facility (T21N and T22N, R4E). Average annual precipitation at the Flagstaff weather station, elevation

6,990 feet, is 19.8 inches, with a distinct dry period in May and June (average 1.2 inches), followed by the summer monsoon in July and August (average 5.3 inches) (Sellers and Hill 1974). The project area has a gently rolling topography with elevations ranging from 7,100 to 7,600 ft. Most soils are of volcanic origin but soils derived from underlying limestone and sandstone formations occur at lower elevations (Soil Conservation Service 1970). Ponderosa pine and Gambel oak are the dominant trees, with scattered alligator juniper (*Juniperus deppeana*) and occasional New Mexican locust (*Robinia neomexicana*) thickets.

Vegetation throughout the remainder of the western half of the Camp Navajo facility is fairly similar to that of the project area. The highest elevation on the facility is Volunteer Mountain (8,047 ft) which supports forests of Douglas-fir (*Pseudotsuga menziesii*) and white fir (*Abies concolor*) on mesic, north-facing slopes. Another unique area is Volunteer Canyon, a steep-walled ravine in which Engelmann spruce (*Picea engelmannii*) is found. The central portion of Camp Navajo is composed of grassland and scarce, second-growth ponderosa pine forest.

History of the project area

Large-scale timber extraction became profitable when the transcontinental railroad arrived in Northern Arizona in 1882 and logging for ties and pilings began around 1885 (BAE). Livestock grazing began in the same period. The project area was transferred from mixed National Forest and private ownership to military use in 1942 and has formed part of the undeveloped buffer zone around the military facilities to the present. This old-growth forest is a major training area for dismounted, small unit tactics for some 2,000 - 3,000 personnel yearly. Military readiness training for individuals and units is scarce in Arizona. There are only three such areas in the State, two of which are located in desert environments, leaving Camp Navajo as the only forested environment for training in Arizona. The BAE states that past management and fire exclusion over the past 120 years has led to extreme fire hazard in this ponderosa pine ecosystem. The Arizona Army National Guard recognizes the need for detailed information and immediate action to reduce the probability of a destructive, high-intensity crown fire which could destroy the only forested training area in the State. The implementation of the proposed action could also decrease the risk of a forest fire moving into the facility itself and destroying property and Department of Defense stored assets. The Arizona Army National Guard-Camp Navajo also recognize the additional benefits that a conservation and restoration project would have in their old-growth forest training area such as improved natural habitats, increased biodiversity, decreased insect and disease problems, increased aesthetics, and increased public awareness.

Status of the Mexican Spotted Owl and its Habitat in the Project Area

A MSO territory is located on the southern boundary of the Camp Navajo facility. The Volunteer Canyon MSO wer Volunteer Canyon PAC (# 0440211) was established byom a management territory in 1997 (Peaks Ranger District files). The PAC is located on Forest Service, Camp Navajo, and Arizona State managed lands. This PAC is located approximately 5 miles south of

the southern boundary of the Restoration Project. This is the nearest known MSO to the project area.

Surveys were conducted for the MSO in 1997 and 1998 according to U.S. Forest Service Region 3 Protocol across the entire Camp Navajo facility (SWCA 1997, 1998). The surveys located a pair of MSO within the known Volunteer Canyon PAC in both 1997 and 1998. No other MSO were located during these surveys.

Stand maps were developed for Camp Navajo and the surrounding landscape by NAU at three scales: (1) the project area (1,561 acres); (2) the Camp Navajo boundary (28,446 acres, including the project area); and (3) adjacent lands for 1 mile around the Camp Navajo boundary (total of 47,940 acres, including the 1 mile surrounding zone and the entire Camp Navajo facility). Most of the adjacent lands are managed by the Kaibab and Coconino National Forests. Stands were delineated from aerial photographs. All forested stands in the project area were sampled on the ground, but resources were not available to directly sample the surrounding lands. Vegetation outside the project area was mapped from aerial photos supported by ground-truthing.

A variable plot cruise of the stands within the project area was conducted during November and December, 1997. Individual stands (> 4 ac) were delineated based on overstory tree structure and species composition, resulting in the delineation of 26 forested stands and 5 non-forested stands. We employed a systematic random sampling technique utilizing a 656 ft (200 m) grid for establishing plot centers across the study area. The grid spacing corresponds to a sampling density of 1 plot per 9.9 acres. A minimum sample size of 3 plots per stand was established, so additional off-glaced within stands that would have had less than 3 plots. Plot centers were located with a compass and each plot was marked with a labeled wire flag. A total of 161 plots was measured.

Based on above stand surveys, 17 acres of "protected" habitat, based on the occurrence of pine-oak habitat on slopes steeper than 40%, are identified within the project area. "Restricted" pine/oak habitat as described in the MSO Recovery Plan (USDI 1995) occurs in 20 of the 26 forested stands (1,074 acres) in the project area. The remaining forested stands are overwhelmingly or exclusively pine, not meeting the MSO Recovery Plan definition of pine-oak habitat. There are no mixed conifer stands within the project area. The nearest mixed conifer stands are on the north slope of Volunteer Mountain, approximately ½ mile south of the project boundary. None of the restricted stands within the project area meet all of the criteria of "target/threshold" habitat as described in the MSO Recovery Plan (USDI 1995) in their current condition. The stands which come closest to meeting the threshold structural criteria are stands 12 and 21, which remain deficient in the number of 18"+ trees/acre.

Most restricted habitat present on the Camp Navajo facility consists of pine-oak forest along the western edge, following the north-south ridge of Volunteer Mountain and neighboring highlands. Some restricted habitat stands are associated with Volunteer Canyon in the southwest corner of the facility. Two small, isolated pine-oak stands occur in the southeast near Tappen Spring, north of Rogers Lake. Ponderosa pine forest makes up most of the central and eastern parts of the

landscape. The north-central area is the developed Camp Navajo facility, Bellemont, and the corridor created by I-40 and the railroad. Other large non-forested areas include part of Garland Prairie to the west and the Rogers Lake area in the southeast.

Based on the results of the project area stand-level inventory, it may restricted habitat stands in the larger Camp Navajo landscape meet all of the target/threshold critarger landscape probably contains sufficiently dense stands (150 square feet basal area) on the order of 40% of the restricted habitat, but the stands are unlikely to be composed of large trees at the density described in the Recovery Plan.

A total of 7,049 acres within the entire 47,940 acre landscape (15%) falls within the restricted or protected habitat category; of this area, 4,804 acres are within Camp Navajo (17% of the facility area) and 1,074 acres are within the restoration project area (68% of the project area). Protected habitat, defined as the occurrence of restricted habitat on slopes > 40%, exists on 187 acres in the landscape (146 acres within Camp Navajo's boundary, 17 acres within the restoration project area), as determined by analysis of slopes (digital elevation model) and vegetation in a geographic information system.

Table 2. Mexican Spotted Owl Habitat Analysis: Acres and Percentages by Habitat Type and Area in the Camp Navajo Restoration Project (BAE).

Habitat Type	Project Area	Camp Navajo Boundary	Camp Navajo with 1 Mile Buffer
Protected Habitat	17.2 (0.1%)	146.4 (0.5%)	187.3 (0.4%)
Restricted or Protected Habitat	1,074 (68%)	4,804.3 (17%)	7,049.3 (15%)
Other Forest Habitat	369.3 (24%)	18,496.9 (65%)	32,041.8 (67%)
Non-Forest or Developed	127.6 (8%)	5,145.2 (18%)	8,848.6 (18%)

The Forest Service has formally consulted on 197 timber sales and other projects in Arizona and New Mexico since August 1993. These projects have resulted in the anticipated incidental take of 102 owls. In addition, the Bureau of Indian Affairs has consulted on one timber sale on the Navajo Reservation which resulted in an anticipated take of five MSO, and a highway reconstruction which resulted in the anticipated incidental take of two MSO. The Federal Highway Administration has consulted on one highway project that resulted in an undetermined amount of incidental take. The take associated with this action will be determined following further consultation. Additionally, the biological opinion for the Kachina Peaks Wilderness

Prescribed Natural Fire (PNF) Plan (#2-21-94-F-220) determined thresholds for incidental take and direct take as follows: 1) one spotted owl or one pair of spotted owl adults and/or associated eggs/juveniles; 2) harm and harassment of spotted owls located in up to two PACs per year; 3) disturbance to spotted owls and habitat modification of a total of seven PACs during the life of the Kachina Burn Plan related to management ignited fire occurring in PACs for which the nest site information is three or more years old; 4) harm and harassment of spotted owls and habitat caused by PNF for which adequate surveys have not been conducted, and; 5) harm and harassment of spotted owls and habitat modification of up to one PAC and 500 acres of potential nest/roost habitat caused by wildfire as an indirect result of PNF during the life of the Kachina Burn Plan. Consultation with Langley Air Force Base (#2-22-96-F-334) for overflights in both New Mexico and Arizona concerning German Air Force operations at Holloman Air Force Base in New Mexico (for flights over the southern half of New Mexico, southwest Texas, and 40 square miles in eastern Arizona), determined that incidental take of MSO would occur due to harassment. The precise level of the take was impossible to predict due to lack of adequate data. However, incidental take is considered to be exceeded if 5% of monitored PACs are believed to have become nonfunctional through harassment from the overflights.

EFFECTS OF THE ACTION

The MSO restricted and protected habitat within Camp Navajo occurs primarily as a north-south corridor along the western edge of the facility. Although the majority of this habitat is currently not known to be used by owls, with the exception of the Volunteer Canyon vicinity, the corridor connects to occupied areas such as Volunteer Canyon and other owl habitat farther south in the Sycamore Canyon area. The habitat corridor links these southern sites to other occupied northern habitats, such as mixed conifer forests on Sitgreaves Mountain, Kendrick Peak, Bill Williams Mountain, and the San Francisco Peaks. A telemetry study found that in the fall of 1995, a dispersing juvenile MSO spent approximately 2 weeks in the immediate vicinity of Volunteer Mountain before dispersing onto the Kaibab National Forest (pers. comm. Joe Ganey, Forest Service Experimental Station, Flagstaff, AZ). Therefore, the protected and restricted habitat within the Camp Navajo facility could serve as an important corridor for dispersing owls.

Volunteer Mountain, located ½ mile south of the Restoration Project area, contains potential mixed conifer nesting habitat on steep slopes. If MSO were to occupy the habitat on Volunteer Mountain, these owls could possibly utilize the project area for foraging. However, MSO foraging sites within owl home ranges have been found to have greater total basal areas and more big down logs, relative to random sites (USDI 1995). The treated stands within the project area will be considerably more open than adjacent stands, therefore lessening the likelihood of use by foraging MSO. However, the higher herbaceous production and diversity associated with the restoration treatments, primarily the use of prescribed fire, may improve habitat for small mammals. The effects of prescribed fire include both negative and beneficial effects on MSO habitat. Beneficial aspects would include increased response of herbaceous vegetation after a fire. Negative effects would include the loss herbaceous cover, down logs and snags. The effects of

fire on the prey base of the MSO are complex and are dependent on the variations in fire characteristics and in prey habitat. Fire intensity, size, and behavior are influenced by numerous factors such as vegetation type, moisture, fuel loads, weather, season, and topography. Fire can effectively alter vegetation structure and composition thereby affecting small mammal habitat. The initial effects of fire are likely to be detrimental to rodent populations as cover and plant forage species would be reduced.

Population responses by small mammals to fire-induced changes in their habitat vary. For example, deer mouse populations might increase immediately following fire and then decrease through time (Ward and Block 1995). Campbell *et al.* (1977) noted that populations of peromyscid mice decreased immediately following fire in an Arizona ponderosa pine forest that removed one-fourth (moderately burned) to two-thirds (severely burned) of the basal area; populations then returned to pre-fire numbers two years following the burn. Further, no differences were found in rodent populations between moderately and severely burned areas. They concluded that the effects of the fire that they studied were short-term, and the short-term positive numerical responses of mice were attributed to an increase in forage, particularly grasses and forbs after the fire (Ward and Block 1995). Irvine (1991) documented post-fire declines in deer mice populations at study sites on the Coconino National Forest. Irvine attributed these declines to reduced food supplies. Lowe *et al.* (1978) noted an increase in deer mice populations the first year after a fire in ponderosa pine near Flagstaff, Arizona. Small mammal diversity and densities are typically depressed for one to three years after a fire (Wright and Bailey 1982). Biswell *et al.* (1973) suggested that rodent populations would be less affected during fall fires, because at that time of year rodents have accumulated seed caches that will mitigate loss of food sources. Predation of surviving rodents that are part of the diet of the MSO may increase immediately after the fire. In one study in northern California, radio-transmitted northern spotted owls spent considerable time in burned-over areas. This activity was assumed to be due to easy capture of prey (Patton and Gordon 1995). In summary, the effects of proposed burning on the foraging habitat of MSO is variable. Monitoring and research regarding prey ecology within the proposed Restoration Project area will assist in determining effects to small mammals after treatment.

The Guard has committed to defer livestock grazing within the project area until 2003, which will permit recovery of the understory plant community. The effects of livestock and wildlife grazing on MSO prey species and their habitat is also a complex issue. Impacts can vary according to grazing species, degree of use, including numbers of grazers, grazing intensity, grazing frequency, and timing of grazing, habitat type and structure, and plant and prey species composition (Ward and Block 1995). It is well documented that repetitive, excessive grazing of plant communities by livestock can significantly alter plant species density, composition, vigor, regeneration, above or below phytomass, soil properties, nutrient flow, water quality, and ultimately lead to desertification when uncontrolled (Belsky and Blumenthal 1997; Ward and Block 1995). These effects have both direct and indirect adverse impacts on animal species that are dependent on plants for food and cover. However, moderate to light grazing can benefit some plant and animal species under certain conditions and in certain environments, maintain communities in certain seral stages, and may increase primary productivity (Ward and Block 1995). No studies document

the direct and indirect effects of livestock and wildlife grazing on the MSO or its prey (USDI 1995). However, Ward and Block (1995) indicate that there exists some knowledge regarding the effects of livestock grazing on small mammals frequently consumed by spotted owls and regarding mesic or montane plant communities inhabited by the owl's prey. Based on studies conducted in other areas of the U.S., Ward and Block (1995) indicated that heavy grazing to decrease populations of voles and improve conditions for deer mice in meadow habitat. Increases in deer mouse abundance in meadows would not offset decreases in vole numbers because voles provide greater biomass per individual and per unit of area. Such decreases could negatively influence spotted owls occupying the Upper Gila Mountains RU where voles are common prey or used as an alternative food source when other prey species are diminished (Ward and Block 1995).

The Recovery Plan (USDI 1995) recommends that 10% of the restricted pine/oak habitat in a planning area or landscape be maintained in threshold habitat conditions or that target habitat is identified. Target habitat consists of restricted habitat stands that most closely approach threshold conditions. Stand exams conducted in the project area indicate that no stands meet all the criteria of threshold habitat as described in the Recovery Plan. The BAE indicates that 68% of the project area consists of restricted habitat, with the majority of this receiving proposed vegetation treatment. Target habitat was not identified by the Guard, either within the project area or within the Camp Navajo facility. Restricted and protected habitat included in the Restoration Project area boundary represents 22% of such habitat present within the entire Camp Navajo facility. Over 1,000 acres of this habitat is proposed for restoration treatment. This will leave over 3,000 acres of restricted and protected habitat untreated on the facility. As no stand exams have been conducted in the restricted habitat outside of the project area, it is not known if any other stands at Camp Navajo meet threshold conditions. The BAE states that it is unlikely that any stands outside the project area meet all the criteria of threshold habitat, but that some stands may approach threshold conditions, just as are present in the project area. The BAE states that no treatment is currently envisioned for the majority of the remaining habitat at Camp Navajo. Designation of target habitat was not conducted, nor landscape analysis and identification of target habitat, the Service has made the following general conclusions regarding target habitat in order to conduct the necessary analysis of effects related to the MSO Recovery Plan for this biological opinion. As detailed stand exams were conducted for the project area, these represent the best available information. These stand exams indicate that two stands (stands 12 and 21) within the project area most closely approach threshold habitat conditions. These stands total 114 acres of the 1,320 acres of restricted habitat proposed for treatment. The acreage included in stands 12 and 21 approaches the required 10% (132 acres) of restricted habitat that should be identified as target habitat within the project area itself. Therefore, for the purposes of this analysis, the Service assumes that these two stands represent target habitat. The Service believes that despite not having a complete detailed picture of the remainder of the Camp Navajo facility, the stands located within the project area likely represent the habitat that most closely approaches threshold habitat on the facility. The Service makes this conclusion based on an understanding of the purpose of the proposed project. Given that the purpose of the project is to restore presettlement conditions, the project area is likely to most closely approach desired conditions (i.e. a large density of large, presettlement trees) within the Camp Navajo facility. As the most limiting factor

in meeting threshold conditions is the density of large (>18 inches) trees, it may be assumed that the project area contains the highest density of habitat attributes on the facility. In addition, the project area is located within the north-south corridor of MSO habitat that is present along the western boundary of the Camp Navajo facility. Therefore, based upon location, pine/oak target habitat would be best identified in this area.

The Recovery Plan recommends that target stands be managed in such a way as to move them toward threshold habitat as soon as possible. The proposed restoration treatments will assist in the growth of larger trees, but by its very nature, such treatments are not compatible with the development of MSO threshold habitat. While large trees will be retained, and growth of such trees is expected, residual trees will not be present at the densities required to meet threshold conditions. The BAE indicates that the criterion for minimum threshold basal area is not feasible under a restoration management goal: the presettlement average basal area on this project site was 56.2 square feet/acre (Fule *et al.* 1997). The threshold basal area of 150 square feet/acre recommended by the Recovery Plan is not compatible with the proposed prescription to emulate the presettlement conditions.

The Recovery Plan recommends that no harvest of trees > 9" dbh occur on any slopes > 40 % where harvest has not occurred for 20 years (USDI 1995). Two pine-oak stands contain slopes > 40 % in which trees > 9" dbh are proposed for removal. Stand 18 contains approximately 6 acres with slopes over 40%; the treatment will remove 12.09 trees/acre in the 9-12" class. Stand 30 contains approximately 8 acres with slopes over 40%; the treatment will remove 25.7 trees/acre in the 9-12" class and 1.43 trees/acre in the 12-16" class. Additional stands within the project area contain slopes > 40 % but none will have trees > 9" removed. In total, thinning of trees >9" dbh will occur on 14 acres of the 17 acres of protected steep slope habitat in the project area.

The BAE indicates tree mortality from burning is expected to be low to negligible because pines will be thinned before burning while oaks will be thinned after burned to easily survive the prescribed burn. Some post-settlement oak trees may die in the burn because of the higher heat susceptibility of oaks (presettlement oaks will be protected by the forest floor raking treatment). But the oak thinning after burning will ensure that the residual oaks will be selected from among the surviving trees. The Recovery Plan recommends that all oaks over 5 inches dbh in target/threshold habitat be retained. Oak up to 10 inches dbh will be harvested in the project area in restricted habitat, as these oaks are considered post-settlement. It is unclear if such harvest will occur in the target stands 12 and 21. Small diameter snags may be expected to be consumed in the prescribed fire, but presettlement snags > 15" and oak snags > 12" as well as smaller snags with characteristic presettlement features such as yellowed bark-will have fuels cleared around the tree boles prior to burning. This procedure was shown to preserve 85-100% of these large snags in previous restoration treatments at the Pearson Natural Area and Mt. Trumbull sites.

The BAE indicates that the proposed restoration treatments will protect the stands by lessening the possibility of widespread, high-intensity wildfire and will enhance the vigor and life spans of old-growth trees by reducing competition from younger trees. The Service believes that the

positive aspects of the proposed treatments include the creation of less dense ponderosa pine stands in the immediate vicinity of Volunteer Mountain. Volunteer Mountain, while not found to be occupied by MSO in 1997 or 1998, contains potential mixed conifer nest/roost habitat, and may become occupied in the future. Thinning of the adjacent pine forest to the degree proposed is likely to assist in protection of this potential MSO nest/roost habitat.

In summary, the effects of the proposed Restoration Project treatments which are not consistent with the Recovery Plan are : 1) The treatment of target stands 12 and 21 in such a way as to move them away from threshold habitat conditions; 2) the removal of trees over 9 inches dbh on 14 acres of protected steep slope habitat, and; 3) the possible removal of oak over 5 inches dbh in target stands 12 and 21.

The effects of these types of forest treatments are typically modeled into the future to estimate their long-term effects on MSO habitat. Because the proposed restoration treatments on Camp Navajo incorporate frequent application of prescribed fire, the BAE indicates that a model based on ecological processes which incorporates modeling of fire behavior and effects was used for this analysis. Ecological process models attempt to mimic the key physiological functions of trees, permitting the models to respond in a more flexible and realistic manner to novel conditions. The FIRESUM model, which contains these features, was developed by the Forest Service for interior conifer forests, including ponderosa pine forests. A version of FIRESUM, called SW-FIRESUM, has recently been calibrated for southwestern ponderosa pine forests (W.W. Covington and others, unpublished results to the Camp Navajo project area, the BAE indicates that the restored stands will retain relatively low basal areas and densities. Under these conditions, understory productivity and diversity will increase. Predictions of fuel structures, snags, and woody debris under a frequent-fire regime are difficult to make because of the limited opportunities to study such areas. However, data collected in long-needled pine forests of northern Mexico, where frequent-fire regimes have continued up to the present, suggest that frequently burned forests have thin duff layers and relatively high proportions of recently-killed (sound) snags and woody debris, rather than decayed material, because wood is eventually consumed by fire before it has time to decompose (Fule and Covington 1996). These results are consistent with observations of southwestern ponderosa pine forests which have been burned at frequent intervals (BAE). The decrease in prey species habitat associated with large, rotten woody debris may be counterbalanced by the increase in understory production, providing food and cover resources for small animals. Across the approximately 1,500 acres of the project area, the general effect of the restoration treatments will be to increase the proportion of large trees while reducing tree density. As described above, the long-term effect of the treatments will be to maintain the proportion of oak and create large ponderosa pine trees. However, the restored stands will remain at approximately presettlement-level densities, well below the target/threshold density discussed in the Recovery Plan.

Although MSO were not found to occupy Volunteer Mountain in 1997 and 1998, given the quality of habitat at this location, the Service believes it is possible that MSO may attempt to nest at this location in the future. The Guard has committed to conducting follow-up MSO surveys within 1

mile of the project area in the years 2000 and 2002. The Service believes this will assist in keeping surveys up to date and in determining if the area becomes occupied by MSO in the future. The Guard has committed to designating a PAC(s) if MSO are located on the facility. If previously unknown MSO are located on the facility the Guard is required to contact the Service and reinitiate consultation. The Guard has not determined the frequency of surveys past 2002, but the Service addresses this issue in a Conservation Recommendation.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions are subject to the consultation requirements established under section 7, and, therefore, are not considered cumulative in the proposed action. In past Biological Opinions, it has been stated that, "Because of the predominant occurrences of MSO on Federal lands, and because of the role of the respective Federal agencies in administering the habitat of the MSO, actions to be implemented in the future by non-Federal entities on non-Federal lands are considered of minor impact." However, there has been a recent increase of harvest activities on non-Federal lands within the range of the MSO. In addition, future actions within or adjacent to the project area that are reasonably certain to occur include urban development, road building and widening, land clearing, trail construction, grazing, and other associated actions. These activities have the potential to reduce the quality of MSO nesting, roosting, and foraging habitat, and cause disturbance to breeding MSO, and would contribute as cumulative effects to the proposed action.

CONCLUSION

After reviewing the current status of the MSO, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that the Camp Navajo Restoration Project as proposed, is not likely to jeopardize the continued existence of the MSO nor will this action result in incidental take of MSO.

DISPOSITION OF DEAD, INJURED, OR SICK SPOTTED OWLS

Upon locating a dead, injured, or sick spotted owl, initial notification must be made to the Service's Law Enforcement Office, Federal Building, Room 8, 26 North McDonald, Mesa, Arizona (telephone: 602/835-8289) within three working days of its finding. Written notification must be made within five calendar days and should 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 specimens to preserve the biological material in the set possible state. If possible, the remains of intact owl(s) shall be provided to this office. If the remains of the owl(s) are not intact or are not collected, the

information noted above shall be obtained and the carcass left in place. Injured animals should be transported to a qualified veterinarian by an authorized biologist. Should the treated owl(s) survive, the Service should be contacted regarding the final disposition of the animal.

CONSERVATION RECOMMENDATIONS

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

1. Ensure that prescribed fire, particularly when conducted at the upper limits of the prescription, does not escape into MSO habitat outside of the project area. To do this, the Service recommends that extra personnel and equipment are stationed on the perimeter fire lines. If a prescribed fire gets out of control and threatens MSO protected or restricted habitat, emergency consultation must be initiated with the Service immediately.
2. Mitigation measures relating to the application of prescribed fire as described in the BAE should be incorporated into all burn plans. Language involving the initiation of emergency consultation with the Service should also be addressed in burn plans.
3. The Service recommends that the Guard plan to survey Volunteer Mountain for MSO every other year after the year 2002, or to conduct monitoring if MSO are located before this date.
4. This consultation does not address actions conducted in the project area beyond 2002, thus the Service recommends that the Guard consult with the Service regarding interval prescribed fire if planned in the project area beyond the above date.
5. The Service recommends that the Guard complete a landscape analysis of restricted pine/oak and mixed conifer habitat on the Camp Navajo facility. Target/threshold habitat as described in the MSO Recovery Plan should be identified on the facility. This will assist in future consultations for habitat altering projects.

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

REINITIATION - CLOSING STATEMENT

This concludes formal consultation on the action outlined in the this biological opinion. 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 maintained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

The Service appreciates your consideration of the threatened Mexican spotted owl. For further information, please contact Michele James or Bruce Palmer. Please refer to the consultation number 2-21-98-F-225 in future correspondence concerning this project.

Sincerely,

/s/ Thomas A. Gatz
Acting Field Supervisor

cc: Regional Director, Fish and Wildlife Service, Albuquerque, NM
Field Supervisor, New Mexico Field Office, Albuquerque, NM

H.B. Smith, Northern Arizona University, School of Forestry, Flagstaff, AZ
Forest Biologist, Coconino National Forest, Flagstaff, AZ (Attn: Cecilia Dargan)
Director, Arizona Game and Fish Department, Phoenix, AZ
Keith Pajkos, Arizona State Land Department, Flagstaff, AZ

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