



United States Department of the Interior

FISH AND WILDLIFE SERVICE
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SUMMARY BIOLOGICAL OPINION ON THE EFFECTS TO THE MEXICAN SPOTTED OWL FROM THE MEXICAN SPOTTED OWL MANAGEMENT PLAN FOR THE MESCALERO APACHE RESERVATION

Cons. #2-22-01-F-515

Date of the final opinion: November 15, 2001

Action agency: Bureau of Indian Affairs, Southwest Region.

Project: The Bureau of Indian Affairs, Mescalero Agency requested formal consultation with the Service on the implementation of the Mexican Spotted Owl Management Plan for the Mescalero Apache Reservation to meet their cultural mandate while incorporating the modern natural resource management goals of the Mescalero Apache Tribe. The Biological Assessment and Evaluation documents potential impacts of implementing this plan on Mexican Spotted Owl habitat on the reservation.

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

Biological opinion: Non-jeopardy

Incidental take statement: Seven Mexican spotted owls are expected to be taken as a result of this project.

Conservation Recommendations: Implementation of conservation recommendations is discretionary. One conservation recommendation is provided.



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Memorandum

To: Regional Director, Bureau of Indian Affairs, Southwest Region, Albuquerque, New Mexico

From: Field Supervisor, U.S. Fish and Wildlife Service, New Mexico Ecological Services Field Office, Albuquerque, New Mexico

Subject: *Mexican Spotted Owl Management Plan for the Mescalero Apache Indian Reservation*

This is in response to your September 19, 2000, request for formal consultation with the U.S. Fish and Wildlife Service (Service) under section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*). The request concerns the implementation of the *Mexican Spotted Owl Management Plan for the Mescalero Apache Indian Reservation*. This document represents the Service's biological opinion on the effects of that action on the threatened Mexican spotted owl (*Strix occidentalis lucida*) (owl).

CONSULTATION HISTORY

Informal consultation with the Mescalero Apache Indian Tribe and Bureau of Indian Affairs (BIA) has been taking place since 1995 when the first draft of the Mescalero Apache Mexican Spotted Owl Plan (Plan) was completed. Since that time, there have been numerous phone calls, meetings, letters and e-mails that have been exchanged among the Service, the Mescalero Apache Tribe, and BIA. A final draft of the Plan was completed in May 1998. In 2000, the Service was court ordered to re-designate critical habitat for the owl. Portions of Reservation lands met the definition of critical habitat for the owl and were proposed as critical habitat on July 21, 2000 (65 FR 45336). In January 2001, the Service determined that adequate special management for the owl is being provided on Mescalero Apache Reservation lands and therefore, they were not included in the final designation of critical habitat. Formal consultation was initiated on September 19, 2000. The biological assessment (BA) submitted to the Service at that time determined that the implementation of the plan would provide long-term beneficial effects to the owl but short-term adverse effects. As a result, implementation of the plan may adversely affect the owl.

The following biological opinion is based on information provided in the BA; data presented in the final Recovery Plan (United States Department of the Interior, Fish and Wildlife Service 1995) for the owl; data in our files; consultation with experts; information provided by the BIA and the Mescalero Apache Tribe; the BIA's September 19, 2000, letter and BA; literature review; and other sources of information.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The proposed action as described in the BA is the implementation of management activities detailed in the 1998 Plan. The goal of the Plan is to design management strategies for timber harvesting, prescribed burning, grazing, and recreation that maintain current owl populations and provide sufficient flexibility for the production of resource outputs (cultural and economic) at levels that meet Tribal desires while reducing the risk of catastrophic fire and maintaining a healthy ecosystem.

The Mescalero Apache Tribe uses three levels of owl habitat management: protected areas, unoccupied project areas, and other forest and woodland types. Protected areas receive the highest level of protection, followed by unoccupied project areas, and other forest and woodland types. All areas with potential for owl use will be surveyed for owls before any management actions that will alter habitat structure are implemented.

Protected Areas

There are three types of Protected Areas: 1) Protected Activity Centers (PACs), 2) areas with slopes greater than 45 percent, and 3) all administratively reserved lands. Within these three protected areas there are implementation guidelines for timber management. There are five specific guidelines that the Plan describes for the designation and management of PACs. The guidelines provided below are for the first level of habitat management, which seeks to protect all occupied nesting and roosting habitat, as well as unoccupied steep slopes and reserved lands.

Protected Activity Centers

1) Establish PACs at all known owl sites since 1994 including new sites located during surveys. Identify the activity center within each PAC. "Activity center" is defined as the nest site, a roost grove commonly used during the breeding season in absence of a verified nest site, or the best roosting/nesting habitat if both nesting and roosting information is lacking. Delineate a contiguous area no less than 400 acres around the activity center using stand boundaries and/or topographic features as appropriate. The boundaries should enclose the best possible owl habitat, configured into as compact a unit as possible, with the nest or activity center located near the center. This should include as much nest/roost habitat as is reasonable, supplemented by foraging habitat where appropriate. Once established, a PAC will be retained until the owl is delisted, new owl management strategies are adopted by the BIA Mescalero Agency and the Service, or there is documentation that a PAC has been unoccupied for 3 consecutive years. PACs that are unoccupied for 3 consecutive years will follow management guidelines for unoccupied project areas, which are described later in this document.

Commercial fuelwood project areas will not be established within PACs unless it is determined by a BIA wildlife biologist that habitat conditions for owl prey species will be improved without adversely affecting owl nesting/roosting habitat.

2) No harvest of trees is allowed at any time in a 100-acre (ac) (247.1 hectare) area within the PAC. This no harvest area will be centered around the nest or roost grove commonly used during the breeding season in the absence of a verified nest site, or the best nesting/roosting habitat if both nesting and roosting information is lacking. Road building and other linear disturbances such as fences and pipelines in this area will be avoided but may be allowed on a case-specific basis. Despite the guidelines for commercial, green fuelwood projects detailed in guideline number one, commercial, green fuelwood project areas will not be established within the 100-ac (247.1 hectare) no harvest area.

3) During the owl breeding season (March 1 - August 31) no harvest of trees is allowed in a 250-ac (617.75 hectare) area within the PAC to minimize any potential adverse effects on the owl during the breeding season. This seasonal no harvest area will include and be centered around the 100-ac (247.1 hectare) no harvest area described in guideline 2. Road building in this area will be avoided but may be allowed on a case-specific basis. The remaining 150 ac (370.65 hectare) area within the PAC may be harvested following the guidelines described in guideline 4 below.

4) Outside of the breeding season (September 1 - February 28 or if breeding is unsuccessful July 16 - February 28), 300 ac (741.3 hectare) outside of the 100-ac (247.1 hectare) no harvest area may be managed. Management for timber outputs will be de-emphasized. The following management guidelines will be followed:

- a) No harvest of trees on slopes greater than 40 percent.
- b) No harvest of trees in 15 percent (maximum 45 ac [111.2 hectare]) of the 300-ac (741.3 hectare) area. This restriction will not apply if the acres set-aside in guideline 4 (a) above exceeds 90 ac (222.39 hectare). If it is less than 90 ac (222.39 hectare), the set aside in guideline 4 (b) will apply until the 45 ac (111.2 hectare) maximum is reached or the combination of acreage set aside in guideline 4 (a) and (b) equals 90 ac (222.39 hectare). No harvest areas will be prioritized based on stands or portions of stands that exhibit nesting or roosting habitat characteristics or the potential to develop the structural components associated with these habitats in the near future.
- c) Even-aged silvicultural treatments will be limited to a maximum of 50 ac (123.55 hectare) with a maximum patch size of 12 ac (29.7 hectare). These treatments will only be utilized in stands where insect and/or disease levels preclude the use of uneven-aged or intermediate silvicultural treatments.
- d) Uneven-aged silvicultural treatments or improvement cuttings will be used whenever possible. The post harvest residual basal area per ac will be at least 55 square feet (ft) (5.1 square meters) in the stands treated with the single tree selection cutting method and at least 90 square ft (8.4 square meters) in stands treated with a thinning. The residual basal area will consist of as many trees equal to or greater than 16 inch (in) (40.6 centimeter) diameter at breast height (dbh) as possible.
- e) Road building will be kept to the minimum necessary to complete planned management activities.

- f) Prescribed fire alone or in conjunction with mechanical removal of ground fuels and submerchantable stems may be used to abate fire risk, meet resource management needs, and improve habitat conditions for owl prey. Habitat components that should be retained or enhanced include large logs (greater than 12 in (30.5 cm) midpoint diameter), grasses and forbs, and shrubs. These habitat components are strong correlates of the presence of many key prey species of the owl. Protection measures in guideline 4 (a) and (b) do not apply to the use of prescribed fire alone or in conjunction with mechanical removal of ground fuels and submerchantable stems.
5. If a stand replacing fire occurs within a PAC, timber salvage plans will be evaluated on a case-specific basis. In all cases, the PAC and a buffer extending 1,300 ft (396.2 m) from the PAC boundary will be surveyed for owls immediately following the fire. The survey will include a minimum of 3 visits, spaced at least 5 days apart. If the PAC or extended buffer is still occupied by owls, then the extent and severity of the fire should be assessed and reconfiguration of the PAC boundaries should be considered. If no owls are detected, salvage logging may proceed in accordance with BIA and Mescalero Apache Tribal guidelines.

As mentioned above in guideline 2, within the 100-ac (247.1 hectare) no harvest area in a PAC, road building and other linear disturbances such as fences and pipelines will be avoided but may be allowed on a case-specific basis. Every effort will be made to avoid doing these management activities inside the no harvest area at any time, but if deemed necessary, precautions will be taken to ensure that activities are done outside of the breeding season. To date, no management activities have taken place inside the 100-ac (247.1 hectare) no harvest area within any PACs. There are no plans for future management in these areas.

As mentioned in guideline 3, during the breeding season no harvest of trees is allowed in a 250-ac (617.8 hectare) area within a PAC. The Mescalero Apache Tribe and the BIA are committed to restricting all other management activities within the 250 ac (617.8) breeding season buffer with the following exceptions: (1) with approval from the BIA wildlife biologist, road building may occur if it is deemed absolutely necessary for the sustained flow of forest products to the Tribal sawmill. To date, no road building has occurred inside the 250-ac (617.8 hectare) breeding season buffer in any PAC during the breeding season and, (2) with approval from the BIA wildlife biologist, prescribed fire and mechanical removal of small diameter stems may be allowed in the 250-ac (617.8 hectare) breeding season buffer during the breeding season only around housing areas and other developed areas if it is absolutely necessary for the protection of life and property from the threat of wildfire. To date, no prescribed fire or mechanical removal of small diameter stems has occurred inside the 250-ac (617.8 hectare) buffer in any PAC during the breeding season.

Steep Slopes

The second category of Protected Areas is all slopes over 45 percent outside of PACs. The Plan lists three guidelines for these areas: (1) no harvest of trees is allowed on any slopes greater than 45 percent except for thinning of trees less than 9 in (22.9 cm) dbh, (2) fuels may be treated with prescribed fire or by mechanical means, and (3) construction of fuel breaks is permitted. No seasonal restrictions apply to this category of Protected Areas because it is outside of PACs.

Reserved Lands

The third category of Protected Areas is Reserved Lands. The Reserved Lands category consists of a contiguous tract of land called the Reserved Area. The Reserved Area is 32,207 ac (79,583.5 hectare) in size and is located in the northwest portion of the Reservation. The lands contained within the Reserved Area are spiritually significant to the Mescalero Tribal members. Therefore, the Forest Management Plan for the period 2000 through 2009 prohibits active resource management within this area. The Reserved Area is typical of high elevation sites within the White Mountain Range. The topography is very steep and both timbered and woodland stands exhibit high basal areas and dense canopy cover. There are no specific owl guidelines for the Reserved Area.

Unoccupied Project Areas

The intent of the management guidelines for Unoccupied Project Areas is to maintain and develop potential nesting and roosting habitat.

Unoccupied Project Areas consist of all planning areas where timber management activities are considered and evaluated. The underlying objective of the management guidelines for Unoccupied Project Areas is to manage the landscape to maintain and create replacement owl nest/roost habitat where appropriate, while providing a diversity of stand conditions and sizes across the landscape. The features associated with nest/roost habitat are high tree basal area, large trees, multi-storied canopy, dense canopy cover and downed logs and snags. Further, these stands often contain a considerable hardwood component generally provided by Gambel oak in pine-oak forests and by Gambel oak, ash, maples and aspen in mixed-conifer forests. The following section details the management guidelines for Unoccupied Project Areas.

Within all planning units where timber management activities are considered and evaluated, a survey of stands will be conducted in the mixed-conifer and pine-oak forests to locate stands at least 15 ac (37.1 hectare) in size that currently have the structural components associated with owl nest/roost habitat or exhibit the potential to develop these components within the next cutting cycle (usually 20 years). Upon completion of the survey, the quality of the habitat contained in each stand and the spatial distribution to known owl sites and other unoccupied owl habitats will be analyzed. The survey results will be analyzed by the Mescalero Apache Tribe/BIA wildlife biologist. On an individual stand basis the biologist will make a determination whether to designate the stand as potential replacement nest/roost habitat. If the stand is designated as potential replacement nest/roost habitat, the need for management activities will be assessed. The overriding management objective within designated stands is to maintain and/or promote the existence of the structural components commonly associated with nest/roost stands. Timber harvesting, mechanical treatment of fuels and prescribed burning may be conducted only if it is determined to be essential to the creation or enhancement of nest/roost habitat within the stand and specific prescriptions will be developed on a case-by-case basis. If these management activities are not essential to the creation or enhancement of nest/roosting habitat within the stand then no management activities will occur.

Other Forest and Woodland Types

The third level of habitat management is Other Forest and Woodland Types. No owl-specific guidelines are proposed for forest and woodland community types where they occur outside of PACs. These community types include: ponderosa pine, spruce-fir, pinyon-juniper, and aspen.

Grazing

Within the Plan, no specific guidelines are proposed for grazing management within the three levels of habitat management.

Recreation

The following recreation guidelines are outlined in the Plan for PACs only: (1) construction of new facilities or expansion of existing facilities should be reviewed on a case specific basis, (2) when feasible, construction and or expansion should be done outside of the breeding season (March 1 - October 30).

Survey Protocol

The Mescalero Apache Tribe and the BIA currently use the 1996 U.S. Forest Service Region 3 owl survey protocol with the following deviations: (1) the field season will be March 1 through September 30, (2) at least three complete surveys will be completed prior to August 31, (3) records of owl sites will be maintained by the Agency/Tribe and not forwarded to the Service, and (4) surveys must be done within one season of the project's implementation.

The extension of the field season is necessary to allow enough time for the completion of four complete surveys per year due to the large size of many project areas and manpower constraints. Survey results on the reservation indicate that owls are quite vocal until well after September 30 and young owls are frequently still in their parent's territory after September 15. The second deviation from the Forest Service protocol is timing. Four complete surveys will be completed in a field season but the fourth survey may be done during the time period of September 1 through September 30.

The third deviation from the Forest Service protocol is necessary because records of owl sites are considered proprietary information and the Mescalero Apache Tribe does not wish to provide this information to outside entities.

When possible, the Mescalero Apache Tribe and the BIA will survey for 2 years prior to management activities. The last two proposed timber sales have each received 4 complete surveys for 2 years prior to management activities. It is anticipated that not all timber sales will receive 2 years of survey prior to harvest. Timber sales on the reservation tend to be quite large and because of this, logging activities may take more than 2 years to complete. The current survey methodology is to survey all unlogged acres within the proposed timber sale each new field season. If an owl is located during any of the surveys then a PAC is established. While a sale may have had only 1 year of survey prior to management, 2 or 3 years of surveys may occur while the management activity is ongoing. The Mescalero Apache Tribe feels that in the unlikely event of a timber sale receiving only 1 year of survey prior to management, the ongoing surveys of the unlogged acres within the proposed timber sale is adequate.

The Division of Natural Resource Management and Protection on the Mescalero Apache Tribe has agreed to expand protocol owl surveys beyond proposed timber sales to include all the owl habitat within the reservation over the next 10 years. Additionally, there are plans to initiate a radio telemetry research project. The scope of this research will depend on the ability to obtain funding.

STATUS OF THE SPECIES/CRITICAL HABITAT

The owl was listed as threatened on March 16, 1993 (58 FR 14248). Critical habitat for the owl was designated on June 6, 1995 (60 FR 29914). Critical habitat was withdrawn on March 25, 1998 (Coalition of Arizona-New Mexico Counties for Stable Economic Growth v. U.S. Fish and Wildlife Service, No. 95-1285-M Civil). On March 13, 2000, the United States District Court for the District of New Mexico, (Southwest Center for Biological Diversity and Silver v. Babbitt and Clark, CIV 99-519 LFG/LCS-ACE), ordered the Service to propose critical habitat within 4 months of the court order, and to complete and publish a final designation of critical habitat for the owl by January 15, 2001. Critical habitat was re-proposed on July 21, 2000 (65 FR 45336) and re-designated on February 1, 2001 (66 FR 8530). Background and status information on the owl is found in the Final Rule listing the owl as a federally-threatened species (58 FR 14248), previous biological opinions issued by us, and the owl Recovery Plan. The information on species description, life history, population dynamics, status, distribution, and range-wide trends provided in those documents is included herein by reference and is summarized below.

The American Ornithologist's Union currently recognizes three spotted owl subspecies: California spotted owl (*Strix occidentalis occidentalis*); Mexican spotted owl (*S. o. lucida*); and northern spotted owl (*S. o. caurina*). The Mexican spotted owl is distinguished from the California and northern subspecies chiefly by geographic distribution and plumage. The Mexican spotted owl is mottled in appearance with irregular white and brown spots on its abdomen, back and head. The spots of the Mexican spotted owl are larger and more numerous than in the other two subspecies giving it a lighter appearance. Several thin white bands mark an otherwise brown tail. Unlike most owls, spotted owls have dark eyes.

The *lucida* subspecies is a distinguishable taxon based on allozyme electrophoresis (Barrowclough and Gutiérrez 1990). Analysis of mitochondrial DNA shows further evidence that the three designated subspecies are valid. Despite the demonstrated phylogenetic relatedness, there is evidence of reduced gene flow between the subspecies, indicating the three subspecies should be treated as separate conservation units (Barrowclough *et al.* 1999).

The Mexican spotted owl has the largest geographic range of the three subspecies. The range extends north from Aguascalientes, Mexico, through the mountains of Arizona, New Mexico, and western Texas, to the canyons of southern Utah, and southwestern Colorado, and the Front Range of central Colorado. Because this is a broad area of the southwestern United States and Mexico, much remains unknown about the subspecies' distribution within this range. This is especially true in Mexico where much of the owl's range has not been surveyed. The owl occupies a fragmented distribution throughout its United States range corresponding to the availability of forested mountains and canyons, and in some cases, rocky canyon lands. Although there are no estimates of the owl's historic population size, its historic range and present distribution are thought to be similar.

According to the Recovery Plan, 91 percent of owls known to exist in the United States between 1990 and 1993 occurred on land administered by the Forest Service; therefore the primary administrator of lands supporting owls in the United States is the Forest Service. Most owls have been found within Region 3, which includes 11 National Forests in New Mexico and Arizona. Forest Service Regions 2 and 4, including 2 National Forests in Colorado and 3 in Utah, support fewer owls. The owl's range is divided into 11 Recovery Units (RU), 5 in Mexico and 6 in the United States, as identified in the Recovery Plan (USDI FWS 1995). The Recovery Plan also identifies recovery criteria and provides distribution, abundance, and density estimates by RU. The Upper Gila Mountain RU has the greatest known concentration of owl sites (55.9 percent), followed by the Basin and Range-East (16.0 percent), Basin and Range-West, (13.6 percent), Colorado Plateau (8.2 percent), Southern Rocky Mountain-New Mexico (4.5 percent), and Southern Rocky Mountain-Colorado (1.8 percent) RUs.

A reliable estimate of the number of owls throughout its entire range is not currently available due to limited information. Fletcher (1990) calculated that 2,074 owls existed in Arizona and New Mexico in 1990 using information gathered by Region 3 of the Forest Service. Fletcher's calculations were subsequently modified by the Service (USDI 1991), who estimated a total of 2,160 owls throughout the United States. However, these numbers are not considered reliable estimates of current population size for a variety of statistical reasons. While the number of owls throughout the range is currently not available, the Recovery Plan reports an estimate of owl sites based on 1990-1993 data. 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. Surveys from 1990 through 1993 indicate one or more owls have been observed at a minimum of 758 sites in the United States and 19 sites in Mexico. In addition, those surveys indicate that the species persists in most locations reported prior to 1989, with the exception of riparian habitats in the lowlands of Arizona and New Mexico, and all previously occupied areas in the southern States of Mexico.

In a summary by the Forest Service of all territory and monitoring data for the 1995 field season, a total of 869 management territories (MT) were reported to the Service (U.S. Forest Service, *in litt.* January 22, 1996). Based on that number of owl sites, the number of owls in the United States may range from 869 individuals, assuming each known site was occupied by a single owl, to 1,738 individuals, assuming each known site was occupied by a pair of owls. The 1996 data are the most current compiled information available; however, more recent surveys efforts have likely resulted in additional sites being located in all RUs.

Owls breed sporadically and do not nest every year. This owl's reproductive chronology varies somewhat across its range. In Arizona, courtship apparently begins in March with pairs roosting together during the day and calling to each other at dusk (Ganey 1988). Eggs are laid in late March or typically early April. Incubation begins shortly after the first egg is laid, and is performed entirely by the female (Ganey 1988). The incubation period for the owl is assumed to be 30 days (Ganey 1988). During incubation and the first half of the brooding period, the female leaves the nest only to defecate, regurgitate pellets, or receive prey from the male, who does all or most of the foraging (Forsman *et al.* 1984, Ganey 1988). Eggs usually hatch in early May, with nestling owls fledging 4 to 5 weeks later, and then dispersing in mid-September to early October (Ganey 1988).

Little is known about the reproductive output for the owl. It varies both spatially and temporally (White *et al.* 1995), but the subspecies demonstrates an average annual rate of

1,001 young per pair. Current demographic research in Arizona and New Mexico has documented populations that are declining at greater than 10 percent a year (Seamans *et al.* 1999). Possible reasons for the population declines are declines in habitat quality and regional trends in climate (Seamans *et al.* 1999). Based on short-term population and radio-tracking studies, and longer-term monitoring studies, the probability of an adult owl surviving from one year to the next is 0.8 to 0.9. Juvenile survival is considerably lower, at 0.06 to 0.29. These estimates may be low due to the high likelihood of permanent dispersal from the study area, and the lag of several years before marked juveniles reappear as territory holders and are detected as survivors through recapture efforts (White *et al.* 1995). Little research has been conducted on the causes of mortality, but it is believed that predation by great horned owls, northern goshawks, red-tailed hawks, and golden eagles, as well as starvation, and accidents or collisions, may all be contributing factors.

Mexican spotted owls nest, roost, forage, and disperse in a diverse array of biotic communities. Nesting habitat is typically in areas with complex forest structure or rocky canyons, and contain mature or old-growth stands that are uneven-aged, multi-storied, and have high canopy closure (Ganey and Balda 1989a, USDI 1991). In the northern portion of the range (southern Utah and Colorado), most nests are in caves or on cliff ledges in steep-walled canyons. Elsewhere, the majority of nests appear to be in Douglas fir (*Pseudotsuga menziesii*) trees (Fletcher and Hollis 1994, Seamans and Gutierrez 1995). A wider variety of tree species are used for roosting; however, Douglas fir is the most commonly used species (Ganey 1988, Fletcher and Hollis 1994, Young *et al.* 1998). Spotted owls generally use a wider variety of forest conditions (mixed conifer, pine-oak, ponderosa pine (*Pinus ponderosa* var. *scopulorum*), piñon-juniper (*Pinus edulis*, *Juniperus* spp.)) for foraging than they use for nesting/roosting.

Seasonal movement patterns of owls are variable. Some individual owls are year-round residents within an area, some owls remain in the same general area but show shifts in habitat use patterns, and some owls migrate considerable distances 12-31 miles during the winter, generally migrating to more open habitat at lower elevations (Ganey and Balda 1989b, Willey 1993, Ganey *et al.* 1998). Home-range size of Mexican spotted owls appears to vary considerably among habitats and/or geographic areas (USDI FWS 1995), ranging in size from 647- 3,688 ac for individuals birds, and 945-3,846 ac for pairs (Ganey and Balda 1989b, Ganey *et al.* 1999). Little is known about habitat use of juveniles during natal dispersal. Ganey *et al.* (1998) found dispersing juveniles in a variety of habitats ranging from high-elevation forests to piñon-juniper woodlands and riparian areas surrounded by desert grasslands.

Mexican spotted owls consume a variety of prey throughout their range but commonly eat small and medium sized rodents such as woodrats (*Neotoma* spp.), peromyscid mice (*Peromyscus* spp.), and microtine voles (*Microtus* spp.). They may also consume bats, birds, reptiles, and arthropods (Ward and Block 1995). Habitat correlates of the owl's common prey emphasizes that each prey species uses a unique habitat. Deer mice (*Peromyscus maniculatus*) are ubiquitous in distribution in comparison to brush mice (*Peromyscus boylei*), which are restricted to drier, rockier substrates, with sparse tree cover. Mexican woodrats (*N. mexicana*) are typically found in areas with considerable shrub or understory tree cover and high log volumes or rocky outcrops. Mexican voles (*Microtus mexicanus*) are associated with high herbaceous cover, primarily grasses; whereas, long-tailed voles (*M. longicaudus*) are found in dense herbaceous cover, primarily forbs, with many shrubs, and limited tree cover. A diverse prey base is dependant on the availability and quality of diverse habitats.

The Recovery Plan provides for three levels of habitat management: protected areas, restricted areas, and other forest and woodland types. "Protected habitat" includes all known owl sites, and all areas in mixed conifer or pine-oak forests with slopes greater than 40 percent where timber harvest has not occurred in the past 20 years, and all reserved lands. The PACs are delineated around known owl sites. A PAC includes a minimum of 600 ac designed to include the best nesting and roosting habitat in the area. The recommended size for a PAC includes, on average from available data, 75 percent of the foraging area of an owl. The management guidelines recommended in the recovery plan for protected areas are to take precedence for activities within those areas. "Restricted habitat" includes mixed conifer forest, pine-oak forest, and riparian areas; the recovery plan provides less specific management guidelines for these areas. The recovery plan provides no owl-specific guidelines for "other habitat."

Past, current, and future timber harvest practices in Region 3 of the Forest Service, in addition to catastrophic wildfire, were cited as primary factors leading to the listing of the owl as a federally-threatened species. Other factors that have or may lead to the decline of this species include a lack of adequate regulatory mechanisms. In addition, the Recovery Plan notes that forest management has created ecotones favored by great horned owls, increasing the likelihood of predation on the owl. Finally, there is a potential for increasing malicious and accidental anthropogenic harm, and the potential for the barred owl to expand its range, resulting in competition and/or hybridization with the owl.

ENVIRONMENTAL BASELINE

Regulations implementing the Act (50 CFR 402.02) define the environmental baseline as the past and present impacts of all Federal, State, or private actions and other human activities in the action area. Also included in the environmental baseline are the anticipated impacts of all proposed Federal projects that have undergone section 7 consultation, and the impacts of State and private actions that are contemporaneous with the consultation in progress.

A total of 521 projects have undergone formal consultation for the owl in Arizona and New Mexico. Of that aggregate, 257 projects resulted in a total anticipated incidental take of 483 owls plus an additional unquantifiable number of owls. These consultations have primarily dealt with actions proposed by the Forest Service, Region 3, but have also addressed 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 construction activities.

Status of the Mexican Spotted Owl (within the Action Area)

Basin and Range - East Recovery Unit

The 460,678 ac Mescalero Apache Reservation is located in south-central New Mexico within the Basin and Range - East RU. The Mescalero Apache Reservation is located in Otero County except for 240 ac which are located in Lincoln County. It is bordered on the north and south by the Lincoln National Forest, and on the east and west by both public and private

lands. As stated in the BA, the Mescalero Apache Reservation is divided into forested and non-forested categories. Approximately 85 percent is considered forested and the remaining 15 percent is divided into the woodland and timberland category. Thirty nine percent of the forested area is available for timber management. It is divided almost equally between the east and west slopes of a mountainous ridge of the Sacramento Mountains that bisects the western half of the Mescalero Apache Reservation.

The Basin and Range - East RU contains the second highest concentration of known owl sites (16.0 percent) in the United States. Because of the high concentration of owls, this RU has been referred to as an important owl distribution center in the Recovery Plan. Owls occur in isolated mountain ranges scattered across this RU, but the largest portion of the owl subpopulation occurs in the Sacramento Mountains. They are most common in mixed-conifer forest, but have been located in ponderosa pine forest and piñon/juniper woodland on a few occasions (Skaggs and Raitt 1988). Owl sites have been reported on National Forest lands in the Sandia, Manzano, Sacramento, and Guadalupe Mountains, as well as the Guadalupe National Park and on Mescalero Apache Tribal lands.

Owls occurring in the Sacramento Mountains have been exposed to various disturbances for more than a century. Disturbances include forest fires, timber and fuelwood harvest, grazing, land development, and recreation. Coniferous forests, especially the mixed-conifer, were extensively logged during an era of railroad logging from 1890 to 1945 (Glover 1984). After the railroad logging era, trees grew rapidly and attained merchantable sizes in about 40-50 years on favorable sites. Consequently, much of the habitat currently used by owls in the Sacramento Mountains is regrowth forest that has attained a high density of moderately sized trees, poles, and saplings, together forming multiple layers. According to the Recovery Plan, the greatest threats in this RU, in order of potential effects, are catastrophic fire, timber harvest, fuelwood harvest, grazing, human developments, and forest insects and disease. Other activities that are considered potential threats to the owl include certain military operations, other habitat alterations (such as powerlines and roads), mining, and recreation. Recovery in this RU will require maintenance of existing and future populations by conserving habitats in areas not only inhabited by owls, but also in unoccupied suitable or potentially suitable habitats.

According to the BA, historic records of owls on the Mescalero Apache Reservation are scarce or nonexistent. The earliest record documented by the Bureau of Indian Affairs, Branch of Forestry is from 1986. Despite this lack of historic records, the owl has long been known to occur on the Reservation. Based on documented sightings since 1986 and survey results, the Reservation supports a significant population of owls. Survey results from 1988 through 1999 show a total of 37 owl sites. As stated in the BA, an "owl site" is defined as any location where an owl is seen or vocalizations are heard. The exact distribution of the population on the Reservation is unknown because surveys are limited to proposed logging units and the entire commercial forest base has not yet been logged. The Reservation predicts that the entire area will be surveyed by the year 2007.

The majority of the owl sites on the Mescalero Apache Reservation are located in mixed-conifer stands with north aspects, however, owl sites are not limited to these stands. An important characteristic of nesting and roosting sites on the reservation is high canopy cover regardless of tree species. Owls on the Mescalero Apache Reservation have been located in stands of ponderosa pine and Gambel oak.

As stated in the BA, uniform, widespread even-aged timber management did not occur on the reservation like other forests in the Southwest. Until the late 1980s, most harvesting on the reservation was intermediate and partial cuttings targeting hazard trees and insect or disease damaged trees. This resulted in a multi-species, multi-cohort forest that was fairly continuous and exhibited vertical and horizontal structural diversity, relatively dense canopy cover, and an intact hardwood and/or woodland component. The only large openings in the forest were the result of stand replacing fires. In the 1980s, uneven-aged management became the preferred silvicultural system on the reservation. This switch in management philosophy produced little change in the forest structure and composition. During the early to mid-1990s, the timber sale areas on the reservation were concentrated in areas with high amounts of dwarf mistletoe infection. A large outbreak of roundheaded pine beetle also occurred in the Elk Canyon and South Tularosa Canyon areas. Within these timber sales, many stands would not meet post harvest objectives if uneven-aged management were used and therefore, even-aged management strategies were used. These stands were comprised of ponderosa pine. From the mid 1990s, to the present, most timber sales have had a mix of stand conditions that has required the use of both even-aged and uneven-aged treatments to meet post harvest objectives. As more practical knowledge was gained, the use of innovative even-aged techniques has been utilized. For example in a mistletoe infected stand a "shelterwood with reserves" or a "clearcut with reserves" cut is most often used. With this silvicultural practice, reserve trees are left in addition to any overstory trees that are retained as a function of regenerating the stand. Reserve trees are not specifically targeted for cutting during future removal phase harvesting.

EFFECTS OF THE ACTION

As stated in the BA, the Mescalero Apache Tribe and the BIA believe that the general forest management practiced on the Mescalero Apache Reservation, along with the implementation of the Plan, will provide adequate habitat quality and quantity for the maintenance of owls on the Mescalero Apache Reservation. Management activities on the Mescalero Apache Reservation are designed to sustain biotic diversity and the natural processes and landscape mosaics that generate diversity. While management practices were not designed specifically for owls but rather to promote biodiversity and protect unique stand conditions and landscape features, owls benefit from these practices because they promote biodiversity, retain structures that are useful to owls (snags, cavities, and large diameter trees) or provide habitat for prey species (down logs, woody debris and a hardwood understory).

Uneven-aged Management

As stated in the BA, classic uneven-aged silvicultural systems benefit the owl in two ways: 1) continuous forest cover is maintained simultaneously over the landscape, and 2) multiple canopy layers are present at the stand level. On the Mescalero Apache Reservation, the application of single tree selection cutting within the uneven-aged silvicultural system differs slightly from the classic approach (selecting all the merchantable trees). One common objective of the single tree selection method is to stimulate development of a new cohort (seedlings) during the 20 year cutting cycle. On the reservation, that component is already present so the need for regeneration is greatly reduced. This means that there is no need to open up the canopy to allow for sunlight to reach the seeds in order for germination to occur. Therefore, post harvest basal area levels in the larger size classes are slightly higher on the reservation. This provides for the high canopy cover component preferred and used by the owl for nesting and roosting.

Another common goal of uneven-aged management is to achieve a desired distribution of size and age classes within a stand. When this goal is achieved, the stand is termed as "regulated." On the reservation, most stands are not close to regulation. It is recognized that reaching regulation will take many cutting cycles. This allows the flexibility to concentrate more on the quality of the residual trees rather than timber targets. The end product of this approach is a stand with an unequal stocking of age/size classes and basal area levels. This stand structure is considered more irregular uneven-aged than balanced uneven-aged. Using the classic approach to uneven-aged management, trees are allowed to grow to a certain size and then harvested. This is not the case on the Mescalero Apache Reservation. As stated in the BA and the Plan, an individual tree is never selected for harvest based solely on its diameter. The target stand table for single tree selection in the *Inventory Analysis for the 2000-2009 Forest Management Plan* shows an old growth retention of 13.1 square ft of basal area per ac in trees 20 in dbh and larger. Maintenance of and management for large trees provides another very important component of owl nest/roost habitat.

Currently, uneven-aged management using the group selection method is not widely used on the Mescalero Apache Reservation. Stands that are treated with the single tree selection method often contain small pockets of trees infected with dwarf mistletoe. These pockets are treated resulting in small patches (less than one ac) resembling a very small clearcut. Large stands may contain several of these patches. The effect is a stand with high levels of vertical and horizontal structural diversity with a scattered mosaic of small even-aged or two storied groups. The edge effects around the groups will provide structural features and openings that mimic gap-phase regeneration and provide early seral vegetation. There are three aspects of the classic approach to single tree selection that are not beneficial to the owl. They are: 1) large tracts of low density forests, 2) the eventual eradication of large diameter trees, and 3) numerous road openings. According to the BA, the single tree selection method used on the Mescalero Apache Reservation results in higher residual basal area levels than commonly associated with this cutting method as it is traditionally applied, and the large tree retention targets and goals provide for the persistence of larger diameter trees. In addition there is very little new road construction on the reservation.

Even-aged Management

As stated previously, the Mescalero Apache Reservation was not subject to uniform, widespread even-aged management in the past. According to the BA, a larger portion of the Mescalero Apache Reservation is uneven-aged forest, however even-aged stands are well represented across the landscape. These stands are composed of a "stratified mixture" where the trees are essentially even-aged but variations in growth rates has led to the presence of multiple canopy layers. Management activities in these stands are designed to favor the retention of larger diameter trees but smaller size class trees are retained in significant quantities to preserve a multi-layer canopy and diameter size class diversity.

With both even-aged management treatments implemented on the Mescalero Apache Reservation ("clearcut with reserves" or "shelterwood with reserves"), the purpose of retaining reserve trees is not tied to the regeneration effort within the stand. Reserve trees are retained to provide structural diversity, lessen the harsh aesthetic impact, provide wildlife habitat, allow for some of the available growing space to be allocated to commercial sized stems and to satisfy large diameter tree retention objectives when possible. Residual stocking provides habitat for species classified as habitat generalists. It also provides structure within

the developing stand, which greatly reduces the timeframe required to achieve a multi-storied stand condition.

As stated in the BA, a clearcut with reserves, or shelterwood with reserves, is easier to apply in stands that have a component of non-host species. In stands that lack a non-host component, retaining a reserve component that meets post harvest objectives is more difficult. In this situation, the reserve component is usually made up of an intact hardwood and/or woodland component. This hardwood/woodland component will promote biodiversity by providing species diversity and vertical and horizontal structural diversity within the developing even-aged regeneration component. While the retention of this reserve component may inhibit the growth of the new commercial species cohort, the Tribe and the BIA feel that the ecological benefits outweigh any potential growth loss.

Other Management

The Tribe is also concerned with retention of hardwood and woodland components. A significant hardwood component exists throughout large areas of the reservation. This hardwood component is retained intact during timber harvesting and forest development follow-up operations. Some limited personal-use fuelwood harvesting of Gambel oak is conducted by Tribal members, but is not considered to constitute a negative impact due to its scattered small-scale nature.

Snags are a key habitat component that is managed by the Tribe. All snags that do not pose a threat to life or property are retained. Snags are an important structural feature of owl habitat.

According to the BA, timber management practices on the reservation vary considerably from those used on National Forest lands across the Southwest. Based on past and predicted timber sale activity for the period of 1997 through 2004, 1.8 PACs will have some timber harvesting within a 0.25 mile radius around the perimeter of the PAC boundary each year. The timber sale activity for the period of 1997 to 2004 is heavily skewed toward mixed-conifer areas and it is predicted that over a 20-year cutting cycle, about one PAC per year will have harvesting within the 0.25 mile radius around the PAC. While timber harvesting results in a change in stand conditions that persists into the future, the potential for disruption or stress to owls from the noise and activity associated with logging practices is short (generally 2 to 3 months). In terms of a 20 year cutting cycle, each PAC located within the commercial forest base can expect to have logging activity nearby for only 2 to 3 months time over the 20 years. Noise-related impacts from timber harvest activities may occur if harvest activities occur within PACs during the breeding season. In addition, the Service believes that there is an increased probability of owl mortalities from vehicle collisions with logging trucks during the breeding season. The short duration of disturbance along with seasonal restrictions (no harvest activities within a 250-ac area within the PAC from March 1 to August 31) would help to minimize some of the negative effects to the owl from noise disturbance and reduce the risk of owl-vehicle collisions. We believe that implementation of the proposed action will not render any currently known PACs unsuitable for nesting and roosting of owls.

Direct impacts of habitat loss are expected to occur in occupied owl habitat within the project area. Timber harvesting within PACs could result in changes in stand conditions that persist into the future. Such changes may include the removal of different habitat components that are important to the owl. These may include the removal of large trees and the reduction of

basal area and/or canopy cover. A change in the size class distribution may also occur. Most of these changes could be considered short-term. The Mexican Spotted Owl Recovery Plan recommends avoiding management in occupied habitats that may affect components that are important to the owl. Although the information provided in the BA is not sufficient for the Service to quantify the effects of management on the reservation, surveys indicate that owls continue to occupy treated PACs and reproduce successfully. This appears to be a result of the management emphasis focusing on increasing biodiversity within those management areas. The Mescalero Apache Tribe depends on the natural resources within the reservation for their livelihood, therefore, their management emphasis is sustainability. It is the Service's opinion that while the project could potentially adversely affect suitable nest/roost habitat occurring on the reservation in the short term, the proposed action will result in a beneficial effect to the owl in the long term.

CUMULATIVE EFFECTS

Cumulative effects are those effects of future non-Federal (State, local government, or private) activities on endangered or threatened species or critical habitat that are reasonably certain to occur in the foreseeable future. Future Federal actions are subject to the consultation requirements established in 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 occurrence of the owls on Federal lands, and because of the role of the respective Federal agencies in administering the habitat of the owl, actions to be implemented in the future by non-Federal entities on non-Federal lands are considered of minor impact." However, there are harvest activities taking place on non-Federal lands (e.g., private land timber sales on inholdings in and around the reservation). In addition, future actions adjacent to reservation lands that are reasonably expected to occur include urban development, road building, land clearing, logging, fuelwood gathering, and other associated actions. These activities reduce the quality and quantity of owl nesting, roosting and foraging habitat, cause disturbance to breeding owls and would contribute as cumulative effects to the proposed action.

CONCLUSION

After reviewing the current status of the owl, the environmental baseline for the action area, the effects of the proposed implementation of the Mescalero Apache Mexican Spotted Owl Plan, and the cumulative effects, it is the Service's biological opinion that the implementation of the Mexican Spotted Owl Management Plan for the Mescalero Apache Reservation is not likely to jeopardize the continued existence of the owl. No critical habitat is currently designated for this species within the reservation; therefore, none will be affected.

This conclusion is based on the following: 1) owls occurring within the reservation have demonstrated occupancy and reproduction under some level of disturbance from timber harvest activities occurring within PACs; 2) a 100-ac no harvest area will be maintained within the PAC; 3) harvest activities would not be allowed within a 250-ac area within the PAC during the breeding season; 4) significant alteration of nest or roost habitat is not expected and the effects to foraging or dispersal habitat are not expected to affect the behavior (i.e., breeding or foraging) of the owls to the extent that the birds are considered lost as viable members of the population; and 5) it is not expected that owls will fail to breed or fail to successfully rear young due to inadequate food supplies available in altered habitat, raise

fewer young, raise less fit young, or desert the area because of disturbance when habitat no longer meets the owl's needs. The implementation of the proposed action is not expected to impede the owl's ability to nest, roost, forage, or disperse within the Basin Range East - Recovery Unit.

INCIDENTAL TAKE

Section 9 of the Act, as amended, prohibits taking (harassing, harming, pursuing, hunting, shooting, wounding, killing, trapping, capturing, or collecting, or attempting to engage in any such conduct) of listed species of fish and wildlife without a special exemption. Harass is further defined as an intentional or negligent act or omission that creates the likelihood of injury to wildlife by annoying it to such an extent to significantly disrupt normal behavior patterns. Normal behavior patterns include, but are not limited to, breeding, feeding, and sheltering. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. 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 a prohibited taking provided that such taking is in compliance with the incidental take statement.

Amount or Extent of Take

For the purposes of consideration of incidental take of owls from the proposed project, incidental take can be broadly defined as either the direct mortality of individual birds, or the alteration of habitat that affects the behavior (i.e., breeding or foraging) of the birds to such a degree that the birds are considered lost as viable members of the population and are thus "taken." Owls may fail to breed, fail to successfully rear young due to inadequate food supplies in altered habitat, raise fewer young, raise less fit young, or desert the area because of disturbance when habitat no longer meets the owl's needs.

The Service anticipates that the proposed action will result in incidental take of owls. This determination is based on the knowledge that nesting owls could be affected; survey data indicate that owls currently occupy the proposed project area, the project will modify habitat within PACs, and the potential for vehicle collisions from owls foraging in these and other areas could potentially occur.

Incidental take of owls is anticipated as a result of the following:

- 1) Mortalities by collision with logging trucks during harvest activities occurring during the breeding season.
- 2) Disturbance of nesting owls from timber harvest activities occurring within PACs during the breeding season resulting in potential abandonment of young in the nest.
- 3) Modification of occupied habitat due to harvest activities occurring within a PAC.

The Service anticipates that the proposed project may result in the incidental take of one owl over the life of the project from collisions with vehicles. Incidental take is expected to be in the form of killing or harm due to increased risk of collision with logging trucks. We

anticipate that take of up to two owls could occur in the form of harassment if any harvest activities occur within PACs during the breeding season when it is more likely that those PACs are being occupied by owls. We also anticipate that take of four owls could occur due to alteration of habitat and the possibility that a PAC could become unusable for nesting or roosting.

Effect of the Take

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the owl.

To the extent that this statement concludes that take of any threatened or endangered species of migratory bird will result from the agency action for which consultation is being made, the Service will not refer the incidental take of any such migratory bird for prosecution under the Migratory Bird Treaty Act of 1918, as amended (16 U.S.C. §§703-712), if such take is in compliance with the terms and conditions specified herein.

Reasonable and Prudent Measures

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize take.

- 1) Minimize disturbance to the owl during project completion.
- 2) Conduct all proposed activities in a manner that will minimize modification and loss of owl habitat.
- 3) Decrease vehicle speed within PACs during the breeding season.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of ESA, the BIA must comply with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are nondiscretionary.

- 1.1 Cutting and skidding will be restricted during the most critical part of the owl breeding season (March 1 - June 1) of each year within known PACs and other potential nest/roost areas within the project area, unless surveys indicate the area is unoccupied.
- 1.2 If a determination is made that owls are nesting, no cutting or skidding may occur within 1/4 mile of the nest site during March 1 - June 1 and vehicle traffic on unsurfaced logging roads within the 100 acre nest site will be avoided. However, if circumstances are such that an existing unsurfaced logging road within the nest stand must be used, vehicle traffic is prohibited during the time that the owls are most active (two hours before sunset to two hours after sunrise). If the area is determined to be unoccupied, activities may proceed without these restrictions.
- 3.1 Speed limits of 15 to 20 miles per hour on unsurfaced logging roads within occupied PACs during the breeding season will be posted and enforced.

The 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, this level of incidental take is exceeded, such incidental take would represent new information requiring review of the reasonable and prudent measures provided. The Federal agency must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

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. The term "conservation recommendations" has been defined as Service suggestions regarding discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information. The recommendations provided here relate only to the proposed action and do not necessarily represent complete fulfillment of the agency's section 7(a)(1) responsibility for this species.

1. Initiate a radio telemetry research project as a way to expand owl surveys to include all the owl habitat within the reservation.

In order for the Service to be kept informed of actions that either minimize or avoid adverse effects or that benefit 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 *Mexican Spotted Owl Plan for the Mescalero Apache Reservation* as described in the BA. As required by 50 CFR 402.16, re-initiation of formal consultation is required if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may impact 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 future communications regarding this project, please refer to consultation #2-22-01-F-429. If you have any questions or would like to discuss any part of this biological opinion, please contact Delfinia Montaño of my staff at (505) 346-2525 ext. 117.

Sincerely,



Joy E. Nicholopoulos
Field Supervisor

LITERATURE CITED

- Barrowclough, G.F., and R.J. Gutiérrez. 1990. Genetic variation and differentiation in the spotted owl (*Strix occidentalis*). *Auk* 107:737-744.
- Barrowclough, G.F., R.J. Gutiérrez, and J.G. Groth. 1999. Phylogeography of spotted owl (*Strix occidentalis*) populations based on mitochondrial DNA sequences: gene flow, genetic structure, and a novel biogeographic pattern. *Evolution* 53:919-931.
- Fletcher, K. 1990. Habitats used, abundance, and distribution of the Mexican spotted owl, *Strix occidentalis lucida*, on National Forest system lands. U.S. Forest Service, Southwestern Region, Albuquerque, New Mexico. 86pp.
- Fletcher, K., and H. Hollis. 1994. Habitats used, abundance, and distribution of the Mexican spotted owl (*Strix occidentalis lucida*) on National Forest System Lands in the Southwestern Region. USDA, Forest Service, Southwestern Region, Albuquerque, New Mexico. 86pp.
- Forsman, E.D., E.C. Meslow, and H.M. Wight. 1984. Distribution and biology of the spotted owl in Oregon. *Wildlife Monographs* 87:1-64.
- Ganey, J.L. 1988. Distribution and habitat ecology of Mexican spotted owls in Arizona. MS Thesis. Northern Arizona University, Flagstaff, Arizona.
- Ganey, J.L. and R.P. Balda. 1989a. Distribution and habitat use of Mexican spotted owls in Arizona. *Condor* 91:355-361.
- Ganey, J.L. and R.P. Balda. 1989b. Home-range characteristics of spotted owls in northern Arizona. *Journal of Wildlife Management* 53:1159-1165.
- Ganey, J.L., W.M. Block, J.K. Dwyer, B.E. Strohmeier, and J.S. Jenness. 1998. Dispersal, movements, and survival rates of juvenile Mexican spotted owls in Northern Arizona. *Wilson Bull.*, 110(2):206-217.
- Ganey, J.L., W.M. Block, J.S. Jenness, and R.A. Wilson. 1999. Mexican spotted owl home range and habitat use in pine-oak forest: implications for forest management. *Forest Science* 45:127-135.
- McDonald, C.B., J. Anderson, J.C. Lewis, R. Mesta, A. Ratzlaff, T.J. Tibbitts, and S.O. Williams. 1991. Mexican spotted owl (*Strix occidentalis lucida*) status report. U.S. Fish and Wildlife Service, Albuquerque, New Mexico. 85 pp.
- New Mexico Department of Game and Fish. 1988. Handbook of Species Endangered in New Mexico, F-201:1-2.
- Seamans, M.E. and R.J. Gutiérrez. 1995. Breeding habitat of the Mexican spotted owl in the Tularosa Mountains, New Mexico. *Condor* 97:944-952.

- Seamans, M.E., R.J. Gutiérrez, C.A. May, and M.Z. Peery. 1999. Demography of two Mexican spotted owl populations. *Conservation Biology* 13:744-754.
- USDI Fish and Wildlife Service. 1991. Mexican spotted owl status review. Endangered species report 20. Albuquerque, New Mexico.
- USDI Fish and Wildlife Service. 1993. Endangered and Threatened Wildlife and Plants; final rule to list the Mexican spotted owl as threatened. *Federal Register* 58:14248-14271.
- USDI Fish and Wildlife Service. 1995. Recovery plan for the Mexican spotted owl (*Strix occidentalis lucida*). Albuquerque, New Mexico. 85pp.
- USDI Fish and Wildlife Service. 1995. Endangered and threatened wildlife and plants; determination of critical habitat for the Mexican spotted Owl; Final rule; 60:29914-29951.
- USDI Fish and Wildlife Service. 1998. Endangered and Threatened Wildlife and Plants; revocation of critical habitat for the Mexican spotted owl, loach minnow, and spikedace. *Federal Register* 63:14378-14379.
- USDI Fish and Wildlife Service. 2000. Endangered and threatened wildlife and plants; proposed designation of critical habitat for the Mexican spotted Owl; Proposed rule; 65:45336-45353.
- Ward, J.P. Jr., and W.M. Block. 1995. Mexican spotted owl prey ecology. *In* Mexican Spotted Owl Recovery Plan. U.S. Department of the Interior, Fish and Wildlife Service, Albuquerque, New Mexico.
- White, G.C., A.B. Franklin, and J.P. Ward, Jr. 1995. Population biology. *In* Mexican Spotted Owl Recovery Plan. U.S. Department of the Interior, Fish and Wildlife Service, Albuquerque, New Mexico.
- Willey, D.W. 1993. Home range characteristics and juvenile dispersal ecology of Mexican spotted owls in southern Utah. Unpubl. Rep. Utah Div. Wildl. Resour., Salt Lake City.
- Young, K.E., R. Valdez, P.J. Zwank, and W.R. Gould. 1998. Density and roost site characteristics of spotted owls in Sierra Madre Occidental, Chihuahua, Mexico. *Condor* 100:732-736.