

APPENDICES A, F, G, H, I, J AND K

APPENDIX A - RECOVERY TEAM MEMBERSHIP

Current Team Members

BRENT BIBLES

Education: B.S., Fisheries and Wildlife, Utah State University, 1987;
M.S. Wildlife and Fisheries Science, University of Arizona, 1992;
Ph.D. Wildlife and Fisheries Science, University of Arizona, 1999.
Current Position: Assistant Professor, of Wildlife Ecology, Center for Natural Resource Management and Protection, Unity College, Unity, Maine
Expertise: Avian ecology; wildlife-habitat relationships; threatened and endangered species conservation

WILLIAM M. BLOCK, Team Leader

Education: B.A., Economics, San Diego State University, 1974
B.S., Wildlife Biology Michigan State University, 1981
M.S., Wildlife Biology, Humboldt State University, 1985
Ph.D., Wildland Resource Science, University of California Berkeley, 1989
Current Position: Program Manager, Wildlife and Terrestrial Ecosystems, US Forest Service, Rocky Mountain Research Station, Flagstaff, AZ
Expertise: Wildlife biology; prey ecology; fire effects on wildlife; effects of fuels reduction on wildlife

JON COOLEY

Education: B.S., Wildlife Ecology, University of Arizona, 1982
M.B.A., WP Carey School of Business, Arizona State University, 1985.
Current Position: Region I Supervisor, Arizona Game and Fish Department; Pinetop, Arizona
Expertise: Endangered species program management; natural resource enterprise management; wildlife agency management/administration

JUAN MARIO CIRETT GALAN

Education: Ecologist
Current Position: Director, Ajos Bavispe National Forest Reserve and Wildlife Refuge, Sonora, Mexico
Expertise: Wildlife management (birds and mammals), natural resources management, protected areas planning

JOSEPH L. GANEY

Education: B.S., Wildlife Management, Humboldt State University, 1981
M.S., Biology, Northern Arizona University, 1988
Ph.D., Zoology, Northern Arizona University, 1991
Current Position: Research Wildlife Biologist, USDA Forest Service, Rocky Mountain Research Station, Flagstaff, AZ.
Expertise: Ecology of Mexican spotted owl; prey ecology; snag dynamics; wildlife-habitat relationships

SHAULA J. HEDWALL

Education: B.S., Natural Resource Sciences, Washington State University, 1993
M.S., Forestry, Northern Arizona University, 2000
Current Position: Senior Fish and Wildlife Biologist, U.S. Fish and Wildlife Service, Flagstaff, AZ
Expertise: Threatened and endangered species conservation; forest and fire ecology; spotted owl ecology; aquatic species ecology and management

FRANK P. HOWE

Education: B.A., Anthropology, St. Cloud State University, 1982
B.A., Biology, St. Cloud State University, 1982
M.S., Wildlife Science, South Dakota State University, 1986
Ph.D., Wildlife Biology Colorado State University, 1993
Current Position: University Research Liaison, Utah Division of Wildlife Resources; Assistant Professor, Department of Wildland Resources, Utah State University
Expertise: Avian ecology; neotropical migratory birds; riparian ecology; wildlife-habitat relationships; conservation

J. MARK KAIB

Education: B.S., Environmental Resource Sciences, Arizona State University, 1992
M.S., Watershed Management, University of Arizona, 1998
M.S., Arid Lands Resource Sciences, University of Arizona, 2005
Current Position: Deputy Regional Fire Coordinator, U.S. Fish and Wildlife Service, Southwest Region 2, Albuquerque, NM
Expertise: Fire history and ecology; dendrochronology; fire effects; monitoring; burned area rehabilitation and restoration; planning

DAVID KLUTE

Education: B.S., Fisheries and Wildlife, University of Missouri, 1992
M.S., Biology, Kansas State University, 1994
Ph.D., Wildlife and Fisheries Science, Pennsylvania State University, 1999
Current Position: Bird Conservation Coordinator, Colorado Division of Wildlife, Denver, CO
Expertise: Avian ecology; bird population monitoring; wildlife-habitat relationships.

CAY OGDEN

Education: B.S., Biology, Boise State University, 1979;
M.S. coursework Wildlife Management, University of Idaho, 1981-85.
Current Position: Regional Wildlife Ecologist, Intermountain Region, National
Park Service, Denver, Colorado.
Expertise: Wildlife biology; ESA Section 7 consultation and recovery
planning

SARAH E. RINKEVICH

Education: B.S., Wildlife and Fisheries Science, University of Arizona, 1987;
M.S., Wildlife Biology, Humboldt State University, 1991.
Ph.D., Conservation Genetics, Traditional Ecological Knowledge, University of
Arizona.
Current Position: Wildlife Biologist, U.S. Fish and Wildlife Service
Expertise: Wildlife ecology; threatened and endangered species; conservation;
conservation genetics.

JESÚS LIZARDO CRUZ ROMO

Education: Biologist, Universidad Nacional Autónoma de México (UNAM),
1998.
Current Position: Assistant Director for Conservation of Priority Species.
Expertise: Wildlife conservation; species at risk actions plans; binational
collaboration for wildlife recovery.

JERRY SIMON

Education: B.S. Range and Forest Management – Colorado State University 1975
Current Position: Forester, Southwestern Region, FS
Expertise: Silviculture; forest management

STEVEN L. SPANGLE, Team Liaison

Education: B.S. Wildlife Management, Humboldt State University, 1977
Current Position: Field Supervisor, U.S. Fish and Wildlife Service, Arizona
Ecological Services Office, Phoenix
Expertise: Wildlife management, raptor ecology; Endangered Species Act

J. ROBERT VAHLE

Education: B.S. Wildlife Biology, Arizona State University, 1970
M. S. Zoology, Arizona State University, 1978
Current Position: Retired - Wildlife Biologist (22 Years U.S. Forest Service, 13
Years Arizona Game and Fish Department, 3 Years Intermountain West Joint
Venture).
Expertise: Forest/range ecology and management related to wildlife habitat
needs.

HIRA A. WALKER

Education: B.A. Biology, Environmental Studies, University of California at Santa Cruz, 1995; Ph.D. Biology, University of New Mexico, Albuquerque, 2005.
Current Position: Non-game and Endangered Species Ornithologist, New Mexico Department of Game and Fish, Santa Fe, New Mexico.
Expertise: Bird conservation and management; stopover ecology; avian use of exotic vegetation; avian population monitoring techniques.

JAMES P. WARD JR

Education: B.S., Wildlife Biology, Humboldt State University, 1985; M.S., Natural Resources (Wildlife Management option), Humboldt State University, 1990; Ph.D., Zoology, Colorado State University, Fort Collins, Colorado, 2001;
Current position: Senior Ecologist, FWS National Wildlife Refuge System, I&M Program
Expertise: Spotted owl ecology; wildlife population ecology; resource monitoring.

GARY C. WHITE

Education: B.S., Fisheries and Wildlife Biology, Iowa State University, 1970; M.S., Wildlife Biology, University of Maine-Orono, 1972; Ph.D., Zoology, Ohio State University, 1976;
Current Position: Professor Emeritus, Department of Fish, Wildlife, and Conservation Biology, Colorado State University, Fort Collins, Colorado.
Expertise: Quantitative methods; population dynamics.

DAVID W. WILLEY

Education: B.A. Biology, 1981. Point Loma College, San Diego.; M.S. Wildlife Ecology, 1988. Colorado State University, Fort Collins; Ph.D. Zoology, 1998. Northern Arizona University.
Current Position: Adjunct Professor and Research Associate, Department of Ecology, Montana State University
Expertise: Wildlife ecology and management; raptor ecology; occupancy modeling and habitat analyses; small mammal ecology; university teaching.

GARY K. ZIEHE

Education: B.S. Range Science, 1982. Texas A&M University, College Station; M.S. Animal Breeding, 1989. Texas A&M University, College Station; Ph.D. Animal Breeding and Reproduction, 1993. Oklahoma State University, Stillwater.
Current Position: Ecosystems Staff Officer, Lincoln National Forest, Alamogordo, NM.
Expertise: Rangeland ecology, quantitative genetics, biometrics

Past Team Members (Affiliation when serving on team)

REGIS CASSIDAY, USDA Forest Service, Southwestern Region (retired)
PAT CHRISTGAU, Arizona Game and Fish Department, Phoenix AZ
FERNANDO CLEMENTE, Colegio De Postgraduados, Campus San Luis Potisi, Mexico
JERRY CRAIG, Colorado Division of Wildlife, Fort Collins, CO
JAMES DICK, USDA Forest Service, Southwestern Region, Albuquerque, NM
ALAN FRANKLIN, Colorado State University, Fort Collins, CO
WIL MOIR, USDA Forest Service, Rocky Mountain Research Station, Flagstaff, AZ
(retired)
THOMAS SPALDING, Arizona Game and Fish Department, Phoenix AZ (retired)
STEVEN THOMPSON, San Carlos Apache Tribe, San Carlos, AZ
DEAN URBAN, Colorado State University, Fort Collins, CO, and Duke University,
Durham, NC
SARTOR O. WILLIAMS III, New Mexico Game and Fish Department, Santa Fe, NM
(retired)

APPENDIX F - LAWS, REGULATIONS, AND AUTHORITIES FOR RECOVERY PLAN IMPLEMENTATION

This Recovery Plan, First Revision is based or predicated upon laws that designate specific legal authority and responsibility to government agencies for managing public resources, including wildlife and wildlife habitat. The following summarizes relevant laws and authorities applicable to implementation of this Recovery Plan.

1. Endangered Species Act

Section 2(c)(2) of the ESA expresses the policy of Congress that “...all Federal departments and agencies shall seek to conserve endangered species and threatened species and shall utilize their authorities in furtherance of the purposes of [the] Act.” Section 7(a)(1) of the ESA requires Federal agencies to “...utilize their authorities in furtherance of the purposes of the Act by carrying out programs for the conservation of endangered species and threatened species....” Thus, Congress clearly intended conservation of endangered and threatened species to be considered in implementation of Federal programs and actions. In addition, other Federal laws and regulations require consideration of endangered and threatened species in program implementation, including the National Forest Management Act (NFMA) and the NEPA.

Implementation of the ESA is the responsibility of the Secretary of the Interior (Secretary) for listed terrestrial species. The Secretary generally delegates implementation authority to the FWS. The following sections of the ESA are relevant to implementation of species recovery efforts:

A. Section 4

Section 4 includes the listing and recovery provisions of the ESA. Section 4(b) of the ESA provides for designation of critical habitat for endangered and threatened species. Regulations governing listing and critical habitat designation are codified at 50 CFR 424. Protection of critical habitat is administered under section 7 of the ESA (discussed below). Critical habitat is defined under section 3(5)(A) of the ESA as:

“(i) the specific areas within the geographical area occupied by the species...on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection; and,
“(ii) specific areas outside the geographical area occupied by the species...upon a determination by the Secretary that such areas are essential for the conservation of the species.”

Section 4(d) of the ESA provides for promulgation of special rules for threatened species only. This allows the Secretary to issue regulations as deemed necessary and advisable for the conservation of such species. Special rules can be useful in enacting regulatory provisions

uniquely applicable to the species at hand and can be promulgated to avoid unnecessary regulatory burden.

B. Section 5

Section 5 directs the Secretary to utilize funds and authorities of other laws in acquisition of lands, as deemed appropriate for conservation of endangered and threatened species.

C. Section 6

This section authorizes cooperation with the states in conservation of threatened and endangered species. Among its provisions is the authority to enter into management agreements and cooperative agreements and to allocate funds to the states that have entered into such agreements.

D. Section 7

Section 7 and its implementing regulations at 50 CFR 402 govern cooperation between Federal agencies. Federal agencies must, in consultation with and with the assistance of the Secretary, ensure that any action they fund, authorize, or carry out is not likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of a listed species' designated critical habitat. Regulations at 50 CFR 402 provide the following definitions:

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

“Destruction or adverse modification” means a direct or indirect alteration that appreciably diminishes the value of critical habitat for both the survival and recovery of a listed species.” This regulatory definition has been legally challenged and is no longer used by FWS; no new regulatory definition has been promulgated to date.

Section 7 requires action agencies to assess the effects of proposed actions on listed species and their critical habitat. If, as a result of that assessment, the agency determines that an action may affect a listed species or its critical habitat, the agency must enter into consultation with FWS. That consultation may result in a biological opinion from FWS, in which a determination is made as to whether jeopardy to the species and/or destruction or adverse modification of its critical habitat are likely to result from the agency action.

If a biological opinion concludes that jeopardy to the species and/or adverse modification of its critical habitat are not likely to result from a proposed action, the action may proceed. The FWS may provide conservation recommendations to the agency on ways to minimize or avoid potential adverse effects on the listed species and/or critical habitat. Implementation of the conservation recommendations are at the action agencies' discretion. In cases where the action is likely to result in the incidental taking of a species, FWS may provide reasonable and prudent

measures to minimize the amount or extent of the take. The terms and conditions that accompany and implement any reasonable and prudent measures are nondiscretionary and must be implemented. However, reasonable and prudent measures and their implementing terms and conditions cannot alter the basic design, location, scope, duration, or timing of the action; and they may involve only minor changes.

If a biological opinion determines that jeopardy and/or adverse modification is likely to result from the proposed action, the FWS and the action agency develop reasonable and prudent alternatives, if any, to the proposed action. Reasonable and prudent alternatives refer to alternative actions that are consistent with the intended purpose of the proposed action, that can be implemented within an action agency's legal authority, that are economically and technologically feasible, and that FWS believes will not result in jeopardy to the listed species or destruction or adverse modification of critical habitat. If no reasonable or prudent alternatives can be identified, the action agency may apply to the Endangered Species Committee for an exemption to prohibition of jeopardy and/or destruction or adverse modification of critical habitat.

E. Section 8

Section 8 authorizes international cooperation in conservation and endangered and threatened species. Included under this section is the authority to provide financial assistance to foreign countries to assist in their conservation efforts.

F. Section 9

Section 9 covers prohibited acts in regard to listed species. Of relevance to the Mexican spotted owl is the prohibition of taking individuals. "Taking" is defined as "...to harass, harm, pursue, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." Permits for direct taking of threatened species may be issued for scientific purposes, to enhance propagation or survival, in cases of economic hardship, for zoological exhibition, or for educational purposes (50 CFR 17.32).

Taking of spotted owls is most likely to occur through "incidental take." "Incidental take" is defined as the taking that results from, but is not the purpose of, carrying out an otherwise lawful activity. Incidental taking of spotted owls may result from activities such as timber harvest, if that activity results in habitat loss to an extent that an individual spotted owl's normal behavior patterns are impaired. In cases where incidental taking will not result in jeopardy to a listed species, the FWS may issue an incidental take statement in a biological opinion on a proposed Federal action, thereby exempting the action agency from the take prohibition. Relief from taking prohibition for non-Federal activities is discussed under "Section 10" below.

G. Section 10

Section 10 authorizes the FWS to issue permits for takings otherwise prohibited under section 9. Permits for purposeful taking may be issued under 10(a)(1)(A) of the ESA for research purposes and to implement recovery actions. In addition, 10(a)(1)(B) of the ESA allows permits for

incidental takings that may result from an activity provided an applicant submits a conservation plan that specifies:

“(i) the impact which will likely result from such taking;

“(ii) what steps the applicant will take to minimize and mitigate such impacts, and the funding that will be available to implement such steps;

“(iii) what alternative actions to such taking the applicants considered and the reasons why such alternatives are not being utilized; and

“(iv) such other measures that the [FWS] may require as being necessary or appropriate for purposes of the plan.”

2. National Forest Management Act

The NFMA governs FS Management on NFS lands. The first planning regulations (rule) articulating implementing language were provided in 1979 and then revised in 1982. In 1997, the Secretary of Agriculture convened a committee of scientists to provide recommendations on how to better implement NFMA. This led to a series of planning rule revisions (2000, 2002, 2005, 2008) that have yet to gain final approval. In 2009 the FS issued a Notice of Intent to prepare an environmental impact statement (EIS) for a new planning rule, starting a new planning-rule-revision effort. A draft EIS was distributed in 2011 and a proposed final programmatic EIS was published in 2012 (79 CFR 30.8480). At this time, that PEIS pending approval by the Secretary of Agriculture.

USDA republished the 2000 rule as amended in the Federal Register in order to make it available to the public in the Code of Federal Regulations (36 CFR Part 219; Federal Register 2009). This interim rule is currently in effect. Below are relevant parts of the interim rule relevant to recovery planning.

Section 219.20 (Species Diversity) states:

“(a)(2)(ii) *Evaluations of species diversity*. Evaluations of species diversity must include, as appropriate, assessments of the risks to species viability and the identification of ecological conditions needed to maintain species viability over time based on the following:

“(A) The viability of each species listed under the Endangered Species Act as threatened, endangered, candidate, and proposed species must be assessed. Individual species assessments must be used for these species.

“(D) In analyzing viability, the extent of information available about species, their habitats, the dynamic nature of ecosystems, and the ecological conditions needed to support them must be identified. Species assessments may rely on general conservation principles and expert opinion. When detailed information on species habitat relationships, demographics, genetics, and risk factors is available, that information should be considered.”

Section 219.20 further provides guidance pertaining to forest plan decisions related to species diversity:

“(b)(2) *Species diversity.* (i) Plan decisions affecting species diversity must provide for ecological conditions that the responsible official determines provide a high likelihood that those conditions are capable of supporting over time the viability of native and desired non-native species well distributed throughout their ranges within the plan area, except as provided in paragraphs (b)(2)(ii) through (iv) of this section. Methods described in paragraph (a)(2)(ii) of this section may be used to make the determinations of ecological conditions needed to maintain viability. A species is well distributed when individuals can interact with each other in the portion of the species range that occurs within the plan area. When a plan area occupies the entire range of a species, these decisions must provide for ecological conditions capable of supporting viability of the species and its component populations throughout that range. When a plan area encompasses one or more naturally disjunct and self-sustaining populations of a species, these decisions must provide ecological conditions capable of supporting over time viability of each population. When a plan area encompasses only a part of a population, these decisions must provide ecological conditions capable of supporting viability of that population well distributed throughout its range within the plan area.

“(b)(3)(i) *Federally listed threatened and endangered species.* Plan decisions must provide for implementing actions in conservation agreements with the FWS or the NMFS that provide a basis for not needing to list a species. In some situations, conditions or events beyond the control or authority of the agency may limit the FS’s ability to prevent the need for Federal listing. Plan decisions should reflect the unique opportunities that NFS lands provide to contribute to recovery of listed species.

“(b)(3)(ii) Plan decisions involving species listed under the ESA must include, at the scale determined by the responsible official to be appropriate to the plan decision, reasonable and prudent measures and associated terms and conditions contained in final biological opinions issued under 50 CFR part 402. The plan decision documents must provide a rationale for adoption or rejection of discretionary conservation recommendations contained in final biological opinions.”

3. National Environmental Policy Act

The NEPA requires Federal agencies to prepare Environmental Impacts Statements (EIS) or Environmental Assessments (EA) for implementation of agency actions and issuance or modification of agency policies and guidance. Impacts of the proposed action or policy amendment on endangered and threatened species must be evaluated, including a range of alternatives. If a deciding official determines that no significant impact will result from an action or policy amendment, a “Finding of No Significant Impact” (FONSI) is issued. If an agency determines that a significant impact will result from the proposed action or policy amendment, an EIS must be prepared. It is released for public review and comment, after which an alternative is selected and a Record of Decision (ROD) is signed by the deciding official.

4. Migratory Bird Treaty Act (MBTA)

Prior to listing the Mexican spotted owl as threatened, the MBTA provided the only Federal protection for the subspecies other than that afforded by land-management agencies. Under the provisions of the MBTA, it is unlawful to pursue, hunt, take, capture, or kill in any manner any migratory bird unless permitted by regulations. The MBTA applies in both the U.S. and Mexico. Because the Mexican spotted owl exhibits migratory behavior in some areas, it is included on the list of birds protected under the MBTA.

5. Tribal Lands

The FWS recognizes that tribes have management jurisdiction over tribal lands and supports tribal efforts to implement the provisions of this Recovery Plan to achieve management consistency throughout the Mexican spotted owl's range. In accordance with Secretarial Order 3206 entitled "American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the ESA, signed by the Secretaries of the Department of the Interior and the Department of Commerce in 1997, the FWS is required to formally consult with tribes for any ESA actions that may impact tribal lands and culturally significant resources.

6. State and Private Lands

Although relatively few Mexican spotted owls are known on state and private lands in the U.S., the FWS encourages states to continue and/or begin a program to inventory forests and canyons for the presence of Mexican spotted owls. As discussed in Part II.H.3.d (Inadequacy of existing regulatory mechanisms), all states within the U.S. range of the owl have protections in place to prohibit the direct taking of Mexican spotted owls. However, we are unaware of any provisions under state law to regulate the loss of Mexican spotted owl habitat. In addition, the FWS should evaluate the importance of state and private lands to the Mexican spotted owl, and consider promulgating a special rule under 4(d) of the ESA that specifies habitat-altering activities that can be allowed on private lands without violating the prohibition of incidentally taking Mexican spotted owls.

7. Mexico

In Mexico there are various legal mechanisms aimed at the regulation of conservation and sustainable uses of wildlife and its habitat, as well as conservation and protection of endangered species. These are found in a suite of laws, official Mexican standards (Normas Oficiales Mexicanas), and international agreements, among others, and provide the basis for the development of actions for conservation, protection, and recovery of the populations of species listed under some risk category, such as the spotted owl.

A. General Law of Ecological Equilibrium and Environmental Protection (Ley General del Equilibrio Ecológico y la Protección al Ambiente)

This is the primary law dealing with environmental matters in Mexico, and it integrally regulates the general terms of environmental protection. This law defines the basic principles of Mexican

environmental law and the instruments for its implementation, as well as the mechanisms for the conservation of ecological equilibrium, environmental protection, and the establishment and administration of natural protected areas, among other matters.

Chapter III of this law is directly focused on conservation and sustainable use of wildlife (fauna and flora). Section III of article 79 states that the conservation of species in the endemic, threatened, endangered, or special protection categories should be one of the criteria to be taken into account when granting concessions, permits, and authorizations for use, possession, administration, conservation, repopulation, propagation, and development of wildlife.

B. General Wildlife Law and its Regulations (Ley General de Vida Silvestre y su Reglamento)

This law is part of the national environmental policies and it seeks to balance wildlife conservation with its use. It fosters the implementation of activities oriented to protect wildlife while creating new opportunities that allow the use of natural resources for social benefit. It creates support for conservation by engaging the population in conservation actions that generate income.

This law regulates extractive and non-extractive uses of wildlife specimens, parts, and derivatives, including those species listed in a risk category in the NOM-059-SEMARNAT-2010, and priority species, seeking at all times the viability and permanence of wildlife in nature.

The most important conservation tools promoted by this law are Management Units for the Conservation of Wildlife (UMAs, Unidades de Manejo para la Conservación de Vida Silvestre). These are collective or private land holdings where the following activities take place: conservation, restoration, protection, maintenance, recovery, reproduction, repopulation, reintroduction, research, rescue, shelter, rehabilitation, exhibition, recreation, environmental education, and sustainable use of wildlife and its habitat.

C. General Law of Sustainable Forest Development and its Regulations (Ley General de Desarrollo Forestal Sustentable y su Reglamento)

This legal body regulates the forestry policy of Mexico with the objective of contributing to social, economic, and ecological development through conservation, protection, restoration, production, zoning, cultivation, management, and use of the forest resources and forested ecosystems of the country.

This law is entrusted with: 1) regulating all matters relative to conservation, management, and use of forest resources; 2) establishing measures for forest conservation, as well as control, surveillance, and sanctions; and, 3) encouraging social participation. It is of particular importance in the conservation of forested areas, including the forests in which the spotted owl is found.

D. Official Mexican Standard NOM-059-SEMARNAT-2010 (Norma Oficial Mexicana NOM-059-SEMARNAT-2010)

This identifies and lists within an at-risk category all those species that are at risk and groups them in four categories: P-endangered, A-threatened, Pr-subject to special protection, and E-probably extinct in the wild.

Even though this standard in itself does not constitute an instrument that fosters species conservation, it is a tool that assists in prioritizing projects related to these species. Based on this, the Secretary of the Environment and Natural Resources is mandated to promote and foster the conservation of species and populations at risk through the development of conservation projects.

E. *In situ* conservation strategies

The implementation of the Recovery Plan in Mexico would be carried out through *in situ* conservation instruments included in the environmental legal framework. The following section describes the available plans and implementation mechanisms for the conservation of the spotted owl and associated species.

i. Natural Protected Areas (Áreas Naturales Protegidas)

Natural Protected Areas have been the main instrument for natural habitat and biodiversity conservation in Mexico's environmental policies. CONANP (National Commission of Natural Protected Areas) is responsible for implementing actions focused on conservation, recovery, restoration, and management, including attention to species at risk found within protected areas as well as in their influence zones. NPAs (Natural Protected Areas) have Management Programs that outline the activities that will be implemented, including species monitoring. Currently, there are 174 NPAs that are managed by CONANP, including those where the spotted owl is present, as mentioned in previous sections.

ii. Certified Conservation Areas (Áreas Certificadas para la Conservación)

This is a tool designed for landowners (communities, ejidos, or private lands) that are interested in the conservation of their land to voluntarily access conservation schemes. Once owners join this program they have access to funding and other benefits through programs of the government or civil society organizations. Under this scheme owners commit to manage their land as if it was a private natural protected area, which allows for conservation of the natural habitat, thus complementing the objectives of natural protected areas.

iii. Management Units for the Conservation of Wildlife (UMAs, Unidades de Manejo para la Conservación de Vida Silvestre)

These are mostly private properties registered to undertake wildlife management, generally associated to economic interests; they also usually undertake activities for conservation of the natural habitat, populations, and wildlife. They are managed by the owners themselves, and

represent a source of income derived from the sustainable use of wildlife. Thus, owners become the most interested party in guaranteeing the viability of wild populations and their natural habitat, undertaking surveillance, monitoring, and management of habitat and populations.

iv. *Program of Conservation of Species at Risk (PROCER) (Programa de Conservación de Especies en Riesgo--PROCER)*

This program is carried out by CONANP, the National Commission of Natural Protected Areas, and its objective is to recover 30 species at risk. Its main tool is the elaboration and execution of Action Programs for the Conservation of Species (PACE), which establish conservation strategies for each priority species, as well as specific actions aimed at conserving, protecting and recovering their populations and habitat.

This program is tightly linked to the work that is conducted inside Natural Protected Areas; however, its action scope is beyond the limits of the NPAs and considers the execution of other forms of conservation activities as well as activities for other species.

F. Other development programs associated with biodiversity conservation

i. *Program for Payment for Environmental Services (Programa de Pago por Servicios Ambientales)*

These programs are operated by the National Forestry Commission (CONAFOR), and its resources provide support to communities, ejidos, Regional Forestry Associations, and private owners of forested lands, who receive a payment in exchange for biodiversity conservation. Supported categories include projects related to biodiversity conservation, agroforestry systems, and carbon capture, among others. Currently, CONANP and CONAFOR have worked jointly to define priority areas for conservation of species at risk.

ii. *Program for Conservation for Sustainable Development (Programa de Conservación para el Desarrollo Sostenible)*

This subsidy program is operated by the CONANP and promotes the conservation of ecosystems and their biodiversity through the active participation of the population in actions and projects that encompass conservation of natural resources, as well as alternative production projects that decrease pressure on natural resources. In this way communities and regional stakeholders view sustainable development as a form through which they can improve their quality of life while conserving natural resources, and converts them into important allies in the conservation of biodiversity.

APPENDIX G - CONSERVATION MEASURES AND MANAGEMENT IN THE UNITED STATES AND MEXICO

1. United States

a. Federal agencies

i. Fish and Wildlife Service

The FWS has only one record of Mexican spotted owls on its lands (in Brown Canyon on Buenos Aries National Wildlife Refuge), so the FWS's main management responsibility involves conducting the processes associated with listed species under the ESA, such as Section 7 consultation on Federal actions that may affect the species and/or its critical habitat, issuance of research permits under Section 10, and recovery planning under Section 4. Over 200 formal Section 7 consultations have been conducted on actions proposed by numerous Federal agencies, and several hundred informal consultations have occurred as well. The FWS designated critical habitat for the owl in 2004. In addition, the FWS has reviewed two petitions to delist the species. In both cases, delisting was determined to be "not warranted" because the petitions failed to present substantial scientific and commercial information to support their assertion that the species should be delisted. Notices of those findings, including discussions of the issues raised in the petitions, were published in the Federal Register on 23 September 1993 (58 FR 49467) and 1 April 1994 (59 FR 15361). The FWS findings were upheld in legal challenges.

ii. Forest Service

The primary administrator of lands supporting Mexican spotted owls in the U.S. is the FS. Most spotted owls have been found within FS Region 3 (including 11 National Forests in Arizona and New Mexico). The Rocky Mountain (Region 2, including two National Forests in Colorado) and Intermountain Regions (Region 4, including three National Forests in Utah) support fewer spotted owls.

Forest Service Southwestern Region (Region 3)

On 5 June 1996, Regional Forester Charles W. Cartwright signed a ROD to implement Alternative G of the Final EIS for Amendment of Forest Plans (FEIS; USDA FS 1996). That decision directs individual National Forests to incorporate Recovery Plan recommendations, as well as those of the Management Guidelines for Northern Goshawk in Southwestern U.S., into their forest plans. The FS then consulted with the FWS under Section 7 of the ESA on the forest plan amendments. The FWS issued a biological opinion finding that implementation of the forest plan amendments would not likely jeopardize the continued existence of the Mexican spotted owl or other listed species. In addition, the Mexican spotted owl Recovery Team reviewed the forest plan amendments and concluded that the direction detailed in the FEIS was generally compatible with the original Recovery Plan recommendations, although some disparities and management concerns were recognized. In addition, on January 17, 2003, the FWS completed a reinitiation of the 1996 Forest Plan Amendments non-jeopardy biological opinion, and again reached a non-jeopardy conclusion. Consultation on individual actions under

these biological opinions anticipated incidental take in the form of harm and/or harassment of owls associated with 243 PACs on FS Region 3 lands. The FS Region 3 reinitiated consultation on the Land and Resource Management Plans (LRMPs) on April 8, 2004. On June 10, 2005, the FWS issued a revised non-jeopardy biological opinion on the amended LRMPs. Following a legal challenge to the 2005 biological opinion, the FWS issued revised biological opinions for each Region 3 forest in spring 2012.

Region 3 of the FS continues to manage under the 1996 ROD, but deviates from some Recovery Plan recommendations when overriding resource, social, or economic considerations (e.g., fuels-reduction projects for the purpose of reducing the risk of high-severity fire in the WUI) require the agency to deviate from those recommendations. Deviations from the direction in the ROD and FEIS require Section 7 consultation with FWS to ensure that FS programs and individual projects will not jeopardize the continued existence of the Mexican spotted owl or adversely modify its critical habitat.

The Southwestern Region of the FS has conducted spotted owl inventories since 1988. In 1994, the FS reported 846 owl “sites” reported between 1984 and 1993 (Fletcher and Hollis 1994). Prior to the listing of the Mexican spotted owl, Region 3 issued guidelines for its management. Those guidelines were issued as Interim Directive Number 1 in June 1989, then revised and reissued as Interim Directive Number 2 approximately one year later. Interim Directive Number 2 guidelines required establishing management territories around all nesting and roosting spotted owls and around territorial owls that were detected at night for which daytime locations were not recorded. All management territories (except those on the Lincoln and Gila National Forests) consisted of approximately 800 ha (2,000 ac) of habitat per territory. Since that time, the FS’s Region 3 has incorporated the recommendation of the original Recovery Plan (USDI FWS 1995) and established approximately 1,061 240-ha (600-ac) PACs at all Mexican spotted owl sites known from 1989 to present (Table II.1). All Southwestern forests have more than one PAC, and the relative percentage of known sites by National Forest has not changed significantly.

Forest Service Rocky Mountain Region (Region 2)

Region 2 of the FS continues to manage under the original Recovery Plan (USDI FWS 1995) recommendations. Most projects occurring in Mexican spotted owl habitat consist of fuels-reduction treatments that have been able to meet the Protected and Restricted Habitat Guidelines in the original recovery plan. Projects rarely occur within PACs.

Since 1990, the Rocky Mountain Region of the FS has conducted spotted owl inventories in most of the National Forests in Colorado. Currently occupied Mexican spotted owl sites are present on the Pike/San Isabel and San Juan National Forests. The FS’s Region 2 has established PACs of at least 240-ha (600-ac) in size at all Mexican spotted owl sites where owls have shown some level of occupancy (i.e., not believed to be transitory owls) since 1990. Several owl sites are being further evaluated for potential establishment of PACs.

Forest Service Intermountain Region (Region 4)

Potential Mexican spotted owl habitat in the FS's Intermountain Region is limited to small portions of the Dixie, Fishlake, and Manti LaSal National Forests in southern Utah. Employees of the Intermountain Region have collected site-specific Mexican spotted owl data since 1990. Survey efforts covered approximately 335,930 ha (830,100 ac) of habitat statewide on FS-administered lands. Few Mexican spotted owl breeding pairs have been documented on these National Forests. The inventories in southern Utah encompassed a wide range of habitat types, but all owls detected were found in steep-walled sandstone canyons, some of which contained intermittent streams and stringers of mixed conifer and/or deciduous multi-layered vegetation. In southern Utah, owls were found nesting only on ledges or small caves in these steep-walled canyons. As a result of these extensive survey efforts, spotted owl inventories were discontinued in rolling forested landscapes of the Intermountain Region and were focused on steep-walled canyon areas consistent with where owls were documented. Broad-scale survey efforts were replaced with forest-level surveys, as needed to determine owl presence in proposed project areas. In 2003, approximately 2,400 ha (6,000 ac) were surveyed on the Teasdale and Escalante Ranger Districts with two detections. As a result of these refocused survey efforts, an additional owl site was located in 2008 and the Dixie National Forest designated three PACs.

The FS has regulatory mechanisms and management direction in place to protect and recover the Mexican spotted owl. The Forest Service Manual (FSM) requires review of all FS planned, funded, executed, or permitted programs and activities for possible effects on the owl (FSM 2672.4). Additionally, each National Forest is required to complete consultation with the FWS for all agency programs or activities that may affect the species (FSM 2671.45c). Existing forest plans for the Dixie, Fishlake, and Manti LaSal National Forests require that spotted owl habitat be protected, maintained, or improved. Additionally, these forests' plans are currently under revision, and owl habitat and recovery are being addressed in the revision process. The existing Recovery Plan guidance is also implemented as appropriate on these three southern Utah forests.

iii. National Park Service (NPS)

In the range of the Mexican spotted owl, the NPS has 57 administrative units. However, most of these park units are very small in acreage and/or have no spotted owl habitat. Other parks with apparent spotted owl habitat characteristics have been surveyed and no owls have been found (Arches NP, Rocky Mountain NP, Great Sand Dunes NP and Preserve, Black Canyon NP, and Curecanti NRA). As a result, 21 parks are known or expected to have spotted owls or owl habitat. Some of the 21 parks have not been surveyed for spotted owls, so the actual presence of owls has not been confirmed at this time. Designation of PACs has been inconsistent in national park units in part because much of the acreage in the 21 parks is wilderness, proposed wilderness, or backcountry land designations. These land-management categories greatly reduce the potential for most management impacts to owls and owl habitat. As a consequence, there is less need for park managers to conduct surveys and identify the specific acreage to be managed for owls through PAC designations. Increases in human recreation in the parks is heightening concern for spotted owls in these less-developed portions of parks, and may stimulate designation of more PACs to focus protection of the owls. This is true particularly where owls are using canyon habitats and may have less ability to retreat from human disturbances. In two

national park units with Mexican spotted owls there is shared management responsibility with the Navajo Nation (Canyon de Chelly and Navajo National Monuments). Consistent with the Navajo Nation's desire to keep owl sites confidential, the owl sites described paragraphs below are not displayed in the Recovery Plan maps of owl distribution.

Generally, the most pressing issue of managing owl habitat in national parks is the need to reduce fuels and reintroduce natural fire regimes, while maintaining or improving owl habitat. Fire Management Plans commonly include owl habitat management as a focus issue in decisions for planned and unplanned fire management.

The following summaries provide detail on owl populations in the 21 parks that are known or expected to have owls or owl habitat.

Arches National Park, Utah

Repeated spotted owl surveys have not detected owls at this park unit. The habitat appears suitable and survey efforts will continue.

Bandelier National Monument, New Mexico

Mexican spotted owls were first reported at Bandelier National Monument in 1910 and owl surveys began in 1985. The spotted owls in Bandelier nest in canyons walls with cool, moist, mixed-conifer forests; the majority of this habitat is in the Bandelier Wilderness. From the 1990s into the 2000s, the park managed all potential habitat within canyon as nesting and roosting habitat. During the 1990s, breeding was documented at three locations. From 2003 to 2011, spotted owls seemed to have disappeared from these sites. In 2011, a wildland fire burned at high and moderate intensities with nearly complete tree mortality through much of the owl's habitat. As of fall 2011, the park is uncertain whether owls could successfully occupy the park. Habitat evaluations and owl surveys will be conducted. For the time being, three breeding locations will be kept on record.

Big Bend National Park, Texas

There is one record of a Mexican spotted owl being heard from the Chisos Basin campground and lodging development in Big Bend National Park during the breeding season by a visiting bird-watcher familiar with owl calls. The conditions of the observation meet the definition of an "owl site" used in the Recovery Plan. No formal surveys have been performed in Big Bend National Park. To date, no confirmed visual sightings or photographs have been made of Mexican spotted owls in the park. Additional, anecdotal information leads the NPS to consider the possibility of spotted owls here. That information includes: the confirmed presence of owls in the Davis Mountains and in a Mexican mountain range south of the Rio Grande; several records of unidentified *Strix* species (either barred or spotted owls) near this park; two predictive habitat models that identified probable habitat in the park; and the professional judgment of Recovery Team members who visited the park and found the habitat to be potentially suitable. The single unconfirmed detection is reflected in the Recovery Plan map of owl distribution.

The park will attempt to conduct owl surveys to determine if spotted owls regularly occupy the park and whether a PAC is warranted. At this time there are no PACs delineated at Big Bend NP.

Bryce Canyon National Park, Utah

There are no documented owl territories within Bryce Canyon National Park. Surveys have been performed throughout the park in areas predicted to be suitable habitat (1993-1995) and in connection to proposed projects (2003, 2008, 2009). No surveys detected spotted owls. Most of the potential spotted owl habitat occurs in proposed wilderness areas where it is protected from development. No prescribed fire treatments are currently planned for the potential owl habitat in the park. Unplanned fire and recreation impacts are currently the greatest threat to the possibility of owls occurring at Bryce Canyon. A lightning-caused event in July 2009 burned several hundred acres in potential spotted owl habitat. Owl surveys in that area prior to the fire had not located spotted owls. Surveys for Mexican spotted owls will continue, generally related to proposed activities within or adjacent to potential habitat.

Canyon de Chelly National Monument, Arizona

Canyon de Chelly's primary mission is to protect the prehistoric ruins and other features of scientific or historical interest. The monument encompasses approximately 34,000 ha (84,000 ac) within the Navajo Nation. The Navajo Nation holds management responsibility for wildlife resources in the monument. Mexican spotted owls and their habitat are managed under the Navajo Nation Management Plan for the Mexican Spotted Owl (2000). Records show the species has occupied parts of the monument since the mid-1980s. Surveys since 2005 have found that owls are widely, but patchily distributed throughout the monument, resulting in designation of five PACs. Both the NPS and Navajo Nation recognize the potential for more owl sites to be located in the monument due to the abundance of steep, north-facing canyon walls, perennial streams, and patches of Douglas-fir that have not yet been surveyed.

Canyonlands National Park, Utah

The first study of Mexican spotted owls in Canyonlands was in 1977. A series of owl studies were conducted in the 1990s (Van Riper and Willey 1992, Willey 1995, 1996, 1998; Swarthout and Steidl 2000, 2001, 2003; Willey and Van Riper 2000). These studies investigated demographics, owl sensitivity to recreational disturbance, prey base, home range size, habitat use, and natal dispersal of the birds. In 1996, PACs were designated around all 22 known owl territories [about 9,300 ha (23,000 ac)], and a GIS layer was developed to manage activities occurring in this owl habitat. Although monitoring has been sporadic, owls have consistently been located in these PACs. In 2002 and 2003, a comprehensive re-survey of the entire park was undertaken to determine the status of the owl population (Schelz et al. 2004). Most of the 22 PACs were surveyed, as were other areas. The resulting 47 Mexican spotted owls (10 pairs and 27 individuals) led to a current estimate of 29 PACs in the park. The top issues threatening the owls in Canyonlands are increased human activity in the remote backcountry and the loss and degradation of riparian habitat.

There are approximately 77,000 ha (190,000 ac) of potential owl habitat in the park, of which about 49,000 ha (120,000 ac) have been surveyed to protocol. Owl nesting habitat in the park is rugged, steep-canyon topography with vertical cliffs and numerous caves with small patches of woodland vegetation (pinyon-juniper being the most common type). As owl habitat in the park is not fire-dependent, prescribed fires are not used as a management tool, and no acres of owl habitat have been lost to canopy fire.

Capitol Reef National Park, Utah

Capitol Reef National Park has nine owl sites designated as PACs. Breeding was confirmed at all nine sites during the 1990s (Willey 1998b). The most recent surveys have occurred during 2008-2010 and all nine PACs were visited; a pair was observed at one site, single males were observed at three others, and no owls were detected at the remaining five sites. The park does not have an estimate of amount of potential owl habitat or of the acreage surveyed. Fires are rare in the park, and large fires would be unlikely to occur near owl territories due to vegetation patterns. No owl habitat in the park has been lost to fire or treated with fuels-management methods. Potential impacts to owls could arise from increased human recreation in areas occupied by owls. Research was conducted in Capitol Reef, Canyonlands, and Zion NPs examining owl response to human activity (Swarthout and Steidl 2001, 2003). Results concluded that the cumulative effects of high levels of short-duration recreational hiking near nests may be detrimental to Mexican Spotted Owls and that buffer zones should be established around nest sites to protect breeding owls (Swarthout and Steidl 2001, 2003).

Carlsbad Caverns National Park, New Mexico

Carlsbad Caverns National Park has 23 detection records of Mexican spotted owls. Formal surveys in 2010, covering half of the wilderness area of the park, documented 16 of those records, which likely represented 4 male individuals and 1 pair. While most of these early records suggest that the owls were dispersing or wintering individuals, the most recent observations (since 2005) indicate that this species is a resident in some of the narrow, steep-sided canyons with floors above 1,525 m (5,000 ft) in elevation. Four sites can be designated as PACs given the recent records. The park is characterized by steep-walled canyons with caves and ledges, with limited areas of scattered ponderosa pine and maple-oak ravine woodlands. The woodlands are less than four percent of the park acreage and tend to occur on north-facing slopes above 1,500 m (4,900 ft) or in canyon bottoms. Although breeding has yet to be documented, the narrow canyons at higher elevations in the park most likely provide nesting habitat for Mexican spotted owls.

The park backcountry receives little human use, and there are no special management restrictions for owls. The Fire Management Plan guides the most prevalent vegetation management in the park. The western half of the park, with rugged canyons and the majority of woodland patch habitats, is slated for management as a wildland fire use study area under the plan. Several large fires since the 1970s, including those in 2010 and 2011, have burned most of the park. However, many of the narrow canyons likely to be used by Mexican spotted owls have not been greatly impacted. However, the influence of these fires may limit woodland regeneration and favor montane shrublands where the owls may forage.

Chiricahua National Monument, Arizona

There are two sites with spotted owl occupancy that are managed as PACs. Management of this acreage is addressed in the Fire Management Plan. In 2011, a wildfire burned over the entire Monument. Owl surveys will be conducted to determine if the PACs are still occupied.

Coronado National Memorial, Arizona

Coronado National Memorial has surveyed for Mexican spotted owls in most years since 1997 and has found a pair using one site consistently. As part of a study of the population biology of Mexican spotted owls in sub-Mogollon Arizona (Duncan and Spiech 2002), the adult owls and their young from 1997 and 1999 were captured, marked with color bands and aluminum bands, and monitored through 2000. The purpose of this study was to determine survivorship, reproductive success, environmental variation, and population trends. Research has also been done on rodent populations in the PAC. In 2011, a wildfire burned over the entire Monument; the PAC burned with a light severity. Owl surveys will be conducted to determine if the PAC is still occupied.

Dinosaur National Monument, Colorado

There is one known owl territory in Dinosaur National Monument where a single bird was observed in two consecutive years in the late 1990s. The territory is located within an extremely remote area of the park that receives little human use. The site has not been designated as a PAC due to the remote location and lack of management action there. There are no known threats to this territory. In 2009, biologists were unsuccessful in their attempt to access the site and determine if owls were present.

Gila Cliff Dwellings National Monument, New Mexico

The Gila Cliff Dwellings National Monument consists of 216 ha (533 ac) and does not have any spotted owl records from within the unit. However, it is surrounded by Gila National Forest acreage, and the park acreage may contribute to owl home ranges that are centered on FS-administered lands.

Glen Canyon National Recreation Area, Arizona and Utah

Glen Canyon National Recreation Area has ten spotted owl detections that are managed as PACs. No surveys have been conducted since the late 1990s except for a survey in Miller Canyon, where a pair was observed in 2009.

Grand Canyon National Park, Arizona

There are 40 known Mexican spotted owl territories within Grand Canyon National Park, all of which have been mapped as PACs. Due to restricted access to many PACs, annual monitoring of all PACs is not practicable. However, a minimum of 18 PACs were occupied in 2001, 20 PACs in 2002, 13 PACs in 2003, and 10 PACs in 2004. One owl in each of seven PACs was radio-

tracked in 2004 (Bowden 2008). Systematic surveys continue to be implemented yearly on the North and South Rim prior to undertaking fire-related activities.

In Grand Canyon National Park, Mexican spotted owls have been located primarily in canyon habitat; however, one owl was confirmed on the plateau at the rim's edge on the South Rim, and one owl was detected in several locations on the North Rim plateau <0.8 km (0.5 mi) from the rim (Bowden 2008). All other owl locations and all roost and nest sites have been confirmed below the rim in canyon habitat. Radio-tracking data and home-range analyses from 2004-2007 (Bowden 2008) showed that owls at Grand Canyon roosted and nested in canyon habitat and occasionally foraged on the high plateau within 1 km (0.6 mi) of the rim in ponderosa pine and mixed-conifer forests. All mixed-conifer forest on the North Rim has been surveyed at least twice since 1991, with one owl detected in 2007 (D. Willey pers. obs.). Approximately 16,000 ha (40,000 ac) of predicted canyon habitat occurs in the park and approximately 50% of it has been surveyed. Until further information is available, the Park continues to survey for owls in mixed conifer habitat on the North Rim and in canyon habitat throughout the park.

Guadalupe Mountains National Park, Texas

There are eleven Mexican spotted owl detections in Guadalupe Mountains National Park that have been identified as PACs. Several other detections of single male owls have been located in the park. The owls are found in areas of steep-walled canyons with wooded bottoms consisting of a well-developed overstory and open understory. Owls may not occupy some survey areas due to an overly dense understory that may limit the owls' ability to forage. Spotted owl observations over the past 30 years cluster the birds' activity areas in about six locations in the park, and some areas remain unsurveyed. Production of young has been documented intermittently since 1994. Most owl habitat is located in remote areas of the park and is not routinely subject to disturbance from human activity. The park has restricted potentially impacting activities (e.g., helicopter use and blasting activity for trail improvements) near known territories during the breeding season. The greatest threat to the owl is habitat loss from stand-replacing wildfire, and the park has initiated fuels treatments to reduce this threat.

Mesa Verde National Park, Colorado

There are three sites documented as owl territories within Mesa Verde National Park and other areas where owls have been heard. Breeding has not been documented since the 1990s. The lack of owl detections recently is a concern and suggests the need for continued surveys. Owl habitat is in sandstone canyons and side canyons with Gambel oak thickets and stands of pinyon-juniper and Douglas-fir. Areas used by spotted owls are managed as de facto PACs but designation is still pending. Recent severe wildfires have burned thousands of acres of pinyon-juniper, Douglas-fir, and woodlands on the mesas adjacent to the canyons, which may provide foraging habitat for the canyon-dwelling owls. Stand-replacing fires continue to be a threat to owls and owl habitat in the park. A unique management issue at Mesa Verde National Park is the Mexican spotted owl's use of Ancestral Puebloan architecture (ruins) for nesting and roosting. This creates a potential conflict with modern human use of these sites by visitors and archeologists.

Navajo National Monument, Arizona

Land within the Navajo National Monument is owned by the Navajo Nation, but is under NPS management for administrative care of culturally significant structures and recreation control. The Monument is approximately 243 ha (600 ac) in size and receives approximately 66,000 visitors per year. The Monument contains canyon habitat for the Mexican spotted owl. Mexican spotted owls were initially identified within the Monument in 1986 and the Navajo Nation established a PAC in Betatakin Canyon in 1997. A majority of the PAC area is outside the Monument on Navajo Nation lands. However, the head of Betatakin Canyon, which is within the Monument, contains spotted owl nesting habitat and there are several records of spotted owl detections in this area. That portion of the PAC on the Monument is subject to the Navajo Nation Management Plan for the Mexican Spotted Owl, but the National Park Service is still required to consult under Section 7 of the Act for any projects that may affect the owl.

Saguaro National Park, Arizona

Resident Mexican spotted owls were first detected in Saguaro National Park in 1992. The park currently supports five owl sites in the Rincon Mountain District of the park, each with a designated PAC and core area (1,200 ha [3,000 ac] total). Radio telemetry studies from 1996-1998 confirmed the number and territories of breeding pairs, their reproductive success, roosting and foraging habitat, and diet, and documented owl behavioral responses to local prescribed burns (Willey 1998a). The owls have been monitored intermittently since that time in relation to fire-management activities. At least one adult (usually a male) has been located in each PAC every year that surveys have been conducted. For management purposes, all vegetated acreage above 2,000 m (6,000 ft) elevation is considered potential spotted owl habitat. Habitat loss from wildland fire and human disturbances related to fire management are probably the greatest potential threats to the park's owls.

Mexican spotted owl breeding habitat is limited to the upper elevations of the Rincon Mountains in the park, usually on north facing slopes; most of this habitat is now in PACs. Prescribed burns have been conducted in about 800 ha (2,000 ac) of such habitat, and wildland fires have occurred in PAC acreage. Approximately 200 ha (500 ac) have been affected by canopy fire (mostly from wildfire) in the past 10 years.

Tonto National Monument, Arizona

In February 2010, a spotted owl was photographed with a night-time camera trap near the center of this National Monument. Until that time, spotted owls had not been confirmed. No surveys had been done because the habitat was not considered suitable. With this new detection, the park will attempt to conduct surveys to determine if a PAC is warranted. At this time there are no PACs delineated at Tonto NM.

Walnut Canyon National Monument, Arizona

The earliest record of Mexican spotted owl activity at Walnut Canyon National Monument dates to 1980, when a roost site was reported. A pair of owls was observed near this location again in

1986, but no nest was found. There are approximately 730 ha (1,800 ac) of owl habitat in the park, all of which has been surveyed to protocol at least once. Informal and protocol surveys occurred in nine breeding seasons between 1987 and 1999. Surveys between 2000 and 2003 did not result in owl detections, though an owl was incidentally observed in 2003. The area in the east canyon that was added to the park in 1996 has not been formally inventoried. Three PACs were established within the monument. No areas within owl habitat have been treated with prescribed fire or mechanical thinning, nor have any areas of habitat been lost to canopy fire in the past 10 years. The Fire Management Plan includes some site-specific mechanical thinning to protect natural and cultural sites at risk, but it does not propose prescribed fire in PACs due to topography. Greatest threats to owls at Walnut Canyon National Monument include growth and development of nearby human communities, drought and insect-related conifer mortality, risk of crown fire, changes in riparian vegetation, and increases in outdoor recreational use.

The three PACs encompass most of the Douglas-fir-Gambel oak, ponderosa pine-Gambel oak, pinyon-juniper-shrub-succulent vegetation on steep slopes, and much of the riparian corridor along the bottom of Walnut Canyon National Monument within and adjacent to the monument. All three PACs include acreage outside of the monument boundary on the surrounding Coconino National Forest. A fourth PAC is centered on the National Forest and includes some acreage of the Monument.

Zion National Park, Utah

There are 29 known Mexican spotted owl territories within Zion National Park, which are mapped into 20 PACs (8,757 ha [21,639ac]). In 2009, owls were detected in 81% of 27 territories monitored. The oldest record for owls in the park, a single juvenile, is from 1928. There were no subsequent owl observations until 1963 and 1974, with formal owl surveys beginning in the 1970s. Research on the owls in Zion occurred between 1987 and 2000; studies included owl distribution, habitat characteristics, home ranges and juvenile dispersal, and habitat disturbance effects on owls. Zion has been monitoring Mexican spotted owl territory occupancy and nesting activity on a regular basis since 1995. Prescribed burning has been used as a management tool on approximately 1,700 ha (4,200 ac) of owl habitat with no loss of the forest canopy.

The greatest threat to spotted owls in Zion comes from increased visitor use, especially visitation to canyons containing owl habitat. Some of the nesting sites are in heavy human-use areas. All of the canyons requiring technical climbing ability and equipment require access permits and have use limits. A three-year study on the effects of recreation in canyons on owl occupancy and reproduction was initiated in 2008. Another concern is high severity fires burning in foraging habitat as a result of increased fuel loads resulting from years of fire suppression. Reintroducing fire is a priority.

Spotted owl nesting habitat in Zion is found in canyons and adjoining areas are used for foraging. The habitat in these landscapes is described as vertical and overhanging cliffs; parallel-walled canyons with cool, north-facing aspects; complex side canyons; and a mosaic of vegetation types. The rock walls include caves, ledges, and fractured zones that provide protected nesting sites. The canyons also include patchy areas of vegetation along canyon

bottoms, on flat benches, or on plateaus or mesa tops above the canyon rim. Canyon habitat in the park is estimated at roughly 25,000 ha (62,000 ac). For this estimate, mesa tops between the canyons were included because the owls may use these areas for foraging. However, this does not imply the mesa tops are considered nesting habitat.

iv. Bureau of Land Management (BLM)

Arizona

Most BLM-administered spotted owl habitat in Arizona is in the Arizona Strip area of the CP EMU. Protection and recovery considerations are oriented toward the vicinity of steep-walled rocky canyons that meet criteria as potential nest/roost habitat. The BLM is implementing the original Recovery Plan (USDI FWS 1995) in this area by avoiding habitat-altering projects such as timber harvest within 1.6 km (1 mi) of canyons that could support breeding or roosting owls. No mixed-conifer forest occurs on public land in the Arizona Strip. The BLM continues to periodically survey for Mexican spotted owls in a few accessible areas. No birds have been found. The BLM in the Arizona Strip addresses Mexican spotted owl recovery opportunities in its Resource Management Plan.

The Hualapai Mountains, administered by the Kingman Field Office (FO), support one historical breeding location for spotted owls. Much of the 1,750 ha (4,300 ac) of ponderosa pine and mixed conifer forest in the Hualapais is shared by the owl and the endangered Hualapai Mexican vole, which also has a recovery plan under implementation. Since the most recent record of Mexican spotted owl breeding activity dates from 1979, no PAC has been designated. As on the Arizona Strip, the BLM continues to periodically survey for Mexican spotted owls in a few accessible areas thought to contain spotted owl habitat, yet no birds have been found. The BLM's activities are oriented to maintaining the existing ponderosa-pine forest and a very small amount of mixed-conifer forest in the Hualapai Mountains. Activities in historical spotted owl habitat are compatible with the original Recovery Plan and those identified in the Hualapai Mexican Vole Recovery Plan (T. Cordery, USDI BLM, pers. comm.).

New Mexico

Of the 849,840 ha (2.1 million ac) designated as Mexican spotted owl critical habitat in New Mexico, only 879 ha (2,171 ac) are located on BLM-administered lands. Furthermore, there are no protected owl habitats, as defined in the original Recovery Plan, or known extant Mexican spotted owl populations on BLM-administered lands in New Mexico. Historically, BLM lands in New Mexico likely contained forest stands suitable for the owl. However, from as early as the 1800s, homesteaders, owners of land grants, and private logging companies removed most of the large commercial timber, and few dense, older forests exist today. Of the six BLM FOs in New Mexico, four have implemented management actions for the Mexican spotted owl: Farmington FO, Taos FO, Rio Puerco FO, and Socorro FO (M. Ramsey, USDI BLM New Mexico State Office, pers. comm.). Of these four FOs, the Farmington FO is the only one to administer lands with critical habitat and has the greatest potential for supporting owls. However, Mexican spotted owl surveys were conducted from 1992 through 2009 and no owls were reported. A single owl was heard in 2002, but it was determined that it was a "floater" moving through the area (USDI BLM 2002). Only limited areas of BLM lands within the Taos FO have the potential

to meet the habitat criteria to support the owl and there has only been a single confirmed owl sighting within the FO; on 26 June 1991, an “inferred Mexican spotted owl” was detected in a Douglas-fir tree on BLM lands on the east side of Archuleta Mesa (UNM 1995). A BLM protocol survey for the owl was conducted in 1993 along the same transects where the owl was recorded in 1991, but no responses from spotted owls were elicited (USDI BLM 1993). Mexican spotted owl surveys were conducted by the Rio Puerco FO in 1992, but no responses from spotted owls were elicited and no suitable habitat was identified (M. Ramsey, USDI BLM New Mexico State Office, pers. comm.). The Rio Puerco FO has not subsequently conducted any surveys for the owl. Although owls are known to occur in mountains in west- and south-central New Mexico, including Mogollon and Tularosa mountains in Catron County, and the San Mateo Mountains in Socorro County, no owls or suitable habitats were documented during owl surveys conducted by the Socorro FO in 1992, 1993, and 1998 (M. Ramsey, USDI BLM New Mexico State Office, pers. comm.).

Considering the most current information on the limited distribution of the Mexican spotted owl and its required habitats on BLM-administered land in New Mexico, ongoing programs within FOs have very little potential to create disturbances to the Mexican spotted owl. Nonetheless, in any areas where Mexican spotted owls or their habitat are identified on BLM-administered lands or where BLM-administered lands are adjacent to other lands that have been identified as Mexican spotted owl habitat, the BLM will follow guidelines in the Recovery Plan in managing its timber and fuelwood programs, oil and gas development, coal leasing and development activities, and off highway vehicle activity.

Utah

Five separate critical habitat units were designated for the owl in Utah totaling some 912,000 ha (2,252,857 ac) (69 FR 53181). Of that total, approximately 147,000 ha (362,135 ac) are located on public lands administered by BLM. The administrative units with designated critical habitat are the Price, Moab, Monticello, Richfield, Kanab, Cedar City, and St. George FOs and the Grand Staircase-Escalante National Monument.

Much of the Utah habitat has been inventoried and monitored by Utah Division of Wildlife Resources (UDWR) personnel with funding from the Utah State BLM Office. As a result of these studies, over 100 protected activity centers (PACs) in Utah have been identified, of which approximately 20% occur on BLM-administered lands. These studies are continuing, and Utah BLM also continues to work collaboratively with UDWR to develop habitat models to guide survey efforts and to assist in project evaluations. Predictive habitat models developed in 1997, 2000, and 2007 (e.g., Willey 2007) are currently being used in determining habitat and potential impacts to the owl and its habitat from actions authorized by BLM.

In 2008, Utah BLM completed work on six land use plans. This effort included major plan revisions for the Vernal, Price, Moab, Monticello, Richfield, and Kanab FOs. Section 7 consultation was a major aspect of plan preparation and appropriate conservation measures were incorporated into the plans. The St. George FO and Grand Staircase-Escalante National Monument also are current in their land management plan Section 7 consultations for the owl.

Colorado

The BLM in Colorado has been managing under the 1995 Recovery Plan recommendations. Most owl habitat occurs in narrow, rocky canyons with difficult access. Few projects occur in these sites, but those that do include grazing permits, transmission line rights-of-way, and a rock quarry. Projects rarely occur within PACs. These projects are generally managed consistent with the guidelines in the 1995 Recovery Plan.

Since 1990, the BLM conducted spotted owl inventories on BLM lands throughout Colorado. Currently occupied owl sites on BLM land in Colorado are located along the Front Range in the Canon City area. The BLM has established PACs of at least 240-ha (600-ac) in size at all Mexican spotted owl sites where owls have shown some level of occupancy (i.e., not believed to be transitory owls) since 1990 (Table B.1). Several owl sites are being further evaluated for potential establishment of PACs. The number of occupied owl sites on BLM lands in Colorado has generally remained steady since 1992, with several of the sites showing strong site fidelity by resident birds. One such site has been occupied by the same male banded for the past 17 years.

v. Department of Defense (DOD)

Fort Huachuca Military Reservation, Arizona

The Fort Huachuca Military Reservation (Post) in southeastern Arizona is known to support nesting Mexican spotted owls. Fort Huachuca manages owls, habitat, and the activities that may affect owls under the terms of a programmatic biological opinion issued by FWS (14 June 2007). Activities in spotted owl habitat generally are confined to various foot maneuvers and driving wheeled vehicles on dirt roads through canyon bottoms, although law-enforcement activities to interdict illegal immigration and smuggling are frequent and widespread in some owl habitat.

Public recreation accounts for the greatest amount and frequency of human activity in spotted owl habitat. One spotted owl site has been popular with birders for over three decades, but the effect of this activity on owls is unknown. Unauthorized off-trail walking has proliferated at this and at least one other site, and these side trails in the canyon bottoms where owls tend to be found have increased forest-floor disturbance and erosion. Undocumented immigrant passage increased dramatically in 2002 and has been significant and frequent through all canyons and spotted owl habitat. Extensive new trail networks have appeared throughout spotted owl habitat. Law enforcement interdiction efforts day and night have similarly increased in scope and frequency.

Whereas unregulated recreation is considered the mostly likely source of impacts on individual owls, the Army considers wildland fire to be the greatest potential threat at the population level. The Army assesses the possibility of wildland fire ignition and spread when planning, designing, and authorizing military activities on the Post (S. Stone, DOD, Fort Huachuca, pers. comm.).

Camp Navajo Garrison Training Center, Arizona

Camp Navajo Garrison Training Center is located in northern Arizona, west of the City of Flagstaff. The installation contains protected, recovery, and designated critical habitat. The Volunteer Canyon PAC was designated in 1988 on the southern end of the installation, in portions of Volunteer Canyon, extending into the Coconino National Forest. Mexican spotted owl surveys of Camp Navajo have been conducted since 1997, primarily within the southern and western portions of the installation. Adult Mexican spotted owls and potential juveniles were heard within the PAC on Camp Navajo during the summer of 2000 and a pair of owls was found in this same location in 2010. Mexican spotted owls were located primarily along the rim and side drainages of Volunteer Canyon near the installation's southern boundary with the Coconino National Forest.

Recovery habitat also occurs along the western portion of the installation. A telemetry study in the fall of 1995 found that a dispersing juvenile Mexican spotted owl spent approximately two weeks in the immediate vicinity of Volunteer Mountain before dispersing onto the Kaibab National Forest (J. Ganey, USDA FS, pers. comm.). The 2008 surveys conducted by the Arizona Game and Fish Department (AGFD) detected an owl in the Volunteer Mountain area; however, no responses were noted during subsequent visits to the site or adjacent sites during the 2008 field season. Therefore, the recovery habitat within the Camp Navajo facility could serve as an important corridor for dispersing owls. Designated critical habitat for the MSO is located along the southern portion of the installation and includes the majority of Volunteer Canyon.

U.S. Naval Observatory Flagstaff Station, Arizona

The U.S. Naval Observatory Flagstaff Station (NOFS) is located in northern Arizona, just outside the City of Flagstaff. The NOFS has joint management of the Dry Lake PAC with the Arizona State Land Department and the Coconino National Forest. Surveys for Mexican spotted owls at NOFS and the Dry Lake Crater Caldera began in 1994 when Arizona State Land Department personnel first detected an owl either immediately adjacent to or on the NOFS property. Since 1994, surveys have been conducted by the Arizona State Land Department, FS, and U.S. Geological Survey/Southwest Biological Science Center/Colorado Plateau Research Station. The owls associated with the Dry Lake PAC are usually located on NFS lands, but the NOFS has been managing its portion of the PAC and recovery habitat per the 1995 Recovery Plan recommendations.

Kirtland Air Force Base, New Mexico

On 20 March 2009, Kirtland Air Force Base (KAFB) personnel detected a male Mexican spotted owl of unknown age incidental to general avian point count surveys (Enviroligical Services, Inc. 2009). KAFB personnel were not successful in their attempts to relocate the owl on 2 April 2009. In response to this first confirmed detection of a spotted owl on KAFB, standardized FWS owl surveys were completed on base from 4 May to 11 July 2009. No spotted owls were detected during the surveys, but some suitable habitat was delineated. Suitable spotted owl habitat on KAFB is patchily distributed and is interspersed with large tracts of open or arid and unusable habitat. Suitable habitat includes stands of ponderosa pine with Gambel oak understory, some drainage bottoms with deciduous components, and some cliff bands. On

KAFB, ponderosa pine is generally distributed at higher elevations or in drainage bottoms. Most canyons with a northern exposure on KAFB are wide, with cliffs occurring in bands usually toward the top of the canyon. As these canyons are broad, these bands receive a high degree of solar radiation and, therefore, are less suitable for breeding spotted owls. Because KAFB contains only pockets of habitat for owls and no mixed-conifer habitat, spotted owls likely do not breed on the base. However, KAFB might provide adequate habitat for dispersing or wintering birds. KAFB does not allow recreational activities in the area where the owl was detected, though unregulated recreational activity (e.g., mountain biking) does occur. Activity in KAFB owl habitat can include occasional law-enforcement activities, hiking by official personnel, biologists conducting wildlife surveys, helicopter activity, and various foot maneuvers.

Other U.S. Military Involvement

Low-level military air operations have been identified through Section 7 consultations as actions that may affect Mexican spotted owls. Low-level flights from air-rescue and attack model helicopters along with jet aircraft have flown over PACs in UGM and BRE EMUs. Emergency training missions of attack helicopters based out of Holloman Air Force Base occurred over several PACs in the Sacramento Mountains as recently as 2009 (J. P. Ward, Mexican Spotted Owl Recovery Team, pers. comm.). It is currently unknown if these types of training missions will continue in the future. Additionally, Fort Bliss near El Paso, Texas, is increasing its troop capacity and future training missions may include helicopter flights over owl sites in nearby mountain ranges of the BRE EMU. Holloman Air Force Base has funded studies to assess the effects of low-level flights but we are not aware that those results have been published.

vi. Department of Energy

Los Alamos National Laboratory, New Mexico

Mexican spotted owls were first reported at Los Alamos National Laboratory (LANL) in 1995 when management-related owl surveys located a nesting pair. At LANL, owls nest in canyons with cool, moist, mixed-conifer forests. The majority of owl habitat is within the central to western portions of LANL. The owls at LANL have been found to nest in cliff cavities rather than trees. Instead of PAC delineation, Areas of Environmental Interest (AEIs) were mapped as part of LANL's 2000 Habitat Management Plan. An AEI consists of a core boundary around suitable nesting habitat with an accompanying buffer habitat extending 420 m (0.25 mi) beyond this boundary. These alternative methods of delineating owl habitat areas were used instead of known nesting areas. The AEIs are surveyed annually and access, noise, and habitat modification restrictions are in place each year until occupancy is determined.

Owl surveys have been conducted on LANL property annually since 1994. In 1995, a pair of Mexican spotted owls was located and the AEI has been occupied each year since. In 2004, 2005, and 2006, a second AEI was found to be occupied by at least one Mexican spotted owl. In 2007, a pair of spotted owls was located in a third canyon and this AEI has been occupied each year since. The two AEIs with active pairs have successfully bred in most years.

b. States

i. Arizona

All of Arizona's native wildlife, including threatened and endangered species, is protected under the general provisions of Arizona Revised Statutes, Title 17. It is illegal to "take" wildlife unless authorized by the Arizona Game and Fish Commission. "Take" is specifically defined under A.R.S. § 17-101 to mean "pursuing, shooting, hunting, fishing, trapping, killing, capturing, snaring or netting wildlife or the placing or using of any net or other device or trap in a manner that may result in the capturing or killing of wildlife." Further, the Mexican spotted owl is protected under A.R.S. § 17-236 which makes it "unlawful to take or injure any bird or harass any bird upon its nest, or remove the nests or eggs of any bird, except as ...authorized by commission order." There is no commission order in Arizona allowing for the "take" of Mexican spotted owl as defined in Title 17.

Currently, in Arizona's State Wildlife Action Plan, the owl is a Species of Greatest Conservation Need. It is listed as a Tier 1a species because it is federally listed as threatened. Species identified in the State Wildlife Action Plan have the highest priority for conservation management and are eligible for congressionally appropriated funds.

Management actions taken by the AGFD for the spotted owl have included: (1) participation in the original FS-sponsored Mexican Spotted Owl Task Force; (2) member of the FWS-sponsored Mexican Spotted Owl Status Review Team; (3) member of the Mexican Spotted Owl Recovery Team; (4) member of three Mexican Spotted Owl EMU Working Teams; (5) funding research and surveys to determine the status of the Mexican spotted owl in Arizona; and (6) continued review and technical guidance on projects that might impact Mexican spotted owl occupied or potential habitat.

Only one Mexican spotted owl nest has been located on Arizona State land, although approximately seven primary activity centers are on state or private lands located within Coconino, Santa Cruz, and Cochise counties. However, more Mexican spotted owls may occur on state lands than what is known because no standardized surveys have been completed on these lands in over a decade.

ii. Colorado

The Mexican spotted owl was state-listed as threatened by the Colorado Division of Wildlife (CDOW) in 1993. "Threatened" wildlife is defined as "...any species or subspecies of wildlife which, as determined by the Colorado Wildlife Commission, is not in immediate jeopardy of extinction but is vulnerable because it exists in such small numbers or is so extremely restricted throughout all or a significant portion of its range that it may become endangered." Threatened status protects wildlife species by making it unlawful "...for any person to take, possess, transport, export, process, sell or offer for sale...any species or subspecies of [threatened] wildlife..." In addition, the CDOW is legislatively mandated to "...establish such programs including acquisition of land...as are deemed necessary for management of...threatened species."

iii. New Mexico

Although the Mexican spotted owl is not state-listed under the New Mexico Wildlife Conservation Act (17-2-37 New Mexico Statutes Annotated [NMSA 1978]), it and other owls are protected by Statute 17-2-14 (NMSA 1978), which states that it is unlawful for any person to take, attempt to take, possess, trap, ensnare, or in any manner injure, maim, or destroy owls. Under this statute, it is also unlawful to purchase, sell, trade, or possess for the purpose of selling or trading any owl parts. The owl is also listed as a Species of Greatest Conservation Need in the Comprehensive Wildlife Conservation Strategy of New Mexico (NMDGF 2006), which is New Mexico's strategic action plan for conserving the state's biodiversity and, thereby, precluding the necessity of listing more species as threatened and endangered.

Management actions taken by the New Mexico Department of Game and Fish (NMDGF) for the spotted owl include: 1) participation in the original FS-sponsored Mexican Spotted Owl Task Force; 2) serving as a member of the FWS-sponsored Mexican Spotted Owl Status Review Team; 3) serving as a consultant to the Mexican Spotted Owl Recovery Team; 4) serving as a member of Mexican Spotted Owl EMU Working Teams; 5) funding research to determine the status of the Mexican spotted owl in New Mexico; 6) funding surveys in Mexico and on non-Federal lands in New Mexico; 7) oversight of the creation of the first Mexican spotted owl statewide database; and, 8) continued review and technical guidance on projects that might impact Mexican spotted owl occupied or potential habitat, as authorized by Statute 17-1-5.1 (NMSA 1978; M. Watson, NMDGF, pers. comm.).

Mexican spotted owls or their required habitats are not known to occur on any state-administered lands, but much of New Mexico's State lands have not been surveyed. Although spotted owls and their required habitats might occur on state park lands and New Mexico Department of Game and Fish Wildlife Management Areas, no standardized surveys have ever been completed on these lands (S. Cary, New Mexico State Parks Department, pers. comm., J. Hirsch, NMDGF, pers. comm.). However, spotted owls have been detected within 1.6 km (1 mile) of State Park and New Mexico Department of Game and Fish co-managed land near Fenton Lake (Sandoval County) during spotted owl surveys completed by the FS (J. Hirsch, NMDGF, pers. comm.). Similar to other state lands, New Mexico State Trust Lands (Trust Lands) are not known to support Mexican spotted owls (S. Knox, New Mexico State Land Office, pers. comm.). Still, it is possible that spotted owls occur on Trust Lands as potential spotted owl habitat has been identified on Trust Lands in southern Colfax County, southern Lincoln County, northwestern Union County, eastern Catron County, and northern Otero County. Surveys have been conducted only when forest-thinning projects were proposed within potential spotted owl habitat on Trust lands near Black Lake (Colfax County), Valley of the Utes (Colfax County), and Moon Mountain (Lincoln County). Thus, spotted owl occupancy of potential habitat cannot be determined until other Trust Lands are surveyed. Funding options are currently being explored for surveying other potential habitat on Trust Lands (S. Knox, New Mexico State Land Office, pers. comm.).

iv. Texas

Few Mexican spotted owls are documented for Texas, and most of the location records are in Guadalupe National Park (see section on Guadalupe Mountains National Park, Texas, above). However, there are four known spotted owl locations in the Davis Mountains of Jeff Davis County based on owl detections since the mid-1990s. These locations are in the Davis Mountains preserve, owned by The Nature Conservancy. Given the size of the Davis Mountains, the extensive amount of canyon and mesic pine-oak habitat, and recent results from predictive habitat models (Chihuahuan Desert Network, USDI NPS, unpublished data), it is likely that there are a number of undiscovered owls in that area. There is also one visual observation of a Mexican spotted owl in Big Bend National Park.

The State of Texas has listed the species as threatened. In addition, Chapters 67 and 68 of the Texas Parks and Wildlife Code, and Sections 65.171-65.176 of the Texas Administrative Code, prohibit the taking, possession, transportation, or sale of any animal species designated by state law as endangered or threatened without issuance of a permit. Destruction of eggs and nests of nongame birds is also prohibited

(<http://www.tpwd.state.tx.us/huntwild/wild/species/ending/regulations/texas/index.phtml>).

v. Utah

The Mexican spotted owl is included on the Utah State Sensitive Species list and the Utah Wildlife Action Plan as a federally Threatened Species and Tier I Species of Greatest Conservation Need, respectively. Threatened species receive protected status under Utah wildlife code. For species under protected status, "...[A] person may not take...protected wildlife or their parts; an occupied nest of protected wildlife; or an egg of protected wildlife." Nor may a person "...transport,...sell or purchase...or possess protected wildlife or their parts."

The Utah Division of Wildlife Resources (UDWR) has been collaborating with Federal agencies in implementing recommendations from the 1995 Recovery Plan. The three primary thrusts of this work have been to fill gaps in data on spotted owl distribution and status, to develop multivariate models of spotted owl canyon habitat in Utah, and to test occupancy sampling as a monitoring tool. The UDWR also works closely with the FWS and other Federal and state agencies in providing information for formal and informal consultations.

c. Tribes

Tribal beliefs and philosophies guide resource management on tribal lands. Included within this cultural context, many tribes employ the federally accepted survey methodology and management techniques consistent with those contained in this Recovery Plan. Several tribes consider owls a bad omen or a warning of danger or neglect, so owls play an important cultural role. Tribal beliefs also dictate that all living creatures are essential parts of nature and, as such, they are revered and protected. For example, the Elders Council of San Carlos Apache Tribe expressed the traditional view that owls and their homes should not be disturbed.

Tribes are sovereign governments with management authority over wildlife and other natural and cultural resources on their lands. Many tribes maintain professionally staffed wildlife and natural resources management programs to ensure prudent management and protection of tribal resources, including threatened and endangered species.

Most tribes consider their wildlife information to be proprietary and therefore we only discuss below information for which disclosure has been authorized by the individual tribes. Mexican spotted owl habitat or potential habitat exists on at least 10 Indian reservations in the United States. At least nine tribes have conducted spotted owl surveys, and at least six Tribes have located spotted owls on their lands. Two other tribes have historical spotted owl records. We discuss below spotted owl conservation efforts on seven Indian Reservations/Pueblos: the Mescalero Apache, San Carlos Apache, Jicarilla Apache, Navajo Nation, Southern Ute, and Northern and Southern Pueblos Agencies.

i. Mescalero Apache Tribe (New Mexico)

The Mescalero Apache Tribe began conducting surveys for the Mexican spotted owl in 1988, five years prior to its listing as a threatened species under the ESA. Since that time, more than 48,500 ha (120,000 ac) of forested reservation lands have been surveyed for the owl. The first draft of the Mescalero's Mexican Spotted Owl Management Plan was completed in 1995 and, after six years of discussions and revisions, the plan was accepted by the FWS in 2001.

Forest management on the Mescalero Apache Reservation emphasizes uneven-aged silvicultural techniques, specifically single-tree and group-selection cutting methods. Uneven-aged management results in a relatively unfragmented forest with stand-level conditions exhibiting vertical and horizontal structural diversity and moderate to thick canopy cover. As in many areas of the southwestern United States, stand-replacing fires are the primary threat to preserving Mexican spotted owl habitat. The Mescalero Apache Tribe maintains an active resource-management program that includes forest stand improvement, fuels reduction in the WUI, and watershed restoration treatments.

ii. San Carlos Apache Tribe (Arizona)

Traditional Apache culture and a deep abiding respect and love for the land, the water and all species inform the Tribe's management of the San Carlos Apache Reservation (Reservation), management of the land, and associated natural resources and environmental protection of all plant and animal species. Traditional Tribal ecological knowledge (TEK) is a key and fundamental principle of species conservation and land management on the Reservation. TEK incorporates concepts of an ecosystem-based approach to land and species management and conservation. It incorporates concepts of adaptive management by the Tribal government, the Tribal leaders and elders, and the Apache people in land and species management and preservation.

Consistent with TEK, the Tribe adopted a Strategic Plan in September of 2004. The Strategic Plan was developed with the Tribe's vision, goals, and objectives, to serve as an action plan for all resources on the Reservation. In February 2004, the Tribe adopted its Mexican

Spotted Owl Conservation Plan for the San Carlos Apache Reservation (Conservation Plan). The Tribe's Conservation Plan was designed and drafted with the assistance, among others, of the FWS. TEK was a paramount consideration and guiding principle in the drafting of the Conservation Plan. The Conservation Plan has been actively implemented on the Reservation since its adoption.

The Conservation Plan delineated PACs around known owl sites in all forested habitat of the Reservation. The Conservation Plan ensures that Tribal land-management activities and policies do not jeopardize the continued existence of Mexican spotted owls on the Reservation. Jeopardizing the existence of any species would be counter to the Apache cultural belief that all things were created for a purpose and have value. Mexican spotted owl habitat has been identified and delineated throughout the Reservation. Approximately 90% of tribally identified nesting, roosting, and foraging habitats are on lands inoperable for timber harvest and therefore are not in the commercial timber base.

In October of 2003, the Tribe adopted the San Carlos Apache Tribe Forest Management Plan (FMP) for the planning period 2004 to 2015. The FMP was also drafted with consideration of TEK. Indeed, the FMP addressed significant sections of the plan to wildlife, threatened and endangered species and fisheries, including addressing the specific needs of the Mexican spotted owl. The FMP has been actively implemented on the reservation since January of 2004. The FMP was available and considered by the team which drafted the Conservation Plan.

Since the adoption of the Conservation Plan, the Tribe and its responsible departments have interfaced and worked with FWS staff in the implementation of the plan. Similarly, departments within the Tribe have worked to implement the Conservation Plan. For instance, consideration is given to spotted owl habitat, including designated PACs, prior to any commercial timber sales on the Reservation. Consultation is undertaken with FWS staff prior to the implementation of commercial timber sales so as to minimize, if not eliminate, impacts to owls.

Furthermore as called for under the Conservation Plan and the FMP, wildland fire management actions are implemented throughout the Reservation as funding allows. These actions include forest thinning and prescribed burns. Mexican spotted owl habitat has benefitted from the management of Tribal forest resources. Indeed, the forest management practices employed on the Reservation are believed to have been a significant factor in reducing and minimizing the effects of the 2011 Wallow Fire, the largest forest fire in recorded Arizona history.

iii. Jicarilla Apache Tribe (New Mexico)

The Jicarilla Apache Nation has developed a Mexican spotted owl conservation plan, approved by the Jicarilla Legislative Council and accepted by the FWS. No resident spotted owls have been detected on the reservation; however, in the event resident owls are detected, the Jicarilla Apache Tribe has proposed to designate a 405 ha (1,000 ac) management territory. Uneven-aged timber management will be allowed to continue in all but 40 ha (100 ac) of the territory. In the absence of confirmed resident owls, all mixed-conifer stands ≥ 10 ha (25 ac) are treated as roosting/nesting sites and timber harvest is not allowed. A seasonal restriction is also proposed around any located active nest sites.

iv. Navajo Nation (Arizona, New Mexico, Utah)

The Navajo Nation occupies over 69,930 km² (27,000 mi²) on the Colorado Plateau within Arizona, New Mexico, and Utah. The Navajo Nation's Department of Fish and Wildlife (Department), under the oversight of the Navajo Nation Council's Resources Committee, is the entity within the Navajo Nation Government that is responsible for management and protection of the Mexican spotted owl on Navajo lands. The Department developed the "Navajo Nation Management Plan for the Mexican Spotted Owl," which was approved by the Resources Committee of the Navajo Nation Council in 2000. Threats to the owl identified in that management plan include abandoned mine reclamation, commercial timber harvest, wildland fire and fire management, fuelwood harvest, livestock grazing, home-site development, large-scale coal mining, recreation, road building and reconstruction, and other human developments and activities.

Although no comprehensive surveys for spotted owls have been performed across the Navajo Nation, this species has been found during pre-project, clearance-type surveys and other biological surveys. This survey information, along with knowledge about the distribution of habitat, gives the Department a relatively good understanding of spotted owl distribution on Navajo lands. The owls occupy three habitat types on the Navajo Nation including the traditional, steep-sloped, mixed-conifer forests; cool, mesic canyons; and a unique habitat referred to as Black Mesa. The latter is restricted to the Black Mesa region near the center of the Navajo Nation, and it is unique because it consists of low- to moderately-sloped drainages containing small patches of Douglas-fir within a matrix of pinyon-juniper woodlands. There is no federally designated critical habitat for the spotted owl on the Navajo Nation.

The Navajo Nation Management Plan for the Mexican Spotted Owl (Management Plan) outlines the various components by which the owl is managed and protected. The owl is protected from "take" under Navajo Nation Code due to its status on the Navajo Endangered Species List; this adds an additional layer of regulation beyond the Federal ESA and Migratory Bird Treaty Act. Their Management Plan provides protection to the owl through: 1) the Tribal project-approval process; 2) mandatory pre-action surveys using the accepted Mexican Spotted Owl Inventory Protocol; 3) establishment of PACs around all recent and historical owl sites consistent with the 1995 Recovery Plan; and, 4) Federal agency consultations with the FWS for Federal actions. In addition, the Department has been a member of the Colorado Plateau Mexican Spotted Owl Recovery Implementation Working Team since its inception.

v. Southern Ute (Colorado)

Both the Southern Ute Tribe and the U.S. Bureau of Indian Affairs, Southern Ute Agency, have shown a strong willingness to work with the FWS in all aspects of Mexican spotted owl conservation, including extensive survey work and implementation of appropriate mitigation measures for planned projects. More than 12,150 ha (30,000 ac) of forested reservation lands have been surveyed for the owl since 1990. Management guidelines have been developed for areas of Tribal land proposed for fuels-reduction projects. These guidelines generally coincide with those set forth in the 1995 Recovery Plan for Restricted and Protected Steep Slope Habitats. Also, fuels-reduction treatments on mesa tops emphasize stand-level conditions with vertical and

horizontal structural diversity and the retention of large, downed logs and snags, where possible, while still meeting the fuels reduction goal.

vi. Northern and Southern Pueblos Agencies (New Mexico)

Twenty-three federally recognized and two Self-Governance Tribes have land within New Mexico’s boundaries. The U.S. Bureau of Indian Affairs Southwest Regional Office has a Federal trust responsibility to provide intergovernmental assistance to all of New Mexico’s tribes through nine agencies: Jicarilla, Laguna, Mescalero, Northern Pueblos, Ramah Navajo, Southern Pueblos, Southern Ute, Ute Mountain, and Zuni. The agencies can provide technical guidance and support for various forest and wildlife programs, such as completing Mexican spotted owl surveys in areas targeted for forest thinning. Tribes served by the Northern Pueblos Agency – the Pueblos of Nambé, Picuris, Pojoaque, San Ildefonso, Ohkay Owingeh, Santa Clara, Taos, and Tesuque – and tribes served by the Southern Pueblos Agency – the Pueblos of Acoma, Cochiti, Isleta, Jemez, Sandia, San Felipe, Santa Ana, Santo Domingo, Ysleta del Sur Pueblo, and Zia – are considered to not support spotted owl habitat or to only support a limited amount of habitat (L. Abeita, Southern Pueblos Agency, pers. comm.; N. Jojola, Northern Pueblos Agency, pers. comm.). Information on extent of spotted owl habitat on other Tribal lands within New Mexico is not available. Nonetheless, when Tribal projects are funded with Federal dollars, Mexican spotted owl surveys are completed on Tribal land in compliance with requirements of the National Environmental Policy Act. In addition, some tribes complete spotted owl surveys on their lands, e.g., when completing forest thinning projects or evaluating the effects of wildland fire. Two of the 10 tribes served by the Southern Pueblo Agency have completed spotted owl surveys, which were done in association with federally funded forest management projects, and no owls were located (L. Abeita, Southern Pueblos Agency, pers. comm.). Lands within the vicinity of the Pueblos of Santa Clara and San Ildefonso were surveyed for owls after the 2000 Cerro Grande Fire. Since then, only one of the eight tribes served by the Northern Pueblos Agency has completed spotted owl surveys, which were done in association with a non-federally funded forest management project (N. Jojola, Northern Pueblos Agency, pers. comm.).

Table G.1. Cumulative range-wide number of sites occupied by one or more Mexican spotted owls on non-Tribal lands in the U.S. at least once during the breeding season since 1989 according to land ownership.

Land Owner	No. Sites	(%)
USDA Forest Service	1,077	81.3%
USDI National Park Service	173	13.1%
USDI Bureau of Land Management	55	4.2%
Private	7	0.53%
US Department of Defense	11	0.8%
State Lands	1	0.07%
Total:	1,324	100%

2. Mexico

a. Protection Status

In Mexico, the Norma Oficial Mexicana 059 (NOM-059-SEMARNAT-2001) is the official list for endangered species. Proposed species are assigned to several threat categories following a review by several Mexican specialists. The Mexican spotted owl is listed as a Threatened species on this list (SEMARNAT 2002). Under the international treaty Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), *Strix occidentalis lucida* is listed on Appendix II (UNEP-WCMC, 2010). The UICN Red List of Threatened Species includes this bird in the category Near Threatened-NT, mentioning declining populations (BirdLife International 2008).

b. Records from Natural Protected Areas (NPAs)

Several Natural Protected Areas (Áreas Naturales Protegidas) in Mexico have records of this species (see Tables G.3 and G.4). The Zona Sujeta a Conservación Ecológica “Sierra Fría” in Aguascalientes is a state-protected area where pairs of owls have been documented in six different localities: Barranca El Tizado, Cueva Prieta, El Carrizal, El Pinal, El Tejamanil, and La Angostura. Since nests have not been found, it is unclear if the species nests in the area (Márquez-Olivas et al. 2002). It is important to mention that in Sierra Fría logging is prohibited and security guards inspect every vehicle driving through the area to stop illegal timber harvest as part of the protected area management (Tarango et al. 2001). There are also records of *Strix occidentalis lucida* in the Reserva de la Biosfera de la Michilía, a Federal protected area in southeastern Durango.

c. Binational Conservation Efforts

Wildlife agencies from Canada, the United States, and Mexico signed a memorandum of understanding in 1996 for the official collaboration among the three countries to protect the wildlife and ecosystems of North America through the establishment of the Trilateral Committee for Wildlife and Ecosystem Conservation and Management. At annual meetings, the Committee addresses a broad array of biodiversity issues, including key strategies for conservation in currently active working groups. One of their working groups, the Species of Common Concern, facilitates dialogue with government wildlife managers to determine species with shared interest and the implementation of protection and recovery actions.

Likewise the CONANP is currently implementing Endangered Species Recovery Plans (Programa de Conservación de Especies en Riesgo [PROCER]) and developing Species Conservation Action Plans (Programas de Acción para la Conservación de Especies [PACE]) to influence protection and recovery of species. Although PROCER is starting with 35 taxa, it is not limited to them because the objective is to pay attention to threatened and priority species in and out of NPAs in Mexico. Based on that premise, *Strix occidentalis lucida*, a listed threatened species by the NOM-059-SEMARNAT-2001, is not excluded from PROCER. It is worth mentioning that although conservation actions focused directly on this species have not been implemented yet, habitat protection has been started for species sharing the owl habitat and protection needs since 2008.

Table G.2. Amount of area within each EMU in the U.S. in different land jurisdictions/ownerships.

Landowner Area by Ecological Management Unit in the United States for the Mexican Spotted Owl										
	BRE		BRW		CP		SRM		UGM	
LAND STATUS	Acres	Hectares	Acres	Hectares	Acres	Hectares	Acres	Hectares	Acres	Hectares
Federal Lands										
BLM	7,175,282.5	2,903,745.4	3,659,160.0	1,480,815.5	24,785,929.3	10,030,549.8	4,255,136.0	1,721,999.3	322,758.8	130,616.4
FS	1,431,950.2	579,492.0	5,580,168.5	2,258,223.1	8,213,268.5	3,323,805.1	15,366,720.6	6,218,716.1	8,699,145.4	3,520,433.3
NPS	277,713.8	112,387.2	79,014.9	31,976.3	4,462,160.5	1,805,779.5	421,809.6	170,701.0	42,427.4	17,169.8
Total Federal	8,884,946.5	3,595,624.7	9,318,343.5	3,771,014.9	37,461,358.3	15,160,134.5	20,043,666.2	8,111,416.4	9,064,331.5	3,668,219.5
State Lands										
AZ	0.0	0.0	5,241,674.7	2,121,239.0	2,407,042.0	974,099.2	0.0	0.0	47,039.7	19,036.4
CO	0.0	0.0	0.0	0.0	60,664.5	24,550.1	758,348.2	306,893.9	0.0	0.0
NM	3,239,860.6	1,311,130.3	550,383.4	222,733.1	736,495.1	298,050.2	690,189.9	279,311.1	503,160.6	203,622.7
UT	0.0	0.0	0.0	0.0	2,554,154.6	1,033,633.8	0.0	0.0	0.0	0.0
Total State	3,239,860.6	1,311,130.3	5,792,058.1	2,343,972.1	5,758,356.3	2,330,333.4	1,448,538.1	586,204.9	550,200.3	222,659.1
Tribal Lands										
Tribal Lands	995,042.8	402,681.1	1,613,903.4	653,126.2	21,620,638.1	8,749,596.8	1,404,034.5	568,194.9	2,321,911.6	939,648.0
Private Lands										
Private Lands	9,596,716.6	3,883,668.9	6,429,327.4	2,601,866.9	15,733,238.6	6,367,041.2	16,453,866.3	6,658,670.1	1,569,133.5	635,008.4
Other										
Other	2,909,784.5	1,177,552.7	239,686.5	96,998.1	336,922.0	136,348.0	552,410.7	223,553.6	29,283.8	11,850.8
TOTAL	25,626,350.9	10,370,657.8	23,393,318.9	9,466,978.1	80,910,513.4	32,743,454.0	39,902,515.9	16,148,039.9	13,534,860.7	5,477,385.7
(in thousands)	25,626.4	10,370.7	23,393.3	9,467.0	80,910.5	32,743.5	39,902.5	16,148.0	13,534.9	5,477.4

Table G.3. Federal and State Protected Areas in Mexico with records of Mexican spotted owls.			
Name	Area (ha)	Location	Type
Reserva Forestal Nacional y Refugio de Fauna Silvestre Sierras de Ajos Bavispe	200,000	Sonora	Federal
Reserva de la Biosfera de Janos	526,482	Chihuahua	Federal
Reserva de la Biosfera Montes Azules	331,200	Chiapas	Federal
Reserva de la Biosfera Sierra de Manantlán	139,577	Jalisco and Colima	Federal
Reserva de Biosfera “La Michilía”	9,325	Durango	Federal
Parque Nacional Cumbres de Monterrey	177,396	Nuevo León	Federal
Parque Nacional Sierra de San Pedro Mártir	72,911	Baja California	Federal
Área de Protección de Flora y Fauna Sierra de Arteaga*	120,428	Nuevo León	Federal
Área de Protección de Flora y Fauna Sierra de Álamos-Río Chucujaqui	92,890	Sonora	Federal
Área de Protección de Flora y Fauna Cerro Mohinora*	9,126	Chihuahua	Federal
Zona Sujeta a Conservación Ecológica “Cerro el Potosí”	989.38	Municipio de Galeana, Nuevo León	State
Zona Sujeta a Conservación Ecológica Sierra Fría	112,090	San José de Gracia, Rincón de Romos, Pabellón de Arteaga, Jesús María y Calvillo, Estado de Aguascalientes	State
Zona Sujeta a Conservación Ecológica “Cerro El Peñón”	103.39	Municipio de Dr. González, Nuevo León	State

*In process to become Protected Area.

Source: Gobierno del Estado de Aguascalientes, 1998; Gobierno del Estado de Nuevo León, 2000, INE-SEMARNAP, 2000; INE-SEMARNAT, 2000; CONANP, 2005; CONANP, 2006; Gobierno Federal, 2009; CONANP, 2010.

Even though there are currently no records of this species in other National Protected Areas (NPAs), it will most likely be found in several of the other NPAs because of its wide distribution. This would increase the distribution of the species within protected areas. This is highly probable in the Transvolcanic Range area, where it would be important to verify several sightings of this species.

Table G.4. Protected Areas in Mexico with potential distribution of Mexican spotted owls.			
Name	Area (ha)	Location	Type
Reserva de la Biosfera Mariposa Monarca	56,259	Michoacán and México	Federal
Parque Nacional Iztaccihuatl-Popocatepetl	90,284	México, Puebla and Morelos	Federal
Parque Nacional Nevado de Toluca	46,784	México	Federal
Parque Nacional Malinche o Matlalcueyatl	45,711	Tlaxcala and Puebla	Federal
Parque Nacional El Tepozteco	23,259	Morelos and D.F.	Federal
Parque Nacional Bosencheve	10,432	México and Michoacán	Federal
Parque Nacional Lagunas de Zempoala	4,790	Morelos and México	Federal
Parque Nacional Insurgente Maria Morelos	4,325	Michoacán	Federal
Parque Nacional Insurgente Miguel Hidalgo y Costilla	1,580	D.F.	Federal
Parque Nacional Desierto de los Leones	1,529	D.F.	Federal
Parque Nacional Cumbres del Ajusco	920	D.F.	Federal
Área de Protección de Flora y Fauna Tutuaca	444,489	Sonora and Chihuahua	Federal
Área de Protección de Flora y Fauna Papigochi	222,274	Chihuahua	Federal
Área de Protección de Flora y Fauna Campo Verde	108,069	Sonora and Chihuahua	Federal
Área de Protección de Flora y Fauna La Primavera	30,500	Jalisco	Federal
Área de Protección de Flora y Fauna Pico de Tancitaro	23,406	Michoacán	Federal
Área de Protección de los Recursos Naturales Cuenca Alimentadora del distrito de riego 043 Estado de Nayarit	2,328,975	Nayarit, Jalisco, and Zacatecas	Federal
Área de Protección de los Recursos Naturales Cuenca Alimentadora del Distrito Nacional de Riego 004 Don Martín	1,519,920	Coahuila	Federal
Área de Protección de los Recursos Naturales Cuenca Alimentadora del Distrito Nacional de Riego 001 Pabellón	97,699	Zacatecas and Aguascalientes	Federal

Source: CONANP 2010

APPENDIX H - ACRONYMS USED IN THE RECOVERY PLAN

AEI	Areas of Environmental Interest
AGFD	Arizona Game and Fish Department
AOU	American Ornithologists' Union
BA	Basal area
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BRE	Basin and Range-East
BRW	Basin and Range-West
CDC	Center for Disease Control
CDOW	Colorado Division of Wildlife
CFR	Code of Federal Regulations
CP	Colorado Plateau
DBH	Diameter at breast height
DC	Desired Condition
DoD	United States Department of Defense
DPS	Distinct Population Segment
DRC	Diameter at root collar
EMU	Ecological Management Unit
ESA	Endangered Species Act
ESR	Emergency stabilization and rehabilitation
FEIS	Final Environmental Impact Statement
FHWA	Federal Highway Administration
FIA	Forest Inventory and Analysis
FLRA	Forest Landscape and Restoration Act
ForestERA	Forest Ecosystem Restoration Analysis
FO	Field office
FS	United States Forest Service
FSM	Forest Service Manual
FWS	U.S. Fish and Wildlife Service
GIS	Geographic Information System
GPS	Global Positioning System
HFRA	Healthy Forests Restoration Act
IDT	Interdisciplinary Team
KAFB	Kirtland Air Force Base
LANL	Los Alamos National Laboratory
NEPA	National Environmental Policy Act
NFS	National Forest System
NMDGF	New Mexico Department of Game and Fish
NMSA	New Mexico Statutes Annotated
NOFS	Naval Observatory Flagstaff Station
NPS	National Park Service
NRZs	Nesting-roosting Zones
OHV	Off-highway vehicle
PAC	Protected Activity Center
PFC	Proper functioning condition

PNVT	Potential natural vegetation type
QMD	Quadratic Mean Diameter
RMRS	Rocky Mountain Research Station
RMSTAND	Stand-exam analysis routines
ROD	Record of Decision
RU	Recovery Units
SDI	Stand Density Index
SMR	Soil moisture
SRM	Southern Rocky Mountain
STR	Soil temperature
SWWP	Southwestern white pine
TIN	Triangulated irregular network
UDWR	Utah Division of Wildlife Resources
UGM	Upper Gila Mountain
USDA	United States Department of Agriculture
USDI	United States Department of the Interior
UTM	Universal Transverse Mercator
SGCNA	Species of Greatest Conservation Need in Arizona
WNV	West Nile Virus
WSCA	Wildlife of Special Concern in Arizona
WUI	Wildland-urban interface

APPENDIX I - LATIN NAMES FOR COMMON NAMES USED IN THE TEXT

Names appear in taxonomic order.

Common Name	Scientific Name
BIRDS	
Golden eagle	<i>Aquila chrysaetos</i>
Northern goshawks	<i>Accipiter gentilis</i>
Red-tailed hawk	<i>Buteo jamaicensis</i>
Thick-billed parrot	<i>Rhynchopsitta pachyrhyncha</i>
Great horned owl	<i>Bubo virginianus</i>
Northern spotted owl	<i>Strix occidentalis caurina</i>
Mexican spotted owl	<i>Strix occidentalis lucida</i>
California spotted owl	<i>Strix occidentalis occidentalis</i>
Barred owl	<i>Strix varia</i>
Barred owl subspecies	<i>Strix varia helveda</i>
Barred owl sunspecies	<i>Strix varia georgieo</i>
Great gray owl	<i>Strix nebulosa</i>
Flammulated owl	<i>Otus flammeolus</i>
Fulvous owl	<i>Strix fulvescens</i>
Imperial woodpecker	<i>Campephilus imperialis</i>
Common raven	<i>Corvus corax</i>
MAMMALS	
Bat species	<i>Vespertilionidae spp.</i>
Rabbits	<i>Sylvilagus spp.</i>
Pocket gopher species	<i>Thomomys spp.</i>
Deer mice	<i>Peromyscus maniculatus</i>
Brush mouse	<i>Peromyscus boylii</i>
Woodrat species	<i>Neotoma spp.</i>
Mexican woodrat	<i>Neotoma mexicana</i>
Vole species	<i>Microtus spp.</i>
Mogollon vole	<i>Microtus mogollonensis</i>
Long-tailed vole	<i>Microtus longicaudus</i>
Mexican vole	<i>Microtus mexicanus</i>
Coyote	<i>Canis latrans</i>
Gray-fox	<i>Urocyon cinereoargenteus</i>
Coati	<i>Nasua nasua</i>
Ring-tailed cat	<i>Bassariscus astutus</i>
Bobcat	<i>Lynx rufus</i>
Elk	<i>Cervus canadensis</i>

INSECTS

Spruce beetle	<i>Dendroctonus rufipennis</i>
Western balsam bark beetle	<i>Dryocoetes confuses</i>
Spruce aphid	<i>Elatobium abietinum</i>
Janet's looper	<i>Nepytia janetae</i>

PLANTS

Maple species	<i>Acer</i> spp.
Rocky Mountain maple	<i>Acer glabrum</i> Torr.
Big-toothed maple	<i>Acer grandidentatum</i> Nutt.
Arizona boxelder	<i>Acer negundo</i> var. <i>arizonicum</i> Sarg.
Alder species	<i>Alnus</i> spp.
Western hop-hornbeam	<i>Ostrya knowltonii</i> Sarg.
Juniper species	<i>Juniperus</i> spp.
Arizona cypress	<i>Cupressus arizonica</i> Greene
Texas madrone	<i>Arbutus xalapensis</i> Kunth.
Chihuahua oak	<i>Quercus chihuahuenses</i> Trel.
Red oak	<i>Quercus coccolobifolia</i> Trel.
Mexican red oak	<i>Quercus eduardii</i> Trel.
Gambel oak	<i>Quercus gambelii</i> Nutt.
Gentry's oak	<i>Quercus gentryi</i> C.H. Mull
Gray oak	<i>Quercus grisea</i> Liebm.
Silverleaf oak	<i>Quercus hypoleucoides</i> A. Camus
Chinkapin oak	<i>Quercus muehlenbergii</i> Engelm.
Mexican white oak tree	<i>Quercus polymorpha</i> Schlecht. & Cham.
Mexican white oak	<i>Quercus potosina</i> Trel./ <i>Quercus laeta</i> Liebm.
No common name	<i>Quercus resinosa</i> Liebm.
New Mexcio locust	<i>Robinia neomexicana</i> Gray
True fir species	<i>Abies</i> spp.
White fir	<i>Abies concolor</i> (Gord. & Glend.) Lindl. ex Hildebr.
Corkbark fir	<i>Abies lasiocarpa</i> var. <i>arizonica</i> (Merriam) Lemmon
Subalpine fir	<i>Abies lasiocarpa</i> var. <i>lasiocarpa</i> (Hook.) Nutt.
Engelmann spruce	<i>Picea engelmannii</i> Parry ex Engelm.
Blue spruce	<i>Picea pungens</i> Engelm.
Bristlecone pine	<i>Pinus aristata</i> Engelm.
Arizona pine	<i>Pinus arizonica</i> Engelm.
Mexican white pine	<i>Pinus ayacahuite</i> Ehrenb. ex Schltldl.
Nut pine	<i>Pinus cembroides</i> Zucc.
Durango pine	<i>Pinus durangensis</i> Martínez.
Piñon pine	<i>Pinus edulis</i> Engelm.
Apache pine	<i>Pinus engelmannii</i> Carr.
Limber pine	<i>Pinus flexilis</i> James
Chihuahuan pine	<i>Pinus leiophylla</i> Schiede & Deppe
Michoacán pine	<i>Pinus michoacana</i> Martínez.

Weeping pine	<i>Pinus patula</i> Schiede ex Schltdl. & Cham.
Ponderosa pine	<i>Pinus ponderosa</i> var. <i>scopulorum</i> Engelm.
Ocote pine	<i>Pinus oocarpa</i> Schiede ex Schltdl.
Southwestern white pine	<i>Pinus strobiformis</i> Engelm.
Aztec pine	<i>Pinus teocote</i> Schiede & Deppe
Douglas-fir	<i>Pseudotsuga menziesii</i> (Mirb.) Franco
Rocky Mountain Douglas-fir	<i>Pseudotsuga menziesii</i> (Mirb.) Franco var. <i>glauca</i> (Beissn.) Franco
Sycamore species	<i>Platanus</i> spp.
Cottonwood species	<i>Populus</i> spp.
Narrowleaf cottonwood	<i>Populus angustifolia</i> James
Quaking aspen	<i>Populus tremuloides</i> Michx.
Willow species	<i>Salix</i> spp.
Dwarf mistletoe	<i>Arceuthobium</i> spp.
Douglas fir dwarf mistletoe	<i>Arceuthobium douglasii</i> Engelm.

APPENDIX J - GLOSSARY

- A -

adaptive kernel (AK) – Refers to a method of estimating home-range size. This method involves estimating a bivariate probability distribution from the observed animal locations, and it can be used to compute the area containing a specified proportion of those locations. A 75% AK was used to calculate the minimize size of PACs in this plan.

adaptive management – A deliberate and iterative process to optimize management strategies. The process entails formation of a management model, management implementation, monitoring and interpretation of system responses, and ultimately refinement of management model given lessons learned.

adult – A spotted owl >27 months old

- B -

basal area – The cross-sectional area of a tree stem (including bark) near its base, generally measured at breast height (approximately 1.5m above ground level).

before-after-control-impact (BACI) – A specific type of manipulative quasi-experiment. Under the BACI design, potential responses are examined before and after proposed manipulations at control (or reference) sites and at impact sites. Differs from an experiment because treatments are not randomly assigned to experimental units and treatments may not be replicated.

biomass – With respect to individuals, this refers to the weight (mass) of a plant or an animal. With respect to areas or communities, this refers to the total mass of living organisms in that area or community at any given time. With respect to owl diet, this refers to the relative contribution of one species (or group) of prey animals to the overall diet.

biotic disturbance – Disturbance resulting from insects, disease, and pathogens that alters forest/woodland structure and composition.

bosque – A discrete grove or thicket of trees, particularly in lowland or riparian areas of the Southwestern United States and Mexico; for example a cottonwood bosque or a mesquite bosque.

breeding dispersal – Movement of an adult spotted owl from home range to another where they establish a territory and attempt to breed.

burned area emergency response (BAER- USDA) – While many wildfires cause little damage to the land and pose few threats to fish, wildlife and people downstream, some fires create situations that require special efforts to prevent further problems after the fire. Loss of vegetation exposes soil to erosion; runoff may increase and cause flooding, sediments may move downstream and damage houses or fill reservoirs, and put endangered species and community

water supplies at risk. The BAER program addresses these situations with the goal of protecting life, property, water quality, and deteriorated ecosystems from further damage after the fire is out.

burned area rehabilitation (BAR- DOI) – Efforts (non-emergency) undertaken within three years of a wildfire to repair or improve fire-damaged lands which are unlikely to recover to management approved conditions; or to repair or replace minor facilities damaged by fire.

- C -

canopy – A layer of foliage, generally the uppermost layer, in a forest stand. Can be used to refer to midstory or ***understory*** vegetation in multi-layered stands.

canopy closure – An estimate of the percentage of ground covered by overhead vegetation (also canopy cover).

co-dominant tree – The condition of having two equally ***dominant tree*** species in a ***forest type***. The crowns of these trees help to form the main canopy in even-aged stands. In uneven-aged stands, the crowns of these trees are above the crowns of the tree's immediate neighbors and receive full light from above and partial light from the sides.

commercial forest land – Forested land deemed tentatively suitable for the production of timber that has not been withdrawn administratively from timber production (see ***reserved land***).

competition – Occurs when a certain resource (e.g., food) is in limited supply and is used by 2 or more species. Can be exploitative (both species use the same resource) or interference (use by one species precludes use by another).

confidence interval – An interval constructed around a parameter estimate in which that estimate should occur with a specified probability, such as 95% of the time. Bounds of the confidence interval are usually defined by the magnitude of dispersion around a mean value.

connectivity – An estimate of the extent to which intervening habitats connect otherwise disjunct subpopulations of spotted owls.

cover type – Refers to a forest or woodland type, such as ponderosa pine, pine-oak, or mixed-conifer. See also ***forest type*** and ***vegetation type***.

- D -

delist – The process of removing a species from the list of threatened and endangered species.

demography – Demography includes various population parameters such as age structure, fecundity, survival rates, and the like. Data from these parameters allows for the quantitative analysis of population structure and trend.

desired conditions – Quantitative and qualitative descriptions of forest and woodland conditions used by spotted owls for nesting, roosting, foraging, and other needs.

diameter at breast height (dbh) – A standard measure of tree diameter measured approximately 1.5 m (4.5 ft) above the ground.

dispersal – The movement of organisms from their one location to another location where they produce offspring. See also ***breeding dispersal*** and ***natal dispersal***.

disturbance – Significant alteration of conditions for owls. Disturbance may alter habitat structure or composition through natural (e.g., fire) or human-caused (e.g., timber harvest) events. Disturbance may also be caused by noise or human activity (e.g., recreation) in close proximity to owls.

dominant tree – The overstory tree species which contributes the most cover or basal area to the ***stand***, compared to other tree species. Dominant trees are those whose crown extends above the general level of the main canopy (Helms 1998).

- E -

early seral stage – An area that is in the early stages of ecological succession.

ecological management unit (EMU) – An updated term for what was previously referred to in the 1995 Recovery Plan as a ***recovery unit (RU)***. A specific geographic area, identified mainly from physiographic provinces, used to evaluate the status of the Mexican spotted owl and within which to develop specific management guidelines.

ecological restoration – Ecological restoration is the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed (Society for Ecological Restoration International Science & Policy Working Group 2004). An intentional activity that initiates or accelerates the recovery of an ecosystem with respect to its health, integrity, and sustainability.

ecological succession – The orderly progression of an area through time from one vegetative community to another in the absence of disturbance. For example, an area may proceed from grass-forb through aspen forest to mixed-conifer forest.

ecosystem – An interacting biophysical system of organisms and their environment.

emergency stabilization (ES-DOI) – Planned actions to stabilize and prevent unacceptable degradation to natural and cultural resource, to minimize threats to life or property resulting from the effects of a fire, or to repair/replace/construct physical improvements necessary to prevent degradation of land or resources.

emigration – Permanent movement of individuals away from a population.

encinal – Of or relating to oaks, particularly plant communities dominated by live oaks.

environmental stochasticity – Random variation in environmental attributes, such as weather patterns or fire regimes.

even-aged forest/stands – Refers to forests composed of trees with a time span of <20 years between oldest and youngest individuals.

even-aged management – The application of a combination of actions that result in the creation of stands in which trees are essentially all of the same age. Cutting methods that produce even-aged stands include clearcuts, seed-tree cuts, and shelterwood cuts.

- F -

fire regime – A description of the frequency, severity, and extent of fires that typically occur in an area or vegetation type.

floater – A member of a spotted owl population that does not hold, maintain, or defend a territory (see Franklin 1992).

forb – A broadleaved, herbaceous plant (e.g., columbine).

forest restoration treatments – Treatments that help recover forest ecosystem resilience and the adaptive capacity of forest ecosystems that have been degraded, or are otherwise outside the natural range of variation that would preclude sustainability through time.

forest type – A means of classifying forests based upon the similarity of species composition and structure. The primary forest types used by the owl in the American southwest are mixed-conifer and pine-oak forests.

fragmentation – The process of reducing the size and connectivity of habitat patches.

fuel loads – The amount of combustible material present per unit area.

fuels – Combustible materials.

fuels-reduction treatments – Reduction of surface and understory fuels, increasing the height to live crown, decreasing crown density, and retaining the majority of large trees of fire-resistant species through thinning and/or the use of fire.

fuelwood – Wood, either green or dead, harvested for purposes of cooking or space heating, and usually measured in cords (1 cord = 128 cubic feet.).

- G -

gene flow – The movement of genetic material among populations.

Geographical Information System (GIS) – A computer system capable of storing and working with spatial data.

graminoids – Any plants of the grass family in particular and also those plants in other families that have a grass-like form or appearance (e.g., sedges).

grazing intensity – A measure of pressure imposed on growing vegetation by feeding herbivorous animals. The number of feeding animals and length and season of use are the main factors that affect vegetation and differentiate grazing intensity.

group-selection cutting – Uneven-aged silvicultural system that entails removing small groups of trees within a restricted area, usually no greater than twice the height of the tallest tree in the group.

- H -

habitat – Suite of existing environmental conditions required by an organism for survival and reproduction. The place where an organism typically lives.

habitat fragmentation – See *fragmentation*.

habitat type – See *vegetation type*.

hanging canyon – A side canyon, the mouth of which lies above the floor of a larger canyon to which the side canyon is tributary.

home range – The area used by an animal in its day-to-day activities.

hybridization – Interbreeding among species resulting in offspring that shares genes from both species. Hybridization has been reported between barred and spotted owls.

- I -

immigration – The movement of individuals from other areas into a given area.

intermediate/suppressed tree position – Trees that are shorter than the dominant and co-dominant, larger trees, yet taller than understory shrubs and herbaceous vegetation.

Intermountain Region – An administrative region of the FS, lying between the Pacific Coastal and Rocky Mountain Ranges and including Utah, Nevada, southern Idaho, and parts of Wyoming and Montana.

J-

juvenile – A spotted owl <5 months old.

- K -

key grazing areas – Primarily riparian areas, meadows (natural), and created openings that receive disproportionate grazing by ungulates due to their location, the quantity and quality of forage they produce, and their grazing or browsing value (Holechek et al. 2001).

- L -

landscape scale – A spatial scale and extent expressed in geographic terms within which to target action, e.g., projects aimed at forest landscape restoration. Landscapes may be defined by watersheds or other topographic or administrative units. Our definition of landscape scale is determined by the particular research or management issue being addressed. The appropriate scale may therefore vary from a particular watershed to a national forest boundary or a specific forested region (such as all ponderosa pine forest on the Mogollon Rim).

large tree – In this Recovery Plan, large trees are defined as trees ≥ 46 -cm (18-inches) dbh.

ladder fuel – Dead or living fuels that connect fuels on the forest floor to the canopy and promote the spread of surface fires to tree crowns.

Land Resource Management Plan (LRMP) – A plan written for the management of a National Forest. These plans were mandated by the National Forest Management Act of 1976.

late seral stage forest – A forest in the latter stages of development, usually dominated by large, old trees.

- M -

macrohabitat – Landscape-scale features that are correlated with the distribution of a species; often used to describe seral stages or discrete arrays of specific vegetation types.

madrean – Pertaining to Mexico's Sierra Madre cordillera, or to plant species or communities whose primary affinity is to that region (see also **Petran**).

madrean pine-oak forest – Forests in which any of several pines characterize the overstory and in which midstory oaks are mostly evergreen species. Many of the dominant species are **Madrean** in affinity. See Marshall (1957) for descriptions. This habitat type was included as pine-oak by Fletcher and Hollis (1994).

majority – For purposes of this plan in regards to our definitions for *forest types*, we use this term to refer to the situation where a single tree species contributes >50% of the basal area (Eyre 1980).

management experiment – A manipulative experiment conducted through partnership of professional managers and scientists to quantify the effects of one or more management activities.

mechanical treatments – Any activity (e.g., silvicultural thinning, biomass removal) performed by human-controlled tools (e.g., chainsaw, feller-buncher) that results in the removal or alteration of wood fiber. Does not include the use of fire.

mesic – Of or relating to conditions between hydric and *xeric* or the specific quality of being adapted to conditions between wet and dry.

metapopulation – Systems of local populations connected by dispersing individuals.

microhabitat – Habitat features at a fine scale; often identifies a unique set of local habitat features to describe those associated with specific owl activities such as nesting, roosting and foraging.

microtine – For the purposes this plan, any vole of the genus *Microtus*.

midstory – Intermediate tree position in a forested stand. These trees are shorter than the dominant and co-dominant, larger trees, yet taller than understory shrubs and herbaceous vegetation.

migration – The seasonal movement from one area to another and back.

mixed-conifer forest type – Overstory species in these forests include Rocky Mountain Douglas-fir, white fir, Rocky Mountain ponderosa pine, quaking aspen, southwestern white pine, limber pine, and blue spruce. Refer to Appendix C.2.b.iii for a more precise discussion and definition of mixed-conifer forest type.

model – A representation of reality, based on a set of assumptions, that is developed and used to describe, analyze, and understand the behavior of a system of interest.

monitoring – The process of collecting information to track changes of selected parameters over time.

mousing – A technique used to assess reproductive status of a pair of spotted owls. Entails feeding mice to adult owls and observing the owls' subsequent behavior.

multi-layered (or multi-storied) stands – Forest stands with >2 distinct canopy layers. Applied to forest stands that contain trees of various heights and diameters and therefore support foliage at various heights in the vertical profile of the stand.

- N -

natal dispersal – Occurs after the fledging period when juveniles leave their nest site to settle and establish a breeding territory.

nest/roost recovery habitat – Areas managed to replace nest/roost habitat lost to disturbance or senescence and to provide new nest/roost habitat for a recovering owl population.

null hypothesis – A hypothesis stating that there is no difference between units being compared.

- O -

occupancy – Use of and presence within a specific area by one or more owls.

old growth – An old forest stand, typically dominated by large, old trees, with relatively high canopy closure and a high incidence of snags, as well as logs and other woody debris.

opening – A break in overstory and understory plant canopy as created by the natural absence or physical removal of trees and shrubs. Quantitative descriptions may be based on overhead canopy closure (e.g., an area of defined size with <10% cover) or on density of trees (e.g., an area of relevant size with fewer than five trees ≥ 11 inches in diameter). The size of area will depend on the ecological objective being considered. Relevant to habitat use by spotted owls, a small opening would be 0.10 ha (0.25 ac), and a large opening would be > 0.81 ha (> 2 ac).

other forest and woodland types – Vegetation types that are neither **restricted** or within **PACs** as to management recommendations provided in this Recovery Plan.

Other Riparian Habitat – Those forested riparian areas that currently are not used by spotted owls for nesting and breeding season roosting but may provide habitat for dispersing and wintering spotted owls.

overstory – The highest limbs and foliage of a tree, and consequently extending and relating to the upper layers of a forest canopy.

- P -

pellet – A compact mass of undigested material remaining after preliminary digestion and eliminated by regurgitation rather than by defecation.

peromyscid – Any mouse in the genus *Peromyscus* of the family Muridae (formerly Cricetidae).

petran – Pertaining to the Rocky Mountain area. Used to identify plant associations or species that have their primary affinity to the Rocky Mountain area (see also **madrean**).

physiognomy – The characteristic features or appearance of a plant community or vegetation.

physiographic province – A geographic region in which climate and geology have given rise to a distinct array of land forms and habitats.

pilot study – A preliminary study conducted to evaluate the efficacy of study design components, including sampling design, field methods, and sample size.

pine-oak forest type – Stands within the *Pinus ponderosa* and *Pinus leiophylla* series that exhibit a pine overstory and oak understory. Refer to Appendix C.2.b.ii for these criteria and a more precise discussion and definition.

plurality – The situation where a species (or group of species of interest) comprises the largest proportion, but not a *majority*, of a mixed-species stand (Eyre 1980).

ponderosa pine forest type – Any forested stand of the *Pinus ponderosa* Series not included in the pine-oak forest type definition, or any stand that qualifies as pure (i.e., any stand where a single species contributes >80% of the basal area of dominant and codominant trees) ponderosa pine, regardless of the series or habitat (see also Eyre 1980). Refer to Appendix C.2.b.i for a more precise discussion and definition.

population – A collection of individuals that share a common gene pool.

population density – The number of individuals per unit area.

population viability – The probability that a population will persist for a specific period of time, despite demographic and environmental stochasticity.

power – With respect to statistical comparisons, refers to the probability of not making a Type-II error.

pre-commercial thinning – The practice of removing some of the smaller trees in a stand so that remaining trees will grow faster.

prescribed fire – A wildland fire burning with planned ignitions under specified conditions.

prey – The collection of species taken by spotted owls as food. These are typically small-medium sized mammals and birds.

protected activity center (PAC) – An area established around an owl nest (or sometimes roost) site, for the purpose of protecting that area. Management of these areas is largely restricted to managing for forest-health objectives.

protected habitat – See *protected activity center (PAC)*.

pure stand – A plant community in which a single species is predominant. For purposes of this plan, we use this term to refer to any stand where a single species contributes >80% of the basal area of ***dominant*** and ***co-dominant trees***.

- R -

recovery – As provided by the Endangered Species Act and its implementing regulations, the process of returning a threatened or endangered species to the point at which protection under the Endangered Species Act is no longer necessary.

recovery habitat – As used within this Recovery Plan, areas outside of PACS managed as nest/roost, foraging dispersal, and wintering habitat. Recovery habitat includes pine-oak, mixed-conifer, and riparian forests well as rocky canyons.

recovery plan – As provided by the Endangered Species Act, a plan for management of a threatened or endangered species that lays out the steps necessary to recover a species (see ***recovery***).

recovery team – A team of experts appointed by the Fish and Wildlife Service whose charge is development of a ***Recovery Plan***.

recovery unit (RU) – A specific geographic area, identified mainly from physiographic provinces, used to evaluate the status of the Mexican spotted owl and within which to develop specific management guidelines. This term has been replaced by ***ecological management unit*** (EMU) in the first revision (2012) of this plan.

recruitment – The addition of individuals to a population from birth and immigration.

reserved lands – Lands that have been administratively withdrawn from commercial activities, such as wilderness areas or research natural areas.

riparian forests – Riparian forests are plant communities affected by surface and subsurface hydrologic features of perennial or intermittent water bodies (e.g., rivers, streams, lakes). Riparian forests have one or both of these principle characteristics: (1) distinctively different tree and shrub species than the adjacent areas and/or (2) tree species similar to adjacent areas but exhibiting more vigorous or robust growth forms (FWS 2009).

riparian recovery habitat – Consists of riparian forests outside of PACs that could frequently be used by owls for foraging, roosting, daily movements, dispersal, and potentially for nesting. See also, ***other riparian habitat***.

Rocky Mountain Region – An administrative region of the FS, including Colorado, Nebraska, South Dakota, and parts of Wyoming.

rotation – The planned number of years between regeneration of a forest stand and final harvest of that stand.

- S -

salvage – Removal of dead, damaged, or unhealthy trees following fire or insect epidemic to recover economic value from the trees.

sanitation salvage – Removal of dead, damaged, or susceptible trees primarily to prevent the spread of pests or pathogens and to promote forest health.

seral species – Any plant or animal that is typical of a seral community (stage).

seral stage – Any plant community whose plant composition is changing in a predictable way; for example, an aspen community changing to a coniferous forest community.

shelterwood cut – An even-aged regeneration cutting in which new tree seedlings are established under the partial shade of remnant seed trees.

silviculture – The practice of controlling the establishment, composition, and growth of forests.

single-tree selection cutting – A cutting method based on removal of individual trees, rather than groups of trees (see also **group selection cutting**).

sink – In a population sense, refers to a population where death rate exceeds birth rate. Such a population can result in a decline (see also **source**).

snag – A standing dead tree.

source - In a population sense, refers to a population where birth rate exceeds death rate. Such a population produces an excess of juveniles that can disperse to other populations (see also **sink**).

Southwestern Region – An administrative unit of the FS, including Arizona, New Mexico, and grasslands in the Oklahoma and Texas panhandle; and, an administrative unit of the FWS, including Arizona, New Mexico, Texas and Oklahoma.

spruce-fir forest type – High-elevation forests occurring on cold sites with short growing seasons, heavy snow accumulations, and strong ecological and floristic affinities to cold forests of higher latitudes. In general, dominant trees include Englemann spruce, subalpine and/or corkbark fir, or sometimes bristlecone pine. Refer to Appendix C.2 for a more precise discussion and definition.

stand – Any homogeneous area of vegetation with more or less uniform soils, landform, and vegetation. Typically used to refer to forested areas.

stochastic – Random or uncertain.

stringers – Narrow bands of trees that extend into confined areas of suitable habitat such as in ravines.

sub-adult – A spotted owl between 5-26 months old.

subpopulation – A well-defined set of individuals that comprises a subset of a larger, interbreeding population (see also ***metapopulation***).

survivorship – The proportion individuals that survive from one time period to the next. Usually measured from year to year in terms of annual survival.

- T -

target population – The group of subjects for which a scientific conclusion can be applied. The target population is established at the onset of a scientific investigation and helps to shape sampling procedures.

team – The Mexican Spotted Owl Recovery Team.

territory – The area that an animal defends against intruders of its own species. Not synonymous with ***home range***, as parts of the home range are typically shared with other individuals.

transient owl – Any Mexican spotted owl that is away from a territory whether a floater, wintering bird, migrant, disperser, etc.

type-I error – The error made when a null hypothesis that is true is inappropriately rejected, as when concluding that two samples from a single population come from two different populations.

type-II error – The error that is made when a null hypothesis that is false is not rejected, as when concluding that two samples from different populations came from a single population.

- U -

understory – Any vegetation whose canopy (foliage) is below, or closer to the ground than, canopies of other plants. The opposite of ***overstory***.

uneven-aged management – The application of a combination of actions needed to simultaneously maintain continuous tall forest cover, recurring regeneration of desirable species, and the orderly growth and development of trees through a range of diameter or age classes. Cutting methods that develop and maintain uneven-aged stands are single-tree selection and group selection.

- V -

vegetation types – A land classification system based upon the concept of distinct plant associations. Vegetation or habitat types (plant associations) have been documented for western forests, and keys to their identification are available. The primary vegetation (or habitat) types used by Mexican spotted owls are discussed in Appendix C.

viability – Ability of a population to persist through time (see **population viability**).

vital rates – Collective term for age- or stagespecific demographic rates, such as birth and death rates, of a population.

vole – Any small rodent in the genus *Microtus*, *Clethrionomys*, or *Phenacomys*, all in the family Muridae.

- W -

wildland fire – A term describing any non-structure fire that occurs in the wildland. Wildland fires are categorized into two distinct types: *Wildfires* (includes both unplanned ignitions and planned ignitions that are declared wildfires. The wildfire term is to be applied to all unplanned ignitions including those events formally termed wildland fire use) and *Prescribed Fires* (planned ignitions).

- X -

xeric – Of or relating to perennially dry conditions or the specific quality of being adapted to dry conditions.

APPENDIX K – MOUNTAIN-PRAIRIE REGION (REGION 6) CONCURRENCE



IN REPLY REFER TO:
FWS/R6
ES

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Mountain-Prairie Region

MAILING ADDRESS:
P.O. BOX 25486, DFC
Denver, Colorado 80225-0486

STREET LOCATION:
134 Union Boulevard
Lakewood, Colorado 80228-1807



SEP 5 2012

Memorandum

To: Regional Director, Region 2
Attention: Wendy Brown

From: ^{Deputy} Regional Director, Region 6

Subject: Concurrence on the Final Mexican Spotted Owl Recovery Plan, First Revision

Thank you for the opportunity to participate in the development of the subject recovery plan. Our Colorado Field Office and Utah Field Office contributed to this ambitious undertaking. We concur with the final plan and look forward to working with the Southwest Region and all of our partners as we work toward recovery and eventual delisting.