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AESO/SE
02-21-02-F-0148

November 6, 2003

Ms. Nora B. Rasure
Forest Supervisor
Coconino National Forest
2323 East Greenlaw Lane
Flagstaff, Arizona 86004-1810

RE: Arizona Trail - Peaks Segment (Sandy Seep to Kelly Tank) Project

Dear Ms. Rasure:

This letter constitutes the U.S. Fish and Wildlife Service's biological opinion based on our review of the Arizona Trail - Peaks Segment (Sandy Seep to Kelly Tank) Project on the San Francisco Peaks, Peaks Ranger District, Coconino National Forest, Coconino County, Arizona. This biological opinion analyzes the project's effects on the threatened 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.*, Act). We received your July 3, 2003, request for formal consultation on July 7, 2003. In that request you determined that activities associated with designating existing trail and building new trail within MSO protected activity centers (PACs) and restricted habitat would likely adversely affect the MSO. The project area does not include any critical habitat for the MSO; therefore, the effects of the action on MSO critical habitat are not addressed in this biological opinion.

This biological opinion is based on information provided in the July 3, 2003, Biological Assessment and Evaluation (BAE), conversations with your staff, and other sources of information. Literature cited in this biological opinion is not a complete bibliography of all literature available on the MSO, or on other subjects considered in this opinion. A complete administrative record of this consultation is on file at this office.

Consultation History

Details of the consultation history are summarized in Table 1.

Table 1. Summary of Consultation History

<i>Date</i>	<i>Event</i>
March 24, 1997	The Forest Service mailed a description of the proposed Arizona Trail - Peaks Segment.
November 21, 1997	Our staff met with Forest Service staff to discuss the Arizona Trail - Peaks Segment.
October 1, 2001	The Forest Service and Fish and Wildlife Service visited and discussed a portion of the proposed Arizona Trail.
December 14, 2001	The Forest Service, Fish and Wildlife Service, and Grand Canyon Trust met to discuss the proposed action and opportunities to minimize impacts to MSO. We visited the Little Springs PAC.
January 22, 2002	We received a revised description of the proposed action.
April 22, 2002	We provided comments on the proposed action.
June 24, 2002	The Forest Service, Fish and Wildlife Service, Arizona Game and Fish Department (AGFD), and Grand Canyon Trust met in the field to discuss alternate routes and wildlife concerns regarding the proposed action.
July 12, 2002	The Forest Service, Fish and Wildlife Service, Arizona Trail Association, Grand Canyon Trust, and AGFD met to discuss the Arizona Trail - Peaks Segment and opportunities to minimize impacts to wildlife.
May 8, 2003	The Forest Service requested informal consultation on the effects of implementing the Arizona Trail - Peaks Segment.
May 22, 2003	We advised the Forest Service that formal consultation for effects to the MSO is appropriate and suggested that we meet to discuss this further.
June 19, 2003	We met with the Forest Service and discussed potential effects from the proposed project to MSO.

July 3, 2003	The Forest Service requested formal consultation on the effects of implementing the Arizona Trail - Peaks Segment on the MSO.
August 8, 2003	We received the Environmental Assessment for the Arizona Trail - Peaks Segment.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The proposed action is to designate and/or construct the Arizona Trail corridor from Sandy Seep (Township 22 North, Range 8 East, Section 32) to Kelly Tank (Township 24 North, Range 6 East, Section 36). This includes a segment of Oldham Trail that begins north of Buffalo Park and links with the Rocky Park Trail to the Schultz Creek trail and subsequently to 15.4 miles of new trail construction in the Fort Valley area and the western side of the San Francisco Peaks. In addition, the Little Elden Trail beginning at Elden Pueblo, north of Camp Townsend on Highway 89 North and ending at the Sunset Trailhead, is an existing equestrian trail that will also be designated as Arizona Trail. New trailheads are proposed at Kelly Tank and at the Humphrey’s trailhead, at the parking area of the Arizona Snowbowl Ski Resort. The trailhead at the Arizona Snowbowl will include a connector trail 0.4 mile in length. The entire Peaks Segment of the Arizona Trail will be approximately 31 miles in length.

The following are estimated mileages for the different types of trail designation included in the proposed action:

- 12.2 miles of current Forest Service System Trail (Dry Lake Hills and Fort Valley Areas). Approximately 4.4 miles of this trail will also have motorcycle use.
- 1.2 miles of non-Forest Service System Trail (“social trail”) will be converted to Forest Service System Trail
- 1.3 miles of two track roads located within a previously designated motorized restricted use area will be converted to trail
- 1.5 miles of roads currently open to motorized use will be closed to vehicles and converted to non-motorized trail.
- 15.4 miles of new single-track construction (approximately 3.5 miles in the Fort Valley area)
- The Bismark Loop, that utilizes 1.1 miles of existing trail and 1.3 miles of two track roads, located within a previously designated motorized closure.

The analysis area applies to a corridor 0.25 mile wide along the length of the 31-mile route. The proposed Arizona Trail route will be a 24-inch tread located within the corridor. The expected primary seasonal use of the proposed Arizona Trail - Peaks Segment will be mid-May through

mid-October. The route may also be signed as a cross-country ski trail.

Outside of PACs, the preferred alternative includes approximately 5.5 miles of trail within 0.5 mile of restricted or protected MSO habitat as defined by the Recovery Plan for the Mexican Spotted Owl (Recovery Plan). This equates to approximately 1,760 acres of MSO habitat within 0.5 mile of these trails. The Forest Service classified most of this habitat as foraging habitat, but mixed conifer and pine-oak protected steep-slope (nesting/roosting) habitat is found adjacent to the proposed trail within the Kachina Peaks Wilderness.

The proposed action includes 2.7 miles of trail located within MSO PACs to be designated as Arizona Trail. Of this, 1.1 miles will be new trail construction and 1.6 miles is existing Forest Service System Trail. The trail will transect three PACs (#040205, #040208, and #040227), follow the outer edge of one PAC (#040206), and be constructed within 0.5 mile of another PAC (#040207). Except for social trails within the Orion PAC, the Forest Service has never consulted on recreation occurring on existing Forest System trails within these PACs.

Proposed Conservation Measures

- The Forest Service will move the trail farther east in the Little Springs PAC (#040227) to increase the distance from the trail to known roost sites.
- The Forest Service will close social trails that intersect the Arizona Trail. These trails will be prioritized based on the sensitivity of the area. The Little Springs area is listed as the number one priority and intersecting social trails will be obliterated during construction of that portion of the Arizona Trail.
- The Forest Service will prohibit camping within a 0.5 mile radius of the four MSO PACs within the project area. In addition, the Forest Service will inform users of the area about the state-wide camping ban within 0.25 mile of open water, and will enforce that prohibition.
- The Forest Service will survey MSO restricted habitat within 0.5 mile of the proposed Arizona Trail route for one year prior to or during the year of trail construction.
- The Forest Service will leave slash piles and downed logs following trail construction to provide small mammal habitat.
- The Forest Service will not construct new trail during the MSO breeding season (March 1 through August 31) within MSO PACs.
- The Forest Service, where possible, will avoid cutting snags; pine and fir trees greater than nine inches diameter-at-breast height (DBH); and Gambel oak trees larger than five inches diameter-at-root collar (DRC). However, it is possible that snags, pine/fir trees

larger than nine inches DBH, and oak trees greater than 5 inches DRC will be removed during trail construction.

- The Forest Service will conduct pre-construction and annual noxious weed surveys, and implement Best Management Practices as identified in the Coconino National Forest Noxious Weed Strategy.
- The Forest Service will implement a Trail Steward Program to assist with compliance and monitoring of conservation measures.

STATUS OF THE SPECIES

The Mexican spotted owl was listed as a threatened species in 1993 (USDI 1993). The primary threats to the species were cited as even-aged timber harvest and catastrophic wildfire, although grazing, recreation, and other land uses were also mentioned as possible factors influencing the MSO population. The Service appointed the Mexican Spotted Owl Recovery Team in 1993, which produced the Recovery Plan for the Mexican Spotted Owl (Recovery Plan) in 1995 (USDI 1995).

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 1993) and in the 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, the MSO does not occur uniformly throughout its range. Instead, it occurs in disjunct localities that correspond to isolated forested mountain systems, canyons, and in some cases steep, rocky canyon lands. Surveys have revealed that the species has an affinity for older, well-structured forest, and the species is known to inhabit a physically diverse landscape in the southwestern United States and Mexico.

The U.S. range of the MSO has been divided into six recovery units (RU), as discussed in the Recovery Plan. The primary administrator of lands supporting the MSO in the United States is the Forest Service. Most owls have been found within Forest Service Region 3 (including 11 National Forests 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 percent of MSO known to exist in the United States between 1990 and 1993 occurred on lands administered by the Forest Service.

Currently, high intensity, stand-replacing fires are influencing ponderosa pine and mixed conifer forest types in Arizona and New Mexico. Mexican spotted owl habitat in the southwestern United States has been shaped over thousands of years by fire. Since MSO occupy a variety of habitats, the influence and role of fire has most likely varied throughout the owl's range. In 1994, at least 40,000 acres of nesting and roosting habitat were impacted to some degree by catastrophic fire in the Southwestern Region (Sheppard and Farnsworth 1995, unpublished

Forest Service Report). Between 1991 and 1996, the Forest Service estimated that approximately 50,000 acres of owl habitat has undergone stand replacing wildfires (G. Sheppard, Forest Service, Kaibab National Forest, Arizona, pers. comm.). However, since 1996, fire has become catastrophic on a landscape scale and has resulted in hundreds of thousands of acres of habitat lost to stand-replacing fires. This is thought to be a result of unnatural fuel loadings, past grazing and timber practices, and a century of fire suppression efforts. The 2002 Rodeo-Chediski fire, at 462,384 acres, burned through approximately 55 PACs on the Tonto and Apache-Sitgreaves National Forests and the White Mountain Apache Reservation (all within the Upper Gila RU). Of the 11,986 acres of PAC habitat that burned on National Forest lands, approximately 55% burned at moderate to high severity. Based on the fire severity maps for the fire perimeter, tribal and private lands likely burned in a similar fashion. We define moderate severity burn as high scorch, trees burned may still have some needles and high severity burn as completely scorching all trees (trees completely dead).

The Upper Gila Mountains 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 west 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). Most habitat within this RU is administered by the Kaibab, Coconino, Apache-Sitgreaves, Tonto, Cibola, and Gila National Forests. The north half of the Fort Apache and northeastern corner of the San Carlos Indian reservations are located in the center of this RU and also support MSOs.

The Upper Gila Mountains RU 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 had been partially or completely harvested prior to the species' listing as threatened in 1993; however, MSO nesting habitat remains in steeper areas. MSOs 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).

Currently, catastrophic wildfire is probably the greatest threat to MSO within the Upper Gila Mountains RU. As throughout the West, fire intensity and size have been increasing within this geographic area. Table 2 shows several high-intensity fires that have had a large influence on MSO habitat in this RU in the last decade. Obviously the information in Table 2 is not a

comprehensive analysis of fires in the Upper Gila Mountains RU or the effects to MSO. However, the information does illustrate the influence that stand-replacing fire has on current and future MSO habitat in this RU. This list of fires alone estimates that approximately 11% of the PAC habitat within the RU suffered high-to moderate-intensity, stand-replacing fire in the last seven years.

Table 2. Some recent influential fires within the Upper Gila Mountains Recovery Unit, approximate acres burned, number of PACs affected, and PAC acres burned.

Fire Name	Year	Total Acres Burned	# PACs Burned	# PAC Acres Burned
Rhett Prescribed Natural Fire	1995	20,938	7	3,698
Pot	1996	5,834	4	1,225
Hochderffer	1996	16,580	1	190
BS Canyon	1998	7,000	13	4,046
Pumpkin	2000	13,158	4	1,486
Rodeo-Chediski	2002	462,384	55	~33,000
TOTAL		525,894	84	~43,645

A reliable estimate of the numbers of owls throughout its entire range is not currently 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. However, Ganey *et al.* (2000) estimates approximately $2,950 \pm 1,067$ (SE) MSOs in the Upper Gila Mountains RU alone. The Forest Service Region 3 most recently reported a total of approximately 980 protected activity centers (PACs) established on National Forest lands in Arizona and New Mexico (USDA Forest Service, Southwestern Region, December 19, 2002). Based on this number of MSO sites, total numbers in the United States may range from 980 individuals, assuming each known site was occupied by a single MSO, to 1,960 individuals, assuming each known site was occupied by a pair of MSOs. The Forest Service Region 3 data are the most current compiled information available to us; however, survey efforts in areas other than National Forest System lands have likely resulted in additional sites being located in all Recovery Units. Currently, we estimate that there are likely 12 PACs in Colorado (not all currently designated) and 105 PACs in Utah.

Since the owl was listed, we have completed or have in draft form a total of 123 formal consultations for the MSO. These formal consultations have identified incidences of anticipated incidental take of MSO in 347 PACs. The form of this incidental take is almost entirely harm or

harassment. These consultations have primarily dealt with actions proposed by the Forest Service, Region 3. However, in addition to actions proposed by the Forest Service, Region 3, we have also reviewed the impacts of actions proposed by the Bureau of Indian Affairs, Department of Defense (including Air Force, Army, and Navy), Department of Energy, National Park Service, and Federal Highway Administration. These proposals have included timber sales, road construction, fire/ecosystem management projects (including prescribed natural and management ignited fires), livestock grazing, recreation activities, utility corridors, military and sightseeing overflights, and other activities. Only one of these projects (release of site-specific owl location information) has resulted in a biological opinion that the proposed action would likely jeopardize the continued existence of the MSO.

In 1996, we issued a biological opinion on Forest Service Region 3's adoption of the Recovery Plan recommendations through an amendment of their Forest Plans. In this non-jeopardy biological opinion, we anticipated that approximately 151 PACs would be affected by activities that would result in incidental take of MSOs, with approximately 91 of those PACs located in the Upper Gila Mountains RU. In addition, we completed a reinitiation of the 1996 Forest Plan Amendments biological opinion which anticipated the additional incidental take of five MSO PACs in Region 3 due to the rate of implementation of the grazing standards and guidelines, for a total of 156 PACs. To date, consultation on individual actions under the amended Forest Plans have resulted in 262 PACs adversely affected, with 144 of those in the Upper Gila Mountains RU.

ENVIRONMENTAL BASELINE

The environmental baseline includes past and present impacts of all Federal, State, or private actions within 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 from which to assess the effects of the action now under consultation.

A. Status of the species within the action area

The Forest Service surveyed all restricted and protected MSO habitat within 0.5 mile of the Arizona Trail for at least two years. Surveys were conducted according to the Forest Service Region 3 Formal Monitoring Survey Protocol. There are five designated MSO PACs within the proposed project area (Table 2). The occupancy history for each PAC is provided in Appendix A.

Table 2. Mexican spotted owl PACs within the Arizona Trail - Peaks Segment Action Area

PAC Number	PAC Name	PAC Acres	Year Territory Located	100-acre Nest Buffer Delineated
040206	Schultz Creek	659	1986	No

PAC Number	PAC Name	PAC Acres	Year Territory Located	100-acre Nest Buffer Delineated
040208	Weatherford	666	1985	Yes
040205	Snowbowl	624	1985	Yes
040227	Little Spring	644	1993	Yes
040207	Orion Spring	917	1987	No

Schultz Creek PAC (#040206)

The Schultz Creek MSO territory was first located in 1986, when a nesting pair was found. In November 1986, the female was found dead, apparently killed by a great-horned owl. In 1987, the Schultz Creek male was observed roosting with a female on the adjacent Mt. Elden territory, but he returned to the 1986 territory later that season. In 1992, a pair response was heard in the PAC, but nesting status was not determined. A non-nesting pair was also found roosting in the PAC in 1993. Since 1993, the PAC has been monitored in four of the past nine years with no MSO responses detected.

Currently, approximately 1.0 mile of motorized trail passes alongside this PAC. The proposed action will designate 0.4 mile of this as Arizona Trail, but the designation of the entire 1.0 mile will change from motorized to non-motorized.

Weatherford PAC (#040208)

A pair was first documented in the Weatherford area in 1985 and monitoring has documented MSO occupancy in 15 of the last 17 years (Appendix A). The Forest Service has designated a 100-acre nest buffer, which includes two nest locations and several daytime roost locations.

Currently, approximately 0.65 miles of the existing Little Elden Trail (which is proposed to be designated Arizona Trail) transects the PAC as does the Pipeline Trail (Waterline Road). The Pipeline Trail, which includes administrative access for motorized vehicles, is located within 0.1 mile of known nest and roost locations.

Snowbowl PAC (#040205)

The Snowbowl MSO territory was first located in 1985, when a single owl was detected. Since that time the PAC has been monitored to protocol 15 of the last 17 years. During that time, the Forest Service has documented occupancy in 12 of those years and reproduction during eight breeding seasons. A nest buffer has not been delineated, but multiple nest trees were located.

Currently, recreational use is very high within and adjacent to this PAC. Vehicle travel on Snowbowl Road, camping, horseback riding, hiking, mountain biking, and picnicking all occur within and adjacent to the Snowbowl PAC. Veit Spring, an area of exceptionally high, year-round recreational use, lies within the northern portion of this PAC.

Little Springs PAC (#040227)

This MSO site was first established in 1993 (Appendix A). A 108-acre nest buffer/activity center was delineated based on daytime roost locations in 1993, 1994, and 2000. There are no designated Forest Service System Trails within this PAC, but two well-established social trails exist within the PAC and, as of late, motorcycle use has been extremely heavy within the PAC due to the presence of a user-created moto-cross trail. In addition, due to the spring and relatively easy access to the site, hiking and camping use at the site is also heavy. During the summer of 1998, a group of approximately 50 to 100 people camped within and adjacent to the PAC for three plus weeks (S. Hedwall, pers. comm. 1998).

Orion PAC (#040207)

The Orion Mexican spotted owls were located in 1987. The site was formally monitored by the Forest Service from 1989 to 1993 and has been informally monitored since that time (Appendix A). Over the years, concern was raised over the increasing human use within the Orion PAC, and the impacts the use was having on the owl pair. The increasing use within the PAC consists of dispersed camping and a growing social trail network. The "Secret Trail" and "Moto Trail" both bisect the PAC, as well as numerous other un-named social trails. The "Secret Trail" passes within close proximity to the 1993 nest site and 1994-1997 roost locations. These trails were built by recreationists without authorization or designation by the Forest Service. The impacts of increased human use appear to be the frequent movement of the pair to new nesting and roosting sites which, in turn, may be affecting nesting success. The pair has not reproduced since 1993. In 1998 it was discovered that the pair had moved approximately 0.75 mile from their historical location (1987-1997). The new location of the pair is within habitat which is lacking in suitable nesting platforms due to the young age of Douglas-fir trees. The concern is that the birds have moved due to human disturbance into habitat which will not meet reproductive needs. Based on the new location of the pair in 1998, the PAC boundaries were modified in January 1999, and now include the roost stands.

The Orion Springs PAC was monitored in the summer of 1999. The site was monitored by the Rocky Mountain Research Station as part of the "Mexican Spotted Owl Population Monitoring Pilot Study: 1999." A pair of MSO were present within the PAC and the owls were determined to be non-nesting that year. The pair was using drainages which have been historically used within this PAC. Monitoring of the Orion Springs PAC took place in 2000 as well. An active nest was located on May 9, 2000, and again on May 27, 2000. The nest site was located in very close proximity to a large dispersed campsite. The Forest Service closed this campsite after finding the active nest. Monitoring in July indicated that the nest had been abandoned and the

owl pair was not located again that year. The closure at the campsite was lifted when nest abandonment was determined. Since that time, a seasonal closure on camping within the Orion PAC has been implemented. The PAC has continued to be monitored on an annual basis. Surveys in 2002 indicated that the PAC was occupied, but nesting status was not determined. Early in the 2003 season, a single male was located within the PAC. The owl was located two drainages to the east of its historical location.

In 1999, as part of the Fort Valley 10K Project, the Forest Service proposed to close the Secret Trail. The trail was supposed to be closed in 2000. However, the trail has not been closed to date and the Forest Service believes it will not be able to close the trail due to other work and funding priorities until the summer/fall of 2005 (see Consultations #2-21-99-F-0145, 2-21-99-F-0145-R1, and 2-21-99-F-0145-R2). We believe the existing condition of unofficial social trails within the PAC and core area has resulted in adverse effects to the Orion Springs PAC. Because trail closures and re-routing and seasonal campsite closures will not occur until the middle or end of the 2005 breeding season, we believe adverse effects to the Orion Springs PAC will continue for the 2004 and 2005 breeding seasons.

B. Factors affecting species' environment within the action area

Actions within the project area that affect MSO include recreation, domestic and wild ungulate grazing, and other associated actions. These activities have the potential to reduce the quality of MSO nesting, roosting, and foraging habitat, and may cause disturbance during the breeding season. Recreation impacts are increasing on the District, especially on the San Francisco Peaks. The Forest Service stated in the Buck Springs Range Allotment BAE (Consultation #02-21-01-F-0425) that owl survey crews reported that owls in the Rock Crossing PAC (#040712), which is located in a heavily used recreation area adjacent to Blue Ridge Reservoir, are much more erratic in their movement patterns and behavior. In addition, the Forest Service and Fish and Wildlife Service have documented potential effects from recreation in the Orion Springs PAC. With increased recreation across the Forest, there may be other PACs adversely affected by recreationists. All of the PACs affected by the proposed action contain Forest Service System and social trails within them that are not part of the Arizona Trail system.

EFFECTS OF THE ACTION

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

According to the Forest Service and the Arizona Trail Association (ATA), the primary users of the Arizona Trail are hikers, equestrians, and mountain bicyclists (outside of wilderness or other specially managed areas). The ATA believes that opportunities will also exist for cross-country skiers, snowshoers, joggers, and packstock users. Although the vision of the Arizona Trail is of a continuous, long-distance trail, it is expected that users traveling more than 100 miles in any one trip will be few. For this reason, the Arizona Trail is being organized in 43 passages to facilitate day, weekend, or week-long trips that will meet a variety of skills and interest levels. As the nonprofit organization for the cross-state Arizona Trail, the ATA is involved in many activities that relate to the Arizona Trail. As the ATA states on their website, "It is these activities that assist in bringing the Arizona Trail to completion, a trail that is becoming one of the premier long-distance trails in the country." It is expected to become a destination trail, similar to the Pacific Crest or Appalachian Trails.

Recreational use of the proposed segment of the Arizona Trail is expected to increase based on the popularity of the Mt. Elden/Dry Lake Hills and San Francisco Peaks areas with the rapidly growing Arizona population and the increased popularity of hiking and mountain biking. The Forest Service estimates a three to five percent increase in trail use annually on the Mt. Elden/Dry Lake Hills trail system, and an additional one to two percent increase in use within three to five years after the Arizona Trail is designated in the project area. It is reasonable to expect that the designation of the trail as a segment of the Arizona Trail system will make it a popular destination for recreation, which may result in much higher use than the Forest Service is predicting. In the 10-year period between 1982 and 1992, day hiking alone in the United States has increased almost two-fold, from 26 million to 50 million people (Flather and Cordell 1995). Already, books and maps are available that advertise the Arizona Trail (e.g., *Biking the Arizona Trail* by Andrea Lankford). In addition, the peak recreational use period will overlap the entire MSO breeding season of March 1 through August 31.

Current estimates of use on existing trail within the proposed project area are projected from trail register data for the months of May through October (Table 3). Table 3 shows the number of people that signed the trail register each year. The far right column reflects the estimated number of people that used the trail system based on an average sign-in ratio of 1 in 6 (17%) forest visitors. This ratio was established by the Forest Service through local experience and observation. It should be noted that figures for 1999 and 2000 are low due to a high fire danger season in 1999 and a forest closure in June 2000. Currently, Coconino National Forest Recreation Staff estimate that the Mt. Elden/Schultz Pass trail system receives approximately 50,000 forest visitors each season of use (May through October) based on the data below. These data do not reflect the use by local residents that access these trails from other portals.

Table 3. Trail Register Information from Six Forest Service System Trailheads within/near the action area.

Year	Elden Lookout	Sandy Seep	Little Elden	Sunset	Schultz Creek	Annual Sign-In Totals	Annual Estimated Totals
1997	5,146	402	179	760	697	7,184	43,104
1998	6,495	632	424	937	859	9,347	56,082
1999	4,800	553	491	993	786	7,623	45,738
2000	4,464	444	513	706	705	6,832	40,992

Recreational activities including hiking, camping, equestrian use, and mountain biking may affect the MSO depending on location, intensity, frequency, and duration (USDI 1995). Direct effects may occur when these activities impact individual birds at nests, roosts, and foraging sites. Indirect effects may occur when recreational activities degrade habitat through vegetation modification (trampling, removal, accidental burning, and soil compaction) or when human-caused disturbance stimuli act as a form of predation risk (Frid and Dill 2002).

There is a growing number of studies attempting to describe and quantify the impacts of non-lethal disturbance on the behavior and reproduction of wildlife, and MSO in particular. Delaney *et al.* (1997) reviewed literature on the response of owls and other birds to noise and concluded the following: 1) raptors are more susceptible to disturbance-caused nest abandonment early in the nesting season; 2) birds generally flush in response to disturbance when distances to the source are less than approximately 200 feet and when sound levels are in excess of 95 dBA; and 3) the tendency to flush from a nest declines with experience or habituation to the noise, although the startle response cannot be completely eliminated by habituation. Delaney *et al.* (1999) found that ground-based disturbances elicited a greater flush response than aerial disturbances. Our guidance is to limit potentially disturbing activities to areas ≥ 0.25 mile from MSO nest sites during the breeding season (March 1 through August 31). This corresponds well with the Delaney *et al.*'s (1999) 0.25 mile threshold for alert responses to helicopter flights. In addition, Delaney *et al.* (1999) found that MSO did not flee from helicopters when caring for young at the nest, but fled readily during the post-fledgling period. This may be a result of optimal fleeing decisions that balance the cost-benefit of fleeing. Frid and Dill (2002) hypothesize that this may be explained using predator risk-disturbance theory and perhaps the cost of an adult MSO fleeing during the nestling period may be higher than during the post-fledgling period.

Swarthout and Steidl (2001) found that MSO modified their behavior (e.g., increased perch height) and/or flushed in response to recreationists (hikers). Based on their results, they recommended placing buffer zones (conservative buffer = 180 ft; less conservative buffer = 40 ft.) around known roosting sites to minimize impacts. In a study to assess the effects of hikers on

the behavior of nesting MSO, Swarthout and Steidl (2003) noted that female MSOs decreased the amount of time they handled prey by 57% and decreased the amount of time they performed daytime maintenance activities by 30% while hikers were present. In addition, hikers caused both female and male owls to increase the frequency of contact vocalizations. Birds may respond to disturbance during the breeding season by abandoning their nests or young; by altering their behavior such that they are less attentive to the young, which increases the risk of the young being preyed upon or disrupting feeding patterns; or by exposing young to adverse environmental stress (Knight and Cole 1995). There is also evidence that disturbance during years of a diminished prey base can result in lost foraging time which, in turn, may cause some raptors to leave an area or not to breed at all (Knight and Cole 1995). Topographic screening between the area of disturbance and the bird's location creates a noise buffer, and may assist in the reduction of noise disturbance (Knight and Cole 1995).

Research on all subspecies of the spotted owl indicate that it exhibits docile behavior when approached by researchers, and there is no clear evidence of significant impact by research activity except for a negative effect on reproduction from back-pack radio transmitters (Gutierrez *et al.* 1995). However, researchers usually minimize disturbance to the extent possible, which may not be the case for recreational trail users. In the long-term, some species may become less responsive to human disturbance if they are not deliberately harassed; others may become very stress-prone towards humans (Bowles 1995, Hammitt and Cole 1987). Excessive interaction with humans may cause a lowering of call response rates or habituation; the effects of habituation on spotted owls are unknown (Gutierrez *et al.* 1995). Habituation, though it may occur to some extent, often is partial or negligible (Frid and Dill 2002). However, it would be logical to assume that wildlife rarely have perfect information and we would expect them to maximize fitness by overestimating rather than underestimating predator risk. It may be that MSO which appear to be "habituated" to recreationists, in reality may have no suitable alternative habitats and remain within areas because other suitable habitat is not available.

Restricted Habitat:

Trail designation will occur through MSO restricted habitat; however, no key habitat components (snags, Gambel oak, large trees, large coarse woody debris) will be modified or lost. The Forest Service states that designating 12.2 miles of existing trail will not alter habitat. However, as stated above, the increase in use due to designating the Arizona Trail may result in many more people accessing this trail segment. Though physical habitat modification from this action may be minimal, there is the potential that this action may render this habitat as less suitable for MSO. This may result from an increased frequency and duration of use by recreationists which may cause MSO to flee, modify behavior, and/or select different habitats.

Schultz Creek PAC:

Recreational activities taking place adjacent to and within this PAC include activity on the Schultz Creek road, camping, horseback riding, mountain biking, motorcycling, and picnicking.

The BAE states that designation of the Arizona Trail segment in the Schultz Creek PAC will increase hiking, mountain biking, and horseback riding within and adjacent to the PAC, but will reduce motorized use near the PAC (this segment will be designated non-motorized following designation of the Arizona Trail). The Forest Service believes that the owls associated with this PAC have either habituated to the current recreation activity or have already moved due to human disturbance. However, since there is no information regarding the owls' presence since 1993, we do not know how these owls have responded to recreational activities within the PAC.

Weatherford PAC:

The Arizona Trail will be located within the PAC, approximately 0.75 mile from known areas of owl activity. The existing equestrian trail extends for a distance of approximately 1.0 mile through this PAC. Using trail register information for the Little Elden Trail, the Forest Service estimates that 3,078 recreationists use this trail during the months of May through October, 2000. This is most likely an underestimate, due to the forest closure in June 2000. The activity center is buffered from proposed Arizona Trail activity due to the steep topography and dense, mixed conifer vegetation. However, the Pipeline (Waterline) Trail runs adjacent to the nest/activity center. The owls associated with this PAC have been frequently located over the years and in the recent past (2002). The Forest Service states that this monitoring indicates tolerance to the high level of use within 0.25 mile of nest sites. However, young have not been successfully fledged since 1989. This may indicate that recreation-related disturbance is affecting these birds, but they are unable to move into an alternative area, possibly due to competition or lack of resources. The addition of Arizona Trail users on the equestrian trail in the south end of the PAC may also increase use within the PAC on the Pipeline (Waterline) Trail, because it connects to the proposed Arizona Trail and offers access to the Inner Basin.

Snowbowl PAC:

Approximately 0.83 mile of new trail will pass through and alongside the Snowbowl PAC. The trail will not intersect the activity center, which includes three nest locations and several pair locations. Designation of the Arizona Trail is expected to increase human activities within the PAC; however, the Forest Service states that the owls associated with this PAC are habituated to recreational activity and that the proposed action will not increase human use within the 100-acre nest buffer. The area within the PAC most used by this pair is topographically buffered from the new trail. However, it is unclear how "habituated" to disturbance these owls may be. The MSO associated with this PAC have multiple nest trees and have not used the same nest tree in several years. In addition, the area of use continues to move north within the PAC. The pair has used nest trees within the adjacent Veit Spring PAC and may be attempting to move away from areas of high recreation within the PAC. However, this pair has been reproductively successful and has fledged young in five of the last seven years.

Little Springs PAC:

Approximately 0.69 mile of new trail for the Arizona Trail will be constructed within the Little Springs PAC. The Forest Service predicts that the proposed trail segment within this PAC will have eight to twelve users per day on weekends and two to four users per day on weekdays. Though the BAE states that the 3.0 mile distance from the Snowbowl Trailhead and 4.0 mile distance from the Kelly Tank Trailhead will reduce the number of day users within the PAC, this area is already receiving much higher use than predicted. The Little Springs PAC is adjacent to several parcels of private property that are used by humans year-round. The springs is a popular destination and on summer weekends current use exceeds eight to twelve users (S. Hedwall, pers. comm. 2003). Benefits to this PAC from the proposed action will include closure of social trails within the PAC and obliteration of one closed road that bisects the proposed Arizona Trail route. This will reduce the potential for the Arizona Trail to add to social trail use.

Orion Springs PAC:

As stated previously, recreation use is high within the Orion PAC. Though the Forest is working towards removing the social trails within the PAC (new Forest System Trail must be built prior to obliterating social trails), this is not expected to be completed until 2005. Based on survey data, the MSO associated with this PAC appear to be very sensitive to recreation disturbance. Although no trail will be constructed within or immediately adjacent to this PAC, approximately 1.5 miles of new trail construction will pass within 0.5 mile of the PAC. Unfortunately, the new trail will connect to established trails that enter the PAC and will result in a loop that connects to the Freidlein Prairie Road and the Weatherford Trail. This may result in an increase in the already high recreational use within the PAC.

In summary, we believe adverse effects will result from designation and construction of the Arizona Trail within the Schultz Creek, Weatherford, Snowbowl, Little Spring, and Orion Springs PACs. Though the proposed action includes many conservation measures and a trail steward program that will assist with compliance and monitoring of these conservation measures, the potential exists for harm and harassment resulting from increased human disturbance and access within PACs and restricted habitat.

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 to the proposed action. Future actions within the project area that are reasonably certain to occur include recreation, fuels reduction treatments, commercial logging, increased development, and other associated actions on the adjacent private land. These activities have the potential to reduce the quality of MSO nesting, roosting, and foraging habitat, cause disturbance to breeding MSOs, and therefore contribute as cumulative effects to the proposed action. However, because of the predominant occurrence of MSOs on Federal lands in

this area, 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 to be of minor impact to the owl population, but may have significant impacts on the Schultz Creek, Weatherford, Snowbowl, Little Spring, and Orion Spring MSO PACs.

Conclusion

After reviewing the current status of the MSO, the environmental baseline for the action area, the effects of the action, and the cumulative effects, it is our biological opinion that construction and use of the Arizona Trail - Peaks Segment will not likely jeopardize the continued existence of the MSO. Critical habitat for this species has been designated, but is currently under review. However, this action does not affect any areas of critical habitat and no destruction or adverse modification of critical habitat is anticipated. Our conclusion is based on the following:

1. New trail construction will not remove key MSO habitat components such as large trees, snags, Gambel oak, or large down logs.
2. The five PACs affected by the proposed action represent a fraction of the 624 known MSO PACs located on Region 3 Forest Service lands in the Upper Gila Mountain Recovery Unit.

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

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulations pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. "Take" is defined under section 3 of the Act as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harm" is further defined by regulation (50 CFR 17.3) to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. "Harass" is defined under 50 CFR 17.3 as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. "Incidental take" is defined under 50 CFR 402.02 as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2) of the Act, taking that is incidental to, and not intended as part of, the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of an Incidental Take Statement.

For the purpose of evaluating incidental take of MSO from the action under consultation, incidental take can be anticipated as either the direct mortality of individual birds, or the alteration of habitat that affects behavior (i.e. breeding or foraging) of birds to such a degree that the birds are considered lost as viable members of the population and thus "taken." They may

fail to breed, fail to successfully rear young, raise less fit young, or desert the area because of disturbance or because habitat no longer meets the owl's needs.

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

Using available information as summarized within this document, we have identified conditions of possible incidental take for the MSO associated with designation and construction of the Arizona Trail within the Schultz Creek, Weatherford, and Little Springs PACs. Based on the best available information concerning the MSO, habitat needs of the species, the project description, and information furnished by the Forest Service, take is anticipated for the MSO as a result of predicted high levels of recreation use within the Schultz Creek, Weatherford, and Little Springs PACs. Though we believe that the Forest Service has proposed conservation measures that will minimize adverse effects to MSO within these PACs, the proposed action is not consistent with the Recovery Plan or the 1996 Forest Plan Amendments to avoid constructing new trail or otherwise encouraging additional recreation within designated MSO PACs.

As stated above, the Fish and Wildlife Service anticipated take for the Orion Springs PAC through recreation actions associated with the Fort Valley 10K Project (Consultations #02-21-99-F-0145, 02-21-99-F-0145-R1, and 02-21-99-F-0145-R2). This take is expected to occur through 2005 (or until the social trail within the PAC is removed). We do not anticipate additional take of MSO associated with the Orion Springs PAC from the proposed Arizona Trail, as long as the social trails within the PAC are closed by 2005. However, if trail closure does not occur, this conclusion may need to be reevaluated.

The Snowbowl PAC is a reproductively successful PAC and has fledged young four of the last six years. Though we believe that it is possible recreation is forcing these birds to change nest trees every year and that perhaps their site fidelity is tied more to habitat resources than habituation to human disturbance, it is difficult to attribute incidental take to this PAC from the proposed action. We recommend that monitoring of this PAC continue and efforts are made to minimize the effects of recreation within the PAC, but we do not anticipate that the Arizona Trail will result in incidental take of MSO in the Snowbowl PAC.

Amount or Extent of Take Anticipated

We anticipate that the take of MSO will be difficult to detect because finding a dead or impaired specimen is unlikely. However the level of incidental take can be anticipated by chronic disturbance that will affect the reproductive success and survival of MSO within the project area. We anticipate harm and harassment to MSO resulting in chronic disturbance from the cumulative effects of past and on-going recreation in these PACs coupled with the proposed action. This will result in continued disturbance, which may result in disrupted MSO reproduction and the ability of these PACs to contribute to recovery of the species.

We anticipate the take of one pair of MSOs and/or associated eggs/juveniles in the form of harm and harassment associated with the Schultz Creek PAC(#040206), the Weatherford PAC (#040208), and the Little Springs PAC (#040227) due to increased recreation resulting from the Arizona Trail. This anticipated take is in the form of chronic (greater than eight breeding seasons) disturbance (non-habitat altering action that disrupts or is likely to disrupt owl behavior). Existing information leads us to conclude that current levels of recreation are impacting MSO occupancy and reproduction within these PACs. The addition of new trail and designating the Arizona Trail within these PACs is reasonably certain to increase the ongoing disturbance.

Effect of the Take

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

Reasonable and Prudent Measures With Terms and Conditions

The following reasonable and prudent measure is necessary and appropriate to minimize take of MSO:

1. The Forest Service shall minimize direct and indirect effects of visitor use to the MSO and its habitat within the Schultz Creek, Weatherford, and Little Springs PACs.

The following term and condition implements reasonable and prudent measure number one:

- 1.1 The Forest Service shall not issue permits for groups larger than 12 persons, which is the limit recommended in the Recovery Plan, during the MSO breeding season (March 1 through August 31) for use of the segment of the Arizona Trail which is within the Schultz Creek, Weatherford, and Little Springs PACs. This is included as a recommendation in the Environmental Assessment for the Project, but not as a conservation measure.

Review Requirement: 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, the level of incidental take is exceeded, such incidental take would represent new information requiring review of the reasonable and prudent measures provided. The Forest Service must immediately provide an explanation of the causes of the taking and review with the Arizona Ecological Services Office the need for possible modification of the reasonable and prudent measures.

The Fish and Wildlife Service will not refer the incidental take of any migratory bird or bald

eagle for prosecution under the Migratory Bird Treaty Act of 1918, as amended (16 U.S.C. Sections 703-712), or the Bald and Golden Eagle Protection Act of 1940, as amended (16 U.S.C. Sections 668-668d).

DISPOSITION OF DEAD, INJURED, OR SICK MSO

Upon locating a dead, injured, or sick spotted owl, initial notification must be made to our Law Enforcement Office, 2450 West Broadway Suite #113, Mesa, Arizona 85202 (telephone: 480/967-7900) within three working days of its finding. Written notification must be made within five calendar days and 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 best 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 Fish and Wildlife Service should be contacted regarding the final disposition of the animal.

CONSERVATION RECOMMENDATIONS

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

1. We recommend that the Forest Service work with the Fish and Wildlife Service to develop a Forest-wide Recreation Plan that minimizes impacts to MSO through avoidance of protected, target-threshold, and other restricted habitats. This plan should work to remove and reduce recreation in areas important to the recovery of the species.
2. We recommend that the Forest Service work with the Fish and Wildlife Service and others to develop studies which determine the effects of recreation on MSO. This research should include monitoring PACs to determine occupancy and reproduction.
3. We recommend that the Forest Service monitor human use of the Arizona Trail - Peaks Segment. This information will assist managers in determining the impacts of recreation on the San Francisco Peaks and Dry Lake Hills. This information will aid the preparation of the San Francisco Peaks Ecosystem Assessment and the proposed Forest-Wide Recreation Plan.

In order to keep us informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitat, we request notification of the implementation of any conservation recommendations.

REINITIATION - CLOSING STATEMENT

This concludes formal consultation on the action outlined in 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 retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat 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.

We appreciate your consideration of the threatened Mexican spotted owl. For further information, please contact Shaula Hedwall (928) 226-0614 (x103) or Brenda Smith (x101) of our Flagstaff Suboffice. Please refer to the consultation number 02-21-02-F-0148 in future correspondence concerning this project.

Sincerely,

/s/ Steven L. Spangle
Field Supervisor

cc: Regional Director, Fish and Wildlife Service, Albuquerque, NM (ARD-ES)
Field Supervisor, Fish and Wildlife Service, New Mexico Field Office, Albuquerque, NM
District Ranger, Peaks Ranger District, Flagstaff, AZ
Wildlife Staff, Peaks Ranger District, Flagstaff, AZ (Attn: Cary Thompson)
Forest Supervisor, Coconino National Forest, Flagstaff, AZ (Attn: Cecelia Overby)

John Kennedy, Habitat Branch, Arizona Game and Fish Department, Phoenix, AZ

LITERATURE CITED

- Bowles, A.E. 1995. Responses of wildlife to noise. *In* Wildlife and Recreationists: Coexistence Through Management and Research. Knight, Richard L. and Kevin J. Gutzwiller, editors. Island Press, Washington, D.C. 372 pp.
- Delaney, D.K., T.G. Grubb, and L.L. Pater. 1997. Effects of helicopter noise on nesting Mexican spotted owls. A report to the U.S. Air Force 49 CES/CEV, Holloman Air Force Base. Project Order No. CE P.O. 95-4. 49 pp.
- Delaney, D.K., T.G. Grubb, P. Beier, L.L. Pater, and M. Hildegard Reiser. 1999. Effects of helicopter noise on Mexican spotted owls. *Journal of Wildlife Management* 63(1):60-76.
- Flather, C.H. and H.K. Cordell. 1996. Outdoor recreation: historical and anticipated trends. *In* Wildlife and Recreationists: Coexistence through management and research. Knight, R.L. and K.J. Gutzwiller, editors. Island Press, Washington, D.C. 372 pp.
- Fletcher, K. 1990. Habitat 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. 78 pp.
- Frid, A. and L. Dill. 2002. Human-caused disturbance stimuli as a form of predation risk. *Conservation Ecology* 6(1):11.[online] URL: <http://www.consecol.org/vol6/iss1/art11>
- Ganey, J.L. 1988. Distribution and habitat ecology of Mexican spotted owls in Arizona. M.S. Thesis, Northern Arizona University, Flagstaff, Arizona. 229 pp.
- Ganey, J.L. and R.P. Balda. 1989. Distribution and habitat use of Mexican spotted owls in Arizona. *Condor* 91:355-361.
- Ganey, J.L., G.C. White, A.B. Franklin, J.P. Ward, Jr., and D.C. Bowden. 2000. A pilot study on monitoring populations of Mexican spotted owls in Arizona and New Mexico: second interim report. 41 pp.
- Gutierrez, R.J., A.B. Franklin, and W.S. Lahaye. 1995. Spotted owl (*Strix occidentalis*). *In* The Birds of North America, No. 179 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, and The American Ornithologists' Union, Washington, D.C.
- Hammitt, W.E. and D.N. Cole. 1987. Wildland recreation: ecology and management. John Wiley and Sons, New York. 341 pp.

Knight, R.L. and D.N. Cole. 1995. Factors that influence wildlife responses to recreationists. *In* Wildlife and Recreationists: Coexistence Through Management and Research. Knight, Richard L. and Kevin J. Gutzwiller, editors. Island Press, Washington, D.C. 372 pp.

Sheppard, G. and A. Farnsworth. 1995. Fire effects and the use of prescribed fire in Mexican spotted owl habitat. Coconino and Kaibab National Forests. Unpublished report. Presented at the symposium entitled "Fire Effects on Threatened and Endangered Species and Habitats," November 15, 1995. 11pp.

U.S. Department of the Interior (USDI), Fish and Wildlife Service. 1991. Mexican spotted owl status review. Endangered species report 20. Albuquerque, New Mexico.

U.S. Department of the Interior (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(49):14248-14271. March 16, 1993.

U.S. Department of the Interior (USDI), Fish and Wildlife Service. 1995. Recovery Plan for the Mexican Spotted Owl. Albuquerque, New Mexico.

Wilson, E.D. 1969. A resume of the geology of Arizona. University of Arizona Press, Tucson. 140 pp.

Appendix A. Survey History for the Schultz Creek, Weatherford, Snowbowl, Little Spring, and Orion Spring MSO PACs.

Survey Year	PAC Name				
	Schultz Creek	Weatherford	Snowbowl	Little Spring	Orion Spring
1985	NI	O-NY	P-NU	A	NI
1986	O-NY	O-NN	O-NU	A	NI
1987	M-NN	O-NN	NI	A	O-NU
1988	NI	O-NN	NI	A	O-NN
1989	A	O-2Y	M-NU	A	O-2Y
1990	A	O-NY	O-NU	A	O-1Y
1991	IM-NR	O-NF	IM-NR	A	O-YD
1992	O-NU	O-NU	O-1Y	NI	O-2Y
1993	O-NN	M-NU	O-1Y	O-NU	O-1Y
1994	NI	M-NU	O-NN	O-NU	O-NN
1995	IM-NR	O-NU	NI	NI	O-NU
1996	IM-NR	M-NU	O-1Y	NI	M-NU
1997	NI	O-NU	NI	F-NU	O-NU
1998	NR	IM-NR	O-1Y	IM-NR	O-NU
1999	NR	O-NU	O-2Y	NI	O-NY
2000	NI	NI	O-1Y	O-NU	O-NY
2001	NI	P-NU	IM-NR	NI	O-NU
2002	NI	O-NU	O-2Y	NI	M-NU
2003	NI	NI	O-1YD	NR	NR

Legend:

O = Pair occupancy inferred or confirmed

M = Male inferred or confirmed

F = Female inferred or confirmed

P = Presence of a single owl, sex unknown, inferred or confirmed

Y = Number of young fledged

YD = Number of young found dead

NI = No information

NU = Nesting status unknown

NY = Nesting status undetermined, no known young produced

NN = Non-nesting/non-reproduction confirmed

NA = Nest abandonment

NF = Nest failed

A = Unoccupied

IM-NR = Informally monitored, no response or location